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XISAAB

FASALKA LABADA

2

DUGSIGA SARE

Wasaaradda Waxbarashada iyo Barbaarinta
Xafiiska Manaahijta

Waxaa Iagu Daabacay W.M.Q, 1978

HORDHAC

Buugaagta Xisaabta dugsiyada Sare oo ah afar is-dabayaal, waxaa la filayaa in ay si habboon u tebiyaan fikradaha xisaabta ee ardayda dugsiyada Sare ee Soomaaliyeed u baahan yihiin.

Buugaagtu. asal ahaan, waa kuwii hore loogu istic-maali jirey dugsiyadeenna Sare ee loogu qoray af-ingiriisiga, hase ahaatee cutubyada intooda badan waa la ballariyay. cutubyo dhowr ahna waa lagu kordhiyay.

Cutubyada buug walba waxay u kala hormarsan yihiin siday Manhajka Xisaabta dugsiyada Sare ay ugu kala horreeyaan.

Haddaba. bare xisaab kasta waxa u bannaan in uu u kala horreysiiyo cutubyada sida uu isagu door u bido ardaydiisa.

Bareyaasha xisaabta ee dhigi doona buugaagtan iyo maamuleyaasha waxaa laga codsanayaa in ay si toos ah ula xidhiidhan Xafiiska Manaahijka. oo ay u sheegan dhalilaha buugaagta iyo sidii loo hagaajin lahaa, haddii ay jiraan dhaliillo.

Buuggan oo ah kii labaad buugaggaa aan soo sheegray oo loogu talagalay Fasalka labaad ee dugsiyada Sare wuxuu ka kooban yahay Shan Cutub: Isle'egta Saabley, Jibbaarro iyo Xididsheyaal, Sunsunno iyo Dareerinno, Xisaabta Ganacsiga iyo Joometari.

Buugaagtan waxa tarjumay. Guddidii buug-qoraalka xisaabta dugsiyada Sare. Guddidu waxa uu ka koobnaayeen Jaalle Cusmaan Aadan (Badawi), Xasan Daahir Obsaaye. Maxamed Cabdulle Biriir. Xuseen Maxamed Xaaji Cumar (Xanaan), Maxamed Cali Muuse. Maxamed Saciid Samatar. Maxamed Cabdiraxmaan Yusuf, Ibrahim Aw Aadan. Muuse Cabdi Cilmi iyo Cali Maxamed Xirsi

Sawirrada buugagga waxaa sameeyey Cabdiraxmaan Cali Maxamed, Maxamed Cabdalla Cali, Maxamed Xirsi Faarax, Axmed Maxamed Cali iyo Cabdullaahi Riyaale Wacays. Dhammaantoodna way mahadsan yihiin

Waxaa kale oo mahad leh Jaalle Axmed Ibrahim Jamac oo isku dubbaridka iyo hubinta habsami-ku-soo-baxa buugga fasalka labaad Xafiiska Manaahijtu u xilsaaray.

Waxaa iyana aqoonsi leh kooxdii ugu horreysay arrayda xisaabta ee Kulliyada Waxbarashada Lafoole. oo ahaa qorayaashii buugaggan oo ugu horreyn ku soo baxay afka Ingiriisiga. Waxay ahaayeen Jaalle Bashiir Faarax Kaahiye, Xasan Daahir Obsiiye, Cabdiraxmaan X. Cabdalla Caciid. Cali Iid Ibrahim, Xuseen Maxamed X. Cumar, Axmed Saciid Diiriye iyo Cawil Cali Cabdi. Mahad gaar ah waxaa leh Brofesar Cabdikariim Cashuur oo abaabulay buug-qoraalkaa ugu horreeyay iyo Maxamed Cilmi Bulaale oo saxay iskuna dubbaridy buugaagtaas hore.

Waxa kale oo mahad naq naga mudan Shaqaalaha Wakaaladda Madbacadda Qaranka ee xilkoodii sida habsamida ah u gutay..

Maamulaha Xafiiska Manaahijta

Cabdiraxmaan Timir Cali

Cutubka I

ALJEBRA

Cutub II

I. JIBBAARRO IYO XIDIDSHEYAAL

II. LOGARDAM

Cutubka III

SUNSUNNO IYO DAREERINNO

Cutubka IV

XISAABTA GANACSIGA

Cutubka V

JOOMETERI

Cutub I

ALJEBRA

Isleegta Saabley.

Isleegta saableyda ahi waa midda heerka labaad leh, t.a. $3x^2 = 27$, $x^2 = 16a$, $x^2 - 1 = 0$ ama $x^2 + 6x + 9 = 0$. Guud ahaan isleegta saableyda sansaankeeda beegalka ahi waa: $ax^2 + bx + C = 0$. Garaafkeeduna sidaan arki doonno, ama magaceedu tilmaamayo waa: **Qaab saab**.

Inta aynaan u gelin furfurista isleegta aan hormarinno aragtiinka soo socda:

ARAGTIIN

Haddii laba tiro oo maangal ah tarankoodu eber yahay, waxa jirta in mid eber tahay (labaduba eber waa noqon karaan, laakiin xaaladaasi muhiim ma aha).

Caddayn.

I. Ka soo qaad $b, t \in R$, $b \cdot t = 0$, $b \neq 0$.

Mar haddii $b \neq 0$ waxa jirta tiro $\frac{1}{b} \in R$. $\frac{1}{b}$ ku dhufo $b \cdot t = 0$ dhinac kasta: $\frac{1}{b} \cdot b \cdot t = \frac{1}{b} \cdot 0$; u kaalay $\left(\frac{1}{b} \cdot b\right) \cdot t = \frac{1}{b} \cdot 0$. Taranka tiro iyo rogaalkeedu waa 1. Markaa $\frac{1}{b} \cdot b = 1$; $1 \cdot t = 0$ $t = 0$.

II. Sidoo kale ka soo qaad b, $t \in R$, $b \cdot t = 0$, $t \neq 0$. Soo raac tallaabooyinka I, waxad iman $b = 0$.

Isleegta saabley oo idil waxa furfura aragtiinka sare, siiba haddii isleegtu u qoran tahay sansaanka:

$$b^2 Y^2 - t^2 = 0,\ b,\ t \in R.$$

Tusaale :

Furfur (b): $x^2 = 16$
$x^2 - 16 = 0$ sansaanka beegalka
$(x - 4)(x + 4) = 0$ Isirin

Markaa, $x - 4 = 0$ ama $x + 4 = 0$

Haddii $x - 4 = 0$ markaa $x = 4$

Haddiise $x + 4 = 0$ markaa $x = -4$

Urur furfuristu waa $\{4, -4\}$

OGOW: 4 iyo -4 oo keli ah ayaa haddii la labajibbaaro soo baxa 16.

Furfur (t): $3x^2 - 2 = 2x^2 + 10$
$3x^2 - 2x^2 - 2 - 10 = 0$
$x^2 - 12 = 0$
$(x - \sqrt{12})(x + \sqrt{12}) = 0$
$x = \sqrt{12}$ ama $x = -\sqrt{12}$

Sii fududee: $x = 2\sqrt{3}$ ama $x = -2\sqrt{3}$.

Xididdada isleegtu waa: $2\sqrt{3}$ iyo $-2\sqrt{3}$

Hubsiimo :

$3x^2 - 2 = 2x^2 + 10$

$3(2\sqrt{3})^2 - 2 = 2(2\sqrt{3})^2 + 10$
$3 \cdot 12 - 2 = 2 \cdot 12 + 10$
$36 - 2 = 24 + 10$
$34 = 34$

ama $3(-2\sqrt{3})^2 - 2 = 2(-2\sqrt{3})^2 + 10$

$3 \cdot 12 - 2 = 2 \cdot 12 + 10$

$34 = 34$

Layliyo :

Furfur isleegyadan, xididdada lakabka la' u dhig sida u fudud. U furfur x.

1) $x^2 - 5 = 11$
2) $2x^2 + 7 = 57$
3) $3x^2 - 9 = x^2 + 27$
4) $14 - x^2 = x^2 - 4$
5) $2(x^2 + 5) = 50$
6) $3x^2 - 9 = x^2 + 21$
7) $7(x^2 - 2) = 3(2 - x^2)$
8) $3x^2 - 5(4 - x^2) = 12$
9) $18 - (x^2 + 6) = 4$
10) $9(8 - x^2) - 2(11 - 4x^2) = 0$
11) $4x^2 = 5$
12) $3x^2 = x^2 + 1$
13) $6 - 2(x^2 - 1) = 3$
14) $15 - (6 - 5x^2) = 18$
15) $2x^2 - 5 = 0 \cdot 3x^2 + 9 \cdot 4$
16) $\dfrac{x^2}{4} = \dfrac{x^2 - 3}{2}$
17) $\dfrac{3x^2 + 5}{3} - \dfrac{x^2 - 1}{5} = 2\dfrac{2}{3}$
18) $\dfrac{6x^2}{5} - \dfrac{2(x^2 + 3)}{4} = -\dfrac{1}{10}$
19) $x^2 + b^2 = 10b^2$
20) $m^2 + x^2 = 3m^2$
21) $a^2x^2 = C^2$
22) $b^2x^2 - C^2 = 3C^2$
23) $mx^2 = 4b^2$
24) $ax^2 + w^2 = 6w^2$

Dariiqooyinka Furfurista Isleegyada Saabley

Isleegyada saabley, dariiqooyinka loo furfuraa waa dariiqada isirinta, dariiqada garaafinta, dariiqada dhammaystirka labajibbaarka iyo dariiqada jidka saabley. Aan siday u kala horreeyaan u wadno. (Fiiri I—IV).

I. DARIIQADA IRISINTA

Sida qaalibka ah, furfurista isleegyada saabley waxa ku jimcoon dariiqooyinkii isirinta, gaar ahaan haddii helista isirradu aanay adkayn. Haddaba dariiqooyinkii isirnita ee tibxaalayaasha aan soo xusuusanno:

Tusaale :

Isiri $2x^2 - 3x + 1$

Waxaad raadisaa laba tiro oo tarankoodu 2 yahay (weheliyaha x^2 iyo madoorsoomaha tarankoodu), isla markaana wadartoodu -3 tahay (weheliyaha x). Labadii tiro waa -1 iyo -2. Hubi, $(-1) \cdot (-2) = 2$, isla markaa $-1 + (-2) = -3$.

Haddaba $2x^2 - 3x + 1$ waxaynnu u dhigi karraa: $2x^2 - 2x - x + 1$. Taas oo tibxaalaha oo isiran inna siinaysa: $2x(x - 1) - 1(x - 1)$; $(2x - 1)\ (x - 1)$.

Hubsiimo:

Isku dhufo:

$$(2x - 1) \text{ iyo } (x - 1) = 2x^2 - 2x - x + 1$$
$$= 2x^2 - 3x + 1.$$

Isleegta aynnu furfurayno dariiqada loo raacayaa waa: u dhig sansaanka beegalka, isiri, dabeedna furfur.

Tusaale :

Furfur $3x^2 = 11x + 20$.

Furfuris :

U dhig sansaanka beegalka ah.

$$3x^2 - 11x - 20 = 0$$

Isiri tibxaalaha bidixda:

$$(3x + 4)\ (x - 5) = 0$$

Dhammaystir furfurista:

$$3x + 4 = 0 \text{ ama } x - 5 = 0$$

$$x = -\frac{4}{3} \text{ ama } x = 5$$

Hubsiimo:

$$3\left[-\frac{4}{3}\right]^2 = 11\left[-\frac{4}{3}\right] + 20 \text{ ama } 3\,(5)^2 = 11\,(5) + 20$$

$$\frac{16}{3} = \frac{16}{3} \qquad \text{ama } 75 = 75$$

Layli :

Isiri tibaaxaha soo socda:

1) $r^2 + 6r + 5$
2) $k^2 - 10k + 9$
3) $x^2 - 3x + 2$
4) $x^2 - x - 6$
5) $a^2 - 5a + 6$
6) $d^2 - 8d + 12$
7) $y^2 - 4y - 5$
8) $s^2 - 3s - 28$
9) $x^2 - 18x + 81$
10) $2x^2 - x - 1$
11) $3x^2 + 2x - 8$
12) $4x^2 - 16$
13) $9x^2 - 30x + 25$
14) $4a^2 - 7a - 15$
15) $2y^2 - 5y - 12$
16) $3x^2 + 30x + 15$
17) $2x^2 - 9x - 5$
18) $100x^2 - 4$
19) $2a^2 + 11a + 12$
20) $3x^2 - 10x + 8$
21) $5a^2 - 6a - 8$
22) $6a^2 + 13a + 6$
23) $6c - 23c^2 + 20$
24) $12x^2 + x + 6$
25) $6a^2 - 17a - 14$
26) $8x^2 - 16x + 8$
27) $15d^2 + 2d - 8$
28) $12x^2 + 6x - 6$
29) $12y^2 + 7y - 12$
30) $18x^2 + 19x - 20$
31) $8x^2 + 9x - 20$
32) $9a^2 + 24a + 16$
33) $12x^2 - 17x - 14$
34) $10b^2 - 89b - 9$
35) $24a^2 + 26a - 15$

Furfur isleeg kasta. Hubi jawaabaha.

1) $x^2 + 8x + 12 = 0$
2) $y^2 - 4y - 5 = 0$
3) $s^2 - 3s - 28 = 0$
4) $2x^2 - x - 1 = 0$
5) $x^2 - 18x + 81 = 0$
6) $3x^2 + 2x = 8$
7) $4x^2 - 16 = 0$
8) $9x^2 + 25 = 30x$
9) $4a^2 = 7a + 15$
10) $5y + 12 = 2y^2$
11) $x^2 - 6x - 55 = 0$
12) $w^2 - 15w + 54 = 0$
13) $2x^2 + x - 1 = 0$
14) $3x^2 - 2x - 1 = 0$
15) $2x^2 = x + 15$
16) $3y^2 + 20y = 7$
17) $3w^2 + 3w = 18$
18) $6x^2 + 13x + 5 = 0$
19) $ax^2 - 17ax + 66a = 0$
20) $3x^3 + 30x^2 + 75x = 0$
21) $4x^2 - 5 = 0$

ISLEEGTA SAABLEY OO XIDDID MAANGAD AH LEH

Haddii aynnu doonno furfurista $x^2 + 1 = 0$ uma heli karro xididdo maangal ah, yacni $\{x \mid x \in R,\ x^2 + 1 = 0\} = \phi$ Hase yeeshee, waxa xididkiisa laga heli karaa ururka tirooyinka maangadka ah. Muddo, ku dhowaan 400 sano ka dambeysey, ayaa Rafael Bombelli oo u dhashay dalka Talyaanigu soo dejiyey fikradda tirooyinka maangadka ah. Wixii ka dambeeyey, aad baa loo adeegsaday laguna dhisay xisaabta iyo cilmiyadaba kalaba. Aan u soo noqonno isleegta $x^2 + 1 = 0$.

Furfuristeedu waa $x^2 = -1$ $x = \pm\sqrt{-1}$. Haddaba tirada $\sqrt{-1}$ kuma jirto ururka R. $\sqrt{-1}$ waa tiro maangad ah. Marka waxa muuqata in

$$\sqrt{-1} \cdot \sqrt{-1} = (\sqrt{-1})^2 = -1.$$

Isleegtii oo dariiqada isirinta lagu furfuray waa:

$x^2 - (\sqrt{-1})^2 = 0$ t.a. $(x - \sqrt{-1})\ (x + \sqrt{-1}) = 0$

$x = \sqrt{-1}$ ama $x = -\sqrt{-1}$.

Qormada loo dhigo badiba tirooyinka maangadka waa i.

Tirada $\sqrt{-1}$ aan u qorro i, yacni $\sqrt{-1} = i$. Sidaa awgeed $\sqrt{-9} = \sqrt{9(-1)} = \sqrt{9} \cdot \sqrt{-1} = 3i$, sidoo kale $\sqrt{-3} = i\sqrt{3}$.

Tusaalooyin :

1. Tirooyinkan fududee, adoo isticmaalaya qormada i.

   b) $2\sqrt{-7}$ t) $\sqrt{-125}$ j) $2\sqrt{-4a}$ x) 5

Jawaab :

b) $2\sqrt{-7} = 2\sqrt{-1} \cdot \sqrt{7} = 2i\sqrt{7}$

t) $\sqrt{-125} = \sqrt{25} \cdot \sqrt{-1} \cdot \sqrt{5} = 5i\sqrt{5}$

j) $2\sqrt{-4a} = 2\sqrt{4} \cdot \sqrt{-1} \cdot \sqrt{a} = 2 \cdot 2i\sqrt{a} = 4i\sqrt{a}$

x) $5 = -i^2 \cdot (5)$ ama $-(i\sqrt{5})^2$.

OGOW: $i^2 = -1$; $-i^2 = -(-1) = 1$.

2. Fududee:

   b) $(5i)^2$ t) $(2\sqrt{-3})^2$

Jawaab :

b) $(5i)^2 = 25i^2 = 25(-1) = -25$

t) $(2\sqrt{-3})^2 = (2i\sqrt{3})^2 = 4i^2 \cdot 3 = -12$

Fiiri, tiro maangad ah labajibbaarkeedu waa taban yahay.

Furfur: $(x - 1)^2 + 5 = 0$

Furfuris :

$(x - 1)^2 + 5 = 0$

$(x - 1)^2 - (i\sqrt{5})^2 = 0$

$(x - 1 + i\sqrt{5})(x - 1 - i\sqrt{5}) = 0$

$x = 1 - i\sqrt{5}$ ama $x = 1 + i\sqrt{5}$

Hubsiimo:

$(x - 1)^2 + 5 = 0$

ama

$(1 - i\sqrt{5-1})^2 + 5$
$= (-i\sqrt{5})^2 + 5$
$= -5 + 5 = 0$

$(1 + i\sqrt{5-1})^2 + 5$
$= (i\sqrt{5})^2 + 5$
$= -5 + 5 = 0$

Layli :

Layliyada 1 ilaa 35 fududee, ku isticmaal i tirada maan gadka ah.

1) $\sqrt{-5}$
2) $2\sqrt{-1}$
3) $6\sqrt{-13}$
4) $7\sqrt{-23}$
5) $\sqrt{-49}$
6) $(\sqrt{-8})^2$
7) $3\sqrt{-72}$
8) $(6\sqrt{-12})^2$
9) $3\sqrt{-16a^2}$
10) $(3\sqrt{-4b})^2$
11) $6\sqrt{-49a}$
12) $a\sqrt{-50y}$
13) $\sqrt{-3}$
14) $3\sqrt{-11}$
15) $4\sqrt{-7}$
16) $\sqrt{-4}$
17) $(\sqrt{-36})^2$
18) $\sqrt{-24}$
19) $5\sqrt{-32}$
20) $-5\sqrt{48x^2}$
21) $-5\sqrt{-28}$
22) $(2\sqrt{-9c^2})^2$
23) $7\sqrt{-64x}$
24) $3x\sqrt{-75a}$
25) $\sqrt{-10}$
26) $\sqrt{-15}$
27) $\sqrt{-17}$
28) $\sqrt{-16}$
29) $(\sqrt{-50})^2$
30) $2\sqrt{-18}$
31) $(4\sqrt{-20})^2$
32) $(-2\sqrt{-96})^2$
33) $a\sqrt{-36b^2}$
34) $5\sqrt{-25d}$
35) $-3\sqrt{-25y}$

Layliyada 36 iyo 55 furfur isleegyada.

36) $x^2 + 2 = 0$
37) $x^2 + 11 = 0$
38) $x^2 + 19 = 0$
39) $x^2 + 18 = 0$
40) $x^2 + 20 = 0$
41) $(x - 1)^2 + 3 = 0$
42) $(x - 2)^2 + 11 = 0$
43) $(x - 4)^2 + 11 = 0$
44) $(x - 3)^2 + 5 = 0$
45) $(x + 6)^2 + 17 = 0$
46) $x^2 + 5 = 0$
47) $x + 7 = 0$
48) $x^2 + 8 = 0$
49) $x + 50 = 0$
50) $x^2 + 75 = 0$
51) $(x - 2)^2 + 1 = 0$
52) $(x - 4)^2 + 7 = 0$
53) $(x + 5)^2 + 7 = 0$
54) $(x - 3)^2 + 13 = 0$
55) $(x + 1)^2 + 21 = 0$

II. DHAMMAYSTIRKA LABAJIBBAARKA

Dhammaystirka labajibbaarka waa magaca la siiyey marka isleegta: $Ax^2 + Bx + C = 0$ loo sansaamiyo $(ax + b)^2 = c$ si loo furfuro. Dariiqada dhammaystirka labajibbaarku way ka ballaaran tahay ta isirinta, gaar ahaan marka helista isirradu adkaato. Waxaad xusuusan tahay, saddex-tibxaalaha $x^2 + 2ax + a^2$ in uu u dhigmo $(x + a)^2$ (laba-tibxaale labajibbaaran).

Sidoo kale $4x^2 + 12x + 9$, waa laba-tibxaale la labajibbaaray maxaa wacay, $4x^2$ iyo 9 waa labajibbaarrada $2x$ iyo 3, tibixda dhexana waa taranka $2x$ iyo 3 oo labalaaban.

Tusaalooyin :

1. Min guuri tibxaalayaashan saableyda ah, oo mid walba ku buuxi tibixda ka dhigeysa laba-tibxaale la labajibbaarey:

   b) $x^2 + 14x$ t) $x^2 + 25$ j) $4x^2 + 16$
   x) $9x^2 + 30x$

Jawaab :

b) $x^2 + 14x$; Mar haddii $14x = 2(7x)$ tibixda labajibbaaran waa: $x^2 + 14x + 49$.

t) $x^2 + 25$; xiddid jibbaarrada x^2 iyo 25 waa: x iyo 5. Markaa tibixda maqani waa: $2 \cdot 5 \cdot x = 10x$. Saddex-tibxaalihii waa: $x^2 + 10x + 25$.

j) $4x^2 + 16$; taranka xidid-jibbaarrada tibxuhu waa: $2x \cdot 4 = 8x$. Markaa tibixda maqani waa labanlaabka 8x, t.a. 16x.

Saddex-tibxaalihii waa: $4x^2 + 16x + 16$.

x) $9x^2 + 30x$; xidid-jibbaarka $9x^2$ waa: 3x; $30x = 2(3x)(5)$. Markaa tibixda maqani waa: $(5)^2 = 25$.

Saddex-tibxaalihii waa: $9x^2 + 30x + 25$.

Isleegtan u dhig sansaanka $(x + b)^2 = t$ dabeedna raadi b iyo t.

1) $x^2 + 5x = 13$ 2) $5 + 8x = 2x^2$

waab :

1) $x^2 + 5x = 13$

$$x^2 + 5x + \left[\frac{5}{2}\right]^2 = 13 + \left[\frac{5}{2}\right]^2$$

$$x^2 + 5x + \frac{25}{4} = 13 + \frac{25}{4}$$

$$\left[x + \frac{5}{2}\right]^2 = \frac{77}{4}$$

$$b = \frac{5}{2} \quad t = \frac{77}{4}$$

2) $5 + 8x = 2x^2$

$$\frac{5}{2} + 4x = x^2$$

$$x^2 - 4x + 4 = \frac{5}{2} + 4$$

$$(x - 2)^2 = \frac{13}{2}$$

$$b = -2 \quad t = \frac{13}{2}$$

Layli :

B. Min guuri tibaax kasta oo ku buuxi tibixda ka dhigaysa laba-tibxaale labajibbaaran.

1) $x^2 - 12x + \ldots\ldots$
2) $x^2 + 5x + \ldots\ldots$
3) $4w^2 + 4w + \ldots\ldots$
4) $9s^2 + 30s + \ldots\ldots$
5) $x^2 + \ldots\ldots + 9 \ldots\ldots$
6) $100y^2 + \ldots\ldots + 9$
7) $\ldots\ldots + (-20w) + 25$
8) $\ldots\ldots + 36r + 36$
9) $8x + 4 + \ldots\ldots$
10) $25 + 70k + \ldots\ldots$
11) $x^2 + 11x + \ldots\ldots$
12) $x^2 + 20$
13) $5x + 9$
14) $8x + 10$
15) $4x^2 + 30$
16) $9x^2 + 3x$
17) $4a^2 + 20ab$
18) $25 - 36w$
19) $(1 + a)^2 + 4(1 - a)$
20) $B^4 + 10B^2$

T. Isle'eg kasta sidan $(x + b)^2 = c$ u sansaami, soona saar b iyo c.

1) $x^2 - 6x = 11$
2) $x^2 + 16x - 3 = 0$
3) $x^2 + 5 = 5x$
4) $2x^2 + 8x + 3 = 0$
5) $3x^2 + 6x - 2 = 0$
6) $2x^2 + 6x = 7$
7) $3x^2 - 9x = 0$
8) $5x^2 + 10x - 12 = 0$
9) $\frac{1}{2}x^2 - 3x + \frac{7}{2} = 0$
10) $ax^2 + 2bx + c = 0$
11) $x^2 + rx + s = 0$
12) $(x + 1)(x - 1) = 4x$
13) $(x + 2)(x - 3) = 0$
14) $5x^2 + x = 0$
15) $21x = 7 - 14x^2$
16) $kx = m - mx^2$

Ku furfur isla dhammaystirka labajibbaarka.

Marka aynnu u dhigno isleegta $2x^2 + 3x + 7 = 0$ oo kale sansaanka $(x + b)^2 = t$, waxaynnu midiidsan habka isirinta iyo aragtiinkii aynnu soo aragnay.

Tusaalooyinka :

1. $x^2 - 8x + 3 = 0$. Ku furfur dariiqada buuxinta labajibbaarka.

Furfuris :

$$x^2 - 8x + 3 = 0$$
$$x^2 - 8x = -3$$

-8 barkeed oo labajibbaaran ku dar dhinac walba.

$$x^2 - 8x + 16 = -3 + 16$$

Midigta waxa yaalla laba-tibxaale labajibbaaran, isiri.

$$(x - 4)^2 = 13$$

$(\sqrt{13})^2 = 13$ midigta u soo rar.

$$(x - 4)^2 - (\sqrt{13})^2 = 0$$

Sii isiri

$$(x - 4 - \sqrt{13})\ (x - 4 + \sqrt{13}) = 0$$

Haddaba:

$x = 4 + \sqrt{13}$ ama $x = 4 - \sqrt{13}$, aragtiinkii.

2. Furfur: $x^2 + 6x - 3 = 0$

Furfuris :

$$x^2 + 6x - 3 = 0$$
$$x^2 + 6x = 3$$
$$x^2 + 6x + 9 = 3 + 9$$
$$(x + 3)^2 - 12 = 0$$
$$(x + 3 - \sqrt{12})\ (x + 3 + \sqrt{12}) = 0$$
$$x = -3 + \sqrt{12} \text{ ama } x = -3 - \sqrt{12}$$
$$x = -3 + 2\sqrt{3} \text{ ama } x = -3 - 2\sqrt{3}$$

Hubsiimo.

$$x^2 + 6x - 3 = 0$$

i) $(-3+2\sqrt{3})^2+6(-3+2\sqrt{3})-3=0$

$(9-12\sqrt{3}+12)+(-18)+12\sqrt{3}-3=0$

$0=0$

ama

ii) $(-3-2\sqrt{3})^2+6(-3-2\sqrt{3})-3=0$

$(9+12\sqrt{3}+12)+(-18)-12\sqrt{3}-3=0$

$0=0$

3. Furfur: $2x^2+5x+4=0$

Furfuris :

$$2x^2+5x=-4$$

$$x^2+\frac{5}{2}x+\frac{25}{16}=-2+\left(\frac{5}{4}\right)^2$$

$$\left(x+\frac{5}{4}\right)^2=-\frac{7}{16}$$

$$\left(x+\frac{5}{4}\right)^2+\frac{7}{16}=0$$

$$\left(x+\frac{5}{4}\right)^2-\left(\frac{i\sqrt{7}}{4}\right)^2=0$$

$$\left(x+\frac{5}{4}+\frac{i\sqrt{7}}{4}\right)\left(x+\frac{5}{4}-\frac{i\sqrt{7}}{4}\right)=0$$

$$x=-\frac{5}{4}-\frac{i\sqrt{7}}{4} \text{ ama } x=-\frac{5}{4}+\frac{i\sqrt{7}}{4}$$

$$x=-\frac{5+i\sqrt{7}}{4} \text{ ama } x=\frac{-5+i\sqrt{7}}{4}$$

$$2x^2 + 5x + 4 = 0$$

$$2\left[-\frac{5+i\sqrt{7}}{4}\right]^2 + 5\left[-\frac{5+i\sqrt{7}}{4}\right] + 4 = 0$$

$$2\left[\frac{25+10i\sqrt{7}-7}{16}\right] + \frac{-25-5i\sqrt{7}}{4} + 4 = 0$$

$$\frac{18+10i\sqrt{7}}{8} + \frac{-50-10i\sqrt{7}}{8} + \frac{32}{8} = 0$$

$0 = 0$ Hagaag.

Sidaas oo kale

$$2\left[-\frac{5-i\sqrt{7}}{4}\right]^2 + 5\left[-\frac{5-i\sqrt{7}}{4}\right] + 4 = 0$$

$0 = 0$ Hagaag.

Layli :

Ku furfur habka dhammaystirka labajibbaarka, hubina iid kasta. Xididdada u dhig sida u fudud.

1) $x^2 - 2x - 8 = 0$
2) $x^2 + 4x + 4 = 0$
3) $x^2 - 7x - 18 = 0$
4) $2w^2 - w = 3$
5) $4y^2 - 9y = 9$
6) $x^2 + 16x - 16 = 0$
7) $w^2 - 3w - 40 = 0$
8) $x^2 + 9x = 0$
9) $2x^2 - \frac{1}{4}x - \frac{3}{3} = 0$
10) $3y^2 - 4y = 4$
11) $x^2 - 5x = 24$
12) $x^2 - 2x - 2 = 0$
13) $x^2 - 2x + 2 = 0$
14) $9x^2 + 2x + 2 = 0$
15) $9x^2 - 2x - 2 = 0$
16) $2x^2 + 5x + 8 = 0$
17) $15x^2 + 11 = 0$
18) $5x^2 + x - 6 = 0$
19) $kx^2 - 4kx + k^2 = 0$
20) $kx^2 - kx - 1 = 0$
21) $x^2 - 4x + 2 = 0$
22) $2x^2 - 4x + 1 = 0$

23) $x^2 + 6x + 10 = 0$

24) $x^2 - 3x + \frac{7}{4} = 0$

25) $-4x^2 + 6x - 1 = 0$

26) $y^2 - y + 5 = 0$

27) $\frac{3x^2}{2} - 6x + 3 = 0$

28) $5x^2 - \frac{10}{3}x = 0$

29) $5x^2 + 10kx = 1$

30) $ax^2 + bx + c = 0$

III. JIDKA SAABLEYDA

Isleeg kasta oo heerka labaad ah waxa loo sansaamin karaa sida: $ax^2 + bx + c = 0 \quad a \neq 0$. Marka isleegtii la garab dhigo sansaankaa waxa la heli karaa tirooyinka ku aaddan a, b iyo c. Bilmetel isleegyadan:

1) $2x^2 - 3x + 6 = 0 \quad a = 2; \quad b = -3; \quad c = 6.$
2) $x^2 - 17 = 0 \quad a = 1; \quad b = 0; \quad c = -17.$
3) $6x^2 = 8 - x = 0$, oo u dhigma $6x^2 + x - 8 = 0$, $a = 6; \quad b = 1; \quad c = -8.$
4) $(4 - x)^2 = 0$, oo u dhigma $x^2 - 8x + 16 = 0$, $a = 1; \quad b = -8; \quad c = 16.$

Haddaba, haddii aynnu furfurno isleegta:

$$ax^2 + bx + c = 0 \quad a \neq 0$$

xididdada ka soo baxaa waxay jid u noqon karaan xiddida isleeg kasta oo ah caynka $ax^2 + bx + c = 0 \quad a \neq 0$.

Ka soo qaad $ax^2 + bx + c = 0 \quad a \neq 0$ in uu yahay isleeg saabley ah. Raac habkii dhammaystirka labajibbaarka, dabadeedna furfur.

$$ax^2 + bx = -c$$

$$x^2 + \frac{b}{a}x = -\frac{c}{a}$$

$$x^2 + \frac{b}{a}x + \left(\frac{b}{2a}\right)^2 = \left(\frac{b}{2a}\right)^2 - \frac{c}{a}$$

$$\left(x + \frac{b}{2a}\right)^2 = \frac{b^2 - 4ac}{4a^2}$$

$$x + \frac{b}{2a} = \frac{\sqrt{b^2 - 4ac}}{2a} \quad \text{ama} \quad x + \frac{b}{2a} = \frac{-\sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-b + \sqrt{b^2 - 4ac}}{2a} \quad \text{ama} \quad x = \frac{-b - \sqrt{b^2 - 4ac}}{2a}$$

Sangaabta: $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Weedhan u dambeysa waxa la yiraahdaa Jidka saableyda, waxayna ka adeegtaa furfurista guud ee isleegta saabley.

Tusaalooyin :

1) Furfur: $x^2 + 2x - 5 = 0$

Furfuris :

Aan adeegsano jidka saableyda:

$a = 1,\ b = 2,\ c = -5$

Markaa $x = \dfrac{-2 \pm \sqrt{2^2 - 4 \cdot 1 \cdot (-5)}}{2 \cdot 1}$

$$= \frac{-2 \pm \sqrt{24}}{2}$$

$$= \frac{-2 \pm 2\sqrt{6}}{2}$$

$$= -1 \pm \sqrt{6}$$

2) Furfur: $2x^2 - 5 = 6x$

Furfuris :

U sansaami sida: $ax^2 + bx + c = 0$

$2x^2 - 6x - 5 = 0;\quad a = 2;\ b = -6;\ c = -5$

Markaa $$x = \frac{6 \pm \sqrt{(-6)^2 - 4 \cdot 2 \cdot (-5)}}{2 \cdot 2}$$

$$= \frac{6 \pm \sqrt{76}}{4}$$

$$= \frac{3 \pm \sqrt{19}}{2}$$

Layli :

Layliyada 1 ilaa 10 dhig tirooyinka ku aaddan a, b iyo c markaad isleeg kasta garab dhigto sansaanka $a^2 + bx + c = 0$.

1) $3x^2 + 2x - 5 = 0$
2) $2x^2 + 3x = 4$
3) $5x^2 = 0$
4) $mx^2 + 3mx + 4 = 0$
5) $\frac{y + 2}{y - 3} = 2y$
6) $x^2 - 3x + 4 = 0$
7) $3x^2 - 14 = 0$
8) $5x^2 - 7x - 6 = 0$
9) $(2x - 3)^2 = 10$
10) $hx^2 + 2hx + (3h + 6) = 0$

Layliyada 11 ilaa 30, furfur mid kasta adoo kaashanaya jidka saableyda.

11) $x^2 + 3x + 1 = 0$
12) $x^2 + 5x + 6 = 0$
13) $x^2 + 4x - 21 = 0$
14) $2x^2 + 7x - 15 = 0$
15) $3y^2 - 7y = 0$
16) $\frac{1}{2}x^2 - 3x - 6 = 0$
17) $6r - 3 = 2r^2$
18) $\frac{x^2 - 5}{4} = 3x$
19) $ax^2 + 2x - 3 = 2r^2$
20) $kx^2 + lx + m = 0$
21) $x^2 - x - 6 = 0$
22) $x^2 - 5 = 0$
23) $y^2 + 5y + 2 = 0$
24) $w^2 + 6w + 6 = 0$
25) $2x^2 = 4 - 5x$
26) $x^2 - \frac{2}{3}x - 1 = 0$
27) $3y^2 + \frac{5}{2}y = 2$
28) $5x^2 = 1 - x$
29) $3x - x^2 - 2x = 0$
30) $7x^2 - 2x + k + 1 = 0$

31) Tus in $ax^2 + bx + c = 0$ marka

$$x = \frac{-b + \sqrt{b^2 - 4ac}}{2a}$$ iyo marka

$$x = \frac{-b - \sqrt{b^2 - 4ac}}{2a}$$

TAKOORAHA SAABLEY

Takooraha isleegta saableyga $ax^2 + bx + c = 0$ waa tirada $b^2 - 4ac$.

tirada $b^2 - 4ac$. Aan u tixgelino saddex arrimood oo kala duwan.

Arrinta 1: Marka $b^2 - 4ac = 0$

Labada xidid ama furfurka jidka saableydu ina siisaa waa:

$$x = \frac{-b + \sqrt{b^2 - 4ac}}{2a}$$ iyo $$x = \frac{-b - \sqrt{b^2 - 4ac}}{2a}$$

Sidaa awgeed labada furfur waa isku mid waana tirada maangalka ah ee $x = \frac{-b}{2a}$

Tusaale :

Furfur: $2x^2 + 4x + 2 = 0$

$b^2 - 4ac = 16 - 4 \cdot 2 \cdot 2 = 0$

$$x = \frac{-4 + \sqrt{0}}{4}$$ ama $$x = \frac{-4 - \sqrt{0}}{4}$$

$x = -1$ ama $x = -1$

Arrinta 2: Haddii $b^2 - 4ac > 0$.

Markaa $\sqrt{b^2 - 4ac}$ waa xidid-jibbaarka tiro maangal ah oo togan. Tiro maangal oo togan, xidid-jibbaarkeedu waa

tiro maangal ah. Haddaba a, b iyo c waa tirooyin maangal sidaa awgeed furfuraddu waa:

$$x = \frac{-b + \sqrt{b^2 - 4ac}}{2a} \text{ iyo } x = \frac{-b - \sqrt{b^2 - 4ac}}{2a}$$

oo ah tirooyin maangal ah.

Bilmetel furfurka $x^2 + 2x - 5 = 0$ waa maangal, sababta oo ah $b^2 - 4ac > 0$.

Arrinta 3: Haddii $b^2 - 4ac < 0$, markaa $\sqrt{b^2 - 4ac}$ waa tiro maangad ah. Aan fududayno:

Haddii $(b^2 - 4ac) < 0$ markaa $-(4ac - b^2) > 0$.

$$\begin{aligned}\sqrt{b^2 - 4ac} &= \sqrt{-1\,(4ac - b^2)} \\ &= \sqrt{-1} \cdot \sqrt{4ac - b^2} \\ &= i\sqrt{4ac - b^2}\end{aligned}$$

OGOW. $\sqrt{4ac - b^2}$ waa tiro maangal ah. Sheeg sababta ay ku noqotay?

Sidaa awgeed furfurka $ax^2 + bx + c = 0$ waa:

$$x = \frac{-b + i\sqrt{4ac - b^2}}{2a}$$

iyo

$$x = \frac{-b - i\sqrt{4ac - b^2}}{2a}$$

Layli :

1) Isleegyada soo socda mid kasta ka dhig sannaanka $ax^2 + bx + c = 0$

1) $x^2 + x - 1 = -x + 2$
2) $x^2 + 8x + 12 = x - 2$
3) $x^2 + 2x - 54 = 3x + 2$
4) $5x - 7 = x^2 + 2x - 5$
5) $4x - 1 = -x^2 - 3x - 13$

2) Furfur isleeg kasta oo layliga 1 ah.

3) Furfur mid kastoo soo socda, la kaasho dariiqada isirinta:

b) $6x^2 - 5x + 1 = 0$
t) $2x^2 - 7x - 15 = 0$
j) $4x^2 - 12x + 9 = 0$
x) $4x^2 - 9 = 0$
kh) $5x^2 - 13x - 6 = 0$

4) Qiimee takooraha mid kasta oo soo socda; sifee furfurka dabeedna furfur.

b) $3x^2 - 2x - 1 = 0$
t) $x^2 - 5x + 4 = 0$
x) $3x^2 - 2x + 1 = 0$
kh) $x^2 - 5x - 4 = 0$

5) Mid kastoo soo socda, u geddi sansaanka beegalka, magacaw a, b iyo c. Qiimee takooraha. Sheeg furfurka jaadka uu noqonayo. Furfur, adoo la kaashanaya jidka saableyda.

b) $x^2 - x - 13 = x + 2$
t) $15x^2 + 2x - 2 = -2x + 2$
j) $4 + x^2 = 7$
x) $-36x + 5x^2 + 16 = 2x - 5$
kh) $-x - 1 = 2x^2 - 6x + 1$
d) $7x^2 + 44 - 54x = 2 - x^2 + x$
r) $x^2 + x + 6 = x + 12$
s) $x^2 - 5x + 6 = x - 7$

6) Saddexagal qumman baa shakaalkiisu 15″ yahay. Wadarta labada dhinac ee kalena waa 21″. Raadi dhererka dhinacyada kale.

7) Laba boqon AB iyo CD ayaa waxay isku gooyaan barta E oo goobo gudaheed ah. Haddii AE = 12″, EB = 3″, raadi dhererka CE iyo ED haddii ED 5″ ka weyn yahay CE.

8) Furfur isleegta: $x^4 - 2x^3 - 2x^2 = 0$

9) Furfur isleegta: $(x + 5)^2 + 3(x + 5) + 2 = 0$.

10) Laydi baa bedkiisu 64′ yahay. Haddii dhererka iyo ballaca wadartoodu 16′ tahay soo saar dhererka, soona saar ballaca.

MASALOOYIN SAABLEY AH

Masalooyin aan yarayn oo nolosheenna soo gala ayaa lagu furfuri karaa isleegta saableyda ah. Masalooyin iman doona, mid walba horta macnaha ka bogo, u dhig isleeg saableyah. Furfurka isleegta ayaa ah kii masalooyinka.

Tusaalooyin :

1. Waayir 56 sm. dhererkiisu yahay ayaa loo qalqalloociyay si uu u noqdo wareegga laydi bed 171 sm^2. leh. Raadi aaddimaha laydiga.

Furfuris :

Wadarta dhererku iyo ballaca laydigu waa wareegga badhkii, ta 28 sm.

Haddii dhererku x sm. yahay, ballacu waa $(28 - x)$ sm.

bedka laydigu waa $x(28 - x)$ sm.

$$x(28 - x) = 171$$
$$28x - x^2 = 171$$
$$x^2 - 28x + 171 = 0$$
$$(x - 19)(x - 9) = 0$$

$x = 19$ ama 9.

Hubi ?

2. Nin baa da'diisu tahay ta inankiisa oo 4 lagu dhuftay. Sham sano ka horna taranka da'doodu wuxu ahaa 234. Soo saar da'dooda haatan.

Ka soo qaad x da'da ninka ee hadda
Marka da'da Aabuhu waa 4x sano.

Shan sano ka hor da'ahoodu waxay ahaayeen:
$(x - 5)$ sano iyo $(4x - 5)$ sano

$$(4x - 5)\ (x - 5) = 234$$
$$4x^2 - 25x + 25 - 234 = 0$$
$$4x^2 - 25x - 209 = 0$$
$$(x - 11)\ (4x + 19) = 0$$

$$x = 11 \text{ ama } x = -4\frac{3}{4}$$

Laakiin $-4\frac{3}{4}$ ma habboona. Waayo?

$$x = 11.$$

Da'da inanku waa 11 sano, ta odayguna waa 44 sano. ku hubi masalada?

Layli :

1) Tiro labajibbaarkeed ayaa isla tiradii le'eg. Waa maxay tiradaasi?
2) Laba abyoone oo isku xiga tarankoodu waa 462. Soo saar labada abyoone.
3) Wadarta tiro iyo labajibbaarkeed waa -1. Raadi tirada.
4) Raadi laba tiro oo dhaban ah oo isku xiga oo wadarta labajibbaarradoodu 244 le'eg tahay.
5) Xaashi buug ku taalla yaa dhererkeedu 4 sm. ka badan yahay ballaceeda. Soo saar dhererka xaashida haddii bedkeedu 132 sm^2. yahay.
6) Qaddiifad labajirraarane ah ayaa lagu gogley qol bedkiisu yahay 72 m^2. geestii. Dhinac waxa ka qaawanaa in 2 m. ballac le'eg, dhinaca kalena in 1 m. ballac le'eg. Soo saar aaddimaha qaddiifadda.
7) Dhagax baa la soo shalwiyey jidka ku siinaya fogaanta markuu socdo t sekend waa $d = 6t + 5t^2$. Amminma ayuu gaarayaa qoto 155 m. ah.
8) Taranka tiro iyo $\frac{11}{7}$ oo lagu daray rogaalka tiradu

waa tiradii labajibbaarkeed oo lagu dhuftay $\frac{50}{7}$.

Waa maxay tiradu?

9) Saddexagal baa salkiisu 2 sm. ka weyn yahay joog-giisa. Saddexagalka bedkiisu waa 40 sm^2. Xi-saabi joogga.

10) Saddexagal xagal qumman baa wareeggiisu 56 sm. yahay, dhererka shakaalkiisuna yahay 25 sm. Xisaabi dhererrada labada dhinac ee kale.

11) Waayir 90 sm. ah ayaa loo qalqalloociyay si uu u noqodo laydi bedkiisu 500 sm^2. yahay. Soo saar dhererka iyo ballaca laydiga.

12) Saddexagal baa bedkiisu 14 sm^2. yahay jooggiisuna $4\frac{1}{2}$ sm. buu ka weyn yahay salkiisa. Soo saar dhererka salka.

13) Saddexagal xagal qumman baa wareeggiisu 9 sm. yahay shakaalkiisuna waa 4 sm. Soo saar dhererka labada dhinac?

14) Marka dhagax sare loo tuuro, joogga j ee uu sare u baxaa w sekend ka dib, waxa inna siiya jid-ka $J = 30w - 5w^2$. Immisa sekend ka dib mar-ka la tuuro ayuu gaarayaa joog 25 m. ah?

15) Beer laydi ah oo addimaheedu 20 m. iyo 15 m. yi-hiin, ayaa waxa ku wareegsan laami. Haddii bedka laamigu 156 m^2. yahay soo saar ballaciisa.

16) Haddii 6 loo qaybiyo tiro waxa soo baxaa wuxuu la mid yahay, wadarta 5 iyo tiradii, oo loo qaybi-yey 5. Raadi tiradaa.

17) Jidka $S = \frac{1}{2}n(n+1)$ wuxu inna siinayaa wa-darta S ee tirooyinka 1, 2, 3,....n. Raadi n had-dii $S = 136$.

WADARTA IYO TARANKA XIDIDDADA

Jidka saableydu wuxuu ina tusayaa in xididdada isleeg kasta oo saabley ah lagu tibaaxi karo weheliyeyaalka isleegtaas, t.a. xididdadu waa tibaaxo ku lug leh weheliyeyaalka.

Ka soo qaad r_1 iyo r_2 in ay yihiin xididdada isleegta $ax^2 + bx + c = 0$.

Markaa,

$$r_1 = \frac{-b + \sqrt{b^2 - 4ac}}{2a}, \quad r_2 = \frac{-b - \sqrt{b^2 - 4ac}}{2a}$$

Haddaba aan soo saarro, $r_1 + r_2$ iyo $r_1 \cdot r_2$.

$$r_1 + r_2 = \frac{-b + \sqrt{b^2 - 4ac}}{2a} + \frac{-b - \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{(-b + \sqrt{b^2 - 4ac}) + (-b - \sqrt{b^2 - 4ac})}{2a}$$

$$= \frac{-2b}{2a} = \frac{-b}{a}$$

$$\therefore r_1 + r_2 = \frac{-b}{a}$$

$$r_1 : r_2 = \frac{(-b + \sqrt{b^2 - 4ac})}{2a} \quad \frac{(-b - \sqrt{b^2 - 4ac})}{2a}$$

$$= \frac{(-b)^2 - (\sqrt{b^2 - 4ac})^2}{4a^2}$$

$$= \frac{b^2 - b^2 + 4ac}{4a^2} = \frac{4ac}{4a^2}$$

$$\therefore r_1 \cdot r_2 = \frac{c}{a}$$

Tusaalooyin :

1. Raadi wadarta iyo taranka xididda isleegta.

$$2x^2 - 3x - 7 = 0$$

Isleegtan $2x^2 - 3x - 7 = 0$; $a = 2$, $b = -3$, $c = -7$

$$r_1 + r_2 = \frac{-b}{a} = \frac{-(-3)}{2} = \frac{3}{2}$$

$$r_1 \cdot r_2 = \frac{c}{a} = \frac{-7}{2}$$

2. Isleegtan $3x^2 - \frac{1k}{2}x = \frac{5}{2}$, xulo k si wadarta xididdadu 6 u noqoto.

$$3x^2 - \frac{1k}{2}x = \frac{5}{2}, \quad 3x^2 - \frac{1k}{2}x - \frac{5}{2} = 0$$

$$a = 3,\ b = -\frac{1k}{2},\ c = -\frac{5}{2}$$

$$r_1 + r_2 = \frac{-b}{a} = \frac{-\left[-\frac{1k}{2}\right]}{3} = \frac{K}{6}$$

Laakiin $r_1 + r_2 = 6$

Markaa $K = 36$

Isleegtu waa $3x^2 - 18x = \frac{5}{2}$.

Layli :

Raadi wadarta iyo taranka xididdada isleeg kasta.

1) $x^2 + 3x + 2 = 0$
2) $x^2 + 4x - 5 = 0$
3) $x^2 - 5x + 6 = 0$
4) $2x^2 - 7x - 4 = 0$
5) $2x^2 - x - 6 = 0$
6) $6x^2 - 11x - 10 = 0$
7) $4x^2 - 1 = 0$
8) $5x^2 - 13x - 6 = 0$
9) $3x^2 + x - 8 = 0$
10) $2x^2 + \frac{5}{3}x - 2 = 0$

Raadi tirada ama tirooyinka halka K gelaya. Hubi mid kasta.

	Haddii ay wadarta xiddidadu tahay:
11) $x^2 + kx + 8 = 0$	6
12) $x^2 + kx - 6 = 0$	5
13) $2x^2 + kx + \frac{5}{3} = 0$	-3
14) $Kx^2 + 4x - 3 = 0$	-1
15) $x^2 + 9x - k = 0$	0
16) $6x^2 + kx = 10$	$\frac{11}{6}$
17) $x^2 + kx = -\frac{3}{2}$	$-\frac{7}{3}$
18) $3x^2 + x = 6k$	$\frac{7}{3}$
19) $kx^2 + 4x = 3$	$\frac{1}{4}$
20) $kx^2 + 3x + k + 5 = 0$	2

21) Isleegtan $kw^2 + lw + m = 0$ u furfur w adoo ucmaalaya habka dhammaystirka labajibbaarka. Sox aar wadarta iyo taranka xididdada.

22) Ka soo [illegible] in xididdada $ax^2 + bx + c = 0$ ay yihiin $r_1 + r_2$. Soc [illegible] taranka $(x - r_1)(x - r_2)$ dabadeedna xaqiiji in

$$r_1 + r_2 = \frac{-b}{a} \text{ iyo in } r_1 \cdot r_2 = \frac{c}{a}$$

23) Soo saar xididdada $x^2 + \frac{b}{a}x + \frac{c}{a} = 0$. Isticmaal habdhammaystirka labajibbaarka.

Haddii isleeg saabley ah xididdada aan ognahay, waxan heli karraa isleegta lafteedii. Tusaalooyinkan soo socda. habka uu tilmaamayo mar walba waa lagu shaqaysan karaa. Laakiin marka xididdadu yikiin caynkan oo kale:

$\frac{-2 + \sqrt{7}}{5}$ iyo $\frac{-2 - \sqrt{7}}{2}$, waxa sahlan habka tusaalaha 2 u tilmaamayo.

Tusaale 1:

Dhig isleegta xididdadeedu $\sqrt{3}$ iyo $-\sqrt{3}$ yihiin:

$r_1 = \sqrt{3} \quad r_2 = -\sqrt{3}$

$(x - \sqrt{3})(x + \sqrt{3}) = x^2 - 3$

Isleegtii waa $x^2 - 3 = 0$.

(Fiiri su'aasha 22).

Tusaale 2:

Dhig isleegta xididdadeedu $\frac{-2 + \sqrt{7}}{5}$ iyo $\frac{-2 - \sqrt{7}}{5}$ yihiin.

$$r_1 = \frac{-2 + \sqrt{7}}{5} \quad r_2 = \frac{-2 - \sqrt{7}}{5} \quad r_1 + r_2 = \frac{-4}{5}$$

$$r_1 \cdot r_2 = \frac{(-2 + \sqrt{7})}{5} \cdot \frac{(-2 - \sqrt{7})}{5} = \frac{4 - 7}{25} = \frac{-3}{25}$$

Xagga isleegta $ax^2 + bx + c = 0$, $r_1 + r_2 = \frac{-b}{a}$, $r_1 \cdot r_2 = \frac{c}{a}$.

Haddaba $\frac{-b}{a} = \frac{-4}{5}$, $\frac{c}{a} = \frac{-3}{25}$, kuwaas oo aynu ku beddeli karro a, b iyo c.

Sidan oo kale $x^2 + \frac{bx}{a} + \frac{c}{a} = 0$.

Markaa $x^2 + \frac{4}{5}x - \frac{3}{25} = 0$ ama $25x^2 + 20x - 3 = 0$

Hubsiimo:

$25x^2 + 20x - 3 = 0 \quad a = 25;\ b = 20;\ c = -3$

$$x = \frac{-20 + \sqrt{400 + 300}}{50} \qquad x = \frac{-20 - \sqrt{400 + 300}}{50}$$

$$= \frac{-20 + 10\sqrt{7}}{50} \qquad = \frac{-20 - 10\sqrt{7}}{50}$$

$$= \frac{-2 + \sqrt{7}}{5} \qquad = \frac{-2 - \sqrt{7}}{5}$$ Hagaag.

Layli :

Dhig isleeg kasta oo xididdadiisa lagu siiyay. Hubi mi kasta.

1) 3, −2
2) 2, 4
3) 5, −5

4) $2 + \sqrt{2},\ 2 - \sqrt{2}$

5) $4 + \sqrt{3},\ 4 - \sqrt{3}$

6) $-3 + \sqrt{5},\ -3 - \sqrt{5}$

7) $-5 + i,\ -5 - i$

8) $\dfrac{2 + \sqrt{3}}{2},\ \dfrac{2 - \sqrt{3}}{2}$

9) $\dfrac{-1 + \sqrt{7}}{5},\ \dfrac{-1 - \sqrt{7}}{2}$

10) $\dfrac{5}{2} + \dfrac{\sqrt{11}}{2},\ \dfrac{5}{2} - \dfrac{\sqrt{11}}{2}$

11) $\dfrac{-3 + i}{4},\ \dfrac{-3 - i}{4}$

12) $\dfrac{1 + 4i}{2},\ \dfrac{1 - 4i}{2}$

13) $\dfrac{1}{2}(1 + \sqrt{6}),\ \dfrac{1}{2}(1 - \sqrt{6})$

14) $\dfrac{1}{4}(-2 + i),\ \dfrac{1}{4}(-2 - i)$

15) $\dfrac{-1 + i\sqrt{2}}{2}\ \dfrac{-1 - i\sqrt{2}}{2}$

16) $\dfrac{3 + 2i\sqrt{2}}{2},\ \dfrac{3 - 2i\sqrt{2}}{2}$

17) $\dfrac{1}{2}(4 + 3i\sqrt{5}),\ \dfrac{1}{2}(4 - 3i\sqrt{5})$

18) a, b

19) a + bi. a − bi

20) 2, 3 iyo 4 (raac dariiqada tusaale 1)

21) -1, 2 iyo $\frac{-1}{2}$

22) 2, 1 + i, 1 − i

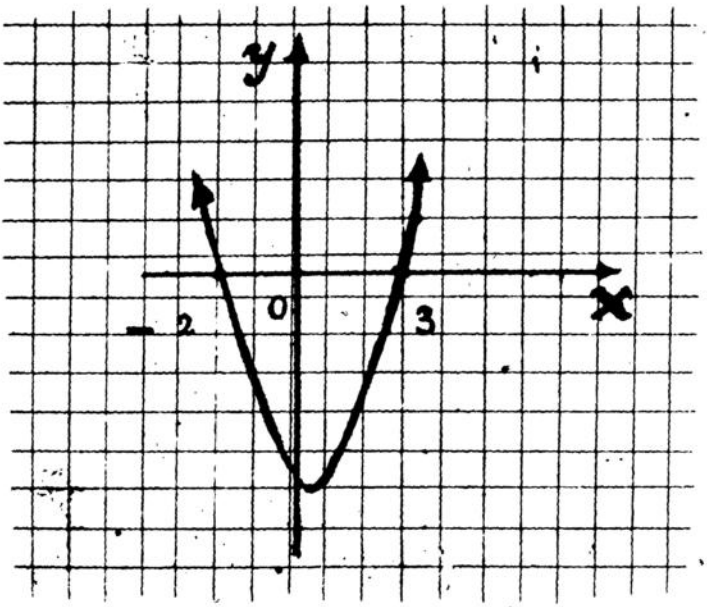
IV. HABKA GARAAFKA EE FURFURISTA SAABLEY

Waxaynnu hore u soo aragnay habka garaafka ee furfurista isleegyada wadajirka. Sidoo kale waa lagu furfuri karaa habka isleegta saabley ah.

Bilmetal, furfurista $x^2 - x - 6 = 0$ waxaynnu ka heli karnaa garaafka $y = x^2 - x - 6$.

Garaafka $y = x^2 - x - 6$ waa garaafka

$\{(x, y) \mid x \in R,\ y \in R,\ y = x^2 - x - 6\}$



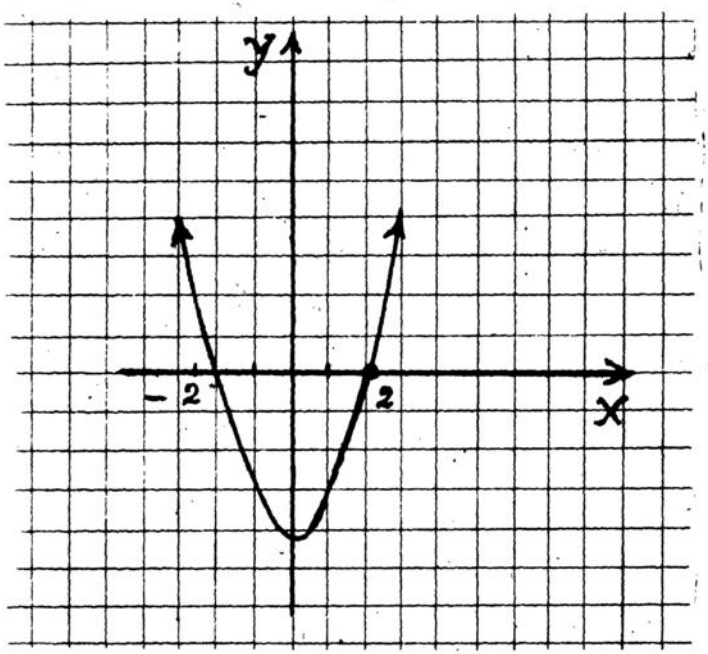
Garaafka $y = x^2 - x - 6$ wuxuu dhidibka x ka jayaa baraha -2 iyo 3. Markaa halka y tahay 0, x waa 2 iyo 3.

Sidaa awgeed furfurka isleegta $x^2 - x - 6$ waa:
$x = -2$ ama $x = 3$.

usaale 1:

$$2x^2 - x - 5 = 0$$

Isleegta ku furfur habka garaafka.



Sawir garaafka $y = 2x^2 - x - 5$ dabadeedna akhri kumada baraha xarriiqda garaafku ka jarayso dhidibka x.

Haddaba garaafkan oo kale, waa adag tahay helista qiimaha runta ah. Waxaynnu heli karraa waa seebidda qiimaha runta ah t.a. qiimaha runta ah ka ugu dhow.

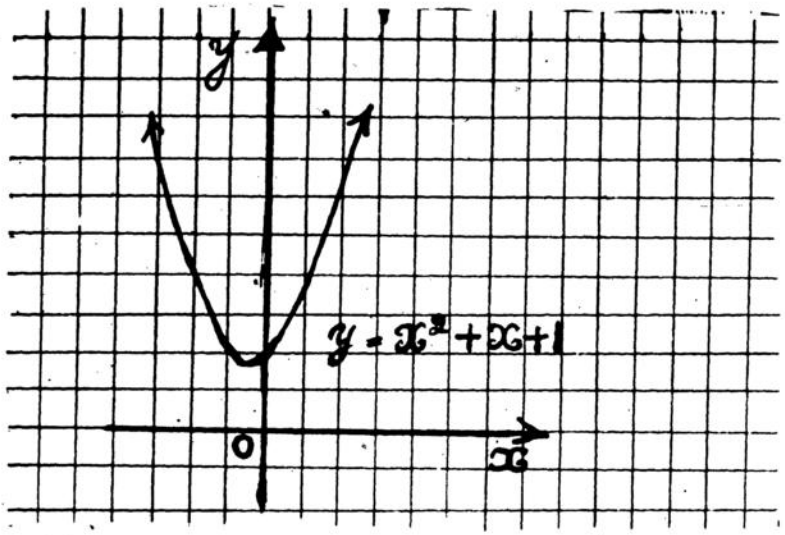
Seebid ahaan $x = -1\frac{3}{4}$ ama $x = 2$.

Tusaale 2:

$$x^2 + x + 1 = 0$$

Aan sawirno garaafka $y = x^2 + x + 1$.

Waxaynnu aragnaa in xarriiqda garaafku aanay meelna ka jaraayn dhidibka x. Sidaa awgeed ma jiraan meelo y eber tahay. Isleegtani furfuris kuma leh ururka tirooyinka maangalka ah.



Layli :

1) Isleegyadan ku furfur habka garaafka. Qiimaha aad x siinaysaa ha u dhexeeyo 5 ilaa −2.

   b) $x^2 - 3x - 4 = 0$
   t) $x^2 - 3x + 5 = 0$
   j) $x^2 - 3x = 0$
   x) $x^2 - 3x - 2 = 0$

2) U furfur garaaf ahaan $2x^2 + 3x - 8 = 0$. Isla garaafkaa aad sawirtay ka soo saar xididdada.

   b) $2x^2 + 3x - 14 = 0$
   t) $2x^2 + 3x + 2 = 0$
   j) $2x^2 + 3x + 1 = 0$
   x) $2x^2 + 3x - 2 = 0$
   d) $2x^2 + 3x - 20 = 0$

3) U furfur garaaf ahaan inta suurta gasha.

b) $x^2 - 4 = 0$

t) $x^2 - x - 2 = 0$

j) $x^2 - 2x + 1 = 0$

x) $0 = x^2 - 3x$

kh) $x^2 = 4x - 4$

d) $bx = x^2$

r) $x^2 + x = 3$

s) $2x^2 + x + 2 = 0$

h) Se dan sooroogelin. Waayo?

FURFURISTA DHEELLIYADA

Waxaad soo furfuri jirtey dheelliyo hore. Haddaba aan is-xusnusinno sadex astaamood oo furfurista dheelliyada inlaga dhawiya.

Ka soo qaad b, t iyo j tirooyin maangal ah.

i. Haddii $b > t$ markaa $a + c > b + c$

ii. Haddii $b > t$ oo $j > 0$ markaa $bj > tj$

iii. Haddii $b > t$ oo $j < 0$ markaa $bj < tj$

Tusaamooyinka iyo layliyada iman doona oo idiil waxay ku soodaan tirooyinka maangalka ah.

Tusaale 1:

Waa maxay qiimaha x ee $5x - 2$ kaga yaraan karto 6?

Jawaab:

Ka soo qaad in $5x - 2 = 6$

$$5x = 8, \quad x = \frac{8}{5}$$

Markaa $5x - 2 = 6$ haddii $x = \frac{8}{5}$.

Sidaa awgeed $5x - 2 < 6$ haddii $x < \frac{8}{5}$

Tusaale 2:

Furfur $4 - \frac{1}{3}x > \frac{2}{3}$

$4 - \frac{1}{3}x > \frac{2}{3} \rightarrow 12 - x > 2$

$\rightarrow -x > -10$

$\rightarrow x < 10$

Tusaale 3:

Soo saar urur furfurista $x(x + 3) < 0$

Haddii $x(x + 3) = 0$; $x = 0$ ama $x = -3$

$\therefore$ $x(x + 3) < 0$ haddii $x < 0$ isla markaa $x > -3$

ama haddii $x > 0$ isla markaa $x < -3$

Tusaale 4:

Furfur: $x^2 < 4x + 12$.

$x^2 < 4x + 12$

$x^2 - 4x - 12 < 0$

$(x - 6)\ (x + 2) < 0$

Haddii $(x - 6)\ (x + 2) = 0$ markaa $x = 6$ ama $x = -2$

Haddii $x < -2$, $(x - 6)\ (x + 2) > 0$

» $-2 < x < 6$, $(x - 6)\ (x + 2) < 0$

» $x > 6$, $(-6)\ (x + 2) > 0$

Sababtoo ah, $x^2 < 4x + 12$ haddii $(x - 6)\ (x + 2) > 0$

$\therefore$ $\{x | x \in R,\ x^2 < 4x + 12\} = \{x | x \in R\ -2 < x < 6\}$.

Ku hubi laba tiro,oo u dhexeeya -2 iyo 6.

Kaba dhig 0 iyo 3:

$x^2 < 4x + 12$
$0 < 4 \cdot 0 + 12$
$0 < 12$ Hagaag

$x^2 < 4x + 12$
$3^2 < 3 \cdot 3 + 12$
$9 < 24$ Hagaag.

Layli :

1) Waa maxay tirrooyinka maangalka ah x ee tibaaxaha soo socdaa kaga weynaan karaan 0.

b) x^2
t) $x^2 - 1$
j) $x^2 - 4$
x) $9 - x^2$
kh) $\frac{5x - 6}{2}$
d) $\frac{x}{x - 2}$
r) $x(x + 3)$
s) $x - x$

2) Sheeg tirooyinka maangalka ah x ee kuwan soo socdaa kaga hoos marayaan dhidibka—x.

b) $y = 2x + 1$
t) $y = \frac{1}{3}x - 6$
j) $y = 1$
x) $y = x^2$
kh) $y = x^2 - 4$
d) $y = 6x - x^2$

3) Furfur dheelliyadan.

b) $3x + 5 \geq 21$

t) $4 - x \leq 3 + 3x$

j) $\frac{1}{2}x - 7 > \frac{2}{3}$

x) $-3x + 2 < \frac{1}{2}x - 6$

kh) $4(x - 2) - 8 > 3 - 2x$

d) $\frac{x - 3}{4} - \frac{2 - 5x}{3} \leq \frac{-x - 1}{6}$

r) $x^2 - 1 < 0$

s) $x^2 + 5x + 6 < 0$

sh) $2x^2 > x + 10$

dh) $x^3 - 1 \geq 0$

c) $2x + 1 < x^2$

g) $2x^2 - x - 3 < 0$

f) $x^2 + 2x - 1 < 0$

q) $x^2 + 2x > 2$

k) $x^2 - x - 3 < 0$

l) $x^2 + 2x - 5 < 0$

Garaafka dheelli saabley oo laba doorsoomi leh

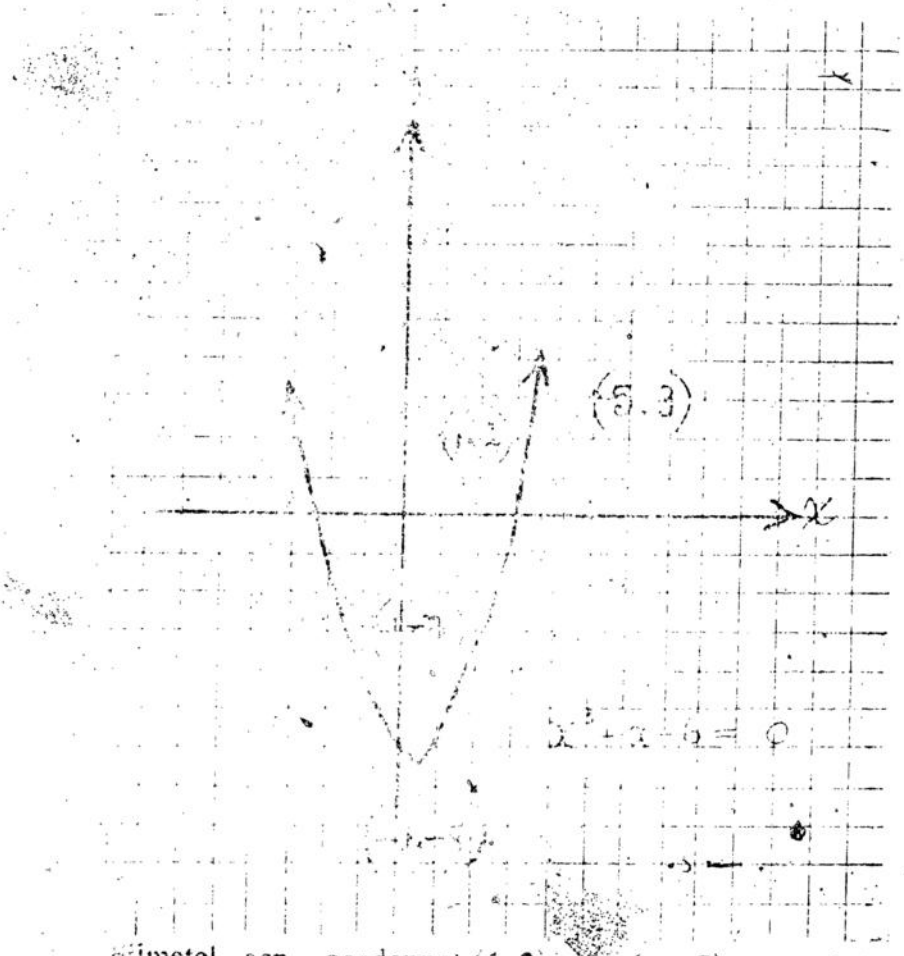
Dheelligan $y - x^2 + x - 6 \geq 0$ oo kale garaafkiisa waa aha xarriiq keli ah sida isleegta ee waa gobol xarriiq ku dayrantahay.

Imminka, aan tusaala ahaan sawirno dheelliga sare garaafkiisa. Horta sawir garaafka $y - x^2 + x - 6 = 0$. Sidaan oonahay garaafku waa saab (eeg sawirka bogga 37 dhe

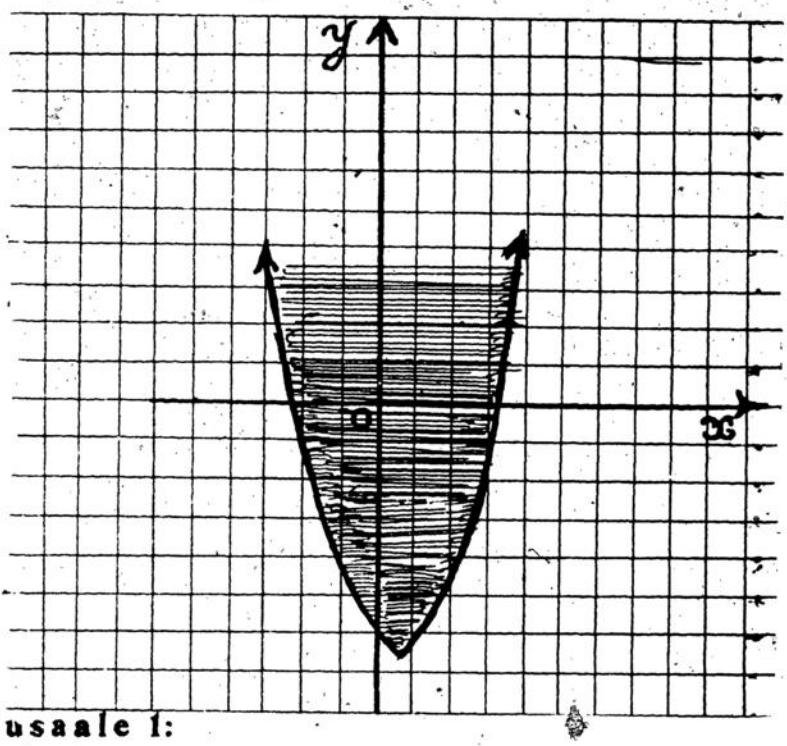
daba saabku (ama xarriig kastaaba) waxay kala soocdaa laba gobol. Gobol xarriigda garaafka ka sarreeya iyo gobol ka hooseeya. Si loo ogaado gobolka dheelliga $y - x^2 + x - 6 \geq 0$ waxaa gobol ee garaafka $y - x^2 + x - 6 = 0$ ka qaado dhawr barood. Gobolka barahiisu raalligeliyaan

$$y - x^2 + x - 6 \geq 0$$

ah gobolkii la rabey.



Tusaale ahaan qaadanno (1, 2) iyo (−1, −3) oo gobolka garaafka ka sarreeya ah iyo (3, 3), (−1, −8) oo gobolka garaafka ka hoosaysa ah. Kuwa hadba raalligelinaya $y - x^2 + x - 6 \geq 0$ waxaa gobolkii la rabey ah. Kaasoo ah $\{(x, y) \mid x \in R, y \in R, y - x^2 + x - 6 \geq 0\}$. Sida loo muujiyo waa gobolka ee la xarriibay (eeg shaxanka).

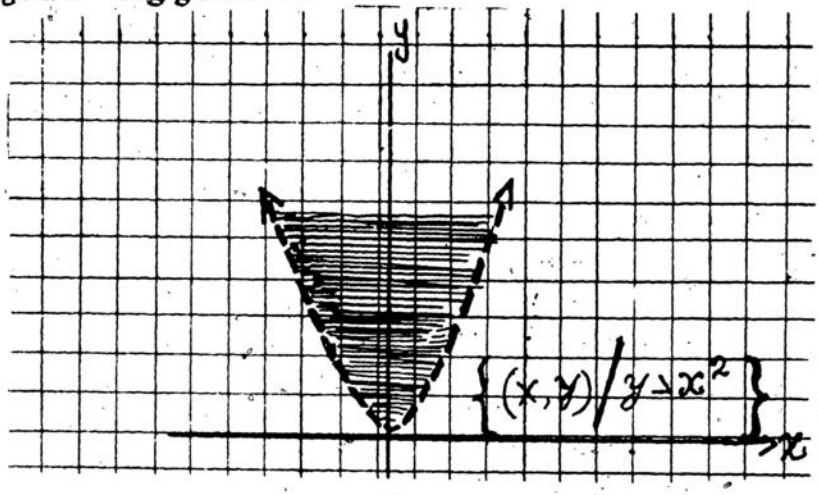


Tusaale 1:

Sawirka garaafka $y>x^2$

Markaa hore sawir garaafka $y = x^2$. Kaddib xaradh gobolka $\{(x, y) \mid x \in R, y \in R, y>x^2\}$.

Ogow, garaafka $\{(x, y) \mid y = x^2\}$ ka mid maaha garaafka $y>x^2$. Taa awgeed waxaa lagu muujiyey xarriiq gogo'an. Eeg garaafkan.

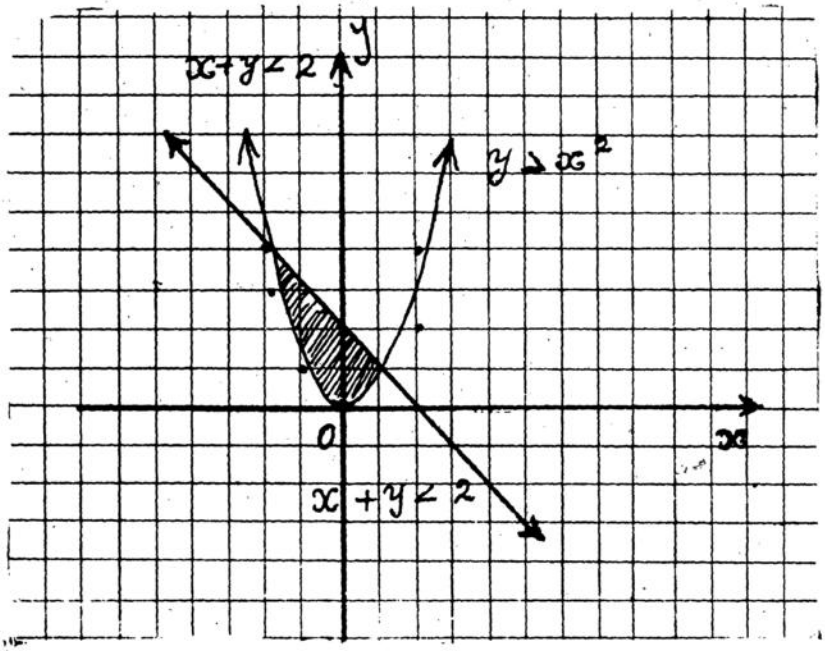


Tusaale 2:

Sawir garaafka $y = x^2$ iyo $x + y = 2$, dabadeedna xaradh isgoyska garaafka $y > x^2$ iyo $x + y < 2$. Baraha raalligelinaya $y > x^2$ waxay ku yaallin saabka gudihiisa (gobolkiisa sare).

Baraha raalligelinaya $x + y < 2$ waxay ku yaalliin xarriiqda toosan hoosteeda.

Markaa baraha labada raalligelinayaa waxay ku yaalliin saabka gudihiisa oo xarriiqda toosan ka hoosaysa. Intaasaana la xardhayaa.



Layli :

Sawir garaafka dheelli kasta.

1) $y - x > 0$
2) $y + x + 3 < 0$
3) $y < x^2$
4) $y < -x^2$
5) $y - x^2 - 4 < 0$
6) $y + 3 < x^2$
7) $y > x^2 + 1$
8) $2y > x^2$
9) $(x + y)^2 > 0$
10) $x < -3$
11) $y < 2$
12) $x^2 + y < 9$

13) Xaradh gobolka barahiisu labada dheelliba raalligelinayaan.

b) $x + 3 > 0$
$y - x^2 > 0$

t) $x^2 + y < 4$
$x + y < 4$

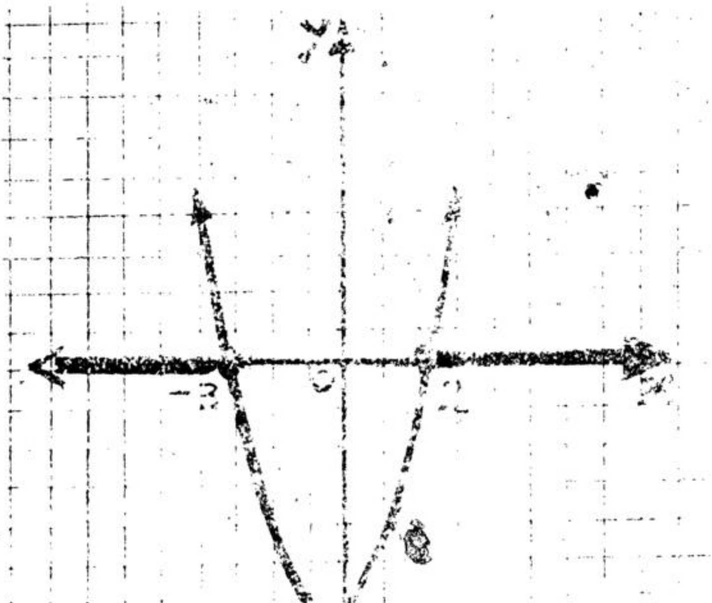
14) Sawir [illegible]

b) $y >$ [illegible]
$y < 5$
$x - y + 3 > 0$

[illegible]
$y - 1 > 0$
$x - 3 > 0$

Garaaf ku furfurista Dheelliyada Saabley.

Dheelliyada qaarkood urur-furfurisiyooda waxa lagu heli karaa hab garaaf. Bilmeel ahaan [illegible] urur-furfurka $x^2 + x > 6$ ee maangalka ah. Sidaa [illegible], horta sawir garaafka $\{(x, y) \mid y = x^2 + x - 6\}$ (Eeg shaxanka).



Kadib waxaan baarnaa waa, qiimayaasha x ee $y>0$, ama qiimayaasha x ee $\{(x, y) \mid y>x^2+x-6\}$ kaga sarreysa dhidibka x. Qiimayaashaasi waa urur furfurka $x^2+x-6>0$. Haddaynnu garaafka uga fiirsanno, waxaynmu hawl yari u arki karraa in qiimayaashu yihiin:

$$\{x \mid x<-3\} \cup \{x \mid x>2\},$$

sida xarriiqda culusi tusayso. (Qormo: goobooyinka yaryar ee -3 iyo 2 dulsaarani waxay muujinayaan in baraha ay goobaabayaan ku tirsanayn urur-furfurka).

Layli :

I. Dheelliyada hoose ku furfur garaaf.

1) $x^2-1 \leq 0$
2) $x^2-3x+2 \geq 0$
3) $2-x-x^2<0$
4) $4+3x-x^2<0$
5) $2x^2-5x+2<0$

II. Dheelliyada hoose ku furfur habka Isirinta.

Tusaale: $x^2+x>6$
$x^2+x>6$ waxa u dhiganta $x^2+x-6>0$
$(x+3)(x-2)>0$, taas oo raalligeleysa haddii iyo haddii qura oo labada isirba togan yihiin ama labaduba taban yihiin.

Marka ay togan yihiin	**Marka ay taban yihiin**
$x+3>0$, $x-2>0$	$x+3<0$, $x-2<0$
t.a. $x>-3$, $x>2$	t.a. $x<-3$, $x<2$
dhexyaalka laba dheelli:	dhexyaalka laba dheelli:
$\{x \mid x>2\}$	$\{x \mid x<-3\}$

Haddaba urur furfuristu waa: $\{x|x>2\} \cup \{x|x<-3\}$.

1) $x^2-4 \geq 0$
2) $x^2+2x \leq -1$
3) $x^2-1 \leq 0$
4) $2x^2-5x>3$
5) $x^2+5x+6 \leq 0$

6) $x^2 - 3x \leq 0$
7) $x^2 + 7x < 10$
8) $x^2 < 2x - 1$
9) $x^2 \leq 9$
10) $x^2 > x + 2$
11) $x^3 + 3x^2 \geq 10x$

FANSAARRO TIBXAALE

Waxa fansaar lagu sheegay xiriir kutirsane kasta oo horaadka ka mid ahba, uu u jiro kutirsane keli ah oo danbeedka ka mid ahi. Waxaad taqaan in fansaar kastaa leeyahay xeer kutirsanaha horaadka ku aaddiya kutirsane danbeedka.

Haddaba fansaarka tibxaale ahi waa fansaarka:

$$f(x) = a_n \cdot x^n + a_{n\,1} \cdot x^{n-1} + a_{n\,2} \cdot x^{n-2} + \ldots . a_0$$

ee a_i yahay tiro maangal ah, n yahay abyoone togan.

Tusaalooyin fansaarro tibxaale ah.

$$S(x) = 5$$
$$g(x) = 2x - 1$$
$$h(x) = 5x^2 - 7x + 5$$
$$f(x) = a_n \cdot x^n + a_{n\,1} \cdot x^{n-1} + \ldots . a_0$$

Imminka g(x) waa fansaar heerka kowaad ah ama fansaar toosan, h(x) waa heerka labaad ama fansaar saabley ah. F(x) waa fansaarka tibxaale ee guud, haddii $a \neq 0$, heerka f(x) waa n.

Waxaad soo aragtay, haddii f(x) yahay xeer fansaar markaa kutrisanaha a ee horaadka waxa ku aadaya kutirsanaha f(a) ee danbeedka.

Tusaale :

Raadi f(2) haddii $f(x) = x^2 + 3x - 4$
Meesha x taallaba 2 ku beddel, markaa

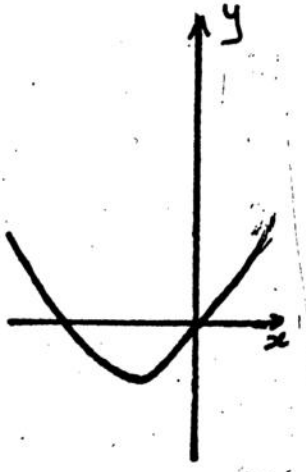
$$f(2) = 2^2 + 3 \cdot 2 - 4 = 4 + 6 - 4 = 6.$$

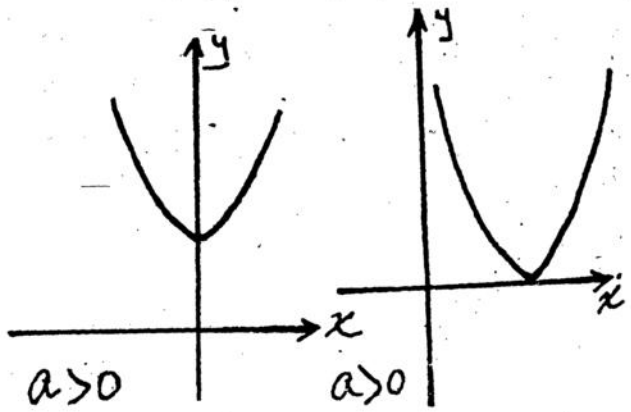
Layli :

1) Haddii $f(x) = x + 3$, raadi
   b. $f(0)$ t. $f(2)$ j. $f(-1)$
2) Haddii $f(y) = 2y$, raadi
   b. $f(-5)$ t. $f(10)$ j. $f(a)$
3) Haddii $f(x) = 2x - 3$, raadi
   b. $f(0)$ t. $f(-2)$ j. $f(c)$
4) Haddii $f(x) = x^2 + 3x + 3$, raadi
   b. $f(2a)$ t. $f(a^3)$ j. (-8)
5) Haddii $f(x) = 2x^2$, raadi
   b. $f(-2)$ t. $f(a + 3)$

Fansaarka Saabley.

Fansaarka tibxaale ee heerka labaad sansaankiisu waa $y = f(x) = a_2 \cdot x^2 + a_1 \cdot x^1 + a_0$. Tibxaalaha midigta qormadaan u dhigi jirnay waa $ax^2 + bx + c$. Haddaba fansaarka saableyda ah ee $y = f(x) = ax^2 + bx + c$ aan sii gorfaynno garaafkiisa. Waxaad wax ka soo aragtay garaafka $y = f(x) = ax^2 + bx + c$ oo dhabtii ah garaafka $\{(x, y) \mid y = ax^2 + bx + c\}$. Guud ahaan sawirka garaafka $y = f(x) = ax^2 + bx + c$ waa saab. Eeg sawirkan hoose.

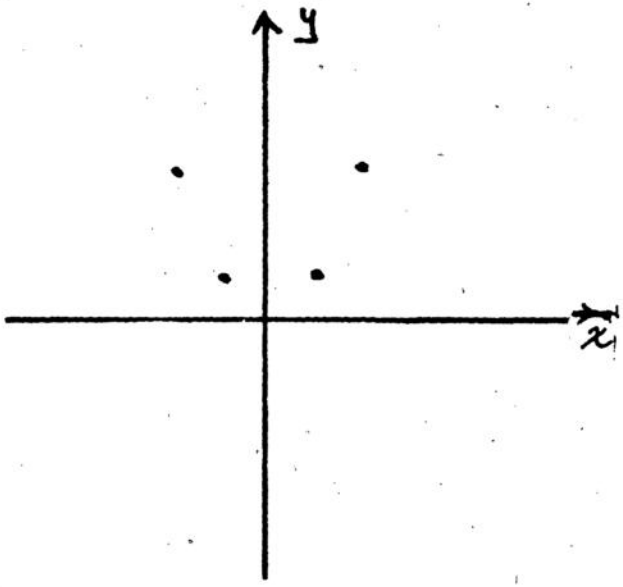




Waxaad aragtay in saabab midba ka kale si uun uga duwan yahay. Waxa taa waca fansaarrada saableyga ah ee ay leeyihiin ayaa kala duwan. Saddexda sawir ee hore waa marka fansaarka $y = f(x) = ax^2 + bx + c$, $a>0$. Haddiise $a<0$ saabku wuu foorara sida sawirka afraad tusayo.

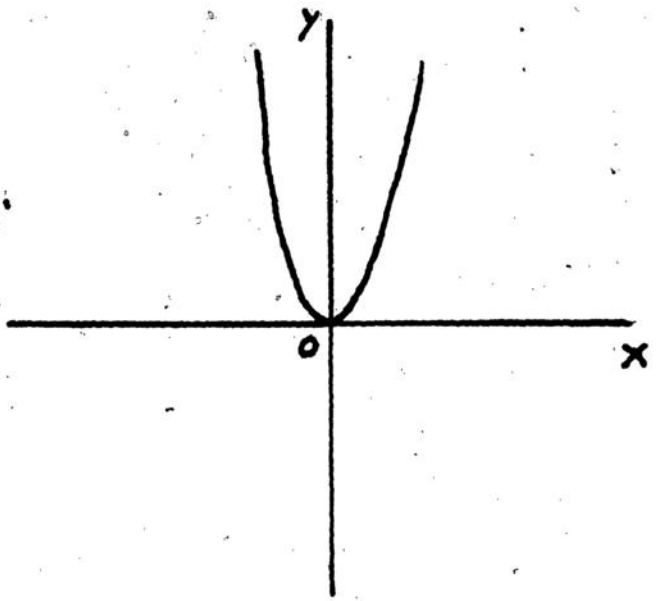
Innagoo tusaala ahaan qaadanayna $f(x) = x^2$ aan sharaxno laba arrimood oo astaamo u ah.

Sawirka soo socda waxa ka muuqda dhawr barood oo ka mid ah.



Haddii baro tiro badan la sameeyo waxa bayaan u muuqanaya garaafka $\{(x, y) \mid y = x^2\}$ oo ah xood siman oo marka absiisuhu kordhaba sare u kacaya. Waxaad aragtaa in dhidibka y uu saabka $f(x)$ laba u dhambalayo. Bilmatel, haddii saabka dhidibka y laga laabo waxa la arkayaa laba inood oo isdul dhacaya. Waxa taa daliil u ah, bar kastoo waaxda I ku taal waxa u jirta tu waaxda II ku taal oo jiif ahaan ugu beegan.

Arrinta caynkaas ah waxa la yiraa Wanqar. Haddii fansaar leeyahay astaan ah; marka $(r, t) \in f$, isla markaa $(-r, t) \in f$, waxa la yiraa garaafka f wuxu ku wanqaran yahay dhidibka y. Imminka fansaarka $y = f(x) = x^2$ wuxu ku wanqaran yahay dhidibka y. Kolkaas dhidibka y waxa loogu yeeryaa dhidibka wanqarka.



Arrinta kalena waa xoodka oo bar ugu hooseysa ama mid ugu sarreysa leh, marba xagga uu u jeedo. Saabka mar walba way isgooyaan dhidibka wanqarka. Barta ay iska gooyaan waxa la yidhaa gees.

Marka geesku sare jiro, qiimaha fansaarka ee x ee ugu weyn waxa la yiraa: u sarreeye. Markase geesku hoos jiro, qii-

maha fansaarka ee x ee ugu yar waxa la yiraa: u-hooseeye. Hadda fansaarka $y = f(x) = x^2$ geeskiisu waa barta $(0, 0)$. U-hooseeyaha fansaarku markaa waa $f(0)$ ama 0.

U fiirso sida fansaarkan looga raadinayo dhidibka wanqarka iyo geeska.

$$y + 3 = x^2 - 2x + 1$$
$$y + 3 = (x - 1)^2$$
$$y = (x - 1)^2 - 3$$

Barahani $(0, -2)$; $(2, -2)$; $(-1, 1)$; $(3, 1)$; $(4, 6)$ $(-2, 6)$ waxay isu raacsan yihiin laba labo. Haddaba sidaan aragnay dhidibka wanqarku waa xarriiqda marta labadii barood ee israacaba bartankooda. Taas oo ah xarriiqda isleegteedu tahay $x - 1 = 0$ ama $x = 1$. Geeska saabku waa barta ay iska gooyaan $x = 1$ iyo $y + 3 = x^2 - 2x + 1$ waana $(1, -3)$.

Guud ahaan fansaar kasta oo u dhigma sansaanka $y = ax^2 + bx + c$ marka la soo saarayo barta geeska iyo dhidibka wanqarka, aan soo diirro jidka la adeegsanayo. Waxan haysannaa fansaarka $y = ax^2 + bx + c$.

Ka dhig $y - c = ax^2 + bx$.

Tibaaxda midigta a ka isiri $y - c = a\left[x^2 + \frac{b}{a}x\right]$

Tibaaxda tidica ku jirta dhammee labajibbaarkeeda.

$$y - c + \frac{b^2}{4a} = a\left\{x^2 + \frac{b}{a}x + \left[\frac{b}{2a}\right]^2\right\}$$

Isiri oo madoorsoomayaasha bidixdana midig u rar.

$$y = a\left[x + \frac{b}{2a}\right]^2 + c - \frac{b^2}{4a}$$

Haddaba weedhan ugu dambeysa; isleegta dhidibka wanqarku waa $x + \frac{b}{2a} = 0$ ama $x = \frac{-b}{2a}$. Kulannada barta

geesku waa $\left[-\frac{b}{2a}, c-\frac{b}{2a}\right]$.

XUSUUSO: haddii $a>0$ markaa $f\left[-\frac{b}{2a}\right]$ waa u-hooseeyihii fansaarka haddiise $a<0$ markaa $f\left[-\frac{b}{2a}\right]$ waa u-sarreeyihii.

Tusaale 1:

Sheeg dhidibka wanqarka iyo geeska:

$$y = f(x) = 2x^2 - 12x + 7$$

Furfuris :

$$\begin{aligned} y - 7 &= 2x^2 - 12x \\ y - 7 &= 2(x^2 - 6x) \\ y - 7 + 18 &= 2(x^2 - 6x + 9) \\ y + 11 &= 2(x - 3)^2 \\ y &= 2(x - 3)^2 - 11 \end{aligned}$$

Haddaba dhidibka wanqarku waa xarriiqda $x - 3 = 0$ ama $x = 3$. Geeskuna waa barta $(3, 11)$.

Tusaale 2:

Fansaarka $y = f(x) = 3x^2 - 4x + 2$, soo saar:

b) Isleegta dhidibka wanqarka.
t) u-hooseeyaha ama u-sarreeyaha kii jira.

Sangaabta aan ka sii raacno:

b) fansaarka aan haysanno $a = 3$ $b = -4$ $c = 2$.

$$\frac{-b}{2a} = -\frac{-4}{2 \cdot 3} = \frac{2}{3}$$

$x = \frac{2}{3}$ jawaab.

t) $a>0$ $\therefore$ $f\left[\frac{2}{3}\right]$ waa u-hooseeyaha fansaarka:

$$f\left(\frac{2}{3}\right) = 3\left(\frac{2}{3}\right)^2 - 4\left(\frac{2}{3}\right) + 2 = \frac{4}{3} - \frac{8}{3} + 2 = \frac{2}{3}$$

Geeska u-hocseeyaha fansaarku waa bar $\left(\frac{2}{3}, \frac{2}{3}\right)$.

Layli 1:

Akhris.

b) Haddii f tahay fansaar, sheeg

i) inay f tahay fansaar saabley ah iyo in kale.
ii) in garaafka $y = f(x)$ ku wanqaran yahay dhidibka y iyo in kale.

1) $f(x) = -5x^2$
2) $f(x) = \frac{1}{3}x^2$
3) $f(x) = \frac{5}{x^2}$
4) $f(x) = -\frac{1}{x^2}$
5) $f(x) = 2x^2 + \frac{1}{3}$
6) $f(x) = 3x^2 - \frac{1}{2}$
7) $f(x) = x^2 + \frac{1}{x}$
8) $f(x) = x^2 - \frac{1}{x}$
9) $f(x) = x(x + 3)$
10) $f(x) = (x - 1)^2$
11) $f(x) = 3(x + 7)^2$
12) $f(x) = (x+1)(x-10)$
13) $f(x) = 3x^2 - 9x + 4$
14) $f(x) = \frac{x^2}{4} + \frac{x}{2} - 1$

t) Haddii $f(x) = 3x^2$ sheeg qiimaha mid kasta oo soo socota:

15) $f(3)$ 17) $f(-3)$ 19) $f(0)$ 21) $f(1)$
16) $f(-1)$ 18) $f(-2)$ 20) $f(2)$ 22) $f\left(\frac{2}{3}\right)$

j) Sheeg in geesaha garaafyada fansaarradan soo socda yihiin u-sarreeyeyaalka ama u-hooseeyeyaalka xoodadka:

23) $y = 3x^2$

24) $y = -\frac{1}{3}x^2$

25) $y = -\frac{1}{2}x^2$

26) $y = 10x^2$

27) $y = -4x^2$

28) $y = \frac{3}{5}x^2$

Layli 2:

Ku sawir garaafyada labada fansaar ee kasta, isku meel.

1) $\{(x, y) \mid y = 3x^2\}$; $\left\{(x, y) \mid y = \frac{1}{3}x^2\right\}$

2) $\{(x, y) \mid y = 4x^2\}$; $\left\{(x, y) \mid y = \frac{1}{4}x^2\right\}$

3) $\{(x, y) \mid y = -5x^2\}$; $\left\{(x, y) \mid y = -\frac{1}{5}x^2\right\}$

4) $\{(x, y) \mid y = -2x^2\}$; $\left\{(x, y) \mid y = -\frac{1}{2}x^2\right\}$

5) $\left\{(x, y) \mid y = \frac{2}{3}x^2\right\}$ $\left\{(x, y) \mid y = -\frac{2}{3}x^2\right\}$

6) $\left\{(x, y) \mid y = \frac{3}{2}x^2\right\}$ $\left\{(x, y) \mid y = -\frac{3}{2}x^2\right\}$

Soo saar qiimaha haddii lammaanaha horsani ka mid yahay fansaarka $\{(x, y) \mid y = ax^2\}$.

7) (3, 6) 8) (2, 16) 9) (3, −90)

10) $\left(-\frac{1}{2}, -\frac{1}{8}\right)$ 11) $\left(4, -\frac{16}{3}\right)$

12) $\left(-\frac{1}{5}, \frac{3}{25}\right)$

13) Haddii $\left(a, \frac{a}{4}\right) \in \{(x, y) \mid y = ax^2\}$ oo $a \neq 0$, dhig dhammaan qiimayaasha «a» ee suuragalka ah.

14) Haddii $\left(2a, \frac{a}{2}\right) \in \{(x, y) \mid y = ax^2\}$ oo $a \neq 0$ dhig dhammaan qiimayaasha «a» ee suuragalka ah.

15) Haddii $\left(k, \frac{k}{q}\right) \in f = \{(x, y) \mid y = kx^2\}$ oo $k \neq 0$ dhig tibixda geli karta halka calaamaddan *, si weerahani (2k, *) f u rumowdo.

16) Haddii $\left(a, \frac{a}{2}\right) \in g = \{(x, y) \mid y = ax^2\}$ oo $a \neq 0$ dhig astirada geli karta halka calaamadda * si weedha: (5, *) $\in$ g u rumowdo.

Layli 3:

Fansaar kasta garaafkeeda sawir. Sheeg: b) isleegta dhidibka wanqarka; t) kulammada geeska; j) in geesku u-sarreeye yahay ama u-hooseeye; x) qiimaha fansaarka ee ku aaddan u-sarreeyaha ama u-hooseeyaha.

1) $\{(x, y) \mid y \mid y = 2(x - 1)^2 + 3\}$
2) $\{(x, y) \mid y = 5(x - 7)^2 + 4\}$
3) $\{(x, y) \mid y = 3(x + 3)^2 + 4\}$
4) $\{(x, y) \mid y = -(x + 2)^2 - 1\}$

5) $\left\{(x, y) \mid y = -\frac{3}{4}(x+2)^2 - \frac{2}{5}\right\}$

6) $\left\{(x, y) \mid y = -4\left[x - \frac{3}{2}\right] - 6\right\}$

7) $\left\{(x, y) \mid y = -6\left[x - \frac{1}{3}\right]^2 - 7\right\}$

8) $\{(x, y) \mid y = 2(x+3)^2 + 2\}$
9) $\{(x, y) \mid y = -(x+5)^2 - 2\}$
10) $\{(x, y) \mid y - 9 = (x+4)^2\}$

Waxa lagu siiyey lammaane horsan oo kutirsaneyaasha fansaar ku jira, iyo isleegta dhidibka wanqarka ee fansaarka. Haddaba dhig lammaane horsan oo kale oo fansaarkaa ka mid ah.

11) $(5, 7)$; $x = 9$
12) $(-3; 2)$; $x = 4$
13) $(0, -4)$; $x = -2$
14) $(-7, 0)$; $x + 2 = 0$
15) $(0, 6)$; $x = -3$
16) $(k + h, l)$: $x = k$
17) $(m - r, r)$; $x = -k$
18) Fansaar garaafkiisu ma ku wanqarmi karaa dhidibka x? Sheeg jawaabtaadu qiilka ay ku dhisan tahay?

19) Laba walba garaafkooda isku meel ku sawri.

b) $\{(x, y) \mid y = 2(x+1)^2 + 4\}$
t) $\{(x, y) \mid y = -(x+1)^2 + 5\}$

j) $\left\{(x, y) \mid y = -3\left[x - \frac{1}{2}\right]^2 + 2\right\}$

x) $\left\{(x, y) \mid y = (2x-1)^2 + \frac{3}{4}\right\}$
kh) $\{(x, y) \mid y = 2(x-1)^2 - 4\}$

d) $\left\{(x, y) \mid y = \frac{1}{3}(x+1)^2\right\}$

r) $\left\{(x, y) \mid y = 3\left[x - \frac{1}{2}\right]^2 - 2\right\}$

s) $\left\{(x, y \mid y = (2x+1)^2 + \frac{8}{8}\right\}$

20) Fansaar waloo soo socda raadi dhammaan qiimayaasha h ama k haddii barta lagu siiyey ka mid tahay fansaarka ku hor yaal.

i) $y = 2(x-3)^2 + k; \quad (6, 1)$
ii) $y = (y-h)^2 + 1; \quad (0, 5)$
iii) $y = -\frac{1}{2}(x+7)^2 + k; \quad (0, 0)$
iv) $y = 2(x-h)^2 + 7; \quad (3, 57)$
v) $y = -(x-h)^2 + 8; \quad (-1, -10)$

21) Soo saar dhammaan qiimayaasha r si (r, 0) ay uga mid noqoto fansaarka:

i) $\left\{(x, y)\ y = \frac{1}{3}(x-2)^2 - 3\right\}$
ii) $\{x, y) \mid y = -7(x-3)^2 + 7\}$
iii) $\left\{(x, y) \mid y = -\frac{1}{2}(x+3)^2 + 2\right\}$
iv) $\left\{(x, y) \mid y = \frac{1}{2}(x+4)^2 - 18\right\}$

22) Soo saar a iyo k haddii labada lammaane ee horsan ka mid yihiin fansaarka ku ag dhigan.

i) $(0, 0)$; $(1, 12)$
$\{(x, y) \mid y = a(x - 2^2 + k\}$

ii) $(5, 0)$; $(6, 20)$
$\{(x, y) \mid y = a(x - 4)^2 + k\}$

iii) $(-2, -1)$; $(3, 39)$
$\{(x, y) \mid y = a(x + 1)^2 + k\}$

iv) $(-2, 3)$; $(-1, 0)$
$\{(x, y) \mid y = a(x + 3)^2 + k\}$

23) Muuji in labadan barood ee hoose ay ka mid yihiin garaafka $y = a(x - h)^2 + k \quad a \neq 0$:

$$\left(h + \frac{1}{2a}, k + \frac{1}{4a}\right) \text{ iyo } \left(h - \frac{1}{2a}, k + \frac{1}{4a}\right)$$

24) Haddii $(r_1, 0)$ iyo $(r_2, 0)$, $r_1, r_2 \neq 0$, ay ka mid yihiin fansaarka
$\{(x, y) \mid y = a(x - h)^2 + k, a \neq 0\}$

markaa $\dfrac{r_1 + r_2}{2} = h$.

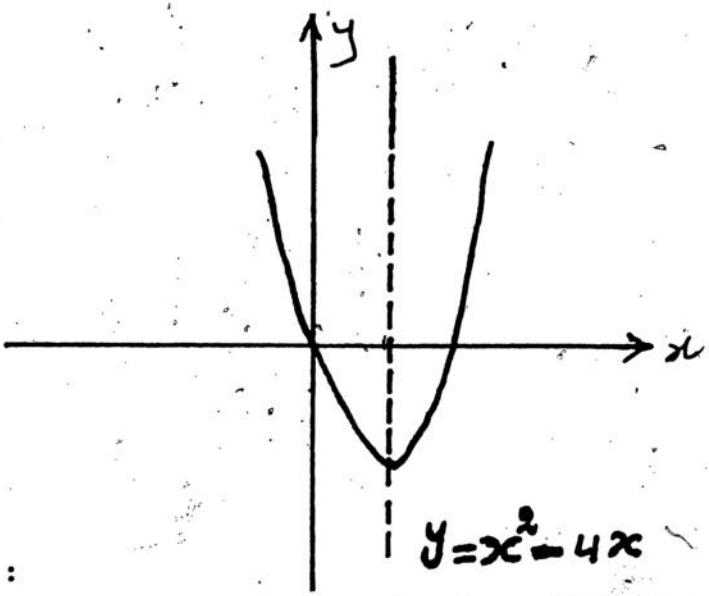
Caddee hawraartaa.

25) Sawir garaafka fansaarrada soo socda:

i) Tusaale: $\{(x, y) \mid y = x^2 - 4x\}$
Koleyba waan ognahay in garaafku saab yahay. Si aynu dhakhso u sawirro, ogow hadda $a > 0$ markaa saabku sarruu u furan yahay. Dhidibka wanqarka $y + 4 = (x - 2)^2$ ama $y = (x - 2)^2 - 4$; waa $x = 2$; geeskuna waa $[2, f(2)]$ ama $(2, -4)$ Laba ama afar barood oo kale samee. Intaa aan soo sheegnay markaad hesho, waxaad sawiri kartaa saabka fansaarka. (Eeg sawirka).

$y = x^2 - 4x$

x	y
-1	5
0	0
4	0
5	5



Layli :

Fansaarrada soo socda inta aanad sawirin, sheeg:

b) Xagga saabku u furan yahay; t) Dhidibka wanqaarka;
j) Geesku in uu sarreeye yahay iyo in uu hooseeye yahay;
x) Sawir saabka fansaar kasta.

i) $\{(x, y) \mid y = x^2 + 6x\}$
ii) $\{(x, y) \mid y = x^2 + 6x\}$
iii) $\{(x, y) \mid y = 3x^2 + 9x\}$
iv) $\{(x, y) \mid y = x^2 - x - 6\}$
v) $\{(x, y) \mid y = x^2 - 2x - 3\}$
vi) $\{(x, y) \mid y = x^2 + 5x + 4\}$
vii) $\{(x, f(x) \mid f(x) = x^2 - 4x + 1\}$
viii) $\{(x, g(x) \mid g(x) = -4 + 4x - x^2\}$
ix) $\{(x, h(x) \mid h(x) = x^2 - x + 3\}$
x) $\{(x, y) \mid y = -4 - 3x - x^2\}$

QAYBINTA TIBXAALAYAASHA

Tibxaale waa fansaar sansaankiisu yahay

$$T(x) = a_n \cdot x^n + a_{n-1} \cdot x^{n-1} + \ldots + a_0 .$$

Waxaad soo aragtay isugeynta, isku-dhufashada iyo isirintoodaba. Haddaba qaybinta tibxaalayaashu waxay la siman tahay qaybinta tirooyinka aritmetigga.

Ka soo qaad in $T_1(x)$ iyo $T_2(x)$ yihiin tibxaalayaal iyo weliba in heerka $T_1(x)$ uu ka weyn yahay ka $T_2(x)$. Markaa waxaan oran doonnaa $T_2(x)$ waa loo qaybin karaa $T_1(x)$ haddii ay jiraan labada tibxaale ee $Q(x)$ iyo $R(x)$ oo keenaya: $T_1(x) = T_2(x) \cdot Q(x) + R(x)$. Heerka $R(x)$ waa in uu ka yar yahay ka $T_2(x)$ mar walba.

Aan tusaalaynee, $x^4 + 3x^3 - 2x^2 - 5x + 7$ oo loo qaybiyey $x^2 - 1$ waa la heli karaa waayo

$$x^4+3x^3-2x^2-5x+7 = (x^2-1)\,(x^2+3x+1)+(-2x+6)\,?$$

(Heerka $(-2x + 6)$ waa hal, heerka $(x^2 - 1)$ waa laba).

Waxa jira siyaabo badan oo loo soo saaro $Q(x)$ iyo $R(x)$. Sida aan badiba isticmaalla waa habka qaybinta dheer.

Tusaale :

$3x^2 - 2x + 1$ u qaybi $5x - 2$

Qaybshaha iyo la qaybshahaba waxa loo qoraa sansaan horsiimo dhinmaysa ah: (horsiimada dhinmaysaa, waxa laga arkaa jibbaarka x ama jibbaarka doorsoomaha tibxaaluhu leeyahay hadba).

$$\begin{array}{r|l}
 & \frac{3}{5}x - \frac{4}{25} \\
\cline{2-2}
5x - 2 & 3x^2 - 2x + 1 \\
 & 3x^2 - \frac{6}{5}x \\
\cline{2-2}
 & -\frac{4}{5}x + 1 \\
 & -\frac{4}{5}x + \frac{8}{25} \\
\cline{2-2}
 & \frac{17}{25}
\end{array}$$

Fiiri waxaannu haysaney

$$T_1(x) = 3x^2 - 2x + 1, \quad T_2(x) = 5x - 2,$$

waxaan hellay $Q(x) = \frac{3}{5}x - \frac{4}{25}$ iyo $R(x) = \frac{17}{25}$ oo qeexdii waafaqsan:

$$3x^2 - 2x + 1 = (5x - 2)\left[\frac{3}{5}x - \frac{4}{25}\right] + \frac{17}{25}.$$

Haddii aynu qaybshaha $T_2(x)$ ku soo koobno laba tixxaale sansaanka $x - a$ ah, qayb kasta baaqigeedu wuxu ahaan doonaa tiro maangal ah.

ARAGTIIN BAAQI

Haddii r tahay tiro maangal ah T(x) yahay tibxaale heerkiisu 1 ka weyn yahay ama le'eg yahay, markaa, kolka T(x) loo qaybiyo x − r baaqigu waa R, R = T(r).

Caddeyn :

Waxaan ognahay in

$$T(x) = (x - r)\ Q(x) + R$$

Mar hadduu qaybshaha $x - r$ yahay tibxaale heerka kowaad ah baaqiga R waa in uu noqdaa tiro maangal ah (madoorsoome).

Haddaba isleegtan $T(x) = (x - r)\ Q(x) + R$ waa ku run tiro kasta oo maangal x. Sidaa awgeed waa in isleegtu run tahay marka r lagu beddelo halka x, t.a.:

Tusaale :

$$\begin{aligned} T(r) &= (r - r)\ Q(r) + R \\ &= 0 \cdot Q(r) + R \\ T(r) &= R \end{aligned}$$

Waa maxay baaqigu marka $x^3 - 2x^2 - 3x + 1$ loo qaybiyo $x - 2$?

Jawaab :

Sida aragtiinku sheegayo

Baaqigu waa $R = T(2) = 2^3 - 2 \cdot 2^2 - 3 \cdot 2 + 1$
$= 8 - 8 - 6 + 1 = -5$

Hubsiimo :

Isticmaal qaybinta dheer.

$$\begin{array}{r|l} & x^2 \quad -3 \\ x - 2 & x^3 - 2x^2 - 3x + 1 \\ & x^3 - 2x^2 \\ \hline & 0 \quad 0 \\ & \quad -3x + 1 \\ & \quad -3x + 6 \\ \hline & \quad -5 \ldots . \text{baaqi} \end{array}$$

Aragtiin isir:

Haddii $T(x)$ yahay tibxaale heerkiisu 1 ka weyn yahay ama le'eg yahay, r na tahay tiro maangal ah, markaa haddii $T(r) = 0$ waxa jirta in $x - r$ ay qaybinayso $T(x)$ t.a $(x - r)$ waa isir $T(x)$.

Caddayn :

Waxaan ognahay in

$$T(x) = (x - r)\ Q(x) + R$$

Aragtiinka baaqiga waxaan ka ognahay in $R = T(x)$.
Haddaba $T(x) = (x - r)\ Q(x) + T(r)$
Laakiin waxaan ognahay in $T(r) = 0$
Markaa $T(x) = (x - r)\ Q(x)$.

Tusaale :

Haddii $T(x) = x^3 - 7x + 6$, markaa $(x + 3)$ isir ma u yahay $T(x)$?

Sida aragtiinka isirku sheegayo $x + 3$ isir buu u noqon karaa $T(x)$ marka $T(-3) = 0$.

Hubi $T(-3) = (-3)^3 - 7(-3) + 6$
$= -27 + 21 + 6 = 0$

Sidaa awgeed $x - (-3) = x + 3$ waa isir
$T(x) = x^3 - 7x + 6.$
$T(x) = (x + 3) \cdot Q(x)$ $\quad Q(x) = ?$

Layli B:

1) $7x^2 + 33x - 10$ u qaybi $x + 5$
2) $15x^2 + x - 2$ u qaybi $3x - 1$
3) $6x^3 - 23x^2 + 16x - 3$ u qaybi $x - 3$
4) $x^5 - 5x^4 + 10x^3 - 10x^2 + 5x - 1$ u qaybi $x - 1$
5) $x^5 - 32$ u qaybi $x - 2$
6) $x^3 - 9x^2 + 24x - 70$ u qaybi $x - 7$
7) $3x^3 + 13x^2 - 40x + 20$ u qaybi $x - 2$
8) $2x^3 - 7x^2 - 10x + 35$ u qaybi $2x - 7$
9) $x^4 - 16$ u qaybi $x - 2$
10) $x^3 - 27$ u qaybi $x - 3$

Layliyadan soo socoda, raadi baaqiga marka tibxaale ka sta loo qaybiyo labatibxaalaha garab yaal. Isticmaal aragtiinka Baaqiga.

11) $x^3 - x^2 + x - 5, \quad x + 1$
12) $x^3 + 4x^2 - 2x - 4, \quad x - 2$
13) $x^3 + 7x^2 - 6x + 4, \quad x + 2$
14) $2x^3 + 6x - 5, \quad x + 5$
15) $x^3 - 3x^2 - 16, \quad x - 4$
16) $x^3 - 27, \quad x + 3$
17) $x^3 - 2ax^2 + 3a^2x - 5a^3, \quad x - a$
18) $x^4 - m^2x^2 + 5m^3x + m^4, \quad x - m$
19) $y^3 + 3by^2 - 4b^2y - 6b^3, \quad x - 2b$
20) $x^3 - a^3, \quad x - a.$

Layliyadan soo socda ku isticmaal aragtiinka isir.

21) Muuji in $(x - 3)$
isir u tahay $x^3 - x^2 - 69x + 189$
22) Muuji in $(x + 1)$
isir u tahay $x^3 - x^2 + 2$

23) Muuji in $(x + 2)$
isir u tahay $2x^4 - x^2 + 5x - 6$

24) Muuji in $(x - 3)$
isir u tahay $x^8 - 6x^7 + 9x^6 + 5x - 15$

25) Muuji in $(x + 1)$
isir u tahay $x^5 + x^4 - 3x - 3$

Layli T:

Isticmaal aragtiinka baaqiga si aad u raadiso

1) $T(3)$ marka $T(x) = x^3 - 7x + 6$
2) $T(1)$ » $T(x) = x^3 - 2x^2 - 5x + 6$
3) $T(-1)$ » $T(x) = x^3 - 2x^2 - 5x + 6$
4) $T\left[\frac{1}{2}\right]$ » $T(x) = 6x^3 + 19x^2 + x - 6$
5) $T(5)$ » $T(x) = x^3 - x^2 - 16x - 20$
6) Soo saar baaqiga marka $7x^6 + 21x^5 - x + 2$ loo qaybiyo $x + 3$
7) Soo saar baaqiga marka $x^4 - 2x^3 - 3x^2 + 7x + 8$ loo qaybiyo $x - 2$
8) Raadi k marka $x^3 + kx^2 + 47x + 60$ u qaybsanto $x + 3$
9) Raadi k marka $kx^3 - 25x^2 + 23x - 6$ u qaybsanto $x - 3$
10) Raadi k marka $(x - 1)$ isir u tahay $x^8 - x^7 - 3x^2 + kx - 5$
11) Raadi k iyo m marka $x^3 + kx^2 - mx$ u qaybsanto $(x + 2)$ $(x - 2)$
12) Raadi k iyo m marka $x^3 - kx^2 - mx - 28$ u qaybsanto $(x + 5)$ $(x - 3)$.
13) Muuji in $x^5 - y^5$ u qaybsami karto $(x - y)$.
14) Muuji in $x^4 - y^4$ u qaybsami karto $(x - y)$.
15) Muuji, hadii n tahay abyoone togan in $(x + y)^n - w^n$ u qaybsam karto $x + y - w$.

QAYBSOOH

Qaybsooh waa magac aan ugu yeerno hab gaaban oo lagu isticmaalo qaybinta tibxaalayaasha. Sida habkaasi ya-hay aan ku muujinno tusaalahan soo socda.

Tusaale 1:

$x^3 - 3x^2 - 2x + 1$ u qaybi $x - 1$

1) Isku-daba qor weheliyeyaasha la' qaybshaha (meesha mid ka maqan yahay 0 geli):

$1 \quad -3 \quad -2 \quad 1$

2) Summadda madoorsoomaha qaybshaha ee -1 beddel wuxu noqonayaa 1. Sida hoose u qor.

$$1 \;\big|\; 1 \quad -3 \quad -2 \quad 1$$

3) Soo deji weheliyaha u horreeya.

$$1 \;\big|\; 1 \quad -3 \quad -2 \quad 1$$
$$\qquad 1$$

4) Ku dhufo 1 dabadeedna -3 hoos dhig.

$$1 \;\big|\; 1 \quad -3 \quad -2 \quad 1$$
$$\qquad\quad 1$$
$$\qquad 1$$

5) Isku dar -3 iyo 1; wadartooda hoos u soo deji

$$1 \;\big|\; 1 \quad -3 \quad -2 \quad 1$$
$$\qquad\quad 1$$
$$\qquad 1 \quad -2$$

6) Tallaabooyinka 4 iyo 5 ku soo noqnoqo ilaa aad ku dhammeyso inta hartay.

$$1 \;\big|\; 1 \quad -3 \quad -2 \quad 1$$
$$\qquad\quad 1 \quad -2 \quad -4$$
$$\qquad 1 \quad -2 \quad -4 \quad \boxed{-3}$$

Ogow in tirooyinka sadarka hoose yihiin weheliyeyaasha qaybta.

7) Aan macnihii hore dib ugu noqonee qaybtani waa $x^2 - 2 \cdot x - 4$. Tirada edegga ku jirtaa t.a. -3 waa baaqigii.

Tusaale 2:

$T(x) = 2x^5 - 3x^3 + 5$ u qaybi $x + 1$. Isticmaal qaybsoohda.

Jawaab :

Weheliyaha

	x^5	x^4	x^3	x^2	x	madoorsoome.
	↓	↓	↓	↓	↓	↓
-1 |	2	0	-3	0	0	5
		-2	2	1	-1	1
	2	-2	-1	1	-1	6

Qaybtu waa $2x^4 - 2x^3 - x^2 + x - 1$. Baaqigu waa 6.

Hubaalmo:

$2x^5 - 3x^3 + 5 = (x + 1)\ (2x^4 - 2x^3 - x^2 + x - 1)$ Hagaag.

Sansaanka guud ee qaybsoohu waa sidan:

$T(x) = a_n \cdot x^n + a_{n-1} \cdot x^{n-1} + \ldots\ldots + a_0$ u qaybi $x - r$

r |	a_n	a_{n-1}	a_0
		ra_n	
		$a_{n-1} + ra_n$	R

Layli :

Isticmaal qaybsoohda oo soo saar qaybta iyo baaqiga mid kasta.

1) $(3x^5 - x^4 + 2x^2 - x + 1) \div (x - 2)$
2) $(x^4 - 16) \div (x + 2)$
3) $(x^5 - 32) \div (x - 2)$

4) $(x^4 - 12x^3 + 54x^2 - 108x + 81) \div (x - 3)$

5) $(7x^3 - 22x^2 - 67x + 8) \div (x - 5)$

6) $(x^3 - 9x^2 - 12x - 28) \div (x - 7)$

7) $(x^4 - 2x^3 - 3x^2 + 8x - 6) \div (x - 2)$

8) $(x^7 - 3) \div (x - 1)$

9) $(x^7 + 2x^6 - x^3 - 2x^2 + 3x + 6) \div (x + 2)$

10) $(8x^3 + 24x^2 - 5x - 15) \div (x + 3)$

11) $(ax^2 + bx + 1) \div (x - r)$

12) Waa maxay tirada k ee ay $x^2 + kx + 9$ baaqi isku mid ah kugu siinayso marka loo qaybiyo $(x - 3)$ ama $(x + 3)$?

13) Isticmaal qaybin soohda oo soo saar qaybta iyo baaqiga haddii $\left\{x^2 - \frac{7}{6}x - \frac{1}{4}\right\} \div \left\{x - \frac{3}{4}\right\}$

14) Haddii 1 xidid u yahay $x^3 - 5x^2 - 17x + 21$ isticmaal qaybsooha si aad u soo saarto labada xidid ee kale.

15) Haddii $T(x) = x^3 - 4x^2 - 11x + 30$ oo $T(2) = 0$ raadi r si $r \neq 2$ oo $T(r) = 0$.

16) Ka soo qaad in aad ogtahay in $T(x) = 2x^3 - 19x^2 + kx + 21$, iyo in $T(3) = 0$, raadi k.
Ka bacdi raadi r_1 iyo r_2 si $T(r_1) = T(r_2) = 0$.

17) Haddii $T_2(x) = 3x^4 + 5x^4 - 5x - 3$, raadi $T_1(x)$ $(x + 1)\ T_1(x) = T_2(x)$

18) Haddii
$T(x) = x^3 + kx^2 - 14x - 48$ oo $T(1) = -54$
raadi $T(-3)$

JIBBAARRO IYO XIDIDSHEYAAL

Jibbaarrada.

Hore waxaynu u barannay, si ballaaranna ugu adeegar nay, hubaasha ah in

$$x^4 = x \cdot x \cdot x \cdot x$$

$$x^k = x \cdot x \cdot x \cdot x.....x$$

Taasi waxay tahay inay x^4 iyo x^k sheegaan taranka x o 4 jeer la isku dhuftay iyo taranka x oo k jeer la isku dhufta siday u kala horreeyaan. Waxaynu ugu yeernay k-da x^k jit baarka, x-da x^k salka.

Haddaba, tusaale ahaan, waxaynu naqaan in

$$5^3 = 5 \cdot 5 \cdot 5 = 125$$

$$\left(-\frac{1}{2}\right)^4 = \left(-\frac{1}{2}\right)\left(-\frac{1}{2}\right)\left(-\frac{1}{2}\right)\left(-\frac{1}{2}\right) = \frac{1}{1}$$

Hadda, waa inaynu fikraddan jibbaarrada faahfaahi naa si aynu ugu adeegan karno tiro kastoo lakab ah Waxay fududaan lahayd haddii aynu marka hore baranno it ka mid ah dhismaha guud ahaaneed ee astaamaha jibbaarra da abyoone.

1.1.1 JIBBAARRADA ABYANE

1.1.1-B **Jibbaarrada Abyoone togan.**

Haddaynu qeexdeennii x^4 ooy k ahayd abyoone togar gundhig ahaan u qaadanno, waxaynu si iska garasha ah u ji dayn karnaa lixda astaamood ee soo socda. Astaan kasta x iyo y waa doorsoomayaal maangal ah, h iyo k-na waa abyoo neyaal togan.

Astaan I:

$$x^k \cdot x^h = x^{k+h}$$

Si aynu u muujinno jidaynta astaantan waxaynu ognahay in

$$x^k = x \cdot x \cdot x \ldots\ldots x$$

iyo

$$x^h = x \cdot x \cdot x \ldots\ldots x$$

Haddaba $x^k \cdot x^h = (x \cdot x \cdot x \ldots x) \quad (x \cdot x \cdot x \ldots x)$

$$x^k \cdot x^h = x \cdot x \cdot x \cdot x \ldots\ldots x$$

$$= x^{k+h}$$

Astaan II:

$$\frac{x^k}{x^h} = x^{k-h} \quad x \neq 0 \quad k > h.$$

Si aynu u muujinno jidaynta astaantan waxaan ognahay.

$$x^k = x \cdot x \cdot x \ldots\ldots x$$

k — isir

iyo

$$x^h = x \cdot x \cdot x \ldots\ldots x$$

h — isir

Haddaba $$\frac{x^k}{x^h} = \frac{x \cdot x \cdot x \ldots\ldots x}{x \cdot x \cdot x \ldots\ldots x}$$

Mar haddii k ay ka weyn tahay h ($k > h$) waxaynu midiidsan karnaa jidka yaraynta kol haddii $x \neq 0$ waxaynu heli in

$$\frac{x^k}{x^h} = \frac{x \cdot x \cdot x \ldots\ldots x}{1} = x^{k-h}$$

Astaan III:

$$\frac{x^k}{x^h} = \frac{1}{x^{k-h}}, \quad x \neq 0, \quad k < h.$$

Tusaalooyin :

b) $5^2 \cdot 5^4 = 5^{2+4} = 5^6$ Astaan I

t) $\frac{3^5}{3^2} = 3^{5-2} = 3^3$ Astaan II

j) $\frac{6^2}{6^4} = \frac{1}{6^{4-2}} = \frac{1}{6^2}$ Astaan III

x) $\frac{3^5}{3^5} = 3^{5-5} = 3^0 = 1$ Astaan IV

kh) $(7^2)^3 = 7^2 \cdot 7^2 \cdot 7^2 = 7^6 = 7^{2(3)}$ Astaan V

d) $(3 \cdot 5)^2 = (3 \cdot 5)\ (3 \cdot 5) = 3^2 \cdot 5^2$ Astaan V

Layli :

1) Raadi taranka iyo qaybta hoos ku xusan.

b) $2^4 \cdot 2^8$ t) $h^2 \cdot h^3$ j) $y^2 \cdot y^3 \cdot y^4$

m) $\frac{m^7}{m^3}$ kh) $\frac{n}{n^4}$ d) $\frac{r^5}{r^5}$ s) $(y^2)^5$

sh) $(4b^3)^2$ dh) $3x^3 \cdot 8x^5$ c) $(2m^2)^3\ (3mx^2)^2$

2) Fududee :

b) $(-2a)\ (-3a)\ (-4a^3)$

t) $(-3x^3)^2\ (2xy)^4$

j) $\frac{64a^3b^2}{4ab^2}$

x) $\frac{(-2x^2y)^3}{(6xy^2)^2}$

3) Fududee tibaaxahan soo socda.

b) $(-3x)^3\ (6x^2) - (2x^4)\ (5x)$

t) $7(x)\ (-3) + (2x^3)^2 - (3x)\ (2x)^3 + \left[\frac{5x^4}{x^3}\right]^2$

haddii $x \neq 0$.

1.1.1-T Jibbaarrada Abyoone Taban.

Si aynu ugu fidinno astaamahaasi jibbaarrada abyoone taban waxaynu sheegi qeexda soo socota.

Qeex :

Haddii x maangal tahay oo aanay eber ahayn, h-na tahay abyoone taban.

$$x^{-h} = \frac{1}{x^h} \qquad x \neq 0.$$

Tusaale I:

$$3^{-2} = \frac{1}{3^2} = \frac{1}{9}$$

Tusaale II:

$$\left[\frac{1}{2}\right]^{-3} = \frac{1}{\left[\frac{1}{2}\right]^3}$$

$$= \frac{1}{\frac{1}{8}} = \frac{8}{1} = \left[\frac{2}{1}\right]^3$$

Tusaalaha dambe wuxuu inoo soo bandhigayaa ra'yiga dhabta ah, tiro kastoo ku jibbaaran abyoone taban waa la mid

togasika [illegible] togan. Taa-
ina [illegible]

Xaaladda I:

Jidaynta xaaladani waa laga maarmi karaa waayo waxay u dhigantaa lixdii astaamood ee hore.

Xaaladda II:

h way togan tahay, k-duna way taban tahay.

Astaan 7(1) $x^h \cdot x^k = x^{h+k}$

$$x^h \cdot x^k = x^h \cdot \frac{1}{x^{-k}} = \frac{x^h}{x^{-k}}$$ qeexda J.A. taban.

Haddaba $\frac{x^h}{x^{-k}} = x^{h-(-k)} = x^{h+k}$ Haddii $h > -k$. Ast. II.

Ama $\frac{x^h}{x^{-k}} = \frac{1}{x^{-k-h}} = \frac{1}{x^{-(h+k)}}$ Haddii $h < -k$. Ast. III

$= x^{k+h}$ Qeexdii J.A. taban.

Ama $\frac{x^h}{x^{-k}} = 1 = x^0 = x^{h+k}$ Haddii $h = -k$.

Dabadeeto: $x^h \cdot x^k = x^{h+k}$

Astaan 7(2) $(x^h)^k = x^{hk}$

$$(x^h)^k = \frac{1}{(x^h)^{-k}}$$ Haddii $k < 0$, qeexda j.a. taban.

$$= \frac{1}{(x^{-hk})} = x^{hk}$$ Qeexda J. Abyoone taban.

Jidaynta xaaladaha kale ee astaanta 7aad ardayga ayaa looga tegay.

Tusaale 5:

Fududee:

b) $x^2 \cdot x^{-3}$, f) $(x^{-2} \cdot x^8)^2$ j) $(x^{-2} \cdot y^{-4})^4$.

Furfuris :

b) $x^2 \cdot x^{-3} = x^{2+(-3)} = x^{-1} = \frac{1}{x}$ Astaan 7(1). Qeexda J.A. taban.

t) $(x^{-2} \cdot x^6)^2 = (x^{-2+6})^2$ Ast. 7(1)
$= (x^4)^2 = x^{(6)(2)} = x^{12}$ Ast. 7(2)

j) $(x^{-2}y^{-3})^4 = (x^{-2})^4 (y^{-3})^4$ Ast. 7(3)
$= x^{(-2)(4)} y^{(-3)(4)}$

$= x^{-8}y^{-12} = \frac{1}{x^8 y^{12}}$ Ast. 7(2) Qeexda J.A. taban.

Tusaale II:

Qiimee mid kastoo kuwan soo socda ah.

b) $4^2 \cdot 3^2$ t) $\frac{327^3}{327^2}$ j) $\left(\frac{2}{3}\right)^2 \left(\frac{3}{2}\right)^3$

Furfuris :

b) $4^2 \cdot 3^2 = (4 \cdot 3)^2$ Ast. 7(3)
$= (4 \cdot 3)^2 = 12^2 = 144$

t) $\frac{327^3}{327^2} = 327^3 \cdot 327^{-2}$ Qeexda J.A. taban.

$= 327^{3+(-2)} = 327$ Ast. 7(1).

j) $\left(\frac{2}{3}\right)^2 \left(\frac{3}{2}\right)^3 = \left(\frac{3}{2}\right)^{-2} \left(\frac{3}{2}\right)^3$ Qeexda J.A. taban.

$= \left(\frac{3}{2}\right)^{(-2)+3} = \left(\frac{3}{2}\right)^1 = \frac{3}{2}$ Ast. 7(1).

$(15)^0 (2)^3 = 15^0 \cdot 2^3$ Ast. 7(3).

$= 1 \cdot 2^3$ Qeexda jibbaar eber.

$= 2^3 = 8$ Ast. asal madoorshe iyo qeexda jibbaarrada.

Tusaale 3:

Fududee $(x^2\, y^2)\ (x^{-1} + y^{-2})$.

Furfuris :

$$(x^2\, y^2)\ (x^{-1} + y^{-2}) = (x^2\, y^2)\ (x^{-1}) + (x^2\, y^2)\ (y^{-2})$$

Ast. kala dhigga isugeeynta ee isku dhufashada.

$$= (x^2\, x^{-1})\ y^2 + x^2\ (y^2\, y^{-2})$$

Ast. kala hormarinta iyo hormagelinta isku dhufashada.

$$= (x^{2+(-1)})\ y^2 + x^2\ (y^{2+(-2)})$$

Ast. 7(1).

$$= x\, y^2 + x^2\, y^0$$

$$= x\, y^2 + x(1) = x\, y^2 + x$$

Qeexda jibbaar iyo Asal madoorshaha.

$$= xy^2 + x = x\,(y^2 + 1).$$

Markaa $(x^2\, y^2)\ (x^{-1} + y^{-2}) = x(y^2 + 1)$.

Layli :

1) Fududee:

b) $(x^{-3})^2$ t) $x^0\, y^{-3}$ j) $3x^{-2}\, y^0$

x) $\dfrac{(x^2)^5}{x^7}$ kh) $\dfrac{x^3\, y^{-2}}{x^2\, y^{-5}}$ d) $\left(\dfrac{3xy^{-1}}{2xy^3}\right)$

2) Qiimee:

b) $\dfrac{(15)^{-3} \cdot 3^{-2}}{15^{-2} \cdot 3^{-3}}$

t) $[(-3)^{-2}]^{-2}$

d) $\left\{\left[\frac{1}{2}\right]^2 \left[\frac{1}{3}\right]\right\}^3$

3) Fududee:

b) $(2x^{-1})^2$ t) $4^{-1} + 3^{-2}$

j) $(x^2 - y^2)\ (x - y)^{-1}$

1.2 Xididsheyaal muujiye Abyane togan.

Markii aad dhigatay xididka labajibbaarka, waxaad baratay in xididka labajibbaarka ee tiro togan r ay tahay tiro S, taas oo ah $S^2 = r$. Waxaad u qortay xididka labajibbaarka r sidan $\sqrt{r}$.

Sidaa awgeed $\frac{2}{5}$ waxay le'eg tahay $\sqrt{\frac{4}{25}}$ mar haddii $\left[\frac{2}{5}\right]^2 = \frac{4}{25}$ oo ay $\frac{2}{5}$ tognayd.

Waxaynu hadda u baahannahay in aynnu ra'yigan sii fidinno si aynu u falanqayn karno naxli la'aan xididdada labajibbaarka ama xididda kastoo lakab ah, ee tiro kastoo maangal ah.

XIDIDDO

Qeex :

Ka soo qaad in n tahay abyoone togan, waxaynu ugu yeeri S xidid n jibbaarka ee r haddii $S^n = r$.

Tusaale :

Ka dhig in $n = 4$, $r = 16$. Bal hadda tixgeli afar tiro oo ah $S_1 = 2$, $S_2 = -2$, $S_3 = 2i$ iyo $S_4 = -2i$. Bal fiirso.

$(S_1)^4 = (2)^4 = 2 \cdot 2 \cdot 2 \cdot 2 = 16$

$(S_2)^4 = (-2)^4 = (-2)\ (-2)\ (-2)\ (-2) = 16$

$(S_3)^4 = (2i)^4 = (2i)\ (2i)\ (2i)\ (2i) = 16i^4 = 16$

$(S_4)^4 = (-2i)^4 = (-2i)\ (-2i)\ (-2i)\ (-2i) = 16$

Haddaba waxaynu aragnaa in 16 ay leedahay afar kala duwan oo xidid 4-jibbaar. Waxaynu arki karnaa in laba yihiin tirooyn «maangal ah», labana yihiin tirooyin «maangad ah». Way ka sarreysaa heerkeenna, inaan caddayno in 16 ay leedahay afar xidid. Hase ahaatee waxaynu qaansan hubaalahan soo socda caddeyn la'aan.

Tiro kastoo maangal ah oo aan eber ahayn waxay leedahay N kala duwan oo xididdo n jibbaar, oo ay barkood, ama dhammaantoodba noqon karaan tirooyin maangal ah. Faahfaahin ahaan:

1) Haddii n tahay abyoone dhaban ah, markaa tiro kastoo maangal togan ahi waxay leedahay laba xidid n jibbaar oo maangal ah, mid togan yahay, midna taban yahay.

2) Haddii n tahay abyoone kisi ah, markaa tiro kastoo maangal togan ihi waxay leedahay hal (kow) xidid n'jibbaar oo maangal ah, toganna haddii tiradu togan tahay, tabanna haddii tiradu taban tahay.

3) Haddii n tahay dhaban oo ay tirada maangalkuna taban tahay, markaa xidid n-jibbaarrada oo dhammi waa maangadyo.

Hubaalahaasi oo aynaan halkan ka caddeyn karayn, shaki la'aan way waxtar badan yihiin. Tusaalihii hore wuxu muujiyey marka ay n dhaban tahay tiraduna togan tahay.

1.2.2 Xidid Doorro.

Tusaalooyinkii iyo faaqidaaddii hore waxaynu guud ahaan ka barannay, haddii $n>1$. Tiro kastoo maangal ihi waxay leedahay hal in ka badan oo xidid n-jibbaar.

Waxaa caado u ah xisaab yahannada inay kala naqeeyaan natiijooyinka xushaana hal ka mid ah xididdadaas una bixiyaan xidid door n-aad.

Qeexda soo socotaa waxay dejisaa heshiis la gaaray.

Haddii r tahay tiro maangal ah, n tahay abyoone togan:

1) Marka $r<0$ xidid n-jibbaarka togan waxa la yiraa xidid doorka n-jibbaarka ee r.

2) Marka $r>0$ xidid n-jibbaarka taban waxa la yiraa xidid doorka n-jibbaarka ee r.

3) Marka $r = 0$ xididkeeda qur ah ee eber ayaa ah xidid doorka n-jibbaarka.

Haddaba, 2 waa xidid doorka 4-jibbaarka ee 16, -2-na waa xidid doorka 3-jibbaarka ee -8. Isla falanqaynteenni abuurka xididdo n-jibbaar waxay jidaysay qeexdaa hore, isla markaana ay koobtay in tiro kastoo maangal ihi leedahay xidid door qura.

1.2.3 XIDIDSHEYAAL

Qeex :

Haddii r tiro kastoo maangal tahay, n abyoone kastoo togan yahay, markaa xidid doorka n-jibbaar r waxa lagu magacaabaa xididshaha $\sqrt[n]{r}$. Waxaynu ugu yeernaa $\sqrt[n]{r}$ «Xididsho»; n-dana «Muujiyaha» xididshaha, r-dana xididsanaha xididdada. Waxa caado noqotay maray $n = 2$ in aan la qorin muujiyaha. Taasoo ah

$$\sqrt{4} = \sqrt[2]{4}$$

Ogow in ay had iyo goor run tahay $(\sqrt[n]{r})^n = r$.

Taasi waxay tahay in $(\sqrt[3]{15})^3 = 15$; $(\sqrt[5]{-5})^5 = -5$

iyo $(\sqrt{1/3})^2 = \frac{1}{3}$.

Sidii jibbaarrada Abyoone togan ee xubinta 1.1.1-B, waxaynu hadda u tixi karnaa xididshaha leh muujiye abyoone togan astaamo. Mid kasta oo astaamaha soo socda leh, x iyo y waa madoorsoomayaal maangal ah, k-na waa Abyoone togan, ta labaad mooyaane oo ay iyada x iyo y togan yihiin marka k dhaban tahay.

Astaan 1:

$$\sqrt[k]{x^k} = x$$

Astaan II:

$$\sqrt[k]{xy} = \sqrt[k]{x} \cdot \sqrt[k]{y}$$

Astaan III:

$$\sqrt[k]{x^h} = (\sqrt[k]{x})^h$$

Astaan IV:

$$\sqrt[k]{x/y} = \frac{\sqrt[k]{x}}{\sqrt[k]{y}}$$

Hadda aynnu isku dayno jidaynta astaanta labaad. Waxaynu u qaadan, haddii k dhaban tahay, inay x iyo y labaduba togan yihiin. Sidii aynu hore u soo aragnay $(\sqrt[n]{r})^n = r$.

Haddaba

$$(\sqrt[k]{x \cdot y})^k = xy$$

$$(\sqrt[k]{x} \cdot \sqrt[k]{y})^k = (\sqrt[k]{x})^k \cdot (\sqrt[k]{y})^k = x \cdot y$$

Haddaba

$\sqrt[k]{x \cdot y}$ iyo $\sqrt[k]{x} \cdot \sqrt[k]{y}$ labaduba waa xidid door ka k-jibbaarka ee xy. Mar haddii xidid doorku madi yahay waxa la heli in $\sqrt[k]{x \cdot y} = \sqrt[k]{x} \cdot \sqrt[k]{y}$.

Inta aynaan gudbin, waxaynu bixin doonnaa tusaalooyin ku saabsan astaamahaas.

Tusaale 1:

b) $\sqrt[5]{32} = \sqrt[5]{2^5} = 2$ Ast. I.

t) $\sqrt[3]{8y^3} = \sqrt[3]{8} \cdot \sqrt[3]{y^3} = \sqrt[3]{2^3} \cdot \sqrt[3]{y^3} = 2y$ Ast. II.

j) $\sqrt[3]{64} = \sqrt[3]{8^2} = (\sqrt[3]{8})^2 = (\sqrt[3]{2^3})^2 = (2)^2 = 4$ Ast. II

x) $\sqrt[3]{x^3/512} = \frac{\sqrt[3]{x^3}}{\sqrt[3]{512}} = \frac{\sqrt[3]{x^3}}{\sqrt[3]{8^3}} = \frac{x}{8}$ Ast. IV.

Tusaale kale ay ku jiraan in ka badan hal astaan wa kan soo socda.

Tusaale 2:

Raadi $\dfrac{\sqrt[5]{x^{10}y^5}}{-32}$

Furfuris :

$$\sqrt[5]{x^{10}y^5/-32} = \frac{\sqrt[5]{x^{10}y^5}}{\sqrt[5]{-32}} \quad \text{Ast. IV}$$

$$= \frac{\sqrt[5]{x^{10}} \cdot \sqrt[5]{y^5}}{\sqrt[5]{-32}} \quad \text{Ast. II}$$

$$= \frac{\sqrt[5]{(x^2)^5} \cdot \sqrt[5]{y^5}}{\sqrt[5]{(-2)^5}} \quad \text{Ast. 7(2) ee J. Abyoone.}$$

$$= \frac{x^2y}{-2} \quad \text{Ast. I.}$$

Gabagabaynta xubintan waxaynu ku falonqayn xannibaadii aynu ku sameynay Astaanta II. Haddaynaan xannibaaddaas ku sameyneen oo aynaan ku koobin x iyo y inay tognaadaan markay k dhaban tahay, waxay inna dhaxalsiin lahayd inaynu si qalad ah u adeegsanno astaanta labaad sida tusaalahan soo socda.

Tusaale :

$$\sqrt{xy} = \sqrt{x}\ \sqrt{y}$$

ka dhig in $x = -9$, $y - 16$. Haddaba

$$\sqrt{xy} = \sqrt{(-9)\ (-16)} = \sqrt{144} = 12$$

ama $\sqrt{x}\ \sqrt{y} = \sqrt{-9}\ \sqrt{-16} = (3i)\ (4i) = 12i^2 = -12$

Tusaalahani wuxuu muujinayaa wixii keenay in la xayirro x-da iyo y-da astaanta II oo lagu koobo inay tognaadaan marka uu muujiyuhu dhaban yahay.

Layli : 1.2

1) Fududee:

b) $\sqrt[4]{x^{16}}$ t) $\sqrt[3]{27^3}$ j) $\sqrt[10]{(32^{-5})^2}$

x) $\sqrt{25x^6}$ kh) $\sqrt[6]{3^{18}\, y^{-16}}$ d) $\sqrt[8]{m^{-24}\, n^{64}}$

r) $\sqrt[3]{\frac{8}{81}}$

s) $\sqrt[6]{\frac{x^{12}}{y^{18}}}$

sh) $\sqrt[3]{\frac{m^{-12}}{N^{-6}}}$

2) Qiimee:

b) $\sqrt[5]{32a^{10}b^5}$ t) $\sqrt[6]{729x^{-6}y^{18}g^{12}}$

j) $\sqrt[4]{\frac{64b^4}{d^{12}}}$ x) $\sqrt[3]{27\left[\frac{b^9 c^6}{x^3 y^{15}}\right]}$

3) Samee xisaabfalka la xusay:

b) $3 \cdot \sqrt[3]{2} + \sqrt[3]{24} - \sqrt[3]{3} + \sqrt[3]{16}$

t) $\sqrt[3]{54} - \sqrt[3]{16} - \sqrt[3]{24} + 81$

XUSUUS: Laba xididshe waxa laysku daraa, (isugeynta weeye), markay isu eg yihiin sidii tibxaha aljabraha. Laba xididshe waxay isu eg yihiin markay labada xididsane iyo labada muujiye ay isle'eg iskuna heer yihiin.

JIBBAARRO IYO MUUJIYAAL LAKAB AH

Waxaynu ku falanqaynay xubnaha 1.1 iyo 1.2 astaamaha hore ee jibbaarrada iyo xididsheyaalka markay jibbaarku iyo muujiyuhu ahaayeen Abyooneyaal. Xubintan waxaynu darii qooyinkas ku fidin doonnaa markay jibbaarradu iyo muuji-

yaalku yihiin lakab. Inta aynu fidinayno oo aynu guud ahaan uga baaraandeganyo waxa lama huraan ah in aynaan buriin astaamihii aynu hore u dejinay.

Haddaba tusaale ahaan

$$(x^{1/3})^3 = x^{3/3} = x$$

Wuxuu waafaqsanaan (oggolaan) $(x^h)^k = x^{hk}$. Si aynu u gargaarsanno falanqeynteennii xididsheyaalka waxaynu dejin qeexdan soo socota.

Qeex :

Haddii x tahay tiro maangal ah oo ay h iyo k-na abyooneyaal togan yihiin, haddaba x^{hk} waa xidid doorka k-jibbaarka x^h. Qeexdani waxay si shaki la'aan ah u sheegi in

$$x^{h/k} = \sqrt[k]{x^h}$$

Marka h tahay 1 (kow) waxaynu arki in qeexda hore ay si dhab ah u tilmaamayso in

$$x^{1/k} = \sqrt[k]{x}$$

Tusaalooyin muujinaaya dulucda qeexda waa kuwa soo socda.

Tusaalooyin :

1) $x^{2/3} = \sqrt[3]{x^2}$

2) $(-27)^{1/3} = \sqrt[3]{-27} = \sqrt[3]{(-3)^3} = -3$

3) $(32)^{2/5} = \sqrt[5]{32^2} = \sqrt[5]{32} \cdot \sqrt[5]{32}$

$= \sqrt[5]{2^5} \cdot \sqrt[5]{2^5} = 2 \cdot 2 = 4.$

Guud ahaan waxaynu jidayn karnaa xaaladda tusaalaha ugu dambeeyey inoo iftiimiyey. Taasoo ah inaynu tusno in x maangal ah, h iyo k abyooneyaal togan ah oo kastaaba.

$$x^{h/k} = (\sqrt[k]{x})^h \qquad (A)$$

Tusaale ahaan qeexda kore

$$x^{h/k} = \sqrt[k]{x^h}$$

Haddaba waa inaynu tusnaa in

$$\sqrt[k]{x^h} = (\sqrt[k]{x})^h.$$

Haddaynu taa sameynana waxaynu dejin xiriirka (A) lagu xusay.

1) Qeex ahaan $\sqrt[k]{x^h}$ waa xidid doorka k-jibbaarka ee x^h.

2) Waxaynu tusi in $(\sqrt[k]{x})^k$ waa xidid k-jibbaarka x^h.

Innagoo adeegsaneyna astaamaha jibbaarraade abyoone ee hore loo dejiyay

$$[(\sqrt[k]{x})^h] = [(\sqrt[k]{x})^k]^h = (x)^h = x^h$$

Haddaba, $(\sqrt[k]{x})^h$ iyana waa xidid k-aad x^h.

3) Eegga waa in aynu tusnaa in labaduba yihiin xidid doorka madiga ah.

b) Haddii $x = 0$, waa caddaan in labaduba isle'eg yihiin.

t) Haddii $x>0$, darkay x togan tahay) waa cadday in $(\sqrt[k]{x})^h$ iyo $\sqrt[k]{x^h}$ labadooduba toogan yihiin oo waliba isle'eg yihiin.

j) Haddii $x<0$, (markay x taban tahay) waa in k kisi tahay, waayo hadday k dhaban ahaan lahayd ma jireen xididdo maangal ahi. Haddaba waxaynu k u qaadan karnaa kisi. Hase yeeshee, waa inay ka muuqataa oo ay caddahay markay k kisi tahay in labada xididshe ay togan ama taban yihiin bishardi markay h abyoone togan ama taban tahay.

Haddaba labaduba waa qiimo doorka, markaad tixgeliso qodobadaas oo dhan waxaynu aragnaa in xiriirkii (A) la dejiyey kaas oo ah $x^{h/k} = (\sqrt[k]{x})^h$.

Tusaalihii aynu hore u soo daliilinay waxaynu hadda la kaashan doonnaa go'aankan aynu haddeer gaarnay, si aynu u hello

$$(32)^{2/5} = (\sqrt[5]{32})^2 = 2^2 = 4.$$

Falanqeyntii tusaalaheennii hore intiisa dambe waxay tilmaantay in aynu u qaadanno haddii muujiyaha xididshuhu yahay dhaban, in xididshahu yahay maangal togan. Waxa kaloon jecelnahay inaynu fiiro siinno inay suuragal tahay in loo rogo jibbaarro taban xididsheyaal muujiye togan leh, marka lala kaashado qeexdii aan ku xusnay xubinta 1.2.3.

Taas oo ah

$$x^{-2\backslash 3} = (x^2)^{-1\backslash 3} = \left(\frac{1}{x^2}\right)^{1/3}$$

$$= \sqrt[3]{\frac{1}{x^2}} = \frac{1}{\sqrt[3]{x^2}}$$ ka timid Ast. 4 xubinta 1.2.3

Waxaynu imminka aragnaa inyanu si macna leh ugu adeegsan karno tirada lakabka ah jibbaar ahaan, markaynu qeexdeennii ahayd $x^{h/k}$ gundhig ka dhiganno. Eegga, waynu isaga qaadan ee caddayn mayno in astaamaha jibbaarrada abyane ee xubin 1.1 ay oggol yihiin ama dhab yihiin markuu jibbaarku lakab ama maangal yahay. Haddaba tusaalooyinka soo socda oo dhan waxaynu u qaadan inay run yihiin.

Tusaale :

Astaan I:

$$x^{1\backslash 3} \cdot x^{4/5} = x^{1\backslash 3 + 4\backslash 5} = x^{17\backslash 15}$$

Tusaale :

Astaan II:

$$\frac{x^{1\backslash 3}}{x^{4\backslash 5}} = x^{1\backslash 3 - 4\backslash 5} = x^{-7\backslash 15}$$

Tusaale :

Astaan V:

b) $(x^{1\backslash 2})^{1\backslash 3} = x^{(1\backslash 2)(1\backslash 3)} = x^{1\backslash 6}$

t) $(x^{2})^{3} = x^{3 \times 2} = x^{6}$

Tusaale :

Astaan VI:

$$(xy)^{2\backslash 3} = x^{2\backslash 3} \cdot y^{2\backslash 3}$$

iyo $x^{-2} = \frac{1}{x^2}$ Qeexda jibbaarrada taban.

Waxaynu xubintan ku soo gabagabayn doonnaa tusaalooyin muujinaaya ku adeegsiga astaamaha jibbaarrada iyo xididsheyaalka ee aynu hore u soo falanqaynay.

Tusaale I:

U qor jibbaarrada tibaaxdan si togan, fududeena.

$$\frac{2^{-1} + 3^{-2}}{4^{-1}}$$

Furfuris :

$$\frac{2^{-1} + 3^{-2}}{4^{-1}} = \frac{\frac{1}{2} + \left[\frac{1}{3}\right]^2}{\frac{1}{4}} = \frac{\frac{1}{2} + \frac{1}{9}}{\frac{1}{4}}$$

$$= \frac{\frac{11}{18}}{\frac{1}{4}} = \frac{11}{18} \cdot \frac{4}{1} = \frac{22}{9}$$

Tusaale II:

Fududee tibaaxdan $\sqrt[3]{\frac{-27x^3}{8y^6}}$

Furfuris :

$$\sqrt[3]{\frac{-27x^3}{8y^6}} = \frac{\sqrt[3]{(-27)\,x^3}}{\sqrt[3]{8y^6}} = \frac{\sqrt[3]{-27}\cdot\sqrt[3]{x^3}}{\sqrt[3]{8}\cdot\sqrt[3]{y^6}}$$

$$= \frac{\sqrt[3]{(-3)^3}\cdot\sqrt[3]{x^3}}{\sqrt[3]{2^3}\cdot(\sqrt[3]{(y^2)^3}} = \frac{-3\cdot x}{2\cdot y^2} = \frac{-3x}{2y^2}$$

Layli 1.3:

1) U qor mid kasta oo kuwan soo socda ah, jibbaarro lakab ah.

b) Xididka 2 jibbaarka ee x^5
t) » 3 » ee a^2
j) » 6 » ee y^3
x) » 10 » ee x^5
kh) » 4 » ee x^2
d) » 5 » ee y^2

2) Qiimee mid kasta oo kuwan soo socda ah.

b) $(-32)^{1\backslash 5}$ t) $(-27)^{2\backslash 3}$ j) $64^{2\backslash 3}$

x) $\dfrac{4^{-1\backslash 2}}{32^{3\backslash 5}}$ kh) $256^{7\backslash 8}$ d) $243^{1\backslash 3}\cdot 243^{7\backslash 15}$

r) $\dfrac{}{32^{2\backslash 5}}$ s) $(64^{5\backslash 6})^{1\backslash 5}$ sh) $(125\cdot 64)^{2\backslash 3}$

dh) $\left[\dfrac{1}{27}\right]^{-2\backslash 3}$

3) U qor sansaanka ugu fudud ee aan lahayn jibbaarro taban.

b) $x^{-2}y^3x$ t) $\dfrac{3^{-2}+2^{-1}}{5^{-1}}$

j) $\dfrac{3^{-1} + 2 \cdot 5^{-1}}{6^{-2}}$ x) $\dfrac{2x \cdot 3^{-2} - 5x \cdot 2^{-2}}{7^{-1}}$

kh) $\dfrac{x^{-2} - y^{-2}}{x + y}$

1.3.2 Yaraynta Heerka ee xididshe.

Heerka xididsheyaalsha qaarkood waa la yarayn karaa. Tani waxay muujinaysaa marka tibixda loo qoro mid leh jibbaarro jajab (lakab) ah sida:

$$\sqrt[4]{x^4} = x^{4\backslash 6} = x^{2\backslash 3} = \sqrt[3]{x^2}$$

$$\sqrt[4]{25} = \sqrt[4]{5^2} = 5^{2\backslash 4} = 5^{1\backslash 2} = \sqrt{5}$$

Bal ogow inaan heerka xididshahan $\sqrt[4]{x\,y^2}$ aan la yarayn karin, waayo $\sqrt[4]{x\,y^2} = x^{1\backslash 4} \cdot y^{2\backslash 4}$. Jajabyada 1/4 iyo 2/4 ma laha hooseeye yare kale oo ay wadaagaan.

Tusaalooyin :

Fududee:

b) $\sqrt[4]{x^3\quad t}$ t) $\sqrt[6]{x^2 y^4}$ j) $\sqrt[6]{\dfrac{\sqrt{x^3}}{y^2}}$

Furfuris :

b) $\sqrt[4]{x^3} = x^{3\backslash 6} = x^{1\backslash 2} = \sqrt{x}$

t) $\sqrt[6]{x^2 y^4} = x^{2\backslash 6}\, y^{4\backslash 6} = x^{1\backslash 4}\, y^{2\backslash 4} = \sqrt[4]{x y^2}$

j) $\sqrt[6]{x^6 y^{-2}} = x^{6\backslash 6}\, y^{-2\backslash 6}$

$= x^{1\backslash 3}\, y^{-1\backslash 3} = \sqrt[3]{x^1 y^{-1}} = \sqrt[3]{x^3 \cdot xy^{-1}}$

$= \sqrt[3]{x^3} \cdot \sqrt[3]{x y^{-1}}$

$= x \cdot \sqrt[3]{\dfrac{\cdot x y^{-1} \cdot y^3}{y^3}} = x \cdot \sqrt[3]{\dfrac{xy^2}{y^3}}$

$= \dfrac{x}{y} \sqrt[3]{xy^2}$

Layli 1.3.2 :

1) Yaree Heerka xididsheyaashan soo socda, markay suuragal tahay.

b) $\sqrt[4]{x^4}$ t) $\sqrt[4]{8}$ j) $\sqrt[10]{x^4y^4}$

x) $\sqrt[12]{x^3y^3}$ kh) $\sqrt[10]{32x^5}$ d) $\sqrt[10]{9x^4y^4}$

r) $\sqrt[3]{\sqrt{\frac{8}{x^2}}}$ s) $\sqrt[4]{\sqrt{\frac{x^4}{y^2}}}$

2) Fududee:

b) $\sqrt{75}$ t) $\sqrt{18x}$ j) $\sqrt{3x^4}$

x) $3 \cdot \sqrt[4]{-16}$ kh) $\sqrt[4]{x^3}$ d) $\sqrt[4]{\sqrt{\frac{-x}{2}}}$

1.3.3 Xididdaheyaal kala heer ah.

Si aynu isugu dhufanno ama isugu qaybinno xididdaheyaal kala heer ah, waxa lama huraan ah in aynu marka hore iyaga ka dhigno xididdheyaal isku heer ah. Qeexida xididdahaha jibbaarrada jajabka (jakab) ah, ayaa inna gargaarsi doona si aynu u garanno sida taasi loo sameeyo.

$$(\sqrt{2}) \cdot (\sqrt[3]{3}) = 2^{1/2} \cdot 3^{1/3} = 2^{3/6} \cdot 3^{2/6}$$
$$= \sqrt[6]{2^3 \cdot 3^2} = \sqrt[6]{72}$$

$$\frac{\sqrt[3]{4}}{\sqrt{2}} = \frac{\sqrt[3]{2^2}}{\sqrt{2}} = \frac{2^{2/3}}{2^{1/2}} = \frac{2^{4/6}}{2^{3/6}}$$

$$= \sqrt[6]{\frac{2^4}{2^3}} = \sqrt[6]{2}$$

Tusaale 1:

Iaku dhufo $\sqrt[4]{3}$ iyo $\sqrt{5}$

Furfuris :

$$(\sqrt[6]{3})\ (\sqrt{5}) = 3^{1\backslash 6} \cdot 5^{1\backslash 2}$$
$$= 3^{1\backslash 6} \cdot 5^{3\backslash 6} = \sqrt[6]{3 \cdot 5^3}$$
$$= \sqrt[6]{3 \cdot 125} = \sqrt[6]{375}$$

Tusaale II:

Fududee $\dfrac{\sqrt[3]{x^2}}{\sqrt[4]{y}}$

Furfuris :

$$\frac{\sqrt[3]{x^2}}{\sqrt[4]{y}} = \frac{x^{2\backslash 3}}{y^{1\backslash 4}} = \frac{x^{8\backslash 12}}{y^{3\backslash 12}} = \sqrt[12]{\frac{x^8}{y^3}}$$

Layli 1.3.3 :

Ka dhig xididsheyaashan soo socda qaar isku heer ah dabadeedna isku dhufo ama isku qaybi.

1. $(\sqrt[6]{3})\ (\sqrt[4]{2})$
2. $(\sqrt[4]{a^2})\ (\sqrt[3]{b})$
3. $(\sqrt[3]{x^2y})\ (\sqrt{a})$
4. $(\sqrt{2b})\ (\sqrt[3]{3a})$
5. $(\sqrt[4]{x})\ (\sqrt[3]{x^2})$
6. $(\sqrt[3]{x^2})\ (\sqrt{x^3})$
7. $\dfrac{\sqrt[3]{8}}{\sqrt{2}}$
8. $\dfrac{\sqrt[3]{x}}{\sqrt[4]{x}}$
9. $\dfrac{4\sqrt[3]{3}}{\sqrt{2}}$
10. $\dfrac{\sqrt[3]{m}}{\sqrt[4]{n}}$
11. $\dfrac{6\sqrt{8}}{\sqrt[3]{4}}$
12. $\dfrac{3\sqrt{6}}{12\sqrt{2}}$

1.3.4 Isku dhufasho tibaaxo xididdhe.

Hadda waxaan soo baranay sida loo fududeeyo iyo sida layskugu dhufto xididsheyaal. Waxaynnu isku deyi inaan naqtiin isku dhufashada tibaaxo aljebra ah qaarkood oo leh xididsheyaal.

Tusaale

Isku dhufo

b) $\sqrt{3}\ (1 + \sqrt{6})$ t) $(2\sqrt{7} + 1)\ (5\sqrt{7} - 2)$

Furfuris b:

$$\begin{aligned}\sqrt{3}\,(1 + \sqrt{6}) &= (\sqrt{3})\ (1) + (\sqrt{3})\ (\sqrt{6}) \\ &= \sqrt{3} + \sqrt{18} = \sqrt{3} + \sqrt{9 \cdot 2} \\ &= \sqrt{3} + \sqrt{9} \cdot \sqrt{2} = \sqrt{3} + 3\sqrt{2}\end{aligned}$$

Furfuris t:

$$\begin{aligned}(2\sqrt{7} + 1)\ (5\sqrt{7} - 2) &= \\ &= (2\sqrt{7})\ (5\sqrt{7}) + (5\sqrt{7})\ (1) \\ &\quad + (-2)\ (2\sqrt{7}) + (-2)\ (1) \\ &= (10)\ (7) + 5\sqrt{7} - 4\sqrt{7} - 2 \\ &= 70 + \sqrt{7} - 2 \\ &= 68 + \sqrt{7}\end{aligned}$$

Tusaale II:

Fidi $(\sqrt{5} - 1)^2$

$$\begin{aligned}(\sqrt{5} - 1)^2 &= \\ &= (\sqrt{5} - 1)\ (\sqrt{5} - 1) \\ &= 5 - \sqrt{5} - \sqrt{5} + 1 \\ &= 5 - 2\sqrt{5} + 1\end{aligned}$$

1.3.5 LAKABAYNTA HOOSEEYAASHA LABA TIBIX AH

Lakabaynta hooseeyaasha jajab waxa weeye in loo qoro jajabka mid u dhigma oo aan ku lahayn xididshe hooseeyaha cusub.

Waxaynnu barannay lakabaynta hooseeyaasha jajabyada qaarkood sida:

$$\sqrt{\frac{2}{3}} = \sqrt{\frac{6}{9}} = \frac{\sqrt{6}}{3}$$

$$\frac{2}{\sqrt{3}} = \frac{2 \cdot \sqrt{3}}{\sqrt{9}} = \frac{2\sqrt{3}}{3}$$

$$\frac{4}{5\sqrt{2}} = \frac{4\sqrt{2}}{5\sqrt{4}} = \frac{4\sqrt{2}}{10} = \frac{2\sqrt{2}}{5}$$

Waxaynu iyana lakabayn doonnaa hooseeyaasha jajab, markuu hooseeyuhu yahay laba tibix sida $1 + \sqrt{3}$ ama $\sqrt{2} - 5\sqrt{3}$. Si loo sameeyo tan waxaynu xusuusannahay in $(x + y)\ (x - y) = x^2 - y^2$. Haddii aynu haysanno hooseeye sida $1 + \sqrt{3}$ waxaynu ku dhufan karnaa tibix kasta oo jajabka ah $1 - \sqrt{3}$, mar haddii

$(1 + \sqrt{3})\ (1 - \sqrt{3}) = 1^2 - (\sqrt{3})^2 = 1 - 3 = -2.$

Laba tibixa $1 - \sqrt{3}$ iyo $1 + \sqrt{3}$ waxa la yiraa «xistiga». Tusaalooyin xistiyo ah waa

$(x + y)$ iyo $(x - y)$, $(-3 + 2\sqrt{5})$ iyo $(3 + 2\sqrt{5})$ iwm.

Tusaalooyin:

1) $\dfrac{2}{\sqrt{2} + 1}$ 2) $\dfrac{3}{\sqrt{5} - \sqrt{2}}$ 3) $\dfrac{1 - \sqrt{3}}{1 + \sqrt{3}}$

Furfuris 1:

$$\frac{2}{\sqrt{2} + 1} = \frac{2\,(\sqrt{2} - 1)}{(\sqrt{2} + 1)\ (\sqrt{2} - 1)}$$

$$= \frac{2(\sqrt{2}-1)}{2-1} = 2(\sqrt{2}-1)$$

Furfuris 2:

$$\frac{3}{\sqrt{5}-\sqrt{2}} = \frac{3(\sqrt{5}+\sqrt{2})}{(\sqrt{5}-\sqrt{2})\ (\sqrt{5}+\sqrt{2})}$$

$$= \frac{3(\sqrt{5}+\sqrt{2})}{5-2} = \frac{3(\sqrt{5}+\sqrt{2})}{3}$$

$$= \sqrt{5}+\sqrt{2}.$$

Furfuris 3:

$$\frac{1-\sqrt{3}}{1+\sqrt{3}} = \frac{(1-\sqrt{3})\ (1-\sqrt{3})}{(1+\sqrt{3})\ (1-\sqrt{3})}$$

$$= \frac{1-2\sqrt{3}+3}{1-3} = \frac{4-2\sqrt{3}}{-2}$$

$$= \frac{-2(-2+\sqrt{3})}{-2} = -2+\sqrt{3}.$$

Layli :

Lakabee hooseeyaasha jajabyadan soo socda.

1) $\sqrt{\frac{\sqrt{3}}{5}}$ 2) $\frac{5}{2\sqrt{6}}$ 3) $\frac{\sqrt{5}}{\sqrt{3}}$

4) $\frac{4}{2+\sqrt{5}}$ 5) $\frac{2}{5-3\sqrt{3}}$ 6) $\frac{5\sqrt{3}}{\sqrt{3}+2}$

7) $\dfrac{-4\sqrt{7}}{5-\sqrt{7}}$ 8) $\dfrac{2}{\sqrt{2}+\sqrt{5}}$

9) $\dfrac{9}{3\sqrt{2}+\sqrt{15}}$ 10) $\dfrac{\sqrt{5}+\sqrt{2}}{\sqrt{5}-\sqrt{2}}$

11) $\dfrac{4\sqrt{3}-\sqrt{4}}{4\sqrt{3}+\sqrt{7}}$ 12) $\dfrac{\sqrt{2}+\sqrt{2}}{\sqrt{2}+\sqrt{5}}$

13) $\dfrac{4+2\sqrt{3}}{\sqrt{7}+1}$ 14) $\dfrac{1-\sqrt{3}}{2+\sqrt{5}}$

1.4 ISLEEGYO XIDIDSHE IYO JIBBAARRO

1.4.1 Isleeg Xididshe.

Isleeg doorsoome ku leh xididsanaha waxa la yiraa isleeg xididshe ama isleeg lakabla'. Isleeg xididshe oo fudud waa mid ah sida $\sqrt[3]{x-1} = 2$ oo aad sansaanqaaddida markaad saddex jibbaarto doc kasta $\sqrt[3]{x-1} = 2$.

$$(\sqrt[3]{x-1})^3 = 2^3$$
$$x - 1 = 8$$
$$x = 9$$

Hubsiimo :

$$\sqrt[3]{9-1} = 2$$
$$\sqrt[3]{8} = 2 \text{ Haa.}$$

$\therefore$ Ururka furfuristu waa $\{9\}$.

Tallaabada u horreeysa ee raadinta ama furfurista isleeg tibix xididshe oo keliya leh, oo xididsanuhu doorsoomeyaal leeyahay waa in loo faquuqaa tibixdaa doc qura oo isleegta ah. Dabadeedna waa in doc kasta la saaraa jibbaar abyane ah, le'egna muujiyaha xididka.

Tusaale I:

Furfur $2 - y - 2\sqrt{y+1} = 0$.

Furfuris :

1) U faquuq xididshaha doc ka mid ah isleegta:

$$2 - y - 2\sqrt{y+1} = 0$$
$$2 - y = 2\sqrt{y+1}$$

2) Labada dococdba labajibbaar:

$$(2 - y)^2 = (2\sqrt{y+1})^2$$
$$4 - 4y + y^2 = 4y + 4$$

3) Furfur isleegta soo baxday:

$$y^2 - 8y = 0$$
$$y(y - 8) = 0$$
$$y = 0 \text{ ama } y - 8 = 0$$
$$y = 0 \text{ ama } y = 8.$$

4) **Hubsiimo:**

$2 - 0 - 2\sqrt{0+1} \overset{?}{=} 0$	$2 - 8 - 2\sqrt{8+1} \overset{?}{=} 0$
Ku beddel oo xusuusnow inaad Cugato xidid doorka	$-6 - 2\sqrt{9} \overset{?}{=} 0$
$2 - 2\sqrt{1} \overset{?}{=} 0$	$-6 - 6 \overset{?}{=} 0$
$2 - 2 = 0$	$-12 \neq 0$
$0 = 0$	Maya
Haa.	

∴ Ururka furfuristu waa $\{0\}$.

Ma sheegi kartaa wuxuu «Qiimo fadqalalo» u muuqday? Taasi waa waxay isleegta tallaabada labaad ayna ugu dhignayn isleegta lagu siiyey? Ogow: $a = b$ marka $a^n = b^n$ ee n tahay abyoone kisi ah. Haddiise n abyoone dhaban ah tahay oo $a^n = b^n$, mar walba $a = b$ run ma noqoto.

Tusaale ahaan, $3^4 = (-3)^4$, ee se $3 \neq -3$.

Furfurista isleeg leh, iy ka badan tibix qura, oo ah xididshe doorsoome (ama doorsoomeyaal) leh, waxaad qaadi doontaa tallaabadii ahayd, kor saar jibbaarka, hal jeer in ka badan.

Tusaale II:

Furfur $\sqrt{x-1} = \sqrt{2x+1}$

Furfuris :

$$\sqrt{x-1} = \sqrt{2x+1}$$

1) Doc kasta labajibbaar $(\sqrt{x-1})^2 = (\sqrt{2x+1})^2$
$x - 2\sqrt{x+1} = 2x + 1$

2) Fududee, faquuqna xididshaha $-2\sqrt{x} = x$

3) Doc kasta labajibbaar $(-2\sqrt{x})^2 = x^2$
$4x = x^2$
$x^2 - 4x = 0$

4) Furfur isleegta soo baxday $x(x-4) = 0$
$x = 0$ ama $x - 4 = 0$
$\therefore x = 4$

5) **Hubsiimo:**

$\sqrt{0} - 1 \overset{?}{=} \sqrt{2} \cdot 0 + 1$

Ku beddel oo xusuusnow inaad Cugato xidid doorka

$-1 \overset{?}{=} \sqrt{1}$

$-1 \overset{?}{=} +1$

$-1 \neq +1$

Maya

$\sqrt{4} - 1 \overset{?}{=} \sqrt{2 \cdot 4 + 1}$

$2 - 1 \overset{?}{=} \sqrt{9}$

$1 \overset{?}{=} 3$ Maya

$\therefore$ Ururka furfuristu waa ϕ ama urur madhan.

Layli 1.4.1:

b) Raadi ururka furfurista isleeg kasta.

1) $\sqrt{m-8} = 0$
2) $\sqrt{5x+1} + 6 = 10$
3) $\sqrt[3]{y^{-1}} = -2$
4) $\sqrt[4]{x^2+x+4} = 2$

5) $2\sqrt{x-1} = x-1$

6) $\sqrt[3]{(5x+7)^2} = 9$

7) $\sqrt{k-5} = \sqrt{k-1}$

8) $\sqrt[3]{y+2} = 4$

9) $4 + \sqrt[4]{a/2} = 6$

10) $4\sqrt[3]{y-1} + 12 = 0$

11) $\sqrt{y-2} = 4-y$

12) $\sqrt{4y^2} = 2y$

13) $\sqrt{x} + \sqrt{x-3} = \dfrac{3}{\sqrt{x-3}}$

14) $\sqrt{d-8} + \sqrt{d} = 2$

t) Raadi doorsoomaha lagu weydiyey ee isleeg kastoo soo socota.

1) $R = \sqrt[3]{\dfrac{3w}{4D}}$ Raadi D

2) $C = \sqrt{9^2 + k^2}$ Raadi K

3) $\sqrt{x+a} = \sqrt{x} + \sqrt{a}$ $a>0$, Raadi x

4) $W = \dfrac{1}{2}\sqrt{1 + \dfrac{T}{L}}$ Raadi T

5) $\dfrac{1}{D} = \sqrt{\dfrac{6F}{D} - 3}$ Raadi D.

1.4.2 Isleeg Jibbaar.

Isleeg kasta oo doorsoomeyaal jibbaarro ah leh waxa la yiraa «Isleeg jibbaar». Isleeg jibbaar fudud ihi waa ta u eg $2^x = 2$ oo aynu ku furfuri karno goobid. Maxaynu 2 kor saari si ay natiijadu u noqoto laba, taas oo ah waa maxay qiimaha x ee isleegta run ka dhigayaa? X-du waa 1 ($x = 1$.

Tani, waxaynu ka soo dheegnay hubaasha ah in $b^{x_1} = b^{x_2}$ haddii iyo haddii qura $x_1 = x_2$.

Isleegyada jibbaar qaarkood waxa laga yaabaa in salalkoodu aanu isleegkaan, hase ahaatee salalka ayaynu isleegkaysiin karnaa markaynu gargaarsano astaamaha aynu u soo dejinay jibbaarrada. Haddii ay dariiqadaasi kuu suuroobi weydo way ka sarreysaa heerkeenna aan ku furfuro isleegyada cutubkani.

Cutubka kale ee kan ku xiga ayaynu ku dhigan doonnaa dariiqooyinka loo furfuro.

Tusaale I:

U furfur x haddii $2^{2x} = 2^{x-1}$

Furfuris :

1) Mar hadday salalku isleeg yihiin sin jibbaarrada

$$2x = x - 1$$

2) Furfur isleegta soo baxday

$$2x = x - 1$$
$$2x - x = -1$$
$$x = -1$$

3) **Hubsiimo:**

$$2^{2(-1)} \overset{?}{=} 2^{(-1)-1}$$
$$2^{-2} = 2^{-2} \quad \text{Haa.}$$

Tusaale II:

U furfur n $\quad 4^{n-1} = \left[\frac{1}{2}\right]^{4n-1}$

Furfuris :

1) U qor doc kasta oo isleegta si ay salalku isugu mid noqdaan — $(2^2)^{n-1} = (2^{-1})^{4n-1}$
2) Doc kasta fududee — $2^{2n-2} = 2^{1-4n}$
3) Jibbaarrada Sin, raadina n — $2n - 2 = 1 - 4n$

$$6n = 3$$

$$n = \frac{3}{6} = \frac{1}{2}$$

4) **Hubsiimo:**
Ku beddel — $(2^2)^{1/2-1} = (2^{-1})^{4(1/2)-1}$
$(2^2)^{-1/2} = (2^{-1})^1$
n qiimaheeda — $2^{-1} = 2^{-1}$ Haa.

Layli :

Furfur:

1) $3^4 = 3^{2x+1}$
2) $7^m = 7^{2m-1}$
3) $4^{3t} = {}^{t-2}$
4) $g^{c-1} = 27^c$
5) $27 = \frac{1}{3r}$
6) $10^{x+1} = 10^{3x+4}$
7) $4^{3n} = 4^{5n+2}$
8) $8^{k-1} = 16^{3k}$
9) $125^{2m-1} = 625^m$
10) $25\,(5^r) = 1$

LOGARDAM

Araar :

Cutubkan waxaynu ku baran kuna falanqayn aaraa'da ku xisaabsiga logardamyada. Ku adeegsiga logardamyadu waa lagama maarmaan. Aragtidu waxay si weyn ugu xiran tahay aqoonteennii hore ee jibbaarrada. Hase yeeshee, waa in inaynu marka hore naqtiinnaa qormo saynis (sansaan Beeggal).

Qormo Saynis.

QEEX. Tiro maangal oo r ahi waxay tahay sansaan ah qormo saynis haddii ay kuwan midkood tahay:

1) $1 < r < 10$ ama

2) Haddii r loo qoro taranka 10^n oo lagu dhuftay tiro A markay n abyoone tahay oo ay $1 < A < 10$. $r = A\,10^n$.

Tusaale :

U dhig 2.36, 186,000 iyo 0.0032 Qormo Saynis.

Furfuris :

b) 2.36 way u ooran tahay qormo saynis, mar haddii $1 < 2.36 < 10$.

t) $186{,}000 = 1.86 \times 10^5$ $\quad r = 186{,}000 \quad A = 1.86$

$r = 1.86 \times 10^5$

j) $0.00032 = 3.2 \times \dfrac{1}{10000}$ $\quad r = 0.00032 \quad A = 3.2$

$= 3.2 \times \dfrac{1}{10^4}$ $\quad r = 3.2 \times 10^{-4}$

$= 3.2 \times 10^{-4}$

Hubaal tiro kastoo maangal ah waa loo qori karaa sansaan qormo saynis. Taasoo fududaysa xisaabsiga gaar ahaan haddii labada isir ee tiradaa u qoran qormo saynis ay yihiin jibbaarro toban.

Tusaale :

Waxan ognahay in $325 = 3.25 \times 10^2$.

Haddaba 3.25 ma u qori karnaa jibbaarro toban, t.a. ma jirtaa x ku run ah $10^x = 3.25$.

Tan aljebra ahaan uma furfuri karro, hase ahaatee, haddii aynu raadin karro x-daa, markaa

$$325 = (3.25)\ (10^2) = 10^x \cdot 10^2 = 10^{x+2}$$

Haddaba aan u qeexno x-daa logardam ahaan, dabadeedna aan falanqeyno sida logardam loo adeegsado.

Qeex :

Haddii ay N tahay tiro maangal ah oo togan, b-na tahay tiro maangal ah oo ka weyn kow $(b>1)$, x tahay tiro maangal ah, oo raalligelisa $b^x = N$, markaa x waa logardamka N ee salka b. Summad ahaan

$$b^x = N \longleftrightarrow x = \log_b N$$

Waa inaad had iyo jeer logardamka uga fekertaa jibbaarka marka salka la saaro ku siiya tirada; taasi waxay tahay logardamku waa jibbaar.

Falanqaynteennii hore waxaynu ku koobaynay tiro x ah taasoo ay $10^x = 3.25$. Halkan x-du waxay noqonaysaa logardamka 3.25 ee salka 10, ama asto ahaan $x = \log_{10} 3.25$.

Mar haddii $\log_b N$ uu yahay jibbaar, hawraar jibbaaroo kasta waxa loo qori karaa sansaan logardam; hawraar kasta oo logardamka waxa loo qori karaa sansaan jibbaar.

Tusaale I:

U qor mid kastoo hawraarahan soo soeda ka mid ah sansaan logardam.

b) $5^{-} = 25$ t) $8^{1\backslash 3} = 2$ j) $3^{-2} = \frac{1}{9}$

Furfuris :

b) $5^2 = 25$ salku waa 5, tiraduna waa 25, jibbaarkuna waa 2. Sidaa awgeed

$5^2 = 25$ waxay u dhigantaa $\log_5 25 = 2$.

t) $8^{1\backslash 3} = 2$. Salku waa 8, tiraduna waa 2, jibbaarkuna waa 1/3. Sidaa awgeed

$8^{1\ 3} = 2$ waxay u dhigantaa $\log_8 2 = 1/3$.

j) $3^{-2} = \frac{1}{9}$. Salku waa 3, tiraduna waa $\frac{1}{9}$, jib baarkuna waa -2. Sidaa awgeed

$$3^{-2} = \frac{1}{9} \text{ waxay u dhigantaa } \log_3 \frac{1}{9} = -2.$$

Tusaale II:

U qor mid kastoo hawraarahan soo socda ah sansaar jibbaar.

b) $\text{Log}_{10}\ 100 = 2$ t) $\text{Log}_3\ 81 = 4$

j) $\text{Log}_2 \frac{1}{2} = -1$

Furfuris :

b) $\text{Log}_{10}\ 100 = 2$. Salku waa 10, tiraduna waa 100 logardamkuna waa 2. Sidaa awgeed $\log_{10}\ 100 = 2$ waxay u dhigantaa $10^2 = 100$.

t) $\text{Log}_3\ 81 = 4$. Salku waa 3, tiraduna waa 81 logardamkuna waa 4. Sidaa awgeed $\log_3\ 81 = 4$ waxay u dhigantaa $3^4 = 81$.

j) $\text{Log}_2 \frac{1}{2} = -1$. Salku waa 2, tiraduna waa $\frac{1}{2}$ logardamkuna waa (-1). Sidaa awgeed

$\log_2 \frac{1}{2} = -1$ waxay u dhigantaa $2^{-1} = \frac{1}{2}$.

Layli :

B. U dhig sansaan logardam:

1) $4^2 = 16$
2) $5^3 = 125$
3) $3^2 = 9$
4) $5^0 = 1$
5) $10^{-2} = 1/100$
6) $10^{2.414} = 110$
7) $10^{0.7789} = 6.01$
8) $10^5 = 100{,}000$
9) $5^{-3} = 1/125$
10) $27^{1/3} = 3$

T. U dhig sansaan Jibbaarrane.

1) $\log_3 27 = 3$
2) $\log_5 125 = 3$
3) $\log_8 64 = 2$
4) $\log_4 1/16 = -2$
5) $\log_7 49 = 2$
6) $\log_{10} 1000 = 3$
7) $\log_{10} 1 = 0$
8) $\log_{10} (0.01) = -2$

Aragtida Logardamyo

Hawraartii (Fansaarkii) logardam ihi waxay u yeeshaa tiradii kasta ee N, jibbaar x ah taasoo uu jibbaarka b^x le'eg yahay N. Si kale waxaynu ugu fekeri karnaa in $\log_b N$ ay tahay jibbaarka b.

Haddaba $b^{\log_b N} = N$

Mar haddii $\log_b N$ ay tahay jibbaar waxaynu Iqman karnaa aragtidii jibbaarrada, kuna adeegsan doonna si uu u liilgeliyo aragtida logardamyo.

Aragtiinka I:

$$\log_b MN = \log_b M + \log_b N$$

Caddayn :

Ka dhig in $\log_b M = x$. oo $\log_b N = y$.

Markaa $b^x = M$, $b^y = N$.

Haddaba $M \cdot N = b^x \cdot b^y = b^{x+y}$

Sidaa awgeed: $\text{Log}_b (M \cdot N) = x + y = \log_b M + \log_b N$

Aragtiinka II:

$$\text{Log}_b \left(\frac{M}{N}\right) = \log_b M - \log_b N$$

Ka dhig in $\log_b M = x$, oo $\log_b N = y$
Markaa $b^x = M$, $b^y = N$

$$\text{Haddaba } \frac{M}{N} = \frac{b^x}{b^y} = b^{x-y}$$

Sidaa awgeed: $\text{Log}_b \left(\frac{M}{N}\right) = x - y = \log_b M - \log_b N.$

Aragtiinka III:

$$\text{Log}_b (N^m) = m \log_b N$$

Caddayn :

Ka dhig in $\log_b N = x$
Markaa $b^x = N$, $N^m = (b^x)^m = b^{xm} = b^{mx}$
Haddaba $\log_b N^m = m \cdot x$

Sidaa awgeed $\log_b N^m = m \log_b N$.

Tusaale I:

Haddii $\log_{10} 5 = 0.6990$, $\log_{10} 30 = 1.4771$ Raadi

b) $\log_{10} 6$ t) $\log_{10} 150$.

Furfuris :

b) $\log_{10} 6 = \log_{10} \left(\frac{30}{5}\right) = \log_{10} 30 - \log_{10} 5$

$= 1.4771 - 0.6990$
$= 0.7781.$

t) $\log_{10} 150 = \log_{10} (30 \times 5)$
$= \log_{10} 30 + \log_{10} 5$
$= 1.4771 + 0.6990$
$= \mathbf{2.1761}$

Tusaale II:

Sug qiimaha doorsoomaha ee

b) $\log_5 N = 2$ t) $\log_b 8 = 3$ j) $\log_4 16 = x$

Furfuris :

b) $\log_5 N = 2 \Rightarrow 5^2 = N \Rightarrow N = 25$

t) $\log_b 8 = 3 \Rightarrow b^3 = 8 \Rightarrow (b^3)^{1/3} = 8^{1/3}$

$\Rightarrow b = \sqrt[3]{8}$

$\therefore b = 2$

j) $\log_4 16 = x \Rightarrow 4^x = 16$

$\Rightarrow 4^x = 4^2$

$\therefore x = 2$

Tusaale III: Raadi y-da

$$\log_3 y^5 - 3 = \log_3 y + \log_2 32$$

Furfuris :

$$\log_3 y^5 - 3 = \log_3 y + \log_2 32$$

Waxan ognahay in $\log_2 32 = 5$

Haddaba $\log_3 y^5 - 3 = \log_3 y + 5$

$5 \log_3 y - \log_3 y = 5 + 3$

$4 \log_3 y = 8$

$\log_3 y = 8/4 = 2$

Dabadeedna $3^2 = y$

$\Rightarrow y = 9$

Tusaale IV:

Raadi x-da $\log_2 (25 - x) = \log_2 x + 2$, haddii ay x-du tahay tiro maangal ah.

Furfuris :

$$\log_2 (25 - x) = \log_2 x + 2$$

$$\log_2 (25 - x) - \log_2 (x) = 2$$

$$\log_2 \left(\frac{25 - x}{x}\right) = 2$$

Haddaba $2^2 = \dfrac{25 - x}{x}$

$$\Rightarrow \quad 4x = 25 - x$$

$$\Rightarrow \quad 5x = 25$$

$$\therefore \quad x = 5$$

Hubsiimo :

$$\log_2 (25 - 5) \overset{?}{=} \log_2 5 + 2$$

$$\log_2 (20) \overset{?}{=} \log_2 5 + 2$$

$$\log_2 (5 \cdot 4) \overset{?}{=} \log_2 5 + 2$$

$$\log_2 5 + \log_2 4 \overset{?}{=} \log_2 5 + 2$$

$$\log_2 5 + 2 \overset{?}{=} \log_2 5 + 2, \quad (\log_2 4 = 2)$$

$\therefore x = 5$

Tusaale V:

Raadi x, haddii $\log_2 (x^2 - 1) = \log_2 8$.

Furfuris :

$$\log_2 (x^2 - 1) \overset{?}{=} \log_2 8$$

Waxaynu naqaan in $b^x = b^y$ haddii iyo haddii qura ah ay $x = y$; waxa taa ka iman kara in $\log_b y = \log_b x$ haddii iyo haddii qura ah oo ay $x = y$.

Haddaba $x^2 - 1 = 8$

$\Rightarrow x^2 = 9$

$\Rightarrow x = 3$ ama $x = -3$

Hubsiimo :

$$\log_2 [(3)^2 - 1] \overset{?}{=} \log_2 8 \qquad \log_2 [(-3)^2 - 1] \overset{?}{=} \log_2 8$$

$$\log_2 (9 - 1) \overset{?}{=} \log_2 8 \qquad \log_2 (9 - 1) \overset{?}{=} \log_2 8$$

$$\log_2 8 = \log_2 8 \qquad \log_2 8 = \log_2 8$$

$\therefore x = 3, -3.$

Tusaale VI:

Furfur $\log_4 (x + 3) + \log_4 (x - 3) = 2.$

Furfuris :

$$\log_4 (x + 3) + \log_4 (x - 3) = 2$$

$\log_4 (x + 3)(x - 3) = 2$ Aragtiinka I

$\Rightarrow (x + 3)(x - 3) = 4^2$

$\Rightarrow x^2 - 9 = 16$

$\Rightarrow x^2 = 25$

$\Rightarrow x = 5$ ama $x = -5$

Hubsiimo :

$x = 5$

$$\log_4 (5 + 3) + \log_4 (5 - 3) \overset{?}{=} 2$$

$$\log_4 8 + \log_4 2 \overset{?}{=} 2$$

$$\frac{3}{2} + \frac{1}{2} \overset{?}{=} 2$$

$2 = 2$ Haa.

Hubsiimo :

$$x = -5$$

$$\log_4 (-5 + 3) + \log_4 (-5 - 3) \overset{?}{=} 2$$

$$\log_4 (-2) + \log_4 (-8) \overset{?}{=} 2$$ Maya.

Waayo logardamka tirooyinka taban lama qaexin.

Tusaale VII:

Tus in ay $\dfrac{\log (x + h) - \log x}{h} = \log \left\{1 + \dfrac{h}{x}\right\}^{1/h}$

Xusuus: Waxa caado noqotay inaan la qorin salka logardamka marku yahay 10.

Furfuris :

$$\frac{\log (x + h) - \log x}{h} = \frac{\log \left\{\dfrac{(x + h)}{x}\right\}}{h}$$ Aragtiinka II.

$$= \frac{\log \left\{1 + \dfrac{h}{x}\right\}}{h}$$ Aljebra ahaan.

$$= \frac{1}{h} \log \left\{1 + \frac{h}{x}\right\}$$ Aljebra ahaan.

$$= \log \left\{1 + \frac{h}{x}\right\}^{1/h}$$ Aragtiinka III.

$$\log (x + h) - \log x = \log \left\{1 + \frac{h}{x}\right\}^{1/h}$$

Layli :

1) Haddii $\log_{10} 2 = 0.3010$, $\log_{10} 3 = 0.4771$, $\log_{10} 5 = 0.6990$. Raadi:

b) $\log_{10} 15$
t) $\log_{10} 12$
j) $\log_{10} 36$
x) $\log_{10} 1/8$
kh) $\log_{10} \sqrt{50}$
d) $\log_{10} \sqrt[3]{10}$
r) $\log_{10} 75$
s) $\log_{10} \sqrt{6}$
sh) $\log_{10} 125$

2) Raadi doorsoomaha mid kastoo kuwan soo socda ah.

b) $\log_{10} 10{,}000 = x$
t) $\log_x \frac{1}{16} = -\frac{1}{2}$
j) $\log_{64} N = \frac{1}{6}$
x) $\log_2 \frac{1}{32} = y$
kh) $\log_6 N = 3$
d) $\log_{27} 9 = y$
r) $\log_b 4 = \frac{2}{3}$
s) $\log_{64} N = \frac{5}{6}$
sh) $\log_{32} N = -\frac{2}{5}$
dh) $\log_{8\ 27} N = \frac{2}{3}$

3) Raadi x-da mid kastoo kuwan soo socda ah, haddii x-du tahay tiro maangal ah. Hubi furfurisyada x si aad u sugto inay hawraaro qeexan yihiin.

b) $\log_2 (3x - 2) = 2 + \log_2 x$
t) $1 + \log_5 x = \log_5 (2x + 8)$
j) $\log_2 (x^2 + 1) = 1 + \log_2 x$
x) $\log_3 x + 2 = \log_3 (x^2 + 18)$
kh) $\log_2 (x + 2) + 4 = 5 - \log_2 (x - 2)$

Ku adeegsiga logardamyo furfurista isleegyo.

Waxaynu logardamyo adeegsan karnaa markaynu furfurayno isleegyada qaarkood. Sidii aynu horeba u soo sheegnay haddii isleegyo jibbaar ayna salalku isku mid ahayn amaba isku mid laga dhigi karin, markaa furfuristooda waxaa

oo igmanayaa logardamyo. Isla markaana kuwa furfuristoo-u qalafsan taKay ama madaxa daalinayso isagaa loo igmadaa.

Tusaale I:

Saddex rugood u sug x-da haddii

$$x^{2\backslash 5} = 3.91$$

Furfuris :

1. Sin logardamyada caadiga ah ee doc kasta	$x^{2\backslash 5} = 3.91$ $\log x^{2\backslash 5} = \log 3.91$
2. Adeegso xeerarka logardamyo si aad u fududeyso docda bidix u furfur log x	$2/5 \log x = \log 3.91$ $\log x = 5/2 \log 3.91$ $\log x = 5/2 (0.5922)$ $\log x = 1.4805$
3. Raadi lidlogar 1.4805	$\therefore x = 30.2$

Tusaale II:

Raadi ururka furfurista $5^x = 40$.

Furfuris :

$$5^x = 40$$

1. Sin log. caadiga ah ee doc kasta	$\log 5^x = \log 40$ $x \log 5 = \log 40$
2. Adeegso xeerarka log. Si aad u fududeeyso docda bidix una furfur x-da	$x = \dfrac{\log 40}{\log 5}$
3. Si aad u sugto x-da Sin log caadiga ah ee doc kasta natiijada tallaabada Labaad. (hawl yaraan awgeed).	$x = \dfrac{1.6021}{0.6990}$ $\log x = \log \dfrac{1.6021}{0.6990}$

4. Adeegso xeerka log si aad u fududeyso docda midig, dabadeedna u furfur x-da

$$\log x = \log 1.6021 - \log 0.6990$$

Haddaba $\log 1.16021 = \log 11.2046 - 10$

$\log 0.6990 = \log 10.8445 - 10$

$\Rightarrow \log x = 0.3601$

5. Raadi lid log. 0.3601

$\Rightarrow x = 2.292$

$\therefore x = 2.292$

OGOW! Haddii $\log_b N = x$, markaa N waxa la yiraa lidlogarlamka x.

Tusaale III:

U dhig $\log_7 8$ tibixo logardam caadi ah.

Furfuris :

Ka soo qaad $x = \log_7 8$

1. U qor isleegta sansaan jibbaar

$$7^x = 8$$

2. Sin logardamyada caadiga ah ee doc kastaa isleegta laga helay tallaabada kowaad, dabadeedna raadi x-da.

$$\log_{10} 7^x = \log_{10} 8$$

$$x \log_{10} 7 = \log_{10} 8$$

$$x = \frac{\log_{10} 8}{\log_{10} 7}$$

Natiijada tusaalaha 3aad waxay guud ahaan muujinaysaa xiriirka ka dhexeeya logardamyada tiro N ah ee laba sal oo kale duwan leh sida b iyo t.

$$\log_b N = \frac{\log_t N}{\log_t b}$$

Bal aan isku dayno jidaynta xiriirkaas.

Caddayn :

Ka dhig in $x = \log_b N$

1. U qor sansaan jibbaar $b^x = N$. Qeexda logardam.
2. Sin logardamyada salku yahay t ee doc kasta $\log_t b^x = \log_t N$, waayo $b^x = N$.
3. Adeegso xeerarka Logardamyada
   $x \log_t b = \log_t N$ Aragtiinka III.
4. U furfur x-da $x = \dfrac{\log_t N}{\log_t b}$ Aljabra ahaan.
5. Ku beddel $\log_b N$, x-da

$$\log_b N = \frac{\log_t N}{\log_t b}$$ Ast. isku beddelka

$$\therefore \log_b N = \frac{\log_t N}{\log_t b}$$

Gaar ahaan, haddii $N = t$ waxaad heleysaa

$$\log_b t = \frac{\log_t t}{\log_t b}$$

ama mar haddii $\log_t t = 1$, $\log_b t = \dfrac{1}{\log_t b}$

Layli :

I. Furfur isleegyadan soo socda haddii

b) $\log_{10} 4 = 0.6021$,

t) $\log_{10} 5 = 0.6990$

j) $\log_{10} 6 = 0.7782$

x) $\log_{10} 7 = 0.8451$

kh) $\log_{10} 8 = 0.903$

1) $6^x = 8$

2) $20^x = 420$

3) $5^{y-1} = 56$

4) $70^x = 280$

5) $4^x = \frac{35}{4}$

6) $8^y = \sqrt{350}$

7) $8\,(4^x) = 14$

8) $6^{2x-1} = 10$

9) $10^{1-y} = 0.01$

10) $10^{y+2} = 0.001$

II. U dhig logardamyada soo socda tibxo logardamka caadiga ah.

b) $\log_5 10$

t) $\log_2 32$

j) $\log_4 64$

x) $\log_3 100$

kh) $\log_6 72$.

CUTUB 3

SUNSUNNO IYO DAREERINNO

Qeex sunsun:

Sunsuunku waa fansaar F_n oo horaadkiisa D yahay urur abyoonayaal ah. Horaadka fansaarku wuxu ka kooban yahay laba mid uun:

b) dhammaan abyoonayaasha togan $n \leq K$ oo K tahay abyoone magacaaban;

t) dhammaan abyoonayaasha togan:

$$(1 , 2 , 3 , 4 , \ldots , n , \ldots).$$

Sida (b) sheegayso marka horaadku ku dhammaanayo tiro, sunsunka F_n waxa la yiraa sunsun kooban ama dhammaad leh, qiimahiisa ku aadan tirada n ee horaadka fansaarka waxa la yiraa tibixda N — aad. Waxaan sunsunkaas u qori karnaa:

$$F_1 , F_2 , F_3 , \ldots . F_n$$

Danbeedka sunsunka badiba tibix kasta waxa lagu asteeyaa hoosqor yar oo horsiimo kordhaysa leh. Waxaan F_1 ugu yeernaa tibixda hore, F_2-na tibixda labaad, ilaa iyo F_n oo ah tibixda n aad ee sunsunka. Sunsunka F_n wuxuu qeexan yahay marka la siiyo jid ama xeer N ah.

Tusaale:

$$F_n = 3N + 5 , N = 1 , 2 , 3 , \ldots , 6$$

Imminka sunsunka F_n wuxu leeyahay lix tibxood:

$$F_1 , F_2 , F_3 , \ldots , F_6$$

Raadinta tibxahaa, waxa lagu helayaa marka abyoone kasta oo ka tirsan: N, $1 \leq N \leq 6$ lagu beddelo isle'egta $F_n = 3N + 5$, sida:

$$F_1 = 3(1) + 5 = 8$$
$$F_2 = 3(2) + 5 = 11$$
$$F_3 = 3(3) + 5 = 14$$
$$\cdots \quad \cdots$$
$$F_6 = 3(6) + 5 = 23$$

Tibxaha sunsunkani waa:

$$8 , 11 , 14 , 17 , 20 , 23$$

Layli:

1. Raadi afarta tibxood ee hore ee sunsunka xeerkiisa lagu siiyey:

b) $F_n = \dfrac{N(N+1)}{2}$

t) $F_n = 1 + \dfrac{1}{N}$

j) $F_n = (-1)^N \cdot 2^N$

x) $F_n = (-1)^{N-1} \cdot 3^N + 1$

kh) $F_n = N^2$

d) $F_n = \dfrac{N}{2N-1}$

r) $F_n = \dfrac{N(N+1)(N+2)}{3}$

s) $F_n = \dfrac{N(N+1)(2N+1)}{6}$

2. Sawir garaafka $F_n = \frac{N(N+1)}{2}$. Waa jaadma garaafkaasu?

1.2 Sunsun Aritmetig:

Fiiri sunsunkan: 5, 8, 11, 14, 17, 20. Waxaad ku arki in labadii tibxood ee is xigaba faraqoodu isle'eg yahay. Matalan $8 - 5 = 3$ $11 - 8 = 3$ $17 - 14 = 3$, sidoo miidhan.

Qeex:

Sunsunka F_n haddii labadii tibxood ee isku xiga faraqoodu yahay isla mid, markaa F_n waa sunsun aritmetig $(S \cdot A)$

Haddaynu ilaaleyno sunsunkan aritmetig $S \cdot A \cdot$ ee 9, 6, 3, 0, -3 waxaan haddiiba arkaynaa in faraq-wadaaggu yahay -3. Sidaa awgeed tibixda lixaad waa -6. Sunsun aritmetig dhisiddiisu waxay u baahan tahay tibixda kowaad iyo faraq-wadaagga oo la ogaado, kolkaas baynu dabadeed ka dhalin karraa tibxaha kale oo idil. Matalan, ka soo qaad in "a" tahay tibixda kowaad, "d" tahay faraq-wadaagga S.A. Marka waxa imanaysa in tibixda labaad tahay $a+d$, ta saddexaad tahay $a + 2d$, ta afraadna tahay $a + 3d$. Eeg, tibix kasta horgalaha "d". Kow buu ka yar yahay tirada uu u joogo. Sidaa awgeed tibixda N-aad ee sunsunka waxa inna siinaysa $L_n = a + (n - 1)d$.

Tusaale:

Qor saddexda tibxood ee ku xiga tibixda u danbeysa $S \cdot A$: 27, 29, 31, 33.

Furfuris:

Mar haddii $d = 2$, $a = 27$ waynu ka xisaabin karraa saddexda tiro ee la doonayo, haddaynu mid kasta tiradiisa ku

beddello $L_n = a + (n - 1)d$. t.a. waxaynnu rabnaa ta shanaad, ta lixaad iyo ta toddobaad:

$$L_5 = 27 + (5 - 1) \cdot 2 = 35$$
$$L_6 = 27 + (6 - 1) \cdot 2 = 37$$
$$L_7 = 27 + (7 - 1) \cdot 2 = 39$$

Layli:

1. Soo saar tibxaha S·A ee leh qiimayaasha, a, d, iyo n Marka:

   b) $a = 1 \quad d = 3 \quad n = 5$
   t) $a = -1 \quad d = 2 \quad n = 4$
   j) $a = 3, \quad d = -2, \quad n = 8$
   x) $a = -2 \quad d = -3 \quad n = 25$

2. Soo saar tibixda lagu weydiiyo ee S·A kasta.
   b) Tibixda tobnaad ee 3, 6, 9, 12 . . .
   t) Tibixda lixaad ee 12, 9, 6 . . .
   j) Tibixda siddeedaad ee $\frac{1}{2}$, 1 , $1\frac{1}{2}$, 2 , . . .
   x) Tibixda afraad ee $(x - y)$, x , $(x + y)$, . . .

3. Askari baa musharkiisu 600 oo gini sannadkii yahay. Haddii sano kasta 5 gini u kordho waa immisa musharkiisu sannadka toddobaad ee uu shaqada hayo?

4. Jaranjaraa catabaddeeda u hoosaysa dhererkeedu 26 hiish yahay. Mid kastana tan ka hoosaysa waxay ka yar tahay $\frac{1}{2}$ hiish. Haddii jaranjaradu 20 catabadood leedahay soo saar dhererka catabadda 20aad.

5. Xabbad cirka loo ganay baa 15840 ft sare u baxda sekendka hore, 15,808 ft bay sekendka labaad joogtaa, sekendka saddexaadna waxay joogtaa 15,776 ft. Immisa fiit bay joogtaa sekendka 45-aad?

1.3 Tirasinka Aritmetigga:

Sunsunka aritmetigga ee guud:

$$a,\ a + d,\ a + 2d,\ a + 3d,\ \ldots,\ a + (n - 1)d,$$

tibixda hore iyo tan danbe waxa la yiraa **Cidhifyo,** kuwa kale ee dhexdana **Tirosinayaasha** u dhexeeya a iyo $a + (n - 1)d$. Tirosinayaasha aritmetiga waxaan ku qeexaynaa: tibxaha u dhexeeya laba tibxood oo kasta oo S.A.

Si aynu K tirosin aritmetigga ugu dhexaysiinno a iyo $a + (n - 1)d$, waxaan u baahannahay in aynu keenno sunsun K tibxood leh oo a iyo $a + (n - 1)d$ cidhifyo u yihiin.

Tusaale 1:

3 iyo 9 u dhexaysii saddex tirasin aritmetig.

Furfuris:

Waxa layna siiyey tibixda hore iyo tii u danbeysey ee S.A. Shan tibxood baynu haysannaa. Kolka aan soo saarro **faraq-wadaagga sunsunka.**

Tibixda N-aad waxa inna siisa $L_n = a + (n - 1)d$.

$$9 = 3 + (5 - 1)d, \quad d = \frac{3}{2}.$$

Tirasinnada aan rabno waxaan ku heleynaa, darka aan $\frac{3}{2}$ ku darro tibixda u horraysa. Waxa soo baxaa waa tibixdii labaad. Ku dar $\frac{3}{2}$ tan labaad waxa soo baxaa waa tibixdii saddexaad, sidaas oo kale u wad ilaa aad tirasinnada oo dhan soo saarto. Imminka tirasinnadii waa $4\frac{1}{2}$, 6, $7\frac{1}{2}$.

Tusaale 2:

Haddii tibixda saddexaad iyo ta toddobaad ee S·A ay yihiin 3 iyo 9 siday u kala horreeyaan, waa maxay tibixda hore ee sunsunku?

Furfuris:

Sida layligan looga jawaabi karaa waa sunsunka oo aan tibxihiisa u qorro sidan:

$$\underset{}{3} \quad \underset{}{9}$$

— — — — — — —. Kadibna sida tusaale 1 aan u soo saarro faraq-wadaagga iyadoo aan tibixdaa saddexaad uga fekereyno tibixda hore ta toddobaadna ta shanaad. Faraq-

wadaagga soo baxayaa waa $\frac{3}{2}$. Waxaynuna ku soo saari karraa tibixda hore haddaynu sunsunka tibixdiisa saddexaad ee 3 u qaadanno tii ugu danbeysay $-L_n$, faraq-wadaaggana $\frac{3}{2}$.

Marka haddii:

$$L_3 = 3 \quad L_7 = a + (n-1)d.$$

Waxa jirta in:

$$3 = a + (3-1) \cdot \frac{3}{2}$$

$$3 = a + 3$$

$$a = 0.$$

.. Sunsunku waa $0, \frac{3}{2}, 3, \frac{9}{2}, \cdots$

Si kalana waa isle'egyadan wadajirka ah oo aan samayno dabadeedna furfurro.

$L_3 = 3$ markaa $3 = a + 2d$

$L_7 = 9$ markaa $9 = a + 6d$

Furfuris:

$$a = 0, d = \frac{3}{2}.$$

Layli:

1. Dhexgeli tirada tirasin ee magacaaban hadba cidhifyada lagu siiyo.
   b) 5, u dhexeysii 13 iyo − 11
   t) 4, u dhexeysii 23 iyo − 16
   j) 3, u dhexeysii − 10 iyo 0
   x) 3, u dhexeysii $\frac{1}{2}$ iyo 0
2. Nin iskaashato ka mid ah oo farsamo yaqaan ah ayaa mushaaradiisu si S.A. muddo 5 bilood ah u kordhaysey. Haddii mushaaradiisu bishii u horreysay 4,400 sh. ahayd bishii shanaadna 6,000 ahayd, bil kasta immisa ayay mushaaradiisu ahayd?
3. Haddii a tahay tirasin u dhaxeeya b iyo C, caddee in $a = \frac{b + C}{2}$.
4. Soo saar tirasinka u dhexeeya:
   b) 8 , 16 t) 16 , 54
   j) − 20 , − 59 x) a , b
   kh) $\frac{1}{2}$, $-\frac{1}{2}$.
5. Toddoba miisaan oo kafed saaran baa u yaalla si S.A. Haddii ka ugu culusi 25 garaam yahay ka u fududina 1 garaam yahay waa maxay kuwa kale culayskoodu?
6. Dadweynaha Muqdisho ku nool min 55,000 ilaa 250,000 buu kordhay muddo 4 sano ah. Raadi inta halkii sanaba korodhay.

Sunsun aritmetig ah wadarayntiisa waxa loo yaqaan dareerin. Tibxo sunsun waḍartood ayaa la yiraa dareerin. Bilmetel, sunsunka 3, 6, 9, 12 dareerinta ku aaddani waa:

$$3 + 6 + 9 + 12$$

1.4.1 Raadinta tibaaxda guud ee wadaraynta N-da tibxood ee hore ee S.A.

Ka soo qaad in S tahay wadarta tibaaxda $L_n = a + (n-1)d$ qeexayso, tibixda hore waa a, faraq-wadaaggu waa d, tibixda danbena wa L.

Haddaan wadarta N-da tibxoodba u qorro horsiimo koraysa iyo mid dhimaysa waxaan heleynaa:

1) $S = a + (a + d) + (a + 2d) + \cdots$
$(L - 2d) + (L - d) + L$

2) $S = L + (L - d) + (L - 2d) + \cdots$
$(a + 2d) + (a + d) + a$

Isle'egyada (1) iyo (2) markaan isku darro tibaaxahooda isku aaddan, waxaan heleynaa:

$$2S = (a+L) + (a+L) + (a+L) + \cdots + (a+L) + (a+L)$$

Waxaan haynaa n — tibxood oo mid walba (a + L) tahay.

Sida awgeed $2S = n(a + L)$ ama $S = \frac{n}{2}(a + L)$

Mar haddiise $L = a + (n - 1)d$, waxaynu guud ahaan helaynaa:

$$S = \frac{n}{2}[a + a + (n - 1)d] \rightarrow S = \frac{n}{2}[2a + (n - 1)d]$$

Taasi waa jidka lagu helo wadarta n — tibxood oo S.A.

Tusaale 3:

Raadi wadarta 16-ka tibxood ee hore ee sunsunka

$$6, 9, 12, \cdots,$$

Furfuris:

Faraq-wadaaggu waa 3, marka aan adeegsanno jidka wadaraynta S·A waxaan helaynaa:

$$S = \frac{n}{2}[2a + (n-1)d] \text{ oo } n = 16,\ a = 6,\ d = 3, \text{ markaa}$$

$$S = \frac{16}{2}[2.6 + (16-1)\,3] = 8\,(12 + 15 \times 3)$$

$$= 8 \times 57 = 456$$

Hubsiimo:

Bal 16ka tibcood ee susunka wadartoodu hubi in ay le'egtahay 456.

Layli:

1. Soo saar wadarta S.A adoo mar walba adeegsanaya jidka $S = \frac{n}{2}[2a + (n-1)d\cdot]$

b) $8, 13, 18, \cdots,$ ilaa 15 tibxood.

t) $3, 5, 7, \cdots,$ ilaa 14 tibxood.

j) $5, 4\frac{1}{2}, 4, \cdots$ ilaa 81 tibxood.

x) $a = 6,\ d = 4,\ n = 17$

kh) $a = 0,\ d = -\frac{1}{2},\ L = -50$

2. Dhig saddexda tibxood ee hore ee S.A. kasta.

b) $a = 3 \quad L = 17 \quad S = 100$

t) $n = 17 \quad L = 7 \quad S = 25\frac{1}{2}$.

3. Soo saar wadarta dhammaan tirooyinka dhabanka ah ee u dhaxeeya 10 iyo 20, cirifyaduna ha ku jireen.

(isku day in aad laba siyood u furfurto)

4. Sallaan baa catabadda u hoosaysaa 26 hiish dherer le'eg tahay. Catabad waliba $\frac{1}{2}$ hiish bay ka yar tahay tan ka hoosaysa. Haddii sallanku 12 catabadood ka samaysan yahay, immisa fuudh weeye dhererka catabadaha oo idil?

5. Xirmooyin sarab dhis ah oo is wada dul saaran, baa xirma waliba ta ka sarraysa mid dheer tahay. Haddii sarabka oo dhamni 105 midh yahay, immisa xirmo ayaa is dul saaran. (xidhmada u sarraysaa waa 1)

6. Raadi tibaax qeexaysa wadarta:

b) n-da hore ee abyoonayaasha togan ee kisiga ah;
t) m-da hore ee abyoonayaasha togan ee dhabanka ah.

7. Arday imtixaan toban su'aalood ah ku jira ayaa lagu yiri su'aal waliba midday ka danbayso ayey laba derejo dheer tahay. Haddii su'aasha saddexaad shan derejo leedahay soo saar derejada ugu badan ee ardaygu keeni karo.

8. S.A. baa tibixdiisa afraad-6 tahay; wadarta 15-ka tibxood ee horena waa 30. Tibixdee baa eber ah?

9. S.A. ayaa wadarta shanta tibxood ee hore tahay -35, wadarta afarta tibxood ee ku xigaana tahay 77. Raadi wadarta labaatanka tibxood ee hore.

10. Tibixda shanaad ee S.A. waa 4, ta toban iyo kowaadna waa tibixda sagaalaad oo lix lagu dhuftay.

Raadi:

i) tibixda hore;

ii) faraq-wadaag iyo;

iii) wadarta labaatanka tibxood ee hore.

11. Faraqa u dhexeeya tibixda hore iyo ta danbe ee S.A. waa 36. Wadarta tobanka tibxood ee hore waa 40. Raadi tibixda danbe.

12. S.A. baa tibixdiisa hore tahay ta toban iyo kowaad oo toddoba lagu dhuftay, wadarta tibixda toddobaad iyo ta toban iyo lixaad waa 5. Soo saar wadarta soddonka tibxood ee hore.

13. Ibraahim iyo Cali baa isaga soo kacay laba magaalo oo 363 mayl isu jira. Haddii Ibraahim maalinta hore 1 mayl jaro, maalinta labaadna 3 mayl, maalinta saddexaadna 5, sidaas oo miiran ku wado (si S.A), Calina maalinta hore 2 mayl jaro, maalinta labaadna 6 mayl, ta saddexaadna 10 mayl, sidaas oo miiran ku wado (si S.A), maalintey kulmayaan?

14. Nin baa doonaya in uu qasacado yaanyo ah meel ku raseeyo. Wuxuu doonayaa in rasada sare 4 qasacadood noqoto. Rasa kastana ta ka sarraysa 1 qasac dheeraato. Hadduu 8 raso samayn rabo immisa qasacadood buu u baahanayaa?

1.42 Qormada wadaraynta:

Sunsunka kooban ee a_1, a_2, a_3, $\cdots$ a_n isku-darkiisa waxaan ku qeexnay dareerinta kooban ee $a_1+a_2+a_3+\cdots+a_n$. Haddaba waxa jira qormo dareerinta soo gaabisa. Badiba summadda lagu isticmaalaa waa «Σ» oo xaraf xarfaha giriiga ka mid ah loona akhriyo sigma. Bilmetel dareerinta

$a_1 + a_2 + a_3 + \cdots + a_n$ waxa loo qorayaa $\sum_{i=1}^{n} a_i$ oo loo akhriyayo «wadarta a_i marka i tahay 1 ilaa n ama $1 \leq i \leq n_i$» i oo hoosqorka a ah waxa la yiraa tuse, a_i waa tibixda dhalisada ah ama tibixda guud ee sunsunka.

Tusaale:

Soo saar $\sum_{i=1}^{4} 5a_i$

Furfuris:

Aan kala bixinno $\sum_{i=1}^{4} 5a_i = 5a_1 + 5a_2 + 5a_3 + 5a_4$.

Ogow: $\sum_{i=1}^{4} 5a_i \neq 5a \sum_{i=1}^{4} 5a_i = 5a\ (1 + 2 + 3 + 4) = 50a$, sababta oo ah, a_i waa doorsoome $a_i = a$. Waxase run ah in $\sum_{i=1}^{4} 5a_i = 5\sum_{i=1}^{4} a_i$.

Tusaale 2:

Soo saar qiimaha $\sum_{k=1}^{4} k^2$

Furfuris:

$$\sum_{k=1}^{4} k^2 = 1^2 + 2^2 + 3^2 + 4^2 = 30$$

Tusaale 3:

Soo saar $\sum_{i=1}^{3} (a_i + 6)$

Furfuris:

$$\sum_{i=1}^{3} (a_i+6) = (a_1+6) + (a_2+6) + (a_3+6) = a_1 + a_2 + a_3 + 18$$

si kalena, waxaan qori karraa:

$$= a_1 + a_2 + a_3 + 6 + 6 + 6$$
$$= a_1 + a_2 + a_3 + 3 \times 6$$
$$= a_1 + a_2 + a_3 + 18.$$

Tusaalooyinkaa sare iyo kuwa kalaba waxaan ka jidayn karraa in:

1) $\sum_{i=1}^{n} Cm_i = C\sum_{i=1}^{n} m_i$ marka C madoorsoome tahay.

2) $\sum_{i=1}^{n}(m_i+C) = \sum_{i=1}^{n} m_i + \sum_{i=1}^{n} C$

$= m_1 + m_2 + m_3 + \cdots m_n + nC$

3) $\sum_{i=1}^{n} a_i b_i \neq \sum_{i=1}^{n} a_i \cdot \sum_{i=1}^{n} b_i$ waayo:

$\sum_{i=1}^{n} a_i b_i = a_1 b_1 + a_2 b_2 + a_3 b_3 + \cdots + a_n b_n$

$\sum_{i=1}^{n} a_i \cdot \sum_{i=1}^{n} b_i = (a_1 + a_2 + \ldots + a_n) \times (b_1 + b_2 + \ldots . \ldots . + b_n)$.

Layli:

Raadi qiimaha:

1) $\sum_{j=1}^{5} j^2$

2) $\sum_{i=1}^{3}(3a_i - 2)$

3) $\sum_{i=1}^{3}(2x_i + 4)$

4) $\sum_{j=1}^{5} 2j - 3$

5) $\sum_{k=0}^{4} \frac{k}{1+k}$

6) $\sum_{j=2}^{5}(j^2 + 1)$

7) $\sum_{j=3}^{5} \frac{1}{3} j$

8) $\sum_{i=1}^{2}(3k_i + 2x^2_i)$

1.5 Sunsun joomateri (S.J):

Imminka ka hor waxaan ka shaqaynayney sunsunka aritmetigga. Hadda, bal aan eegno sunsun kale, kaas oo leh astaan ah tibix kasta haddii loo qaybiyo ta ka horreysa waxa la helaa tiro joogto ah. Sunsunka caynkaas ah waxa la yiraa sunsun joomateri. Sunsunka joometeriga waxa loo qoraa $\{a_n\}$ tirada joogtada ahna r, marka $a_n + 1 = r$, a_n oo n tahay

[illegible] Tirada r waxa lagu magacaabaa [illegible]

[illegible] 32, ... waa sunsun joometeri [illegible] ta ka horraysa oo 2 lagu [illegible]

[illegible] joometeri $\{a_n\}$ ku dha- [illegible]

[illegible] tibixda [illegible] miidhan [illegible] $a \cdot r^{n-1}$. Hadd[illegible] tibixda n-aad tahay L[illegible]

$$a_n = a \cdot r^{n-1}$$

Laylis

1. [illegible] hore ee sunsun joometeri [illegible] 12.

[illegible] shanaad?
[illegible] tobnaad?
[illegible] siddeedaad?
[illegible] n-aad?

[illegible] $a_1 = -1$ $a_3 = -4$. [illegible] joometeriyada:

[illegible] $a_3 = 4$?

[illegible] waa 2 ta saddexaadna waa 8, [illegible] tibixda labaad. Tibixaan [illegible] yiraa tirasinka joome[illegible] 8. Kee labada weyn tira[illegible] aritmetig?

2.5.1 Wad[illegible]

[illegible] wadarta tibxaha [illegible] fiiri sunsunkan joometeri,

a, ar^1, ar^2, ar^3, . . . , dareerinta joometeri ee n tibxood ka koobani waa:

$$S_n = a + ar + ar^2 + ar^3 + \cdots + ar^{n-1} \qquad (1)$$

ku dhufo r: dhinac kasta (1). Markaa:

$$rs_n = ar + ar^2 + ar^3 + ar^4 \cdots ar^{n-1} + ar^n \qquad (2)$$

kala jar isle'egta (1) iyo ta (2), waxaad heli:

$$S_n (1 - r) = a - ar^n$$

$$S_n = \frac{a(1 - r^n)}{1 - r}$$ [illegible]

U fiirso hadda, wadarta S_n waa [illegible] sidan:

$$S_n = \frac{a(r^n - 1)}{(r - 1)}$$

Sida aad aragto wadar [illegible] tahay marka $r \neq 1$. Haddiise $r = 1$ dareerinta [illegible] baxdaa waa:

$$S_n = a + a + a + \cdots + a \qquad (1)$$

Sidaa awgeed $S_n = na$ [illegible]

1.5.2 Wadarta dareerinno joometeri [illegible]:

Ilaa iyo hadda waxaan [illegible] dareerinno joometeri oo kooban. Marka se dareerintu aanay koobnayn wadarta $S_n = \sum_{1=n}^{\infty} ar^{n-1}$.

darta $S_n = \sum ar^{n-1}$ A[illegible] si fudud u qorro.

Fiiri dareerintan joometeri ee wadarteedu tahay:

$$S_n = 3 + 3\frac{1}{2} + 3 \cdot \frac{1}{4} + 3 \cdot \frac{1}{8} + \cdots + 3 \cdot (\frac{1}{2})^{n-1}.$$

Marka:

$$n = 5, (\frac{1}{2})^{n-1} = \frac{1}{16}$$

$$n = 6,\ \left(\frac{1}{2}\right)^{1-6} = \frac{1}{32}$$

$$n = 7,\ \left(\frac{1}{2}\right)^{7-1} = \frac{1}{64}$$

$$n = 8,\ \left(\frac{1}{2}\right)^{8-1} = \frac{1}{128}$$

Waxaan aragnaa in marka n sii weynaataba, $\left(\frac{1}{2}\right)^{n-1}$ ay sii yaraanayso oo eber ay ku sii siqayso. Sidaa awgeed, marka n uu qiima aad u weyn leeyahay, $\left(\frac{1}{2}\right)^{n-1}$ wax aad u yar baa ku soo kordhaya, wadartuna seebid ahaan waa:

$$S_n = \frac{3}{1 - \frac{1}{2}} = 6.$$

Inagoo dhawr laylis tusaalayn karra aan ku soo gebegebeyno:

marka $|r| < 1$ wadarta dareerinta aan koobnayni waa:

$$S_n = \frac{a}{1 - r}$$

Layli:

1. Raadi wadarta S.J. 3, 6, 12, ··· ilaa lix tibxood.

2. Raadi wadarta S.J. 2, 6, 18, ··· ilaa sideed tibxood.

3. Raadi wadarta S.J. $\frac{1}{8}, \frac{1}{4}, \frac{1}{2} \cdots$ ilaa shan tibxood.

4. Xoogbaa lagu abbaaray saxar xarriiq toosan mara. Xooggu wuxu yeelay in saxarkii sekend kasta fogaantii sekendkii ka horreeyey badhkeed socdo. Haddii saxarku sekendkii u horreeyey 10 m socday, fogaan intee le'eg buu jarayaa sekendka afraad dhammaadkiisa?

5. Nin baa Sabti laba waraaqood u kala diray laba nin, wuxuuna faray in midba laba nin oo kale maalinta Sabtida laba waraaqood u kala diro oo uu intaana faro. Haddaan meella laba waraaqood ku kulmin, immisa waraaqood baa la diray siddeedda Sabti ee hore?

6. Wadarta tibixda hore iyo ta labaad ee S.J. waa -3. Wadarta tibixda shanaad iyo ta lixaadna waa $-\frac{3}{16}$. Soo saar wadarta siddeedda tibxood ee hore.

7. Δ Saddexgal siman baa dhinac 12 hiish yahay. Dhinacyada bar badhtannadooda baa laysku xiray si uu u samaysmo saddexgal yar oo ka hore ku guda jira. Habkaas haddii la sii wado, raadi wadarta wareegga shanta saddexagal ee siman ee ugu horreeya?

8. Tibixda saddexaad ee sunsun waa 16, ta shanaad-na waa 4. Raadi faraq-wadaagga sunsunka iyo wadarta toddobada tibxood ee hore haddii sunsunku yahay S.A.

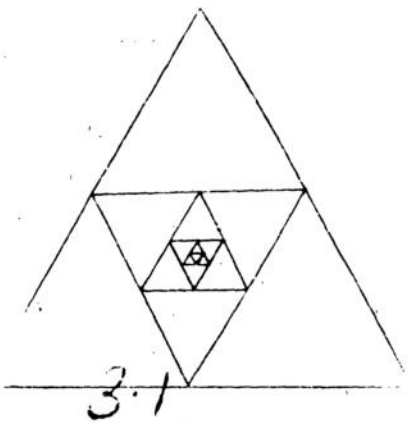
Soo saar saamiwadaagga iyo wadarta lixda tibxood ee hore haddii sunsunku yahay S.J.

9. Tibixda labaad ee S.J. oo koobani waa 3, ta shanaadna waa $\frac{81}{8}$. Raadi saami-wadaagga iyo wadarta shanta tibxood ee hore.

10. Raadi wadarta dareerinta $2 + \frac{2}{3} + \frac{2}{9} \cdots$

11. Raadi wadarta dareerinta $1 - \frac{1}{2} - \frac{1}{4} - \frac{1}{8}$

12. Kubbad baa laga daayey joog 28 ft ah. Marka ay dhulka ku dhacdo waxay dib u booddaa joogga ay hadba ka soo dhacdo badhkii. Soo saar fogaanta ay kubbadu jarayso ilaa ay fadhiisato.



CUTUBKA 4

XISAABTA GANACSIGA

Waxa jirta in lacagtii la gashado heya'd maaliyo ay keento dheef la yiraa dheefkor, dheef taasoo ka faa'iida badan dheefta fudud, waayo dheefta laga heli maayo raasammaalka joogtada ah oo qura, laakiin dheefta ururtana waa laga heli.

Qeex:

Dheef-kor waxa la yiraa lacagta la helo marka dheeftu ay ku darsanto raasamaalka dhammaadka kal gaddis kasta (kal gaddisyadu waa gaalisyo ammineed, waana isku wada mid, wayna isku xigaan). Xusuuso in dheef fududi ay ahayd dheefta laga bixiyo raasamaalka lagu bilaabay lacag gashiga oo qura; ammin dhammaadka qiimaha qaan gaarka ahi waa raasamaalka oo loo geeyay dheeftii fududayd. Bal hadda tixgali tusaalaha soo socda.

Tusaale 1:

Ka soo qaad in jaalle B ku shaqa gashaday So. Sh. 1,000 dheef fudud oo ah 6% muddo 3 sano ah.

Markaa:

R = So. Sh. 1,000 — D = Rdt

d = 6% sana 6/100 — $D = 1{,}000 \times \frac{6}{100} \times 3$

T = 3 sano — D = So. Sh. 180

$$H = R + D$$
$$H = 1{,}000 + 180$$
$$= 1{,}000 + 180$$
$$H = 1{,}180$$

Jaalle B wuxu dheef u helay So. Sh. 180, wadarta u qaan gaartayna (hanti) waa So. Sh. 1,180.

U fiirso in R ka joogto rasamaal, d dulsaar, t ammin, D dheef, H-na hanti.

Markaan ka soo qaad in jaalle T ku shaqa gashaday So. Sh. 1,000 dheef ah 6% muddo 6 bilood ah. Markaa:

$D = Rdt$ $\qquad R = 1{,}000$

$D = 1000 \times \frac{6}{100} \times \frac{1}{2}$ $\qquad d = 6\%$ ama $6/100$

$D =$ So. Sh. 30 $\qquad T = 6$ bilood $= \frac{1}{2}$ sano

$$H = R + D$$
$$H = 1{,}000 + 30$$
$$H = \text{So. Sh. } 1{,}030$$

Jaalle T wuxuu lahaanayaa So. Sh. 1,030, markay 6 bilood dhammaato. Misna ka soo qaad jaalle T inuu ku sii shaqa gashaday lacagtiisii ahayd 1,030 dheef ah 6% muddo 6 bilood oo kale, jaalle T wuxu dheef uga helayaa lacag gashigiisaa labaad So. Sh. 30.90, taasoo ka dhigaysa hantidiisa So. Sh. 1,060.90. Haddii jaalle T sidaas ku sii wado 6 bilood oo kasta ilaa iyo intay ka soo wareegeyso 3 sano, markaa jaalle T hantidiisu waxay gaari So. Sh. 1,194.05. Xisaabintaas oo tifaftirani waa tan soo socota:

$$D = Rdt$$

6 bilood ee hore $\qquad D = 1{,}000 \times \frac{6}{100} \times \frac{1}{2} = 30,$

» » » 2aad $\qquad D = 1{,}030 \times \frac{6}{100} \times \frac{1}{2} = 30.90,$

» » » 3aad $\qquad D = 1060.90 \times \frac{6}{100} \times \frac{1}{2} = 31.83,$

6 biloob ee hore

» » » 4aad $D = 1092.73 \times \frac{6}{100} \times \frac{1}{2} = 32.83,$

» » » 5aad $D = 1125.51 \times \frac{6}{100} \times \frac{1}{2} = 33.76,$

» » » 6aad $D = 1159.27 \times \frac{6}{100} \times \frac{1}{2} = 34.78,$

» » » $H = R + D$

» » » H = So. Sh. 1,030
» » » H = So. Sh. 1,060.90
» » » H = So. Sh. 1,092.73
» » » H = So. Sh. 1,125.51
» » » H = So. Sh. 1,159.27
» » » H = So. Sh. 1,194.05

Saddex sano ka dib, haddii aynu isgarab dhigno dheefta u helay jaalle B saddexdaa sano mar iyo tan jaalle T helay saddexdaa sano 6 jeer (mar), waxaan aragnaa in jaalle T heli Sh. So. (1194.05-1180) ama 14.05 oo dheeraad ah. Tusaalaha sare wuxu muujinayaa in dheefkorku ka faa'iido badan yahay dheefta fudud.

Waa ay iska caddahay in dariiqada looga shaqeeyay tusaale 1 dheer tahay dhibna yaraynn. Hase ahaatee, waxa jira jid lagu helo hanti kor kasta oo lagaga maarmi karo dariiqada tusaha ee sare.

Haddii aynnu dooneyno in aynnu diirro jidka hanti korka, waa inaynnu xasuusannaa in kal gaddisba kal gaddiska ka dambeeya uu raasimaalku sii bato dheeftuna sii badato. Markaa, haddii aynnu dooneyno in la helo hantida raasamaalka R oo lagu bixiyo boqolkiiba dulsaarka d samadkiiba mar, waxan u shaqayneynaa sida hoos lagu caddayn doono: Hantida R_1 ee dhammaadka sannadka 1aad waxa lagu helaa

$$R_1 = R + Rd = R(1 + d) \qquad (1)$$

Bilowga sannadka labaad raasamaalku ma aha R ee waa R_1; hantiduna dhammaadka sannadka labaad waa:

$$R_2 = R_1 + R_1 d = R_1 (1 + d) \text{ ku beddel } R_1 \text{ qiimaheeda} \quad (1)$$
$$R_2 = R (1 + d) . (1 + d) = R (1 + d)^2 \quad (2)$$

Sidoo kale saddex sano ka dib waxa la helayaa in:

$$R_3 = R_2 (1 + d) = R (1 + d)^2 . (1 + d)$$
$$\text{ama } R_3 = R (1 + d)^3 \quad (3)$$

Markaa, waxaa halkaa nooga cad in hantiyuhu dhammaad kasta ee sannadaha isku xiga, noqonayaan sunsun joometeri oo saami wadaagiisu yahay $(1 + d)$, tibixdiisa ugu horraysaana tahay $R (1 + d)$; marka, hanti korka H ee R, t sannadood ka dib waa:

$$H = R (1 + d)^t \quad (4)$$

haddana dheefkorka D waxa uu la mid yahay $D = H - R$ ku beddel H qiimaheeda:

$$D = R (1 + d)^t - R$$
$$\text{ama } D = R [(1 + d)^t - 1] \quad (5)$$

Inta aynan u galin tusaalooyin ku saabsan isle'egyada (4) iyo (5) aan qeexno waxa la yiraa **dulsaar magac ah**, dabadeedna hawraarinno laba xaaladood oo lagama maarmaan u ah ade egsiga jidka (4) iyo ka (5).

Dulsaarrada dheefaha waxa badanaaba saldhig u ah sannadka, xataa haddii loo rogo kal gaddisyo sannad ka yar. Dulsaarka dheefta ee uu sannadku saldhig u yahay waxaa la yiraa **dulsaar magac ah.**

Ogow:

Dulsaar dheefeed kasta u qaado dulsaar magac ah (ama sannadkiiba).

Intaan dheef kor ama hantikor la xisaabin ka hor:

1) waa in tibixda ammineed loo qoraa wadarta tirooyinka kal gaddisyada; isla markaana;

2) waa in dulsaarka dheefeed loo beddelaa dulsaarka kale ee ku beegan.

Tusaale 2:

Raadi tirada kal gaddisyada ee lacag gashadyada soo socda:

b) shan sano oo la koriyay sannadkiiba;
t) saddex sano oo la koriyay sannad-badhkiiba;
j) afar sano oo la koriyay sannad-waaxdiiba;
x) laba sano oo la koriyay bishiiba.

Furfuris:

Guud ahaan tirada kal gaddisyada waxa lagu helaa sidan:

Sannadyo × tirada kal gaddisyada ee sannadkii ku jira
= wadarta tirada kal gaddisyada.

Xusuusnow:

«kal gaddis» waxan u soo gaabinna «kal».

Haddaba:

b) 5 sano oo la koriyay sannadkiiba
= 5 sano × 1 kal sannadkiiba = 5 kal

t) 3 sano oo la koriyay sanad-badhkiiba
= 3 sano × 2 kal/sano = 6 kal

j) 4 sano oo la koriyay sannad-waaxdiiba
= 4 sano × 4 kal/sano = 16 kal.

x) 2 sano oo la koriyay bishiiba
= 2 sano × 12 kal/sano = 24 kal.

Tusaale 3:

Raadi dulsaarka kalkiiba ee hanti gashadyada soo socda:

b) 5% la koriyay sannadkiiba.
t) 7% la koriyay sannad-badhkiiba.
j) 6% la koriyay sannad-waaxdiiba.
x) 6% la koriyay bishiiba.

Furfuris:

Xusuusnow in dulsaarka dheefeed ee laga hadlayaa u yahay dulsaarka magaca ah (ama dulsaarka sannadkiiba); haddaba, haddii dulsaarku yahay 4% la koriyayna sannad-waaxdiiba, dulsaarka kalkiiba waa 1%.
(1% baa la bixiyay afar jeer sannadka gudisiisii waxay u dhigantaa 4% sannadkiiba. Waxad ku heli kartaa dulsaarka kalkiiba:

$$\frac{\text{dulsaarka sannadkiiba}}{\text{tirada inta kal ee sannadka ku jirta}} = \text{Dulsaarka kalkiiba}$$

Sidaa daraadeed:

b) 5% la koriyay sannadkiiba $= \frac{5\%}{1 \text{ kal/sano}}$

$= 5\%$ kalkiiba (ama 5% sannad kasta)

t) 7% la koriyay sannad badhkiiba $= \frac{7\%}{2 \text{ kal/sano}}$

$= 3\frac{1}{2}\%$ kalkiiba (ama $3\frac{1}{2}\%$ 6 bilood kas-taba).

j) 6% la koriyay sannad-waaxdiiba $= \frac{6\%}{4 \text{ kal/sano}}$

$1\frac{1}{2}\%$ kalkiiba (ama $1\frac{1}{2}\%$ waax kasta).

x) 6% la koriyay bishiiba $= \frac{6\%}{12 \text{ kal/sano}}$

$\frac{1}{2}\%$ kalkiiba (ama $\frac{1}{2}\%$ bishii kasta).

Imminka aan u soo noqonno tusaalooyin ku saabsan adeegsiga isle'egyada (4) iyo (5). Annagoo tixgalinayna tusaale (2) iyo (3).

Tusaale4:

Raadi hanti korka H iyo dheefkorka D ee So. Sh. 800,000 oo lagu bixiyo dulsaar ah 6% sannadkiiba, muddo 4 sano ah. Isticmaal jidka hanti korka.

Furfuris:

Siin : R = So. Sh. 800,000, d = 0.06. t = 4 kal
Haddaba:

$$H = R\,(1 + d)^t$$

$$H = 800{,}000\ (1 + 0.06)^4$$

haddii aan adeegsanno fikradda logardamyada waxan helaynaa in:

$H = 800{,}000 \times 1.262477 =$ So. Sh. 1,009,982

waxan naqaan in:

$$D = H - R$$

$D = 1{,}009{,}982 - 800{,}000 =$ So. Sh. 209,982

Tusaale 5:

Raadi hanti korka H iyo dheefkorka D ee So. Sh. 800,000 haddii lagu bixiyo dulsaar ah 2.50% lana koriyo sannadbadhkiiba, muddo 5 sannadood ah. Isticmaal jidka hanti korka.

Siin : R = So. Sh. 800,000, d = 1.25% kalkiiba, t = 10 kal.

$H = R\,(1 + d)^t$
$H = 800{,}000\ (1 + 0.0125)^{10}$
$H = 800{,}000 \times 1.132271$
H = So. Sh. 905,816.80

$D = H - R \rightarrow$ D = So. Sh. (905,816.80 − 800,000)
D = So. Sh. 105,816.80

Tusaale 6:

Adoo isticmaalaya jidka hanti korka, raadi hanti korka H iyo dheefkorka D ee So. Sh. 1,000 haddii lagu bixiyo dulsaar ah 6% lana koriyo sannad-waaxdiiba, muddo saddex sano ah.

Furfuris:

Siin: $R = 1{,}000$, $d = 1\frac{1}{2}\%$ kalkiiba, $t = 12$ kal.

$$H = 1{,}000\,(1 + 0.015)^{12} = 1000 \times 1.195618 =$$

Sh. Sh. 1,195.618

$$D = \text{So. Sh. } (1{,}195.618 - 1000) = \text{So. Sh. } 195.618$$

QIIMAHA JOOGA:

Qeex:

Qiimaha jooga R ee hantida H keenay waqti la gooyay marka uu ku koro t kal-gaddis, waa raasamaalka lagu bixiyay d dulsaar dheefeed ee markii uu isu ururay dhaliyay lacagta H waqtigii go'naa.

Haddaba:

$$H = R\,(1 + d)^t \qquad R = \frac{H}{(1 + d)^t}$$

ama $R = H\,(1 + d)^{-t}$ ———————————— (6)

Tusaale 7:

Raadi qiimaha jooga ee ku dhaliya hantida So. Sh. 1,000 muddo 3 sano ah, marka dulsaarku yahay 6% lana koriyo sannad-waaxdiiba.

Furfuris:

Siin : H = So. Sh. 1,000, d = $1\frac{1}{2}$% kalkiiba, t = 12 kal.

Markaa:

$$R = \frac{1{,}000}{(1 + d)^{12}} = 1{,}000\ (1 + 0.015)^{-12}$$

R = So. Sh. 836.39

Tusaale 8:

Jaalle Jimcaale ayaa furtay buug kayd Jannaayo 1, 1973, wuxuuna ku bilaabay So. Sh. 500. Bankigu wuxuu bixinayay 4% sannad waaxdiiba.

Oktoobar 1, 1973, Jimcaale wuxuu ku daray lacag kaydkiisii ka dhigaysa So. Sh. 700.

b) imisay ahayd lacagta uu Jimcaale dhigtay bankiga 1dii Oktoobar?

t) immisaa Jimcaale u kaydsanayd Abriil, 1974?

j) immisa weeye wadarta dheefta uu helay?

Furfuris:

Marka hore waa inaan hellaa lacagta Jimcaale u kaydsanayd maalintuu dhiganaayay lacagta dambe. Hantidiisaa

oo loo geeyay intuu dhigay maalintaa waa raasamaalka uu ka helayo waqtiga haray.

b) sannad-waaxyaha bankiyada waxay badanaaba bilawdaan maalinta ugu horraysa Jannaayo, Abriil, Luuliyo iyo Oktoobar. Taas macnaheedu waa Jimcaale keydkiisii ahaa So. Sh. 500 wuxuu dheef keenayay saddex sannad-waaxood intaanu samayn lacag dhigashadiisii labaad.

Markaa:

R_1 = So. Sh. 500
d = 1%
t = 3

$H_1 = 500\ (1 + 1\%)^3$
$H_1 = 500\ (1 + 0.01)^3$
H_1 = So. Sh. 515.15

Lacagtuu Jimcaale dhigtay Oktoobar 1 waa So. Sh. 184.85

t) Oktoobar 2, lacagta buugga Jimcaale ku jirtay waxay ahayd So. Sh. 700.

Markaa:

R_2 = So. Sh. 700
d = 1%
t = 2

$H = R\ (1 + d)^t$
$= \text{So. Sh. } 700\ (1+1\%)^2$
$= 700\ (1.02010)$
H_2 = So. Sh. 714.07

Abriil 1 - 74 Jimcaale kaydkiisu wuxuu ahaa So. Sh. 714.07

j) laba dariiqo ayaa lagu heli karaa wadarta dheeftu helay Jimcaale:

1. Isugeynta dheefaha raasamaal kasta lagu bixiyay ama;

Helidda faraqa u dhaxeeya hantida ugu dambeysay iyo wadarta dhammaan dhigashada.

1. $D_1 = H_1 - R_1$
= So. Sh. 515.15
— 500.00
D_1 = So. Sh. 15.15

$D_2 = H_2 - R_2$
= So. Sh. 714.07
— 700.00
D_2 = So. Sh. 14.07

$$D_1 + D_2 = 15.15 + 14.07 = \text{So. Sh. } 29.22$$

So. Sh. 500.00	So. Sh. 714.07
+ 184.85	− 684.85
So. Sh. 684.85	So. Sh. 29.22

Layli:

Xisaabi hantikorka iyo dheefkorka:

1.	Raasmaal	Dulsaar	La koriyay	Sannado
b)	So. Sh. 300	4%	bishiiba	5
t)	1200	5%	sannad-badhkiiba	10
j)	450	7%	sannad-badhkiiba	18
x)	2500	6%	bishiiba	3
kh)	800	4½%	sannad-badhkiiba	12
d)	1500	8%	sannad-waaxdiiba	15

2. Jaamac wuxuu furtay buug kayd Jannaayo 1, 1972, wuxuuna ku bilaabay kaydkiisii So. Sh. 1,000. Luuliyo 1, 1972, wuxuu ku daray lacag kaydkiisii gaarsiinaysa So. Sh. 1500. Haddii bankigu bixinayay 6% oo la koriyay sannad-waaxdiiba:

b) immisaa kaydkiisu ahaa luuliyo 1, 1972, intaanu lacagta labaad ku darin?

t) immisaa lacag u taallay Jannaayo, 1, 1973?

j) immisay noqon wadarta lacagta uu dheef u helay?

3. Hibo ayaa dhigatay lacag banki, bixiya dulsaar ah 4½% sannad-waaxdiiba. Muddo 4 sano ah markay u taallay waxa kaydkii Hibo gaaray So. Sh. 4550. Immisay ahayd lacagtay Hibo ku bilawday kaydkeeda?

4. Raadi hantikorka iyo dheefkorka laga helayo So. Sh. 1,000 haddii dheefta lagu koriyo dulsaarrada soo socda sannad-badhkiiba muddo siddeed sano ah:

   b) 3%
   c) 6%
   12%
   x) waa maxay xiriirka hantiyaha ka dhexeyn karaa marka dulsaar kasta la labanlaabo?

Raadi hantida iyo dheefkroka mid kasta oo soo socda:

5. £ 160, muddo 2 sano ah, marka dulsaarku yahay 3½% sannadkiiba.

6. £ 68, muddo 5 sano ah, marka dulsaarku yahay 2½% sannadkiiba.

7. So. Sh. 2968, muddo 3 sano ah marka dulsaarku yahay 2½%.

8. Tirada dad deggan magaallo ayay ku kordhaan 2½% sannad kasta. Saddex sano ka hor tirada dadka magaaladaasi waxay ahayd 448,000. Waa immisa tirada dadku imika?

9. Qiimaha fatuurad baa sannadkiiba dhinma 12%. Haddii qiimaha fatuuraddu markay cusbayd u ahaa So. Sh. 10, 240, immisuu noqon qiimaha fatuuraddu 3 sano ka dib?

10. Raadi raasamaalka noqda So. Sh. 28,137 laba sano ka dib haddii dulsaarka dheefkorku yahay 4½% sannadkiiba, dheefkorkana la koriyay sannad-badhkiiba?

11. Nin baa bangi dhigtay £1,860 waxana loo oggolaaday dulsaar dheefkor oo ah 4%. Haddii sannad kasta dhammaadkeeda uu 150 gini oo kale uu dhigto bankiga. waa immisa hantidiisu 4 sano ka dib?

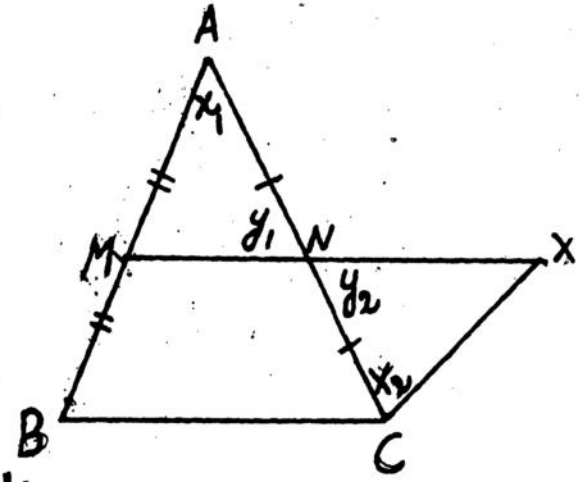
CUTUB 5

JOOMETERI

Aragtiinka Tikraarka:

Xarriiqda isku xidha badhtamaha laba dhinac oo saddexagal waxay la barbarro tahay dhinaca saddexaad waxayna le'eg tahay badhkiis.

SH:



Ogaal:

Waxaynnu haysannaa saddexagal Δ ABC oo ay M iyo N ku dul yaalliin badhtamaha dhinacyada AB iyo AC siday u kala horreeyaan.

In 'a caddeeyo:

1. in MN || BC
2. in $MN = \frac{1}{2} BC$

Dhismo:

Waxad barta C ka jeexdaa xarriiq BA la barbarro ah. Xarriiqdaa iyo MN oo la fidiyo barta isku jaraan ku magacaw X.

Caddayn:

Δ AMN iyo Δ CXN, markaad fiirisid waxad arkaysaa in:

$X_1 = X_2$	(xaglo talantaali ah)
$Y_1 = Y_2$	(xaglo foodsaar ah)
AN = NC	(ogaal)
$\therefore \Delta$ AMN $\cong \Delta$ CXN	(X. DH. X.)
AM = CX, MN = NX	
Laakiinse, AM = MB	(ogaal)
$\therefore$ CX = BM	
Haddana CX $\parallel$ MB	(dhismo)
$\therefore$ XCBM waa barbarrocle	(dh. iska horjeeda way = waana $\parallel$)
$\therefore$ (1) MN $\parallel$ BC	
Ta labaad, BC = MX	(dh. isku horjeeda ee $\parallel$ le XCBM)
$\therefore$ MN = NX =	

$$\frac{1}{2} MX = \frac{1}{2} BC \qquad \therefore MN = \frac{1}{2} BC$$

Xigasho:

Xarriiqda toosan ee ka bilaabmata badhtamaha baraha saddexagal, lana barbarro ah dhinacyada kale, waxay kala badhaa dhinaca saddexaad, ee saddexagalkaa.

Ogaal:

M waa bar ku dul taal meel ka mid ah dhinaca AC, isla markaana MN $\parallel$ BC.

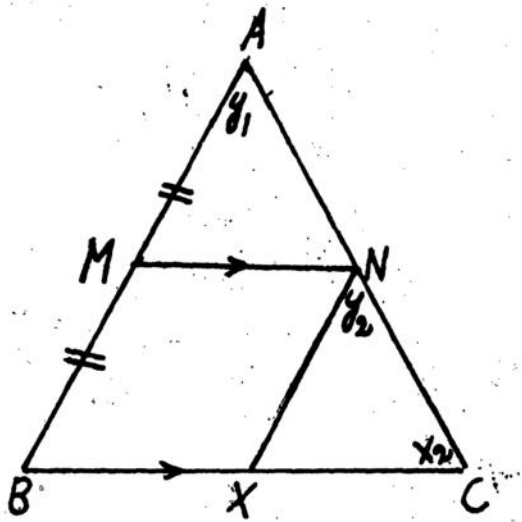
In la caddeeyo:

N inay tahay badhtamaha dhinaca AC.

Dhismo:

Dhamaystir barbarroolaha MNXB.

SH:



Caddayn:

NX = MB	(dh. iska horjeeda ee barbarroolaha)
BM = MA	(ogaal)
∴ NX = MA	

Markaad dheehatid saddexagalka ANM iyo NXC, waxad arkaysaa in:

AM = NX	(waa la caddeeyay, MN ∥ BC)
$X_1 = X_2$	(xaglo gudboon)
$Y_1 = Y_2$	(xaglo gudboon)
∴ Δ AMN ≅ Δ NXC	(X. DH. X.)
∴ AN = NC	

Markaa, N waxay ku taallaa badhtamaha AC.

Aragtiinka 2aad:

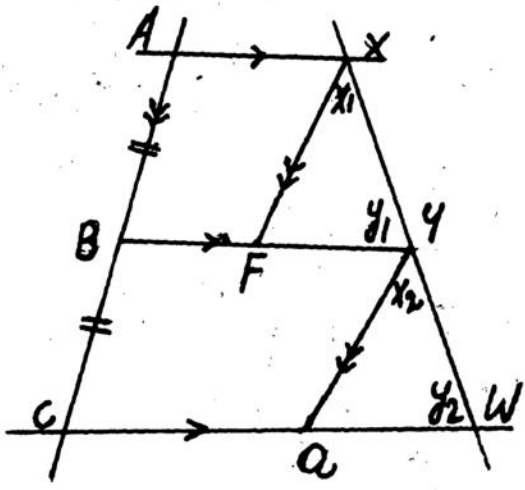
Haddii saddex ama in ka badan oo xarriiqood oo barbarro ahi ay in isle'eg ka gooyaan wadaajiye, markaa qaybo isle'eg bay ka jaraan wadaajiye kasta.

Ogaal:

Waxaynnu haysannaa saddex xarriiq oo barbarro ah kana jaraya xarriiq afraad meelaha A, B, iyo C. Taasoo ay AB = BC, isla markaana ka jaraya xarriiq kale meelaha kala ah X, Y, iyo W.

In la caddeeyo:

XY = YW.



Dhismo:

Waxad jeexda XF iyo YQ oo la barbarro ah xarriiqda ABC, si ay uga jaraan BY iyo CW meelaha F iyo Q midkiiba.

Caddayn:

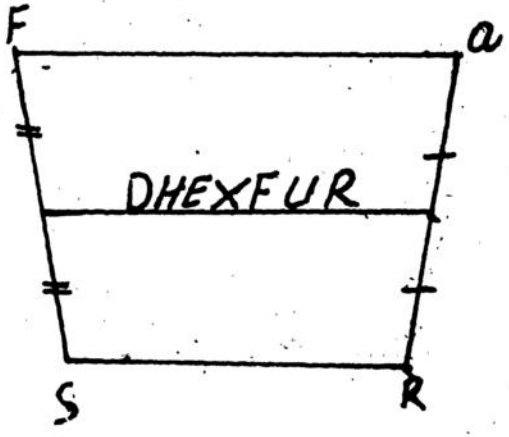
AXFB waa barbarroole	(dh. iskahor. waa =)
AB = XF	(» » ee ∥ aha)
Sidaas oo kale YQ = BC	(» » »)
AB = BC ∴ XF = YQ	(ogaal)
Haddaba markaad fiirisid	

Δ XFY iyo Δ YQW, waxad arkaysaa in:

XF = YQ	(waa la caddeeyay	)
$X_1 = X_2$	(xaglo gudboon	)
$Y_1 = Y_2$	(xaglo gudboon	)
$\therefore \Delta$ XFY $\cong \Delta$ YQW	(X. Dh. X.	)
$\therefore$ YX = YW.		

DHEXFURKA KOORTA:

Qeex: Dhexfurka koortu waa xarriiqda isku xirta badhtamaha labada dhinac ee aan barbarrada ahayn ee koorta.



Aragtiinka 2aad:

Dhexfurka koortu wuxu la barbarro yahay salalka wuxuna le'eg yahay wadartooda oo laba loo qaybshey.

Ogaal:

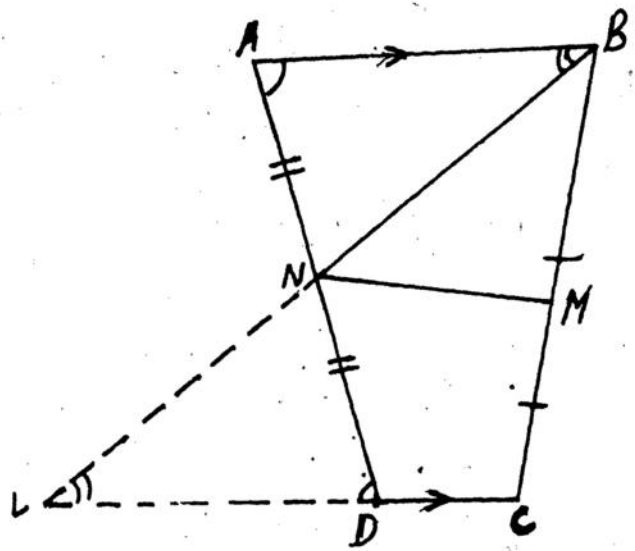
Waxaynnu ognahay in koorta:
ABCD ay AN = ND, BM = MC

In la caddeeyo:

1. MN || DC
2. $MN = \frac{1}{2}(AB + DC)$

Dhismo:

Waxad fidisaa BN iyo CD si ay ugu kulmaan meel ah L;



Caddayn:

Δ ABN iyo Δ DLN.

$\angle NAB = \angle NDL$	(xaglo talantaali ah)
$\angle ABN = \angle DLN$	(xaglo talantaali ah)
AN = ND	(ogaal)
$\therefore \Delta ABN \cong \Delta DLN$	(X. Dh. X.)
$\therefore$ BN = NL, AB = LD	

Haddaba markaad fiirisid Δ BLC, M iyo N waxay ku dul yaalliin badhtamaha dhinacyada BC iyo BL.

Markaa MN || CL
$\therefore$ MN || AB || DC.

$$\text{Ta labaad } MN = \frac{1}{2} LC$$

$$= \frac{1}{2} (LD + DC)$$

$$= \frac{1}{2} (AB + DC)$$

Layli:

1. Saddexagal ayaa dhinacyadiisu yihiin 17 sm, 12 sm iyo 22 sm. Waxad doontaa dhererka xarriiq isku xirta badhtamaha laba dhinac oo saddexagalka ka mid ah.

2. Saddexagal ABC ayaa wareeggiisu yahay 22 sm. F, Q iyo R waxa weeye saddex barrood oo ku yaalla badhtamaha dhinacyada AB, AC iyo BC. Haddaba, haddii AB = 7 sm. FR = 6 sm, muxuu noqonayaa dhererka BC.

3. Waxad caddaysaa afarta xarriiqood ee isku xira badhtamaha dhinacyada afargeesle inay yihiin barbarroole.

4. Xaglagooyaasha barbarroolaha ABCD ayaa waxay iska jaraan meesha lagu magacaabo "O", F waxa weeye bar ku dul taalla badhtamaha dhinca BC ee barbarroolaha. Haddaba waxad caddaysaa in:

   1) OF || DC

   2) $OF = \frac{1}{2} DC$.

5. F iyo Q waxa weeye laba barood oo ku dul yaalla badhtamaha dhinacyada BC iyo AD ee barbarroolaha ABCD. Markaa, haddii xaglagooyaasha AC iyo BD ay ku kulmaan barta O, caddee in FOQ uu yahay xarriiq toosan.

6. M iyo N waxa weeye laba barood oo ku dul yaalla badhtamaha dhinacyada AB iyo AC, X waxa weeye bar ku dul taalla meel ka mid ah dhinaca BC ee saddexagalka ABC. Haddaba waxad caddaysaa in MN kala badho AX.

7. Haddii geesoole xaglagooyayaashiisu ay iska jaraan xaglo qumman, waxad caddaysaa shaxanka kuu soo baxaya inuu yahay laydi marka aad isku xirtid badhtamaha dhinacyada geesoolaha.

8. F, Q, R, iyo S waxa weeye baro ku dul yaalla badhtamaha dhinacyada geesoolaha ABCD. Caddee in FQRS uu yahay barbarroole?

9. B waxa weeye xagal qumman oo Δ ABC. X waxa weeye bar ku taalla badhtamaha dhinaca AC.

Caddee in $BX = \frac{1}{2} AC$. (siin: waxad jeexda xarriiqda XY oo ku qotonta BC)?

10. X iyo T waxa weeye laba barood oo ku dul yaalla badhtama dhinacyada AD iyo BC midkiiba ee barbarroolaha ABCD. Waxad caddaysaa in BX iyo BY ay saddex inood oo isle'eg u qaybshaan AC.

11. Saddexagal ayaa dhinacyadiisu yihiin 10 sm, 12 sm iyo 14 sm. Waxad soo saartaa dhererka saddexda xarriijimood ee isku xiraya badhtamaha dhinacyada.

12. ABCD waxa weeye koor ay labadeeda dhinac ee barbarrada ahi yihiin AB iyo CD. F, Q, R iyo S waxa weeye baro badhtamaha dhinacyada AD, DB, AC iyo CB midkiiba. Caddee in:

1) FQRS uu yahay xarriiq toosan;

2) FQ = RS.

Dhismaha koowaad:

Dhismaha koowaad wuxu ku saabsan yahay xarriiq aynnu rabno inaynnu u qaybinno Q meelood oo isle'eg.

Ogaal:

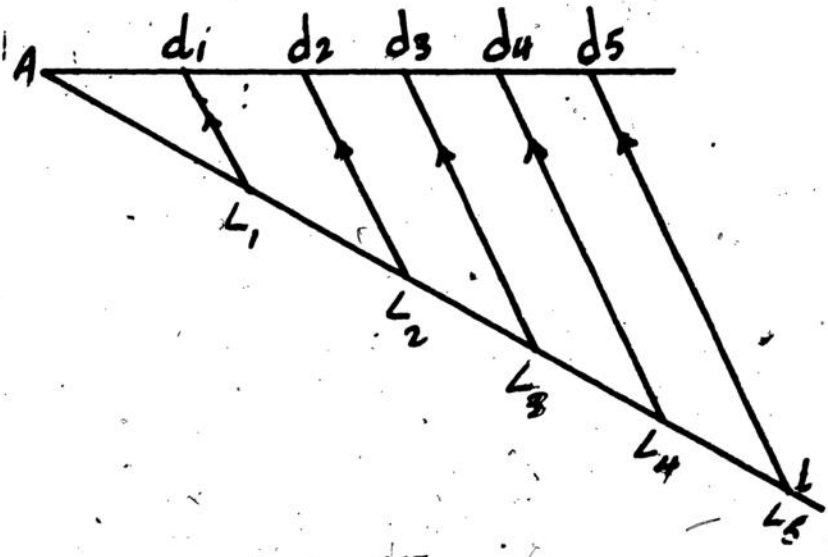
Waxaynnu haysannaa xarriiq AB oo aynnu rabno inaynnu u qaybinno shan gurub oo isle'eg. Dariiqada sida loo qaybinayaa waxay tahay sidatan: Barta A waxad ka jeexdaa xarriiqda AL dhererkiisu in kastaaba ha ahaadee. Goobeeye adoo isticmaalaaya waxad xarriiqda AL ka jartaa shan qaybood oo isle'eg.

Ka soo qaad in baraha qaybahaasi ka jaraan AL ay yihiin: L_1, L_2, L_3, L_4, iyo L_5. Waxad isku xirtaa L_5 iyo B. Isla markaa waxad ka jeexdaa meelaha L_4, L_3, L_2 iyo L_1 xarriiqo la barbarro ah L_5B, kana jaraya xarriiqda AB meelaha kala ah d_4, d_3, d_2, iyo d_1. Dabadeedna qaybaha isle'eg ee aynnu rabno inaynnu soo saarro waxa weeye: $Ad_1 = d_1d_2 = d_2d_3 = d_3d_4 = d_4B$.

Caddayn:

$L_1d_1 \parallel L_2d_2 \parallel L_3d_3 \parallel L_4d_4 \parallel L_5B$. Tikraarku $AL_1 = L_1L_2 = L_2L_3 = L_3L_4 = L_4L_5$ markaa adigo la kaashanaya aragtiinka II, waxad arki in:

$$Ad_1 = d_1d_2 = d_2d_3 = d_3d_4 = d_4B.$$



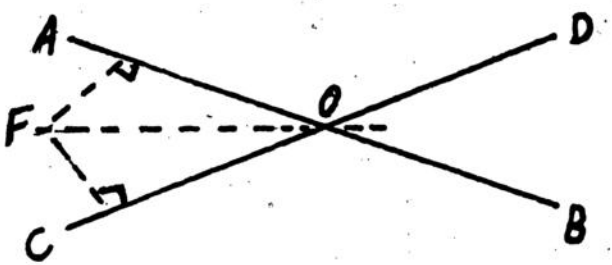
Layli:

1. Waxad jeexdaa xarriiq dhererkeedu yahay 2″, una qaybi 3 inood oo isle'eg. Cabbir qayb ka mid ah.
2. Waxad jeexdaa xarriiq dhererkeedu yahay 3″, dabadeed u qaybi 5 qaybood oo isle'eg. Cabbir qayb ka mid ah?
3. Waxad haysataa xarriiqda AB oo dhererkeedu yahay 3″. Waxad muujisaa barta F oo ku dul taalla xarriiqda AB, haddii AF : FB = 2 : 3. Cabbir AF?
4. Waxad jeexdaa xarriiqda LM oo dhererkeedu yahay 4″. Waxad muujisaa barta F oo ku dul taalla xarriiqda LM haddii $LF = \frac{}{7}$ LM. Cabbir LF?

TUBTA BARTA

Aragtiin:

Tubta, baro u siman laba xarriiq oo toosan, oo isgooya waa lammaanaha kala badhayaasha ah ee xaglaha u dhexeeya.



Ogaal:

Waxaynnu haysannaa laba xarriiq AB iyo CD oo toosan oo isku gooyanaya barta O″. F waa barta u dhexeysaa AO

iyo CO taasoo ay qotomayaasha FM iyo FN in isle'eg u wada jiraan AB iyo CD.

In la Caddeeyo:

F inay ku taallo xagla badhaha mid ka mid ah oo u dhe xeeya AB iyo CD.

Dhismo:

Isku xir OF.

Caddayn:

Waxad ka soo qaaddaa F inay ku taallo meel ka mid ah xagasha AOC. Ka dib markaa fiirisid saddexagallada FOM iyo FON, waxad arkaysaa in:

$\angle FMO = \angle FNO$	(xaglo qumman	)
$FO = FO$	(astaan midaal	)
$FM = FN$	(ogaal	)
$\therefore \Delta FOM \cong \Delta FON$	(X. Qumman Dh. iyo Sh.	)
$\therefore \angle FOM = \angle FON$		

F waxay ku taallaa xagasha AOC kala badhkeed.

Sidoo kale haddii F ku taallo meel ka mid ah xaglaha COB, BOD, markaa waxay ku dhacaysaa hadba xagashay ku taallo kala badhkeeda.

Dhan kale haddaynnu ka eegno, waxaynnu arkaynaa bar kasta oo ku taalla kala badhka xaglaha u dhexeeya xarriiqaha AOB iyo COD inay u siman tahay xarriiqaha.

Haddii FO ay ku taallo kala badhka xagasha AOC, isla markaasna FM iyo FN yihiin qotomayaasha ka yimaadda F ee ku qotoma AO iyo CO, markaas waxaynnu caddayn karraa in Δ FOM iyo Δ FON ay isku sargo'an yihiin (X. Dh. X.).

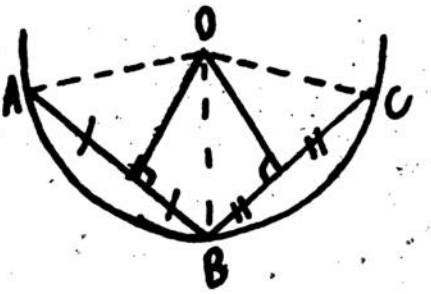
$$\therefore FM = FN.$$

Baro isku toos ah:

Saddex ama in ka badan oo barood haddii ay ku yaalliin xarriiq toosan waxa la yiraa baro isku toos ah.

Dhismo:

Dhisidda goobo maraysa saddex barood oo aan isku toos ahayn.



Ogaal:

Waxaynnu ognahay saddexda barood ee A, B iyo C mananay isku toos ahayn. Sida loo dhiso goobada maraysa saddexda barood ee A, B iyo C waxay tahay: waxad jeexdaa labada qotome badhe ee AB iyo CD, dabadeedna fidi si ay ugu kulmaan meesha lagu magacaabo O. Markaa barta ay ku kulmaan labada qotome badhe ayaa noqonaysa xuddunta goobada la rabo in la soo saaro. Gacankeedina wuxu noqonayaa AO.

Caddayn:

$\therefore$ OA = OB.

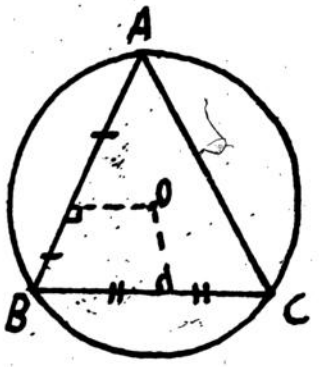
Sidoo kale, OB = OC

$\therefore$ OA = OB = OC

Goobada xuddunteedu tahay O, gacankeeduna yahay AO ayaa maraysa baraha B iyo C.

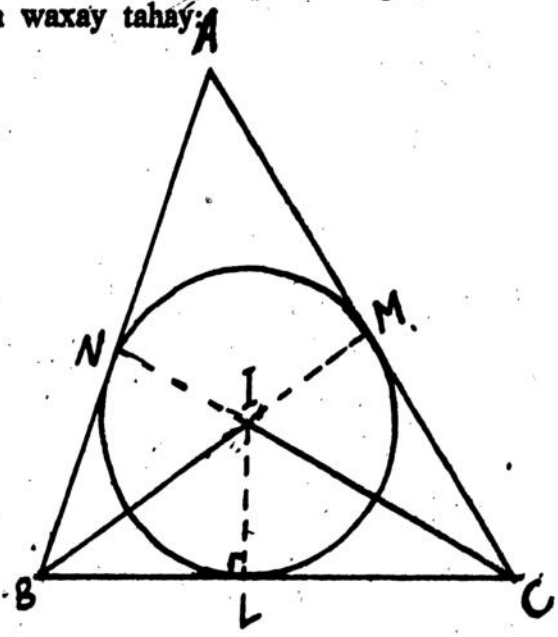
Sida kale ee aynnu u samayn karo goobo maraysa saddex barood oo aan isku toos ahayni waxay tahay: adigoo xuddunta u qaata meesha ay ku kulmaan qotoma badhayaasha AB iyo BC. Markaa waxa kun soo baxaya saddexagal dul-

meeran. Taas micneheedu waxa weeye, saddexagalkaa ku hoos jira goobada isaga oo markaas geesihiisu taabanayaan goobada.



Haddii aynnu haysanno goobo ku hoos jirta saddexagal oo taabanaysa dhinacyada saddexagalka, waxaynnu oranaynaa saddexagal dhexmeeran.

Dhisidda goobo ku hoos jirta saddexagal, ama saddexagal dhex-meeran waxay tahay:



Ogaal:

Δ ABC

In la dhiso:

In aynnu dhisno goobo ku hoos jirta saddexagal ABC.

Dhismo:

Waxad kala badhaa xaglaha B iyo C, waxadna ka soo qaaddaa in ay kala badhayaashu ku kulmaan meesha I. Waxad samayn xarriiq timaadda I, kuna qotonta BC. Markan, waxad samaysaa goobo xuddunteedu tahay I gacankeeduna yahay IL. Markaa, waxaynnu helaynaa goobadii aynnu rabney inaynnu samayno oo ku hoos jirta saddexagalka ABC.

Caddayn:

Waxad jeexda qotomayaasha ka yimaadda I ee ku qotoma AB iyo AC. I waxay ku taallaa kala badhaha xagasha B.

$$IL = IN$$

Sidoo kale:

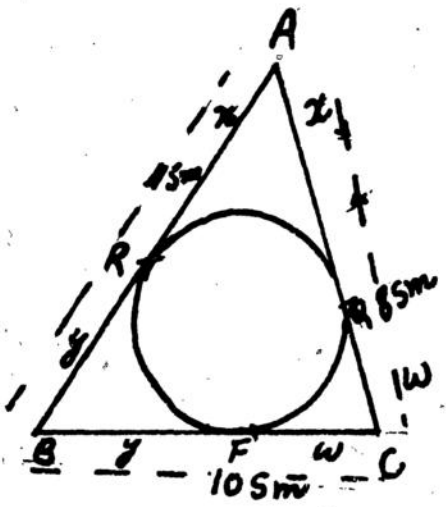
$$IL = IM$$
$$IL = IN = IM$$

Markaa waxad samaysaa goobo xuddunteedu tahay I, gacankeeduna IL oo maraysa meelaha M iyo N oo ka mid ah dhinacyada AB iyo AC ee saddexagalka. Ta labaad, mar haddii L, M iyo N ay yihiin xaglo qumman, kolkaa goobadu waxay ka taabanaysaa saddexagalka meelaba kala ah L, M iyo N.

Tusaale:

Saddexagal dhexmeeran oo ah ABC oo dhinacyadiisa BC, CA iyo AB ay ka taabanayaan goobada meelaha kala ah F, Q iyo siday u kala horreeyaan.
Haddii AB = 8 sm, waxad doontaa dhererka AR, BF iyo CQ. Waxaynnu ognahay in taabtaha:

$$AQ = AR = X \text{ sm}$$
$$BR = BF = Y \text{ sm}$$
$$CF = CQ = W \text{ sm}.$$



Markaa:

$x + y = 11$ sm ———————————— (1)
$y + w = 10$ sm ———————————— (2)
$x + w = 8$ sm ———————————— (3)
(1) ··· (2) $x - w = 1$ sm ———————————— (4)

Wadarta (3) iyo (4) $2x = 9$

$$x = 4.5 \text{ sm}$$

$$y = 11 - 4.5 = 6.5 \text{ sm}$$
$$w = 8 - 4.5 = 3.5 \text{ sm}$$

$AR = 4.5$ sm, $BF = 6.5$ sm, $CQ = 3.5$ sm.

Layli:

1. Waxad samaysaa tubta bar soconaysa oo u siman laba xarriiq oo toosan oo isgoynaya laguna magacaabo AB iyo CD isla markaana in isle'eg u wada jira A iyo B.

2. A iyo B waxa weeye laba barood oo isu jira 6 sm. C waxa weeye bar aan isku toos la ahayn A iyo B. Haddaba waxad sawirtaa tubta barta soconaysa ee C ee u siman A iyo B, isla markaana 4 sm u jirta barta A.

3. ABC waxa weeye saddexagal. Dhinaciisa AB = 6 sm, $\angle A = 60°$, $\angle B = 70°$. Haddaba sawir barta F ee u siman AB iyo AC isla markaasna 4 sm u jirta barta C?

4. A iyo B waxa weeye laba barood oo 5 sm isu jira. Waxad doontaa tubta bar u jirta 2 sm xarriiqda AB isla markaana 3 sm u jirta barta A?

5. Waxad samaysaa Δ ABC oo ay $\angle B = 70°$, $\angle C = 40°$, AC = 8 sm, dabadeedna waxad samaysaa goobo ku dul meersan saddexagalka ABC.

6. Mar labaad sawir layliska 5aad, adigoo markan samaynaya saddexagal dhexmeersan?

7. Waxad raadisaa gacanka goobo ku dhex jirta saddexagal siman oo joogiisu yahay 18 sm?

8. Saddexagal siman oo dhinaciisu yahay 12 sm. ayaa dul meeran. Markaa muxuu noqonayaa gacanka goobada dul meeraysa saddexagalka?

9. Waxad samaysaa Δ ABC, oo ay AB = 6 sm, BC = 8 sm, CA = 5 sm. Dabeedna waxad cabbirtaa fogaanta u dhexaysa geesaha iyo barta ay ku kulmaan saddexagalku?

10. ABC waxa weeye saddexagal ay xagashiisa B furan tahay. Joogagga saddexagalku waxay ku kulmaan meesha lagu magacaabo D. Haddaba waxad caddaysaa in $\angle BAC = \angle BDC$?

GOOBOOYIN:

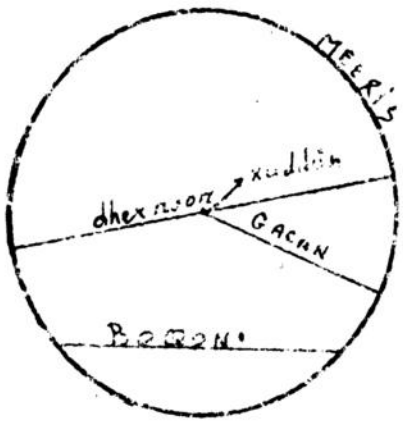
Qeexid: Goobadu waa urur barо u siman bar maguuraan ah. Bartaa maguuraanka ah waxa la yiraa xuddun. Xarriiqda isku xirta xuddunta iyo meeriska waxa la yiraa gacan. Xarriiq kasta oo isku xirta laba meelood oo ka mid ah meeriska, isla markaana marta xuddunta, waxa la yiraa **Dhexroor**. Xarriiqda isku xirta laba meelood oo ka mid ah meeriska, laakiin aan marin xuddunta waxa la yiraa **Boqon**.

Aragtiin:

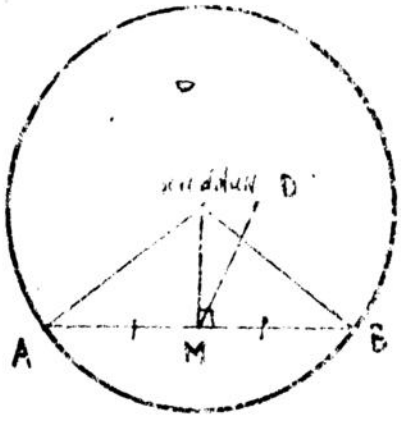
Boqon kasta oo goobo qotome badhabiisu waxuu maraa xuddunta goobada.

Ogaal:

Waxaynnu haysannaa goobo xuddunteedu tahay X iyo hoqonka AB.



Sh. I



In la caddeeyo:

In qotoma badhaha MD ee boqonka AB uu maro xuddunta goobada.

Caddayn:

Waxad ka soo qaadaa in MD aanu marin xuddunta X. Isku xir X iyo M oo ku yaalla kala badhka AB. Haddana waxad isku xirtaa XA iyo XB.

Δ XAM iyo Δ XBM

XA = XB (waa gacanno)

XM = XM (astaan midaal)

AM = MB (ogaal)

Δ XAM $\cong$ Δ XBM (Dh. Dh. Dh.)

$\angle$XMA = $\angle$XMB = 90°

Mar haddii XMB iyo XMA ay yihiin xaglo deris ah, waxa halkaa inooga cad inay XM iyo MD isku beegan yihiin.

Aragtiinka 1aad:

Waxa kale oo ay inoo sheegaysaa in:

1. Xarriiqda isku xirta badhtamaha boqonka iyo xuddunta goobadu ay ku qotonto boqonka.

2. Dhan kale haddaynnu ka eegno, qotomaha goobada xuddunteeda ka yimaadda, wuxu kala badhaa boqon kasta oo goobada ku yaalla.

Aragtiinka 2aad:

Boqonnada isle'egki waxay u siman yihiin goobada xuddunteeda, haddii ay ku wada yaalliin isla goobo ama goobooyin isle'eg.

Ogaal:

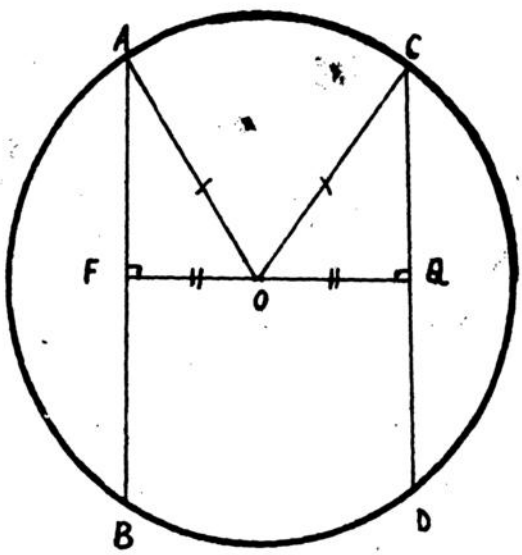
Waxaynnu haysannaa laba boqon oo isle'eg oo kala ah AB iyo CD. Waxa kale oo aynnu ognahay in OF iyo OQ ay yihiin qotomayaasha ka yimaadda xuddunta O ee kala badha boqonnada AB iyo CD.

Waxa kaloo aynnu ognahay in haddii boqonnadu isle'eg yihiin kala badhkooduna isle'eg yihiin.

Δ AFO iyo Δ CQO	
AF = CQ	(kala badhka boqonnada)
AO = CO	(gacannada goobada)
$\angle$AFO = $\angle$CQO	(xagal qumman)
$\therefore$ Δ AFO $\cong$ Δ CQO	(dh. shakaal iyo X. qumman)
$\therefore$ OF = OQ	

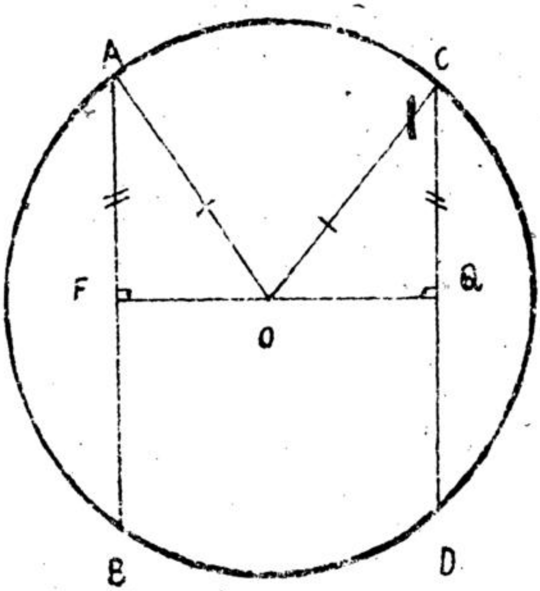
Markaa, labada boqon ee isle'egi waxay u siman yihiin xuddunta goobada.

Dhan kale haddaynnu uga wareegno aragtiinka labaad waxaan arkaynaa in ay isle'eg yihiin boqonnada u siman xuddunta goobadu.



Isla oaddeeyo:

Inay AB iyo CD isle'eg yihiin mar haddii ay u siman yihiin xuddunta goobada.



addayn:

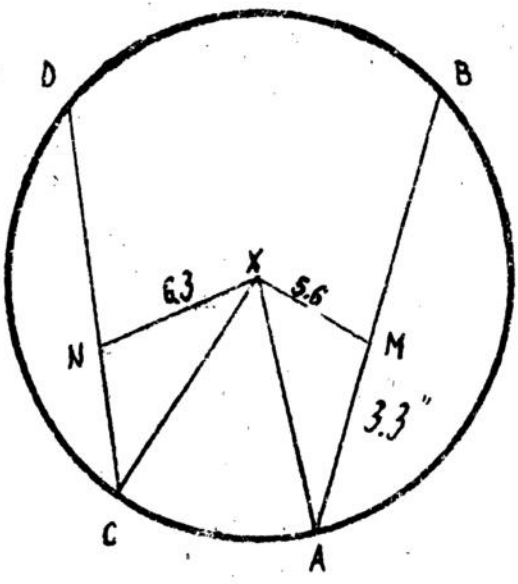
[illegible] iyo Δ CQO
[illegible] OO (ogaal
[illegible] (gacan
[illegible] ∠CQO (x. qanunan
[illegible] ≅ Δ CQO (dh. sh. x. qanuunan
[illegible] = CQ
[illegible] 2 CQ
[illegible] CD

[illegible]:

[illegible] dhererkiisu yahay 6.6" ayaa u jira 5.6" goobo xuddunteed. Doon gacanka goobada. Isla markaasna waxad doontaa dhererka boqon 6.3" u jira goobada xudduntee-da.

Furfuris:

Ka dib markaad fiirisid shaxanka waxad u qaadan in dhererka AB uu yahay 6.6". XM waxa weeye qotomaha ka yimaadda xuddunta ee AB ku qotoma.



Markaa M waxa weeye kala badhka AB.

1. $\therefore$ AM = 3.3"

   $\therefore$ Δ AMX waa Δ qumman

   $$AX^2 = (5.6)^2 + (3.3)^2$$
   $$= 31.36 + 10.89$$
   $$= 42.45$$

   $$AX = \sqrt{42.25} = 6.5$$

2. NX = 6.3, XN waxa weeye qotomaha ka yimaadda X ee ku qotoma CD. N waxa weeye badhtamaha CD. CX oo gacanka ihi waa 6.5. Kolkaa CNX waa Δ qumman.

$$\therefore (CN) = (6.5)^2 - (6.3)^2$$
$$= (6.5 + 6.3)\ (6.5 - 6.3)$$
$$= (12.8)\ (0.2)$$
$$= 2.56$$

$$CN = \sqrt{2.56} = 1.6''$$
$$\therefore CD = 2CN = 3.2''$$

Layli:

1. Boqon dhererkiisu yahay 4.2 sm ayaa goobo xudduntеed u jira 2.8 sm. Raadi gacanka goobada?
2. Boqon dhererkiisu yahay 7 sm ayaa ku yaalla goobo gacankeedu yahay 3.7 sm. Waxad doontaa intay isu jiraan boqonka iyo xudduntu?
3. Goobo ayaa gacankeedu yahay 3.9 sm. Isla markaana boqon ku yaalla goobada ayaa xuddunta goobada u jira 1.5 sm. Raadi dhererka boqonka?
4. Laba boqon oo isle'eg oo kala ah XY iyo YW baa waxay ku yaalliin goobo xuddunteedu tahay C. Caddee in xarriiqda CY kala badho xagasha XYW?
5. XW waa boqon ku yaalla goobo dhexroorkeedu yahay XY. Haddii O ay tahay xuddunta goobada, OD uu yahay qotomaha ka yimaadda O ee ku qotoma boqonka XW, caddee inay YW = 2 OD?
6. O waxa weeye xaddunta goobo gacankeedu 37 sm. AB-na waa boqon ku yaalla goobada oo dhererkiisu yahay 24 sm. Haddaba waxad raadisaa bedka saddexagalka OAB?
7. ABC waa saddexagal qumman oo ay xagashiisa qummani tahay B. E-na waa xuddunta goobo maraysa A iyo B. Haddaba waxad caddaysaa xarriiqda marta E lana barbarro ah BC inay kala badho AC?
8. Laba boqon oo isle'eg ayaa waxay isku gooyaan meel goobada dhexdeeda ah. Haddaba waxad caddaysaa in xarriiqda isku xirta barta ay isku gooyaan iyo xuddunta goobadu ay kala badho xagasha u dhexaysa boqonnada.

9. Boqon dhererkiisu yahay 30 sm ayaa 20 sm u jira goobo xuddunteed. Haddaba, muxuu noqonayaa dhererka boqon 24 sm u jira xuddunta goobada?

10. Waxad caddaysaa inay isle'eg yihiin laba boqon, haddii xaglaha ay ka sameeyaan xuddunta goobadu ay isle'eg yihiin?

11. Imisuu boqon u jiraa xuddunta goobo gacankeedu yahay 18 sm, haddii dhererka boqonkaasi uu yahay 12 sm.

12. AB waa dhexroor dhererkiisu yahay 34 sm. BC-na waa boqon dhererkiisu yahay 8 sm. Immisuu boqonka BC u jiraa xuddunta goobada.

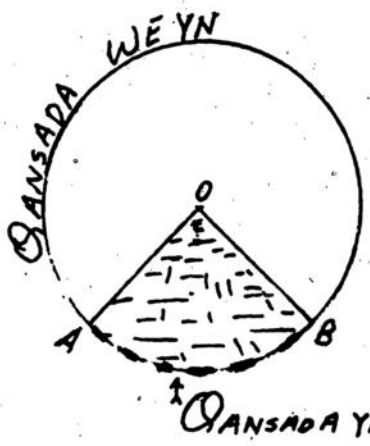
13. Laba boqon oo isle'eg oo kala ah AB iyo CD ayaa iska gooya meesha lagu magacaabo N. Caddee in AN = ND, BN = CN?

14. Laba boqon oo barbarro ah yaa dhererkoodu kala yahay 12 sm iyo 8 sm. Haddii gacanka goobadu yahay 10 sm. Waxad doonta inta ay isu jiraan labada boqon haddii ay:

    i) ku wada yaalliin dhinac qudha.

    ii) ku kala yaalliin labada dhinac ee xuddunta?

QAANSO:



Qeexid: Haddii A iyo B ay yihiin laba barood oo ku dul yaalla goobada xuddunteedu tahay O, oo AOB-na aanay ahayn xarriiq toosan, markaa xarriiqda xoodan ee u dhexaysa A iyo B kolkaad raacdid meeriska goobada waxa la yiraa **Qaanso.** Haddii xagasha qaansadu ka laasho xuddunta goobada ay ka yar tahay 180°, markaa qaansada waxa lagu magacaaba qaansada yar, tan kalena qaansada weyn, sida shaxanka ka muuqata.

Haddii laba qaanso ay isle'eg yihiin kuna wada yaalliin isla goobo, ama laba goobo oo isle'eg, xaglaha ay ka yaalaan xuddunta goobadaasi way isle'eg yihiin.

Aragtiinka 1aad ee qaansooyinka:

Laba boqon way isle'eg yihiin haddii labadooda qaanso, oo ku wada yaal goobo keliya ama laba goobo oo isle'eg ay isle'eg yihiin.

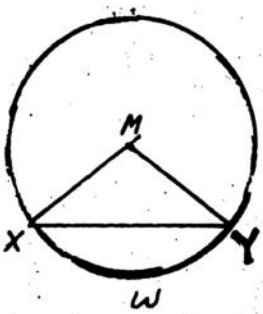
Caddayn:

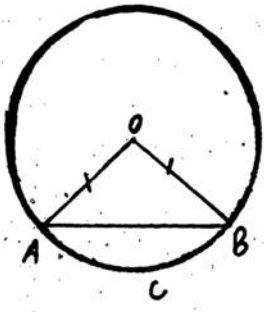
Waxaynnu haysannaa laba goobo oo isle'eg xudduna-hooduna kala yihiin O iyo M, iyo labada qaanso ee ACB iyo XWY oo isle'eg.

In la caddeeyo:

AB = XY

Dhismo:





Waxad jeexdaa gacannada goobooyinka AO, BO, XM iyo YM. Waxad fiirisaa:

$\triangle$ AOB iyo $\triangle$ XWY.
$\angle O = \angle M$ (qaanso ACB=qaanso XWY)
AO = ON = XM = MY (gacannada goobooyinka)
$\triangle$ AOB $\cong$ $\triangle$ XMY (dh. x. dh.)
AB = XY.

Haddaba waxaynnu ku soo gabagabaynaynaa:

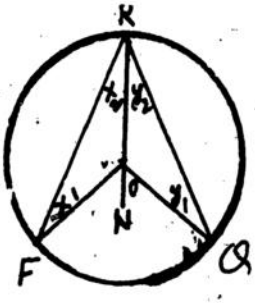
1. Qaansooyinka isle'eg, xaglaha ay xuddunaha goobooyinka ka laalaan way isle'eg yihiin.

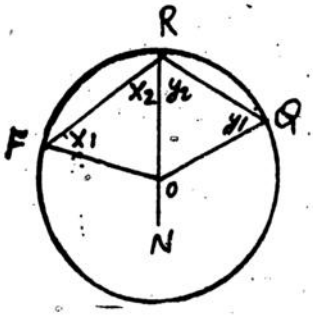
2. Xaglaha ay meerisyada goobooyinka ka laalaan qaansooyinka isle'eki way isle'eg yihiin.

Aragtiinka 2aad ee qaansooyinka iyo goobooyinka:

Xagasha ay qaanso ka laasho goobo xuddunteed waxay le'eg tahay labanlaabka xagasha ay isla qaansadaasi ka laasho meeriska goobadaas.

Ogaal:





Waxaynnu haysannaa goobada FQR oo xudduneedu tahay O.

In la caddeeyo:

In ay xagasha FOQ = 2 FRQ.

Dhismo:

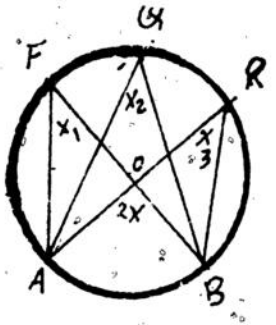
Isku xir RO, dabadeedna waxad u fidisaa ilaa N.

Caddayn:

OF = OR (gacannada goobada)
$\therefore x_1 = x_2$ (FQR waa Δ labaale ah)
$\therefore \angle FON = x_1 + x_2 = 2x_2$ (x. dibadeeda Δ FOR)
Sidaas oo kale:
$\angle QON = y_1 + y_2 = 2y_2$ (x. dibadeeda Δ FOR)
i) $\angle FOQ = FON + QON$
ii) $\angle FOQ = 2x_2 + 2y_2$
$= 2 (x_2 + y_2)$
$= 2$ FRQ.

Aragtiinka 3aad:

Xaglaha goobo qoqobkeed ku wada yaalla way isle'eg yihiin



Ogaal:

Waxaynnu haysannaa F, Q, iyo R oo ah barо ku yaalla meelo ka mid ah meeriska goobada AFQR ... B.

In la caddeeyo:

In $\angle AFB = \angle AQB = \angle ARB = \cdots$
isku xir A iyo xuddunta goobada.

Caddayn:

$\angle AOB = 2x_1$ (x. xuddunta = 2 · xagasha meeriska)

$= 2x_2$ (x. xuddunta = 2 · xagasha meeriska)

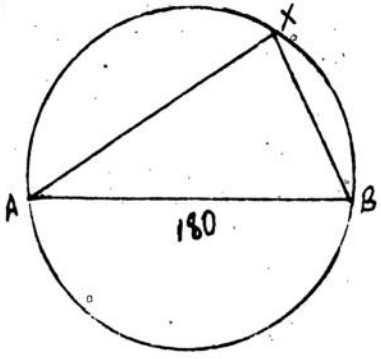
$= 2x_3$ iwm. (x. xuddunta = 2 · xagasha meeriska)

$\therefore x_1 = x_2 = x_3 = \cdots$

$\therefore AFB = AQB = ARB = \cdots \cdots$

Aragtiinka 4aad:

Xagal kasta oo ku taalla goobo badhkeed waa xagal qumman.



Ogaal:

Waxaynnu haysannaa goobo xuddunteedu tahay O dhexroorkeeduna yahay AB. Waxaynnu kaloo haysannaa barta X oo ku dul taalla meel ka mid ah meeriska qoqobka sare.

In la caddeeyo:

$\angle AXB = 90°$

Caddayn:

$\angle AOB = 2\angle AXB$. (x. xuddunta = 2 · xagasha meeriska

Laakiinse:

$\angle AOB = 180°$ (ADB waa xagal tooban)

$\therefore 2\angle AXB = 180°$

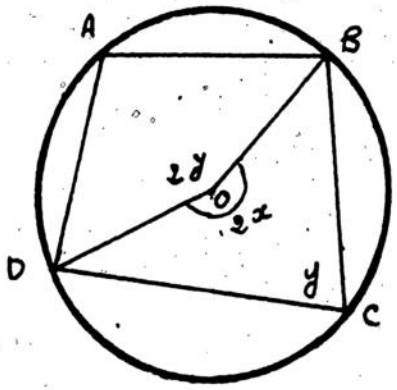
$\therefore \angle AXB = 90°$

MEER WADAAG:

Qeex: Meer wadaag waa afargeesle ay geesihiisu taabanayaan goobo ku dul meersan.

Aragtiinka 5aad:

Xaglaha iska soo horjeeda ee meer wadaaggu waa xaglo isbuuxsha.



Ogaal:

Waxaynnu haysannaa afargeeslaha ABCD oo dul meersan.

In la Caddeeyo:

$\angle BAD + \angle BCD = 180°$

Dhismo:

B iyo D ku xir xuddunta O ee goobada ABCD.

Caddayn:

$\angle BOD = 2y$ (x. xuddun = 2x xagasha meeriska)

X. daacsan $\angle BOD = 2x$ (x. xuddun = 2x xagasha meeriska)

$\therefore 2x + 2y = 360°$ (xaglaha bareed)

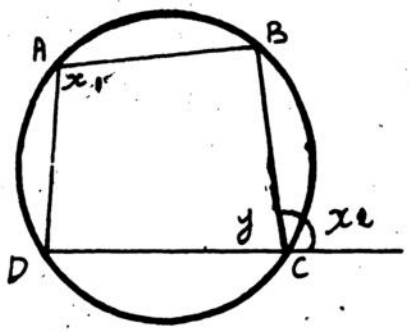
$\therefore 2(x + y) = 360°$

$\therefore x + y = 180°$

$\therefore \angle BAD + \angle BCD = 180°$

Xigasho:

Haddii dhinac ka mid ah meer-wadaagga la fidsho markaa xagal dibadeedda halkaa ka samaysantaa waxay le'eg tahay xagal gudeedda ka soo horjeedda.



$x_1 + y = 180$ ($\angle$x. iska horjeedda ee meer-wadaag)

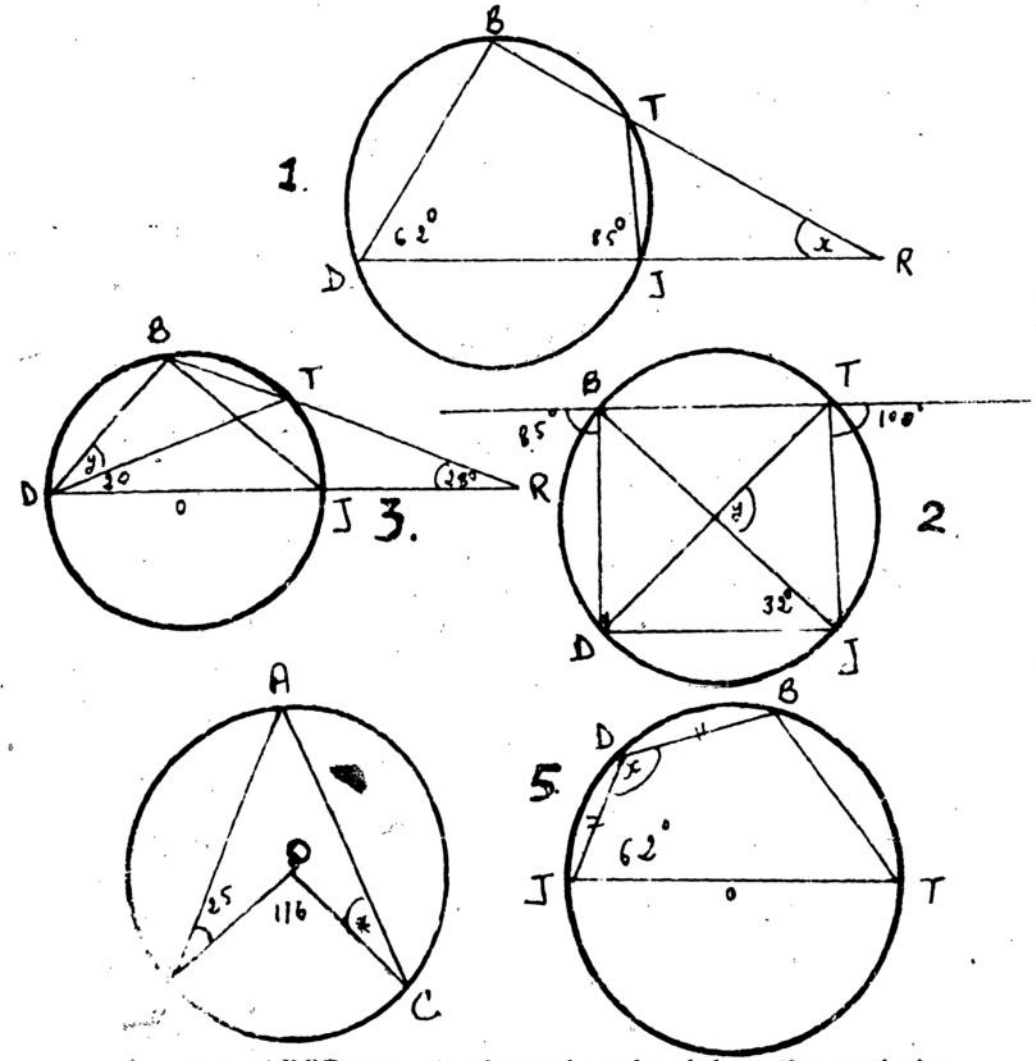
$x_2 + y = 180$

$\therefore x_1 = x_2$

$\angle BCX = \angle BAD$ ($\angle$x. deris ah)

Layli:

Raadi mar kasta cabbirka x iyo y oo ku yaalla xaglaha shaxannada soo socda. O had iyo jeer waa xuddunta goobadaas.



ABCD waa afar barood oo ku dul yaalla meelo ka mid ah meeriska goobada ABCD. Labada boqon ee AC iyo BD waxay iska gooyaan meesha lagu magacaabo X, oo ay AX = AB. Haddaba waxad caddaysaa in DX = DC.

AB iyo DC waa laba boqon oo barbarro ah oo ku yaalla ABCD. AC iyo BD waxay iska gooyaan meesha lagu magacaabo X. Caddee in:

1) XD = XC
2) ∠AXB = 2 ∠ABX

8. XAB iyo XCD waxa weeye laba xarriiq oo toosan oo ka wada bilaabma barta X ee ku taalla meel dibedda ka ah goobada ABCD, isla markaana ka jara goobadaas meelaha kala ah, A, B, C iyo D siday u kala horreeyaan. Haddii CX = CB, caddee in AX = AD.

9. O waxa weeye xuddunta goobo gacankeedu yahay OA, BC-na waxa weeye boqon la barbarro ah gacanka OA. Caddee xarriiqda AB inay kala badho xagasha OBC?

10. ABC waa saddexagal dul meersan, O-na waa xuddunta goobada ku dul meersan saddexagalka. D-na waa bar ku taalla kala badhka BC, caddee in ∠BOD = ∠BAC?

11. ABCD waa meer-wadaag. Haddaba haddii xarriiqda BD ay kala badho labada xaglood ee ABX iyo ADC, caddee in BD uu yahay dhexroorka goobada ABCD?

12. ABCD waa goobo xuddunteedu tahay O, dhexroorkeeduna yahay AD. Haddii AB = BC, caddee in xarriiqda BO ay la barbarro tahay CD?

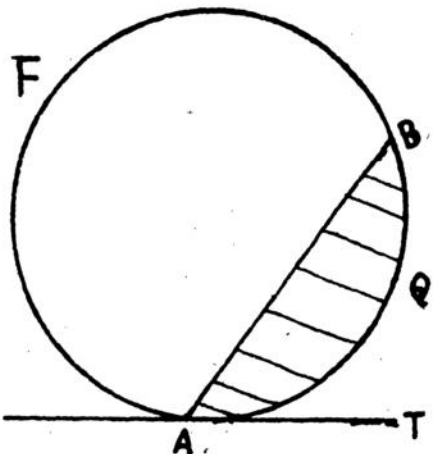
13. O waa bar ku taalla xuddunta goobada gacankeedu yahay OA. AB-na waa boqon ku yaalla goobadaas. Caddee in goobada kale ee dhexroorkeedu yahay OA ay kala badho boqonka AB?

14. Laba goobo oo kala ah FABR iyo SABQ ayaa iska gooyaa meelaha A iyo B. FAQ iyo RAS waa laba xarriiq oo toosan. Caddee in xagasha ∠FBR = SBQ?

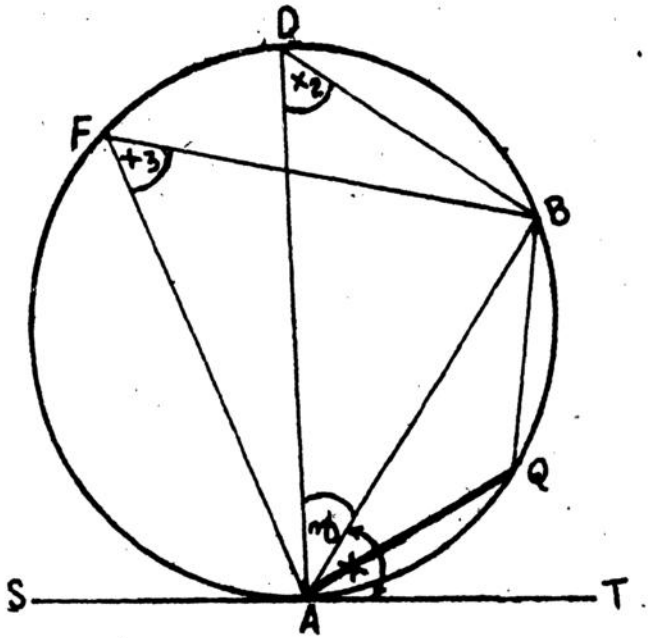
15. ABC waa △ labaale ah oo AB = AC. Goobo maraysa labada gees ee A iyo B ayaa AC ka jarta barta X. BC-na barta Y. Caddee in XY = YC?

Qoqob talantaali ah:

Ka dib markaad fiirisid shaxanka, waxaad arki in boqonka AB uu u kala qaybiyo AQBF laba qoqob oo ah qaybta xardhan ee AQB iyo qaybta cad ee ABF. Waxaad ka soo qaaddaa inuu SAT yahay taabtaha goobada.



Taabtaha SAT wuxuu ka taabtaa goobada meel keliya, taasoo ah barta A. Haddaba, waxaynnu oran karraa, qoqobka AFB wuxuu talantaalli u yahay xagasha TAB, haddii uu ku yaallo qoqobka weyn. Sidaas oo kale, qoqobka xardhan ee AQB wuxu talantaalli u yahay xagasha SAB.



Aaragtiinka qoqobbada talantaalliga ah:

Xaglaha u dhexeeya taabtaha goobada iyo boqonka mara meesha ay iska taabtaan goobada iyo xarriiqda taabtaha ahi waxay middiiba le'eg tahay xaglaha ku yaalla qoqobbada talantaalliga ah.

Ogaal:

Waxaan ognahay in ay xarriiqda SAT ka taabanayso goobada A oo keliya. Markaana ay taabte tahay. Waxaynnu kale oo aan ognahay in boqonka AB uu u kala qaybiyo goobada laba qoqob oo ah AFB iyo AFQ.

In la caddeeyo:

$$\angle TAB = \angle AFB, \ \angle SAB = \angle AQB$$

Dhismo:

Waxaad jeexdaa dhexroorka AD, dabadeedna isku xir D iyo B.

Caddayn:

$x_1 + y = 90$	(Taabtaha)
$ABD = 90$	(x. ah goobo badhkeed)
	(wadarta xaglaha Δ ABD
$\therefore x_2 + y = 90$	$= 180°$)
$\therefore x_1 + x_2 = x_2 + x_3$	(waa isku qoqob)
$\therefore x_1 = x_2 = x_3$	
$\therefore \angle TAB = \angle AFB$	

Sidoo kale:

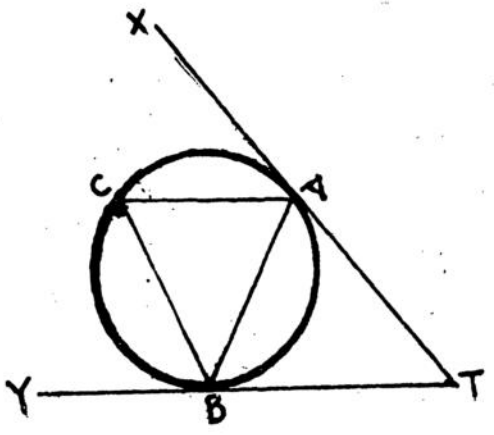
	(xaglo deris ah oo ku yaal xar.
$\angle SAT = 180 - x_1$	toosan)
$= 180 - x_3$	(x. iska horjeeda ee afargees-
	meeran)
$\angle SAB = \angle AQB$	(x. iska horjeed ee afar geesle-
	meeran)

Layli:

Shaxanka hoose TAX iyo TBY waa taabteyaalka goobada, C-na waa bar ku dul taal meeriska qoqobka weyn. Haddaba, waxad soo saartaa xaglaha qarsoon ee layliyada 1 ——— 4,

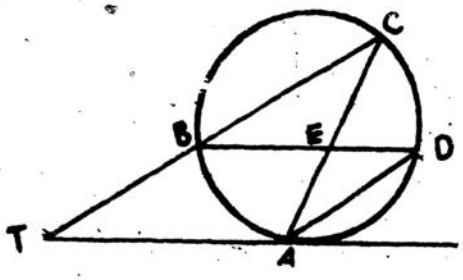
1. Haddii $\angle ATB = 68°$, doon $\angle ACB$
2. Haddii $\angle ABC = 43°$. $\angle BAC = 73°$, Raadi $\angle ATB$
3. Haddii $\angle CAX = 65°$. $\angle CNY = 76°$, Raadi $\angle ATB$
4. Haddii $\angle ABC = 48°$. $\angle ATB = 72°$, Raadi $\angle BAC$

Shaxan:



5. Laba taabte oo ka wada bilaabma barta Y ayaa ka taabta goobada meelaha A iyo B. Boqonka BC wuxu la barbarro yahay TA. Haddii $\angle BAT = 54°$. Soo saar $\angle BAC$?
6. AB waa goobo boqonkeed, ACB-na waa qaansada yar, ama qoqobka yar. Taabteyaalka A iyo B-na waxay ku kulamaan barta T oo dibedda ka ah goobada. Markaa haddii $\angle ATB = 54°$, $\angle CAT = 23°$ soo saar $\angle CTA$?

7. Shaxanka 4aad, haddii $\angle ACB = 37°$ $\angle ATB = 42°$ soo saar, $\angle ABT$ iyo $\angle AEB$.



8. Saddexagal dhexmeeran ayaa xagliniisu ay yihiin 40°, 60° iyo 80°. Goobada ku hoos jirtaa waxay ka taabataa dhinacyada saddexagalka meelaha ah, F, Q iyo R. Haddaba waxad soo saartaa xagalaha

9. A, B iyo C waa saddex barood oo ku yaalla goobo meeriskeed. Taabtaha ka taabta goobada barta C ayaa wuxuu kula kulma AB oo la fidiyay meesha lagu magacaabo T. Haddii ACT = 103, ATC = 43° soo saar xagalaha ABC?

10. AT waxay taabte u tahay goobada ABCD. Haddii $\angle BAC = 64°$, $\angle CAT = 72°$, soo saar $\angle BCA$ iyo $\angle CDA$.

11. AB, BC iyo CA waa saddex boqon oo isle'eg oo ku wada yaalla goobo qudha. Laba taabte oo ka wada bilaabma T yaa ka taabanaya goobada meelaha kala ah B iyo C. Caddee in BTC uu yahay saddexagal qumman?

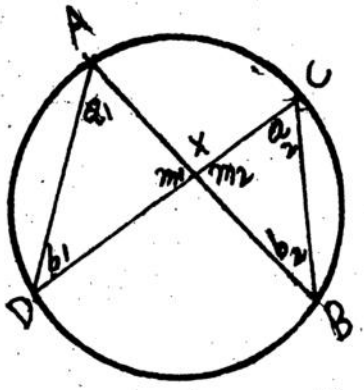
12. A, B iyo C waa saddex barood oo ku yaalla goobo meeriskeed, taasoo ay BC la barbarro tahay taabtaha goobada ee barta A. Caddee in Δ ABC u yahay labaale?

Astaamaha laydi ee goobada:

Aragtiinka 2aad: Haddii laba boqon ay iska gooyaan meel goobo dhexdeeda ah, markaa taranta labada qaybood ee qobonkaasi waxay le'eg yihiin taranta labada qaybood ee boqonka kale.

Ogaal:

Waxaynnu ognahay inay labada boqon ee AB iyo CD ay iska gooygn barta X.



In la caddeeyo:

$AX \cdot XB = CX \cdot XD$.

Dhismo:

Isku xir AD iyo CB.

Caddayn:

$a_1 = a_2$	(isku gogob DB)
$b_1 = b_2$	(isku gogob AC)
$m_1 = m_2$	(x. food saar ah)

$\therefore$ Δ AXD wuxu u egyahay Δ CXB

$$\therefore \frac{AX}{CX} = \frac{XD}{XB} = \frac{(DA)}{BC}$$

$\therefore AX \times XB = CX \times XD$

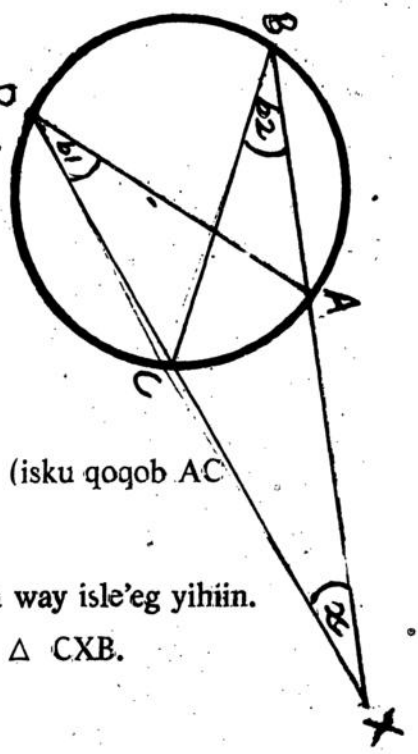
Inta ay naan u gelin aragtiinka labaad, bal aan isku dayno inaynu ogaanno taraartu waxay tahay: haddii boqon labadiisa madax mid ka mid ah la fidiyo, markaa xarriiqda dhan ee kuu soo baxa ayaa la yiraa taraar, sida XAB ama XCD.

Aaragtiinka 2aad:

Haddii laba taraarood oo goobo ay ku kulmaan meel goobada dibadeeda ah, markaa taranta labada qaybood ee taraartaas waxay le'eg tahay taranta labada qaybood ee taraarta kale (marka iyadana laga cabbiro isla isgoyskaas).

O g a a l:

Waxaynu ognahay in XAB iyo XCD ay yihiin labada taraarood ee goobada ABCD.



In la caddeeyo:

In $XA \cdot XB = XC \cdot XD$.

D h i s m o:

Isku xir AD iyo CB.

C a d d e y n:

$\triangle$ AXD iyo $\triangle$ CXB

$b_1 = b_2$ (isku qoqob AC

X way u dhexaysaa

$\therefore$ Labada xaglood ee harayna way isle'eg yihiin.

$\therefore$ $\triangle$ AXD wuxu u egyahay $\triangle$ CXB.

$$\therefore \frac{AX}{CX} = \frac{XD}{XB} = \frac{(DA)}{BC}$$

$\therefore AX \cdot XB = CX \cdot XD.$

Aragtiinka 3aad:

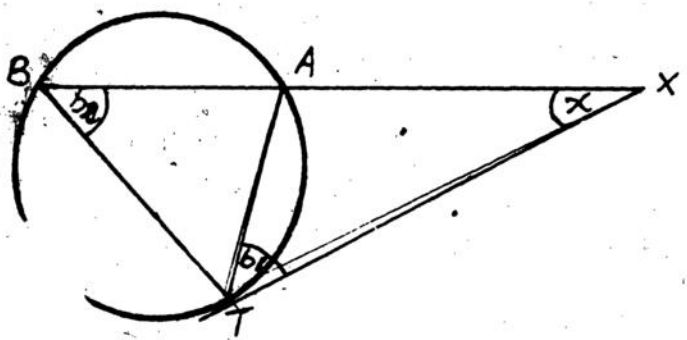
Haddii taraar iyo taabte goobo ay ku kulmaan meel, markaa taranta labada qaybood ee taraarta iyo waxa isle'eg laba jibbaarka taabtaha.

O g a a l :

Waxaynnu ognahay in XAB ay tahay taraarta goobada BAT, iyo in XT uu yahay taabtaha goobada BAT.

In la caddeeyo:

$$XA \cdot XB = XT^2$$



Dh i s m o :

Isku xir TA iyo TB

C a d d e y n :

Δ XAT iyo Δ XTB

$b_1 = b_2$ (x. ku yaalla qoqobyo talantaalli ah)

X way u dhexaysaa. Xaglaha harayna way isle'eg yihiin

$\therefore$ Δ XAT iyo Δ XTB waa isu eg yihiin.

$$\therefore \frac{XA}{XT} = \frac{(AT)}{TB} = \frac{TX}{BX}$$

$$\therefore AX \cdot XB = XT^2$$

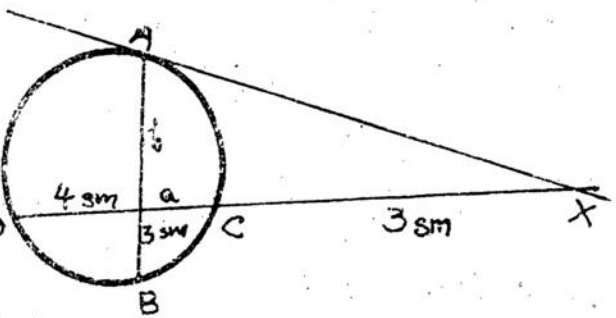
Ogow:

Waa lagama maarmaan inaynnu ogaanno labada qaybood ee taabtaha, meesha laga cabbirayo iyo sida la isugu dhufanayo. Kolkaas si ay inoogu fududaato arrintaasi bal aan fiirinno tusaalooyinka soo socda:

Tusaale 1aad:

Doon qiimaha a iyo b ee shaxanka:

Shaqo



i) $3(2 + a) = 6 \cdot$

$7 + a = 12$

$\therefore a = 5$

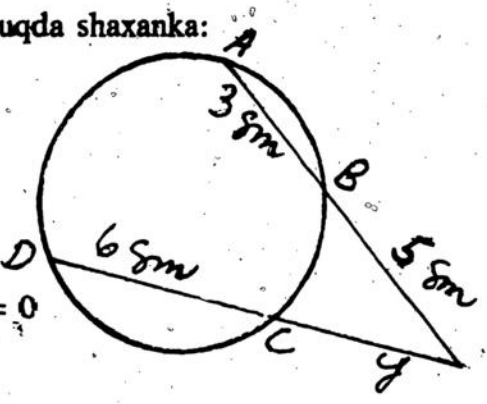
ii) $b \times 3 = 4 \times 5$

$$b = \frac{20}{3}$$

$$b = 6\frac{2}{3} \text{ sm.}$$

Tusaalaha 2aad:

Raadi qiimaha Y ee ka muuqda shaxanka:



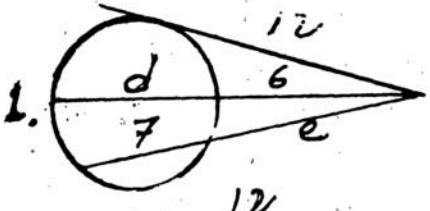
SH:

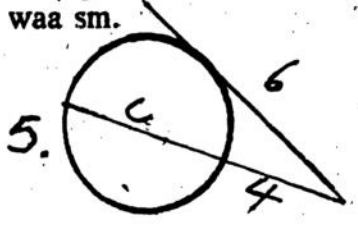
$XA \cdot XB = XC \cdot XD$
$\therefore\ c\,(c + 6) = 5 \cdot 8$
$\therefore\ c^2 + 6c - 40 = 0$
$\therefore\ c^2 + 10c - 4c - 40 = 0$
$\therefore\ c\,(c + 10) - 4\,(c + 10) = 0$
$(c + 10)\,(c - 4) = 0$
$\therefore\ c = 4$ ama $c = -10$

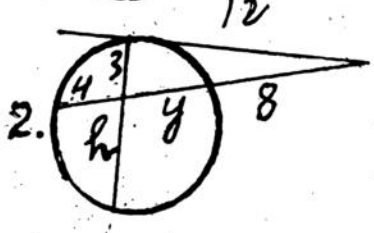
Markaa tirada taban oo ah -10 waad iska dhaafaysaa, oo waxad qaadanaysaa tirada togan. Kolkaa, jawaabtu waa 4 sm.

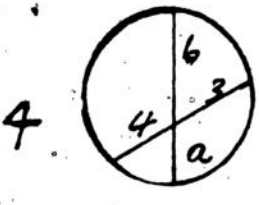
Layli:

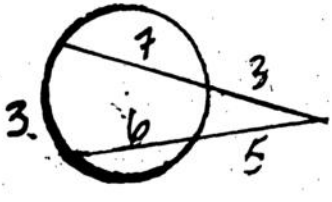
Raadi xarfaha dahsoon marka laga bilaabo shaxanka 1aad ilaa 5aad. Cabbiraad kasta waa sm.











Ka shaqee xisaabaha soo socda oo dhan adigoo la kaashanaya astaamaha laydi ee goobada.

6. F iyo Q waa laba barood oo ku yaalla dhinacyada AB iyo AC siday u kala horreeyaan ee saddexagalka ARC, oo ay $AQF = B$. Caddee in $AF \cdot AB = AQ \cdot AC$

7. ABC waa $\triangle$ uu $AB = AC$. Goobo maraysa barta C ayaa waxay ka taabataa barta A, isla markaasna waxay ka goysaa CB (ama BC oo la fidshay) barta D. Caddee in $AC = BC \cdot BD$.

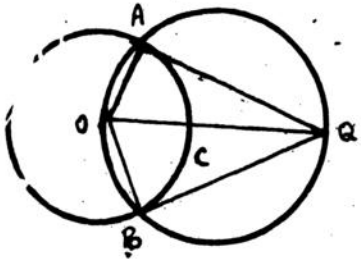
8. XAB iyo XCD waa laba taraarood oo ku yaalla goobada ABCD. Haddii $XA = XC$. Caddee in $AB = CB$

9. BE iyo CF waa labada joog ee saddexagalka ABC. Halka ay labadu isku gooyaana waxa lagu magacaabaa barta H. Caddee in $BH \cdot HE = CH \cdot HF$?

10. Laba goobo ayaa iska gooya meelaha A iyo B. X waa bar ku dul taalla meel ka mid ah BA oo la fidshey. Laba taabte oo ka wada bilaabma barta X ayaa labada goobo ka taabta meelaha kala ah F iyo Q. Caddee in $XF = XQ$?

Taabteyaal:

taabtaha ka yimaad bar goobo dibedda ka ah.



Ugaal:

Waxaynnu haysannaa goobada yar ee xuddunteedu tahay O iyo barta Q oo ku taalla meel goobada ka baxsan.

In la caddeeyo:

Laba taabte oo ka yimaada bar goobo dibedda ka ah way isle'eg yihiin.

Dhis:

Waxaynnu rabnaa inaynnu dhisno labada taabte ee goobada kana yimaad barta Q.

Dhismo:

Isku xir O iyo Q, dabadeedna kala badh. Markaa, saar goobeeyaha kala badhka OQ oo ah barta C, gacankiisana fidi ilaa iyo CO. Kolkaa waxad samaysaa goobada weyn oo ka gooynaysa tan hore meelaha A iyo B. Isku xir QA iyo QB. Markaa QA iyo QB waa labada taabte ee aynnu rabney inaynnu samaynno.

Caddeyn:

Isku xir OA iyo OB. Mar haddii C tahay badhtamaha OQ. OQ waxay noqonaysaa dhexroorka goobada weyn ee xuddunteedu C tahay.

$\therefore\ \angle OAQ = \angle OBQ = 90$ (x. goobo badhkeed)

OA iyo OB waa gacannada goobada yar waana ay isle'eg yihiin:

$\therefore\ \triangle\ QBO \cong \triangle\ QAO$ (90°, shakaal iyo dhinac)

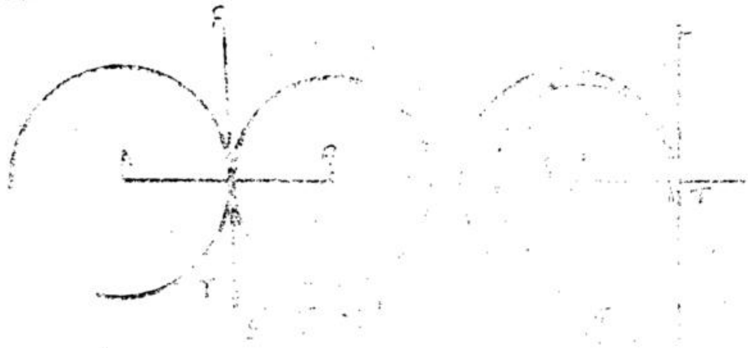
Markaa $QA = QB$,

Gooboovinka istaabta:

Waxaynnu oran karraa laba goobo way istaabtaan haddii xarriiqda toosan ee marta barta ay iska taabtaan ay labada gooboba u tahay taabte. Laba siyood ayay gooboovinku isu taaban karaan. Kuwaas oo ah iyagoo dusha ama gudaha iska

taabta sida shaxanka hoose ku muujisan. Ka soo qaad inay xuddunahoodu kala yihiin A iyo B [illegible] ay wadaagaan uu yahay FT.

SH:



Shaxanka [illegible] in $\angle ATF = \angle BTF =$ [illegible] kol haddii xaglaha [illegible] dambe, $\angle ATF = \angle BTF =$ [illegible] qum-man kuna qotoma [illegible] way isu beegan yihiin [illegible]

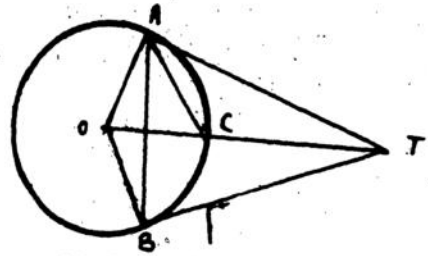
Gabagab [illegible] taab-taan, kolkaa [illegible] ma [illegible] maaha ay iska taabtaan.

Inta [illegible] qoonnacooda, haddii [illegible] iska [illegible] ne iska taabtaan [illegible]

Laylis:

O [illegible] teyaalka goobaa [illegible] aad, adigoo mar kasta [illegible]

1. Haddii $\angle$ [illegible]
2. Haddii $\angle$ [illegible]
3. Haddii $\angle$ [illegible]
4. Haddii $\angle$ [illegible]
5. Haddii $\angle$ [illegible]



6. Taabte ka yimaadda barta T ayaa wuxuu ka taabtaa goobo barta R. Haddii gacanka goobadu yahay 2.8 sm., T-na 5.3 sm u jirto xuddunta, soo saar dhererka taabtaha TR.

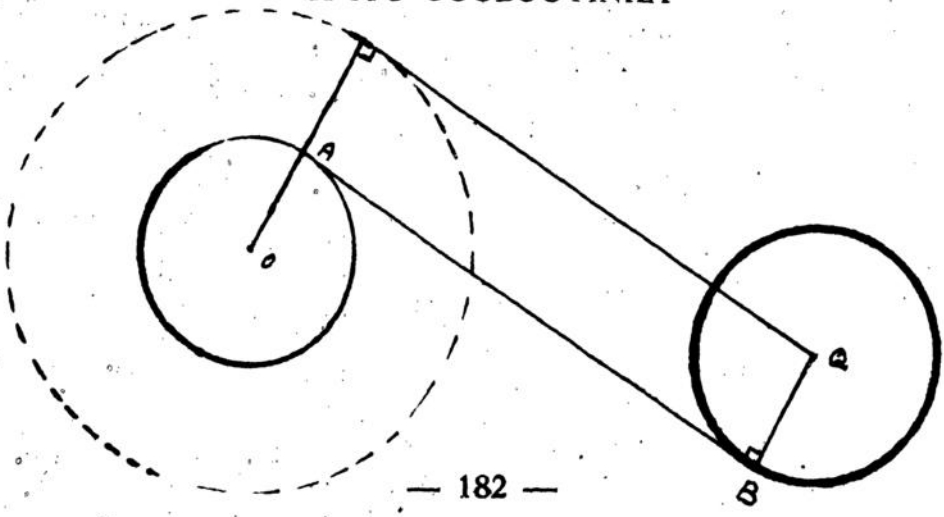
7. Barta F ayaa u jirta 6.5 sm goobo xuddunteed. Dhererka taabtuhu waa 5.6 sm. marka laga cabbiro barta D. Soo saar gacanka goobada.

8. AB waa boqon ku yaalla goobo xuddunteedu tahay O. Haddii $\angle AOB = 78°$, soo saar xagasha furan ee u dhexaysa AB iyo taabtaha goobada ee barta B.

9. ABC waa Δ ay $AB = 2$ sm, $BC = 2.1$ sm, $CA = 2.9$ sm. Caddee inay BC u tahay taabte goobo xuddunteedu tahay A gacankeeduna yahay AB.

10. Labo taabte oo ka wada bilaabma barta X ayaa ka taabtaa goobo xuddunteedu tahay O, meelaha kala ah A iyo B. AC waa dhexroorka goobada. Haddii $\angle AOX = 47°$, soo saar $\angle BAC$?

TAABTEYAALKA IYO GOOBOOYINKA



Dhismaha taabteyaal ay laba goobo oo kala gooni ahi wadaagaan.

O g a a l : waxaynnu haysanna laba goobo oo xuddunahoodu kala yihiin O iyo Q.

In la tuso:

Sida loo dhisayo taabte ay wadaagaan labada goobo.

Dh i s m o :

Samee goobo xuddunteedu tahay O, gacankeeduna yahay wadarta labada goobo gacannadooda. Haddana samee taabtaha TQ ee goobada cusub. Isku xir OT. Ka soo qaad in xarriiqda OT ay ka gooynayso goobada hoose barta A. Jeex xarriiqda QB oo la barbarro ah TO kana jaraysa goobada xuddunteedu tahay Q barta B. Isku xir A iyo B. Kolkaa AB waa taabtaha ay wadaagaan labada goobo.

C a d d e y n :

AT iyo BQ way isle'eg yihiin waana $\|$, x a g a s h a $\angle OTQ = 90°$ (taab $\perp$ gacanka).

$\therefore$ ABQT waa laydi, xagalaha A iyo B-na waa xaglo qumman.

$\therefore$ AB waa taabtaha ka dhexeeya labada goobo.

O g o w :

Waxaynnu rabnaa inaynnu ogaanno inaanay jirin si loo sameeyo taabte ka dhexeeya laba goobo haddii midi tan kala hoosteeda ku jirto.

L a y l i :

1. Waxad samaysaa laba goobo oo gacannadoodu kala yihiin 1″ iyo 2″, xuddunahooduna isu jiraan 3.5″ Kolkaa waxad sameysaa taabtaha u dhexeeya, adigoo isla markaa cabbiraya dhererkooda.

[illegible] rodbeoyinkiisa waxad [illegible] labada go- [illegible]

[illegible] yihiin 2 sm iyo [illegible] 8 sm. Samee [illegible] cabbiraya.

[illegible] yihiin 3 sm iyo [illegible] 7 sm. Samee la- [illegible] isla markaana [illegible]

SADDE[illegible]

Q[illegible] saddexagal ay isle'eg yi- hiin, ke[illegible] yihiin laakiinse [illegible] isku muuq yihiin [illegible]

Aragtiinka 1:

Haddii laba saddexagal ay is xagallo le'eg yihiin markaa dhinacyada isku aaddan ee saddexagalladu waa isku saami.

Ogaal:

Waxaynnu haysanna labada Δ ee ABC iyo FQR oo ay $\angle A = \angle F$, $\angle B = \angle Q$, $\angle C = \angle R$.

In la caddeeyo:

$$\frac{AB}{FQ} = \frac{BC}{QR} = \frac{CA}{RF}$$

Dhismo:

Dhinacyada AB iyo AC waxad ka gooysaa $AX = FQ$ iyo $AY = FR$. Isku xir XY.

Caddayn:

Δ AXY $\cong$ Δ FQR (dh. x. dh.)

Kolkaa Δ AXY waa FQR oo la barabixiyay.

$\therefore X_1 = X_2 = X_3$ (ogaal)

$\therefore$ XY $\parallel$ BC (xagallo gudboon)

$$\therefore \frac{AB}{AX} = \frac{AC}{AY}$$

$AX = FQ$, $AY = FR$ (dhismo ahaan)

$$\therefore \frac{AB}{FQ} = \frac{AC}{FR}$$

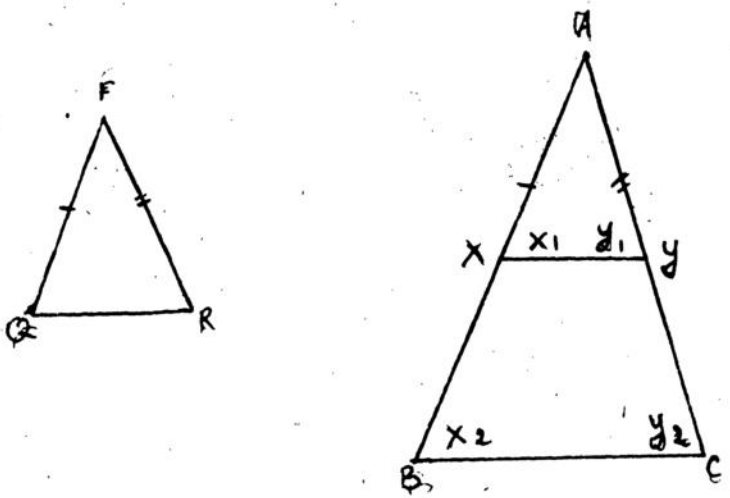
Sidoo kale:

$$\frac{AB}{FQ} = \frac{BC}{QR}$$

$$\therefore \frac{AB}{FQ} = \frac{BC}{QR} = \frac{CA}{RF}$$

Aaragtiinka 2aad:

Haddii dhinacyada isu aaddan ee laba saddexagal ay isku saami yihiin, kolkaa labada saddexagal way is xagal le'eg yihiin.



O g a a l :

Waxaynnu haysannaa Δ ABC iyo Δ FQR oo ay

$$\frac{AB}{FQ} = \frac{BC}{QR} = \frac{CA}{RF}.$$

In la caddeeyo:

Δ ABC iyo Δ FQR inay is xagalo le'eg yihiin.

Dh i s m o :

Dhinacyada AB iyo AC, waxad ka amaaradaysaa $AX = FQ$ iyo $AY = FR$.
Isku xir XY.

Caddayn:

$$\frac{AB}{FQ} = \frac{AC}{FR}$$

$$\therefore \frac{AB}{AX} = \frac{AC}{AY} \qquad (AX = FQ,\ AY = FR \text{ dhismo})$$

$\therefore$ AY || BC

$\therefore$ $X_1 = X_2$, $Y_1 = Y_2$ (xaglo gudboon)

Kolkaa Δ ABC iyo Δ AXY waa is xaglo le'eg yihiin waana isu'eg yihiin.

Δ ABC waa Δ AXY oo la weyneeyey.

$$\therefore \frac{BC}{XY} = \frac{AB}{AX}$$

$$= \frac{AB}{FQ} \qquad (AX = FQ, \text{ dhismo})$$

$$= \frac{BC}{QR} \qquad (\text{Ogaal})$$

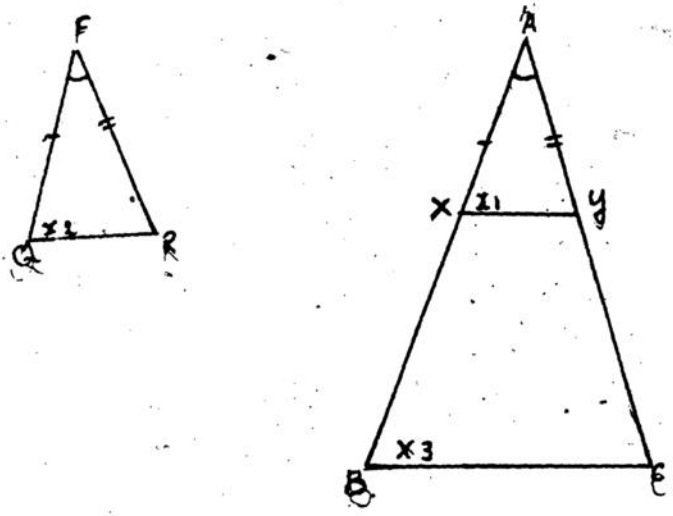
$\therefore$ XY = QR

$\therefore$ Δ AXY $\cong$ FQR (Dh. X. Dh.)

$\therefore$ Δ FQR waa Δ AXY oo la barabixiyay. Δ ABC iyo Δ FQR way is xaglo le'eg yihiin waana isu'eg yihiin.

Aaragtiinka 3aad:

Haddii laba xaglood oo laba saddexagal ay isle'eg yihiin dhinacyada xaglaha isu'eg u dhexeeyaana ay isku saami yihiin, markaa labada saddexagal waa is xagalo le'eg yihiin wayna isku eg yihiin.



Ogaal:

Waxaynnu haysanaa labada saddexagal ABC iyo FQR oo ay $\angle A = \angle F$, $\frac{AB}{FQ} = \frac{AC}{FR}$.

In la caddeeyo:

$\triangle$ ABC iyo $\triangle$ FQR inay is xagla le'eg yihiin iskuna e'g yihiin.

Dhismo:

Dhinacyada AB iyo AC waxaad ka amaaradaysaa AX = FQ, AY = FR. Isku xir XY.

Caddayn:

$\triangle$ AXY $\cong$ $\triangle$ FQR (Dh. X. Dh.)

$\triangle$ AXY waa barabixidda $\triangle$ FQR

$\therefore X_1 = X_2$

Laakiinse:

$$\frac{AB}{FQ} = \frac{AC}{FR} \quad \text{(Ogaal)}$$

$$\frac{AB}{AX} = \frac{AC}{AY} \quad \text{(AX = FQ, AY = FR, dhismo)}$$

$\therefore XY \parallel BC$

$\therefore X_1 = X_3$ (xaglo gudboon)

$\therefore \angle B = \angle Q$, sidoo kale $\angle C = \angle R$

$\therefore \Delta$ ABC iyo Δ FQR way isku eg' yihiin wayna is xaglo le'eg yihiin.

Ogow:

Si aanu wareer iyo walbahaar kuugu dhalan, markaad magacaabaysid saddexagallo isku eg, waa inaad:

1) Xuruuf isku mid ah ku dhigtaa xagalaha isle'eg side X_1 , X_2 iwm.)

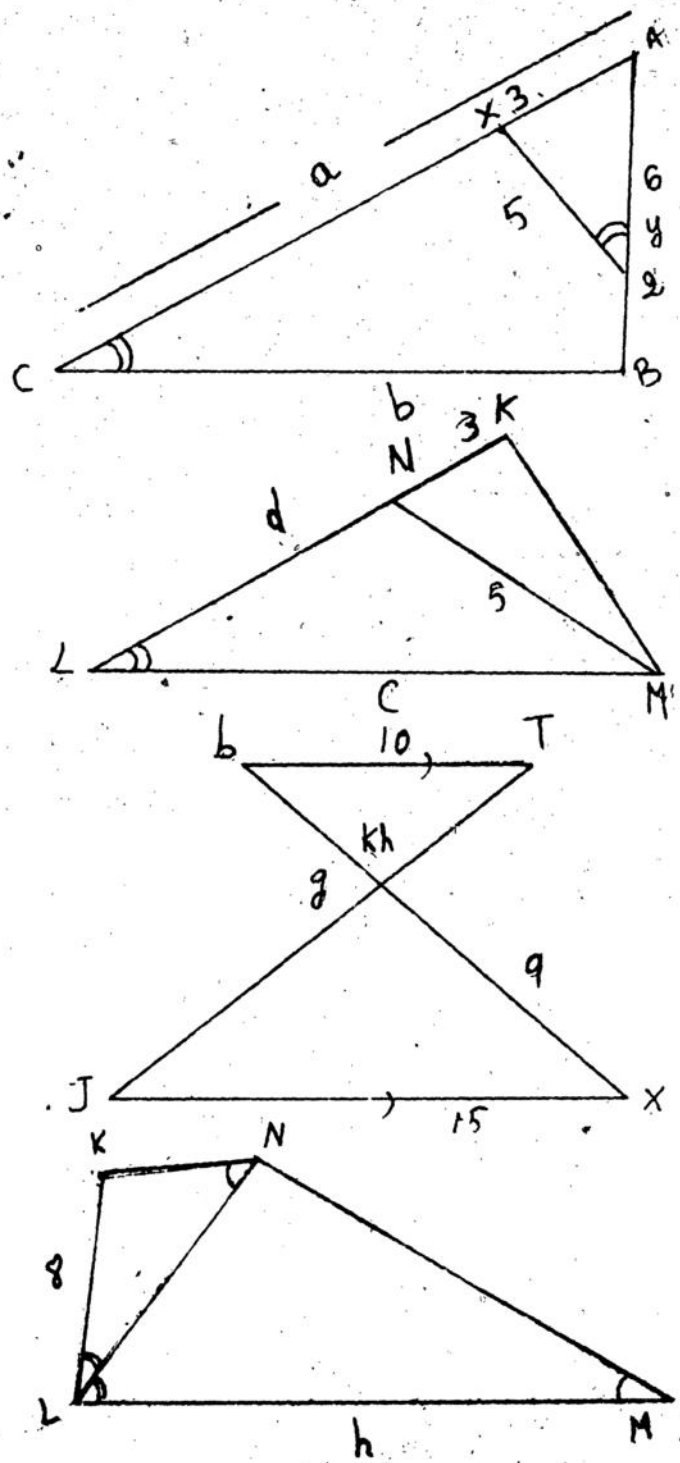
2) Xuruuftooda u kala horaysii sida xagalahooda isle'egki isugu aaddan yihiin.

3) Saamiyada oo dhan waa in aad dhigtaa, ha lagaa rabo ama yaan lagaa rabine, ka dib markaad caddaysi inay laba saddexagal isku eg yihiin sidan oo kale:

$$\frac{AB}{XY} = \frac{BC}{YW} = \frac{AC}{XW}$$

Layli:

Shaxanka 1 — 4, soo saar xarfaha dahsoon. Cabbirradooda waa sm.


A
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J
X
15
K
N
8
L
h
M

5) XY iyo FQ waa laba boqon oo iska gooya barta A oo ku taalla goobada XFYQ dhexdeeda. Caddee in Δ FAX iyo Δ QAY ay isku eg yihiin, isla markaana cadee in $\frac{FA}{YA} = \frac{XF}{QY}$.

6) X waa bar ku taalla meel goobada ABQF dibadeeda ah. XAB iyo XFQ waa laba xarriiq oo toosan. Caddee in Δ XAF iyo Δ XFQ isku eg yihiin, isla markaana muuji in $\frac{AF}{BQ} = \frac{AX}{QX}$.

7) XT waa taabtaha goobada FQT kana yimaadda barta X. XFQ waa taraar. Caddee in Δ ATE iyo Δ XTQ isku eg yihiin, isla markaana $\frac{XT}{XQ} = \frac{TF}{TQ}$

8) Waxad caddaysaa xarriiqaha isku xira badhteyaasha dhinacyada saddexagal inay u qaybshaan saddexagalka afar saddexagal oo isu'eg.

9) ABCD waa afar geesle. Xarriiq maraysa barta A, lana barbarro ah BC ayaa dhinaca DC ka goosya barta E. Caddee inay $\angle DAE = \angle BDC$.

10) X iyo Y waa baro ku yaalla meelo ka mid ah dhinacyada AB iyo AC siday u kala horreeyaan ee saddexagalka ABC, taasoo ay $\angle AXY = \angle C$. Haddii AX = 7 sm, XY = 5 sm, BX = 8 sm., soo saar dhererka BC iyo BY.