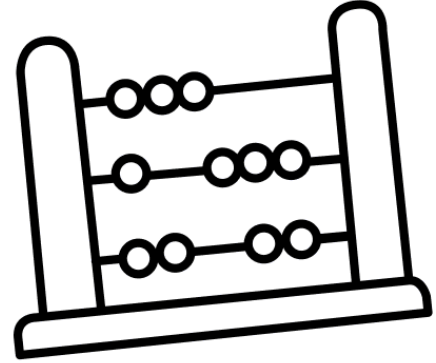


Matixita taxanaha joomatari (geometric sequences) garaaf ahaan



Maths

Cutub: Xiriirrada aan tooska ahayn (non-linear relationships)

Natiijo

Waxaan matixi karaa taxanaha joomatari (geometric sequences) garaaf ahaan waxaanan qiimeeyaa qaab-dhismeedka guud.

Taxane joomatari (geometric sequence) waa taxane leh xiriir isku dhufasho joogto ah oo u dhexeeya xubnaha isku xiga.

Saami guud (common ratio) waa sifo muhiim u ah taxanaha joomatari. Isku-dhufashada joogtada ah ee u dhexeeya xubnaha isku xiga waxaa loo yaqaan saamiga guud (common ratio).

Matixita taxanaha joomatari (geometric sequences) garaaf ahaan



Garaaf u sameynta saami guud (common ratio) ka weyn 1



Garaaf u sameynta saami guud (common ratio) ka yar 1

Garaaf u sameynta saami guud (common ratio) ka weyn

1



Sharaxaad

Cali iyo Saciid waxay samaynayaan moodello taxane ah.

Taxanahaygu waa xisaabeed (arithmetic).
Wuxuu ka bilaabmaa 1 wuxuuna leeyahay xeer
xubnaha isku xiga oo ah $+2$



Taxanahaygu waa joomatari (geometric).
Wuxuu ka bilaabmaa 1 wuxuuna leeyahay xeer
xubnaha isku xiga oo ah $\times 2$



Garaaf u sameynta saami guud (common ratio) ka weyn

1

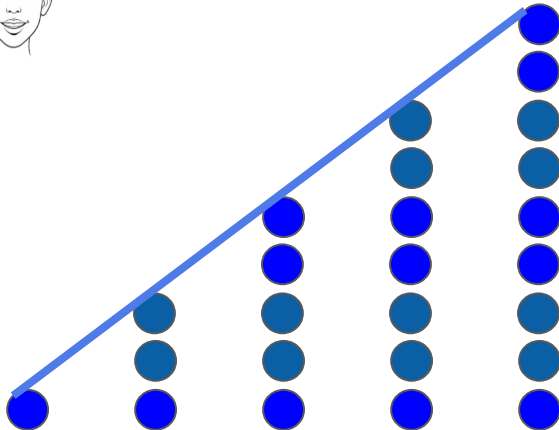


Sharaxaad

Cali iyo Saciid waxay samaynayaan moodello taxane ah.

Taxanahaygu waa xisaabeed (arithmetic).
Wuxuu ka bilaabmaa 1 wuxuuna leeyahay xeer
xubnaha isku xiga oo ah +2

Waxaan arki karaa sababta loogu yeero taxanayaal
toosan (linear sequences). Wuxuu ku kordhayaa
xariiq toosan.



Garaaf u sameynta saami guud (common ratio) ka weyn

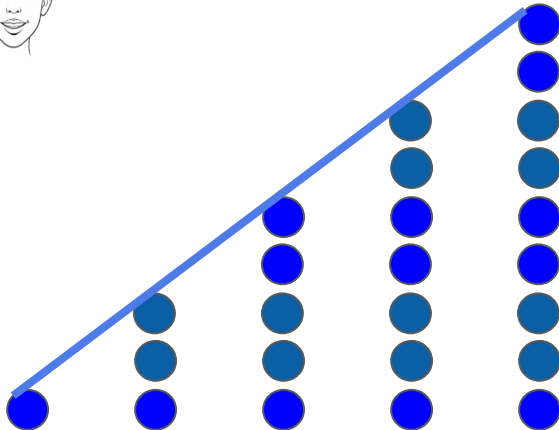
1



Sharaxaad

Cali iyo Saciid waxay samaynayaan moodello taxane ah.

Taxanahaygu waa xisaabeed (arithmetic).
Wuxuu ka bilaabmaa 1 wuxuuna leeyahay xeer
xubnaha isku xiga oo ah +2



Waxaan arki karaa sababta loogu yeero taxanayaal
toosan (linear sequences). Wuxuu ku kordhayaa
xariiq toosan.



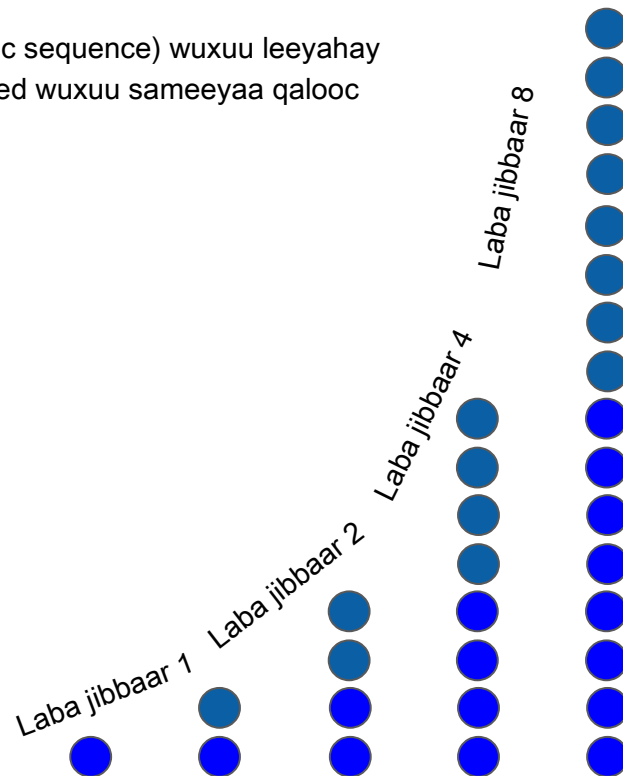
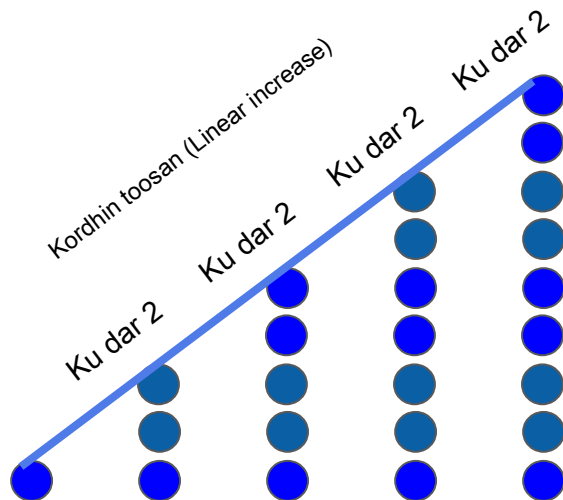
Aynu qorsheeyno isku-xiggeyga (sequence) aniga



Garaafyada (Graphing) saamiga guud (common ratio) oo ka weyn 1

Cali iyo Saciid waxay samaynayaan moodello (models) isku-xiggeyada (sequences).

Isku-xiggeygan joomatari (geometric sequence) wuxuu leeyahay kordhin sii kordheysa, sidaas darteed wuxuu sameeyaa qalooc (curve).



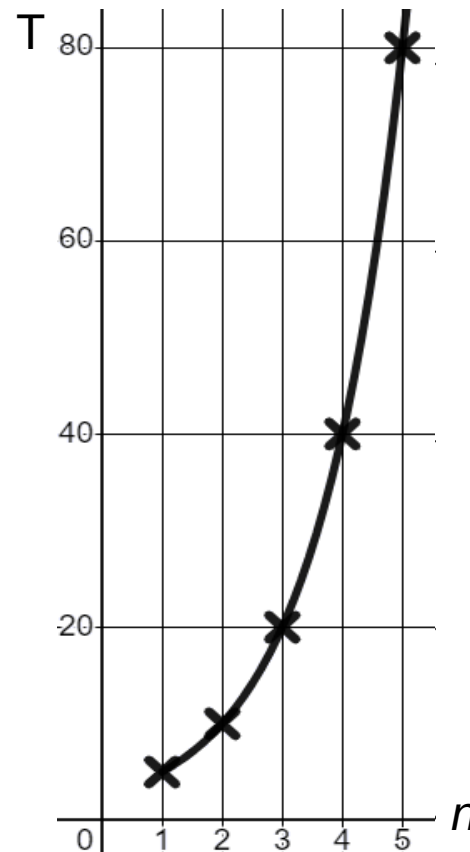
Garaafyada (Graphing) saamiga guud (common ratio) oo ka weyn 1

Waxaanu ku aragnaa qaabka qalooca (curved shape) isku mid ah marka aanu garaafeyno (graph) isku-xiggeyada (sequences) kale ee joomatari (geometric).

Nambarka ereyga (Term number (n))	1	2	3	4	5
Qiimaha ereyga (Term value (T))	5	10	20	40	80



Xariiq (line) dhex maraya dhibcahan (points) wuxuu naga caawinayaa inaan si cad u aragno qaabkan qalooca (curved shape) ee jiidada (gradient) sii kordheysa. Si kastaba ha ahaatee, sida caadiga ah ma sawirno xariiqda (line) marka aanu qorsheynayno isku-xiggeyada (sequences).



Garaafyada saamiga guud (common ratio) oo ka weyn 1



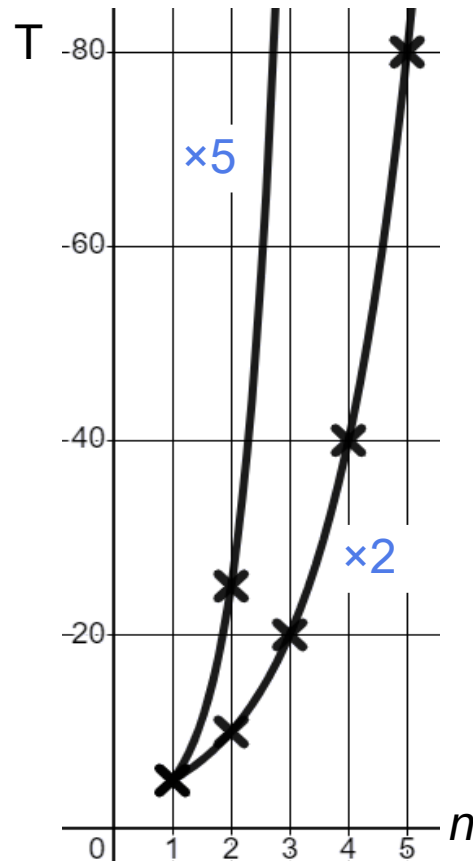
Sharaxaad

Kordhinta saamiga guud (common ratio) waxay kordhisaa xawaaraha isbeddelka (rate of change).

Nambarka term-ka (n)	1	2	3	4	5
Qiimaha term-ka (T)	5	10	20	40	80



Nambarka term-ka (n)	1	2	3	4	5
Qiimaha term-ka (T)	5	25	125	625	3125



Garaafyada saamiga guud (common ratio) oo ka weyn 1



Sharaxaad

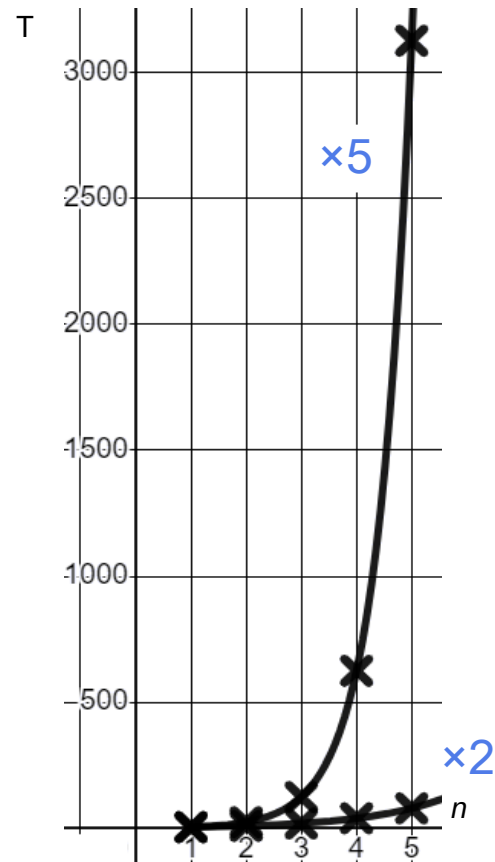
Sababtoo ah isbeddelka (rate of change) ee $\times 5$ waa mid aad u degdeg badan, waxaan u baahanahay inaan hagaajinno miisaanka dhidibka (axis scale).

Nambarka term-ka (n)	1	2	3	4	5
Qiimaha term-ka (T)	5	10	20	40	80

$\times 2$ $\times 2$ $\times 2$ $\times 2$

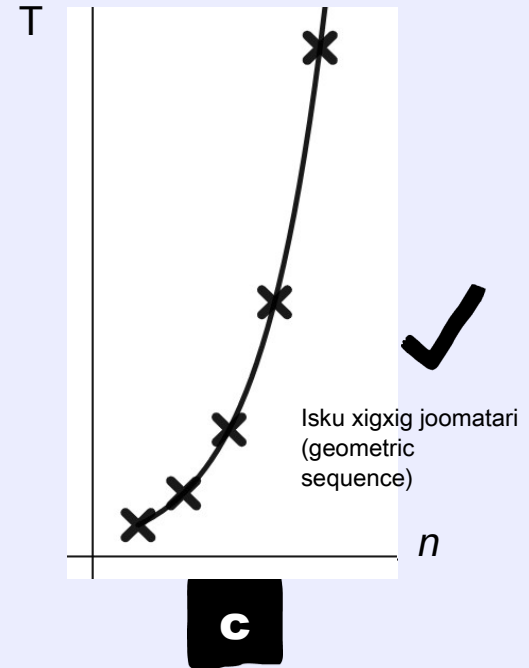
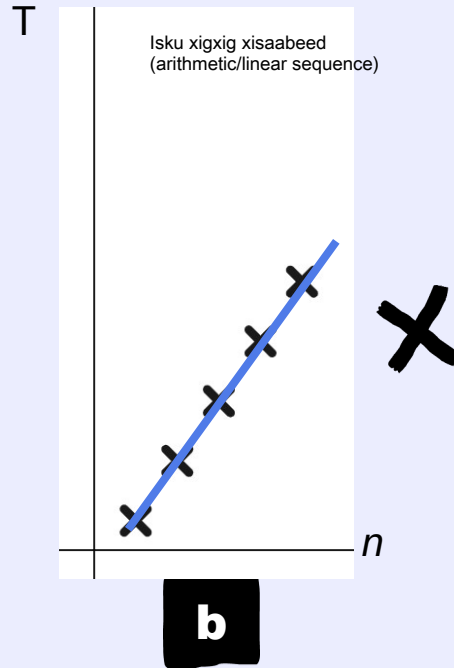
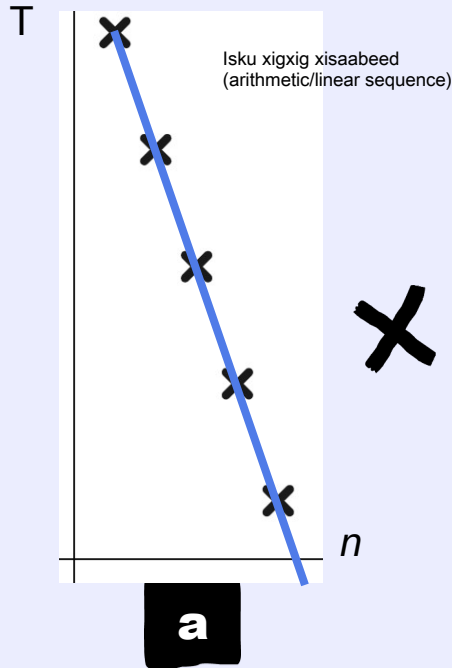
Nambarka term-ka (n)	1	2	3	4	5
Qiimaha term-ka (T)	5	25	125	625	3125

$\times 5$ $\times 5$ $\times 5$ $\times 5$



Garaafyada saamiga guud (common ratio) oo ka weyn 1

Kee ka mid ah garaafyadan ayaa muujin kara isku xigxig joomatari (geometric sequence)?
Miisaanka T iyo n waxay kordhaan qaddar isku mid ah.



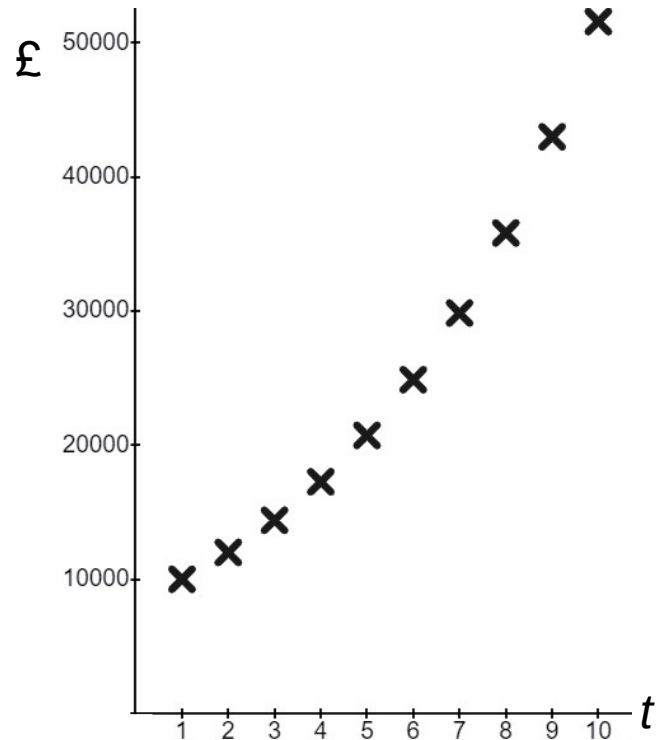
Garaafyada saamiga guud (common ratio) oo ka weyn 1

Garaafkani waa tusaale fiican oo ku saabsan halka aad ku arki doonto xisaabtan adduunka dhabta ah.

Ganacsi ayaa maalgeliya £10 000 oo ah saamiyada (shares) shirkad Tamar Cagaaran. Qiimahoodu (value) wuxuu kordhaa 20% sanad walba.

t	1	2	3	4	5	...
£	10 000	12 000	14 400	17 280	20 736	

Diagram showing the progression of values over time t with a common ratio of $\times 1.2$ indicated by arrows between consecutive values.



Inta ay dheer tahay waqtiga ay maalgashiga (investment) ka tagaan, ayuu si dhakhso ah u koraa.

Garaafyada (Graphing) saamiga guud (common ratio) oo ka weyn 1

Halkan waxaa ah garaafyada (graphs) seddex isku-xigxig joomatari (geometric sequences) oo leh xariiqo (lines) la sawiray si loo muujiyo qaloocyadooda kor u kac

Isku-dhaf (Match) saamiyadan guud (common ratios) ee xariiqdooda (line) u dhigma.

a

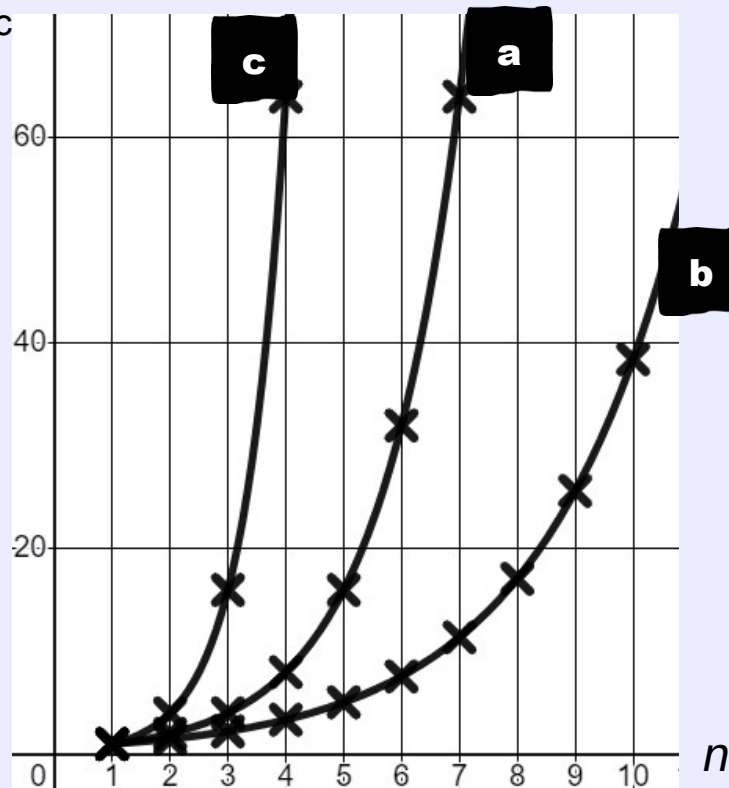
Saamiga guud (Common ratio) ee 2

b

Saamiga guud (Common ratio) ee 1.5

c

Saamiga guud (Common ratio) ee 4

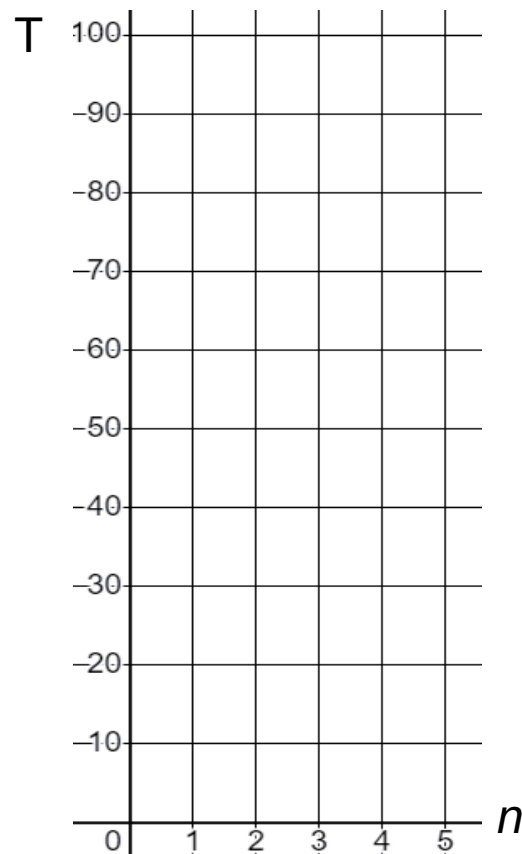


Hawsha A Garaafyada (Graphing) saamiga guud (common ratio) oo ka weyn 1



1) Buuxi shaxda (table) qiimaha (values) oo sawir isku-xigxiga joomatari (geometric sequence) ee ka bilaabma 1 oo leh saami guud (common ratio) ah 3

Nambarka xubinta (Term number) (n)	1	2	3	4	5
Qiimaha xubinta (Term value) (T)					



Hawsha A Garaafyada (Graphing) saamiga guud (common ratio) oo ka weyn 1



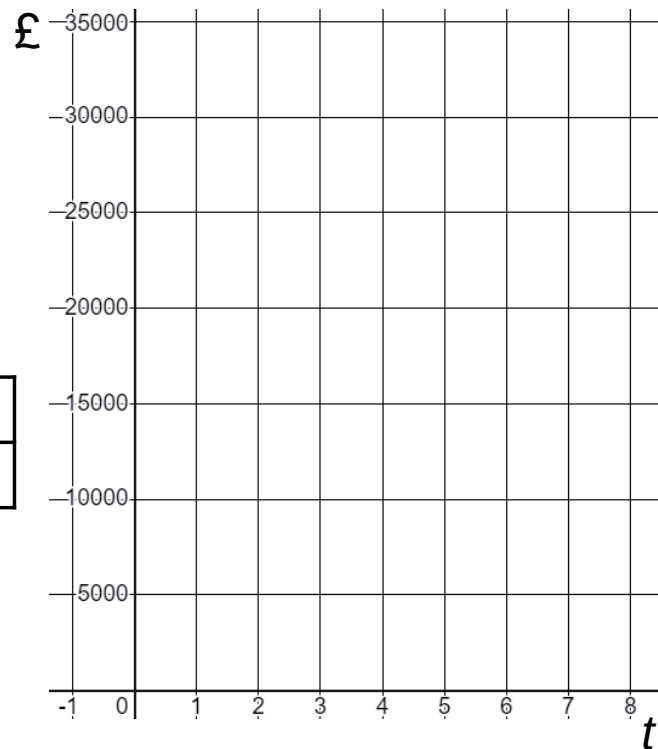
2) Waxaad maalgashataa £2000 shirkad tignoolajiyad cusub, saamiyadaagu (shares) waxay qiimahooda (value) kordhiyaan 50% sanad walba. Xisaab qiimahooda (value) 8ka sano ee ugu horreeya oo ku sawir garaafka (graph).

t	1	2	3	4	5	6	7	8
£	2000							

$\times 1.5$

Talo: Kordhinta 50% waa isku-dhufasho (multiplier) ah 1.5

Talo: Ku soo wareeji (Round) qiimahaaga (values) £1-ka ugu dhow oo ku sawir qiyaas ahaan (approximately).



3) Saciid wuxuu ka fikirayaa qaabka (shape) garaafyada (graphs) isku-xigxiga joomatari (geometric sequences).



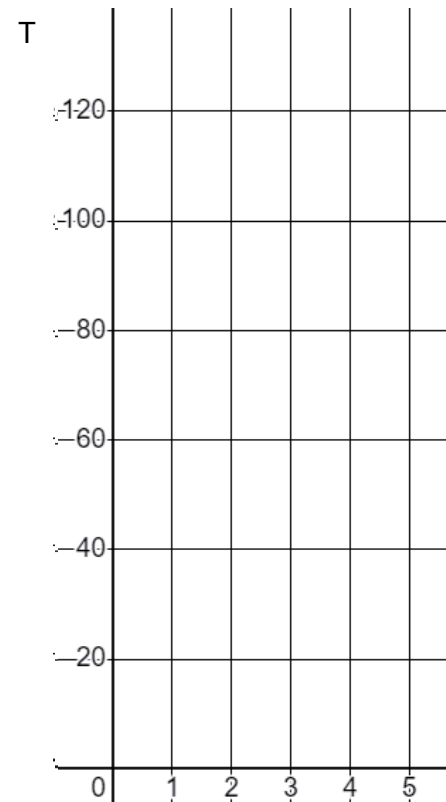
Ma garanayo in xubinta bilowga (starting term) ay saamayso qaabka (shape). Haddii aan isticmaalo isku saami guud (common ratio) 2 laakiin aan ka bilaabo laba nambor oo kala duwan, miyaan heli doonaa qaab (shape) kala duwan?

n	1	2	3	4	5
T	2				

n	1	2	3	4	5
T	8				

Isticmaalka saamiga guud (common ratio) 2 si loo dhammeeyo shaxda (tables), sawir labada garaaf (graphs), oo u qor gunaanad (conclusion) Saciid.

Ka digtoonow, waxaad kaliya oo qiyaas ahaan (approximately) sawiri kartaa dhibcaha (points).



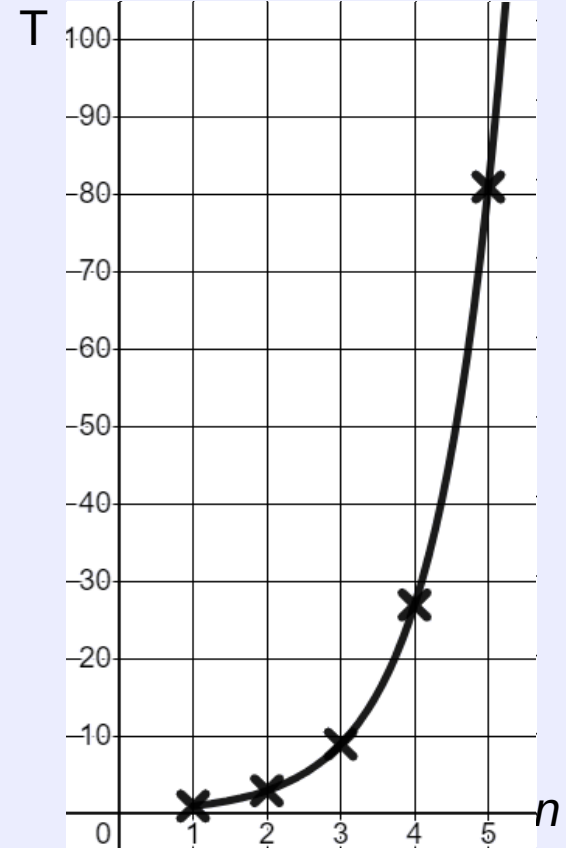
Hawsha A Sawirista saami guud (common ratio) ka weyn 1

1) Buuxi shaxda qiimaha (value) oo sawir taxanaha joomatari (geometric sequence) ee ka bilaabma 1 oo leh saami guud (common ratio) 3

Namba xubinta (term number) (n)	1	2	3	4	5
Qiime (value) (T)	1	3	9	27	81

$\times 3$ $\times 3$ $\times 3$ $\times 3$

Xariiq (line) wuxuu naga caawinayaa inaan aragno qalooca taxanaha joomatari (geometric sequence), laakiin ma sawirno.

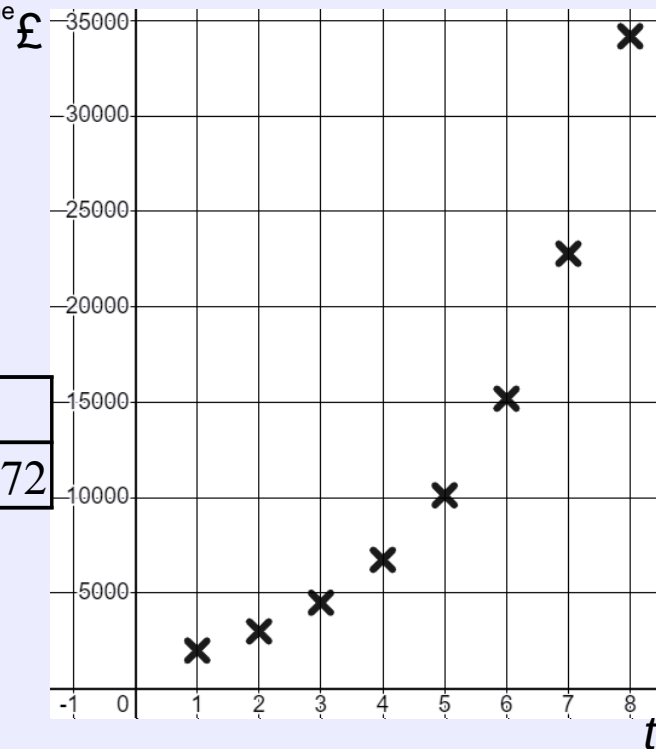


Hawsha A Sawirista saami guud (common ratio) ka weyn 1

2) Waxaad maal gashatay £2000 shirkad tignoolajiyadeed cusub, saamiyadaadu waxay ku kordhaan qiime (value) 50% sannadkii. Xisaabi qiimahooda 8 sano ee ugu horreeya oo ku sawir garaafka.

t	1	2	3	4	5	6	7	8
£	2000	3000	4500	6750	10 125	15 188	22 781	34 172

$\times 1.5$ $\times 1.5$ $\times 1.5$ $\times 1.5$ $\times 1.5$ $\times 1.5$ $\times 1.5$



Dhibcuhu waxay sawiraan qaabka qalooca taxanaha joomatari (geometric sequence).

3) Saciid wuxuu ka fikirayaa qaabka garaafyada taxanayaasha joomatari (geometric sequences).



Ma garanayo in term-ka bilowga uu saameeyo qaabka. Haddii aan isticmaalo saami guud (common ratio) isku mid ah 2 laakiin aan ku bilaabo laba lambar oo kala duwan, ma heli doonaa qaab kala duwan?

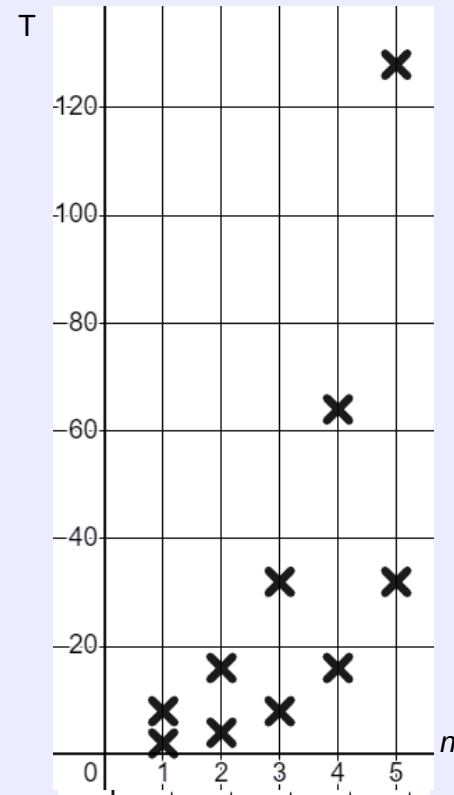
n	1	2	3	4	5
T	2	4	8	16	32



n	1	2	3	4	5
T	8	16	32	64	128



Isticmaal saami guud (common ratio) si aad u buuxiso shaxanka, sawir labada garaaf, oo u qor gabagabo (conclusion) Saciid.



3) Saciid wuxuu ka fikirayaa qaabka garaafyada taxanayaasha joomatari (geometric sequences).



Ma garanayo in term-ka bilowga uu saameeyo qaabka. Haddii aan isticmaalo saami guud (common ratio) isku mid ah 2 laakiin aan ku bilaabo laba lambar oo kala duwan, ma heli doonaa qaab kala duwan?

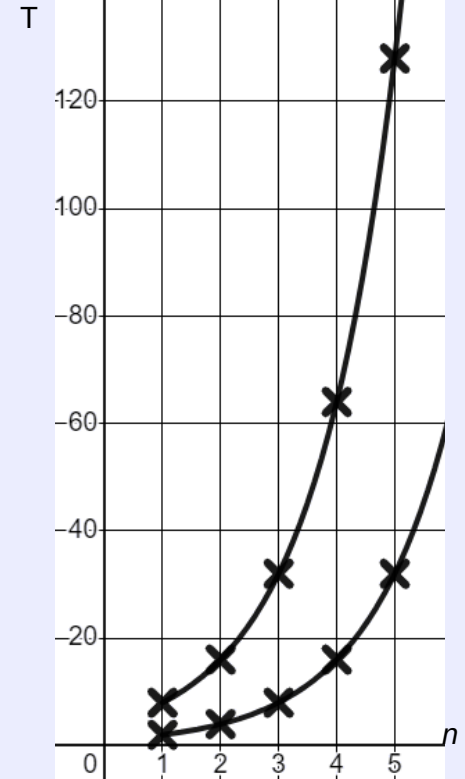
n	1	2	3	4	5
T	2	4	8	16	32

$\times 2$ $\times 2$ $\times 2$ $\times 2$

n	1	2	3	4	5
T	8	16	32	64	128

$\times 2$ $\times 2$ $\times 2$ $\times 2$

Labada garaaf waxay leeyihiin qaab isku mid ah.
Qalooc kor u kacaya oo sii sii kordhaya.



Qaabka casharka

Matixista taxanayaasha joomatari (geometric sequences) garaaf ahaan



Sawirista saami guud (common ratio) ka weyn 1



Sawirista saami guud (common ratio) ka yar 1

Garaafyada saamiga guud ee ka yar 1 (Graphing a common ratio less than 1)

Isra iyo Yacquub waxay sawirayaan garaafyada joomatari (geometric graphs).

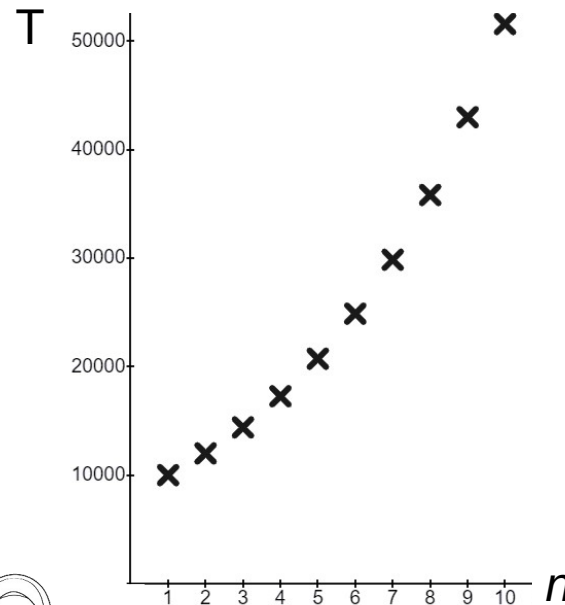
n	1	2	3	4	5	...
T	10 000	12 000	14 400	17 280	20 736	

$\times 1.2$ $\times 1.2$ $\times 1.2$ $\times 1.2$

Garaafyada joomatari (Geometric graphs) aad bay u qurxoon yihiin!
Waxay had iyo jeer sameeyaan qalooca kor u kaca (upward curve),
xataa haddii saamiga guud (common ratio) yar yahay!



Ma hubtaa Yacquub? Miyaad isku dayday saami guud
(common ratio) oo ah 1?



Garaafyada saamiga guud ee ka yar 1 (Graphing a common ratio less than 1)

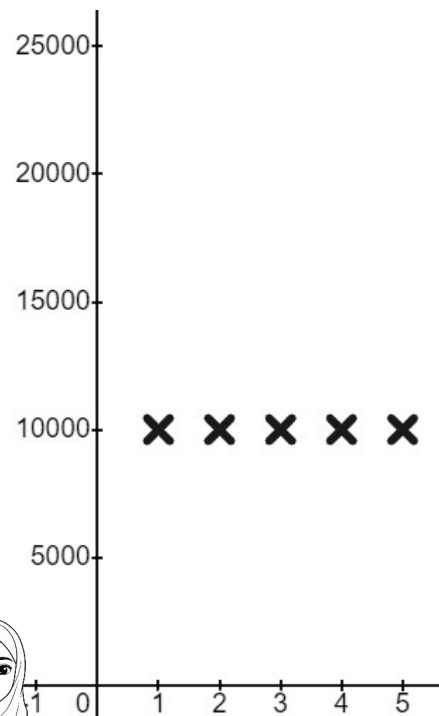
Isra iyo Yacquub waxay sawiraan garaafyada joomatari (geometric graphs).

n	1	2	3	4	5	...
T	10 000	10 000	10 000	10 000	10 000	

$\times 1$ $\times 1$ $\times 1$ $\times 1$

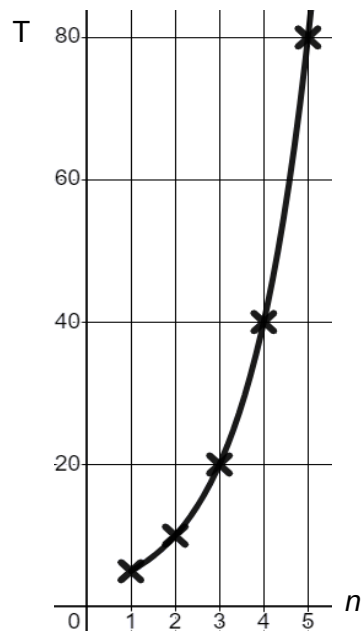
Waa hubaal! Saamigu (ratio) had iyo jeer waa 1 : 1
Qiimuhu (value) weligiis ma beddelmo!

Haa. Waxaad ka heshaa xariiq toosan oo jiif ah (straight horizontal line) laga bilaabo qiimahaaga (value) koowaad.



Garaafyada saamiga guud ee ka yar 1 (Graphing a common ratio less than 1)

Saami guud (Common ratio) 2



Marka, qaab (shape) intee le'eg ayay saami guud (common ratio) oo ah ina siinaya?

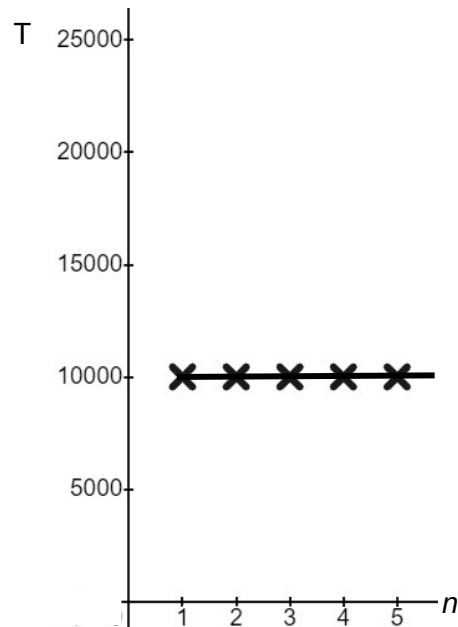
$\frac{1}{2}$



Ma aqaan. Aynu ogaanno!



Saami guud (Common ratio) 1



Garaafyada saamiga guud ee ka yar 1 (Graphing a common ratio less than 1)

Saami guud (Common ratio) oo ah $\frac{1}{2}$

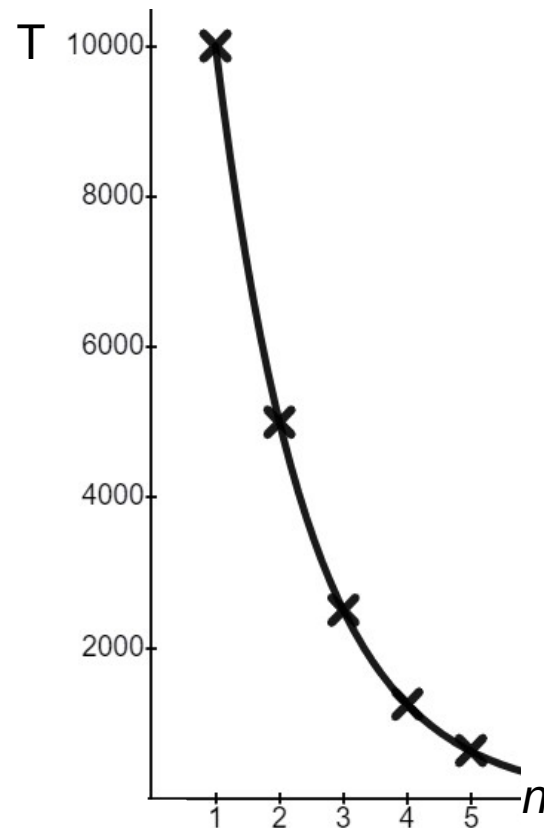
n	1	2	3	4	5
T	10 000	5 000	2 500	1 250	625

$\times \frac{1}{2}$ $\times \frac{1}{2}$ $\times \frac{1}{2}$ $\times \frac{1}{2}$

Waa hubaal! Qiimayaashu (values) way yaraanayaan!



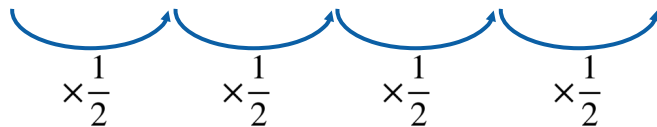
Wali waxay samaysaa qalooc (curve) laakiin waa qalooc hoos u dhacaya (downward curve).



Garaafyada saamiga guud ee ka yar 1 (Graphing a common ratio less than 1)

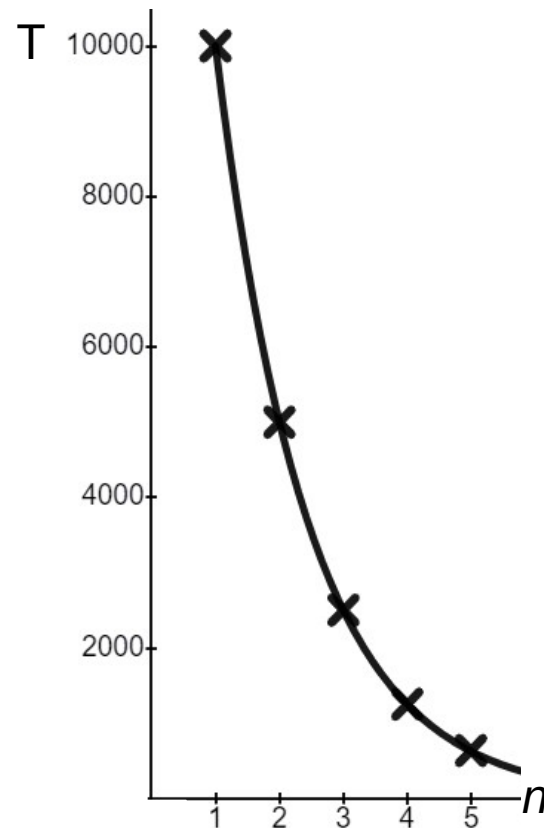
Saami guud (Common ratio) oo ah $\frac{1}{2}$

n	1	2	3	4	5
T	10 000	5 000	2 500	1 250	625



Xariiqdu (line) waxay ina tusaysaa dabeecadda qalooca (nature of the curve). Hoos u dhacaya (Decreasing) laakiin heer hoos u dhaca oo gaabiya (slowing).

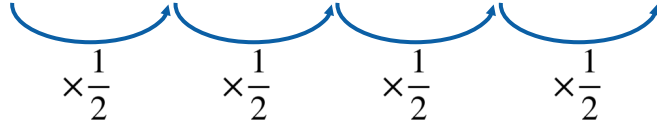
Sikastaba, ma sawirno xariiqda (line) taxanahan (sequence). Ma jiro 1.5-aad (1.5th term).



Garaaf samaynta saami guud (common ratio) ka yar 1

Saami guud (common ratio) ee $\frac{1}{2}$

n	1	2	3	4	5
T	10 000	5 000	2 500	1 250	625

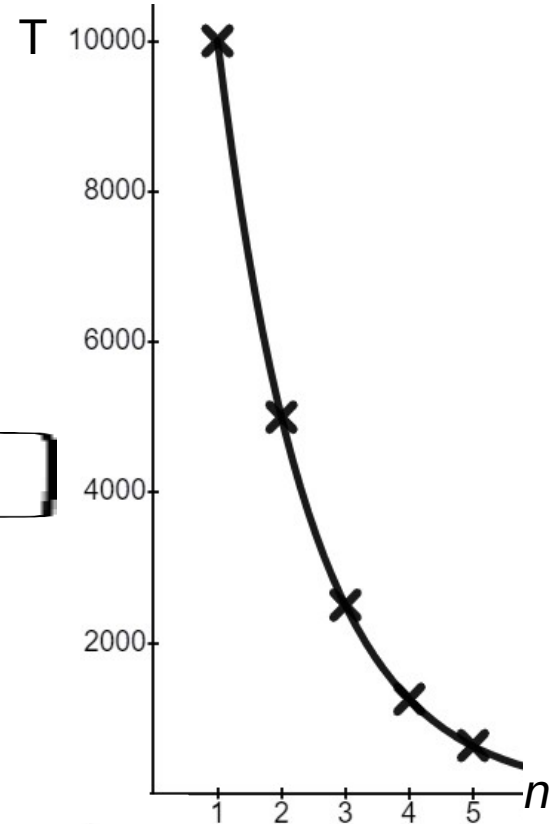


Marka ma waxaan heli doonnaa qaabkan dhammaan saamiyada ka yar 1?



Ma aqaan. Aan isku dayno

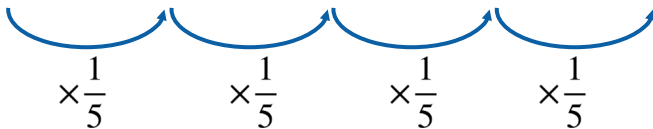
$\frac{1}{5}$



Garaaf samaynta saami guud (common ratio) ka yar 1

Saami guud (common ratio) ee $\frac{1}{5}$

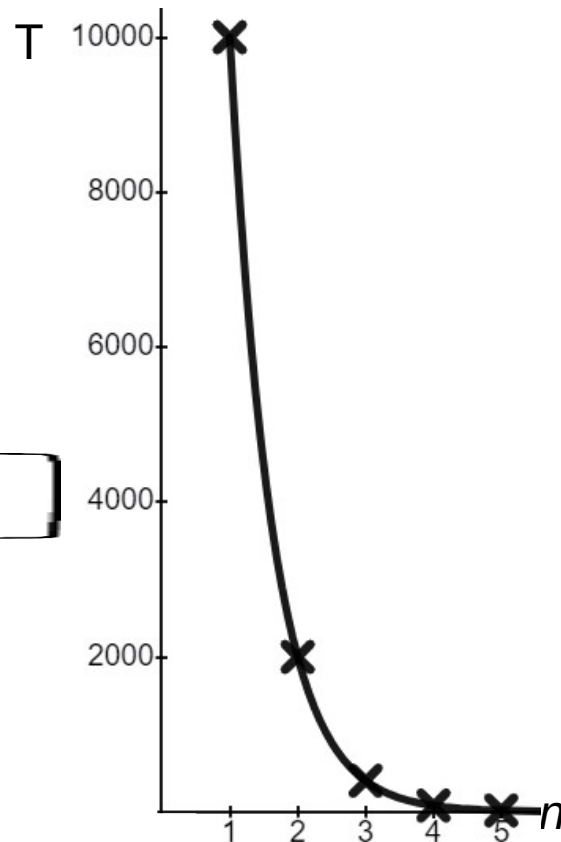
n	1	2	3	4	5
T	10 000	2000	400	80	16



Waa isku qaab. Kaliya waa qalooc (curve) aad u taag badan!

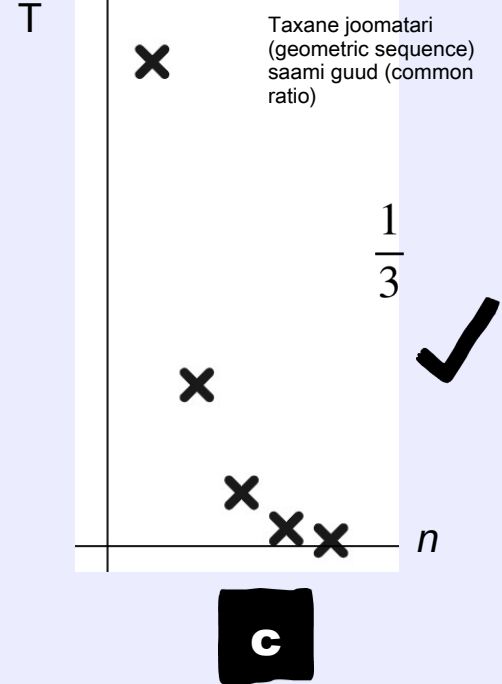
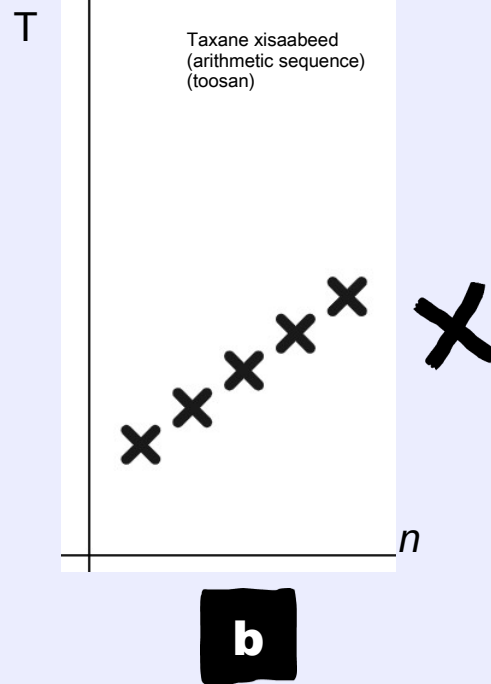
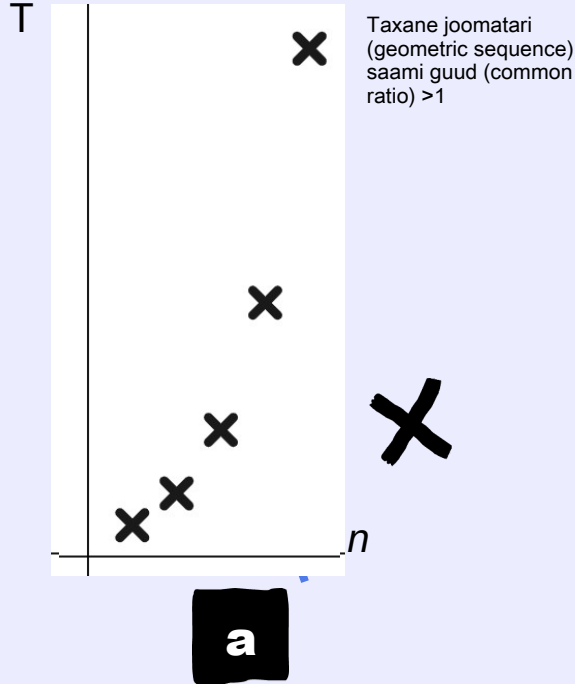


Waa garaaf (graph) aad u xiiso leh!



Garaaf samaynta saami guud (common ratio) ka yar 1

Kee ka mid ah garaafyadan (graphs) wuxuu muujinayaa taxane joomatari (geometric sequence) oo leh saami guud (common ratio) $\frac{1}{3}$?
(Miyaasaha (scales) T iyo n waxay kordhaan qaddarro isleeg.)



Garaaf samaynta saami guud (common ratio) ka yar 1

Saami guud (common ratio) ee $\frac{1}{5}$

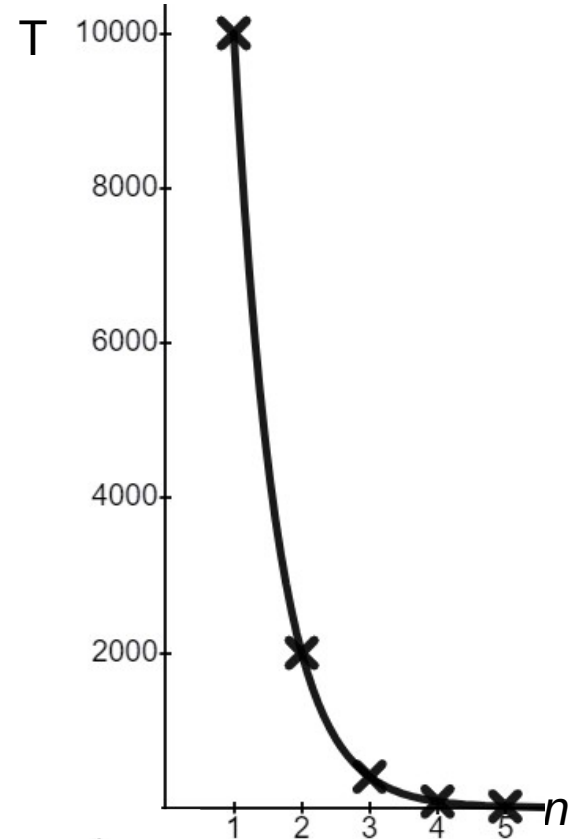
n	1	2	3	4	5
T	10 000	2000	400	80	16

$\times \frac{1}{5}$ $\times \frac{1}{5}$ $\times \frac{1}{5}$ $\times \frac{1}{5}$

Sug! Ma aan tijaabin dhammaan noocyada saamiyada guud (common ratios) ee ka yar 1



Maxaad u malaynaysaa inuu Yacquub ula jeedo?



Garaaf samaynta saami guud (common ratio) ka yar 1

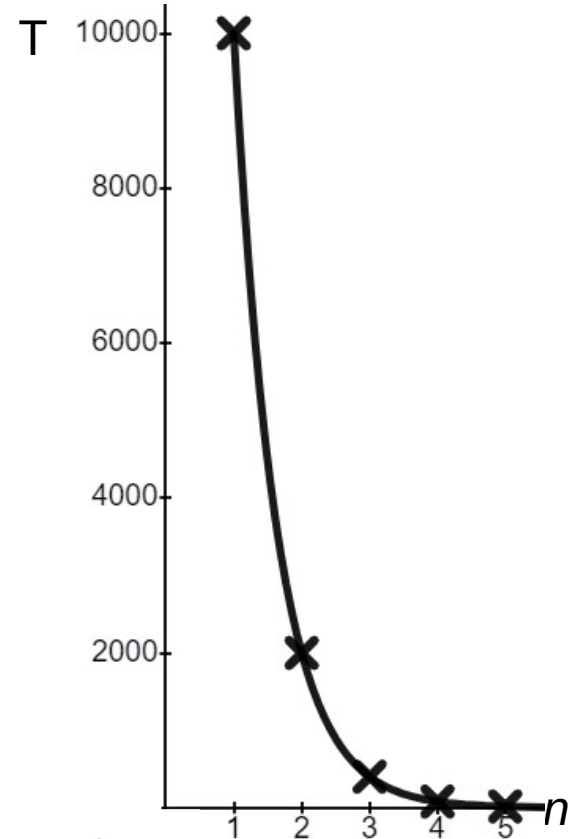
Saami guud (common ratio) ee $\frac{1}{5}$

n	1	2	3	4	5
T	10 000	2000	400	80	16

$\times \frac{1}{5}$ $\times \frac{1}{5}$ $\times \frac{1}{5}$ $\times \frac{1}{5}$

Sug! Ma aan tijaabin dhammaan noocyada saamiyada guud (common ratios) ee ka yar 1

Ma waxaad u jeeddaa kuwa taban (negatives)?



Jaantusyada (graphing) saamiga guud (common ratio) oo ka yar 1

Saamiga guud (common ratio) waa -2

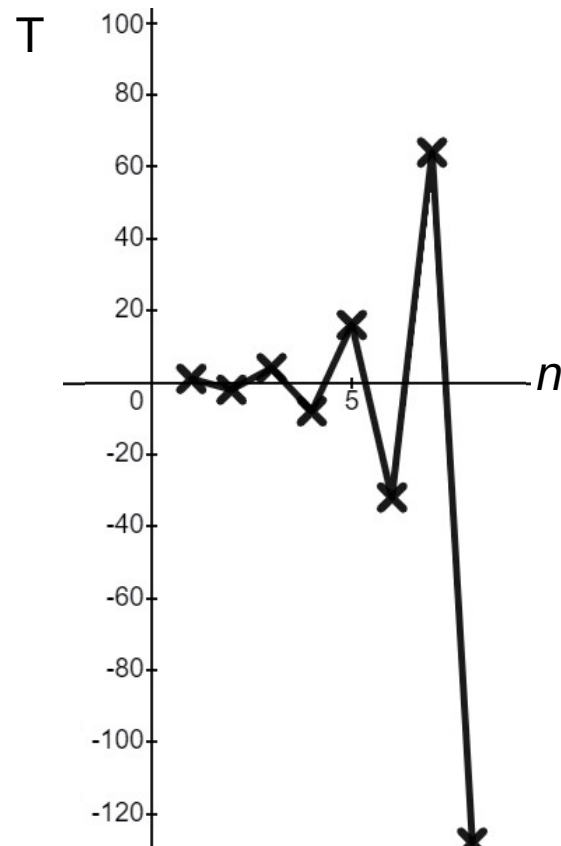
n	1	2	3	4	5	6	7	8
T	1	-2	4	-8	16	-32	64	-128



Waa jaantus (graph) cajiib ah!



Waxay u kala boodboodaysaa (oscillating) inta u dhaxaysa ereyada togan (positive) iyo kuwa taban (negative).



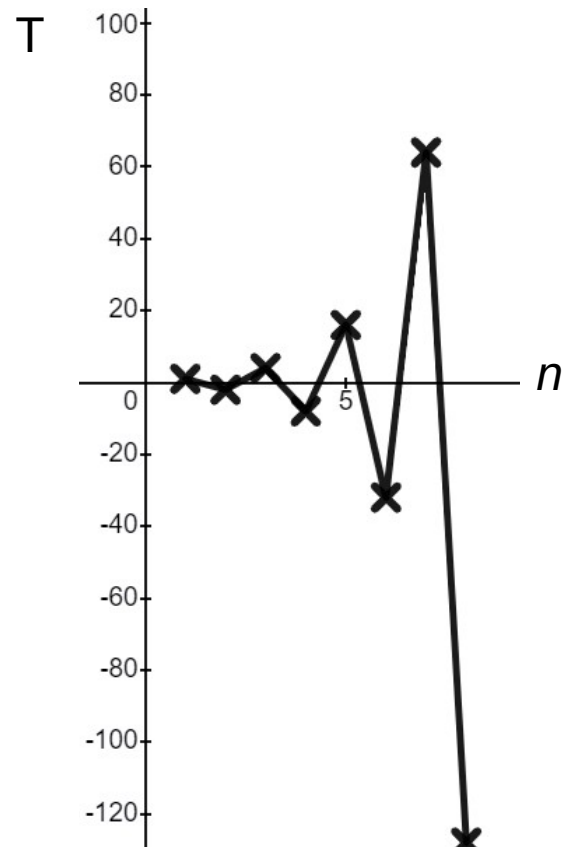
Jaantusyada (graphing) saamiga guud (common ratio) oo ka yar 1

Saamiga guud (common ratio) waa -2

n	1	2	3	4	5	6	7	8
T	1	-2	4	-8	16	-32	64	-128



Marka saamiga guud (common ratio) ee taxanaha joomatari (geometric sequence) uu yahay mid taban (negative), ereyadu waxay u kala boodboodaan (oscillate) togan (positive) ilaa taban (negative).



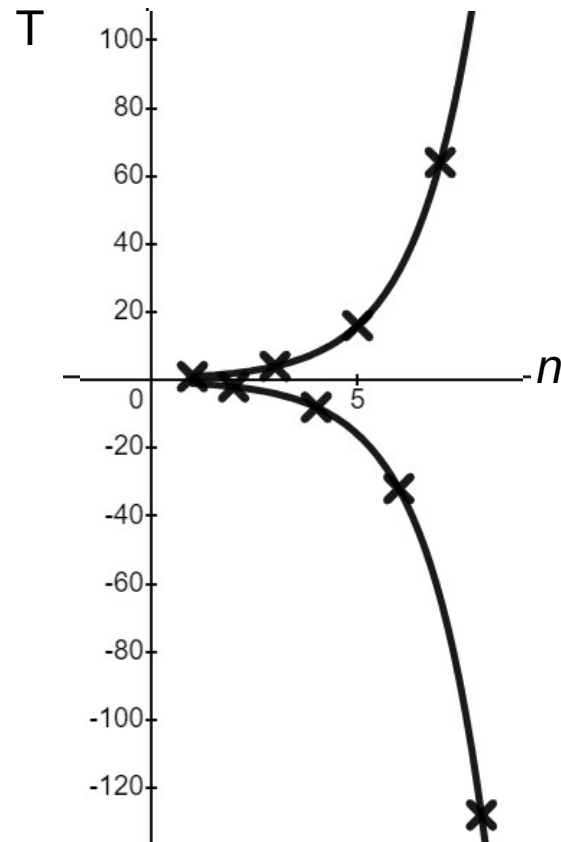
Jaantusyada (graphing) saamiga guud (common ratio) oo ka yar 1

Saamiga guud (common ratio) waa -2

n	1	2	3	4	5	6	7	8
T	1	-2	4	-8	16	-32	64	-128



Waxaa laga yaabaa inaad ogaato in ereyada togan (positive) ay wali sameeyaan qalooc (curve), ereyada taban (negative)na ay sameeyaan qalooc (curve) iyaga u gaar ah.



Jaantusyada (graphing) saamiga guud (common ratio) oo ka yar 1

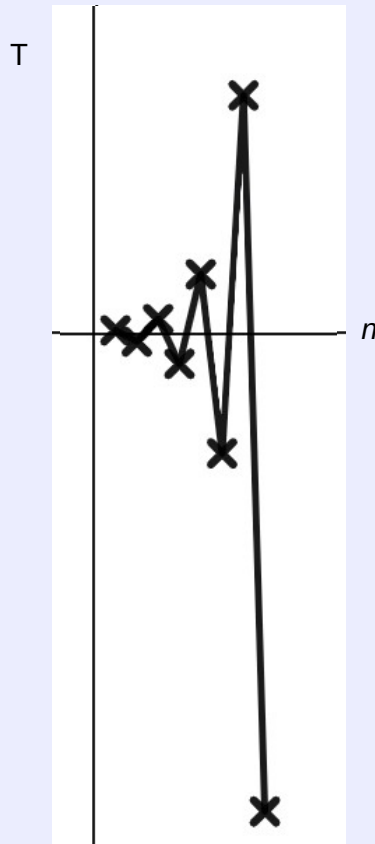
Kani waa jaantuska (graph) taxanaha joomatari (geometric sequence).
Waa maxay saamiga guud (common ratio) uu noqon karo?

a 5 ✗

b $\frac{1}{5}$ ✗

c -5 ✓

Marka ereyadu u kala boodboodaan (oscillate) togan (positive) ilaa taban (negative), saamiga guud (common ratio) waa inuu ahaadaa mid taban (negative).

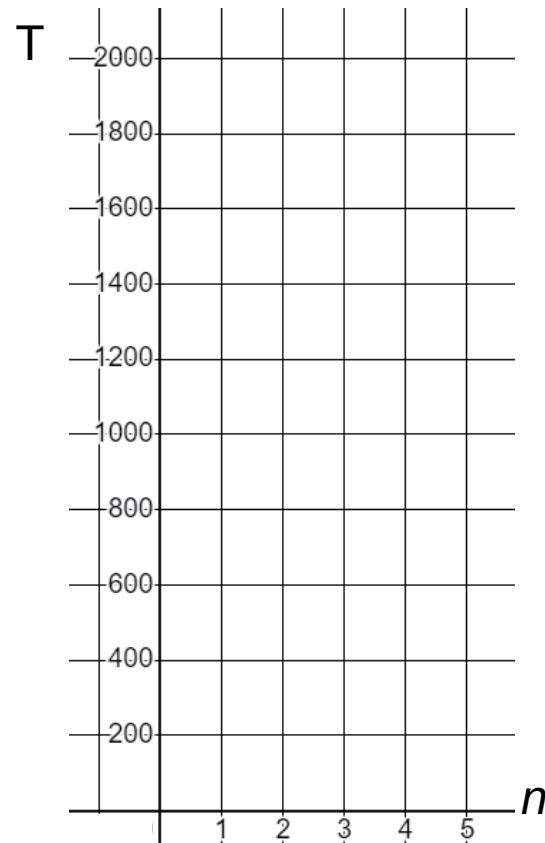


1) a) Buuxi shaxda qiimaha (table of values) oo jaantus (graph) taxanahan joomatari (geometric sequence) oo leh saamiga guud (common ratio) $\frac{1}{3}$

n	1	2	3	4	5
T	2025				

$\times \frac{1}{3}$

Ku sawir isku-duwayaasha (coordinates) sida ugu saxsan ee aad karto.

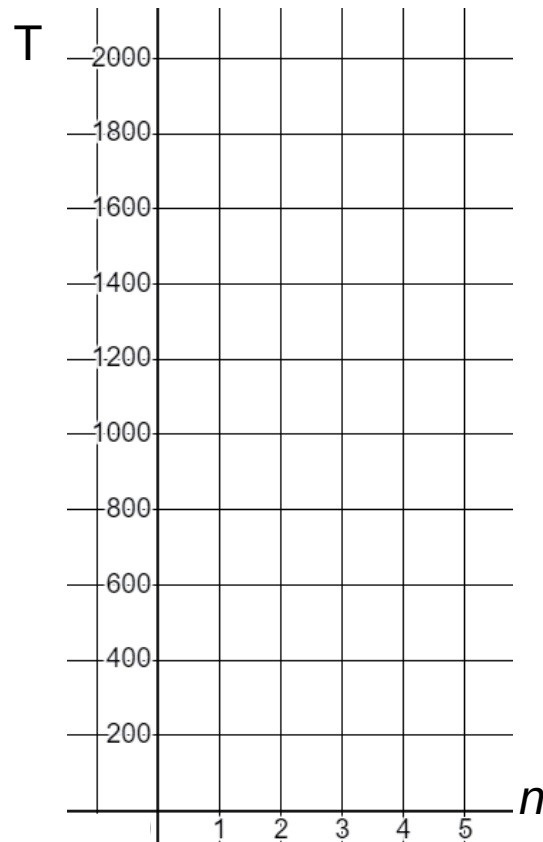


1) b) Buuxi shaxda qiimaha (table of values) oo jaantus (graph) taxanahan joomatari (geometric sequence) oo leh saamiga guud (common ratio) $\frac{2}{3}$

n	1	2	3	4	5
T	2025				

$\times \frac{2}{3}$

Ku sawir isku-duwayaasha (coordinates) sida ugu saxsan ee aad karto.

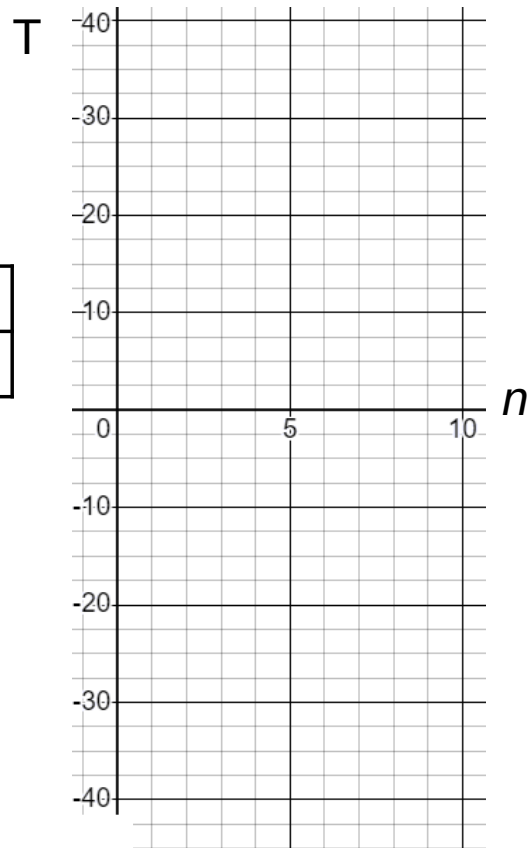


2) Buuxi shaxda qiimaha (table of values) oo jaantus (graph) taxanahan joomatari (geometric sequence) oo leh saamiga guud (common ratio) -1.5

n	1	2	3	4	5	6	7	8
T	2.56							

$\times -1.5$

Ku sawir isku-duwayaasha (coordinates) sida ugu saxsan ee aad karto.



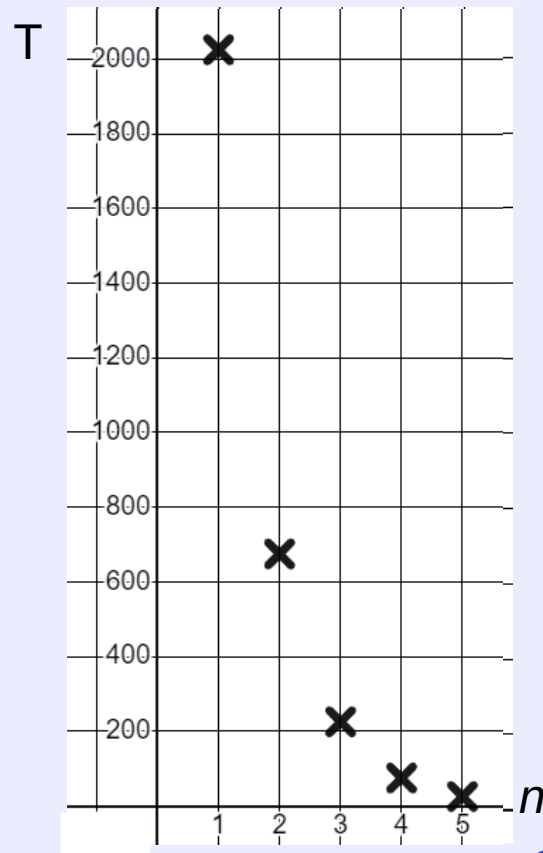
1) a) Buuxi shaxda qiimaha oo garaaf tixdan joomatari (geometric sequence) leh saami guud (common ratio)

$$\frac{1}{3}$$

n	1	2	3	4	5
T	2025	675	225	75	25

$\times \frac{1}{3}$ $\times \frac{1}{3}$ $\times \frac{1}{3}$ $\times \frac{1}{3}$

Common ratio between 0 and 1 giving us a downward curve.



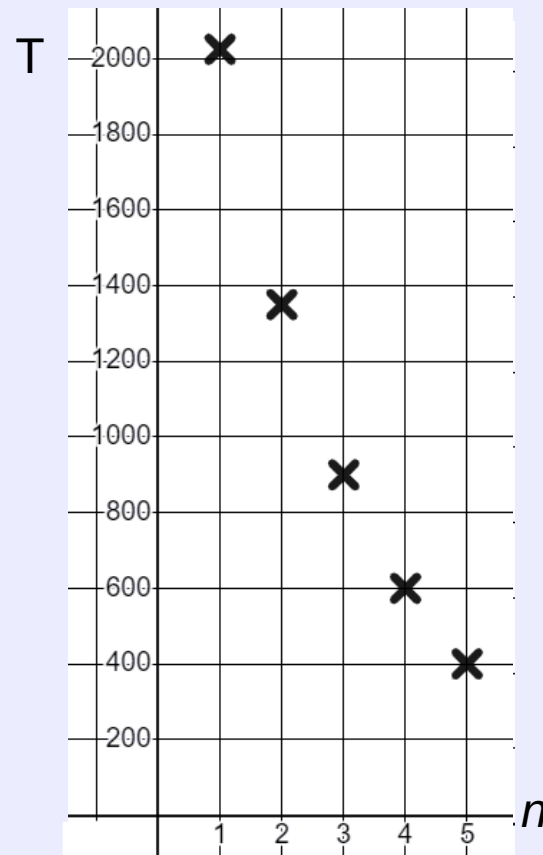
1) b) Buuxi shaxda qiimaha oo garaaf tixdan joomatari (geometric sequence) leh saami guud (common ratio) $\frac{2}{3}$

n	1	2	3	4	5
T	2025	1350	900	600	400

$\times \frac{2}{3}$ $\times \frac{2}{3}$ $\times \frac{2}{3}$ $\times \frac{2}{3}$

Saami guud (common ratio) inta u dhaxaysa 0 iyo 1 oo na siinaya qalooc hoos u dhaca oo ka yar qaloocayaga.

$$\frac{1}{3}$$

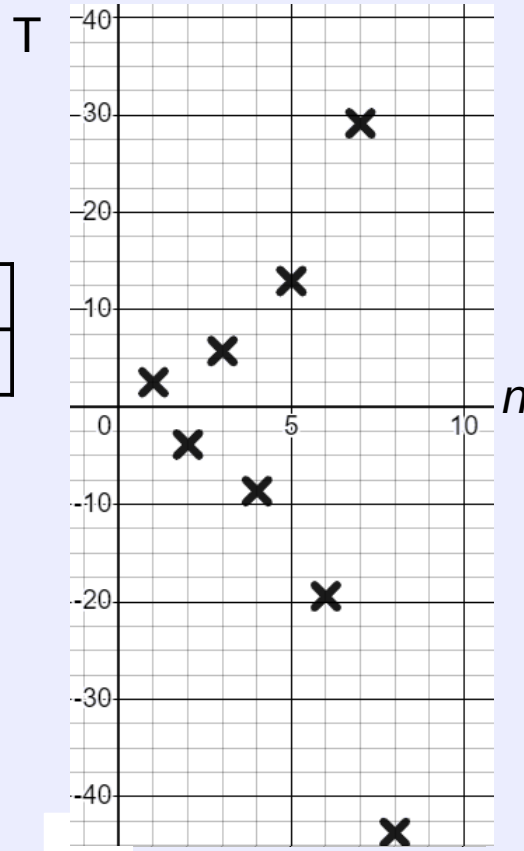


2) Buuxi shaxda qiimaha oo garaaf tixdan joomatari (geometric sequence) leh saami guud (common ratio) -1.5

n	1	2	3	4	5	6	7	8
T	2.56	-3.84	5.76	-8.64	12.96	-19.44	29.16	-43.74

$\times -1.5$ $\times -1.5$ $\times -1.5$ $\times -1.5$ $\times -1.5$ $\times -1.5$ $\times -1.5$

Saami guud (common ratio) taban oo na siinaya ereyo isbeddelaya, kuwa toganna sameeya qalooc, kuwa tabanna sameeya qalooc.



Waxaan u matali karnaa tixaha joomatari (geometric sequences) garaaf ahaan oo qaddarin karnaa in qaarkood sameeyaan qalooc kor u kaca, qaarkood qalooc hoos u dhaca, qaarna isbeddelaan togan ilaa taban.