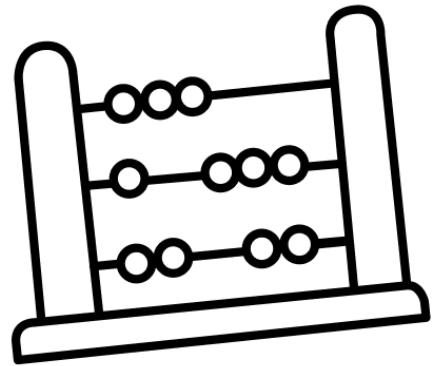


Fidinta fikirka ku saabsan taxanaha (sequences)

Maths

Cutub: Muuqaallo garaafyo (graphical representations)



Natiijo

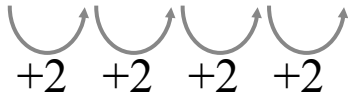
Waxaan qiimeyn karaa in taxanaha (sequences) aan la taaban karin ay yeelan karaan qiime (value) taban.

Erayada muhiimka ah

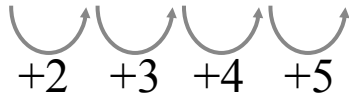
Taxane xisaabeed (arithmetic/linear sequence) waa taxane uu farqiga u dhexeeya xubnaha isku xiga uu yahay joogto.

E.g. 10, 12, 14, 16, 18,...

E.g. 10, 12, 15, 19, 24,...



Kani waa taxane xisaabeed (arithmetic sequence) leh farqi guud (common difference) oo ah +2

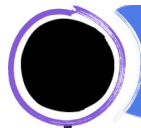


Kani ma aha taxane xisaabeed (arithmetic sequence) maxaa yeelay ma jiro farqi guud (common difference) oo u dhexeeya xubnaha isku xiga.

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

Qaabka casharka

Fidinta fikirka ku saabsan taxanaha (sequences)



Taxanayaal la taaban karo (concrete) iyo kuwa aan la taaban karin (abstract)

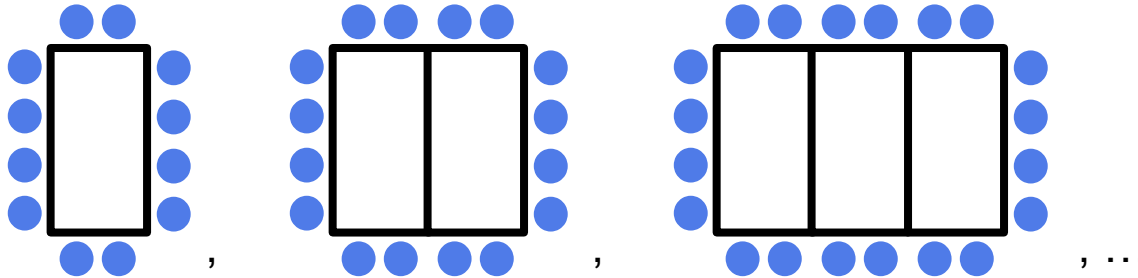


Fidinta taxanaha (sequences) labada jiho

Taxanayaal la taaban karo (concrete) iyo kuwa aan la taaban karin (abstract)

Waxaa jira tusaalayaal badan oo la taaban karo (concrete) oo taxanayaal (sequences) ah oo adduunka naga xeeran.

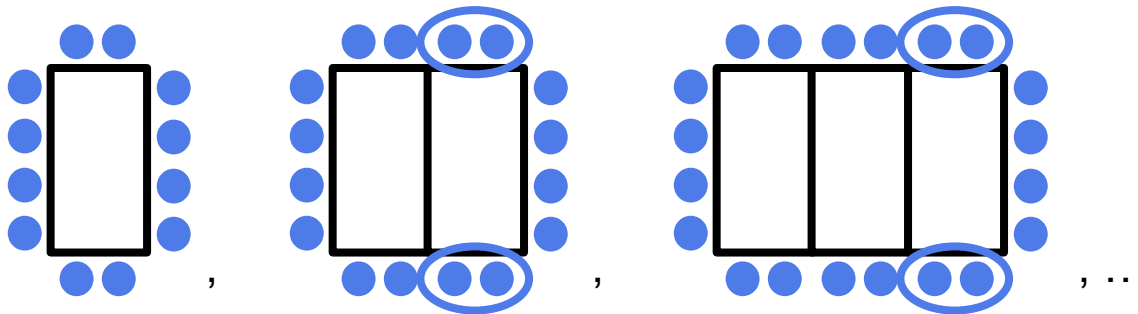
Tusaale ahaan, miisas ku yaal hoolka cuntada.



Ma arki kartaa qaab (pattern)?

Waxaa jira tusaalayaal badan oo la taaban karo (concrete) oo taxanayaal (sequences) ah oo adduunka naga xeeran.

Tusaale ahaan, miisas ku yaal hoolka cuntada.



Miisas (t)	1	2	3
Dad (p)	12	16	20

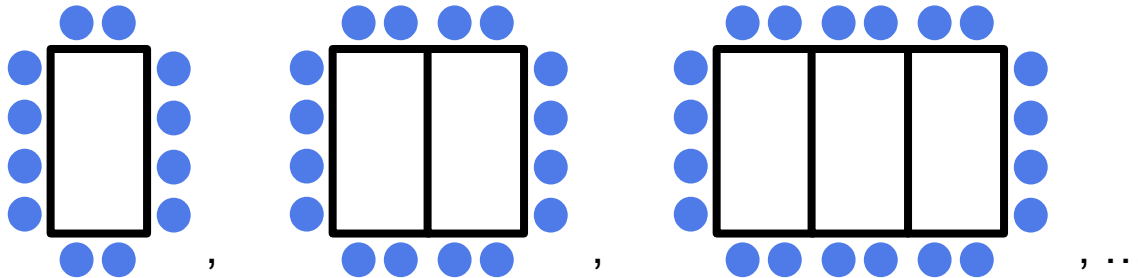


Aqoonsiga qaababka (patterns) ee taxanayaasha (sequences) wuxuu noo saamaxayaa inaan saadaalino xubnaha mustaqbalka.

Taxanayaal la taaban karo (concrete) iyo kuwa aan la taaban karin (abstract)

Waxaa jira tusaalayaal badan oo la taaban karo (concrete) oo taxanayaal (sequences) ah oo adduunka naga xeeran.

Tusaale ahaan, miisas (tables) gudaha hoolka cuntada.



Miisas (tables) (t)	1	2	3	4	5	6	7	8
Dad (people) (p)	12	16	20	24	28	32	36	40

+4 +4 +4 +4 +4 +4 +4

Aqoonsiga qaababka (patterns) iyo xiriirrada (relationships) dheeraadka ah wuxuu naga caawinayaa inaan saadaalino (extrapolate) ereyo (terms) mustaqbalka fog.

Imisa qof ayaa ku wareegsan 100 miisas (tables)?

Miisas (tables) (t)	1	2	3	4	5	6	7	8
Dad (people) (p)	12	16	20	24	28	32	36	40

+4 +4 +4 +4 +4 +4 +4

Taxanayaal la taaban karo (concrete) iyo kuwa aan la taaban karin (abstract)

Aqoonsiga qaababka (patterns) iyo xiriirrada (relationships) dheeraadka ah wuxuu naga caawinayaa inaan saadaalino (extrapolate) ereyo (terms) mustaqbalka fog.

$$4t + 8 = p$$

Miisas (tables) (t)	100	101	102	...
Dad (people) (p)	408	412	416	
Miisas (tables) (t)	1000	1001	1002	...
Dad (people) (p)	4008	4012	4016	
Miisas (tables) (t)	1 000 000	1 000 001	1 000 002	...
Dad (people) (p)	4 000 008	4 000 012	4 000 016	

Isticmaalka isla'egta (equation) wuxuu naga caawinayaa inaan si hufan u helno ereyo (terms) waaweyn.

Aragtida qaababka iyo xiriirrada dheeraadka ah waxay noo ogolaaneysaa inaan qiyaasno ereyada (terms) mustaqbalka fog.

$$4t + 8 = p$$

Imisa qof ayaa ku wareegsan hal miis oo bilyan ah?

$$4(1\ 000\ 000\ 000) + 8 = (4\ 000\ 000\ 008)$$

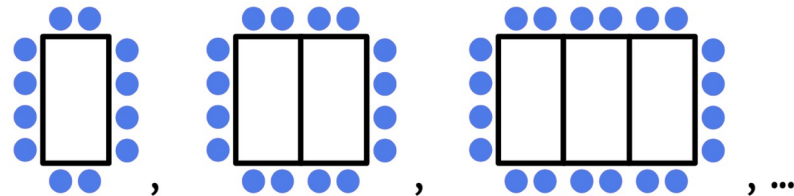
Imisa qof ayaa ku wareegsan laba miis oo bilyan ah?

$$4(2\ 000\ 000\ 000) + 8 = (8\ 000\ 000\ 008)$$

Waa maxay dhibaataada tirooyinkan?

Waxaan dhaafnay tirada dadka dhulka (Planet Earth).

Moodellada la taaban karo (concrete) waxaa badanaa xaddidaya xaddidyada jirka (physical limits).



Imisa qof ayaa ku wareegsan hal miis oo bilyan ah?

$$4(1\ 000\ 000\ 000) + 8 = (4\ 000\ 000\ 008)$$

Imisa qof ayaa ku wareegsan laba miis oo bilyan ah?

$$4(2\ 000\ 000\ 000) + 8 = (8\ 000\ 000\ 008)$$

Waa maxay dhibaata tirooyinkan?

Run mise been?

Dhammaan moodellada la taaban karo (concrete) waxay sii socon karaan si aan dhammaad lahayn (infinitely).



Run



Been



Sabab u sheeg jawaabtaada



Moodellada la taaban karo (concrete) waxaa badanaa xaddidaya xaddidyada jirka (physical limits).

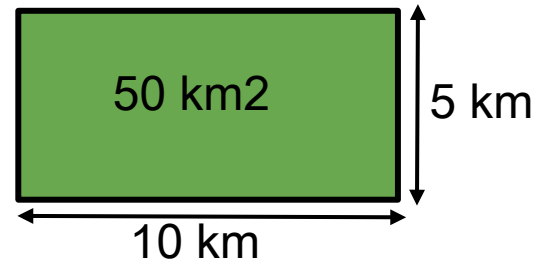


Qaababku (patterns) waxay sii socdaan si aan dhammaad lahayn (infinitely).



Aan eegno tusaale kale oo la taaban karo (concrete).

Beerale (farmer) wuxuu u baahan yahay inuu lacag ka helo iyadoo uu ka iibinayo qaar ka mid ah dhulkiisa.



Hal sano ka dib waxay lumiyaan hal kiiloomitir (kilometre) dherer kasta oo dhulkooda ah.



Sannadkii labaad ka dib, waxay lumisay kiiloomitir kale dherer kasta oo dhulkooda ah.



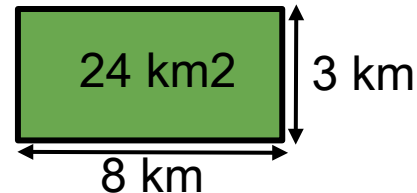
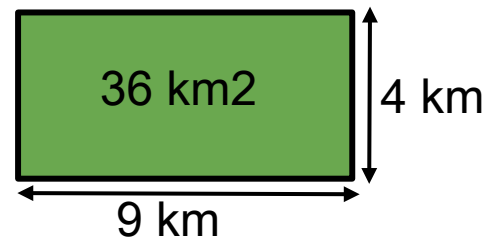
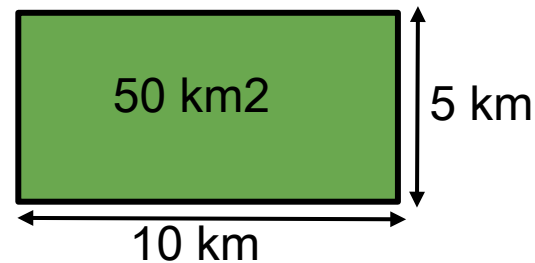
Taxanayaal la taaban karo iyo kuwa aan la taaban karin (Concrete versus abstract sequences)

Aynu eegno tusaale kale oo la taaban karo.

50, 36, 24, ...

Ma arki kartaa qaab (pattern) taxanahan?

Ma heli kartaa labada xubnood ee xiga?



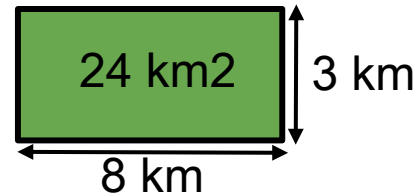
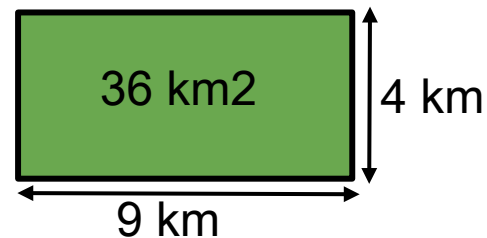
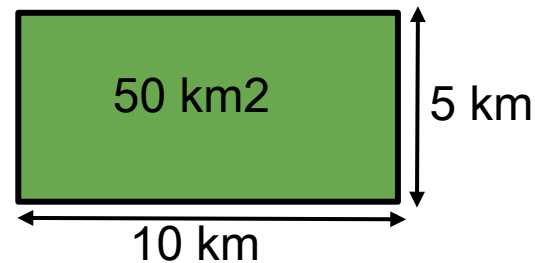
Taxanayaal la taaban karo iyo kuwa aan la taaban karin (Concrete versus abstract sequences)

Aynu eegno tusaale kale oo la taaban karo.

10×5	9×4	8×3	7×2	6×1
50,	36,	24,	14,	6,

Ma arki kartaa qaab (pattern) taxanahan?

Ma heli kartaa labada xubnood ee xiga?



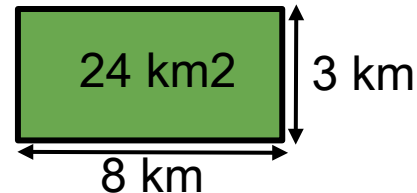
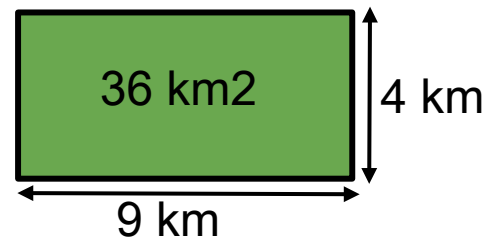
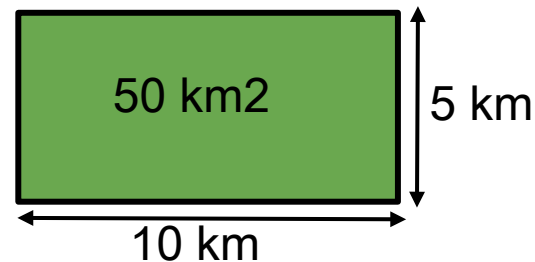
Taxanayaal la taaban karo (concrete) iyo kuwa aan la taaban karin (abstract)

Aan eegno tusaale kale oo la taaban karo.

10×5	9×4	8×3	7×2	6×1	5×0	4×-1
50,	36,	24,	14,	6,	0,	-4,

Waa maxay dhibaataada ka dambeysa tan?

Dunida la taaban karo (concrete world), ma yeelan karno bed (area) taban (negative) dhibaataadan, marka qaabkan (pattern) si kuma sii socon karo sidan.

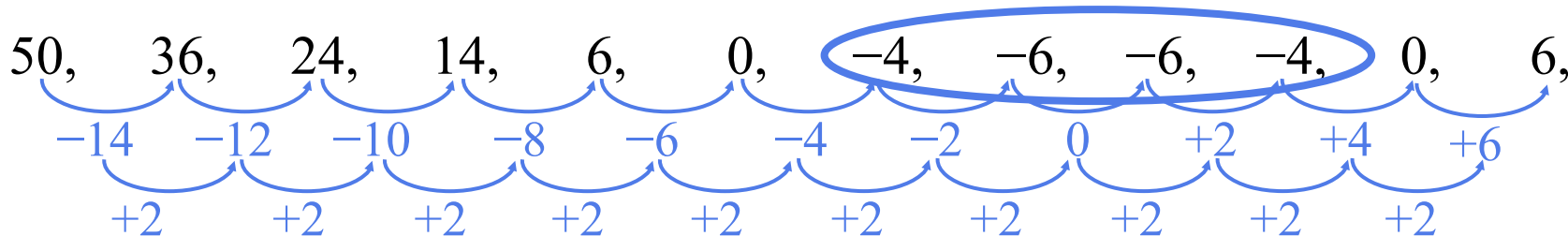


Taxanayaal (sequences) la taaban karo (concrete) iyo kuwa aan la taaban karin (abstract)



Sharaxaad

Mararka qaarkood xisaabta (maths) waxaan rabnaa, oo waxaan awoodnaa, inaan sameynno moodello (models) aan la taaban karin (abstract).



Halkii aad uga fikiri lahayd tan sida moodel (model) jireed (physical) oo cabbirro (dimensions) iyo bed (area) leh, aynu aragno qaab (pattern) kale.

Taxanahayaga aan la taaban karin (abstract sequence) wuxuu yeelan karaa xubno (terms) taban (negative).

Taxanayaal (sequences) la taaban karo (concrete) iyo kuwa aan la taaban karin (abstract)



Run mise been?

Taxanayaasha (sequences) aan la taaban karin (abstract) waxay yeelan karaan xubno (terms) taban (negative).

51, 43, 35, 27, 19, ...



Run



Been

Sabab u sheeg jawaabtaada



Shanta xubnood (terms) ee ugu horreysa waa kuwa togan (positive).
Taxanahan (sequence) wuxuu istaagi doonaa markuu gaaro eber (zero).



Haddii taxanahan (sequence) yahay mid aan la taaban karin (abstract), xubnaha (terms) waxay noqon karaan kuwa taban (negative).



51, 43, 35, 27, 19, 11, 3, -5, -13, ...

1) Jadwalkani wuxuu ina tusayaa taariikhda wakhtiyada rikoodhka (record times) adduunka ee orodka 100 m (100 m sprint) ee ragga.

Sannad (Year)	1940	1960	1980	2000	2020	2040	2060	2080	2100
Waqti (Time) (s)	10.22	10.06	9.9	9.74	9.58				

a) Aqoonso qaab (pattern) oo u adeegso si aad u saadaaliso wakhtiyada (times) ilaa sannadka 2100.

b) Kani waa taxane (sequence) la taaban karo (concrete). Waa maxay xadkiisa (limit) jireed (physical)?

1) Jadwalkani wuxuu ina tusayaa taariikhda wakhtiyada rikoodhka (record times) adduunka ee orodka 100 m (100 m sprint) ee ragga.

Sannad (Year)	1940	1960	1980	2000	2020	2040	2060	2080	2100
Waqtii (Time) Waqtii (s)	10.22	10.06	9.9	9.74	9.58	9.42	9.26	9.1	8.94



a) Aqoonso qaab (pattern) oo u adeegso si aad u saadaalisoo wakhtiyada (times) ilaa sannadka 2100.

Taxane xisaabeed (arithmetic sequence) oo
farqiiga guud (common difference) yahay -0.16

b) Kani waa taxane la taaban karo (concrete sequence). Waa maxay xadkiisa jireed (physical limit)?

Sannadka 3140 wuxuu arki lahaa waqtii ah -0.1 ilbiriqsi. Waxay noqon lahayd mid aan macquul ahayn in la yeesho xaddi taban (negative term) macnahan. Taxanuhu wuxuu noqon lahaa mid aan la taaban karin (abstract).

Qaabka casharka

Kordhinta fikirka ku saabsan taxanayaasha



Taxanayaal la taaban karo (concrete) iyo kuwa aan la taaban karin (abstract)



Kordhinta taxanayaasha labada jiho

Kordhinta taxanayaasha labada jiho

Kani waa taxane joomatari (geometric sequence) oo saamiga guud (common ratio) yahay 2

Nambarka xaddiga (n)	1	2	3	4	5	6
Qiimaha xaddiga (T)	17	34	68	136	272	544

Note: The table in the image contains a typo for the 5th term, which is 272 instead of 271. The diagram below the table shows a common ratio of 2 between consecutive terms.

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

Waa maxay xaddiyada maqan ee 1aad iyo 6aad?

$$272 \times 2 = 544$$

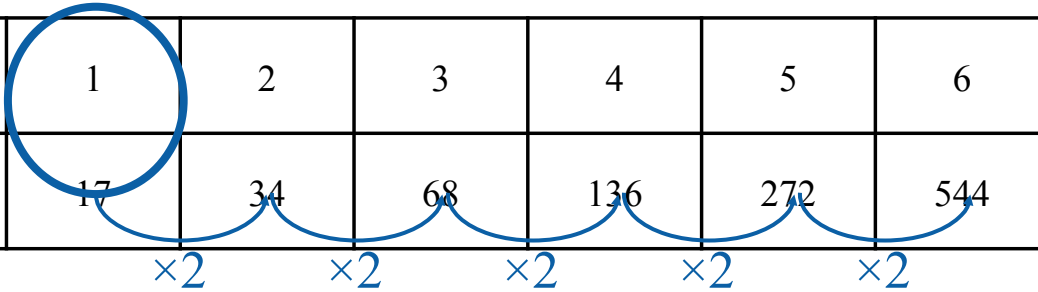
$$34 \div 2 = 17$$

Waxaad dhali kartaa xaddiyadii hore adigoo isticmaalaya rogaal celinta (inverse) xeerka xaddi-ilaa-xaddi (term-to-term rule).

Kordhinta taxanayaasha labada jiho

Kani waa taxane joomatari (geometric sequence) oo saamiga guud (common ratio) yahay 2

Nambarka xaddiga (n)	1	2	3	4	5	6
Qiimaha xaddiga (T)	17	34	68	136	272	544



Mararka qaarkood qaabaynta xisaabta (mathematical modelling), ma dooneyno inaan ku xadidno taxane (sequence) inuu leeyahay eray koowaad. Waxaan dooneynaa inaan awoodno inaan dib u eegno wax ka sii horreeya.

Kordhinta taxanaha (sequences) labada jiho

Tusaale caadi ah oo tan ah waa dib u eegista taariikhda.

Toddobaad	1	2	3	4	5
Bakteeriya (000's)	12.96	19.44	29.16	43.74	65.61



Saynisyahannadu waxay diiwaan gelinayaan koritaanka bakteeriyada waxayna helayaan natiijooyinkan. Waxay ogaadeen in koritaanku u dhigma qaabka taxanaha joomatari (geometric sequence).

Kordhinta taxanaha (sequences) labada jiho

Tusaale caadi ah oo tan ah waa dib u eegista taariikhda.

Toddobaad				1	2	3	4	5
Bakteeriya (000's)	3.84	5.76	8.64	12.96	19.44	29.16	43.74	65.61

Diagram showing the sequence progression with arrows and multipliers:

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

Waxaan isticmaali karnaa xogtan la duubay, waxaan u qaadanaynaa in qaabkan koritaanku uu had iyo jeer jiray, waxaan dib u eegaynaa taariikhda.

$$12.96 \div 1.5 = 8.64$$

$$8.64 \div 1.5 = 5.76$$

$$5.76 \div 1.5 = 3.84$$

Waxaa laga yaabaa inaan dooneyno inaan ogaanno goorta bakteeriyadu ka yaraatay 4000.
Waxay ahayd inaan dib uga gudubno erayga koowaad.

Saynisyahannadu waxay diiwaan gelinayaan shucaaca (radioactivity) muunad.

Waqti (saacadood)	1	2	3	4
Nuclei Shucaac (Radioactive Nuclei)	600 000	480 000	384 000	307 200

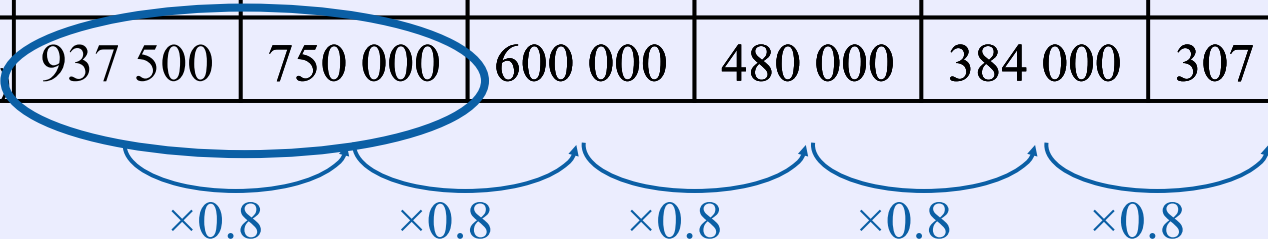
Xogta ay diiwaan geliyaan waxay sameysaa taxane joomatari (geometric sequence).

Ka qaad in qaabkan uu jiray hore, oo hel labada xilli ee ka hor xilliga koowaad ee la qoray.

Tilmaan: U qaybi xilli kasta xilligii hore si aad u hesho saamiga guud (common ratio).

Saynisyahanadu waxay qorayaan shucaaca muunad.

Waqti (saacadood)			1	2	3	4
Nuclei Shucaac (Radioactive Nuclei)	937 500	750 000	600 000	480 000	384 000	307 200



$\times 0.8$

$\times 0.8$

$\times 0.8$

$\times 0.8$

$\times 0.8$

Xogta ay qoraan waxay samaysaa taxane joomatari (geometric sequence).

Ka qaad in qaabkan uu jiray hore, oo hel labada xilli ee ka hor xilliga koowaad ee la qoray.

Qiyaasaha tirada nuclei-ga ka hor qorista.

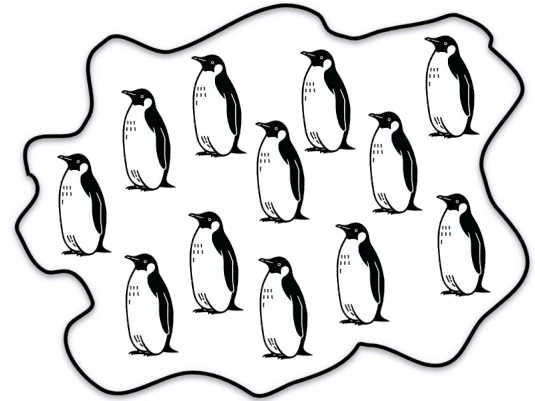
1) Saynisyahanadu waxay bilaabeen inay sannad kasta bartaan tirada Penguin-ga jasiirad ku taal Badweynta Koonfureed, waxayna heleen tirooyinkan.

Sannad	1	2	3	4
Tirada Dadweynaha (000's)	160	200	250	312.5

Xogta tirada dadweynaha waxay samaysaa taxane joomatari (geometric sequence).

a) U soco hore si aad u qiyaasto tirada dadweynaha sannadka soo socda iyo laba sannadood gudahood.

b) U soco gadaal si aad u ogaato imisa sannadood ka hor tirada dadweynuhu waxay ka hoosaysay boqol kun.



1) Saynisyahannadu waxay bilaabaan inay sannad walba daraaseeyaan tirada Penguin-ka ee jasiirad ku taal Koonfurta Badweynta, waxayna helaan tirooyinkan.

Sanad (Year)	1	2	3	4	5	6
Tirada Dadka (000's) (Population (000's))	160	200	250	312.5	390.6	488.3

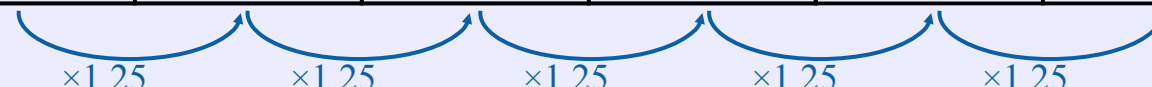


Diagram illustrating the geometric sequence of population data:

- Year 1 to Year 2: $\times 1.25$
- Year 2 to Year 3: $\times 1.25$
- Year 3 to Year 4: $\times 1.25$
- Year 4 to Year 5: $\times 1.25$
- Year 5 to Year 6: $\times 1.25$

Xogta tirada dadku waxay sameysaa taxane joomatari (geometric sequence).

$$200 \div 160 = 1.25$$

a) Hor u dhaqaaq si aad u qiyaasto tirada dadka sanadka soo socda iyo laba sanadood gudahood.

$$312.5 \times 1.25 = 390.625$$

$$390.625 \times 1.25 = 488.281...$$

1) Saynisyahannadu waxay bilaabaan inay sannad walba daraaseeyaan tirada Penguin-ka ee jasiirad ku taal Koonfurta Badweynta, waxayna helaan tirooyinkan.

Sanad (Year)				1	2	3	4
Tirada Dadka (000's) (Population (000's))	81.92	102.4	128	160	200	250	312.5

$\times 1.25$ $\times 1.25$ $\times 1.25$ $\times 1.25$ $\times 1.25$ $\times 1.25$

b) Dib u dhaqaaq si aad u ogaato inta sano ka hor tirada dadku ka yarayd boqol kun.

U qaado in qaabkan (model) uu shaqeyn jiray taariikh ahaan.

Tirada dadku waxay ka hoosaysay boqol kun (100,000) saddex sano ka hor inta aan daraasku bilaabmin.

Taxanayaasha (Sequences) waxay ku dabaqi karaan qaabaynta xaalado badan. Waxaan u isticmaali karnaa moodelladaas si aan u dhaqaaqno horay iyo gadaal, ugana saadaalino mustaqbalka iyo taariikhda.

Qaar ka mid ah moodellada la taaban karo waxay leeyihiin xaddidyo jireed, laakiin xisaabta waxaan ku qaadayn karnaa taxanayaal (sequences) aan la taaban karin, waxayna noqon karaan kuwo aan dhammaad lahayn (infinite) iyo sidoo kale leh qiimayaal (values) taban.