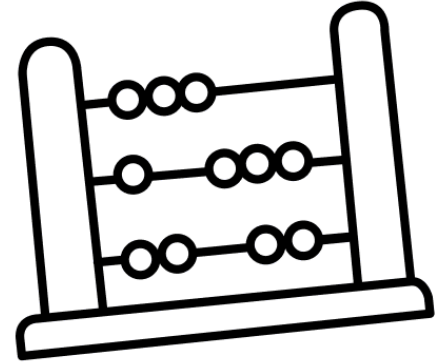


Beddelka mawduuca iyadoo la adeegsanayo qaacidada (formula) adag



Maths

Cutub: Tibaaxaha iyo qaacidada (formula)

Natiijo

Waxaan fahmi karaa fahanka hawlgallada (operations) rogaal-celinta ah ee qaacidada (formula) adag si aan uga dhigo doorsoome (variable) gaar ah mawduuca.

Erayada muhiimka ah

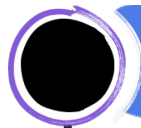
Mawduuca isla'egta (equation)/qaacidada (formula) waa doorsoome (variable) lagu muujiyay doorsoomayaal kale. Waa inuu leeyahay jibbaar (exponent) 1 iyo isugeyn (coefficient) 1.

Tusaale ahaan, a waa mawduuca qaacidada (formula) tan $a = \sqrt{c^2 - b^2}$

laakiin, a^2 ma aha mawduuca qaacidada (formula) tan $a^2 = c^2 - b^2$

Qaabka casharka

Beddelka mawduuca iyadoo la adeegsanayo qaacidada (formula) adag



Beddelka mawduuca laba tillaabo



Dib-u-habaynta qaacidada (formula) adag

Dib-u-habaynta waa xirfad muhiim ah xisaabta. Waxay naga caawisaa xaalado badan.

Tusaale ahaan, sida aan u xallino isla'egtan (equation).

$$5x + 12 = 42$$

Hawlgalka (operation) isku mid ah labada dhinac si loo ilaaliyo sinnaanta (equality)

RHS la fududeeyay laakiin x weli lama go'doomin

$$5x \times \frac{1}{5} = 30 \times \frac{1}{5}$$

Ku dhufo labada dhinac isku-dhafka (reciprocal) ee 5

Dib-u-habaynta waa xirfad muhiim ah xisaabta. Waxay naga caawisaa xaalado badan.

Tusaale ahaan, sida aan u xallino isla'egtan (equation).

$$5x + 12 = 42$$

Waxaan qabanay laba hawlgaal rogan (inverse operations) oo ah -12 iyo $\times \frac{1}{5}$ si aan u go'doomino x.

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

Dib-u-habayn (rearrangement) ah $5x + 12 = 42$

$$x = \frac{42 - 12}{5}$$

Dib-u-habayn (rearrangement) ah $5x = 42 - 12$ taas oo x hadda waa mawduuca (subject).

Marka dib-u-habayn (rearrangement) la sameynayo, mawduuca (subject) inta badan waxaa loo fahmi karaa inuu yahay tirada aan la garanayn ee aad raadinayso qiimeheeda (value).

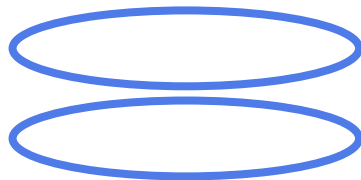
Marka dib-u-habayn (rearrangement) la sameynayo, had iyo jeer ma raadinayno qiime (value) la siiyay, sida milan (solution) isla'egta (equation).

Tusaale ahaan, shaqada toosan (linear function) $2x + y = 12$



Qaabkani wuxuu noo sahlayaa inaan si hufan u sawirno khadka (graph the line).

Xiriir kasta oo isku-dar (additive) ah sidaan waxaan si dhakhso leh u arki karnaa afar habayn (arrangements).



Iyadoo y yahay mawduuca (subject), waxaan si degdeg ah u ogaanaynaa jirada (gradient), -2

$$2x \times \frac{1}{2} = (12 - y) \times \frac{1}{2}$$

$$x = \frac{12 - y}{2}$$

Iyadoo x yahay mawduuca (subject), waxaan si hufan u heli karnaa isku-duwayaasha x (x coordinate) haddii aan ognahay y



Shaqada toosan (linear function) $3x + y = 15$, ka dhig y mawduuca (subject).

Ikhtiyaarka koowaad:

Hawlgalada rogan (inverse operations).

Ikhtiyaarka labaad:

Afarta habayn (arrangements) ee xiriirkan isku-dar (additive) ah.



Beddelidda mawduuca (subject) laba tillaabo

Shaqada toosan (linear function) $3x + y = 15$, isticmaal hawlgalada rogan (inverse operations) si aad uga dhigto x mawduuca (subject).

$$3x + y = 15$$

$$3x + y - y = 15 - y$$

Rogaha (inverse) $+ y$

$$3x = 15 - y$$

$$3x \times \frac{1}{3} = (15 - y) \times \frac{1}{3}$$

Rogaha (inverse)
 $\times 3$

$$x = \frac{15 - y}{3} = 5 - \frac{y}{3}$$

Beddelka mawduuca (subject) oo leh laba tillaabo

Hawsha tooska ah (linear function) $3x + y = 15$, isticmaal hawlgallo rogaal (inverse operations) si x uga dhigto mawduuca (subject).

$$3x + y = 15$$

$$3x + y - y = 15 - y$$

$$3x = 15 - y$$

$$3x \times \frac{1}{3} = (15 - y) \times \frac{1}{3}$$

$$x = \frac{15 - y}{3} = 5 - \frac{y}{3}$$

Hawsha tooska ah (linear function) $7x - y = 28$, isticmaal hawlgallo rogaal (inverse operations) si x uga dhigto mawduuca (subject).

$$7x - y = 28$$

$$7x - y + y = 28 + y$$

$$7x = 28 + y$$

$$7x \times \frac{1}{7} = (y + 28) \times \frac{1}{7}$$

$$x = \frac{y + 28}{7} = \frac{y}{7} + 4$$

Axmed iyo Caasha waxay qorayaan qaaciido (formula).

Qaaciidda (formula) koowaad: d lagu daro 5 ka dib loo qaybiyo 2 wuxuu ka dhigayaa e

Qaaciidda (formula) labaad: d loo qaybiyo 2 ka dib lagu daro 5 wuxuu ka dhigayaa e



Labadooduba waxay yiraahdaan, "lagu daro 5" iyo "loo qaybiyo 2" marka waxaan u malaynayaa inaan heli doonno isku qaaciido (formula).

Waxaan u malaynayaa inaan heli doonno laba qaaciido (formula) oo aad u kala duwan!



Axmed iyo Caasha waxay qorayaan qaaciido (formula).

Qaaciidda (formula) koowaad: d lagu daro 5 ka dib loo qaybiyo 2 wuxuu ka dhigayaa e

$$\frac{d + 5}{2} = e$$

Qaaciidda (formula) labaad: d loo qaybiyo 2 ka dib lagu daro 5 wuxuu ka dhigayaa e

$$\frac{d}{2} + 5 = e$$



Labadooduba waxay yiraahdaan, "lagu daro 5" iyo "loo qaybiyo 2" marka waxaan u malaynayaa inaan heli doonno isku qaaciido (formula).

Mahadsanid Caasha! Hadda waxaan arki karaa in nidaamku (order) muhiim yahay.

Waxaan u malaynayaa inaan heli doonno laba qaaciido (formula) oo aad u kala duwan!



Beddelka mawduuca (subject) oo leh laba tillaabo

Nidaamku (order) wuxuu muhiim noqon doonaa marka aan dib u habeynayno qaaciidadan (formula).

Qaaciidda (formula) koowaad: d lagu daro 5 ka dib loo qaybiyo 2 wuxuu ka dhigayaa e

$$\frac{d + 5}{2} = e$$

Qaaciidda (formula) labaad: d loo qaybiyo 2 ka dib lagu daro 5 wuxuu ka dhigayaa e

$$\frac{d}{2} + 5 = e$$

Haddii aan doonayno in d uga dhigno mawduuca (subject), hawlgallada rogaal (inverse operations) ee labaduba waa -5 iyo $\times 2$ laakiin nidaamka (order) aan ku dabaqno waa muhiim.

Beddelka mawduuca (subject) laba tillaabo (steps) ah

Qaaciddada (Formula)

koowaad:

-5 marka hore

$$\frac{d+5}{2} = e$$

$$\frac{d+5}{2} - 5 = e - 5$$

$$\frac{d+5}{2} - \frac{10}{2} = e - 5$$

$$\frac{d-5}{2} = e - 5$$

$$2 \times \left(\frac{d-5}{2} \right) = 2 \times (e - 5)$$

$$d - 5 = 2e - 10$$

$$d = 2e - 5$$

Tani waxay ahayd mid aan waxtar lahayn, sababtoo ah kani dhab ahaan ma aha 5

$$\frac{d+5}{2} = e$$

$$\frac{d}{2} + \frac{5}{2} = e$$

$$\frac{d}{2} = e - \frac{5}{2}$$

$$2 \times \frac{d}{2} = 2 \times \left(e - \frac{5}{2} \right)$$

$$d = 2e - 5$$

Beddelka mawduuca (subject) laba tillaabo (steps) ah



Qaaciddada (Formula)

koowaad:

$$\frac{d+5}{2} = e$$

×2 marka hore

$$2 \times \left(\frac{d+5}{2} \right) = 2 \times e$$

$$d+5 = 2e$$

$$d = 2e - 5$$

Habkani aad buu waxtar u badan yahay!

Marka dib loo habeeynayo isleegyada (equations) iyo qaaciddooyinka (formula) ay ku jiraan jajab (fractions), waxaa caqli gal ah in laga fikiro sida loo soconayo.

Qaaciddada (Formula) labaad:

-5 marka hore

$$\frac{d}{2} + 5 = e$$

$$\frac{d}{2} + 5 - 5 = e - 5$$

$$\frac{d}{2} = e - 5$$

$$\frac{d}{2} \times 2 = (e - 5) \times 2$$

$$d = 2(e - 5) = 2e - 10$$

×2 marka hore

$$\frac{d}{2} + 5 = e$$

Hubi inaad ku
dhufato (multiply)
dhammaan ereyada
(terms) 2

$$2 \times \left(\frac{d}{2} + 5 \right) = 2 \times e$$

$$d + 10 = 2e$$

$$d = 2e - 10$$

Ma jiro farqi weyn oo waxtar (efficiency) ah oo u dhexeeya labada hab.

Waa maxay tillaabada (step) ugu waxtarka badan ee marka hore la qaado marka dib loo habeeynayo qaaciddadan (formula)?

$$\frac{y+7}{3} = x$$

a

-7 labada dhinac (both sides)



Aad u waxtar darro!

$$\frac{y+7}{3} - 7 = x - 7$$

b

$-\frac{7}{3}$ labada dhinac (both sides)



Waxay shaqeyn doontaa, laakiin ma aha tan ugu waxtarka badan.

$$\frac{y}{3} = x - \frac{7}{3}$$

c

$\times 3$ labada dhinac (both sides)



Aad bay u hufan tahay!

$$y+7 = 3x$$

1) Dib u habee qaacidada kasta si c uu noqdo mawduuca.

a) $6c + 7 = 19$

b) $3c + 8 = d$

c) $3d - c = 19$

d) $d - 3c = 19$

e) $\frac{c}{9} + 3 = d$

f) $\frac{c + 3}{9} = d$

2) Laura waxay dib u habaynaysay isla'egyadan si y uu noqdo mawduuca.

a) $2y + 3x = 18$

$$2y = 18 - 3x$$

✗

b) $\frac{y}{2} - 5 = x$

$$y - 5 = 2x$$

$$y = 2x + 5$$

✗

c) $2y + 3 = 7x$

$$2y = 7x + 3$$

$$y = \frac{7x + 3}{2}$$

✗

Waxaan hubiyay jawaabahayga oo dhammaantood waa qalad. Ma i caawin kartaa inaan arko halka aan ku qaldamay?



In each case circle Laura's errors and write a sentence to explain what she should do differently.

1) Dib u habee qaacidada kasta si c uu noqdo mawduuca.

a) $6c + 7 = 19$

$$6c = 19 - 7$$

$$c = \frac{19 - 7}{6}$$

b) $3c + 8 = d$

$$3c = d - 8$$

$$c = \frac{d - 8}{3}$$

c) $3d - c = 19$

$$3d = 19 + c$$

$$3d - 19 = c$$

d) $d - 3c = 19$

$$d = 19 + 3c$$

$$d - 19 = 3c$$

$$\frac{d - 19}{3} = c$$

1) Dib u habee qaacidada kasta si c uu noqdo mawduuca.

$$\text{e) } \frac{c}{9} + 3 = d$$

$$\frac{c}{9} = d - 3$$

$$c = 9(d - 3) = 9d - 27$$

$$\text{f) } \frac{c + 3}{9} = d$$

$$c + 3 = 9d$$

$$c = 9d - 3$$

2) Laura waxay dib u habaynaysay isla'egyadan si y uu noqdo mawduuca.

a) $2y + 3x = 18$

$2y = 18 - 3x$ ✗

Si y uu noqdo mawduuca, koeffisiyentku waa inuu ahaadaa 1. U qaybi labada dhinac 2

b) $\frac{y}{2} - 5 = x$

$y - 5 = 2x$

$y = 2x + 5$ ✗

Markaad labada dhinac ku dhufato 2, hubi inaad ku dhufato dhammaan ereyada. Sadarkaani waa inuu akhriyaa $y - 10 = 2x$

c) $2y + 3 = 7x$

$2y = 7x + 3$

$y = \frac{7x + 3}{2}$ ✗

Waxaad ula jeeday inaad ku darto -3 labada dhinac



Beddelka mawduuca qaacidada adag



Beddelka mawduuca laba tillaabo



Rearranging more complex formulae

Qaar ka mid ah qaacidadaha aan u baahan nahay inaan dib u habeyno waxay ku lug yeelan doonaan jibbaarada (exponents).

Tusaale ahaan, ka dhig x mawduuca.

$$y = x^2 + 5$$

Kiiskan si ka duwan uma dhaqanno. Weli waxaan isticmaalnaa hawlgallo rogaal-celin (inverse operations).

Qaar ka mid ah qaaciidooyinka (formula) aan dib u habeynayno waxay ku lug yeelan doonaan jibbaarayaal (exponents).

Tusaale ahaan, x ka dhig mawduuca (subject).

$$y = x^2 + 5$$

$$\sqrt{y - 5} = \sqrt{x^2}$$

Marka xigta waxaan u baahanahay rogaal-celinta (inverse) labajibbaaran (squaring).

$$\sqrt{y - 5} = x$$

Dib u habeynta qaaciidooyinka (formula) adag

Layla waxay dib u habeynaysaa isla'egtan (equation) si x uga dhigto mawduuca (subject).

$$\sqrt{y} + \sqrt{9} = \sqrt{x^2}$$

Rogaal-celinta (inverse) labajibbaaran (squaring) waa xidid labajibbaaran (square root), marka ma samayn karaa tan?



$$\sqrt{16} + \sqrt{9} = \sqrt{25}$$

Ma aqaan laakiin waxaan ku tijaabin karnaa tusaale tiro (numerical example).



Dib u habeynta qaaciidooyinka (formula) adag

Layla waxay dib u habeynaysaa isla'egtan (equation) si x uga dhigto mawduuca (subject).

$$y + 9 = x^2$$

$$16 + 9 = 25$$

$$\sqrt{y} + \sqrt{9} \neq \sqrt{x^2}$$

$$\sqrt{16} + \sqrt{9} \neq \sqrt{25}$$



Marka, xididka (root) eray kasta (term) qaadi karo. Waa inaan isku ururiyaa (group).


$$\sqrt{y + 9} = x$$

Dib u habeynta qaaciidooyinka (formula) adag

Layla waxay dib u habeynaysaa isla'egtan (equation) si x uga dhigto mawduuca (subject).

$$y = x^2 + 9$$

$$y + 9 = x^2$$

$$\sqrt{y + 9} = x$$

Waa fiican tahay.
Mahadsanid Caasha!



Marka, $y + 9 = x^2$ wuxuu
noqdaa

$$\sqrt{y + 9} = x$$



x ka dhig mawduuca (subject).

$$y = x^2 + 7$$

$$\sqrt{y - 7} = x$$

Samee x uu yahay mawduuca (subject).

$$y = x^3 - 7$$

$$\sqrt[3]{y + 7} = x$$

Xidid saddex (Cube root), rogaal
celinta saddex jibaarista (cubing).

Dib-u-habaynta qaacidada (formula) adag

Samee x uu yahay mawduuca (subject).

$$y = x^2 + 7$$

$$y - 7 = x^2$$

$$\sqrt{y - 7} = x$$

Samee x uu yahay mawduuca (subject).

$$y = x^3 - 7$$

$$y + 7 = x^3$$

$$\sqrt[3]{y + 7} = x$$

Samee x uu yahay mawduuca (subject).

$$y = x^2 + z$$

$$y - z = x^2$$

$$\sqrt{y - z} = x$$

Samee x uu yahay mawduuca (subject).

$$y = x^4 - 1$$

$$y + 1 = x^4$$

$$\sqrt[4]{y + 1} = x$$

Marka ereyga leh jibbaar (exponent) aan ahayn 1 uu leeyahay isku-dhufasho (coefficient) aan ahayn 1, markaas nidaamku runtii waa muhiim.

Tusaale ahaan, samee x uu yahay mawduuca (subject).

$$y = 3x^2$$

$$y = 3x^2$$

Ma kani...

$$\sqrt{y} = 3x$$

ama...

$$\frac{y}{3} = x^2$$

$$\frac{\sqrt{y}}{3} = x \quad \times$$

$$\sqrt{\frac{y}{3}} = x \quad \checkmark$$

Kee ayaa sax ah?

Dib-u-habaynta qaacidada (formula) adag

Fahamka tibaaxda (expression) $3x^2$ waa faa'iido leh inuu naga caawiyo fahamka sababta dib-u-habayntan (rearrangement) ay sax u tahay.

Ma kani x laba jibaaran (squared) ka dib lagu dhuftey 3?



$$y = 3x^2$$

Ama, x lagu dhuftey 3 ka dib laba jibaaran (squared)?



$$\frac{y}{3} = x^2$$

$$\sqrt{\frac{y}{3}} = x$$



Dib-u-habaynta qaacidada (formula) adag

Fahamka tibaaxda (expression) $3x^2$ waa faa'iido leh inuu naga caawiyo fahamka sababta dib-u-habayntan (rearrangement) ay sax u tahay.

$$3x^2$$

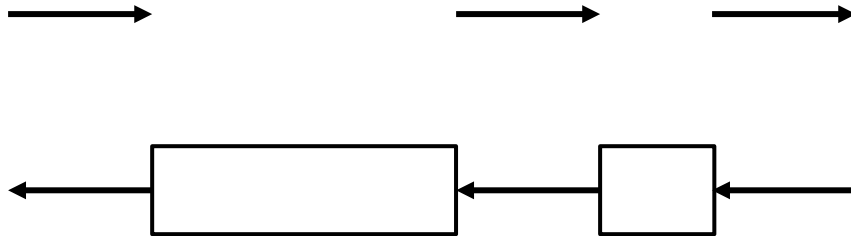
Ma kani x laba jibaaran (squared) ka dib lagu dhuftey 3?



$$y = 3x^2$$

$$\frac{y}{3} = x^2$$

$$\sqrt{\frac{y}{3}} = x$$



Habaynta qaacido aad u adag (Rearranging more complex formula)

Kee waa habaynta saxda ah ee qaacidadaan si b u noqdo mawduuca?

$$a = 5b^2$$

a $\frac{a}{5} = b^2$ ✗

÷5 waa tillaabada koowaad ee saxda ah laakiin jibbaarka b waa inuu ahaadaa 1

$$a = 5b^2$$

b $\sqrt{\frac{a}{5}} = b$ ✓

$$\frac{a}{5} = b^2$$

c $\frac{\sqrt{a}}{5} = b$ ✗

$$\sqrt{\frac{a}{5}} = b$$

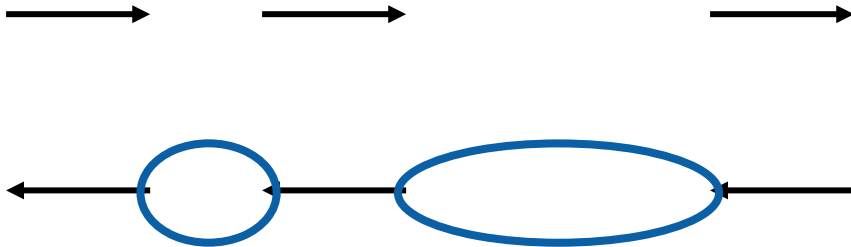
Habaynta qaacido aad u adag (Rearranging more complex formula)

Ka dhiga x mawduuca waa ka duwan yahay qaacidadan.

$$y = (3x)^2$$

$$\sqrt{y} = 3x$$

$$\frac{\sqrt{y}}{3} = x$$



Kee waa habaynta saxda ah ee qaacidadaan si b u noqdo mawduuca?

$$a = (5b)^2$$

a $\sqrt{a} = 5b$ ✗

Jidhka laba jibaaran (Square root) waa tillaabada koowaad ee saxda ah laakiin jibbaarka b waa inuu ahaadaa 1

b $\sqrt{\frac{a}{5}} = b$ ✗

c $\frac{\sqrt{a}}{5} = b$ ✓

$$\begin{aligned}\sqrt{a} &= 5b \\ \frac{\sqrt{a}}{5} &= b\end{aligned}$$

1) Habayn qaacido kasta si x u noqdo mawduuca.

a) $y = 4x^2$

b) $y = (4x)^2$

c) $y = 4x^2 + 1$

d) $y = 4(x^2 + 1)$

e) $y = \frac{x^2}{4}$

f) $y = \frac{4}{x^2}$

g) $3x = \sqrt{y}$

h) $\sqrt{3x} = y$

i) $3\sqrt{x} = y$

1) Habayn qaacido kasta si x u noqdo mawduuca.

a) $y = 4x^2$

$$\frac{y}{4} = x^2$$

$$\sqrt{\frac{y}{4}} = x$$

b) $y = (4x)^2$

$$\sqrt{y} = 4x$$

$$\frac{\sqrt{y}}{4} = x$$

c) $y = 4x^2 + 1$

$$y - 1 = 4x^2$$

$$\frac{y - 1}{4} = x^2$$

$$\sqrt{\frac{y - 1}{4}} = x$$

1) Habayn qaacido kasta si x u noqdo mawduuca.

d) $y = 4(x^2 + 1)$

$$\frac{y}{4} = x^2 + 1$$

$$\frac{y}{4} - 1 = x^2$$

$$\sqrt{\frac{y}{4} - 1} = x$$

e) $y = \frac{x^2}{4}$

$$4y = x^2$$

$$\sqrt{4y} = x$$

f) $y = \frac{4}{x^2}$

$$x^2 y = 4$$

$$x^2 = \frac{4}{y}$$

$$x = \sqrt{\frac{4}{y}}$$

1) Habayn qaacido kasta si x u noqdo mawduuca.

g) $3x = \sqrt{y}$

$$x = \frac{\sqrt{y}}{3}$$

h) $\sqrt{3x} = y$

$$3x = y^2$$

$$x = \frac{y^2}{3}$$

i) $3\sqrt{x} = y$

$$\sqrt{x} = \frac{y}{3}$$

$$x = \left(\frac{y}{3}\right)^2$$

$$x = \frac{y^2}{9}$$

Soo koobid

Bedelida mawduuca qaacido aad u adag (Changing the subject with more complex formula)

Waxaan ku dabaqi karnaa fahamka hawlgallada rogaal celiska ah (inverse operations) qaacido adag si aan uga dhigno doorsoome gaar ah mawduuca.

Tusaale ahaan, si e uga dhigno mawduuca qaacidadan, waxaan ka jareynaa 8 labada dhinac, ka dibna u qaybinaynaa labada dhinac 5.

$$5e + 8 = d$$

$$5e = d - 8$$

$$e = \frac{d - 8}{5}$$