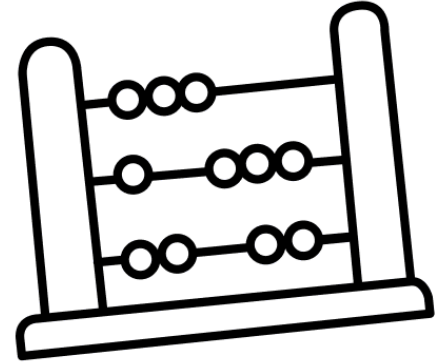


Injineer

Maths

Unit Xisaabta goobta shaqada



Natiijo

Waxaan fahmi karaa sida xisaabta loogu isticmaalo injineerada.

Tiro waa qaab jajab (fraction) marka loo muujiyo hal tiro oo loo qaybiyay tiro kale.

Injineer



Saxnaanta injineerinka



Codsiyada kale ee xisaabta

Maxaad u malaynaysaa in injineerada ay sameeyaan?

Injineeradu waxay qaadaan mabaadi'da sayniska iyo xisaabta waxayna ku dabaqaan si ay u helaan xalalka dhibaatooyinka.

Waxay dhisaan buundooyin ka gudba webiyada iyo dooxooyinka.

Waxay dhisaan tunnel hoostooda webiyada, badda, iyo magaalooyinka.

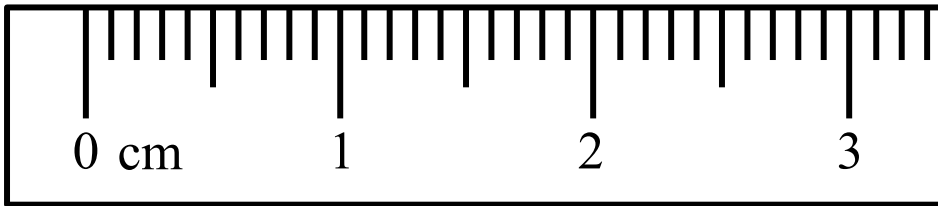
Waxay dhisaan dhismayaal aad u sarreeya meelo cidhiidhi ah.

Asal ahaan, waxay xalliyaan dhibaatooyinka aadanaha. Xallinta dhibaata waa nuxurka xisaabta.

Qodobka ugu muhiimsan ee shaqada injineerada waa saxnaanta. Haddii aysan sax ahayn, buundadu way dumi, dhismuhu wuxuu dumaa, ama diyaaraddu way ka dhacdaa cirka.

Fiiri xisaabtaada (ruler). Waa maxay cabbiraadahan yaryar ee saxda ah ee u dhexeeya sentimitir kasta?

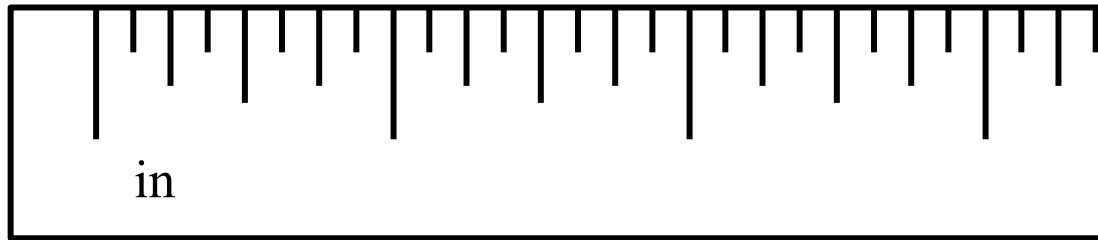
Waa millimitir, waxaana jira toban millimitir hal sentimitir.



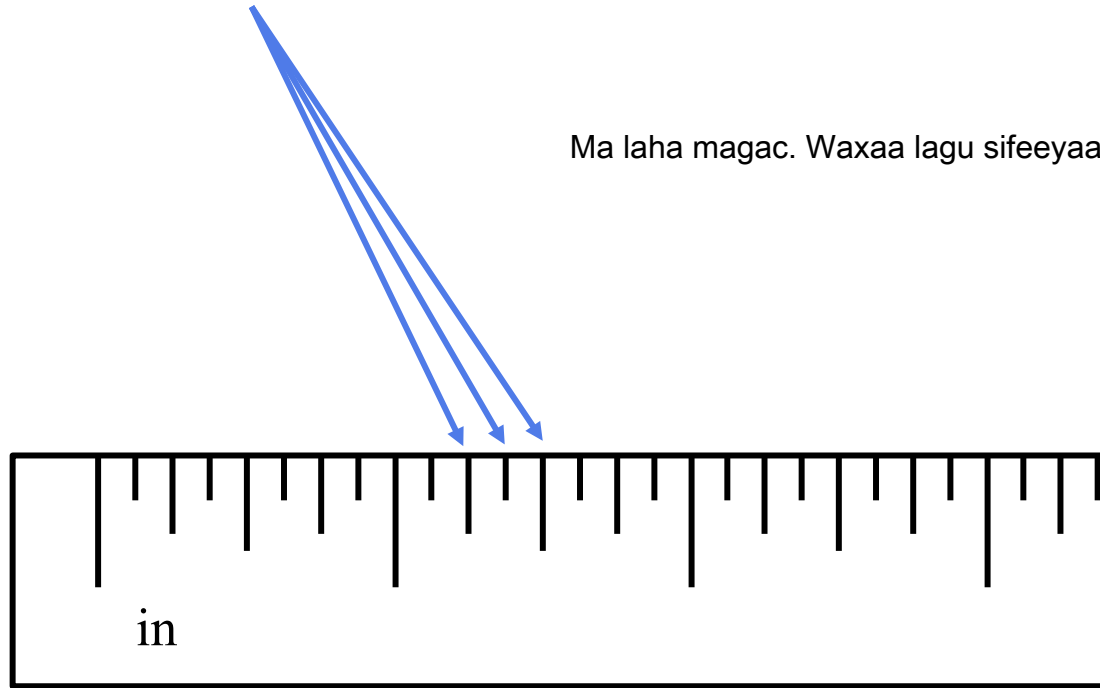
Millimitir iyo sentimitir waa cabbiraado metric ah.

Maxay 'in' u taagan tahay iyo qoyskee cabbirro ayay ka tirsan tahay?

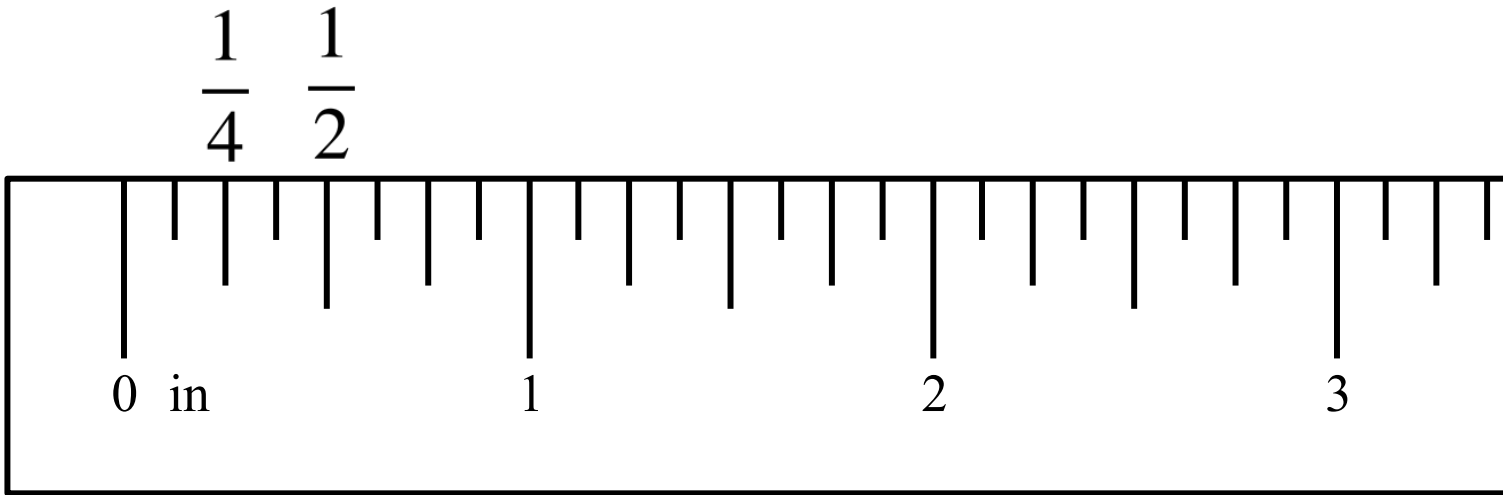
'in' waxay u taagan tahay inji (inches), cabbir Imperial. Taariikh ahaan UK waxaan isticmaalnay nidaamka cabbirka Imperial.



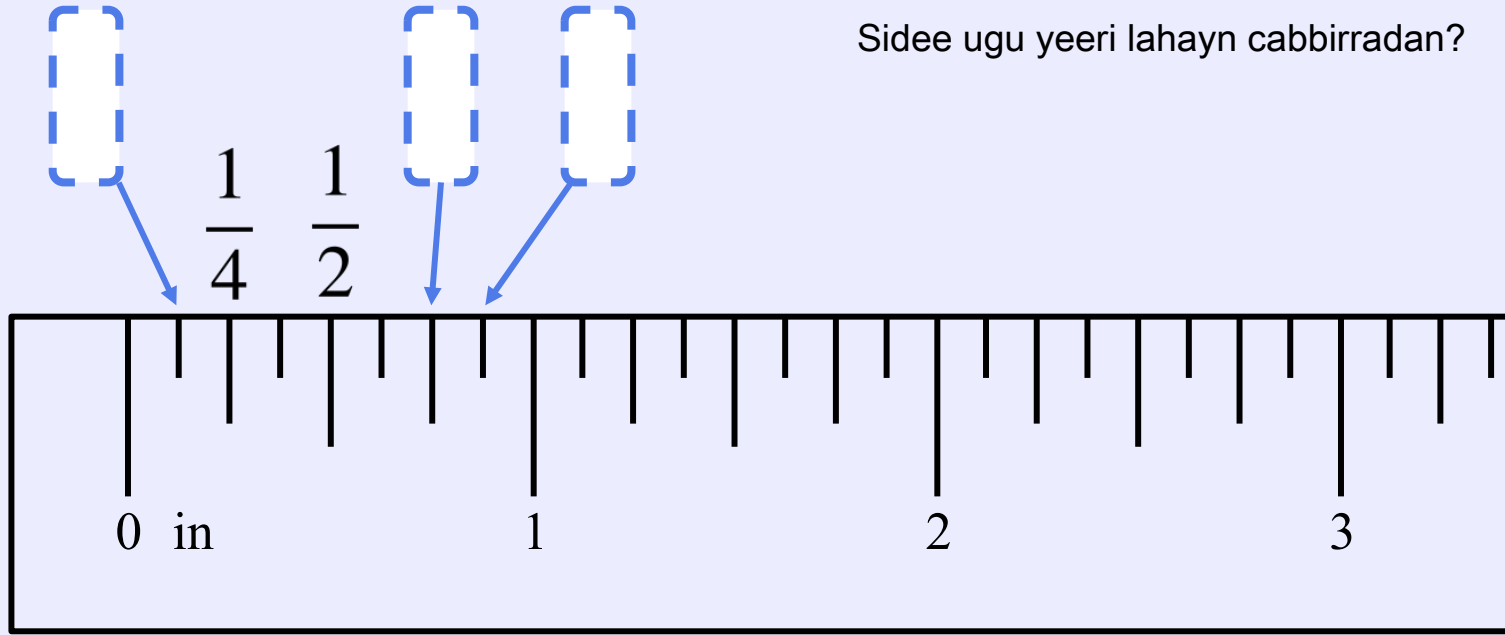
Maxaad u malaynaysaa inaan ugu yeerno cabbirradan yaryar ee saxda ah ee u dhexeeya injiyada?



Ma laha magac. Waxaa lagu sifeeyaa jajab inji.



Sidee ugu yeeri lahayn cabbirradan?



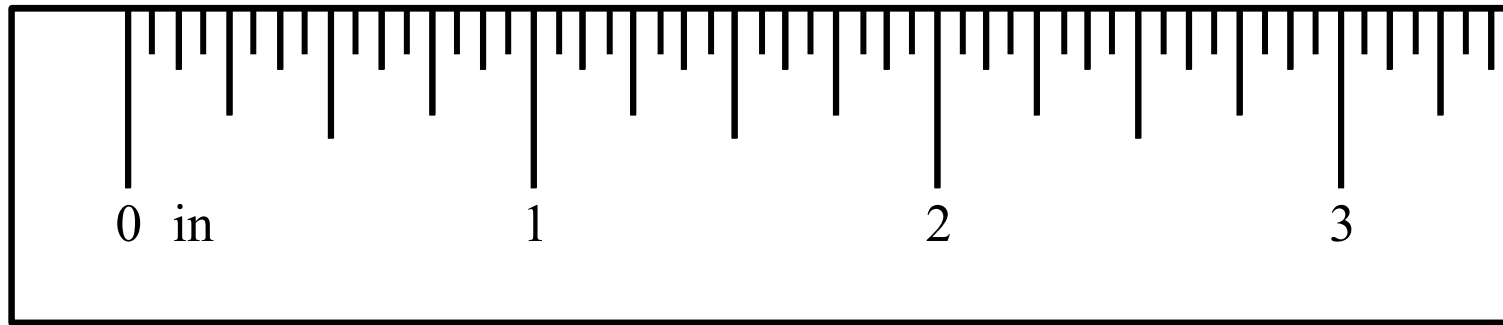
"Nus inji"

"Rubuc inji"

$\frac{1}{8}$ $\frac{1}{4}$ $\frac{1}{2}$

Waxaa laga yaabaa inaad hesho xisaab (ruler) ka sax ah kan.

Maxaad u malaynaysaa inay tahay jajabkan cusub?

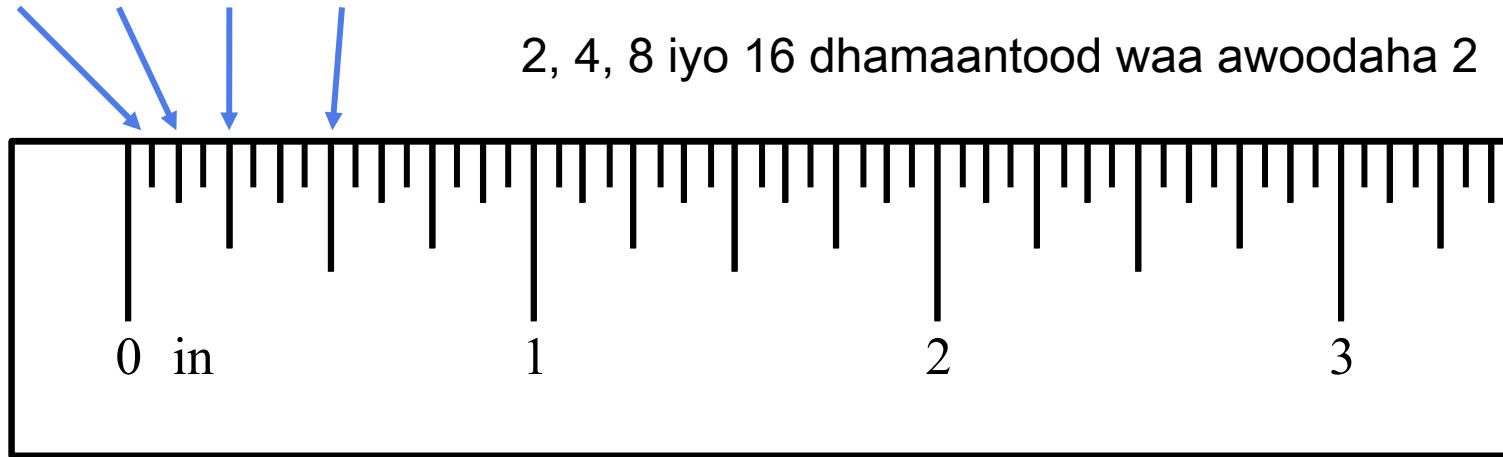


Meel saddex iyo tobnaad oo inch ah ayaa ku dhawaad sax ah sida gacanta bini'aadamku u goyn karo, sidaas darteed xisaabihii hore waxay aad u yarayd inay ka sax yihiin tan.

$$\frac{1}{16} \quad \frac{1}{8} \quad \frac{1}{4} \quad \frac{1}{2}$$

Maxaad ka ogaataa hooseeyayaasha jajabyada?

2, 4, 8 iyo 16 dhamaantood waa awoodaha 2

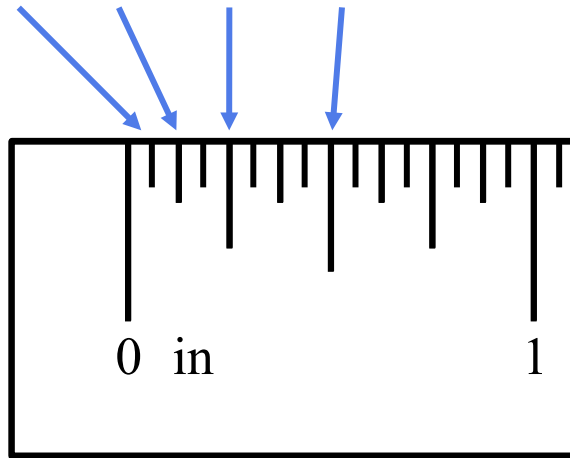


Tani waa ula kac, sababtoo ah nus nus waa rubuc, nus rubuc waa sideed meelood meel, iyo nus sideed meelood meel waa saddex iyo tobnaad.

$$\frac{1}{16} \quad \frac{1}{8} \quad \frac{1}{4} \quad \frac{1}{2}$$

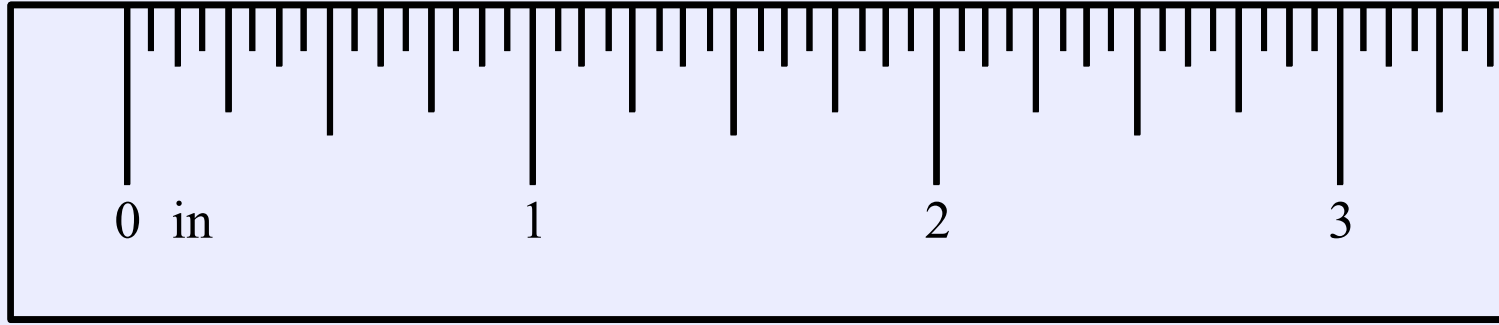
2, 4, 8 iyo 16 dhamaantood waa awoodaha 2

Awoodahan laba, oo lagu daro hal xaqiiqo muhiim ah, ayaa u oggolaaday injineerradii hore inay si sax ah isula xiriiraan.



Meelaha ugu ballaadhan, suulka qof weyn wuxuu qiyaas ahaan yahay hal inch dhexroor.





Nus nus waa _____.

Nus _____ waa saddex iyo tobnaad.

Nus saddex iyo tobnaad waa _____.

$$\frac{1}{32}$$

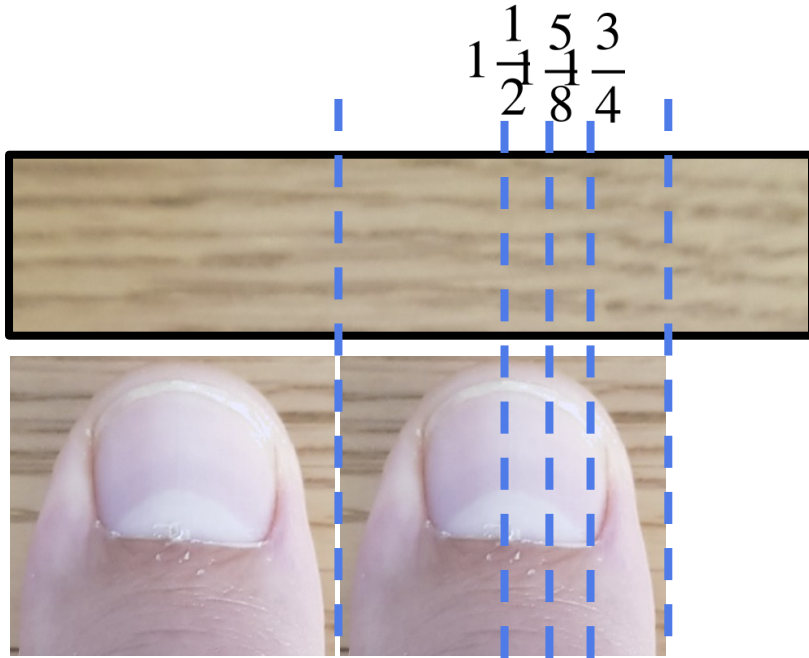


Dhererkani wuxuu qiyaas ahaan yahay _____ dheer.



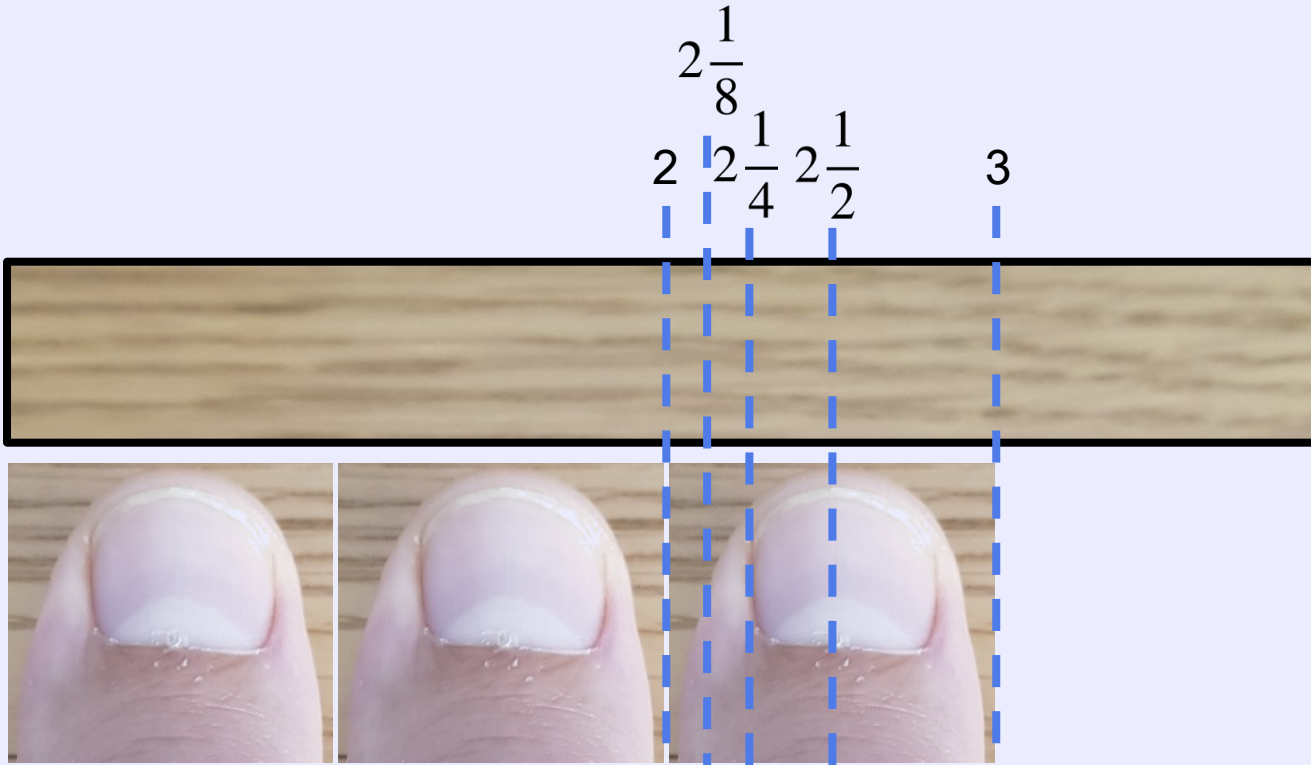
Dhererkani wuxuu qiyaas ahaan yahay _____ dheer.

Qaanuunkan gacanta wuxuu u oggolaaday injineerada UK inay cabbiraan, gooyaan, oo ay isgaarsiyaan si sax ah.

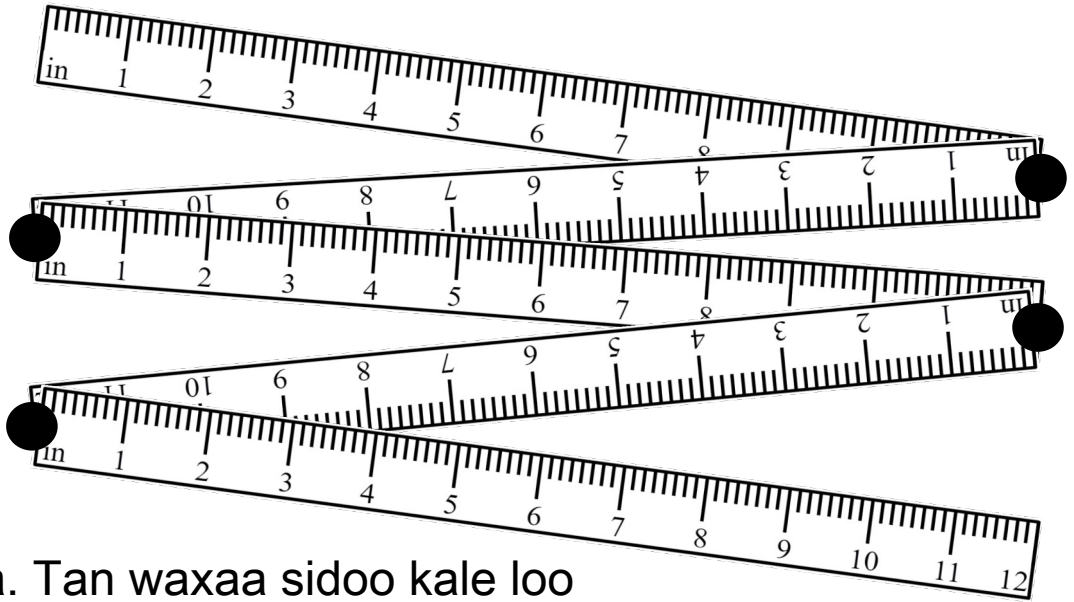


Waxaan cabbiri karnaa dherer sax ah sida hal iyo shan meelood oo sideed meelood oo inji ah.

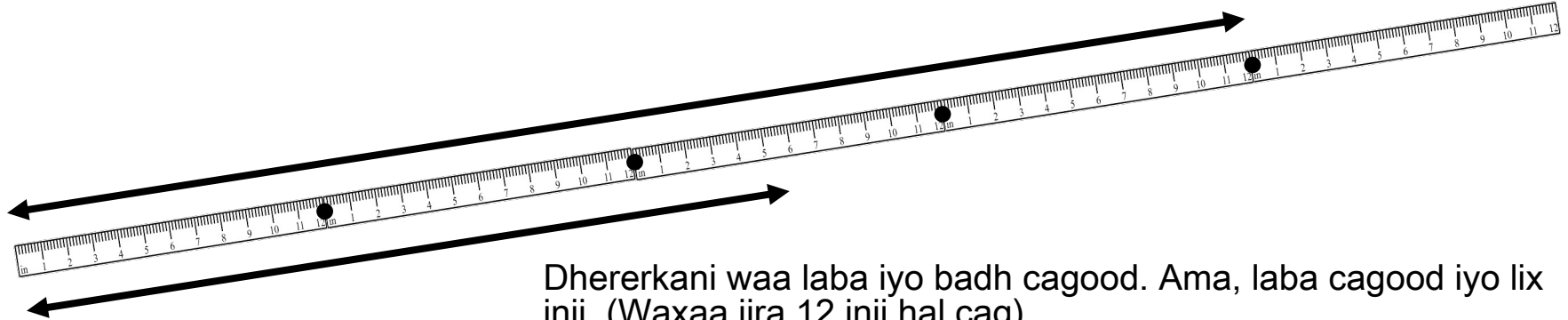
Cabbir laba iyo hal meel oo sideed meelood oo inji ah.



Cabbiraadaha dhaadheer, nijaariyadu waxay sitaan qalab kale oo xiiso leh.

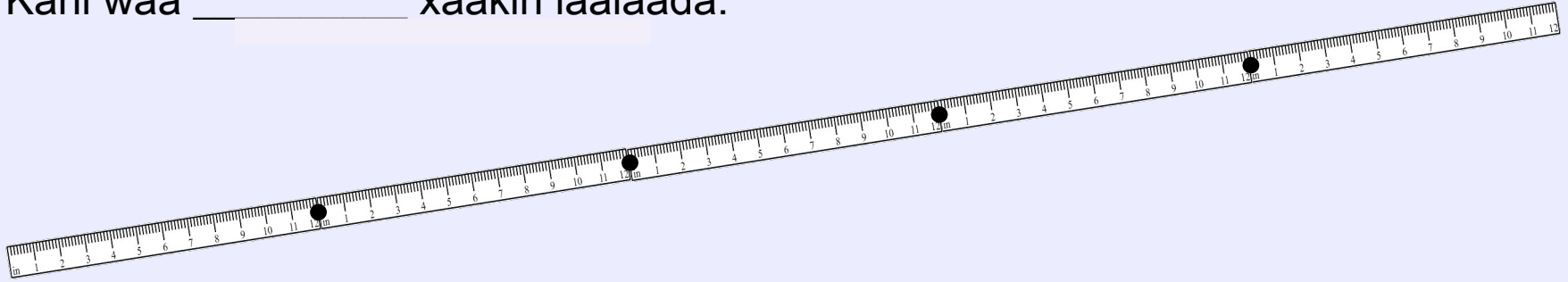


Xaakin shan cagood oo laalaada. Tan waxaa sidoo kale loo yaqaan Xaakinta Nijaarka ama Xaakinta Dhagaxa.



Dhererkani waa laba iyo badh cagood. Ama, laba cagood iyo lix inji. (Waxaa jira 12 inji hal cag)

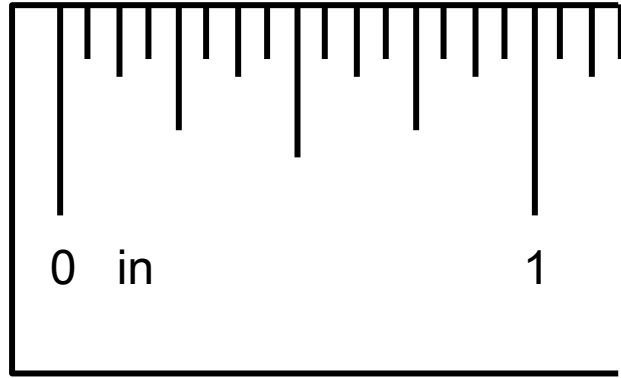
Kani waa _____ xaakin laalaada.



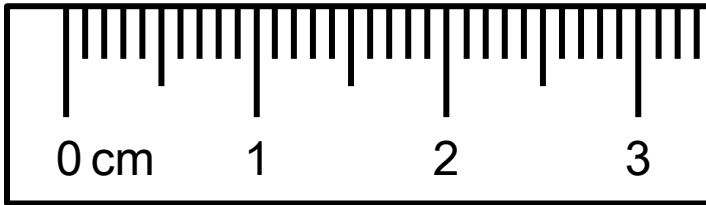
Waxaa jira _____ hal caq.

Cabbirka cagaha iyo injiyada iyo saxnaanta ilaa hal meel oo lix iyo toban meelood oo inji ah waxay ku filneyd caqabadihii hore. Dhismayaasha dhawr dabaq ah ayaa weli taagan haddii loo dhiso heerkan saxnaanta.

Si kastaba ha ahaatee, maanta waxaan dhisnaa dhismayaal dhaadheer oo ku dhow hal kiiloomitir, buundooyin ku xaniban culeys milyan oo tan, iyo diyaaradaha iyo gantaalada ku socda ku dhawaad 1000 mph. Baahiyahan casriga ah waxay ka dhigan yihiin in meel saddex iyo tobnaad oo inch ah aysan ku filnayn. Heerarka saxnaanta injineerada maanta waa inay aad uga sax badan yihiin taas.



Waxaad ku arki kartaa xisaabtaada in hal millimitir uu ka yar yahay saddex iyo tobnaad oo inch ah. Taasi waxay ka dhigaysaa cabbir sax ah oo la isticmaalo. Si kastaba ha ahaatee, taasi weli kuma filna caqabadaha injineerinka casriga ah.



Ma taqaan cabbirrada mitirka ee dhererka oo ka yar hal millimitir?

Hal mitir

Hal sentimitir

Hal millimitir

$$\frac{1}{100}$$

$$\frac{1}{1000}$$

$$\frac{1}{1\,000\,000}$$

$$\frac{1}{1\,000\,000\,000}$$

$$\frac{1}{1\,000\,000\,000\,000}$$

Tignoolajiyada goynta laser-ka waxay ka dhigan tahay injineerada casriga ah inay goyn karaan ilaa 25 mikron (mikromitir) saxnaan.

Atomku wuxuu ku dhow yahay 100 pikomitir dhexroor.

Injineeradu waxay ku qeexaan cabbirradan qaab caadi ah.

Hal sentimitir	$\frac{1}{100} \text{ m}$	$1 \times 10^{-2} \text{ m}$
----------------	---------------------------	------------------------------

Hal millimitir	$\frac{1}{1000} \text{ m}$	$1 \times 10^{-3} \text{ m}$
----------------	----------------------------	------------------------------

Hal mikromitir	$\frac{1}{1\,000\,000} \text{ m}$	$1 \times 10^{-6} \text{ m}$
----------------	-----------------------------------	------------------------------

Hal nanomitir	$\frac{1}{1\,000\,000\,000} \text{ m}$	
---------------	--	--

Hal pikomitir	$\frac{1}{1\,000\,000\,000\,000} \text{ m}$	
---------------	---	--

Injineeradu waxay ku qeexaan cabbiraadahan qaab caadi ah (standard form).

Hal sentimitir	$\frac{1}{100} \text{ m}$	$1 \times 10^{-2} \text{ m}$
----------------	---------------------------	------------------------------

Hal milimitir	$\frac{1}{1000} \text{ m}$	$1 \times 10^{-3} \text{ m}$
---------------	----------------------------	------------------------------

Hal mikromitir	$\frac{1}{1\,000\,000} \text{ m}$	$1 \times 10^{-6} \text{ m}$
----------------	-----------------------------------	------------------------------

Hal nanomitir	$\frac{1}{1\,000\,000\,000} \text{ m}$	
---------------	--	-------------

Hal pikomitir	$\frac{1}{1\,000\,000\,000\,000} \text{ m}$	
---------------	---	-------------

Injineeradu waxay isticmaali karaan qalabka goynta laser-ka si ay u saxaan ilaa 25 mikron. Waa maxay tan qaab caadi ah (standard form)?

a $25 \times 10^{-6} \text{ m}$

b $2.5 \times 10^{-5} \text{ m}$

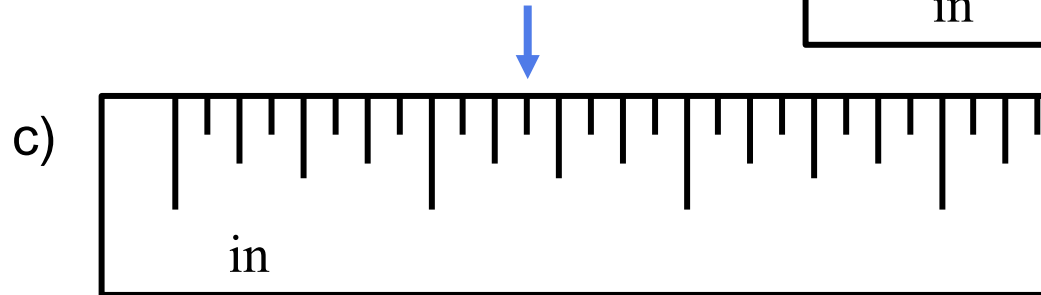
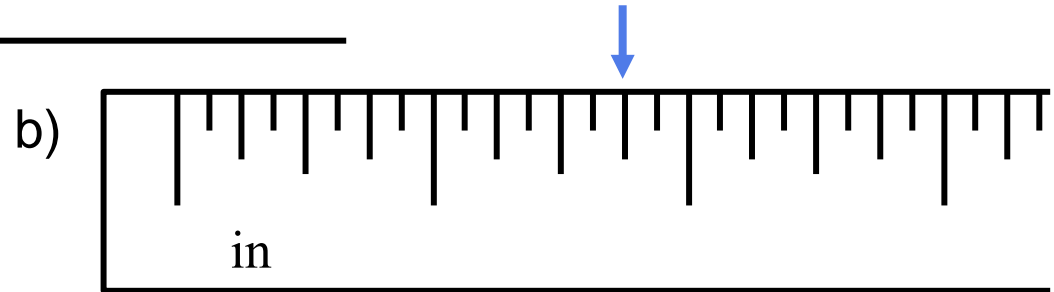
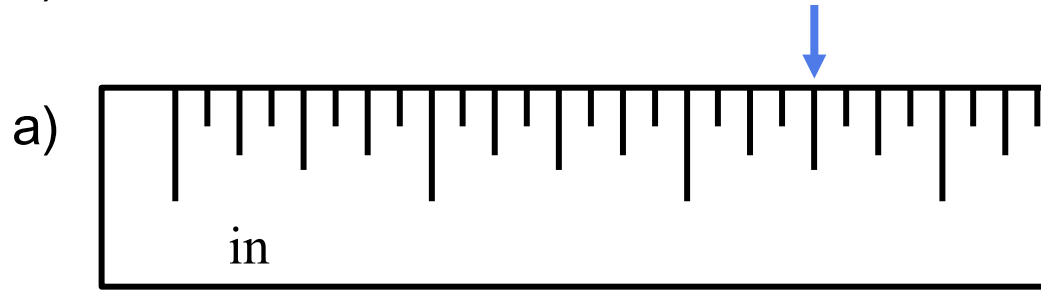
c $2.5 \times 100^{-6} \text{ m}$



Hal mikron (mikromitir) = $1 \times 10^{-6} \text{ m}$

Adigoo isticmaalaya halbeegga caalamiga ah (SI) ee cabbirka mitirka iyo luqadda caalamiga ah ee xisaabta (standard form), injineerada adduunka oo dhan waxay si sax ah isula xiriiri karaan.

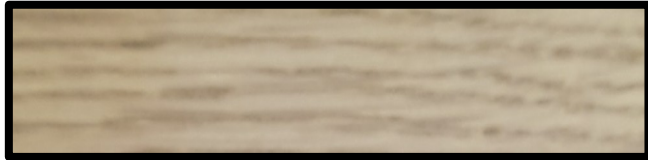
1) Akhri cabbiraadahan.



2) Isticmaal qiyaas guud (rule of thumb) si aad u cabbirto kuwan hoose:

a) Hal iyo saddex meelood oo sideed meelood oo inji ah.

b) Laba iyo saddex meelood oo lix iyo toban meelood oo inji ah.



3) a) Immisa millimitir ayaa ku jira sentimitir?

Hal sentimitir

$$\frac{1}{100} \text{ m}$$

$$1 \times 10^{-2} \text{ m}$$

Hal millimitir

$$\frac{1}{1000} \text{ m}$$

$$1 \times 10^{-3} \text{ m}$$

b) Immisa mikromitir ayaa ku jira millimitir?

Hal mikromitir

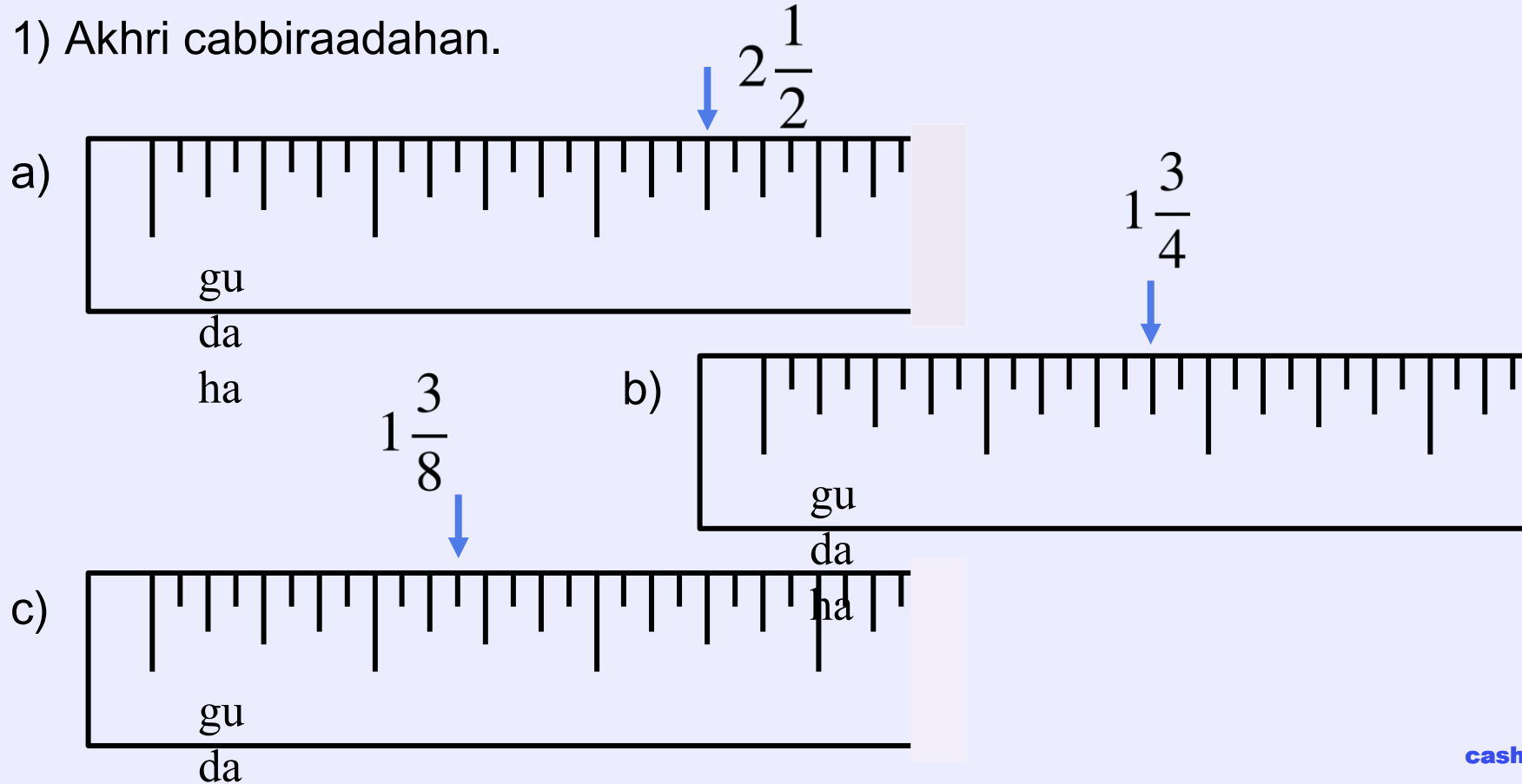
$$\frac{1}{1\,000\,000} \text{ m}$$

$$1 \times 10^{-6} \text{ m}$$

c) Immisa mikromitir ayaa ku jira sentimitir?

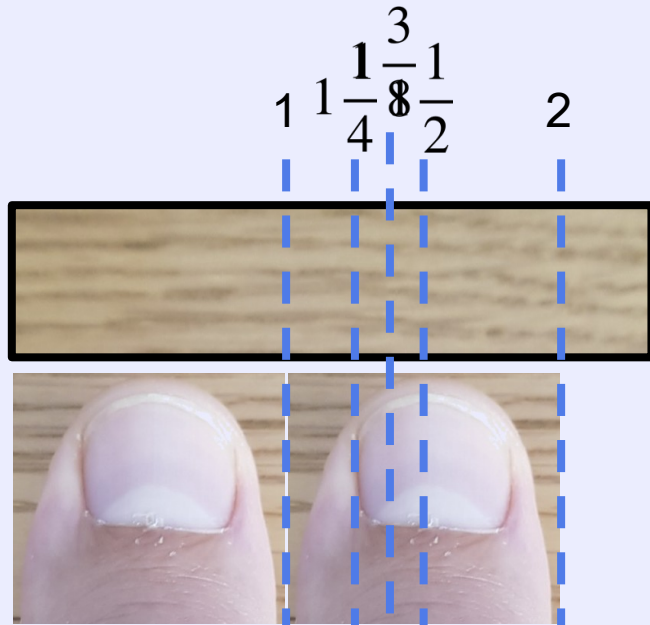
d) Injineerada waxay ku goyn karaan leysar (laser) sax ah ilaa $2.5 \times 10^{-5} \text{ m}$
Waa intee qayb ee sentimitir?

1) Akhri cabbiraadahan.

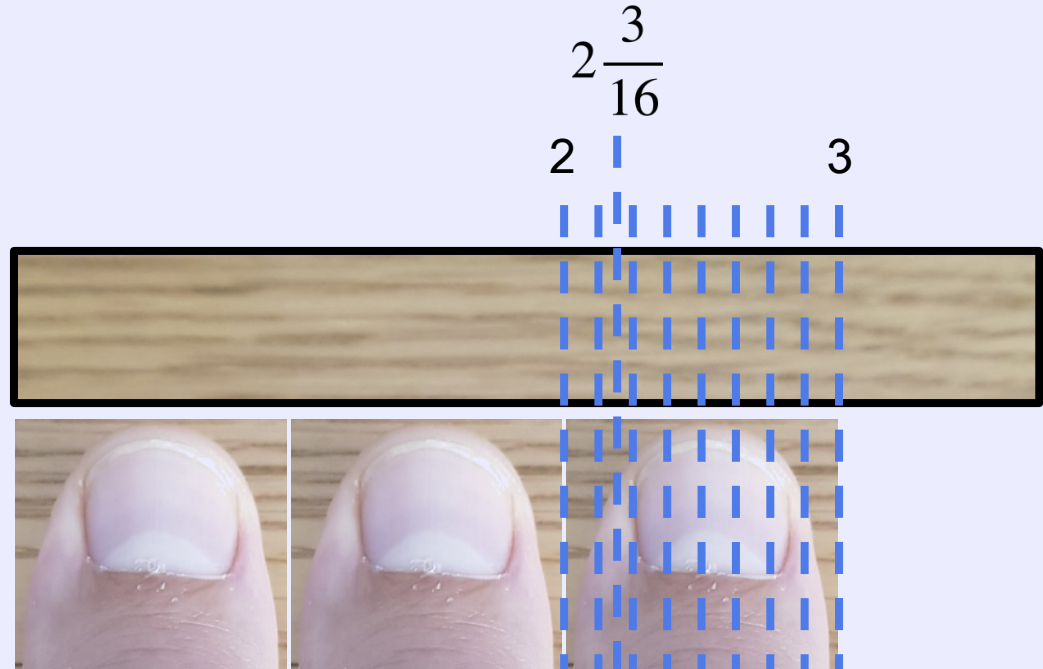


2) U isticmaal qiyaas (rule of thumb) si aad u cabbirto kuwan hoose:

a) Hal iyo saddex meelood oo sideed inji.



b) Laba iyo saddex meelood oo lix iyo toban inji.



3) a) Immisa millimitir ayaa ku jira sentimitir?

Hal sentimitir

$$\frac{1}{100} \text{ m}$$

$$1 \times 10^{-2} \text{ m}$$

10

Hal millimitir

$$\frac{1}{1000} \text{ m}$$

$$1 \times 10^{-3} \text{ m}$$

b) Immisa mikromitir ayaa ku jira millimitir?

Hal mikromitir

$$\frac{1}{1\,000\,000} \text{ m}$$

$$1 \times 10^{-6} \text{ m}$$

$$(1 \times 10^{-3}) \div (1 \times 10^{-6}) = 1000$$

c) Immisa mikromitir ayaa ku jira sentimitir?

$$(1 \times 10^{-2}) \div (1 \times 10^{-6}) = 10\,000$$

3)

Hal sentimitir	$\frac{1}{100} \text{ m}$	$1 \times 10^{-2} \text{ m}$
Hal millimitir	$\frac{1}{1000} \text{ m}$	$1 \times 10^{-3} \text{ m}$
Hal mikromitir	$\frac{1}{1\,000\,000} \text{ m}$	$1 \times 10^{-6} \text{ m}$

d) Injineerada ayaa ku gooyn kara leysarka saxnaan ah $2.5 \times 10^{-5} \text{ m}$
Waa imisa qayb ee sentimitir?

$$\frac{2.5 \times 10^{-5}}{1 \times 10^{-2}} = \frac{2.5 \times 10^{-5} \times 10^5}{1 \times 10^{-2} \times 10^5} = \frac{2.5}{10^3} = \frac{25}{10\,000} = \frac{1}{400}$$

Ma qiyaasi kartaa rubuc boqol oo sentimitir! Kani waa saxnaanta injineeradu ku shaqeeyaan.

Injineer



Saxnaanta injineernimada



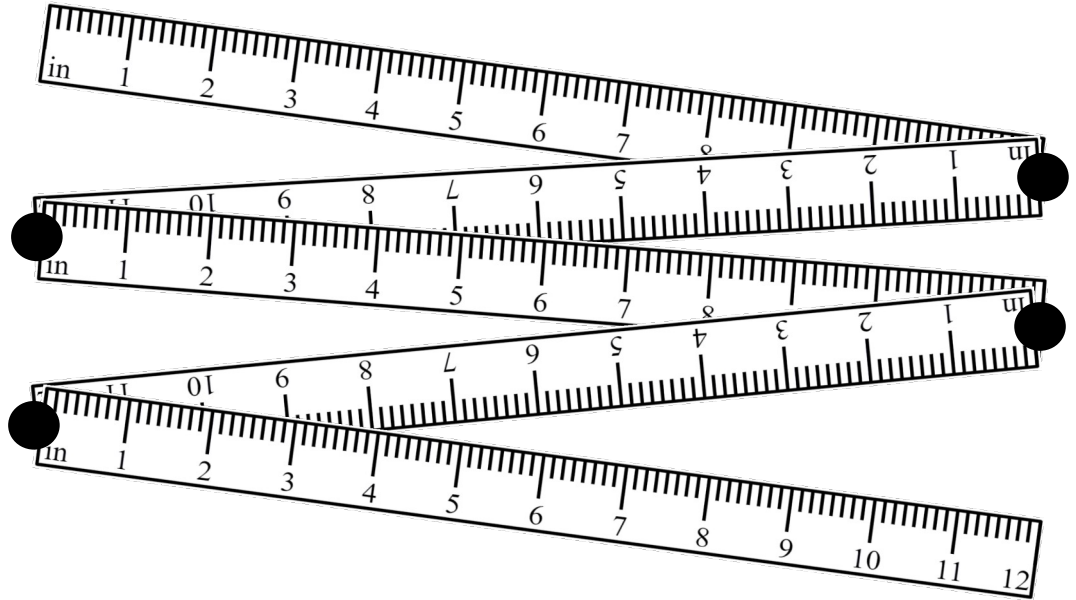
Codsiyada kale ee xisaabta

Codsiyada kale ee xisaabta



Sharaxaad

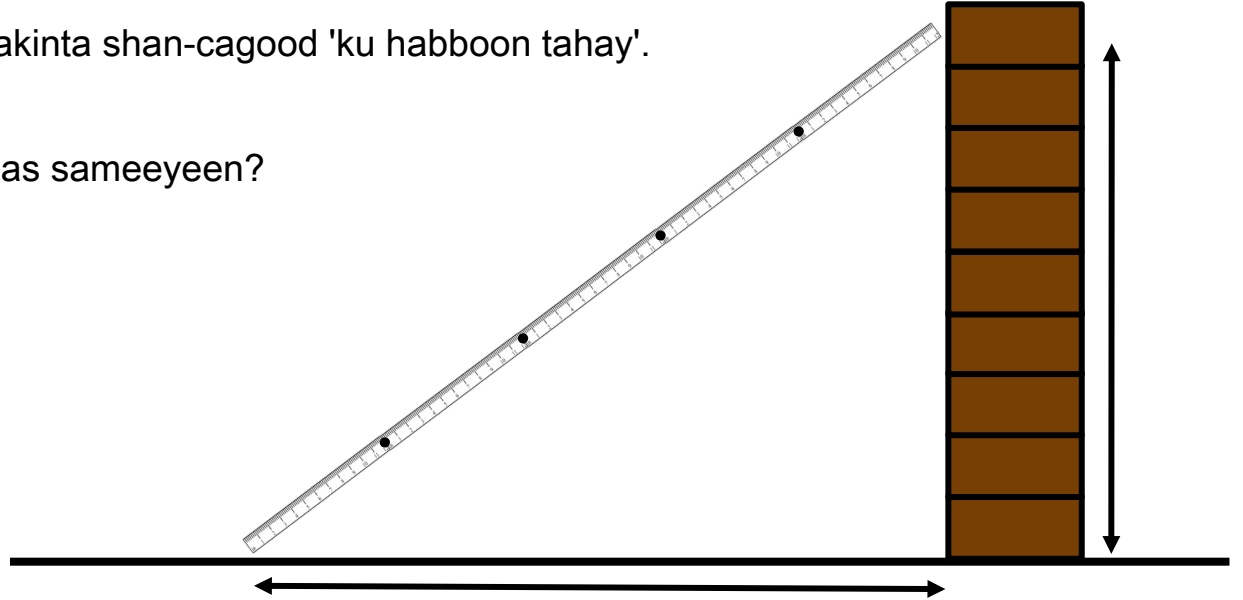
Xeerka Mason wuxuu ahaa xaakin shan-cagood ah oo la laalaabo. Afar ma aha, lixna ma aha. Shan. Tani waxay ahayd sabab.



Marka la dhisayo gidaar, bilowga hawsha, mason wuxuu qiyaasi jiray saddex cagood oo gidaarka kor ah, iyo afar cagood oo saldhigga ah.

Kadib waxay arki jireen haddii xaakinta shan-cagood 'ku habboon tahay'.

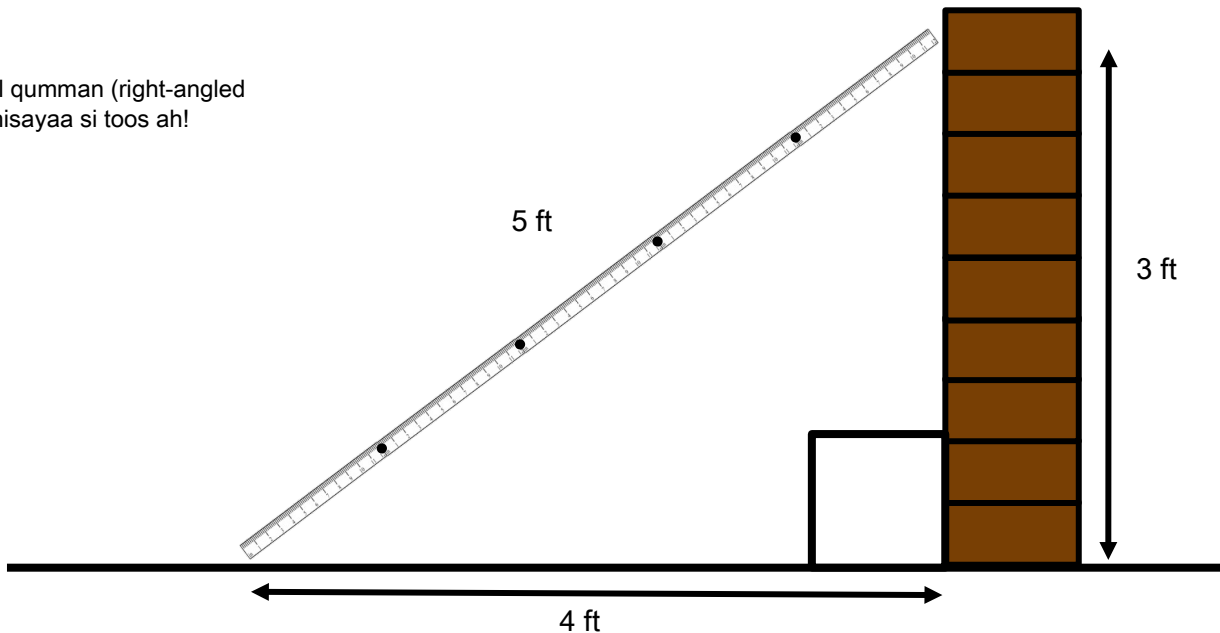
Maxaad u malaynaysaa inay sidaas sameeyeen?



Kani waa aragtida (Theorem) ee Pythagoras oo shaqeysa!

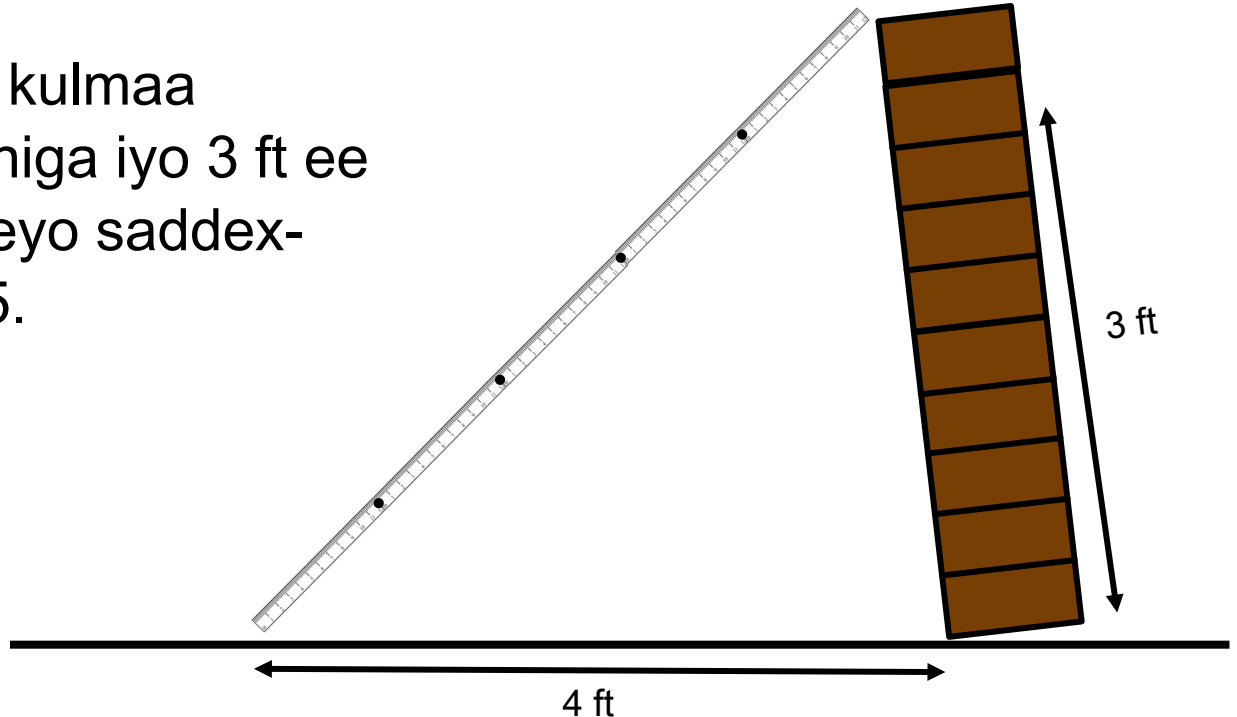
$3^2 + 4^2 = 5^2$, waa saddex-geesood (triplet) Pythagorean.

Tani waxay muujinaysaa in kani yahay saddex-xagal qumman (right-angled triangle). Waxaa muhiim ah, gidaarka waxaa laga dhisayaa si toos ah!



Haddii gidaarku uusan ahayn 'qumman', sharciga shanta-cagood (five-foot rule) ma habboonaayo.

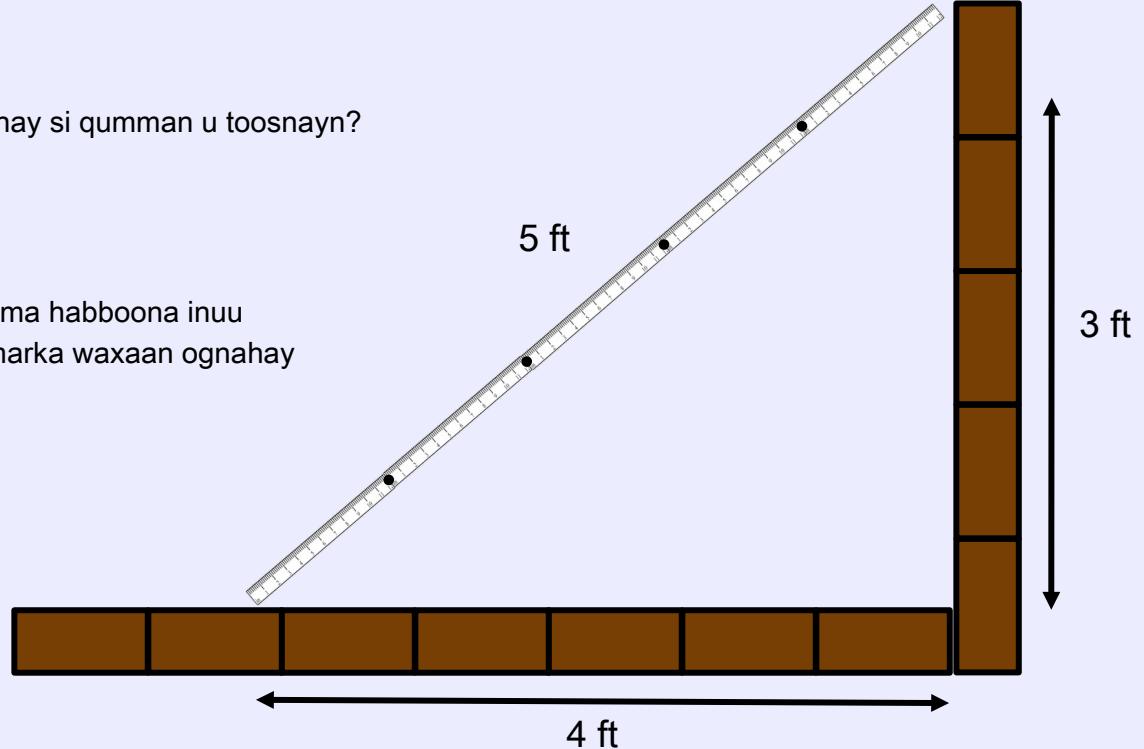
Sharcigu waa inuu la kulmaa
dhibcaha 4 ft ee saldhiga iyo 3 ft ee
gidaarka si loo sameeyo saddex-
xagal qumman 3, 4, 5.



Lebedyadan waxaa la dhigayaa geeska dhismo cusub.

Sidee ku ogaanaynaa in labada gidaar aanay si qumman u toosnayn?

Waxaa laga yaabaa inaad tidhi, 'Sharcigu ma habboona inuu sameeyo saddex-xagal qumman 3, 4, 5, marka waxaan ognahay in geesku uusan ahayn xagal qumman'.

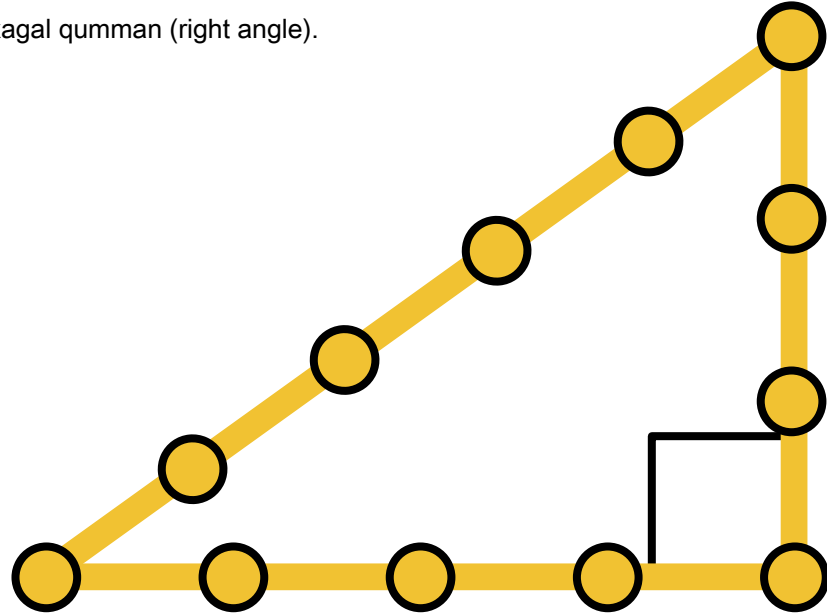


Injineerada Masaarida qadiimiga ah waxay sameyn jireen saddex-xagal 3, 4, 5 oo xadhig ah oo lagu calaamadeeyay guntimo.

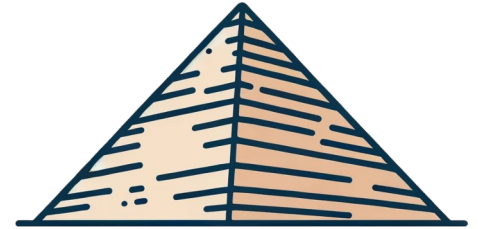
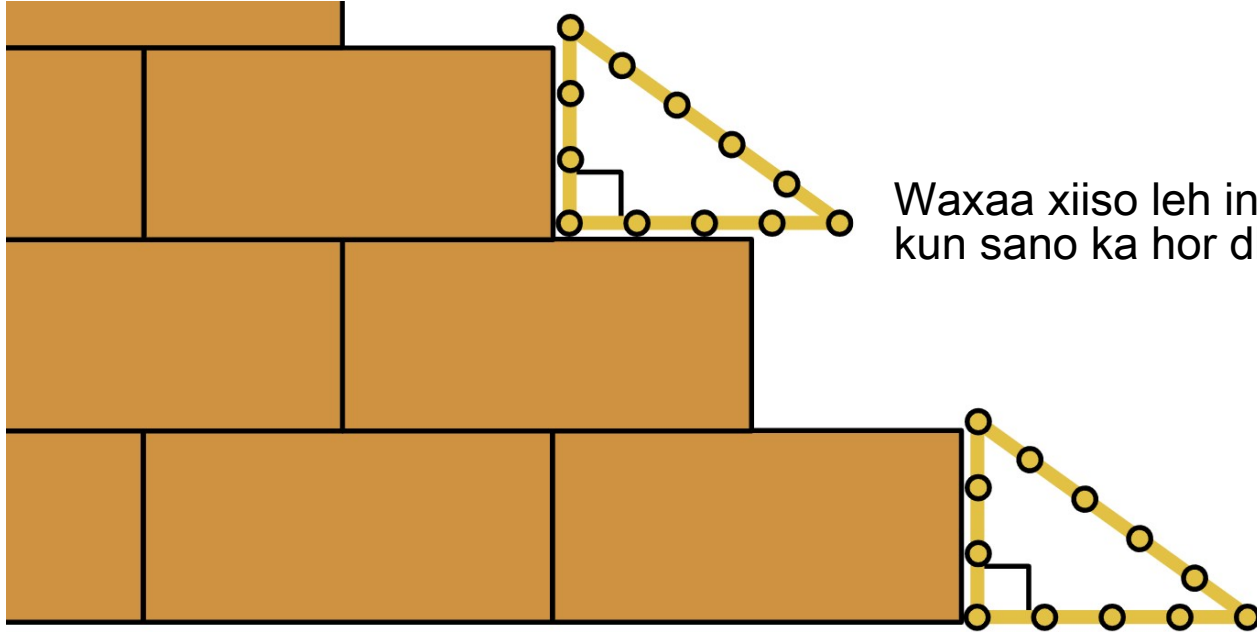
Markay saddexagalka si adag u jiiideen, waxay ogaadeen inay leeyihiin xagal qumman (right angle).

Ma u malaynaysaa inay isticmaaleen cagaha (feet)?

Masaaridii hore waxay ka horreeyaan 'cagaha' kumanaan sano, laakiin haddii aad isticmaasho halbeeg isku mid ah oo xadhigga ku dhex jira, xadhiggu wuu shaqeeyaa.



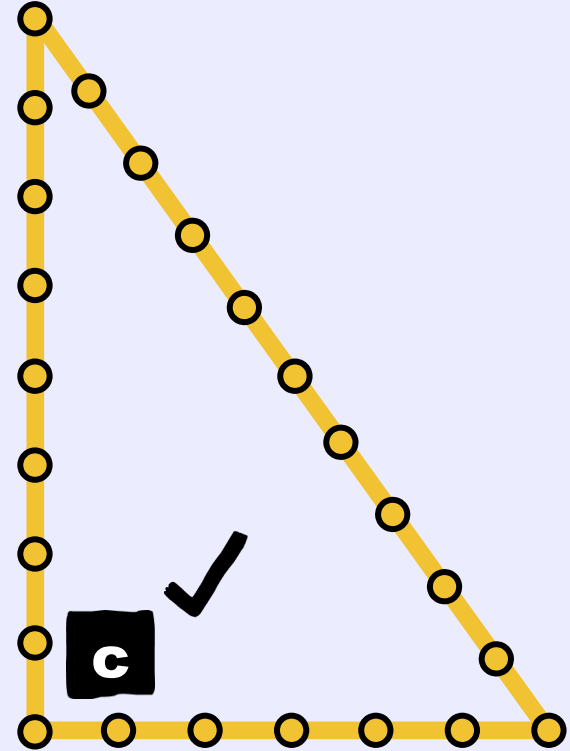
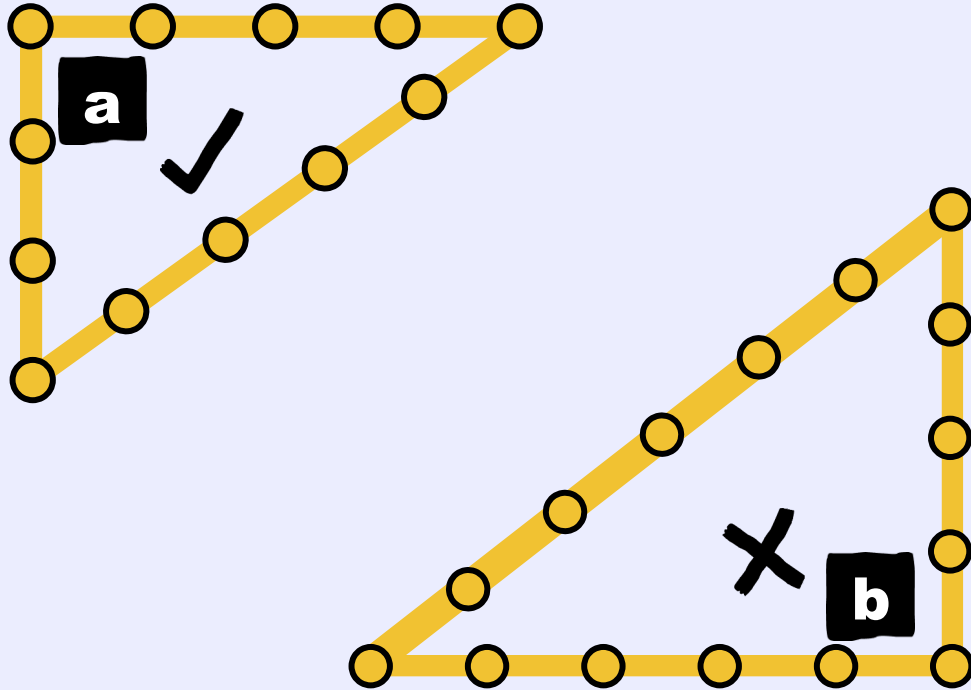
Injineerradii Masaarida ee qadiimiga ahaa waxay ahaayeen kuwa ugu horreeya ee dhisaayaasha waaweyn ee taariikhda aadanaha. Waxay isticmaaleen saddexagallo 3, 4, 5 si ay u hubiyaan in wax kasta ay 'qumman' yihiin markay dhisaan.



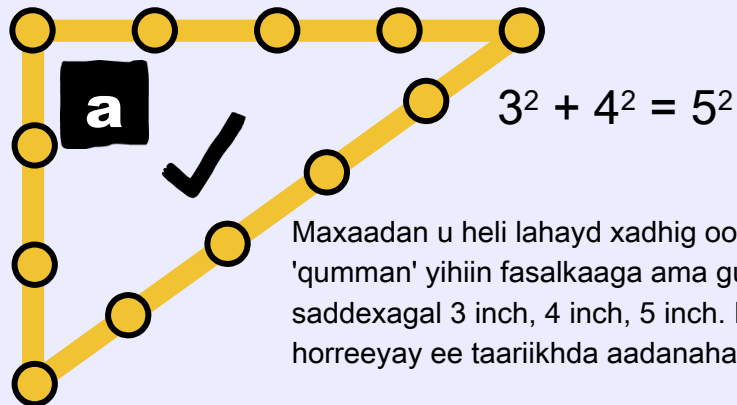
Waxaa xiiso leh inay tani sameeyeen laba kun sano ka hor dhalashadii Pythagoras!

Codsiyada kale ee xisaabta

Kee ka mid ah xadhigyadan ayay Masaaridu isticmaali karaan si ay u hubiyaan in wax 'qumman' yihiin?

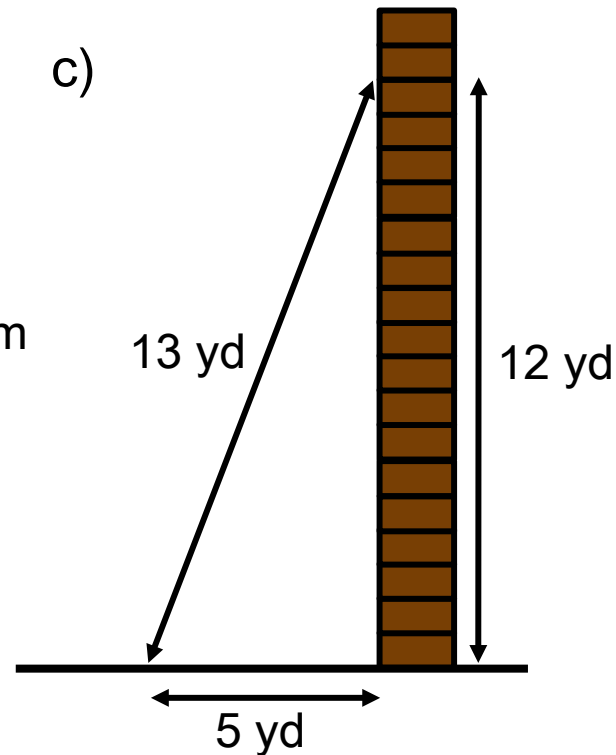
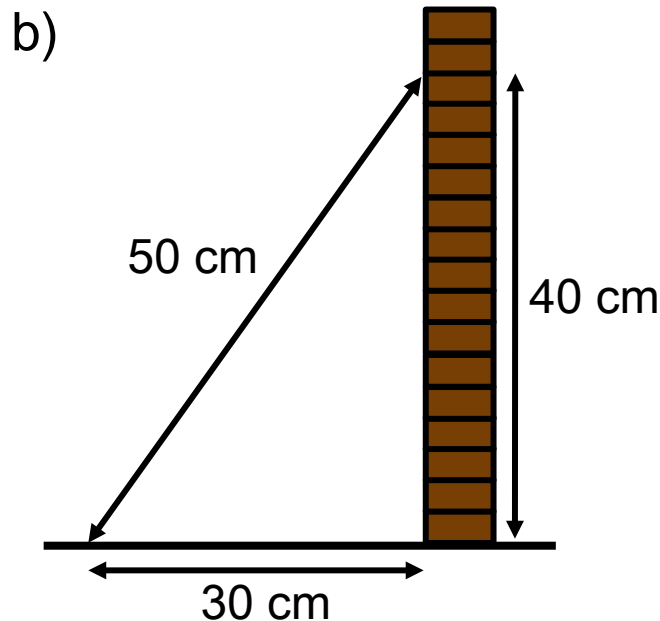
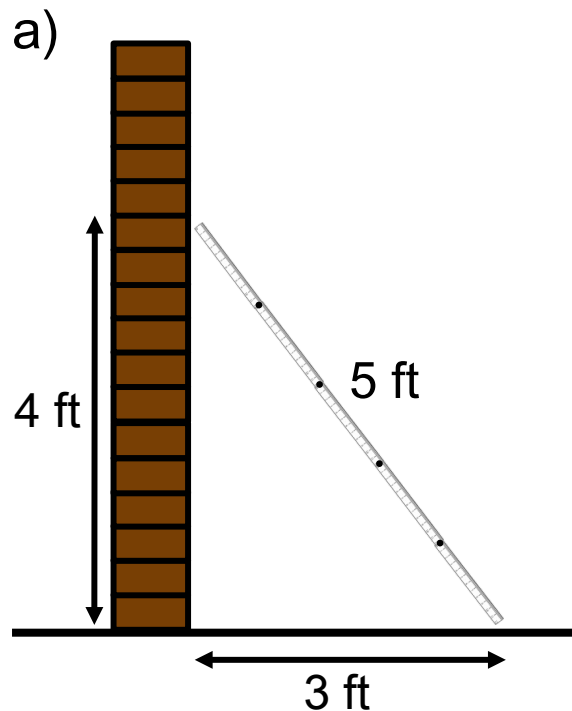


Injineerradii Masaarida ee qadiimiga ahaa (iyo kuwa badan oo iyaga ka dambeeyay!) waxay isticmaaleen saddexagallo 3, 4, 5 sababtoo ah tani waa saddexda ugu yar, sidaas darteed waa kuwa ugu waxtarka badan in la sameeyo.

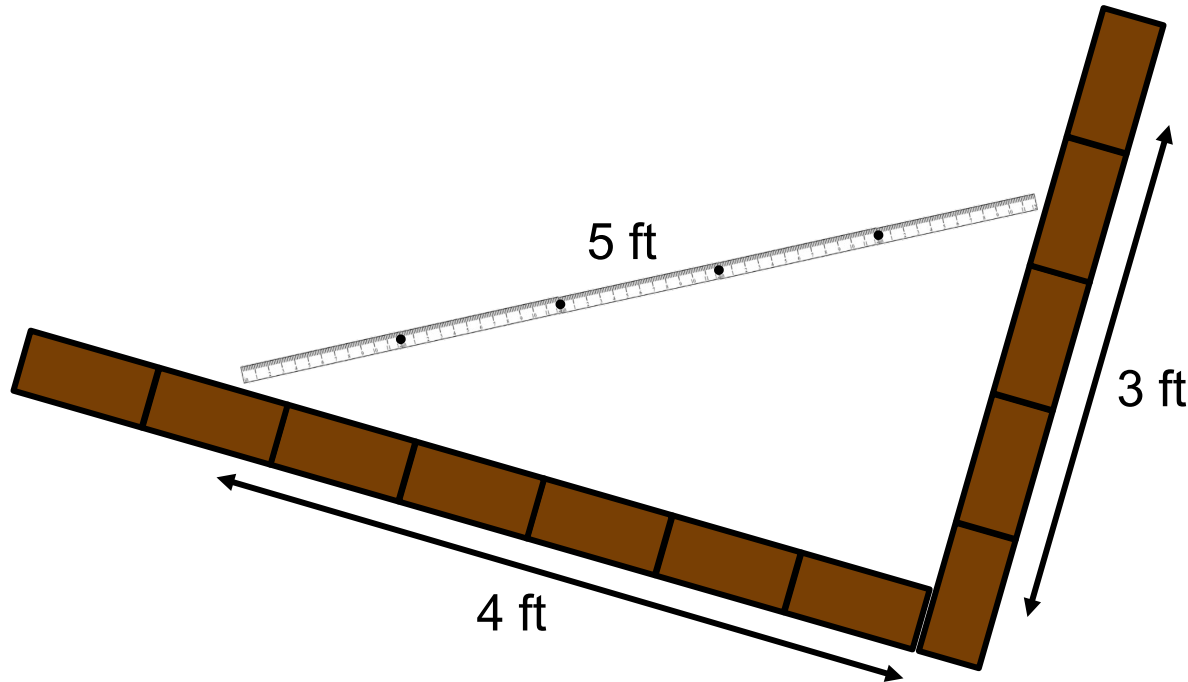


Maxaadan u heli lahayd xadhig oo aad samaysan lahayd saddexagalkaaga 3, 4, 5 si aad u hubiso in wax 'qumman' yihiin fasalkaaga ama gurigaaga? Uma baahnid inaad isticmaasho cagaha, waxaad samayn kartaa saddexagal 3 inch, 4 inch, 5 inch. Haddii aad tani sameyso, waxaad u dhaqmi doontaa sida injineerradii ugu horreeyay ee taariikhda aadanaha!

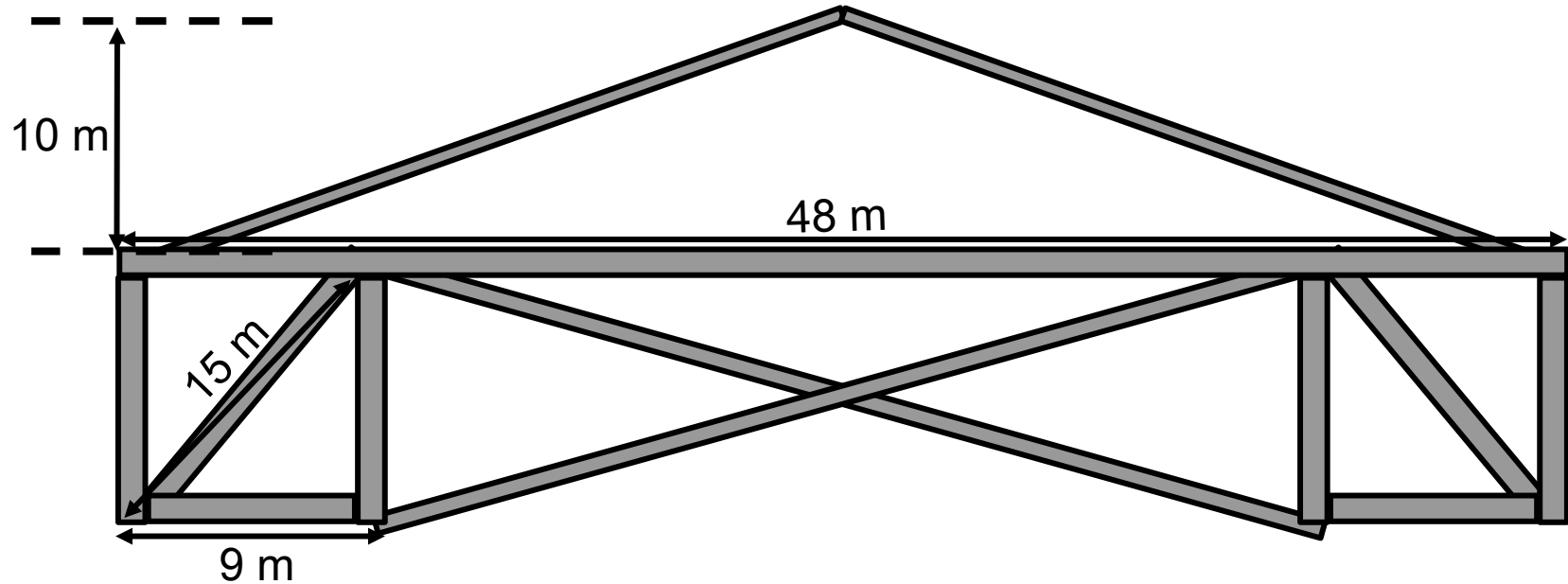
1) Muuji in mid kasta oo ka mid ah darbiyadan uu taagan yahay si toos ah.



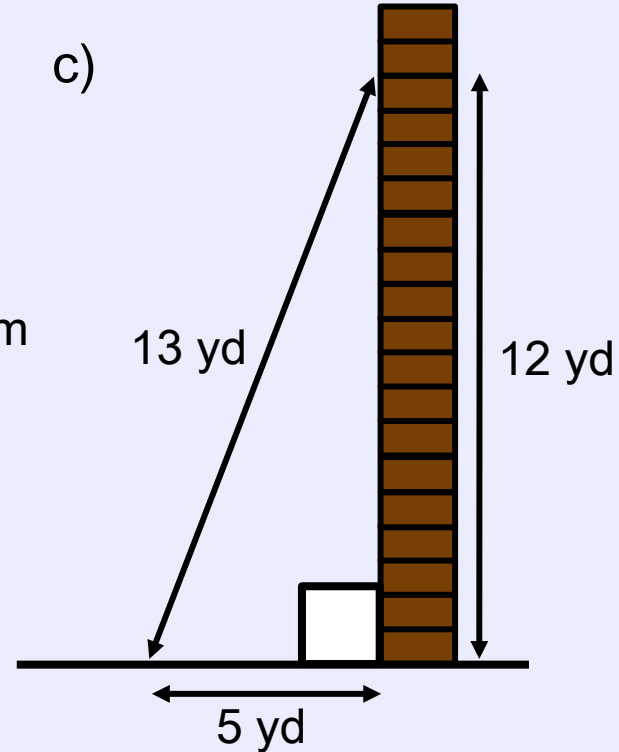
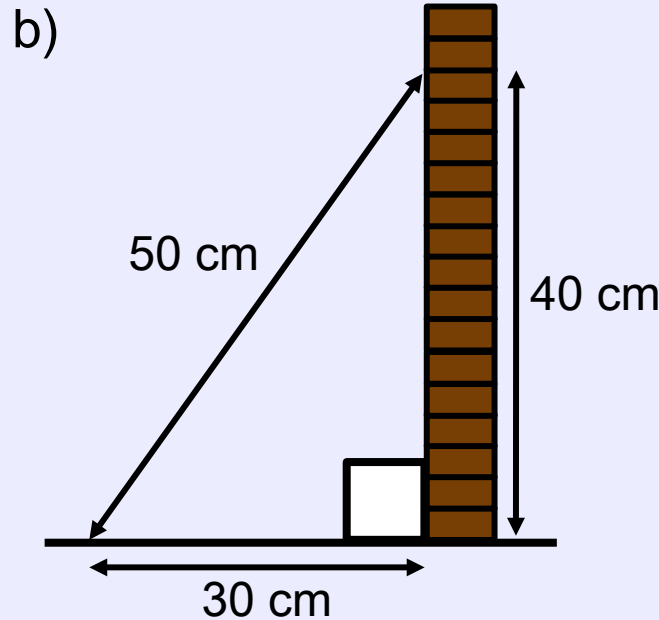
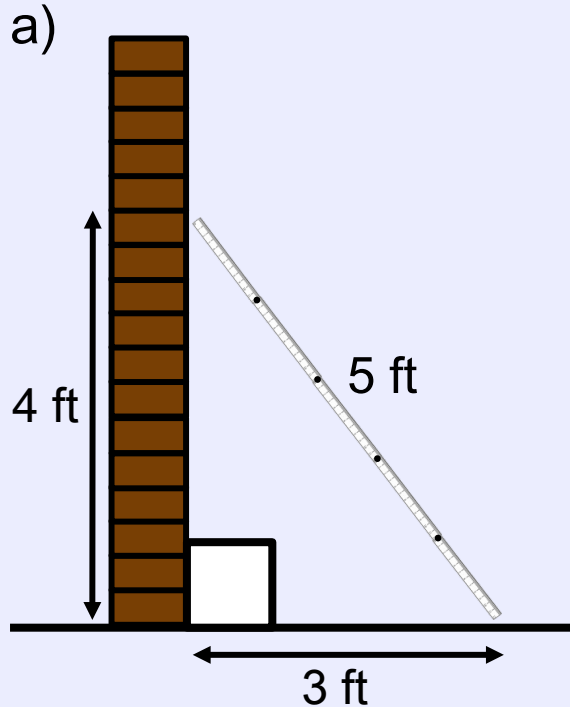
2) Sharax sida aan u ogaanay in geeskanu uusan ahayn 'mid toosan'.



3) Injineerada maanta waxay isticmaalaan Pythagoras si ay u xisaabiyaan dhererka. Soo hel dhammaan dhererka maqan ee birta buundadan. Naqshaddu waa isku mid (symmetrical).

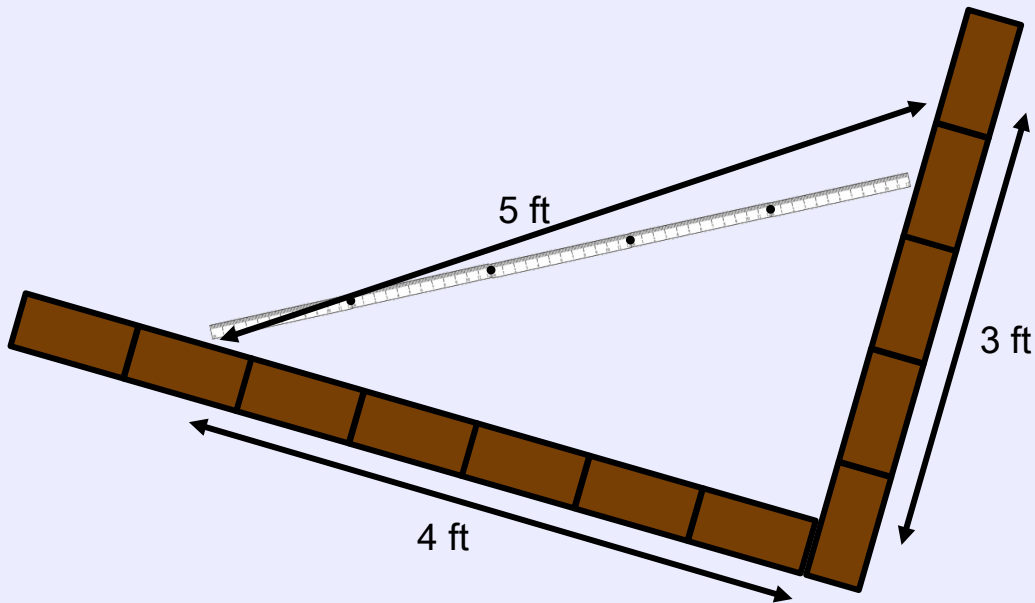


1) Muuji in mid kasta oo ka mid ah darbiyadan uu taagan yahay (upright).



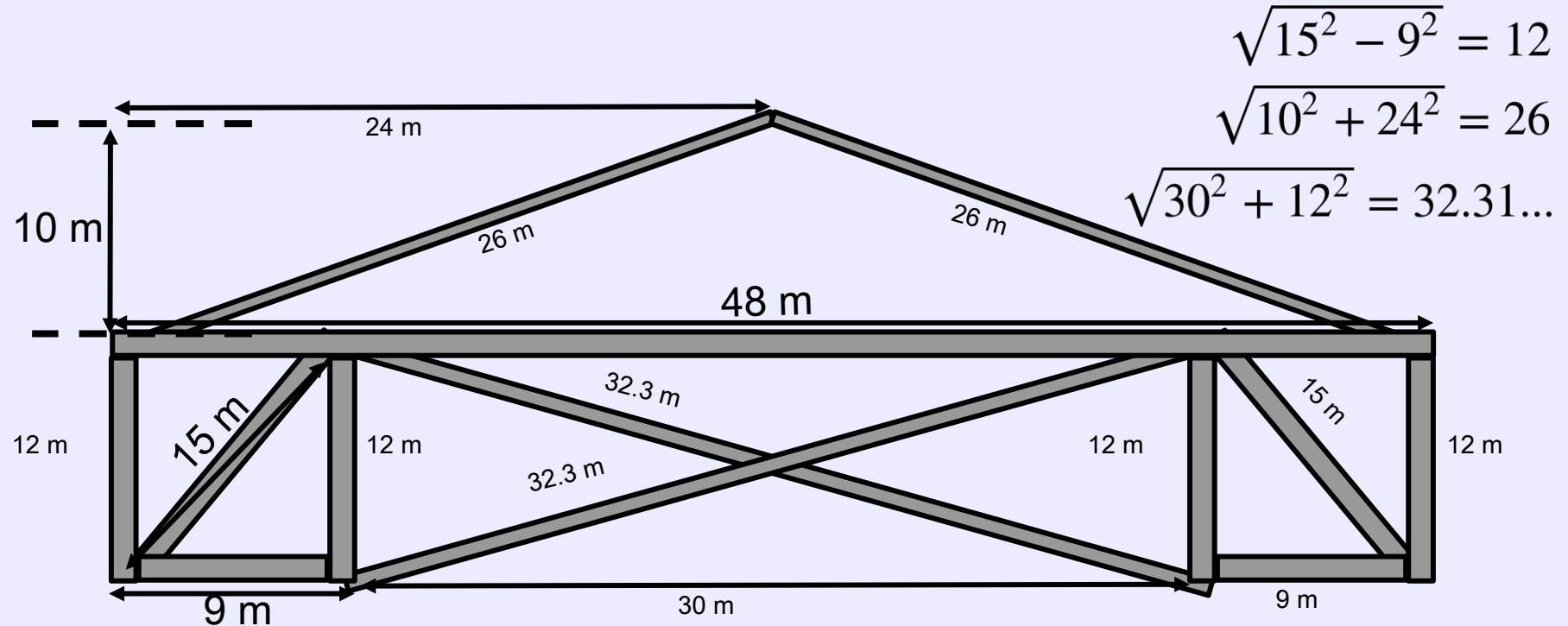
2) Sharax sida aan u ogaanay in geeskanu uusan ahayn 'midig'.

Waxaad laga yaabaa inaad tidhi, "Si loo ahaado 'midig' Xeerka Mason waa inuu 'ku habboonaado' dhibcaha lagu qiyaasay 3 ft iyo 4 ft si loo sameeyo saddexagal 'midig' 3, 4, 5".



"Sababtoo ah xeerku halkan kuma 'habboona' waxaan ognahay in dhererka saddexaad uusan ahayn 5 ft sidaas darteed kani ma aha saddexagal xagal-midig; geesku ma aha xagal-midig."

3) Injineerrada maanta waxay isticmaalaan Pythagoras si ay u xisaabiyaan dhererka. Soo hel dhammaan dhererka maqan ee biraha buundadan. Naqshaddu waa siman (symmetrical).



Waxaan aragnay qaar ka mid ah siyaabaha xisaabta ay u isticmaalaan injineerrada.

Waxaan fahamnay baahida loo qabo saxnaanta iyo in injineerrada ay isticmaalaan qaabka caadiga ah (standard form) si ay u gudbiyaan tirooyin aad u sax ah.

Waxaan ognahay in kumanaan sano injineerrada ay isticmaaleen aragtida Pythagoras (Pythagoras' theorem) si ay u hubiyaan xagasha midig iyo kuwa aan midig ahayn shaqadooda.