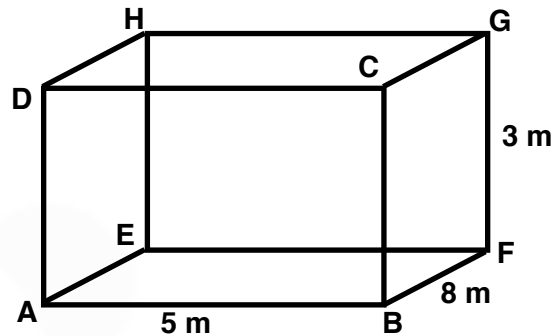


## Graphs of sine, cosine and tangent

### Starter

1. **(Review of last lesson)** In the cuboid,  $GF = 3$  m,  $AB = 5$  m,  $BF = 8$  m. Find:
- the exact length of  $AF$
  - the angle the line  $AG$  makes with the plane  $CDGH$ , to 1 d.p.



**Working:** (a) *Draw a right-angle triangle with  $AF$  in it.*

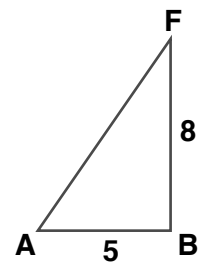
By Pythagoras,  $AF^2 = 5^2 + 8^2$

$$AF^2 = 89$$

$$AF = \sqrt{89}$$

*Leave in surd form as exact answer required.*

**N.B.**  $\sqrt{89} = 9.43$  (3 s.f.)



(b) *Draw a right-angle triangle with  $AG$  in it.*

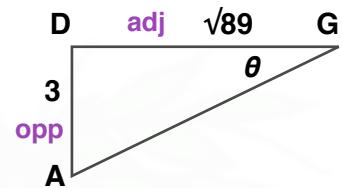
$DG = AF$  and  $AD = GF$

*Label the given sides.*

*Choose which trig. ratio to use: tan*

$$\tan \theta = \frac{3}{\sqrt{89}}$$

$$\theta = \tan^{-1}\left(\frac{3}{\sqrt{89}}\right) = 17.6^\circ$$



The angle between the line  $AG$  and the plane  $CDGH$  is  $17.6^\circ$  (3 s.f.)

### Notes

Your calculator gives  $\sin^{-1}\left(\frac{1}{2}\right)$  as  $30^\circ$ , but is there another angle such that  $\sin x = \frac{1}{2}$  when  $x$  is between  $0^\circ$  and  $360^\circ$ .

**E.g. 1** Copy and complete the table for  $0^\circ$  to  $360^\circ$ , gives values to 2 d.p.

	$0^\circ$	$30^\circ$	$60^\circ$	$90^\circ$	$120^\circ$	$150^\circ$	$180^\circ$	$210^\circ$	$240^\circ$	$270^\circ$	$300^\circ$	$330^\circ$	$360^\circ$
$\sin x$	0	0.5											
$\cos x$	1	0.87											
$\tan x$	0	0.58											

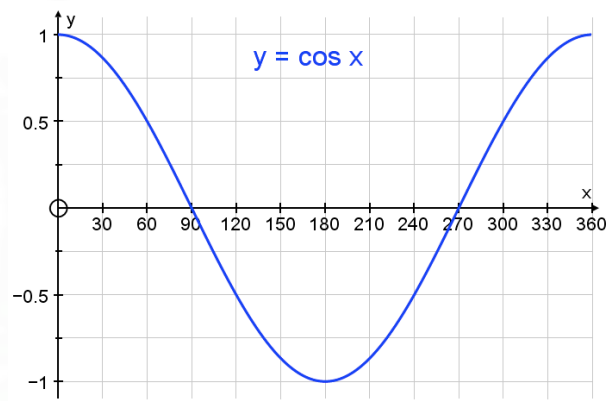
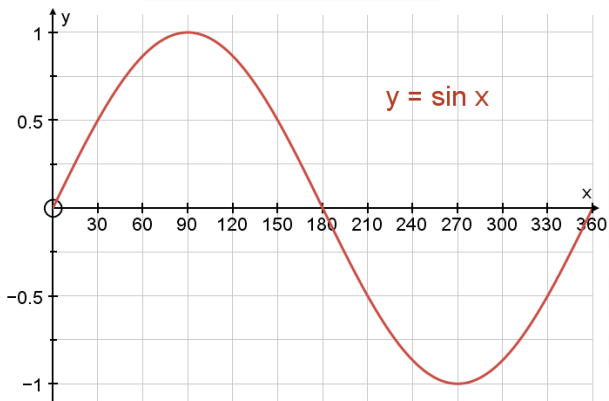
**Working:**

	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°	360°
sin x	0	0.5	0.87	1	0.87	0.5	0	-0.5	-0.87	-1	-0.87	-0.5	0
cos x	1	0.87	0.5	0	-0.5	-0.87	-1	-0.87	-0.5	0	0.5	0.87	1
tan x	0	0.58	1.73	—	-1.73	-0.58	0	0.58	1.73	—	-1.73	-0.58	0

\*\*\*tan x is undefined for 90° and 270°.

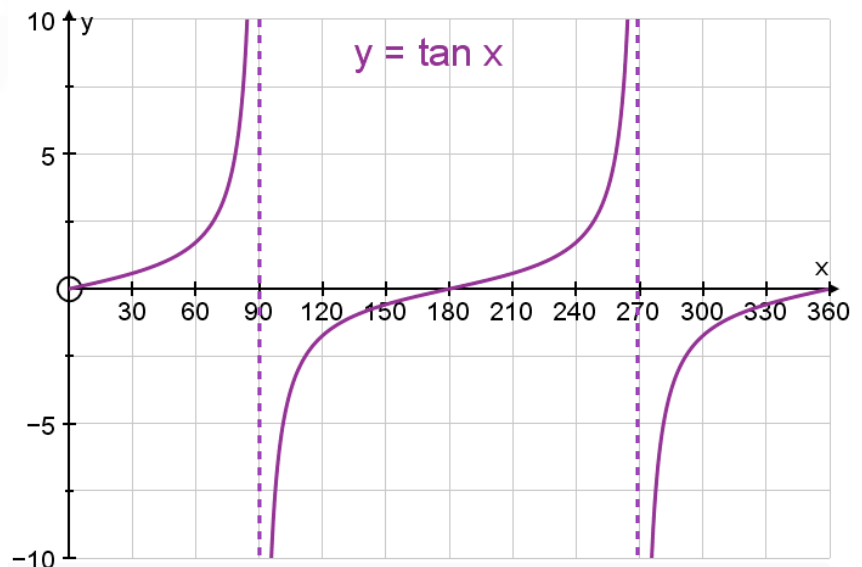
**E.g. 2** Draw the graph of  $y = \sin x$ .  
Use the scales: Horizontal scale: 1 cm  $\equiv$  30°. Vertical scale: 4 cm  $\equiv$  1 unit.

**E.g. 2** Draw the graph of  $y = \cos x$ .  
Use the scales: Horizontal scale: 1 cm  $\equiv$  30°. Vertical scale: 4 cm  $\equiv$  1 unit.



**N.B.** If we translate the graph of  $y = \sin x$  to the left 90°, it will become the graph of  $y = \cos x$ .

**E.g. 3** Draw the graph of  $y = \tan x$ .  
Use the scales: Horizontal scale: 1 cm  $\equiv$  30°. Vertical scale: 4 cm  $\equiv$  1 unit.



The graph of  $y = \tan x$  has two *asymptotes (denoted by dotted lines)* at the place where the curve is undefined.

The curve gets closer and closer to the asymptote but never actually touches it.

Video: [Sine graph](#)  
Video: [Cosine graph](#)  
Video: [Tangent graph](#)

[Solutions to Starter and E.g.s](#)

### Exercise

From the syllabus "Recognise and sketch the graphs of  $y = \sin x$ ,  $y = \cos x$  and  $y = \tan x$ ."

9-1 class textbook: No exercise needed

A\*-G class textbook: No exercise needed

9-1 homework book: No exercise needed

A\*-G homework book: No exercise needed