Q1. Solve 18x - 5 = 13x + 30   *Non-Calculator!*

Q2. State the area of a circle with a diameter of 20cm, use $\pi = 3.14$

Q3. Write 5.6 x 10^{-3} in normal form

Q4. Share £252 in the ratio 3:2

Q5. Calculate the speed a car is travelling at if it can travel 125km in 1 hour and 15 minutes
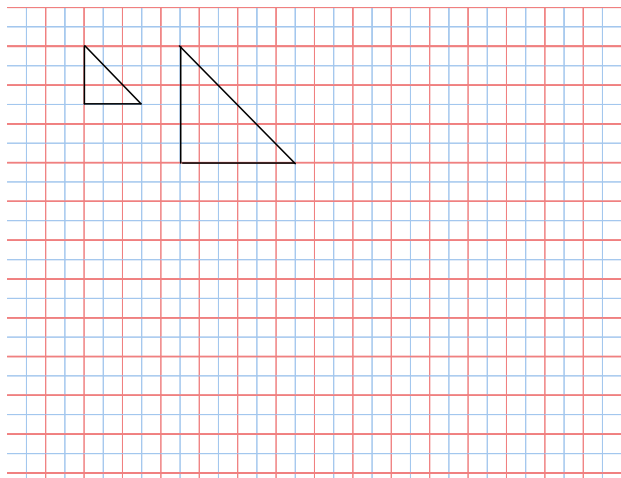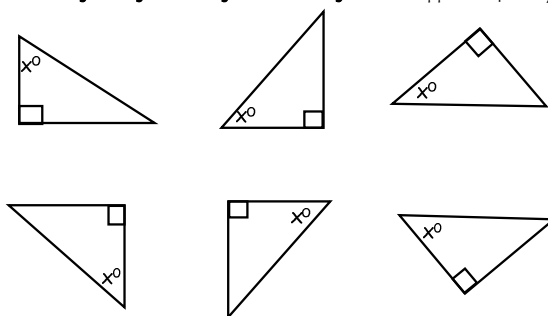
Today we will be learning about right-angled trigonometry.

Labelling Sides in a Right-Angled Triangle

The Hypotenuse is the longest side and is always opposite the right angle.

Mark in the opposite, adjacent and the hypotenuse side for each of these right-angled triangles according to x° Opp. Adj. Hyp.

Q1. Rearrange the formula $V = \pi r^2 h$ so that r is the subject

Q2. 400 bars of soap cost £40, how much would 7 cost?

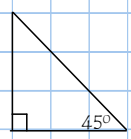Q3. State the equation of the line joining (-3, 2) and (0, 4)

Q4. Solve for x   5x – 1 = 2x + 14

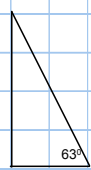Q5. Write 18 out of 30 as a percentage

Today we will be continuing to learn about trigonometric ratios.

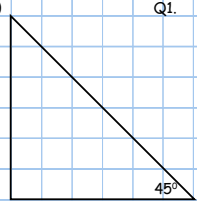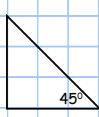Recognising Ratios of sides in Right Angled Triangles

1.

(i) Enlarge by a scale factor of 2

opp. ÷ adj. =   adj. ÷ hyp. =   opp. ÷ hyp. =
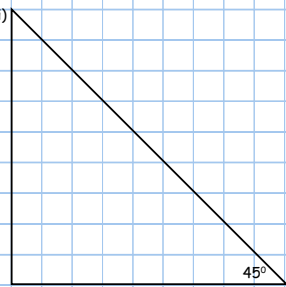
(ii) Enlarge by a scale factor of 3

opp. ÷ adj. =   adj. ÷ hyp. =   opp. ÷ hyp. =
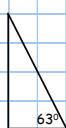
(iii) Reduce by a s.f. of 0.5

opp. ÷ adj. =   adj. ÷ hyp. =   opp. ÷ hyp. =

45°
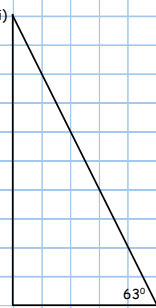
2.

(i) Enlarge by a scale factor of 1.5

opp. ÷ adj. =   adj. ÷ hyp. =   opp. ÷ hyp. =

(ii) Enlarge by a scale factor of 2.5

opp. ÷ adj. =   adj. ÷ hyp. =   opp. ÷ hyp. =

63°

(i)   Q1.   (ii)

45°   45°

(iii)

45°

(i)   Q2.   (i)

63°

63°

(ii)

63°

Trigonometric Ratios

For every possible acute angle in a triangle, there is a given ratio for the sides opposite and adjacent to it.

These ratios are known as Sin, Cos and Tan.

Trigonometric Ratios

$\text{Sin } x°$ $\text{Cos } x°$ $\text{Tan } x°$

Write down the sin, cos and tan for x in each

(a)

3 | x° | 5 | 4

(b)

13 | 12 | x° | 5

(c)

12 | 9 | x° | 15

(d)

8 | 10 | x° | 6

(e)

8 | x° | 15 | 17

(f)

29 | x° | 20 | x° | 21

Q1. Find 18% of 200

18% of 100 = 18
18 × 2 = 36

Q2. Round 71.2278 to 1 decimal place

71.2

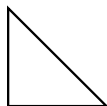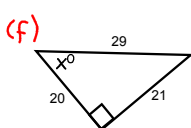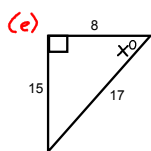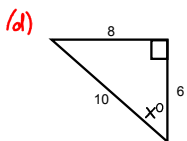**Q3. Multiply out and simplify 3(x + 4) + 2(2x – 8)**

3x + 12 + 4x – 16
7x – 4

Q4. Write 16 out of 48 as a percentage

$\frac{16}{48} = \frac{1}{3} = 33\frac{1}{3}\%$

Q5. Calculate the time it takes Harry to drive 180km if he drives at 80kmph

$T = \frac{D}{S} = \frac{180}{80} = 2.25 = 2hrs\ 15mins$
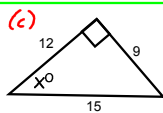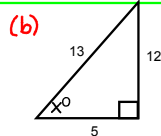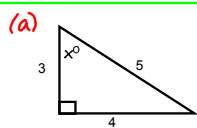
Today we will be continuing to learn about trig. ratios.

Opposite | Hypotenuse | Adjacent | x°

$Sin\ x° = \frac{opp.}{hyp.}$　　　$Cos\ x° = \frac{adj.}{hyp.}$　　　$Tan\ x° = \frac{opp}{adj}$

SOH CAH TOA

Right – Angled Trigonometry

Example 1: Write down sin, cos and tan for the angle x°

$Sin\ x° = \frac{o}{h} = \frac{3}{5}$ or 0.6

$Cos\ x° = \frac{a}{h} = \frac{4}{5}$ or 0.8

$Tan\ x° = \frac{o}{a} = \frac{3}{4}$ or 0.75

3 | 5 | 4 | x°
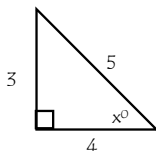
Right – Angled Trigonometry

Example 2: Write down sin, cos and tan for the angle x°

$Sin\ x° = \frac{28}{53}$

$Cos\ x° = \frac{45}{53}$

$tan\ x° = \frac{28}{45}$

x° | 45 | 53 | 28

Recognising Ratios on Right Angled Triangles

What ratio can I find in this triangle?

x° 12 hyp.
8 adj

$$\cos x^\circ = \frac{8}{12} = \frac{2}{3}$$

Recognising Ratios on Right Angled Triangles

What ratio can I find in this triangle?

15.5 opp.
x° 23.5 adj.

$$\tan x^\circ = \frac{15.5}{23.5}$$

Finding the angle given the ratio

If we know the ratio for a given angle, we can find the angle.
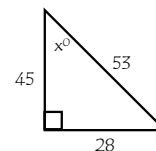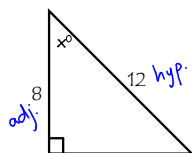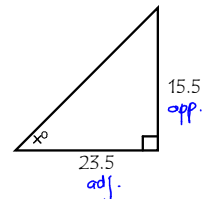
Examples: Find x°, given $x = \tan^{-1}(1.5) = 56.3^\circ$ (1d.p.)

(a) $\cos x^\circ = 0.8$ (b) $\tan x^\circ = 1.5$ (c) $\sin x^\circ = 0.88$

$x^\circ = \cos^{-1}(0.8) = 36.9^\circ$ (1d.p.) $x = \sin^{-1}(0.88) = 61.6^\circ$ (1d.p.)

(d) $\cos x^\circ = \frac{3}{4}$

$$x = \cos^{-1}\left(\frac{3}{4}\right) = 41.4^\circ \text{ (1d.p.)}$$

Finding the angle given the ratio

Questions: Find x° (to the nearest unit), given

(a) $\cos x^\circ = 0.65$ (b) $\tan x^\circ = 2.3$ (c) $\sin x^\circ = 0.2$

(d) $\sin x^\circ = 0.75$ (e) $\tan x^\circ = 4.88$ (f) $\cos x^\circ = 0.55$

(g) $\tan x^\circ = 1$ (h) $\cos x^\circ = 0.86$ (i) $\sin x^\circ = 0.45$

(j) $\sin x^\circ = \frac{32}{65}$ (k) $\cos x^\circ = \frac{107}{120}$ (l) $\tan x^\circ = \frac{83}{29}$

Daily Practice   17.8.2017

Q1. Find 28% of 7000
10% of 7000 = 700
1% " " = 70
$\begin{array}{r} 28 \\ \times 70 \\ \hline 1960 \end{array}$

Q2. Calculate the size of x   x cm   8.93cm   5.25cm
$x^2 = 8.93^2 - 5.25^2$
$x^2 = 52.1884$
$x = \sqrt{52.1884} = 7.22\text{cm}$ (2d.p.)

Q3. How far does Tim drive if he drives at a speed of 54mph for 1 hour and 45 minutes
$D = S \times T = 54 \times 1.75 = 94.5\text{miles}$

Q4. Share £240 in the ratio 1:4 $1 + 4 = 5$
$\begin{array}{r} 48 \\ 5\overline{)240} \end{array}$ $\begin{array}{r} 48 \\ \times 4 \\ \hline 192 \end{array}$ £48 £192

Q5. Solve for x, 2(x + 5) = 3(x + 17)
$2x + 10 = 3x + 51$
$10 = x + 51$
$-41 = x$
$x = -41$

Today we will be continuing to use Sin, Cos and Tan ratios to find missing angles in triangles.

Finding the angle

Examples:

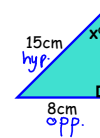1. (i) Which ratio can we find? Tan x°

   (ii) Find the value of x

$\tan x° = \frac{o}{a} = \frac{6.7}{5.5}$

$x = \tan^{-1}\left(\frac{6.7}{5.5}\right)$

$x = 50.6°$ (1d.p.)

- 6.7cm opp.
- 5.5cm adj.

Finding the angle

Examples:

2. Find the value of x

- 15cm hyp.
- 8cm opp.

$\sin x° = \frac{o}{h} = \frac{8}{15}$

$x = \sin^{-1}\left(\frac{8}{15}\right) = 32.2°$

Finding the angle

(a)
7.7 cm, 5.2 cm, x°

(b)
12.8 m, 29.4 m, x°

(c)
x°, 1.8m, 2.9 m

(d)
12.8 cm, 20.7 cm, x°

(e)
5.7 m, 9.3 m, x°

(f)
3 cm, 6.5 cm, x°

Finding the angle in context

James has designed a ramp into a house. It is 4.5m long and has a slope of 4.8m. To pass inspection, it needs to have an angle of elevation less than 20°.

Will it pass inspection?

- hyp. 4.8m
- x°
- 4.5m adj.
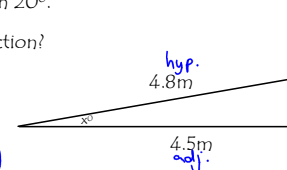
$\cos x° = \frac{4.5}{4.8}$

$x = \cos^{-1}\left(\frac{4.5}{4.8}\right)$

$x = 20.4°$ (1d.p.)

No, because 20.4° > 20°

Daily Practice   18.8.2017

Q1. Round 71.882 to 2 decimal places

→ 71.88

Q2. Find 2% of 850

$850 \div 100 = 8.5$

$8.5 \times 2 = 17$

Q3. Solve 3 - 3x = 18 + 2x

$3 - 5x = 18$

$-5x = 15$

$x = -3$

Q4. What is the value of x?

- 13 cm
- 9 cm
- x°

$\cos x° = \frac{9}{13}$ $x = \cos^{-1}\left(\frac{9}{13}\right) = 46.19°$

(2d.p.)
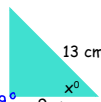
Q5. Write down the value of 3a² when a = -1

$3 \times (-1)^2 = 3 \times 1 = 3$

Today we will be learning how to find a missing side in a right - angled triangle using trig. ratios.

1. An aircraft making a steady descent decreases height by 2·16 km in 18·41 km.

   What is the angle of descent, $x°$?

   18·41 km

   2·16 km

2. Find angle x in this isosceles triangle

   $\sin m° = \frac{39}{81}$

   $m = \sin^{-1}\left(\frac{39}{81}\right) = 28.8° \, (1d.p)$

   $x = 28.8° \times 2 = 57.6°$

   81   81

   81 mm   81 mm

   39   39

   78 mm
   78

3. A manufacturer of concrete roof tiles states that to be suitable for concrete tiles the angle of a roof (pitch) must be greater than 21°.

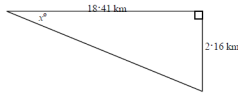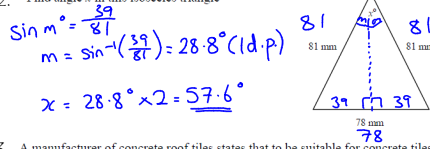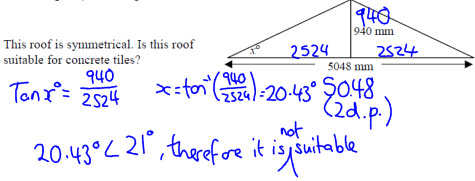   This roof is symmetrical. Is this roof suitable for concrete tiles?

   940
   940 mm

   2524   2524

   5048 mm

   $\tan x° = \frac{940}{2524}$ $x = \tan^{-1}\left(\frac{940}{2524}\right) = 20.43° \quad \frac{5048}{2524}$
   (2d.p.)

   $20.43° < 21°$, therefore it is not suitable

4. The angle of approach, $x°$, of a plane P as it comes in to land should be between 3° and 5° with the horizontal.

   The air traffic controller has to tell the pilot whether he is too high, too low or on the correct "glide path".

   P

   160 m

   A   3000 m $x°$
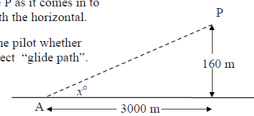
   An incoming plane is 3000 m away from its landing point A and is at a height of 160 m as shown in the diagram.

   Is the plane too high, too low or on the correct "glide path"?

5. A firefighter has a 12 metre ladder and needs to reach a window 10 metres from the ground.

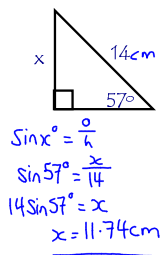   What angle, $x°$, will the ladder make with the building?

   12 m   10 m
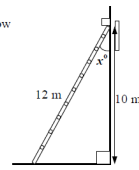
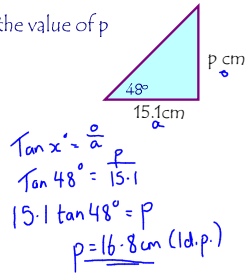## Finding the length of a missing side

Given an angle and 1 side in a right – angled triangle, you can find the lengths of the other sides using trig. ratios.
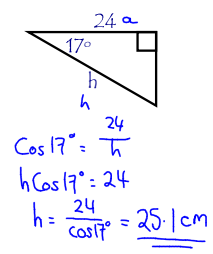
Examples:

1. Find the length of x

   x   14 cm

   57°

   $\sin x° = \frac{o}{h}$

   $\sin 57° = \frac{x}{14}$

   $14 \sin 57° = x$

   $x = 11.74 \, cm$

2. Find the value of p

   p cm

   48°

   15.1 cm

   $\tan x° = \frac{o}{a}$

   $\tan 48° = \frac{p}{15.1}$

   $15.1 \tan 48° = p$

   $p = 16.8 \, cm \, (1d.p.)$

Finding the length of a side

3. Find the value of h

   24 a

   17°

   h

   h

   $\cos 17° = \frac{24}{h}$

   $h \cos 17° = 24$

   $h = \frac{24}{\cos 17°} = 25.1 \, cm$

(a)
6·8 cm
x cm
35°

(b)
x m
8·1 m
58°

(c)
x m
57°
9·5 m

(d)
x cm
8·3 cm
50°

(e)
x m
59°
5·8 m

(f)
70 cm
22°
x cm

(g)
x m
33°
1·9 m

(h)
x cm
68°
5·4 cm

(i)
8·2 cm
43°
x cm

Daily Practice   21.8.2017

Q1. Find 25% of 900

$\frac{225}{4\overline{)900}}$

Q2. Multiply out and simplify 2x(3x – 1) + 4x(x – 8)

$6x^2 - 2x + 4x^2 - 32x$

$10x^2 - 34x$

Q3. Write as a unitary ratio $\frac{1}{5}$: 4

$\times 5 \quad \times 5$

$1 : 20$

Q4. Round 67.224 to the nearest unit

$\rightarrow 67$

Q5. Write 1 hour and 6 minutes as a decimal of hours

$\frac{6}{60} = 0.1$ 1.1 hours

Today we will be working out trigonometry

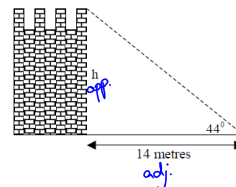questions in context.

Homework Online due Monday 28.8.2017

Trigonometric Ratio Questions in context

Examples:

1.

The diagram shows a tower, height h.

From a distance of 14 metres from the base of the tower, the angle of elevation to the top of the tower is 44^0.

Calculate the height of the tower.

14 metres
adj.

$$\tan x^\circ = \frac{o}{a}$$

$$\tan 44^\circ = \frac{h}{14}$$

$$14\tan 44^\circ = h$$

$$h = 13.5m \ (1d.p.)$$

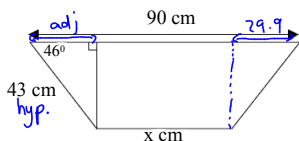
Trigonometric Ratio Questions in context

Examples:

2. The diagram shows the end view of a symmetrical water trough.

Calculate the length x

adj
90 cm
29.9
46^0
43 cm
hyp.
x cm

$$\cos x^\circ = \frac{a}{h}$$

$$\cos 46^\circ = \frac{a}{43}$$

$$43\cos 46^\circ = a$$

$$a = 29.9cm \ (1d.p.)$$

$$x = 90 - 2 \times 29.9$$

$$x = 30.3cm$$

Q1. Multiply out and simplify $7(2x - 8) + 3(x + 4)$

$14x - 56 + 3x + 12$

$17x - 44$

Q2. Factorise $8h - 12 \ = 4(2h - 3)$

Q3. Rearrange $y = mx + c$ such that 'x' is the subject

$-c \qquad\qquad -c$

$y - c = mx$

$\frac{y-c}{\div m} = \frac{mx}{\div m}$

$\frac{y-c}{m} = x$ $x = \frac{y-c}{m}$ or $x = (y-c) \div m$

Q4. Share £200 in the ratio 4:1 $4+1=5$

$\frac{40}{5\overline{)200}}$ $\begin{array}{c}40 \\ \times 4 \\ \hline 160\end{array}$ £160 : £40

Q5. Write the rule for the table shown

$D = 2C(-1)$

C	1	2	3	...	7
D	1	3	5	...	13

$+2 \quad +2$

Today we will be continuing to practise mixed questions on trigonometry.

Trigonometric Ratio Questions in context   23.8.17

Examples: Page 133 + 134

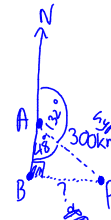3. A plane (P) flies at a bearing of 132° for 300km from the airport (A).

which is directly south of A

It is now due east of the city of Bemenko, how far is the plane from Bemenko?

$$\sin 48^\circ = \frac{x}{300}$$

$$x = 300 \sin 48^\circ$$

$$x = 222.94km \ (2d.p.)$$

<u>Daily Practice</u>   <u>24.8.2017</u>

Q1. Round 182362 to 3 significant figures

$\longrightarrow$ 182000

Q2. Find $^4/_5$ of 264

$$\begin{array}{r} 52.8 \\ \hline 5\,)\,2\,8\,4\,{}^4\!0 \end{array}$$

$$\begin{array}{r} 52.8 \\ \times\;\;4 \\ \hline 211.2 \\ {}_{3} \end{array}$$

Q3. Multiply out and simplify 3m – 2(m + 6)

3m – 2m – 12

<u>m – 12</u>

Q4. $1\frac{3}{5} \div \frac{4}{7} = \frac{8}{5} \div \frac{4}{7} = \frac{8}{5} \times \frac{7}{4}$

$= \frac{56}{20} = 2\frac{16}{20} = \underline{\underline{2\frac{4}{5}}}$

Q5. Factorise 4xy – 8y

$= 4y(x - 2)$