MATHLETICS

Trigonometry and the Right-angled Triangle

Student Book - Series J-2

$\sin\theta \quad \cos\theta$
$\tan\theta$

Mathletics Instant Workbooks

Trigonometry and the right-angled triangle
Student Book - Series J 2

Contents

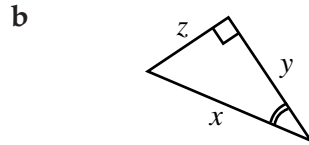 Author of The Topics and Topic Tests: AS Kalra

Trigonometry and the right-angled triangle
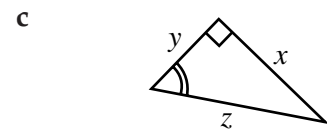
Topic 1 - Naming the sides of a right-angled triangle

QUESTION **1**   In each of the following triangles, state whether x, y and z are the opposite side, adjacent side or hypotenuse with reference to the angle marked.
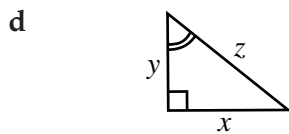
a

$x = $ ____ , $y = $ ____ , $z = $ ____

b

$x = $ ____ , $y = $ ____ , $z = $ ____

c

$x = $ ____ , $y = $ ____ , $z = $ ____

d

$x = $ ____ , $y = $ ____ , $z = $ ____

e

$x = $ ____ , $y = $ ____ , $z = $ ____

f
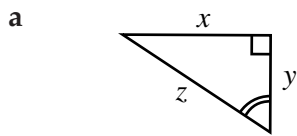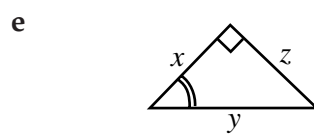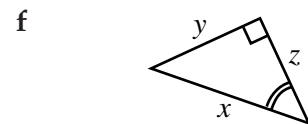
$x = $ ____ , $y = $ ____ , $z = $ ____

QUESTION **2**   Name the sides in the following right-angled triangles with reference to the angle marked.

a

$p = $ ____ , $q = $ ____ , $r = $ ____

b

$a = $ ____ , $b = $ ____ , $c = $ ____

c

$d = $ ____ , $e = $ ____ , $f = $ ____

d

$a = $ ____ , $b = $ ____ , $c = $ ____

e

$p = $ ____ , $q = $ ____ , $r = $ ____

f
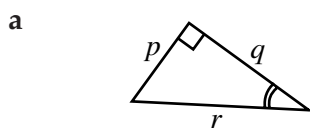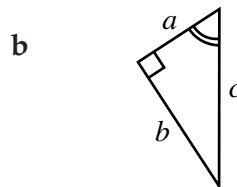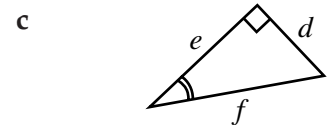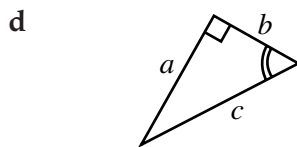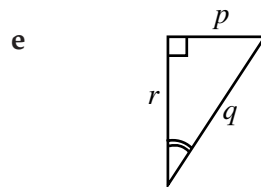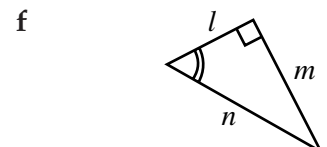
$l = $ ____ , $m = $ ____ , $n = $ ____

QUESTION **3**   Name the hypotenuse in each triangle given below.

a

____

b

____

c

____
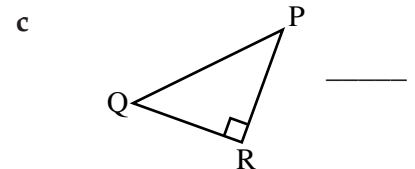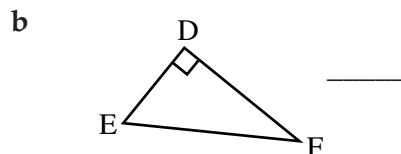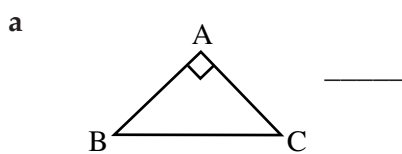
Trigonometry and the right-angled triangle

Topic 2 - The trigonometric ratios

QUESTION **1**   Write the trigonometric ratios for the following triangles.

a

_____

b

_____

c

_____

d

_____

e

_____

f

_____

QUESTION **2**   Find sin θ, cos θ and tan θ in the following triangles.

a

_____

b

_____

c

_____

d

_____

e

_____

f

_____
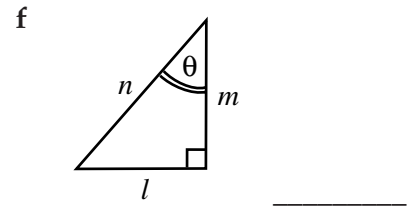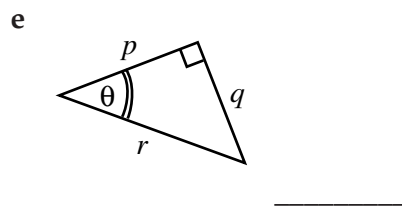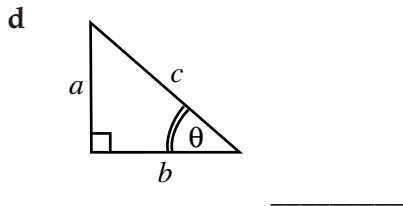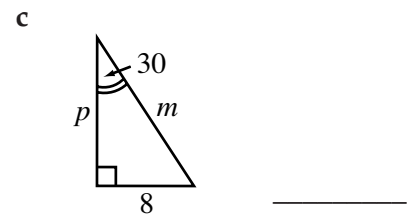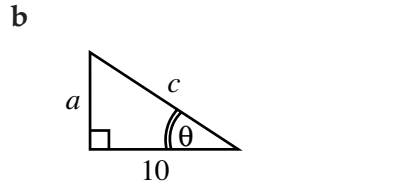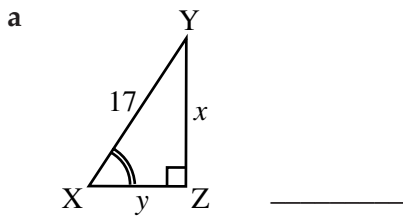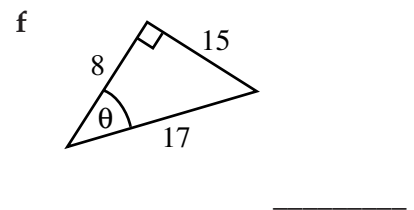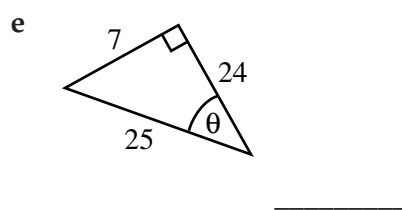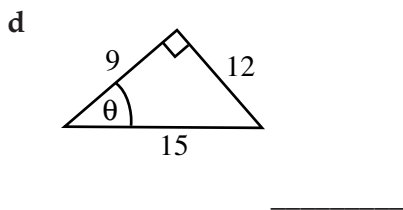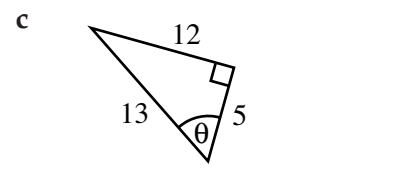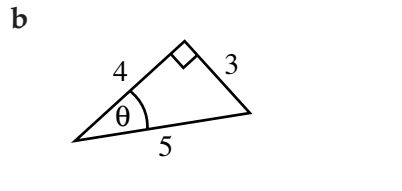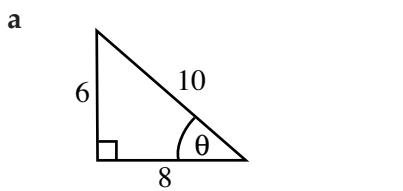
QUESTION **3**   Use Pythagoras' theorem to find the unknown side and then find sin θ, cos θ and tan θ.

a

_____

b

_____

c

_____
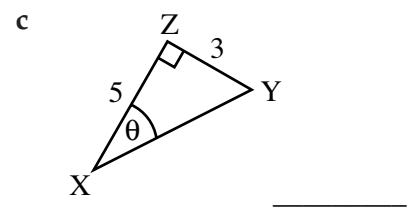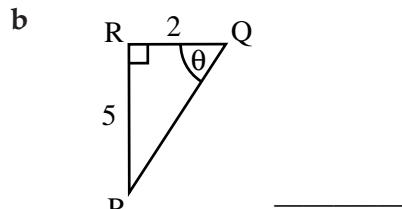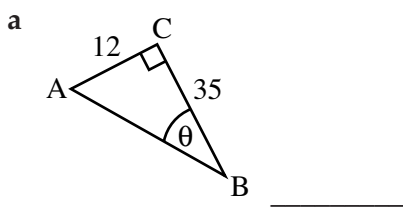
Trigonometry and the right-angled triangle

Topic 3 - Use of a calculator in trigonometry

QUESTION 1   Find the value of the following correct to three decimal places.

a $\sin 69$ = _____

b $\cos 60$ = _____

c $\tan 21$ = _____

d $\cos 82$ = _____

e $\tan 28$ = _____

f $\sin 58$ = _____

g $\tan 31$ = _____

h $\sin 35$ = _____

i $\cos 43$ = _____

QUESTION 2   Find the value of the following correct to three significant figures.

a $2.8 \sin 42$ = _____

b $\tan 58\ 4'$ = _____

c $\sin 27\ 15'$ = _____

d $8 \cos 19$ = _____

e $\sin 53\ 27'$ = _____

f $\cos 28\ 35'$ = _____

g $\sin 59\ 28'$ = _____

h $30.6 \cos 65\ 12'$ = _____

i $\tan 31\ 49'$ = _____

QUESTION 3   Find the value of the following correct to two decimal places.

a $\dfrac{\tan 58}{6}$ = _____

b $\dfrac{\cos 63}{5}$ = _____

c $\dfrac{14.3}{\sin 54}$ = _____

d $\dfrac{\sin 39\ 41'}{4.7}$ = _____

e $\dfrac{\sin 54\ 28'}{2.5}$ = _____

f $\dfrac{18.6}{\cos 37\ 15'}$ = _____

g $\dfrac{\tan 25\ 54'}{8.25}$ = _____

h $\dfrac{\tan 38\ 29'}{8.6}$ = _____

i $\dfrac{359}{\tan 75\ 36'}$ = _____

QUESTION 4 A is an acute angle. Find its size to the nearest degree.

a $\sin A = 0.5736$ _____

b $\tan A = 0.7836$ _____

c $\cos A = 0.8126$ _____

d $\cos A = 0.5990$ _____

e $\sin A = 0.7587$ _____

f $\tan A = 1.491$ _____

g $\tan A = 2.5583$ _____

h $\cos A = 0.2935$ _____

i $\sin A = 0.9941$ _____

QUESTION 5 A is an acute angle. Find its size in degrees and minutes.

a $\sin A = 0.5$ _____

b $\cos A = 0.3568$ _____

c $\tan A = 1.326$ _____

d $\cos A = 0.4836$ _____

e $\tan A = 0.7983$ _____

f $\sin A = 0.4839$ _____
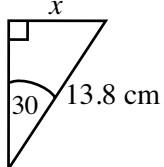
QUESTION 6   Find the size of the acute angle in degrees and minutes.
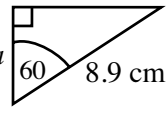
a $\cos A = \dfrac{1}{2}$ _____

b $\sin A = \dfrac{13}{18}$ _____

c $\tan A = \dfrac{15.7}{12.85}$ _____

d $\tan A = \dfrac{15}{22}$ _____

e $\cos A = \dfrac{8.5}{11.9}$ _____

f $\sin A = \dfrac{1.732}{2}$ _____
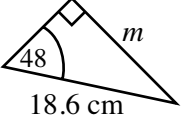
Trigonometry and the right-angled triangle

Topic 4 - Finding an unknown side
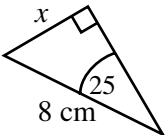
QUESTION **1**   Find the value of the unknown side correct to one decimal place.

a

x

30 13.8 cm

_____

b

a 60 8.9 cm

_____

c

48

m

18.6 cm

_____
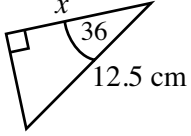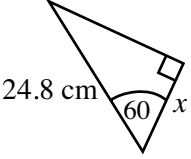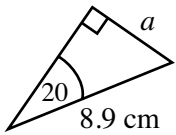
QUESTION **2**   Find the value of x in the following triangles, correct to three decimal places.

a

x

25

8 cm

_____

b

x 36

12.5 cm

_____

c

24.8 cm 60 x

_____
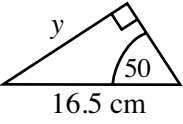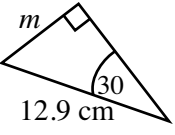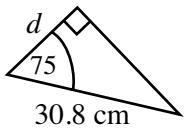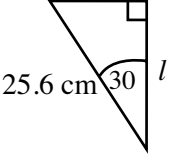
QUESTION **3**   Find the value of the pronumeral correct to two decimal places.

a

a

20

8.9 cm

_____

b

y

50

16.5 cm

_____

c

m

30

12.9 cm

_____

d

d

75

30.8 cm

_____

e

25.6 cm 30 l

_____

f

18.2 cm

70

c

_____
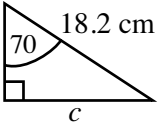
QUESTION **4**   Michelle is flying a kite on a 55 metre string that makes an angle of 56 with the horizontal. Calculate the height of the kite to the nearest metre.

_____

_____

_____

QUESTION **5**   In ∆ABC, ∠C = 90 , ∠B = 34.5 and BC = 3.6 cm. Find AB.

_____

_____

_____

Trigonometry and the right-angled triangle

Topic 5 - Finding the hypotenuse

QUESTION **1**   Find the length of the hypotenuse correct to one decimal place.

a

5 cm, 25°, h

_____

b

60°, 8 cm, h

_____

c

12 cm, 38°, h

_____
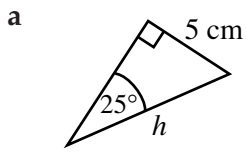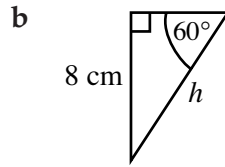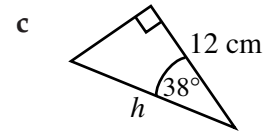
QUESTION **2**   Find the length of the hypotenuse correct to one decimal place.

a

3 cm, 40°, h

_____

b

7 cm, 70°, h

_____

c

h, 29°, 10 cm

_____
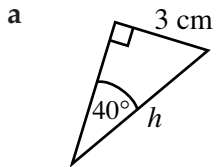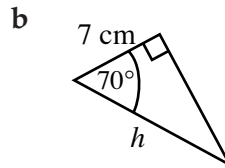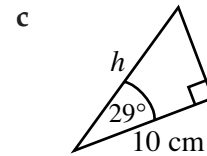
QUESTION **3**   Find the length of the hypotenuse correct to one decimal place.

a

50°, h, 24 cm

_____

b

29 cm, 34°, h

_____

c

9 cm, 55°, h

_____

d

13.5 cm, 48°, h

_____

e

21.6 cm, h, 81°

_____

f

15.7 cm, 72°, h

_____
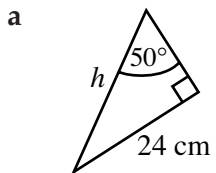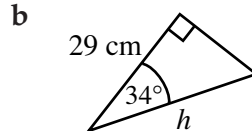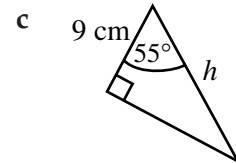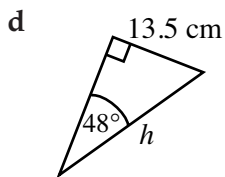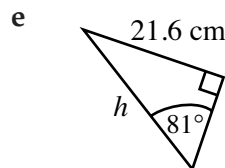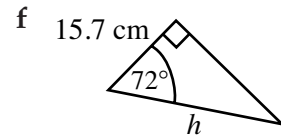
QUESTION **4**   The diagram shown opposite is a trapezium with
DC parallel to AB. Calculate the length of BD and AB.

_____

_____

_____

D, 10 cm, C, 60°, A, B
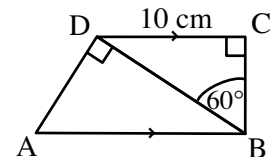
QUESTION **5**   Find the length of the diagonal of a rectangle if the length of the rectangle is 10.7 cm
and the diagonal makes an angle of 30° with the longer side.

_____

_____

_____

Trigonometry and the right-angled triangle

Topic 6 - Finding the unknown angle

QUESTION **1**   Find the size of the angle marked with a pronumeral correct to the nearest minute.

a
7.5 θ
3.2
_____

b
6.3
α
10.5
_____

c
5.6
12.7 β
_____
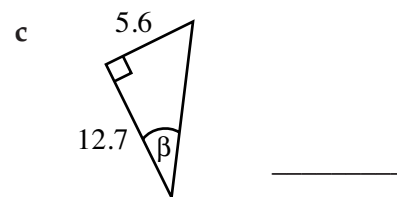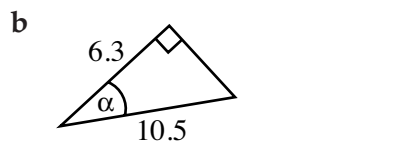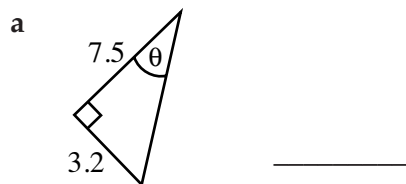
QUESTION **2**   Find the size of the angle marked.

a
8.9
α
20.1
_____

b
3.5
11.5 β
_____

c
7.8
θ 16.2
_____
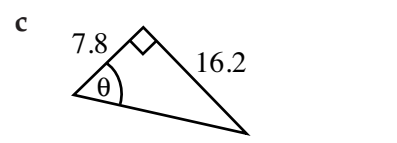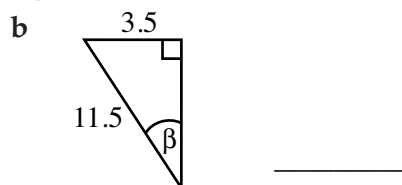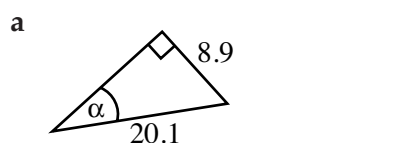
QUESTION **3**   Find the size of the angle marked.

a
5.9
α
19.6
_____

b
8.7
17.3
β
_____

c
18.9
θ
28.75
_____

d
3.8
15.6
β
_____

e
20.8
α
33.6
_____

f
11.7
θ 23.8
_____
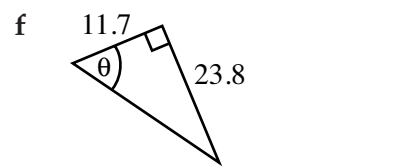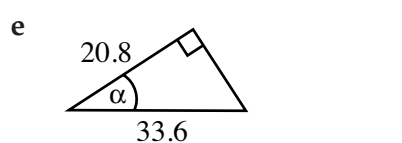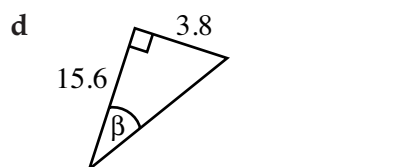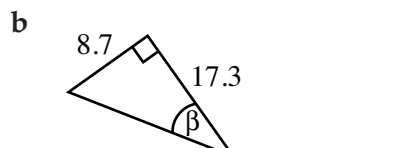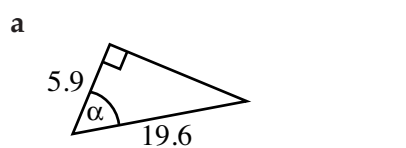
QUESTION **4**   An 18 m ladder standing on level ground reaches 14 m up a vertical wall. Find the angle that the ladder makes with the ground (give your answer to the nearest degree).

_____

_____

_____

QUESTION **5**   ABCD is a rectangle with AC = 25 cm and AD = 14 cm. Find ∠ACD correct to the nearest degree.

_____

_____

_____

Trigonometry and the right-angled triangle

Topic 7 - Exact trigonometric ratios

QUESTION **1**   Evaluate the following using the exact values of the trigonometric ratios.

a $\sin 30 \ = $ _____

b $\sin 60 \ = $ _____

c $\sin 30 \ \cdot \cos 45 \ = $ _____

d $\cos 60 \ = $ _____

e $\cos 45 \ = $ _____

f $\sin 45 \ \cdot \cos 45 \ = $ _____

g $\sin 45 \ = $ _____

h $\tan 60 \ = $ _____

i $\cos 30 \ = $ _____

j $\tan 30 \ = $ _____

k $\sin 30 \ \cdot \cos 60 \ = $ _____

l $\tan 45 \ = $ _____

m $\dfrac{\sin 45}{\cos 45} = $ _____

n $\dfrac{\sin 30}{\cos 30} = $ _____

o $\dfrac{\sin 60}{\tan 60} = $ _____

p $\dfrac{\cos 30}{\cos 60} = $ _____

q $\dfrac{\cos 60}{\sin 45} = $ _____

r $\dfrac{\sin 30}{\sin 60} = $ _____

QUESTION **2**   Prove the following relationships.

a $\dfrac{\sin 30}{\cos 30} = \tan 30$

b $\dfrac{\sin 45}{\cos 45} = \tan 45$

c $\dfrac{\sin 60}{\cos 60} = \tan 60$

_____   _____   _____

_____   _____   _____

d $2\sin 30 \ \cos 30 \ = \sin 60$

e $2\sin 45 \ \cos 45 \ = \sin 90$

f $2\sin 60 \ \cos 60 \ = \sin 120$

_____   _____   _____

_____   _____   _____

QUESTION **3**   Prove the following results.

a $\sin 30 \ \times \cos 60 \ = \dfrac{1}{4}$ _____

b $\sin 60 \ + \cos 30 \ = \sqrt{3}$ _____

_____

_____

c $\sin 30 \ + \cos 30 \ + \cos 45 \ = \dfrac{1+\sqrt{3}+\sqrt{2}}{2}$ _____

QUESTION **4**   A 12 m ladder standing on level ground makes an angle of 60 with the ground. How far up the vertical wall does it reach?

_____

_____

_____

Trigonometry and the right-angled triangle

Topic 8 - Angle of elevation, angle of depression and bearings

QUESTION **1**

a The angle of elevation of the top of a tower AB is 58 from a point C on the ground at a distance of 200 metres from the base of the tower. Calculate the height of the tower to the nearest metre.

_____

_____

_____
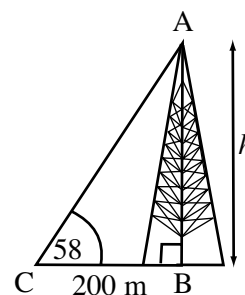
b A man 1.65 m tall is 18 metres away from a tower 25 m high. What is the angle of elevation of the top of the tower from his eyes?

_____

_____

_____

c From the top of a building 80 metres high, the angle of depression of a car parked on the ground is 52 . Find the distance of the car from the base of the building. (Write your answer correct to two decimal places.)

_____

_____

_____

QUESTION **2**

a A ship sets out from a point A and sails due north to a point B, a distance of 150 km. It then sails due east to a point C. If the bearing of C from A is 048 37', find:

i the distance BC.   **ii** the distance AC.

_____   _____

_____   _____

b A ship leaves port for a destination 80 km east and 70 km north. In which direction should it sail?

_____

_____

_____

c A ship starts from a port P, sails S46 W for a distance of 120 km. Find:

i how far south of P it is.   **ii** how far west of P it is.

_____   _____

_____   _____

Trigonometry and the right-angled triangle

Topic 9 - Problem solving involving two right-angled triangles

QUESTION **1**   From the diagram given opposite, find:

a   the length of side AB.

_____

_____

b   the length of side CD.

_____

_____

c   the angle *DAC*.

_____

_____
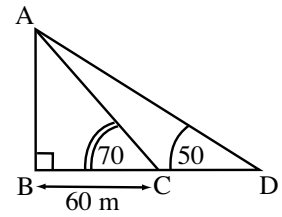
QUESTION **2**   In the diagram given opposite, calculate:

a   the length *a* (correct to one decimal place).

_____

_____

b   the size of angle *θ*.

_____

_____

c   the length *b*.

_____

_____
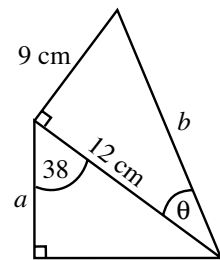
QUESTION **3**   Find the value of the unknowns in the given diagram.

_____

_____

_____

_____
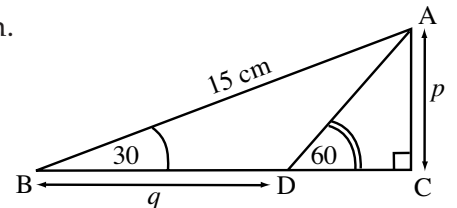
QUESTION **4**   The angle of elevation of the top of a cliff from a boat 600 m out to sea is 37 . If the boat then travels a further *d* metres out to sea, the angle of elevation of the cliff is now 25 . Find:

a   the height of the cliff above sea level to the nearest metre.

_____

_____

_____

b   the value of *d* to the nearest metre.

_____

_____

_____

_____
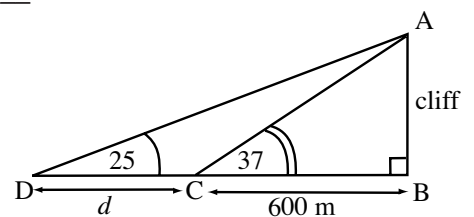
Trigonometry and the right-angled triangle

Topic Test

PART A

Instructions
This part consists of 10 multiple-choice questions
Each question is worth 1 mark
Attempt ALL questions
Calculators are NOT to be used
Fill in only ONE CIRCLE for each question

Time allowed: 15 minutes   **Total marks = 10**

Marks

1 Use your calculator to find sin 36 correct to two decimal places.
Ⓐ 0.58   Ⓑ 0.57   Ⓒ 0.59   Ⓓ 0.81

`1`

2 Evaluate 12 sin 85 correct to two decimal places.
Ⓐ 12.05   Ⓑ 11.95   Ⓒ 1.05   Ⓓ 137.16

`1`

3 Find the value of $\dfrac{\sin 38 - \cos 55}{\tan 36}$ correct to one decimal place.
Ⓐ 0.2   Ⓑ 0.5   Ⓒ 0.05   Ⓓ 0.1

`1`

4 If $\sin \theta = \dfrac{4}{7}$, calculate the size of the angle θ to the nearest degree.
Ⓐ 55   Ⓑ 30   Ⓒ 35   Ⓓ 45

`1`

5 A 3 metre ladder leans against a building with its top reaching a height of
2.6 metres. What angle, to the nearest degree, does the ladder make with the wall?
Ⓐ 35   Ⓑ 40   Ⓒ 30   Ⓓ None of these

`1`

6 In the triangle ABC, the angle B is 90, AB is 4 m and AC is 5 m. Find the size of
angle A correct to the nearest degree.
Ⓐ 37   Ⓑ 53   Ⓒ 39   Ⓓ 27

`1`

7 Jane is flying a kite on a 100 m string that makes an angle of 48 with the horizontal. How
high is the kite above Jane's hand? Give your answer correct to the nearest metre.
Ⓐ 65 m   Ⓑ 82 m   Ⓒ 78 m   Ⓓ 74 m

`1`

8 The diagonal of a rectangle makes an angle of 42 with one of the longer sides. If the length
of the rectangle is 12 cm, find the length of the diagonal correct to one decimal place.
Ⓐ 15.8 m   Ⓑ 22.5 m   Ⓒ 16.1 m   Ⓓ 17.9 m

`1`

9 From the top of a tower the angle of depression of a boat is 30. If the tower is 20 m
high, how far is the boat from the foot of the tower?
Ⓐ 40 m   Ⓑ $10\sqrt{3}$ m   Ⓒ $20\sqrt{2}$ m   Ⓓ $20\sqrt{3}$ m

`1`

10 If $\cos \theta = \dfrac{1}{2}$, find the size of angle θ.
Ⓐ 30   Ⓑ 60   Ⓒ 45   Ⓓ 55

`1`

Total marks achieved for PART A   `10`

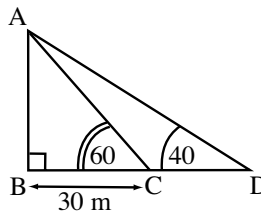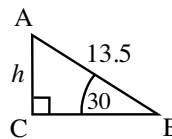# Trigonometry and the right-angled triangle

Topic Test

PART B

Instructions
This part consists of 15 questions
Each question is worth 1 mark
Attempt ALL questions
Calculators may be used

Time allowed: 20 minutes

Total marks = 15

Questions	Answers only	Marks

Use your calculator to find correct to two decimal places:

1 $\tan 58°$. — 1

2 $\sin 63°$. — 1

3 $19.7 \cos 78°$. — 1

4 $\dfrac{28.67}{\sin 46°}$. — 1

5 $\dfrac{\sin 35° + \cos 35°}{\tan 34°}$. — 1

6 $\tan 48° - \sin 30° + \cos 73°$ — 1

Calculate the size of each angle to the nearest degree if:

7 $\cos \theta = \dfrac{4}{5}$. — 1

8 $\sin \theta = \dfrac{12}{13}$. — 1

9 $\tan \theta = 0.6781$. — 1

For the triangle ABC given opposite, calculate:

10 the value of h. — 1

11 the size of $\angle$A. — 1

12 the length of BC. — 1

From the diagram given opposite find:

13 the length of the side AB. — 1

14 the length of the side CD. — 1

15 the angle DAC. — 1

Total marks achieved for PART B /15