

Y9 Maths

Unit 9 Test

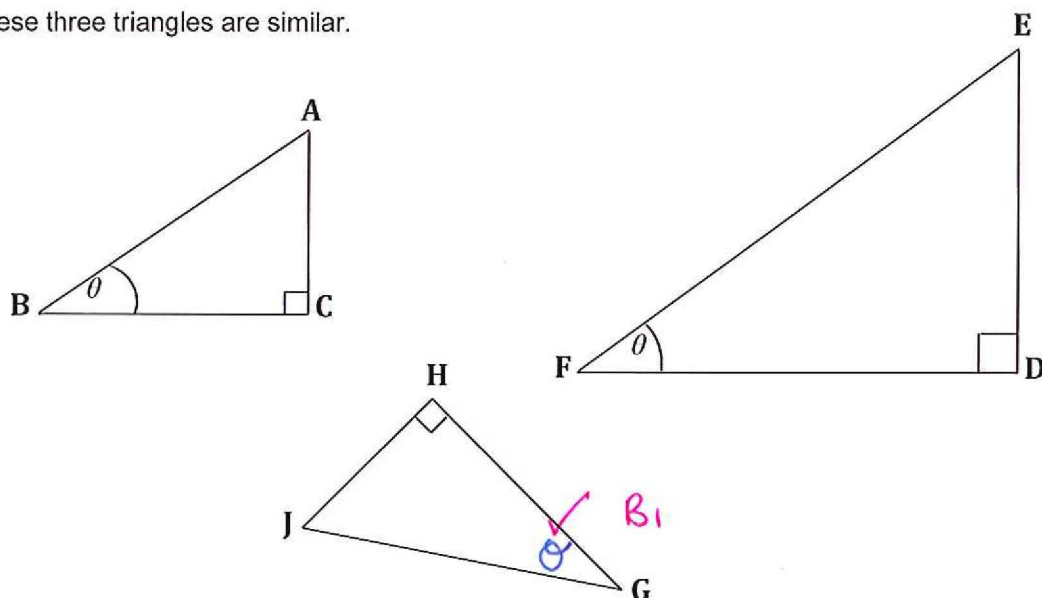
Trigonometry

Name: Markscheme

CALCULATOR ALLOWED

Total: 50 marks

1 These three triangles are similar.



a Mark θ in the corresponding position in triangle GHJ.

b Complete this identity.

$$\frac{AC}{AB} = \frac{DE}{EF} = \frac{HJ}{GJ} \quad \checkmark B_1$$

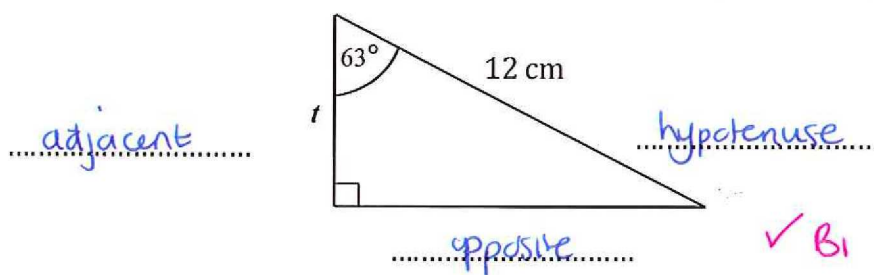
c Is $\frac{AC}{AB} = \sin \theta$ or $\cos \theta$ or $\tan \theta$?

$$\sin \theta \quad \checkmark B_1$$

(4 marks)



2 a Label the sides of the triangle shown with opposite, adjacent and hypotenuse.



b Calculate t correct to 2 decimal places.

$$\cos 63^\circ = \frac{t}{12} \quad \checkmark m_1 \text{ correct trig ratio}$$

$$t = 12 \times \cos 63^\circ \quad \checkmark m_1 \text{ correct rearranging}$$

$$t = 5.447885 \dots$$

$$5.45 \text{ cm} \quad \checkmark A_1$$

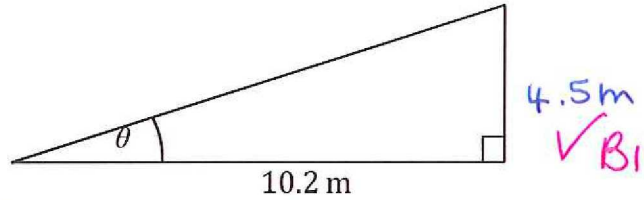
(4 marks)



- 3 The diagram shows the shape of a children's slide.

Calculate the angle of slope, marked θ , given that the base length is 10.2 m and the upright height is 4.5 m.

Round your answer to 3 sf



✓ correct ratio
 $\tan \theta = \frac{4.5}{10.2}$

$\theta = \tan^{-1} \left(\frac{4.5}{10.2} \right)$ ✓ m₁

$\theta = 23.805943...$

✓ A₁

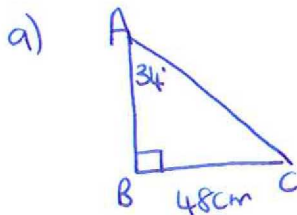
23.8

(4 marks)



- 4 A triangle ABC is right-angled at B. The length of BC is 48 cm and the angle BAC is 34° .

- a Draw a sketch of the triangle ABC with the information marked on your diagram.
b Calculate the length of AC correct to 3 significant figures.



or any correct version

✓ B₁ correct triangle
✓ B₁ correct labelling

b) $\sin 34^\circ = \frac{48}{AC}$ ✓ B₁ correct ratio

$AC = \frac{48}{\sin 34^\circ}$ ✓ m₁ correct rearrangement

$AC = 85.83799...$

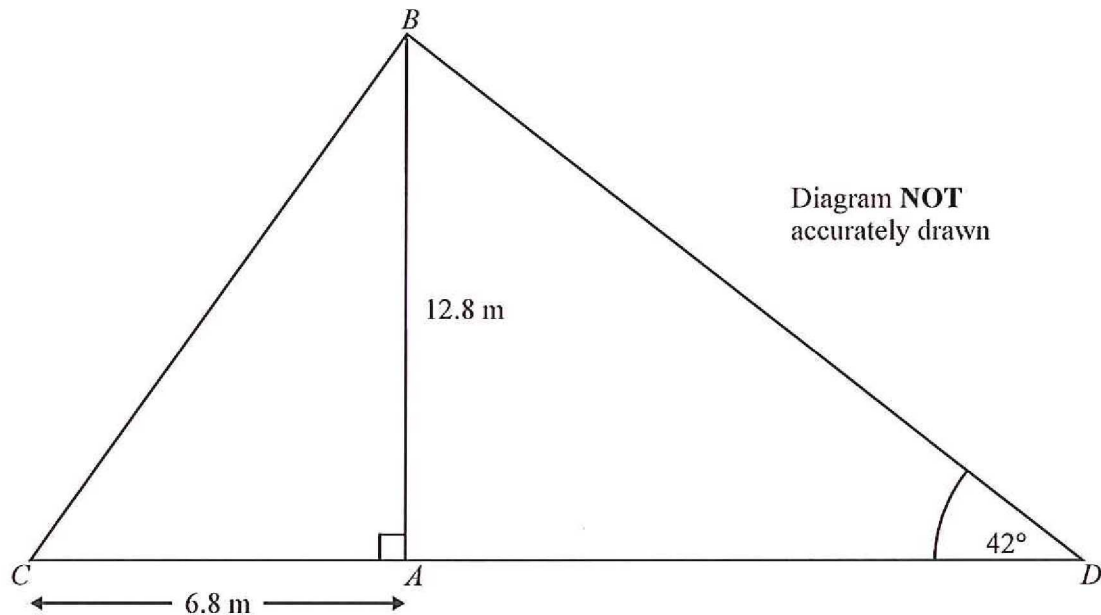
✓ A₁

85.8

cm
(5 marks)



- 5 The diagram represents a vertical flagpole, AB .
The flagpole is supported by two ropes, BC and BD , fixed to the horizontal ground at C and at D .



$$AB = 12.8 \text{ m.}$$

$$AC = 6.8 \text{ m.}$$

$$\text{Angle } BDA = 42^\circ$$

- (a) Calculate the size of the angle that line BC makes with the horizontal.
Give your answer correct to 3 significant figures.

$$\tan \hat{C} = \frac{12.8}{6.8} \quad \checkmark \text{ Trig ratio}$$

$$C = \tan^{-1} \left(\frac{12.8}{6.8} \right) \quad \checkmark \text{ m1}$$

$$C = 62.0205 \dots$$

$$\begin{array}{r} \checkmark \text{ A1} \\ 62.0 \end{array}$$

(3)

- (b) Calculate the length of the rope BD .

$$\sin 42^\circ = \frac{12.8}{BD} \quad \checkmark \text{ Correct trig ratio}$$

$$BD = \frac{12.8}{\sin 42^\circ} \quad \checkmark \text{ m1}$$

$$BD = 19.12929 \dots$$

$$\begin{array}{r} \checkmark \text{ A1} \\ 19.1 \text{ m} \end{array}$$

(3)

(6 marks)

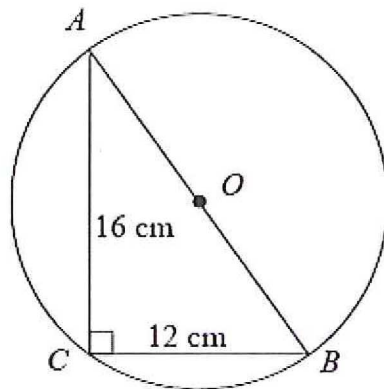


Diagram NOT
accurately drawn

The diagram shows triangle ABC and a circle, centre O .

A , B and C are points on the circumference of the circle.

Angle $ACB = 90^\circ$.

$AC = 16$ cm and $BC = 12$ cm.

Work out the radius OB of the circle.

$$AB^2 = 16^2 + 12^2 \quad \checkmark m_1$$

$$AB^2 = 400$$

$$AB = \sqrt{400} = 20 \text{ cm} \quad \checkmark m_1$$

$$\therefore OB = 10 \text{ cm}$$

10 $\checkmark A_1$
.....cm

(3 marks)



7

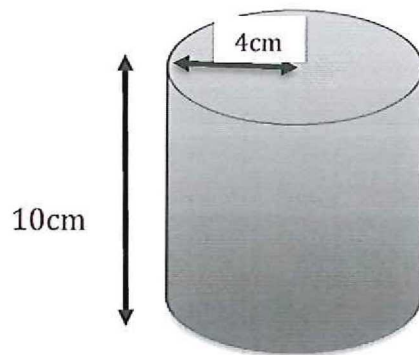


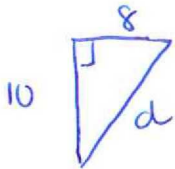
Diagram **NOT**
accurately drawn

The diagram shows a cylinder with a height of 10 cm and a radius of 4 cm.

The length of a pencil is 13 cm.

The pencil cannot be broken.

- Is it possible for the pencil to fit inside the cylinder? Show by calculation
- Calculate the angle the base of the cylinder makes with the diagonal



$$a) d^2 = 10^2 + 8^2 \quad \checkmark B_1$$

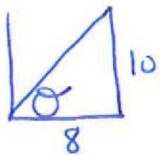
$$d^2 = 164 \quad \checkmark m_1$$

$$d = \sqrt{164} = 12.80624847 \dots \quad \checkmark A_1$$

$\therefore$ The pencil will not be able to fit $\checkmark C_1$ with "their" calculations
in the cylinder as it is 13 cm long $(13 > 12.8)$

$$b) \tan \theta = \frac{10}{8} \quad \checkmark \text{trig ratio}$$

$$\theta = \tan^{-1} \left(\frac{10}{8} \right) \quad \checkmark m_1$$



$$\theta = 51.34019 \dots$$

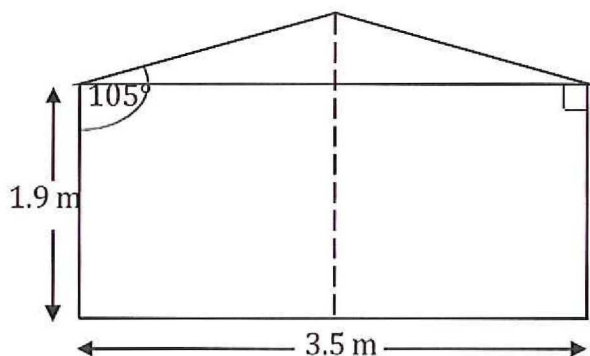
$$\theta = 51.3^\circ \quad \checkmark A_1$$

(7 marks)



- 8 Building regulations state: 'Garden sheds must be no more than 2.5 m high if they are less than 2 m from the boundary fence.'

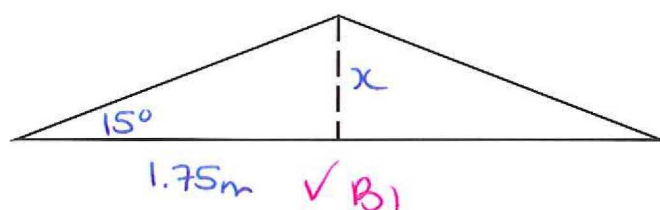
The diagram shows the proposed symmetrical cross-section of a shed that will be built within 2 m of a boundary fence.



Will the shed be too tall to satisfy building regulations?

Use this triangle to help you.

Fill in the information you know.



$$\tan 15^\circ = \frac{x}{1.75} \quad \checkmark \text{ Correct trig ratio}$$

$$x = 1.75 \times \tan 15^\circ \quad \checkmark m1$$

$$x = 0.468911 \quad \checkmark A1$$

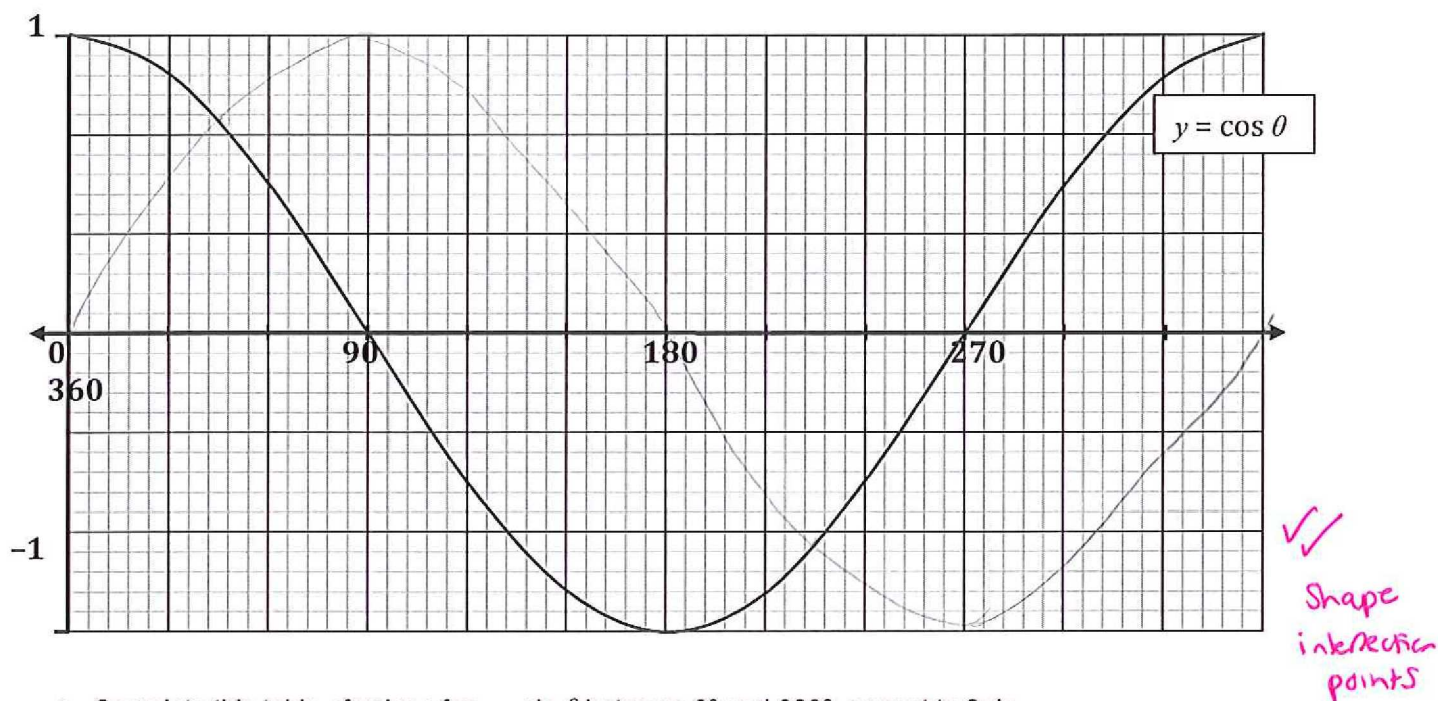
$$\therefore \text{height} = 1.9\text{m} + 0.469\text{m} = 2.369\text{m} \quad \checkmark m1 \quad \checkmark A$$

$\therefore$ No, the shed is not too tall and it will

satisfy the requirements $\checkmark C1$ with "their" calculations

(7 marks)

9 The graph shows $y = \cos \theta$ for values of θ between 0° and 360° .



a Complete this table of values for $y = \sin \theta$ between 0° and 360° , correct to 2 dp.

x	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°	360°
y	0	0.5	0.87	1	0.87	0.5	0	-0.5	-0.87	-1	-0.87	-0.5	0

✓ B1

b Plot and draw this curve, $y = \sin \theta$, on the axes above.

c How many points of intersection are there?

2 ✓

d For which values of θ between 0° and 360° does $\sin \theta = \cos \theta$?

$\theta = 45^\circ, 225^\circ$
(6 marks)

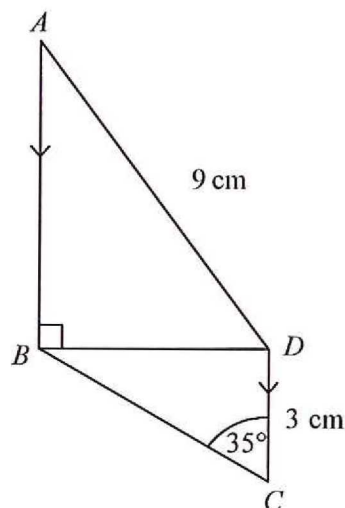


Diagram **NOT**
accurately drawn

AB is parallel to DC .

$AD = 9$ cm, $DC = 3$ cm.

Angle $BCD = 35^\circ$.

Angle $ABD = 90^\circ$.

Calculate the size of angle BAD .

$$\tan 35^\circ = \frac{BD}{3} \quad \checkmark m_1$$

$$BD = 3 \tan 35^\circ$$

$$BD = 2.100626 \dots \quad \checkmark A_1$$

$$\sin \hat{BAD} = \frac{2.100626 \dots}{9} \quad \checkmark m_1$$

$$\hat{BAD} = 13.49747 \dots$$

$\checkmark A_1$

13.5°

(4 marks)

TOTAL = 50 MARKS

If you've finished, and checked your work, try this challenge.
YOU WILL **NOT** BE MARKED ON THIS SECTION

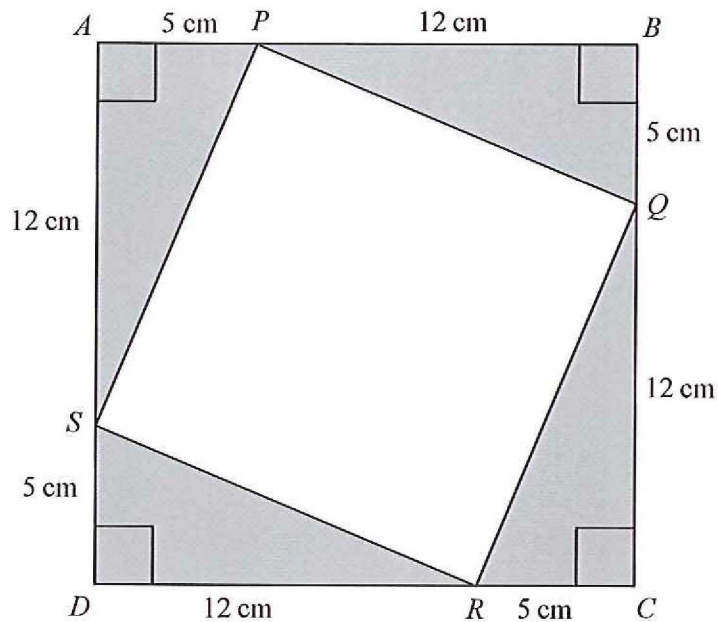


Diagram **NOT**
accurately drawn

4 copies of the triangle and the quadrilateral $PQRS$ are used to make the square $ABCD$.

(b) Work out the area of the quadrilateral $PQRS$ using no calculator

$$PS^2 = 5^2 + 12^2$$

$$PS^2 = 169$$

$$\therefore PS = 13 \text{ cm}$$

$$\text{Area} = 13^2 = 169$$

.....169..... cm^2