

Mark schemes

Q1.

$$\tan x = \frac{3}{7} \text{ or } \tan^{-1} \frac{3}{7}$$

$$\text{or } \sin x = \frac{3(\sin 90)}{\sqrt{3^2 + 7^2}}$$

$$\text{or } \sin x = \frac{3(\sin 90)}{\sqrt{58}}$$

$$\text{or } \cos x = \frac{7}{\sqrt{3^2 + 7^2}}$$

$$\text{or } \cos x = \frac{7}{\sqrt{58}}$$

$$\text{or } 90 - \tan^{-1} \frac{7}{3}$$

or 90 - [66.7, 66.81]
or 90 - 67

oe

$$\text{eg } \cos x = \frac{7^2 + (\sqrt{7^2 + 3^2})^2 - 3^2}{2 \times \sqrt{3^2 + 7^2} \times 7}$$

Any letter

M1

[23, 23.3]

A1

Additional Guidance

$$\tan = \frac{3}{7} \text{ or } \tan \frac{3}{7} \text{ or } \tan^{-1} = \frac{3}{7} \text{ (unless recovered)}$$

M0

Answer [23, 23.3] (possibly coming from scale drawing)

M1A1

If using sine rule must rearrange to $\sin x =$ for M1

If using cosine rule must rearrange to $\cos x =$ for M1

Allow [0.42, 0.43] for $\frac{3}{7}$

Allow 2.33... for $\frac{7}{3}$

Allow [7.6, 7.62] for $\sqrt{3^2 + 7^2}$

Q2.

$$\sin 72 = \frac{x}{8}$$

$$\text{or } 8 \times \sin 72$$

$$\text{or } \cos(90 - 72) = \frac{x}{8}$$

$$\text{or } 8 \times \cos(90 - 72)$$

$$\text{or } \frac{x}{\sin 72} = \frac{8}{\sin 90}$$

$$\text{or } \frac{\sin 72}{x} = \frac{\sin 90}{8}$$

oe

$$\text{eg } 8 \cos 72 \text{ or } 2.47... \text{ or } 2.5 \text{ and } \sqrt{8^2 - (8 \cos 72)^2}$$

M1

[7.6, 7.61]

A1

Additional Guidance

If trigonometry and Pythagoras are used it must be a fully correct method that would lead to the correct value of x

Accept $\sin 72 \times 8$

M1

Accept opp or o for x eg $\sin 72 = \frac{\text{opp}}{8}$

M1

$\sin = \frac{x}{8}$ or $\sin \theta = \frac{x}{8}$ (unless recovered)

M0

Answer coming from scale drawing

M0A0

Answer in range seen followed by 7 or 8

M1A1

[2]

Q3.

$$(a) \cos x = \frac{8}{11}$$

$$\text{or } \sin x = \frac{\sqrt{11^2 - 8^2}}{11}$$

$$\text{or } \tan x = \frac{\sqrt{11^2 - 8^2}}{8}$$

oe

M1

43(.3...)

A1

(b) $\tan 40 = \frac{y}{37}$ or $\tan 50 = \frac{37}{y}$

oe

$x = 48.3... \text{ and } 37^2 + y^2 = 48.3^2$

$48.3 \cos 50 \text{ or } 48.3 \sin 40$

M1

31. (...)

A1

[4]

Q4.

Identification of cosine

$\frac{\sin P}{12} = \frac{\sin 90}{15}$ $\sin Q = \frac{9}{15}$

M1

$\cos P = \frac{9}{15}$

$\sin P = \frac{12}{15} (\sin 90)$ $90 - \sin^{-1}\left(\frac{9}{15}\right)$

oe

oe

M1 dep

53(.1...)

A1

[3]

Q5.

$\sin 30 = \frac{6}{7}$

M1

$\frac{6}{\sin 30}$ or 12

M1dep

$\cos x = \frac{8}{\text{their } 12}$ or 0.66... or 0.67

or $\cos x = \frac{8 \times \sin 30}{6}$

$\cos^{-1} \frac{2}{3}$

oe

48.(...)

A1

[4]

Q6.

(a) $\pm 73^2 \pm 48^2$

(5329 ± 2304) (7633 or 3025)

$x^2 + 48^2 = 73^2$

M1

$73^2 - 48^2$ or $5329 - 2304$

or $x^2 + 48^2 = 73^2$

or $x^2 + 2304 = 5329$

and $\sqrt{3025}$

or $55 \times 55 = 3025$

or $55^2 = 3025$

Strand (ii). Must show subtraction and square root

Q1

55

55 with no working is M1, Q0, A1

A1

- (b) Sight of cos with 32 and 42 used together (equation or expression can be nonsense)

M1

$\cos x = 32 \div 42$ or $\cos^{-1}(32 \div 42)$

or $\cos x = 0.76..$ or $\cos^{-1}(0.76..)$

or $\cos^{-1} = 32 \div 42$

oe

M1Dep

[40.3, 40.4]

*40 with working**Correct answer is 3 marks no matter what they do before.**Ms are for partial working if answer incorrect*

A1

[6]

Q7.

(a) $25^2 + 43^2$

$43^2 - 25^2$

M1

$\sqrt{\text{their 2474}}$

M1Dep

49.7 ...

Accept 50 with working
Ignore incorrect working after correct answer seen

A1

Alternative

Either angle correctly calculated to 30 or 60 or better and used with an appropriate trig ratio and side

Angles are 30.17... and 59.826

eg $43 \div \cos 30$

or $43 \div \sin 60$

or $25 \div \cos 60$

or $25 \div \sin 30$

NB *if cosine rule used then*

*$25^2 + 43^2 - 2 \times 25 \times 43 \times \cos 90$ must lead to $\sqrt{2474}$ for M2
otherwise it is M0*

M2

[49.69, 49.75]

A0 if outside range due to premature rounding.

A1

(b) Sight of tan

M1

$\tan x = 15 \div 33$

oe

M1Dep

24.4..

Accept 24 with working
Ignore incorrect rounding after correct answer seen

A1

Alternative

Hypotenuse correctly calculated as [36, 36.3] and then either side used with the hypotenuse and an appropriate trig ratio or cosine rule

eg $\cos^{-1}(33 \div 36)$

$\sin^{-1}(15 \div 36)$

or

$\cos y = (33^2 + 36^2 - 15^2) \div (2 \times 33 \times 36)$

M2

[24.35, 24.45]

A0 if outside range due to premature rounding.

A1

[6]

Q8.

(a) $\frac{3}{4}$

oe

B1

(b) **Alternative method 1**

$6 \div 4$ or 1.5 or $4 \div 6$ or $\frac{2}{3}$
or

$4 \div 3$ or $\frac{4}{3}$ or $3 \div 4$ or $\frac{3}{4}$
oe

M1

4.5

A1

Alternative method 2

$\frac{y}{6} = \text{their } \frac{3}{4}$
oe

M1

4.5

ft their tan x from (a)

A1ft

Alternative method 3

\tan^{-1} (their $\frac{3}{4}$) or [36.8, 36.9]

This could be on the diagram or seen in part (a)

M1

4.5

ft their tan x from (a)

A1ft

Additional Guidance

For M1, accept $\frac{2}{3}$ or $\frac{4}{3}$ given as a decimal truncated or rounded to 2dp or better
Award both marks for an answer of 8 in part (b) unless an incorrect statement is made; eg

M0A0

in (a), $\tan x = \frac{4}{3}$, in (b), $\frac{3}{4} = \frac{y}{6}$, answer 4.5

M1A1

in (a), $\tan x = \frac{4}{3}$, in (b), $\tan x = \frac{6}{y}$ (incorrect), $\frac{4}{3} = \frac{6}{y}$, answer 4.5

M0A0

in (a), $\tan x = \frac{4}{3}$, in (b), $\tan x = \frac{y}{6}$, $\frac{4}{3} = \frac{y}{6}$, answer 8

M1A1ft

If the answer line is blank, but 4.5 is seen correctly embedded or as the correct length on the diagram, award only the method mark

M1A0

In alt 2 and alt 3 their $\tan x$ must be a value for $\tan x$ and not a value for x

[3]

Q9.

sin 28 chosen

cos 62 chosen

B1

$$\frac{7}{\sin 28}$$

$$\frac{7}{\cos 62}$$

M1

[14.9, 14.9104]

Allow 15 if correct working for M1 seen

A1

[3]

Q10.

(horizontal =) $8 \cos 42$ (= [5.9, 6]) or

(horizontal =) $8 \sin 48$ (= [5.9, 6])

$$M1 \cos 42 = \frac{x}{8} \text{ or } \sin 48 = \frac{x}{8}$$

(x is the horizontal)

M2

(vertical =) $8 \sin 42$ (= [5.35, 5.4]) or

(vertical =) $8 \cos 48$ (= [5.35, 5.4]) or

(vertical =) $\sqrt{8^2 - \text{their } [5.9, 6]^2}$ (= [5.35, 5.4])

$$M1 \sin 42 = \frac{y}{8} \text{ or } \cos 48 = \frac{y}{8}$$

(y is the vertical)

or

$8_2 - \text{their } [5.9, 6]_2$

M2

[35.4, 35.5]

A1

Alternative method

(vertical =) $8 \sin 42$ (= [5.35, 5.4])

(vertical =) $8 \cos 48$ (= [5.35, 5.4])

$$M1 \sin 42 = \frac{y}{8} \quad \text{or} \quad \cos 48 = \frac{y}{8}$$

(*y is the vertical*)

M2

(horizontal =) $8 \cos 42$ (= [5.9, 6]) **or**

(horizontal =) $8 \sin 48$ (= [5.9, 6]) **or**

(horizontal =) $\sqrt{8^2 - \text{their } [5.35, 5.4]^2}$ (= [5.9, 6])

$$M1 \cos 42 = \frac{x}{8} \quad \text{or} \quad \sin 48 = \frac{y}{8}$$

(*x is the horizontal*)

or

$8^2 - \text{their } [5.35, 5.4]^2$

M2

[35.4, 35.5]

SC2 [31.8, 31.9]

A1

[5]

Q11.

(a) $\frac{3}{5}$ or 0.6

B1

(b) 35 or 35.0 or 34.99(...)
Do not accept 34.9

B1

[2]

Q12.

$\sin 20 = \frac{x}{12}$
or $12 \sin 20$

oe

M1

4.1...

Accept 4 with working shown

A1

[2]