

M1.

$$\frac{1}{2} \times 5x \times 3x \times \sin 30$$

$$\text{or Height} = 3x \times \sin 30$$

$$\text{or Height} = 1.5x$$

oe

Height may be on the diagram

M1

$$\frac{1}{2} \times 5x \times 3x \times \sin 30 = 45$$

$$\text{or } 3.75x^2 = 45$$

oe

M1

$$x^2 = 45 \div 3.75$$

$$\text{or } x^2 = 12$$

oe

M1

$$3.46(4\dots) \text{ or } 3.5 \text{ or } \sqrt{12} \text{ or } 2\sqrt{3}$$

A1

Additional GuidanceIgnore further working if $\sqrt{12}$ is followed by an attempt to simplify the surd

[4]

M2.

$$\frac{40}{360} \times \pi \times 18^2 \text{ or } 113.(\dots)$$

oe

M1

$$\frac{1}{2} \times 18^2 \times \sin 40 \text{ or } 104.(\dots)$$

oe

M1

$$8.9\dots \text{ or } 9$$

A1

[3]

M3.(a) Sight of x^2 , $-xy$, $+xy$ and $-y^2$ plus some indication that xy terms cancel.

Eg $x^2 - \cancel{xy} + \cancel{xy} - y^2$

Minimum would be

$$x^2 - xy + xy - y^2 = x^2 - y^2$$

B1

(b) $\frac{1}{2} \times 5\sqrt{2} \times (\sqrt{3} - 1) \times \frac{\sqrt{3}+1}{2\sqrt{2}}$

Correct substitution into $\frac{1}{2} ab \sin C$

B1

$$(\sqrt{3}-1)(\sqrt{3}+1) = 3 - 1 (= 2)$$

This must be evaluated at some stage

B1

Clear indication that the expression cancels down to a fraction equivalent to $\frac{5}{2}$

Must show or state cancelling (strand(ii)) for justifying a result.

Cancelling can be done at any stage

Q1

Alternative method

$$\text{Height} = (\sqrt{3}-1) \times \frac{\sqrt{3}+1}{2\sqrt{2}} = \frac{1}{\sqrt{2}}$$

Must get this correct to show explicitly or implicitly (eg could rationalise denominator) that $(\sqrt{3}-1)(\sqrt{3}+1) = 3 - 1 (= 2)$

B1

$$\frac{1}{2} \times 5\sqrt{2} \quad \times \text{ their } \frac{1}{\sqrt{2}}$$

B1ft

Clear indication that the expression cancels down to a fraction equivalent to $\frac{5}{2}$

Must show or state cancelling (strand(ii)) for justifying a result.

Cancelling can be done at any stage

Q1

[4]

M4.

(a)
$$(\cos B =) \frac{(3\sqrt{2})^2 + (\sqrt{2})^2 - (\sqrt{14})^2}{2 \times 3\sqrt{2} \times \sqrt{2}}$$

$$(\sqrt{14})^2 = (3\sqrt{2})^2 + (\sqrt{2})^2 - 2 \times 3\sqrt{2} \times \sqrt{2} \times \cos B$$

M1

$$\frac{18 + 2 - 14}{2 \times 3 \times 2}$$

$$14 = 18 + 2 - 12 \times \cos B$$

allow one error

oe

M1dep

$$\cos B = \frac{6}{12} = \frac{1}{2} \text{ and } B = 60^\circ$$

or $(B =) \cos^{-1}(\frac{1}{2}) = 60^\circ$

A1

(b)
$$\sin 60 = \frac{\sqrt{3}}{2} \text{ seen}$$

M1

$$\frac{1}{2} \times 3\sqrt{2} \times \sqrt{2} \times \sin 60$$

oe

B1

$$\frac{3\sqrt{3}}{2}$$

oe

A1

[6]

M5.(a) $\pi \times 9.2 \times 9.2$ or 265.(...)
oe

M1

$$\frac{125}{360} \times \pi \times 9.2 \times 9.2$$

oe

M1dep

[92, 92.5]

A1

(b) $\frac{1}{2} \times 9.2 \times 9.2 \times \sin 125$
oe

M1

[34.6, 34.7]

A1

[57, 58]

*ft their (a) – [34.6, 34.7]
Allow rounding of final answer*

A1ft

[6]

M6.

$$\frac{1}{2} \times w \times 2w \times \sin 30 (= 18)$$

oe e.g.1 $2w^2 \sin 30 = 36$

e.g.2 $\sin 30 = \frac{18}{w^2}$

M1

$$w^2 = 36 \text{ or } w = 6 \text{ or } 2w = 12$$

A1

their 6^2 + their 12^2

$$-2 \times \text{their } 6 \times \text{their } 12 \times \cos 30$$

$$(= [55.29, 55.3])$$

their $36 + 4 \times \text{their } 36$

$-4 \times \text{their } 36 \times \cos 30$

$(= [55.29, 55.3])$

M1

$$\sqrt{\text{their } [55.29, 55.3]}$$

Dep on previous M1

Do not allow if from incorrect working

e.g. $\sqrt{36 \cos 30}$ is M0 Dep

M1dep

$$[7.4, 7.44]$$

ft their w if 2nd and 3rd M1 gained

A1ft

[5]

M7. $\frac{1}{2} \times 12 \times 14 \times \sin 52$ oe

$$h = 12 \sin 52 (= 9.456\dots) \text{ and } \frac{1}{2} \times 14 \times h$$

M1

$$[66, 66.3]$$

A1

cm²

B1

[3]

M8.(a) $\frac{9^2 + 5^2 - 11^2}{2 \times 9 \times 5}$ (= cos x)
 $11^2 = 9^2 + 5^2 - 2 \times 9 \times 5 \cos x$

M1

-0.16(6...) or -0.17

Can be implied from answers of 99.(...) with 1st M1 awarded

or $-\frac{15}{90}$ or $-\frac{1}{6}$

M1

[99.59, 100]

A1

(b) $\frac{1}{2} \times 9 \times 5 \times \sin$ (their 99.6)

M1

$\frac{1}{2} \times 9 \times 5 \times \sin$ (their 99.6) $\times 4$ oe

$\frac{1}{2} \times 9 \times 5 \times \sin$ (their 99.6) $\times 2$

+ $\frac{1}{2} \times 9 \times 5 \times \sin$ (180 - their 99.6) $\times 2$

M1dep

[88.6, 89]

A1ft

[6]

M9. $\cos 57 = \frac{AD}{9}$ or $\sin 57 = \frac{AB}{9}$ seen
 oe
 Note:

$$AD = 9\cos 57 \text{ or } \sqrt{9^2 - (9\sin 57)^2} \text{ or } 4.9\dots$$

$$AB = 9\sin 57 \text{ or } \sqrt{9^2 - (9\cos 57)^2} \text{ or } 7.5\dots$$

M1

$$\frac{1}{2} \times 9 \cos 57 \times 9 \sin 57$$

oe

Area of right-angled triangle

M1 dep

[18.3, 18.8]

A1

$$\frac{9}{\sin(180 - 82)} \times \sin 39 (= 5.71\dots)$$

$$\text{or } \frac{9}{\sin(180 - 82)} \times \sin 43 (= 6.198\dots)$$

Calculating length of CD or equiv calc using sine rule for BC

M1

$$\frac{1}{2} \times 9 \times \text{their } 5.7 \times \sin 43$$

$$\text{or } \frac{1}{2} \times 9 \times \text{their } 6.198 \times \sin 39$$

$$\text{or } \frac{1}{2} \times \text{their } 5.7 \times \text{their } 6.198 \times \sin 98$$

M1 dep

[17.4, 17.6]

A1

[35.7, 36.4]

Award 7 marks if all 3 answers are in range unless there is clear evidence of incorrect working

A1

[7]

M10. Scale factor $\frac{18}{8}$ or $\frac{8}{18}$ seen or
 11.25 may be on diagram

B1

or $AC = 5 \times 2.25 (= 11.25)$

or angle $B =$ angle E seen

or angle $A =$ angle D seen

Use of cosine rule to work out any angle

$$8^2 = 4^2 + 5^2 - 2 \times 4 \times 5 \times \cos C$$

$$18^2 = 9^2 + \text{their } 11.25^2 - 2 \times 9 \times \text{their } 11.25 \times \cos C$$

$$4^2 = 5^2 + 8^2 - 2 \times 5 \times 8 \times \cos D$$

$$9^2 = 18^2 + \text{their } 11.25^2 - 2 \times 18 \times \text{their } 11.25 \times \cos A$$

$$5^2 = 4^2 + 8^2 - 2 \times 4 \times 8 \times \cos E$$

$$\text{their } 11.25^2 = 9^2 + 18^2 - 2 \times 9 \times 18 \times \cos B$$

M1

Correct rearranging of formula to isolate cosine

$$\frac{4^2 + 5^2 - 8^2}{2 \times 4 \times 5} \quad \text{or} \quad -\frac{23}{40}$$

$$\frac{9^2 + \text{their } 11.25^2 - 18^2}{2 \times 9 \times \text{their } 11.25} \quad \text{or} \quad -\frac{23}{40}$$

$$\frac{5^2 + 8^2 - 4^2}{2 \times 5 \times 8} \quad \text{or} \quad \frac{73}{80}$$

$$\frac{\text{their } 11.25^2 + 18^2 - 9^2}{2 \times \text{their } 11.25 \times 18} \quad \text{or} \quad \frac{73}{80}$$

$$\frac{4^2 + 8^2 - 5^2}{2 \times 4 \times 8} \quad \text{or} \quad \frac{55}{64}$$

$$\frac{9^2 + 18^2 - \text{their } 11.25^2}{2 \times 9 \times 18} \quad \text{or} \quad \frac{55}{64}$$

M1dep

Obtaining one angle

$$\text{eg } C = 125.(...) \text{ or } 125$$

$$B = 30.(...) \text{ or } 31 = E$$

$$A = 24.(...) \text{ or } 24 = D$$

May be seen on diagram

A1

Substitution into $\frac{1}{2} ab \sin C$

$$\frac{1}{2} \times \text{their } 11.25 \times 9 \times \sin \text{their } 125$$

$$\frac{1}{2} \times \text{their } 11.25 \times 18 \times \sin \text{their } 24$$

$$\frac{1}{2} \times 18 \times 9 \times \sin \text{their } 31$$

oe

$$\frac{1}{2} \times 4 \times 5 \times \sin \text{their } 125$$

$$\frac{1}{2} \times 5 \times 8 \times \sin \text{their } 24$$

$$\frac{1}{2} \times 4 \times 8 \times \sin \text{their } 31$$

M1

[41, 42]

A1

[6]

