GCSE Foundation/Higher 15

Shape, space and measure

Mark scheme

100 minutes

84 marks

Geometrical reasoning

M1. (AB^2 =) $9^2 + 7^2$ (= 130)

M1

$\sqrt{9^2 + 7^2}$ or $\sqrt{\text{their } 130}$

M1 dep

11.4(…)

A1

[3]

M2. $w + 40 = 72$

May be on diagram

M1

(w =) 32 seen

A1

$2w = 64$ or $2w = 2 \times$ their 32 or third angle = 72

or $2w + t + 72 = 180$ oe

M1

$180 - 72 - 64$ or $180 - 72 -$ their 32×2

oe 108 − 64

M1

44

A1

[5]

M3. (a) 5 (equal) exterior angles must total 360°

and

360 ÷ 5 = 72 or 5 × 72 = 360

360 ÷ 5 = 72 is not enough … there must be some reference to exterior angles

B1

(b) 2×72 or $360 - (2 \times 108)$

oe

M1

(x =) 144

A1

[3]

M4. (a) 10.15

B1

(Forms an) isosceles triangle

oe

B1

(b) 9.8 ÷ 2(.0)

100 ÷ 2(.0) (× 9.8) or 50 (× 9.8)

Allow 10 ÷ 2 and 5 × 9.8

Condone attempts to change to different units by multiplying/dividing by 10, 100, ...

M1

4.9

or 490

A1

5

B1 ft

[5]

M5. (a) 50 ≤ plan area ≤ 55

B1 43 ≤ plan area < 50 or
55 < plan area ≤ 62 or
Attempt to find plan area

B2

(b) (their) plan area × 4
(= area of turf)

Allow restart with new (their) plan area

M1

(their) area of turf × cost / m^2

Cost / m^2 ↔ (their) area of turf

M1

(£) 406 to (£) 446.60 inclusive

cao

A1

[5]

M6. ∠*BAC* = 55° **and** resaon

∠*BCA = 55°* ***and*** *reason*

B2

∠*BCA* = 55°

∠*BAC = 55°*

B1

B1 For each angle and B1 for **complete** reason why **one** of them is 55°.

For example:

- $\angle BCA$ and $\angle ACB$ are alternate (**not** Z angles)
- $\angle ABC$ and $\angle BC?$ are alternate **and** stating that sum of $\angle$s on straight line = 180 to find $\angle BCA$ from 180 – 70 – 55
- stating that sum of $\angle$s in Δ = 180 to find either angle from 180 – 70 – 55

Assuming that Δ ABC is isosceles scores zero

[2]

M7. $6^2 + 2.5^2$

or 42.25 seen

M1

√(their 42.25)

M1dep

6.5

A1

[3]

M8. (a) (1) 2 2

B1

1
2 1
1

B1

(b) Correctly drawn solid

B1 Correct solid incorrect orientation
Allow with no shading
Penalise (–1) incorrect shading

B2

[4]

M9. (a) (i) (0)25

±2°

B1

(ii) 295

±2°

B1

(b) Correct course (±2°) drawn with **all** construction arcs shown

*B1 Incorrect or no course shown with **all** construction arcs attempted*

*or Correct course (±2°) drawn with **some** construction arcs shown, **not** arcs from A and/or B*

B2

[4]

M10. *P* **and** valid explanation.

eg,
a clear indication that *P* has a right angle and *Q* does not
(all angle calculations shown must be correct) **and** $a^2 + b^2 = c^2$
(or Pythagoras' rule) only works in a right angled triangle

*B1 An incomplete/missing/incorrect explanation **and** either:*

P and 90° (and 100°) correct and shown

or P (and 90°) and 100° correct and shown

or (P and) 90° and 100° correct and shown

B2

[2]

M11. (a) Alternate

Do not accept 'Z angle'

B1

(b) Full explanation

Angle BFE = 70 (straight line)
Angle EBF = 70 angles in a triangle
Hence isosceles as angles same

E3

Partial explanation missing one salient point

Angle BFE = 70 (straight line)
Angle EBF = 70
Hence isosceles as angles same

E2

Partial explanation missing two salient points

Angle BFE = 70 (straight line)
Angle EBF = 70
Hence isosceles

E1

[7]

M12. (a) Complete explanation

eg, Quadrilateral can be divided
into 2 triangles **and** 2 × 180

Use of $(n – 2) \times 180$ with $n = 4$

or Using ∑ (external angles) = 360

eg, ∑ (internal angles + external angles)
= 4 × 180
∑ (internal angles) = 4 × 180 – 360

B for partial explanation

B0 for 2 × 180 only

B2

(b) (i) $3x – 12 + x – 6 + 2x + 90 = 360$

or better eg, $6x + 72 = 360$

B0 for 3x – 12 + x – 6 + 2x + 90 = 180

B1

(ii) $6x = 288$ or $6x = 360 – 72$ or
x = (Their 288) ÷ 6

ft M1 for 6x = 108 or 6x = 180 – 72
or (Their 108) ÷ 6

M1

$x = 48$

ft A1 for x = 18

A1

132

3 × (Their x) – 12 for 35 ≤ x ≤ 63

SC1 48 with no working or using T & I

SC2 (48 and)132 with no working or using T & I

B1 ft

[6]

M13. Allow embedded solutions, but if contradicted M marks only

(a) Bearing 037° ± 2

B1

290° ± 2

B1

Correct intersection of lines

Ignore any x. Within $\frac{1}{2}$ sq of grid intersection

B1

(b) 6 to 6.2 cm

B1

Their 6.1 × 5

M1

30 to 31

A1

[6]

M14. 20 × 10 × 20 (= 4000)

Must be volume calculation not surface area

M1

5 × 5 × 2 (= 50)

Must be volume calculation not surface area

M1

$\frac{\text{their } 4000}{\text{their } 50}$ or

80 or

$\frac{(20\times10\times20)-(70\times5\times5\times2)}{5\times5\times2}$

M3 for 4 × 2 × 10

M2 for two of 2, 4 or 10 multiplied together and by another number

M1

10

A1

[4]

M15. 360/5

540/5

M1

72 or 108 seen

A1

(180 – their 108)/2

108 – 72 or 180 – 72 – 72

M1

36

A1

[4]

M16. *(∠ACB =)* 180 – 2 × 40

oe or 100 seen

M1

2 × (their 100) + 40 + *x* = 360

oe

DM1

120

[3]

M17. **Note** Mark the method that gives the best score
Do not award M1 if **either** B1 clearly comes from incorrect assumptions
(e.g. ∠*BAE* = 90)
SC3 complete method with 1 arithmetic error

(∠*BAD*) → 70

B1

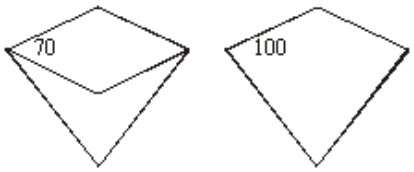
(∠*BAE*) → 100

B1

(their 100) – (their 70)

M1

30



A1

(∠*ADC*) → 250

B1

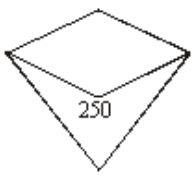
360 – 250 – 50 or 60

B1

(their 60) ÷ 2

M1

30



A1

(∠*ADB*) → 55 or (∠ADE) → 125

B1

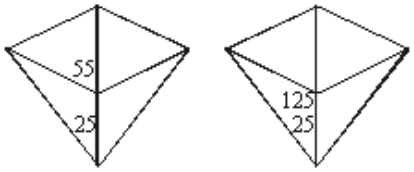
(∠*AED*) → 25

B1

(their 55) – (their 25) **or** 180 – (their 125) – (their 25)

M1

30



A1

(∠*CAD*) → 35

B1

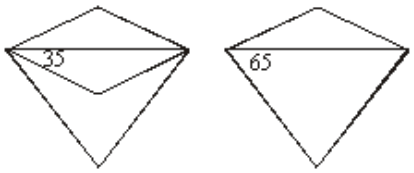
(∠*CAE*) → 65

B1

(their 65) – (their 35)

M1

30



A1

[4]

M18. Sight of 360

B1

360 ÷ 20 (= 18)

Totalling ratios and dividing into 'their 360'

M1

7 × 18 = 126

A1

[3]

M19. $a = 50$

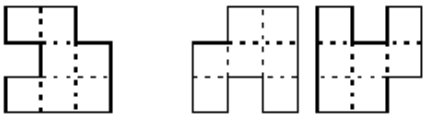
B1

$b = 110$

B1

[2]

M20.



B1 with 1 error

SC1 ± 90° degree rotation

B2

[2]

M21. 180 – 162 or 18

(n – 2) × 180 = 162n

M1

360 ÷ their 18

M1 dep

$x = 20$

A1

[3]

M22. (a) 180 – 48 (= 132)

Provided that the candidate has not used R = 48°

M1

Their 132 ÷ 2 (= 66)

DM1

180 – 66 = 114

66 + 48 = 114 scores A1

A1 cao

(b) Angle sum of triangle = 180°

B1

Quadrilateral = 2 triangles

Quadrilateral = 4 triangles – 360°
or
4 × st. lines – sum of ext angles i.e.
4 ×180 – 360

B1

[5]

M23. $1.2^2 + 3^2$ (= 10.44)

Must add two squares

M1

√(Their 10.44)

Dependent on first M1

DM1

3.2(3.....)

A1

[3]