

GCSE MATHEMATICS

Aligned to Pearson Edexcel GCSE Mathematics (1MA1)

FOUNDATION TIER

GEOMETRY

PRACTICE BOOK

Modules 25–32 | 360 original questions

Formula guides, full worked answers and marking guidance

FREE WEBSITE EDITION

Student name: _____

Target grade: _____ Start date: _____ Completion: _____

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MODULE 25-32 / G1-G25

Unit 4 Contents and Study Plan

8 MODULES | 360 ORIGINAL QUESTIONS

Name: _____ Date: _____ Score: ____ / ____

Complete Core Skills, Exam Practice, Grade 4-5 Challenge and same-topic retrieval in every module. Formula and method guides, full worked answers and marking guidance are collected at the back.

MODULE	TOPIC	SPECIFICATION	SCORE
25	Angles, Polygons and Geometric Reasoning	G1, G3, G4, G6	__ / __
26	Constructions, Loci, Bearings and Scale	G2, G14, G15	__ / __
27	Transformations, Symmetry and Congruence	G1, G5, G7, G11, G19	__ / __
28	Perimeter, Area and Composite Shapes	G14, G16, G17	__ / __
29	Circles, Circumference, Arcs and Sectors	G9, G17, G18	__ / __
30	Volume, Surface Area and 3D Solids	G12, G13, G14, G16, G17	__ / __
31	Pythagoras, Trigonometry and Exact Values	G20, G21	__ / __
32	Vectors and Mixed Geometry Problem Solving	G24, G25; mixed G1-G21	__ / __

Assessment information can change. For the current paper format, calculator rules, timing, marks and qualification details, consult the official Pearson Edexcel GCSE Mathematics (1MA1) specification on the Pearson Qualifications website.

MODULE 01-08 / G1-G25

Specification Coverage Map

INDEPENDENTLY AUTHORED PRACTICE

Name: _____ Date: _____ Score: ____ / ____

This independently authored Foundation Tier practice book is organised around the skills represented by Pearson Edexcel GCSE Mathematics (1MA1) content references G1-G25. The reference identifies specification alignment only; the questions, data, diagrams and worked solutions in this book are independently created.

Pearson Edexcel is referenced only to identify the qualification for which this resource is intended. This publication does not reproduce Pearson Edexcel question papers, mark schemes, examiner reports, sample assessment materials or specification text.

For the official and most recent specification, assessment structure and Pearson Edexcel materials, use the Pearson Qualifications website directly. Do not rely on this independent resource as the authoritative source of qualification rules.

Practice emphasis: Angles, constructions, transformations, properties of shapes, measures, perimeter, area, volume and coordinate geometry. The exercises are designed as independent GCSE Mathematics practice rather than replicas of Pearson Edexcel examination questions.

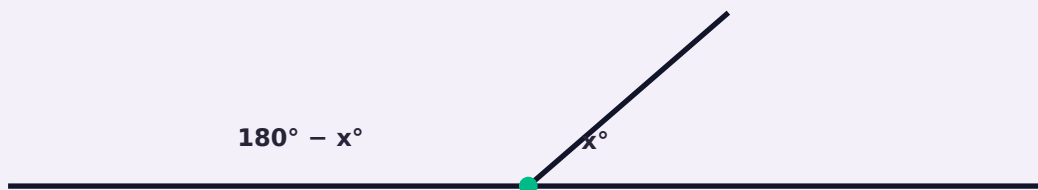
G1-G7	Angle facts, polygons, constructions and transformations
G9-G15	Circles, coordinates, solids, measurement and bearings
G16-G21	Area, perimeter, volume, sectors, Pythagoras and trigonometry
G24-G25	Translations, vector arithmetic and geometric reasoning

MODULE 25-26 / G1, G2, G3, G15

Geometry Visual Reference: Angles and Bearings

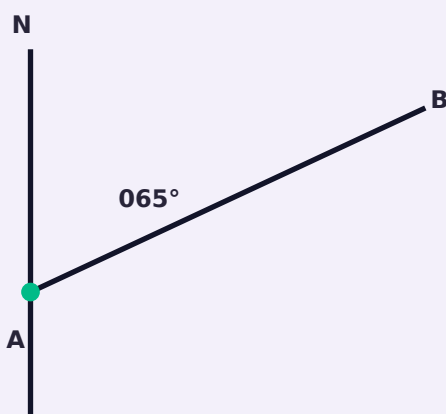
DIAGRAMS | READ, LABEL, APPLY

ANGLE FACTS AND PARALLEL LINES



Straight line = 180° | Full turn = 360° | Triangle = 180°

THREE-FIGURE BEARINGS



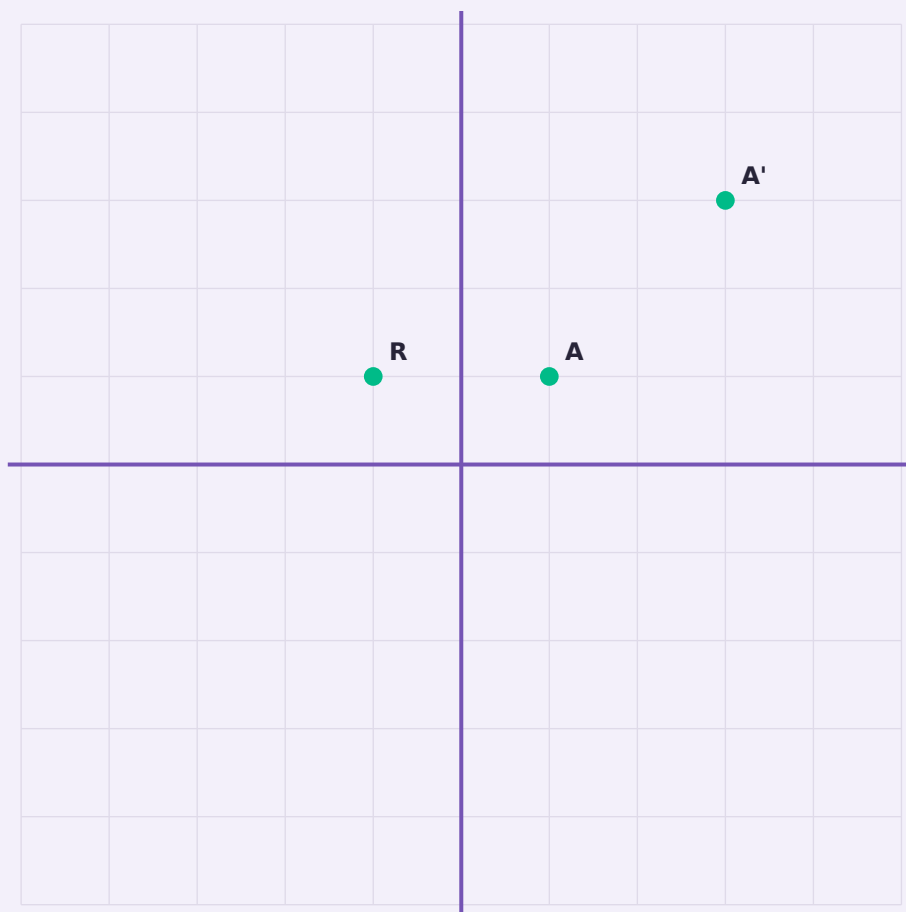
Bearings are measured clockwise from north and written with three digits.

MODULE 27 / G7, G11, G19

Geometry Visual Reference: Transformations

REFLECTION | TRANSLATION | ENLARGEMENT

COORDINATE GRID AND TRANSFORMATIONS



Translation adds a vector. Reflection mirrors a point in a line.

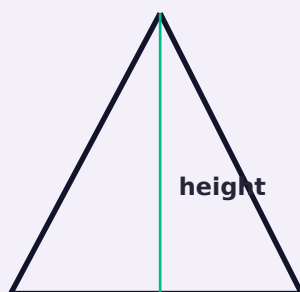
Enlargement from the origin multiplies both coordinates.

MODULE 28-29 / G9, G16, G17, G18

Geometry Visual Reference: Area and Circles

RECTANGLE | TRIANGLE | TRAPEZIUM | CIRCLE

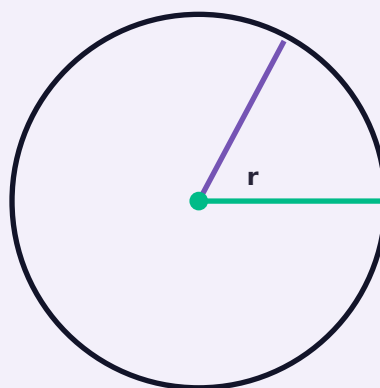
TRIANGLE AND TRAPEZIUM



base

$$\text{Area} = \frac{1}{2} \times \text{base} \times \text{height}$$

CIRCLE, RADIUS AND SECTOR



$$C = 2\pi r \quad A = \pi r^2$$

AREA CHECKLIST

Rectangle: $A = lw$

Triangle: $A = \frac{1}{2}bh$

Trapezium: $A = \frac{1}{2}(a+b)h$

Circle: $A = \pi r^2$

Sector: $A = (\theta/360^\circ)\pi r^2$

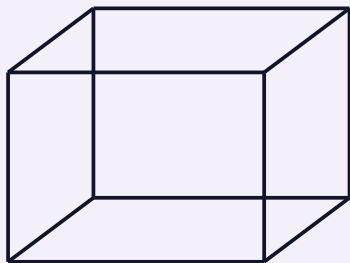
Arc: $L = (\theta/360^\circ)2\pi r$

MODULE 30-32 / G16, G20, G21, G24, G25

Geometry Visual Reference: Solids, Trig and Vectors

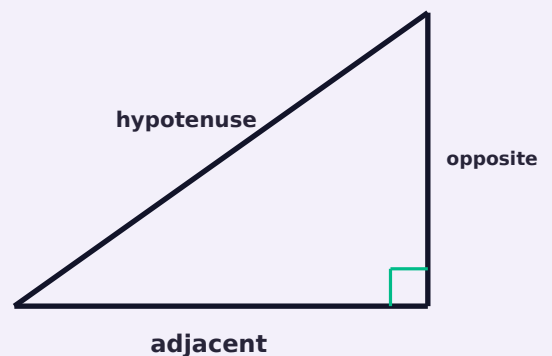
VOLUME | PYTHAGORAS | SOHCAHTOA

CUBOID AND CYLINDER



$$V = lwh \quad | \quad \text{Cylinder } V = \pi r^2 h$$

RIGHT-ANGLED TRIANGLE



$$a^2 + b^2 = c^2 \quad \text{SOH CAH TOA}$$

VECTOR OPERATIONS

$$(a,b) + (c,d) = (a+c, b+d)$$

$$k(a,b) = (ka, kb)$$

$$\text{Vector } AB = B - A$$

Use cm^2 for area, cm^3 for volume, and degrees for angles.

MODULE 25 / G1, G3, G4, G6

Angles, Polygons and Geometric Reasoning

CORE SKILLS | PART A

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

1. Two angles form a straight line. One angle is 32° . Find the other angle. [1 mark]

2. Angles around a point include 80° , 95° and a third angle. Find the third angle. [2 marks]

3. A triangle has angles 38° and 62° . Find its third angle. [2 marks]

4. Two parallel lines are crossed by a transversal. One corresponding angle is 36° . Find the matching corresponding angle. [1 mark]

5. Find the sum of the interior angles of a 5-sided polygon. [2 marks]

MODULE 25 / G1, G3, G4, G6

Angles, Polygons and Geometric Reasoning

CORE SKILLS | PART B

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

6. Two angles form a straight line. One angle is 39° . Find the other angle. [1 mark]

7. Angles around a point include 91° , 95° and a third angle. Find the third angle. [2 marks]

8. A triangle has angles 41° and 64° . Find its third angle. [2 marks]

9. Two parallel lines are crossed by a transversal. One corresponding angle is 40° . Find the matching corresponding angle. [1 mark]

10. Find the sum of the interior angles of a 6-sided polygon. [2 marks]

MODULE 25 / G1, G3, G4, G6

Angles, Polygons and Geometric Reasoning

CORE SKILLS | PART C

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

11. Two angles form a straight line. One angle is 46° . Find the other angle. [1 mark]

12. Angles around a point include 102° , 95° and a third angle. Find the third angle. [2 marks]

13. A triangle has angles 44° and 66° . Find its third angle. [2 marks]

14. Two parallel lines are crossed by a transversal. One corresponding angle is 44° . Find the matching corresponding angle. [1 mark]

15. Find the sum of the interior angles of a 7-sided polygon. [2 marks]

MODULE 25 / G1, G3, G4, G6

Angles, Polygons and Geometric Reasoning

EXAM PRACTICE | PART A

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

16. Two angles form a straight line. One angle is 53° . Find the other angle. [1 mark]

17. Angles around a point include 113° , 95° and a third angle. Find the third angle. [2 marks]

18. A triangle has angles 47° and 68° . Find its third angle. [2 marks]

19. Two parallel lines are crossed by a transversal. One corresponding angle is 48° . Find the matching corresponding angle. [1 mark]

20. Find the sum of the interior angles of a 8-sided polygon. [2 marks]

MODULE 25 / G1, G3, G4, G6

Angles, Polygons and Geometric Reasoning

EXAM PRACTICE | PART B

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

21. Two angles form a straight line. One angle is 60° . Find the other angle. [1 mark]

22. Angles around a point include 124° , 95° and a third angle. Find the third angle. [2 marks]

23. A triangle has angles 50° and 70° . Find its third angle. [2 marks]

24. Two parallel lines are crossed by a transversal. One corresponding angle is 52° . Find the matching corresponding angle. [1 mark]

25. Find the sum of the interior angles of a 9-sided polygon. [2 marks]

MODULE 25 / G1, G3, G4, G6

Angles, Polygons and Geometric Reasoning

EXAM PRACTICE | PART C

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

26. Two angles form a straight line. One angle is 67° . Find the other angle. [1 mark]

27. Angles around a point include 135° , 95° and a third angle. Find the third angle. [2 marks]

28. A triangle has angles 53° and 72° . Find its third angle. [2 marks]

29. Two parallel lines are crossed by a transversal. One corresponding angle is 56° . Find the matching corresponding angle. [1 mark]

30. Find the sum of the interior angles of a 10-sided polygon. [2 marks]

MODULE 25 / G1, G3, G4, G6

Angles, Polygons and Geometric Reasoning

GRADE 4-5 CHALLENGE | PART A

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

31. Two angles form a straight line. One angle is 74° . Find the other angle. [1 mark]

32. Angles around a point include 146° , 95° and a third angle. Find the third angle. [2 marks]

33. A triangle has angles 56° and 74° . Find its third angle. [2 marks]

34. State two geometric properties of a rectangle. [2 marks]

35. Find the sum of the interior angles of a 11-sided polygon. [2 marks]

MODULE 25 / G1, G3, G4, G6

Angles, Polygons and Geometric Reasoning

GRADE 4-5 CHALLENGE | PART B

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

36. Two angles form a straight line. One angle is 81° . Find the other angle. [1 mark]

37. Angles around a point include 157° , 95° and a third angle. Find the third angle. [2 marks]

38. A triangle has angles 59° and 76° . Find its third angle. [2 marks]

39. State two geometric properties of a rhombus. [2 marks]

40. Find the sum of the interior angles of a 12-sided polygon. [2 marks]

MODULE 25 / G1, G3, G4, G6

Angles, Polygons and Geometric Reasoning

SAME-TOPIC RETRIEVAL

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

41. Two angles form a straight line. One angle is 88° . Find the other angle. [1 mark]

42. Angles around a point include 168° , 95° and a third angle. Find the third angle. [2 marks]

43. A triangle has angles 62° and 78° . Find its third angle. [2 marks]

44. State two geometric properties of an isosceles triangle. [2 marks]

45. Find the sum of the interior angles of a 13-sided polygon. [2 marks]

MODULE 26 / G2, G14, G15

Constructions, Loci, Bearings and Scale

CORE SKILLS | PART A

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

1. A direction is 25° clockwise from north. Write its three-figure bearing. [1 mark]

2. The bearing of B from A is 035° . Find the bearing of A from B. [2 marks]

3. On a map, 1 cm represents 5 km. Two towns are 3 cm apart. Find the real distance. [2 marks]

4. A line segment AB is 10 cm long. How far is the perpendicular bisector from A? [2 marks]

5. An angle of 40° is bisected. Find the size of each resulting angle. [1 mark]

MODULE 26 / G2, G14, G15

Constructions, Loci, Bearings and Scale

CORE SKILLS | PART B

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

6. A direction is 35° clockwise from north. Write its three-figure bearing. [1 mark]

7. The bearing of B from A is 050° . Find the bearing of A from B. [2 marks]

8. On a map, 1 cm represents 6 km. Two towns are 4 cm apart. Find the real distance. [2 marks]

9. A line segment AB is 12 cm long. How far is the perpendicular bisector from A? [2 marks]

10. An angle of 48° is bisected. Find the size of each resulting angle. [1 mark]

MODULE 26 / G2, G14, G15

Constructions, Loci, Bearings and Scale

CORE SKILLS | PART C

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

11. A direction is 45° clockwise from north. Write its three-figure bearing. [1 mark]

12. The bearing of B from A is 065° . Find the bearing of A from B. [2 marks]

13. On a map, 1 cm represents 7 km. Two towns are 5 cm apart. Find the real distance. [2 marks]

14. A line segment AB is 14 cm long. How far is the perpendicular bisector from A? [2 marks]

15. An angle of 56° is bisected. Find the size of each resulting angle. [1 mark]

MODULE 26 / G2, G14, G15

Constructions, Loci, Bearings and Scale

EXAM PRACTICE | PART A

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

16. A direction is 55° clockwise from north. Write its three-figure bearing. [1 mark]

17. The bearing of B from A is 080° . Find the bearing of A from B. [2 marks]

18. On a map, 1 cm represents 8 km. Two towns are 6 cm apart. Find the real distance. [2 marks]

19. A line segment AB is 16 cm long. How far is the perpendicular bisector from A? [2 marks]

20. An angle of 64° is bisected. Find the size of each resulting angle. [1 mark]

MODULE 26 / G2, G14, G15

Constructions, Loci, Bearings and Scale

EXAM PRACTICE | PART B

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

21. A direction is 65° clockwise from north. Write its three-figure bearing. [1 mark]

22. The bearing of B from A is 095° . Find the bearing of A from B. [2 marks]

23. On a map, 1 cm represents 9 km. Two towns are 7 cm apart. Find the real distance. [2 marks]

24. A line segment AB is 18 cm long. How far is the perpendicular bisector from A? [2 marks]

25. An angle of 72° is bisected. Find the size of each resulting angle. [1 mark]

MODULE 26 / G2, G14, G15

Constructions, Loci, Bearings and Scale

EXAM PRACTICE | PART C

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

26. A direction is 75° clockwise from north. Write its three-figure bearing. [1 mark]

27. The bearing of B from A is 110° . Find the bearing of A from B. [2 marks]

28. On a map, 1 cm represents 10 km. Two towns are 8 cm apart. Find the real distance. [2 marks]

29. A line segment AB is 20 cm long. How far is the perpendicular bisector from A? [2 marks]

30. Describe the locus of points exactly 7 cm from a fixed point P. [2 marks]

MODULE 26 / G2, G14, G15

Constructions, Loci, Bearings and Scale

GRADE 4-5 CHALLENGE | PART A

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

31. A direction is 85° clockwise from north. Write its three-figure bearing. [1 mark]

32. The bearing of B from A is 125° . Find the bearing of A from B. [2 marks]

33. On a map, 1 cm represents 11 km. Two towns are 9 cm apart. Find the real distance. [2 marks]

34. A line segment AB is 22 cm long. How far is the perpendicular bisector from A? [2 marks]

35. Describe the locus of points equidistant from two fixed points A and B. [2 marks]

MODULE 26 / G2, G14, G15

Constructions, Loci, Bearings and Scale

GRADE 4-5 CHALLENGE | PART B

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

36. A direction is 95° clockwise from north. Write its three-figure bearing. [1 mark]

37. The bearing of B from A is 140° . Find the bearing of A from B. [2 marks]

38. On a map, 1 cm represents 12 km. Two towns are 10 cm apart. Find the real distance. [2 marks]

39. A line segment AB is 24 cm long. How far is the perpendicular bisector from A? [2 marks]

40. Describe the locus of points equidistant from two intersecting straight lines. [2 marks]

MODULE 26 / G2, G14, G15

Constructions, Loci, Bearings and Scale

SAME-TOPIC RETRIEVAL

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

41. A direction is 105° clockwise from north. Write its three-figure bearing. [1 mark]

42. The bearing of B from A is 155° . Find the bearing of A from B. [2 marks]

43. On a map, 1 cm represents 13 km. Two towns are 11 cm apart. Find the real distance. [2 marks]

44. A line segment AB is 26 cm long. How far is the perpendicular bisector from A? [2 marks]

45. Describe the locus of points exactly 10 cm from a straight line. [2 marks]

MODULE 27 / G1, G5, G7, G11, G19

Transformations, Symmetry and Congruence

CORE SKILLS | PART A

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

1. Translate the point $(-4,2)$ by the vector $(2,-3)$. State its image. [2 marks]

2. Reflect the point $(2,3)$ in the x-axis. [1 mark]

3. Reflect the point $(2,3)$ in the y-axis. [1 mark]

4. Rotate the point $(-3,2)$ 90° anticlockwise about the origin. [2 marks]

5. Enlarge the point $(2,1)$ by scale factor 2 about the origin. [2 marks]

MODULE 27 / G1, G5, G7, G11, G19

Transformations, Symmetry and Congruence

CORE SKILLS | PART B

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

6. Translate the point $(-3,3)$ by the vector $(3,-2)$. State its image. [2 marks]

7. Reflect the point $(3,4)$ in the x-axis. [1 mark]

8. Reflect the point $(3,4)$ in the y-axis. [1 mark]

9. Rotate the point $(-2,3)$ 90° anticlockwise about the origin. [2 marks]

10. Enlarge the point $(3,2)$ by scale factor 3 about the origin. [2 marks]

MODULE 27 / G1, G5, G7, G11, G19

Transformations, Symmetry and Congruence

CORE SKILLS | PART C

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

11. Translate the point $(-2,4)$ by the vector $(4,-1)$. State its image. [2 marks]

12. Reflect the point $(4,5)$ in the x-axis. [1 mark]

13. Reflect the point $(4,5)$ in the y-axis. [1 mark]

14. Rotate the point $(-1,4)$ 90° anticlockwise about the origin. [2 marks]

15. Enlarge the point $(4,3)$ by scale factor 4 about the origin. [2 marks]

MODULE 27 / G1, G5, G7, G11, G19

Transformations, Symmetry and Congruence

EXAM PRACTICE | PART A

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

16. Translate the point $(-1,5)$ by the vector $(2,0)$. State its image. [2 marks]

17. Reflect the point $(5,6)$ in the x-axis. [1 mark]

18. Reflect the point $(5,6)$ in the y-axis. [1 mark]

19. Rotate the point $(0,5)$ 90° anticlockwise about the origin. [2 marks]

20. Enlarge the point $(5,4)$ by scale factor 2 about the origin. [2 marks]

MODULE 27 / G1, G5, G7, G11, G19

Transformations, Symmetry and Congruence

EXAM PRACTICE | PART B

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

21. Translate the point (0,6) by the vector (3,-3). State its image. [2 marks]

22. Reflect the point (6,7) in the x-axis. [1 mark]

23. Reflect the point (6,7) in the y-axis. [1 mark]

24. Rotate the point (1,6) 90° anticlockwise about the origin. [2 marks]

25. Enlarge the point (6,1) by scale factor 3 about the origin. [2 marks]

MODULE 27 / G1, G5, G7, G11, G19

Transformations, Symmetry and Congruence

EXAM PRACTICE | PART C

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

26. Translate the point (1,7) by the vector (4,-2). State its image. [2 marks]

27. Reflect the point (7,3) in the x-axis. [1 mark]

28. Reflect the point (7,3) in the y-axis. [1 mark]

29. Rotate the point (2,7) 90° anticlockwise about the origin. [2 marks]

30. Two triangles have three pairs of corresponding sides equal. Which congruence test proves they are congruent? [2 marks]

MODULE 27 / G1, G5, G7, G11, G19

Transformations, Symmetry and Congruence

GRADE 4-5 CHALLENGE | PART A

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

31. Translate the point (2,8) by the vector (2,-1). State its image. [2 marks]

32. Reflect the point (8,4) in the x-axis. [1 mark]

33. Reflect the point (8,4) in the y-axis. [1 mark]

34. Rotate the point (3,8) 90° anticlockwise about the origin. [2 marks]

35. Two triangles have two equal sides and the included angle equal. Which congruence test applies? [2 marks]

MODULE 27 / G1, G5, G7, G11, G19

Transformations, Symmetry and Congruence

GRADE 4-5 CHALLENGE | PART B

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

36. Translate the point (3,9) by the vector (3,0). State its image. [2 marks]

37. Reflect the point (9,5) in the x-axis. [1 mark]

38. Reflect the point (9,5) in the y-axis. [1 mark]

39. Rotate the point (4,9) 90° anticlockwise about the origin. [2 marks]

40. How many lines of symmetry does a regular hexagon have? [1 mark]

MODULE 27 / G1, G5, G7, G11, G19

Transformations, Symmetry and Congruence

SAME-TOPIC RETRIEVAL

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

41. Translate the point (4,10) by the vector (4,-3). State its image. [2 marks]

42. Reflect the point (10,6) in the x-axis. [1 mark]

43. Reflect the point (10,6) in the y-axis. [1 mark]

44. Rotate the point (5,10) 90° anticlockwise about the origin. [2 marks]

45. What is the order of rotational symmetry of a square? [1 mark]

MODULE 28 / G14, G16, G17

Perimeter, Area and Composite Shapes

CORE SKILLS | PART A

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

1. A rectangle measures 8 cm by 3 cm. Find its perimeter. [2 marks]

2. A rectangle measures 9 m by 4 m. Find its area. [1 mark]

3. A triangle has base 8 cm and perpendicular height 5 cm. Find its area. [2 marks]

4. A trapezium has parallel sides 6 cm and 10 cm and perpendicular height 4 cm. Find its area. [3 marks]

5. An L-shape is made by removing a 3 cm by 2 cm rectangle from a 12 cm by 8 cm rectangle. Find its area. [3 marks]

MODULE 28 / G14, G16, G17

Perimeter, Area and Composite Shapes

CORE SKILLS | PART B

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

6. A rectangle measures 9 cm by 4 cm. Find its perimeter. [2 marks]

7. A rectangle measures 10 m by 5 m. Find its area. [1 mark]

8. A triangle has base 10 cm and perpendicular height 6 cm. Find its area. [2 marks]

9. A trapezium has parallel sides 7 cm and 11 cm and perpendicular height 5 cm. Find its area. [3 marks]

10. An L-shape is made by removing a 4 cm by 3 cm rectangle from a 13 cm by 9 cm rectangle. Find its area. [3 marks]

MODULE 28 / G14, G16, G17

Perimeter, Area and Composite Shapes

CORE SKILLS | PART C

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

11. A rectangle measures 10 cm by 5 cm. Find its perimeter. [2 marks]

12. A rectangle measures 11 m by 6 m. Find its area. [1 mark]

13. A triangle has base 12 cm and perpendicular height 7 cm. Find its area. [2 marks]

14. A trapezium has parallel sides 8 cm and 12 cm and perpendicular height 6 cm. Find its area. [3 marks]

15. An L-shape is made by removing a 5 cm by 2 cm rectangle from a 14 cm by 10 cm rectangle. Find its area. [3 marks]

MODULE 28 / G14, G16, G17

Perimeter, Area and Composite Shapes

EXAM PRACTICE | PART A

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

16. A rectangle measures 11 cm by 6 cm. Find its perimeter. [2 marks]

17. A rectangle measures 12 m by 7 m. Find its area. [1 mark]

18. A triangle has base 14 cm and perpendicular height 8 cm. Find its area. [2 marks]

19. A trapezium has parallel sides 9 cm and 13 cm and perpendicular height 7 cm. Find its area. [3 marks]

20. An L-shape is made by removing a 3 cm by 3 cm rectangle from a 15 cm by 11 cm rectangle. Find its area. [3 marks]

MODULE 28 / G14, G16, G17

Perimeter, Area and Composite Shapes

EXAM PRACTICE | PART B

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

21. A rectangle measures 12 cm by 7 cm. Find its perimeter. [2 marks]

22. A rectangle measures 13 m by 4 m. Find its area. [1 mark]

23. A triangle has base 16 cm and perpendicular height 9 cm. Find its area. [2 marks]

24. A trapezium has parallel sides 10 cm and 14 cm and perpendicular height 4 cm. Find its area. [3 marks]

25. An L-shape is made by removing a 4 cm by 2 cm rectangle from a 16 cm by 8 cm rectangle. Find its area. [3 marks]

MODULE 28 / G14, G16, G17

Perimeter, Area and Composite Shapes

EXAM PRACTICE | PART C

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

26. A rectangle measures 13 cm by 3 cm. Find its perimeter. [2 marks]

27. A rectangle measures 14 m by 5 m. Find its area. [1 mark]

28. A triangle has base 18 cm and perpendicular height 5 cm. Find its area. [2 marks]

29. A trapezium has parallel sides 11 cm and 15 cm and perpendicular height 5 cm. Find its area. [3 marks]

30. An L-shape is made by removing a 5 cm by 3 cm rectangle from a 17 cm by 9 cm rectangle. Find its area. [3 marks]

MODULE 28 / G14, G16, G17

Perimeter, Area and Composite Shapes

GRADE 4-5 CHALLENGE | PART A

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

31. A rectangle measures 14 cm by 4 cm. Find its perimeter. [2 marks]

32. A parallelogram has base 15 m and perpendicular height 6 m. Find its area. [2 marks]

33. A triangle has base 20 cm and perpendicular height 6 cm. Find its area. [2 marks]

34. A trapezium has parallel sides 12 cm and 16 cm and perpendicular height 6 cm. Find its area. [3 marks]

35. An L-shape is made by removing a 3 cm by 2 cm rectangle from a 18 cm by 10 cm rectangle. Find its area. [3 marks]

MODULE 28 / G14, G16, G17

Perimeter, Area and Composite Shapes

GRADE 4-5 CHALLENGE | PART B

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

36. A rectangle measures 15 cm by 5 cm. Find its perimeter. [2 marks]

37. A parallelogram has base 16 m and perpendicular height 7 m. Find its area. [2 marks]

38. A triangle has base 22 cm and perpendicular height 7 cm. Find its area. [2 marks]

39. A trapezium has parallel sides 13 cm and 17 cm and perpendicular height 7 cm. Find its area. [3 marks]

40. An L-shape is made by removing a 4 cm by 3 cm rectangle from a 19 cm by 11 cm rectangle. Find its area. [3 marks]

MODULE 28 / G14, G16, G17

Perimeter, Area and Composite Shapes

SAME-TOPIC RETRIEVAL

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

41. A rectangle measures 16 cm by 6 cm. Find its perimeter. [2 marks]

42. A parallelogram has base 17 m and perpendicular height 4 m. Find its area. [2 marks]

43. A triangle has base 24 cm and perpendicular height 8 cm. Find its area. [2 marks]

44. A trapezium has parallel sides 14 cm and 18 cm and perpendicular height 4 cm. Find its area. [3 marks]

45. An L-shape is made by removing a 5 cm by 2 cm rectangle from a 20 cm by 8 cm rectangle. Find its area. [3 marks]

MODULE 29 / G9, G17, G18

Circles, Circumference, Arcs and Sectors

CORE SKILLS | PART A

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

1. A circle has radius 3 cm. Find its circumference in terms of π . [2 marks]

2. A circle has diameter 8 cm. Find its circumference in terms of π . [1 mark]

3. A circle has radius 4 cm. Find its area in terms of π . [2 marks]

4. A sector has radius 12 cm and angle 30° . Find its arc length in terms of π . [3 marks]

5. A sector has radius 12 cm and angle 30° . Find its area in terms of π . [3 marks]

MODULE 29 / G9, G17, G18

Circles, Circumference, Arcs and Sectors

CORE SKILLS | PART B

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

6. A circle has radius 4 cm. Find its circumference in terms of π . [2 marks]

7. A circle has diameter 10 cm. Find its circumference in terms of π . [1 mark]

8. A circle has radius 5 cm. Find its area in terms of π . [2 marks]

9. A sector has radius 12 cm and angle 45° . Find its arc length in terms of π . [3 marks]

10. A sector has radius 12 cm and angle 45° . Find its area in terms of π . [3 marks]

MODULE 29 / G9, G17, G18

Circles, Circumference, Arcs and Sectors

CORE SKILLS | PART C

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

11. A circle has radius 5 cm. Find its circumference in terms of π . [2 marks]

12. A circle has diameter 12 cm. Find its circumference in terms of π . [1 mark]

13. A circle has radius 6 cm. Find its area in terms of π . [2 marks]

14. A sector has radius 12 cm and angle 60° . Find its arc length in terms of π . [3 marks]

15. A sector has radius 12 cm and angle 60° . Find its area in terms of π . [3 marks]

MODULE 29 / G9, G17, G18

Circles, Circumference, Arcs and Sectors

EXAM PRACTICE | PART A

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

16. A circle has radius 6 cm. Find its circumference in terms of π . [2 marks]

17. A circle has diameter 14 cm. Find its circumference in terms of π . [1 mark]

18. A circle has radius 7 cm. Find its area in terms of π . [2 marks]

19. A sector has radius 12 cm and angle 90° . Find its arc length in terms of π . [3 marks]

20. A sector has radius 12 cm and angle 90° . Find its area in terms of π . [3 marks]

MODULE 29 / G9, G17, G18

Circles, Circumference, Arcs and Sectors

EXAM PRACTICE | PART B

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

21. A circle has radius 7 cm. Find its circumference in terms of π . [2 marks]

22. A circle has diameter 16 cm. Find its circumference in terms of π . [1 mark]

23. A circle has radius 8 cm. Find its area in terms of π . [2 marks]

24. A sector has radius 12 cm and angle 120° . Find its arc length in terms of π . [3 marks]

25. A sector has radius 12 cm and angle 120° . Find its area in terms of π . [3 marks]

MODULE 29 / G9, G17, G18

Circles, Circumference, Arcs and Sectors

EXAM PRACTICE | PART C

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

26. A circle has radius 8 cm. Find its circumference in terms of π . [2 marks]

27. A circle has diameter 18 cm. Find its circumference in terms of π . [1 mark]

28. A circle has radius 9 cm. Find its area in terms of π . [2 marks]

29. A sector has radius 12 cm and angle 150° . Find its arc length in terms of π . [3 marks]

30. A sector has radius 12 cm and angle 150° . Find its area in terms of π . [3 marks]

MODULE 29 / G9, G17, G18

Circles, Circumference, Arcs and Sectors

GRADE 4-5 CHALLENGE | PART A

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

31. A circle has radius 9 cm. Find its circumference in terms of π . [2 marks]

32. A circle has diameter 20 cm. Find its circumference in terms of π . [1 mark]

33. A circle has radius 10 cm. Find its area in terms of π . [2 marks]

34. A sector has radius 12 cm and angle 180° . Find its arc length in terms of π . [3 marks]

35. A sector has radius 12 cm and angle 180° . Find its area in terms of π . [3 marks]

MODULE 29 / G9, G17, G18

Circles, Circumference, Arcs and Sectors

GRADE 4-5 CHALLENGE | PART B

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

36. A circle has radius 10 cm. Find its circumference in terms of π . [2 marks]

37. A circle has diameter 22 cm. Find its circumference in terms of π . [1 mark]

38. A circle has radius 11 cm. Find its area in terms of π . [2 marks]

39. A sector has radius 12 cm and angle 210° . Find its arc length in terms of π . [3 marks]

40. A sector has radius 12 cm and angle 240° . Find its area in terms of π . [3 marks]

MODULE 29 / G9, G17, G18

Circles, Circumference, Arcs and Sectors

SAME-TOPIC RETRIEVAL

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

41. A circle has radius 11 cm. Find its circumference in terms of π . [2 marks]

42. A circle has diameter 24 cm. Find its circumference in terms of π . [1 mark]

43. A circle has radius 12 cm. Find its area in terms of π . [2 marks]

44. A sector has radius 12 cm and angle 270° . Find its arc length in terms of π . [3 marks]

45. A sector has radius 12 cm and angle 270° . Find its area in terms of π . [3 marks]

MODULE 30 / G12, G13, G14, G16, G17

Volume, Surface Area and 3D Solids

CORE SKILLS | PART A

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

1. A cuboid measures 5 cm by 3 cm by 4 cm. Find its volume. [2 marks]

2. A cuboid measures 6 cm by 4 cm by 3 cm. Find its surface area. [3 marks]

3. A cylinder has radius 2 cm and height 6 cm. Find its volume in terms of π . [3 marks]

4. A triangular prism has triangular base 10 cm, perpendicular height 4 cm, and prism length 8 cm. Find its volume. [3 marks]

5. Convert 1.5 litres to cubic centimetres. [2 marks]

MODULE 30 / G12, G13, G14, G16, G17

Volume, Surface Area and 3D Solids

CORE SKILLS | PART B

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

6. A cuboid measures 6 cm by 4 cm by 5 cm. Find its volume. [2 marks]

7. A cuboid measures 7 cm by 5 cm by 4 cm. Find its surface area. [3 marks]

8. A cylinder has radius 3 cm and height 7 cm. Find its volume in terms of π . [3 marks]

9. A triangular prism has triangular base 12 cm, perpendicular height 5 cm, and prism length 9 cm. Find its volume. [3 marks]

10. Convert 1.9 litres to cubic centimetres. [2 marks]

MODULE 30 / G12, G13, G14, G16, G17

Volume, Surface Area and 3D Solids

CORE SKILLS | PART C

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

11. A cuboid measures 7 cm by 5 cm by 6 cm. Find its volume. [2 marks]

12. A cuboid measures 8 cm by 6 cm by 5 cm. Find its surface area. [3 marks]

13. A cylinder has radius 4 cm and height 8 cm. Find its volume in terms of π . [3 marks]

14. A triangular prism has triangular base 14 cm, perpendicular height 6 cm, and prism length 10 cm. Find its volume. [3 marks]

15. Convert 2.3 litres to cubic centimetres. [2 marks]

MODULE 30 / G12, G13, G14, G16, G17

Volume, Surface Area and 3D Solids

EXAM PRACTICE | PART A

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

16. A cuboid measures 8 cm by 6 cm by 4 cm. Find its volume. [2 marks]

17. A cuboid measures 9 cm by 4 cm by 6 cm. Find its surface area. [3 marks]

18. A cylinder has radius 5 cm and height 9 cm. Find its volume in terms of π . [3 marks]

19. A triangular prism has triangular base 16 cm, perpendicular height 7 cm, and prism length 11 cm. Find its volume. [3 marks]

20. Convert 2.7 litres to cubic centimetres. [2 marks]

MODULE 30 / G12, G13, G14, G16, G17

Volume, Surface Area and 3D Solids

EXAM PRACTICE | PART B

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

21. A cuboid measures 9 cm by 3 cm by 5 cm. Find its volume. [2 marks]

22. A cuboid measures 10 cm by 5 cm by 3 cm. Find its surface area. [3 marks]

23. A cylinder has radius 6 cm and height 10 cm. Find its volume in terms of π . [3 marks]

24. A triangular prism has triangular base 18 cm, perpendicular height 4 cm, and prism length 12 cm. Find its volume. [3 marks]

25. Convert 3.1 litres to cubic centimetres. [2 marks]

MODULE 30 / G12, G13, G14, G16, G17

Volume, Surface Area and 3D Solids

EXAM PRACTICE | PART C

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

26. A cuboid measures 10 cm by 4 cm by 6 cm. Find its volume. [2 marks]

27. A cuboid measures 11 cm by 6 cm by 4 cm. Find its surface area. [3 marks]

28. A cylinder has radius 2 cm and height 11 cm. Find its volume in terms of π . [3 marks]

29. A triangular prism has triangular base 20 cm, perpendicular height 5 cm, and prism length 13 cm. Find its volume. [3 marks]

30. A vertical cylinder is viewed from directly above. What shape is its plan? [1 mark]

MODULE 30 / G12, G13, G14, G16, G17

Volume, Surface Area and 3D Solids

GRADE 4-5 CHALLENGE | PART A

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

31. A cuboid measures 11 cm by 5 cm by 4 cm. Find its volume. [2 marks]

32. A cuboid measures 12 cm by 4 cm by 5 cm. Find its surface area. [3 marks]

33. A cylinder has radius 3 cm and height 12 cm. Find its volume in terms of π . [3 marks]

34. A triangular prism has triangular base 22 cm, perpendicular height 6 cm, and prism length 14 cm. Find its volume. [3 marks]

35. A cone has radius 3 cm and perpendicular height 8 cm. Find its volume in terms of π . [3 marks]

MODULE 30 / G12, G13, G14, G16, G17

Volume, Surface Area and 3D Solids

GRADE 4-5 CHALLENGE | PART B

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

36. A cuboid measures 12 cm by 6 cm by 5 cm. Find its volume. [2 marks]

37. A cuboid measures 13 cm by 5 cm by 6 cm. Find its surface area. [3 marks]

38. A cylinder has radius 4 cm and height 13 cm. Find its volume in terms of π . [3 marks]

39. A triangular prism has triangular base 24 cm, perpendicular height 7 cm, and prism length 15 cm. Find its volume. [3 marks]

40. A sphere has radius 6 cm. Find its volume in terms of π . [3 marks]

MODULE 30 / G12, G13, G14, G16, G17

Volume, Surface Area and 3D Solids

SAME-TOPIC RETRIEVAL

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

41. A cuboid measures 13 cm by 3 cm by 6 cm. Find its volume. [2 marks]

42. A cuboid measures 14 cm by 6 cm by 3 cm. Find its surface area. [3 marks]

43. A cylinder has radius 5 cm and height 14 cm. Find its volume in terms of π . [3 marks]

44. A triangular prism has triangular base 26 cm, perpendicular height 4 cm, and prism length 16 cm. Find its volume. [3 marks]

45. A rectangular-based pyramid has base 10 cm by 8 cm and perpendicular height 9 cm. Find its volume. [3 marks]

MODULE 31 / G20, G21

Pythagoras, Trigonometry and Exact Values

CORE SKILLS | PART A

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

1. A right-angled triangle has shorter sides 3 cm and 4 cm. Find its hypotenuse. [3 marks]

2. A right-angled triangle has hypotenuse 5 cm and one shorter side 3 cm. Find the other side. [3 marks]

3. In a right-angled triangle, the opposite side is 5 cm and the angle is 30° . Find the hypotenuse to 1 decimal place. [3 marks]

4. In a right-angled triangle, the adjacent side is 6 cm and the angle is 30° . Find the opposite side to 1 decimal place. [3 marks]

5. Give the exact value of $\sin(0^\circ)$. [1 mark]

MODULE 31 / G20, G21

Pythagoras, Trigonometry and Exact Values

CORE SKILLS | PART B

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

6. A right-angled triangle has shorter sides 5 cm and 12 cm. Find its hypotenuse. [3 marks]

7. A right-angled triangle has hypotenuse 13 cm and one shorter side 5 cm. Find the other side. [3 marks]

8. In a right-angled triangle, the opposite side is 6 cm and the angle is 45° . Find the hypotenuse to 1 decimal place. [3 marks]

9. In a right-angled triangle, the adjacent side is 7 cm and the angle is 45° . Find the opposite side to 1 decimal place. [3 marks]

10. Give the exact value of $\sin(30^\circ)$. [1 mark]

MODULE 31 / G20, G21

Pythagoras, Trigonometry and Exact Values

CORE SKILLS | PART C

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

11. A right-angled triangle has shorter sides 8 cm and 15 cm. Find its hypotenuse. [3 marks]

12. A right-angled triangle has hypotenuse 17 cm and one shorter side 8 cm. Find the other side. [3 marks]

13. In a right-angled triangle, the opposite side is 7 cm and the angle is 60° . Find the hypotenuse to 1 decimal place. [3 marks]

14. In a right-angled triangle, the adjacent side is 8 cm and the angle is 60° . Find the opposite side to 1 decimal place. [3 marks]

15. Give the exact value of $\sin(45^\circ)$. [1 mark]

MODULE 31 / G20, G21

Pythagoras, Trigonometry and Exact Values

EXAM PRACTICE | PART A

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

16. A right-angled triangle has shorter sides 7 cm and 24 cm. Find its hypotenuse. [3 marks]

17. A right-angled triangle has hypotenuse 25 cm and one shorter side 7 cm. Find the other side. [3 marks]

18. In a right-angled triangle, the opposite side is 8 cm and the angle is 30° . Find the hypotenuse to 1 decimal place. [3 marks]

19. A right-angled triangle has adjacent side 9 cm and hypotenuse 14 cm. Find the angle to 1 decimal place. [3 marks]

20. Give the exact value of $\sin(60^\circ)$. [1 mark]

MODULE 31 / G20, G21

Pythagoras, Trigonometry and Exact Values

EXAM PRACTICE | PART B

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

21. A right-angled triangle has shorter sides 9 cm and 12 cm. Find its hypotenuse. [3 marks]

22. A right-angled triangle has hypotenuse 15 cm and one shorter side 9 cm. Find the other side. [3 marks]

23. In a right-angled triangle, the opposite side is 9 cm and the angle is 45° . Find the hypotenuse to 1 decimal place. [3 marks]

24. A right-angled triangle has adjacent side 10 cm and hypotenuse 15 cm. Find the angle to 1 decimal place. [3 marks]

25. Give the exact value of $\sin(90^\circ)$. [1 mark]

MODULE 31 / G20, G21

Pythagoras, Trigonometry and Exact Values

EXAM PRACTICE | PART C

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

26. A right-angled triangle has shorter sides 12 cm and 16 cm. Find its hypotenuse. [3 marks]

27. A right-angled triangle has hypotenuse 20 cm and one shorter side 12 cm. Find the other side. [3 marks]

28. In a right-angled triangle, the opposite side is 10 cm and the angle is 60° . Find the hypotenuse to 1 decimal place. [3 marks]

29. A right-angled triangle has adjacent side 11 cm and hypotenuse 16 cm. Find the angle to 1 decimal place. [3 marks]

30. Give the exact value of $\cos(0^\circ)$. [1 mark]

MODULE 31 / G20, G21

Pythagoras, Trigonometry and Exact Values

GRADE 4-5 CHALLENGE | PART A

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

31. A right-angled triangle has shorter sides 15 cm and 20 cm. Find its hypotenuse. [3 marks]

32. A right-angled triangle has hypotenuse 25 cm and one shorter side 15 cm. Find the other side. [3 marks]

33. In a right-angled triangle, the opposite side is 11 cm and the angle is 30°. Find the hypotenuse to 1 decimal place. [3 marks]

34. A right-angled triangle has hypotenuse 19 cm and angle 30°. Find the adjacent side to 1 decimal place. [3 marks]

35. Give the exact value of $\cos(60^\circ)$. [1 mark]

MODULE 31 / G20, G21

Pythagoras, Trigonometry and Exact Values

GRADE 4-5 CHALLENGE | PART B

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

36. A right-angled triangle has shorter sides 20 cm and 21 cm. Find its hypotenuse. [3 marks]

37. A right-angled triangle has hypotenuse 29 cm and one shorter side 20 cm. Find the other side. [3 marks]

38. In a right-angled triangle, the opposite side is 12 cm and the angle is 45° . Find the hypotenuse to 1 decimal place. [3 marks]

39. A right-angled triangle has hypotenuse 20 cm and angle 45° . Find the adjacent side to 1 decimal place. [3 marks]

40. Give the exact value of $\tan(45^\circ)$. [1 mark]

MODULE 31 / G20, G21

Pythagoras, Trigonometry and Exact Values

SAME-TOPIC RETRIEVAL

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

41. A right-angled triangle has shorter sides 12 cm and 35 cm. Find its hypotenuse. [3 marks]

42. A right-angled triangle has hypotenuse 37 cm and one shorter side 12 cm. Find the other side. [3 marks]

43. In a right-angled triangle, the opposite side is 13 cm and the angle is 60° . Find the hypotenuse to 1 decimal place. [3 marks]

44. A right-angled triangle has hypotenuse 21 cm and angle 60° . Find the adjacent side to 1 decimal place. [3 marks]

45. Give the exact value of $\tan(30^\circ)$. [1 mark]

MODULE 32 / G24, G25; mixed G1-G21

Vectors and Mixed Geometry Problem Solving

CORE SKILLS | PART A

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

1. Add the vectors $(2, -3)$ and $(4, 1)$. [2 marks]

2. Subtract vector $(2, -3)$ from $(5, 7)$. [2 marks]

3. Multiply the vector $(1, -2)$ by 2. [1 mark]

4. Find vector AB if $A = (-3, 2)$ and $B = (1, 0)$. [2 marks]

5. A cylindrical tank has radius 3 cm and height 5 cm. A second similar tank has length scale factor 2. Find the second tank volume in terms of π . [4 marks]

MODULE 32 / G24, G25; mixed G1-G21

Vectors and Mixed Geometry Problem Solving

CORE SKILLS | PART B

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

6. Add the vectors $(3, -2)$ and $(3, 3)$. [2 marks]

7. Subtract vector $(3, -2)$ from $(6, 6)$. [2 marks]

8. Multiply the vector $(2, -1)$ by 3. [1 mark]

9. Find vector AB if $A = (-2, 3)$ and $B = (3, 2)$. [2 marks]

10. A cylindrical tank has radius 4 cm and height 6 cm. A second similar tank has length scale factor 2. Find the second tank volume in terms of π . [4 marks]

MODULE 32 / G24, G25; mixed G1-G21

Vectors and Mixed Geometry Problem Solving

CORE SKILLS | PART C

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

11. Add the vectors (4,-1) and (2,5). [2 marks]

12. Subtract vector (4,-1) from (7,5). [2 marks]

13. Multiply the vector (3,0) by 4. [1 mark]

14. Find vector AB if A=(-1,4) and B=(5,4). [2 marks]

15. A cylindrical tank has radius 5 cm and height 7 cm. A second similar tank has length scale factor 2. Find the second tank volume in terms of π . [4 marks]

MODULE 32 / G24, G25; mixed G1-G21

Vectors and Mixed Geometry Problem Solving

EXAM PRACTICE | PART A

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

16. Add the vectors (5,0) and (1,7). [2 marks]

17. Subtract vector (2,0) from (8,4). [2 marks]

18. Multiply the vector (4,1) by 5. [1 mark]

19. Find vector AB if A=(0,5) and B=(4,6). [2 marks]

20. A cylindrical tank has radius 6 cm and height 8 cm. A second similar tank has length scale factor 2. Find the second tank volume in terms of π . [4 marks]

MODULE 32 / G24, G25; mixed G1-G21

Vectors and Mixed Geometry Problem Solving

EXAM PRACTICE | PART B

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

21. Add the vectors (6,1) and (0,9). [2 marks]

22. Subtract vector (3,-3) from (9,3). [2 marks]

23. Multiply the vector (5,2) by 2. [1 mark]

24. Find vector AB if A=(1,2) and B=(6,4). [2 marks]

25. A cylindrical tank has radius 7 cm and height 9 cm. A second similar tank has length scale factor 2. Find the second tank volume in terms of π . [4 marks]

MODULE 32 / G24, G25; mixed G1-G21

Vectors and Mixed Geometry Problem Solving

EXAM PRACTICE | PART C

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

26. Add the vectors (7,2) and (-1,11). [2 marks]

27. Subtract vector (4,-2) from (10,2). [2 marks]

28. Multiply the vector (6,-2) by 3. [1 mark]

29. Find vector AB if A=(2,3) and B=(8,1). [2 marks]

30. A cylindrical tank has radius 8 cm and height 10 cm. A second similar tank has length scale factor 2. Find the second tank volume in terms of π . [4 marks]

MODULE 32 / G24, G25; mixed G1-G21

Vectors and Mixed Geometry Problem Solving

GRADE 4-5 CHALLENGE | PART A

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

31. Add the vectors (8,3) and (-2,13). [2 marks]

32. Subtract vector (2,-1) from (11,1). [2 marks]

33. Multiply the vector (7,-1) by 4. [1 mark]

34. Find vector AB if A=(3,4) and B=(7,3). [2 marks]

35. A cylindrical tank has radius 9 cm and height 11 cm. A second similar tank has length scale factor 2. Find the second tank volume in terms of π . [4 marks]

MODULE 32 / G24, G25; mixed G1-G21

Vectors and Mixed Geometry Problem Solving

GRADE 4-5 CHALLENGE | PART B

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

36. Add the vectors (9,4) and (-3,15). [2 marks]

37. Subtract vector (3,0) from (12,0). [2 marks]

38. Multiply the vector (8,0) by 5. [1 mark]

39. Find vector AB if A=(4,5) and B=(9,5). [2 marks]

40. A cylindrical tank has radius 10 cm and height 12 cm. A second similar tank has length scale factor 2. Find the second tank volume in terms of π . [4 marks]

MODULE 32 / G24, G25; mixed G1-G21

Vectors and Mixed Geometry Problem Solving

SAME-TOPIC RETRIEVAL

Name: _____ Date: _____ Score: ____ / ____

Show clear working. Non-calculator methods are recommended unless a calculator is explicitly appropriate.

41. Add the vectors (10,5) and (-4,17). [2 marks]

42. Subtract vector (4,-3) from (13,-1). [2 marks]

43. Multiply the vector (9,1) by 2. [1 mark]

44. Find vector AB if A=(5,2) and B=(11,3). [2 marks]

45. A cylindrical tank has radius 11 cm and height 13 cm. A second similar tank has length scale factor 2. Find the second tank volume in terms of π . [4 marks]

MODULE 25-26 / G1-G25

Formula and Method Guide

LEARN | PRACTISE | CHECK

MODULE 25 | Angles, Polygons and Geometric Reasoning | G1, G3, G4, G6

- Angles on a straight line sum to 180° ; angles around a point sum to 360° .
- Angles in a triangle sum to 180° ; angles in a quadrilateral sum to 360° .
- Corresponding and alternate angles in parallel lines are equal; co-interior angles sum to 180° .
- Interior-angle sum of an n -sided polygon is $(n-2) \times 180^\circ$.

WORKED CHECK

A triangle has angles 50° and 70° . Find its third angle.

Triangle angles total 180° : $180 - 50 - 70 = 60^\circ$.

MODULE 26 | Constructions, Loci, Bearings and Scale | G2, G14, G15

- A perpendicular bisector crosses a segment at its midpoint and makes a 90° angle.
- An angle bisector divides an angle into two equal angles.
- Bearings are measured clockwise from north and always written using three digits.
- Reverse bearings differ by 180° ; apply the map scale using consistent units.

WORKED CHECK

On a map, 1 cm represents 9 km. Two towns are 7 cm apart. Find the real distance.

Real distance = map distance $\times$ scale = $7 \times 9 = 63$ km.

MODULE 27-28 / G1-G25

Formula and Method Guide

LEARN | PRACTISE | CHECK

MODULE 27 | Transformations, Symmetry and Congruence | G1, G5, G7, G11, G19

- Translation adds a vector to every coordinate; state both horizontal and vertical movement.
- Reflection in the x-axis changes the sign of y; reflection in the y-axis changes the sign of x.
- A 90° anticlockwise rotation about the origin maps (x,y) to $(-y,x)$.
- Enlargement about the origin multiplies coordinates by the scale factor; congruent figures are identical in shape and size.

WORKED CHECK

Reflect the point (6,7) in the y-axis.

Reflection in the y-axis changes x to $-x$: $(-6,7)$.

MODULE 28 | Perimeter, Area and Composite Shapes | G14, G16, G17

- Rectangle: perimeter = $2(l+w)$, area = lw .
- Triangle: area = $\frac{1}{2} \times \text{base} \times \text{perpendicular height}$.
- Trapezium: area = $\frac{1}{2}(a+b)h$, where a and b are parallel sides.
- Split a composite figure into familiar shapes or subtract a cut-out; state square units.

WORKED CHECK

A triangle has base 16 cm and perpendicular height 9 cm. Find its area.

Triangle area = $\frac{1}{2} \times \text{base} \times \text{height} = \frac{1}{2} \times 16 \times 9 = 72 \text{ cm}^2$.

MODULE 29-30 / G1-G25

Formula and Method Guide

LEARN | PRACTISE | CHECK

MODULE 29 | Circles, Circumference, Arcs and Sectors | G9, G17, G18

- Diameter = $2 \times$ radius; circumference = $2\pi r = \pi d$.
- Circle area = πr^2 .
- Arc length = $(\text{sector angle}/360^\circ) \times$ circumference.
- Sector area = $(\text{sector angle}/360^\circ) \times$ circle area; leave exact answers in terms of π when requested.

WORKED CHECK**A circle has radius 8 cm. Find its area in terms of π .**

$$\text{Area} = \pi r^2 = \pi \times 8^2 = 64\pi \text{ cm}^2.$$

MODULE 30 | Volume, Surface Area and 3D Solids | G12, G13, G14, G16, G17

- Cuboid volume = length $\times$ width $\times$ height; prism volume = cross-sectional area $\times$ length.
- Cylinder volume = $\pi r^2 h$; cone volume = $\frac{1}{3}\pi r^2 h$.
- Pyramid volume = $\frac{1}{3} \times$ base area $\times$ perpendicular height; sphere volume = $\frac{4}{3}\pi r^3$.
- Use cm^2 or m^2 for surface area and cm^3 , m^3 or litres for volume.

WORKED CHECK**A cylinder has radius 6 cm and height 10 cm. Find its volume in terms of π .**

$$\text{Cylinder volume} = \pi r^2 h = \pi \times 6^2 \times 10 = 360\pi \text{ cm}^3.$$

MODULE 31-32 / G1-G25

Formula and Method Guide

LEARN | PRACTISE | CHECK

MODULE 31 | Pythagoras, Trigonometry and Exact Values | G20, G21

- Pythagoras: $a^2 + b^2 = c^2$, where c is the hypotenuse opposite the right angle.
- SOH: $\sin \theta = \text{opposite/hypotenuse}$; CAH: $\cos \theta = \text{adjacent/hypotenuse}$.
- TOA: $\tan \theta = \text{opposite/adjacent}$.
- Use exact values for 0° , 30° , 45° , 60° and 90° where the question asks for an exact answer.

WORKED CHECK

In a right-angled triangle, the opposite side is 9 cm and the angle is 45° . Find the hypotenuse to 1 decimal place.

$\sin(45^\circ) = \text{opposite/hypotenuse}$; $\text{hypotenuse} = 9/\sin(45^\circ) = 12.7$ cm.

MODULE 32 | Vectors and Mixed Geometry Problem Solving | G24, G25; mixed G1-G21

- A translation vector (a,b) moves a units horizontally and b units vertically.
- Add or subtract vectors component by component; scalar multiplication scales both components.
- Vector $AB = \text{position of } B - \text{position of } A$.
- In mixed problems, identify the needed diagram, formula, units and any relevant scale factor before calculating.

WORKED CHECK

Multiply the vector $(5,2)$ by 2.

Multiply each component by 2: $(10,4)$.

MODULE 25 / G1, G3, G4, G6

Angles, Polygons and Geometric Reasoning

WORKED ANSWERS | QUESTIONS 1-15

Marking guidance: B1 = correct answer; M1 = valid method; A1 = accurate final result. Equivalent simplified answers are accepted.

- | | | |
|-----------|---|-----------|
| 01 | Answer: 148°
Angles on a straight line total 180°: $180 - 32 = 148^\circ$. | 1m |
| 02 | Answer: 185°
Angles around a point total 360°: $360 - 80 - 95 = 185^\circ$. | 2m |
| 03 | Answer: 80°
Triangle angles total 180°: $180 - 38 - 62 = 80^\circ$. | 2m |
| 04 | Answer: 36°
Corresponding angles between parallel lines are equal. | 1m |
| 05 | Answer: 540°
Interior-angle sum = $(n-2) \times 180^\circ = (5-2) \times 180^\circ = 540^\circ$. | 2m |
| 06 | Answer: 141°
Angles on a straight line total 180°: $180 - 39 = 141^\circ$. | 1m |
| 07 | Answer: 174°
Angles around a point total 360°: $360 - 91 - 95 = 174^\circ$. | 2m |
| 08 | Answer: 75°
Triangle angles total 180°: $180 - 41 - 64 = 75^\circ$. | 2m |
| 09 | Answer: 40°
Corresponding angles between parallel lines are equal. | 1m |
| 10 | Answer: 720°
Interior-angle sum = $(n-2) \times 180^\circ = (6-2) \times 180^\circ = 720^\circ$. | 2m |
| 11 | Answer: 134°
Angles on a straight line total 180°: $180 - 46 = 134^\circ$. | 1m |
| 12 | Answer: 163°
Angles around a point total 360°: $360 - 102 - 95 = 163^\circ$. | 2m |
| 13 | Answer: 70°
Triangle angles total 180°: $180 - 44 - 66 = 70^\circ$. | 2m |
| 14 | Answer: 44°
Corresponding angles between parallel lines are equal. | 1m |
| 15 | Answer: 900°
Interior-angle sum = $(n-2) \times 180^\circ = (7-2) \times 180^\circ = 900^\circ$. | 2m |

Award method marks where the correct operation or set-up is shown. Check units, degree notation, exact π form and any required rounding.

MODULE 25 / G1, G3, G4, G6

Angles, Polygons and Geometric Reasoning

WORKED ANSWERS | QUESTIONS 16-30

Marking guidance: B1 = correct answer; M1 = valid method; A1 = accurate final result. Equivalent simplified answers are accepted.

16 Answer: 127° 1m

Angles on a straight line total 180°: $180 - 53 = 127^\circ$.

17 Answer: 152° 2m

Angles around a point total 360°: $360 - 113 - 95 = 152^\circ$.

18 Answer: 65° 2m

Triangle angles total 180°: $180 - 47 - 68 = 65^\circ$.

19 Answer: 48° 1m

Corresponding angles between parallel lines are equal.

20 Answer: 1080° 2m

Interior-angle sum = $(n-2) \times 180^\circ = (8-2) \times 180^\circ = 1080^\circ$.

21 Answer: 120° 1m

Angles on a straight line total 180°: $180 - 60 = 120^\circ$.

22 Answer: 141° 2m

Angles around a point total 360°: $360 - 124 - 95 = 141^\circ$.

23 Answer: 60° 2m

Triangle angles total 180°: $180 - 50 - 70 = 60^\circ$.

24 Answer: 52° 1m

Corresponding angles between parallel lines are equal.

25 Answer: 1260° 2m

Interior-angle sum = $(n-2) \times 180^\circ = (9-2) \times 180^\circ = 1260^\circ$.

26 Answer: 113° 1m

Angles on a straight line total 180°: $180 - 67 = 113^\circ$.

27 Answer: 130° 2m

Angles around a point total 360°: $360 - 135 - 95 = 130^\circ$.

28 Answer: 55° 2m

Triangle angles total 180°: $180 - 53 - 72 = 55^\circ$.

29 Answer: 56° 1m

Corresponding angles between parallel lines are equal.

30 Answer: 1440° 2m

Interior-angle sum = $(n-2) \times 180^\circ = (10-2) \times 180^\circ = 1440^\circ$.

Award method marks where the correct operation or set-up is shown. Check units, degree notation, exact π form and any required rounding.

MODULE 25 / G1, G3, G4, G6

Angles, Polygons and Geometric Reasoning

WORKED ANSWERS | QUESTIONS 31-45

Marking guidance: B1 = correct answer; M1 = valid method; A1 = accurate final result. Equivalent simplified answers are accepted.

31 Answer: 106° 1m
Angles on a straight line total 180°: $180 - 74 = 106^\circ$.

32 Answer: 119° 2m
Angles around a point total 360°: $360 - 146 - 95 = 119^\circ$.

33 Answer: 50° 2m
Triangle angles total 180°: $180 - 56 - 74 = 50^\circ$.

34 Answer: four right angles and opposite sides equal 2m
A rectangle has four right angles and opposite sides equal.

35 Answer: 1620° 2m
Interior-angle sum = $(n-2) \times 180^\circ = (11-2) \times 180^\circ = 1620^\circ$.

36 Answer: 99° 1m
Angles on a straight line total 180°: $180 - 81 = 99^\circ$.

37 Answer: 108° 2m
Angles around a point total 360°: $360 - 157 - 95 = 108^\circ$.

38 Answer: 45° 2m
Triangle angles total 180°: $180 - 59 - 76 = 45^\circ$.

39 Answer: four equal sides and opposite angles equal 2m
A rhombus has four equal sides and opposite angles equal.

40 Answer: 1800° 2m
Interior-angle sum = $(n-2) \times 180^\circ = (12-2) \times 180^\circ = 1800^\circ$.

41 Answer: 92° 1m
Angles on a straight line total 180°: $180 - 88 = 92^\circ$.

42 Answer: 97° 2m
Angles around a point total 360°: $360 - 168 - 95 = 97^\circ$.

43 Answer: 40° 2m
Triangle angles total 180°: $180 - 62 - 78 = 40^\circ$.

44 Answer: two equal sides and equal base angles 2m
An isosceles triangle has two equal sides and equal base angles.

45 Answer: 1980° 2m
Interior-angle sum = $(n-2) \times 180^\circ = (13-2) \times 180^\circ = 1980^\circ$.

Award method marks where the correct operation or set-up is shown. Check units, degree notation, exact π form and any required rounding.

MODULE 26 / G2, G14, G15

Constructions, Loci, Bearings and Scale

WORKED ANSWERS | QUESTIONS 1-15

Marking guidance: B1 = correct answer; M1 = valid method; A1 = accurate final result. Equivalent simplified answers are accepted.

- | | | |
|-----------|--|-----------|
| 01 | Answer: 025°
Bearings are measured clockwise from north and written with three digits: 025°. | 1m |
| 02 | Answer: 215°
Reverse bearing differs by 180°: $(35+180) \bmod 360 = 215^\circ$. | 2m |
| 03 | Answer: 15 km
Real distance = map distance $\times$ scale = $3 \times 5 = 15$ km. | 2m |
| 04 | Answer: 5 cm
A perpendicular bisector passes through the midpoint: $10 \div 2 = 5$ cm. | 2m |
| 05 | Answer: 20°
An angle bisector divides the angle into equal parts: $40 \div 2 = 20^\circ$. | 1m |
| 06 | Answer: 035°
Bearings are measured clockwise from north and written with three digits: 035°. | 1m |
| 07 | Answer: 230°
Reverse bearing differs by 180°: $(50+180) \bmod 360 = 230^\circ$. | 2m |
| 08 | Answer: 24 km
Real distance = map distance $\times$ scale = $4 \times 6 = 24$ km. | 2m |
| 09 | Answer: 6 cm
A perpendicular bisector passes through the midpoint: $12 \div 2 = 6$ cm. | 2m |
| 10 | Answer: 24°
An angle bisector divides the angle into equal parts: $48 \div 2 = 24^\circ$. | 1m |
| 11 | Answer: 045°
Bearings are measured clockwise from north and written with three digits: 045°. | 1m |
| 12 | Answer: 245°
Reverse bearing differs by 180°: $(65+180) \bmod 360 = 245^\circ$. | 2m |
| 13 | Answer: 35 km
Real distance = map distance $\times$ scale = $5 \times 7 = 35$ km. | 2m |
| 14 | Answer: 7 cm
A perpendicular bisector passes through the midpoint: $14 \div 2 = 7$ cm. | 2m |
| 15 | Answer: 28°
An angle bisector divides the angle into equal parts: $56 \div 2 = 28^\circ$. | 1m |

Award method marks where the correct operation or set-up is shown. Check units, degree notation, exact π form and any required rounding.

MODULE 26 / G2, G14, G15

Constructions, Loci, Bearings and Scale

WORKED ANSWERS | QUESTIONS 16-30

Marking guidance: B1 = correct answer; M1 = valid method; A1 = accurate final result. Equivalent simplified answers are accepted.

16 Answer: 055° 1m

Bearings are measured clockwise from north and written with three digits: 055°.

17 Answer: 260° 2m

Reverse bearing differs by 180°: $(80+180) \bmod 360 = 260^\circ$.

18 Answer: 48 km 2m

Real distance = map distance $\times$ scale = $6 \times 8 = 48$ km.

19 Answer: 8 cm 2m

A perpendicular bisector passes through the midpoint: $16 \div 2 = 8$ cm.

20 Answer: 32° 1m

An angle bisector divides the angle into equal parts: $64 \div 2 = 32^\circ$.

21 Answer: 065° 1m

Bearings are measured clockwise from north and written with three digits: 065°.

22 Answer: 275° 2m

Reverse bearing differs by 180°: $(95+180) \bmod 360 = 275^\circ$.

23 Answer: 63 km 2m

Real distance = map distance $\times$ scale = $7 \times 9 = 63$ km.

24 Answer: 9 cm 2m

A perpendicular bisector passes through the midpoint: $18 \div 2 = 9$ cm.

25 Answer: 36° 1m

An angle bisector divides the angle into equal parts: $72 \div 2 = 36^\circ$.

26 Answer: 075° 1m

Bearings are measured clockwise from north and written with three digits: 075°.

27 Answer: 290° 2m

Reverse bearing differs by 180°: $(110+180) \bmod 360 = 290^\circ$.

28 Answer: 80 km 2m

Real distance = map distance $\times$ scale = $8 \times 10 = 80$ km.

29 Answer: 10 cm 2m

A perpendicular bisector passes through the midpoint: $20 \div 2 = 10$ cm.

30 Answer: A circle of radius 7 cm centred at P 2m

Every point at a fixed distance 7 cm from P lies on a circle centred at P.

Award method marks where the correct operation or set-up is shown. Check units, degree notation, exact π form and any required rounding.

MODULE 26 / G2, G14, G15

Constructions, Loci, Bearings and Scale

WORKED ANSWERS | QUESTIONS 31-45

Marking guidance: B1 = correct answer; M1 = valid method; A1 = accurate final result. Equivalent simplified answers are accepted.

- | | | |
|-----------|---|-----------|
| 31 | Answer: 085°
Bearings are measured clockwise from north and written with three digits: 085°. | 1m |
| 32 | Answer: 305°
Reverse bearing differs by 180°: $(125+180) \bmod 360 = 305^\circ$. | 2m |
| 33 | Answer: 99 km
Real distance = map distance $\times$ scale = $9 \times 11 = 99$ km. | 2m |
| 34 | Answer: 11 cm
A perpendicular bisector passes through the midpoint: $22 \div 2 = 11$ cm. | 2m |
| 35 | Answer: The perpendicular bisector of AB
Points equally distant from A and B lie on the perpendicular bisector of AB. | 2m |
| 36 | Answer: 095°
Bearings are measured clockwise from north and written with three digits: 095°. | 1m |
| 37 | Answer: 320°
Reverse bearing differs by 180°: $(140+180) \bmod 360 = 320^\circ$. | 2m |
| 38 | Answer: 120 km
Real distance = map distance $\times$ scale = $10 \times 12 = 120$ km. | 2m |
| 39 | Answer: 12 cm
A perpendicular bisector passes through the midpoint: $24 \div 2 = 12$ cm. | 2m |
| 40 | Answer: The angle bisectors of the two lines
Equal perpendicular distances from the two lines occur on their angle bisectors. | 2m |
| 41 | Answer: 105°
Bearings are measured clockwise from north and written with three digits: 105°. | 1m |
| 42 | Answer: 335°
Reverse bearing differs by 180°: $(155+180) \bmod 360 = 335^\circ$. | 2m |
| 43 | Answer: 143 km
Real distance = map distance $\times$ scale = $11 \times 13 = 143$ km. | 2m |
| 44 | Answer: 13 cm
A perpendicular bisector passes through the midpoint: $26 \div 2 = 13$ cm. | 2m |
| 45 | Answer: Two parallel lines, one on each side
The locus is the pair of parallel lines 10 cm from the original line. | 2m |

Award method marks where the correct operation or set-up is shown. Check units, degree notation, exact π form and any required rounding.

MODULE 27 / G1, G5, G7, G11, G19

Transformations, Symmetry and Congruence

WORKED ANSWERS | QUESTIONS 1-15

Marking guidance: B1 = correct answer; M1 = valid method; A1 = accurate final result. Equivalent simplified answers are accepted.

- | | | |
|-----------|--|-----------|
| 01 | Answer: (-2,-1)
Add the vector components: $(-4+2, 2-3) = (-2,-1)$. | 2m |
| 02 | Answer: (2,-3)
Reflection in the x-axis changes y to $-y$: $(2,-3)$. | 1m |
| 03 | Answer: (-2,3)
Reflection in the y-axis changes x to $-x$: $(-2,3)$. | 1m |
| 04 | Answer: (-2,-3)
A 90° anticlockwise rotation maps (x,y) to $(-y,x)$: $(-2,-3)$. | 2m |
| 05 | Answer: (4,2)
Multiply both coordinates by 2: $(4,2)$. | 2m |
| 06 | Answer: (0,1)
Add the vector components: $(-3+3, 3-2) = (0,1)$. | 2m |
| 07 | Answer: (3,-4)
Reflection in the x-axis changes y to $-y$: $(3,-4)$. | 1m |
| 08 | Answer: (-3,4)
Reflection in the y-axis changes x to $-x$: $(-3,4)$. | 1m |
| 09 | Answer: (-3,-2)
A 90° anticlockwise rotation maps (x,y) to $(-y,x)$: $(-3,-2)$. | 2m |
| 10 | Answer: (9,6)
Multiply both coordinates by 3: $(9,6)$. | 2m |
| 11 | Answer: (2,3)
Add the vector components: $(-2+4, 4-1) = (2,3)$. | 2m |
| 12 | Answer: (4,-5)
Reflection in the x-axis changes y to $-y$: $(4,-5)$. | 1m |
| 13 | Answer: (-4,5)
Reflection in the y-axis changes x to $-x$: $(-4,5)$. | 1m |
| 14 | Answer: (-4,-1)
A 90° anticlockwise rotation maps (x,y) to $(-y,x)$: $(-4,-1)$. | 2m |
| 15 | Answer: (16,12)
Multiply both coordinates by 4: $(16,12)$. | 2m |

Award method marks where the correct operation or set-up is shown. Check units, degree notation, exact π form and any required rounding.

MODULE 27 / G1, G5, G7, G11, G19

Transformations, Symmetry and Congruence

WORKED ANSWERS | QUESTIONS 16-30

Marking guidance: B1 = correct answer; M1 = valid method; A1 = accurate final result. Equivalent simplified answers are accepted.

16 Answer: (1,5) 2m

Add the vector components: $(-1+2, 5+0) = (1,5)$.

17 Answer: (5,-6) 1m

Reflection in the x-axis changes y to $-y$: $(5,-6)$.

18 Answer: (-5,6) 1m

Reflection in the y-axis changes x to $-x$: $(-5,6)$.

19 Answer: (-5,0) 2m

A 90° anticlockwise rotation maps (x,y) to $(-y,x)$: $(-5,0)$.

20 Answer: (10,8) 2m

Multiply both coordinates by 2: $(10,8)$.

21 Answer: (3,3) 2m

Add the vector components: $(0+3, 6-3) = (3,3)$.

22 Answer: (6,-7) 1m

Reflection in the x-axis changes y to $-y$: $(6,-7)$.

23 Answer: (-6,7) 1m

Reflection in the y-axis changes x to $-x$: $(-6,7)$.

24 Answer: (-6,1) 2m

A 90° anticlockwise rotation maps (x,y) to $(-y,x)$: $(-6,1)$.

25 Answer: (18,3) 2m

Multiply both coordinates by 3: $(18,3)$.

26 Answer: (5,5) 2m

Add the vector components: $(1+4, 7-2) = (5,5)$.

27 Answer: (7,-3) 1m

Reflection in the x-axis changes y to $-y$: $(7,-3)$.

28 Answer: (-7,3) 1m

Reflection in the y-axis changes x to $-x$: $(-7,3)$.

29 Answer: (-7,2) 2m

A 90° anticlockwise rotation maps (x,y) to $(-y,x)$: $(-7,2)$.

30 Answer: SSS 2m

The side-side-side congruence test applies when all three corresponding sides are equal.

Award method marks where the correct operation or set-up is shown. Check units, degree notation, exact π form and any required rounding.

MODULE 27 / G1, G5, G7, G11, G19

Transformations, Symmetry and Congruence

WORKED ANSWERS | QUESTIONS 31-45

Marking guidance: B1 = correct answer; M1 = valid method; A1 = accurate final result. Equivalent simplified answers are accepted.

- 31 Answer: (4,7)** 2m
Add the vector components: $(2+2, 8-1) = (4,7)$.
- 32 Answer: (8,-4)** 1m
Reflection in the x-axis changes y to $-y$: $(8,-4)$.
- 33 Answer: (-8,4)** 1m
Reflection in the y-axis changes x to $-x$: $(-8,4)$.
- 34 Answer: (-8,3)** 2m
A 90° anticlockwise rotation maps (x,y) to $(-y,x)$: $(-8,3)$.
- 35 Answer: SAS** 2m
The side-angle-side congruence test uses two sides and their included angle.
- 36 Answer: (6,9)** 2m
Add the vector components: $(3+3, 9+0) = (6,9)$.
- 37 Answer: (9,-5)** 1m
Reflection in the x-axis changes y to $-y$: $(9,-5)$.
- 38 Answer: (-9,5)** 1m
Reflection in the y-axis changes x to $-x$: $(-9,5)$.
- 39 Answer: (-9,4)** 2m
A 90° anticlockwise rotation maps (x,y) to $(-y,x)$: $(-9,4)$.
- 40 Answer: 6** 1m
A regular n-sided polygon has n lines of symmetry; a hexagon has 6.
- 41 Answer: (8,7)** 2m
Add the vector components: $(4+4, 10-3) = (8,7)$.
- 42 Answer: (10,-6)** 1m
Reflection in the x-axis changes y to $-y$: $(10,-6)$.
- 43 Answer: (-10,6)** 1m
Reflection in the y-axis changes x to $-x$: $(-10,6)$.
- 44 Answer: (-10,5)** 2m
A 90° anticlockwise rotation maps (x,y) to $(-y,x)$: $(-10,5)$.
- 45 Answer: 4** 1m
A square matches itself four times during a complete 360° turn.

Award method marks where the correct operation or set-up is shown. Check units, degree notation, exact π form and any required rounding.

MODULE 28 / G14, G16, G17

Perimeter, Area and Composite Shapes

WORKED ANSWERS | QUESTIONS 1-15

Marking guidance: B1 = correct answer; M1 = valid method; A1 = accurate final result. Equivalent simplified answers are accepted.

01 Answer: 22 cm **2m**

$$\text{Perimeter} = 2(\text{length} + \text{width}) = 2(8 + 3) = 22 \text{ cm.}$$

02 Answer: 36 m² **1m**

$$\text{Area} = \text{length} \times \text{width} = 9 \times 4 = 36 \text{ m}^2.$$

03 Answer: 20 cm² **2m**

$$\text{Triangle area} = \frac{1}{2} \times \text{base} \times \text{height} = \frac{1}{2} \times 8 \times 5 = 20 \text{ cm}^2.$$

04 Answer: 32 cm² **3m**

$$\text{Area} = \frac{1}{2}(a+b)h = \frac{1}{2}(6+10) \times 4 = 32 \text{ cm}^2.$$

05 Answer: 90 cm² **3m**

$$\text{Whole area} - \text{removed area} = 12 \times 8 - 3 \times 2 = 90 \text{ cm}^2.$$

06 Answer: 26 cm **2m**

$$\text{Perimeter} = 2(\text{length} + \text{width}) = 2(9 + 4) = 26 \text{ cm.}$$

07 Answer: 50 m² **1m**

$$\text{Area} = \text{length} \times \text{width} = 10 \times 5 = 50 \text{ m}^2.$$

08 Answer: 30 cm² **2m**

$$\text{Triangle area} = \frac{1}{2} \times \text{base} \times \text{height} = \frac{1}{2} \times 10 \times 6 = 30 \text{ cm}^2.$$

09 Answer: 45 cm² **3m**

$$\text{Area} = \frac{1}{2}(a+b)h = \frac{1}{2}(7+11) \times 5 = 45 \text{ cm}^2.$$

10 Answer: 105 cm² **3m**

$$\text{Whole area} - \text{removed area} = 13 \times 9 - 4 \times 3 = 105 \text{ cm}^2.$$

11 Answer: 30 cm **2m**

$$\text{Perimeter} = 2(\text{length} + \text{width}) = 2(10 + 5) = 30 \text{ cm.}$$

12 Answer: 66 m² **1m**

$$\text{Area} = \text{length} \times \text{width} = 11 \times 6 = 66 \text{ m}^2.$$

13 Answer: 42 cm² **2m**

$$\text{Triangle area} = \frac{1}{2} \times \text{base} \times \text{height} = \frac{1}{2} \times 12 \times 7 = 42 \text{ cm}^2.$$

14 Answer: 60 cm² **3m**

$$\text{Area} = \frac{1}{2}(a+b)h = \frac{1}{2}(8+12) \times 6 = 60 \text{ cm}^2.$$

15 Answer: 130 cm² **3m**

$$\text{Whole area} - \text{removed area} = 14 \times 10 - 5 \times 2 = 130 \text{ cm}^2.$$

Award method marks where the correct operation or set-up is shown. Check units, degree notation, exact π form and any required rounding.

MODULE 28 / G14, G16, G17

Perimeter, Area and Composite Shapes

WORKED ANSWERS | QUESTIONS 16-30

Marking guidance: B1 = correct answer; M1 = valid method; A1 = accurate final result. Equivalent simplified answers are accepted.

16 Answer: 34 cm 2m

$$\text{Perimeter} = 2(\text{length} + \text{width}) = 2(11 + 6) = 34 \text{ cm.}$$

17 Answer: 84 m² 1m

$$\text{Area} = \text{length} \times \text{width} = 12 \times 7 = 84 \text{ m}^2.$$

18 Answer: 56 cm² 2m

$$\text{Triangle area} = \frac{1}{2} \times \text{base} \times \text{height} = \frac{1}{2} \times 14 \times 8 = 56 \text{ cm}^2.$$

19 Answer: 77 cm² 3m

$$\text{Area} = \frac{1}{2}(a+b)h = \frac{1}{2}(9+13) \times 7 = 77 \text{ cm}^2.$$

20 Answer: 156 cm² 3m

$$\text{Whole area} - \text{removed area} = 15 \times 11 - 3 \times 3 = 156 \text{ cm}^2.$$

21 Answer: 38 cm 2m

$$\text{Perimeter} = 2(\text{length} + \text{width}) = 2(12 + 7) = 38 \text{ cm.}$$

22 Answer: 52 m² 1m

$$\text{Area} = \text{length} \times \text{width} = 13 \times 4 = 52 \text{ m}^2.$$

23 Answer: 72 cm² 2m

$$\text{Triangle area} = \frac{1}{2} \times \text{base} \times \text{height} = \frac{1}{2} \times 16 \times 9 = 72 \text{ cm}^2.$$

24 Answer: 48 cm² 3m

$$\text{Area} = \frac{1}{2}(a+b)h = \frac{1}{2}(10+14) \times 4 = 48 \text{ cm}^2.$$

25 Answer: 120 cm² 3m

$$\text{Whole area} - \text{removed area} = 16 \times 8 - 4 \times 2 = 120 \text{ cm}^2.$$

26 Answer: 32 cm 2m

$$\text{Perimeter} = 2(\text{length} + \text{width}) = 2(13 + 3) = 32 \text{ cm.}$$

27 Answer: 70 m² 1m

$$\text{Area} = \text{length} \times \text{width} = 14 \times 5 = 70 \text{ m}^2.$$

28 Answer: 45 cm² 2m

$$\text{Triangle area} = \frac{1}{2} \times \text{base} \times \text{height} = \frac{1}{2} \times 18 \times 5 = 45 \text{ cm}^2.$$

29 Answer: 65 cm² 3m

$$\text{Area} = \frac{1}{2}(a+b)h = \frac{1}{2}(11+15) \times 5 = 65 \text{ cm}^2.$$

30 Answer: 138 cm² 3m

$$\text{Whole area} - \text{removed area} = 17 \times 9 - 5 \times 3 = 138 \text{ cm}^2.$$

Award method marks where the correct operation or set-up is shown. Check units, degree notation, exact π form and any required rounding.

MODULE 28 / G14, G16, G17

Perimeter, Area and Composite Shapes

WORKED ANSWERS | QUESTIONS 31-45

Marking guidance: B1 = correct answer; M1 = valid method; A1 = accurate final result. Equivalent simplified answers are accepted.

31 Answer: 36 cm 2m

Perimeter = $2(\text{length} + \text{width}) = 2(14 + 4) = 36 \text{ cm}$.

32 Answer: 90 m² 2m

Parallelogram area = base $\times$ perpendicular height = $15 \times 6 = 90 \text{ m}^2$.

33 Answer: 60 cm² 2m

Triangle area = $\frac{1}{2} \times \text{base} \times \text{height} = \frac{1}{2} \times 20 \times 6 = 60 \text{ cm}^2$.

34 Answer: 84 cm² 3m

Area = $\frac{1}{2}(a+b)h = \frac{1}{2}(12+16) \times 6 = 84 \text{ cm}^2$.

35 Answer: 174 cm² 3m

Whole area – removed area = $18 \times 10 - 3 \times 2 = 174 \text{ cm}^2$.

36 Answer: 40 cm 2m

Perimeter = $2(\text{length} + \text{width}) = 2(15 + 5) = 40 \text{ cm}$.

37 Answer: 112 m² 2m

Parallelogram area = base $\times$ perpendicular height = $16 \times 7 = 112 \text{ m}^2$.

38 Answer: 77 cm² 2m

Triangle area = $\frac{1}{2} \times \text{base} \times \text{height} = \frac{1}{2} \times 22 \times 7 = 77 \text{ cm}^2$.

39 Answer: 105 cm² 3m

Area = $\frac{1}{2}(a+b)h = \frac{1}{2}(13+17) \times 7 = 105 \text{ cm}^2$.

40 Answer: 197 cm² 3m

Whole area – removed area = $19 \times 11 - 4 \times 3 = 197 \text{ cm}^2$.

41 Answer: 44 cm 2m

Perimeter = $2(\text{length} + \text{width}) = 2(16 + 6) = 44 \text{ cm}$.

42 Answer: 68 m² 2m

Parallelogram area = base $\times$ perpendicular height = $17 \times 4 = 68 \text{ m}^2$.

43 Answer: 96 cm² 2m

Triangle area = $\frac{1}{2} \times \text{base} \times \text{height} = \frac{1}{2} \times 24 \times 8 = 96 \text{ cm}^2$.

44 Answer: 64 cm² 3m

Area = $\frac{1}{2}(a+b)h = \frac{1}{2}(14+18) \times 4 = 64 \text{ cm}^2$.

45 Answer: 150 cm² 3m

Whole area – removed area = $20 \times 8 - 5 \times 2 = 150 \text{ cm}^2$.

Award method marks where the correct operation or set-up is shown. Check units, degree notation, exact π form and any required rounding.

MODULE 29 / G9, G17, G18

Circles, Circumference, Arcs and Sectors

WORKED ANSWERS | QUESTIONS 1-15

Marking guidance: B1 = correct answer; M1 = valid method; A1 = accurate final result. Equivalent simplified answers are accepted.

01 Answer: 6π cm **2m**

Circumference = $2\pi r = 2\pi \times 3 = 6\pi$ cm.

02 Answer: 8π cm **1m**

Circumference = $\pi d = 8\pi$ cm.

03 Answer: 16π cm² **2m**

Area = $\pi r^2 = \pi \times 4^2 = 16\pi$ cm².

04 Answer: 2π cm **3m**

Arc length = $(30/360) \times 2\pi \times 12 = 2\pi$ cm.

05 Answer: 12π cm² **3m**

Sector area = $(30/360) \times \pi \times 12^2 = 12\pi$ cm².

06 Answer: 8π cm **2m**

Circumference = $2\pi r = 2\pi \times 4 = 8\pi$ cm.

07 Answer: 10π cm **1m**

Circumference = $\pi d = 10\pi$ cm.

08 Answer: 25π cm² **2m**

Area = $\pi r^2 = \pi \times 5^2 = 25\pi$ cm².

09 Answer: 3π cm **3m**

Arc length = $(45/360) \times 2\pi \times 12 = 3\pi$ cm.

10 Answer: 18π cm² **3m**

Sector area = $(45/360) \times \pi \times 12^2 = 18\pi$ cm².

11 Answer: 10π cm **2m**

Circumference = $2\pi r = 2\pi \times 5 = 10\pi$ cm.

12 Answer: 12π cm **1m**

Circumference = $\pi d = 12\pi$ cm.

13 Answer: 36π cm² **2m**

Area = $\pi r^2 = \pi \times 6^2 = 36\pi$ cm².

14 Answer: 4π cm **3m**

Arc length = $(60/360) \times 2\pi \times 12 = 4\pi$ cm.

15 Answer: 24π cm² **3m**

Sector area = $(60/360) \times \pi \times 12^2 = 24\pi$ cm².

Award method marks where the correct operation or set-up is shown. Check units, degree notation, exact π form and any required rounding.

MODULE 29 / G9, G17, G18

Circles, Circumference, Arcs and Sectors

WORKED ANSWERS | QUESTIONS 16-30

Marking guidance: B1 = correct answer; M1 = valid method; A1 = accurate final result. Equivalent simplified answers are accepted.

16 Answer: 12π cm 2m

Circumference = $2\pi r = 2\pi \times 6 = 12\pi$ cm.

17 Answer: 14π cm 1m

Circumference = $\pi d = 14\pi$ cm.

18 Answer: 49π cm² 2m

Area = $\pi r^2 = \pi \times 7^2 = 49\pi$ cm².

19 Answer: 6π cm 3m

Arc length = $(90/360) \times 2\pi \times 12 = 6\pi$ cm.

20 Answer: 36π cm² 3m

Sector area = $(90/360) \times \pi \times 12^2 = 36\pi$ cm².

21 Answer: 14π cm 2m

Circumference = $2\pi r = 2\pi \times 7 = 14\pi$ cm.

22 Answer: 16π cm 1m

Circumference = $\pi d = 16\pi$ cm.

23 Answer: 64π cm² 2m

Area = $\pi r^2 = \pi \times 8^2 = 64\pi$ cm².

24 Answer: 8π cm 3m

Arc length = $(120/360) \times 2\pi \times 12 = 8\pi$ cm.

25 Answer: 48π cm² 3m

Sector area = $(120/360) \times \pi \times 12^2 = 48\pi$ cm².

26 Answer: 16π cm 2m

Circumference = $2\pi r = 2\pi \times 8 = 16\pi$ cm.

27 Answer: 18π cm 1m

Circumference = $\pi d = 18\pi$ cm.

28 Answer: 81π cm² 2m

Area = $\pi r^2 = \pi \times 9^2 = 81\pi$ cm².

29 Answer: 10π cm 3m

Arc length = $(150/360) \times 2\pi \times 12 = 10\pi$ cm.

30 Answer: 60π cm² 3m

Sector area = $(150/360) \times \pi \times 12^2 = 60\pi$ cm².

Award method marks where the correct operation or set-up is shown. Check units, degree notation, exact π form and any required rounding.

MODULE 29 / G9, G17, G18

Circles, Circumference, Arcs and Sectors

WORKED ANSWERS | QUESTIONS 31-45

Marking guidance: B1 = correct answer; M1 = valid method; A1 = accurate final result. Equivalent simplified answers are accepted.

31 Answer: 18π cm **2m**

Circumference = $2\pi r = 2\pi \times 9 = 18\pi$ cm.

32 Answer: 20π cm **1m**

Circumference = $\pi d = 20\pi$ cm.

33 Answer: 100π cm² **2m**

Area = $\pi r^2 = \pi \times 10^2 = 100\pi$ cm².

34 Answer: 12π cm **3m**

Arc length = $(180/360) \times 2\pi \times 12 = 12\pi$ cm.

35 Answer: 72π cm² **3m**

Sector area = $(180/360) \times \pi \times 12^2 = 72\pi$ cm².

36 Answer: 20π cm **2m**

Circumference = $2\pi r = 2\pi \times 10 = 20\pi$ cm.

37 Answer: 22π cm **1m**

Circumference = $\pi d = 22\pi$ cm.

38 Answer: 121π cm² **2m**

Area = $\pi r^2 = \pi \times 11^2 = 121\pi$ cm².

39 Answer: 14π cm **3m**

Arc length = $(210/360) \times 2\pi \times 12 = 14\pi$ cm.

40 Answer: 96π cm² **3m**

Sector area = $(240/360) \times \pi \times 12^2 = 96\pi$ cm².

41 Answer: 22π cm **2m**

Circumference = $2\pi r = 2\pi \times 11 = 22\pi$ cm.

42 Answer: 24π cm **1m**

Circumference = $\pi d = 24\pi$ cm.

43 Answer: 144π cm² **2m**

Area = $\pi r^2 = \pi \times 12^2 = 144\pi$ cm².

44 Answer: 18π cm **3m**

Arc length = $(270/360) \times 2\pi \times 12 = 18\pi$ cm.

45 Answer: 108π cm² **3m**

Sector area = $(270/360) \times \pi \times 12^2 = 108\pi$ cm².

Award method marks where the correct operation or set-up is shown. Check units, degree notation, exact π form and any required rounding.

MODULE 30 / G12, G13, G14, G16, G17

Volume, Surface Area and 3D Solids

WORKED ANSWERS | QUESTIONS 1-15

Marking guidance: B1 = correct answer; M1 = valid method; A1 = accurate final result. Equivalent simplified answers are accepted.

01 Answer: 60 cm³ **2m**

Volume = $lwh = 5 \times 3 \times 4 = 60 \text{ cm}^3$.

02 Answer: 108 cm² **3m**

Surface area = $2(lw + lh + wh) = 2(24 + 18 + 12) = 108 \text{ cm}^2$.

03 Answer: 24π cm³ **3m**

Cylinder volume = $\pi r^2 h = \pi \times 2^2 \times 6 = 24\pi \text{ cm}^3$.

04 Answer: 160 cm³ **3m**

Cross-sectional area = $\frac{1}{2} \times 10 \times 4 = 20 \text{ cm}^2$; volume = $20 \times 8 = 160 \text{ cm}^3$.

05 Answer: 1500 cm³ **2m**

1 litre = 1000 cm^3 ; $1.5 \times 1000 = 1500 \text{ cm}^3$.

06 Answer: 120 cm³ **2m**

Volume = $lwh = 6 \times 4 \times 5 = 120 \text{ cm}^3$.

07 Answer: 166 cm² **3m**

Surface area = $2(lw + lh + wh) = 2(35 + 28 + 20) = 166 \text{ cm}^2$.

08 Answer: 63π cm³ **3m**

Cylinder volume = $\pi r^2 h = \pi \times 3^2 \times 7 = 63\pi \text{ cm}^3$.

09 Answer: 270 cm³ **3m**

Cross-sectional area = $\frac{1}{2} \times 12 \times 5 = 30 \text{ cm}^2$; volume = $30 \times 9 = 270 \text{ cm}^3$.

10 Answer: 1900 cm³ **2m**

1 litre = 1000 cm^3 ; $1.9 \times 1000 = 1900 \text{ cm}^3$.

11 Answer: 210 cm³ **2m**

Volume = $lwh = 7 \times 5 \times 6 = 210 \text{ cm}^3$.

12 Answer: 236 cm² **3m**

Surface area = $2(lw + lh + wh) = 2(48 + 40 + 30) = 236 \text{ cm}^2$.

13 Answer: 128π cm³ **3m**

Cylinder volume = $\pi r^2 h = \pi \times 4^2 \times 8 = 128\pi \text{ cm}^3$.

14 Answer: 420 cm³ **3m**

Cross-sectional area = $\frac{1}{2} \times 14 \times 6 = 42 \text{ cm}^2$; volume = $42 \times 10 = 420 \text{ cm}^3$.

15 Answer: 2300 cm³ **2m**

1 litre = 1000 cm^3 ; $2.3 \times 1000 = 2300 \text{ cm}^3$.

Award method marks where the correct operation or set-up is shown. Check units, degree notation, exact π form and any required rounding.

MODULE 30 / G12, G13, G14, G16, G17

Volume, Surface Area and 3D Solids

WORKED ANSWERS | QUESTIONS 16-30

Marking guidance: B1 = correct answer; M1 = valid method; A1 = accurate final result. Equivalent simplified answers are accepted.

16 Answer: 192 cm³ 2m

Volume = $lwh = 8 \times 6 \times 4 = 192 \text{ cm}^3$.

17 Answer: 228 cm² 3m

Surface area = $2(lw + lh + wh) = 2(36 + 54 + 24) = 228 \text{ cm}^2$.

18 Answer: 225π cm³ 3m

Cylinder volume = $\pi r^2 h = \pi \times 5^2 \times 9 = 225\pi \text{ cm}^3$.

19 Answer: 616 cm³ 3m

Cross-sectional area = $\frac{1}{2} \times 16 \times 7 = 56 \text{ cm}^2$; volume = $56 \times 11 = 616 \text{ cm}^3$.

20 Answer: 2700 cm³ 2m

1 litre = 1000 cm^3 ; $2.7 \times 1000 = 2700 \text{ cm}^3$.

21 Answer: 135 cm³ 2m

Volume = $lwh = 9 \times 3 \times 5 = 135 \text{ cm}^3$.

22 Answer: 190 cm² 3m

Surface area = $2(lw + lh + wh) = 2(50 + 30 + 15) = 190 \text{ cm}^2$.

23 Answer: 360π cm³ 3m

Cylinder volume = $\pi r^2 h = \pi \times 6^2 \times 10 = 360\pi \text{ cm}^3$.

24 Answer: 432 cm³ 3m

Cross-sectional area = $\frac{1}{2} \times 18 \times 4 = 36 \text{ cm}^2$; volume = $36 \times 12 = 432 \text{ cm}^3$.

25 Answer: 3100 cm³ 2m

1 litre = 1000 cm^3 ; $3.1 \times 1000 = 3100 \text{ cm}^3$.

26 Answer: 240 cm³ 2m

Volume = $lwh = 10 \times 4 \times 6 = 240 \text{ cm}^3$.

27 Answer: 268 cm² 3m

Surface area = $2(lw + lh + wh) = 2(66 + 44 + 24) = 268 \text{ cm}^2$.

28 Answer: 44π cm³ 3m

Cylinder volume = $\pi r^2 h = \pi \times 2^2 \times 11 = 44\pi \text{ cm}^3$.

29 Answer: 650 cm³ 3m

Cross-sectional area = $\frac{1}{2} \times 20 \times 5 = 50 \text{ cm}^2$; volume = $50 \times 13 = 650 \text{ cm}^3$.

30 Answer: A circle 1m

The top-down view of a vertical cylinder is a circle.

Award method marks where the correct operation or set-up is shown. Check units, degree notation, exact π form and any required rounding.

MODULE 30 / G12, G13, G14, G16, G17

Volume, Surface Area and 3D Solids

WORKED ANSWERS | QUESTIONS 31-45

Marking guidance: B1 = correct answer; M1 = valid method; A1 = accurate final result. Equivalent simplified answers are accepted.

31 Answer: 220 cm³ **2m**
 Volume = $lwh = 11 \times 5 \times 4 = 220 \text{ cm}^3$.

32 Answer: 256 cm² **3m**
 Surface area = $2(lw + lh + wh) = 2(48 + 60 + 20) = 256 \text{ cm}^2$.

33 Answer: 108π cm³ **3m**
 Cylinder volume = $\pi r^2 h = \pi \times 3^2 \times 12 = 108\pi \text{ cm}^3$.

34 Answer: 924 cm³ **3m**
 Cross-sectional area = $\frac{1}{2} \times 22 \times 6 = 66 \text{ cm}^2$; volume = $66 \times 14 = 924 \text{ cm}^3$.

35 Answer: 24π cm³ **3m**
 Cone volume = $\frac{1}{3} \pi r^2 h = \frac{1}{3} \times \pi \times 3^2 \times 8 = 24\pi \text{ cm}^3$.

36 Answer: 360 cm³ **2m**
 Volume = $lwh = 12 \times 6 \times 5 = 360 \text{ cm}^3$.

37 Answer: 346 cm² **3m**
 Surface area = $2(lw + lh + wh) = 2(65 + 78 + 30) = 346 \text{ cm}^2$.

38 Answer: 208π cm³ **3m**
 Cylinder volume = $\pi r^2 h = \pi \times 4^2 \times 13 = 208\pi \text{ cm}^3$.

39 Answer: 1260 cm³ **3m**
 Cross-sectional area = $\frac{1}{2} \times 24 \times 7 = 84 \text{ cm}^2$; volume = $84 \times 15 = 1260 \text{ cm}^3$.

40 Answer: 288π cm³ **3m**
 Sphere volume = $\frac{4}{3} \pi r^3 = \frac{4}{3} \times \pi \times 6^3 = 288\pi \text{ cm}^3$.

41 Answer: 234 cm³ **2m**
 Volume = $lwh = 13 \times 3 \times 6 = 234 \text{ cm}^3$.

42 Answer: 288 cm² **3m**
 Surface area = $2(lw + lh + wh) = 2(84 + 42 + 18) = 288 \text{ cm}^2$.

43 Answer: 350π cm³ **3m**
 Cylinder volume = $\pi r^2 h = \pi \times 5^2 \times 14 = 350\pi \text{ cm}^3$.

44 Answer: 832 cm³ **3m**
 Cross-sectional area = $\frac{1}{2} \times 26 \times 4 = 52 \text{ cm}^2$; volume = $52 \times 16 = 832 \text{ cm}^3$.

45 Answer: 240 cm³ **3m**
 Pyramid volume = $\frac{1}{3} \times \text{base area} \times \text{height} = \frac{1}{3} \times (10 \times 8) \times 9 = 240 \text{ cm}^3$.

Award method marks where the correct operation or set-up is shown. Check units, degree notation, exact π form and any required rounding.

MODULE 31 / G20, G21

Pythagoras, Trigonometry and Exact Values

WORKED ANSWERS | QUESTIONS 1-15

Marking guidance: B1 = correct answer; M1 = valid method; A1 = accurate final result. Equivalent simplified answers are accepted.

01 Answer: 5 cm 3m
 $c^2 = 3^2 + 4^2 = 25$; $c = \sqrt{25} = 5$ cm.

02 Answer: 4 cm 3m
Other side $^2 = 5^2 - 3^2 = 16$; other side $=\sqrt{16}=4$ cm.

03 Answer: 10.0 cm 3m
 $\sin(30^\circ) = \text{opposite/hypotenuse}$; hypotenuse $=5/\sin(30^\circ)=10.0$ cm.

04 Answer: 3.5 cm 3m
 $\tan(30^\circ) = \text{opposite/6}$; opposite $=6 \times \tan(30^\circ)=3.5$ cm.

05 Answer: 0 1m
Use the exact-value table: $\sin(0^\circ)=0$.

06 Answer: 13 cm 3m
 $c^2 = 5^2 + 12^2 = 169$; $c = \sqrt{169} = 13$ cm.

07 Answer: 12 cm 3m
Other side $^2 = 13^2 - 5^2 = 144$; other side $=\sqrt{144}=12$ cm.

08 Answer: 8.5 cm 3m
 $\sin(45^\circ) = \text{opposite/hypotenuse}$; hypotenuse $=6/\sin(45^\circ)=8.5$ cm.

09 Answer: 7.0 cm 3m
 $\tan(45^\circ) = \text{opposite/7}$; opposite $=7 \times \tan(45^\circ)=7.0$ cm.

10 Answer: 1/2 1m
Use the exact-value table: $\sin(30^\circ)=1/2$.

11 Answer: 17 cm 3m
 $c^2 = 8^2 + 15^2 = 289$; $c = \sqrt{289} = 17$ cm.

12 Answer: 15 cm 3m
Other side $^2 = 17^2 - 8^2 = 225$; other side $=\sqrt{225}=15$ cm.

13 Answer: 8.1 cm 3m
 $\sin(60^\circ) = \text{opposite/hypotenuse}$; hypotenuse $=7/\sin(60^\circ)=8.1$ cm.

14 Answer: 13.9 cm 3m
 $\tan(60^\circ) = \text{opposite/8}$; opposite $=8 \times \tan(60^\circ)=13.9$ cm.

15 Answer: $\sqrt{2}/2$ 1m
Use the exact-value table: $\sin(45^\circ)=\sqrt{2}/2$.

Award method marks where the correct operation or set-up is shown. Check units, degree notation, exact π form and any required rounding.

MODULE 31 / G20, G21

Pythagoras, Trigonometry and Exact Values

WORKED ANSWERS | QUESTIONS 16-30

Marking guidance: B1 = correct answer; M1 = valid method; A1 = accurate final result. Equivalent simplified answers are accepted.

16 Answer: 25 cm 3m
 $c^2 = 7^2 + 24^2 = 625$; $c = \sqrt{625} = 25$ cm.

17 Answer: 24 cm 3m
Other side $^2 = 25^2 - 7^2 = 576$; other side $=\sqrt{576} = 24$ cm.

18 Answer: 16.0 cm 3m
 $\sin(30^\circ) = \text{opposite/hypotenuse}$; hypotenuse $=8/\sin(30^\circ) = 16.0$ cm.

19 Answer: 50.0° 3m
 $\cos \theta = \text{adjacent/hypotenuse} = 9/14$; $\theta = \cos^{-1}(9/14) = 50.0^\circ$.

20 Answer: $\sqrt{3}/2$ 1m
Use the exact-value table: $\sin(60^\circ) = \sqrt{3}/2$.

21 Answer: 15 cm 3m
 $c^2 = 9^2 + 12^2 = 225$; $c = \sqrt{225} = 15$ cm.

22 Answer: 12 cm 3m
Other side $^2 = 15^2 - 9^2 = 144$; other side $=\sqrt{144} = 12$ cm.

23 Answer: 12.7 cm 3m
 $\sin(45^\circ) = \text{opposite/hypotenuse}$; hypotenuse $=9/\sin(45^\circ) = 12.7$ cm.

24 Answer: 48.2° 3m
 $\cos \theta = \text{adjacent/hypotenuse} = 10/15$; $\theta = \cos^{-1}(10/15) = 48.2^\circ$.

25 Answer: 1 1m
Use the exact-value table: $\sin(90^\circ) = 1$.

26 Answer: 20 cm 3m
 $c^2 = 12^2 + 16^2 = 400$; $c = \sqrt{400} = 20$ cm.

27 Answer: 16 cm 3m
Other side $^2 = 20^2 - 12^2 = 256$; other side $=\sqrt{256} = 16$ cm.

28 Answer: 11.5 cm 3m
 $\sin(60^\circ) = \text{opposite/hypotenuse}$; hypotenuse $=10/\sin(60^\circ) = 11.5$ cm.

29 Answer: 46.6° 3m
 $\cos \theta = \text{adjacent/hypotenuse} = 11/16$; $\theta = \cos^{-1}(11/16) = 46.6^\circ$.

30 Answer: 1 1m
Use the exact-value table: $\cos(0^\circ) = 1$.

Award method marks where the correct operation or set-up is shown. Check units, degree notation, exact π form and any required rounding.

MODULE 31 / G20, G21

Pythagoras, Trigonometry and Exact Values

WORKED ANSWERS | QUESTIONS 31-45

Marking guidance: B1 = correct answer; M1 = valid method; A1 = accurate final result. Equivalent simplified answers are accepted.

31 Answer: 25 cm 3m
 $c^2 = 15^2 + 20^2 = 625$; $c = \sqrt{625} = 25$ cm.

32 Answer: 20 cm 3m
Other side $^2 = 25^2 - 15^2 = 400$; other side $=\sqrt{400} = 20$ cm.

33 Answer: 22.0 cm 3m
 $\sin(30^\circ) = \text{opposite/hypotenuse}$; hypotenuse $=11/\sin(30^\circ) = 22.0$ cm.

34 Answer: 16.5 cm 3m
 $\cos(30^\circ) = \text{adjacent}/19$; adjacent $=19 \times \cos(30^\circ) = 16.5$ cm.

35 Answer: 1/2 1m
Use the exact-value table: $\cos(60^\circ) = 1/2$.

36 Answer: 29 cm 3m
 $c^2 = 20^2 + 21^2 = 841$; $c = \sqrt{841} = 29$ cm.

37 Answer: 21 cm 3m
Other side $^2 = 29^2 - 20^2 = 441$; other side $=\sqrt{441} = 21$ cm.

38 Answer: 17.0 cm 3m
 $\sin(45^\circ) = \text{opposite/hypotenuse}$; hypotenuse $=12/\sin(45^\circ) = 17.0$ cm.

39 Answer: 14.1 cm 3m
 $\cos(45^\circ) = \text{adjacent}/20$; adjacent $=20 \times \cos(45^\circ) = 14.1$ cm.

40 Answer: 1 1m
Use the exact-value table: $\tan(45^\circ) = 1$.

41 Answer: 37 cm 3m
 $c^2 = 12^2 + 35^2 = 1369$; $c = \sqrt{1369} = 37$ cm.

42 Answer: 35 cm 3m
Other side $^2 = 37^2 - 12^2 = 1225$; other side $=\sqrt{1225} = 35$ cm.

43 Answer: 15.0 cm 3m
 $\sin(60^\circ) = \text{opposite/hypotenuse}$; hypotenuse $=13/\sin(60^\circ) = 15.0$ cm.

44 Answer: 10.5 cm 3m
 $\cos(60^\circ) = \text{adjacent}/21$; adjacent $=21 \times \cos(60^\circ) = 10.5$ cm.

45 Answer: $\sqrt{3}/3$ 1m
Use the exact-value table: $\tan(30^\circ) = \sqrt{3}/3$.

Award method marks where the correct operation or set-up is shown. Check units, degree notation, exact π form and any required rounding.

MODULE 32 / G24, G25; mixed G1-G21

Vectors and Mixed Geometry Problem Solving

WORKED ANSWERS | QUESTIONS 1-15

Marking guidance: B1 = correct answer; M1 = valid method; A1 = accurate final result. Equivalent simplified answers are accepted.

01 Answer: (6,-2) 2m

Add corresponding components: $(2+4, -3+1) = (6, -2)$.

02 Answer: (3,10) 2m

Subtract corresponding components: $(5-2, 7-(-3)) = (3, 10)$.

03 Answer: (2,-4) 1m

Multiply each component by 2: $(2, -4)$.

04 Answer: (4,-2) 2m

$AB = B - A = (1 - (-3), 0 - 2) = (4, -2)$.

05 Answer: $360\pi \text{ cm}^3$ 4m

Original volume $= \pi \times 3^2 \times 5 = 45\pi$; volume scale factor $= 2^3 = 8$; new volume $= 360\pi \text{ cm}^3$.

06 Answer: (6,1) 2m

Add corresponding components: $(3+3, -2+3) = (6, 1)$.

07 Answer: (3,8) 2m

Subtract corresponding components: $(6-3, 6-(-2)) = (3, 8)$.

08 Answer: (6,-3) 1m

Multiply each component by 3: $(6, -3)$.

09 Answer: (5,-1) 2m

$AB = B - A = (3 - (-2), 2 - 3) = (5, -1)$.

10 Answer: $768\pi \text{ cm}^3$ 4m

Original volume $= \pi \times 4^2 \times 6 = 96\pi$; volume scale factor $= 2^3 = 8$; new volume $= 768\pi \text{ cm}^3$.

11 Answer: (6,4) 2m

Add corresponding components: $(4+2, -1+5) = (6, 4)$.

12 Answer: (3,6) 2m

Subtract corresponding components: $(7-4, 5-(-1)) = (3, 6)$.

13 Answer: (12,0) 1m

Multiply each component by 4: $(12, 0)$.

14 Answer: (6,0) 2m

$AB = B - A = (5 - (-1), 4 - 4) = (6, 0)$.

15 Answer: $1400\pi \text{ cm}^3$ 4m

Original volume $= \pi \times 5^2 \times 7 = 175\pi$; volume scale factor $= 2^3 = 8$; new volume $= 1400\pi \text{ cm}^3$.

Award method marks where the correct operation or set-up is shown. Check units, degree notation, exact π form and any required rounding.

MODULE 32 / G24, G25; mixed G1-G21

Vectors and Mixed Geometry Problem Solving

WORKED ANSWERS | QUESTIONS 16-30

Marking guidance: B1 = correct answer; M1 = valid method; A1 = accurate final result. Equivalent simplified answers are accepted.

16 Answer: (6,7) 2m

Add corresponding components: $(5+1, 0+7)=(6,7)$.

17 Answer: (6,4) 2m

Subtract corresponding components: $(8-2, 4-(0))=(6,4)$.

18 Answer: (20,5) 1m

Multiply each component by 5: $(20,5)$.

19 Answer: (4,1) 2m

$AB = B-A = (4-(0), 6-5)=(4,1)$.

20 Answer: $2304\pi \text{ cm}^3$ 4m

Original volume $= \pi \times 6^2 \times 8 = 288\pi$; volume scale factor $= 2^3 = 8$; new volume $= 2304\pi \text{ cm}^3$.

21 Answer: (6,10) 2m

Add corresponding components: $(6+0, 1+9)=(6,10)$.

22 Answer: (6,6) 2m

Subtract corresponding components: $(9-3, 3-(-3))=(6,6)$.

23 Answer: (10,4) 1m

Multiply each component by 2: $(10,4)$.

24 Answer: (5,2) 2m

$AB = B-A = (6-(1), 4-2)=(5,2)$.

25 Answer: $3528\pi \text{ cm}^3$ 4m

Original volume $= \pi \times 7^2 \times 9 = 441\pi$; volume scale factor $= 2^3 = 8$; new volume $= 3528\pi \text{ cm}^3$.

26 Answer: (6,13) 2m

Add corresponding components: $(7-1, 2+11)=(6,13)$.

27 Answer: (6,4) 2m

Subtract corresponding components: $(10-4, 2-(-2))=(6,4)$.

28 Answer: (18,-6) 1m

Multiply each component by 3: $(18,-6)$.

29 Answer: (6,-2) 2m

$AB = B-A = (8-(2), 1-3)=(6,-2)$.

30 Answer: $5120\pi \text{ cm}^3$ 4m

Original volume $= \pi \times 8^2 \times 10 = 640\pi$; volume scale factor $= 2^3 = 8$; new volume $= 5120\pi \text{ cm}^3$.

Award method marks where the correct operation or set-up is shown. Check units, degree notation, exact π form and any required rounding.

MODULE 32 / G24, G25; mixed G1-G21

Vectors and Mixed Geometry Problem Solving

WORKED ANSWERS | QUESTIONS 31-45

Marking guidance: B1 = correct answer; M1 = valid method; A1 = accurate final result. Equivalent simplified answers are accepted.

31 Answer: (6,16) 2m

Add corresponding components: $(8-2, 3+13)=(6,16)$.

32 Answer: (9,2) 2m

Subtract corresponding components: $(11-2, 1-(-1))=(9,2)$.

33 Answer: (28,-4) 1m

Multiply each component by 4: $(28,-4)$.

34 Answer: (4,-1) 2m

$AB = B-A = (7-(3), 3-4)=(4,-1)$.

35 Answer: $7128\pi \text{ cm}^3$ 4m

Original volume= $\pi \times 9^2 \times 11=891\pi$; volume scale factor= $2^3=8$; new volume= $7128\pi \text{ cm}^3$.

36 Answer: (6,19) 2m

Add corresponding components: $(9-3, 4+15)=(6,19)$.

37 Answer: (9,0) 2m

Subtract corresponding components: $(12-3, 0-(0))=(9,0)$.

38 Answer: (40,0) 1m

Multiply each component by 5: $(40,0)$.

39 Answer: (5,0) 2m

$AB = B-A = (9-(4), 5-5)=(5,0)$.

40 Answer: $9600\pi \text{ cm}^3$ 4m

Original volume= $\pi \times 10^2 \times 12=1200\pi$; volume scale factor= $2^3=8$; new volume= $9600\pi \text{ cm}^3$.

41 Answer: (6,22) 2m

Add corresponding components: $(10-4, 5+17)=(6,22)$.

42 Answer: (9,2) 2m

Subtract corresponding components: $(13-4, -1-(-3))=(9,2)$.

43 Answer: (18,2) 1m

Multiply each component by 2: $(18,2)$.

44 Answer: (6,1) 2m

$AB = B-A = (11-(5), 3-2)=(6,1)$.

45 Answer: $12584\pi \text{ cm}^3$ 4m

Original volume= $\pi \times 11^2 \times 13=1573\pi$; volume scale factor= $2^3=8$; new volume= $12584\pi \text{ cm}^3$.

Award method marks where the correct operation or set-up is shown. Check units, degree notation, exact π form and any required rounding.