

MATHEMATICS

Stage 5

Measurement and Space, Properties of Geometrical Figures

Similarity

Special Properties

Teacher: Kyall Duncan

Exam Equivalent Time: 139.5 minutes (based on allocation ~1.25 min/mark)

norWEST

CHRISTIAN COLLEGE

STRENGTH OF PURPOSE

Questions

1. **D** Similarity (015093)

What scale factor has been used to transform Triangle *A* to Triangle *B*?

8 cm

6 cm

3 cm

4 cm

3 cm

$1\frac{1}{2}$ cm

NOT TO SCALE

Triangle *A*

Triangle *B*

A. $\frac{1}{2}$

B. $\frac{3}{4}$

C. 2

D. 3

2. **D** Special Properties (249437)

Which of the following triangle types is **impossible** to draw?

- A. a right-angled, scalene triangle
- B. a right-angled, equilateral triangle
- C. an obtuse-angled, isosceles triangle
- D. an acute-angled, scalene triangle

3. **D** Similarity (248489)

The picture below shows a flower.

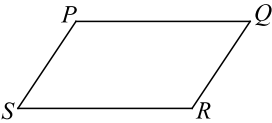


The picture is 2 cm wide. The actual flower is 40 cm wide.

What scale is used in the picture?

- A. 1 cm represents 80 cm
- B. 4 cm represents 20 cm
- C. 1 cm represents 20 cm
- D. 1 cm represents 2 cm

4. **C** Special Properties (249611)



PQRS is a parallelogram.

Which of these must be a property of *PQRS*?

- A. Line *PS* is perpendicular to line *PQ*.
- B. Line *PQ* is parallel to line *PS*.
- C. Diagonals *PR* and *SQ* are perpendicular.
- D. Line *PS* is parallel to line *QR*.

5. **C** Special Properties (249440)

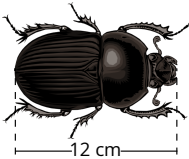
A triangle has two acute angles.

What type of angle couldn't the third angle be?

- A. an acute angle
- B. an obtuse angle
- C. a right-angle
- D. a reflex angle

6. **c** Similarity (248499)

The actual body length of a beetle Brad has caught is 24 mm.
A scale drawing of the beetle is shown below.



What scale is used in the drawing?

- A. 1 cm represents 5 mm
- B. 1 cm represents 2 mm
- C. 2 cm represents 1 mm
- D. 5 cm represents 1 mm

7. **c** Special Properties (249600)

A closed shape has two pairs of equal adjacent sides.
What is the shape?

- A. rectangle
- B. trapezium
- C. kite
- D. triangle

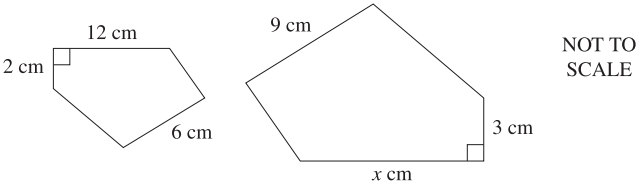
8. **c** Special Properties (249616)

Which of these are **always** equal in length?

- A. the diagonals of a rhombus
- B. the diagonals of a parallelogram
- C. the opposite sides of a parallelogram
- D. the opposite sides of a trapezium

9. **c** Similarity (197628)

Two similar figures are shown.



What is the value of x ?

- A. 6
- B. 8
- C. 18
- D. 27

10. **c** Similarity (248529)

Spiro is making a scale drawing of his house.

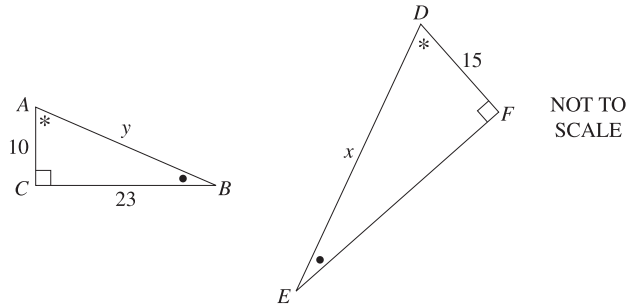
- The height of the garage in the scale model is 6 centimetres.
- The height of Spiro's actual garage is 3 metres.

What does 1 centimetre in Spiro's scale drawing represent in his real house?

- A. 1800 cm
- B. 200 cm
- C. 100 cm
- D. 50 cm

11. **B** Similarity (002012)

Triangles ABC and DEF are similar.



Which expression could be used to find the value of x ?

- A. $y \times \frac{10}{15}$
- B. $y \times \frac{10}{23}$
- C. $y \times \frac{15}{10}$
- D. $y \times \frac{23}{15}$

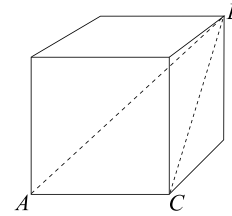
12. **B** Special Properties (249748)

Which statement is always true?

- A. Scalene triangles have two angles that are equal.
- B. All angles in a parallelogram are equal.
- C. The opposite sides of a trapezium are equal in length.
- D. The diagonals of a rhombus are perpendicular to each other.

13. **B** Special Properties (249577)

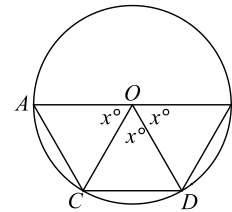
A , B and C are vertices on the cube below.



What is the best description of $\triangle ABC$?

- A. isosceles
- B. equilateral
- C. scalene
- D. right-angled

14. **B** Special Properties (249815)



AB is the diameter of a circle, centre O .

There are 3 triangles drawn in the lower semi-circle and the angles at the centre are all equal to x° .

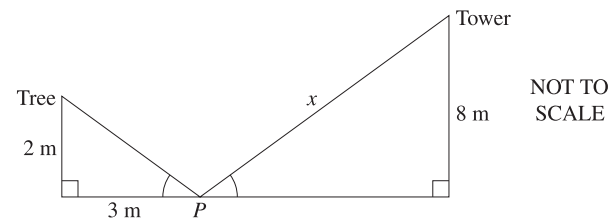
The three triangles are best described as:

- A. isosceles
- B. scalene
- C. right-angled
- D. equilateral

15. **B+** Similarity (014288)

A point P lies between a tree, 2 metres high, and a tower, 8 metres high. P is 3 metres away from the base of the tree.

From P , the angles of elevation to the top of the tree and to the top of the tower are equal.

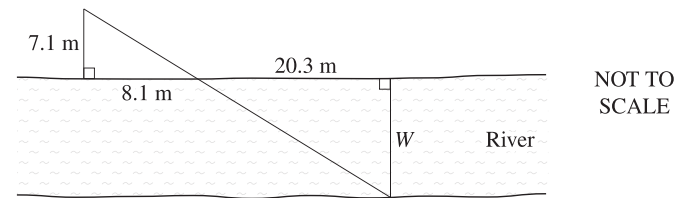


What is the distance, x , from P to the top of the tower?

- A. 9 m
- B. 9.61 m
- C. 12.04 m
- D. 14.42 m

16. **B+** Similarity (060339)

The width (W) of a river can be calculated using two similar triangles, as shown in the diagram.

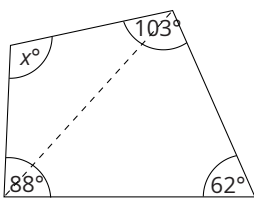


What is the approximate width of the river?

- A. 17.8 m
- B. 19.3 m
- C. 23.2 m
- D. 24.9 m

17. **D** Special Properties (249606)

The sum of the internal angles of a polygon can be calculated by drawing triangles from any given vertex as shown below.



What is the size of the angle marked x in the diagram below? (2 marks)

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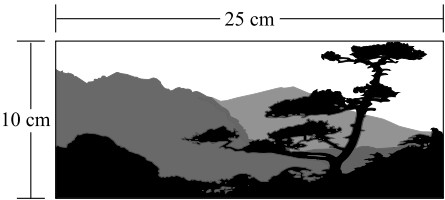
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18. **C** Similarity (248513)

Kransky has a photo which is 25 cm wide and 10 cm high



He wants to enlarge it to make a poster with a width of 50 cm.

What will be the height of the poster? (2 marks)

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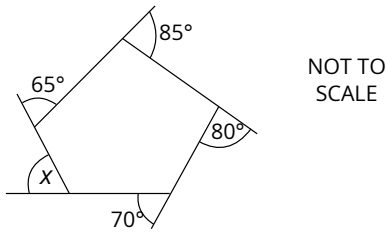
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19. **c** Special Properties (249848)

A five sided polygon is drawn below.



What is the value of x ? (2 marks)

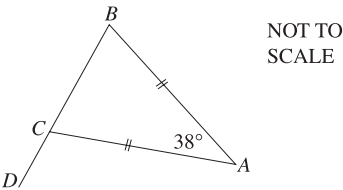
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20. **c** Special Properties (029155)



In the diagram, ABC is an isosceles triangle with $AB = AC$ and $\angle BAC = 38^\circ$. The line BC is produced to D .

Find the size of $\angle ACD$. Give reasons for your answer. (2 marks)

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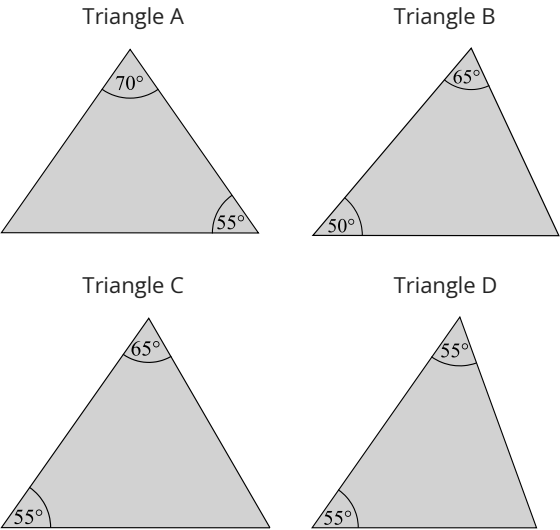
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21. **c** Similarity (248244)

Select the **pair** of similar triangles.

The triangles are not drawn to scale. (2 marks)



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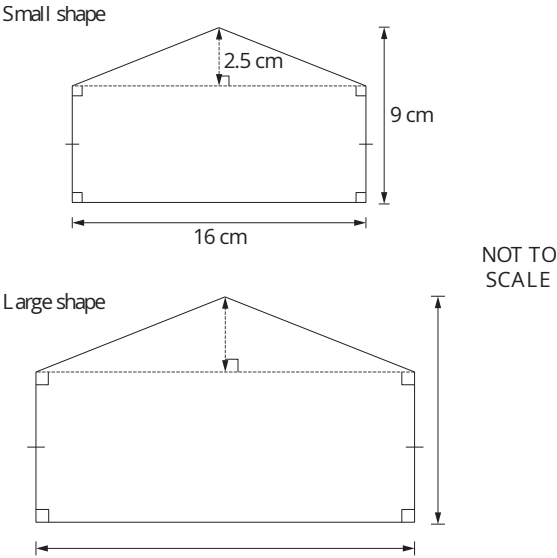
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22. **c** Similarity (178755)

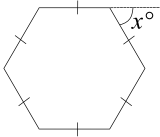
The diagrams show two similar shapes. The dimensions of the small shape are enlarged by a scale factor of 1.5 to produce the large shape.



Calculate the area of the large shape. (3 marks)

23. **c** Special Properties (249920)

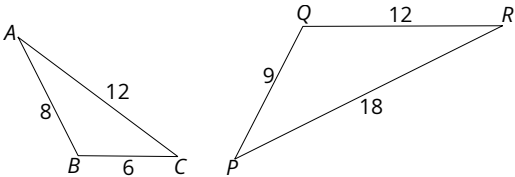
A regular hexagon is pictured below.



What is the value of x ? (2 marks)

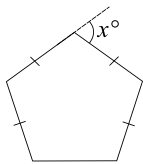
24. **c** Similarity (249036)

Prove that this pair of triangles are similar. (2 marks)



25. **c** Special Properties (249868)

A regular pentagon is pictured below.



What is the value of x ? (2 marks)

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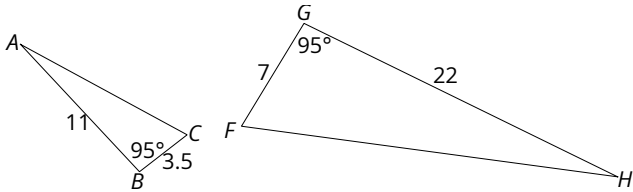
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26. **c** Similarity (249073)

Prove that this pair of triangles are similar. (2 marks)



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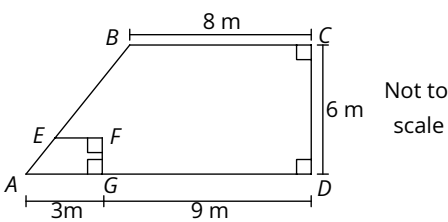
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27. **c** Similarity (248235)

Trapeziums $ABCD$ and $AEFG$ are similar.



What is the distance from E to F ? (2 marks)

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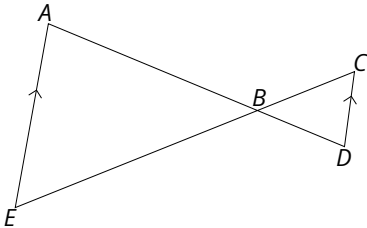
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28. **c** Similarity (249054)

Prove that this pair of triangles are similar. (2 marks)



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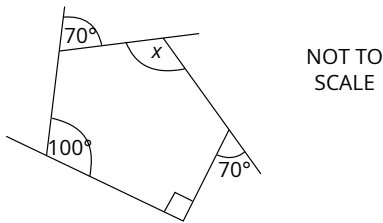
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29. **B** Special Properties (249947)

A pentagon is pictured below, where one internal angle is a right angle.



What is the value of x ? (3 marks)

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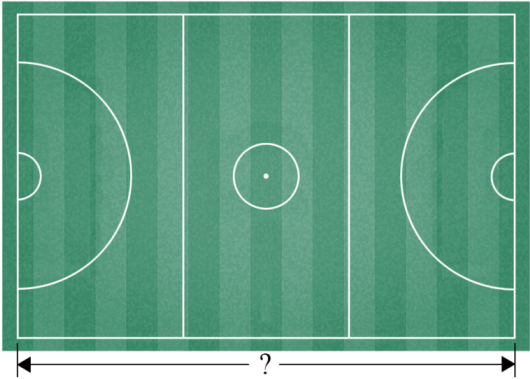
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30. **B** Similarity (248523)

Libby plays on a hockey field that is 120 metres long.
She makes a scale diagram of the field using a ratio of 1 : 400.



How long, in centimetres, should Libby make the scale diagram of the field? (2 marks)

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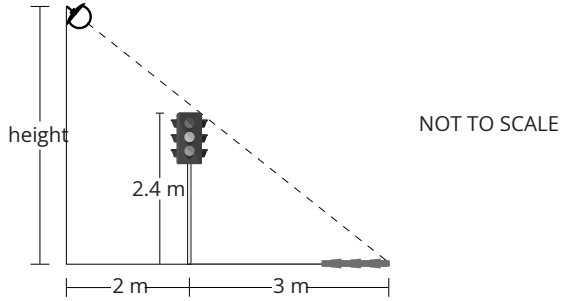
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31. **B** Similarity (248223)

A traffic light is 2.4 m tall. Its shadow from a nearby floodlight is 3 m long.

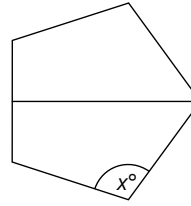


What is the height of the floodlight? (3 marks)

[illegible]

32. **B** Special Properties (249785)

Two identical quadrilaterals fit together to make this regular pentagon.



What is the value of x ? (2 marks)

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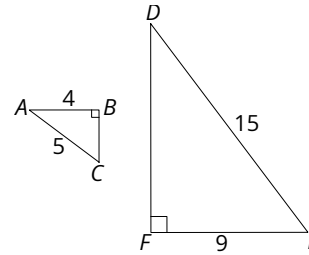
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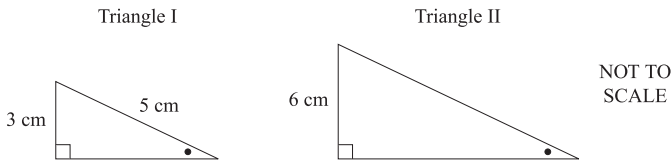
33. **B** Similarity (249089)

Prove that this pair of triangles are similar. (3 marks)

[illegible]

34. **B** Similarity (248787)

Triangle I and Triangle II are similar. Pairs of equal angles are shown.



Find the area of Triangle II? (3 marks)

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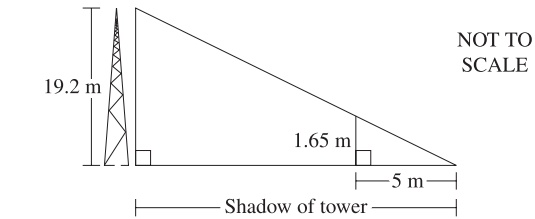
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35. **B** Similarity (029440)

At a particular time during the day, a tower of height 19.2 metres casts a shadow. At the same time, a person who is 1.65 metres tall casts a shadow 5 metres long.



What is the length of the shadow cast by the tower at that time? (2 marks)

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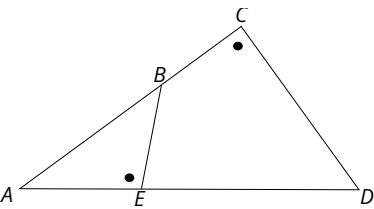
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36. **B** Similarity (249100)

Prove that this pair of triangles are similar. (2 marks)



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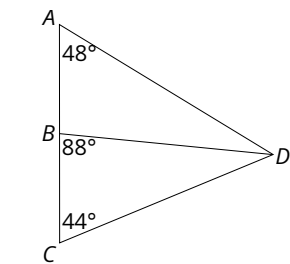
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37. **B** Similarity (249231)

Show that $\triangle ACD$ and $\triangle DCB$ in the figure below are similar. (2 marks)



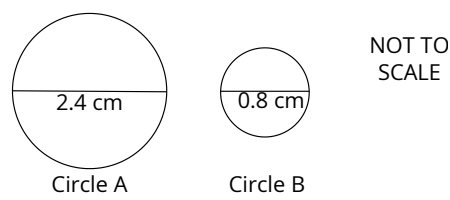
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38. **B+** Similarity (249334)



i. What scale factor is used to convert Circle A into Circle B. (1 mark)

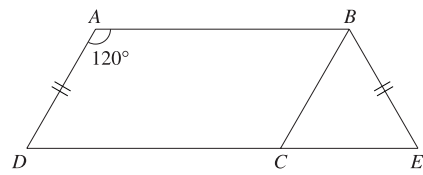
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ii. Complete this equation:

Area of Circle A = ____ $\times$ Area of Circle B. (1 mark)

39. **B+** Special Properties (027720)



The diagram shows a parallelogram $ABCD$ with $\angle DAB = 120^\circ$. The side DC is produced to E so that $AD = BE$.
Prove that $\triangle BCE$ is equilateral. (3 marks)

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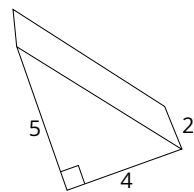
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40. **B+** Similarity (249243)

A triangular prism is pictured below.



By what factor will its volume change if

i. Each dimension is doubled? (1 mark)

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ii. Each dimension is decreased by two-thirds? (2 marks)

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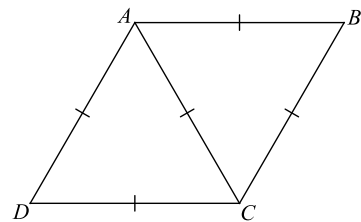
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41. **B+** Special Properties (249756)

$ABCD$ is a rhombus. AC is the same length as the rhombus sides.



What is the size of $\angle DCB$? (2 marks)

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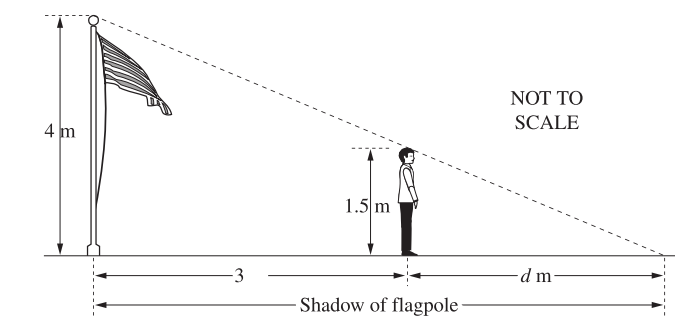
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42. **A** Similarity (003173)

Jacques and a flagpole both cast shadows on the ground. The difference between the lengths of their shadows is 3 metres.



What is the value of d , the length of Jacques' shadow? (3 marks)

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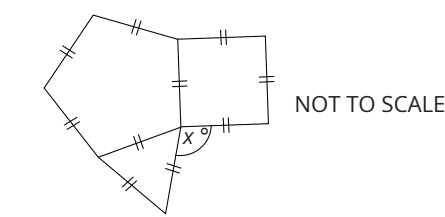
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43. **A** Special Properties (249809)

A regular pentagon, a square and an equilateral triangle meet at a point.



What is the size of the angle x° ? (3 marks)

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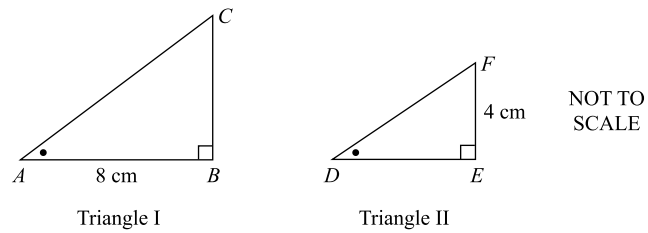
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44. **A** Similarity (159063)

Two similar right-angled triangles are shown.



The length of side *AB* is 8 cm and the length of side *EF* is 4 cm.
The area of triangle *ABC* is 20 cm².
Calculate the length in centimetres of side *DF* in Triangle II, correct to two decimal places. *(4 marks)*

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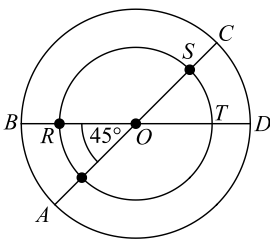
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45. **A** Similarity (248267)

Two circles have the same centre, *O*, as shown in the diagram below.



The radius of the small circle is $\frac{2}{3}$ the radius of the large circle.
Arc *CD* is 21 cm and the angle between the lines *AC* and *BD* is 45°.
What is the length of the arc *RS* in centimetres? *(3 marks)*

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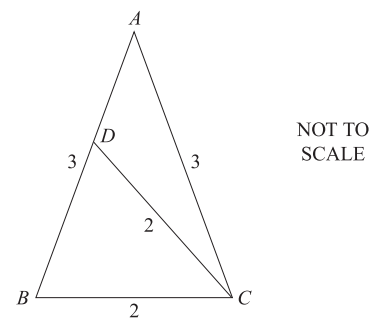
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46. **A** Similarity (118846)

In $\triangle ABC$, sides AB and AC have length 3, and BC has length 2. The point D is chosen on AB so that DC has length 2.



i. Prove that $\triangle ABC$ and $\triangle CBD$ are similar. (2 marks)

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ii. Find the length AD . (2 marks)

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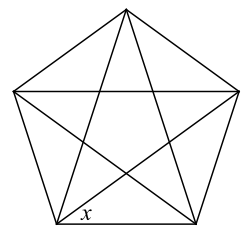
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47. **A** Special Properties (249772)

A star is drawn on the inside of a regular pentagon, as shown below.



What is the size of the angle marked x ? (3 marks)

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