5.18 Similar Shapes (Lengths): Test Pack

EDEXCEL 1MA1 · Calculator allowed · about 60 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Two similar rectangles have corresponding sides in the ratio 2:5. Write down the scale factor from the smaller rectangle to the larger rectangle.

(Total for Question 1 is 1 mark)

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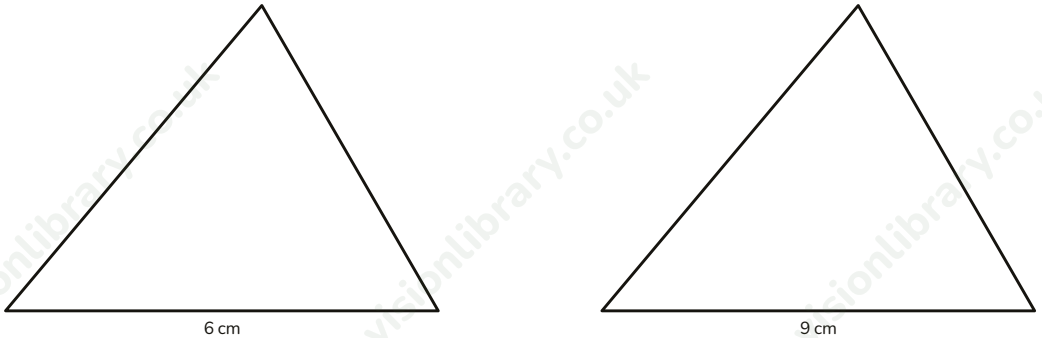
2 A triangle is enlarged by a scale factor of 3. One side of the original triangle is 4 cm. Work out the length of the corresponding side on the enlarged triangle.

(Total for Question 2 is 1 mark)

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3 Two similar triangles have corresponding sides 6 cm and 9 cm. What is the scale factor from the triangle with side 6 cm to the triangle with side 9 cm? Give your answer as a fraction.

Diagram NOT accurately drawn



(Total for Question 3 is 1 mark)

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4 Rectangle A measures 6 cm by 9 cm.

(a) Which of these rectangles is mathematically similar to rectangle A? **(1)**

- ☐ A) 8 cm by 13 cm
- ☐ B) 12 cm by 18 cm
- ☐ C) 9 cm by 13 cm
- ☐ D) 15 cm by 21 cm

(Total for Question 4 is 1 mark)

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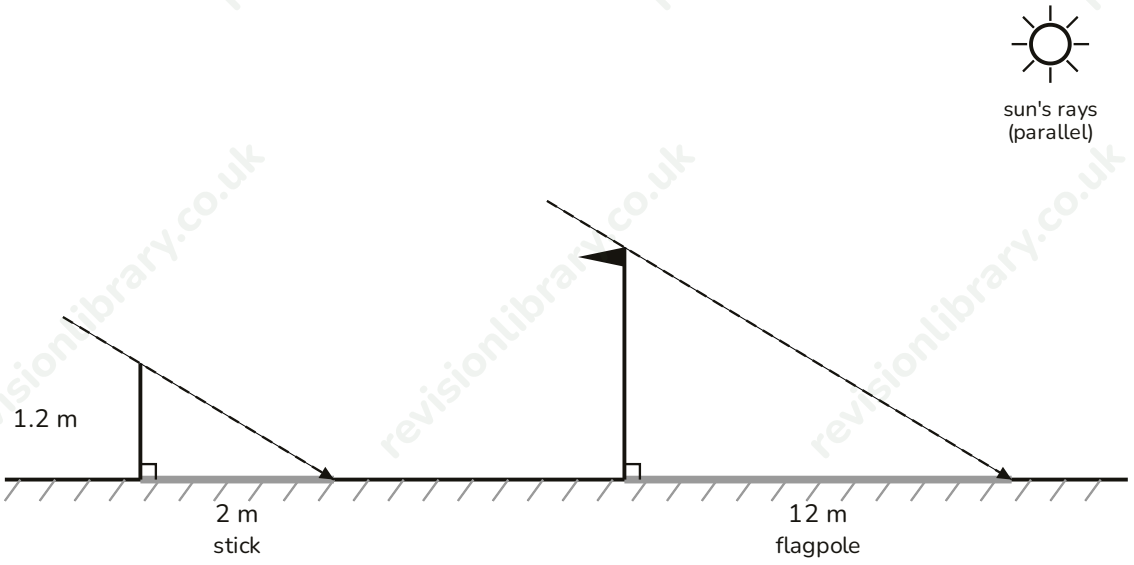
5 Two squares are drawn, of any size. Are the two squares mathematically similar? Explain your answer.

(Total for Question 5 is 1 mark)

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6 A vertical stick of height 1.2 m casts a shadow 2 m long. At the same time, a nearby vertical flagpole casts a shadow 12 m long. The stick and its shadow, and the flagpole and its shadow, can be modelled as two similar right-angled triangles.

Diagram NOT accurately drawn



(a) Explain why the two triangles are similar. **(1)**

(b) Work out the height of the flagpole. Give your answer in metres. **(3)**

(Total for Question 6 is 4 marks)

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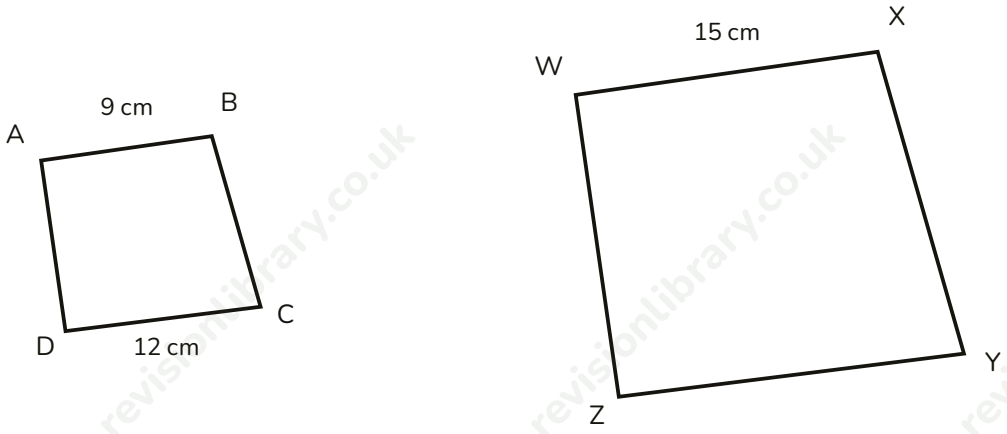
7 A scale drawing of a garden is made. A path in the garden has a real length of 18 m. On the scale drawing, the path is drawn with a length of 6 cm. Write the scale of the drawing in the form 1 : n.

(Total for Question 7 is 3 marks)

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8 Quadrilateral ABCD is mathematically similar to quadrilateral WXYZ, with AB corresponding to WX, BC corresponding to XY, CD corresponding to YZ, and DA corresponding to ZW. AB = 9 cm, WX = 15 cm and CD = 12 cm. Work out the length of YZ.

Diagram NOT accurately drawn

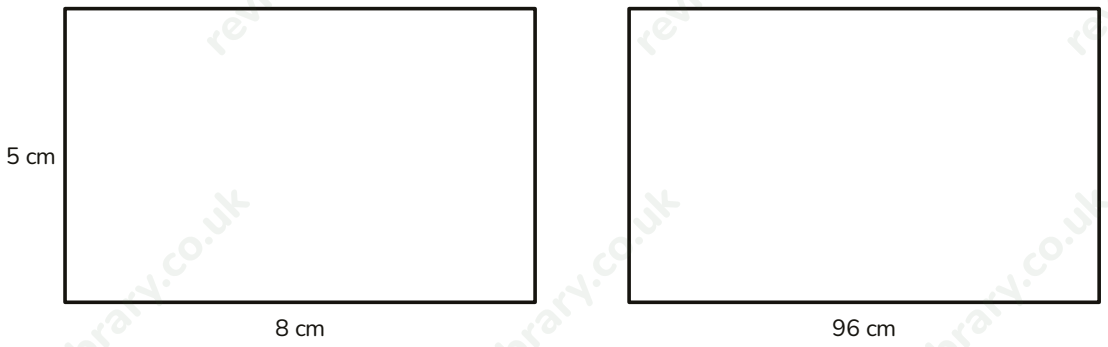


(Total for Question 8 is 3 marks)

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9 A company logo is a rectangle with width 8 cm and height 5 cm. The logo is enlarged, keeping it mathematically similar, to print on a banner with a width of 96 cm.

Diagram NOT accurately drawn



(a) Work out the scale factor of the enlargement. **(1)**

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(b) Work out the height of the banner version of the logo. **(2)**

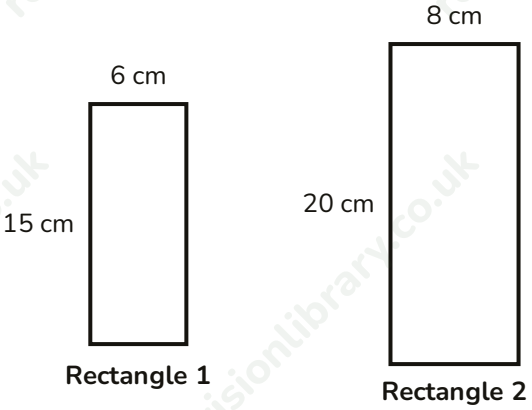
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(Total for Question 9 is 3 marks)

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10 Rectangle 1 has dimensions 6 cm by 15 cm. Rectangle 2 has dimensions 8 cm by 20 cm. Leah says, 'Rectangle 1 and rectangle 2 are mathematically similar.' Determine whether Leah is correct. Show your working.

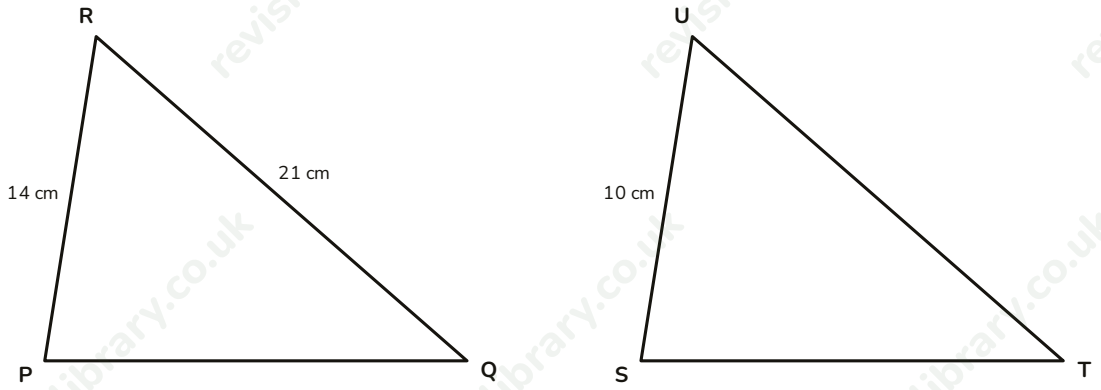
Diagram NOT accurately drawn



(Total for Question 10 is 3 marks)

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11 Triangle PQR is similar to triangle STU. In triangle PQR, PR = 14 cm and QR = 21 cm. In triangle STU, SU = 10 cm.



(a) Find the scale factor from triangle PQR to triangle STU (give as a decimal). **(1)**

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(b) Find TU, the side in triangle STU corresponding to QR. **(3)**

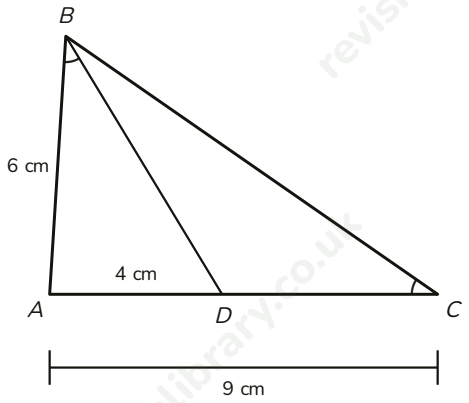
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(Total for Question 11 is 4 marks)

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12 In the diagram, D lies on AC of triangle ABC, such that angle ABD = angle ACB. AB = 6 cm, AD = 4 cm and AC = 9 cm.

Diagram NOT accurately drawn



(a) Prove that triangle ABD is similar to triangle ACB. **(2)**

(b) Given that BC = 10.5 cm, work out the length of BD. **(3)**

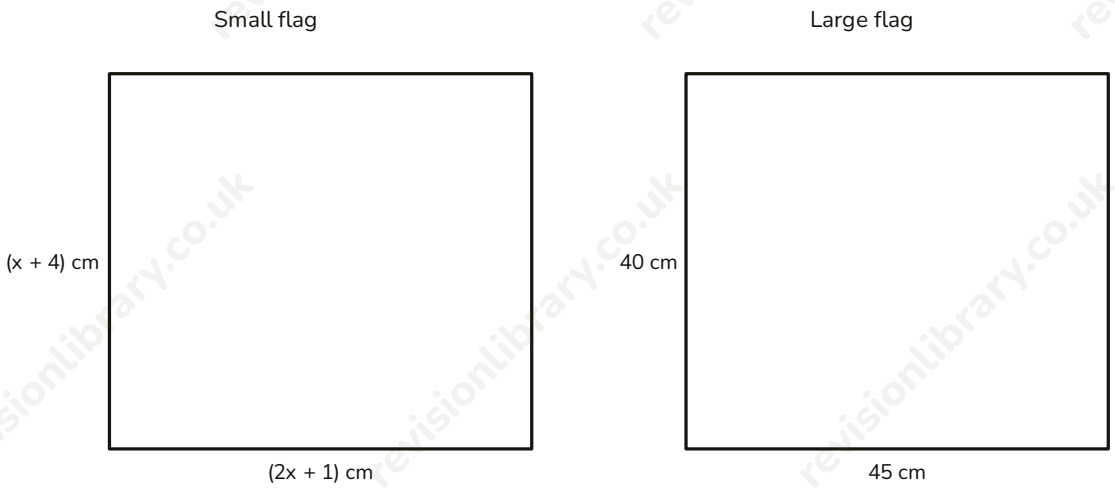
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(Total for Question 12 is 5 marks)

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13 Nadia is designing two mathematically similar flags for a school fete. The small flag has width $(2x + 1)$ cm and height $(x + 4)$ cm. The large flag has width 45 cm and height 40 cm. The scale factor of enlargement from the small flag to the large flag is 5.

Diagram NOT accurately drawn



(a) Using the width, form and solve an equation to find the value of x. **(3)**

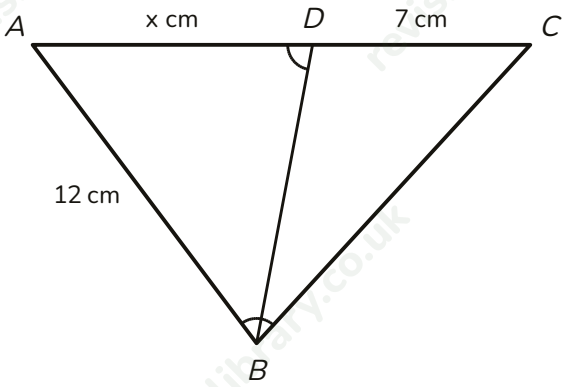
(b) State the width and height of the small flag, and verify your value of x using the height dimension. **(2)**

(Total for Question 13 is 5 marks)

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14 In triangle ABC, D is a point on AC such that angle ADB = angle ABC. AB = 12 cm, AD = x cm and AC = (x + 7) cm.

Diagram NOT accurately drawn



(a) Explain why triangle ABD is similar to triangle ACB. **(1)**

(b) Show that $x^2 + 7x - 144 = 0$. **(2)**

(c) Solve the equation to find the value of x, explaining why the other solution is rejected. **(2)**

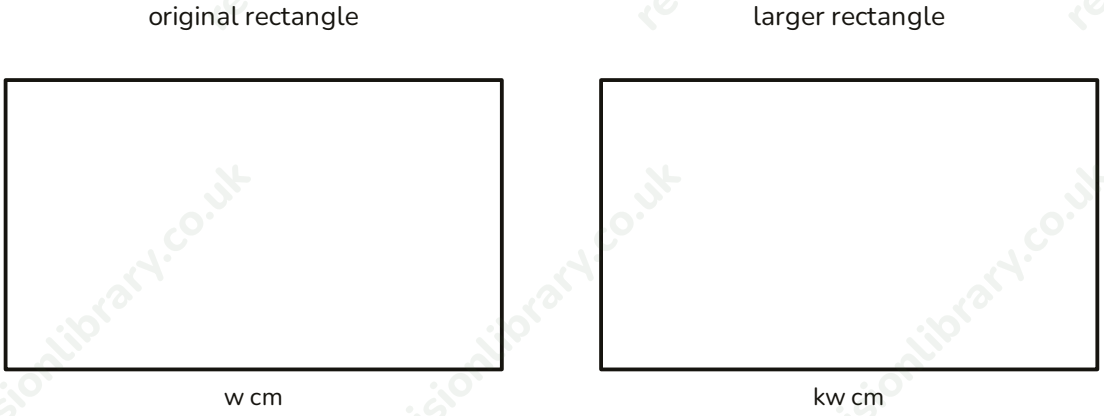
(d) Hence state the length of AC. **(1)**

(Total for Question 14 is 6 marks)

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15 A rectangle has width w cm. A mathematically similar, larger rectangle is formed by enlarging the original rectangle by a scale factor of k. The perimeter of the larger rectangle is 3 times the perimeter of the original rectangle. State the value of k and justify your answer.

Diagram NOT accurately drawn



(Total for Question 15 is 2 marks)

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Mark scheme · 5.18 Similar Shapes (Lengths): Test Pack

Question 1

scale factor 5/2 or 2.5 cao **B1**

Answer: 5/2 (2.5).

Question 2

12 cm cao **B1**

Answer: 12 cm.

Question 3

scale factor 9/6 = 3/2 cao **B1**

Answer: 3/2.

Question 4

(a) B) 12 cm by 18 cm **B1**

(a) Answer: B

Question 5

Yes, because corresponding angles are all 90 degrees and corresponding sides share a constant ratio, which need not equal 1, oe **B1**

Answer: Yes, any two squares are mathematically similar.

Question 6

(a) both triangles have a right angle (object vertical to horizontal ground) and the same angle of elevation of the sun (parallel light rays), so they are similar (AA) **B1**

(a) Answer: Both triangles have a right angle and the same angle of elevation of the sun, so they are similar (AA).

(b) scale factor = 12/2 oe (= 6) **M1**

(b) 1.2 x their scale factor **M1**

(b) 7.2 (m) cao **A1**

(b) Answer: 7.2 m

Question 7

18 m converted to 1800 cm oe **M1**

1800 / 6 (= 300) **M1**

1 : 300 cao **A1**

Answer: 1 : 300

Question 8

scale factor = 15/9 oe (= 5/3) **M1**

12 x their 5/3 **M1**

20 (cm) cao **A1**

Answer: 20 cm

Question 9

(a) 12 cao **B1**

(a) Answer: 12

(b) 5 x their 12 **M1**

(b) 60 (cm) cao ft their (a) **A1**

(b) Answer: 60 cm

Question 10

15/6 (= 2.5) or 6/15 (= 0.4) found **M1**

20/8 (= 2.5) or 8/20 (= 0.4) found **M1**

correct conclusion: Yes, Leah is correct, because the ratios of corresponding sides are equal (both 2.5), cao **A1**

Answer: Yes, Leah is correct: 15/6 = 2.5 and 20/8 = 2.5, so the ratios are equal.

Question 11

(a) scale factor SU/PR = 10/14 = 5/7 = 0.714285... or exact fraction 5/7 **B1**

(a) Answer: 5/7 or 0.714285... (SU corresponds to PR: 10/14 = 5/7)

(b) use TU = QR x (5/7) or set up correct proportion **M1**

(b) calculate TU = 21 x 5/7 **M1**

(b) 15 cm cao **A1**

(b) Answer: 15 cm

Question 12

(a) angle BAD = angle CAB (angle A is common to both triangles) **B1**

(a) angle ABD = angle ACB (given), so triangle ABD is similar to triangle ACB (AA) **B1**

(a) Answer: Angle A is common, and angle ABD = angle ACB (given), so the triangles are similar by AA.

(b) correct correspondence identified, e.g. AB/AC = BD/CB oe (= 6/9) **M1**

(b) BD = 10.5 x 6/9 oe (correct rearrangement) **M1**

(b) 7 (cm) cao **A1**

(b) Answer: 7 cm

Question 13

(a) 5(2x + 1) = 45 oe (correct equation formed from the width) **M1**

(a) 2x + 1 = 9 oe (correct simplification) **M1**

(a) x = 4 cao **A1**

(a) Answer: x = 4

(b) width = 9 cm and height = 8 cm cao ft their (a) **B1**

(b) valid check shown using the height, e.g. 5(x + 4) = 5 x 8 = 40, matching the large flag's height, confirming x = 4 **B1**

(b) Answer: Width = 9 cm, height = 8 cm (checks: 9 x 5 = 45 and 8 x 5 = 40)

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Question 14

(a) angle A is common to both triangles, and angle ADB = angle ABC (given), so triangle ABD is similar to triangle ACB (AA) **B1**

(a) Answer: Angle A is common, and angle ADB = angle ABC is given, so the triangles are similar by AA.

(b) AB/AC = AD/AB oe, i.e. 12/(x + 7) = x/12 (correct ratio from the similar triangles) **M1**

(b) correct expansion and rearrangement to $x^2 + 7x - 144 = 0$ cso **C1**

(b) Answer: $x^2 + 7x - 144 = 0$ (shown)

(c) (x - 9)(x + 16) = 0 oe, or correct use of the quadratic formula **M1**

(c) x = 9, rejecting x = -16 since a length cannot be negative **A1**

(c) Answer: x = 9 (x = -16 is rejected as a length cannot be negative)

(d) 16 (cm) cao ft their x **B1**

(d) Answer: 16 cm

Question 15

k = 3 cao **B1**

correct justification: because the perimeter (like any length) of a similar shape scales by the same linear scale factor as its corresponding sides, oe **B1**

Answer: k = 3

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