KS3.M-G18 Congruence and Similarity

AQA KS3.M-G18 · Calculators not allowed · about 75 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 State whether the following pair of triangles are congruent: Triangle PQR and triangle XYZ, where P matches X, Q matches Y, R matches Z, and all three corresponding sides are equal in length.

(1)

2 Give the congruence condition name for the following: two triangles with two angles equal and the included side equal.

(1)

3 Triangle A and triangle B are shown with angles 50 degrees and 50 degrees, and a side between them equal. Are the triangles congruent? State the reason.

(2)

4 Write down whether the pair of shapes are similar or not: two rectangles, one 3 cm by 6 cm and the other 6 cm by 12 cm.

(1)

5 A triangle has sides 5 cm, 7 cm and 9 cm. A second triangle has sides 10 cm, 14 cm and 18 cm. Are the triangles similar? Explain briefly.

(2)

6 A small model of a bridge is similar to the real bridge with scale 1:150. On the model the arch height is 4 cm. Find the actual arch height in metres.

(3)

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7 Two similar triangles have corresponding sides 8 cm and 12 cm. The small triangle has another side of length 10 cm. Find the matching side length in the larger triangle.

(3)

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8 Triangle ABC is congruent to triangle DEF. Point B corresponds to E. If AB = 6 cm and EF = 6 cm, give the length of DE if AC = 10 cm and DF corresponds to AC.

(2)

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9 A triangle has sides 6 cm, 8 cm and 10 cm. A similar triangle has shortest side 9 cm. Find the other two sides of the similar triangle.

(3)

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10 Rectangle R is similar to rectangle S. R measures 4 cm by 9 cm. S has a width of 6 cm. Find the length of S.

(3)

11 Two triangles are similar. The ratio of areas is 9:16. Find the scale factor between lengths of the triangles.

(2)

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12 A rectangle measures 7 cm by 15 cm. A similar rectangle has its shorter side 5.6 cm. Find the longer side of the similar rectangle. Give your answer to 1 decimal place.

(3)

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13 Triangles PQR and STU have PQ = 5 cm, QR = 7 cm, PR = 8 cm and ST = 5 cm, TU = 7 cm, SU = 8 cm. Are the triangles congruent or just similar? Give a brief reason.

(2)

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14 Two similar polygons have perimeters in the ratio 5:8. Find the ratio of their corresponding side lengths and the ratio of their areas.

(3)

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15 A map uses a scale where 1 cm represents 2 km. Two similar triangular fields on the map have corresponding heights 3.5 cm and 5.25 cm. Find the actual difference in height of the fields in metres.

(3)

16 Triangle ABC has angles 30 degrees, 60 degrees and 90 degrees. Triangle DEF also has angles 30 degrees, 60 degrees and 90 degrees. Are the triangles similar? Explain briefly, including what this tells you about the side lengths.

(2)

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17 Triangles XYZ and PQR are similar. In triangle XYZ, XY = 6 cm, YZ = 9 cm. In triangle PQR, PQ = 8 cm and QR corresponds to YZ. Find PR in triangle PQR given that PR corresponds to XZ which is 12 cm in triangle XYZ.

(4)

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18 Stretch question. A garden planter is an enlargement of a smaller template by a scale factor of 7/4. The template has area 32 cm^2. Find the area of the planter. Then, if the planter has a side that measures 17.5 cm, find the matching side length on the template. Show your working.

(6)

Mark scheme · KS3.M-G18 Congruence and Similarity

Question 1

- **B1** Correct statement: yes, they are congruent (SSS) cao
- Answer: **Yes, they are congruent (SSS).**

Question 2

- **B1** Correct name: ASA cao
- Answer: **ASA**

Question 3

- **M1** Identify that two angles and the included side are equal or equivalent reasoning
- **A1** Conclusion: triangles are congruent by ASA cao
- Answer: **Yes, congruent by ASA.**

Question 4

- **B1** Correct statement: similar, sides are in proportion 1:2 cao
- Answer: **Similar (scale factor 2).**

Question 5

- **M1** Shows side ratios are equal: 10/5 = 14/7 = 18/9 = 2 or equivalent
- **A1** States they are similar with scale factor 2 cao
- Answer: **Yes. All corresponding sides have ratio 2, so similar with scale factor 2.**

Question 6

- **M1** Method: multiply 4 cm by 150 to get real height in cm or state 4 x 150 = 600 cm
- **A1** Correct conversion to metres: 6 m cao
- **B1** Units stated: metres cao
- Answer: **6 m**

Question 7

- **M1** Method: state scale factor = 12/8 = 3/2 or 1.5
- **M1** Multiply 10 by scale factor to get 15 (allow equivalent method)
- **A1** Answer 15 cm cao
- Answer: **15 cm**

Question 8

- **M1** Use congruence: corresponding sides equal, so DE corresponds to AB or AC as stated
- **A1** Correct length: DE = 6 cm cao
- Answer: **6 cm**

Question 9

- **M1** Find scale factor: 9/6 = 3/2
- **M1** Multiply 8 and 10 by 3/2 to get 12 and 15
- **A1** Correct pair: 12 cm and 15 cm cao
- Answer: **12 cm and 15 cm**

Question 10

- **M1** Find scale factor: 6/4 = 3/2
- **M1** Multiply 9 by 3/2 to get 13.5
- **A1** Answer 13.5 cm cao
- Answer: **13.5 cm**

Question 11

- **M1** Recognise that area ratio = (scale factor)^2 and take square roots: $\sqrt{9/16}$ = 3/4
- **A1** State scale factor 3:4 or 3/4 cao
- Answer: **3/4**

Question 12

- **M1** Find scale factor: 5.6/7 = 0.8
- **M1** Multiply 15 by 0.8 to get 12
- **A1** Answer 12.0 cm or 12.0 cao
- Answer: **12.0 cm**

Question 13

- **M1** Recognise that all three corresponding sides are equal
- **A1** State congruent by SSS cao
- Answer: **Congruent, because all three corresponding sides are equal (SSS).**

Question 14

- **M1** Recognise perimeter ratio equals linear scale factor: 5:8
- **M1** State scale factor 5/8 or 5:8 for lengths
- **A1** Area ratio = (5/8)^2 = 25/64 cao
- Answer: **Lengths 5:8; areas 25:64**

Question 15

- **M1** Find map difference: 5.25 - 3.5 = 1.75 cm
- **M1** Convert to real distance: 1.75 cm -> 1.75 x 2 km = 3.5 km
- **A1** Convert to metres: 3.5 km = 3500 m cao
- Answer: **3500 m**

Question 16

- **M1** Recognise that equal corresponding angles give similarity by AA
- **A1** State triangles are similar because corresponding angles are equal (AA), so corresponding side lengths must be in the same proportion; accept correct explanation
- Answer: **They are similar because their corresponding angles are equal (AA), so their corresponding side lengths must be in the same proportion (a fixed ratio).**

Question 17

- **M1** Find scale factor using corresponding sides: PQ/XY = 8/6 = 4/3
- **M1** Use that QR corresponds to YZ to check scale factor: expected QR = 9 x 4/3 = 12 (method shown)
- **M1** Apply same scale factor to XZ: PR = 12 x 4/3 = 16
- **A1** Final answer PR = 16 cm cao
- Answer: **16 cm**

Question 18

- **M1** Compute area scale factor = (7/4)^2 = 49/16
- **M1** Multiply template area 32 by 49/16 to get planter area: 32 x 49/16 = 2 x 49 = 98
- **A1** State planter area 98 cm^2 cao
- **M1** For linear matching side, use inverse scale factor: template length = planter length x (4/7) or show method
- **M1** Compute template length: 17.5 x 4/7 = 17.5 x 4 / 7 = 10
- **A1** State template side 10 cm cao
- Answer: **Planter area: 98 cm^2; template side: 10 cm**