# OCR 09 Congruence and Similarity (Higher)

1. Calculate .
2. If  and  find .
3. If  and  find .
4. The two triangles below are similar. Calculate length AB.

15 cm

62°

6 cm

62°

A

C

B

10 cm

**Not to scale**

1. Rectangle **A** is similar to rectangle **B**. Calculate the area of rectangle **B**.

3 cm

**B**

2 cm

**A**

**Not to scale**

5 cm

Use the diagram below to answer questions 6 to 8.

ABCDEF is a regular hexagon, with centre O*.*

O

A*O*

B

C

D

E

F**

**b**

**a**

**Not to scale**

1. Write the vector  in terms of **a** and **b**.
2. Write the vector in terms of **a** and **b**.
3. Write the vector  in terms of **a** and **b**.

Use the diagram below to answer questions 9 and 10.

The diagram shows two mathematically similar solids.

**A**

**B**

3 cm

9 cm

1. Solid **A** has a volume of 30 cm3. Calculate the volume of Solid **B**.
2. Solid **B** has a surface area of 558 cm2. What is the surface area of solid **A**?
3. ABC is an equilateral triangle. D is the midpoint of BCand AD is perpendicular to BC*.*

Prove that triangles ADC and ADB are congruent.

D

C

B

A

**Not to scale**

1. On the grid below, enlarge triangle **A** by scale factor , centre (5, 4).

*y*

*x*

**A**

1. On the grid above, enlarge triangle **A** by scale factor -2, centre (0, 0).
2. Triangle **A** is shown on the grid below. Triangle **A** is reflected in the *y*-axis to give triangle **B**. Triangle **B** is then reflected in the line  to give triangle **C**. Describe the single transformation that maps triangle **A** to triangle **C**.

*y*

**A**

*x*

1. A £5 note is a rectangle, 125 mm  65 mm. A £50 note is a rectangle, 156 mm  85 mm.

Show that the two notes are not mathematically similar.

1. A packing company has boxes in two sizes, small and large. A large box is a cube with volume

216 cm3. A small box is a cube with side length 1.5 cm.

What is the maximum number of small boxes that will fit in a large box?

1. Two shapes A and B are mathematically similar. The area of shape A is 27 cm2 and the area of shape B is 432 cm2. One length of shape A is 5 cm. Find the corresponding length for shape B.
2. A coffee shop sells coffee in two different cup sizes, medium and large. The cups are mathematically similar. The large cup holds 490 ml and is 18 cm tall. The medium cup is 12 cm tall. How much does the medium cup hold? Give your answer to the nearest millilitre.
3. Two similar shapes have volumes in the ratio 1 : 343.

What is the ratio of their surface areas?

1. Quadrilateral ABCD is shown below.

, ,  and .

Are triangles ACB and ACD congruent?

7

5

3

120°

60°

A

B

D

C

**Not to scale**

### Answers

1. 
2. 
3. 
4. Scale factor is 1.5 so cm.
5. Scale factor is 2.5 so missing length in **B** cm.

Area of rectangle **B** cm2.

1. 
2.  or 
3. 
4. Scale factor of sides is 3, so volume scale factor is 27. Therefore, volume of solid **B** cm3.
5. Scale factor of sides is 3, so area scale factor is 9. Surface area of solid **A** cm2.
6. Triangles are congruent as angles and sides are equal. Can be proved by SSS, SAS, ASA or RHS.
7. Triangle at , , .
8. Triangle at , , .
9. Rotation, 180° about .
10. They are not mathematically similar as .
11. Side length of large box cm

Ratio of side lengths 

(Ratio of areas )

Ratio of volumes 

So the maximum number of small boxes that will fit in a large box is 64.

1. , so the area scale factor is 16.

Length scale factor is 4.

, so missing length is 20 cm.

1. Scale factor .

Volume of medium cup ml

1. Surface area ratio .
2. Using the cosine rule

 so 









 or 

The length cannot be negative so .

Length AC is common to both triangles ABC and ADC.

Angle ACB  angle ACD.

Length BC  length CD.

Triangles ABC and ADC are congruent (SAS).

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| **Assessment Objective** | **Qu.** | **Topic** | **R** | **A** | **G** |  | **Assessment Objective** | **Qu.** | **Topic** | **R** | **A** | **G** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| AO1 | 1 | Calculate with vectors |  |  |  |  | AO1 | 1 | Calculate with vectors |  |  |  |
| AO1 | 2 | Calculate with vectors |  |  |  |  | AO1 | 2 | Calculate with vectors |  |  |  |
| AO1 | 3 | Calculate with vectors |  |  |  |  | AO1 | 3 | Calculate with vectors |  |  |  |
| AO1 | 4 | Find a length in similar shapes |  |  |  |  | AO1 | 4 | Find a length in similar shapes |  |  |  |
| AO1 | 5 | Find an area in similar shapes |  |  |  |  | AO1 | 5 | Find an area in similar shapes |  |  |  |
| AO1 | 6 | Identify a vector |  |  |  |  | AO1 | 6 | Identify a vector |  |  |  |
| AO1 | 7 | Identify a vector |  |  |  |  | AO1 | 7 | Identify a vector |  |  |  |
| AO1 | 8 | Identify a vector |  |  |  |  | AO1 | 8 | Identify a vector |  |  |  |
| AO1 | 9 | Understand relationship between lengths and volumes of similar shapes |  |  |  |  | AO1 | 9 | Understand relationship between lengths and volumes of similar shapes |  |  |  |
| AO1 | 10 | Understand relationship between lengths and surface areas of similar shapes |  |  |  |  | AO1 | 10 | Understand relationship between lengths and surface areas of similar shapes |  |  |  |
| AO2 | 11 | Prove that two triangles are congruent |  |  |  |  | AO2 | 11 | Prove that two triangles are congruent |  |  |  |
| AO2 | 12 | Enlarge using a fractional scale factor |  |  |  |  | AO2 | 12 | Enlarge using a fractional scale factor |  |  |  |
| AO2 | 13 | Enlarge using a negative scale factor |  |  |  |  | AO2 | 13 | Enlarge using a negative scale factor |  |  |  |
| AO2 | 14 | Identify a single transformation |  |  |  |  | AO2 | 14 | Identify a single transformation |  |  |  |
| AO2 | 15 | Show that two rectangles are not similar |  |  |  |  | AO2 | 15 | Show that two rectangles are not similar |  |  |  |
| AO3 | 16 | Understand relationship between lengths and volumes of similar shapes |  |  |  |  | AO3 | 16 | Understand relationship between lengths and volumes of similar shapes |  |  |  |
| AO3 | 17 | Understand relationship between lengths and areas of similar shapes |  |  |  |  | AO3 | 17 | Understand relationship between lengths and areas of similar shapes |  |  |  |
| AO3 | 18 | Understand relationship between lengths and volumes of similar shapes |  |  |  |  | AO3 | 18 | Understand relationship between lengths and volumes of similar shapes |  |  |  |
| AO3 | 19 | Find surface area ratio given volume ratio of similar shapes |  |  |  |  | AO3 | 19 | Find surface area ratio given volume ratio of similar shapes |  |  |  |
| AO3 | 20 | Determine if two triangles are congruent |  |  |  |  | AO3 | 20 | Determine if two triangles are congruent |  |  |  |