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Similarity and Congruence

Solutions & Answer Key

Full worked solutions, marking scheme & answer key

IGCSE Mathematics

The Panda Math Tutor

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Companion to the *Student Worksheet*

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Note

About this booklet. These are the complete solutions to every question in the *Similarity and Congruence — Student Worksheet*. Question numbers match exactly: congruent shapes C1–C5, congruent triangles K1–K8, similar shapes S1–S6, similar triangles T1–T7, area and volume scale factors F1–F10, applications A1–A5, the Mixed Review MR1–MR10, and the examination questions Q1–Q8 of Part III. Every proof is set out the way the examiner expects: a numbered list of matching pairs, a reason for each, the condition named, and a final congruence statement in corresponding order. Part V collects the common mistakes to watch for, and Part VI is a quick answer key for fast marking.

4 Part IV — Complete Solutions

Note

For every scale-factor question the length scale factor k is found first, then squared for area or cubed for volume — never the other way round. Depth is scaled to difficulty, with fuller reasoning on the proofs and the multi-step problems.

4.1 Solutions — Congruent Shapes

Solution C1

Since $PQRST \cong ABCDE$, the letters correspond in order: $P \leftrightarrow A$, $Q \leftrightarrow B$, $R \leftrightarrow C$, and so on.

(a) $AB = PQ = \boxed{6\,\text{cm}}$ **(b)** $BC = QR = \boxed{9\,\text{cm}}$ **(c)** $\angle C = \angle R = \boxed{112°}$

Solution C2

(a) $\boxed{\text{Congruent}}$ — all squares have equal angles, and equal sides make them the same size as well.
(b) $\boxed{\text{Similar but not congruent}}$ — all circles have the same shape, but these have different radii, so $k = \frac{7}{3} \neq 1$.
(c) $\boxed{\text{Similar but not congruent}}$ — the sides are in the same ratio, since $\frac{4}{6} = \frac{6}{9} = \frac{2}{3}$.
(d) $\boxed{\text{Neither}}$ — the ratios differ: $\frac{4}{5} = 0.8$ but $\frac{6}{7} = 0.857\ldots$, so the shapes are not even similar.

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Solution C3

The correspondence is $W \leftrightarrow D$, $X \leftrightarrow E$, $Y \leftrightarrow F$, $Z \leftrightarrow G$.

(a) $DE = WX = \boxed{13\,\text{cm}}$

(b) $FG = YZ = \boxed{10\,\text{cm}}$

(c) $\angle E = \angle X = \boxed{78^\circ}$

(d) $\angle F = \angle Y = \boxed{104^\circ}$

(e) Congruent shapes have equal perimeters, so

$$13 + 6 + 10 + 8 = \boxed{37\,\text{cm}}.$$

Solution C4

Congruent $\Rightarrow$ similar: similar shapes need equal angles and sides in a common ratio. Congruent shapes have equal angles and *equal* sides, which is simply the ratio $k = 1$. So every congruent pair satisfies the definition of similarity.
Similar $\not\Rightarrow$ congruent: similarity allows any scale factor, not just 1. For example, a triangle with sides 3, 4, 5 and a triangle with sides 6, 8, 10 are similar with $k = 2$, but they are clearly different sizes, so they are not congruent.

$$\boxed{\text{Congruence is the special case of similarity with } k = 1.}$$

Solution C5

Since $\triangle PQR \cong \triangle LMN$, corresponding sides are equal, so $PQ = LM$:

$$7x - 4 = 3x + 12$$

$$4x = 16 \implies \boxed{x = 4}.$$

Substituting back:

$$PQ = 7(4) - 4 = \boxed{24\,\text{cm}}.$$

Check: $LM = 3(4) + 12 = 24$ ✓

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Preview ends here

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