Angle Relationships, Congruence, and Similarity

8 Unit Test

Free and always will be!

Instructions: Read all questions carefully to ensure you understand what is being asked. When completing your official tests / exams, your grade will be based upon your: **understanding, fluency, reasoning, and problem solving,** so ensure you show all lines of working and draw accurate, labelled diagrams where necessary. (ACiQ|9.0 Mathematics standard elaborations found on final page (general assessment marking standards)). [Practise tests are marked out of a score of 10]. For multiple choice questions, tick or fill in the circle next to the corresponding letter under the question.

Check your work if you have time. *Remember:* you don't have to start at question one, it's always best to firstly look through the test, highlight the easy looking questions and complete them first, then secondly, go back through and work on the harder questions. Good luck! And remember to breathe!

$$\sum = \frac{}{10} = \quad \%$$

Part 1: Multiple Choice (2 marks)

Question 1:

a) How many degrees does a complementary angle sum up to?

A. $45°$ **B.** $90°$ **C.** $135°$ **D.** $180°$

◯ A   ◯ B   ◯ C   ◯ D

Space for Q1a…

b) If two angles are opposite each other, and one is $35°$, what is the measure of the other?

A. $35°$ **B.** $45°$ **C.** $55°$ **D.** $145°$

○ **A**   ○ **B**   ○ **C**   ○ **D**

Space for Q1b…

Question 2:

a) Two triangles are congruent if:

A. They have one angle equal.
B. Their sides are proportional.
C. All corresponding angles are equal and all corresponding sides are equal.
D. They have the same area.

○ **A**   ○ **B**   ○ **C**   ○ **D**

Space for Q2a…

b) Which of these is a condition for similarity but not for congruence?

A. All sides are equal.
B. All angles are equal.
C. Corresponding sides are proportional.
D. All corresponding angles and sides are equal.

○ **A**   ○ **B**   ○ **C**   ○ **D**

Space for Q2b…

Part 2: Short Answer (4 marks)

Question 3:

a) Two lines intersect, forming four angles. If one angle is $70°$, what are the measures of the other three angles?

b) If a transversal intersects two parallel lines, and one angle formed is $70°$, what are the measures of the other interior angles?

Question 4:

a) Explain the difference between congruent and similar triangles.

b) If triangle ABC is similar to triangle DEF with a similarity ratio of $3:1$, and side AB measures $9\,cm$, what is the length of side DE?

Part 3: Problem Solving (4 marks)

Question 5:

a) You are designing a room layout where two walls meet at a $135°$ angle. What is the measure of the other supplementary angle?

b) A bridge has a tension cable that makes a $25°$ angle with the vertical post. What angle does the beam make with the horizontal?

Question 6:

a) Given that triangles PQR and XYZ are congruent with $PQ = 5\,cm$, $QR = 7\,cm$, and $\angle PQR = 60°$, describe triangle XYZ.

b) *(complex unfamiliar)* A rectangle has dimensions $6\,cm$ by $8\,cm$. A similar rectangle has dimensions $9\,cm$ by $12\,cm$. Find the scale factor of the enlargement. If the area of the first rectangle is $48\,cm^2$, what is the area of the second rectangle?

Solutions

1a. (0.5 marks)

B. $90°$.

Complementary angles add up to $90°$.

b. (0.5 marks)

A. $35°$.

2a. (0.5 marks)

C. All corresponding angles are equal and all corresponding sides are equal .

- This is the definition of congruence.

b. (0.5 marks)

C. Corresponding sides are proportional .

- Similarity involves proportional sides, whereas congruence requires exact equality of sides.

3a. (1 mark)

Opposite angles (or vertical angles) are equal,

and adjacent angles are supplementary:

The opposite angle to $70°$ is also $70°$.

The adjacent angles to the $70°$ angle would be

$$\rightarrow 180° - 70°$$
$$= 110° \text{ each.}$$

So, the angles are $70°, 70°, 110°,$ and $110°$.
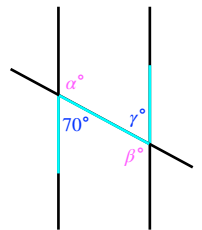
b (1 mark).

For parallel lines cut by a transversal:

Consecutive interior angles would be supplementary to: $70°$,

so $\alpha = 180° - 70°$

$\alpha = 110°$.

Vertical angles are the same as the given angle, so other angles are $\gamma = 70°$,

and $\beta = 110°$

4a. (0.5 marks)

Congruent triangles have exactly the same shape and size; all corresponding sides and angles are equal.Similar triangles have the same shape but not necessarily the same size; all corresponding angles are equal,and the sides are proportional.

b. (1.5 marks)

Since the ratio is $3 : 1$, for every 3 units on triangle ABC, there is 1 unit on triangle DEF.

Thus, if $AB = 9\,cm$:

$$DE = \frac{9}{3}$$
$$= 3\,cm\,.$$

OR

Length $DE =$ Length $AB \times$ scale factor

Length $DE = 9 \times$ scale factor

$$\text{Scale Factor} = \frac{3 \div 3}{9 \div 3}$$
$$= \frac{1}{3}\,.$$

$$DE = 9 \times \frac{1}{3}$$
$$= \frac{9 \times 1}{3}$$
$$DE = \frac{9}{3}$$
$$= 3\,cm\,.$$

5a. (1 mark)

Since the other angle is supplementary:

$$180° - 135°$$
$$= 45°\,.$$
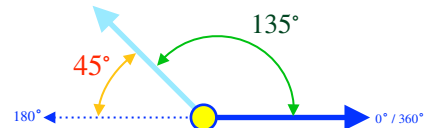
b. (1 mark)

Since the beam makes a $25°$ angle with the vertical:

All angles in a triangle add to $180°$, so the angle with the horizontal $= 180° - 90° - 25°$

$$= 65°\,.$$
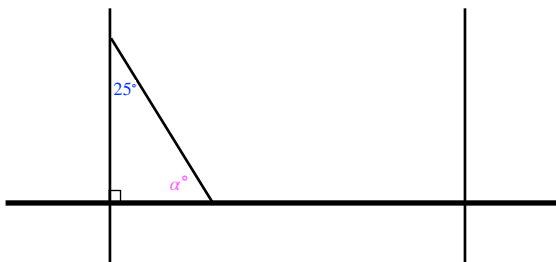
6a. (0.5 marks)

Since triangles PQR and XYZ are congruent, triangle XYZ must have:

$$XY = 5\,cm$$
$$YZ = 7\,cm$$
$$\angle XYZ = 60°.$$

b. (1.5 marks)

The scale factor is found by comparing one corresponding side: $\dfrac{9}{6} = 1.5$

The area of similar shapes increases by the square of the scale factor:

Area of second rectangle $=$ Area of first rectangle $\times$ (Scale Factor $)^2$

$$= 48\,cm^2 \times (1.5)^2$$
$$= 48 \times 2.25$$
$$= 108\,cm^2.$$

For Length we multiply by the scale factor (S),

for Area we multiply by the square of the scale factor (S^2).

$$\sum = \frac{}{10} = \quad \%$$

General Assessment Marking Standards

Remember: When your official tests are marked, they won't be a score out of 10, they will be a grade (A,B,C,D,E) based on the following standards:

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Year 8 Mathematics standard elaborations

		A	B	C	D	E
		The folio of student work contains evidence of the following:				
Mathematical proficiencies	**Understanding**	accurate and consistent identification, representation, description and connection of mathematical concepts and relationships in complex unfamiliar, complex familiar, and simple familiar situations	accurate identification, representation, description and connection of mathematical concepts and relationships in complex familiar and simple familiar situations	identification, representation, description and connection of mathematical concepts and relationships in simple familiar situations	partial identification, representation and description of mathematical concepts and relationships in some simple familiar situations	fragmented identification, representation and description of mathematical concepts and relationships in isolated and obvious situations
	Fluency	choice, use and application of comprehensive facts, definitions, and procedures to find solutions in complex unfamiliar, complex familiar, and simple familiar situations	choice, use and application of effective facts, definitions, and procedures to find solutions in complex familiar and simple familiar situations	choice, use and application of facts, definitions, and procedures to find solutions in simple familiar situations	choice and use of partial facts, definitions, and procedures to find solutions in some simple familiar situations	choice and use of fragmented facts, definitions and procedures to find solutions in isolated and obvious situations
	Reasoning	comprehensive explanation of mathematical thinking, strategies used, and conclusions reached in complex unfamiliar, complex familiar, and simple familiar situations	detailed explanation of mathematical thinking, strategies used, and conclusions reached in complex familiar and simple familiar situations	explanation of mathematical thinking, strategies used, and conclusions reached in simple familiar situations	partial explanation of mathematical thinking, strategies used, and conclusions reached in some simple familiar situations	fragmented explanation of mathematical thinking, strategies used, and conclusions reached in isolated and obvious situations
	Problem-solving	purposeful use of problem-solving approaches to find solutions to problems.	effective use of problem-solving approaches to find solutions to problems.	use of problem-solving approaches to find solutions to problems.	partial use of problem-solving approaches to make progress towards finding solutions to problems.	fragmented use of problem-solving approaches to make progress towards finding solutions to problems.

Key	shading emphasises the qualities that discriminate between the A–E descriptors

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