Construction and Properties of Triangles

A. Fill in the Blanks

1. The sum of the lengths of any two sides of a triangle is always _____ than the length of the third side.

2. A triangle with all three sides of different lengths is called a _____ triangle.

3. In a right-angled triangle, the square of the hypotenuse is equal to the _____ of the squares of the other two sides.

4. The ASA construction criterion stands for _____, Side, _____.

5. An _____ angle of a triangle is equal to the sum of its two opposite interior angles.

B. Match the Following;

Column A (Type of Triangle)	Column B (Property))
1. Scalene	A. All three angles are less than 90°.
2. Isosceles	B. One angle is exactly 90°.
3. Equilateral	C. All three sides are of different lengths.
4. Acute	D. All three sides and angles are equal.
5. Right-angled	E. At least two sides are equal in length.

C. Practice Problems

1. Find the value of x in the triangle below. (A triangle is shown with angles: x, 55°, and 75°)

2. The angles of a triangle are in the ratio 1:2:3. Find the measure of each angle.

3. In $\triangle ABC$, $\angle A = 40°$ and $\angle B = 60°$. Find the measure of the exterior angle at vertex C.

4. Is it possible to form a triangle with side lengths 7 cm, 8 cm, and 16 cm? Justify your answer.

5. In an isosceles triangle, the vertex angle is 80°. What are the measures of the base angles?

D. Warm-up Questions

1. What is the sum of all interior angles in any triangle?

2. A triangle has angles measuring 50°, 60°, and 70°. What type of triangle is it based on its angles?

3. If a triangle has two equal sides, what is it called?

4. Can a triangle have two obtuse angles? Why or why not?

5. In a right-angled triangle, what is the name of the side opposite the right angle?
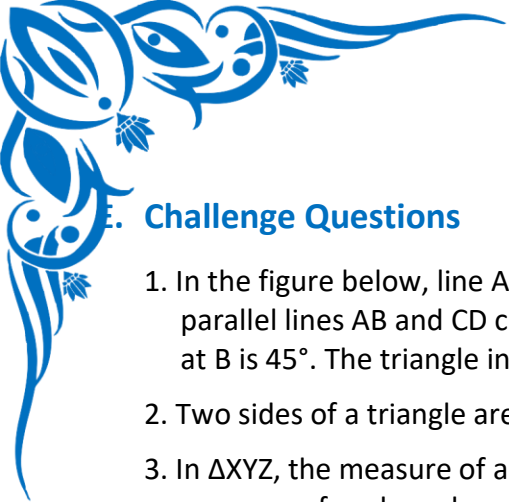
E. Challenge Questions

1. In the figure below, line AB is parallel to line CD. Find the values of x, y, and z. (A diagram shows two parallel lines AB and CD cut by two transversals that form a triangle in between. Angle at A is 65°. Angle at B is 45°. The triangle inside has angles x, y, z.)

2. Two sides of a triangle are 9 cm and 12 cm. What is the possible range for the length of the third side?

3. In ΔXYZ, the measure of angle Y is 30° more than angle X, and angle Z is 15° less than angle Y. Find the measure of each angle.

4. A 15-meter ladder is placed against a wall such that the foot of the ladder is 9 meters away from the base of the wall. How high up the wall does the ladder reach?

5. You are asked to construct a triangle with angles 80°, 100°, and 20°. Is this construction possible? Explain your reasoning.

F. Word Problems & Application

1. Anisha walks 12 km east and then 5 km north. What is the shortest distance (a straight line) from her starting point to her final position?

2. A triangular park has sides measuring 40 m, 70 m, and 25 m. Can such a park exist? Explain using the triangle inequality property.

3. A flagpole casts a shadow of 24 feet. The distance from the top of the pole to the tip of the shadow is 25 feet. What is the height of the flagpole?

4. A designer is creating a triangular logo. She wants two of the angles to be 45° each. What will the third angle be, and what type of triangle is this (classify by both sides and angles)?

5. To support a young tree, a gardener attaches a wire from the top of the tree's trunk to a stake in the ground. The wire is 2.5 m long and the stake is 1.5 m from the base of the tree. How tall is the tree trunk from the ground to where the wire is attached?

G. True or False

1. A triangle can have two right angles. _____

2. An equilateral triangle is always an acute triangle. _____

3. It is possible to construct a triangle with sides 5 cm, 5 cm, and 10 cm. _____

4. The hypotenuse is the longest side in any triangle. _____

5. If two angles of a triangle are 60° each, the triangle must be equilateral. _____