

SPARK Hybrid Education Center

Mathematics Unit Test | February - Geometry & Proofs | Upper Level

Name: _____ Date: _____ Score: _____ / 100

SECTION 1: Multiple Choice (1 point each = 10 points)

1. The contrapositive of 'If p then q' is:

- A) If q then p
- B) If NOT p then NOT q
- C) If NOT q then NOT p
- D) If p then NOT q

2. Two triangles have two pairs of equal angles. Which theorem proves similarity?

- A) SSS
- B) SAS
- C) AA
- D) HL

3. Two triangles have all three pairs of sides equal. Which congruence theorem applies?

- A) SAS
- B) SSS
- C) ASA
- D) AAS

4. CPCTC stands for:

- A) Congruent Parts Create Triangles Correctly
- B) Corresponding Parts of Congruent Triangles are Congruent
- C) Congruent Proofs Confirm Triangle Congruence
- D) none of these

5. Triangle ABC ~ Triangle DEF with scale factor 2. If AB = 5, DE =

- A) 2.5
- B) 5
- C) 10
- D) 15

6. $\sin(A) = \text{opposite} / \text{hypotenuse}$. What is $\cos(A)$?

- A) opposite / adjacent
- B) adjacent / hypotenuse
- C) hypotenuse / adjacent
- D) opposite / hypotenuse

7. In a 30-60-90 triangle, if the short leg = 6, the hypotenuse =

- A) 6
- B) $6 \times \sqrt{3}$
- C) 12
- D) 3

8. A two-column proof has columns labeled 'Statements' and:

- A) Theorems
- B) Definitions
- C) Reasons
- D) Postulates

9. The reflexive property states:

- A) $a + b = b + a$
- B) if $a = b$ and $b = c$ then $a = c$
- C) any segment is congruent to itself
- D) angles sum to 180

10. HL (Hypotenuse-Leg) congruence applies ONLY to:

- A) scalene triangles
- B) obtuse triangles
- C) right triangles
- D) equilateral triangles

SECTION 2: Matching (2 points each = 10 points)

COLUMN A (Terms)

1. ____ AA similarity
2. ____ Converse
3. ____ SSS congruence
4. ____ SOH-CAH-TOA
5. ____ Scale factor

COLUMN B (Definitions)

- a. Two pairs of equal angles prove triangles similar
- b. Switching the hypothesis and conclusion of a conditional
- c. All three pairs of sides equal proves congruence
- d. Memory device for sin, cos, and tan ratios
- e. The ratio of corresponding sides in similar triangles

SECTION 3: Show Your Work (4 points each = 20 points)

1. Write the converse and contrapositive of: 'If a polygon is a square, then it has 4 right angles.' **SHOW YOUR WORK:**

2. Prove that triangles ABC and DEF are congruent given: $AB = DE$, $BC = EF$, and angle B = angle E. Name the theorem. **SHOW YOUR WORK:**

3. Triangle PQR ~ Triangle XYZ. $PQ = 6$, $XY = 9$. If $QR = 8$, find YZ. **SHOW YOUR WORK:**

4. In a right triangle, the opposite side = 8, the hypotenuse = 17. Find $\sin(A)$, $\cos(A)$, and $\tan(A)$. **SHOW YOUR WORK:**

5. A 45-45-90 triangle has legs of length 7. Find the hypotenuse (exact answer). **SHOW YOUR WORK:**

SECTION 4: Word Problems (20 points each = 60 points)

Problem 1. (20 pts)

A student wants to measure the height of a building. She stands 50 feet from the base and measures a 60-degree angle of elevation to the top. Using $\tan(60) = \text{approximately } 1.73$, find the height of the building. Show all work.

Problem 2. (20 pts)

Two triangles are formed when a diagonal is drawn in a rectangle. Prove that the two triangles are congruent using a two-column proof format. List your Statements and Reasons.

Problem 3. (20 pts)

Triangle ABC has sides $AB = 4$, $BC = 6$, $AC = 5$. Triangle DEF has sides $DE = 8$, $EF = 12$, $DF = 10$. (a) Are the triangles similar? Explain. (b) What is the scale factor from ABC to DEF? (c) If angle A = 40 degrees, what is angle D? Explain your reasoning.

Section 1: Multiple Choice

1. B

2. BC

Section 2: Matching

1. AA similarity = a

2. Converse = b

3. SSS congruence = c

4. SOH-CAH-TOA = d

5. Scale factor = e

Sections 3 & 4: Use professional judgment to award partial credit.

Award full points for correct final answer with clear work shown. Award half credit for correct process with a computation error. Deduct points for missing steps even when the answer is correct. Word problems: 20 pts = 8 setup + 8 work + 4 answer/label.