

Reasoning, Logic and Two-Column Proofs

Grade 10 – Geometry math · Test Answer Key · Standards: G-CO.C.9

Each solution gives the complete reasoning and the points awarded. Proof answers show one acceptable chain of statements; other valid orders earn the same credit when every reason is correct.

Standards: G-CO.C.9 · **Level:** Grade 10 Geometry

Question 1 Converse and contrapositive (2 points)

- a. If a whole number is divisible by 3, then it is divisible by 6.
- b. If a whole number is not divisible by 3, then it is not divisible by 6.

(a) converse above, (b) contrapositive above

Scoring: 1 point for each correctly formed statement.

Question 2 Types of reasoning (2 points)

- a. Inductive: the rider generalizes from observed cases.
- b. Deductive: a general fact is applied to a specific shape.

(a) inductive, (b) deductive

Scoring: 1 point per part (label with a valid reason).

Question 3 Properties of equality (2 points)

- a. Division Property of Equality (divide both sides by 3).
- b. Transitive Property.

(a) division, (b) transitive

Scoring: 1 point per property.

Question 4 Solve and justify (3 points)

Statement	Reason
$3x + 12 - 7 = 2x + 15$	Distributive Property
$3x + 5 = 2x + 15$	Combine like terms
$x + 5 = 15$	Subtraction Property (subtract $2x$)

Statement	Reason
$x = 10$	Subtraction Property (subtract 5)

Check: $3(14) - 7 = 35$ and $2(10) + 15 = 35$.

$x = 10$

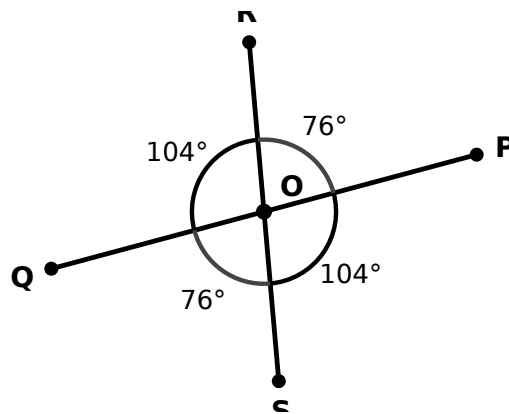
Scoring: 1 point for the correct value, 2 points for the reasons (1 point if two or more are missing).

Question 5 Quarter of a segment (4 points)

Statement	Reason
1. M is the midpoint of AB	Given
2. $AM = \frac{1}{2}AB$	Definition of midpoint
3. N is the midpoint of AM	Given
4. $AN = \frac{1}{2}AM$	Definition of midpoint
5. $AN = \frac{1}{2}(\frac{1}{2}AB)$	Substitution
6. $AN = \frac{1}{4}AB$	Simplify (multiplication)

Scoring: 1 point for each correct pair of statements 1-2, 3-4, 5 and 6 with valid reasons.

Question 6 Vertical angles (3 points)



Solved figure for Question 6.

- Vertical angles are equal: $9x - 14 = 6x + 16$, so $3x = 30$ and $x = 10$.
- $9(10) - 14 = 76^\circ$, and $6(10) + 16 = 76^\circ$.
- A neighbor forms a linear pair: $180^\circ - 76^\circ = 104^\circ$.

$x = 10$; 76° ; 104°

Scoring: 1 point per part.

Question 7 Using a true statement (2 points)

- a. By the contrapositive, $ABCD$ is not a square.
- b. No. A rectangle with unequal sides is not a square, so the converse is not guaranteed.

(a) not a square, (b) no

Scoring: 1 point per part.

Question 8 Counterexamples (2 points)

- a. $x = -4$: $(-4)^2 = 16 > 9$, but -4 is not greater than 3.
- b. Two 40° angles in different triangles are congruent but not vertical angles.

(a) $x = -4$, (b) two separate 40° angles

Scoring: 1 point for each valid counterexample.