

Reasoning and Proof: math test solutions, Grade 10 – download the PDF

Test solutions with the detailed point scale. Add up your points and spot what to review.

Suggested time: 45 minutes. Out of 20 points. Calculator allowed only when the problem says so.

1 Conditional statements

/ 4 pts

- a. Converse: “If a quadrilateral has four right angles, then it is a rectangle.” True (1 pt).
Inverse: “If a quadrilateral is not a rectangle, then it does not have four right angles.” True (1 pt). Contrapositive: “If a quadrilateral does not have four right angles, then it is not a rectangle.” True (1 pt).
- b. Because the statement and its converse are both true: “A quadrilateral is a rectangle if and only if it has four right angles.” (1 pt)

2 Reasoning and counterexamples

/ 3 pts

- a. Inductive reasoning (1 pt).
- b. The number 20 is a multiple of 5 and is even (1 pt).
- c. $3 + 5 = 8$, and 3 and 5 are prime but 8 is not (1 pt).

3 Algebra proof

/ 4 pts

1. $4(x + 3) = 2x + 30$ (Given). 2. $4x + 12 = 2x + 30$ (Distributive Property) (1 pt). 3. $2x + 12 = 30$ (Subtraction Property: subtract $2x$) (1 pt). 4. $2x = 18$ (Subtraction Property: subtract 12) (1 pt). 5. $x = 9$ (Division Property) (1 pt).

Check: $4 \cdot 12 = 48 = 2 \cdot 9 + 30$.

4 Angle addition

/ 4 pts

Angle Addition Postulate (1 pt): $(4x - 6) + (2x + 12) = 108$ (1 pt). $6x + 6 = 108$, so $x = 17$ (1 pt). $m\angle ABD = 4 \cdot 17 - 6 = 62^\circ$ and $m\angle DBC = 2 \cdot 17 + 12 = 46^\circ$; $62 + 46 = 108$ (1 pt).

5 Paragraph and flow proof

/ 5 pts

- a. Since $\angle 1$ and $\angle 3$ are complementary, $m\angle 1 + m\angle 3 = 90^\circ$ (1 pt). Since $\angle 2$ and $\angle 3$ are complementary, $m\angle 2 + m\angle 3 = 90^\circ$ (1 pt). By substitution, $m\angle 1 + m\angle 3 = m\angle 2 + m\angle 3$, and subtracting $m\angle 3$ gives $m\angle 1 = m\angle 2$, so $\angle 1 \cong \angle 2$ (1 pt).
- b. Box 1: $m\angle 1 + m\angle 3 = 90^\circ$ (Definition of complementary angles). Box 2: $m\angle 2 + m\angle 3 = 90^\circ$ (Definition of complementary angles). Box 3: $m\angle 1 + m\angle 3 = m\angle 2 + m\angle 3$ (Substitution), with arrows from boxes 1 and 2. Box 4: $m\angle 1 = m\angle 2$ (Subtraction Property), then $\angle 1 \cong \angle 2$ (Definition of congruent angles) (2 pts).



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