

Quadrilateral Properties: Parallelograms to Kites

Grade 10 – Geometry math · Test Answer Key · Standards: G-CO.C.11

Each answer shows the property, the work and the scoring split. For proofs, one valid chain is shown and any logically complete chain earns the same credit.

Standards: G-CO.C.11 · **Level:** Grade 10 Geometry

Question 1 Parallelogram sides (2 points)

Opposite sides are congruent: $7x - 9 = 4x + 12$, so $3x = 21$ and $x = 7$. Then $PQ = 7(7) - 9 = 40$.

$x = 7$; $PQ = 40$

Scoring: 1 point for x , 1 point for PQ .

Question 2 Parallelogram angles (3 points)

- Consecutive angles are supplementary: $(5x + 8) + (7x + 16) = 180$, so $12x + 24 = 180$ and $x = 13$.
- $\angle P = 5(13) + 8 = 73^\circ$ and $\angle Q = 7(13) + 16 = 107^\circ$.
- Opposite angles are congruent: $\angle R = 73^\circ$ and $\angle S = 107^\circ$.

$x = 13$; 73° , 107° , 73° , 107°

Scoring: 1 point per part.

Question 3 Diagonal pieces (2 points)

The diagonals bisect each other: $2x + 5 = 4x - 11$, so $16 = 2x$ and $x = 8$. Then $AE = 21$ and $AC = 42$.

$x = 8$; $AC = 42$

Scoring: 1 point for x , 1 point for AC .

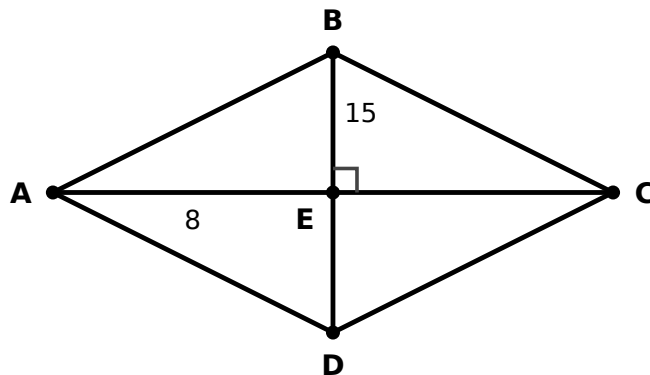
Question 4 Test for a parallelogram (3 points)

- Yes: diagonals that bisect each other prove a parallelogram.
- No: an isosceles trapezoid has one pair of parallel sides and a pair of congruent legs.
- Yes: both pairs of opposite angles congruent is a parallelogram test.

(a) yes, (b) no, (c) yes

Scoring: 1 point per part (answer and reason).

Question 5 Rhombus measures (3 points)



Solved figure: $AE = 8$, $BE = 15$, $BD = 30$.

- a. The diagonals are perpendicular and bisect each other, so $AE = 8$ and $BE = \sqrt{(17^2 - 8^2)} = \sqrt{225} = 15$.
- b. $BD = 2 \cdot 15 = 30$.
- c. Area = $\frac{1}{2} \cdot 16 \cdot 30 = 240$.

BE = 15; BD = 30; area 240

Scoring: 1 point per part.

Question 6 Prove diagonals give a parallelogram (3 points)

Statement	Reason
1. $AE \cong CE$ and $BE \cong DE$	Given
2. $\angle AEB \cong \angle CED$	Vertical angles are congruent
3. $\triangle AEB \cong \triangle CED$	SAS
4. $AB \cong CD$ and $\angle EAB \cong \angle ECD$	CPCTC
5. $AB \parallel CD$	Converse of the Alternate Interior Angles Theorem

Scoring: 1 point for steps 2 and 3, 1 point for step 4, 1 point for the parallel conclusion with its reason.

Question 7 Trapezoids (2 points)

The midsegment is the average of the bases: $(14 + 26) \div 2 = 20$.

The angles along a leg are supplementary: $180^\circ - 65^\circ = 115^\circ$.

Midsegment 20; adjacent angle 115°

Scoring: 1 point per part.

Question 8 Kite angles (2 points)

The angles between the unequal sides are congruent, so $\angle D = \angle B = 112^\circ$. The four angles add to 360° : $\angle C = 360^\circ - 76^\circ - 112^\circ - 112^\circ = 60^\circ$.

$\angle D = 112^\circ$; $\angle C = 60^\circ$

Scoring: 1 point per angle.