

Geometry · Parallelograms and Special Quadrilaterals · Test Answer Key

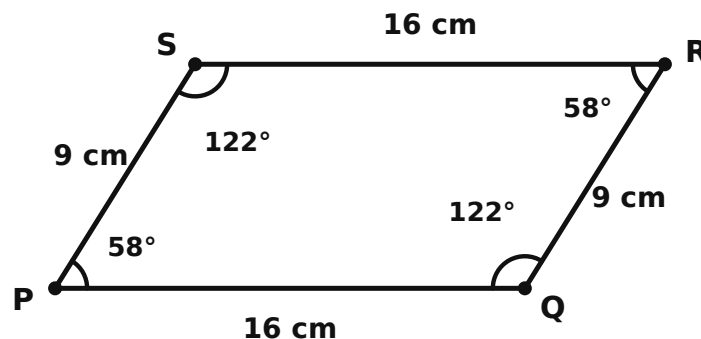
Common Core G-CO.C.11 · mathovore.fr

Each solution names the theorem it uses and ends with a scoring guide. Award the points shown for correct work, and give partial credit when a student has the right method with one arithmetic slip. Accept any valid proof order that keeps each statement supported by a reason.

GeometryCommon Core: G-CO.C.11

Question 1: Properties of a parallelogram (2 points)

- Opposite sides are congruent: $RS = PQ = 16 \text{ cm}$ and $SP = QR = 9 \text{ cm}$.
- Consecutive angles are supplementary: $m\angle Q = 180^\circ - 58^\circ = 122^\circ$. Opposite angles are congruent: $m\angle R = 58^\circ$ and $m\angle S = 122^\circ$.



All sides and angles of PQRS.

a) $RS = 16 \text{ cm}$, $SP = 9 \text{ cm}$; b) 122, 58, 122 degrees

Scoring: 1 point for each correct part (a, b). Give part b the point only if all three angles are correct.

Question 2: Angles with a variable (2 points)

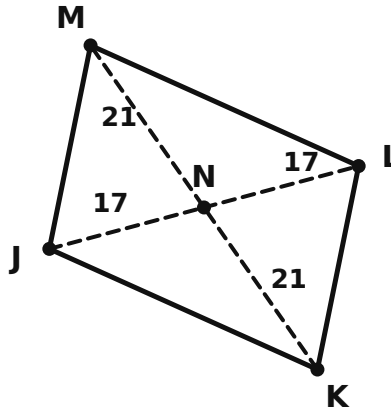
Consecutive angles are supplementary: $(5x-15) + (3x+35) = 180$, so $8x+20 = 180$ and $x = 20$. Then $m\angle W = 85^\circ$ and $m\angle X = 95^\circ$. Opposite angles are congruent: $m\angle Y = 85^\circ$ and $m\angle Z = 95^\circ$.

$$x = 20, m\angle Y = 85^\circ, m\angle Z = 95^\circ$$

Scoring: 1 point for the correct equation and $x=20$; 1 point for both angles.

Question 3: Diagonals with two variables (2 points)

The diagonals bisect each other. $JN = NL: 3x-4 = x+10$, so $x=7$ and $JN=17$. Then $JL=34$.
 $KN = NM: 2y+5 = 4y-11$, so $y=8$ and $KN=21$. Then $KM=42$.



$$JN = NL = 17 \text{ and } KN = NM = 21.$$

$$JL = 34, KM = 42$$

Scoring: 1 point for JL (equation and value), 1 point for KM (equation and value).

Question 4: Parallelogram or not? (3 points)

- a. Yes. One pair of opposite sides that is parallel and congruent is enough to prove a parallelogram.
- b. Yes. Both pairs of opposite angles are congruent, so the quadrilateral is a parallelogram.
- c. No. Two pairs of congruent adjacent sides with perpendicular diagonals describe a kite, and a kite whose two pairs of sides are unequal is not a parallelogram.

a) yes, b) yes, c) no

Scoring: 1 point per part, awarded only when both the yes or no answer and the justification are correct.

Question 5: Diagonals of a rectangle (2 points)

The diagonals of a rectangle are congruent: $6x+4 = 4x+18$, $2x=14$ and $x=7$. Then $RT = 6(7)+4 = 46$. Check: $SU = 4(7)+18 = 46$.

$$x=7, RT=46$$

Scoring: 1 point for $x=7$ with the congruent-diagonals equation; 1 point for $RT=46$.

Question 6: Angles of a rhombus (2 points)

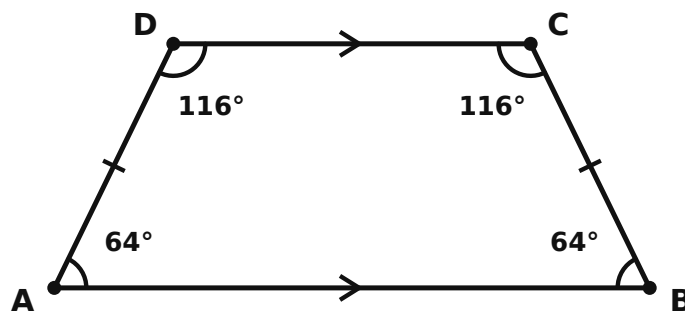
Consecutive angles are supplementary: $m\angle BAD = 180^\circ - 76^\circ = 104^\circ$. Diagonal $\overline{AC}$ bisects $\angle BAD$, so $m\angle BAC = \frac{104}{2} = 52^\circ$.

$$m\angle BAD = 104^\circ, m\angle BAC = 52^\circ$$

Scoring: 1 point for each correct angle with a valid reason.

Question 7: Isosceles trapezoid (2 points)

- Base angles are congruent: $m\angle B = 64^\circ$. Consecutive angles along a leg are supplementary: $m\angle D = m\angle C = 180^\circ - 64^\circ = 116^\circ$.
- Diagonals of an isosceles trapezoid are congruent: $4x+1=6x-11$, $12=2x$, $x=6$. So $AC=4(6)+1=25$.



The four angles are 64, 64, 116 and 116 degrees.

a) 64, 116, 116 degrees; b) AC = 25

Scoring: 1 point for all three angles; 1 point for the equation and $AC = 25$.

Question 8: Kite (2 points)

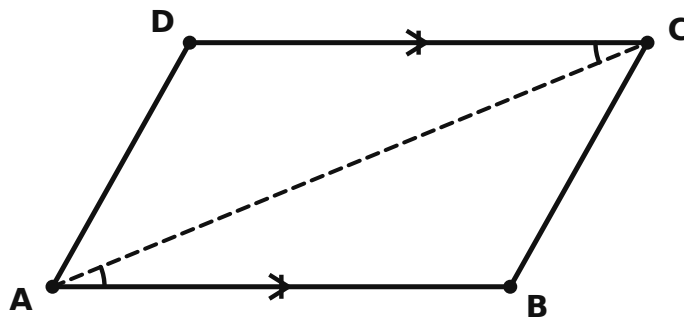
In a kite, the angles between the unequal sides are congruent: $m\angle L = m\angle N$. The angle sum is 360° , so $2m\angle L = 360^\circ - 88^\circ - 48^\circ = 224^\circ$ and $m\angle L = 112^\circ$. The diagonals of a kite are perpendicular, so $m\angle KPL = 90^\circ$.

$$m\angle L = 112^\circ, m\angle KPL = 90^\circ$$

Scoring: 1 point for 112° with the angle-sum reasoning; 1 point for 90° .

Question 9: Two-column proof (3 points)

Statements	Reasons
1. $\overline{AB}$ is parallel to $\overline{DC}$ and $AB = DC$	1. Given
2. $m\angle BAC = m\angle DCA$	2. Alternate interior angles theorem
3. $AC = AC$	3. Reflexive property
4. Triangle ABC is congruent to triangle CDA	4. SAS (steps 1, 2, 3)
5. $m\angle BCA = m\angle DAC$	5. CPCTC
6. $\overline{AD}$ is parallel to $\overline{BC}$	6. Converse of the alternate interior angles theorem
7. $ABCD$ is a parallelogram	7. Definition of a parallelogram (both pairs of opposite sides parallel)



Diagonal AC with the congruent angles BAC and DCA marked.

Scoring: 1 point for proving the triangles congruent (steps 2 to 4 with correct reasons); 1 point for steps 5 and 6; 1 point for the conclusion using the definition.

Total
20 points