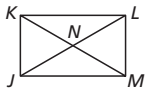
Answers

34. 18
35. 39.6
36. 39.6
37. 19.8
38. 25.5
39. 10.5
40. 25.5
41. 21
42. 41°
43. 49°
44. 82°
45. 98°
46. $m\angle 1 = 57°$; $m\angle 2 = 66°$; $m\angle 3 = 33°$; $m\angle 4 = 114°$; $m\angle 5 = 57°$
47. $m\angle 1 = 37°$; $m\angle 2 = 53°$; $m\angle 3 = 90°$; $m\angle 4 = 37°$; $m\angle 5 = 53°$
48. $RT = SU = 2\sqrt{10}$, so $\overline{RT} \cong \overline{SU}$. Slope of $\overline{RT} = -3$, and slope of $\overline{SU} = \frac{1}{3}$, so $\overline{RT} \perp \overline{SU}$. The coordinates of the mdpt. of $\overline{RT}$ and $\overline{SU}$ are $(-4, -3)$, so $\overline{RT}$ and $\overline{SU}$ bisect each other. So the diags. of $RSTU$ are $\cong$ $\perp$ bisectors of each other.
49. $EG = FH = 3\sqrt{2}$, so $\overline{EG} \cong \overline{FH}$. Slope of $\overline{EG} = -1$, and slope of $\overline{FH} = 1$, so $\overline{EG} \perp \overline{FH}$. The coordinates of the mdpt. of $\overline{EG}$ and $\overline{FH}$ are $\left(\frac{7}{2}, -\frac{1}{2}\right)$, so $\overline{EG}$ and $\overline{FH}$ bisect each other. So the diags. of $EFGH$ are $\cong$ $\perp$ bisectors of each other.
50. Not valid; by Thm. 6-5-2, if the diags. of a $\square$ are $\cong$, then the $\square$ is a rect. By Thm. 6-5-4, if the diags. of a $\square$ are $\perp$, then the $\square$ is a rhombus. If a $\square$ is both a rect. and a rhombus, then the $\square$ is a square. To apply this chain of reasoning, you must first know that $EFRS$ is a $\square$.
51. valid
52. valid

6-4 Properties of Special Parallelograms *(pp. 408–415)*

EXAMPLES

In rectangle $JKLM$, $KM = 52.8$, and $JM = 45.6$. Find each length.



■ KL

$JKLM$ is a $\square$. — Rect. $\rightarrow$ $\square$

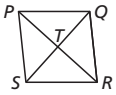
$KL = JM = 45.6$ — $\square \rightarrow$ opp. sides $\cong$

■ NL

$JL = KM = 52.8$ — Rect. $\rightarrow$ diags. $\cong$

$NL = \frac{1}{2}JL = 26.4$ — $\square \rightarrow$ diags. bisect each other

■ **$PQRS$ is a rhombus. Find $m\angle QPR$, given that $m\angle QTR = (6y + 6)°$ and $m\angle SPR = 3y°$.**



$m\angle QTR = 90°$ — Rhombus $\rightarrow$ diags. $\perp$

$6y + 6 = 90$ — Substitute the given value.

$y = 14$ — Solve for y.

$m\angle QPR = m\angle SPR$ — Rhombus $\rightarrow$ each

$m\angle QPR = 3(14)° = 42°$ — diag. bisects opp. $\angle$

■ **The vertices of square $ABCD$ are $A(5, 0)$, $B(2, 4)$, $C(-2, 1)$, and $D(1, -3)$. Show that the diagonals of square $ABCD$ are congruent perpendicular bisectors of each other.**

$AC = BD = 5\sqrt{2}$ — Diags. are $\cong$.

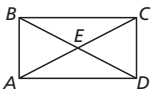
slope of $\overline{AC} = -\frac{1}{7}$ — Product of slopes is -1, so diags. are $\perp$.

slope of $\overline{BD} = 7$

mdpt. of $\overline{AC}$ = mdpt. of $\overline{BD} = \left(\frac{3}{2}, \frac{1}{2}\right)$ — Diags. bisect each other.

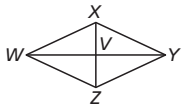
EXERCISES

In rectangle $ABCD$, $CD = 18$, and $CE = 19.8$. Find each length.



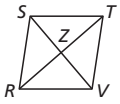
34. AB
35. AC
36. BD
37. BE

In rhombus $WXYZ$, $WX = 7a + 1$, $WZ = 9a - 6$, and $VZ = 3a$. Find each measure.



38. WZ
39. XV
40. XY
41. XZ

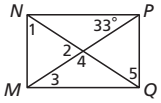
In rhombus $RSTV$, $m\angle TZV = (8n + 18)°$, and $m\angle SRV = (9n + 1)°$. Find each measure.



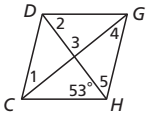
42. $m\angle TRS$
43. $m\angle RSV$
44. $m\angle STV$
45. $m\angle TVR$

Find the measures of the numbered angles in each figure.

46. rectangle $MNPQ$



47. rhombus $CDGH$



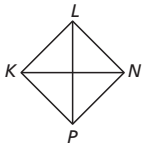
Show that the diagonals of the square with the given vertices are congruent perpendicular bisectors of each other.

48. $R(-5, 0)$, $S(-1, -2)$, $T(-3, -6)$, and $U(-7, -4)$
49. $E(2, 1)$, $F(5, 1)$, $G(5, -2)$, and $H(2, -2)$

6-5 Conditions for Special Parallelograms *(pp. 418–425)*

EXAMPLES

■ **Determine if the conclusion is valid. If not, tell what additional information is needed to make it valid.**



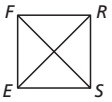
Given: $\overline{LP} \perp \overline{KN}$

Conclusion: $KLNP$ is a rhombus.

The conclusion is not valid.
If the diagonals of a parallelogram are perpendicular, then the parallelogram is a rhombus. To apply this theorem, you must first know that $KLNP$ is a parallelogram.

EXERCISES

Determine if the conclusion is valid. If not, tell what additional information is needed to make it valid.



50. Given: $\overline{ER} \perp \overline{FS}$, $\overline{ER} \cong \overline{FS}$
Conclusion: $EFRS$ is a square.

51. Given: $\overline{ER}$ and $\overline{FS}$ bisect each other.
$\overline{ER} \cong \overline{FS}$
Conclusion: $EFRS$ is a rectangle.

52. Given: $\overline{EF} \parallel \overline{RS}$, $\overline{FR} \parallel \overline{ES}$, $\overline{EF} \cong \overline{ES}$
Conclusion: $EFRS$ is a rhombus.

■ **Use the diagonals to tell whether a parallelogram with vertices $P(-5, 3)$, $Q(0, 1)$, $R(2, -4)$, and $S(-3, -2)$ is a rectangle, rhombus, or square. Give all the names that apply.**

$PR = \sqrt{98} = 7\sqrt{2}$ *Distance Formula*
$QS = \sqrt{18} = 3\sqrt{2}$ *Distance Formula*

Since $PR \neq QS$, $PQRS$ is not a rectangle and not a square.

slope of $\overline{PR} = \frac{7}{-7} = -1$ *Slope Formula*

slope of $\overline{QS} = \frac{3}{3} = 1$ *Slope Formula*

Since the product of the slopes is -1, the diagonals are perpendicular. $PQRS$ is a rhombus.

Use the diagonals to tell whether a parallelogram with the given vertices is a rectangle, rhombus, or square. Give all the names that apply.

53. $B(-3, 0)$, $F(-2, 7)$, $J(5, 8)$, $N(4, 1)$

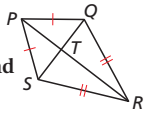
54. $D(-4, -3)$, $H(5, 6)$, $L(8, 3)$, $P(-1, -6)$

55. $Q(-8, -2)$, $T(-6, 8)$, $W(4, 6)$, $Z(2, -4)$

6-6 Properties of Kites and Trapezoids *(pp. 427–435)*

EXAMPLES

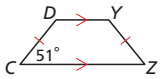
■ **In kite $PQRS$, $m\angle SRT = 24°$, and $m\angle TSP = 53°$. Find $m\angle SPT$.**



$\triangle PTS$ is a right triangle. *Kite → diags. ⊥*
$m\angle SPT + m\angle TSP = 90°$ *Acute ∠s of rt. △ are comp.*

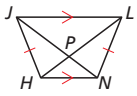
$m\angle SPT + 53 = 90$ *Substitute 53 for $m\angle TSP$.*
$m\angle SPT = 37°$ *Subtract 53 from both sides.*

■ **Find $m\angle D$.**



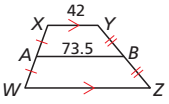
$m\angle C + m\angle D = 180°$ *Same-Side Int. ∠s Thm.*
$51 + m\angle D = 180$ *Substitute 51 for $m\angle C$.*
$m\angle D = 129°$ *Subtract.*

■ **In trapezoid $HJLN$, $JP = 32.5$, and $HL = 50$. Find PN.**



$\overline{JN} \cong \overline{HL}$ *Isosc. trap. → diags. ≅*
$JN = HL = 50$ *Def. of ≅ segs.*
$JP + PN = JN$ *Seg. Add. Post.*
$32.5 + PN = 50$ *Substitute.*
$PN = 17.5$ *Subtract 32.5 from both sides.*

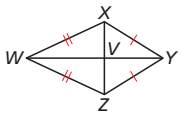
■ **Find WZ.**



$AB = \frac{1}{2}(XY + WZ)$ *Trap. Midsegment Thm.*
$73.5 = \frac{1}{2}(42 + WZ)$ *Substitute.*
$147 = 42 + WZ$ *Multiply both sides by 2.*
$105 = WZ$ *Solve for WZ.*

EXERCISES

In kite $WXYZ$, $m\angle VXY = 58°$, and $m\angle ZWX = 50°$. Find each measure.

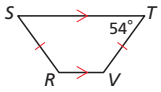


56. $m\angle XYZ$ **57.** $m\angle ZWV$

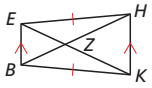
58. $m\angle VZW$ **59.** $m\angle WZY$

Find each measure.

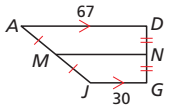
60. $m\angle R$ and $m\angle S$



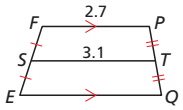
61. BZ if $ZH = 70$ and $EK = 121.6$



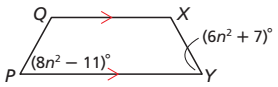
62. MN



63. EQ



64. Find the value of n so that $PQXY$ is isosceles.



Give the best name for a quadrilateral whose vertices have the given coordinates.

65. $(-4, 5)$, $(-1, 8)$, $(5, 5)$, $(-1, 2)$

66. $(1, 4)$, $(5, 4)$, $(5, -4)$, $(1, -1)$

67. $(-6, -1)$, $(-4, 2)$, $(0, 2)$, $(2, -1)$

Answers

53. rhombus
54. rect.
55. rect., rhombus, square
56. 64°
57. 25°
58. 65°
59. 123°
60. $m\angle R = 126°$; $m\angle S = 54°$
61. 51.6
62. 48.5
63. 3.5
64. $n = 3$ or $n = -3$
65. kite
66. trap.
67. isosc. trap.

CHAPTER 6

CHAPTER TEST

Organizer

Objective: Assess students' mastery of concepts and skills in Chapter 6.

PREMIER **Online Edition**

Resources

Assessment Resources

Chapter 6 Tests

- Free Response (Levels A, B, C)
- Multiple Choice (Levels A, B, C)
- Performance Assessment

Teacher One Stop™

Test & Practice Generator

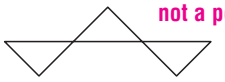
State Resources

go.hrw.com
State Resources Online
KEYWORD: MG7 Resources

CHAPTER 6

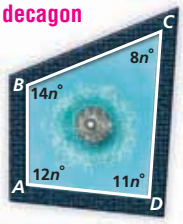
CHAPTER TEST

Tell whether each figure is a polygon. If it is a polygon, name it by the number of its sides.

1.  not a polygon

2.  polygon; decagon

3. The base of a fountain is in the shape of a quadrilateral, as shown. Find the measure of each interior angle of the fountain.

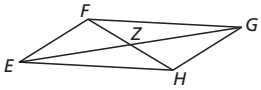


3. m∠A = 96°; m∠B = 112°; m∠C = 64°; m∠D = 88°

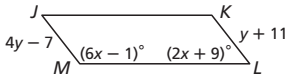
4. Find the sum of the interior angle measures of a convex nonagon. 1260°

5. Find the measure of each exterior angle of a regular 15-gon. 24°

6. In □EFGH, EH = 28, HZ = 9, and m∠EHG = 145°. Find FH and m∠FEH. FH = 18; m∠FEH = 35°

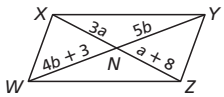


7. JKLM is a parallelogram. Find KL and m∠L. KL = 17; m∠L = 52°

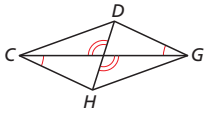


8. Three vertices of □PQRS are P(−2, −3), R(7, 5), and S(6, 1). Find the coordinates of Q. (−1, 1)

9. Show that WXYZ is a parallelogram for a = 4 and b = 3.

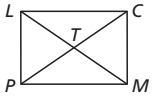


10. Determine if CDGH must be a parallelogram. Justify your answer.

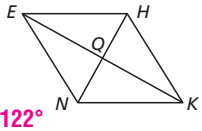


11. Show that a quadrilateral with vertices K(−7, −3), L(2, 0), S(5, −4), and T(−4, −7) is a parallelogram.

12. In rectangle PLCM, LC = 19, and LM = 23. Find PT and PM. PT = 11.5; PM = 19



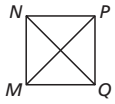
13. In rhombus EHKN, m∠NQK = (7z + 6)°, and m∠ENQ = (5z + 1)°. Find m∠HEQ and m∠EHK. m∠HEQ = 29°; m∠EHK = 122°



Determine if the conclusion is valid. If not, tell what additional information is needed to make it valid.

14. Given: $\overline{NP} \cong \overline{PQ} \cong \overline{QM} \cong \overline{MN}$
Conclusion: MNPQ is a square. not valid

15. Given: $\overline{NP} \cong \overline{MQ}$, $\overline{NM} \cong \overline{PQ}$, $\overline{NQ} \cong \overline{MP}$
Conclusion: MNPQ is a rectangle. valid

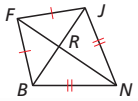


Use the diagonals to determine whether a parallelogram with the given vertices is a rectangle, rhombus, or square. Give all the names that apply.

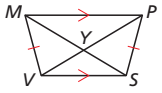
16. A(−5, 7), C(3, 6), E(7, −1), G(−1, 0) rhombus

17. P(4, 1), Q(3, 4), R(−3, 2), S(−2, −1) rect.

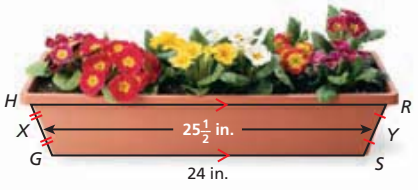
18. m∠JFR = 43°, and m∠JNB = 68°. Find m∠FBN. 103°



19. PV = 61.1, and YS = 24.7. Find MY. 36.4



20. Find HR. 27 in.



Answers

9. XN = ZN = 12, so $\overline{XN} \cong \overline{ZN}$. Thus $\overline{WY}$ bisects $\overline{XZ}$. WN = YN = 15, so $\overline{WN} \cong \overline{YN}$. Thus $\overline{XZ}$ bisects $\overline{WY}$. The diags. of WXYZ bisect each other. By Thm. 6-3-5, WXYZ is a □.

10. No; 1 pair of opp. sides of the quad. are ∥. A pair of vert. ∡ formed by the diags. are ≅. None of the conditions for a □ are met.

11. Possible answer: slope of $\overline{KL}$ = slope of $\overline{ST} = \frac{1}{3}$; slope of $\overline{KT}$ = slope of $\overline{LS} = -\frac{4}{3}$; both pairs of opp. sides have the same slope, so $\overline{KL} \parallel \overline{ST}$ and $\overline{KT} \parallel \overline{LS}$; by def., KLST is a □.

14. Possible answer: MNPQ is a rhombus by def. because its 4 sides are ≅. To show that MNPQ is a square, you need to know that MNPQ is also a rect.