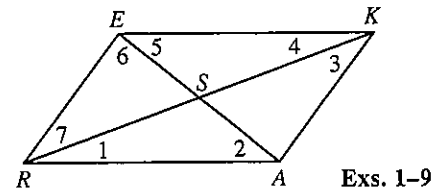


NAME _____

Ways to Prove that Quadrilaterals Are Parallelograms

Exercises 1-9 refer to $\square RAKE$. Complete each statement.

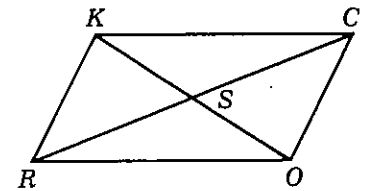
- If $ER = 14$, $KA =$ _____.
- If $RS = 12$, $RK =$ _____.
- If $m\angle ARE = 53$, $m\angle AKE =$ _____.
- If $m\angle RAK = 130$, $m\angle ARE =$ _____.



Find the value of x .

- If $ES = 2x + 5$ and $SA = 17$, $x =$ _____.
- If $EK = 4x - 3$ and $RA = 53$, $x =$ _____.
- If $m\angle 2 = 2x - 9$ and $m\angle 5 = x + 11$, $x =$ _____.
- If $m\angle RAK = 150$ and $m\angle KER = 6x$, $x =$ _____.
- If $m\angle ARE = x + 10$ and $m\angle REK = 3x - 2$, $x =$ _____.

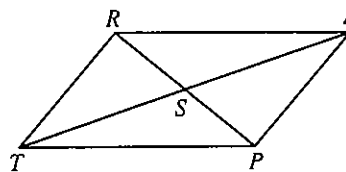
State the principal definition or theorem that enables you to deduce, from the information given, that quad. $ROCK$ is a parallelogram.



- $\overline{OR} \cong \overline{CK}$; $\overline{OC} \cong \overline{RK}$ _____
- $\overline{RK} \cong \overline{OC}$; $\overline{RK} \parallel \overline{OC}$ _____
- $\overline{OR} \parallel \overline{CK}$; $\overline{OC} \parallel \overline{RK}$ _____
- $RS = SC$; $KS = SO$ _____
- $\angle ROC \cong \angle CKR$; $\angle KRO \cong \angle OCK$ _____

Supply the missing reasons in the proof.

15. Given: $\triangle RST \cong \triangle PSA$
 Prove: $PART$ is a parallelogram.

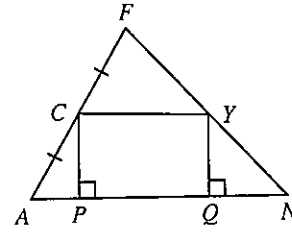


Statements	Reasons
1. $\triangle RST \cong \triangle PSA$	1. _____
2. $\overline{RS} \cong \overline{PS}$; $\overline{TS} \cong \overline{AS}$	2. _____
3. S is the midpoint of \overline{PR} and \overline{AT} .	3. _____
4. \overline{PR} and \overline{AT} bisect each other.	4. _____
5. $PART$ is a parallelogram.	5. _____

Theorems Involving Parallel Lines

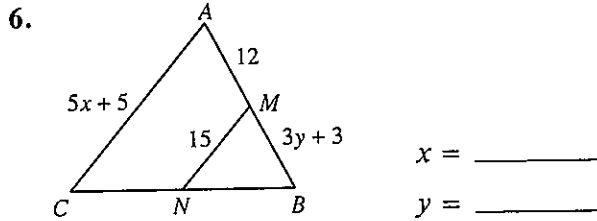
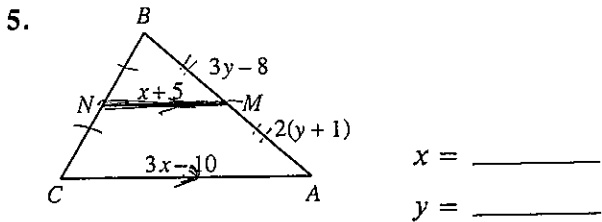
In Exercises 1-4 C is the midpoint of \overline{FA} , and \overline{CP} and \overline{YQ} are perpendicular to \overline{AN} . Classify each statement as true or false.

1. If Y is the midpoint of \overline{FN} , then $\overline{CY} \parallel \overline{AN}$. _____
2. $CY = \frac{1}{2}AN$ _____
3. If $\overline{CY} \parallel \overline{AN}$, then Y is the midpoint of \overline{FN} . _____
4. If $\overline{CY} \parallel \overline{AN}$, then $CP = YQ$. _____



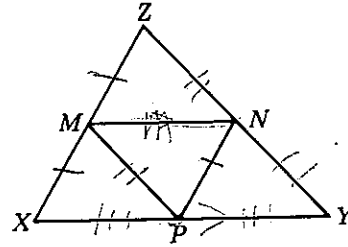
Exs. 1-4

In Exercises 5 and 6 M and N are the midpoints of \overline{AB} and \overline{CB} , respectively. Find the values of x and y .



In Exercises 7-13 points M , N , and P are the midpoints of \overline{XZ} , \overline{ZY} , and \overline{XY} , respectively.

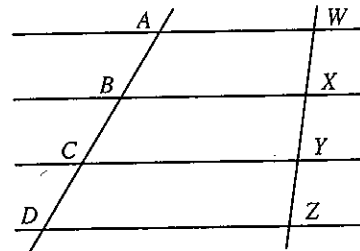
7. If $XY = 30$, then $MN =$ _____.
8. If $MP = 13.5$, then $YZ =$ _____.
9. If $MZ = 6$, then $NP =$ _____.
10. If $YZ = 4a$, then $MP =$ _____.
11. If $m\angle YNP = 84$, then $m\angle Z =$ _____.
12. If $m\angle ZMN = 70$ and $m\angle ZNM = 55$, then $m\angle X =$ _____.
13. If the perimeter of $\triangle MNP = 36$, then the perimeter of $\triangle XYZ =$ _____.



Exs. 7-13

In Exercises 14-17 \overline{AW} , \overline{BX} , \overline{CY} , and \overline{DZ} are parallel and $\overline{WX} \cong \overline{XY} \cong \overline{YZ}$.

14. If $AD = 21$, then $CD =$ _____.
15. If $BD = 32$, then $BC =$ _____.
16. If $AC = 5x - 8$ and $AB = x + 5$, then $x =$ _____.
17. If $BC = 7x$ and $AD = 9x + 24$, then $x =$ _____.



Exs. 14-17

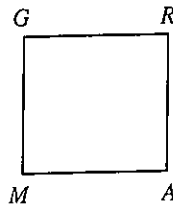
Special Parallelograms

Classify each statement as true or false.

1. Opposite sides of a rectangle must be parallel. _____
2. The diagonals of a rhombus must be perpendicular. _____
3. Consecutive angles of a rhombus are always complementary. _____
4. The diagonals of a rectangle are always perpendicular. _____
5. Opposite sides of a parallelogram must be congruent. _____
6. Each diagonal of a rectangle always bisects a pair of opposite angles. _____

In Exercises 7-9 *GRAM* is a parallelogram.

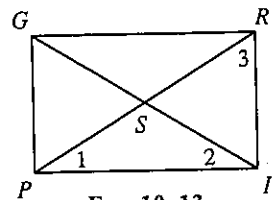
7. If $m\angle G = 90$, then *GRAM* is a _____.
8. If $\overline{MA} \cong \overline{AR}$, then *GRAM* is a _____.
9. If $\overline{GM} \perp \overline{GR}$ and $\overline{GM} \cong \overline{GR}$, then *GRAM* is a _____.



Exs. 7-9

In Exercises 10-13 *GRIP* is a rectangle.

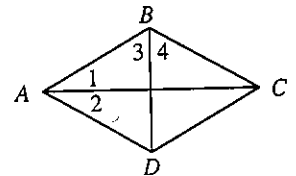
10. If $m\angle 1 = 20$, then $m\angle 2 =$ _____.
11. If $GI = 15.2$, then $RS =$ _____.
12. If $PS = 6x - 4$ and $GI = 28$, then $x =$ _____.
13. If $m\angle 1 = 5t$, and $m\angle 3 = 8t - 1$, then $t =$ _____.



Exs. 10-13

In Exercises 14-17 *ABCD* is a rhombus.

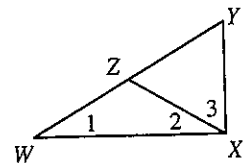
14. If $AB = 7.5$, then $BC =$ _____.
15. Name all angles congruent to $\angle 1$. _____
16. If $m\angle 1 = 40$, then $m\angle 3 =$ _____.
17. If $m\angle 3 = 6x + 16$ and $m\angle 4 = 8x$, then $x =$ _____.



Exs. 14-17

In $\triangle WYX$, $\angle WXY$ is a right angle and \overline{XZ} is a median.

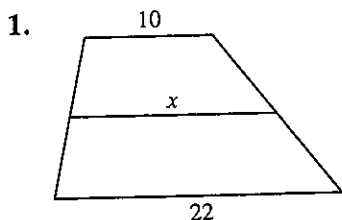
18. If $YZ = 8\frac{1}{4}$, $XZ =$ _____.
19. If $XZ = 12.5$, $WY =$ _____.
20. If $m\angle 1 = 30$, then $m\angle 2 =$ _____ and $m\angle 3 =$ _____.



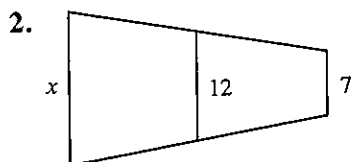
Exs. 18-20

Trapezoids

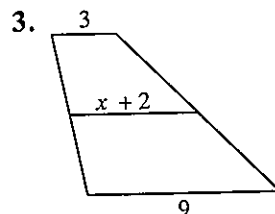
Each diagram shows a trapezoid and its median. Find the value of x .



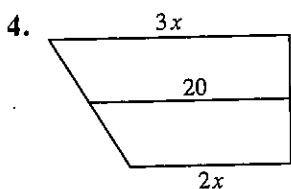
$x = \underline{\hspace{2cm}}$



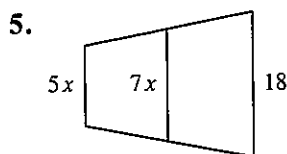
$x = \underline{\hspace{2cm}}$



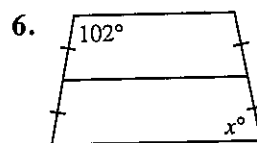
$x = \underline{\hspace{2cm}}$



$x = \underline{\hspace{2cm}}$



$x = \underline{\hspace{2cm}}$



$x = \underline{\hspace{2cm}}$

In Exercises 7-12 \overline{EF} is the median of trapezoid $ABCD$. Complete.

7. If $m\angle A = 63$, then $m\angle DEF = \underline{\hspace{2cm}}$ and $m\angle D = \underline{\hspace{2cm}}$.

8. If $m\angle CFE = 72$, then $m\angle B = \underline{\hspace{2cm}}$ and $m\angle C = \underline{\hspace{2cm}}$.

9. If $AB = 16$ and $DC = 10$, then $EF = \underline{\hspace{2cm}}$.

10. If $AB = 21$ and $EF = 18$, then $DC = \underline{\hspace{2cm}}$.

11. If $ABCD$ is isosceles and $m\angle B = 65$, then $m\angle A = \underline{\hspace{2cm}}$, $m\angle D = \underline{\hspace{2cm}}$, and $m\angle C = \underline{\hspace{2cm}}$.

12. If $ABCD$ is isosceles, name all angles congruent to $\angle A$. $\underline{\hspace{2cm}}$

In Exercises 13-17 $IJ = JL = LG$ and $IK = KM = MH$.

13. If $JK = 5$, then $LM = \underline{\hspace{2cm}}$ and $GH = \underline{\hspace{2cm}}$.

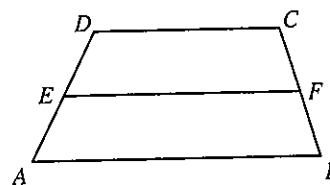
14. If $LM = 12$, then $JK = \underline{\hspace{2cm}}$ and $GH = \underline{\hspace{2cm}}$.

15. If $JK = 10$ and $LM = x + 8$, then $x = \underline{\hspace{2cm}}$.

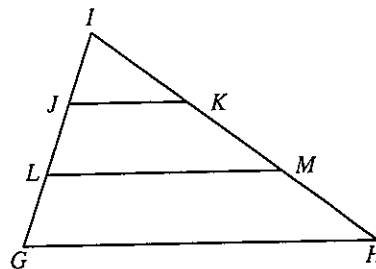
16. If $GH = 36$, then $LM = \underline{\hspace{2cm}}$ and $JK = \underline{\hspace{2cm}}$.

17. If $LM = 4x$ and $GH = x + 6$, write JK in terms of x .

$JK = \underline{\hspace{2cm}}$. Then $x = \underline{\hspace{2cm}}$.



Exs. 7-12

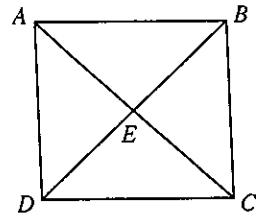


Exs. 13-17

Quadrilaterals

In Exercises 1-6 $ABCD$ is a parallelogram. Complete.

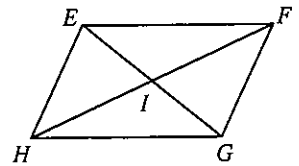
- If $m\angle ADC = 92$, then $m\angle ABC = \underline{\hspace{2cm}}$ and $m\angle DAB = \underline{\hspace{2cm}}$.
- If $BD = 20$, then $BE = \underline{\hspace{2cm}}$.
- If $AB = 9x - 2$ and $DC = 6x + 4$, then $x = \underline{\hspace{2cm}}$.
- If $AE = 9$ and $AC = 5x + 3$, then $x = \underline{\hspace{2cm}}$.
- If $ABCD$ is a rectangle and $DE = 13.4$, then $AE = \underline{\hspace{2cm}}$.
- If $ABCD$ is a rhombus, then $m\angle AED = \underline{\hspace{2cm}}$.



Exs. 1-6

In Exercises 7-10 information is given about quadrilateral $EFGH$. What additional information is needed to prove $EFGH$ is a parallelogram?

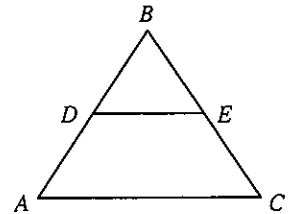
- $\angle EHG \cong \angle EFG$ _____
- $\overline{EH} \parallel \overline{FG}$ _____
- $\overline{EF} \cong \overline{HG}$ _____
- I is the midpoint of \overline{EG} . _____



Exs. 7-10

In Exercises 11-13, D is the midpoint of \overline{AB} . Complete.

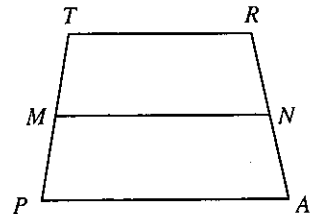
- If E is the midpoint of \overline{BC} and $AC = 26$, then $\angle BDE \cong \angle$ _____ and $DE = \underline{\hspace{2cm}}$.
- If $\overline{DE} \parallel \overline{AC}$ and $BE = 12$, then $BC = \underline{\hspace{2cm}}$.
- If $\overline{BE} \cong \overline{EC}$, then $ADEC$ is a(n) _____.



Exs. 11-13

In Exercises 14-17, M and N are the midpoints of \overline{TP} and \overline{RA} , respectively, and $TRAP$ is a trapezoid. Complete.

- \overline{MN} is the _____ of $TRAP$.
- If $\overline{TP} \cong \overline{RA}$, then $TRAP$ is a(n) _____.
- If $MN = 16$ and $TR = 14$, then $PA = \underline{\hspace{2cm}}$.
- If $\overline{TP} \cong \overline{RA}$ and $m\angle P = 80$, then $m\angle A = \underline{\hspace{2cm}}$ and $m\angle TMN = \underline{\hspace{2cm}}$.



Exs. 14-17

Give the most descriptive name for quadrilateral $QUAD$.

- $\overline{QU} \parallel \overline{DA}$; $\overline{QD} \parallel \overline{UA}$; $\overline{QD} \perp \overline{DA}$ _____
- $\overline{QU} \parallel \overline{DA}$; $\overline{QU} \cong \overline{UA} \cong \overline{DA}$ _____
- $\overline{QU} \parallel \overline{DA}$; $\overline{QD} \cong \overline{UA}$; $m\angle Q = m\angle U = 115$ _____