

Section 6.2 Parallelograms

Then

You classified polygons with four sides as quadrilaterals.

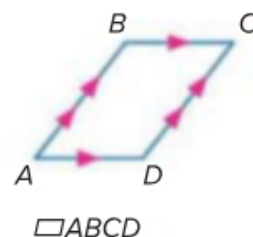
Now

- Recognize and apply properties of the sides and angles of parallelograms.
- Recognize and apply properties of the diagonals of parallelograms.

1 Sides and Angles of Parallelograms A **parallelogram** is a quadrilateral with both pairs of opposite sides parallel.

To name a parallelogram, use the symbol \square . In $\square ABCD$, $\overline{BC} \parallel \overline{AD}$ and $\overline{AB} \parallel \overline{DC}$ by definition.

Other properties of parallelograms are given in the theorems below.

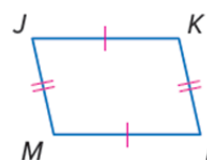


Theorems Properties of Parallelograms

6.3 If a quadrilateral is a parallelogram, then its opposite sides are congruent.

Abbreviation *Opp. sides of a \square are \cong .*

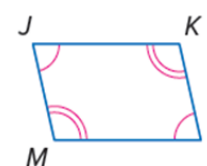
Example If $\square JKLM$ is a parallelogram, then $\overline{JK} \cong \overline{ML}$ and $\overline{JM} \cong \overline{KL}$.



6.4 If a quadrilateral is a parallelogram, then its opposite angles are congruent.

Abbreviation *Opp. \angle s of a \square are \cong .*

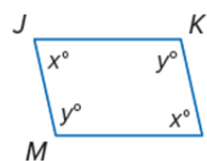
Example If $\square JKLM$ is a parallelogram, then $\angle J \cong \angle L$ and $\angle K \cong \angle M$.



6.5 If a quadrilateral is a parallelogram, then its consecutive angles are supplementary.

Abbreviation *Cons. \angle s in a \square are supplementary.*

Example If $\square JKLM$ is a parallelogram, then $x + y = 180$.



6.6 If a parallelogram has one right angle, then it has four right angles.

Abbreviation *If a \square has 1 rt. \angle , it has 4 rt. \angle s.*

Example In $\square JKLM$, if $\angle J$ is a right angle, then $\angle K$, $\angle L$, and $\angle M$ are also right angles.



Real-World Example 1 Use Properties of Parallelograms

BASKETBALL In $\square ABCD$, suppose $m\angle A = 55$, $AB = 2.5$ feet, and $BC = 1$ foot. Find each measure.

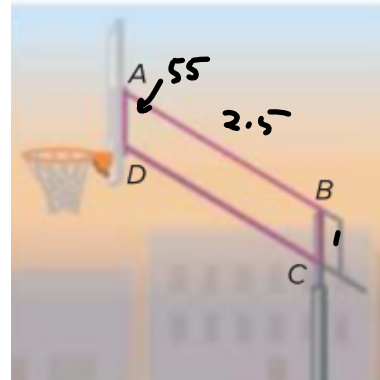
$m\angle B = 125$

$AD = 1$

$m\angle C = 55$

$DC = 2.5$

$m\angle D = 125$



MIRRORS The wall-mounted mirror shown uses parallelograms that change shape as the arm is extended. In $\square JKLM$, suppose $m\angle J = 47$. Find each measure.

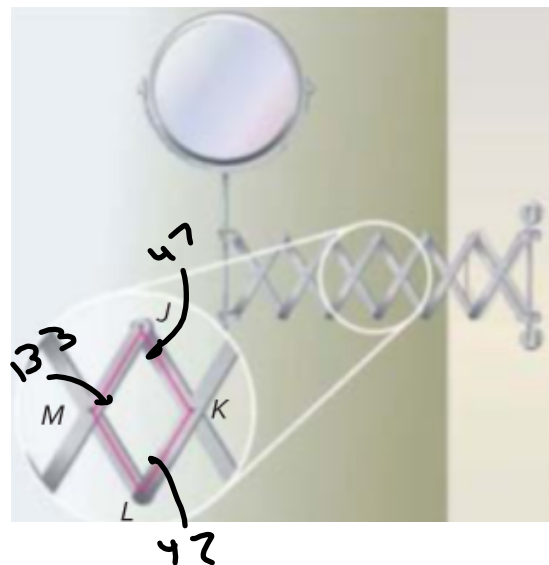
A. $m\angle L$

B. $m\angle M$

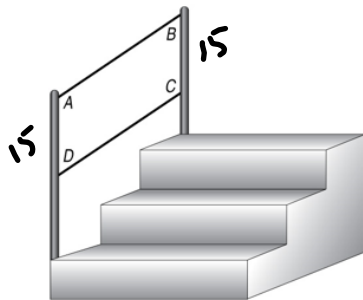
C. Suppose the arm was extended farther so that $m\angle J = 90$. What would be the measure of each of the other angles? Justify your answer.

90°

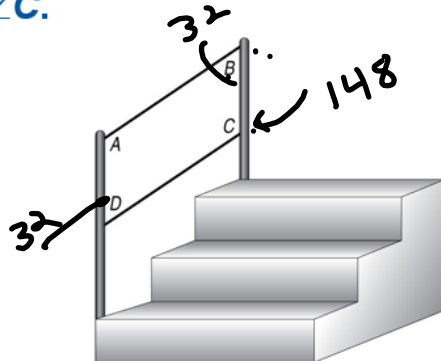
If one \angle is rt \angle
All rt \angle 's



A. CONSTRUCTION In $\square ABCD$, suppose $m\angle B = 32$, $CD = 80$ inches, $BC = 15$ inches. Find AD .

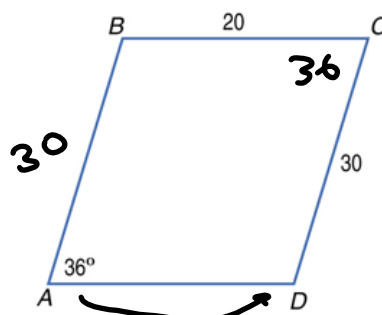


B. CONSTRUCTION In $\square ABCD$, suppose $m\angle B = 32$, $CD = 80$ inches, $BC = 15$ inches. Find $m\angle C$.



C. CONSTRUCTION In $\square ABCD$, suppose $m\angle B = 32$, $CD = 80$ inches, $BC = 15$ inches. Find $m\angle D$.

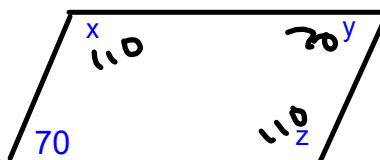
A. $ABCD$ is a parallelogram. Find AB .



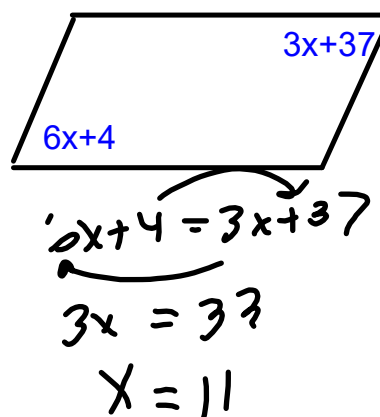
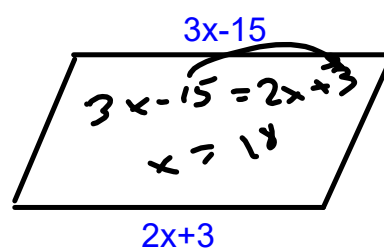
B. $ABCD$ is a parallelogram. Find $m\angle C$. = 36

C. $ABCD$ is a parallelogram. Find $m\angle D$. 144

Example: Find x, y, and z



Example: Find x



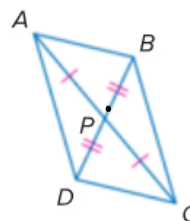
2 Diagonals of Parallelograms The diagonals of a parallelogram have special properties as well.

Theorems Diagonals of Parallelograms

6.7 If a quadrilateral is a parallelogram, then its diagonals bisect each other.

Abbreviation *Diag. of a \square bisect each other.*

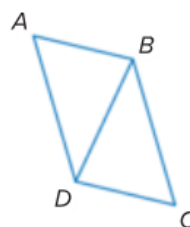
Example If $ABCD$ is a parallelogram, then $\overline{AP} \cong \overline{PC}$ and $\overline{DP} \cong \overline{PB}$.



6.8 If a quadrilateral is a parallelogram, then each diagonal separates the parallelogram into two congruent triangles.

Abbreviation *Diag. separates a \square into 2 $\cong \triangle$.*

Example If $ABCD$ is a parallelogram, then $\triangle ABD \cong \triangle CDB$.



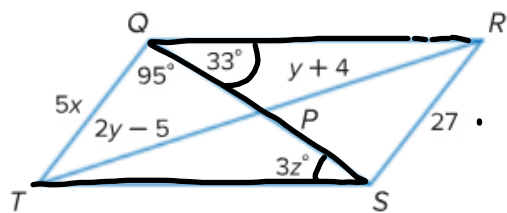
ALGEBRA If $QRST$ is a parallelogram, find the value of the indicated variable.

$$2y - 5 = y + 4$$

$$y = 9$$

$$3z = 33$$

$$z = 11$$



$$5x = 27$$

$$x = \frac{27}{5}$$

A. If $WXYZ$ is a parallelogram, find the value of r .

