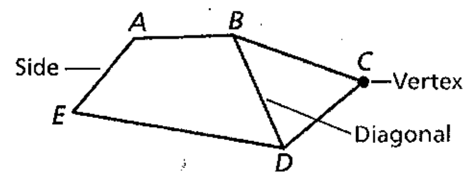
Teacher's Copy

6.1 Properties and attributes of Polygons

Learning Goal: Students will classify polygons based on their sides and angles and find and use the measures of interior and exterior angles of polygons.



Polygon

side of the polygon

vertex of the polygon

diagonal

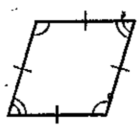
regular polygon

concave

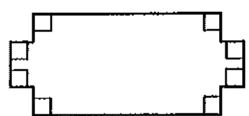
convex

Definitions

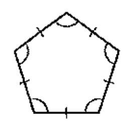
Tell whether the polygon is regular or irregular. Tell whether it is concave or convex.



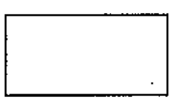
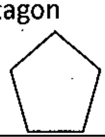
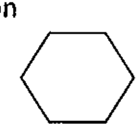
irregular
convex



irregular
Concave

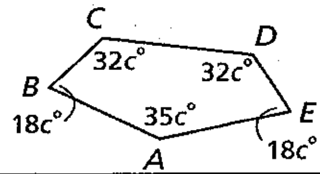


regular
Convex

Polygon	Number of sides	Number of triangles	Sum of interior angles
Triangle	3	1	$(1)180 = 180$
Quadrilateral 	4	2	$(2)180 = 360°$
Pentagon 	5	3	$(3)180 = 540°$
Hexagon 	6	4	$(4)180 = 720°$
n-gon	n	$n-2$	$(n-2)180°$

Theorem 6-1-1 **Polygon Angle Sum Theorem**

The sum of the interior angle measures of a convex polygon with n sides is $(n-2)180°$.

Find the sum of the interior angle measures of a convex heptagon. $(n-2)180=$ $(7-2)180=900°$	Find the sum of the interior angle measures of a convex 15-gon. $(15-2)180=2340°$
Find the measure of each interior angle of a regular 16-gon. $(16-2)180=157.5°$ $2520\div16=157.5°$	Find the measure of each interior angle of a regular decagon. $(10-2)180=\frac{1440}{10}=144°$
Find the measure of each interior angle of pentagon *ABCDE*. $\angle A+\angle B+\angle C+\angle D+\angle E=540$ $35c+18c+32c+32c+18c=540$ $\frac{135c}{135}=\frac{540}{135}$ $c=4$	 $\angle A=140°$ $\angle B=72°$ $\angle C=128°$ $\angle D=128°$ $\angle E=72°$

An exterior angle is formed by one side of a polygon and the extension of a consecutive side.

Theorem 6-1-2 **Polygon Exterior Angle Sum Theorem**

The sum of the exterior angle measures, one angle at each vertex, of a convex polygon is 360°.

(NO MATTER HOW MANY SIDES IT HAS!)

Find the measure of each exterior angle of a regular 20-gon

$$\frac{360}{20}=18°$$

Find the measure of each exterior angle of a regular dodecagon.

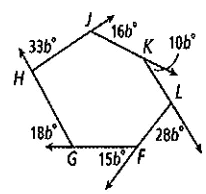
$$\frac{360}{12}=30°$$

Find the value of *b* in polygon *FGHJKL*.

$33b+16b+10b+28b+15b+18b=360$

$\frac{120b}{120}=\frac{360}{120}$

$b=3$

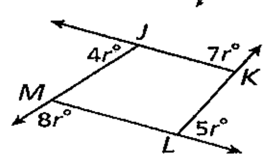


Find the value of *r* in polygon *JKLM*.

$4r+8r+5r+7r=360$

$\frac{24r}{24}=\frac{360}{24}$

$r=15$



The interior angle + the exterior angle = 180. In other words the interior angle and its exterior angle are supplementary.

How many sides does a regular polygon have if each interior angle measures 162.

$162=\frac{(n-2)(180)}{n}$

$162n=(n-2)(180)$

$162n=180n-360$

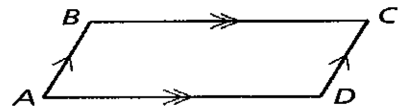
$\frac{360}{18}=\frac{18n}{18}$ $n=20$

HW: P386 16-38

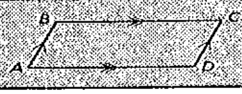
6.2 Properties of Parallelograms

Learning Goals: Students will prove and apply properties of parallelograms and use properties of parallelograms to solve problems.

A quadrilateral with two pairs of parallel sides is a parallelogram. To write the name of a parallelogram, you use the symbol ▱.



Theorem 6-2-1 Properties of Parallelograms

THEOREM	HYPOTHESIS	CONCLUSION
If a quadrilateral is a parallelogram, then its opposite sides are congruent. (▱ → opp. sides ≅)		$\overline{AB} \cong \overline{CD}$ $\overline{BC} \cong \overline{DA}$

Theorems Properties of Parallelograms

	THEOREM	HYPOTHESIS	CONCLUSION
6-2-2	If a quadrilateral is a parallelogram, then its opposite angles are congruent. (▱ → opp. ∠s ≅)		$\angle A \cong \angle C$ $\angle B \cong \angle D$
6-2-3	If a quadrilateral is a parallelogram, then its consecutive angles are supplementary. (▱ → cons. ∠s supp.)		$m\angle A + m\angle B = 180°$ $m\angle B + m\angle C = 180°$ $m\angle C + m\angle D = 180°$ $m\angle D + m\angle A = 180°$
6-2-4	If a quadrilateral is a parallelogram, then its diagonals bisect each other. (▱ → diags. bisect each other)		$\overline{AZ} \cong \overline{CZ}$ $\overline{BZ} \cong \overline{DZ}$

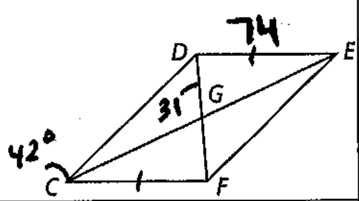
In ▱$CDEF$, DE = 74 mm, DG = 31 mm, and $m\angle FCD$ = 42°.

CF = 74

$m\angle EFC$ = 138°

$m\angle EFC + m\angle FCD = 180°$

180
−42
138°



Find YZ and Angle Z

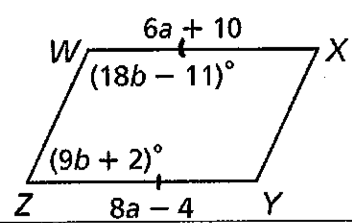
$6a + 10 = 8a - 4$

$-6a \quad +4 \quad -6a \quad +4$

$\frac{14}{2} = \frac{2a}{2}$

$a = 7$

$ZY = 8(7) - 4 = 52$



$\angle W + \angle Z = 180$

$18b - 11 + 9b + 2 = 180$

$27b - 9 = 180$

$+9 \quad +9$

$\frac{27b}{27} = \frac{189}{27}$

$b = 7$

$m\angle Z = 9(7) + 2 = 65°$

Find JG and FH

$JG = 3w = w + 8$

$-w \quad -w$

$\frac{2w}{2} = \frac{8}{2}$

$w = 4$

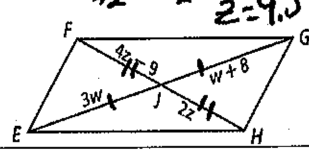
$JG = 4 + 8 = 12$

FH $4z - 9 = 2z$

$-4z \quad -4z$

$\frac{-9}{-2} = \frac{-2z}{-2}$

$z = 4.5$



$FH = 4(4.5) - 9 + 2(9)$

$FH = 27$

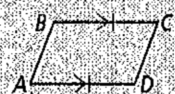
HW: P395 15-43 Day 1

HW: Worksheet Day 2

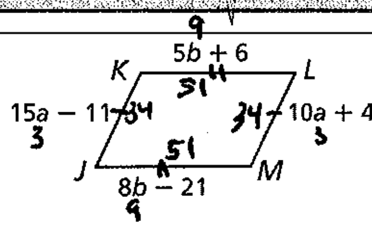
6-3 Conditions for Parallelograms

Learning Goal: Students will prove that a given quadrilateral is a parallelogram.

Theorems Conditions for Parallelograms

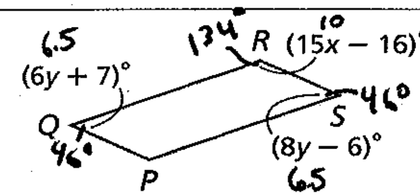
	THEOREM	EXAMPLE
6-3-1	If one pair of opposite sides of a quadrilateral are parallel and congruent, then the quadrilateral is a parallelogram. (quad. with pair of opp. sides ∥ and ≅ → ▱)	
6-3-2	If both pairs of opposite sides of a quadrilateral are congruent, then the quadrilateral is a parallelogram. (quad. with opp. sides ≅ → ▱)	
6-3-3	If both pairs of opposite angles of a quadrilateral are congruent, then the quadrilateral is a parallelogram. (quad. with opp. ∠s ≅ → ▱)	

Show that JKLM is a parallelogram for $a = 3$ and $b = 9$.



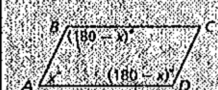
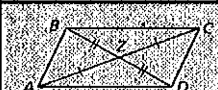
Yes
opp side ≅

Show that *PQRS* is a parallelogram for $x = 10$ and $y = 6.5$.



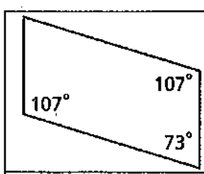
∠R + ∠S = 180
134 + 46 = 180
180 = 180
Yes ∠R + ∠S are supp.

Theorems Conditions for Parallelograms

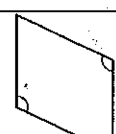
	THEOREM	EXAMPLE
6-3-4	If an angle of a quadrilateral is supplementary to both of its consecutive angles, then the quadrilateral is a parallelogram. (quad. with ∠ supp. to cons. ∠s → ▱)	
6-3-5	If the diagonals of a quadrilateral bisect each other, then the quadrilateral is a parallelogram. (quad. with diags. bisecting each other → ▱)	

Conditions for Parallelograms
Both pairs of opposite sides are parallel. (definition)
One pair of opposite sides are parallel and congruent. (Theorem 6-3-1)
Both pairs of opposite sides are congruent. (Theorem 6-3-2)
Both pairs of opposite angles are congruent. (Theorem 6-3-3)
One angle is supplementary to both of its consecutive angles. (Theorem 6-3-4)
The diagonals bisect each other. (Theorem 6-3-5)

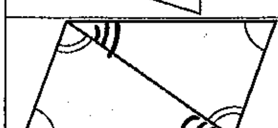
Determine if the quadrilateral must be a parallelogram. Justify your answer.



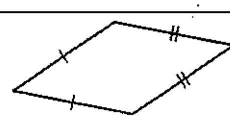
Yes 73° is supp to both of its consecutive ∠s.



No 1 pair of opp ∠s ≅



Yes Third ∠s Thm indicates opp ∠s ≅



No consecutive sides ≅ not opp. sides.

HW: P402: 9-13, 17-23

6.2-6.3 Coordinate Geometry

Remember the distance formula

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Slope Formula

$$m = \frac{(y_2 - y_1)}{(x_2 - x_1)}$$

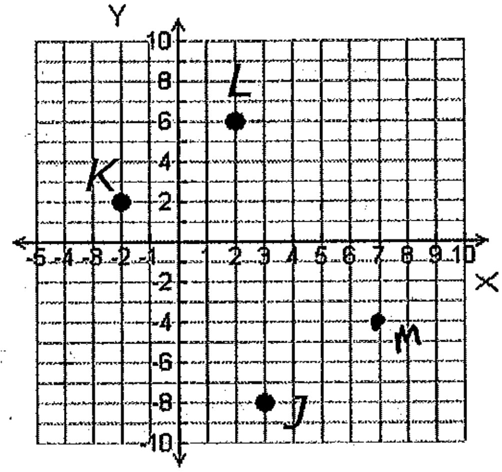
Slopes of Parallel lines are equal.

Slopes of perpendicular line are opposite reciprocals.

Three vertices of JKLM are $J(3, -8)$, $K(-2, 2)$, and $L(2, 6)$. Find the coordinates of vertex M.

$\overline{KL} = \frac{(6-2)}{(2+2)} = \frac{4}{4}$

$M(7,-4)$

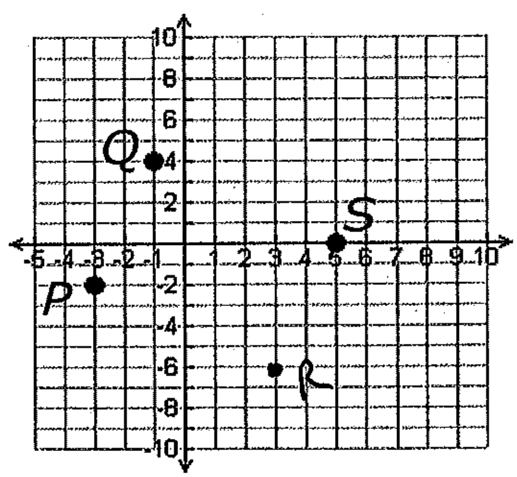


Three vertices of PQRS are $P(-3, -2)$, $Q(-1, 4)$, and $S(5, 0)$. Find the coordinates of vertex R.

$QP = \frac{6}{2}$

$QS = \frac{-4}{6}$

$R(3,-6)$



Show that quadrilateral *JKLM* is a parallelogram by using the definition of parallelogram. $J(-1, -6)$, $K(-4, -1)$, $L(4, 5)$, $M(7, 0)$.

Slope $\overline{JK} = \overline{LM}$

$\overline{KL} = \overline{MJ}$

$\overline{JK}: \dfrac{(-1+{}^{+}6)}{(-4+{}^{+}1)} = \dfrac{5}{-3}$ or $-\dfrac{5}{3}$

$\overline{KL} = \dfrac{(-1-5)}{(-4-4)} = \dfrac{-6}{-8} = \dfrac{3}{4}$

$\overline{LM} = \dfrac{(0-5)}{(7-4)} = \dfrac{-5}{3}$ or $-\dfrac{5}{3}$

$\overline{MJ} = \dfrac{0+{}^{+}6}{7+{}^{+}1} = \dfrac{6}{8} = \dfrac{3}{4}$

opp sides // so ▱ JKLM by def.

Show that quadrilateral *ABCD* is a parallelogram by using Theorem 6-3-1. $A(2, 3)$, $B(6, 2)$, $C(5, 0)$, $D(1, 1)$.

Slope $\overline{DA} = \overline{BC}$

$\overline{DA} = \dfrac{(1-3)}{(1-2)} = \dfrac{-2}{-1} = 2$

$\overline{BC} = \dfrac{(0-2)}{5-6} = \dfrac{-2}{-1} = 2$

ABCD is a ▱ opp sides // + ≅

Distance formula

$\overline{DA} \cong \overline{BC}$

$\overline{DA} = \sqrt{(x_2-x_1)^2 + (y_2-y_1)^2}$

$= \sqrt{(1-2)^2 + (1-3)^2}$

$\overline{DA} = \sqrt{1+4} = \boxed{\sqrt{5}}$

$\overline{BC} = \sqrt{(5-6)^2 + (0-2)^2}$

$\overline{BC} = \sqrt{1+4} = \boxed{\sqrt{5}}$

Use the definition of a parallelogram to show that the quadrilateral with vertices $K(-3, 0)$, $L(-5, 7)$, $M(3, 5)$, and $N(5, -2)$ is a parallelogram.

$\overline{KL} = \dfrac{7-0}{-5+{}^{+}3} = \dfrac{7}{-2}$ or $-\dfrac{7}{2}$

$\overline{MN} = \dfrac{-2-5}{5-3} = \dfrac{-7}{2}$ or $-\dfrac{7}{2}$

$\overline{LM} = \dfrac{5-7}{-3+{}^{+}5} = \dfrac{-2}{8} = +\dfrac{1}{4}$

$\overline{NK} = \dfrac{-2-0}{5+{}^{+}3} = \dfrac{2}{8} = \dfrac{1}{4}$

$\overline{KL} = \overline{MN}$

$\overline{LM} = \overline{NK}$

KLMN is a ▱

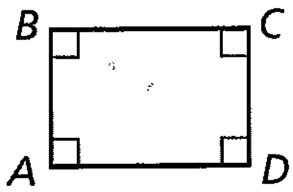
opp sides are //

HW: Worksheet

6.4 Special Parallelograms

Learning Goals: Students will prove, apply and use properties of rectangles, rhombuses, and squares.

A rectangle is a quadrilateral with four right angles.



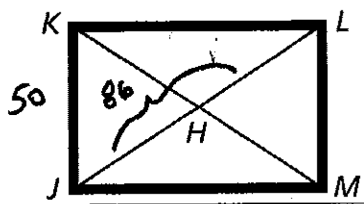
Rectangle $ABCD$

Theorems Properties of Rectangles

THEOREM	HYPOTHESIS	CONCLUSION
6-4-1 If a quadrilateral is a rectangle, then it is a parallelogram. (rect. → ▱)	B C A D	$ABCD$ is a parallelogram.
6-4-2 If a parallelogram is a rectangle, then its diagonals are congruent. (rect. → diags. ≅)	B C A D	$\overline{AC} \cong \overline{BD}$

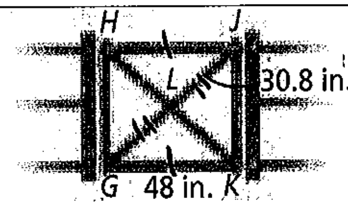
A woodworker constructs a rectangular picture frame so that $JK = 50$ cm and $JL = 86$ cm. Find HM.

JL = KM
KM = KH + MH
86 = KH + MH
÷ 2
43 = HM



Find HJ

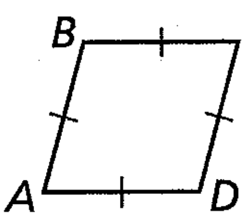
HJ = 48



Find HK

JL + GL = GJ
30.8 + 30.8 = GJ
61.6 = GJ
GJ = HJ
61.6 = HJ

A **rhombus** is a quadrilateral with four congruent sides.



Rhombus $ABCD$

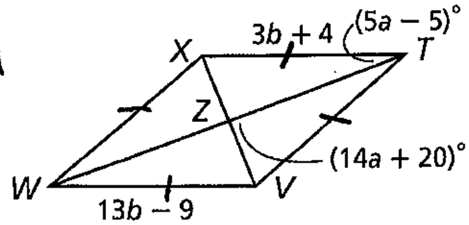
Theorems Properties of Rhombuses

THEOREM	HYPOTHESIS	CONCLUSION
6-4-3 If a quadrilateral is a rhombus, then it is a parallelogram. (rhombus → ▱)	B C A D	$ABCD$ is a parallelogram.
6-4-4 If a parallelogram is a rhombus, then its diagonals are perpendicular. (rhombus → diags. ⊥)	B C A D	$\overline{AC} \perp \overline{BD}$
6-4-5 If a parallelogram is a rhombus, then each diagonal bisects a pair of opposite angles. (rhombus → each diag. bisects opp. ∠s)	B C A D 1 2 3 4 5 6 7 8	$\angle 1 \cong \angle 2$ $\angle 3 \cong \angle 4$ $\angle 5 \cong \angle 6$ $\angle 7 \cong \angle 8$

Find TV

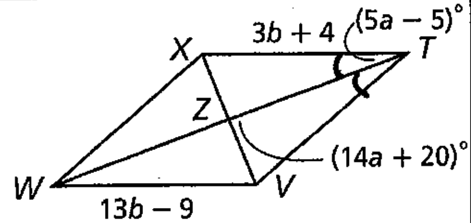
Find TV

3b + 4 = 13b − 9
−3b +9 −3b +9
13 = 10b
/10 /10
b = 1.3
3(1.3) + 4 = 7.9
TV = 7.9

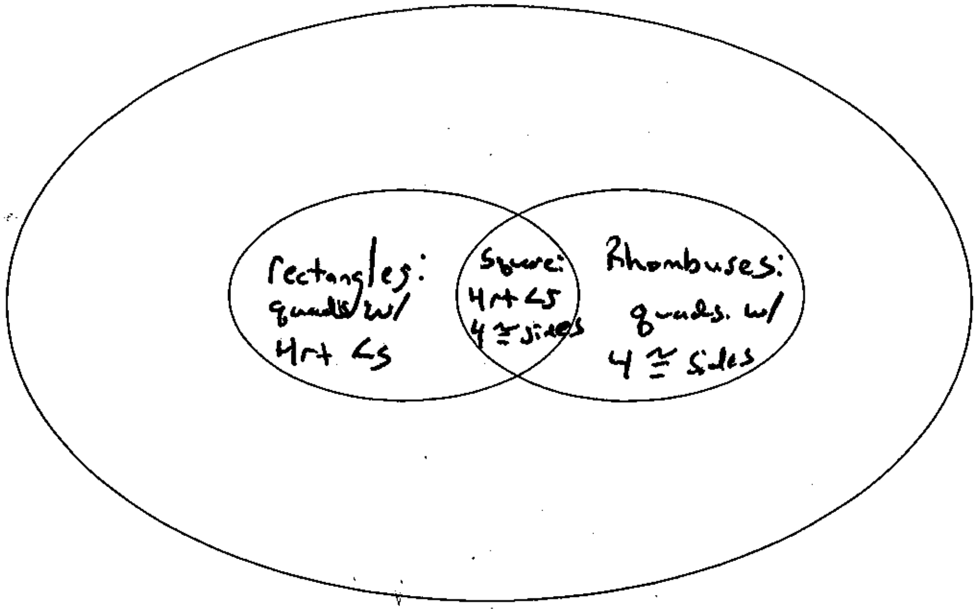


Find ∠VTZ

14a + 20 = 90
−20 −20
14a = 70
/14 /14
a = 5
∠VTZ = 5(5) − 5 = 20°



▱s : quads w/ 2 pairs of // sides

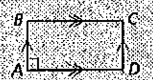


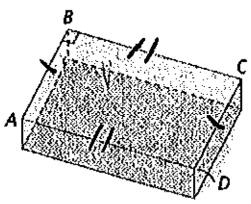
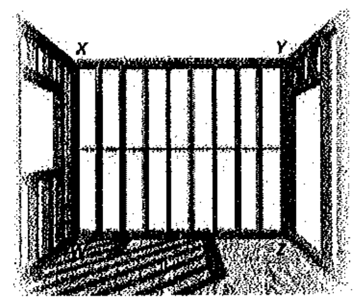
HW: P412, 10-15, 18-31
HW: Worksheet

6.5 Properties of Special Parallelograms

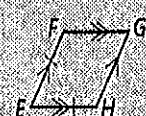
Learning Goal: Students will prove that a given quadrilateral is a rectangle, rhombus, or square.

Theorems Conditions for Rectangles

THEOREM	EXAMPLE
6-5-1 If one angle of a parallelogram is a right angle, then the parallelogram is a rectangle. (▱ with one rt. ∠ → rect.)	
6-5-2 If the diagonals of a parallelogram are congruent, then the parallelogram is a rectangle. (▱ with diags. ≅ → rect.)	 $\overline{AC} \cong \overline{BD}$

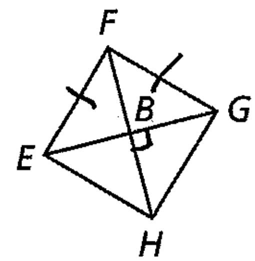
A manufacture builds a mold for a desktop so that $\overline{AB} \cong \overline{CD}$, $\overline{BC} \cong \overline{DA}$, and m∠ABC = 90°. Why must ABCD be a rectangle?  – Both pairs of opp sides are ≅. ABCD is a ▱ – m∠ABC = 90° ABCD is a Rect.	A carpenter's square can be used to test that an angle is a right angle. How could the contractor use a carpenter's square to check that the frame is a rectangle?  Both pairs of opp sides are ≅ so WXYZ is a ▱. If 1 ∠ is rt. then the frame is a Rect.

Theorems Conditions for Rhombuses

THEOREM	EXAMPLE
6-5-3 If one pair of consecutive sides of a parallelogram are congruent, then the parallelogram is a rhombus. (▱ with one pair cons. sides ≅ → rhombus)	
6-5-4 If the diagonals of a parallelogram are perpendicular, then the parallelogram is a rhombus. (▱ with diags. ⊥ → rhombus)	
6-5-5 If one diagonal of a parallelogram bisects a pair of opposite angles, then the parallelogram is a rhombus. (▱ with diag. bisecting opp. ∠s → rhombus)	

<u>You can also prove that a given quadrilateral is a rectangle, rhombus, or square by using the definitions of the special quadrilaterals.</u>

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



Given: $\overline{EF} \cong \overline{FG}, \overline{EG} \perp \overline{FH}$

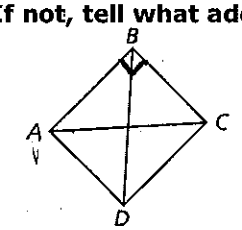
Conclusion: *EFGH* is a rhombus.

Not valid. You must first know that EFGH is a ▱.

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

Given: $\angle ABC$ is a right angle.

Conclusion: *ABCD* is a rectangle.



Not valid

if 1 ∠ of a ▱ is a rt. ∠, then the ▱ is a rect.

To apply this thm., you need to know that ABCD is a ▱.

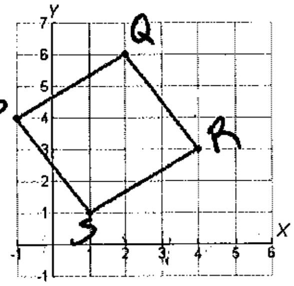
HW: P422, 1-3,6-8,11-16

6.5 Coordinated of Parallelograms

Recall the distance formula, midpoint formula and slope formuls.

$D = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $S = \frac{y_2 - y_1}{x_2 - x_1}$

Use the diagonals to determine whether a parallelogram with the given vertices is a rectangle, rhombus, or square. Give all the names that apply.
$P(-1, 4)$, $Q(2, 6)$, $R(4, 3)$, $S(1, 1)$



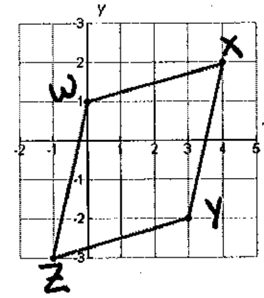
$QS = \sqrt{(1-2)^2 + (1-6)^2}$
$= \sqrt{26}$ =

$PR = \sqrt{(4-{-1})^2 + (3-4)^2}$
$= \sqrt{26}$

$\overline{QS} = \overline{PR}$

Rectangle, Rhombus, Square

Use the diagonals to determine whether a parallelogram with the given vertices is a rectangle, rhombus, or square. Give all the names that apply.
$W(0, 1)$, $X(4, 2)$, $Y(3, -2)$, $Z(-1, -3)$



$WY = \sqrt{(3-0)^2 + (-2-1)^2}$

$WY = \sqrt{18} = 3\sqrt{2}$

$ZX = \sqrt{(4-{-1})^2 + (2-{-3})^2}$

$ZX = \sqrt{50} = 5\sqrt{2}$

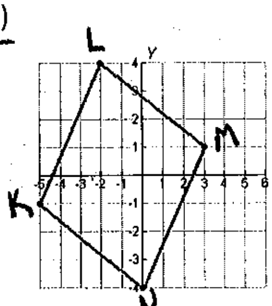
$WY = \frac{-2-1}{3-0} = \frac{-3}{3} = -1$

$ZX = \frac{2+3}{4+1} = \frac{5}{5} = 1$

$WY \perp ZX$

Rhombus

Use the diagonals to determine whether a parallelogram with the given vertices is a rectangle, rhombus, or square. Give all the names that apply.
K(−5, −1), L(−2, 4), M(3, 1), N(0, −4)



$LN = \sqrt{(0-{-2})^2 + (-4-4)^2}$

$LN = \sqrt{68} = 4\sqrt{17}$

$KM = \sqrt{(3-{-5})^2 + (1-{-1})^2}$

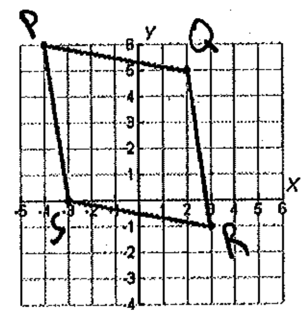
$KM = \sqrt{68} = 4\sqrt{17}$ $LN \cong KM$

$LN = \frac{-4-4}{0-{-2}} = \frac{-8}{2} = -4$ $LN \perp KM$

$KM = \frac{1-{-1}}{3-{-5}} = \frac{2}{8} = \frac{1}{4}$

Rectangle
Rhombus
Square

Use the diagonals to determine whether a parallelogram with the given vertices is a rectangle, rhombus, or square. Give all the names that apply.
P(−4, 6) , Q(2, 5) , R(3, −1) , S(−3, 0)



$PR = \sqrt{(3-{-4})^2 + (-1-6)^2}$

$PR = \sqrt{74}$ =

$QS = \sqrt{(-3-2)^2 + (0-5)^2}$

$QS = \sqrt{34}$

$PR = \frac{-1-6}{3-{-4}} = \frac{-7}{7} = -1$ $PR \perp QS$

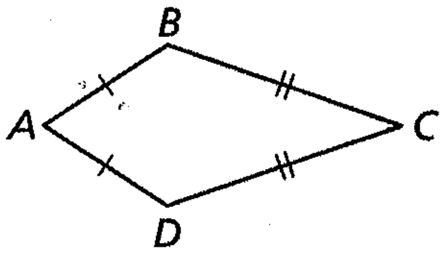
$QS = \frac{0-5}{-3-2} = \frac{-5}{-5} = 1$ Rhombus

HW Worksheet

6.6 Properties of Kites

Learning Goals: Students will use properties of kites to solve problems.

A kite is a quadrilateral with exactly two pairs of congruent consecutive sides.

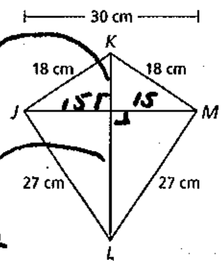


Kite *ABCD*

Theorems Properties of Kites

THEOREM	HYPOTHESIS	CONCLUSION
6-6-1 If a quadrilateral is a kite, then its diagonals are perpendicular. (kite → diags. ⊥)		$\overline{AC} \perp \overline{BD}$
6-6-2 If a quadrilateral is a kite, then exactly one pair of opposite angles are congruent. (kite → one pair opp. ∡ ≅)		$\angle B \cong \angle D$ $\angle A \ncong \angle C$

Lucy is framing a kite with wooden dowels. She uses two dowels that measure 18 cm, one dowel that measures 30 cm, and two dowels that measure 27 cm. To complete the kite, she needs a dowel to place along KL. She has a dowel that is 36 cm long. About how much wood will she have left after cutting the last dowel?



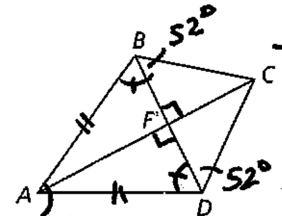
$15^2+b^2=18^2$
$225+b^2=324$
$\sqrt{b^2}=\sqrt{99}$
$b=9.95$

9.95
+
22.45

$15^2+b^2=27^2$
$225+b^2=729$
$\sqrt{b^2}=\sqrt{504}=22.45$

$32.4-36=\boxed{3.6}$

In kite ABCD, m∠DAB = 54°, and m∠CDF = 52°. Find m∠BCD and m∠ABC.



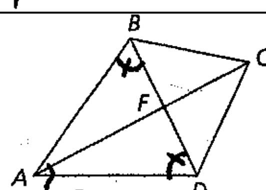
52° 76° 52° 54°

$52+52=104$
$\angle B+\angle D+\angle C=180$
$104+\angle C=180$
$-104 \quad -104$
$\angle C=76$
$\angle BCD=76°$

$\triangle ABD$ = isosceles
$180-54=126$
$\div 2$

$m\angle ABC=63+52$
$m\angle ABC=115°$

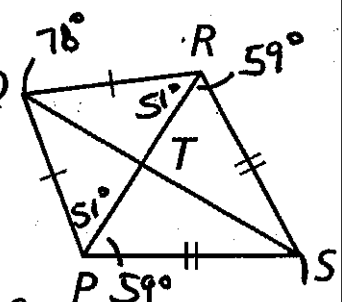
In kite ABCD, m∠DAB = 54°, and m∠CDF = 52°. Find m∠FDA.



54°

180
-54
$126\div 2=63°$

In kite *PQRS*, m∠*PQR* = 78°, and m∠*TRS* = 59°. Find m∠*QRT*, m∠QPS, m∠PSR.



$\triangle RPS = \angle R+\angle P+\angle S$
$180=59+59+\angle S$
$180=118+\angle S$
-118
$62°=\angle S$

$180-78=102\div 2=51°$

$m\angle QPS=51+59$
$=110°$

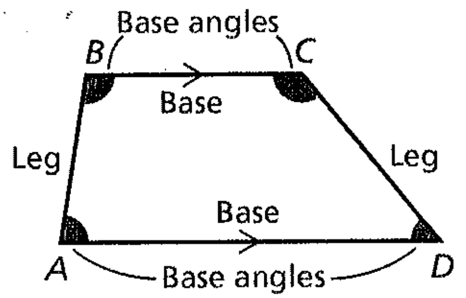
$m\angle PSR=62°$

$m\angle QRT=51°$

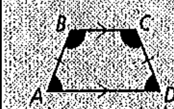
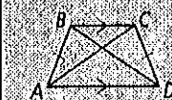
HW: P432: 4-6, 13-16,24,25,28,29,31

6.6 Properties of Trapezoids

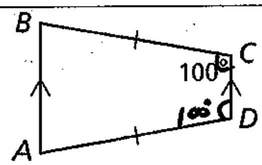
A trapezoid is a quadrilateral with exactly one pair of parallel sides. Each of the parallel sides is called a base. The nonparallel sides are called legs. Base angles of a trapezoid are two consecutive angles whose common side is a base.



Theorems Isosceles Trapezoids

THEOREM	DIAGRAM	EXAMPLE
6-6-3 If a quadrilateral is an isosceles trapezoid, then each pair of base angles are congruent. (isosc. trap. → base ∠s ≅)		$\angle A \cong \angle D$ $\angle B \cong \angle C$
6-6-4 If a trapezoid has one pair of congruent base angles, then the trapezoid is isosceles. (trap. with pair base ∠s ≅ → isosc. trap.)		ABCD is isosceles.
6-6-5 A trapezoid is isosceles if and only if its diagonals are congruent. (isosc. trap. ↔ diags. ≅)		$\overline{AC} \cong \overline{DB} \leftrightarrow$ ABCD is isosceles.

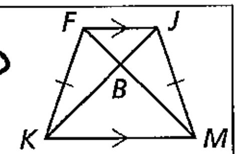
Find m∠A.



$180-100 = 80°$

$\angle A + \angle D = 180$

KB = 21.9m and MF = 32.7. Find FB.

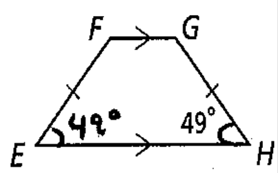


KB + BJ = FB + BM or (MF)

$21.9 + BJ = 32.7$
$-21.9 \qquad -21.9$

BJ = 10.8 BJ = FB FB = 10.8

Find m∠F.

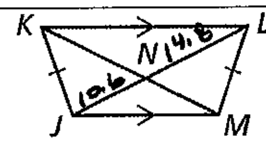


$\angle F + \angle E = 180$

$\angle F + 49 = 180$
$-49 \quad -49$

$\angle F = 131°$

JN = 10.6, and NL = 14.8. Find KM.

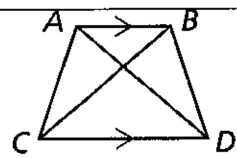


JN + NL = KM

10.6 + 14.8 = KM

25.4 = KM

AD = 12x − 11, and BC = 9x − 2. Find the value of x so that ABCD is isosceles.

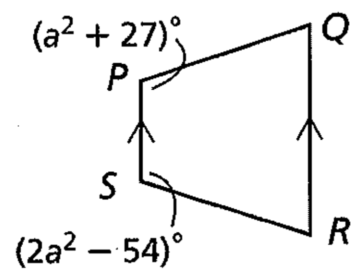


AD = BC

$12x - \cancel{11} = 9x - 2$
$-9x \quad +11 \quad -9x \quad +4$

$\frac{3x}{3} = \frac{9}{3}$ $\boxed{x = 3}$

Find the value of a so that PQRS is isosceles.

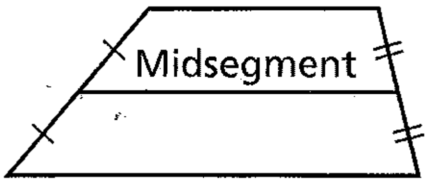


$\cancel{a^2} + 27 = 2a^2 - \cancel{54}$
$\cancel{-a^2} + 54 \quad -a^2 + 54$

$\sqrt{81} = \sqrt{a^2}$

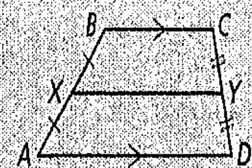
a = 9 or −9

The midsegment of a trapezoid is the segment whose endpoints are the midpoints of the legs. In Lesson 5-1, you studied the Triangle Midsegment Theorem. The Trapezoid Midsegment Theorem is similar to it.



Theorem 6-6-6 **Trapezoid Midsegment Theorem**

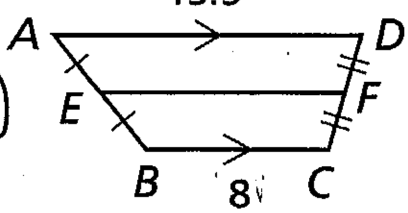
The midsegment of a trapezoid is parallel to each base, and its length is one half the sum of the lengths of the bases.



$\overline{XY} \parallel \overline{BC}$, $\overline{XY} \parallel \overline{AD}$

$XY = \frac{1}{2}(BC + AD)$

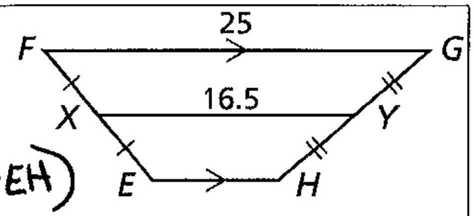
Find *EF*.



$EF = \frac{1}{2}(13.5 + 8)$

$EF = 10.75$

Find EH



$XY = \frac{1}{2}(FG + EH)$

$\frac{16.5}{\frac{1}{2}} = \frac{\frac{1}{2}(25 + EH)}{\frac{1}{2}}$

$\underset{-25}{33} = \underset{-25}{25} + EH$

$EH = 8$

HW: P432, 7-12,17,18,27,30,32