Quadrilaterals

Geometry Chapter 8

Geometry 8

- This Slideshow was developed to accompany the textbook
 - Larson Geometry

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- ▶ 2011 Holt McDougal
- Some examples and diagrams are taken from the textbook.

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8.1 Find Angle Measures in Polygons

Polygon

- Closed figure made of straight segments
- Diagonal
 - Segment that joins nonconsecutive vertices



Notice that the pentagon is made into 3 triangles.

8.1 Find Angle Measures in Polygons All polygons can be separated into triangles The sum of the angles of a triangle is 180° For the pentagon, multiply that by 3 Polygon Interior Angles Theorem Sum of the measures of the interior angles of a n-gon is (n − 2)180° Sum of the measures of the interior angles of a quadrilateral is 360°

8.1 Find Angle Measures in Polygons

The coin is a regular 11-gon. Find the sum of the measures of the interior angles.



The sum of the measures of the interior angles of a convex polygon is 1440°. Classify the polygon by the number of sides.

S = (n-2)180° S = (11-2)180° = 1620 1440° = (n-2)180° 8 = n-2 n = 10



$$S = (n-2)180^{\circ}$$

$$S = (5-2)180^{\circ} = 540^{\circ}$$

$$93^{\circ} + 156^{\circ} + 85^{\circ} + x + x = 540^{\circ}$$

$$334 + 2x = 540$$

$$2x = 206$$

$$x = 103$$



$$\frac{360}{5} = 72^{\circ}$$

$$180 = x + 72$$

$$x = 108$$

$$= (5 - 2) \cdot 180$$

Or

$$S = (5 - 2) \cdot 180$$

$$S = 540$$

int angle = $\frac{540}{5} = 108$

- 8.1 Answers
- 8.1 Homework Quiz

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8.2 Use Properties of Parallelograms

- On scrap paper draw two sets of parallel lines that intersect each other.
- Measure opposite sides. How are opposite sides related?
- Measure opposite angles. How are opposite angles related?

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Theorems were demonstrated in the focus







- 8.2 Answers
- 8.2 Homework Quiz

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8.3 Show that a Quadrilateral is a Parallelogram

Review

- What are the properties of parallelograms?
 - Opposite sides parallel
 - Opposite sides are congruent
 - Opposite angles are congruent
 - Diagonals bisect each other

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8.3 Show that a Quadrilateral is a Parallelogram

If we can show any of these things in a quadrilateral, then it is a parallelogram.

- If both pairs of opposite sides of a quad are parallel, then it is a parallelogram (definition of parallelogram)
- If both pairs of opposite sides of a quad are congruent, then it is a parallelogram.
- If both pairs of opposite angles of a quad are congruent, then it is a parallelogram.
- If the diagonals of a quad bisect each other, then it is a parallelogram.
- If one pair of opposite sides of a quad is both parallel and congruent, then it is a parallelogram.

8.3 Show that a Quadrilateral is a Parallelogram Examples: Is it a parallelogram? 6 cm 6 cm

First: yes Second: No, congruent is not same as parallel



Sum of angles = 360

 $\begin{array}{l} 42^\circ + 138^\circ + 42^\circ + m \measuredangle Z = 360^\circ \\ m \measuredangle Z = 138^\circ \end{array}$

Diagonals bisect each other

$$2x = 10 - 3x$$
$$5x = 10$$
$$x = 2$$

CONCEPT SUMMARY For Your Not		for Your Notebook
Ways to Prove a Quadrilateral is a Parallelogram		
1.	Show both pairs of opposite sides are parallel. (DEFINITION)	
2.	Show both pairs of opposite sides are congruent. (<i>Theorem 8.7</i>)	∠_ #
3.	Show both pairs of opposite angles are congruent. (<i>Theorem 8.8</i>)	
4.	Show one pair of opposite sides are congruent and (<i>Theorem 8.9</i>)	parallel.
5.	Show the diagonals bisect each other. (<i>Theorem 8.10</i>)	

- 8.3 Answers
- 8.3 Homework Quiz



8.4 Properties of Rhombuses, Rectangles, and Squares



8.4 Properties of Rhombuses, Rectangles, and Squares

- For any rectangle EFGH, is it *always* or *sometimes* true that $\overline{FG} \cong \overline{GH}$?
- A quadrilateral has four congruent sides and angles. Classify the figure.

Sometimes, \overline{FG} and \overline{GH} are consecutive sides, not opposite

Square; each angle is 360/4 = 90 and all sides \approx

8.4 Properties of Rhombuses, Rectangles, and Squares Diagonals Rhombus: diagonals are perpendicular Rhombus: diagonals bisect opposite angles

Rectangle: diagonals are congruent



Diagonals are perpendicular: m∠AED = 90°

Diagonals bisect each other: DE = EB = 8DE + EB = DB = 16

Right triangle AEB is formed with EB = 8 Use $\tan 53^\circ = \frac{8}{AE}$ $AE \tan 53^\circ = 8$ $AE = \frac{8}{\tan 53^\circ} = 6.0$



$$m \angle QPR = m \angle SPT$$
$$m \angle PTS = m \angle TSP = 34^{\circ}$$
$$m \angle QPR = m \angle SPT = 180^{\circ} - 34^{\circ} - 34^{\circ} = 112^{\circ}$$

Diangonals are congruent and bisect each other

$$RP = \frac{1}{2}RT = \frac{1}{2}QS = \frac{1}{2}(10) = 5$$

RT = 10 m∠RTS = 34°

$$\sin 34^\circ = \frac{RS}{10}$$
$$RS = 10 \cdot \sin 34^\circ = 5.6$$

- 8.4 Answers
- 8.4 Homework Quiz









Yes, If the diagonals are \cong , then the trapezoid is isosceles

$$\begin{split} m \angle HEF + m \angle EHG &= 180^{\circ} \\ 70^{\circ} + m \angle EHG &= 180^{\circ} \\ m \angle EHG &= 110^{\circ} = m \angle FGH \\ \end{split}$$
 Since the base angles are \cong , the trapezoid is isosceles

8.5 Use Properties of Trapezoids and Kites

▶ In trapezoid JKLM, $\angle J$ and $\angle M$ are right angles, and JK = 9 cm. The length of the midsegment \overline{NP} of trapezoid JKLM is 12 cm. Find ML.

midsegment = $\frac{1}{2}(b_1 + b_2)$ $12 = \frac{1}{2}(ML + 9)$ 24 = ML + 9ML = 15



8.5 Use Properties of Trapezoids and Kites

In a kite, the measures of the angles are 3x°, 75°, 90°, and 120°. Find the value of x.

▶ 546 #4-32 even, 38, 44-48 all = 21

 $3x^{\circ} + 75^{\circ} + 90^{\circ} + 120^{\circ} = 360^{\circ}$ $3x^{\circ} + 285^{\circ} = 360^{\circ}$ $3x^{\circ} = 75^{\circ}$ x = 25

- 8.5 Answers
- 8.5 Homework Quiz





Parallelogram, rectangle, rhombus, square, trapezoid, isosceles trapezoid

Kite (≅ consecutive sides)

Trapezoid (exactly one pair of parallel sides, diagonals not $\stackrel{\sim}{=}$)

8.6 Identify Special Quadrilaterals

• Give the most specific name for the quadrilateral.



- A student knows the following information about quadrilateral MNPQ: $\overline{MN} || \overline{PQ}, \overline{MP} \cong \overline{NQ}$, and $\angle P \cong \angle Q$. The student concludes that MNPQ is an isosceles trapezoid. Why is this wrong?
- ▶ 554 #3-12 all, 14-30 even, 38, 40, 44-50 even = 25
- Extra Credit 557 #2, 4 = +2

Quadrilateral (not enough information to be more specific)

Could be a square or a rectangle since you don't know the relationship between \overline{MQ} and \overline{NP} .

- 8.6 Answers
- 8.6 Homework Quiz

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