

Zero The Math Hero Standard Mathematical Elements - Lesson 7

Lesson 7 discusses two important theorems. The theorems, which are related to polygons, are:

- The Polygon Interior Angle-Sum Theorem
- The Polygon Exterior Angle Theorem

Lesson 7 also defines the term polygon, as well as specific polygon types. Problem solving is used to find missing measures for both interior and exterior polygon angles. Definitions of specific quadrilateral types are also provided.

Zero the Math Hero – Lesson 7

Lesson 7 – Definitions

polygon - a closed plane figure made of segments joined only at their endpoints

triangle - a polygon with 3 sides

octagon - a polygon with 8 sides

quadrilateral - a polygon with 4 sides

nonagon - a polygon with 9 sides

pentagon - a polygon with 5 sides

decagon - a polygon with 10 sides

hexagon - a polygon with 6 sides

undecagon - a polygon with 11 sides

heptagon - a polygon with 7 sides

dodecagon - a polygon with 12 sides

convex polygon - a polygon that has none of its diagonals outside the polygon

concave polygon - a polygon that is not convex

diagonal - for a polygon, a segment that joins 2 nonconsecutive vertices

parallelogram - a quadrilateral that has both pairs of opposite sides parallel (and congruent).

rectangle - a parallelogram that has four right angles

rhombus - a parallelogram that has four congruent sides

square - a parallelogram that has four right angles and four congruent sides

trapezoid - a quadrilateral that has only one pair of parallel sides

isosceles trapezoid - a trapezoid whose non-parallel sides are congruent.

kite - a quadrilateral that has two pairs of adjacent sides congruent, but no opposite sides are congruent

Lesson 7 – Theorems

Theorem 3 (The Polygon Interior Angle-Sum Theorem) - The sum of the measures of the interior angles of a convex n -gon is $(n-2)180$ degrees.

Theorem 4 (The Polygon Exterior Angle Theorem) - The sum of the measures of the exterior angles for a convex polygon, one at each vertex, will always be 360 degrees.

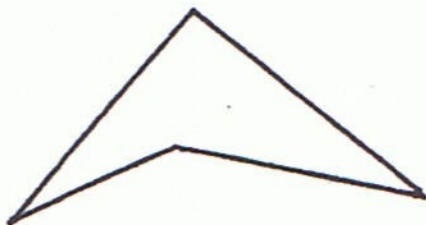
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Lesson 7 - Practice Problems

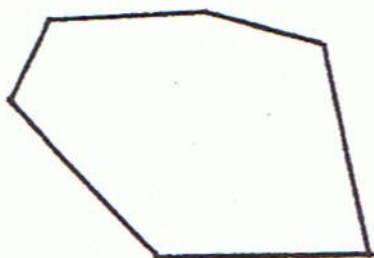
Polygons and Quadrilaterals

1. Name the type of polygon and tell if it is convex or concave.



1. _____

2. Name the type of polygon and tell if it is



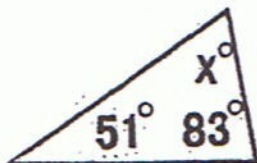
2. _____

3. The sum of the exterior angles, one at each vertex, for any polygon always equals ? degrees.

A. 150 B. 90 C. 180 D. 360

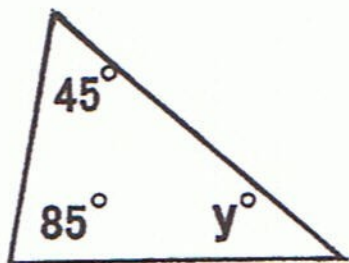
3. _____

4. Find x.



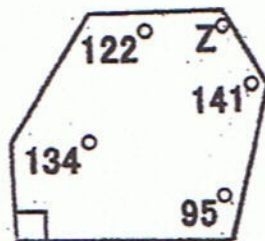
x = _____

5. Find y.



y = _____

6. Find z.



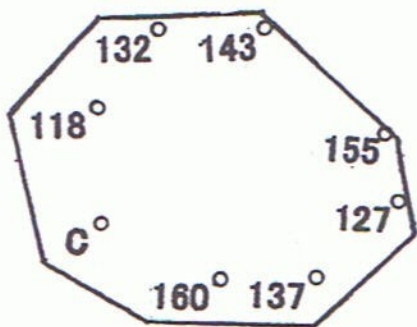
z = _____

Name: _____

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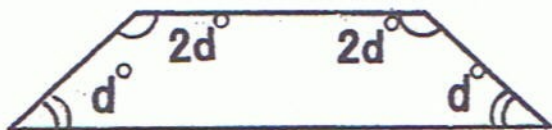
Lesson 7 - Practice Problems - Continued
Polygons and Quadrilaterals

7. Find c .



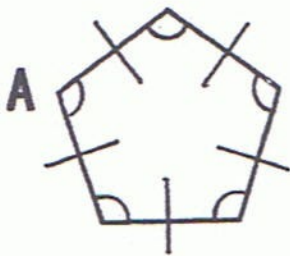
$c =$ _____

8. Find d .



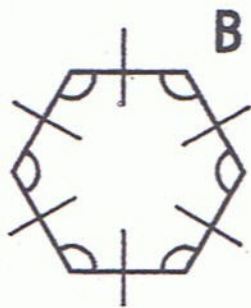
$d =$ _____

9. Find $m \angle A$.



$m \angle A =$ _____

10. Find $m \angle B$.



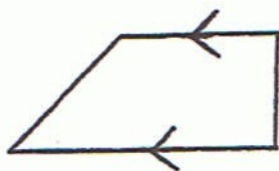
$m \angle B =$ _____

Name: _____

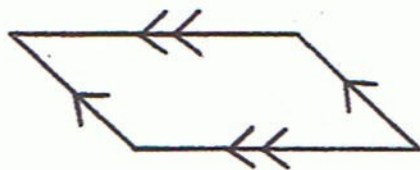
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Lesson 7 - Practice Problems - Continued
Polygons and Quadrilaterals

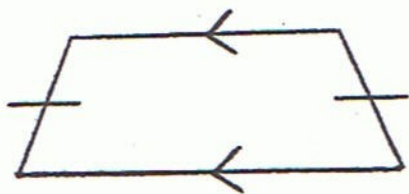
Name the quadrilateral. Use the most precise name possible.



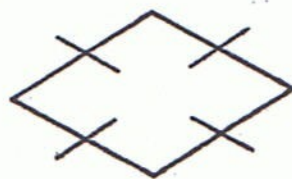
11. _____



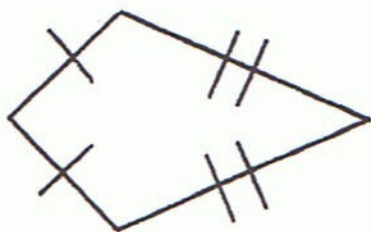
12. _____



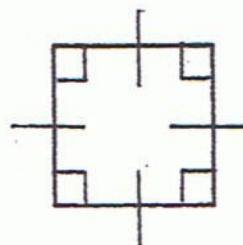
13. _____



14. _____



15. _____



16. _____

Name: _____

Date: _____

Quiz - Terms and Theorems
Zero the Math Hero – Lesson 7

Lesson 7 – Terms

Directions: Fill in each blank with the letter that corresponds to the *best* correct answer, A-K.

- | | |
|--|------------------------|
| 1. _____ a quadrilateral that has only one pair of parallel sides | A. polygon |
| 2. _____ a quadrilateral that has two pairs of adjacent sides congruent, but no opposite sides are congruent | B. convex polygon |
| 3. _____ a parallelogram that has four congruent sides | C. concave polygon |
| 4. _____ a polygon that is not convex | D. diagonal |
| 5. _____ a parallelogram that has four right angles and four congruent sides | E. parallelogram |
| 6. _____ a closed plane figure made of segments joined only at their endpoints | F. rectangle |
| 7. _____ for a polygon, a segment that joins 2 nonconsecutive vertices | G. rhombus |
| 8. _____ a polygon that has none of its diagonals outside the polygon | H. square |
| 9. _____ a trapezoid whose non-parallel sides are congruent | I. trapezoid |
| 10. _____ a quadrilateral that has both pairs of opposite sides parallel (and congruent). | J. isosceles trapezoid |
| 11. _____ a parallelogram that has four right angles | K. kite |

12. – 21. **Directions:** In the blank beside each specific polygon name, write the number of sides it has.

- | | | | |
|-----------------|---------------------|----------------|---------------|
| _____ undecagon | _____ heptagon | _____ pentagon | _____ octagon |
| _____ triangle | _____ dodecagon | _____ nonagon | _____ hexagon |
| _____ decagon | _____ quadrilateral | | |

Name: _____

Date: _____

Quiz - Terms and Theorems - Continued

Zero the Math Hero – Lesson 7

Lesson 7 – Theorems

Directions: Each theorem is missing two words, indicated by “(?)”. Use the letter choices beneath each theorem to indicate the correct missing words.

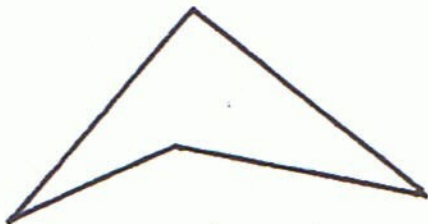
22. _____ The sum of the measures of the (?) angles of a (?) n-gon is $(n-2)180$ degrees.
L. right, convex M. interior, convex
N. congruent, convex O. obtuse, concave
23. _____ The sum of the measures of the exterior angles for a convex polygon, (?) at each vertex, will always be (?) degrees.
P. one, 180 Q. two, 180 R. one, 360 S. two, 360

Name: ANSWER KEY

Date: _____

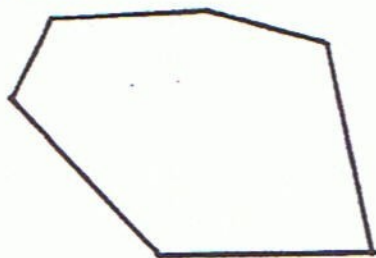
Lesson 7 - Practice Problems
Polygons and Quadrilaterals

1. Name the type of polygon and tell if it is convex or concave.



1. quadrilateral
concave

2. Name the type of polygon and tell if it is convex or concave.



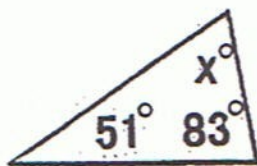
2. hexagon
convex

3. The sum of the exterior angles, one at each vertex, for any polygon always equals ? degrees.

A. 150 B. 90 C. 180 D. 360

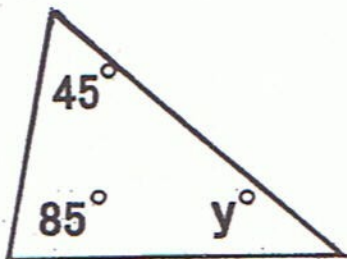
3. D (360)

4. Find x.



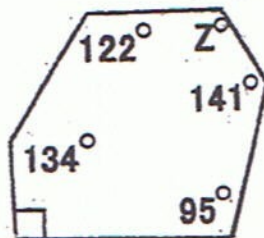
$x = \underline{46^\circ}$

5. Find y.



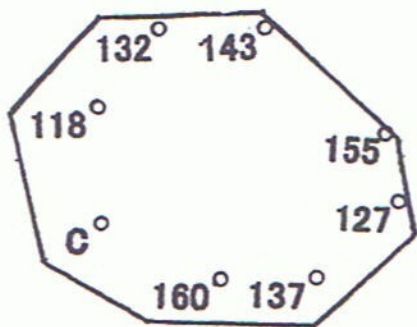
$y = \underline{50^\circ}$

6. Find z.

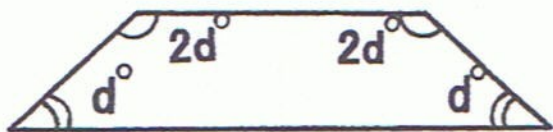


$z = \underline{138^\circ}$

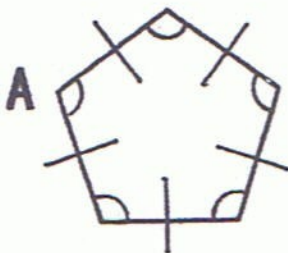
Lesson 7 - Practice Problems - Continued
Polygons and Quadrilaterals

7. Find c .

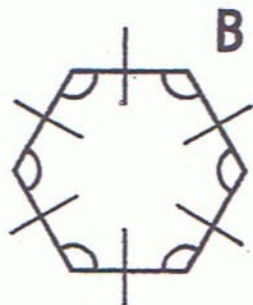
$$c = \underline{108^\circ}$$

8. Find d .

$$d = \underline{60^\circ}$$

9. Find $m \angle A$.

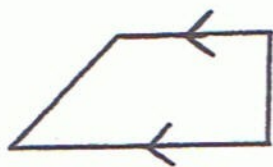
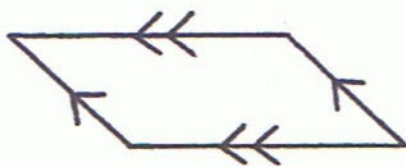
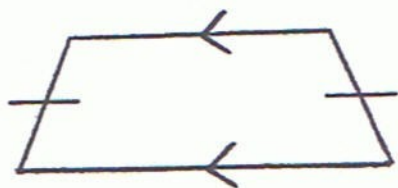
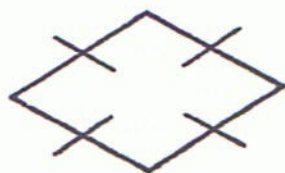
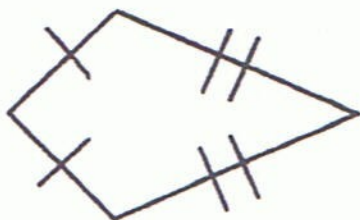
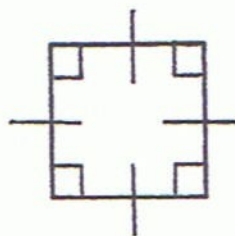
$$m \angle A = \underline{108^\circ}$$

10. Find $m \angle B$.

$$m \angle B = \underline{120^\circ}$$

Lesson 7 - Practice Problems - Continued
Polygons and Quadrilaterals

Name the quadrilateral. Use the most precise name possible.

11. trapezoid12. parallelogram13. isosceles trapezoid14. rhombus15. kite16. square

Name: ANSWER KEY

Date: _____

Quiz - Terms and Theorems
Zero the Math Hero - Lesson 7

Lesson 7 - Terms

Directions: Fill in each blank with the letter that corresponds to the *best* correct answer, A-K.

- I a quadrilateral that has only one pair of parallel sides A. polygon
- K a quadrilateral that has two pairs of adjacent sides congruent, but no opposite sides are congruent B. convex polygon
- G a parallelogram that has four congruent sides C. concave polygon
- C a polygon that is not convex D. diagonal
- H a parallelogram that has four right angles and four congruent sides E. parallelogram
- A a closed plane figure made of segments joined only at their endpoints F. rectangle
- D for a polygon, a segment that joins 2 nonconsecutive vertices G. rhombus
- B a polygon that has none of its diagonals outside the polygon H. square
- J a trapezoid whose non-parallel sides are congruent I. trapezoid
- E a quadrilateral that has both pairs of opposite sides parallel (and congruent). J. isosceles trapezoid
- F a parallelogram that has four right angles K. kite

12. - 21. Directions: In the blank beside each specific polygon name, write the number of sides it has.

- | | | | |
|---------------------|------------------------|-------------------|------------------|
| <u>11</u> undecagon | <u>7</u> heptagon | <u>5</u> pentagon | <u>8</u> octagon |
| <u>3</u> triangle | <u>12</u> dodecagon | <u>9</u> nonagon | <u>6</u> hexagon |
| <u>10</u> decagon | <u>4</u> quadrilateral | | |

Name: ANSWER KEY

Date: _____

Quiz - Terms and Theorems - Continued

Zero the Math Hero - Lesson 7

Lesson 7 - Theorems

Directions: Each theorem is missing two words, indicated by "(?)". Use the letter choices beneath each theorem to indicate the correct missing words.

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L. right, convex M. interior, convex
N. congruent, convex O. obtuse, concave
23. R The sum of the measures of the exterior angles for a convex polygon, (?) at each vertex, will always be (?) degrees.
P. one, 180 Q. two, 180 R. one, 360 S. two, 360