

The Geometry and Honors Geometry Semester A examination will have the following types of questions:

- Selected Response
- Student Produced Response (Grid-in)
- Short Answer

A calculator, scrap paper, and patty paper may be used. A compass and straightedge is required.

The formulas below will be provided in the examination booklet.

Polygon Angle Formulas

Let n be the number of sides of a polygon.

Sum of degree measures of the interior angles of a polygon:

$$180(n-2)$$

Degree measure of an interior angle of a regular polygon:

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

Coordinate Geometry Formulas

Let (x_1, y_1) and (x_2, y_2) be two points in the plane.

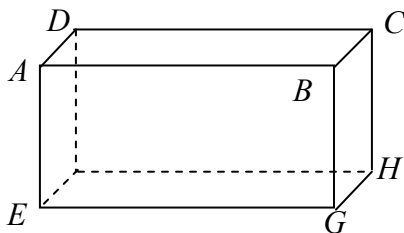
$$\text{slope} = \frac{y_2 - y_1}{x_2 - x_1} \text{ where } x_2 \neq x_1$$

$$\text{midpoint} = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

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

1. Name the three undefined terms of geometry.
2. Complete the following with always, sometimes, or never.
 - a. Two points are _____ collinear.
 - b. Two points are _____ coplanar.
 - c. Three points are _____ collinear.
 - d. Three points are _____ coplanar.
3. How many different lines are determined by two points?
 - A 0
 - B 1
 - C 2
 - D 3
4. How many different lines are determined by three noncollinear points?
 - A 0
 - B 1
 - C 2
 - D 3
5. How many different planes are determined by three noncollinear points?
 - A 0
 - B 1
 - C 2
 - D 3

6. Look at the rectangular prism below.



Name the intersection of planes $ABGE$ and $ABCD$.

7. On a number line, point A has coordinate 5, and point D is on the line such that $AD = 8$. What are the two possible coordinates of point D ?

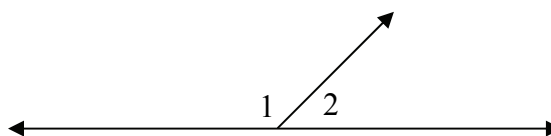
For items 8 through 11, points A , B , and C are on a number line, with B between A and C .

8. If $AB = 10$ and $BC = 20$, then $AC =$ _____
9. If $AC = 20$ and $BC = 12$, then $AB =$ _____
10. If $AB = x$, $BC = 2x + 30$, and $AC = 90$, then $x =$ _____
11. If $AB = 2x + 10$, $BC = 5x + 40$, and $AC = 9x - 70$, what is the length of \overline{AB} ? _____

For items 12 through 15, points A , B , and C are collinear, with B the midpoint of \overline{AC} .

12. If $AB = 6$, then $AC =$ _____
13. If $AB = 3x + 20$ and $BC = 50$, then $x =$ _____
14. If $AB = 4x + 20$ and $BC = 6x - 30$, then $x =$ _____
15. If $AB = 5x + 30$ and $AC = 12x + 10$, then $x =$ _____
16. Points E , F , G , H lie on a line, in that order.
 - a. If $\overline{EF} \cong \overline{GH}$, name another pair of congruent segments.
 - b. If $\overline{EF} \cong \overline{GH}$, $EH = 50$, $FG = 36$, what is the length of \overline{EG} ? _____

Look at the drawing below.



17. If $m\angle 1 = 125^\circ$, what is the measure of $m\angle 2$?
18. If $m\angle 1 = (4x + 20)^\circ$ and $m\angle 2 = (x + 10)^\circ$, what is the value of x ?
19. If $m\angle 1 = (6x + 38)^\circ$ and $m\angle 2 = (4x + 22)^\circ$, what is $m\angle 1$?

20. In the figure below, $m\angle ABC = (2x + 20)^\circ$ and $m\angle CBD = (4x + 40)^\circ$.

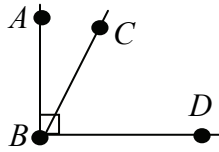


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- a. What is the value of x ?
 - b. What is the measure of $\angle ABC$?
21. Look at the figure below

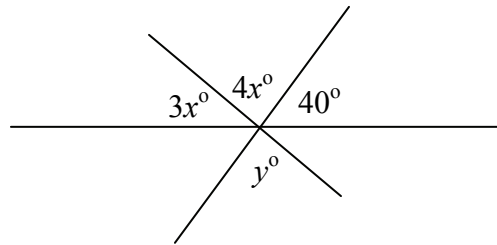


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Find the values of x and y .

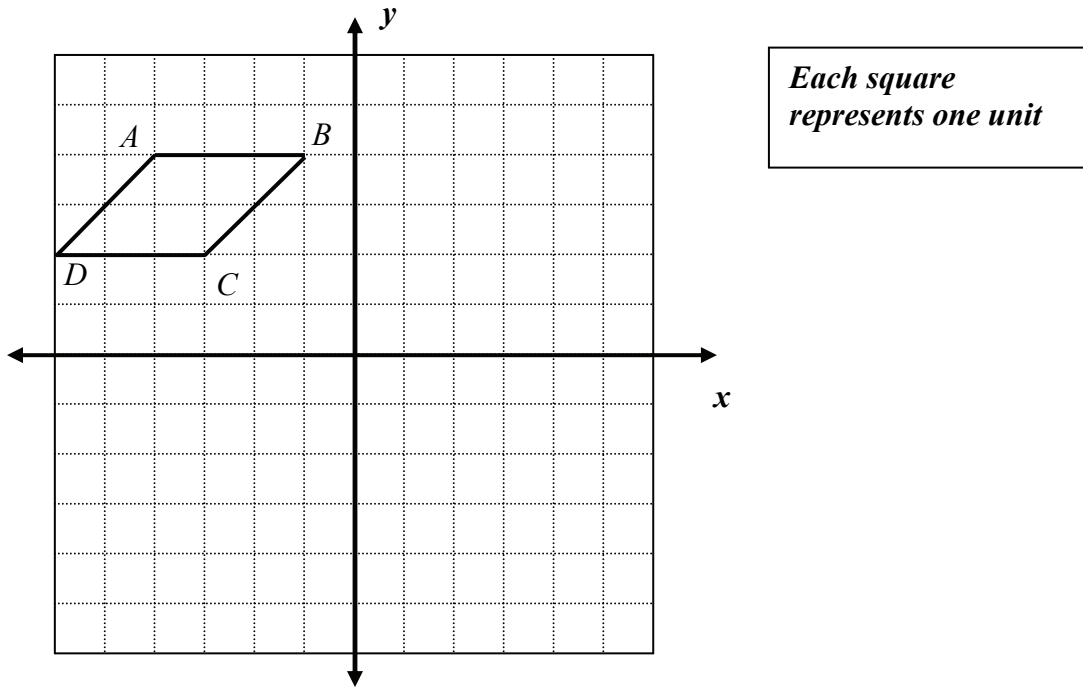
For items 22 through 27, write a rule in the form $F(x, y) = (?, ?)$ that describes the given transformations.

22. (x, y) is reflected about the x -axis.
23. (x, y) is reflected about the y -axis.
24. (x, y) is reflected about the line $y = x$
25. (x, y) is rotated 180 degrees about the origin.
26. (x, y) is translated five units right and three units down.
27. (x, y) is translated six units left, then reflected across the y -axis.

28. Which of the following terms describes transformations, such as reflections, rotations, and translations, in which the preimage and image are congruent?

- A Congruent
- B Similar
- C Rigid
- D Regular

29. Look at the parallelogram on the coordinate plane below.



- a. Reflect $ABCD$ across the y -axis. Name the reflected figure $A'B'C'D'$.
- b. Translate $A'B'C'D'$ four units downward. Name the translated figure $A''B''C''D''$.
- c. Write the coordinates of C' and C'' .
- d. If $P(x, y)$ is on $ABCD$, what are the coordinates of the transformed point on $A'B'C'D'$? Explain how you determined your answer. Use words, symbols, or both in your explanation.

30. Look at the conditional below.

If an animal is a dog, then the animal is warm-blooded.

- a. Draw an Euler diagram for this conditional.
 - b. Write the converse of the conditional.
 - c. Write the inverse of the conditional.
 - d. Write the contrapositive of the conditional.
31. Look at the following statement.
- If you are 19 years old, then you can vote.*
- a. Draw an Euler diagram for this conditional.
 - b. Use the Euler diagram to evaluate the statement: *If you vote then you are 19 years old.*
32. Let
- p : Chris earns \$20
 q : Chris buys gas
 r : Chris drives to Rockville

Assume the following premises:

$$p \rightarrow q$$
$$q \rightarrow r$$

For each premise below, write the conclusion(s) in words, *if any*, which follows.

- a. p
- b. q
- c. $\sim p$
- d. $\sim q$
- e. r

33. Look at the statements below.

If Chris earns \$10, then he will go to the game.

If Chris goes to the game, then he will bring Jane.

What is the valid conclusion from the statements above?

For items 34 and 35, write a valid conclusion from the following statements:

34. If a triangle is equilateral, then it is equiangular.

Triangle ABC is equilateral.

35. If Sally studies for a test, then she will pass the test.

Sally does not pass the test.

36. How is a truth table used to determine whether two statements are logically equivalent?

37. Complete the following truth table.

P	Q	$\sim P$	$P \rightarrow Q$	$P \wedge Q$	$P \vee Q$
T	T				
T	F				
F	T				
F	F				

38. Complete the following truth table.

P	Q				$[(P \wedge \sim Q) \vee Q] \rightarrow P$
T	T				
T	F				
F	T				
F	F				

39. Which of the following are logically equivalent?
- A A statement and its converse
 - B A statement and its inverse
 - C A statement and its contrapositive
 - D A statement, its converse, its inverse, and its contrapositive
40. A proof by contradiction is another name for an _____ proof.
41. Suppose you wish to prove the following using indirect proof.

If two parallel lines are cut by a transversal, then the alternate interior angles are congruent.

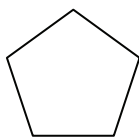
Which of the following would you try to contradict in an indirect proof?

- A Suppose two parallel lines are cut by a transversal.
 - B Suppose alternate interior angles are congruent.
 - C Suppose alternate interior angles are not congruent.
 - D Suppose two parallel lines are not cut by a transversal.
42. Complete the following using indirect reasoning.
- If I earn \$20 this week, then I will go to a movie. I did not go to a movie.
therefore, _____

For items 43 through 47, state whether inductive reasoning or deductive reasoning is used.

43. If Mr. Johns was absent on Monday, Tuesday, and Wednesday, I conclude that he will be absent on Thursday.
44. The Cubs have not won a World Series in 100 years. Therefore, they will not win this year.
45. All squares have congruent diagonals. If I construct a square, the diagonals will be congruent.
46. If an animal is a Black bear, it will hibernate in the winter. I spotted a black bear; I concluded that the bear would hibernate this winter.
47. I saw a pattern as follows: Triangle, square, pentagon. I concluded that the next figure in the pattern would be a hexagon.
48. Make a logical chain from these statements.
If I go to the store, I will buy candy.
If I buy candy, I will not eat my dinner.
If it is sunny outside today, I will go to the store.
49. Determine the number of lines of symmetry that each figure has.
a. square
b. regular octagon
c. circle
50. Charlie states that the number of degrees of rotational symmetry for a regular hexagon is always a multiple of 60° (0° , 60° , 120° , 180° , ...). Is Charlie correct? Use mathematics to justify your answer.

51. Look at the regular pentagon below.



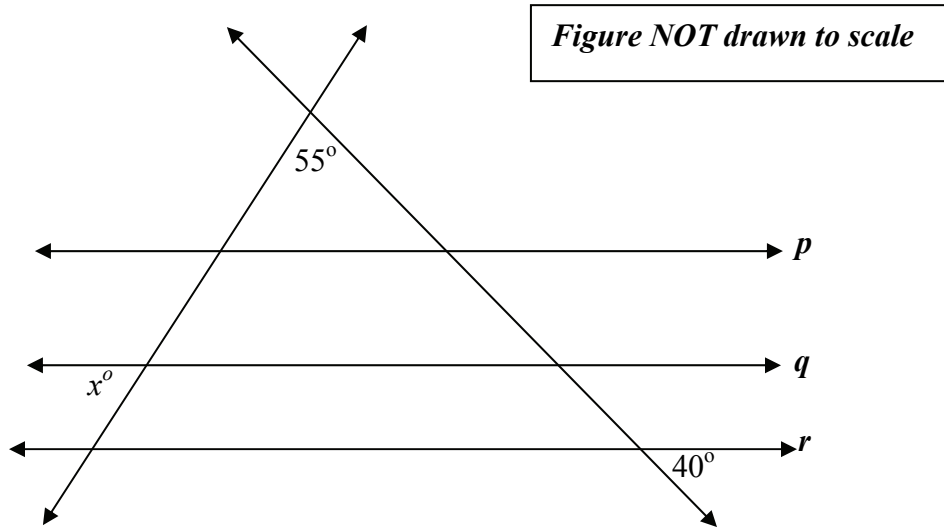
Which of the following is NOT a possible measure of the pentagon's rotational symmetry?

- A** 36° **B** 72° **C** 144° **D** 216°

52. Place an X in the boxes where the property is true.

Property	Parallelogram	Rectangle	Square	Rhombus	Trapezoid
Opposite sides congruent					
Only one pair of opposite sides are parallel					
Opposite angles congruent					
Each diagonal forms 2 congruent triangles					
Diagonals bisect each other					
Diagonals congruent					
Diagonals perpendicular					
A diagonal bisects two angles					
All angles are right angles					
All sides are congruent					

53. In the figure below, $p \parallel q \parallel r$.



What is the value of x ?

54. Find the value of x and y in the figure below.

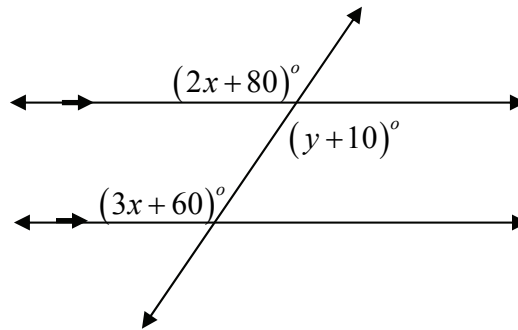
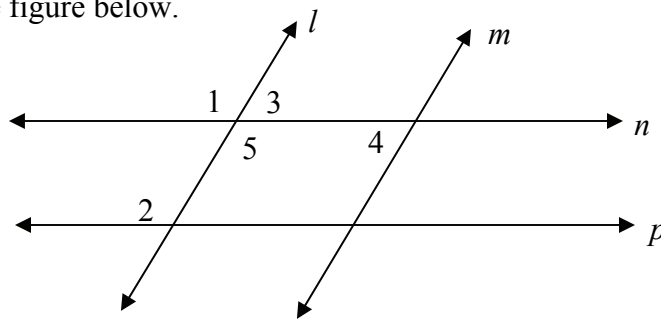


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55. Look at the figure below.



For each of statement below, state which lines can be proven parallel. Justify your answer.

- a. $\angle 1 \cong \angle 2$
- b. $\angle 3 \cong \angle 4$
- c. $\angle 4$ and $\angle 5$ are supplementary .

56. Look at isosceles triangle ABC below.

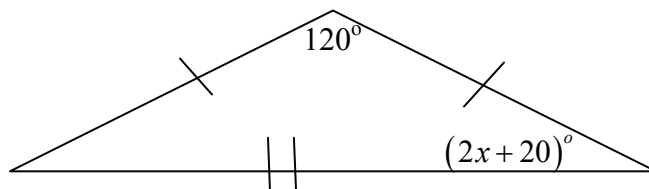
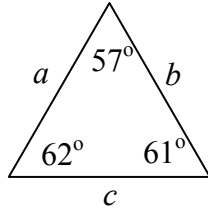


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What is the value of x ?

57. Look at the triangle below.



Which of the following statements is true about a , b , and c ?

- A $a < b < c$
- B $b < c < a$
- C $c < a < b$
- D $a < c < b$

58. Look at the figure below.

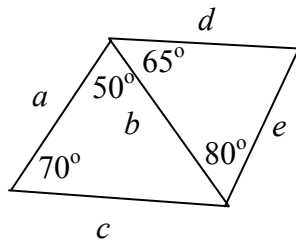


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Name the sides in order from least to greatest.

- 59. Find the sum of the interior angles of a pentagon.
- 60. Find the measure of each interior angle of a regular 15-sided polygon.
- 61. Determine the measure of each exterior angle of a regular 9-sided polygon.
- 62. The measure of each exterior angle of a regular polygon is 45° . How many sides does the polygon have?
- 63. The measure of each interior angle of a regular polygon is 120° . How many sides does the polygon have?

64. Two sides of a triangle measure 6 and 9.

Circle the possible values of the length of the third side.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

65. Find the value of y in the figure below.

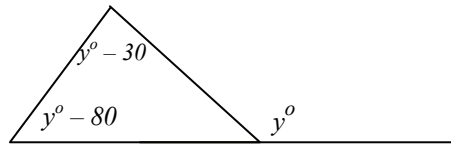


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66. What is the difference in the measures of an interior angle of a regular pentagon, and an exterior angle of a regular pentagon?

For items 67 and 68, find the value of x in each figure.

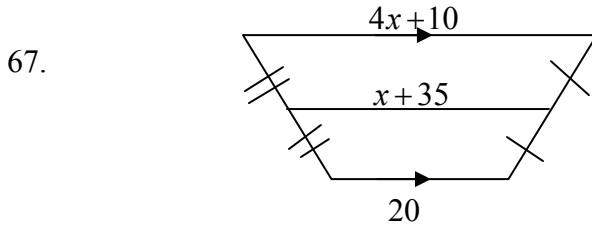


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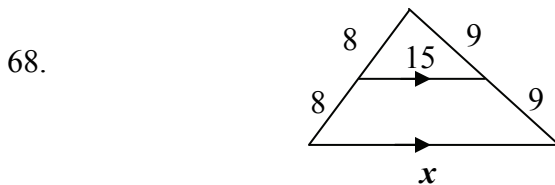


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69. Graph the points $A(3, 2)$, $B(1, -2)$, $C(2, -5)$, $D(4, -1)$ on the coordinate plane. What kind of quadrilateral is $ABCD$? Use mathematics to justify your answer.
70. Points $A(-3, -1)$, $B(-1, 1)$, and $C(1, 1)$ are three vertices of a parallelogram.
- How many parallelograms can be formed using these three points?
 - Give the coordinates of the fourth vertex of the other parallelograms.

71. A triangle has vertices $A(-3, 4), B(4, 6), C(-7, 18)$. Use slopes to determine whether the triangle is a right triangle. Justify your answer using mathematics.
72. In a coordinate plane, point A has coordinates $(2, 9)$ and point B has coordinates $(5, 17)$. What are the coordinates of the midpoint of \overline{AB} ?
73. For each figure below, determine which congruence postulate or theorem can be used to prove the triangles congruent. If the triangles cannot be proven congruent, state that fact.

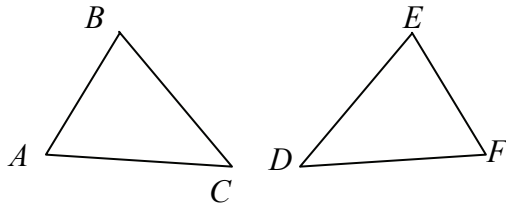
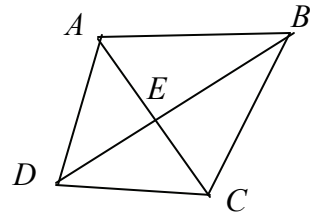


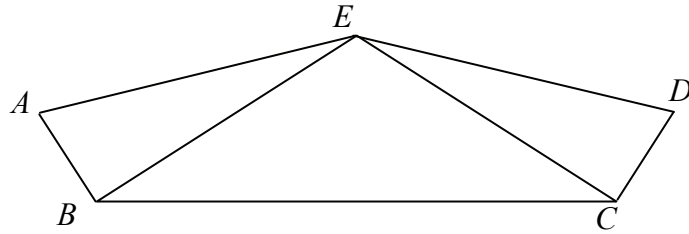
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- a. $\overline{AB} \cong \overline{EF}, \overline{AC} \cong \overline{DF}, \angle A \cong \angle F$
- b. $\angle A \cong \angle F, \angle B \cong \angle E, \angle C \cong \angle D$
- c. $\angle A \cong \angle F, \angle B \cong \angle E, \overline{AB} \cong \overline{EF}$
- d. $\overline{AB} \cong \overline{EF}, \overline{AC} \cong \overline{DF}, \overline{BC} \cong \overline{DE}$
- e. $\overline{BC} \cong \overline{DE}, \overline{AC} \cong \overline{DF}, \angle B \cong \angle E$
- f. $\angle C \cong \angle D, \angle A \cong \angle F, \overline{AB} \cong \overline{EF}$
74. Polygons $ABCD$ and $DEFG$ are congruent. Why is $\angle C \cong \angle F$?

75. Given: \overline{BD} is the perpendicular bisector of \overline{AC} .
 Prove: $\angle BAC \cong \angle BCA$



76. Given:
 $\angle EBC \cong \angle ECB$
 $\overline{AB} \perp \overline{BE}$
 $\overline{DC} \perp \overline{CE}$
 $\angle EAB \cong \angle EDC$

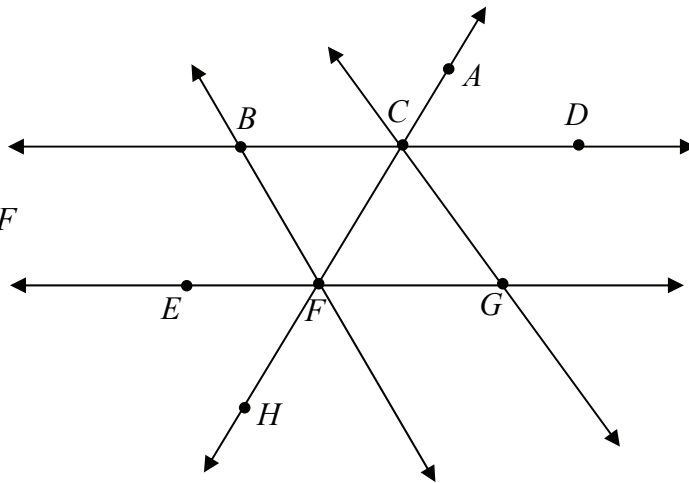


Prove: $\overline{AE} \cong \overline{DE}$

77.

- Given: $\overline{BD} \parallel \overline{EG}$
 $\overline{BC} \cong \overline{FG}$

Prove: $\angle CBF \cong \angle CGF$



78. Quadrilateral $PQRS$ has diagonals \overline{PR} and \overline{QS} that intersect at point T . For the conditions given below, state whether the quadrilateral is a rhombus, rectangle, parallelogram, or none of these figures.

- $\overline{PS} \parallel \overline{QR}, \overline{PS} \cong \overline{QR}$
- $PQRS$ is a parallelogram, $\overline{PR} \perp \overline{QS}$
- $PQRS$ is a parallelogram, $\overline{PR} \cong \overline{QS}$
- $\overline{QP} \parallel \overline{RS}$

79. Perform the following constructions. Use mathematics to justify each construction.

- a. The perpendicular bisector of a segment
- b. The bisector of an angle
- c. A line parallel to a given line, through a point not on the line
- d. A point equidistant from three given points

80. Point P is on the angle bisector of $\angle ABC$. Which of the following statements is true?

I Point P is equidistant from \overline{BA} and \overline{BC} .

II $\angle PBA \cong \angle PBC$

A Neither **I** nor **II**

B **I** only

C **II** only

D Both **I** and **II**

81. Point P is on the perpendicular bisector of \overline{AB} . Which of the following statements is true?

I $AP = BP$

II $AP = \frac{1}{2}AB$

A Neither **I** nor **II**

B **I** only

C **II** only

D Both **I** and **II**