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.

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

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

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

1. How many different lines are determined by two points?

A 0 **B** 1 **C** 2 **D** 3

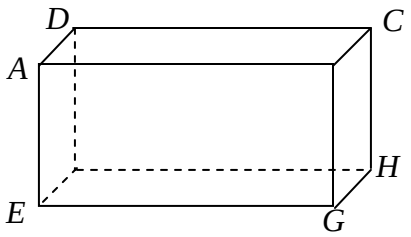
2. How many different lines are determined by three noncollinear points?

A 0 **B** 1 **C** 2 **D** 3

3. How many different planes are determined by three noncollinear points?

A 0 **B** 1 **C** 2 **D** 3

4. Look at the rectangular prism below.



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

In problems 5 through 8 below, points *A*, *B*, and *C* are on a number line, with *B* between *A* and *C*.

5. If $AB = 10$ and $BC = 20$, then $AC =$ _____

6. If $AC = 20$ and $BC = 12$, then $AB =$ _____

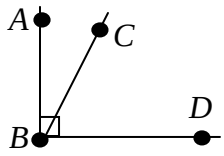
7. If $AB = x$, $BC = 2x + 30$, and $AC = 90$, then $x =$ _____

8. If $AB = 2x + 10$, $BC = 5x + 40$, and $AC = 9x - 70$, what is the length of $\overline{AB}$? ____

9. 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 $\overline{EG}$? _____

10. 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*?

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



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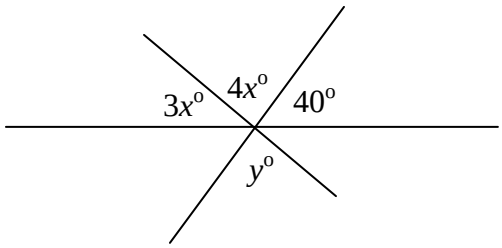
a. What is the value of *x*?

b. What is the measure of $\angle ABC$?

12. Look at the figure below



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Find the values of *x* and *y*.

13. 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** or **II**

B **I** only

C **II** only

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

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

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

II $\angle PBA \cong \angle PBC$

A Neither **I** or **II**

B **I** only

C **II** only

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

15. Write a rule in the form $F(x, y) = (?, ?)$ that describes the given transformations.

a. (x, y) is reflected about the x-axis.

b. (x, y) is reflected about the y-axis.

c. (x, y) is reflected about the line $y = x$

d. (x, y) is rotated 180 degrees about the origin.

e. (x, y) is translated five units right and three units down.

16. 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.

17. 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

18. 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.

19. 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?

20. Look at the following statement.

If you are 19 years old, then you can vote.

a. Draw an Euler diagram for this conditional.

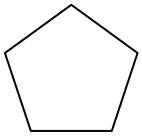
b. Use the Euler diagram to evaluate the statement: *If you vote then you are 19 years old.*

21. Write a valid conclusion from the following statements:

a. If a triangle is equilateral, then it is equiangular.
Triangle ABC is equilateral.

b. If Sally studies for a test, then she will pass the test.
Sally does not pass the test.

22. Look at the regular pentagon below.



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

A 36^o **B** 72^o **C** 144^o **D** 216^o

23. a. A proof by contradiction is another name for an _____ proof.

b. Suppose you wish to prove the following using <u>indirect</u> 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 <u>indirect</u> 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.

24. 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.

a. $\overline{PS} \parallel \overline{QR}, \overline{PS} \cong \overline{QR}$

b. *PQRS* is a parallelogram, $\overline{PR} \perp \overline{QS}$

c. *PQRS* is a parallelogram, $\overline{PR} \cong \overline{QS}$

d. $\overline{QP} \parallel \overline{RS}$

25. 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

26. Find the sum of the interior angles of a pentagon.

27. Find the measure of each interior angle of a regular 15-sided polygon.

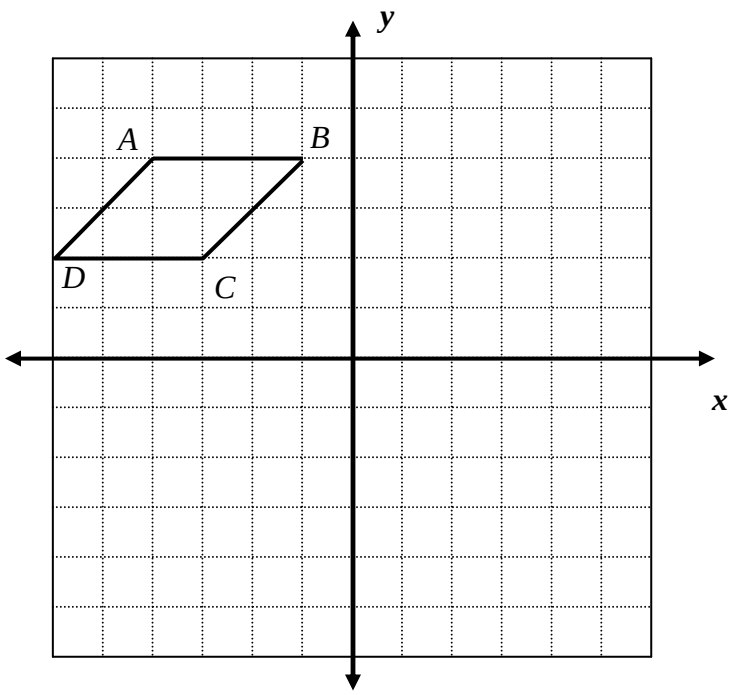
28. Determine the measure of each exterior angle of a regular 9-sided polygon.

29. The measure of each exterior angle of a regular polygon is 45^o. How many sides does the polygon have?

30. The measure of each interior angle of a regular polygon is 120^o. How many sides does the polygon have?

31. Charlie states that the number of degrees of rotational symmetry for a regular hexagon is always a multiple of 60^o (0^o, 60^o, 120^o, 180^o, …). Is Charlie correct? Use mathematics to justify your answer.

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



Each square represents one unit

a. Reflect *ABCD* across the *y*-axis. Name the reflected figure $A'B'C'D'$.

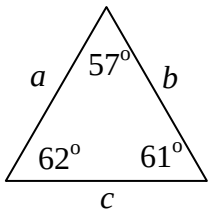
b. Translate $A'B'C'D'$ four units downward. Name the translated figure $A''B''C''D''$.

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.

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

34. 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 $a < c < b$

35. Points *A*, *B*, and *C* are collinear, with *B* the midpoint of $\overline{AC}$.

a. If $AB = 6$, then $AC =$ ____

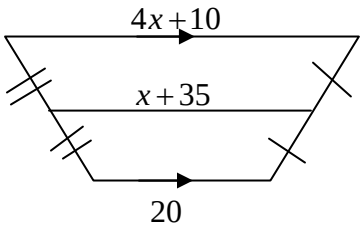
b. If $AB = 3x + 20$ and $BC = 50$, then $x =$ ____

c. If $AB = 4x + 20$ and $BC = 6x - 30$, then $x =$ _____

d. If $AB = 5x + 30$ and $AC = 12x + 10$, then $x =$ ____

36. Find the value of x and/or y in each figure below.

a.



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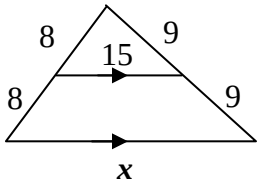
b.



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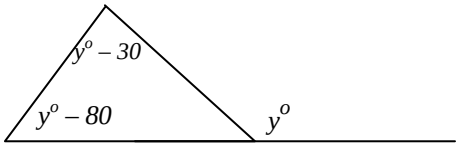
c.



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d.

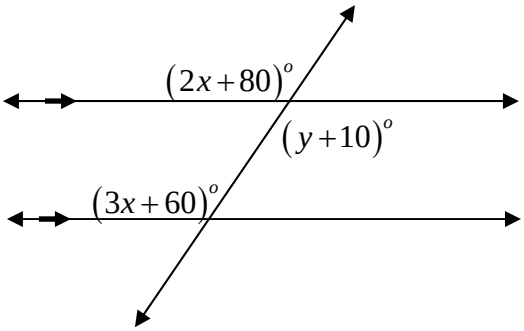


Figure NOT drawn to scale

37. 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

38. 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

39. 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.

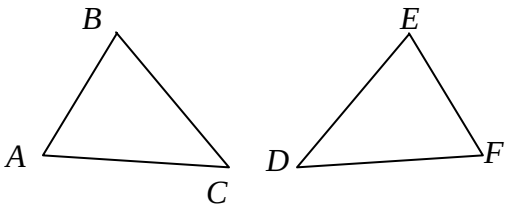


Figure NOT drawn to scale

a. $\overline{AB} \cong \overline{EF}, \overline{AC} \cong \overline{DF}, \angle A \cong \angle F$

b. $\angle A \cong \angle F, \angle B \cong \angle E, \angle C \cong \angle D$

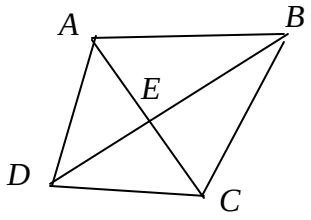
c. $\angle A \cong \angle F, \angle B \cong \angle E, \overline{AB} \cong \overline{EF}$

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. $\angle C \cong \angle D, \angle A \cong \angle F, \overline{AB} \cong \overline{EF}$

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



41. Polygons *ABCD* and *DEFG* are congruent. Why is $\angle C \cong \angle F$?

42. Name the three undefined terms of geometry.

43. For each group of statements, state whether inductive reasoning or deductive reasoning is used.

    a. If Mr. Johns was absent on Monday, Tuesday, and Wednesday, I conclude that he will be absent on Thursday.
    b. The Cubs have not won a World Series in 100 years. Therefore, they will not win this year.
    c. All squares have congruent diagonals. If I construct a square, the diagonals will be congruent.
    d. 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.
    e. I saw a pattern as follows: Triangle, square, pentagon. I concluded that the next figure in the pattern would be a hexagon.

44. 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.

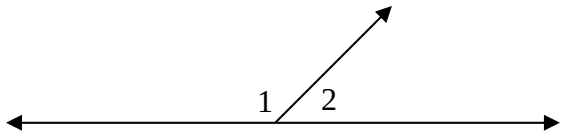
45. Points $A(-3,-1), B(-1,1),$ and $C(1,1)$ are three vertices of a parallelogram.

    a. How many parallelograms can be formed using these three points?

    b. Give the coordinates of the fourth vertex of the other parallelograms.

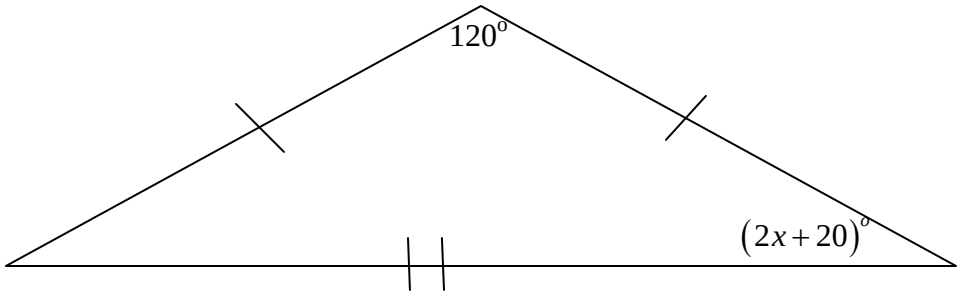
46. A triangle has vertices $A(-3,4), B(4,6), C(-7,18)$. Use slopes to determine whether the triangle is a right triangle. Justify your answer using mathematics.

47. Look at the drawing below.



    a. If $m\angle 1 = 125^o$, what is the measure of $m\angle 2$?
    b. If $m\angle 1 = (4x+20)^o$ and $m\angle 2 = (x+10)^o$, what is the value of x?
    c. If $m\angle 1 = (6x+38)^o$ and $m\angle 2 = (4x+22)^o$, what is $m\angle 1$?

48. Look at isosceles triangle *ABC* below.



What is the value of *x*?

49. 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 $\overline{AB}$?

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

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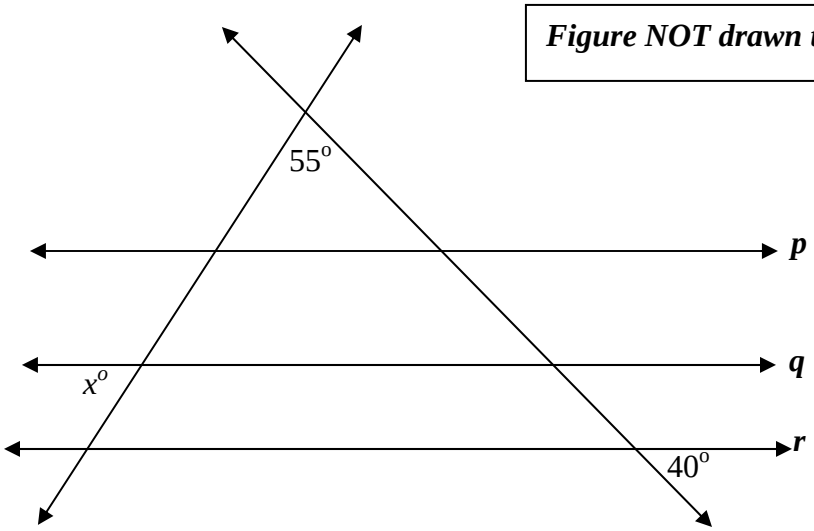
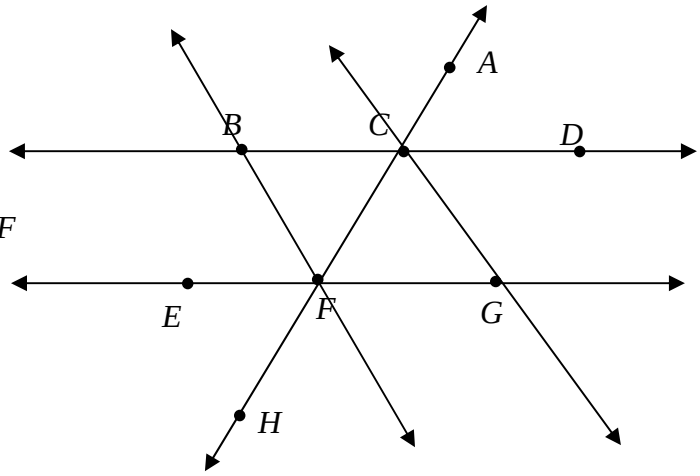


What is the value of *x*?

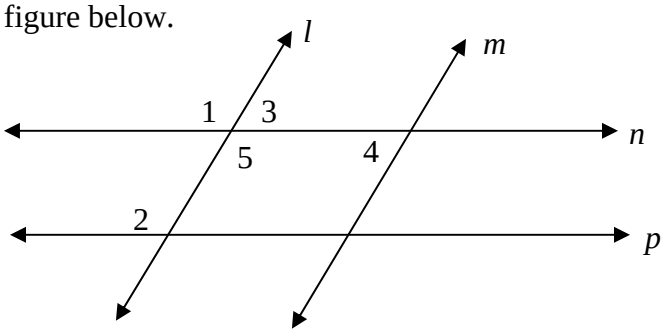
51.

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

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



52. 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.

53. Determine the number of lines of symmetry that each figure has.
   a. square
   b. regular octagon
   c. circle

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

Property	Parallelogram	Rectangle	Square	Rhombus	Trapezoid
1. Opposite sides congruent					
2. Only one pair of opposite sides are parallel					
3. Opposite angles congruent					
4. Each diagonal forms 2 congruent triangles					
5. Diagonals bisect each other					
6. Diagonals congruent					
7. Diagonals perpendicular					
8. A diagonal bisects two angles					
9. All angles are right angles					
10. All sides are congruent					

The remaining problems on this review are for HONORS Geometry Students Only

55. Complete the following truth table.

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

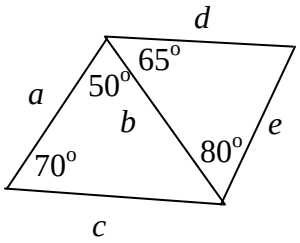
56. Complete the following truth table.

P	Q				$\left[\left(P \wedge \sim Q\right) \vee Q\right] \to P$
T	T				
T	F				
F	T				
F	F				

57. Write the function in the form $F(x, y) = (?, ?)$ for the set of points (x, y) that are a translation of six units left, then reflected across the *y*-axis.

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

59. Look at the figure below.



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Name the sides in order from least to greatest.

60. 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

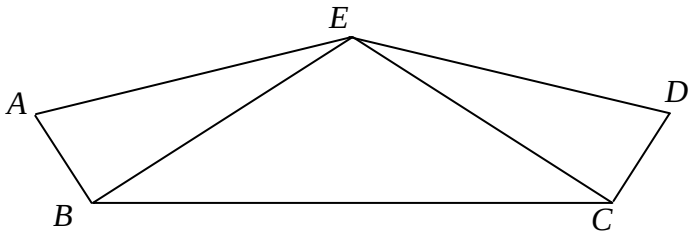
c. $\sim p$

d. $\sim q$

e. r

61. Given:

$\angle EBC \cong \angle ECB$
$\overline{AB} \perp \overline{BE}$
$\overline{DC} \perp \overline{CE}$
$\overline{AB} \cong \overline{DC}$



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

62. 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.

63. 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, _____