Name _____

GEOMETRY HONORS

SUMMER ASSIGNMENT
2016

Welcome to Geometry Honors!!

Complete the following assignment in the attached packet. This is due the first day of school. Bring in a copy of your answers including ALL WORK SHOWN, to hand in for a grade, This will count as your first test grade (10 points will be taken off for each day late). It will be graded on completeness rather than correctness. This assignment will be reviewed at the beginning of the school year and you will be tested on this material again after it is reviewed. These skills will be needed throughout the year.

This is your ticket to Geometry Honors. Make sure that you start the year off well and have your assignment ready upon your return.

Please answer all questions in the packet and clearly label your answers by boxing them in. You must show work where appropriate. If you need additional space to complete problems, please do your work on a separate sheet of paper, clearly label your work, and staple your additional pages to the back of the packet.

1. SOLVING LINEAR EQUATIONS: Solve the equation for the indicated variable. Write your solution in the box to the right. YOU MUST SHOW ALL WORK!

1. Which value of *p* is the solution of $5p - 1 = 2p + 20$?	
2. What is the solution of the equation $5 - 2x = -4x - 7$?	
3. Which value of *x* is the solution of the equation $2(x - 4) + 7 = 3$?	
4. What is the value of *x* in the equation $2(x - 4) = 4(2x + 1)$?	
5. Solve for *x*: $15x - 3(3x + 4) = 6$	
6. If $2x + 5 = -25$ and $-3m - 6 = 48$, what is the product of *x* and *m*?	

7. If $-2x + 3 = 7$ and $3x + 1 = 5 + y$, find the value of y.	
8. What is the value of *x* in the equation $13x - 2(x + 4) = 8x + 1$?	
9. If $3(x + 2) - 2(x + 1) = 8$, what is the value of *x* ?	
10. Solve algebraically for *x*: $3(x + 1) - 5x = 12 - (6x - 7)$	
11. What is the value of *x* in the equation $\frac{x}{2} + \frac{x}{6} = 2$?	
12. Which value of *x* is the solution of the equation $\frac{2}{3}x + \frac{1}{2} = \frac{5}{6}$?	

13. What is the value of *w* in the equation $\frac{3}{4}w + 8 = \frac{1}{3}w - 7$?	
14. In the equation $\frac{1}{4}n + 5 = 5\frac{1}{2}$, what is *n* is equal to?	
15. Which value of *x* is the solution of the equation $\frac{1}{7} + \frac{2x}{3} = \frac{15x - 3}{21}$?	
16. Solve for *m*: $\frac{m}{5} + \frac{3(m-1)}{2} = 2(m-3)$	
17. Solve: $\frac{3x+1}{3} = \frac{4x+5}{4} - \frac{8+x}{6} + \frac{2x+5}{8}$	
18. The number of people on the school board is represented by *x*. Two subcommittees with an equal number of members are formed, one with $\frac{2}{3}x - 5$ members and the other $\frac{x}{4}$ with members. How many people are on the school board?	

2. OPERATIONS WITH POLYNOMIALS: Simplify each of the following according to the given instructions.

1. The sum of $3x^2 + x + 8$ and $x^2 - 9$ can be expressed as

2. What is the sum of $x^2 - 3x + 7$ and $3x^2 + 5x - 9$?

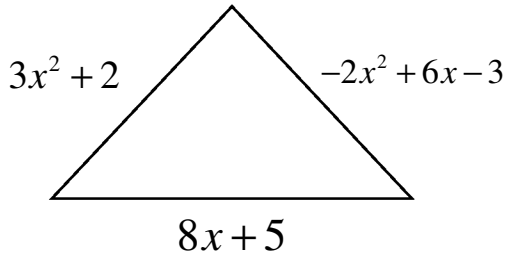
3. The expression $(2x^2 + 6x + 5) - (6x^2 + 3x + 5)$ is equivalent to

4. The expression $(3x^2 + 2xy + 7) - (6x^2 - 4xy + 3)$ is equivalent to

5. When $4x^2 + 7x - 5$ is subtracted from $9x^2 - 2x + 3$, the result is

6. What is the result when $6x^2 - 13x + 12$ is subtracted from $-3x^2 + 6x + 7$?

7. Find the perimeter of the triangle:



8. What is the product of $2r^2 - 5$ and $3r$?

9. What is the product of $-3x^2y$ and $(5xy^2 + xy)$?

10. What is the product of $(c+8)$ and $(c-5)$?

11. What is the product of $(3x+2)$ and $(x-7)$?

12. The expression $(x-6)^2$ is equivalent to

13. The expression $(2x+1)^2-2(2x^2-1)$ is equivalent to

14. What is the product of (x + 4) and (x – 4)?

15. If *h* represents a number, write an equation that is a correct translation of "Sixty more than 9 times a number is 375".

16. The width of a rectangle is 4 less than half the length.
    a. If ℓ represents the length, write an equation that could be used to find the width, *w*.

If the area of the rectangle is 40, write an equation that could be used to find the area of the rectangle in terms of l.

3. FACTORING COMPLETELY: Factor each of the following expressions completely.
   Remember to look for your factoring methods in the following order:
   i. Greatest Common Factor
   ii. Trinomial A/M
   iii. Factoring by Grouping ("Tricky" Trinomial)
   iv. Difference of Two Perfect Squares

1. $2x^2 - 32$	8. $x^3 + 7x^2 + 10x$
2. $x^3 - x$	9. $4x^2 - 6x^2 - 4$
3. $5x^2 - 10x - 15$	10. $y^4 - 1$
4. $2a^2 - 2b^2$	11. $5x^2 + 20x + 20$
5. $4a^2 - 4$	12. $3b^2 - 15b + 12$
6. $ba^2 - by^2$	13. $z^5 - 4z^4 - 21z^3$
7. $4y^2 - 4y - 48$	14. $3x^2 + x - 2$

4. SOLVING QUADRATIC EQUATIONS BY FACTORING: Solve each of the following quadratic equations. YOU MUST SHOW ALL WORK.

Remember:

i. Set the equation equal to 0.
ii. Factor the non-zero side of the equation completely
iii. Set each factor equal to 0.
iv. Solve each equation.

1. What is the solution set of the equation $3x^2 = 48$?

2. What is the solution set of the equation $x^2 - 5x = 0$?

3. $x^2 - 4x = -3$

4. $3 + x(x - 1) = 5$

5. $\frac{x+5}{2} = \frac{3}{x}$

6. $x^2 = x$

7. $\frac{x+3}{8} = \frac{x}{x-3}$

8. $2y^3 + 12y^2 = 80y$

9. $5b^2 + 6b = -1$

10. $2y^2 + 5y = 3$

11. The length of a rectangular window is 5 feet more than its width, *w*. The area of the window is 36 square feet. Find the dimensions of the window.

12. The length of a rectangle is 2 feet less than twice the width. The area of the rectangle is 84 square feet. Find the dimensions of the rectangle.

5. GRAPHING ON THE COORDINATE PLANE:

x = abscissa, y = ordinate

Slope:

$$m = \frac{\text{vertical change}}{\text{horizontal change}} = \frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1}$$

Equations of Lines: m = slope

$y = mx + b$ slope-intercept

$y - y_1 = m(x - x_1)$ point-slope

Parallel and Perpendicular:

Parallel: slopes are equal.

Perpendicular: slopes are negative reciprocals (flip over and negate)

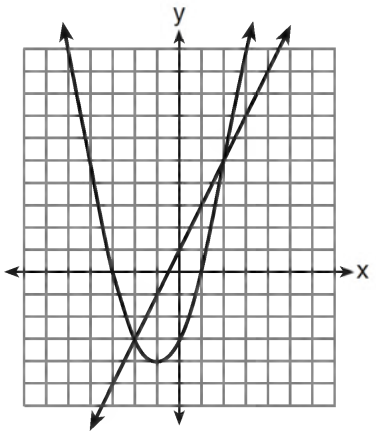
1. What is an equation of the line that passes through the points $(2,1)$ and $(6,-5)$?

2. What is the slope of the line represented by the equation $4x + 3y = 7$?

3. What is the solution to the system of equations? (Where do the two graphs intersect?)

$$y = 2x + 1$$

$$y = x^2 + 2x - 3$$



4. The lines represented by the equations $4x + 6y = 6$ and $y = \frac{2}{3}x - 1$ are

   i. Parallel, but not the same line
   ii. Perpendicular
   iii. Intersecting but not perpendicular
   iv. The same line

5. Write an equation of a line that is parallel to the line whose equation is $3y = x + 6$ and that passes through the point $(-3,4)$.

6. Write an equation of a line that is perpendicular to the line whose equation is $3y = x + 6$ and that passes through the point $(-3,4)$.

7. The slope of $\overline{QR}$ is $\frac{x-1}{4}$ and the slope of $\overline{ST}$ is $\frac{8}{3}$. If $\overline{QR} \perp \overline{ST}$, determine and state the value of *x*.

8. Write an equation that represents the line that passes through the points $(1,1)$ and $(-2,7)$.

9. What is the slope of a line passing through points $(-7,5)$ and $(5,-3)$?

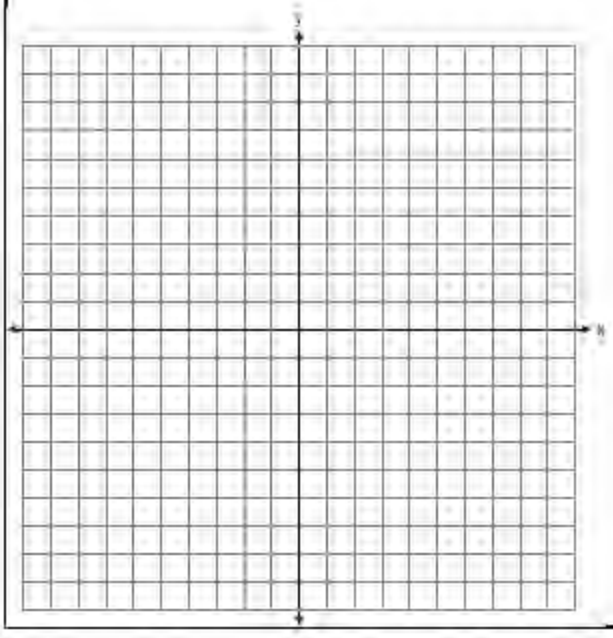
10. Write an equation of a line that represents a VERTICAL line.

11. Write an equation of a line that represents a HORIZONTAL line.

12. Graph the following two functions and determine the points where they intersect.

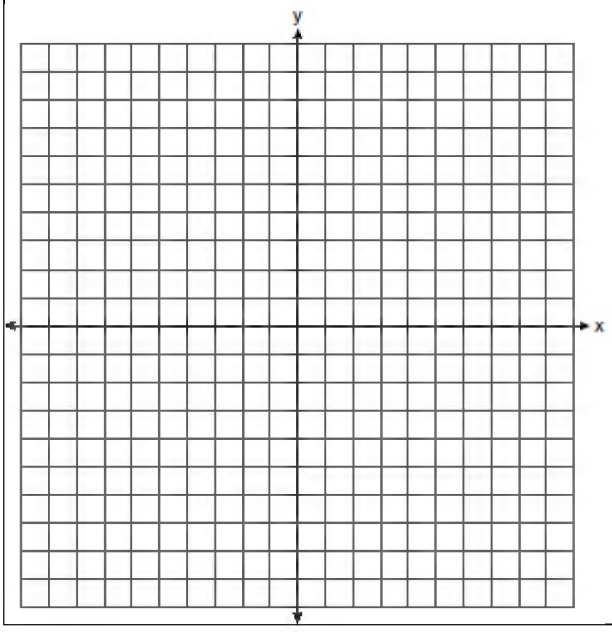
$y = x^2 - 6x - 9$

$y = -9x - 19$



13. Point $(k,-3)$ lies on the line whose equation is $x-2y=-2$. What is the value of *k*?

14. Sketch the graph of y = 4 and x = -3 on the same set of axes. Make sure to label each equation.



6. SQUARE ROOTS: Please show all work in the space provided. Box in your answer.

1. What is $\sqrt{150}+\sqrt{24}$ expressed in simplest radical form?

2. Express $y\sqrt{3}-\left(\sqrt{32}+y\sqrt{27}\right)$ in simplest radical form.

3.

The expression $\sqrt{60}$ is equivalent to:

(1) $4\sqrt{15}$ (3) $2\sqrt{30}$

(2) $20\sqrt{3}$ (4) $2\sqrt{15}$

4.

Simplify:

$$6\sqrt{40}$$

5.

Which is an irrational number?

(1) $\sqrt{49}$ (3) $\frac{5}{16}$

(2) 0 (4) $\sqrt{6}$

6.

Which is a rational number?

(1) $\sqrt{10}$ (3) $\sqrt{24}$

(2) $\sqrt{9}$ (4) $\sqrt{120}$

7.

$\sqrt{32}$ is equivalent to:

(1) $4\sqrt{2}$ (3) $2\sqrt{16}$

(2) $8\sqrt{4}$ (4) $16\sqrt{2}$

8.

The expression $\sqrt{12} + \sqrt{27}$ is equivalent to:

9.

Simplify:

$$6\sqrt{24} - \sqrt{96}$$

10.

What is the sum of $3\sqrt{2}$ and $\sqrt{50}$?

11.

Find the sum of $9\sqrt{3}$ and $\sqrt{75}$.

12.

Simplify:

$$\sqrt{45} - \sqrt{20}$$

13.

Find the difference of $12\sqrt{11}$ and $\sqrt{44}$.

14.

Simplify:

$$\sqrt{200} - 3\sqrt{2}$$

15.

What is the sum of $12\sqrt{5}$ and $\sqrt{125}$?

7. INDUCTIVE REASONING

VOCABULARY:

- A **conjecture** is an unproven statement that is based on observations
- **Inductive reasoning** is a process that involves looking for patterns and making conjectures.
- A **counterexample** is an example that shows a conjecture is false.

Sketch the next figure in the pattern.

SOLUTION

Each figure looks like the one before it except that it has rotated 90°. The next figure will have the smaller circle in the lower-left quarter of the bigger circle.

1.

Sketch the next figure in the pattern.

Conjecture: The product of two consecutive even integers is divisible by ___?___.

SOLUTION

List some specific examples and look for a pattern.

Examples:

$2 \times 4 = 8 = 8 \times 1$ $\quad 6 \times 8 = 48 = 8 \times 6$ $\quad 10 \times 12 = 120 = 8 \times 15$

$4 \times 6 = 24 = 8 \times 3$ $\quad 8 \times 10 = 80 = 8 \times 10$ $\quad 12 \times 14 = 168 = 8 \times 21$

Conjecture: The product of two consecutive even integers is divisible by 8.

2. Fill in the blank:

Conjecture: For any two numbers a and b, the product of $(a + b)$ and $(a - b)$ is always equal to ___?___.

$(2 + 1) \times (2 - 1) = 3 = 2^2 - 1^2$ $\quad (4 + 2) \times (4 - 2) = 12 = 4^2 - 2^2$

$(3 + 2) \times (3 - 2) = 5 = 3^2 - 2^2$ $\quad (6 + 3) \times (6 - 3) = 27 = 6^2 - 3^2$

Show the conjecture is false by finding a counterexample.

Conjecture: All odd numbers are prime.

SOLUTION

The conjecture is false. Here is a counterexample: The number 9 is odd and is a composite number, not a prime number.

3. Show the conjecture is false by finding a counter example:

The square of the sum of two numbers is equal to the sum of the squares of the two numbers. That is, $(a + b)^2 = a^2 + b^2$.

8. POINTS, LINES, PLANES

VOCAULARY:

- A **point** has no dimension.
- A **line** extends in one dimension.
- A **plane** extends in two dimensions.
- **Collinear** points are points that lie on the same line.
- **Coplanar** points are points that lie on the same plane.
- On a line passing through points A and B, **segment AB** consists of all points between A and B and endpoints A and B
- On a line passing through points A and B, then **ray AB** consists of the initial point A and all the points on the same side of A as point B.
- If point C is between A and B, then ray CA and ray CB are **opposite rays.**
- Two or more geometric figures **intersect** if they have one or more points in common. The intersection of the figures is the set of points the figures have in common.

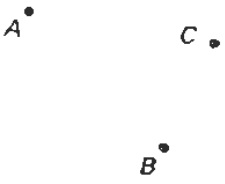
a. Draw three noncollinear points, A, B, and C. Then draw point D on line AB between points A and B. Draw segment CD. Draw ray CA and ray CB.

b. Are points A, B, and D collinear? Are points B, C, and D collinear?

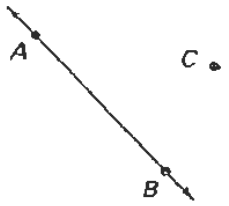
c. Are ray CA and ray CB opposite rays? Are ray DA and ray DB opposite rays?

SOLUTION

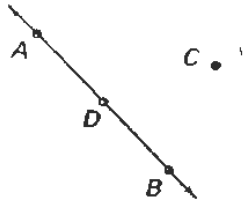
a.



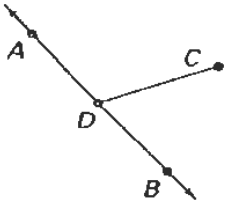
1. First, draw A, B, and C.



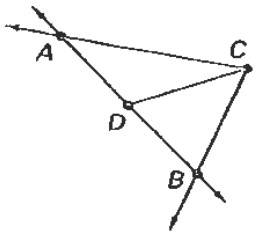
2. Draw line AB.



3. Draw D.



4. Draw segment CD.



5. Draw ray CA and ray CB.

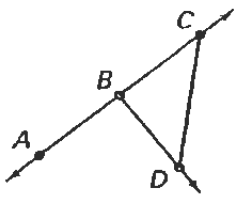
b. Yes, points A, B, and D are collinear because they lie on line AB. No, points B, C, and D are noncollinear because a straight line cannot be drawn through all three points.

c. No, ray CA and ray CB are not opposite rays. Point C is not between A and B. Yes, ray DA and ray DB are opposite rays. Point D is between A and B.

1.

1. Draw collinear points A, B, and C, with point B between A and C. Draw point D not on line AC. Draw line AD. Draw point E on line AD between point A and point D. Draw segment EC. Draw ray BD. Draw ray EB.

Use the diagram to name the figures.



2. Three noncollinear points
3. Two opposite rays
4. One line segment
5. Three collinear points
6. Two rays which are *not* opposite rays
7. Two line segments that are on the same line

9. DISTANCE AND LINE SEGMENTS

VOCABULARY

A **postulate** or **axiom** is a rule that is accepted without proof.

Postulate 1 Ruler Postulate:

The points on a line can be matched one to one with the real numbers. The real number that corresponds to a point is the **coordinate** of the point.

The **distance** between points A and B, written as AB, is the absolute value of the difference between the coordinates of A and B.

AB is also called the **length** of $\overline{AB}$.

When three points lie on a line, you can say that one of them is between the other two.

Postulate 2 Segment Addition Postulate:
If B is between A and C, then $AB + BC = AC$. If $AB + BC = AC$, then B is between A and C.

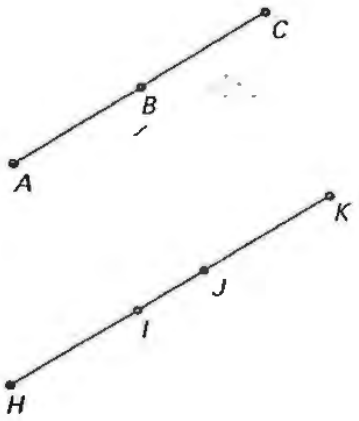
The Distance Formula is a formula for computing the difference between two points in a coordinate plane.

The Distance Formula:
If $A(x_1, y_1)$ and $B(x_2, y_2)$ are points in a coordinate plane, then the distance between A and B is $AB = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$.

Segments that have the same length are called **congruent segments.**

1.

1. In the diagram of the collinear points, $BC = 5$ and $BC = AB$. Find the following lengths.
   a. AC
   b. AB
   c. Are any segments congruent?
2. In the diagram of the collinear points, $HK = 9$, $HI = JK$, and $IJ = 1$. Find the following lengths.
   a. HI
   b. JK
   c. HJ
   d. IK



2. Using the distance formula, find the length of the segment joining the points whose coordinates are:

a. (6, 4), (- 8, 11)

b. (- 5, 8), (- 10, 14)

c. (- 4, - 20), (- 10, 15)

d. (40, 32), (36, 20)

e. (5, - 8), (0, 0)

f. (A, B), (- A, - B)

VOCABULARY

An **angle** consists of two different rays that have the same initial point.

The rays are the **sides** of the angle.

The initial point is the **vertex** of the angle.

Angles that have the same measure are called **congruent angles.**

A point is in the **interior** of an angle if it is between points that lie on each side of the angle.

A point is in the **exterior** of an angle if it is not on the angle or in its interior.

An **acute** angle has measure greater than 0° and less than 90°.

A **right** angle has measure equal to 90°.

An **obtuse angle** has measure greater than 90° and less than 180°.

A **straight** angle has measure equal to 180°.

Two angles are **adjacent angles** if they share a common vertex and side, but have no common interior points.

Postulate 3 Protractor Postulate:
Consider a point A on one side of $\overleftrightarrow{OB}$. The rays of the form $\overrightarrow{OA}$ can be matched one to one with the real numbers from 0 to 180.

The **measure** of $\angle AOB$ is equal to the absolute value of the difference between the real numbers for $\overrightarrow{OA}$ and $\overrightarrow{OB}$.

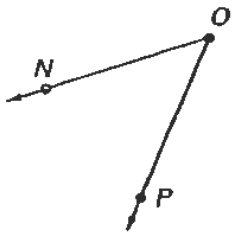
Postulate 4 Angle Addition Postulate:

If P is in the interior of $\angle RST$, then $m\angle RSP + m\angle PST = m\angle RST$.

Naming Angles

a. Write three names for the angle and name the vertex and sides of the angle.

b. Suppose R is in the interior of $\angle NOP$, with $m\angle NOR = 23°$ and $m\angle ROP = 27°$. Find $m\angle NOP$.



SOLUTION

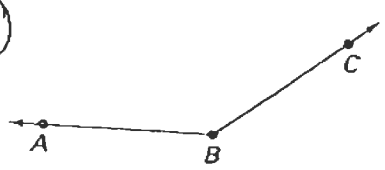
a. $\angle NOP$, $\angle PON$, and $\angle O$ are all appropriate names for this angle. The vertex of this angle is point O and the sides are $\overrightarrow{ON}$ and $\overrightarrow{OP}$.

b. By Angle Addition Postulate, $m\angle NOP = m\angle NOR + m\angle ROP = 23° + 27° = 50°$

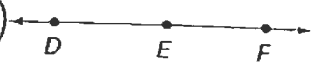
1.

Write three names for the angles and name the vertex and sides of each.

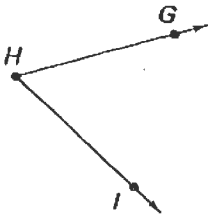
1.



2.



3. Suppose that the angle at the right measures 60° and that there is a point K in the interior of the angle such that $m\angle GHK = 25°$. Find $m\angle KHI$.



Classifying Angles in a Coordinate Plane

Plot the points $A(1, 1)$, $B(-1, 1)$, $C(1, 3)$, $D(3, 2)$, and $E(3, 1)$. Then classify the following angles as acute, right, obtuse, or straight.

a. $\angle CAB$ b. $\angle DAE$ c. $\angle BAD$ d. $\angle EAB$

SOLUTION

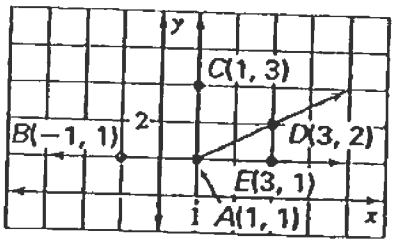
Begin by plotting the points, then observe whether each angle is less than 90°, equal to 90°, between 90° and 180°, or equal to 180°.

a. right angle

b. acute angle

c. obtuse angle

d. straight angle



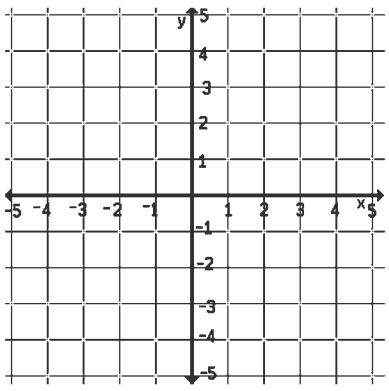
2. Plot the given points and classify the given angles as acute, right, obtuse or straight.

$A(-2, 4)$, $B(-5, 1)$, $C(0, 0)$, and $D(3, 0)$

a. $\angle ACB$

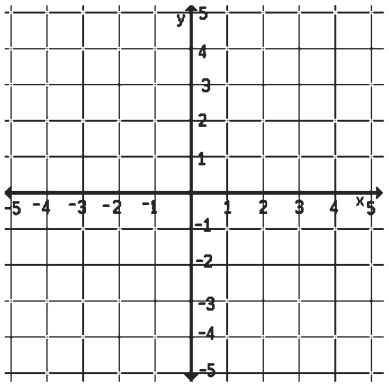
b. $\angle BCD$

c. $\angle ACD$



3. Plot the given points and classify the given angles as acute, right, obtuse or straight.

$E(4, 0), F(3, 2), G(1, 0), H(-1, -2), I(-1, 2)$



a. $\angle HGF$

b. $\angle EGF$

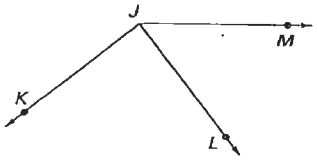
c. $\angle EGI$

d. $\angle FGI$

e. $\angle HGI$

4. For the following exercises, use the diagram below:

a. $m\angle KJM = 145°$, $m\angle KJL = 6x°$, and $\angle LJM = (3x + 10)°$, find x.



b. $m\angle KJM = (2x^2 + 6x - 5)°$, $m\angle KJL = 85°$, and $\angle LJM = (x^2 + 1)°$, find x. (*Hint:* Make sure your answer is reasonable!)

c. $3(m\angle LJM) = 2(m\angle KJL)$ and $m\angle KJM = 140°$, find $\angle KJL$.

d. the ratio of $m\angle KJL$ to $m\angle LJM$ is 5:3, and $m\angle KJM = 144°$, find $\angle LJM$.

VOCABULARY

The **midpoint** of a segment is the point that divides, or **bisects**, the segment into two congruent segments.

A **segment bisector** is a segment, ray, line, or plane that intersects a segment at its midpoint.

A **construction** is a geometric drawing that uses a limited set of tools, usually a **compass** and a **straightedge.**

An **angle bisector** is a ray that divides an angle into two adjacent angles that are congruent.

The Midpoint Formula:
If $A(x_1, y_1)$ and $B(x_2, y_2)$ are points in a coordinate plane, then the midpoint of $\overline{AB}$ has coordinates $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$.

Finding the Coordinates of the Midpoint of a Segment

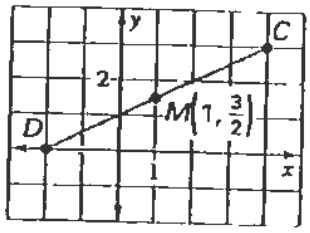
Find the coordinates of the midpoint of $\overline{CD}$ with endpoints $C(4, 3)$ and $D(-2, 0)$.

SOLUTION

Use the Midpoint Formula as follows.

$$M = \left(\frac{4 + (-2)}{2}, \frac{3 + 0}{2}\right)$$

$$= \left(1, \frac{3}{2}\right)$$



1.

Find the coordinates of the midpoint of the segment whose endpoints are given.

1. $E(4, -4), F(1, 7)$

2. $G(2, 9), H(-3, 6)$

3. $I(-8, 3), J(3, 0)$

Finding the Coordinates of the Endpoint of a Segment

The midpoint of $\overline{KL}$ is $M(6, -2)$. One endpoint is $K(4, 3)$. Find the coordinates of the other endpoint.

SOLUTION

Let (x, y) be the coordinates of L. Use the Midpoint Formula to write equations involving x and y.

$$\frac{4 + x}{2} = 6 \qquad \frac{3 + y}{2} = -2$$

$$4 + x = 12 \qquad 3 + y = -4$$

$$x = 8 \qquad y = -7$$

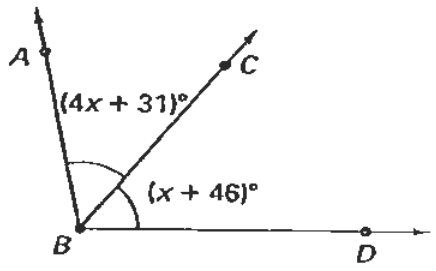
So, the other endpoint of the segment is $L(8, -7)$.

2.

Find the coordinates of the other endpoint of a segment with the given endpoint and midpoint *M*.

(4.) $N(-1, 5), M(0, 1)$ (5.) $P(6, -4), M(3, 10)$ (6.) $R(-7, -3), M(0, 0)$

In the diagram, $\overrightarrow{BC}$ bisects $\angle ABD$. Solve for x.



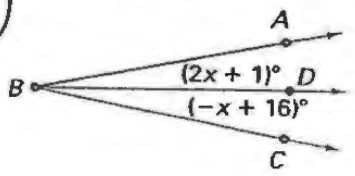
SOLUTION

$m\angle ABC = m\angle CBD$	Congruent angles have equal measures.
$(4x + 31)° = (x + 46)°$	Substitute given measures.
$4x = x + 15$	Subtract 31° from each side.
$3x = 15$	Subtract x from each side.
$x = 5$	Divide each side by 3.

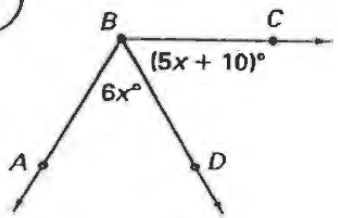
3.

$\overrightarrow{BD}$ bisects $\angle ABC$. Find the value of x.

7.

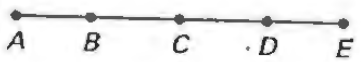


8.



4.

In Exercises 1–4, C is the midpoint of both $\overline{AE}$ and $\overline{BD}$.

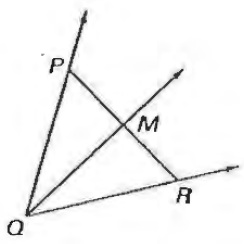


1. If $BC = x^2 - 18$ and $CD = x + 2$, find x.
2. If $AC = 2x - 1$ and $AE = x^2 - 2$, find x.
3. Can you be certain that $AB = DE$? Explain.
4. If $AB = 2x + 3$ and $DE = x^2$, what are the possible values of x?

5.

Let $\angle PQR$ be an angle, and let M be the midpoint of $\overline{PR}$.

Can you conclude that $\overrightarrow{QM}$ bisects $\angle PQR$? If so, explain why. If not, sketch a counterexample.



VOCABULARY

Two angles are **vertical angles** if their sides form two pairs of opposite rays.

Two adjacent angles are a **linear pair** if their noncommon sides are opposite rays.

Two angles are **complementary angles** if the sum of their measures is 90°. Each angle is the **complement** of the other.

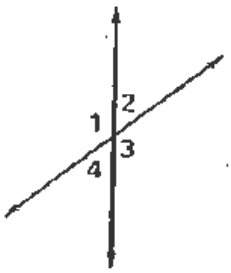
Two angles are **supplementary angles** if the sum of their measures is 180°. Each angle is the **supplement** of the other.

Identifying Vertical Angles and Linear Pairs

a. Are $\angle 1$ and $\angle 3$ vertical angles?

b. Are $\angle 2$ and $\angle 4$ a linear pair?

c. Are $\angle 1$ and $\angle 4$ a linear pair?



SOLUTION

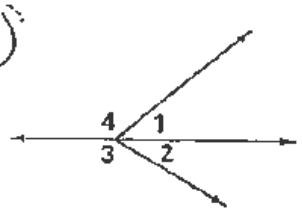
a. Yes. The sides of the angles form two pairs of opposite rays.

b. No. The angles are not adjacent.

c. Yes. The angles are adjacent and their noncommon sides are opposite rays.

1.

(1.)



a. Are $\angle 1$ and $\angle 2$ a linear pair?

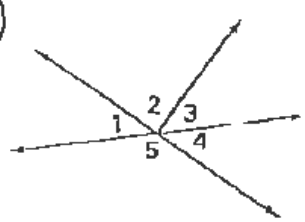
b. Are $\angle 1$ and $\angle 3$ vertical angles?

c. Are $\angle 1$ and $\angle 4$ a linear pair?

d. Are $\angle 2$ and $\angle 4$ vertical angles?

2.

(2.)



a. Are $\angle 1$ and $\angle 5$ a linear pair?

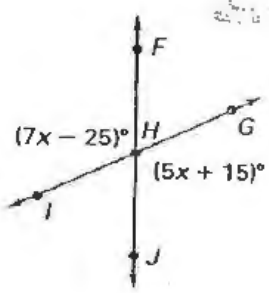
b. Are $\angle 1$ and $\angle 2$ a linear pair?

c. Are $\angle 1$ and $\angle 4$ vertical angles?

d. Are $\angle 3$ and $\angle 5$ vertical angles?

Finding Angle Measures

Solve for x in the diagram at the right. Then find the angle measures.



SOLUTION

Use the fact that vertical angles are congruent.

$$(7x - 25)^\circ = (5x + 15)^\circ$$

$$x = 20$$

Use substitution to find the angle measures.

$m\angle FHI = (7x - 25)^\circ = (7 \cdot 20 - 25)^\circ = 115^\circ$

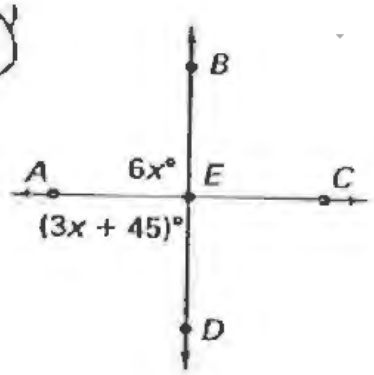
$m\angle GHJ = (5x + 15)^\circ = (5 \cdot 20 + 15)^\circ = 115^\circ$

Next, realize that $\angle FHI$ and $\angle FHG$ are a linear pair. So, the measures of these two angles must sum to 180°. So, $m\angle FHG = 180^\circ - 115^\circ$, so $m\angle FHG = 65^\circ$.

Finally, notice that $\angle FHG$ and $\angle IHJ$ are vertical angles. So, $m\angle IHJ = 65^\circ$.

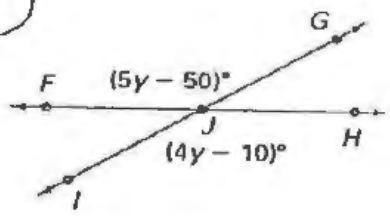
3.Solve for x:

3.



4. Solve for y :

4.



Finding Measures of Complements and Supplements

a. Given that $\angle E$ is a complement of $\angle F$ and $m\angle E = 68^\circ$, find $m\angle F$.

b. Given that $\angle G$ is a supplement of $\angle H$ and $m\angle G = 152^\circ$, find $m\angle H$.

SOLUTION

a. $m\angle F = 90^\circ - m\angle E = 90^\circ - 68^\circ = 22^\circ$

b. $m\angle H = 180^\circ - m\angle G = 180^\circ - 152^\circ = 28^\circ$

5.

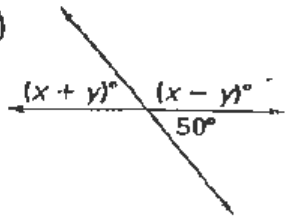
Find the measure of the angle.

5. Given that $\angle A$ is a complement of $\angle B$ and $m\angle B = 81°$, find $m\angle A$.

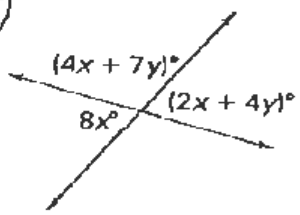
6. Given that $\angle C$ is a supplement of $\angle D$ and $m\angle C = 27°$, find $m\angle D$.

6. In the following exercises, find the values of x and y in each diagram.

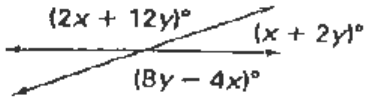
6.



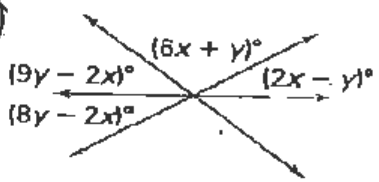
7.



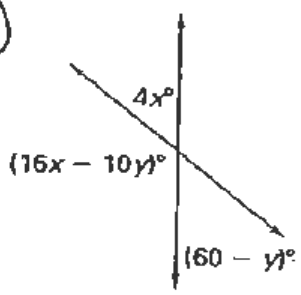
8.



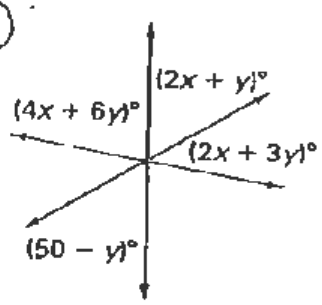
9.



10.



11.



7.

In Exercises 2–5, tell whether the statement is *true* or *false*. If it is true, explain why; if it is false, sketch a counterexample.

2. Given $\angle ACB$ and $\angle BCD$ with a common side $\overrightarrow{CB}$:
If $\angle ACD$ is a right angle, then $\angle ACB$ and $\angle BCD$ are complementary.

3. Given $\angle ACB$ and $\angle BCD$ with a common side $\overrightarrow{CB}$:
If $\angle ACD$ is a straight angle, then $\angle ACB$ and $\angle BCD$ are supplementary.

4. If $\angle RUS$ and $\angle SUT$ are a linear pair, and $\angle SUT$ and $\angle TUV$ are also a linear pair, then $\angle RUS$ and $\angle TUV$ are vertical angles.

5. If $\angle RUS$ and $\angle TUV$ are vertical angles, then $\angle RUS$ and $\angle SUT$ are a linear pair.

13. AREA AND PERIMETER

VOCABULARY

Formulas for the perimeter P, area A, and circumference C of some common plane figures are given below.

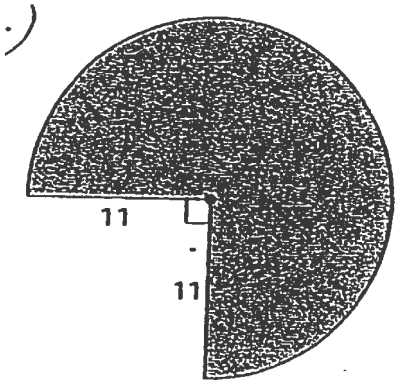
Square	Rectangle
Side length s	length l and width w
$P = 4s$	$P = 2l + 2w$
$A = s^2$	$A = lw$
Triangle	**Circle**
Side lengths a, b, and c,	radius r
base b, and height h	$C = 2\pi r$
$P = a + b + c$	$A = \pi r^2$
$A = \frac{1}{2}bh$	

A Problem-Solving Plan:

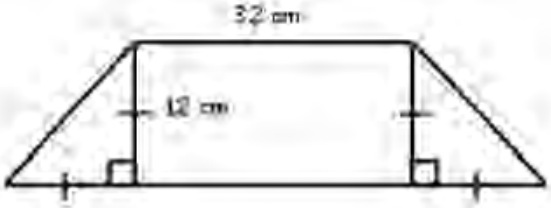
1. Ask yourself what you need to solve the problem. Write a **verbal model** or draw a sketch that will help you find what you need to know.
2. **Label known and unknown facts** on or near your sketch.
3. Use labels and facts to **choose related definitions, theorems, formulas,** or other results you may need.
4. **Reason logically** to link the facts, using a proof or other written argument.
5. Write a **conclusion** that answers the original problem. **Check** that your reasoning is correct.

1. Find the perimeter (or circumference) and area of the given figure:

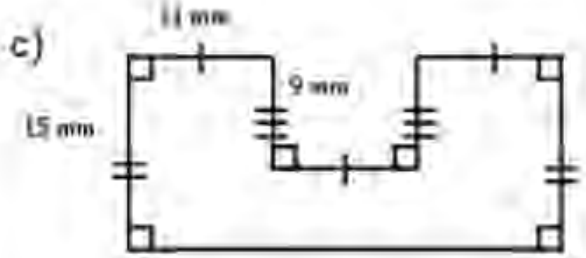
a.



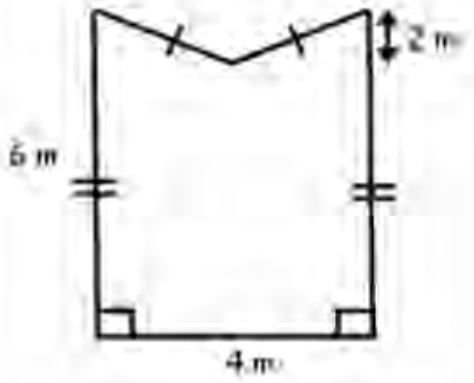
b.



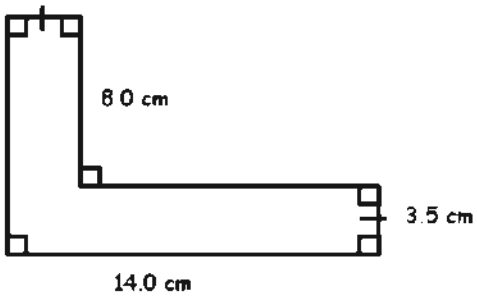
c.



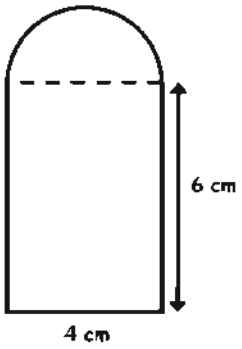
d.



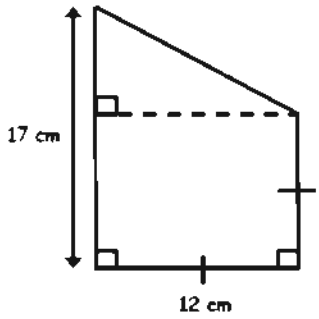
e.



f.



g.



h.

The design of a machine part is shown. The cut-out shape is a quarter circle. Calculate the area of the machine part.