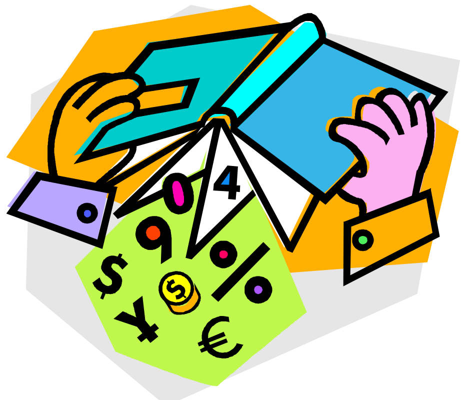


Summer 2020

Dear Geometry Honors Students and Parents:

Welcome to Geometry! For the 2020-2021 school year, we would like to focus your attention to the prerequisite skills and concepts for Geometry. In order to be successful in Geometry, a student must demonstrate a proficiency in:

- Solving Quadratic Equations (factoring and quadratic formula)
- Systems of Equations
- Simplifying Radicals
- Polygons
- Geometric Building Blocks (points, lines, planes, line segments, rays, angles)
- Angles (supplementary/complementary)
- 3D Figures

As prerequisite skills, these topics are ***not*** re-taught in the Geometry course. To ensure that all students demonstrate the basic skills to be successful, these topics will be assessed throughout the school year by different methods, such as weekly assignments and spiral review questions on assessments. Students are encouraged to seek extra help before or after school from their teacher for any topics requiring more personal in-depth remediation.

It is expected that each student will fully complete the review questions. The teacher will check the packet for completion and effort for homework credit. If you have any questions, please do not hesitate to contact your child's Geometry teacher.

Quadratic Equations

Standard Form of a Quadratic: $ax^2 + bx + c$

Solving Quadratic Equations:

- Factoring
- Quadratic Formula

Guided Practice: Solve by Factoring, where $a = 1$.

Solve by Factoring: $2x^2 - 20x = -42$

$2x^2 - 20x + 42 = 0$ ← set equal to zero, and in standard form, if not already done.

$2(x^2 - 10x + 21 = 0)$ ← look for a GCF and factor out

$2(x^2 - 10x + 21 = 0)$ ← look at the signs to see what the

(−)(−) signs of our factors will be

Second sign positive, both first sign.
Second sign negative, signs different.

a = 1 c = 21 ac = 21 ← find the product of ac

factors	product	sum
-21, -1	21	-22
-7, -3	21	-10

← list the factors of ac (in this case, both negative)

← find the sum of the factors. choose the one that equals b

2(x – 7)(x – 3) = 0 ← put factors into parenthesis

prime prime ← check to see if factors can be factored further. If so, factor again.

(x – 7) = 0 or (x – 3) = 0 ← set each linear factor equal to zero

x = 7 or x = 3 ← solve each linear factor

Tips:

- If the a is negative, start by factoring out a "−1"
- If there are no factors of *c* that add up to *b*, then the trinomial is "**prime**."
- Remember: If c is negative, the factors will have different signs (one positive and one negative). If *c* is positive, then the factors will both have the same sign as *b*.
- The "ac" method is only one of many types of factoring (GCF, Grouping, Difference of Perfect Squares, Perfect Square Trinomial, Slide and Divide).

Guided Practice: Solve using the Quadratic Formula.

Quadratic Formula: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Solve using the Quadratic Formula: $15x + 3x^2 + 18$

$3x^2 + 15x + 18 = 0$ ← set equal to zero, and in standard form, if not already done.

$a = 3$, $b = 15$, $c = 18$ ← Identify a, b and c.

$x = \frac{-15 \pm \sqrt{15^2 - 4 \cdot 3 \cdot 18}}{2 \cdot 3}$ ← Substitute into the quadratic formula

$x = \frac{-15 \pm \sqrt{225 - 216}}{6}$ ← Simplify (remember the order of operations!)

$x = \frac{-15 \pm \sqrt{9}}{6}$

$x = \frac{-15 \pm 3}{6}$

$x = \frac{-15+3}{6}$ or $x = \frac{-15-3}{6}$ ← Split up the ±

$x = \frac{-12}{6}$ or $x = \frac{-18}{6}$ ← Simplify each answer

$x = -2$ or $x = -3$

System of Equations

Ways to Solve a System of Equation:

- Graphing
- Substitution
- Elimination

Guided Practice: Solve a System using Elimination.

Solve the system of equations: $\begin{cases} -2x + y = 4 \\ x = -y - 5 \end{cases}$

$\begin{cases} -2x + y = 4 \\ x + y = -5 \end{cases}$	← Line up the variables on one side and the constants on the other side.
eliminate "x"	← Determine a variable you want to eliminate—you want the coefficients to be the same number with opposite signs.
$2(x + y = -5)$ $2x + 2y = -10$	← If necessary, multiply one or both equations by a number to force the coefficients to be the same number with opposite signs.
$-2x + y = 4$ $+\ \underline{2x + 2y = -10}$	← **Add** the equations together so that one variable cancels out.
$3y = -6$ $y = -2$	← Solve the equation.
$-2x + (-2) = 4$ $-2x = 6$ $x = -3$	← Substitute the value of variable into one of the original equations to determine the value of the second variable
(-3, -2)	← Write your answer as an ordered pair.

multiply second equation by 2

Tips:

- You may have to multiply by a negative number to get the coefficients to have opposite signs.
- To solve by **graphing**, graph each equation and identify the point of intersection.
- To solve by **substitution**, solve one equation for one variable and substitute it into the other equation. Then solve for the other variable. Substitute that back into the first equation to find the remaining variable.

Radicals

Tips:

- You will need to know all your perfect squares $1^2 = 1$ through $20^2 = 400$.
- $\sqrt[index]{radicand}$ Radical symbol

Guided Practice: Simplify Radicals

Simplify: $-5\sqrt{128}$

$-5\sqrt{64 \cdot 2}$ ← split the radicand into a factor pair, one of which is a perfect square

$-5 \cdot \sqrt{64} \cdot \sqrt{2}$ ← put each factor under its own radical symbol

$-5 \cdot 8 \cdot \sqrt{2}$ ← find the square root of the perfect square factor

$-40\sqrt{2}$ ← simplify

Guided Practice: Add/Subtract Radicals

Tips:

- In order to add or subtract radicals, the index and the radicand must be the same!
- You combine radicals as if you were combining like-terms—add/subtract their coefficients **ONLY**.
- Sometimes it may be necessary to simplify the radicals before you add or subtract.

Simplify: $-\sqrt{99} + 6\sqrt{11} - 2\sqrt{3}$

$-\sqrt{9 \cdot 11} + 6\sqrt{11} - 2\sqrt{3}$ ← Simplify each radical separately, if necessary (as above)

$-\sqrt{9} \cdot \sqrt{11} + 6\sqrt{11} \quad -2\sqrt{3}$

$-3\sqrt{11} + 6\sqrt{11} - 2\sqrt{3}$

$3\sqrt{11} - 2\sqrt{3}$ ← Combine "like radicals"

Guided Practice: Multiplication of Radicals

Tips:

- **T**his is NOT the only way to simplify these problems

Simplify: $2\sqrt{5} \cdot 4\sqrt{8}$

$2\sqrt{5} \cdot 8\sqrt{2}$ ← Simplify each radical, if possible

$2 \cdot 8 \cdot \sqrt{5} \cdot \sqrt{2}$ ← Group coefficients together, group radicands together

$16\sqrt{10}$ ← Multiply coefficients and radicands

simplified ← Simplify radical, if possible

Guided Practice: Division of Radicals

Tips:

- **T**his is NOT the only way to simplify these problems

Simplify: $\frac{\sqrt{192}}{2\sqrt{3}}$

$\frac{\sqrt{64 \cdot 3}}{2\sqrt{3}}$ ← Simplify each radical, if possible

$\frac{\sqrt{64} \cdot \sqrt{3}}{2\sqrt{3}}$

$\frac{8\sqrt{3}}{2\sqrt{3}}$

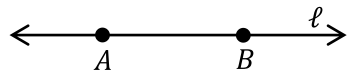
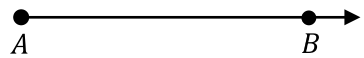
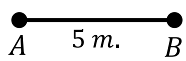
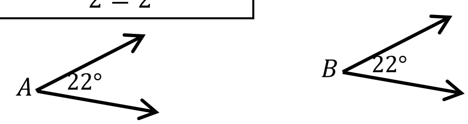
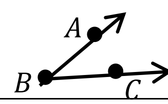
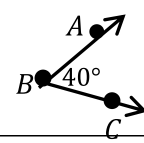
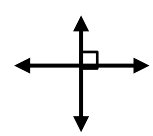
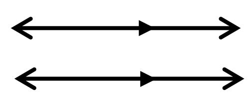
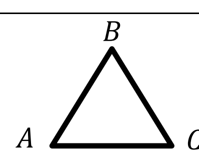
$\frac{4\sqrt{3}}{\sqrt{3}}$ ← Divide numbers outside the radical

4 ← Divide numbers under the radical

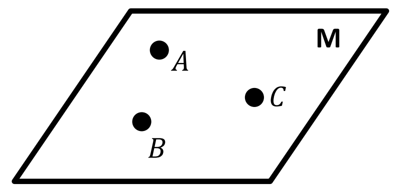
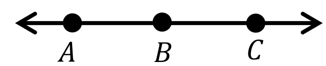
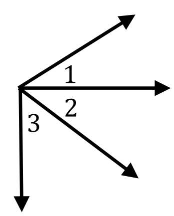
no radical remaining ← Simplify radical, if possible

Geometric Notation and Defintions

The following set of notation and definitions will be used throughout the entire course.

Notation	Meaning	Diagram
$\overleftrightarrow{AB}$ or $\overleftrightarrow{BA}$ or Line ℓ	Line AB or Line ℓ *Has one dimension. Through any two points, there is exactly one line.*	
$\overline{AB}$ or $\overline{BA}$	Segment AB *Consists of two endpoints A and B and all of the points on* $\overleftrightarrow{AB}$ *between A and B*	
$\overrightarrow{AB}$ *Can't switch order!!*	Ray AB *Consists of one endpoint A and all the points on* $\overleftrightarrow{AB}$ *that are on the same side as B*	
AB or BA	The length of segment AB (has no segment bar on top)	 $AB = 5\ m.$
$=$	Equal to **Lengths and angle measures are equal*	 **Equal** $CD = EF$ $2 = 2$ **Congruent** $\overline{CD} \cong \overline{EF}$
$\cong$	Congruent (has the same measure) **Segments and angles are congruent*	 **Equal** $m\measuredangle A = m\measuredangle B$ **Congruent** $\measuredangle A \cong \measuredangle B$
$\measuredangle ABC$ or $\angle ABC$	Angle ABC has a vertex of B The vertex should be the middle letter	
$m\measuredangle ABC$ or $m\angle ABC$	The measure of angle ABC	 $m\measuredangle ABC = 40°$
°	Degree(s), a unit measure for angles	$100°$
$\perp$	Perpendicular *Two lines that intersect to form a right angle.*	
$\parallel$	Parallel *Two coplanar lines that never intersect. They have the same slope.*	
ΔABC ΔCBA	Triangle ABC	

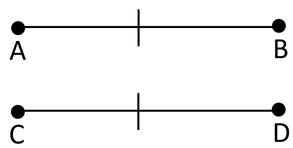
Other Definitions

Point Point A A	*A point has no dimension.* *It is represented by a dot.*	
Plane Plane ABC Plane M	*A plane has two dimensions. It is represented by a shape that looks like a floor or a wall and extends without end.* *Through any three points not on the same line, there is exactly one plane.* *You can use three points, not all on the same line, to name it.* *Sometimes, you can use a capital letter without a point, if it is provided.*	 Plane ABC or Plane M
Opposite Rays	Two rays with a common end point that go in opposite directions. The first letter is the endpoint.	 $\overrightarrow{BA}$ and $\overrightarrow{BC}$ are opposite rays
Collinear Points	Points that are on the same line.	See diagram above for OPPOSITE RAYS. A, B, C are collinear points.
Coplanar Points	Points that are on the same plane.	See diagram for PLANE above. A, B, C are coplanar points
Adjacent Angles	Angles that share a common vertex and a common side that do not overlap each other. Angles must be coplanar.	 $\measuredangle 1$ and $\measuredangle 2$ are adjacent angles. $\measuredangle 2$ and $\measuredangle 3$ are adjacent angles. $\measuredangle 1$ and $\measuredangle 3$ are **NOT** adjacent angles.

Segments

Congruent Segments - Line segments that have the same **length**.

A "tick mark" is used on each segment to show that they are congruent.



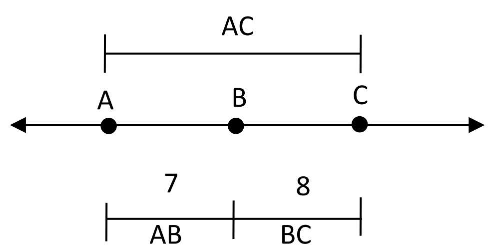
Lengths are equal

AB = CD

Segments are congruent

$\overline{AB} \cong \overline{CD}$

Segment Addition Postulate - If point B is **between** A and C, then AB + BC = AC. Also, if AB + BC = AC, then point B is **between** point A and C.

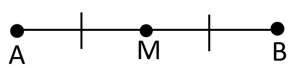


AB + BC = AC

7 + 8 = AC

15 = AC

Midpoint - the point that **divides** a segment into two congruent segments.



M is the midpoint of $\overline{AB}$.

$\overline{AM} \cong \overline{MB}$ and AM = MB

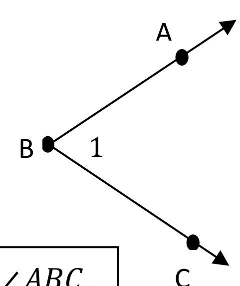
Angles

Classifying angles:

1. **Acute:** an angle with measure between 0° and 90°
2. **Right:** an angle with measure equal to 90°
3. **Obtuse:** an angle with measure between 90° and 180°
4. **Straight:** an angle with measure equal to 180°

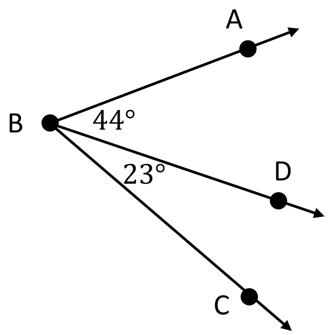
Naming angles:

1. Use 3 letters (middle letter is always the vertex)
2. Use the vertex letter (only when one angle is present)
3. Sometimes an angle can be named with a number



This angle can be named as: $\angle ABC$, or $\angle CBA$, or $\angle B$, or $\angle 1$

Angle Addition Postulate: The sum of two adjacent angle measures is equal to the measure of the larger angle.

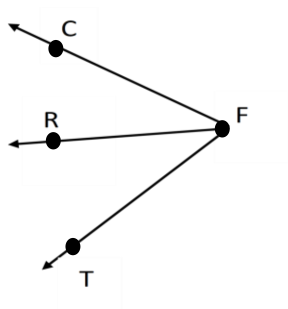


$m\angle ABC = m\angle ABD + m\angle DBC$

$m\angle ABC = 44° + 23°$

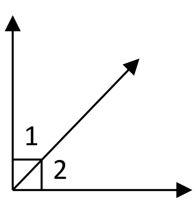
$m\angle ABC = 67°$

Angle Bisector: a ray that divides an angle into two congruent angles. (Their measures are equal)

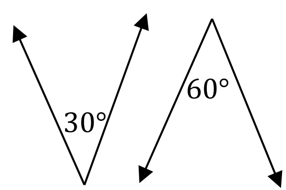


Given: $\overrightarrow{FR}$ *bisects* $\angle CFT$, ***therefore*** $\angle CFR \cong \angle RFT$

Complementary Angles: Two angles whose sum is 90°.

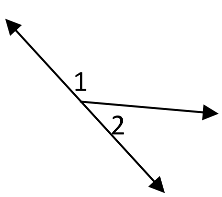


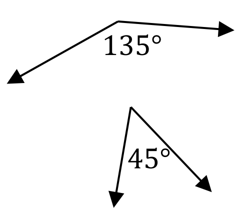
Adjacent



Nonadjacent

Supplementary Angles: Two angles whose sum is 180°.

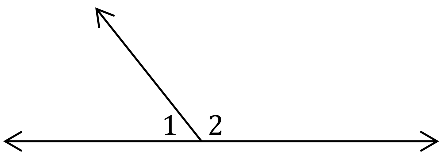




Adjacent Nonadjacent

Linear Pair: two **adjacent** angles whose **non-common** sides are opposite rays.

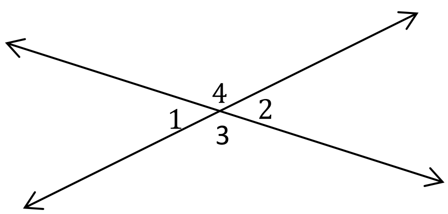
- Linear pairs are supplementary.



$\angle 1 \text{ and } \angle 2 \text{ are linear pairs} \Longrightarrow m\angle 1 + m\angle 2 = 180°$

Vertical Angles: two angles that are opposite each other when two lines intersect.

- Vertical angles are congruent.

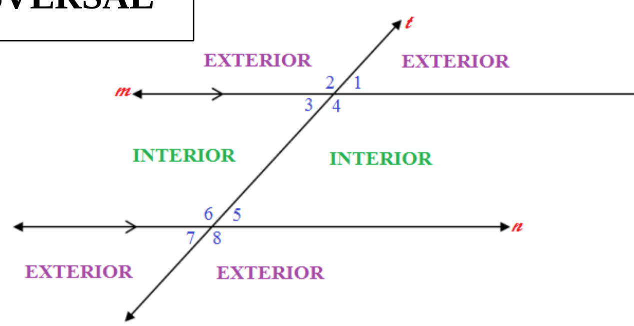


$\angle 1 \text{ and } \angle 2 \text{ are vertical angles}$
and
$\angle 3 \text{ and } \angle 4 \text{ are vertical angles}$

- $\angle 1 \cong \angle 2 \text{ and } \angle 3 \cong \angle 4$

PARALLEL LINES CUT BY A TRANSVERSAL

Line *m* is parallel to Line *n*.
Line *m* and Line *m* are cut by a transversal, Line *t*.



- A line that intersects two or more lines is called a ***transversal***.
- When parallel lines are cut by a ***transversal***, 4 acute and 4 obtuse angles are formed.
  *The acute angles are all congruent. ∠1, ∠3, ∠5, and ∠7
  *The obtuse angles are all congruent. ∠2, ∠4, ∠6, and ∠8
- Any acute angle is supplementary to any obtuse angle.
- **Corresponding angles** lie on the same side of the transversal in corresponding positions.
  ∠1 & ∠5, ∠4 & ∠8, ∠2 & ∠6, ∠3 & ∠7
- Angles on opposite sides of the transversal are called **alternating.**
- **Alternate Interior angles are:** ∠3 & ∠5, ∠4 & ∠6
- **Alternate Exterior angles are:** ∠1 & ∠7, ∠2 & ∠8

Polygons and their Measures

♦ **Polygon**- A **closed** plane figure with the following properties:

1- It is formed by **3** or more **line segments**, called **sides**. (no curves)
2- Each side intersects exactly two sides, one at each **vertex**, so that no two sides with a common endpoint are **collinear**.

➢ Naming a Polygon: name in a clockwise or counterclockwise fashion

♦ **Convex** – all vertices point out

♦ **Concave** – at least one vertex points inward

***A polygon is concave if it is not convex. ***

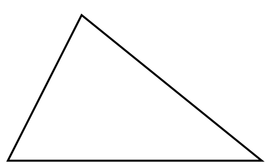
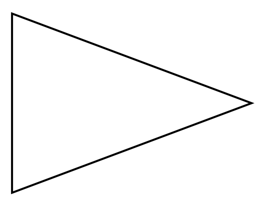
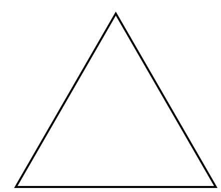
♦ **Equilateral Polygon**- A polygon where all **sides** are **equal or congruent**.

♦ **Equiangular Polygon**- A polygon where all **interior angles** are **equal or congruent**

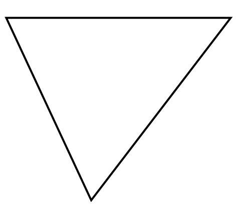
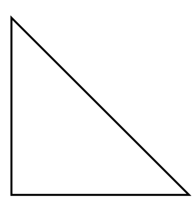
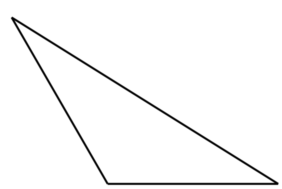
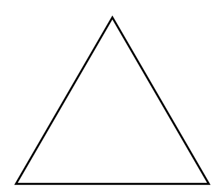
♦ **Regular Polygon**- A **convex** polygon that is both **equilateral** and **equiangular**.

♦ **Diagonal** (of a polygon)- A segment that joins two **non-adjacent** vertices.

Classifying Triangles by Sides

Scalene Triangle	Isosceles Triangle	Equilateral Triangle
		
0 Congruent Sides	At least 2 Congruent Sides	3 Congruent Sides

Classifying Triangles by Angles

Acute Triangle	Right Triangle	Obtuse Triangle	Equiangular Triangle
			
All angles are less than 90°.	Exactly one angle is 90°.	One angle is greater than 90°.	All angles are 60°.

Interior and Exterior Angles of a Polygon:

Convex Polygon	# Sides	Sum of the Measures of Interior Angles	Each Interior Angle of a Regular Polygon	Sum of the Measures of Exterior Angles	Each Exterior Angle of a Regular Polygon
n-gon	n	$(n-2)\cdot 180°$	$\frac{(n-2)\cdot 180°}{n}$	$360°$	$\frac{360°}{n}$

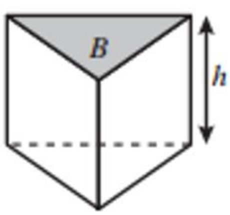
Area and Perimeter

Terms to know:

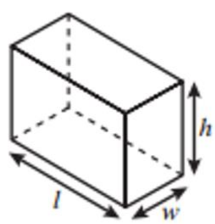
- *Area*: how much is contained within a 2-dimensional, contained shape
- *Perimeter*: the distance around a 2-dimensional, contained shape
    - for a circle, called *circumference*
- Base and Height: one must be a side length. they must be perpendicular to each other
- Area of a square (b·h), rectangle (b·h), triangle(½b·h) , circle (πr^2)
- Perimeter of polygons (sum of all the sides)
- Circumference of a circle ($2\pi r$)
- Pythagorean Theorem: the relationship between the sides of a right triangle
    - $\mathbf{a^2 + b^2 = c^2}$, where c is the hypotenuse

3-D Figures

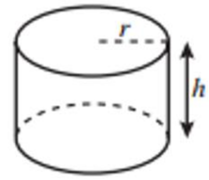
Surface Area and Volume Formulas



$SA = ph + 2B$
$V = Bh$



$SA = lw + lh + hw$
$V = lwh$

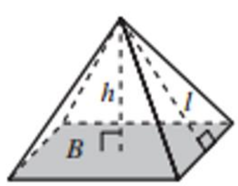


$SA = c + 2B$ or $2\pi r^2 + 2\pi rh$
$V = Bh$ or $\pi r^2 h$

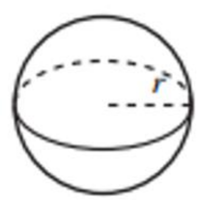
$SA = \frac{1}{2}cl + B$
$V = \frac{1}{3}Bh$

OR

$SA = \pi r^2 + \pi rl$
$V = \frac{1}{3}\pi r^2 h$



$SA = LA + B$
$V = \frac{1}{3}Bh$



$SA = 4\pi r^2$

$V = \frac{4}{3}\pi r^3$

Practice Problems

Solving Quadratics

For 1-4 solve by factoring or the quadratic formula.

1. $x^2 - 5x + 6 = 0$

2. $-7x + x^2 = 20$

3. $25x^2 - 1 = 0$

4. $24x^2 - 6 = -10x$

System of Equations

For 5-6 solve the following system of equations.

5. $\begin{cases} -4x + 3y = -19 \\ 2x + y = 7 \end{cases}$

6. $\begin{cases} 8x - 5y = 14 \\ 10x - 2y = 9 \end{cases}$

Radicals

For 7-12 simplify. Express your answer in simplified radical form.

7. $-\sqrt{169}$

8. $\sqrt{80} - 14\sqrt{5}$

9. $-3\sqrt{2} \cdot \sqrt{50}$

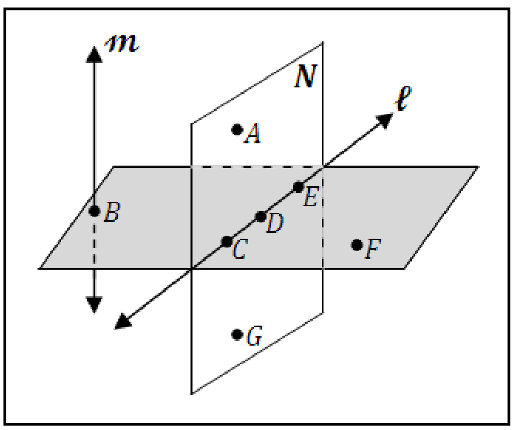
10. $\frac{\sqrt{120}}{\sqrt{8}}$

11. $\sqrt{\frac{72}{9}}$

12. $5\sqrt{2} + 2\sqrt{128}$

<u>Points, Lines and Planes</u>

13.



A. C, D, A are collinear..........................True False

B. A and F are collinear.........................True False

C. B, C, and F are coplanar.....................True False

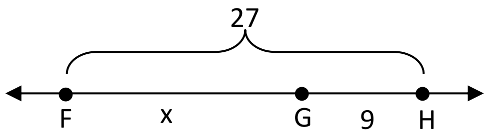
D. I can **form** exactly one plane with points $C, D,$ and E........................True False

E. Plane N and Plane BCF intersect at line ℓ...............................True False

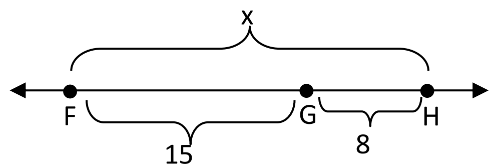
F. Give another name for $\overline{CE}$	G. Give another name for line ℓ
H. Give another name for $\overrightarrow{CE}$	I. Give another name for Plane BCF
J. Given that D is the midpoint of $\overline{CE}$, what can you conclude?	K. Name a pair of opposite rays.

<u>Segments</u>

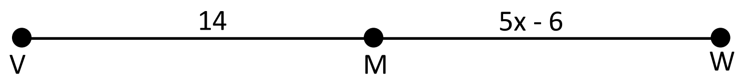
14. Solve for x:



15. Solve for x:

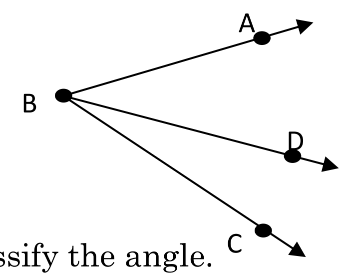


16. Point M is the midpoint of $\overline{VW}$. Solve for x.



Angles

For #17-20, use the diagram to answer the following questions:



17. Name 3 different angles.

18. The $m\angle ABD = 26°$ and $m\angle DBC = 16°$, find $m\angle ABC$, then classify the angle.

19. If $\overrightarrow{BD}$ $bisects$ $\angle ABC$, find $m\angle ABD$ and $m\angle DBC$ if $m\angle ABC = 80°$.

20. If $\overrightarrow{BD}$ $bisects$ $\angle ABC$, find x if $m\angle ABD = (12x - 10)°$ and $m\angle DBC = (5x + 4)°$.

For #21 - 28, label each angle pair as vertical angles, linear pairs, or neither.

21. ∠1 and ∠2

22. ∠1 and ∠3

23. ∠2 and ∠4

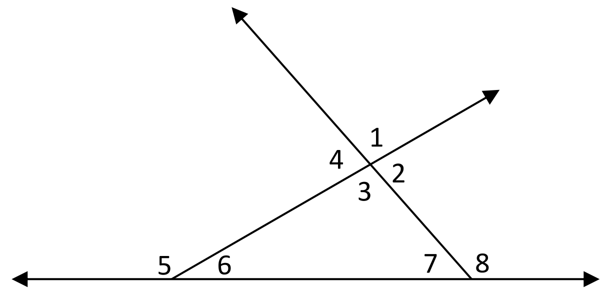
24. ∠3 and ∠4

25. ∠5 and ∠6

26. ∠5 and ∠7

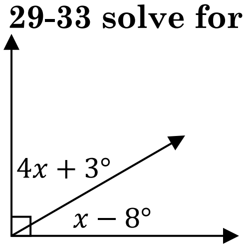
27. ∠6 and ∠8

28. ∠7 and ∠8

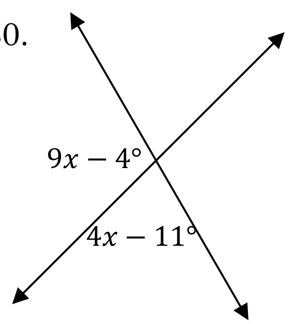


For 29-33 solve for *x*.

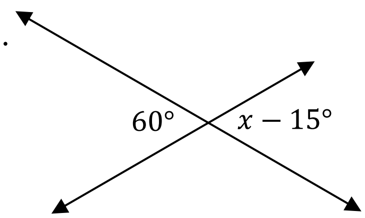
29.



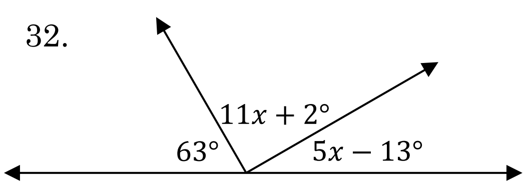
30.



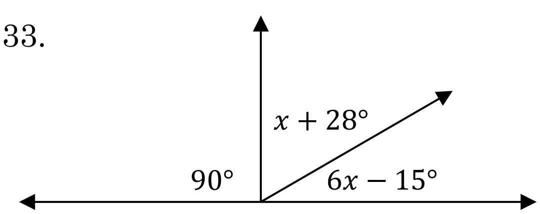
31.



32.



33.



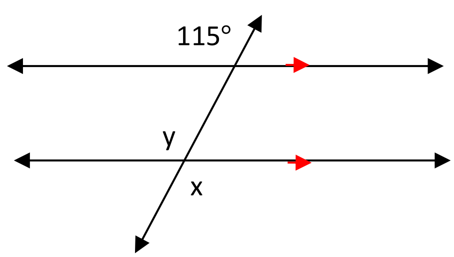
34. Find the measure of two supplementary angles if the measure of the larger angle is 52 more than the measure of the smaller angle.

35. Find the measure of two complementary angles if the measure of one angle is 3 more than the measure of its complement.

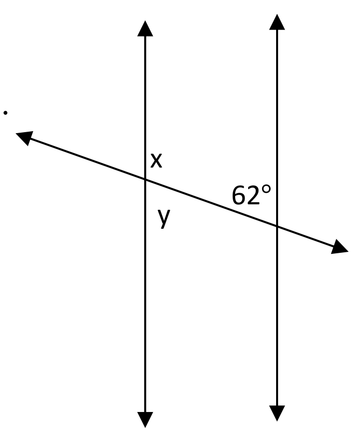
PARALLEL LINES CUT BY A TRANSVERSAL

For #36-37, solve for the missing variables.

36.

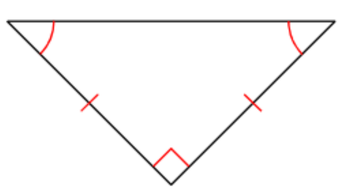


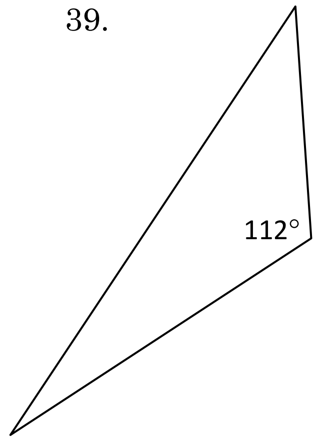
37.

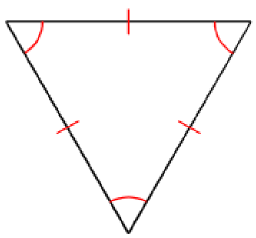


Polygons and their Measures

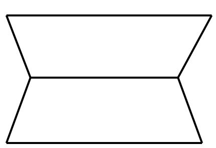
For 38-40, classify the triangle based on its sides and angles.

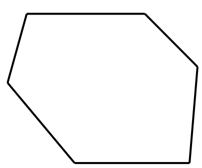
38. 

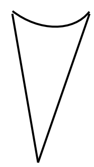
39. 

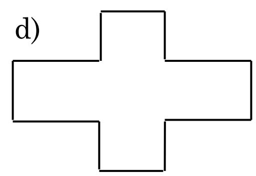
40. 

41. Tell whether or not the figure is a polygon ***and*** whether it is convex or concave.

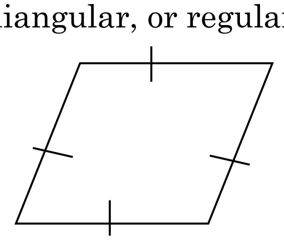
a) 

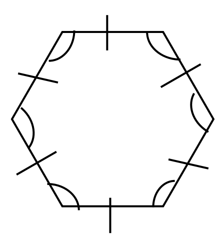
b) 

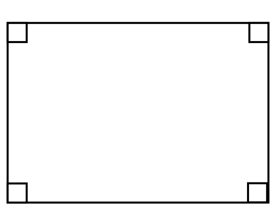
c) 

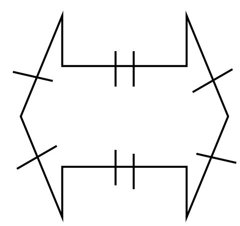
d) 

42. Name the polygon according to the number of sides. Tell whether the polygon is equilateral, equiangular, or regular.

a) 

c) 

b) 

d) 

43. Given a convex regular 18-gon, find:

a.) the sum of the measures of the interior angles.

b.) each interior angle.

c.) the sum of the measures of the exterior angles.

d.) each exterior angle.

---

44. Given a convex regular 30-gon, find:

a.) the sum of the measures of the interior angles.

b.) each interior angle.

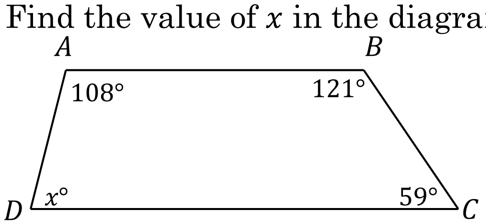
c.) the sum of the measures of the exterior angles.

d.) each exterior angle.

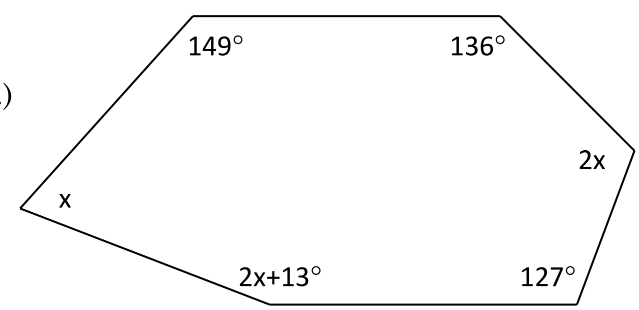
---

45. Find the value of x in the diagram.

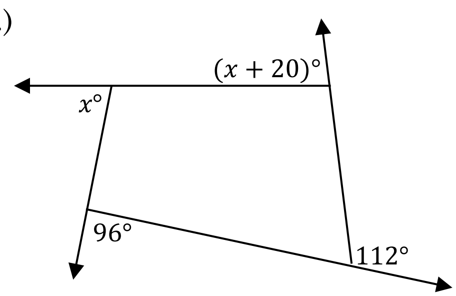
a.)



b.)



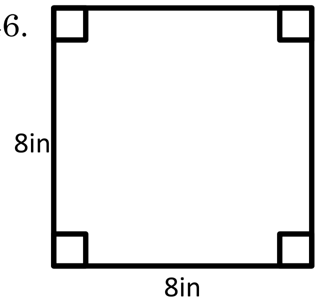
c.)



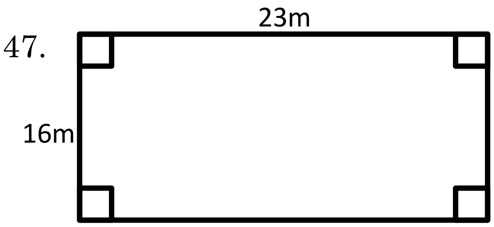
Perimeter and Area

*For 46-52 find the **area <u>AND</u> perimeter/circumference** of each shape:*

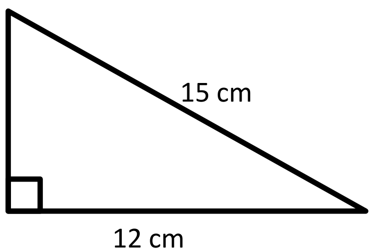
46.



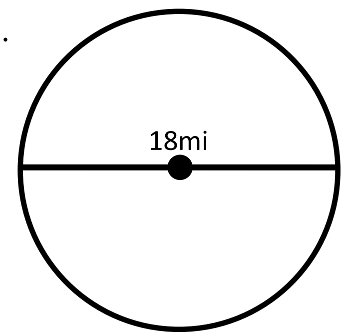
47.



48.



49.



50. A square with side length 17km.

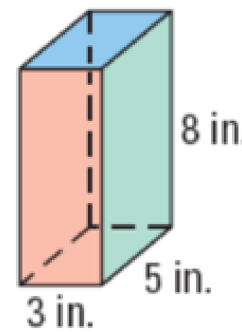
51. A circle with radius 3ft

52. Right triangle with legs 2m and 6m.

Volume and Surface Area

For 53-54 use the rectangular prism given below.

53. Identify the number of faces, edges, and vertices in the rectangular prism.



54. Find the surface area of the rectangular prism.

55. Find the volume of the cylinder. Write the exact answer with π and the estimated answer rounded to the nearest tenth.