BRIEN MCMAHON HIGH SCHOOL
MATH DEPARTMENT

GEOMETRY A
SUMMER PACKET
2011

The problems in this packet are designed to help you review topics from previous mathematics courses that are important to your success in Geometry A and Honors Geometry. The topics covered in this packet should be mastered before entering Geometry. If topics have not been mastered, examples have been provided in each section.

Topics in this packet will be assessed within the first week of school through a test. Completion of this packet will help the student's 1st quarter grade.

While it is not required, it is recommended that students buy a calculator for their personal use throughout the school year. A scientific calculator will be sufficient for Geometry, however a TI – 83 graphing calculator is recommended for Algebra 2 and beyond.

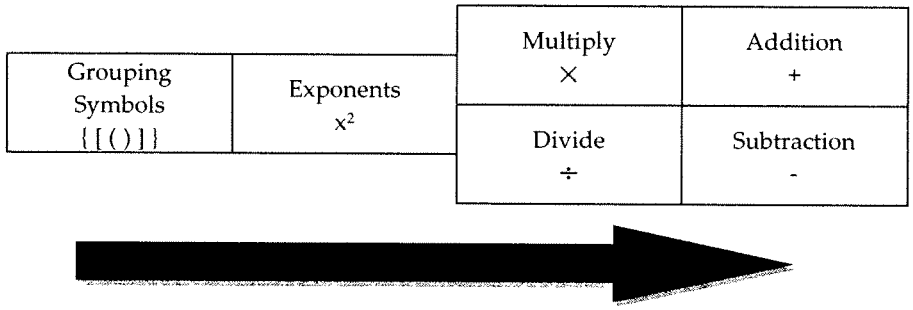
Name_____ Date_____

TOPIC 1: ORDER OF OPERATIONS

NOTES:

Order of Operations:

1. Parentheses
2. Exponents
3. Multiply or Divide
4. Addition or Subtraction



PROBLEM SET: **Simplify.**

1) $6+3(4)$

2) $6+7\cdot 10$

3) $(2)(8)\bullet(3)(5)$

4) $17-[4+2\bullet 3]$

5) $32-[5(30\div 5)+1]+7$

6) $50-2(16-2\bullet 6)^2$

7) $5+[4\bullet 3(2+1)]$

8) $\left[\frac{6\bullet 2(8-3)}{11+4}\right]\bullet 6$

9) $8\left(\frac{6+24}{3+2\bullet 6}\right)^3$

TOPIC 2: SOLVING EQUATIONS

EXAMPLES: **Solve for x.**

$15x+20+5x+8=-5-7$

$20x+28=-12$ Comb. Like Terms

$-28=-28$ Subtract 28.

$\frac{20x}{20}=\frac{-40}{20}$ Simplify.

$x=-2$ Divide by 20.

Simplify.

$7(x-3)=8x+2$

$7x-21=8x+2$ Distribute.

$-7x=-7x$ Subtract $7x$.

$-21=x+2$ Simplify.

$-2=-2$ Subtract 2.

$-23=x$ Simplify.

$x^2-2=34$

$+2=+2$ Add 2.

$x^2=36$ Simplify.

$\sqrt{x^2}=\sqrt{36}$ Square Root

$x=\pm 6$

PROBLEM SET - **Solve for x. Show all work. (Some answers may be decimals).**

1) $12+x=5$

2) $-2=7-x$

3) $12=-3x$

4) $9x-1=44$

5) $2x-6=4x-14$

6) $5x-2-3=25$

7) $2x+7+8x=-5+18$

8) $\frac{4}{5}x=8$

9) $\frac{1}{3}x-4=7$

10) $3(x+7)-2x=23$

11) $0.25x-0.35=1.15$

12) $\frac{1}{4}x+2=-\frac{2}{3}$

13) $-2x+\frac{1}{2}=-2$

14) $x^2=49$

15) $x^2+4=40$

16) $\frac{x}{8}=\frac{20}{32}$

17) $\frac{5}{9}=\frac{12}{x}$

18) $\frac{x}{8}=\frac{x+1}{6}$

19) $\frac{10}{x-2}=\frac{5}{3}$

TOPIC 3: EXPONENTS

NOTES & EXAMPLES:

An expression like 5^3 is called a power. The exponent 3 represents the number of times the base 5 is used as a factor: $5^3 = 5 \cdot 5 \cdot 5$ (3 as a factor of 5). To simplify expressions involving exponents, you often use properties of exponents. Let a and b be numbers and let m and n be integers.

Rules of Exponents		Examples
• Adding/Subtracting	$a^m + a^m = 2a^m$	$5x^3 + 3x^3 - 4x^2 = 8x^3 - 4x^2$
• Product of Powers Property	$a^m \cdot a^n = a^{m+n}$	$4^2 \cdot 4^7 = 4^{2+7} = 4^9$
• Zero Power Property	If $a \neq 0$, then $a^0 = 1$	$(5x^3)^0 = 1$

PROBLEM SET: **Simplify the expression using rules of exponents.**

1) $4x^2 + 3x - 6x - 2$

2) $(3x^3 - 2x + 6) + (3x^2 - 4x + 1)$

3) $x^3 - 6x^2 - 7 - 4x^3 - x + 7$

4) $(8x^2 - 3x + 11) - (2x^2 - 5x - 4)$

5) $(9x^2y^3 + 4x^3y^2 - 2x^2y^2) - (6x^3y^2 - 2x^2y^3)$

6) $3x^2 \cdot 3x^2$

7) $x^6y^2 \cdot x^3yz^8 \cdot 4yz$

8) $(3a^4b^3)^0 + a^2b^3$

TOPIC 4: RADICALS

NOTES & EXAMPLES

If $a^2 = b$, then b is the square root of a. If x represents any positive real number, then the expression $\sqrt{x}$ is the positive square root of x. It is the *positive* number we square to get x. The expression $-\sqrt{x}$ is the negative square root of x. It is the negative number we square to get x. For example, The positive square root of 25 is 5 and can be written $\sqrt{25}=5$. The negative square root of 25 is -5 and can be written $-\sqrt{25}=-5$. Zero has just one square root: $\sqrt{0}=0$. Negative numbers do not have a square root; $\sqrt{-25}=\varnothing$ (no solution in the real numbers). Some square roots are decimals: $\sqrt{46}\approx 6.78$.

PROBLEM SET: **Simplify.**

1) $\sqrt{50}$ 2) $\sqrt{81}$ 3) $\sqrt{0}$ 4) $\sqrt{-49}$

TOPIC 5: FRACTIONS & DECIMALS

NOTES & EXAMPLES

To convert a fraction into a decimal, divide the numerator by the denominator. $\frac{4}{5}=4\div 5=0.8$. When using a calculator to solve remember, "top divided by bottom".

To convert a decimal to a fraction is a bit more complicated. Any numbers to the left of the decimal point are whole numbers and are the large numbers in a mixed fraction. All numbers to the right are made into a fraction. Put a 1 in the denominator and a zero under every number in the numerator. Then simplify the fraction. For example: $4.625=4\frac{625}{1000}=4\frac{5}{8}$. "1000" is in the denominator because it has three zeros to correspond to the three numbers in the numerator.

PROBLEM SET: **Convert the fractions to decimals and the decimals to fractions.**

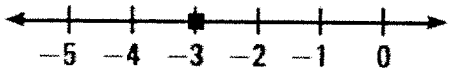
1) $\frac{4}{10}$ 2) $\frac{10}{4}$ 3) $\frac{4}{3}$ 4) $\frac{45}{86}$

5) 2.75 6) 0.7 7) 4.375 8) 0.0001

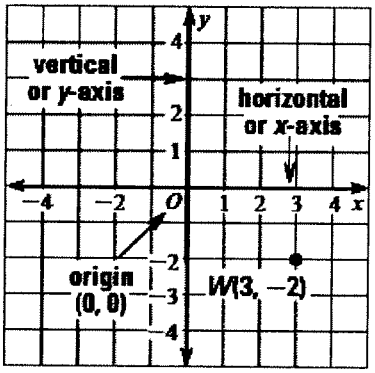
TOPIC 6: PLOTTING POINTS

NOTES & EXAMPLES

In one dimension, plot the points on a number line. For example $x=-3$ would be represented by the following:

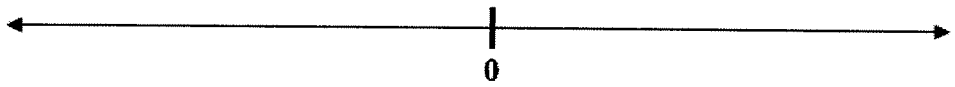


In two dimensions, plot the points on the coordinate plane. The coordinate plane is made-up of the horizontal *x-axis* and the vertical *y-axis*. Each point in the coordinate plane corresponds to an ordered pair of real numbers. For example, the ordered pair *W*(3, -2), has an *x*-coordinate of 3 and a *y*-coordinate of -2. It would be represented by the following:



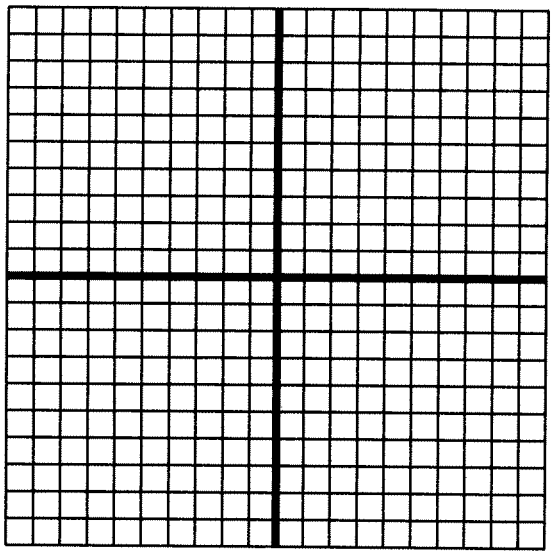
PROBLEM SET: **Put numbers on the number line and plot the following.**

1) $x=-4$ 2) $x=3$ 3) $x=3.5$ 4) $x=-0.5$ 5) $x=\frac{5}{2}$



PROBLEM SET: **Plot the following points on the coordinate plane.**

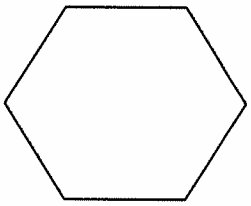
1) (4,8) 2) (−2,10) 3) (−4,−6) 4) (7,−3) 5) (−10,0) 6) (0,6)

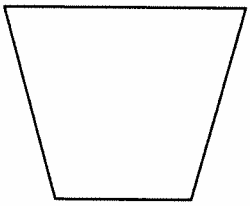


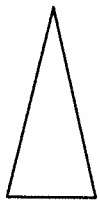
TOPIC 7: POLYGONS

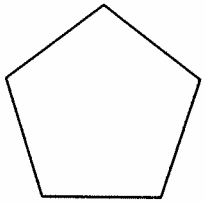
PROBLEM SET: **Match the figure below with the most specific name from the word bank below.**

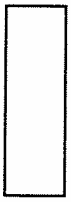
Rhombus	Rectangle	Trapezoid	Right Triangle	Square
Pentagon	Cone	Pyramid	Cylinder	Circle
Octagon	Pentagon	Heptagon	Isosceles Triangle	Equilateral Triangle

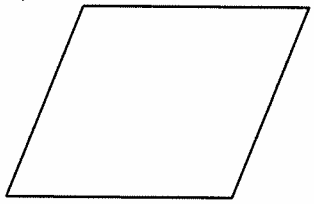
1)  _____

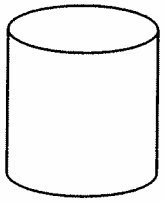
2)  _____

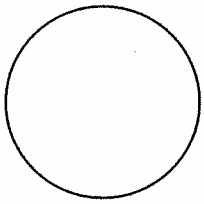
3)  _____

4)  _____

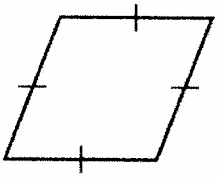
5)  _____

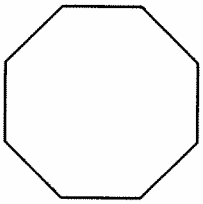
6)  _____

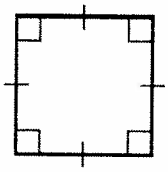
7)  _____

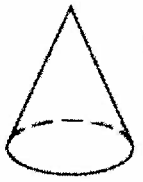
8)  _____

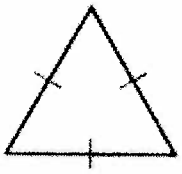
9)  _____

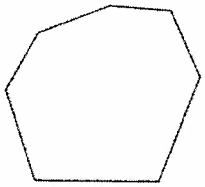
10)  _____

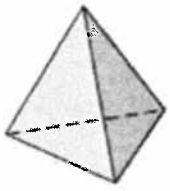
11)  _____

12)  _____

13)  _____

14)  _____

15)  _____

16)  _____

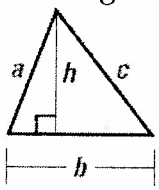
TOPIC 8: PERIMETER & CIRCUMFERENCE

NOTES:

Perimeter is the distance around the outside of an object. It is measured in linear units (inches, meters, centimeters, etc.)

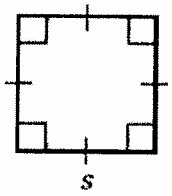
PERIMETER/CIRCUMFERENCE FORMULAS:

Triangle



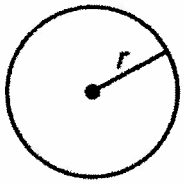
$P = a + b + c$

Square



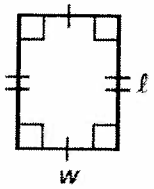
$P = 4s$

Circle



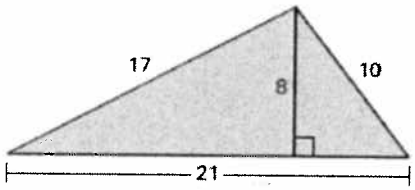
$C = 2\pi r$

Rectangle



$P = 2l + 2w$

EXAMPLES: **Find the perimeter**

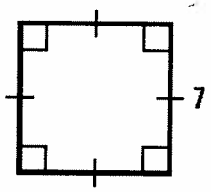


Add all the outer sides. Since 8 is the height of the triangle and not the length of one of the sides, we do not use it to find the perimeter.

17 + 10 + 21 = 48 units

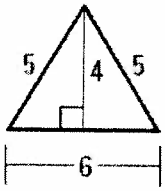
PROBLEM SET: **Find the perimeter or circumference.**

1)



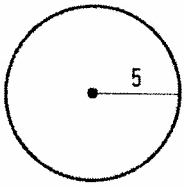
P = _____

2)



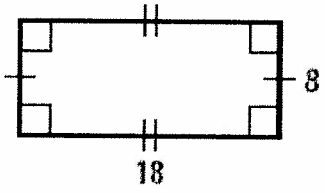
P = _____

3)



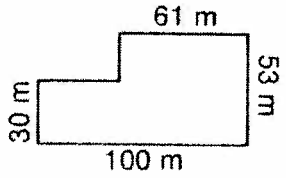
P = _____

4)



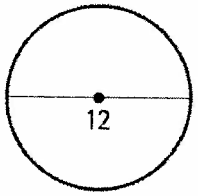
P = _____

5)



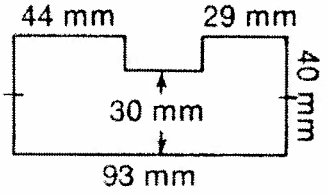
P = _____

6)



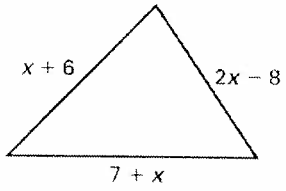
P = _____

7)



P = _____

8) The perimeter of the triangle is 73. Solve for x.



x = _____

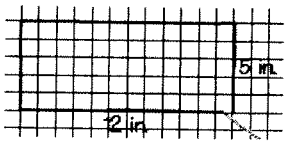
TOPIC 9: AREA

NOTES:

Area is a quantity expressing the two-dimensional size of a surface. It is measured in square units; square inches (in^2), square centimeters (cm^2), square miles (mi^2). Think of area as the amount of floor tiles needed to cover a floor.

EXAMPLE:

Find the area of the rectangle.



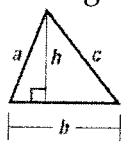
$A = lw$ Area formula for a rectangle

$A = (12)(5)$ Plug in appropriate values

$A = 60in^2$ Evaluate

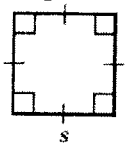
AREA FORMULAS:

Triangle



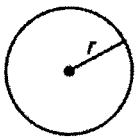
$A = \frac{1}{2}bh$

Square



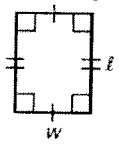
$A = s^2$

Circle



$A = \pi r^2$

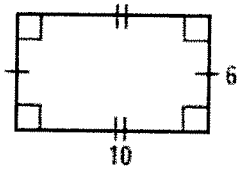
Rectangle



$A = lw$

PROBLEM SET: **Find the area of the figure. Use π = 3.14.**

1)



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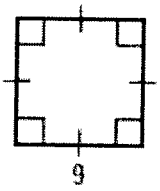

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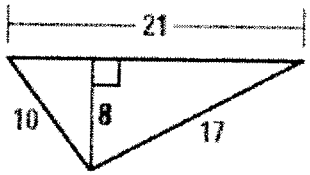
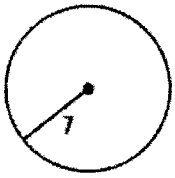
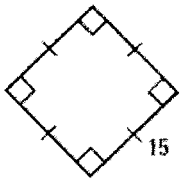


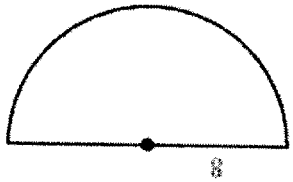
4)



5)



6)



TOPIC 10: VOLUME

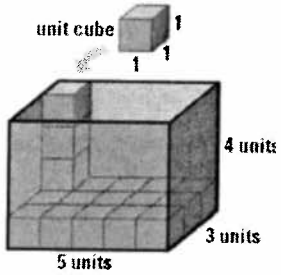
NOTES:

Volume is a quantity expressing the number of cubic units contained in the interior of a solid. Volume is measured in cubic units: cubic inches (in^3), cubic centimeters (cm^3), cubic feet (ft^3). Think of volume as the amount of "stuff" required to FILL a container.

EXAMPLE:

What is the volume of the box?

How many cubic units will fill the container?

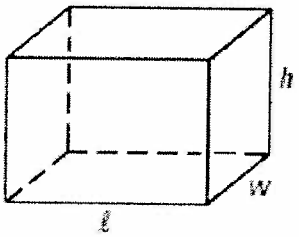
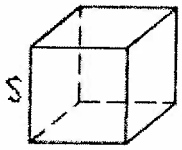


$V = lwh$ Formula for the volume.

$V = (5)(3)(4)$ Substitute values.

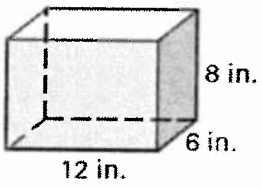
$V = 60u^3$ Evaluate.

FORMULAS:

Rectangular Prism	Cube
	
$V = lwh$	$V = lwh = s^3$

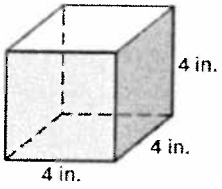
PROBLEM SET: **Find the volume or missing side length of each rectangular prism.**

1)



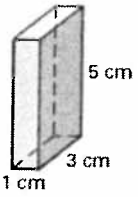
$V =$ _____

2)



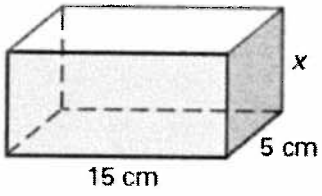
$V =$ _____

3)



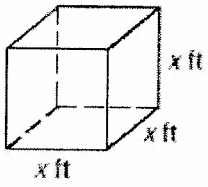
$V =$ _____

4) $V = 225\ cm^3$



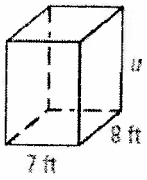
$x =$ _____

5) $V = 125\ ft^3$



$x =$ _____

6) $V = 560\ ft^3$



$u =$ _____

TOPIC 11: FORMULAS

NOTES & EXAMPLES:

A formula is an algebraic equation that relates two or more real-life quantities. Solve a formula by plugging in all the known variables and solving for the unknown.

Circumference of a Circle: $C = 2\pi r$;
C = Circumference; r = radius; $\pi = 3.14$
Find the radius if $C = 100$ in

$100 = 2(3.14)r$	Plug in all known values.
$(100) = 6.28r$	Multiply to simplify.
$\frac{100}{6.28} = \frac{6.28r}{6.28}$	Divide both sides by 6.28.
$15.92 = r$	The height is 15 units.

PROBLEM SET:

1) Area of a Rectangle: $A = lw$; l = length of base; w = width of rectangle
Find Area if $w = 13$; $l = 5$

2) Circumference of a Circle: $C = 2\pi r$; $\pi = 3.14$; r = radius
Find radius if $C = 62.8$

3) Perimeter of a Rectangle: $P = 2(l + w)$; l = length of rectangle; w = width of rectangle
Find length if $P = 28$; $w = 6$.

4) Area of a square: $A = s^2$; s = side length.
Find side if $A = 64$.

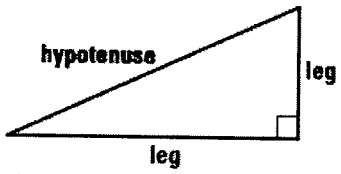
5) Area of a triangle: $A = \frac{1}{2}bh$; b = length of base; h = height of triangle
Find height if $A = 40$; $b = 16$.

6) Perimeter of a Square: $P = 4s$; s = length of side
Find side length if $P = 68$.

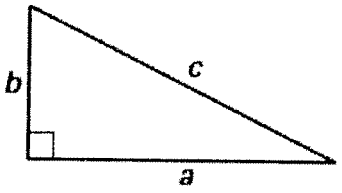
TOPIC 12: RIGHT TRIANGLES

NOTES:

In a right triangle, the sides that form the right angle are the *legs* of the triangle. The side opposite the right angle is the *hypotenuse* of the triangle.



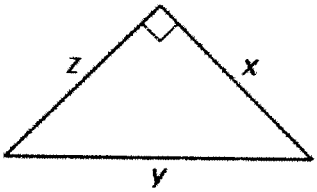
EXAMPLE: **Identify the legs and hypotenuse in the triangles below.**



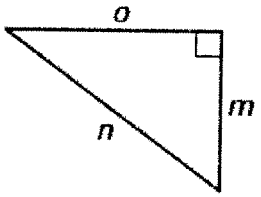
Side a: Leg
Side b: Leg
Side c: Hypotenuse

PROBLEM SET: **Identify the legs and hypotenuse in the triangles below.**

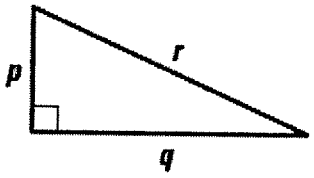
1)



2)



3)



TOPIC 13: LENGTH OF SEGMENTS

PROBLEM SET: **Use a ruler to find the length of each segment in inches and in centimeters.**

in_____ cm: _____

in_____ cm: _____

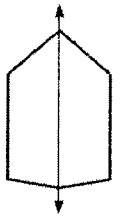
in_____ cm: _____

in_____ cm: _____

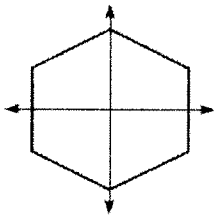
TOPIC 14: TRANSFORMATIONS

NOTES:

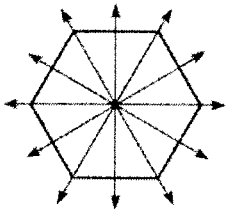
A figure has a line of symmetry if the figure can be mapped onto itself by a line of reflection.



This hexagon has only one line of symmetry.

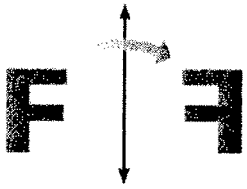


This hexagon has two lines of symmetry.



This hexagon has six lines of symmetry.

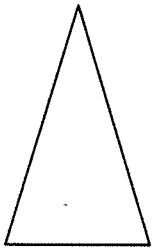
Figures in a plane can be reflected to form a new figure. The new figure is called the image and the original figure is called the preimage or object.



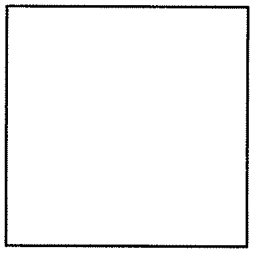
Reflection in a line

PROBLEM SET: **Draw any apparent line of symmetry in each of the following shapes.**

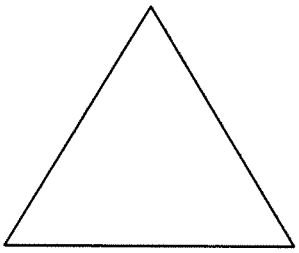
1)



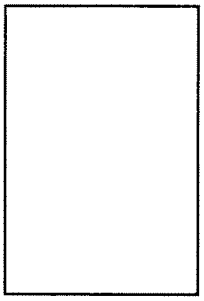
2)



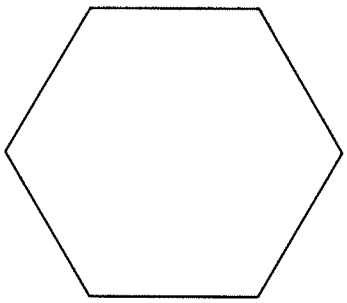
3)



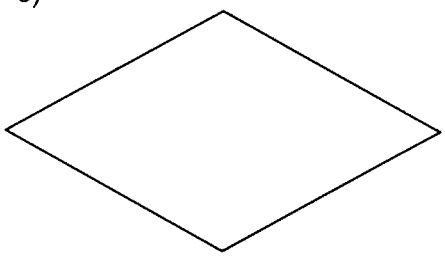
4)



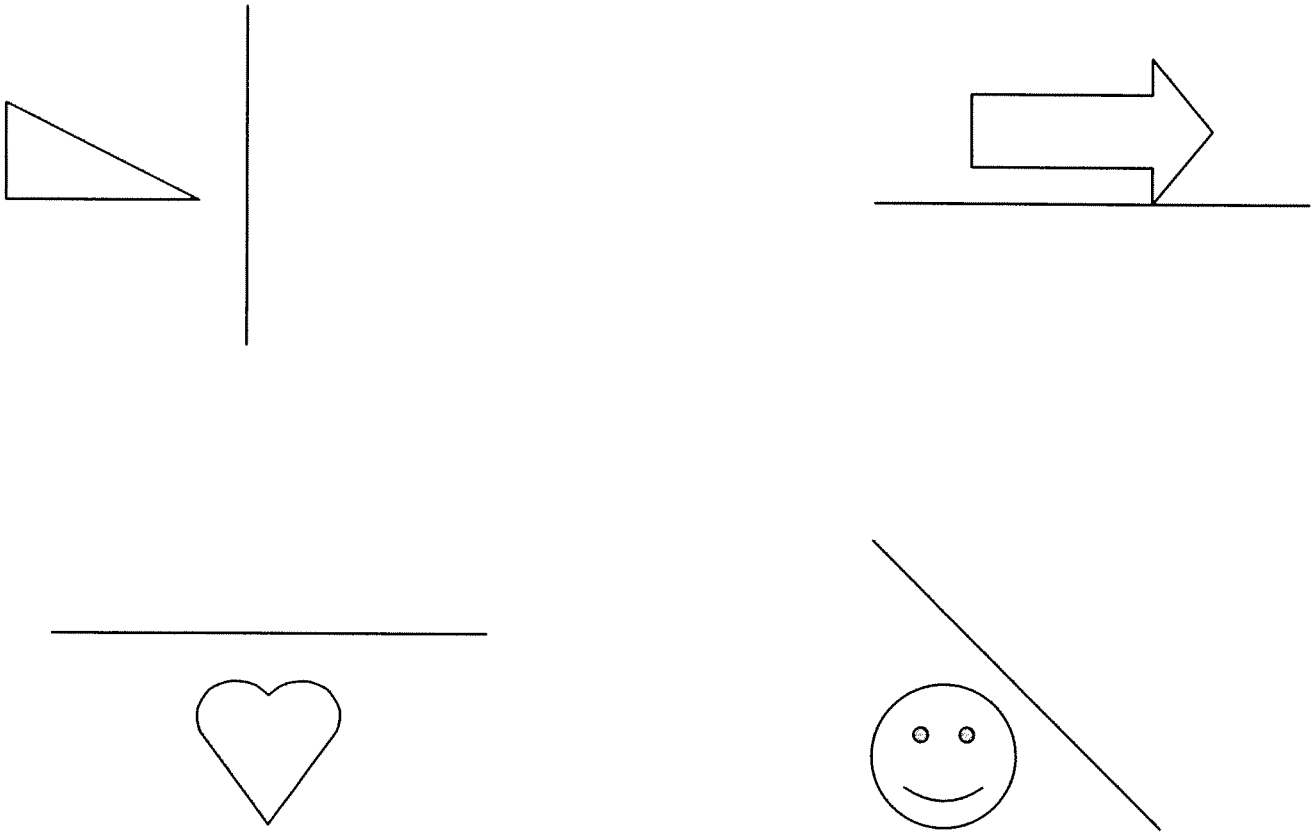
5)



6)

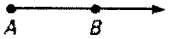


Sketch the reflection of each shape over the given line.



TOPIC 15: GEOMETRIC FIGURES

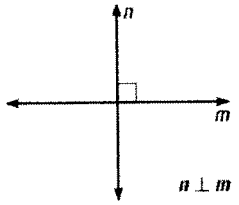
NOTES & EXAMPLES:

Geometric Figure	Picture	Notation
line		$\overleftrightarrow{AB}$
point		Point A
Ray		$\overrightarrow{AB}$
line segment		$\overline{AB}$
plane		*Plane ABC*

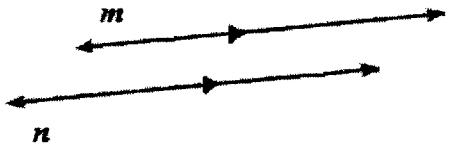
Definitions:

<u>Collinear Points:</u> Points that lie on the same line 	<u>Non-Collinear Points:</u> Points that do not lie on the same line 

Perpendicular Lines: Lines that intersect to form a right angle, the symbol for perpendicular lines is "⊥".



Parallel Lines: Lines that do not intersect, the symbol for parallel is "||." The two "arrows" in the picture illustrate parallel lines.

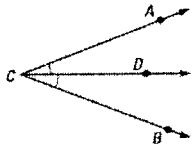


$m \parallel n$

Congruent Line Segments: Segments that have the same length. The symbol for congruence is "≅". The "notches" in the picture illustrate congruent segments.

$\overline{FG} \cong \overline{AB}$

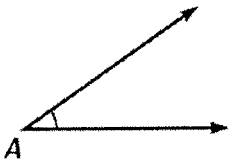
Congruent Angles: Angles that have the same measure. The symbol for congruence is "≅". The marks inside the angle illustrate congruent angles.



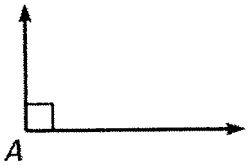
$\angle ACD \cong \angle DCB$

Midpoint: The point that divides a segment into two congruent segments.

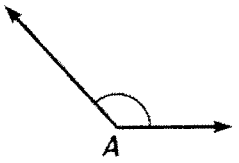
Acute Angle: An angle whose measure is between 0^0 and 90^0.



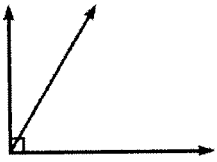
Right Angle: An angle whose measure is 90^0



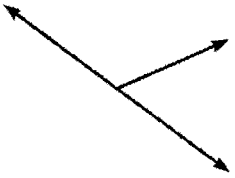
Obtuse Angle: An angle whose measure is between 90^0 and 180^0.



Complementary Angles: Two angles whose measure have the sum 90^0.



Supplementary Angles: Two angles whose measures have the sum 180^0.



PROBLEM SET: **Draw a sketch of the following.**

1) $\overline{DE}$

2) $\overline{FG}$

3) Point A

4) $\overline{BC}$

5) $\overrightarrow{GF}$

6) $\overline{HJ}$ intersecting $\overline{KL}$

7) Plane MNO

8) Plane PQR intersecting plane QRS

9) $\overline{TV} \perp \overline{UV}$

10) Collinear points XYZ

11) Right Angle Q

12) Line Segment $\overline{XY}$ with midpoint Z.

13) Collinear Points *d, E, F,* and *G*

14) A set of supplementary angles

15) A set of complementary angles

16) Parallel lines *f* and *g*

TOPIC 16: WORD PROBLEMS

PROBLEM SET: **Solve each problem by showing work or explaining your answer.**

1) Mrs. Smith, a 7th grade math teacher puts the following problem on the board: 9 – 2(3). Joe says the answer is 21, but Alex says the answer is 3. Who is correct and why?

2) Mario bought a book for $9 and 5 magazines. All together he spent $24.50. How much was the cost of one magazine?

3) Ralph weighs 282 pounds. If he loses 6 pounds a week, how long will it take him to get down to 204 pounds?

4) Mary is three times older than Seth is. If their ages total 76, how old is Mary?

5) You are riding a bicycle it takes you 28 minutes to go 8 miles. If you continue traveling at the same rate, how long will it take you to go 15 miles?

6) A microwave cooking guide includes a formula for the temperature of liquid after it is heated in the microwave on high. The guide indicated the formula is:

T = the new temperature

$\frac{7}{6}$ = the rate of heating (degrees per second)

S = the # of seconds

I = the initial temperature of the liquid

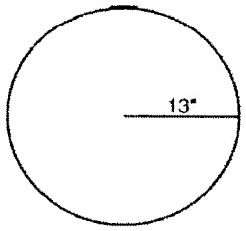
$$T = \frac{7}{6}S + I$$

What is the initial temperature of a liquid that is heated on high for 30 seconds and has a new temperature of 95 degrees?

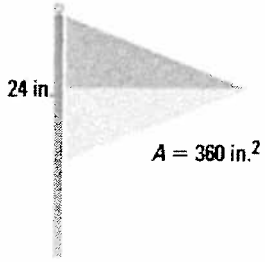
7) A rectangular pane of glass measures 12 inches by 18 inches. It is surrounded by a wooden frame that is 2 inches wide. What is the area of the window, including the frame?

8) A center pivot irrigation system uses a fixed water supply to supply water a circular region of a field. The radius of the watering system is 560 feet long. Find the area of the watered region. Round your answer to the nearest square foot.

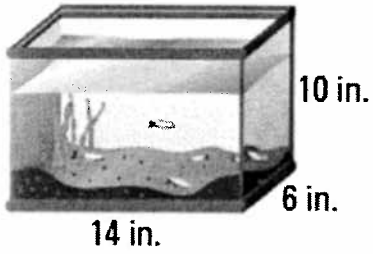
9) The rim of a bicycle wheel with a radius of 13 inches is shown below. To the nearest tenth of an inch, what is the circumference of the wheel?



10) You are making a triangular flag (as shown below) with a base of 24 in and an area of 360 in^2. What should the height of the flag be?



11) Find the volume of the water tank shown below. Leave your answer in cubic inches.



12) The capital letter "T" has reflectional symmetry as shown below. What other capital letters in the English alphabet also have reflectional symmetry?