NORTH HAVEN HIGH SCHOOL

221 Elm Street

North Haven, CT 06473

Geometry (Level 2 and Level 3)
Summer Assignment 2017

June 2017

Dear Parents, Guardians, and Students,

The Geometry curriculum builds on geometry concepts and vocabulary that were introduced in middle school and also uses a number of techniques learned in Algebra I. Completing this packet will keep foundational geometry concepts and vocabulary fresh in students' minds and provide a starting point for Geometry at the beginning of the year. Reference sheets are included in the packet to help complete the work.

Please be sure that the completed packet is brought to school on the first day of class. The teacher will check the packet and students will receive a grade based on completion. Students must show work in this packet and complete all of the problems to receive full credit. Calculators may be used when needed, but this cannot serve as a replacement for showing work. If students have trouble with an item, they should skip it, and come back to it later, but persevere in trying to solve the problem.

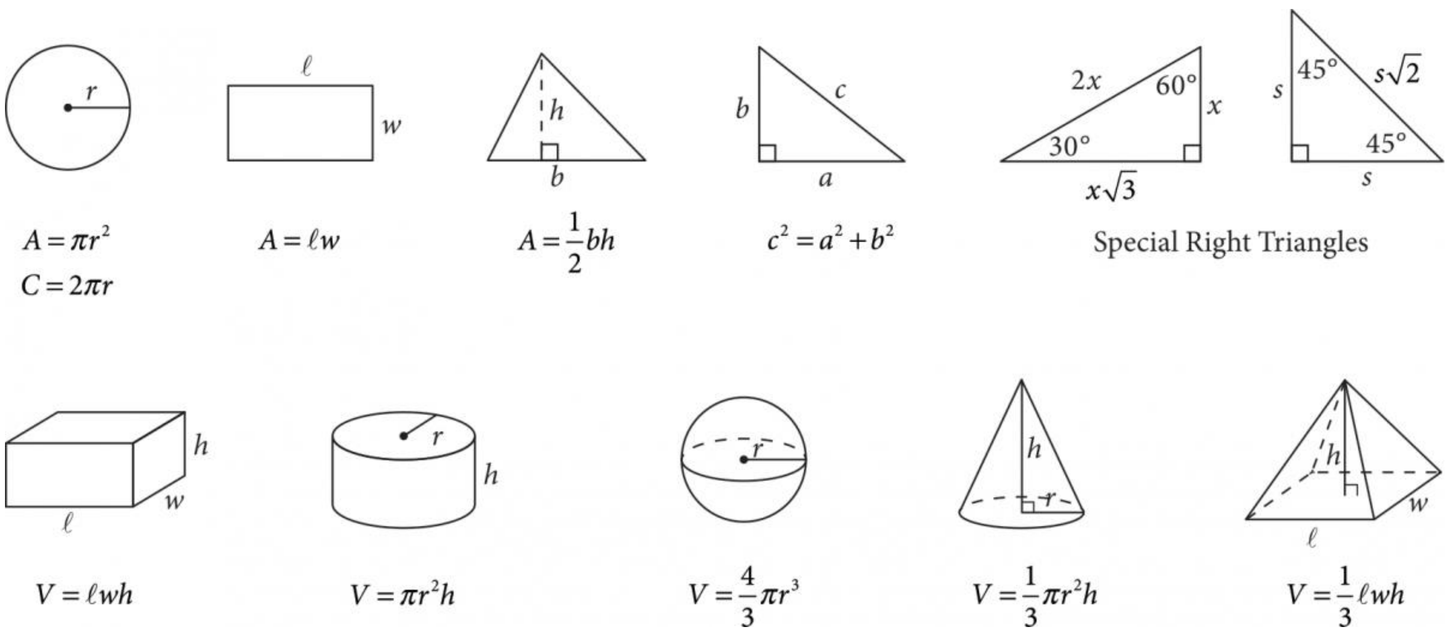
The mathematics department thanks you for your support and wishes you and your family a happy and restful summer!

Sincerely,

Ms. August, Mrs. Gaulin, and Mrs. Opramolla
Geometry Teachers

Mrs. Romberg
Mathematics Program Coordinator
romberg.tracey@north-haven.k12.ct.us

SAT Reference Information:



The number of degrees of arc in a circle is 360.

The number of radians of arc in a circle is 2π.

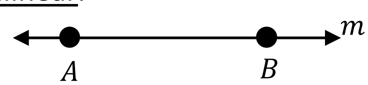
The sum of the measures in degrees of the angles of a triangle is 180.

Part 1 – Geometry Review/Preview

You should know the following vocabulary from previous math classes. Please use the following reference sheets, to complete the problems on the subsequent geometry review/preview pages.
The three undefined terms in geometry are: point, line, and plane. These are also called the "Building Blocks of Geometry" because everything is based on these three ideas. We are able to describe them but not define them.

Point – is a specific location in space with no size or shape.

Line – is a set of points that go on indefinitely in both directions. Points on the same line are said to be collinear.

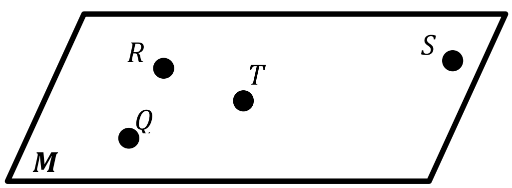


symbolic notation $\longleftrightarrow$

Possible names:
$\overleftrightarrow{AB}$
$\overleftrightarrow{BA}$
Line m

***named with any two points on the line OR**
an italicized single letter at the end of the line

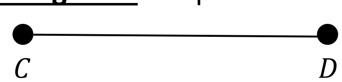
Plane – is a flat surface with no edges and no boundaries. It has two dimensions. Objects on the same plane are said to be coplanar.



Possible names:
Plane M
Plane QRT
Plane STR

***named by an upper case script letter OR**
any three non-collinear (not on the same line) points on the plane.

Line segment – is part of a line containing two endpoints and all points between the endpoints.

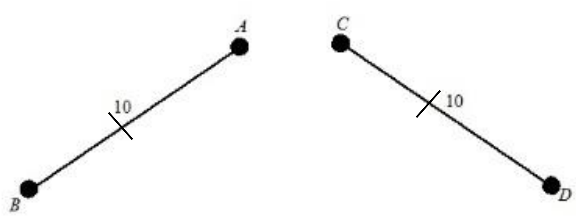


symbolic notation $-$

Possible names:
$\overline{CD}$
$\overline{DC}$

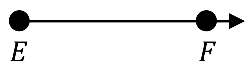
***named with the two endpoints only**

Congruent segments – two segments that have the same length. Congruent segments are marked in diagrams by tick marks or hashes.

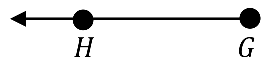


symbolic notation $\cong$
$\overline{AB} \cong \overline{CD}$ **(said as "segment** AB **is congruent to segment** CD**)**

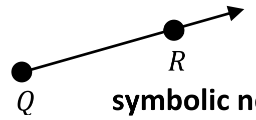
<u>Ray</u> – is a portion of a line that extends from one point indefinitely in one direction.



symbolic notation $\overrightarrow{EF}$



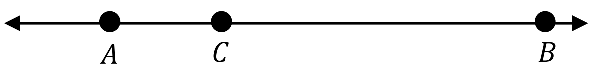
symbolic notation $\overrightarrow{GH}$



symbolic notation $\overrightarrow{QR}$

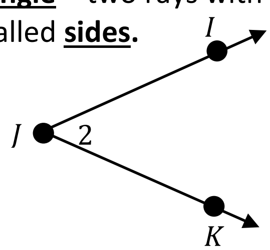
***endpoint <u>always</u> named first then <u>any</u> other point on the ray.**

<u>Opposite Rays</u> – share the same end point and are collinear.



$\overrightarrow{CA}$ and $\overrightarrow{CB}$ are opposite rays

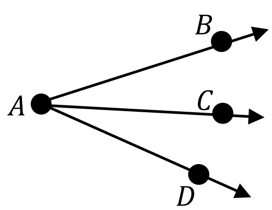
<u>Angle</u> – two rays with the same endpoint. The common endpoint is called the **<u>vertex</u>** and the rays are called **<u>sides</u>.**



symbolic notation $\angle$
J is the vertex

<u>Possible names:</u>
$\angle IJK$
$\angle KJI$
$\angle J$
$\angle 2$

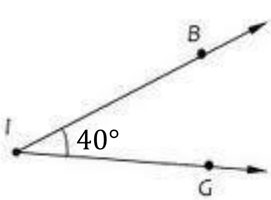
***when naming angles <u>the vertex is always the middle letter</u>, the angle can also be named by just the vertex letter or number inside the angle at the vertex.**

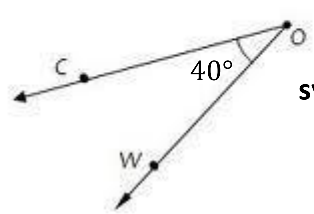


***You cannot name any of these angles $\angle A$ because the vertex is shared by three different angles.**

The most common unit of measure for angles is the <u>degree</u>. A <u>protractor</u> is used to measure angles. Use the 90° angle as your reference angle when using a protractor.

<u>Congruent angles</u> – two angles that have the same measure. Congruent angles are marked in diagrams using arcs.

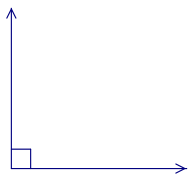
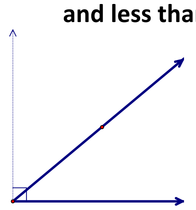
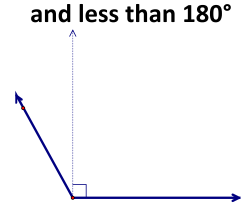
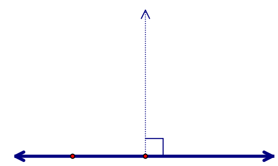




symbolic notation $\cong$

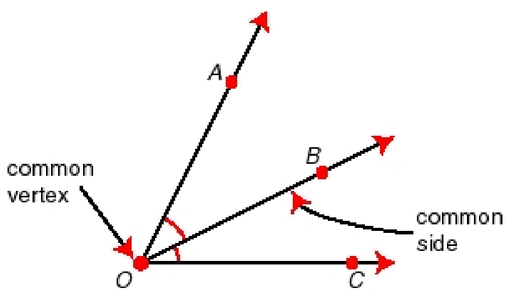
$\angle GIB \cong \angle WOC$ (said as " Angle GIB is congruent to angle WOC")

Angles can be classified by their degree measure.

Right Angle: measures exactly 90°	Acute Angle: Measures more than 0° and less than 90°	Obtuse Angle: Measures more than 90° and less than 180°	"Straight Angle": Measures 180°
			

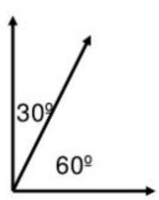
Angle Pairs:

Adjacent angles – two angles that share a common vertex and side, but have no common interior Points.

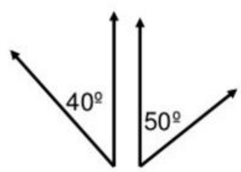


***$\angle AOB$ and $\angle BOC$ are adjacent angles**

Complementary angles – two angles whose measures have the sum of 90°

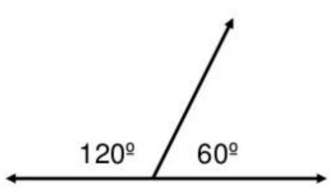


Adjacent and Complementary Angles

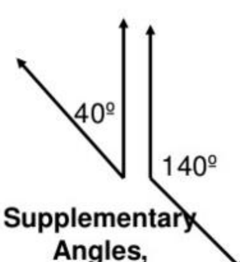


Complementary Angles but not Adjacent

Supplementary angles – two angles whose measures have the sum of 180°

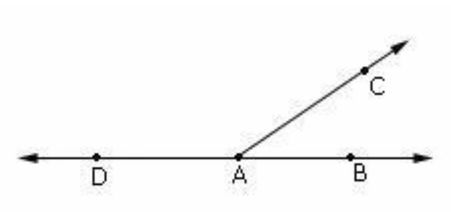


Adjacent and Supplementary Angles (aka Linear Pair)



Supplementary Angles, but not Adjacent

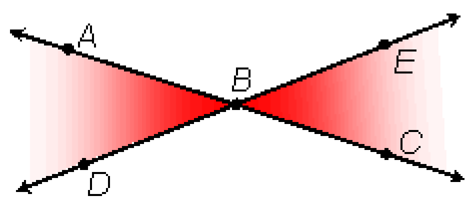
Linear Pair – two adjacent angles whose non-common sides are opposite rays (or form a straight angle)



***$\angle DAC$ and $\angle BAC$ are a linear pair**

***linear pairs are supplementary**

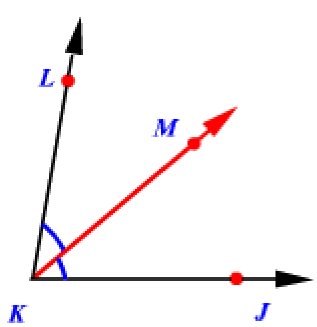
Vertical angles – a pair of non-adjacent angles formed by the intersection of two lines



***$\angle ABD$ and $\angle EBC$ are vertical angles**

***vertical angles are congruent**

Angle Bisector – a line, line segment, or ray which divides an angle into two equal parts.

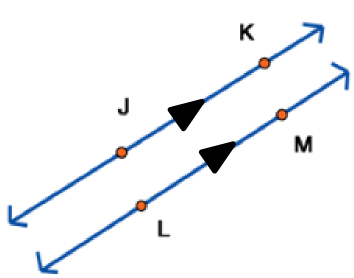


***$\overrightarrow{KM}$ is an angle bisector of $\angle LKJ$**

Intersecting Figures

Two lines intersect at one point only.
Line and plane intersect at one point only.
Two planes intersect at a line.

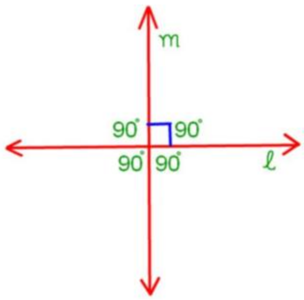
Parallel lines – coplanar lines that never intersect. Parallel lines are marked in diagrams using arrowheads.



symbolic notation ∥

$\overleftrightarrow{JK} \parallel \overleftrightarrow{LM}$ (said as "line JK is parallel to line LM")

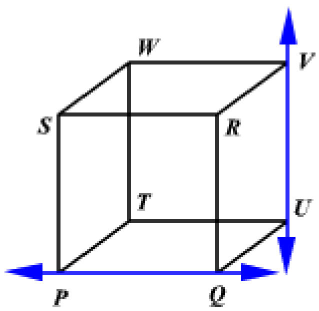
Perpendicular lines – coplanar lines that intersect forming four right angles.



Symbolic notation $\perp$

***$m \perp l$ (said as"line m is perpendicular to line l)**

Skew lines – are not parallel, do not intersect and are not on the same plane.



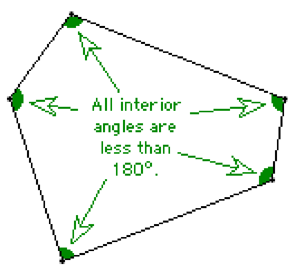
***$\overleftrightarrow{PQ}$ is skew to $\overleftrightarrow{UV}$**

Polygons- are closed figures, made up of line segments that meet only at their end points and are on one plane.

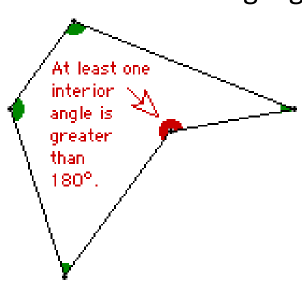
# of Sides	Polygon Name
3	Triangle
4	Quadrilateral
5	Pentagon
6	Hexagon
7	Heptagon

# of Sides	Polygon Name
8	Octagon
9	Nonagon
10	Decagon
11	Hendecagon
12	Dodecagon

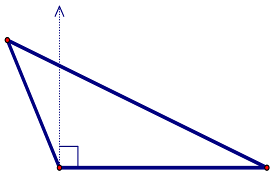
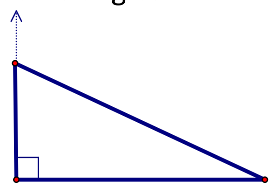
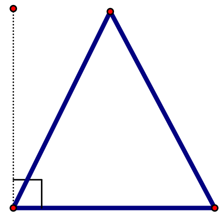
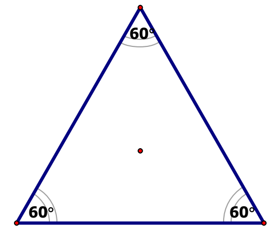
Convex polygon – a polygon that has all interior angles less than 180°. All the vertices point 'outwards', away from the center.



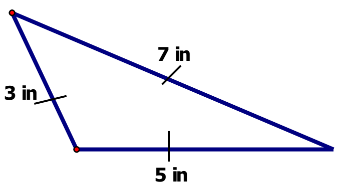
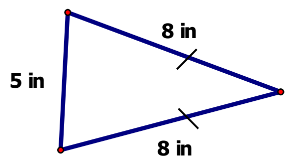
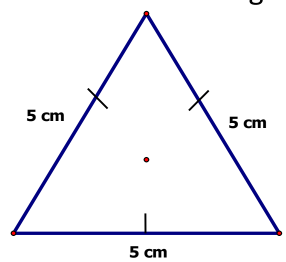
Concave polygon – a polygon that has one or more interior angle greater than 180°. Some vertices point 'inwards', towards the center.



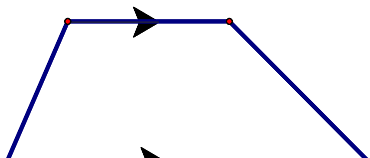
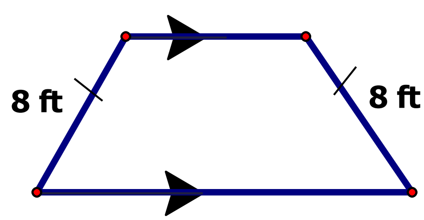
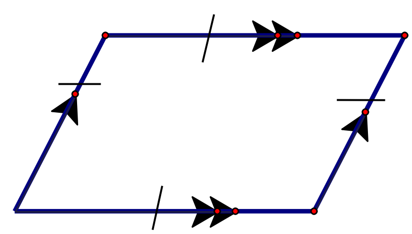
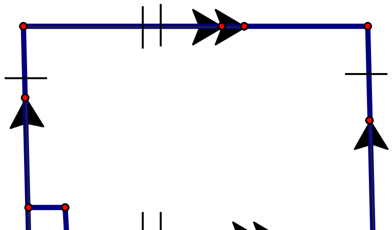
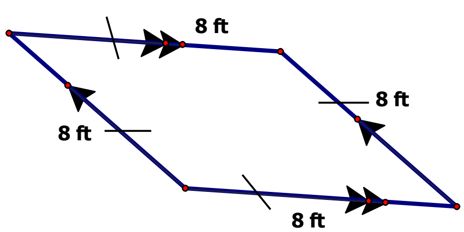
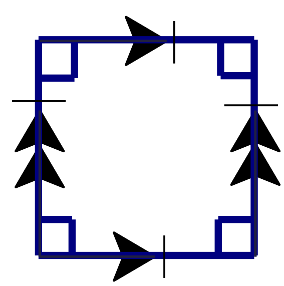
<u>Triangles</u> – There are special kinds of triangles. Triangles may be classified by their angle measures.

Obtuse Triangle: has one obtuse angle and two acute angles 	**Right Triangle:** has one right angle and two acute angles 	**Acute Triangle:** has three acute angles 	**Equilateral Triangle:** special kind of acute triangle, all 3 angles measure 60° 

Triangles may also be classified by their side lengths.

Scalene Triangle: no sides are the same length 	**Isosceles Triangle:** at least two sides are the same length 	**Equilateral Triangle:** all three sides are the same length 

Quadrilaterals – There are special kinds of quadrilaterals.

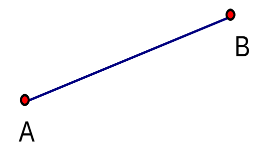
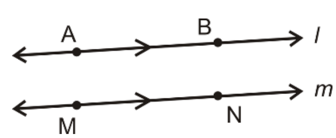
Trapezoid: has one pair of parallel sides (called bases… shown to be parallel by use of arrows) 	**Isosceles Trapezoid:** has one pair of parallel sides and the other two sides are the same length 	**Parallelogram:** has two pairs of parallel sides 
Rectangle: parallelogram with four right angles 	**Rhombus:** parallelogram with four sides that are the same length 	**Square:** parallelogram with four right angles and four sides that are the same length **All sides measure 5 feet** 

Part 2 – Geometric Figures

Sketch and label each of the following geometric figures.

1. $\overline{GE}$	**2.** $\overleftrightarrow{OM}$	**3.** Plane TRY	**4.** $\overrightarrow{IS}$
5. right $\angle XCL$	**6.** $\overleftrightarrow{TG}$	**7.** Obtuse $\angle AND$	**8.** Plane FUN
9. Pentagon	**10.** Acute $\angle DMH$	**11.** Scalene ΔLAO	**12.** Obtuse isosceles ΔNHS
13. Octagon	**14.** Straight $\angle LMP$	**15.** Right $\angle JDG$	**16.** Hexagon
17. Opposite rays $\overrightarrow{MJ}$ and $\overrightarrow{ML}$	**18.** Parallel lines $\overleftrightarrow{LI}$ and $\overleftrightarrow{CA}$	**19.** Perpendicular lines LA and $\overleftrightarrow{RQ}$	**20.** A pair of vertical angles, $\angle JPW$ and $\angle KPC$
21. $\angle QRS$ bisected by $\overrightarrow{RT}$	**22.** A pair of adjacent angles, $\angle DOG$ and $\angle LOD$	**23.** Collinear points A, B, C, and D	**24.** A linear pair, $\angle CAB$ and $\angle DAB$

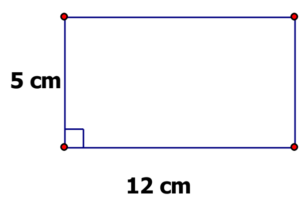
You have been given one piece of information for each of the rows below. Complete the chart with the appropriate vocabulary term, definition, diagram or symbol.

	Vocabulary Word	Description / Definition	Diagram	Symbol
25.	Line JK	a.	b.	c.
26.	d.	e.		f.
27.	g.	Angle ABC whose measure is greater than 90˚ and less than 180˚	h.	i.
28.	Ray PQ	j.	k.	l.
29.	m.	A flat surface that contains the non-co-linear points SAG and extends infinitely in all directions	n.	o.
30.	Acute Angle JKL	p.	q.	r.
31.	s.	t.		u.

Part 3 – Area

Use the SAT formula sheet to assist you in calculating the area of the following figures. Show formula(s) used and work to support your answer. The first problem is complete and a few problems have been started for you.

39.



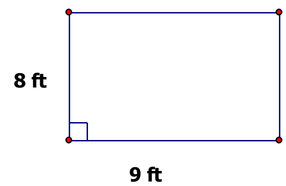
Shape(s) : *Rectangle*

Formula: $Area = base \cdot height$

Work: $Area = 12\ cm. \cdot 5\ cm.$

Answer: $Area = 60\ cm^2$

40.



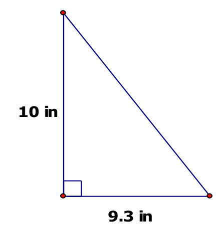
Shape(s) :

Formula:

Work:

Answer:

41.



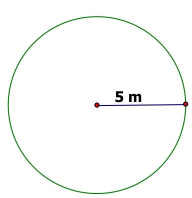
Shape(s) : *Triangle*

Formula: $Area = \frac{1}{2}\ b\ h$

Work:

Answer:

42.



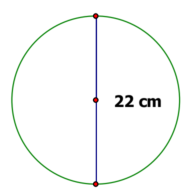
Shape(s) :

Formula:

Work:

Answer:

43.



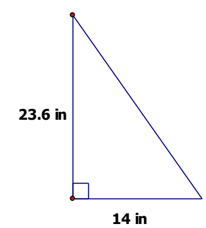
Shape(s) :

Formula:

Work:

Answer:

44.



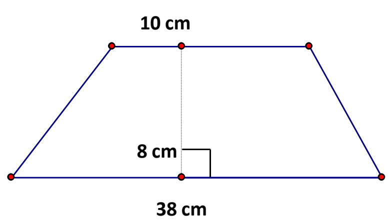
Shape(s) :

Formula:

Work:

Answer:

45.



Shape(s) : *Trapezoid*

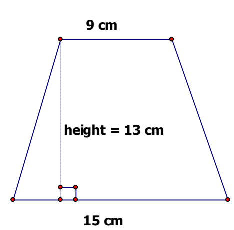
Formula:

$$Area = \frac{1}{2}(base_1 + base_2)height$$

Work:

Answer:

46.



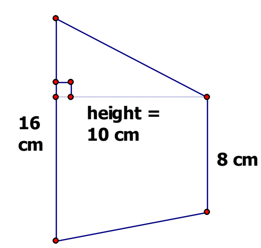
Shape(s) :

Formula:

Work:

Answer:

47.

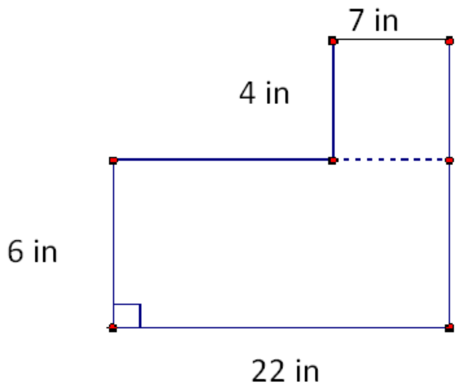
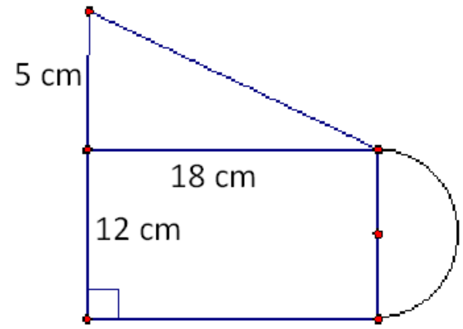
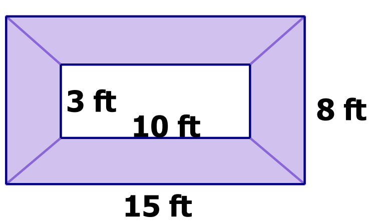
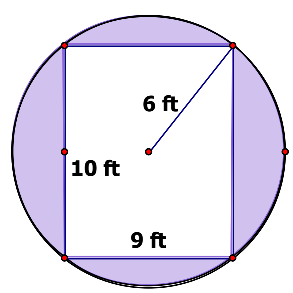


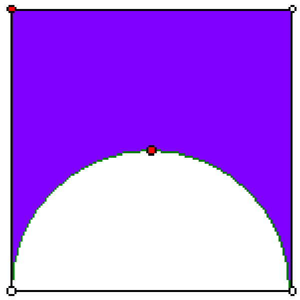
Shape(s) :

Formula:

Work:

Answer:

48.  Shape(s) : Formula(s)& Work: Answer:	49.  Shape(s) : Formula(s)& Work: Answer:
50. A 3x10 rectangle has been removed from a 15x8 rectangle. Find the area of the shaded region.  Shape(s) : Formula(s)& Work: Answer:	51. A 10' x 9' rectangle has been removed from a circle with radius 6 ft. Find the area of the shaded region.  Shape(s) : Formula(s)& Work: Answer:

52. Square with perimeter measuring 32 cm. Find the shaded area.  Shape(s) : Formula(s)& Work: Answer:	53. A swimming pool measures 18' x 32'. A cement walkway that is 3' wide is to be poured around the pool. How many square feet of cement will be poured? **Sketch a diagram and solve**. Answer:

Part 4 – Radical Expressions

You must know **(memorize!)** the following facts regarding numbers that are perfect squares. We will focus on only the positive values. When we have these values memorized, we can quickly calculate important values.

$1^2 = 1$	therefore	$\sqrt{1} =$
$2^2 = 4$	therefore	$\sqrt{4} =$
$3^2 = 9$	therefore	$\sqrt{9} =$
$4^2 = 16$	therefore	$\sqrt{16} =$
$5^2 = 25$	therefore	$\sqrt{25} =$
$6^2 = 36$	therefore	$\sqrt{36} =$
$7^2 = 49$	therefore	$\sqrt{49} =$
$8^2 = 64$	therefore	$\sqrt{64} =$
$9^2 = 81$	therefore	$\sqrt{81} =$
$10^2 = 100$	therefore	$\sqrt{100} =$
$11^2 = 121$	therefore	$\sqrt{121} =$
$12^2 = 144$	therefore	$\sqrt{144} =$
$13^2 = 169$	therefore	$\sqrt{169} =$
$14^2 = 196$	therefore	$\sqrt{196} =$
$15^2 = 225$	therefore	$\sqrt{225} =$

Example #1: Simplifying radicals

$$\sqrt{72} = \sqrt{36} * \sqrt{2} = 6 * \sqrt{2} = \boxed{6\sqrt{2}}$$

Example #2: Dividing Radicals

$$\frac{\sqrt{45}}{\sqrt{5}} = \sqrt{9} = \boxed{3}$$

Example #3: Squaring Radicals

$$\left(5\sqrt{3}\right)^2 = \left(5\sqrt{3}\right)\left(5\sqrt{3}\right) = 25\sqrt{9} = 25(3) = \boxed{75}$$

Example #4: Rationalizing the denominator

$$\frac{5}{\sqrt{3}} = \frac{5}{\sqrt{3}} * \left(\frac{\sqrt{3}}{\sqrt{3}}\right) = \frac{5\sqrt{3}}{\sqrt{9}} = \boxed{\frac{5\sqrt{3}}{3}}$$

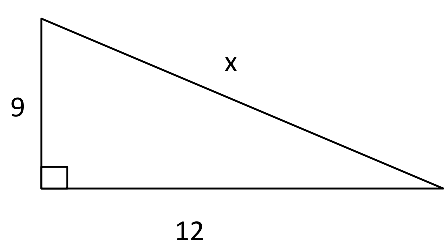
Simplify the following expressions that contain perfect squares. Show all work in boxes to receive credit. Remember: Use your perfect squares to simplify.

54. $\sqrt{50}$	55. $\sqrt{198}$	56. $\sqrt{48}$	57. $\sqrt{96}$
58. $\sqrt{16}+\sqrt{36}$	59. $(3\sqrt{2})^2$	60. $\frac{\sqrt{72}}{\sqrt{3}}$	61. $\frac{2}{\sqrt{6}}$

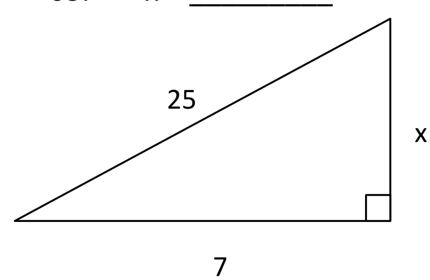
Part 5 – Pythagorean Theorem

Use the Pythagorean Theorem $(a^2 + b^2 = c^2)$ to find the missing side of each right triangle. Give answer as a whole number or a simplified radical (**no decimals**).

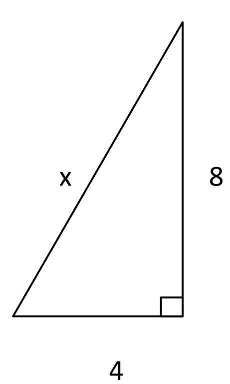
62. x = ________



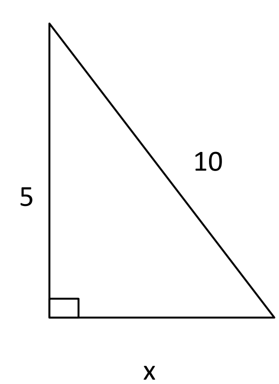
63. x = __________



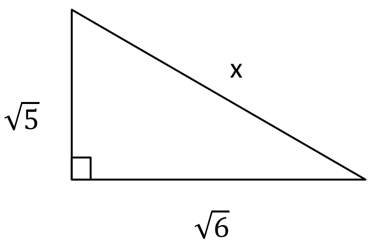
64. x = __________



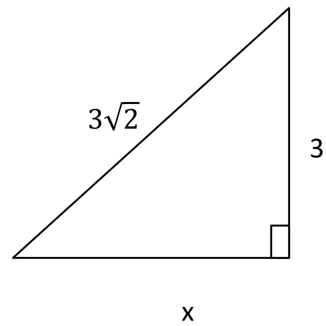
65. x = __________



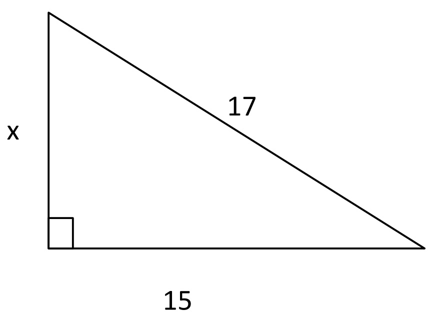
66. x = __________



67. x = __________



68. Find the missing side and then the Perimeter and Area of the right triangle.



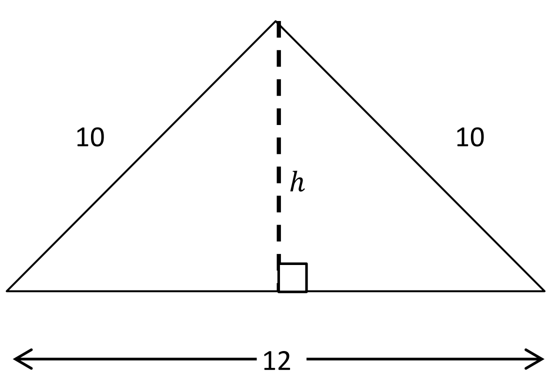
x = _________

Perimeter = _________

Area = ________

69. A 20 foot ladder is leaning against a house. The base of the ladder is 12 feet away from the house on the ground. Draw a diagram and determine how far up the house the ladder will reach.

70. Find the height and then the area of the isosceles triangle.



Height = ________

Area = _________