Math 310 Final Exam Practice Questions

A. Probability

1. A fair coin was flipped 5 times and landed heads five times. What is the probability of a head on the next toss?

2. One card is selected at random from an ordinary deck of 52 cards. Find the probability of each of the following events.
(a) A spade is drawn.
(b) The king of spades is drawn.
(c) A heart or a face card is drawn.
(d) The two of clubs is not drawn.

3. A box contains three blue cards and four white cards. Two cards are drawn one at a time.
(a) Find the probability that both cards are blue if the draws are made with replacement.
(b) Find the probability that both cards are blue if draws are made without replacement.
(c) Draw a tree diagram for the experiment in part (b), complete with all probabilities.

4. In firing a NASA three-stage rocket, the probability of the success of stage 1 is 95%, of stage 2, 97%, and of stage 3, 98%. Assuming that the stages are independent, what is the probability for success in all three stages during a single launch?

5. (a) If the odds in favor of the Dodgers winning the game are 8 to 5, what is the probability that they will win?
(b) If the probability our team will win is 2/5, what are the odds against our team?

6. Two standard dice are rolled. What are the odds in favor of rolling a sum of 3?

7. The English names of the months of the year are placed in a hat and one is drawn at random.
(a) List the sample space for this experiment.
(b) List the event consisting of the outcomes that the month drawn starts with the letter J.
(c) What is the probability of drawing the name of a month that starts with J?

8. (a) If $P(A) = 2/3$, $P(B) = 1/2$, and $P(B|A) = 1/3$, find $P(A|B)$.
(b) If two-thirds of the books in the library are new, and half of the books in the library are non-fiction, but only one-third of the new books are non-fiction, find the probability that a book selected at random from the library is new, given that it is a non-fiction book.

9. Sara has a collection of 7 books: *War and Peace*, *Steppenwolf, One Hundred Years of Solitude, Huckleberry Finn, Lord of the Flies, The Old Man and the Sea, The Grapes of Wrath.* If she randomly selects three of her books to read in sequence this month, what is the probability that she will read *War and Peace*, *Steppenwolf,* and *One Hundred Years of Solitude* in that order?

B. Statistics

1. Mrs. Jurado's class of 20 students averaged 75 on a standardized reading test. Miss Johnson's class of 25 students averaged 66. What is the mean of the two classes combined?

2. Claude paid $38.80 for dinner for himself and two friends. If one friend's meal cost twice as much as Claude's and Claude's meal cost the same as his other friend, answer the following:
(a) What is the mean cost of the meals?
(b) What is the median cost of the meals?
(c) What is the modal cost of the meals?

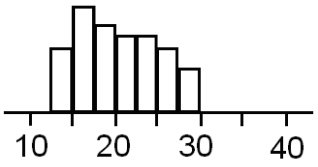
3. Find the standard deviation of this set of numbers: 5, 14, 12, 6, 7, 3, 15, 10.
Simplify your answer and express it in terms of a radical.

4. Which of the following data sets is likely to have the greatest standard deviation? Why?
A: the ages of the 37 members of the Girl's Senior Varsity Soccer Team at SFVHS
B: the ages of the 70 teachers at SFVHS
C: the ages of the 94 members of the Retired Faculty Association of SFVHS

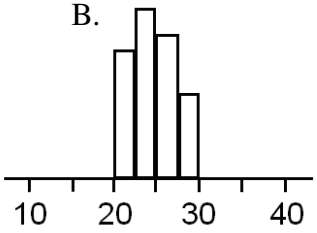
5. Without calculating, decide which set of Data has the largest standard deviation. Why?
A. 10, 20, 30, 40, 50, 60, 70, 80
B. 110, 120, 130, 140, 150, 160, 170, 180
C. 20, 40, 60, 80, 100, 120, 140, 160

6. Which data distribution appears to have the greater standard deviation?

A.



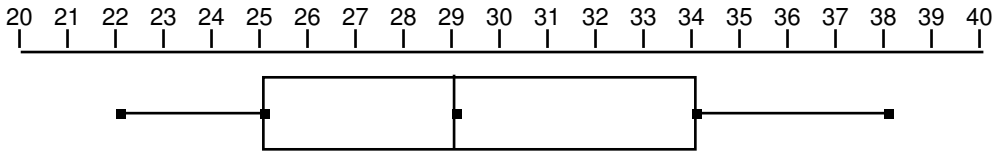
B.



7. The budget for the Women's Center is $1,000,000. If $500,000 is spent on advertising, $150,000 is spent on conferences, and the remainder is spent on long-term securities, construct a circle graph to indicate how the money is spent. Give the central angle for each sector.

8. Construct a box-and-whisker plot for the data: 6, 6, 8, 8, 1, 2, 3, 9, 10, 30, 11, 15

9. (a) Write a set of data consistent with the box-and-whisker plot below:



(b) Present your data in the form of a stem-and-leaf plot.

10. The mean age of 5 persons in a room is 30 years. A 36-year-old person walks in. What is the mean age of the persons in the room now?

11. Circle the correct answer below and show your work.

Average Tests #1 through 4 = 72
Test #4 = 84
Average Tests #4 through 7 = 82

What is the average of the seven tests?

A. 76 points B. 72 points C. 74 points D. 70 points E. 82 points

C. Measurement

1. Use the formula $F = \frac{9}{5}C + 32$ to convert the temperature 34^{o} Celsius to its corresponding temperature on the Fahrenheit scale.

2. List the following in decreasing order: 1 m^2, 9999 cm^2, 10^7 mm^2

3. Complete each of the following.

(a) 500 cm^2 = _____ m^2
(b) 81 km = _____ m
(c) 4738 g = _____ kg
(d) 300 mL = _____ L
(e) 17 m = _____ cm
(f) 0.10222 kL = _____ mL
(g) 0.027 L = _____ cm^3
(h) 3×10^6 m^3 = _____ km^3
(i) 3 miles = _____ ft
(j) 2592 in^2 = _____ yd^2

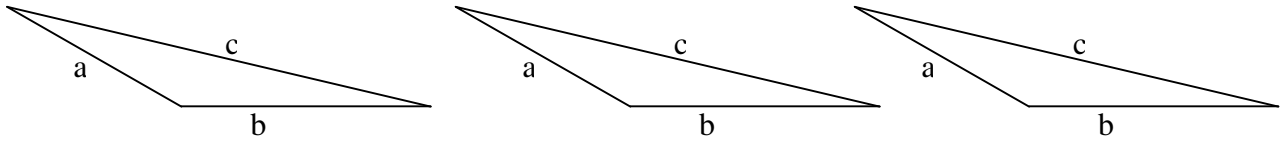
4. One edge of a cubic tank is 7 m long and the tank is filled with water.
(a) Find the volume of the tank in cubic meters.
(b) Find the capacity of the tank in liters.
(c) Find the mass of the water in kilograms.

5. Complete the following table converting metric measures.

	mm	cm	m	km
a		6200		
b			360	
c				0.3
d	2300000			

D. Basic Definitions, Lines, Angles, Triangles, Polygons

1. Draw the altitudes (heights) of the triangle if:
(a) side a is the base (b) side b is the base (c) side c is the base



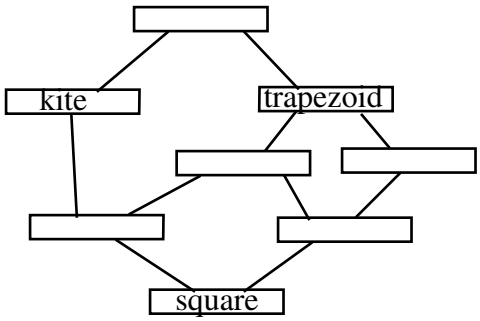
2. The perimeter of an isosceles triangle is 30 cm. Which of the following cannot be the length of the base?

A. 1 cm B. 5 cm C. 9 cm D. 15 cm

3. Use your straightedge to draw
(a) an isosceles triangle with at least one obtuse angle.
(b) a scalene, right triangle.

4. Define each figure given below fully and make a sketch of a typical example. (A definition may be based on any **previous** definition.) You may assume that "polygon" has been defined previously.
(a) quadrilateral (b) trapezoid (c) kite (d) rhombus
(e) parallelogram (f) rectangle

5. Put the following in the empty boxes below to show the relationship among the terms:
isosceles trapezoid parallelogram quadrilateral rectangle rhombus



6. Circle T for True or F for False.

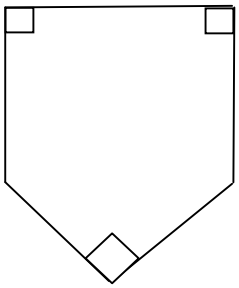
(a) T or F If AM = MB, then A, M, and B are collinear.
(b) T or F If two angles are congruent, then they are right angles.
(c) T or F The supplement of an obtuse angle is an obtuse angle.
(d) T or F A line and a point not on the line are coplanar.
(e) T or F Two distinct lines can have no more than one point in common.
(f) T or F Two skew lines determine one and only one plane.
(g) T or F If a plane contains one point of a line, then it must contain the entire line.

E. Missing Angles

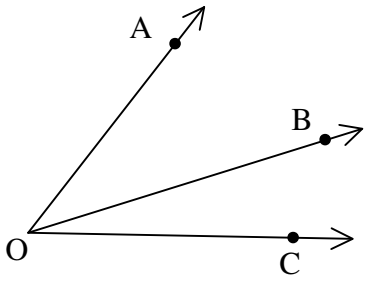
1. (a) Add the angle measurements and express your answer in degrees, minutes, and seconds: 18° 35' 29" + 22° 55' 41"

(b) If the measure of an angle is 22° 55' 41", what is the measure of its supplement? Its complement?

2. Home plate on a baseball field has three right angles and two congruent angles. Find the measures of each of these two congruent angles. Explain your reasoning.



3. Given:



$m\angle AOB = x + 10$ degrees
$m\angle BOC = 2x - 5$ degrees
$m\angle AOC = 50°$

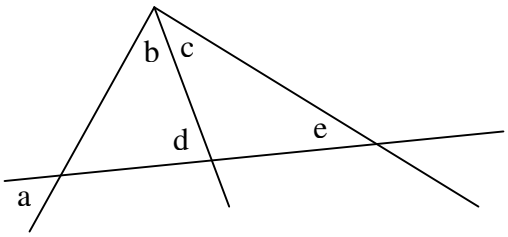
Is $\overrightarrow{OB}$ the angle bisector of $\angle AOC$?

4. Each of the interior angles of a polygon has the same measure. The sum of the measures of the interior angles is 360^o. Which of the following could be the polygon?

A. a rectangle B. a regular hexagon C. a regular pentagon D. an equilateral triangle

5. If the exterior angles of a regular polygon are 22.5° each, how many sides does the polygon have?

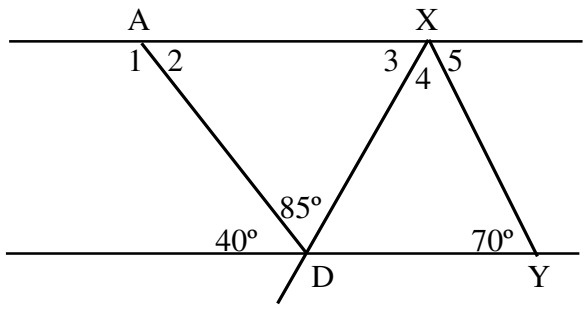
6. In the diagram, $m\angle b = m\angle c$, $m\angle a = 80^o$, $m\angle d = 75^o$. Find $m\angle e$.



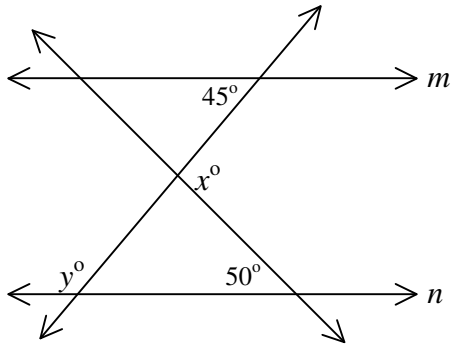
7. If the non-base angle of an isosceles triangle measures 32.33°, what are the measures of the other two angles?

F. Parallel Lines

1. If AX ∥ DY, find the measure of each angle: (a) ∠1 (b) ∠2 (c) ∠3 (d) ∠4 (e) ∠5



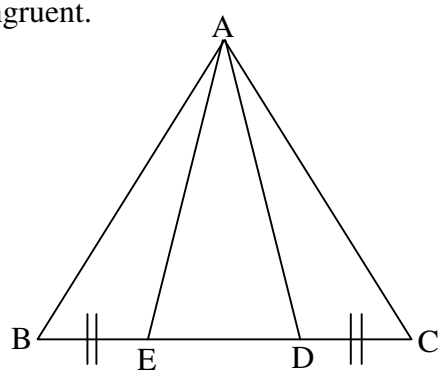
2. The lines *m* and *n* are parallel. Find the angle measures *x* and *y*.



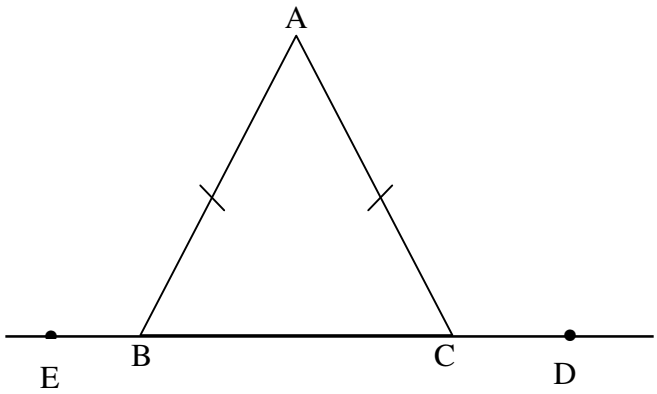
3. Explain why the sum of the measures of the three angles in any triangle is 180 degrees. You may use a picture and properties of parallel lines. Label your drawing and explain your argument using words and mathematical symbols.

G. Congruence

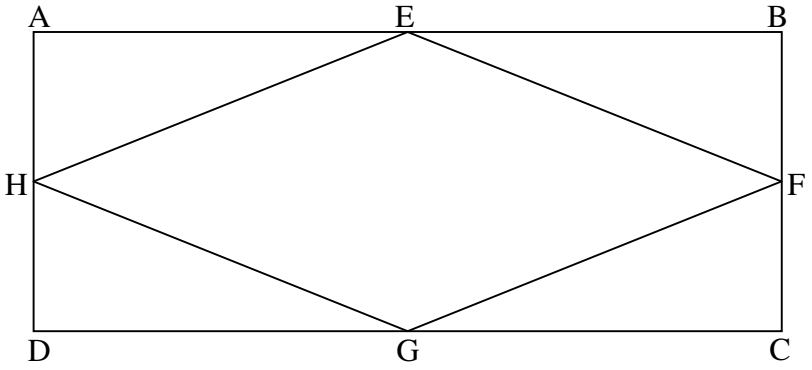
1. Triangle ABC below is equilateral. Congruent line segments are indicated. Identify one pair of congruent triangles and explain carefully why they are congruent.



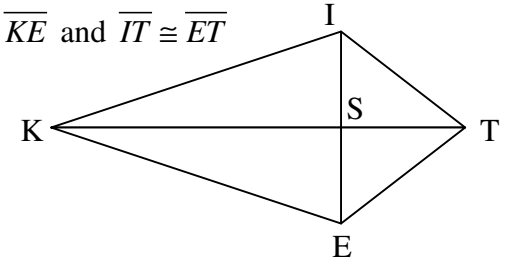
2. Given congruent segments, prove that ∠EBA is congruent to ∠DCA.



3. E, F, G, H are the midpoints of the sides of Rectangle ABCD. Prove that Quadrilateral EFGH is a rhombus.



4. Given: Quadrilateral KITE with $\overline{KI} \cong \overline{KE}$ and $\overline{IT} \cong \overline{ET}$
   Prove: $\overline{KT} \perp \overline{IE}$



H. Construction

All lines must be drawn using a straightedge. For all compass-and-straightedge constructions, all arcs necessary for the construction must be clearly shown. Leave all relevant pencil marks for the construction, and no others. Accuracy and neatness count.

1. Draw an angle. Then use your compass and straightedge to construct a duplicate copy of the angle.

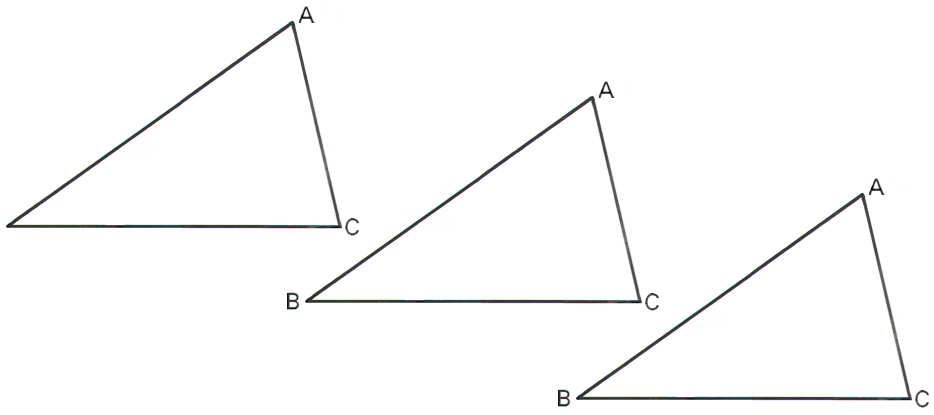
2. Draw a line segment. Mark a point not on the line segment. Then use your compass and straight edge to construct a line which contains the point and is parallel to the line segment.

3. Use your straightedge to draw a line segment. Then use your compass and straight edge to bisect your line segment.

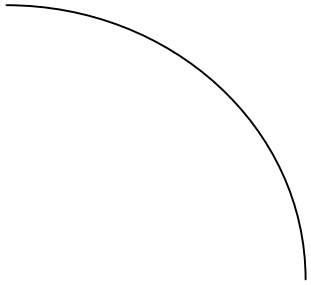
4. Construct:
(a) the bisector of angle A.

(b) the altitude through B.

(c) the median through C.



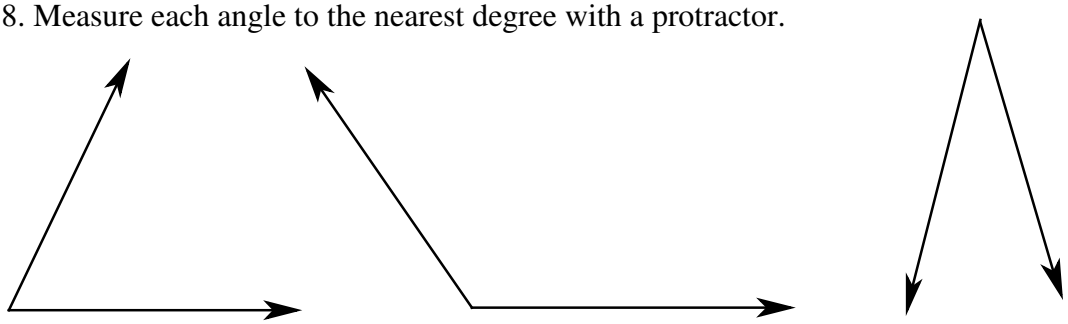
5. Use your compass and straightedge to construct
the center of the circle that includes the arc at right.



6. Use your ruler to draw a line segment
(a) $1\frac{3}{4}$ inches long.
(b) 6 centimeters long.

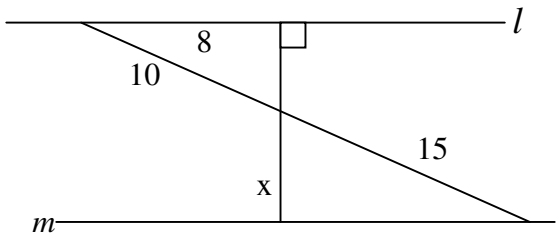
7. Carefully draw and label (A, B, etc.) each of the following examples.
(a) Two triangles, ΔABC and ΔDEF, where $\overline{AB} \cong \overline{DE}$, $\overline{BC} \cong \overline{EF}$ but triangles are not congruent
(b) Two triangles, ΔABC and ΔDEF, where $\overline{AB} \cong \overline{DE}$, $\angle A \cong \angle D$ but the triangles are not congruent

8. Measure each angle to the nearest degree with a protractor.

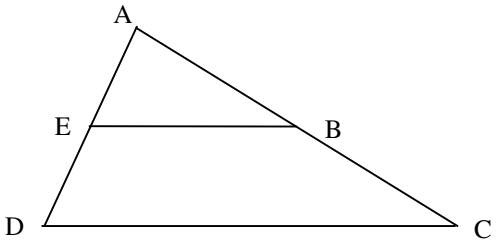


I. Similarity

1. Given lines *l* and *m* are parallel, find x.



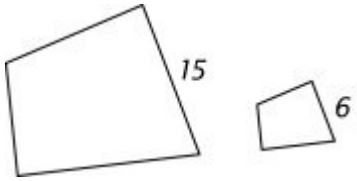
2. (a) If $\overline{EB}$ is parallel to $\overline{DC}$, does it follow that triangle ABE is similar to triangle ACD? Explain.



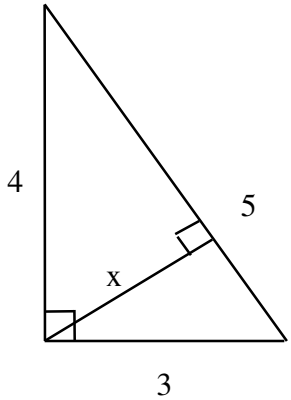
(b) If the measure of $\overline{DC}$ is 10 and the measure of $\overline{EB}$ is 7, what is the ratio of the measure of $\overline{AE}$ to the measure of $\overline{AD}$?

3. A post office's flagpole casts a shadow of 52 feet when a 6-foot mailman standing next to it casts a shadow of 8 feet. How tall is the flagpole?

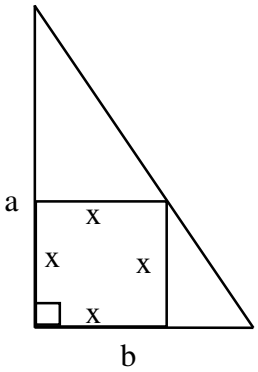
4. The quadrilaterals at right are similar.
(a-c) Comparing the second to the first, what is the ratio of
(a) their corresponding sides?
(b) their areas?
(c) their perimeters?
(d) Find the area of the second if the area of the first is 300.
(e) Find the perimeter of the second if the perimeter of the first is 80.



5. Find the length x of the altitude of the large right triangle at right. Explain your reasoning.



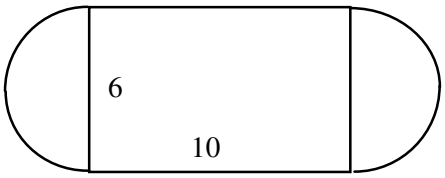
6. Find x in terms of a and b.



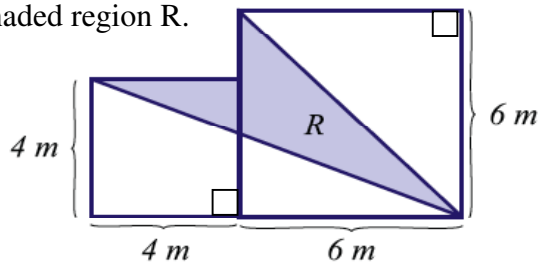
J. Perimeter and Area

1. The 6 by 10 rectangle below right has semi-circles attached on each end.

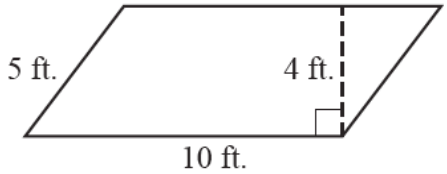
(a) Find the perimeter of the figure shown.
(b) Find the area enclosed by the figure.



2. Find the area of the shaded region R.



3. Find the area of the parallelogram at right.

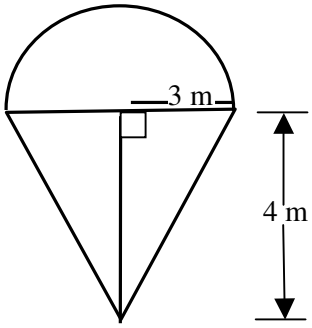


4. A circle is divided into 9 congruent sectors. The radius of the circle is 8 inches.

(a) What is the area of one of the 9 sectors?
(b) What is the arc length of one of the 9 sectors?

5. Find the area of a right triangle whose hypotenuse is 6 inches long and with one of the other sides 4 inches long.

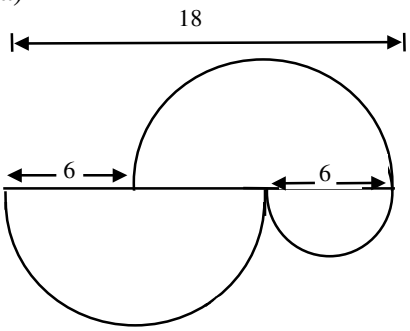
6. What is the area of the figure at right? The arc is a semicircle.



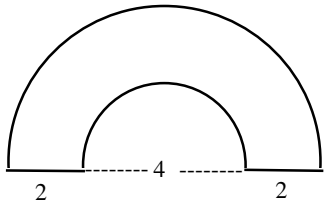
7. If the diameter of a circle is 14 cm, find each of the following.
(a) the circumference of the circle
(b) the area of the circle
(c) the area of a sector of the circle that corresponds to a central angle of 18°

8. Find the perimeters of each of the following if all arcs shown are semicircles. The measurements are in cm.

(a)



(b)



9. (a) Use your ruler to draw two rectangles with the same perimeters, but different areas. Calculate the areas and perimeter.

(b) Use your ruler to draw two rectangles with the same areas, but different perimeters. Calculate the area and perimeters.

K. Solids, Surface Area, and Volume

1. Both the radius and height of a cylinder are the same as the radius of a sphere.
(a) Which of the two, if either, has the greater volume? Explain your answer; no credit for guessing.
(b) Which of the two solids, if either, has the greater entire surface area? Explain your answer; no credit for guessing.

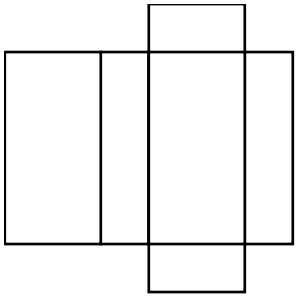
2. Find the surface area (including both bases) of a cylinder whose volume is 18π m^3 and whose base has area 9π m^2.

3. If the volume of a cube is 8 cm^3, what is its surface area?

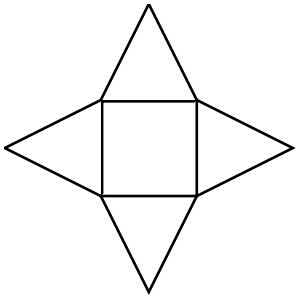
4. Find the surface area of a square pyramid of which the area of the base is 36 cm^2 and the height is 4 cm.

5. Name the polyhedron formed by each net.

(a)



(b)

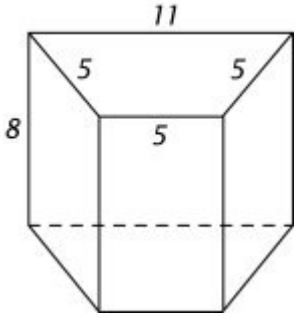


6. Find the volume of a right circular cone whose slant height is 50 cm and whose height is 0.4 m.

7. (a) If the volume of a sphere is $\frac{500\pi}{3}$ m^3, what is the radius?

(b) Find the volume of a circular cylinder whose height is 2 m and whose base radius is 3 m.
(c) Find the height of a square pyramid if the base has side 5 cm and the volume is 75 cm^3.

8. The bases of the right prism shown at right are isosceles trapezoids. Find its volume.



9. This solid is a regular dodecahedron.

(a) How many faces does it have?
Hint: How many faces border the face on top? On the bottom?

(b) Explain why the expression $\frac{12 \times 5}{3}$ can be used to find its number of vertices.

(c) How many edges does a dodecahedron have?

10. Sketch a prism and a pyramid each with hexagonal base.
(Sketch should be neat, done using a straightedge, with "hidden" edges dashed as in #8 above.)

L. Pythagorean Theorem

1. Prove the Pythagorean Theorem.

2. Find the number x so that 3/x, 4/5, and 1 are the lengths of a right triangle with hypotenuse of length 1.

3. For each of the following, can the measures represent sides of a right triangle? Explain your answers.
(a) 6, 8, 10
(b) $\sqrt{2}$, $\sqrt{3}$, 5

4. An adventurer leaves her home first driving 3 miles west and then 4 miles north. She then goes one mile straight up in the air in her hot air balloon. How far away from home is she?

5. Find the distance between the points (–1/2, 1) and (3/2, 4/3).

*6. *Challenge Problem* (too hard for final, but good practice): The perimeter of a right triangle is 40 cm. If the shortest side is 8 cm long, find the difference in length between the other two sides.

M. Coordinate Geometry

1. a) Find the equation of a line, with y-intercept –3, that is parallel to the line containing the points (1, 2) and (3, 5).

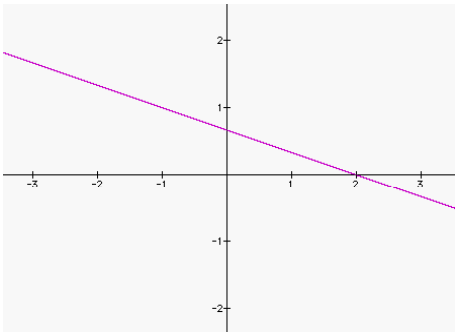
b) Find the equation of a line, with x-intercept 4, that is perpendicular to the line $y = 2x + 5$.

2. A candle initially 20 inches tall burns at a constant rate of 1.5 inches per hour.

a) Find an equation for the height y of the candle after it has burned for x hours (assume that x is not so large that the candle has burned down).

b) How many hours will the candle burn?

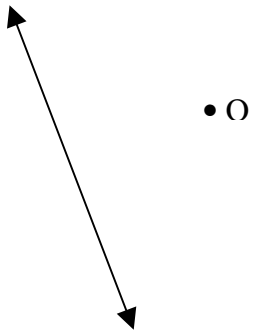
3. Identify the equation whose graph is best represented by this picture.



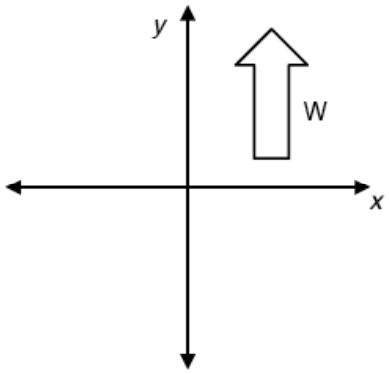
A. $2x + 6y = 4$ B. $2x + 6y = 8$ C. $3x + 4y = 6$ D. $2x + 6y = 16$

N. Rotations, Reflections, Translations, Symmetry

1. Use a compass and straightedge to find the image of the line under a 180 degree rotation about the point O.

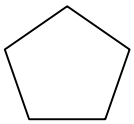


2. In the diagram below, draw the image of arrow W, reflected across the y-axis and then rotated 180^o about the origin counterclockwise.



3. For each of the following transformations, describe a geometric object that is transformed to itself by:
   (a) reflection
   (b) rotation
   (c) translation

4. a) What is the smallest (nonzero) angle of rotational symmetry for a regular pentagon?



b) How many lines of symmetry does a regular pentagon have? Draw them.