SAMPLE FINAL EXAM QUESTIONS: GEOMETRY

The purpose of these sample questions is to clarify the course objectives, and also to illustrate the level at which objectives should be mastered. Each Geometry final exam will have a part that is common to *all* Geometry sections; this common part will consist of problems that are similar in format to these Sample Final Exam Questions. The remainder of the final exam will be created by the individual instructor.

These sample questions are freely available to both instructors and students. They may be used throughout the year for homework, quizzes, and tests.

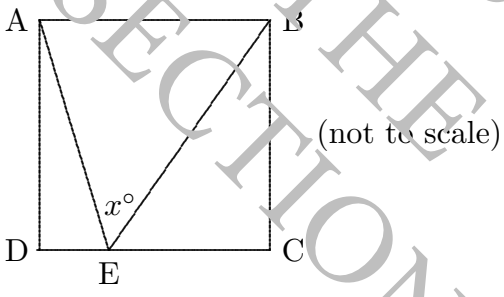
These sample questions have been carefully created to have the following properties:

- They do a good job of assessing achievement of the course objectives.
- They have enough inherent variability that their use cannot be construed as "teaching to the test."

There are many problems that incorporate algebra into geometry in a superficial way, while testing important properties of geometric figures. Here are some examples. *Any* required properties could be tested here.

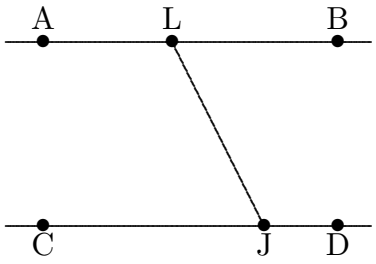
1. (a) In $\triangle PQR$, $\angle Q \cong \angle R$. If $PQ = 10x - 14$, $PR = 2x + 50$, and $RQ = 4x - 30$, find the value of x.

   (b) In the accompanying diagram, $ABCD$ is a rectangle, E is a point on $\overline{CD}$, $m\angle DAE = 20°$, and $m\angle CBE = 30°$. What is $m\angle x$?



   (c) In $\triangle ABC$, $m\angle A = 3x + 40$, $m\angle B = 8x + 35$, and $m\angle C = 10x$. What is the longest side of the triangle?

   (d) In the accompanying diagram, A, L and B are collinear; C, J, and D are collinear. If $m\angle JLB = 6x - 7$ and $m\angle LJD = 7x + 5$, find the value of x.



Problems (2), (3) and (4) help to distinguish between the level of proof expected in Honors classes and non-Honors classes. Problems (2) and (3) are for all classes; problem (4) is for Honors classes only.

2. Next to each letter, write a valid conclusion that can be deduced from each set of true statements. If no valid conclusion can be deduced, write "no conclusion."

   (a) A or B
   not A _____

   (b) $P \Rightarrow Q$
   P _____

   (c) $A \Rightarrow B$
   B _____

   (d) (not A) $\Rightarrow$ (not B)
   B _____

3. Negate each of the following sentences. Write the negation as simply as possible.

sentence	negation
$x < 3$	

Carol has red hair and is short.

$P \Rightarrow Q$

$x = 3$ and $y \geq 4$

4. Write a two-column proof.

GIVEN: If Fred does not waste time in class, then he does well in Geometry.

If Fred is absent from class, then his grades will go down.

Either Fred does not waste time in class, or Fred is absent from class.

Fred's grades do not go down.

Let T represent "Fred wastes time in class."

Let A represent "Fred is absent from class."

Let S represent "Fred's grades go down."

Let B represent "Fred does well in Geometry."

PROVE: Fred does well in Geometry.

Questions may certainly draw on prerequisite skills: e.g., finding slopes of lines and distances between points, as illustrated in the following problem:

5. Quadrilateral $ABCD$ has vertices $A(-3,6)$, $B(6,0)$, $C(9,-9)$, and $D(0,-3)$. Prove that ABCD is a parallelogram, but *not* a rhombus.

6. (a) Write the equation of the circle with center $(1,-3)$ and radius 5.

   (b) Is the point $(3,0)$ on the circle described above? Justify your answer.

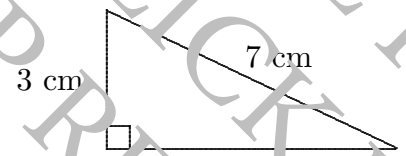
7. Find the area of each of the following geometric figures. Be sure to include correct units.

   (a) the circle through the points $(0,0)$ and $(3,4)$

   exact area: _____

   area rounded to the nearest hundredth: _____

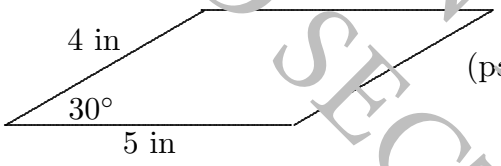
   (b)



   exact area: _____

   area rounded to the nearest hundredth: _____

   (c)



   exact area: _____

   area rounded to the nearest hundredth: _____

8. Find the requested volumes. Be sure to include correct units.

(a) A can of tennis balls has the shape of a right circular cylinder, as shown below. It contains three spherical tennis balls, each having radius 1.5 inches. Find the volume of the container.

volume, rounded to the nearest hundredth: _____

(b)

exact volume: _____

(c) The circumference of the Earth is approximately 25,000 miles. Find the volume of the Earth.

volume, rounded to the nearest hundredth: _____

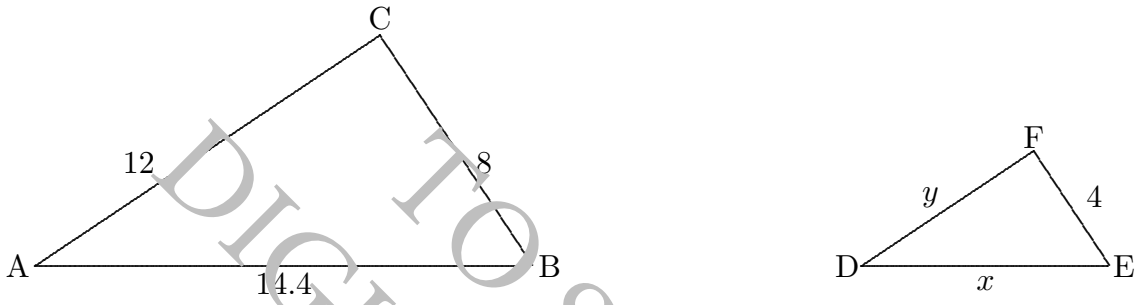
Here are two ways that understanding of basic vocabulary can be tested: by asking for definitions, or by asking for examples:

9. Write a definition for each of the following:
   (a) a geometric figure
   (b) an isosceles triangle
   (c) a regular hexagon
   (d) a cylinder
   (e) skew lines
   (f) an acute angle

10. Make a sketch illustrating each of the following sets of requirements. If not possible, so state.
   (a) a rectangle that is not a square
   (b) a non-convex two-dimensional object
   (c) a chord of a circle that is not a diameter
   (d) a right triangle

Certainly the concepts of similarity and congruency must be addressed:

11. In the accompanying diagram, $\triangle ABC$ is similar to $\triangle DEF$, $AB = 14.4$, $BC = 8$, $CA = 12$, $DE = x$, and $EF = 4$. Find x and y.



12. (a) What does it mean to say that two geometric figures (in a plane) are *congruent*?

(b) What does it mean to state that two triangles are congruent by SSS?

(c) Is there a SSA congruency theorem for triangles? If not, give a counterexample.

(d) In the diagram below, $\angle A \cong \angle E$, and C is the midpoint of $\overline{AE}$. Correctly state two triangles that are congruent, and justify by citing an appropriate congruency theorem.