At least 5 of these questions (potentially in a slightly modified form) will appear on exam #2.

1. A fixed point of a rigid motion is a point that is taken to itself by the rigid motion. Identify the fixed points of the four rigid motions and use this information to identify the type of the rigid motion formed by reflecting about the line $y = 4x + 3$ followed by reflecting about the line $y = 7x + 9$.

2. There are three regular tilings of the plane, what are they? Why are there no other regular tilings of the plane?

3. Describe all the symmetries of a regular hexagon.

4. A reflection takes the point $(8, 0)$ to the point $(0, 6)$, what is the line of reflection?

5. Explain why there is no semi-regular tiling of the plane by squares, triangles, and pentagons.

6. Show that there is a 12-sided figure that tiles the plane. Describe how the figure could be modified to make an 13 sided figure that tiles the plane.

7. Draw a finite line segment AB in the plane and an infinite line ℓ parallel to AB. Explain how to construct the five points $C_1, C_2, \ldots, C_5$ on ℓ such that the triangle formed by A, B, and C_i is isosceles.

8. $\square ABCD$ is a square of area 25. Four triangles are formed by drawing lines from A to the midpoint of BC, from B to the midpoint of CD, from C to the midpoint of AD, and from D to the midpoint of AB. What is the shape formed in the center of this picture?

9. A large circle is drawn on a sheet of paper. Using a straightedge and compass, how would you construct the center of the circle?

10. The midpoints of the sides of the triangle $\triangle ABC$ are connected to form 4 smaller triangles within $\triangle ABC$. Explain the relationship between these smaller triangles and between any of the smaller triangles and the triangle $\triangle ABC$.

11. Why is the sum of the lengths of the diagonals of a quadrilateral longer than the sum of the lengths of opposite sides.

12. In the construction of steel frame objects (such as bridges) you will see many more triangles than squares or other polygons. Explain why this might be. It may be helpful to compare properties of a triangle formed by bolting three steel beams together to the properties of a quadrilateral formed by bolting four steel beams together.

13. What is the length of the altitude drawn to the hypotenuse of a $(5, 12, 13)$ right triangle.

14. Alice and Bob are taking a hike together. They leave there car and walk 3 miles in a straight line until they reach a waterfall and then they walk another 4 miles to the cliff over the river. As the leave the cliff face and begin to walk back to their car, Bob looks at the GPS on his phone and complains about having an 8 mile walk back to the car. Alice tells him he better get a new phone because there is no way that they are 8 miles from the car. Who is right and why?

15. The shadow from a 5 story building (50 feet tall) stretches all the way across the street to the end of the sidewalk which is 100 feet from the front of the building. You notice the that the shadow of the flagpole that is 10 feet in front of the building, also just reaches the sidewalk. How tall is the flagpole?