(15) 1. A building casts a shadow which is 60 feet long. A nearby fence has a pole 6 feet tall which casts a shadow 8 feet long. How tall is the building? Briefly describe every concept from geometry involved in this problem.
2. A spherical tank of radius 2 meters holds $2,000 worth of a chemical. How much can a larger spherical tank of radius 6 meters hold? (Hint: You do not need to use a volume formula.)

3. In a family with three children, we know that one child is a girl. What is the probability that the other two children are boys?
(15) 4. Will the following teeter-totter balance? If not, how should the fulcrum be moved so that it will balance?

(15) 5. Let point $X$ be the center of the square $ABCD$ of side length $AB = 10$ centimeters. Assume that the angle $YXZ$ is a right angle. Find the area of the quadrilateral $XYCZ$. Explain your answer.
6. (a) Explain why only triangles, squares, and hexagons can be used if a single type of regular polygon is to tile the plane.

(b) Explain why only triangles, squares, and pentagons can be used as the faces of a regular polyhedron.
7. Let point $A$ be the center of one circle and let point $B$ be the center of a second circle. Assume the two circles intersect in the two points $X$ and $Y$. Explain why the line segment $AB$ and $XY$ are perpendicular. (Hint: Find congruent triangles.)
(20) 8. Five students take a quiz, and their scores are \{5, 5, 5, 10, 10\}.

(a) Find the mean, median, and mode.

(b) Four additional students take the quiz. The mean for the nine students is one less than it was for the five students, the median is one greater, and the mode is unchanged. What are the four scores of the additional students? (Hint: First explain why one of the scores must be 6, and next find the sum of the four additional scores.)
(20) 9. (a) Discuss the **rotational** symmetries of the wallpaper pattern formed by tiling the plane with equilateral triangles, colored as shown below. Describe the fixed points and the various angles of rotation.

(b) Discuss the **glide reflections** of this colored triangular wallpaper pattern.