Each correct answer is worth 25 points.

1. Find the smallest integer $X$ such that 5,896,800 times $X$ is a perfect cube.

2. Points $A(0, 0)$, $B(5, y)$ and $C(12, 6)$ form a right angle $\angle ABC$. Find all possible values for $y$.

3. What is the sum of the digits of $10^{45} - 45$?

4. In the picture at right the two large circles are tangent to each other and to line $m$. The smaller circle is tangent to each of the larger circles. If the radius of the larger circles is 4 inches and the radius of the smaller circle is 2 inches, how far is the top of the smaller circle from line $m$?

5. Two wheels, one 20 inches in diameter and the other 16 inches in diameter, are fastened to the ends of a rigid axle 2 feet long. As the axle turns the wheels travel in two concentric circles. What is the radius of the circle traveled by the larger wheel?

6. A tour bus company knows from experience that if it charges $960 for a certain tour there will be a full bus of 80 passengers. However, for each $30 increase in the cost of the tour the number of passengers decreases by 2. How much should the company charge for the tour in order to maximize revenue?

7. If Bert can beat Ernie by one-tenth of a mile in a one mile race and Ernie can beat Elmo by one-fifth of a mile in a one mile race, by what distance would Bert beat Elmo in a one mile race?

8. A group of 24 adults and 36 children comes to a river they wish to cross. They find a small boat that will hold 1 adult or 2 children. Everyone is able to row the boat. How many trips will it take for everyone to get across the river? (A round trip across the river is two trips.)