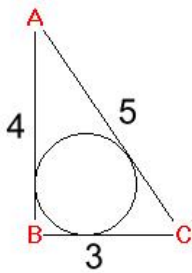


Eastern Shore Mathematics Competition - November 14, 2001

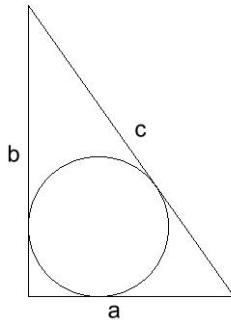
Instructions: Complete as many problems as you can in the time provided. To receive full credit for a problem, show all work and provide a clearly written explanation. (Little credit will be given for an answer consisting of just a number or a single phrase.)

1. For each of the following, find the area of the circle inscribed in the given right triangle.

(a)



(b)

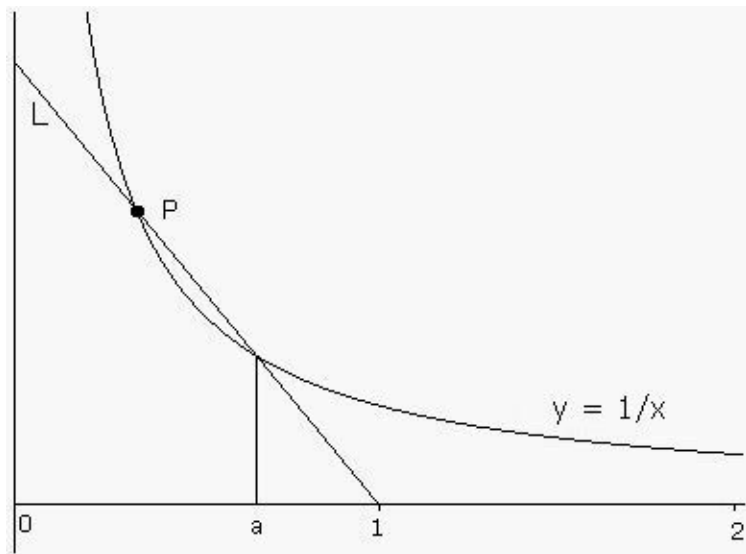


Note: For (b), give the area of the circle in terms of a , b and c .

2. A five gallon radiator contains a mixture of water and antifreeze.
- (a) Suppose the mixture is currently 40% antifreeze. How much of the mixture must be drained, and replaced with *pure* antifreeze, so that the mixture will become a 50% antifreeze solution?
 - (b) Generalize part (a), as follows: suppose the mixture is currently $x\%$ antifreeze, and we desire a $y\%$ antifreeze solution. In terms of x and y , how much of the mixture must be drained, and replaced with pure antifreeze, to achieve a $y\%$ solution?

3. Two motorists set out at the same time from A to B, a distance of 100 miles. They follow the same route but travel at different speeds. Each travels at a constant rate which is an integer number of miles per hour, and their speeds differ by a prime number of miles per hour. After driving for two hours, the distance of the slower car from A is five times that of the faster car from B. What is the speed of each motorist?
4. A box contains 5 computer memory chips, 2 of which are defective. The chips are tested, one at a time, until the second defective chip is found.
- (a) What is the probability that the fifth chip to be tested will be the second defective chip?
- (b) Can you generalize this probability for n chips? (That is, answer question (a), but under the assumption that the box contains n chips, with $n \geq 5$, of which 2 are defective.)

5. Refer to the diagram below. Assume that the curve $y = \frac{1}{x}$ intersects the line L at $x = a$, and that L intersects the x -axis at $x = 1$. Assume also that L and $y = \frac{1}{x}$ both pass through point P .



- (a) Find the y -intercept of line L .
- (b) Find the slope of line L .
- (c) Identify the coordinates of point P .