

RHIT High School Math Contest 2014

Prob 1. If $x + \frac{x}{3} = 2x + 7$ then x is

- a) $-21/4$ b) $-21/2$ c) $21/4$ d) $21/2$ e) none of these

Prob 2. A simplified value of the fraction $\frac{\frac{5}{6} + \frac{1}{3}}{2 + \frac{1}{9}}$ is

- a) $10/19$ b) $21/38$ c) $11/19$ d) $23/38$ e) none of these

Prob 3. A glass is full of water. The total weight of the glass and water is 12 ounces. After drinking half of the water, the weight of glass and remaining water is 7 ounces. What is the weight of the glass in ounces?

- a) 1 b) 2.5 c) 1.5 d) 2 e) none of these

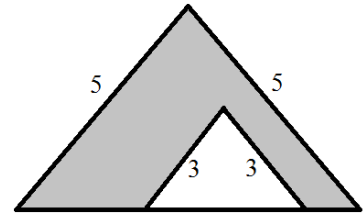
Prob 4. Three fair coins are tossed. What is the probability that the all land heads?

- a) $1/3$ b) $1/6$ c) $1/9$ d) $1/12$ e) none of these

Prob 5. The original price of a dress is discounted by 10 percent and then the discounted price is increased by 20 percent giving the final price of the dress. The final price is what percent of the original price?

- a) 108 b) 100 c) 110 d) 112 e) none of these

Prob 6. Two isosceles right triangles with side lengths 3 cm. and 5 cm. are positioned as shown in the figure. The area of the shaded region (in square centimeters) is



- a) $21/2$ b) 6 c) 8 d) 9 e) none of these

Prob 7. A number added to its self is the same as the number divided by 4. What is the number?

- a) 16 b) 8 c) 4 d) 2 e) none of these

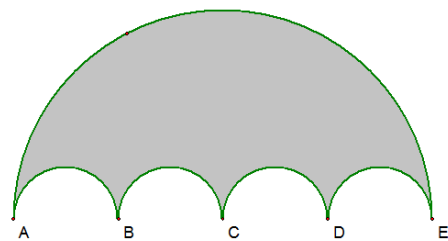
Prob 8. Let S be the sum of the two upper faces when two fair dice are rolled. The probability that S is a perfect square is

- a) $1/9$ b) $1/12$ c) $2/9$ d) $7/36$ e) none of these

Prob 9. The sum of the ages of Molly and Polly is 10. The product of their ages is 21. The sum of the squares of their ages is

- a) 54 b) 56 c) 58 d) 60 e) none of these

Prob 10. The points $A, B, C, D,$ and E lie on a line with $AB = BC = CD = DE = 1$. The shaded region is bounded by five semicircles as shown in the figure. The perimeter of the shaded region is

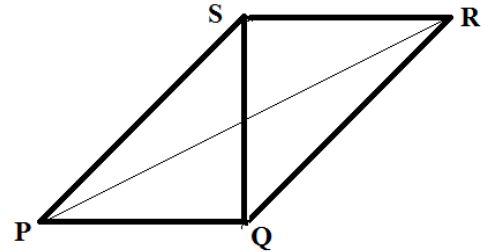


- a) 4π b) 2π c) 8π d) $5\pi/2$ e) none of these

Prob 11. Let $f = i + j^2$, where i and j are non-negative integers. If $0 \leq i \leq 3$ and $0 \leq j \leq 3$, then the sum of all possible distinct values of f is

- a) 68 b) 72 c) 70 d) 64 e) none of these

Prob 12. A square is cut along a diagonal and reassembled to form the parallelogram PQRS as shown in the diagram. If $PR = 80$ inches, what is the area of the original square, in square inches?



- a) 1280 b) 1240 c) 1340 d) 1320 e) none of these

Prob 13. If $f(x) = px + q$ and $f(f(f(x))) = 8x + 21$, and if p and q are real numbers, then

$p^2 + q^2$ is equal to

- a) 18 b) 12 c) 16 d) 32 e) none of these

Prob 14. The circumferences of two circles are consecutive primes p_1 and p_2 , with $p_1 > p_2$. p_1 and p_2 are consecutive primes if there are no primes between p_1 and p_2 . Central angles of 30 degrees subtend arcs of lengths s_1 and s_2 on the two circles. If $s_1 + s_2 = 3$ then $p_1 - p_2$ is

- a) 1 b) 2 c) 3 d) 4 e) none of these

Prob 15. The difference of two positive numbers is 4 and the product of the two numbers is 19. The sum of the two numbers is

- a) $\sqrt{23}$ b) $\sqrt{23}/2$ c) $2 + \sqrt{23}$ d) $2\sqrt{23}$ e) none of these

Prob 16. A man has walked two-thirds of the distance across a railroad bridge when he sees a train approaching at 54 miles per hour. If R is his uniform speed (in miles per hour) such that he can just manage to escape by running to either end of the bridge, then the sum of the digits in R is

- a) 7 b) 6 c) 9 d) 10 e) none of these

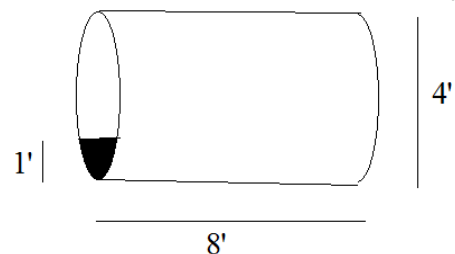
Prob 17. Given a 5 digit number $abcde$. Put a one in front gives $1abcde$. Multiply $1abcde$ by 3 gives the 6 digit number $abcde1$. The sum of the digits in the original 5 digit number $abcde$ is

- a) 25 b) 26 c) 27 d) 28 e) none of these

Prob 18. Sara and David were reading the same novel. When Sara asked David what page he was reading, he replied that the product of the page number he was reading and the next page number was 100172. The sum of the digits for the page was David reading was

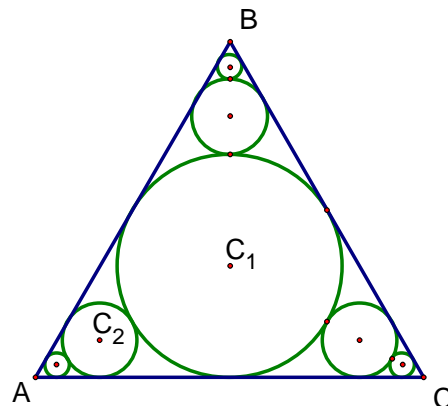
- a) 10 b) 11 c) 12 d) 13 e) none of these

Prob 19. A Right circular cylinder with a radius of 2 feet and height of 8 feet is partially filled with oil. When it is placed horizontally on a level surface, as shown in the figure, the top of the oil is 1 foot above this surface. If the cylinder is then placed in a vertical position, with a circular base resting on a level surface, then what is the height (in feet) of the oil above the base?



- a) $4\pi/3 - 2\sqrt{3}/\pi$ b) $8/3 - 2\sqrt{3}/\pi$ c) $8\pi/3 - 4\sqrt{3}$
 d) $8/\pi - \sqrt{3}/3$ e) none of these

Prob 20. Circle C_1 has a radius of 1 and is inscribed in the equilateral triangle ABC . The circle C_2 is constructed tangent to C_1 , and also tangent to AB and AC . An infinite sequence of circles is constructed with successive circles tangent to the previous circle and also tangent to sides AB and AC . Similar sequences of circles are also constructed near the other two vertices. Let K be the sum of the areas of all the regions that are inside the triangle but not inside any of the circles. If you use the approximations $\pi \cong 3.142$ and $\sqrt{3} \cong 1.732$, then the resulting approximate value of K is nearest to which of the following?



- a) 0.872 b) 0.874 c) 0.876 d) 0.878 e) 0.880