2013
Leap Frog Relay Grades 9-10
problems 11-20

No calculators allowed
Correct Answer = 4 points
Incorrect Answer = −1 point
Blank = 0 points

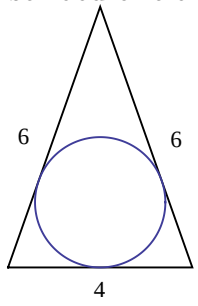
11. A music player has a list price of \$100. However, the store is having a 10% off sale for the month of April. But you are in luck, because you came on a Tuesday in April when the store gives an additional 15% *off the sale price* at the register. Assuming sales tax is 10% of the register price, how much are you going to pay for the music player?

    (a) \$83.85 (b) \$83.95

    (c) \$84.05 (d) \$84.15

    (e) None of these

12. The circle is inscribed in the isosceles triangle with respective side lengths 6, 6 and 4. Determine the area of the inscribed circle.



    (a) $\frac{\pi}{2}$ (b) $\frac{3\pi}{2}$

    (c) $\frac{5\pi}{2}$ (d) $\frac{7\pi}{2}$

    (e) None of these

13. How many 4-digit palindromic numbers *abba* are divisible by 9?

(a) 7 (b) 8

(c) 9 (d) 10

(e) None of these

14. The two lines $y = 2x + b$ and $y = x + 2013$ meet at a point on the line $y = 4x + 21$. Determine the value of b.

(a) $b = 1344$ (b) $b = 1349$

(c) $b = 1354$ (d) $b = 1359$

(e) None of these

15. What is the volume of the cube that is inscribed in a sphere whose radius is 6 feet?

(a) $188\sqrt{3}$ ft^3 (b) $190\sqrt{3}$ ft^3

(c) $192\sqrt{3}$ ft^3 (d) $194\sqrt{3}$ ft^3

(e) None of these

16. Ten *consecutive* natural numbers sum to 1005. What is the sum of the smallest and largest of these ten natural numbers? (A consecutive list of numbers is in the from $n, n + 1, n + 2, \ldots$.)

(a) 201 (b) 203

(c) 205 (d) 207

(e) None of these

17. If $4^{x+1} = 8^{2x+3}$, then $16^x = \ldots$.

(a) $\frac{1}{2}$ (b) 256

(c) $\sqrt{2}$ (d) $\frac{1}{128}$

(e) None of these

18. Find the real number solution to the equation

$$\frac{1}{x} + \frac{x}{3} = \frac{1+x}{x+3}.$$

(a) $x = 1 - \sqrt[3]{9}$

(b) $x = -\sqrt[3]{6}$

(c) $x = 1 - \sqrt[3]{6}$

(d) $x = -\sqrt[3]{9}$

(e) None of these

19. The graph of the parabola $y = ax^2 + bx + c$ goes through the point $(-1, 3)$ and has vertex $(1, 1)$. Compute the product abc.

(a) $abc = -\frac{3}{4}$

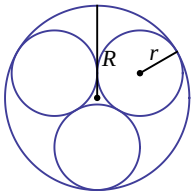
(b) $abc = -\frac{5}{4}$

(c) $abc = -\frac{7}{4}$

(d) $abc = -\frac{9}{4}$

(e) None of these

20. In the figure below, the three small circles all have the same radius r and are mutually tangent to each other, as well as tangent to the larger circle with radius R. Then, $R/r = \ldots$.



(a) $(3 + \sqrt{3})/2$.

(b) $(3 + 2\sqrt{3})/2$.

(c) $(2 + 3\sqrt{3})/3$.

(d) $(3 + 2\sqrt{3})/3$.

(e) None of these