

2013
Leap Frog Relay Grades 9-10
problems 1-10

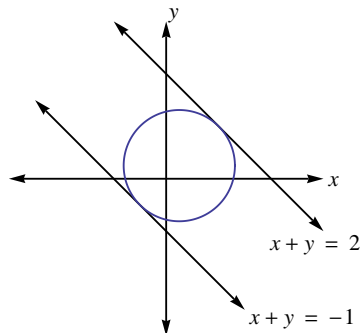
No calculators allowed

Correct Answer = 4 points

Incorrect Answer = -1 point

Blank = 0 points

1. If 5 forks balance 3 knives and 4 knives balance 7 spoons, how many forks balance 21 spoons?
(a) 19 forks
(b) 20 forks
(c) 21 forks
(d) 22 forks
(e) None of these
2. Five students take a 100 point test. Their average score is 82. Suppose a sixth student takes the test and as a result increases the average (of all six scores) by 2 points. What was the test score of the sixth student?
(a) 92
(b) 94
(c) 96
(d) 98
(e) None of these
3. The circle in the figure is mutually tangent to the two lines $x+y = 2$ and $x+y = -1$. What is the area enclosed by the circle?



- (a) $\frac{5\pi}{8}$ (b) $\frac{7\pi}{8}$
(c) $\frac{9\pi}{8}$ (d) $\frac{11\pi}{8}$

(e) None of these

4. Move forward 3 steps, backward 6 steps, forward 9 steps, etc. If you continue this way forward/backward in multiples of 3, ending with a final forward 2013 steps, how far are you (in steps) from your original position?

- (a) 999 steps. (b) 1002 steps.
(c) 1005 steps. (d) 1008 steps.

(e) None of these

5. How many real number solutions to the equation

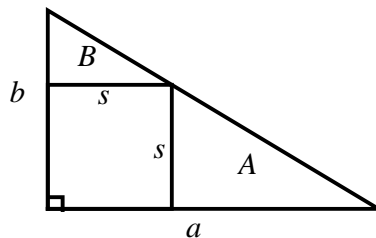
$$x^{2013} - 3x^{2011} = x^{2011} - 3x^{2009}$$

are there?

- (a) 2 (b) 3
(c) 4 (d) 5

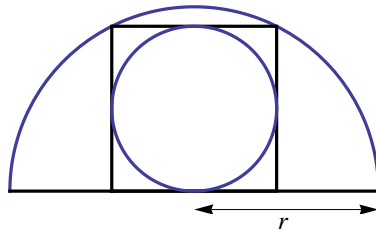
(e) None of these

6. In the figure below, the large right triangle has respective leg lengths a and b as pictured. The s by s square is inscribed in the triangle. The respective areas of the two smaller right triangles are A and B as indicated. Determine the ratio of the areas A/B as a function of a and b .



- (a) $A/B = a^2/b^2$ (b) $A/B = a/b$
(c) $A/B = (ab)/(a + b)$ (d) $A/B = \sqrt{a^2 + b^2}/(a + b)$
(e) None of these

7. If the parabola whose equation is $y = ax^2 + bx + c$ goes through the point $(0, 2)$ and has its vertex at $(-1, 1)$, then $a + b + c =$ _____.
- (a) 2 (b) 3
(c) 4 (d) 5
(e) None of these
8. Suppose a, b, c are real numbers such that $a + b + c = 3$ and $ab + ac + bc = 2$. Then $a^2 + b^2 + c^2 =$ _____.
- (a) 3 (b) 4
(c) 5 (d) 6
(e) None of these
9. If x is 20% of y , then y is _____% of x .
- (a) 5 (b) 120
(c) 80 (d) 50
(e) None of these
10. The semicircle pictured has a radius equal to r inches. The square is inscribed in the semicircle and the smaller circle is inscribed in the square. What is the area of the smaller circle in terms of r ?



- (a) $\frac{\pi r^2}{6}$ inches². (b) $\frac{\pi r^2}{5}$ inches².
(c) $\frac{\pi r^2}{4}$ inches². (d) $\frac{\pi r^2}{3}$ inches².
(e) None of these