



**Central
Arizona
College**

2019 Pinal County High School Math Competition

Level III

When directed to solve a quadratic equation by completing the square, Sam arrived at the equation $\left(x - \frac{5}{2}\right)^2 = \frac{13}{4}$. Which equation could have been the original equation given to Sam?

a.) $x^2 + 5x + 7 = 0$

d.) $x^2 - 5x + 3 = 0$

b.) $x^2 + 5x + 3 = 0$

e.) None of the above.

c.) $x^2 - 5x + 7 = 0$

Determine the smallest integer that makes $-3x + 7 - 5x < 15$ true.

a.) -2

d.) 1

b.) -1

e.) None of the above.

c.) 0

An application developer released a new app to be downloaded. The table below gives the number of downloads for the first four weeks after the launch of the app. Write an exponential equation that models these data.

Number of Weeks (W)	1	2	3	4
Number of Downloads (D)	120	180	270	405

a.) $D = 120(1.5)^{W-1}$

d.) $W = 120 \left(\frac{2}{3}\right)^D$

b.) $W = 120(1.5)^D$

e.) None of the above.

c.) $D = 120 \left(\frac{2}{3}\right)^{W-1}$

Krystal was given \$3000 when she turned 2 years old. Her parents invested it at 2% interest rate compounded annually. No deposits or withdrawals were made. Which expression can be used to determine how much money Krystal had in the account when she turned 18?

a.) $3000(1 + 0.02)^{16}$

d.) $3000(1 - 0.02)^{18}$

b.) $3000(1 - 0.02)^{16}$

e.) None of the above.

c.) $3000(1 + 0.02)^{18}$

Which equation has the same solutions $x^2 + 6x + 7 = 0$.

a.) $(x + 3)^2 = 2$

d.) $(x + 3)^2 = 16$

b.) $(x - 3)^2 = 2$

e.) None of the above.

c.) $(x - 3)^2 = 16$

Connor wants to attend the town carnival. The price of admission to the carnival is \$4.50, and each ride costs an additional 79 cents. If he can spend at most \$16.00 at the carnival, which inequality can be used to solve for r , the number of rides Connor can go on, and what is the maximum number of rides he can go on?

- a.) $0.79 + 4.50r \leq 16.00$; 3 rides
- b.) $0.79 + 4.50r \leq 16.00$; 4 rides
- c.) $4.50 + 0.79r \leq 16.00$; 14 rides
- d.) $4.50 + 0.79r \leq 16.00$; 15 rides
- e.) None of the above.

In 2013, the United States Postal Service charged \$0.46 to mail a letter weighing up to 1 oz. and \$0.20 per ounce for each additional ounce. Which function would determine the cost, in dollars, $c(z)$, of mailing a letter weighing z ounces where z is an integer greater than 1?

a.) $c(z) = 0.46z + 0.20$

d.) $c(z) = 0.20(z - 1) + 0.46$

b.) $c(z) = 0.20z + 0.46$

e.) None of the above.

c.) $c(z) = 0.46(z - 1) + 0.20$

A gardener is planting two types of trees:

Type A is three feet tall and grows at a rate of 15 inches per year

Type B is four feet tall and grows at a rate of 10 inches per year.

Algebraically determine exactly how many years it will take for these trees to be the same height.

a.) 2.0 years

d.) 3.5 years

b.) 2.5 years

e.) None of the above.

c.) 3.0 years

The inequality $7 - \frac{2}{3}x < x - 8$ is equivalent to

a.) $x > 9$

d.) $x < \frac{-3}{5}$

b.) $x > \frac{-3}{5}$

e.) None of the above.

c.) $x < 9$

Sam and Jeremy have ages that are consecutive odd integers. The product of their ages is 783. Which equation could be used to find Jeremy's age, j , if he is the younger man?

a.) $j^2 + 2 = 783$

d.) $j^2 - 2j = 783$

b.) $j^2 - 2 = 783$

e.) None of the above.

c.) $j^2 + 2j = 783$

What is the value of x in the equation $\frac{x-2}{3} + \frac{1}{6} = \frac{5}{6}$

a.) 4

d.) 11

b.) 6

e.) None of the above.

c.) 8

Convert the conic into rectangular coordinates.

$$r = \frac{18}{6 + 24\cos(\theta)}$$

a.) $x^2 - 15y^2 + 24x - 9 = 0$

b.) $15x^2 + 16y^2 + 24x - 9 = 0$

c.) $y^2 + 24x - 9 = 0$

d.) $15x^2 - y^2 - 24x + 9 = 0$

e.) None of the above.

Find the domain of $H(x) = \log_8 x^5$

a.) All nonzero real numbers

d.) All real numbers except 8

b.) All real numbers

e.) None of the above.

c.) All positive real numbers

Simplify $\frac{\log_7 16}{\log_7 2}$

a.) 2

b.) 4

c.) 6

d.) 8

e.) None of the above.

If $\sin(x) = -\frac{\sqrt{3}}{2}$, find all solutions in $[0^\circ, 360^\circ)$.

a.) 30° & 150°

d.) 240° & 300°

b.) 60° & 120°

e.) None of the above.

c.) 210° & 330°

A plane flies 1.3 hours at 110 mph on a bearing of 38° . It then turns and flies 1.5 hours at the same speed on a bearing of 128° . What is the angle formed by the two vectors?

a.) 90°

d.) 30°

b.) 60°

e.) None of the above.

c.) 45°

From the top of a fire tower, a forest ranger sees his partner on the ground at an angle of depression of 30° . If the distance from the forest ranger to his partner is 48 feet, how tall is the tower?

a.) 23 feet

d.) 29 feet

b.) 25 feet

e.) None of the above.

c.) 27 feet

A pulley is rotating 360 times per minute. Through how many radians does a point on the edge of the pulley move in 15 seconds?

a.) 180π

d.) 720π

b.) 360π

e.) None of the above.

c.) 540π

Find the value of $(f \circ g)'$ at the given value.

$$f(u) = u^6 - 2, \quad u = g(x) = \sqrt{x}, \quad x = 1.$$

a.) 1

d.) 4

b.) 2

e.) None of the above.

c.) 3

Find the function value of $\cos^2\left(\frac{3\pi}{4}\right)$

a.) $\frac{\sqrt{3}}{2}$

d.) $\frac{3}{2}$

b.) $\frac{\sqrt{2}}{2}$

e.) None of the above.

c.) $\frac{1}{2}$