

Math Team

Meet 3 Events A and B Problems 1-2 Practice (2018-19 through 2019-20)

Event A

Problem #1 ("quickie"; 1 point)

Try to solve each problem within one minute.

1. Determine exactly the coordinates of the intersection of the lines $x + y = 15$ and $5x + 8y = 87$. (MSHSML 2019-20 3A #1)

literal
↳ more than one variable

$$5x + 5y = 75$$

$$5x + 8y = 87$$

$$5x + 5y = 75$$

$$3y = 12$$

$$y = 4 \Rightarrow x = 15 - y = 15 - 4 = 11 \Rightarrow (x, y) = (11, 4)$$

1. Determine exactly the coordinates of the intersection of the lines $\frac{x}{5} + \frac{y}{2} = 1$ and $\frac{-3x}{4} + \frac{y}{2} = 1$. (MSHSML 2018-19 3A #1)

$$\frac{x}{5} = \frac{-3x}{4} \Rightarrow x = 0 \Rightarrow y = 2 \quad \therefore (x, y) = (0, 2)$$

Event A

Problem #2 ("textbook"; 2 points)

Try to solve each problem within two minutes.

2. Four times Frank's favorite number is 25 more than Gabby's favorite number and four times Gabby's favorite number is 26 more than Frank's favorite number. Determine exactly the sum of Frank's and Gabby's favorite numbers. (MSHSML 2019-20 3A #2)

$$4F = G + 25 \quad 4G = F + 26$$

$$\underline{4G = F + 26}$$

$$4(F+G) = (F+G) + 51$$

$$3(F+G) = 51$$

$$F+G = \boxed{17}$$

$$F+G = ?$$

2. Determine exactly the ordered triple (x, y, z) that satisfies this system of equations:

$$7x + 2y - 4z = 19$$

$$5x + 3y - 3z = 15$$

$$5x - 3y + 3z = 15$$

} Sum

(MSHSML 2018-19 3A #2)

$$10x = 30 \Rightarrow x = 3$$

$$\left. \begin{array}{l} 21 + 2y - 4z = 19 \\ 15 + 3y - 3z = 15 \end{array} \right\} \rightarrow \begin{array}{l} (2y - 4z = -2) \cdot (-3) \Rightarrow -6y + 12z = 6 \\ (3y - 3z = 0) \cdot 2 \Rightarrow 6y - 6z = 0 \end{array}$$

$$\underline{6z = 6} \Rightarrow z = 1$$

$$5(3) - 3y + 3(1) = 15$$

$$15 - 3y + 3 = 15$$

$$-3y = -3$$

$$y = 1$$

$$(x, y, z) = \boxed{(3, 1, 1)} \checkmark$$

Event B

Problem #1 ("quickie"; 1 point)

Try to solve each problem within one minute.

1. A cube has side length of 3. A cylinder has a height of $\overset{3}{\text{Y}}$. They both have the same volume. Determine exactly the radius of the cylinder. [calculator allowed] (MSHSML 2019-20 3B #1)

$$V_{\text{cube}} = V_{\text{cyl}}$$

$$3^3 = \pi r^2 \cdot 3$$

$$9 = \pi r^2$$

$$r^2 = \frac{9}{\pi}$$

$$r = \sqrt{\frac{9}{\pi}} = \frac{3\sqrt{\pi}}{\pi}$$



1. If the areas of an equilateral triangle and a square are equal, determine exactly the ratio of the side of the square to the side of the triangle. Express your answer in the form

$\frac{sq}{\Delta}$

$\left(\frac{a}{b}\right)^c$ [calculator allowed] (MSHSML 2018-19 3B #1)

$$A_{\Delta} = A_{\square}$$

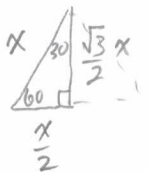
$$\frac{1}{2} \cdot \frac{x}{2} \cdot \frac{\sqrt{3}x}{2} = e^2$$

$$\frac{\sqrt{3}}{4} x^2 = e^2 \Rightarrow$$

$$\frac{e^2}{x^2} = \frac{\sqrt{3}}{4}$$

$$\frac{e}{x} = \left(\frac{3^{1/2}}{4}\right)^{1/2} = \frac{3^{1/4}}{2} = \frac{4\sqrt{3}}{2}$$

$$= \left(\frac{3}{16}\right)^{1/4}$$

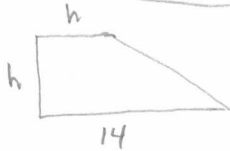


Event B

Problem #2 ("textbook"; 2 points)

Try to solve each problem within two minutes.

2. A trapezoid has an area of 36. One of the bases of the trapezoid has length 14 and the length of the other base is equal to the height of the trapezoid. Determine exactly the height of the trapezoid. [calculator allowed] (MSHSML 2019-20 3B #2)



$$h > 0$$

$$h = -18 \text{ or } h = \boxed{4} \checkmark$$

X

$$A_{\text{trap}} = \frac{b_1 + b_2}{2} h$$

$$36 = \frac{14 + h}{2} \cdot h$$

$$72 = 14h + h^2$$

$$0 = h^2 + 14h - 72$$

$$0 = (h + 18)(h - 4)$$

2. Given a $3 \times 3 \times 3$ cube, a $1 \times 1 \times 1$ cube is cut out of the middle of each face. What is the surface area of the resulting solid? [calculator allowed] (MSHSML 2018-19 3B #2)

$$SA = 6 \cdot 9 + 6 \cdot 4 = 54 + 24 = \boxed{78}$$

