In order to keep a malfunctioning satellite from falling into the earth, space agency officials decide to use a powerful rocket. At the time the rocket is attached, the satellite will be traveling with an initial velocity, v_0, and for every second that the rocket fires, it will add approximately 180 meters per second $\left(\frac{\text{m}}{\text{s}}\right)$ to this velocity. In order to ensure safety on earth, the velocity must be increased to at least $3{,}800\ \frac{\text{m}}{\text{s}}$. Also, the rocket can fire for no more than 4 seconds. For the initial velocity of the satellite, v_0, which of the following systems of inequalities best models this situation, where t is time, in seconds, after the rocket is first fired?

A
$v_0 + 180t \geq 3{,}800$

$t \leq 4$

B
$v_0 + 180t \geq 3{,}800$

$180t \leq 4$

C
$v_0 + 3{,}800 \leq 180t$

$t \leq 4$

D
$v_0 + 3{,}800 \leq 180t$

$180t \leq 4$

*The highlighted choice is not necessarily the answer(sorry for the inconvenience)

Elena is designing a paint can with thickness t millimeters and height h centimeters. She calculates that the thickness of the can in millimeters must be at least 0.1 times the height of the can in centimeters in order to withstand pressure. Due to cost constraints, the cost of material used, $(0.2 + t + 0.5h)$ cents, must be at most 12.2 cents. Which of the following systems of inequalities best models the relationship between height and thickness described above?

A $\begin{cases} t \leq 12 - \frac{h}{2} \\ 10t \geq h \end{cases}$

B $\begin{cases} t \leq 12 - \frac{h}{2} \\ t \geq 10h \end{cases}$

C $\begin{cases} t \geq 12 - \frac{h}{2} \\ 10t \geq h \end{cases}$

D $\begin{cases} t \geq 12 - \frac{h}{2} \\ t \geq 10h \end{cases}$

$$2\left(x-\frac{1}{3}\right)-\frac{3}{2}\left(y-\frac{1}{6}\right)=0$$

$$3\left(y-\frac{1}{2}\right)+\frac{8}{3}\left(x-\frac{1}{6}\right)=0$$

Consider the system of equations above. If (x, y) is the solution to the system, what is the value of the sum of x and y?

A $\frac{5}{6}$

B $\frac{25}{36}$

C $\frac{2}{3}$

D None of the above

$$24-6y=2x$$

$$6(y-2)=3+x$$

Consider the system of equations above. If (x, y) is the solution to the system, then what is the value of $y+x$?

Answer:

Two airplanes, which start $3{,}300$ miles apart, fly toward each other. The two planes fly at a constant speed, but their speeds differ by 80 miles per hour (mph). After 5 hours, the planes pass each other. What is the speed of the faster plane?

- (A) $290\ \text{mph}$
- (B) $338\ \text{mph}$
- (C) $370\ \text{mph}$
- (D) $450\ \text{mph}$

Devin is a landscaper who needs to prepare different types of grass seed for his customers' yards. Bluegrass seed costs $\$2.00$ per pound while drought-resistant seed costs $\$3.00$ per pound. If for a particular day the two types of grass seed totaled $\$68.00$ and together weighed 25 pounds, how many pounds of bluegrass seed did Devin prepare?

- (A) 4
- (B) 7
- (C) 18
- (D) 21

$y = -(x - 5)^2 + 9$

The equation above represents a parabola in the xy-plane. Which of the following equivalent forms of the equation displays the x-intercepts of the parabola as constants or coefficients?

A $y = -x^2 + 10x - 16$

B $y = -(x - 8)(x - 2)$

C $y = -(x - 7)(x - 3) + 5$

D $y = -x(x - 10) - 16$

$\frac{1}{2}x^2 - \frac{1}{6}x - \frac{1}{3} = 0$

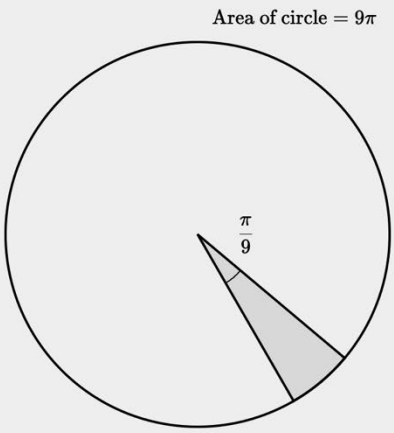
What are the solutions to the equation above?

A $x = 1$ and $x = -\frac{2}{3}$

B $x = \frac{1}{6} - \sqrt{\frac{23}{36}}$ and $x = \frac{1}{6} + \sqrt{\frac{23}{36}}$

C $x = 2$ and $x = -\frac{4}{3}$

D $x = \frac{1}{6} - \sqrt{-\frac{23}{36}}$ and $x = \frac{1}{6} + \sqrt{-\frac{23}{36}}$

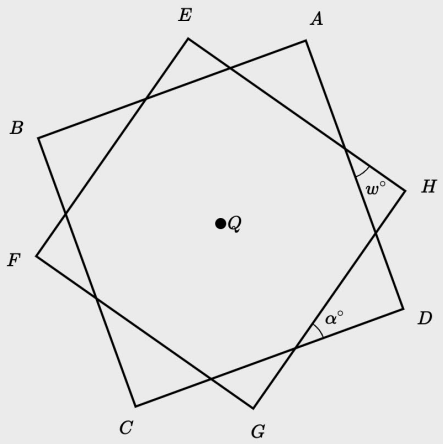


The circle shown to the left with area 9π has a sector with a central angle of $\frac{1}{9}\pi$ radians. What is the area of the sector?

- (A) $\frac{1}{2}\pi$
- (B) $\frac{1}{162}\pi$
- (C) 2π
- (D) 162π

Which of the following radian measures is equal to 135° ?

- (A) $\frac{\pi}{4}$ radians
- (B) $\frac{\pi}{2}$ radians
- (C) $\frac{3\pi}{4}$ radians
- (D) π radians



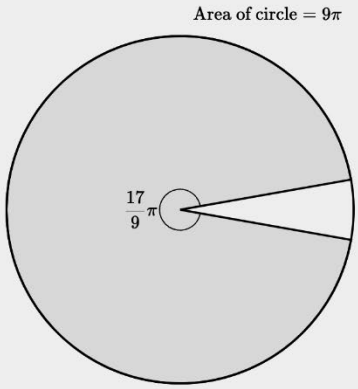
Both square $ABCD$ and square $EFGH$ shown at left have center Q. However, they do not have the same area. Which of the following must be true?

A $\alpha^\circ = w^\circ$

B $\alpha^\circ = -w^\circ$

C $\alpha^\circ = 90^\circ - w^\circ$

D $\alpha^\circ = 180^\circ - w^\circ$



The circle shown to the left with area 9π has a sector with a central angle of $\frac{17}{9}\pi$ radians. What is the area of the sector?

A $\frac{17}{2}\pi$

B $\frac{2}{17}\pi$

C $\frac{17}{162}\pi$

D $\frac{162}{17}\pi$

A circle in the xy-plane has a diameter with endpoints at $(-41, 69)$ and $(31, -85)$. Which of the following is an equation of the circle?

A $(x+41)^2 + (y-69)^2 = 28900$

B $(x+5)^2 + (y+8)^2 = 7225$

C $(x-31)^2 + (y+85)^2 = 28900$

D $(x+10)^2 + (y+16)^2 = 7225$

A circle graphed in the xy-plane has its center at $(0, 15)$. If the point $(3, 2)$ lies on the circle, which of the following is an equation of the circle?

A $(x-15)^2+y^2=178$

B $(x-15)^2+y^2=\sqrt{178}$

C $x^2+(y-15)^2=178$

D $x^2+(y-15)^2=\sqrt{178}$

A circle in the xy-plane has the equation $x^2+y^2-14y-51=0$. What is the center of the circle?

A $(51, 14)$

B $(7, 10)$

C $(0, 0)$

D $(0, 7)$

If $3x > 7$ and $3y > 8$, which of the following must be true?

Possible Answers:

$3y - 3x > 1$

$x + y > 5$

$y > x$

$x - y < 5$

If $a - b > c$ and $d - c < b$, which of the following must be true?

Possible Answers:

$b > a$

$a > c$

$a > d$

$b > d$