$K = (4.14 \cdot 10^{-15})\nu - \phi$

In night vision goggles, light rays cause electrons to be projected from a metal surface. The above equation relates the kinetic energy in electron volts (eV), K, of emitted electrons to the frequency in hertz, ν, of incident light rays and the *work function*, ϕ, in eV, of the metallic surface.

In a particular set of night vision goggles, the electrons emitted must have a kinetic energy of at least 2.46 eV. If the frequency of incoming light rays is less than $9.60 \cdot 10^{14}$ hertz , which of the following systems of inequalities best models the relationship between the work function, ϕ, and the light source frequency, ν ?

A)
$\nu > 9.60 \cdot 10^{14}$

$\phi \leq \left(4.14 \cdot 10^{-15}\right)\nu - 2.46$

B)
$\nu < 9.60 \cdot 10^{14}$

$\phi \leq \left(4.14 \cdot 10^{-15}\right)\nu - 2.46$

C)
$\nu > 9.60 \cdot 10^{14}$

$\phi \geq \left(4.14 \cdot 10^{-15}\right)\nu + 2.46$

D)
$\nu < 9.60 \cdot 10^{14}$

$\phi \leq \left(4.14 \cdot 10^{-15}\right)\nu + 2.46$

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 $\quad \begin{cases} t \leq 12 - \dfrac{h}{2} \\ 10t \geq h \end{cases}$ ...

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

C $\quad \begin{cases} t \geq 12 - \dfrac{h}{2} \\ 10t \geq h \end{cases}$ ...

D $\quad \begin{cases} t \geq 12 - \dfrac{h}{2} \\ t \geq 10h \end{cases}$ ...

$$24 - 6y = 2x$$

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

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

Answer: [   ]

$$0.7a - 0.8b = -0.1$$

$$a - 1.4 = -6(b - 0.1)$$

Consider the system of equations above. If (a, b) is the solution to the system, then what is the value of the sum of a and b?

A -0.5 ...

B -0.1 ...

C 0.1 ...

D 0.5 ...

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

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

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 $\dfrac{5}{6}$ ...

B $\dfrac{25}{36}$ ...

C $\dfrac{2}{3}$ ...

D   None of the above   ...

At Charlie's Cinema, a total of $1,200$ adult and child movie tickets were sold to bring in $\$10,875$ in ticket sales one evening. If each child ticket costs $\$7.50$ and each adult ticket costs $\$10.00$, how many adult tickets were sold that evening?

Answer:

$f(x) = x^2 - 4x - 1$

Which of the following is an equivalent form of the function f above in which the minimum value of f appears as a constant or coefficient?

A $f(x) = -(x-2)^2 - 5$ ...

B $f(x) = (x-4)(x-1)$ ...

C $f(x) = (x-2)^2 - 5$ ...

D $f(x) = x(x-4) - 1$ ...

$V = \dfrac{s^2 h}{3}$

The formula above gives the volume of a right square pyramid of height h and square base of side length s. If the side length of a right square pyramid increases by 30% while the height remains constant, what happens to the volume?

A The volume increases by 30%. ...

B The volume increases by 69%. ...
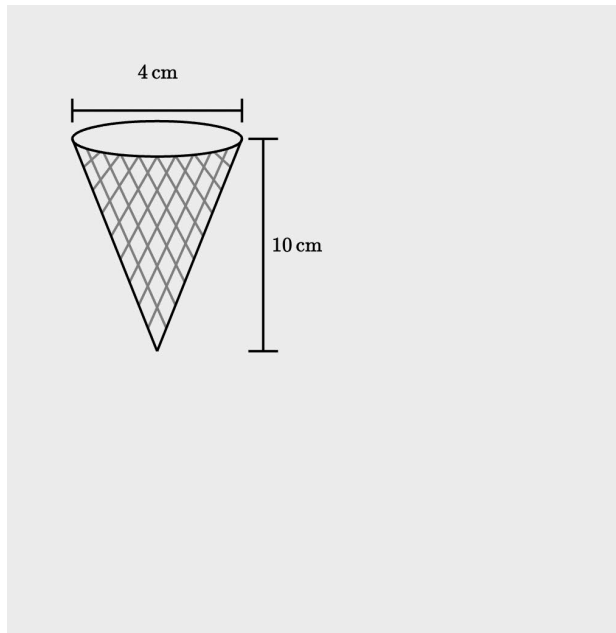
C The volume increases by 169%. ...

D The volume increases by 300%. ...

$$6x^2 - 7x - 5 = 0$$

Let $x = j$ and $x = k$ be solutions to the equation above, with $j > k$. What is the value of $j - k$?

Answer:

4 cm

10 cm

An ice cream cone maker wants to build a more stable cone by increasing the diameter and decreasing the height of the cone. The cone currently has diameter 4 centimeters (cm) and height $10\,\text{cm}$, as shown to the left. They want the height of the new cone to be $8\,\text{cm}$. Which of the following is closest to the smallest radius the new cone can have so that the volume is at least the volume of the old cone?

A $2.0\,\text{cm}$ ...

B $2.3\,\text{cm}$ ...

C $4.5\,\text{cm}$ ...

D $5.0\,\text{cm}$ ...

2

5
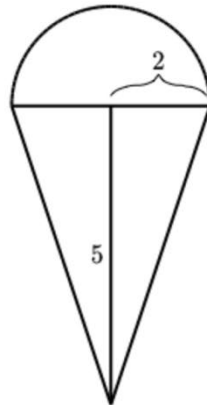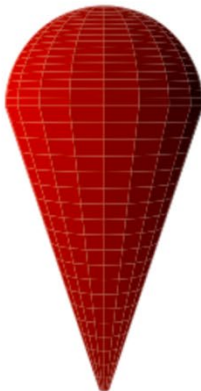
If the volume of the solid above is $a\pi$ cubic units, what is the value of a ?

Area of circle $= 25\pi$
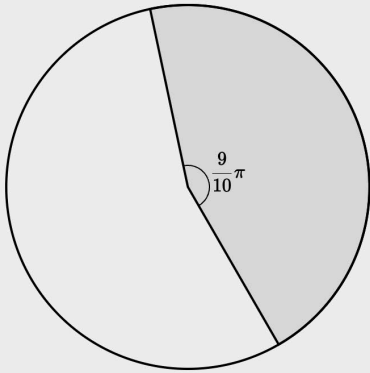
The circle shown to the left with area 25π has a sector with a central angle of $\dfrac{9}{10}\pi$ radians. What is the area of the sector?

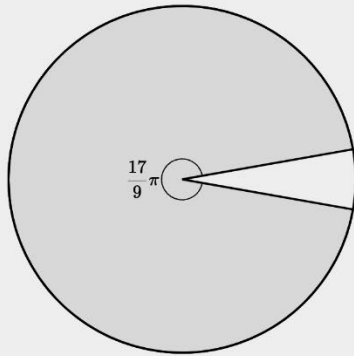- (A) $\dfrac{4}{45}\pi$ ...
- (B) $\dfrac{45}{4}\pi$ ...
- (C) $\dfrac{9}{500}\pi$ ...
- (D) $\dfrac{500}{9}\pi$ ...

Area of circle $= 9\pi$

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

- (A) $\dfrac{17}{2}\pi$ ...
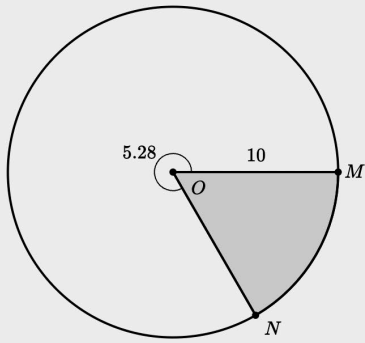- (B) $\dfrac{2}{17}\pi$ ...
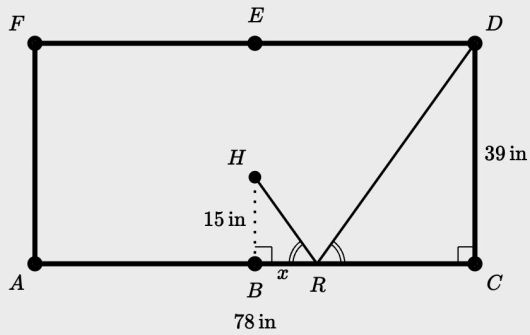- (C) $\dfrac{17}{162}\pi$ ...
- (D) $\dfrac{162}{17}\pi$ ...

The circle shown at left is centered at O, the measure of the obtuse central angle MON is 5.28 radians, and $MO = 10$. What is the area of the shaded sector of the circle formed by the acute angle NOM?

Answer: _____

How do I enter a student-produced response on the SAT? [Show me!]

The diagram at left shows a rectangular billiard table with a width of 39 inches (in) and a length of 78 in. A player is trying to shoot the red ball located at point H, into the corner pocket D by bouncing the ball off of a point R that is x inches from point B. The player knows that when the ball bounces off point R, $\angle HRB$ will be congruent to $\angle DRC$. If the point B is the midpoint of $\overline{AC}$ and the red ball is 15 in above B, approximately what is the value of x?

A. 7 in · · ·

B. 9 in · · ·

C. 11 in · · ·

D. 13 in · · ·
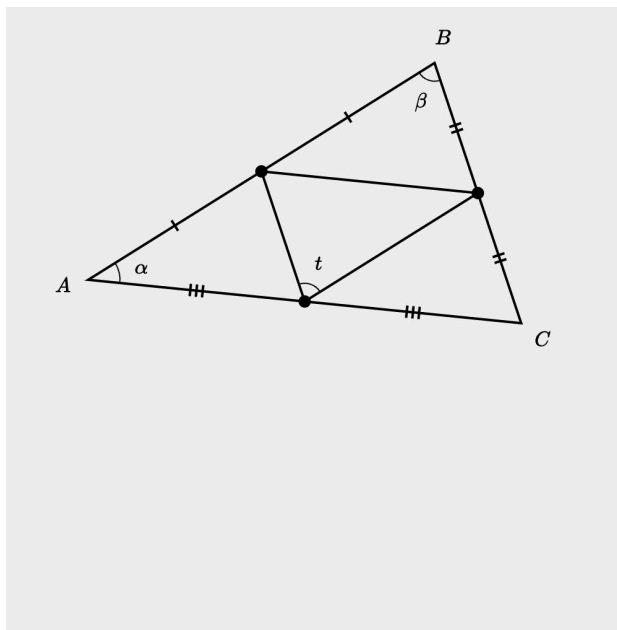
In triangle ABC shown at left, tick marks of equal number represent sides of equal length. Therefore, the point along line segment $\overline{AB}$ is the midpoint of $\overline{AB}$. What is the value of β in terms of α and t?

- (A) α
- (B) t
- (C) $\dfrac{\pi}{2} - \alpha$
- (D) $\dfrac{\pi}{2} - t$

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 $(0, 7)$

A circle in the xy-plane has the equation $36x^2 + 36y^2 - 12x - 27y - 8 = 0$. How long is the radius of the circle?

- A $\dfrac{5}{8}$
- B $\dfrac{25}{64}$
- C $\dfrac{2}{9}$
- D $\dfrac{\sqrt{2}}{3}$

$2x - 3y > 8$

$y > 2x - 5$

Which of the following represents the complete set of values for y that satisfy the system of inequalities above?

Possible Answers:

$y > 2$

$y < -\dfrac{3}{2}$

$y > \dfrac{2}{3}$

$y < -3$

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

Possible Answers:

$b > a$

$a > c$

$a > d$

$b > d$