

- 1 The expression

$$(y^2 - t^2)(y + k)$$

can be written as

$$y^3 + 36y^2 - 9y + s$$

where t , k , and s are constants. What is the value of s ?

Choose 1 answer:

(A) -324

(B) -54

(C) 54

(D) 324

- 2 $4x^2 + 28x + 49$

Which of the following is equivalent to the given expression?

Choose 1 answer:

(A) $(2x + 7)^2$

(B) $(2x + 49)^2$

(C) $(4x + 7)^2$

(D) $(4x + 49)^2$

- 3 If $m^2 + p^2 = x$ and $4mp = y$, which of the following is equivalent to $4x + 2y$?

Choose 1 answer:

(A) $(2m + p)^2$

(B) $(2m + 2p)^2$

(C) $(4m + 2p)^2$

(D) $(4m + 8p)^2$

- 4 Which of the following is equivalent to $2x^2 + 4x + 3$?

Choose 1 answer:

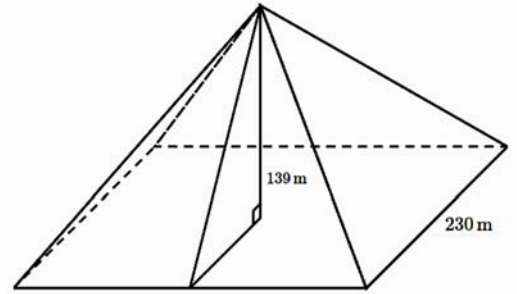
(A) $2(x + 1)^2 + 1$

(B) $2(x + 1)^2 + 3$

(C) $2(x + 1)^2 + 5$

(D) $2(x + 1)^2 + 4x + 1$

5



The pyramid at Khufu is one of the Great Pyramids of Giza. The right pyramid has a square base with base lengths of 230 meters, as shown. The original vertical height of the pyramid is believed to have been approximately 146.5 meters. Due to erosion, the height is now approximately 139 meters. If the base area of the pyramid did not change, what is the difference between the volume of the pyramid now and the original volume of the pyramid in cubic meters?

Choose 1 answer:

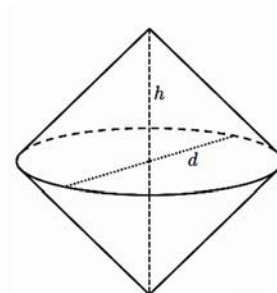
(A) 575 m^3

(B) $132,250 \text{ m}^3$

(C) $2,451,033 \text{ m}^3$

(D) $2,583,283 \text{ m}^3$

6



A top is formed by fusing two identical right circular cones by their bases as shown. The height of the top, h , which is the distance between the two cone points, is 6 centimeters (cm). The diameter of the circular cone bases, d , is also 6 cm. What is the volume of the entire object, in cubic centimeters?

Choose 1 answer:

(A) 9π

(B) 18π

(C) 36π

(D) 72π

- 7 Yohan is blowing up a spherical balloon. He blows 108π cubic centimeters of air with every breath. It takes him 72 breaths to fully inflate the balloon. What is the radius of the balloon in centimeters when it is fully inflated?

- 8 A washing machine is being redesigned to handle a greater volume of water. One part is a pipe with a radius of 3 centimeters (cm) and a length of 11 cm. It gets replaced with a pipe of radius 4 cm, and the same length. The new pipe can hold $w\pi$ more cubic centimeters (cm^3) of water than the old pipe, where w is a constant. What is the value of w ?

- 9 If $y = kx$, where k is a constant, and $y = 28$ when $x = 12$, what is the value of y when $x = 9$?

- 10 Alexei uses 62 liters of water when he takes an 8 minute shower. Running the water at the same rate, it takes him 10.5 minutes to fill the tub for a bath. To the nearest liter, how many more liters of water does Alexei use when he takes a bath than when he takes a shower?

11

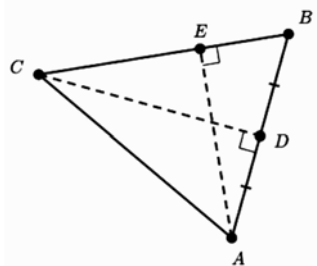
A donut company makes cream-filled donuts using $\frac{1}{4}$ cup (c) of dough and $\frac{1}{2}$ tablespoon (tbsp) of cream per donut. The company decides to change their recipe to use 3 times the amount of cream for their "New Triple-Stuffed Donuts!" If the donut company's new recipe uses the same amount of dough per donut, what is the ratio of dough to cream needed to make 12 triple-stuffed donuts?

Choose 1 answer:

- (A) 1 c : 3 tbsp
(B) 1 c : 6 tbsp
(C) 2 c : 3 tbsp
(D) 1 c : 2 tbsp

- 12 Tanya reuses her non-recyclable plastic containers by drawing on them and oven shrinking them to create ornaments. For one ornament, she creates a rectangular drawing that is 8 centimeters (cm) long by 21 cm wide. It shrinks to a similar rectangle $2\frac{2}{3}$ cm long. What is the total area of the shrunken drawing in square centimeters?

13



In the diagram, \overline{AD} is congruent to \overline{BD} . Which of the following statements must be true?

Choose 1 answer:

- (A) \overline{AE} bisects $\angle CAB$
(B) $\angle ACB$ is congruent to $\angle ABC$
(C) Triangle ABC is isosceles
(D) \overline{AE} is a median of $\triangle ABC$

- 14 If $8^{\frac{5}{6}} - 8^{\frac{1}{2}} = 8^m$ for some value of m , what is the value of m ?

Choose 1 answer:

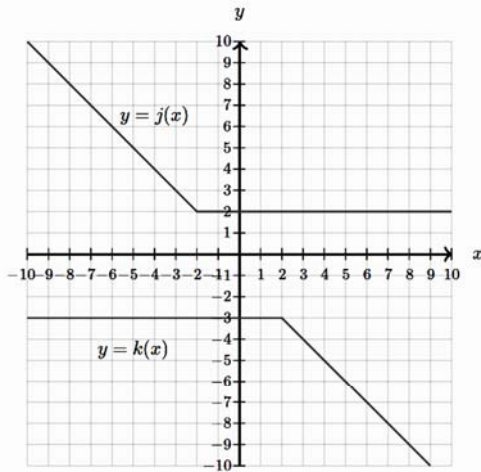
- (A) $\frac{1}{3}$
(B) $\frac{1}{2}$
(C) 1
(D) $\frac{5}{3}$

- 15 Mega Movers charges \$19.50 per day for truck rentals, plus an additional mileage fee of \$0.95 per mile. U-Move-It charges \$42.00 per day for truck rentals, plus an additional mileage fee of \$0.45 per mile for mileage over 20 miles. Which of the following systems of equations could be used to find the total mileage, m , that will make the cost, p , of renting a moving truck for one day equal at each rental company, assuming $m \geq 20$?

Choose 1 answer:

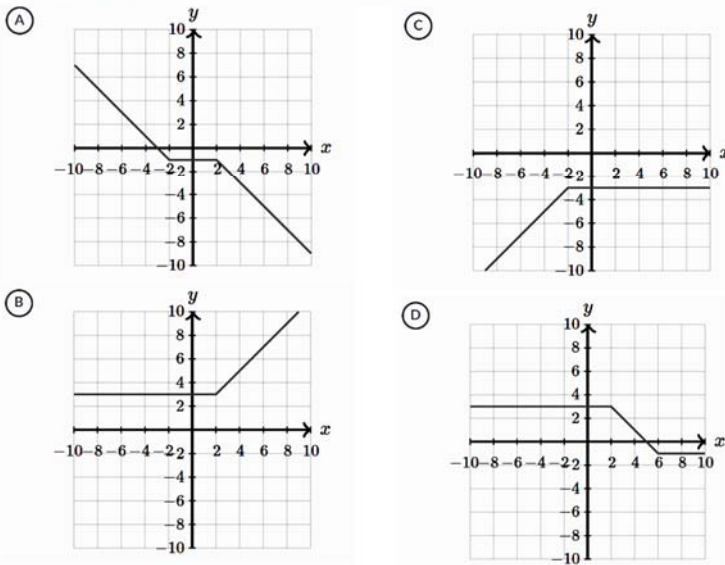
- (A) $p = 19.5 + 0.95m$
 $p = 42 + 0.45m$
(B) $p = 19.5m + 0.95$
 $p = 42m + 0.45$
(C) $p = 19.5 + 0.95m$
 $p = 42 + 0.45(m - 20)$
(D) $p = 19.5 + 0.95m$
 $p = 42 + 0.45(20 - m)$

16



The graphs of $y = j(x)$ and $y = k(x)$ are shown. Which of the following graphs is the graph of $y = j(k(x))$?

Choose 1 answer:



17

$$\frac{3.5}{3p^3} + \frac{7}{4p}$$

Which expression is equivalent to the sum for all $p > 7$?

Choose 1 answer:

- (A) $\frac{24.5}{12p^4}$
- (B) $\frac{21p^2 + 14}{12p^3}$
- (C) $\frac{21p^2 - 14}{12p^3}$
- (D) $\frac{10.5p^2 - 28}{12p^3}$

18

$$8 - 3n = -3(n - 1) + 5$$

Which of the following best describes the solution set to the equation shown?

Choose 1 answer:

- (A) The equation has no solutions.
- (B) The equation has exactly one solution, $n = 3$.
- (C) The equation has exactly one solution, $n = 0$.
- (D) The equation has infinitely many solutions.

19

If (x, y) is a solution to the system of equations shown, what is the product of the y -coordinates of the solutions?

$$x^2 + y^2 = 9$$

$$x + y = 3$$

20

$$2x^2 - 50$$

Which of the following is equivalent to the given expression?

Choose 1 answer:

- (A) $2x(x - 25)$
- (B) $2(x - 5)(x + 5)$
- (C) $-2(x - 5)^2$
- (D) $-2(x + 5)^2$

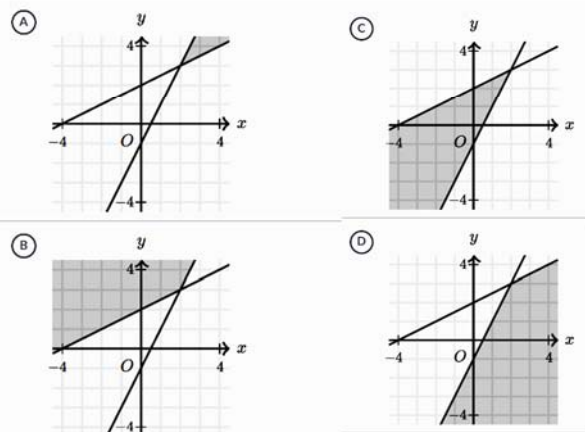
21

$$y \geq 2x - 1$$

$$y \leq \frac{1}{2}x + 2$$

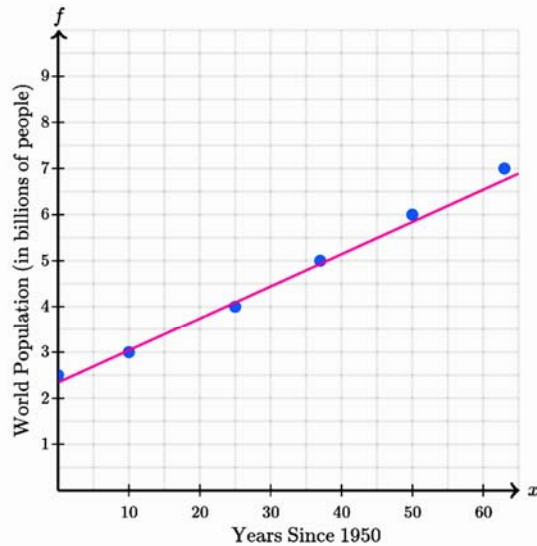
In which of the following does the shaded region represent the solution set in the xy -plane to the system of inequalities?

Choose 1 answer:



22

World Population (1950 – 2013)



The scatter plot shows the world population between the years 1950 and 2013. A function that models the data shown is:

$$f(x) = 0.07x + 2.34$$

where x represents the number of years since 1950, and $f(x)$ represents the world population in billions of people. According to this model, what was the approximate world population in the year 1981?

Choose 1 answer:

- (A) 2.34 billion people
- (B) 4.51 billion people
- (C) 5.2 billion people
- (D) 1,252.29 billion people

23 $(x + 1)^2 - 36 = 0$

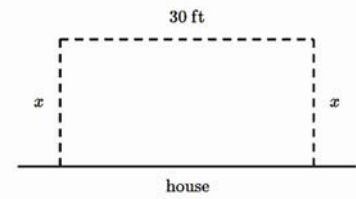
What are the solutions to the given equation?

Choose 1 answer:

- (A) $x = -5, x = 7$
- (B) $x = -5, x = -7$
- (C) $x = 5, x = -7$
- (D) $x = 5, x = 7$

24

Brett plans to build a fence in his backyard. His design is shown in the figure, with the dashed lines representing the fence.



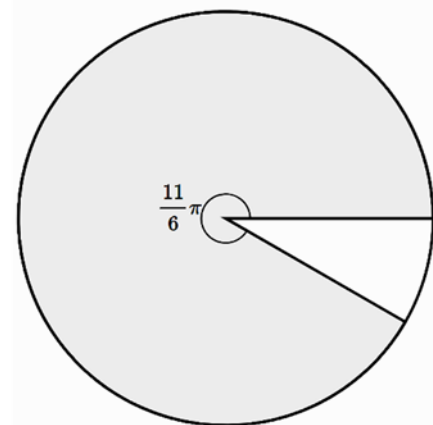
Brett would like to make x , the width of the fence, as wide as possible yet remain on budget. If he has \$490 with which to purchase fencing that costs \$7 per foot, what is the value of x in feet?

25

An artist advertises an enlarged model of a scorpionfly. The scale of the model to the original is $36 : 1$, and the model has an enlarged width of 1170 millimeters. Assuming these measurements are accurate, how wide was the original scorpionfly, in millimeters?

26

Area of circle = 36π



The figure shows a circle with a radius of 2 units. A shaded circle sector has a central angle of three halves times π radians. The circle shown with area 36π has a sector with a central angle of $\frac{11}{6}\pi$ radians. What is the area of the sector?

Choose 1 answer:

- (A) $\frac{432}{11}\pi$
- (B) $\frac{11}{432}\pi$
- (C) 33π
- (D) 132π