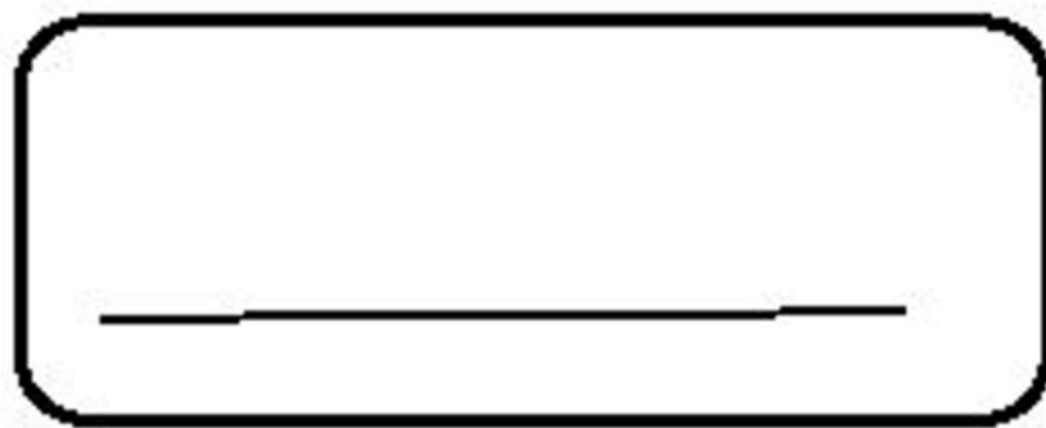


Note: Figure not drawn to scale.

In the given figure, \overline{NP} is the diameter of semicircle O . Angles Q , R and S are right angles, and point P is the midpoint of \overline{NQ} . If $PQ = 52$ feet and $NS = 18$ feet, the area of the figure can be expressed as $a\pi + b$ square feet, where a and b are integers. What is the value of $a + b$?



(19) The equation $2|x - 5| = k$, where K is a constant, has exactly one solution. Which of the following could be the value of $\frac{k}{2}$?

- (A) -5 only
(B) -5 or 5
(C) 0 only
(D) 5 only

$$|x - 5| = \frac{k}{2}$$

$$|x - 5| = 0$$

$$x - 5 = 0$$

(20) The percent increase in mass of a certain red kangaroo from 80 days old to 160 days old was 676%. If this red kangaroo's mass was K grams at 80 days old, which expression represents its mass, in grams, at 160 days old?

- (A) $7.76k$
(B) $6.76k$
(C) $1.08k$
(D) $0.08k$

$$100 + 676 = 776$$

(18) $\frac{1}{5xy} + xyz = \frac{1}{4yz}$

In the given equation x , y and z are positive numbers. Which expression is equivalent to y ?

- (A) $\frac{5x-4z}{20x^2z^2}$
(B) $\sqrt{\frac{5x-4z}{20x^2z^2}}$
(C) $\frac{1}{4xz^2-5x^2-z}$
(D) $\sqrt{\frac{1}{4xz^2-5x^2-z}}$

$$x = 3$$

$$z = 2$$

Shift solving

$$4z + 20x^2y^2z^2 = 5x$$

$$20x^2y^2z^2 = 5x - 4z$$

$$y^2 = \frac{5x - 4z}{20x^2z^2}$$

$$y = \sqrt{\frac{5x - 4z}{20x^2z^2}}$$



(21)

x	$g(x)$
-21	2
-9	0
15	4

$$g(x) = \frac{mx+b}{x+3}$$

The table shows three values of x and their corresponding values of $g(x)$, where

$g(x) = \frac{f(x)}{x+3}$ and f is a linear function. $y = mx + b$

What is the y -intercept of the graph of $y = f(x)$ in the xy -plane?

(A) (0, -9)

(B) (0, 3)

(C) (0, 9)

(D) (0, 27)

(22) For groups of 25 or more people, a museum charges \$28 per person for the first 25 people and \$17 for each additional person. Which function f gives the total charge, in dollars, for a tour group with n people, where $n \geq 25$?

$$25 \times 28 + 5 \times 17 = 785$$

(A) $f(n) = 17n + 275$

(B) $f(n) = 17n + 28$

(C) $f(n) = 17n + 700$

(D) $f(n) = 45n - 425$

$$17(30) + 275 = 785$$

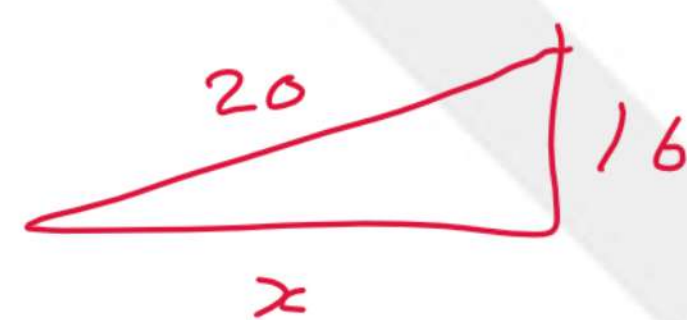
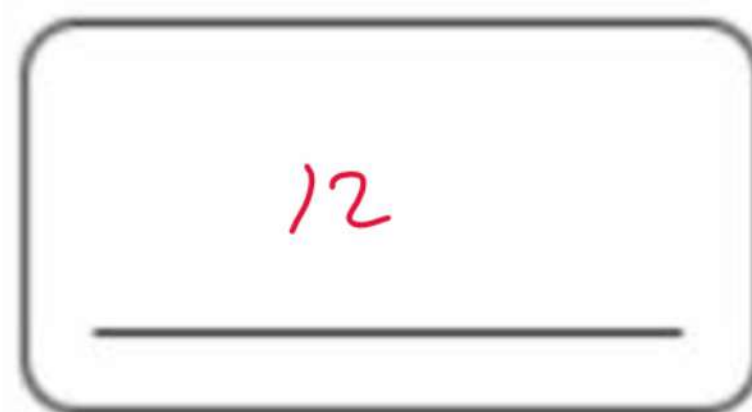


- 1) A librarian works at a constant pace, simultaneously shelving exactly 200 books in an hour and exactly 20 movies in an hour, and shelving only books and movies. If the librarian works for a total of T hours which expression shows the total number of items (books and movies) that the librarian shelves during that time?

$$220T$$

- A) $220T$
B) $20T + 200$
C) $220T + 440$
D) $200T + 20$

- 2) A right triangle has a hypotenuse of 20 inches and another side length of 16 inches. What is the length of the third side of the right triangle in inches?



$$\sqrt{20^2 - 16^2}$$

- 3) The following equations could all have the constant k equal zero and have a defined solution EXCEPT

a) $kx = 0$ $0 = 0$

b) $3 = k - x$

c) $4k + x = 7$

d) $2/k = x$ $\frac{2}{0}$ undefined

- 4) A new spaceship tourism company wishes to design a spacecraft that will allow its passengers to reenter Earth's atmosphere comfortably without losing consciousness. The physicians with whom the company consulted advised the company employees that healthy humans can survive up to 9g of force and lose consciousness at 5g of force. Which expression gives the range of g-force values, g , that the company's engineers should ensure the spacecraft can provide during reentry?

- A) $g < 5$
B) $g > 5$
C) $5 < g < 9$
D) $g > 9$

- 5) A company has four different stores at four different locations throughout a large city. The company gathered data on the initial pre sale prices, and respective quantities sold of a particular item.

Store	Price Before Sale	Quantity Sold Before Sale	Sale Price	Quantity Sold During Sale
Store A	\$12.50	350	\$11.00	400
Store B	\$13.25	260	\$10.00	520
Store C	\$11.75	550	\$9.50	625
Store D	\$14.00	220	\$10.25	460

Look at how many of the particular item Stores A and B sold at the presale price. What is the arithmetic mean of this set of values to the nearest tenth?

- a) 8.1
b) 9.7
c) 10.5
d) 12.8

$$\text{Mean} = \frac{\text{sum}}{n} = \frac{12.5 \times 350 + 13.25 \times 260}{350 + 260} = 12.8$$



- 6) Which of the following equations properly expresses the functional relationship given by this expression?

"Take an input variable and divide it by 4; then subtract 5 from the result."

A) $f(x) = \frac{x-5}{4}$

B) $f(x) = \frac{x}{4} - 5$

C) $f(x) = 5 - \frac{x}{4}$

D) $f(x) = \frac{5-x}{4}$

$\frac{x}{4} - 5$

- 7) If an amusement park worker measures three riders as being 48 inches, 56 inches, and 40 inches tall and the margin of error of each of the worker's measurements is plus/minus 2 inches, what is the possible range of the sum of the riders' actual heights in inches?

A) $48 \leq \text{total height} \leq 144$

B) $42 \leq \text{total height} \leq 150$

C) $138 \leq \text{total height} \leq 150$

D) $158 \leq \text{total height} \leq 180$

$48 + 56 + 40$

$= 144 \pm 6$

$144 + 6 = 150$

$144 - 6 = 138$

- 8) In the equation below, F stands for gravitational force, m_1 and m_2 : stand for the masses of two different objects, G is a constant, and d stands for the distance between the two objects. (Note that mass and distance must have positive values.)

$$F = \frac{G \times m_1 \times m_2}{d^2}$$

min
Max

What would most minimize the gravitational force between objects 1 and 2?

a) Minimize d

b) Maximize m_1 and m_2

c) Minimize $m_1 m_2$ and maximize d

d) Maximize d, m_1 , and m_2

Same
Opp

$\frac{\text{Max}}{\text{Min}} \mid \frac{\text{Min}}{\text{Max}}$

- 9) A cube has edge with a length of 2 inches . what the surface area of the cube in square inches?

24

$A = 6s^2$
 $= 6(2)^2$
 $= 24$

- 10) The final velocity of a given object is expressed by the following formula: $v = u + aT$. If a ball has an initial velocity of 4 m/s and a constant acceleration of 6 m/s², which inequality shows the range of times, T, that will cause the final velocity to have a value of at least 22 m/s?

A) $T \geq 3$ seconds

B) $T > 8$ seconds

C) $3 \text{ seconds} \leq T \leq 5 \text{ seconds}$

D) $6 \text{ seconds} \leq T \leq 22 \text{ seconds}$

$22 = 4 + 6T$
shift
sol
 > 3



- 11) A particular black hole has a density of 1.0×10^6 kg/m³. A physicist is conducting a thought experiment in which she would like to approximate how much she would weigh if she had the density of a black hole rather than her current weight of 150 pounds, assuming her volume remained the same. Given that her overall body density is approximately 990 kg/m³ and that there are approximately 2.2 pounds in a kilogram, approximately how many pounds would she weigh in her thought experiment?

- A) 2178
B) 151500
C) 990000000
D) 2178000000

Handwritten work for Question 11:

$$\frac{150 \times 1 \times 10^6}{990} = 151515$$

Options are labeled: A) 2178, B) 151500, C) 990000000, D) 2178000000. Option B is circled.

- 12) Consider the following system of equations with variables A and B and constant integers X and Y:

$$\begin{aligned} 1A + 2B &= 4 \\ XA + YB &= 4X \end{aligned}$$

By what number must the sum of X and Y be divisible in order for the two equations to have infinitely many solutions?

Handwritten answer: 3

Handwritten notes for Question 12:

$$\begin{aligned} ax + by &= c \\ dx + ey &= f \\ \frac{a}{d} &= \frac{b}{e} \\ \frac{a}{d} &\neq \frac{b}{e} \\ \frac{a}{d} &= \frac{b}{e} = \frac{c}{f} \end{aligned}$$

Handwritten work for Question 12:

$$\frac{1}{x} \neq \frac{2}{y}$$

$$y = 2x$$

$$x + y = x + 2x = 3x$$

- 13) Pam is going to watch a movie on her television at home. She is going to watch the movie as it was shown in movie theaters, in its original aspect ratio of 1.85:1 (length:height). Her television has an aspect ratio of 4:3 and a length of 48 inches. If the movie takes up the entire length of her television screen, how many inches of screen height, to the nearest whole inch, will NOT be used on her TV screen to show the movie?

- a) 10
b) 16
c) 22
d) 44

Handwritten work for Question 13:

Original aspect ratio: $l:h = 1.85:1$

TV aspect ratio: $l:h = 4:3$

TV length: 48 inches

Calculation for TV height: $\frac{48 \times 1}{1.85} = 25.8$

Calculation for TV height: $\frac{48 \times 3}{4} = 36$

Difference: $36 - 25.8 = 10.2$

- 14) If $-16 - 6x + x^2 = x^2 - abx - 8b$, where a and b are constants, what is the value of a?

- a) 6
b) -2
c) 3
d) 5

Handwritten work for Question 14:

$$-ab = -6$$

$$-8b = -16$$

$$b = 2$$

$$-a(2) = -6$$

$$a = 3$$

- 15)

Handwritten equation: $4x + 6 = 8$

Which equation has the same solution as the given equation?

- a) $4x = 108$
b) $4x = 24$
c) $4x = 12$
d) $4x = 2$

Handwritten equation: $4x = 2$



16)

$$\sqrt{x} + 4 = 12$$

shift
sn

Which of the following is the solution to the equation above?

- a) 8
- b) 16
- ☒ c) 64
- d) 140

17) If $4x+2=12$. What is the value of $16x+8$?

- a) 40
- ☒ b) 48
- c) 56
- d) 60

shift
sn

$$x = 2.5$$

$$16(2.5) + 8 = 48$$

$$12x + 8$$

$$48$$

18)

$$5(x-3)=10x+5$$

What value of x satisfies the equation above?

- ☒ a) -4
- b) 1
- c) 5
- d) 15

shift
sn

19)

$$k+12=336$$

what is the solution to the given equation?

- a) 28
- ☒ b) 324
- c) 348
- d) 1
- c) 4032

$$336 - 12$$

$$= 324$$

20)

$$C=10x+4y$$

The formula above gives the monthly **cost C, in dollars**, of operating a delivery truck when the driver works a total of **x hours** and when **y gallons** of gasoline are used. If, in a particular month, it cost no more than **\$2,000** to operate the truck and at least 150 gallons of gas were used, what is the maximum number of **hours** the driver could have worked?

- A) 125
- ☒ B) 140
- C) 500
- D) 1400

$$2000 = 10x + 4(150)$$

shift
sn

