

- 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?

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?

12



$(3, 4, 5) \times 4$

$(12, 16, 20)$

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

a) $kx=0$
 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

Sum no.

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

$$\frac{12.50 \times 350 + 13.25 \times 260}{350 + 260} = 12.8$$



- 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, \pm 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) $158 \leq \text{total height} \leq 180$

$48 + 56 + 40 = 144$

$144 - 6 = 138$

$144 + 6 = 150$

$\frac{5}{10} = 0.5$

$\frac{9}{3} = 3$

$\frac{6}{12} = 0.5$

Same opp

- 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.)

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

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

a) Minimize d

b) Maximize m_1 and m_2

c) Minimize $m_1 \times m_2$ and maximize d

d) Maximize d, m_1 , and m_2

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

24

$6s^2$
 $6(2)^2$

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

$V = u + aT$

$4 + 6T \geq 22$



- 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

$$\begin{array}{r} P \quad D \\ 150 \quad 990 \\ \times \quad 1.0 \times 10^6 \\ \hline 150 \times 1.0 \times 10^6 = 151515 \end{array}$$

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

$$1A + 2B = 4$$

$$XA + YB = 4X$$

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

$$\boxed{3}$$

$$\begin{array}{l} ax + by = c \\ dx + ey = f \end{array}$$

$$\frac{a}{d} = \frac{b}{e}$$

$$\frac{a}{d} \neq \frac{b}{e}$$

$$\frac{a}{d} = \frac{b}{e} = \frac{c}{f}$$

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

$$y = 2x$$

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

- 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

$$\begin{array}{l} \text{original} \\ l \quad h \\ 1.85 : 1 \\ 48 : \boxed{} \end{array}$$

$$\frac{48 \times 1}{1.85} = 25.9$$

$$36 - 25.9$$

$$\begin{array}{l} \text{TV} \\ l : h \\ 4 : 3 \\ 48 : \boxed{} \\ \frac{48 \times 3}{4} = 36 \end{array}$$

- 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

$$\begin{array}{l} -ab = -6 \\ -3b = -16 \\ \boxed{b=2} \\ -a(2) = -6 \\ \boxed{a=3} \end{array}$$

- 15)

$$4x + 6 = 8$$

Which equation has the same solution as the given equation?

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

$$4x = 2$$



16)

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

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

- a) 8
- b) 16
- ☒ c) 64
- d) 140

Shift
Soln

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

- a) 40
- ☒ b) 48
- c) 56
- d) 60

Shift
Soln
 $x=2.5$
 $16(2.5)+8$
 $=48$

12×4
 48

18)

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

What value of x satisfies the equation above?

- ☒ a) -4
- b) 1
- c) 5
- d) 15

19)

$$k+12=336$$

what is the solution to the given equation?

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

$336-12$

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
Soln



- 1) $0.8p = t$
At a store, a coat originally priced at p dollars is on sale for t dollars, and the relationship between p and t is given in the equation above. What is p in terms of t ?

- a) $p = t - 0.8$
b) $p = 0.8t$
~~c) $p = \frac{0.8}{t}$~~
d) $p = \frac{t}{0.8}$

$$p = \frac{t}{0.8}$$

- 4) Maya plans to invest 300\$ by buying shares of two different stocks. Stock A costs 5.62\$ per share and stock B costs 12.97\$ per share. Which equation represents the number of shares of these stocks Maya can buy. Where a is the number of shares of stock A and b is the number of shares of stock B?

(Assume that there are no fees)

- a) $12.97a + 5.62b = 300$
b) $12.97a - 5.62b = 300$
c) $5.62a + 12.97b = 300$
d) $5.62a - 12.97b = 300$

2)

If $2\sqrt{2x} = a$, what is $2x$ in terms of a ?

- a) $\frac{a}{2}$
b) $\frac{a^2}{4}$
~~c) $\frac{a^2}{2}$~~
d) $4a^2$

$$2\sqrt{2x} = \left(\frac{a}{2}\right)^2$$

$$2x = \frac{a^2}{4}$$

$$a = 5$$

$$2\sqrt{2x} = 5$$

$$\frac{25}{4} = 6.25$$

3)

$$2s + t = 11$$

In the equation above, what is the value of s when $t = 1$?

$$2s + 1 = 11 - 1$$

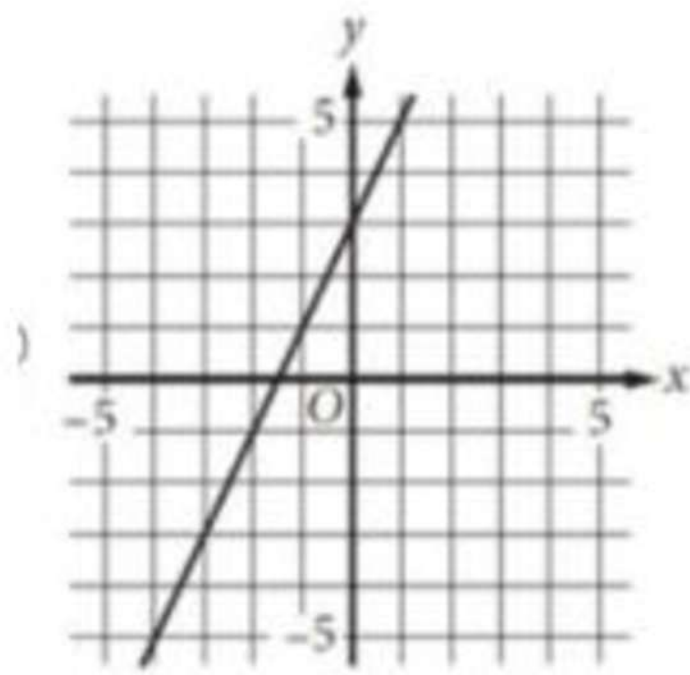
$$2s = 10$$

$$s = 5$$



5) Which of the following is the graph of the equation $y=2x+3$ in the xy -plane?

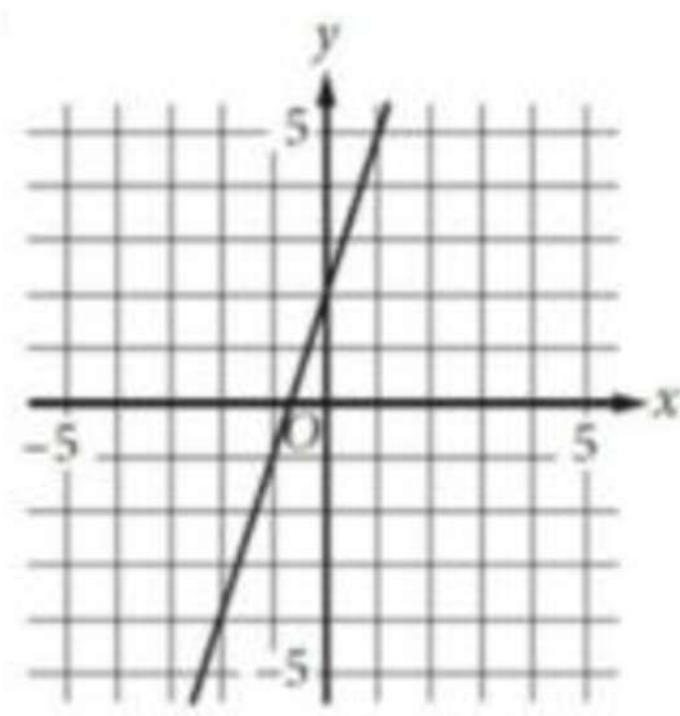
a)



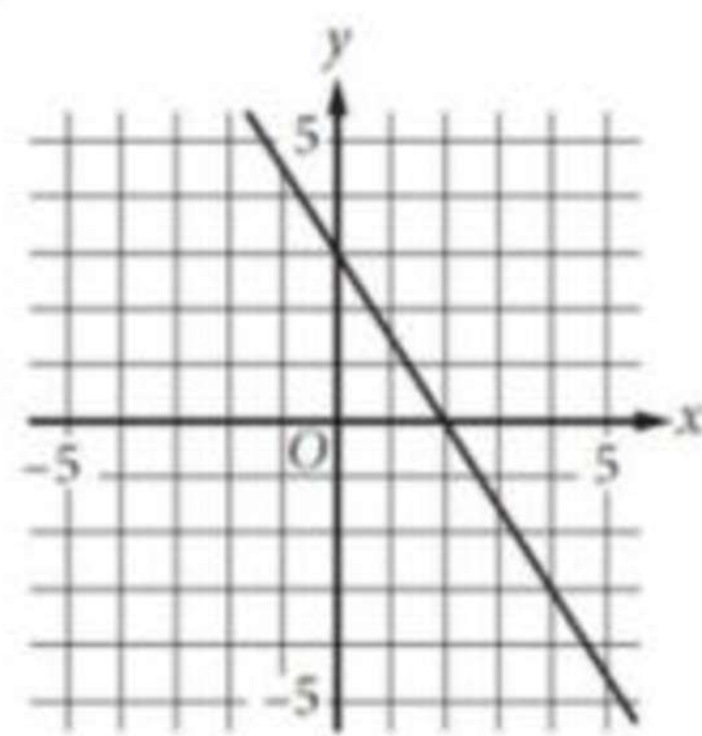
D

$$\frac{1.84}{1000}$$

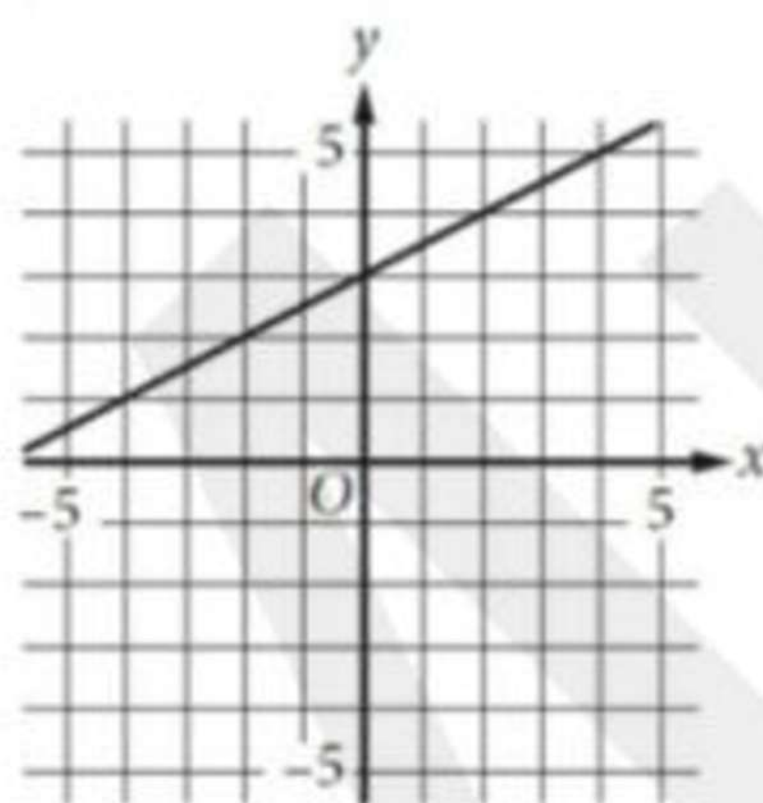
b)



c)



d)



6) The boiling point of water at sea level is 212 degrees Fahrenheit ($^{\circ}\text{F}$). For every increase of 1,000 feet above sea level, the boiling point of water drops approximately 1.84°F . Which of the following equations gives the approximate boiling point B , in $^{\circ}\text{F}$, at h feet above sea level?

A) $B=212-1.8h$

B) $B=212-(0.00184)h$

~~C) $B=212h$~~

~~D) $B=1.84(212)-1000h$~~

$y = mx + b$
 slope m = Average rate of change
 y -int b = initial starting at $x=0$

7) A pool initially contains 1,385 cubic feet of water. A pump begins emptying the water at a constant rate of 20 cubic feet per minute. Which of the following functions best approximates the volume $v(t)$, in cubic feet, of water in the pool t minutes after pumping begins, for $0 \leq t \leq 69$?

A) $v(t)=1385-20t$

~~B) $v(t)=1385+69t$~~

~~C) $v(t)=1385+20t$~~

~~D) $v(t)=1385+69t$~~

8) In the xy -plane, line l passes through the points $(0,0)$ and $(1,4)$. Which of the following is an equation of line l ?

~~a) $y=\frac{1}{3}x+1$~~

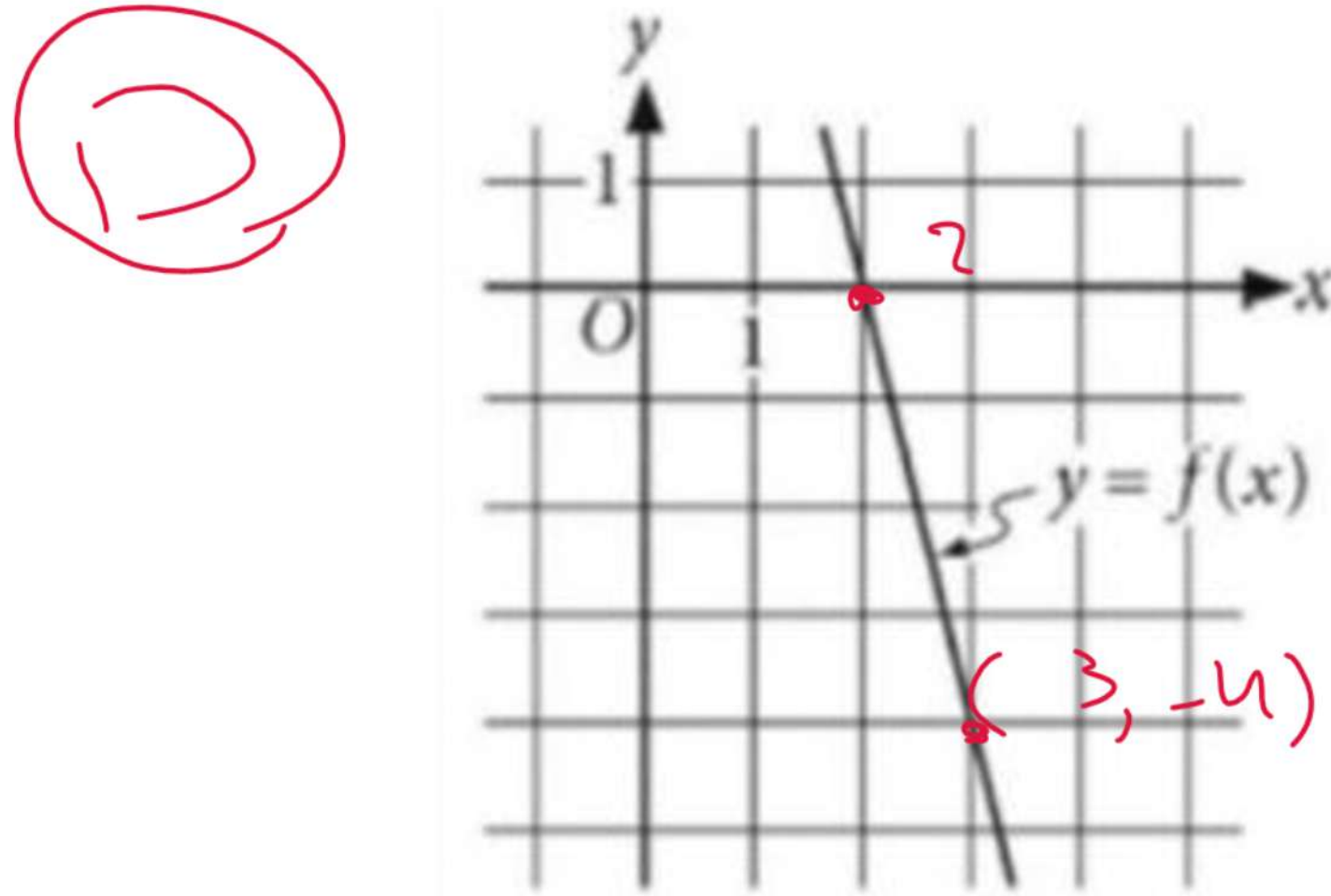
~~b) $y=\frac{1}{3}x-1$~~

~~c) $y=3x+1$~~

~~d) $y=3x-1$~~



- 9) the graph of the linear function f is shown.
Which of the following defines f ?



- a) $f(x) = -4x + 2$
☒ b) $f(x) = -4x + 8$
 c) $f(x) = -1/4x + 2$
 d) $f(x) = -1/4x + 8$

- 10) A farmer sold 108 pounds of produce that consisted of z pounds of zucchini and c pounds of cucumbers. The farmer sold the zucchini for 1.69\$ per pound and the cucumbers for 0.99\$ per pound and collected a total of 150.32\$. Which of the following systems of equations can be used to find the number of pounds of zucchini that were sold?

- ☒ a) $z + c = 150.32$
 $1.69z + 0.99c = 108$
☒ b) $z + c = 108$
 $1.69z + 0.99c = 150.32$
 c) $z + c = 108$
 $0.99z + 1.69c = 150.32$
☒ d) $z + c = 150.32$
 $0.99z + 1.69c = 108$

- 11) $x + 2y = 16$
 $0.5x - y = 10$

The solution to the system of equations above is (x, y) . what is the value of x ?

- a) 2
 b) 2
☒ c) 18
 d) 36

- 12) $x + y = 21$
 $x - 2y = -3$

The solution to the system of equations above is (x, y) . what is the value of x ?

- a) 6
 b) 8
☒ c) 13
 d) 15

- 13) $2x - y = -4$
 $2x + y = 4$

The solution to the system of equations above is (x, y) . what is the value of x ?

- a) -4
 b) -2
☒ c) 0
 d) 2



- 14) $3x + 2y = 16$
 $6x + 2y = 28$
 If the system of equations above has solution (x, y) , what is the value of $x + y$?

6

$$x = 4 \quad y = 2$$

$$4 + 2$$

- 16) When 9 is increased by $3x$, the result is greater than 36. What is the least possible integer value for x ?

10

$$9 + 3x > 36$$

$$3x > 27$$

$$x > 9$$

10, 11, 12

- 17) $y \geq 2 - 2x + 11$
 $y > 3x - 9$

D

In the xy -plane, point A is contained in the graph of the solution set of the system of inequalities above. Which of the following could be the coordinates of point A?

- a) (2, 1)
 b) (4, 1)
 c) (4, 5)
 d) (6, 6)

- 15) Ryan has 1,500 yards of yarn. He wants to knit at least 2 scarves and at least 3 hats. Each scarf requires 300 yards of yarn, and each hat requires 120 yards of yarn. If s represents the number of scarves and h represents the number of hats, which of the following systems of inequalities represents this situation?

a) $s + h \leq 1,500$

$$s \geq 2$$

$$h \geq 3$$

b) $2s + 3h \leq 1,500$

$$s \geq 2$$

$$h \geq 3$$

c) $2s + 3h \leq 1,500$

$$s > 300$$

$$h \geq 120$$

d) $300s + 120h \leq 1,500$

$$s \geq 2$$

$$h \geq 3$$

- 18) Jonathan needs to earn at least \$175 next week and can work at most 20 hours. He earns \$10 per hour at his lawn service job and \$8 per hour at his job at the gym. Which of the following systems of inequalities represents this situation in terms of the number of hours he will work at his lawn service job, l , and the number of hours he will work at his job at the gym, g , next week?

A) $10l + 8g \leq 175$

$$l + g \leq 20$$

B) $10l + 8g \leq 175$

$$l + g \geq 20$$

C) $10l + 8g \geq 175$

$$l + g \leq 20$$

D) $10l + 8g \geq 20$

$$l + g \geq 175$$



19) During an ice age, the average annual global temperature was at least 4 degrees Celsius lower than the modern average. If the average annual temperature of an ice age is y degrees Celsius and the modern average annual temperature is x degrees Celsius, which of the following must be true?

- a) $y = x - 4$
- b) $y \leq x + 4$
- c) $y \geq x - 4$
- d) $y \leq x + 4$

\geq

20) If $x > 0$, which of the following is equivalent to

$$\frac{1}{2x} + \frac{1}{2x} = \frac{x+1}{2x}$$

- a) $\frac{1}{x}$
- b) $\frac{1}{2x}$
- c) $\frac{3}{2x}$
- d) $\frac{2}{3x}$

