

Unit 1: Relationship Between Quantities

1) A rectangle has an area of 90 cm^2 and a width of 6 cm. Find the length of the rectangle.

- A. 540 cm
- * B. 15 cm
- C. 150 cm
- D. 6 cm

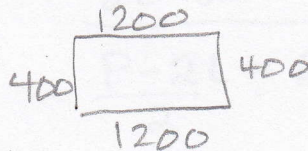
$$A = 90 \quad A = W \cdot L$$

$$\frac{90}{6} = \frac{6 \cdot L}{6} \quad L = 15 \text{ cm}$$

2) A rectangle has a length of 12 m and a width of 400 cm. What is the perimeter of the rectangle?

- A. 824 cm
- B. 1600 cm
- C. 2000 cm
- * D. 3200 cm

$$12 \text{ m} = 1200 \text{ cm}$$



$$P = \text{add all sides} = 3200$$

3) What is the area of a circle with a circumference of 43.98226 inches? Use 3.14159 for π .

- A. 153.44029 in^2
- * B. 153.93791 in^2
- C. 153.9325 in^2
- D. 153.9394 in^2

① Find $C = 2\pi r$ ② Find Area

$$43.98226 = 2(3.14159)r$$

$$\frac{43.98226}{6.28318} = \frac{6.28318r}{6.28318}$$

$$7 = r$$

$$A = \pi r^2 = 3.14159(7)^2 = 153.93791$$

4) The tension caused by a wave moving along a string is found using the formula $T = \frac{mv^2}{L}$. If m is the mass of the string in grams, L is the length of the string in centimeters, and v is the velocity of the wave in centimeters per second, what is the unit of the tension of the string, T ?

- * A. Gram-centimeters per second squared
- B. Centimeters per second squared
- C. Grams per centimeter-second squared
- D. Centimeters squared per second

$$T = \frac{\text{grams} \cdot \left(\frac{\text{cm}}{\text{sec}}\right)^2}{\text{cm}}$$

$$= \text{grams} \cdot \frac{\text{cm}^2}{\text{sec}^2} \cdot \frac{1}{\text{cm}}$$

5) The distance a car travels can be found using the formula $d = rt$, where d is the distance, r is the rate of speed, and t is time. How many miles does the car travel, if it drives at a speed of 70 miles per hour for $\frac{1}{2}$ hour?

- * A. 35 miles
- B. 70 miles
- C. 105 miles
- D. 140 miles

$$d = rt$$

$$= 70 \cdot \frac{1}{2}$$

$$= 35 \text{ miles}$$

6) A certain population of bacteria has an average growth rate of 0.02 bacteria per hour. The formula for the growth of the bacteria's population is $A = P_0(2.71828)^{0.02t}$

- A. 7
- B. 272
- * C. 1478
- D. 20000

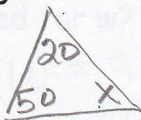
If you begin with 200 bacteria, about how many bacteria will there be after 100 hours?

$$A = 200(2.71828)^{0.02(100)}$$

$$= 200(2.71828)^2 = 1477.8$$

7) The sum of the angle measures in a triangle is 180° . Two angles of a triangle measure 20° and 50° . What is the measure of the third angle?

- A. 30°
- B. 70°
- * C. 110°
- D. 160°



$$20 + 50 + x = 180$$

$$70 + x = 180$$

$$\begin{array}{r} 70 + x = 180 \\ -70 \quad -70 \\ \hline x = 110 \end{array}$$

8) Which equation shows $P = 2l + 2w$ when solved for w ?

- A. $w = \frac{2l}{P}$
- B. $w = \frac{2l - P}{2}$
- C. $w = 2l - \frac{P}{2}$
- * D. $w = \frac{P - 2l}{2}$

$$P = 2l + 2w$$

$$\begin{array}{r} P = 2l + 2w \\ -2l \quad -2l \\ \hline P - 2l = 2w \\ \frac{P - 2l}{2} = \frac{2w}{2} \\ w = \frac{P - 2l}{2} \end{array}$$

9) Bruce owns a business that produces widgets. He must bring in more in revenue than he pays out in costs in order to turn a profit.

$$\text{revenue} > \text{cost}$$

- It costs \$10 in labor and materials to make each of his widgets *cost*
- His rent each month for his factory is \$4000 *cost*
- He sells each widget for \$25 *revenue*

How many widgets does Bruce need to sell each month to make a profit?

- A. 160
- B. 260
- * C. 267
- D. 400

$$25x > 10x + 4000$$

$$\begin{array}{r} 25x > 10x + 4000 \\ -10x \quad -10x \\ \hline 15x > 4000 \\ \frac{15x}{15} > \frac{4000}{15} \quad x > 266.\bar{6} \end{array}$$

10) Convert 5 miles to feet

- A. 1500 ft
- * B. 26400 ft
- C. 25000 ft
- D. 60 ft

$$\frac{5 \text{ miles}}{1} \cdot \frac{5280 \text{ ft}}{1 \text{ mile}} = 26400 \text{ ft}$$

11) An amount of $\$1000$ is deposited into a bank account that pays 4% annual interest. If there are no other withdrawals or deposits, what will be the balance of the account after 3 years?

- A. \$1000
- B. \$2744
- C. \$884.75
- * D. \$1124.86

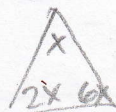
$$y = a(1+r)^t$$

$$= 1000(1+0.04)^3$$

$$= 1124.864$$

12) The angles of a certain triangle measure x° , $2x^\circ$, and $6x^\circ$. Solve for x .

- * A. 20
- B. 10
- C. 5
- D. 15



$$x + 2x + 6x = 180$$

$$9x = 180$$

$$x = 20$$

Unit 2: Reasoning with Equations and Inequalities

13) Which equation shows $ax - w = 3$ solved for w ?

- * A. $w = ax - 3$
- B. $w = ax + 3$
- C. $w = 3 - ax$
- D. $w = 3 + ax$

$$\begin{array}{r} ax - w = 3 \\ -ax \quad -ax \\ \hline -w = -ax + 3 \\ \frac{-w}{-1} = \frac{-ax + 3}{-1} \end{array} \quad w = ax - 3$$

14) Which equation is equivalent to $\frac{7x}{4} - \frac{3x}{8} = 11$?

- A. $17x = 88$
- * B. $11x = 88$
- C. $4x = 44$
- D. $2x = 44$

$$8 \left(\frac{7x}{4} - \frac{3x}{8} = 11 \right) \quad \begin{array}{l} 14x - 3x = 88 \\ 11x = 88 \end{array}$$

15) Which equation shows $4n = 2(t - 3)$ solved for t ?

- A. $t = \frac{4n-2}{3}$
- B. $t = \frac{4n-3}{2}$
- * C. $t = \frac{4n+6}{2} = 2n+3$
- D. $t = 4n-3$

Way 1

$$\begin{array}{r} 4n = 2(t-3) \\ \frac{4n}{2} = \frac{2(t-3)}{2} \\ 2n = t-3 \\ +3 \quad +3 \\ \hline 2n+3 = t \end{array}$$

Way 2

$$\begin{array}{r} 4n = 2(t-3) \\ 4n = 2t - 6 \\ +6 \quad +6 \\ \hline 4n+6 = 2t \\ \frac{4n+6}{2} = \frac{2t}{2} \\ 2n+3 = t \end{array}$$

16) Which equation shows $6(x + 4) = 2(y + 5)$ solved for y ?

- A. $y = x + 3$
- B. $y = x + 5$
- * C. $y = 3x + 7$
- D. $y = 3x + 17$

$$\begin{array}{r} 6x + 24 = 2y + 10 \\ -10 \quad -10 \\ \hline 6x + 14 = 2y \\ \frac{6x + 14}{2} = \frac{2y}{2} \end{array} \quad 3x + 7 = y$$

17) This equation can be used to find h , the number of hours it takes Flo and Bryan to mow their lawn:

$$\frac{h}{3} + \frac{h}{6} = 1$$

$$6 \left(\frac{h}{3} + \frac{h}{6} = 1 \right)$$

How many hours will it take them to mow their lawn? Find h

- A. 6
- * C. 2
- B. 3
- D. 1

$$\begin{array}{l} 2h + h = 6 \\ 3h = 6 \\ h = 2 \end{array}$$

18) For what values of x is the inequality $\frac{2}{3} + \frac{x}{3} > 1$ true?

- A. $x < 1$
- * B. $x > 1$
- C. $x < 5$
- D. $x > 5$

$$\begin{array}{r} \frac{2}{3} + \frac{x}{3} > 1 \\ -\frac{2}{3} \quad -\frac{2}{3} \\ \hline \frac{x}{3} > \frac{1}{3} \\ 3 \cdot \frac{x}{3} > 3 \cdot \frac{1}{3} \\ x > 1 \end{array}$$

19) A ferry boat carries passengers back and forth between two communities on the Peachville River.

- It takes 30 minutes longer for the ferry to make the trip upstream than downstream.
- The ferry's average speed in still water is 15 mph
- The river's current is usually 5 mph

This equation can be used to determine how many miles apart the two communities are:

$$\frac{m}{15-5} = \frac{m}{15+5} + 0.5 \quad 20 \left(\frac{m}{10} = \frac{m}{20} + 0.5 \right)$$

What is m , the distance between the two communities?

- A. 0.5 miles
- B. 5 miles
- * C. 10 miles
- D. 15 miles

$$\begin{array}{r} 2m = m + 10 \\ -m \quad -m \\ \hline m = 10 \end{array}$$

20) A manager is comparing the cost of buying ball caps with the company emblem from two different companies.

- Company X charges a \$50 fee plus \$7 per cap
- Company Y charges a \$30 fee plus \$9 per cap

$$\text{Cost X} = \text{Cost Y}$$

For what number of ball caps will the manager's cost be the same for both companies?

- * A. 10 caps
- B. 20 caps
- C. 40 caps
- D. 100 caps

$$\begin{array}{r} 50 + 7x = 30 + 9x \\ -7x \quad -7x \\ \hline 50 = 30 + 2x \\ -30 \quad -30 \\ \hline 20 = 2x \\ x = 10 \end{array}$$

21) A shop sells one-pound bags of peanuts for \$2 and three-pound bags of peanuts for \$5. If 9 bags are purchased for a total cost of \$36, how many three-pound bags were purchased?

- A. 3
- * B. 6
- C. 9
- D. 18

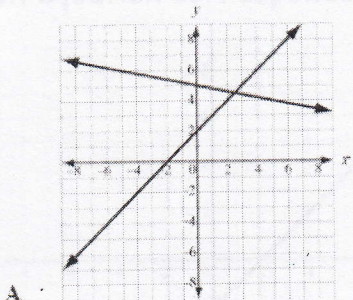
$$\begin{array}{r} x = 1 \text{ lb } (\$2) \quad -2(x+y=9) \quad -2x - 2y = -18 \\ y = 3 \text{ lb } (\$5) \quad 2x + 5y = 36 \quad 2x + 5y = 36 \\ \hline 3y = 18 \quad y = 6 \end{array}$$

22) Which graph represents the solution to $x > 3$?

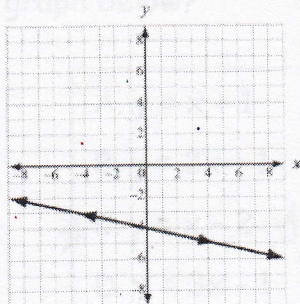
↑ open



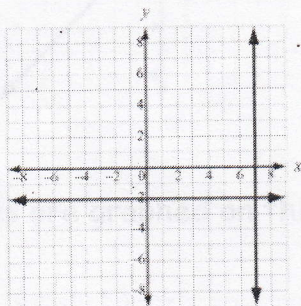
23) Which graph represents a system of linear equations that has multiple common coordinate pairs?



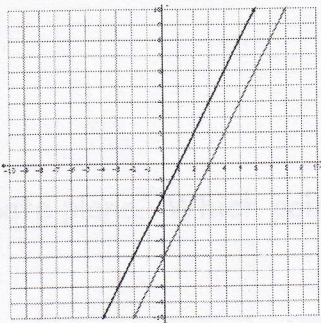
A



* B



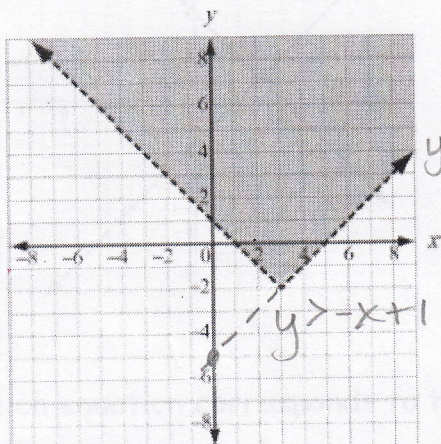
C



D

means the same solutions or ∞ solutions

24) Which pair of inequalities is shown in the graph?



- * A. $y > -x + 1$ and $y > x - 5$ ✓
 B. $y \geq x + 1$ and $y > x - 5$
 C. $y > -x + 1$ and $y \geq -x - 5$
 D. $y > x + 1$ and $y > -x - 5$

25) Solve the inequality $7 - 4x \geq 3$?

- * A. $x \leq 1$
 B. $x \geq 1$
 C. $x \leq -1$
 D. $x \geq -1$

$$\begin{aligned} 7 - 4x &\geq 3 \\ -7 &\quad -7 \\ \hline -4x &\geq -4 \\ \frac{-4x}{-4} &= \frac{-4}{-4} \end{aligned}$$

must flip direction of inequality sign because of dividing by -1 .
 $x \leq 1$

26) Solve this system of equations.

$$\begin{cases} 2x - y = 1 \\ 5 - 3x = -y \end{cases}$$

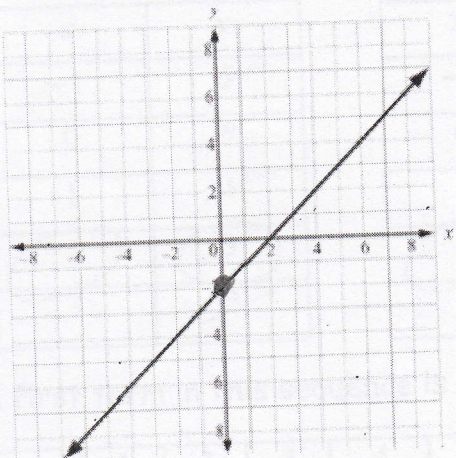
$$\begin{aligned} 2x - y &= 1 \\ -3x + y &= -5 \\ \hline -x &= -4 \\ \hline x &= 4 \end{aligned}$$

$$\begin{aligned} 2(4) - y &= 1 \\ 8 - y &= 1 \\ -8 &\quad -8 \\ \hline -y &= -7 \\ \hline y &= 7 \end{aligned}$$

- A. ~~(-4, -7)~~
 B. ~~(4, -6)~~
 C. ~~(-4, 8)~~
 * D. (4, 7)

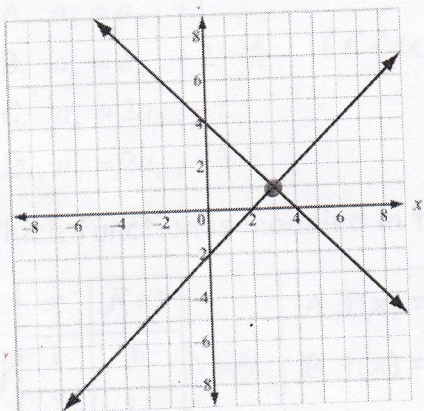
Unit 3: Linear and Exponential Functions

27) Which equation corresponds to the graph below?



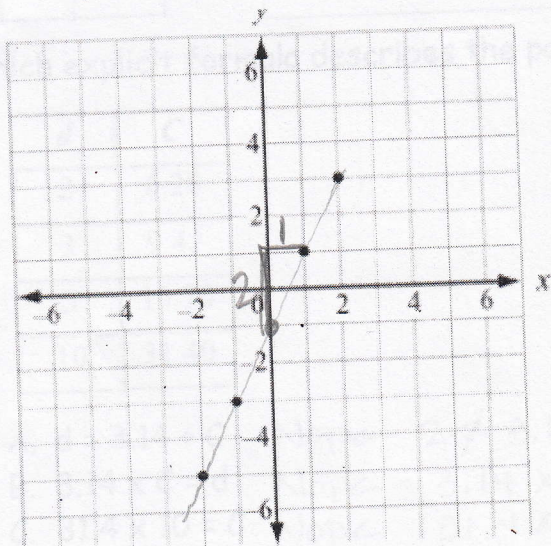
- A. $y = x + 1$
- B. $y = 2x + 1$
- * C. $y = x - 2$ *only choice with b of -2*
- D. $y = 3x - 1$

28) Two lines are graphed on this coordinate plane. Which point appears to be a solution of both lines?



- A. (0, -2)
- B. (0, 4)
- C. (2, 0)
- * D. (3, 1)

29) Which equation corresponds to the points in the coordinate plane?



- * A. $y = 2x - 1$
- B. $y = x - 3$
- C. $y = x - 1$
- D. $y = x + 1$

30) Based on the tables, at what point do the lines $y = -x + 5$ and $y = 2x - 1$ intersect?

$y = -x + 5$	
x	y
-1	6
0	5
1	4
2	3
3	2

$y = 2x - 1$	
x	y
-1	-3
0	-1
1	1
2	3
3	5

- A. (1, 1)
- B. (3, 5)
- *C. (2, 3)
- D. (3, 2)

31) The first term in this sequence is -1.

n	1	2	3	4	5	...
a_n	-1	1	3	5	7	...

Which function represents the sequence?

- A. $a_n = a_{n-1} + 1$
- *B. $a_n = a_{n-1} + 2$ ← recursive formula $d = 2$
- C. $a_n = 2a_{n-1} - 1$
- D. $a_n = 2a_{n-1} - 3$

32) Which function is modeled in this table?

x	f(x)
1	8
2	11
3	14
4	17

- A. $f(x) = x + 7$
- B. $f(x) = x + 9$
- C. $f(x) = 2x + 5$
- *D. $f(x) = 3x + 5$

$m = \frac{3}{1}$
 $y = 3x + b$
 $8 = 3(1) + b$
 $8 = 3 + b$
 $-3 \quad -3$
 $5 = b$

33) Which explicit formula describes the pattern in this table?

d	C
2	6.28
3	9.42
5	15.70
10	31.40

- A. $d = 3.14 + C$ Nope $2 \neq 3.14 + 6.28$
- B. $3.14 \times C = d$ Nope $3.14 \times 6.28 \neq 2$
- C. $31.4 \times 10 = C$ Nope $31.4 \times 10 \neq 6.28$
- *D. $C = 3.14 \times d$ Yes! $6.28 = 3.14 \times 2$

34) If $f(12) = 4(12) - 20$, which function gives $f(x)$?

- A. $f(x) = 4x$
- B. $f(x) = 12$
- * C. $f(x) = 4x - 20$
- D. $f(x) = 12x - 20$

$f(x) = 4(x) - 20$ they just plugged in 12 for x.
 $f(12) = 4(12) - 20$

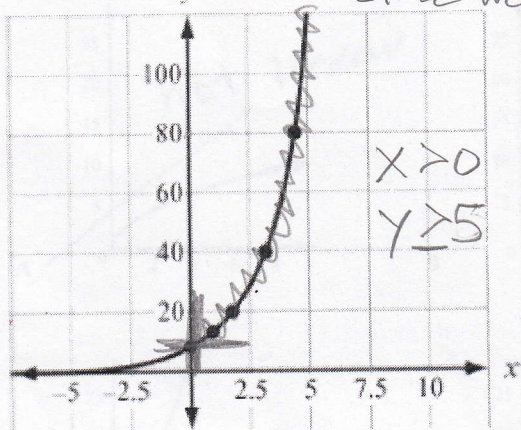
35) A farmer owns a horse that can continuously run an average of 8 miles an hour for up to 6 hours. Let y be the distance the horse can travel for a given x amount of time in hours. The horse's progress can be modeled by a function.

Which of the following describes for domain of the function?

- * A. $0 \leq x \leq 6$
- B. $0 \leq y \leq 6$
- C. $0 \leq x \leq 48$
- D. $0 \leq y \leq 48$

x values

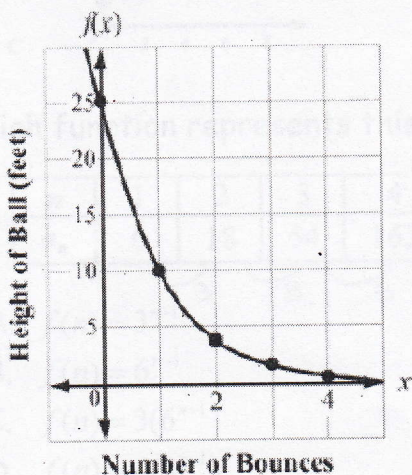
36) A population of squirrels doubles every year. Initially there were 5 squirrels. A biologist studying the squirrels created a function to model their population growth. $P(t) = 5(2^t)$ where t is time. The graph of the function is shown. What is the range of the function?



Since we are talking about living things both time & # of squirrels must be positive.

- A. any real number *can't be 20.5 squirrels*
- B. any whole number greater than 0 *can't be neg. Squirrels*
- * C. any whole number greater than 5 *can be = to 5*
- D. any whole number greater than or equal to 5

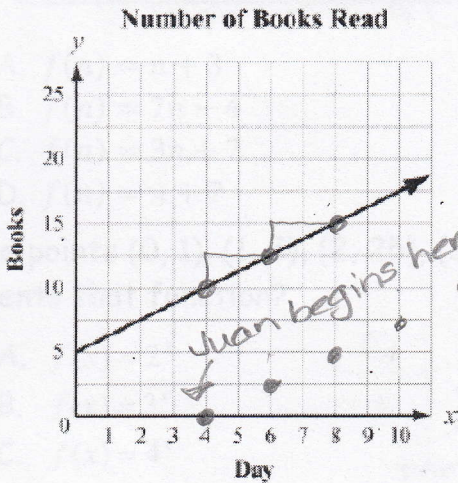
37) The function graphed on this coordinate grid shows $f(x)$, the height of a dropped ball in feet after its x th bounce.



On which bounce was the height of the ball 10 ft?

- * A. bounce 1 *height = 10*
- B. bounce 2 *height ≈ 4*
- C. bounce 3 *height ≈ 2*
- D. bounce 4 *height ≈ 1*

38) Juan and Patti decided to see who could read the most books in a month. They began to keep track after Patti had already read 5 books that month. This graph shows the number of books Patti read for the next 10 days.

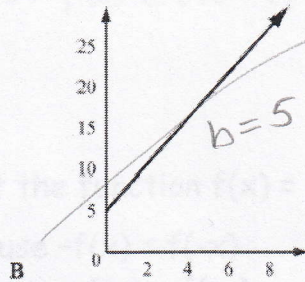
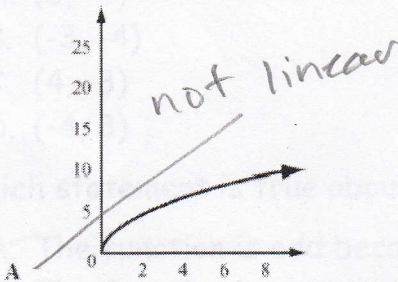


If Juan has read no books before the fourth day of the month and he reads at the same rate as Patti, how many books will he have read by day 12?

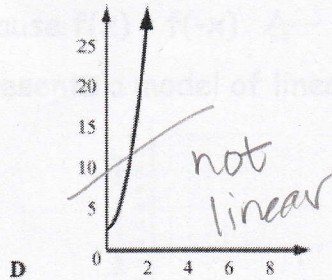
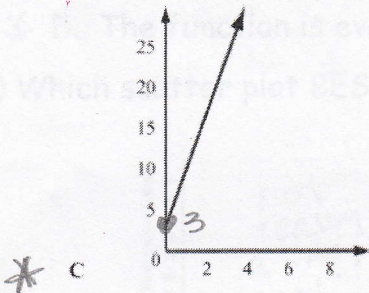
- A. 5
- * B. 10
- C. 15
- D. 20

Patti is reading at a rate of up 1 unit, right 2 units. If you apply this rate to Juan who starts Day 4 @ 0 then he would have read

39) To rent a canoe, the cost is \$3 for the oars and life preserver, plus \$5 an hour for the canoe. Which graph models the cost of renting a canoe?



$y = 5x + 3$
 ↑
 linear



40) Which function represents this sequence?

n	1	2	3	4	5	...
a_n	6	18	54	162	486	...

exponential $y = ab^x$
 $= 6 \cdot 3^x$

- A. $f(n) = 3^{n-1}$
- B. $f(n) = 6^{n-1}$
- C. $f(n) = 3(6^{n-1})$
- * D. $f(n) = 6(3^{n-1})$

41) The first term of the sequence is 3. Which function represents the sequence?

n	1	2	3	4	5	...
a_n	3	10	17	24	31	...

+7 +7 +7 +7

linear $y = 7x + b$

$$3 = 7(1) + b$$

$$3 = 7 + b$$

$$\frac{-7}{-7} \quad \frac{-7}{-7}$$

$$-4 = b$$

$$y = 7x - 4$$

- A. $f(n) = n + 3$
- * B. $f(n) = 7n - 4$
- C. $f(n) = 3n + 7$
- D. $f(n) = n + 7$

42) The points (0, 1), (1, 5), (2, 25), (3, 125) are on the graph of a function. Which equation represents that function?

- A. $f(x) = 2^x$
- B. $f(x) = 3^x$
- C. $f(x) = 4^x$
- * D. $f(x) = 5^x$

0	1	2	3
1	5	25	125

times 5

exponential
 $y = ab^x$
 $= 1.5^x$

43) A function g is an odd function. If $g(-3) = 4$, which other point lies on the graph of g ?

- * A. (3, -4)
- B. (-3, -4)
- C. (4, -3)
- D. (-4, 3)

odd functions mean $g(-1) = -g(1)$
 so $g(-3) = -g(3)$
 $4 = -(-4)$

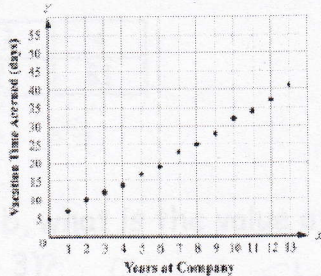
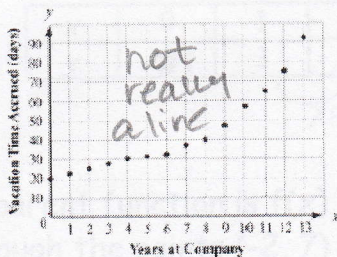
44) Which statement is true about the function $f(x) = 7$?

- ~~A. The function is odd because $-f(x) = f(-x)$~~
- ~~B. The function is even because $-f(x) = f(-x)$~~
- ~~C. The function is odd because $f(x) = f(-x)$~~
- * D. The function is even because $f(x) = f(-x)$

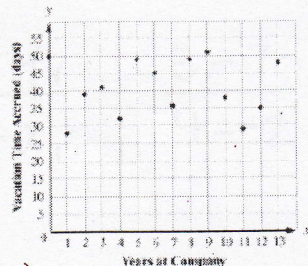
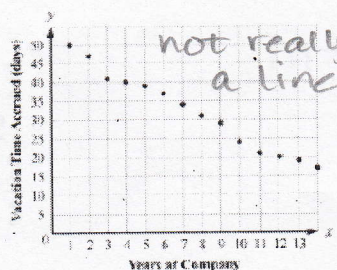
$f(1) = 7$ $f(-1) = 7$
 even

← Definition of even function

45) Which scatter plot BEST represents a model of linear growth?

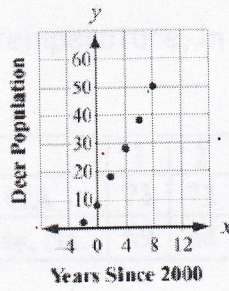
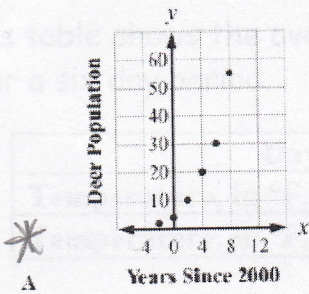


most linear of choices

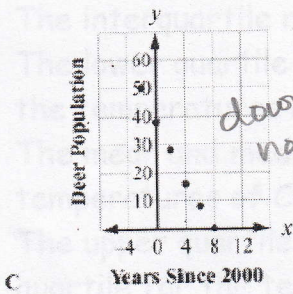


46) Which scatter plot BEST represents a model of exponential growth?

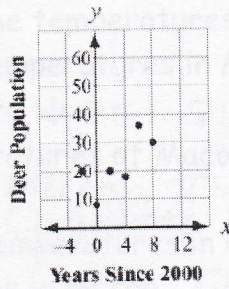
looks like "j-curve"



more linear than "j"



downward? nope



nope

47) Which table represents an exponential function?

multiplying by same thing each time!

A.

x	0	1	2	3	4
y	5	6	7	8	9

+1 +1 +1 +1

B.

x	0	1	2	3	4
y	0	22	44	66	88

+22 +22 +22 +22

C.

x	0	1	2	3	4
y	5	13	21	29	37

+8 +8 +8 +8

* D.

x	0	1	2	3	4
y	1	3	9	27	81

x3 x3 x3

48) If the parent function is $f(x) = mx + b$, what is the value of the parameter m for the line passing through the points $(-2, 7)$ and $(4, 3)$?

Find slope!

A. 9

B. $-\frac{3}{2}$

C. -2

* D. $-\frac{2}{3}$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{3 - 7}{4 - (-2)} = \frac{-4}{6} = -\frac{2}{3}$$