Linear Functions
(10 questions on STAAR)

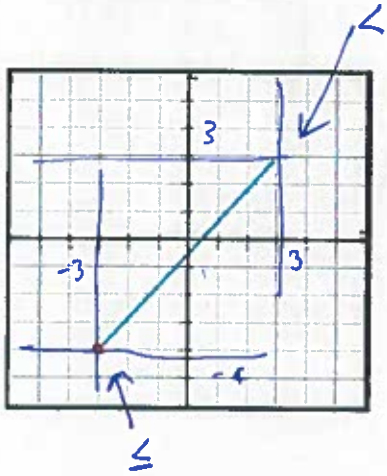
Domain and Range (A2A)
Determine the **domain and range of a linear function** in **mathematical problems; determine reasonable domain and range values for real-world situations**, both **continuous and discrete**, and represent D and R using inequalities
I can... - Determine domain and range of a graph - Determine domain and range of a real world situation (word problem or graph) - Determine if domain and range should be written as discrete or continuous

Notes:

Continuous – can be any # ex: time it takes to run a mile $4:00 < x < 21:00$

Discrete – can be only certain #s ex: #s of students in class $\{1, 2, 3, 4, 5\}$

Continuous Graphs



≤ <

Step #1: Find the **DOMAIN**.

- Draw a vertical line at the most left point and most right point.
- Look at the x-axis

Domain

$-3 \leq x < 3$

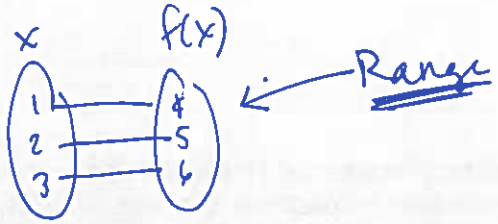
Step #2: Find the **RANGE**.

- Draw a horizontal line at the bottom point and the top point.
- Look at the y-axis

Range

$-4 \leq y < 3$

Mapping

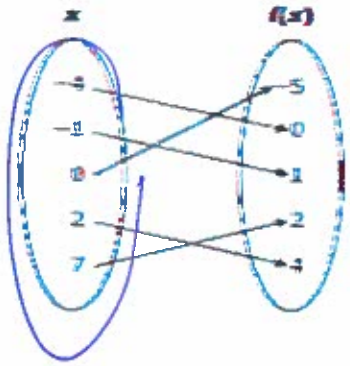


Real World Situation

(1) Determine if continuous or discrete
(2) Domain or Range?

Sample Questions

10 The mapping below represents all of the points on the graph of function *f*.



What is the domain of *f*?

F $\{-4, -1, 0, 2, 7\}$

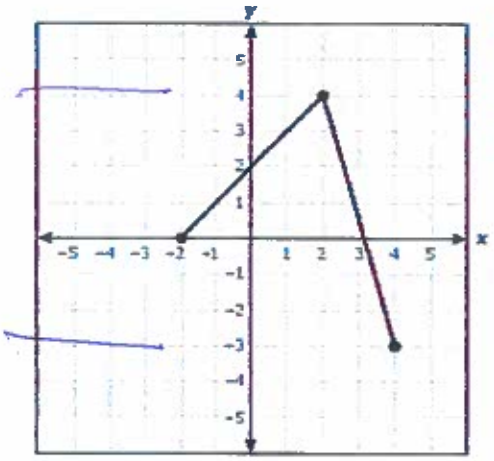
G $\{-5, -4, -1, 0, 1, 2, 4, 7\}$

H $\{-5, 0, 1, 2, 4\}$

J $\{5\}$

(53%)

16 What is the range of the function graphed on the grid?



F $\{x \mid x = -2, 2, 4\}$

G $\{y \mid -3 \leq y < 4\}$

H $\{x \mid -2 \leq x \leq 4\}$

J $\{y \mid y = -3, 0, 4\}$

(77%)

54 The student council sent its members on four field trips during the school year. The number of buses needed to transport the members on each trip is a function of the number of members who went on each trip. This function consists of only the ordered pairs (52, 3), (72, 4), (86, 5), and (105, 6). What is the domain for this situation?

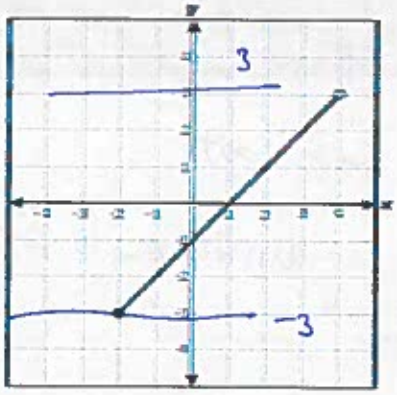
F {52, 105}

G {3, 4, 5, 6}

H {52, 72, 86, 105}

J {3, 4, 5, 6, 52, 72, 86, 105}

39 Function f is graphed below.



What is the range of f?

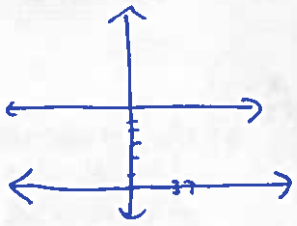
A $\{x \mid -2 \leq x < 4\}$

B $\{x \mid -2 < x \leq 4\}$

C $\{y \mid -3 < y \leq 3\}$

D $\{y \mid -3 \leq y < 3\}$

(51%)



13 What are the domain and range of $f(x) = -37$?

A Domain: All real numbers greater than or equal to –37
Range: All real numbers

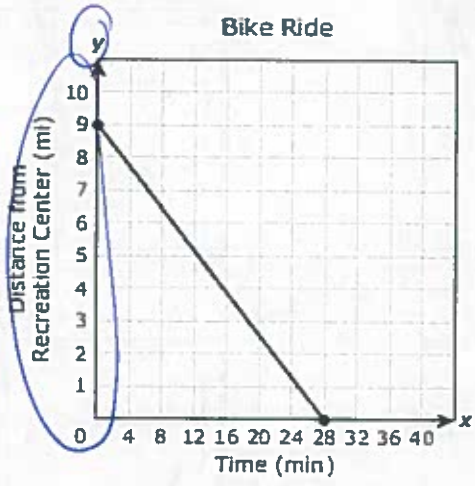
B Domain: {–37}
Range: All real numbers

C Domain: All real numbers
Range: All real numbers greater than or equal to –37

D Domain: All real numbers
Range: {–37}

(46%)

44 A student rode a bike from school to a recreation center. The graph shows the student's distance in miles from the recreation center after riding the bike for x minutes.



What is the range of the function for this situation?

F All real numbers greater than or equal to 0 and less than or equal to 28

G All real numbers greater than or equal to 0 and less than or equal to 9

H All real numbers less than or equal to 28

J All real numbers less than or equal to 9

30 The total cost in dollars to buy uniforms for the players on a volleyball team can be found using the function $c = 34.95u + 6.25$, where u is the number of uniforms bought. If there are at least 8 players but not more than 12 players on the volleyball team, what is the domain of the function for this situation?

in x spot

uniforms → discrete

F $0 < u \leq 12$

G $0 < c \leq 425.65$

H {8, 9, 10, 11, 12}

J {265.85, 320.80, 355.75, 390.70, 425.65}

(75%)

5 A set of weights includes a 4 lb barbell and 6 pairs of weight plates. Each pair of plates weighs 20 lb. If x pairs of plates are added to the barbell, the total weight of the barbell and plates in pounds can be represented by $f(x) = 20x - 4$.

y

X = # of plates

y = total weight

What is the range of the function for this situation?

A {0, 1, 2, 3, 4, 5, 6}

B {4, 24, 44, 64, 84, 104, 124}

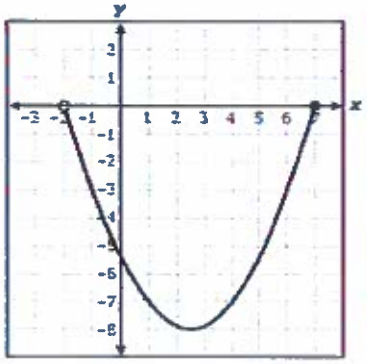
C {0, 2, 4, 6}

D {4, 44, 84, 124}

X

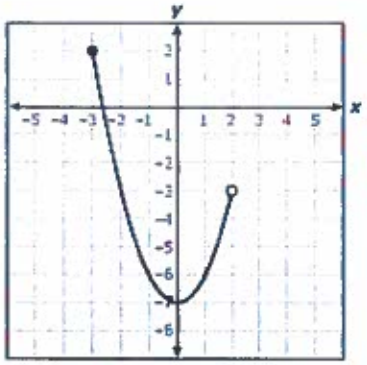
53 Which graph represents a function with a domain of all real numbers greater than or equal to −7 and less than 2?

A

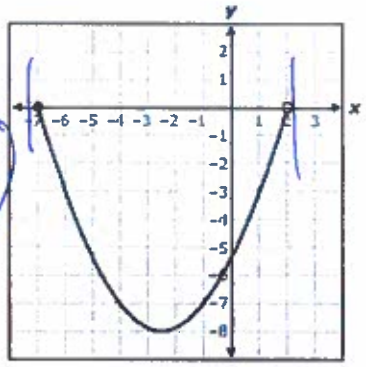


C

B

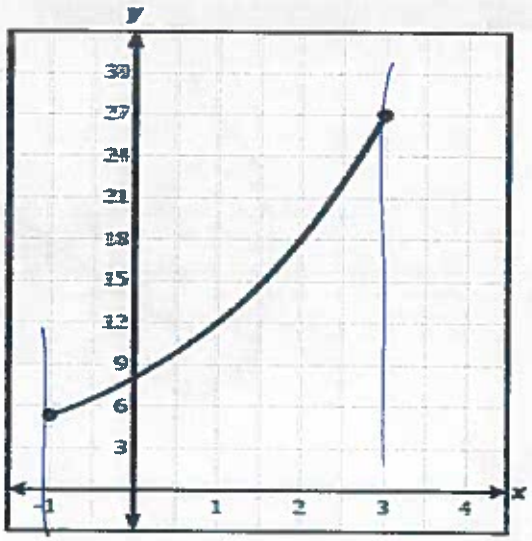


D



X

23 What appears to be the domain of the part of the exponential function graphed on the grid?



-1 3

A $-1 \leq x \leq 3$

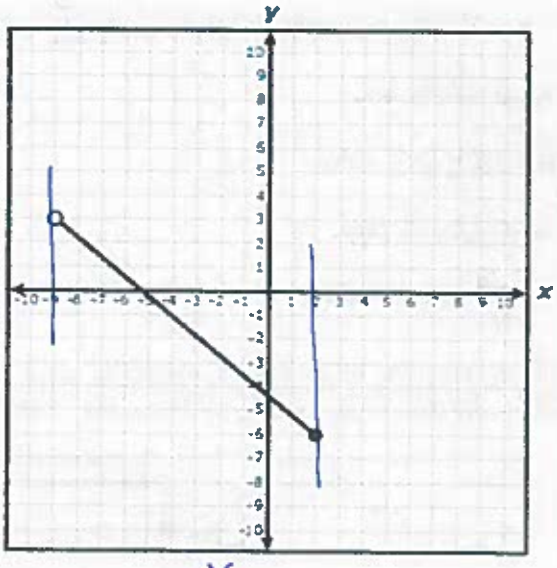
~~B $1 \leq y \leq 3$~~

C $5.3 \leq x \leq 27$

~~D $5.3 \leq y \leq 27$~~

44 The graph of part of linear function g is shown on the grid.

(6,7.0)



X

Which inequality best represents the domain of the part shown?

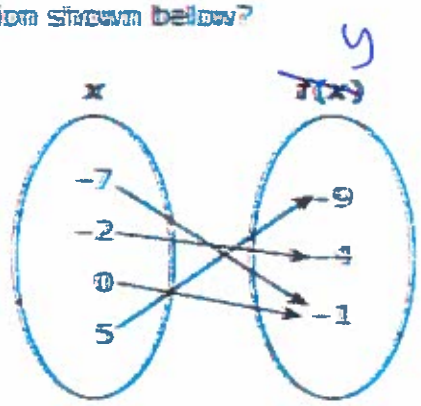
F $-9 < x \leq 2$

G $-9 \leq x < 2$

~~H $-6 < g(x) \leq 3$~~

~~J $-6 \leq g(x) < 3$~~

What is the range of the function shown below?



F {−7, −2, 0, 5}

G {−9, −4, −1}

H {−9, −7, −4, −2, −1, 0, 5}

J {−1}

47 The daily cost of hiring a plumber, y, to work x hours on a repair project can be modeled using a linear function. The plumber charges a fixed cost of $80 plus an additional cost of $45 per hour. The plumber works a maximum of 8 hours per day.

For one day of work, what is the range of the function for this situation?

$80 + 45x$

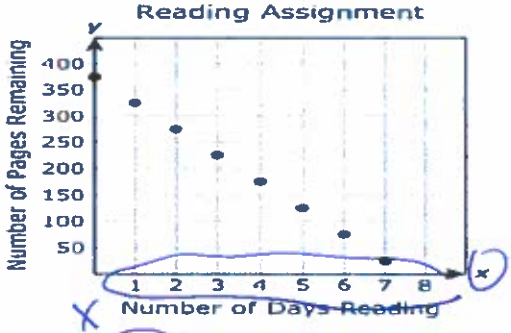
A $0 \leq x \leq 8$

B $80 \leq y \leq 440$

C $0 \leq x \leq 10$

D $45 \leq y \leq 685$

A college student recorded his progress for a reading assignment at the end of each day for 7 days. The graph shows the linear relationship between the number of pages remaining and x, the number of days the student spent reading.



Which of these best describes the domain of the function for this situation?

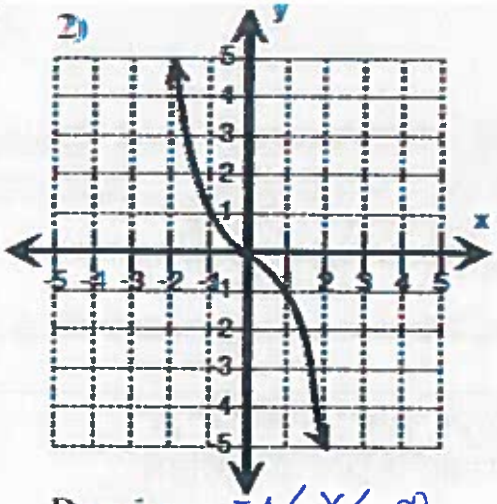
A All whole numbers greater than or equal to 0 and less than or equal to 425

B All whole numbers greater than or equal to 0 and less than or equal to 7

C All whole numbers greater than or equal to 25 and less than or equal to 375

D All whole numbers greater than or equal to 0 and less than or equal to 9

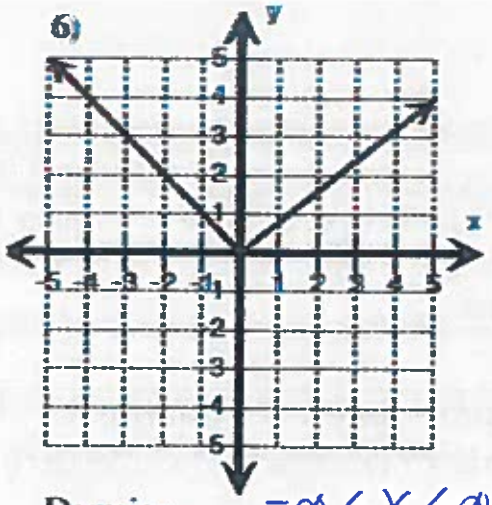
2)



Domain: $-\infty < x < \infty$

Range: $-\infty < y < \infty$

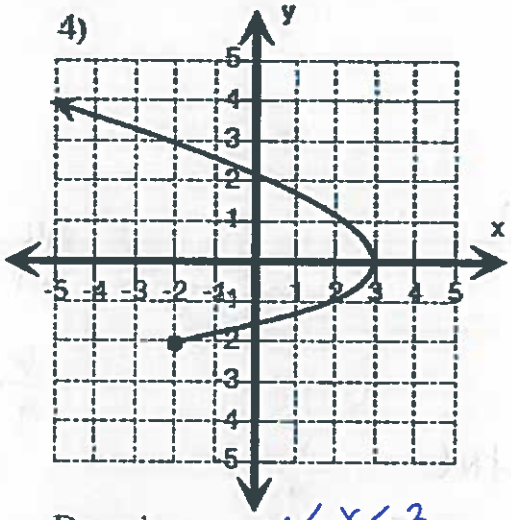
6)



Domain: $-\infty < x < \infty$

Range: $0 \leq y < \infty$

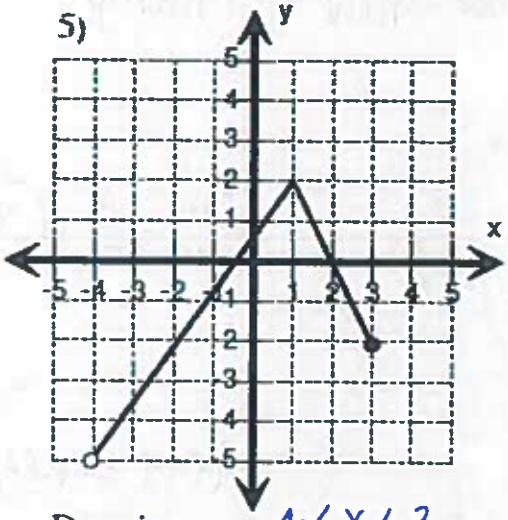
4)



Domain: $-\infty < x \leq 3$

Range: $-2 \leq y < \infty$

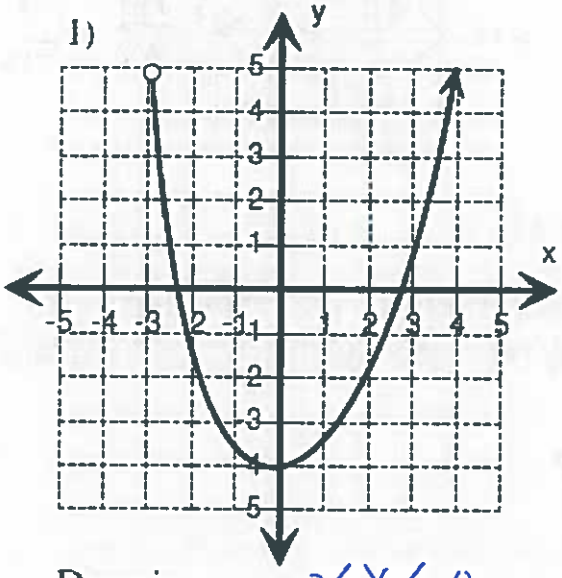
5)



Domain: $-4 < x \leq 3$

Range: $-5 < y \leq 2$

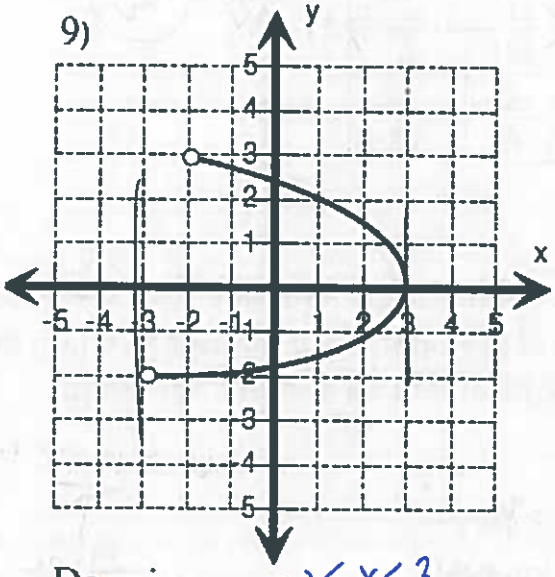
1)



Domain: $-3 < x < \infty$

Range: $-4 \leq y < \infty$

9)



Domain: $-3 < x \leq 3$

Range: $-2 < y < 3$

Rate of Change (A3B)

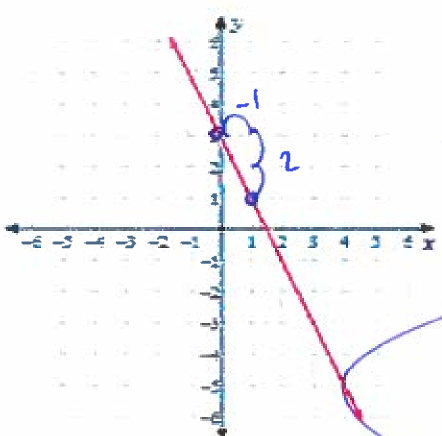
Calculate the **rate of change** of a linear function represented **tabular, graphically**, or **algebraically** in context of mathematical and **real-world problems**

I can…

- Manipulate any equation to identify slope and y-intercept
- Rate of change and slope through multiple representation

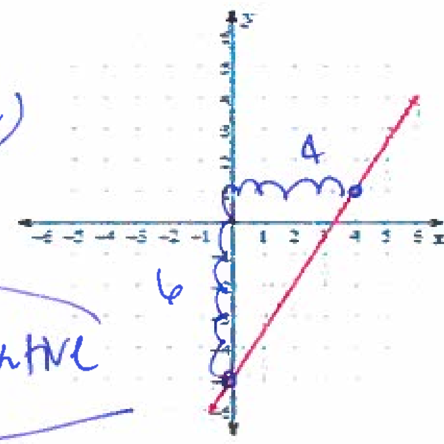
Notes:

Rate of change – how it changes



rise/run = 2/-1 = -2

left = negative



rise/run = 6/4, 6/4 = 3/2

x	y
0	3
-2	6
-4	9
-6	12

-2, +3: $\frac{\Delta y}{\Delta x} = \frac{3}{-2}$

x	y
10	4
-2	1
-14	-2
-26	-5

-12, -3: $\frac{\Delta y}{\Delta x} = \frac{-3}{-12} = \frac{1}{4}$

Word Problem: If the equation $y = 35x + 60$ represents the cost of joining a gym, where x is the number of months you join and y represents your total cost; explain what the numbers 35 and 60 represent.

35 = how it changes

$35 cost each month

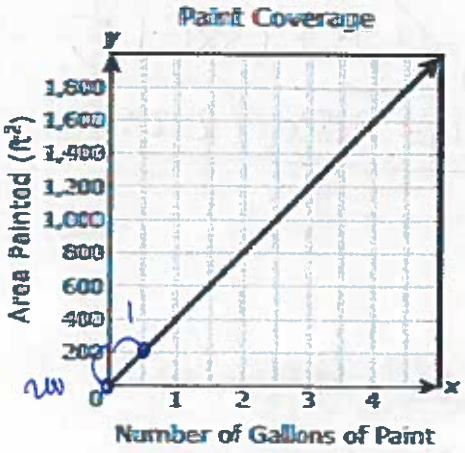
$y = mx + b$

slope, rate of change, how story changes

24

Sample Questions

21 The graph shows the linear relationship between the maximum area in square feet that can be painted and the number of gallons of paint used.



Which of these best represents the rate of change of the maximum area painted with respect to the number of gallons of paint used?

A 200 ft^2/gal

B $\frac{1}{200}$ ft^2/gal

C 400 ft^2/gal

D $\frac{1}{400}$ ft^2/gal

19 The table represents some points on the graph of a linear function.

x	y
−2	12
0	3
3	−10.5
7	−28.5

What is the rate of change of y with respect to x for this function?

A $\frac{2}{9}$

B $-\frac{9}{2}$

C $\frac{9}{2}$

D $-\frac{2}{9}$

(57%) **52** The function $y = 3.75 + 1.5(x - 1)$ can be used to determine the cost in dollars for a taxi ride of x miles. What is the rate of change of the cost in dollars with respect to the number of miles?

F $1.50 per mile

G $3.75 per mile

H $4.25 per mile

J $5.25 per mile

$y = 3.75 + 1.5x - 1.5$

$y = 1.5x + 2.25$

(66%) **42** The table shows the linear relationship between the balance of a student's savings account and the number of weeks he has been saving.

Savings Account

Week	0	1	3	6	8	13
Balance (dollars)	32	39	53	74	88	123

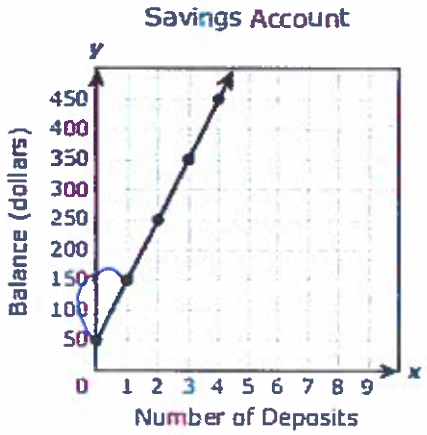
+1, +7

$\frac{\Delta y}{\Delta x} = \frac{7}{1} = 7$

Based on the table, what was the rate of change of the balance of the student's savings account in dollars and cents per week?

Record your answer and fill in the bubbles on your answer document.

(87%) **1** A savings account balance can be modeled by the graph of the linear function shown on the grid.



What is the rate of change of the balance with respect to the number of deposits?

A $100 per deposit

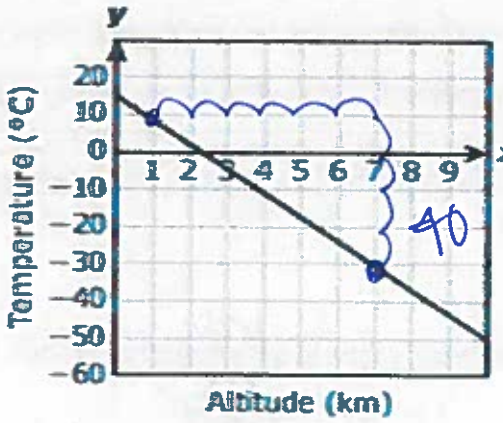
B $50 per deposit

C $0.50 per deposit

D $2 per deposit

$\frac{\text{RISE}}{\text{RUN}} = \frac{100}{1} = 100$

26 The graph models the linear relationship between the temperature of Earth's atmosphere and the altitude above sea level.



rise/run 40/−6 = −6.6̄

Which of these best represents the rate of change of the temperature with respect to altitude?

F −6.5°C/km

G −3.5°C/km

H −0.29°C/km

J −0.15°C/km

26 The average blue whale gains weight at a constant rate each day during its first six months of life. The relationship between the average blue whale's weight in tons, w, and its age in days, d, for the first six months of its life can be modeled by the function $w = 0.1d + 3$. Based on this relationship, which statement is not true for the average blue whale?

change beginning

F The average blue whale weighs 3 tons at birth. ✓

G When the average blue whale is 5 days old, it weighs 20 tons.

H The average blue whale gains 0.1 ton per day during its first six months of life. ✓

J When the average blue whale weighs 18 tons, it is 150 days old. ✓

4 The function $y = 6 + 1.25x$ can be used to find the cost of joining an online music club and buying x songs from the website. Based on this information, which statement about the graph of this situation is true?

F The y-intercept of the graph represents the cost of each song.

G The y-intercept of the graph represents the cost of joining the music club.

H The slope of the graph represents the total number of songs bought by members of the club.

J The slope of the graph represents the number of songs each member buys when visiting the website.

39 The table represents some points on the graph of linear function h.

x	$h(x)$
2	490
5	295
6	230
8	100

Which situation can be modeled by this function?

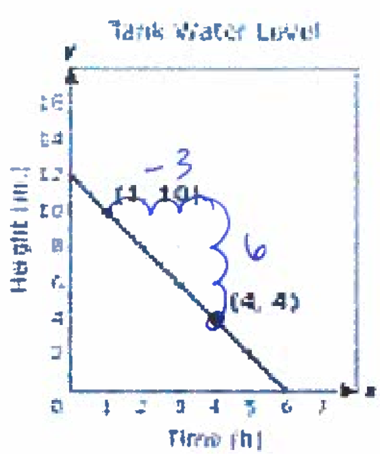
A The cost in dollars of buying x items that cost $245 each

B The number of miles an airplane had traveled after flying 555 miles per hour for x hours

C The remaining number of miles on a 620-mile trip after traveling 65 miles per hour for x hours

D The amount owed on a $555 loan after paying $65 per month for x months

1. What does the rate of change represent?



A. How much water is in the tank

B. How long it will take to drain the tank

C. How much water the tank had in the beginning

D. How fast the water drains every hour

Graphs of Linear Functions (A3C)

Graph linear functions on the coordinate plan and **identify** key features, including **x-intercept, y-intercept, zeros, and slope**, in **mathematical and real-world problems**

I can...
- Interpret the meaning of intercepts
- Limitations that may arise from the context of the problem

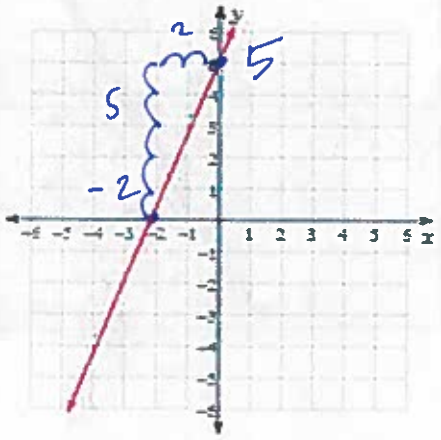
Notes:

x-intercept – where it crosses x-axis

zero- same as

y-intercept – where it crosses y-axis

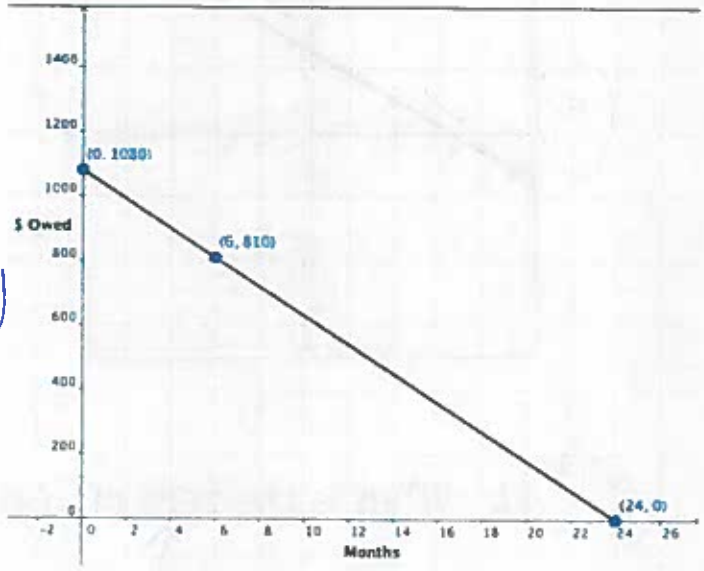
slope – $\frac{\text{Rise}}{\text{run}}$



slope = $\frac{5}{2}$

X-int = (-2, 0)

y-int (0, 5)



X-int: (24, 0)
At 24 months there is $0 owed

y-int: (0, 1080)
At 0 months, $1,080 is owed.

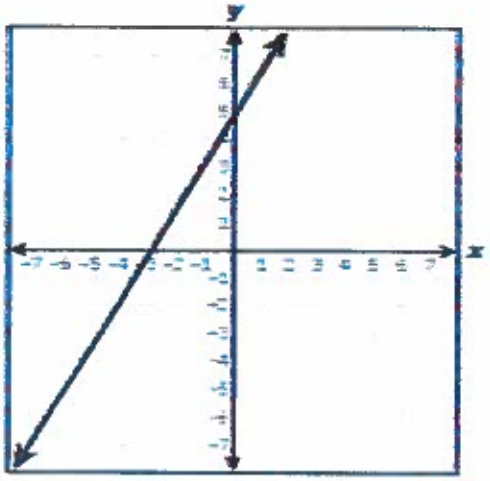
How to Graph equation into calculator

Put equation into Y= Graph
· look at graph or go to table

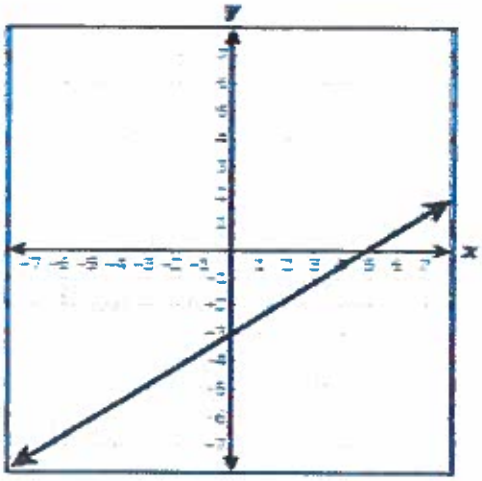
Sample Questions

(84%) **54** Which line appears to have an x-intercept of −5 and a y-intercept of 3?

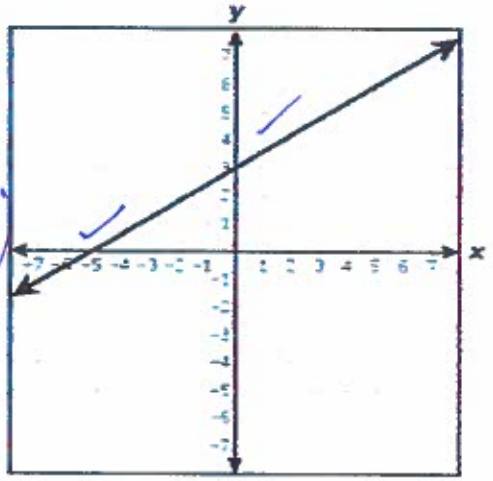
F



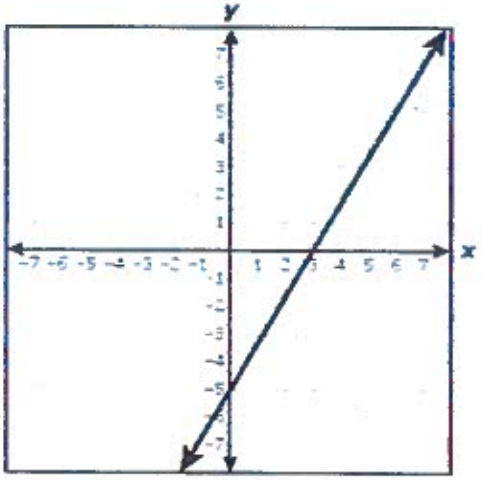
H



G



J



(59%) **41** What is the zero of $r(x) = \frac{8}{3}x - 16$?

↑ x-int

A −16

B −6

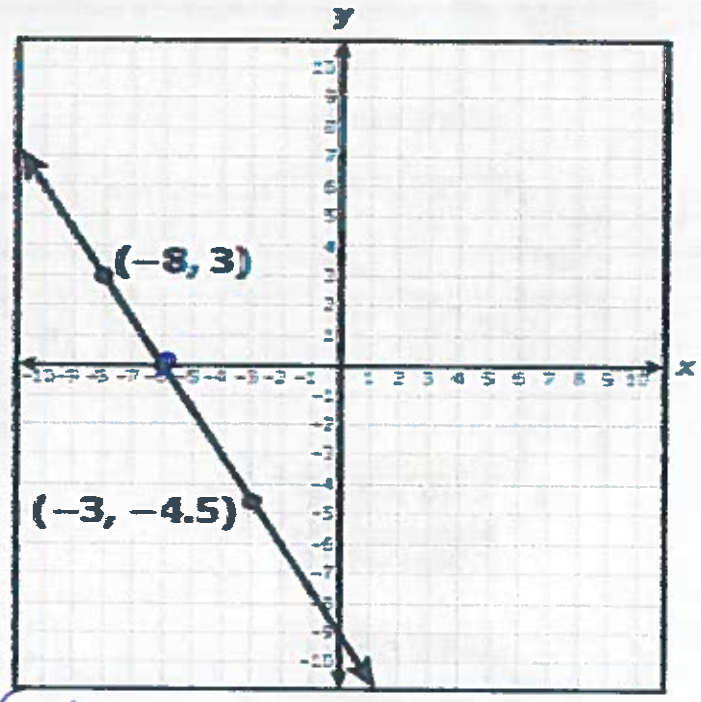
C 6

D 16

graph in calculator and look at picture

42 The graph of linear function g is shown on the grid.

(6|2)



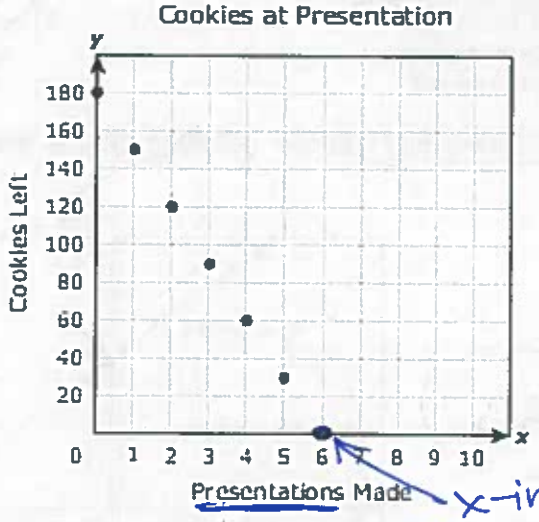
x-int

What is the zero of g?

−6

Record your answer and fill in the bubbles on your answer document.

17 The graph shows the relationship between the number of cookies a presenter at a convention had left to give away and the number of presentations she had made.



presentations

cookies

x-int: (6, 0)

What does the x-intercept of the graph represent?

A The number of cookies the presenter had before making any presentations

B The maximum number of cookies the presenter gave away during every presentation

C The number of presentations the presenter made per hour

D The maximum number of presentations the presenter made before running out of cookies

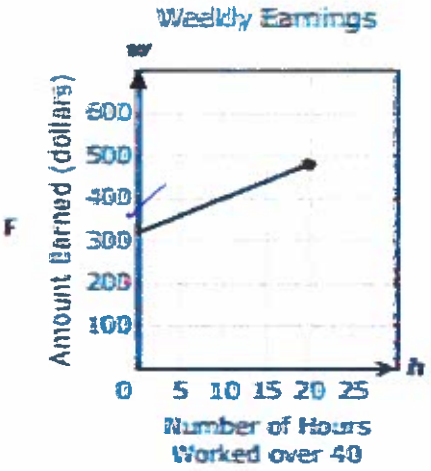
6/12

(47%)

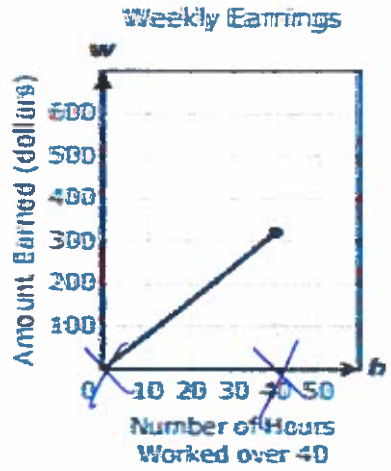
12 A lifeguard earns $320 per week for working 40 hours plus $12 per hour worked over 40 hours. A lifeguard can work a maximum of 60 hours per week.

Which graph best represents the lifeguard's weekly earnings in dollars for working h hours over 40?

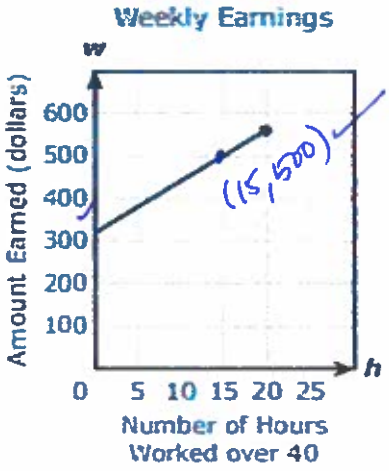
F



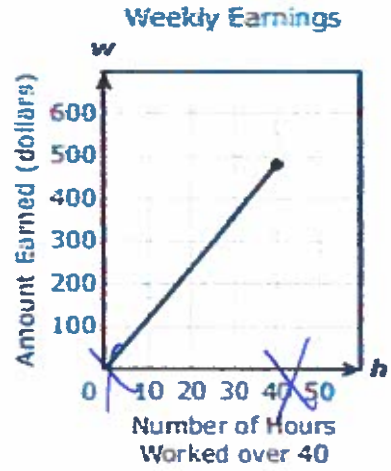
H



G

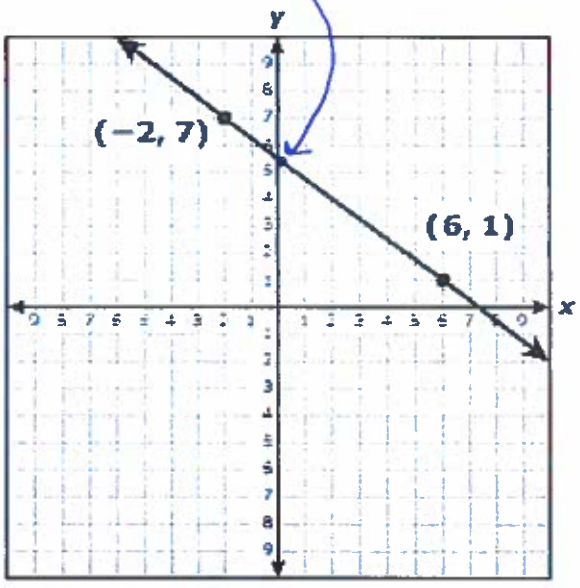


J



(68%)

14 What is the y-intercept of the line graphed on the grid?

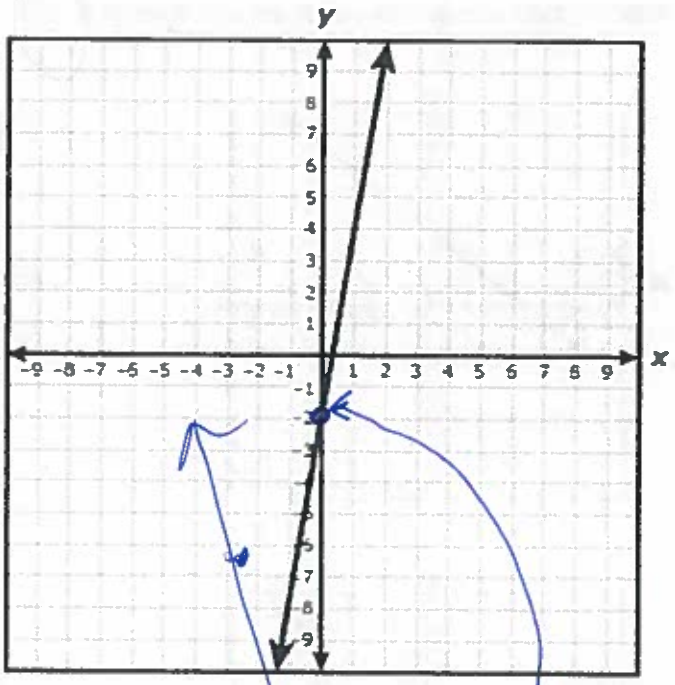


5.5

Record your answer and fill in the bubbles on your answer document.

32 The graph of a function is shown on the grid.

(78%)



Which ordered pair best represents the location of the *y*-intercept?

F $(\frac{1}{3}, 0)$

G $(0, -2)$

H $(0, \frac{1}{3})$

J $(-2, 0)$

The points $(-3, 101.5)$ and $(3, -3.5)$ are on the graph of linear function *k*. What are the coordinates of the point where the graph of *k* crosses the *y*-axis?

List: Spreadsheets

A $(2.8, 0)$

B $(49, 0)$

C $(0, 2.8)$

D $(0, 49)$

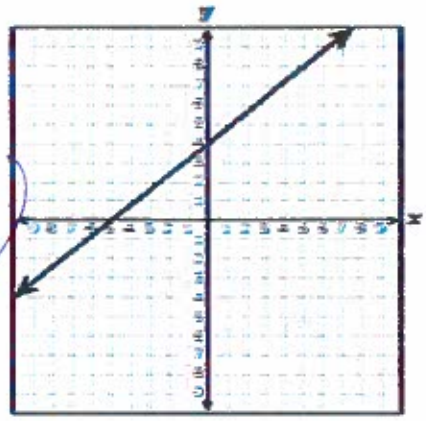
x	y
−3	101.5
3	−3.5

$y = -17.5x + 49$

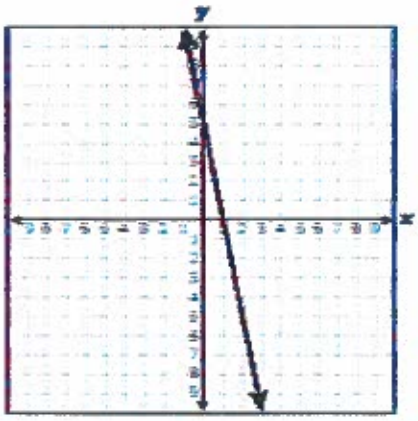
y-int

(809) **43** Which graph shows a line with an x-intercept of −5?

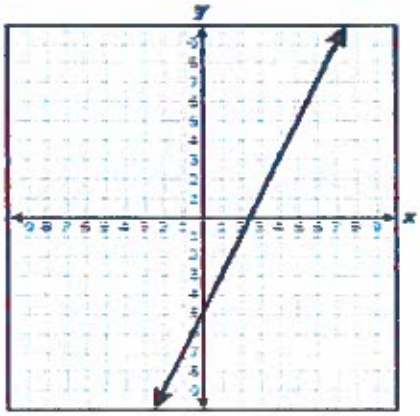
A



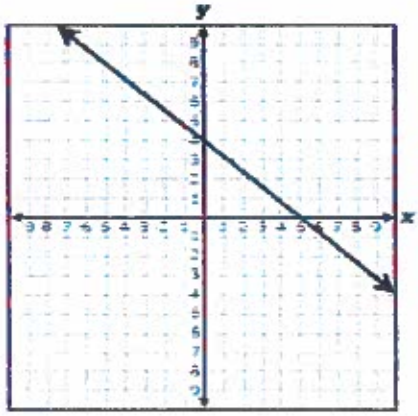
C



B

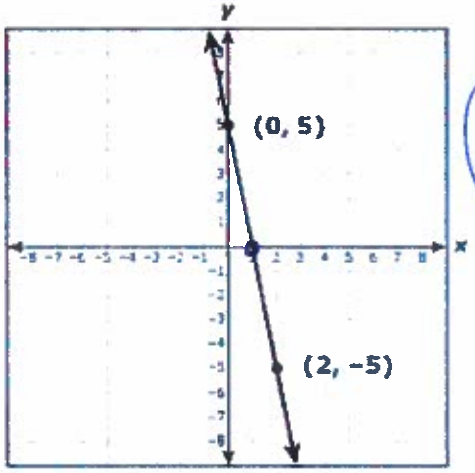


D



27 What is the zero of the linear function graphed below?

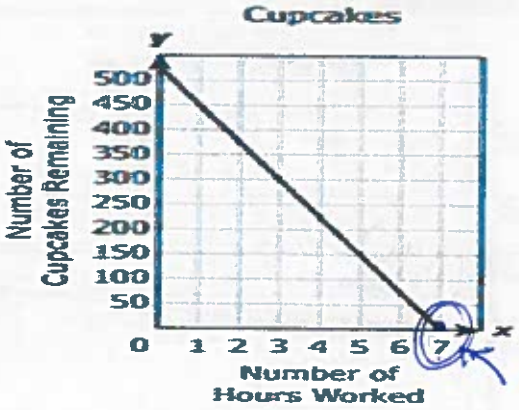
x-int



1

Record your answer and fill in the bubbles on your answer document.

The graph models the linear relationship between the remaining number of cupcakes a baker must frost and the number of hours the baker has worked.



#of hours
(7, 0)
#of cupcakes

What does the *x*-intercept represent in this situation?

A The number of hours it takes the baker to frost all the cupcakes

B The number of cupcakes the baker must frost

C The number of cupcakes the baker frosts per hour

D The number of hours the baker works in a day

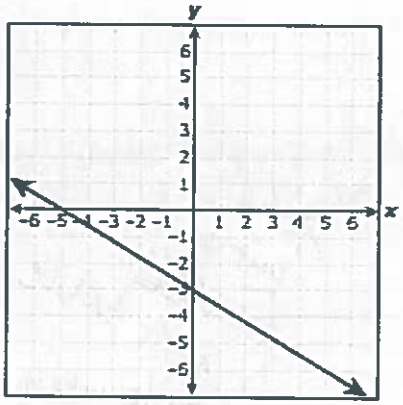
(5690)

23 Which graph represents $-3x + 5y = -15$?

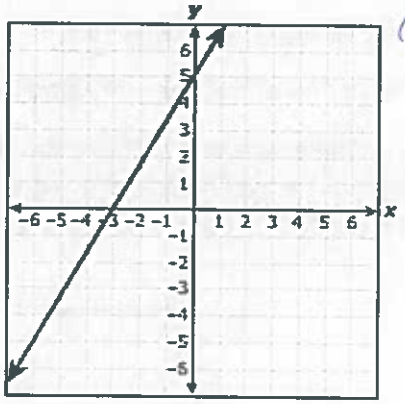
OR put this into Graph, Relations and look @ Graph

$-3x+5y=-15$
$+3x \quad +3x$
$\frac{5y}{5} \quad \frac{3x-15}{5} \quad \frac{15}{5}$
$y = \frac{3}{5}x - 3$

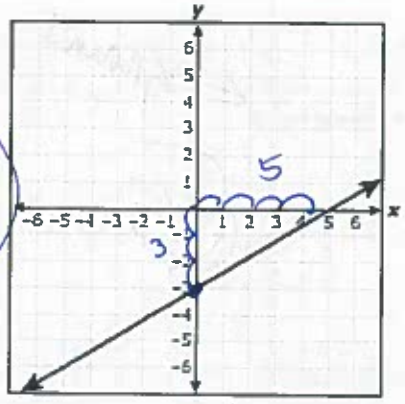
A



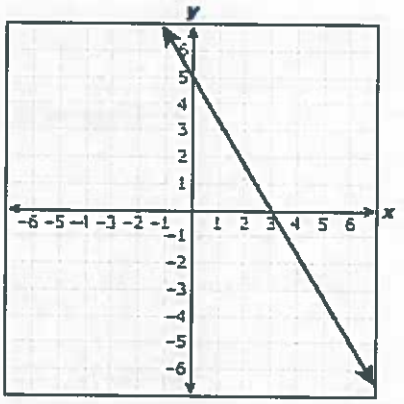
C



B

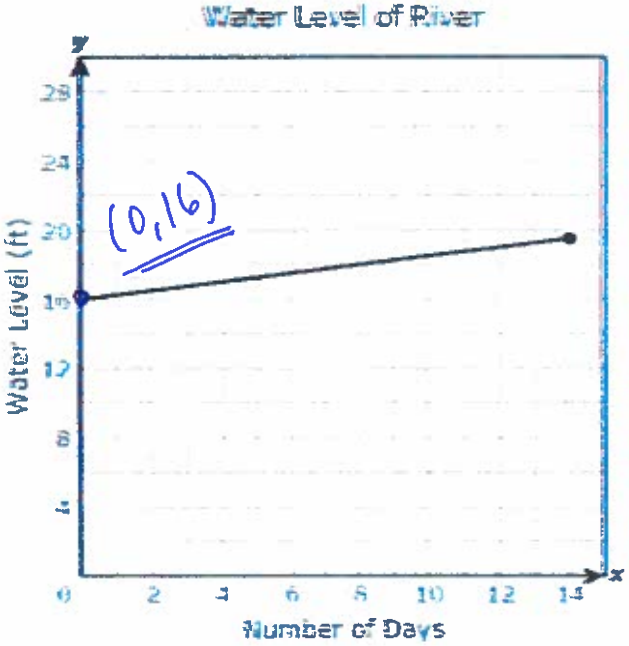


D



(71%)

16 The water level of a river was measured each day during a two-week period. The graph models the linear relationship between the water level of the river in feet and the number of days the water level was measured.



Which statement best describes the y-intercept of the graph?

F The water level increased by 0.25 ft per day.

G The maximum water level was 19.5 ft.

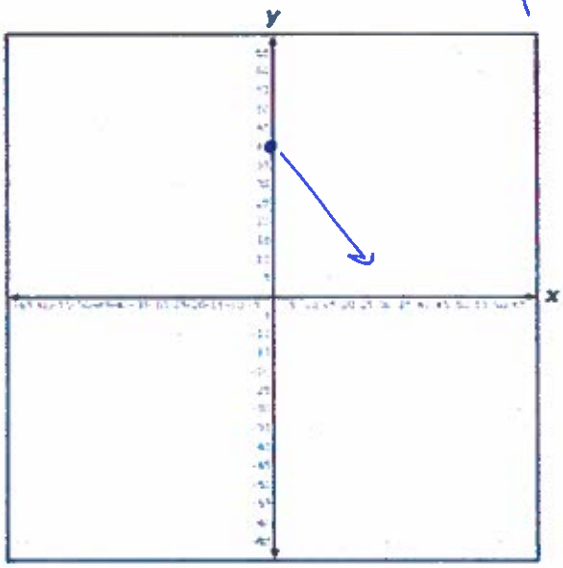
H The initial water level was 16 ft.

J The water level was measured for 14 days.

(52%)

27 A paper airplane was thrown from the top of a tall building. The height of the paper airplane above the ground can be found using the function $y = -1.5x - 60$, where x is the time in seconds the airplane has been in the air.

put into graph
- go to table
- go to when y=0



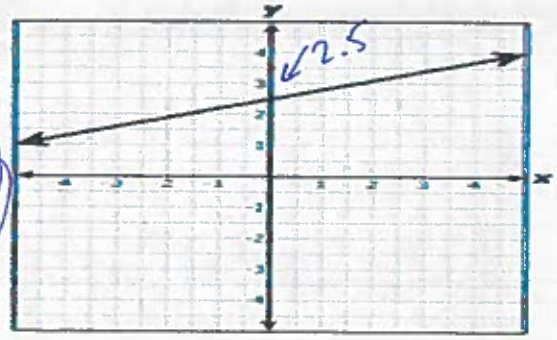
How many seconds did it take the paper airplane to reach the ground?

Record your answer and fill in the bubbles on your answer document.

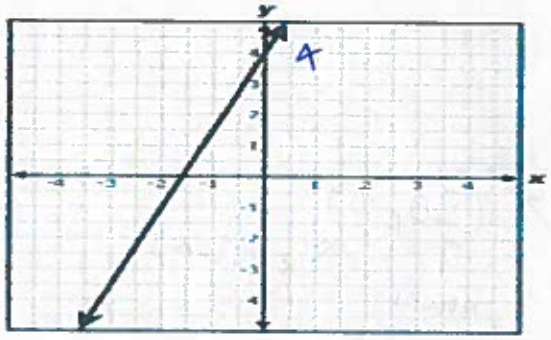
36

Which graph shows a line with the same y-intercept as the graph of $10x - 16y = -40$?

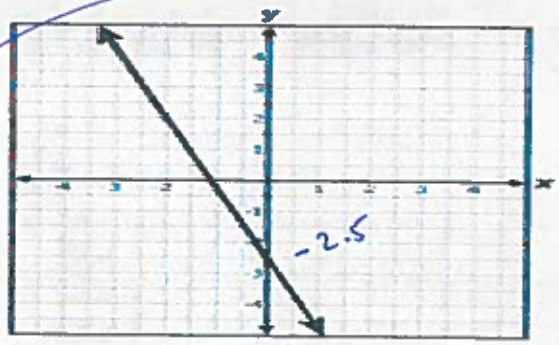
A



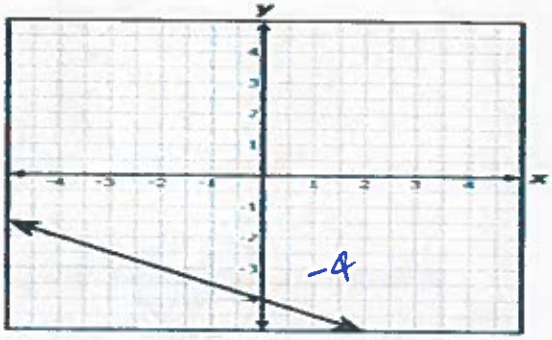
B



C



D



$10x - 16y = -40$

$-10x \quad -10x$

$\frac{-16y}{-16} = \frac{-10x - 40}{-16} \quad -16$

$y = \frac{5}{8}x + \frac{5}{2}$

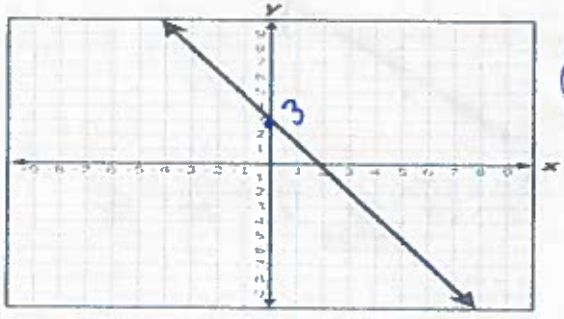
$\uparrow$

2.5

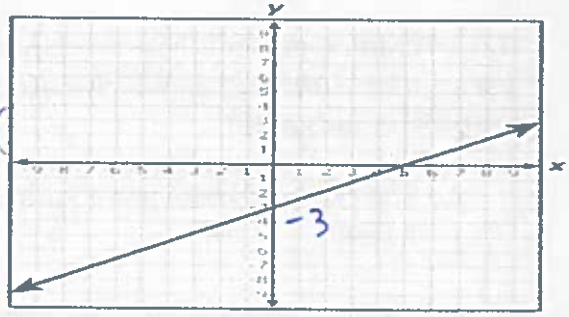
Which graph represents $9(x - 5) = -15y$?

A

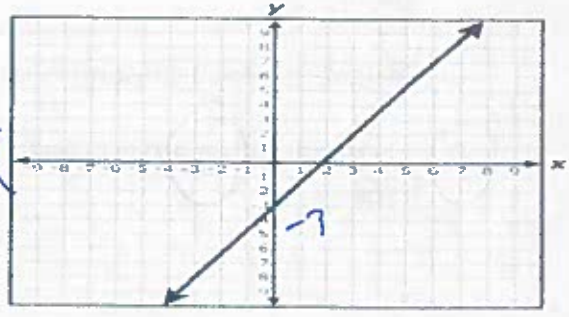
B



C



D

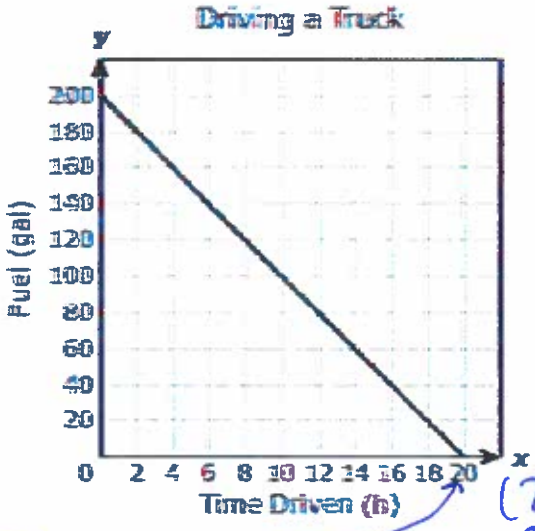


$9(x - 5) = -15y$

$\frac{9x}{-15} - \frac{45}{-15} = \frac{-15y}{-15}$

$y = \frac{-3}{5}x + 3$

(8.22) **47** The graph below shows the relationship between the number of gallons of fuel remaining in a truck and the number of hours the truck has been driven.



(20, 0)
↑ hours
× gallons

What does the x-intercept of the graph represent?

A The number of gallons of fuel in the truck before any driving occurred

B The number of hours the truck was driven before running out of fuel

C The number of gallons of fuel the truck can hold

D The number of hours required to use one gallon of fuel

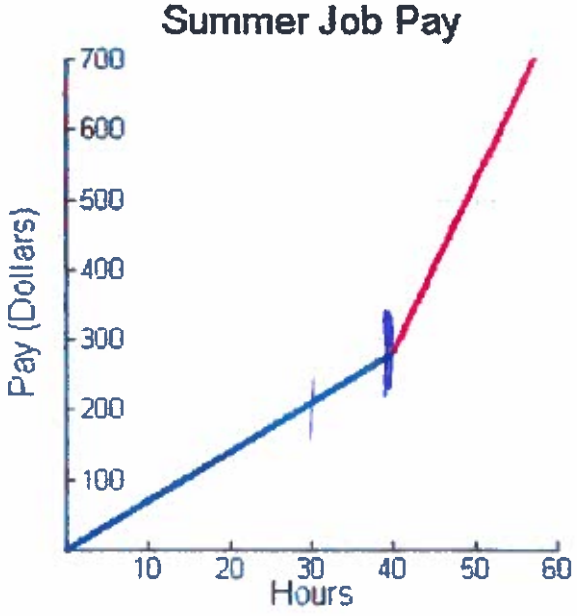
1. The graph represents how much Elizabeth earns in her summer job. Which statement is true about the graph?

A. She gets paid more per hour after 30 hours.

B. She gets paid less per hour after 40 hours.

C. She gets paid at a constant rate.

D. She gets paid more per hour after 40 hours.



Graphs of Linear Inequalities (A3D)

Graph the **solution set** of **linear inequalities** in two variables on the coordinate plane

I can...
- Determine the region of the graph that represents solution
- Does a point satisfy the inequality?

Notes:

Steps

1. Get equation into $y = mx + b$
2. Graph $m = \frac{\text{rise}}{\text{run}}$ b = y-int
3. Solid or dashed line?
4. Shade above or below?
*** If you divide by a negative #, flip the symbol

* Put equation into graph look at =

SOLID LINE
$\leq$ $\geq$

in solution set →

DASHED LINE
$<$ $>$

→ not in solution set

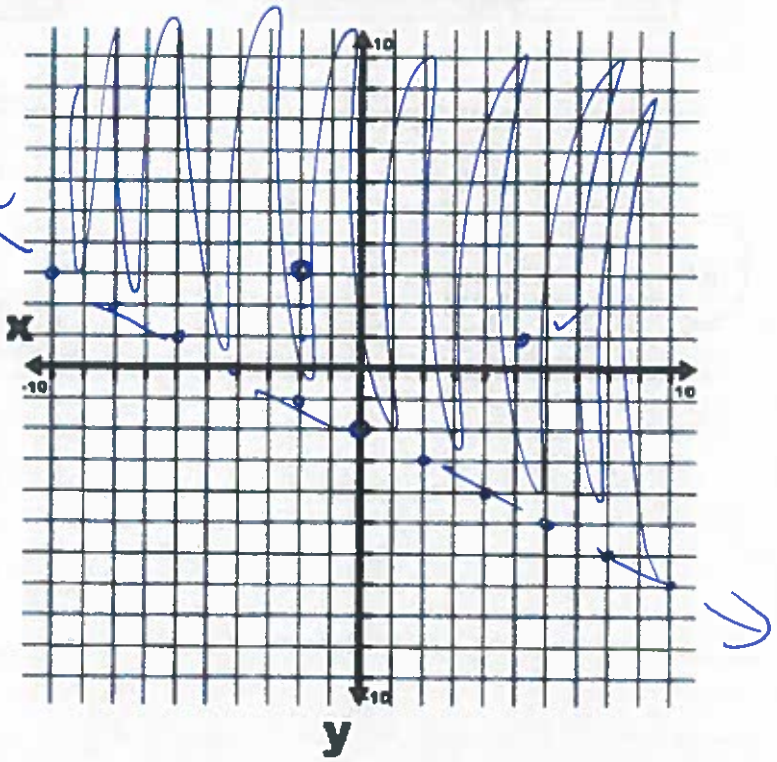
SHADE ABOVE
$\geq$ $>$
$\leq$ $<$ SHADE BELOW

Inequality #1: $y > -\frac{1}{2}x - 2$ ← y-int

$-\frac{1}{2} = \frac{\text{rise}}{\text{run}}$

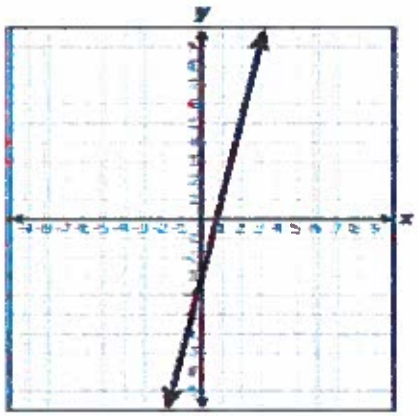
Is the point $(-2, 3)$ in the solution set? yes

Is the point $(5, 1)$ in the solution set? yes



Sample Problems

The graph of $y = 4x - 3$ is shown on the grid.

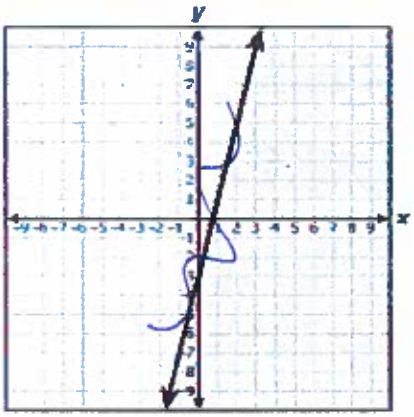


Which graph represents the solution set of $y > 4x - 3$?

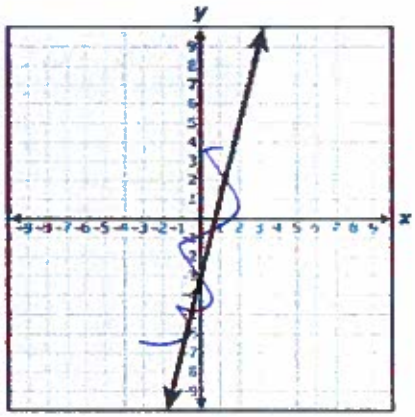
Put into Graph, relations

Shade above dashed

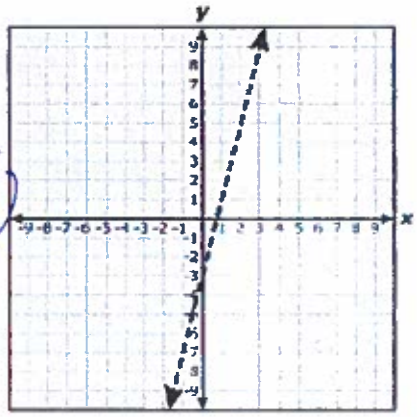
A



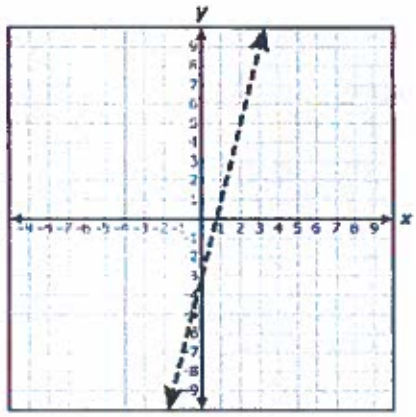
C



B



D



(55%)

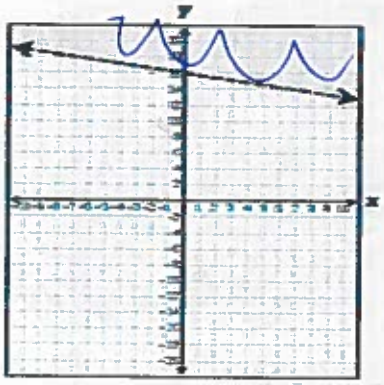
49 Which graph represents the inequality $-2x + 7y \leq 112$?

$+2x \quad +2x$

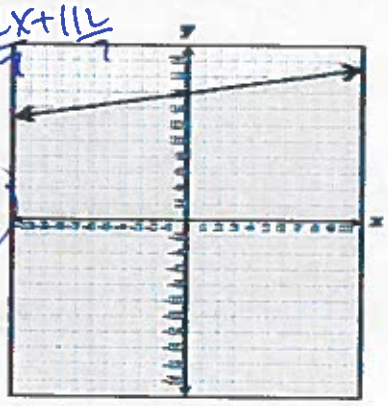
$\frac{7y}{7} \leq \frac{2x+112}{7}$

$y \leq \frac{2}{7}x + 16$

A



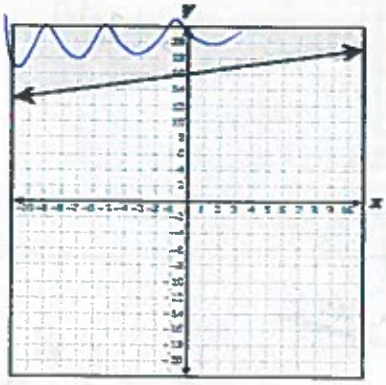
C



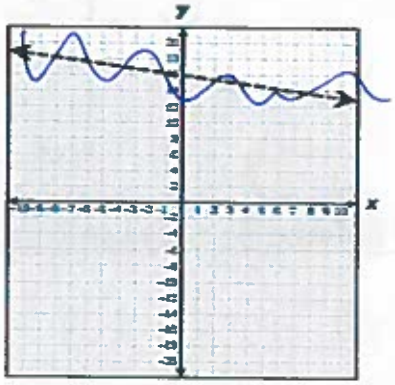
OR

Put into Graph, Relations

B

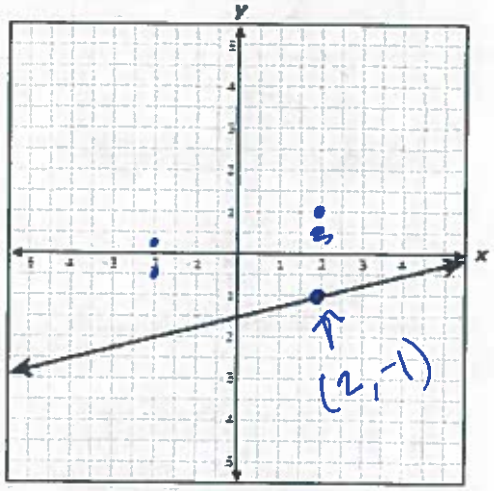


D



(68%)

7 The graph of $0.5x - 2y = 3$ is shown on the grid.



Which ordered pair is in the solution set of $0.5x - 2y \geq 3$?

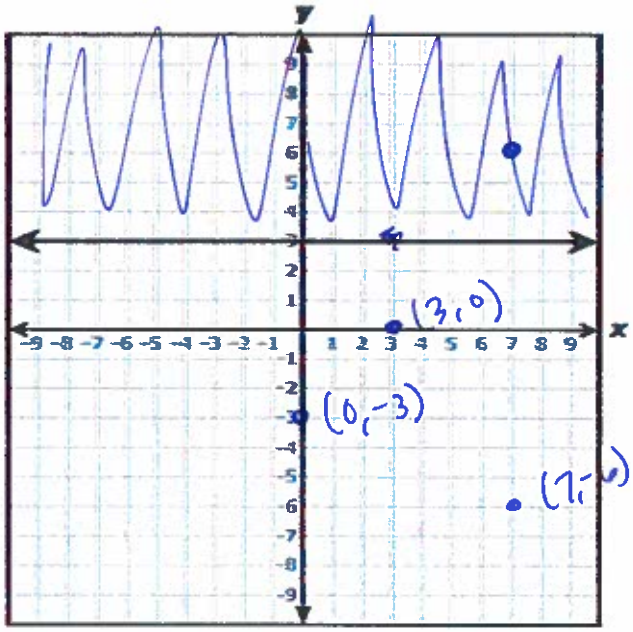
A $(-2, 0.5)$

B $(2, 1)$

C $(2, -1)$

D $(-2, -0.5)$

The graph of $y = 3$ is shown on the grid.



Which ordered pair is in the solution set of $y \geq 3$?

above

A (7, –6)

B (3, 0)

C (0, –3)

D (7, 6)

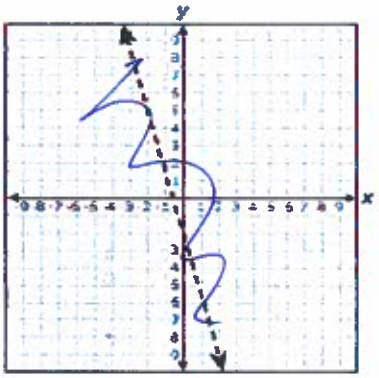
(5,7)

47 Which graph represents the solution set of $y \geq -\frac{7}{2}x - 2$?

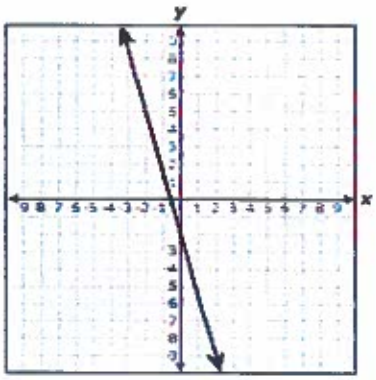
Solid

Put into graph, relations

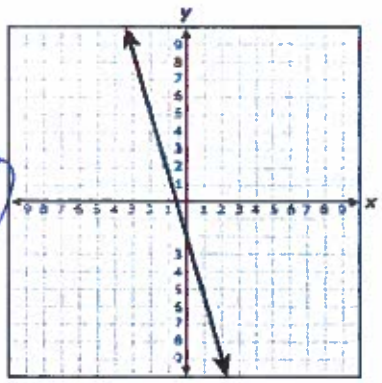
A



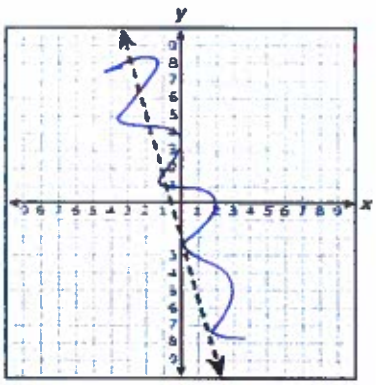
C



B

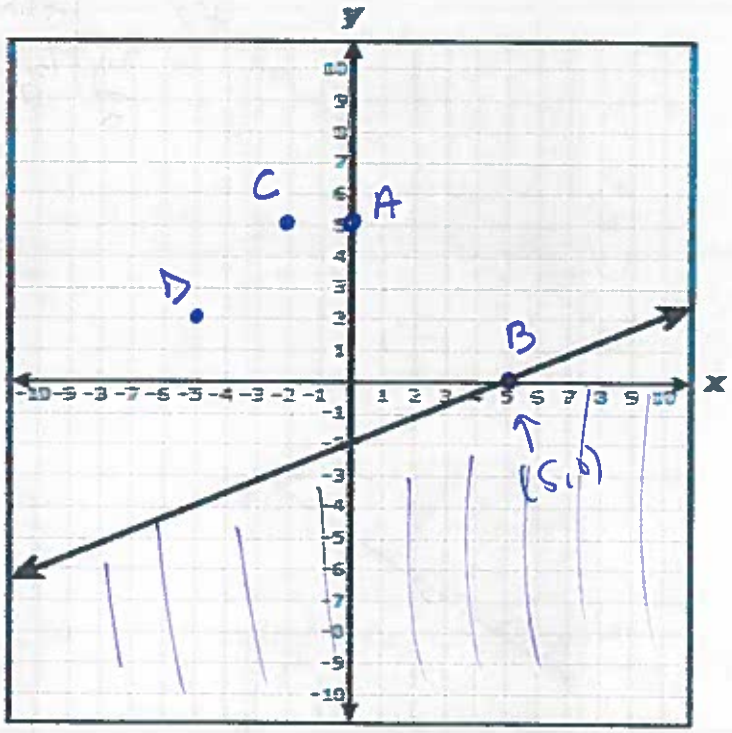


D



45 The graph of $2x - 5y = 10$ is shown on the grid.

(60%)



Which ordered pair is in the solution set of $2x - 5y \geq 10$?

put into graph, relations

A (0, 5)

B (5, 0)

C (−2, 5)

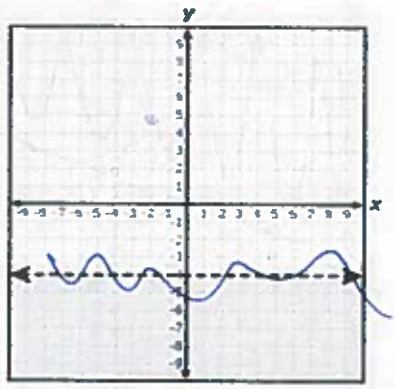
D (−5, 2)

3 Which graph best represents the solution set of $y \leq -4x$?

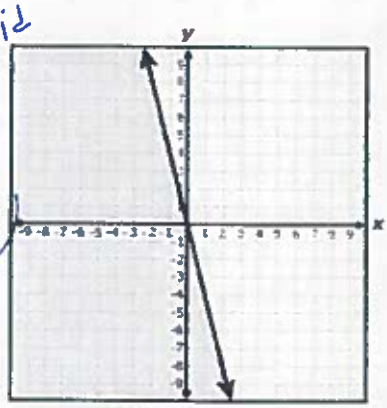
(73%)

solid

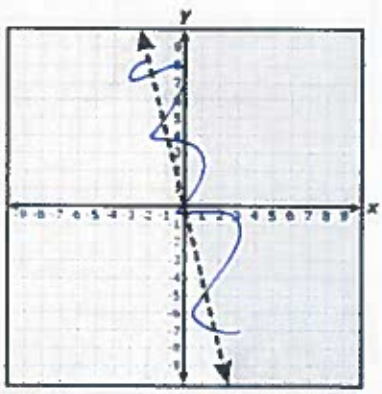
A



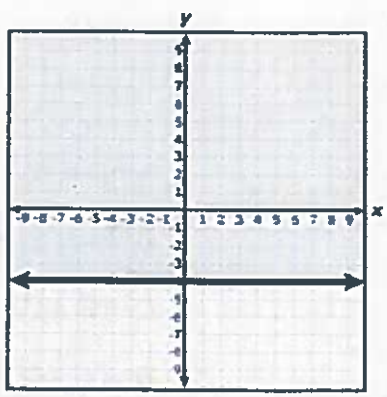
C



B



D



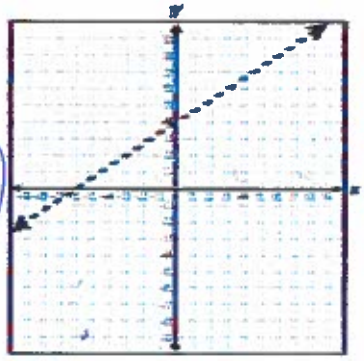
$y > \frac{2}{3}x + 4$

15 Which graph represents the inequality $-2x + 3y > 12$?

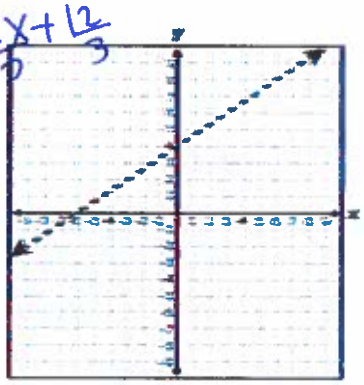
$+2x \quad +2x$

$\frac{3y}{3} > \frac{2x+12}{3}$

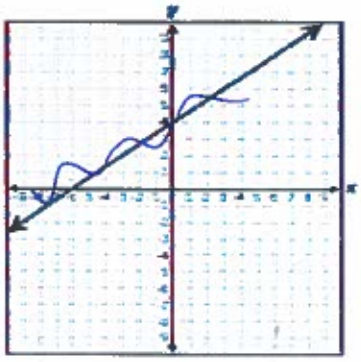
A



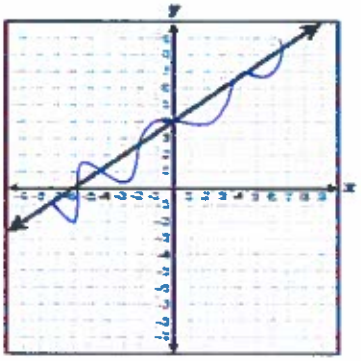
C



B

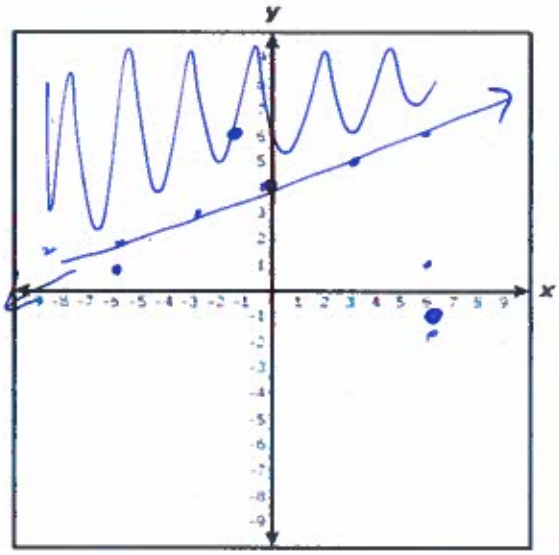


D



(502)

37 Which ordered pair is in the solution set of $y \geq \frac{1}{3}x + 4$?



A (−6, 1)

B (−1, 6) ✓

C (6, −1)

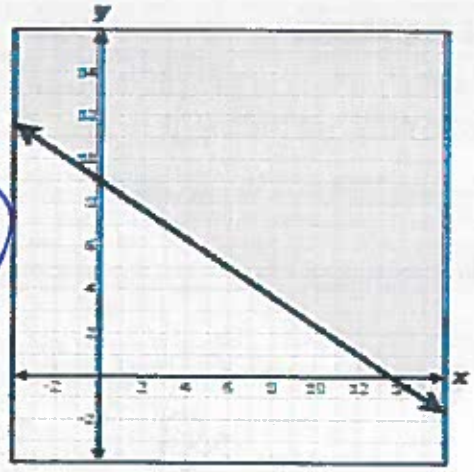
D (1, −6)

(55%)

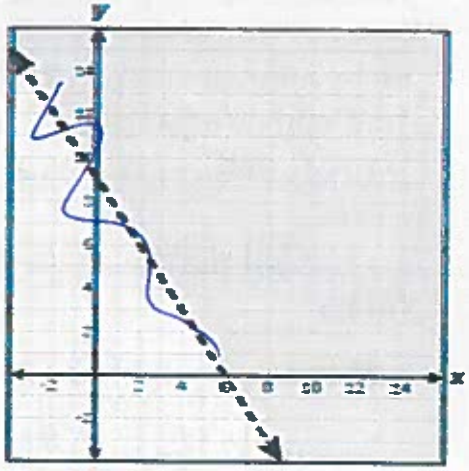
19 Which graph best represents the solution set of $-4x \leq 6y - 54$?

solid

A



C



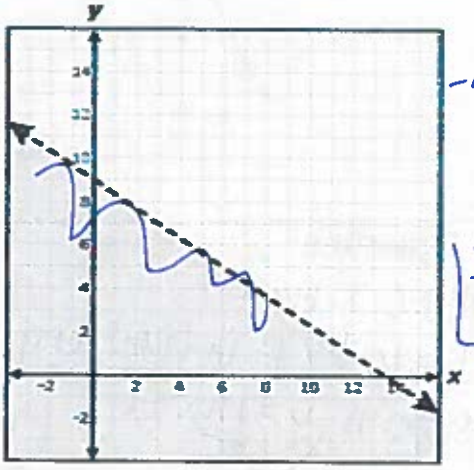
$-4x \leq 6y - 54$

$+54 \quad +54$

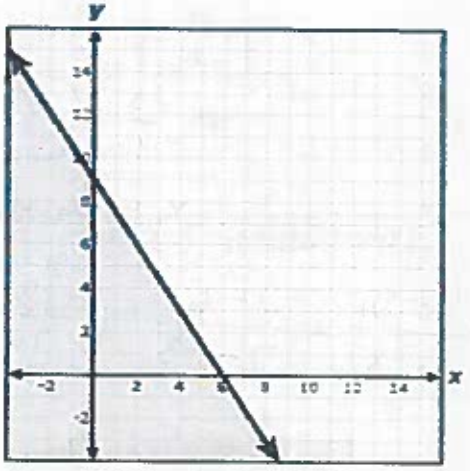
$\frac{-4x+54}{6} \leq \frac{6y}{6}$

$-\frac{2}{3}x + 9 \leq y$

B



D

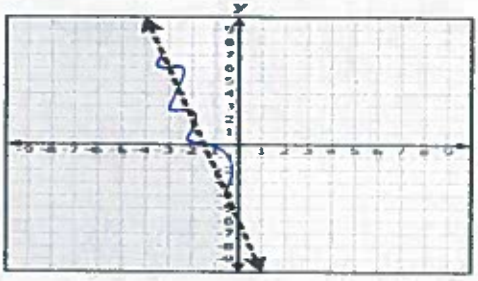


Which graph represents the solution set of $-4x - y \leq -6$?

solid

$+4x \quad +4x$

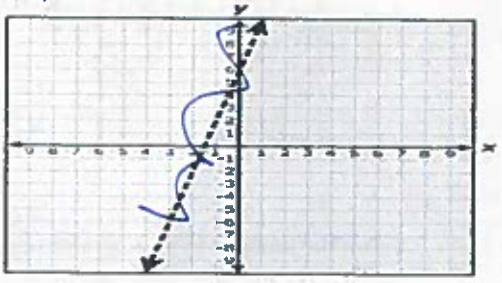
A



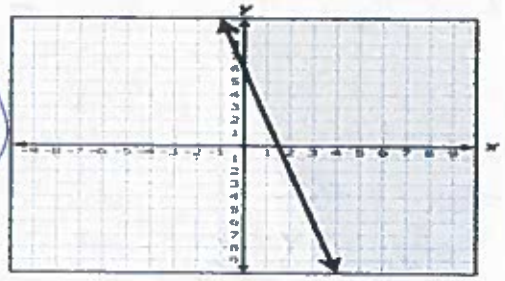
$\frac{-y}{-1} \leq \frac{4x-6}{-1}$

$y \geq -4x + 6$

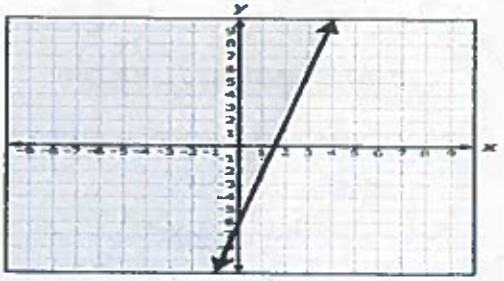
C



B



D



Slope of a Line (A3A)

Determine the **slope of a line** given a **table** of values, a **graph**, **two points** on the line, and an **equation written in various forms**, including $y = mx + b$, $Ax + By = C$, and $y - y_1 = m(x - x_1)$

I can...
- Find slope of an equation in any form

Notes:

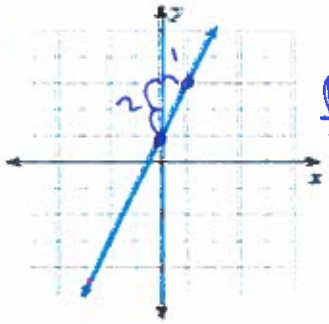
Table:

x	y
-3	5
-2	2
-1	-1
0	-4
1	-7

$\frac{\Delta y}{\Delta x}$

$m = \frac{-3}{1} = -3$

Graph:



$\frac{\text{Rise}}{\text{Run}} = \frac{2}{1} = 2$

Two Points: $(-3, 6), (7, -7)$ (x_1, y_1, x_2, y_2)

$\frac{y_2 - y_1}{x_2 - x_1} = \frac{-7 - 6}{7 - -3} = \frac{-13}{10}$

Equation: $6x - 5y = -20$

$6x - 5y = -20$

$-6x \quad -6x$

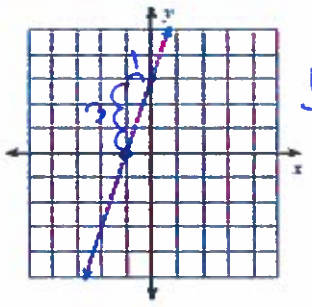
$\frac{-5y}{-5} = \frac{-6x - 20}{-5}$

- move x over
- divide by # in front of y
- slope is $y = mx + b$

$y = \frac{6}{5}x + 4$

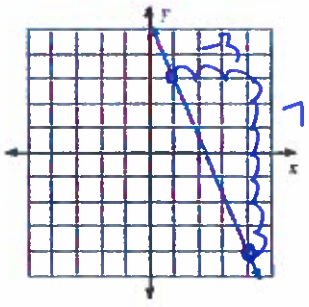
Find the slope of each line.

1)



$\frac{\text{Rise}}{\text{Run}} = \frac{12}{4} = 3$

2)



$\frac{\text{Rise}}{\text{Run}} = \frac{7}{3}$

Find the slope of the line through each pair of points.

3) $(6, 7), (12, 5)$ (x_1, y_1, x_2, y_2)

$\frac{5 - 7}{12 - 6} = \frac{-2}{6} = -\frac{1}{3}$

4) $(14, -2), (15, -12)$ (x_1, y_1, x_2, y_2)

$\frac{y_2 - y_1}{x_2 - x_1} = \frac{-12 - -2}{15 - 14} = \frac{-10}{1} = -10$

Find the slope of each line.

5) $4x + 3y = 6$

$-4x \quad -4x$

$\frac{3y}{3} = \frac{-4x + 6}{3}$

$y = -\frac{4}{3}x + 2$

slope

$\frac{y_2 - y_1}{x_2 - x_1} =$

6) $8x - y = -4$

$-8x \quad -8x$

$\frac{-y}{-1} = \frac{-8x - 4}{-1}$

$y = 8x + 4$

slope

Sample Questions

(54%)

16 What is the slope of the line represented by $5x - 12y = 24$?

F -2

G $\frac{24}{5}$

H -12

J $\frac{5}{12}$

$-5x \quad -5x$

$\frac{-12y}{-12} \quad \frac{-5x+24}{-12} \quad \frac{}{-12}$

$y = \frac{5}{12}x - 2$

slope

(60%)

51 What is the slope of the line that passes through the points $(26, 7)$ and $(-39, 12)$?

$x_1\ y_1 \quad x_2\ y_2$

A $-\frac{1}{13}$

B $\frac{5}{13}$

C -13

D $\frac{13}{5}$

$\frac{12-7}{-39-26} = \frac{5}{-65} = \frac{-1}{13}$

$\frac{y_2 - y_1}{x_2 - x_1}$

(50%)

51 What is the slope of the line that passes through the points $(5, -11)$ and $(-9, 17)$?

$x_1\ y_1 \quad x_2\ y_2$

A -2

B $-\frac{1}{2}$

C 7

D 2

$\frac{y_2 - y_1}{x_2 - x_1} = \frac{17 - -11}{-9 - 5} = \frac{28}{-14} = -2$

The table represents some points on the graph of linear function h.

x	$h(x)$
−4	−7
−2	$-5\frac{1}{2}$
0	−4
2	$-2\frac{1}{2}$

$\frac{\Delta y}{\Delta x}$ +2 +1.5 −5.5

$\frac{1.5}{2} = .75 = \frac{3}{4}$

What is the slope of the graph of h?

A $\frac{3}{4}$

B $\frac{4}{3}$

C $-\frac{3}{4}$

D $-\frac{4}{3}$

3 Which table shows the same rate of change of y with respect to x as $y = 4(-\frac{5}{8}x)$?

* put into Graph, go to Table

A

x	y
−3	−12
−1	−4
2	8
5	20

+3 +12 $\frac{12}{3} = 4$

C

x	y
−4	6.5
2	2.75
4	1.5
8	−1

+6 −3.75 $-\frac{3.75}{6} = -\frac{5}{8}$

B

x	y
−4	10.4
2	0.8
4	−2.4
8	−8.8

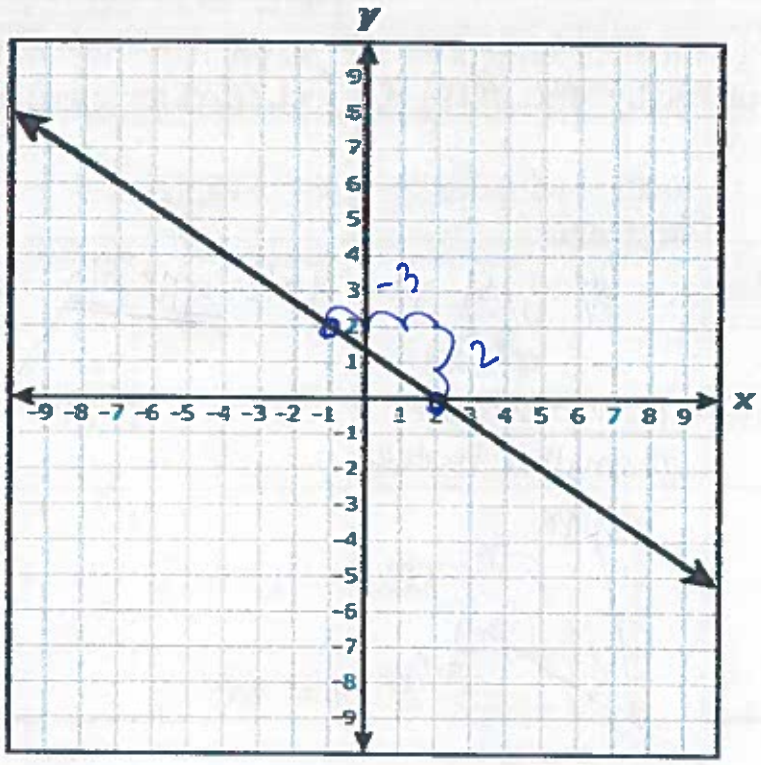
+6 −9.6 $\frac{-9.6}{6}$ $-\frac{8}{5}$

D

x	y
−3	12
−1	4
2	−8
5	−20

+2 −8 $\frac{-8}{2} = -4$

The graph of a linear function is shown on the grid.



What is the slope of the line?

Rise / Run = 2 / -3

A −10

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

C $-\frac{2}{3}$

D 2

Effects of Change (A3E)

Determine the **effects on the graph** of the **parent function f(x) = x** when f(x) is replaced **by af(x), f(x) + d, f(x-c), f(bx)** for specific values of a, b, c, and d

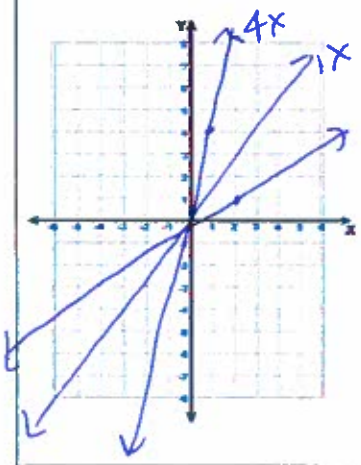
I can…

- Analyze equations/graphs to explain vertical shifts, horizontal shifts, and stretching

Notes: just put into graph and look at picture

$af(x)$

Rule: a big → steeper
a small → flatter



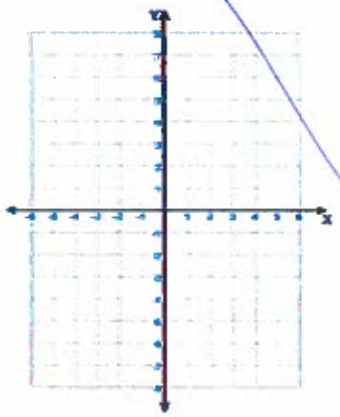
$f(x) = x$

$f(x) = 4x$

$f(x) = \frac{1}{2}x$

$f(bx)$

Rule: _____



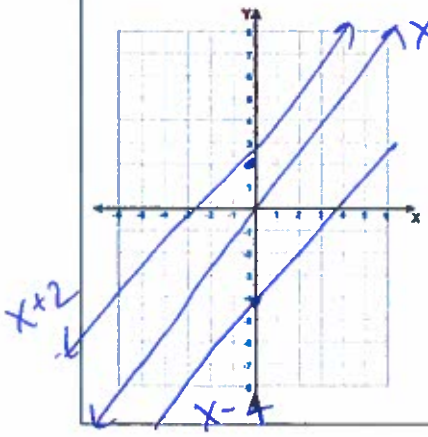
$f(x) = x$

$f(x) =$

$f(x) =$

$f(x) \pm d$

Rule: Shift up (d is positive) or down (d is negative)



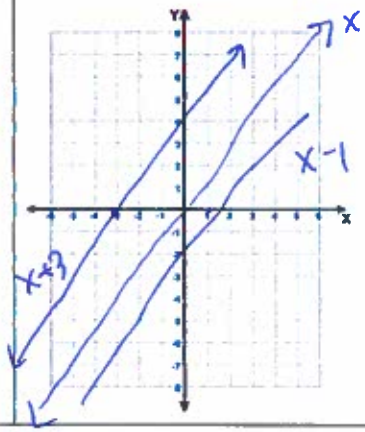
$f(x) = x$

$f(x) = x + 2$

$f(x) = x - 4$

$f(x \pm c)$

Rule: Shift left (c is positive)
Shift right (c is negative)



$f(x) = x$

$f(x) = (x + 3)$

$f(x) = (x - 1)$

Sample Problems

(65%)

45 A student graphed $f(x) = x$ and $g(x) = f(x) + 3$ on the same coordinate grid. Which statement describes how the graphs of f and g are related?

Shift up 3

A The graph of f is shifted 3 units up to create the graph of g.

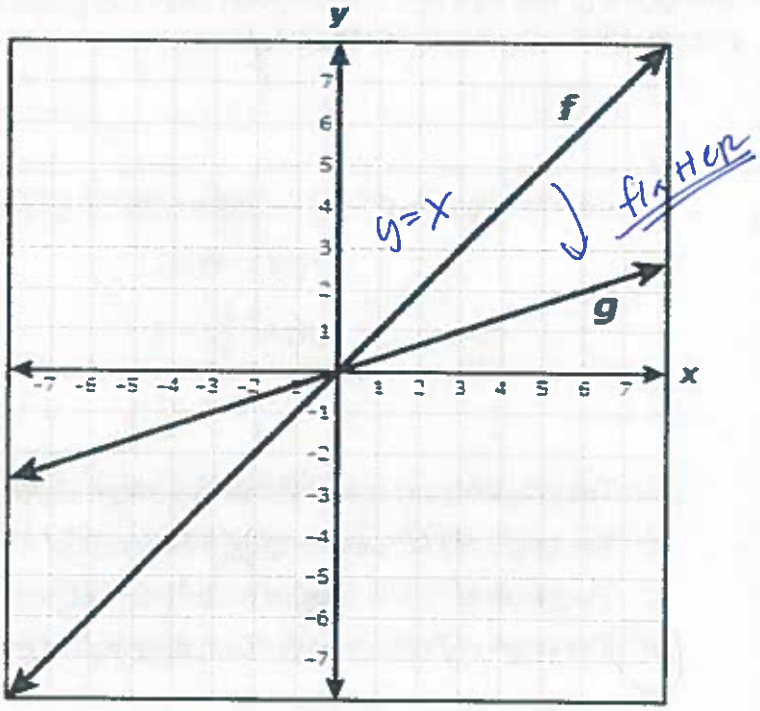
B The graph of f is steeper than the graph of g.

C The graph of f is shifted 3 units down to create the graph of g.

D The graph of f is less steep than the graph of g.

35 The graphs of linear functions f and g are shown on the grid.

(65%)



Which function is best represented by the graph of g?

A $g(x) = f(x) - 4$

B $g(x) = \frac{1}{3} f(x)$

C $g(x) = f(x) - 2$

D $g(x) = 3f(x)$

(S9.)

11 Linear function $f(x) = x$ is graphed on a coordinate plane. The graph of a new line is formed by changing the slope of the original line to $\frac{2}{3}$ and the y-intercept to 4. Which statement about the relationship between these two graphs is true?

$Y = \frac{2}{3}X + 4$ ↑ up 4

A The graph of the new line is steeper than the graph of the original line, and the y-intercept has been translated down.

B The graph of the new line is less steep than the graph of the original line, and the y-intercept has been translated up.

C The graph of the new line is steeper than the graph of the original line, and the y-intercept has been translated up.

D The graph of the new line is less steep than the graph of the original line, and the y-intercept has been translated down.

1. How does the graph of $f(x)$ compare with the graph of (x) ?

$$f(x) = 4x + 1$$

$$g(x) = \frac{1}{4}x - 1$$

A. The graph of $f(x)$ is flatter than the graph of $g(x)$.

B. The graph of $f(x)$ has the same y-intercept of the graph of $g(x)$.

C. The graph of $f(x)$ is parallel to the graph of $g(x)$.

D. The graph of $f(x)$ is steeper than the graph of $g(x)$.

4. In words describe the change of the line $f(x) = \frac{1}{4}x - 5$ to line $g(x) = x + 4$

A. $g(x)$ is more steep and shifted up 9

B. $g(x)$ is more steep and shifted up 4

C. $g(x)$ is more flat and shifted up 9

D. $g(x)$ is more flat and shifted down 4

up 9