

Linear Functions

CollegeBoard Question Bank

Abstract

This exercise sheet contains

- an **Easy** category with 14 questions;
- a **Medium** category with 14 questions;
- a **Hard** category with 9 questions

for you to attempt. A digital copy of this sheet is available for you on [moodle](#). Feel free to utilize [the Question Space on Teams](#) to ask for guidance.

Best,
Omar :)

Linear Functions

Easy

- (1) **84664a7c** MULTIPLE CHOICE One answer only

The front of a roller-coaster car is at the bottom of a hill and is 15 feet above the ground. If the front of the roller-coaster car rises at a constant rate of 8 feet per second, which of the following equations gives the height h , in feet, of the front of the roller-coaster car s seconds after it starts up the hill?

- a. $h = 8s + \frac{355}{15}$
- b. $h = 15s + \frac{355}{8}$
- c. $15s + 8$
- d. $h = 8s + 15$

(2) **06fc1726** MULTIPLE CHOICE One answer only

If the function is defined by

$$f(x) = \frac{2x - 1}{3}.$$

What is the value of $f(5)$?

- a. 3
- b. $\frac{4}{3}$
- c. 9
- d. $\frac{7}{3}$

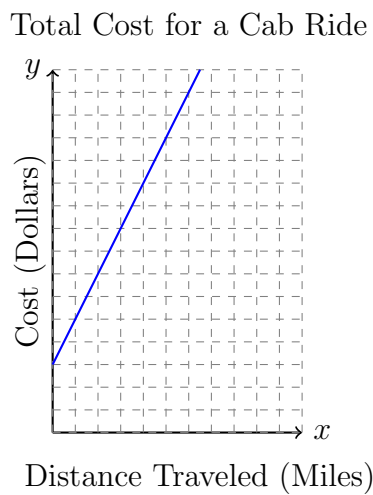
(3) **3f5375d9** MULTIPLE CHOICE One answer only

The function g is defined by $g(x) = -x + 8$. What is its zero-value?

- a. 4
- b. -8
- c. 0
- d. 8

- (4) **3f5375d9** MULTIPLE CHOICE One answer only

The line graphed in the xy -plane below models the total cost, in dollars, for a cab ride, y , in a certain city during nonpeak hours based on the number of miles traveled, x .



According to the graph, what is the cost for each additional mile traveled, in dollars, of a cab ride?

- a. \$3.00
- b. \$2
- c. \$2.00
- d. \$2.60

(5) **12983c1e** MULTIPLE CHOICE One answer only

Some values of the linear function f are shown in the table below.

x	$f(x)$
1	5
3	13
5	21

Which of the following defines f ?

- a. $f(x) = 4x + 1$
- b. $f(x) = 2x + 3$
- c. $f(x) = 3x + 2$
- d. $f(x) = 5x$

(6) **3462d850**

MULTIPLE CHOICE

One answer only

Marisol drove 3 hours from City A to City B. The equation below estimates the distance d , in miles, Marisol traveled after driving for t hours.

$$d = 45$$

Which of the following does 45 represent in the equation?

- a. It took Marisol 45 hours to drive from City A to City B.
- b. Marisol drove at an average speed of about 45 miles per hour.
- c. Marisol took 45 trips from City A to City B.
- d. The distance between City A and City B is 45 miles.

(7) 255996a6

MULTIPLE CHOICE

One answer only

$$T = 1,000 + 18h$$

In the equation above, T represents Brittany's total take-home pay, in dollars, for her first week of work, where h represents the number of hours she worked that week and 1,000 represents a sign-on bonus. If Brittany's total take-home pay was \$1,576, for how many hours was Brittany paid for her first week of work?

- a. 88
- b. 55
- c. 32
- d. 16

(8) **a1696f3e**

MULTIPLE CHOICE

One answer only

The function g is defined as $g(x) = 5x + a$, where a is a constant. If $g(4) = 31$, what is the value of a ?

- a. 22
- b. 11
- c. 30
- d. -23

(9) **de6fe450**

MULTIPLE CHOICE

One answer only

On January 1, 2015, a city's minimum hourly wage was \$9.25. It will increase by \$0.50 on the first day of the year for the next 5 years. Which of the following functions best models the minimum hourly wage, in dollars, x years after January 1, 2015, where $x = 1, 2, 3, 4, 5$?

- a. $f(x) = 9.25x + 0.50$
- b. $f(x) = 9.25 + 0.50x$
- c. $f(x) = 9.25 - 0.50x$
- d. $f(x) = 9.25x - 0.50$

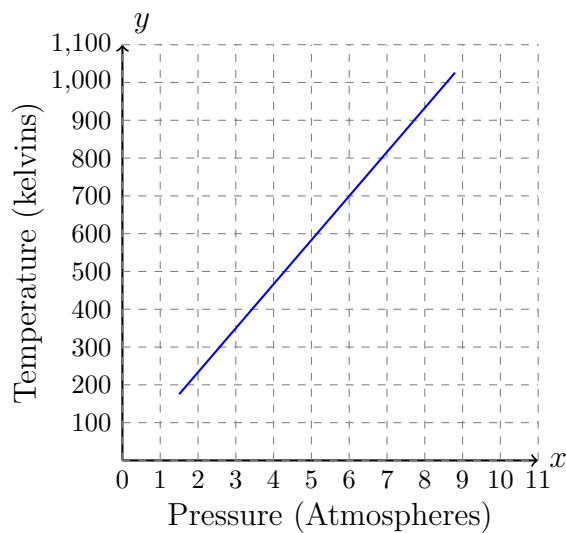
(10) **2eef7e61** MULTIPLE CHOICE One answer only

The graph of the function f is a line in the xy -plane. If the line has slope $\frac{3}{4}$ and $f(0) = 3$, which of the following defines f ?

- a. $f(x) = \frac{3}{4}x - 3$
- b. $f(x) = 4x + 3$
- c. $f(x) = 4x - 3$
- d. $f(x) = \frac{3}{4}x + 3$

(11) 0ea7ef01 MULTIPLE CHOICE One answer only

Oxygen gas is placed inside a tank with a constant volume. The graph shows the estimated temperature y , in kelvins, of the oxygen gas when its pressure is x atmospheres.



What is the estimated temperature, in kelvins, of the oxygen gas when its pressure is 6 atmospheres?

- a. 6
- b. 700
- c. 60
- d. 760

(12) **ecaa9c0**

MULTIPLE CHOICE

One answer only

Robert rented a truck to transport materials he purchased from a hardware store. He was charged an initial fee of \$20.00 plus an additional \$0.70 per mile driven. If the truck was driven 38 miles, what was the total amount Robert was charged?

- a. \$52.90
- b. \$46.60
- c. \$66.90
- d. \$86.50

(13) **8643d906** MULTIPLE CHOICE One answer only

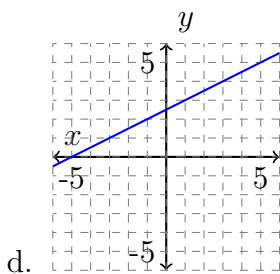
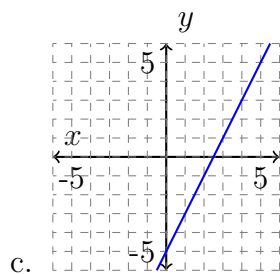
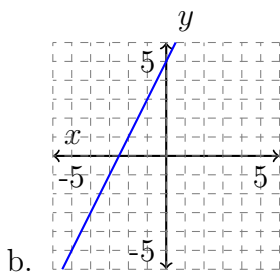
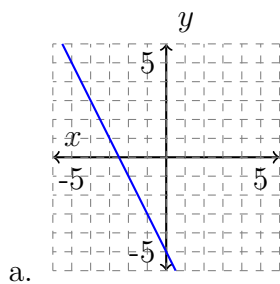
$$P(t) = 250 + 10t$$

The population of snow leopards in a certain area can be modeled by the function P defined above, where is the population t years after 1990. Of the following, which is the best interpretation of the equation $P(30) = 550$?

- a. The snow leopard population in this area is predicted to be 550 in the year 2030.
- b. The snow leopard population in this area is predicted to be 30 in the year 2020.
- c. The snow leopard population in this area is predicted to be 30 in the year 2030.
- d. The snow leopard population in this area is predicted to be 550 in the year 2020.

(14) a8e6bd75 MULTIPLE CHOICE One answer only

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



Medium

- (1) **e62cfe5f** SHORT ANSWER Case-Insensitive

According to a model, the head width, in millimeters, of a worker bumblebee can be estimated by adding 0.6 to four times the body weight of the bee, in grams. According to the model, what would be the head width, in millimeters, of a worker bumblebee that has a body weight of 0.5 grams?

(2) **620fe971** MULTIPLE CHOICE One answer only

A team of workers has been moving cargo off of a ship. The equation below models the approximate number of tons of cargo, y , that remains to be moved x hours after the team started working.

$$y = 120 - 25x$$

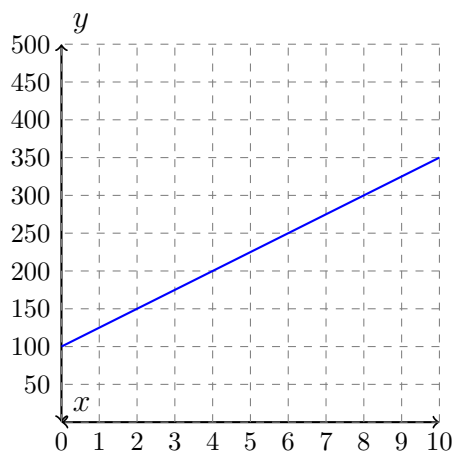
The graph of this equation in the xy -plane is a line. What is the best interpretation of the x -intercept in this context?

- a. The team will have moved all the cargo in about 4.8 hours.
- b. The team started with 120 tons of cargo to move.
- c. The team has been moving about 4.8 tons of cargo per hour.
- d. The team has been moving about 25 tons of cargo per hour.

(3) 5cf1bbc9

MULTIPLE CHOICE

One answer only



The graph of the function f , where $y = f(x)$, gives the total cost y , in dollars, for a certain video game system and x games. What is the best interpretation of the slope of the graph in this context?

- a. The video game system costs \$100.
- b. Each game costs \$25.
- c. Each game costs \$100.
- d. The video game system costs \$25.

(4) **dae126d7** MULTIPLE CHOICE One answer only

The boiling point of water at sea level is 212 degrees Fahrenheit $^{\circ}F$. For every 550 feet above sea level, the boiling point of water is lowered by about 1 $^{\circ}F$. Which of the following equations can be used to find the boiling point B of water, in $^{\circ}F$, x feet above sea level?

- a. $B = 212 - \frac{x}{500}$
- b. $B = 550 - \frac{x}{212}$
- c. $B = 212 + \frac{x}{550}$
- d. $B = 550 + \frac{x}{212}$

(5) 271f7e3f

MULTIPLE CHOICE

One answer only

$$f(x) = \frac{(x + 7)}{4}$$

For the function f defined above, what is the value of $f(9) - f(1)$?

- a. $\frac{9}{4}$
- b. 1
- c. $\frac{1}{4}$
- d. 2

(6) **c651cc56** MULTIPLE CHOICE One answer only

Some values of the linear function f are shown in the table below.

x	$f(x)$
0	-2
2	4
6	16

What is the value of $f(3)$?

- a. 7
- b. 8
- c. 6
- d. 9

(7) **c651cc56**

MULTIPLE CHOICE

One answer only

In the xy -plane, the points $(-2, 3)$ and $(4, -5)$ lie on the graph of which of the following linear functions?

a. $f(x) = \frac{1}{2}x + 4$

b. $f(x) = -\frac{4}{3}x + \frac{1}{3}$

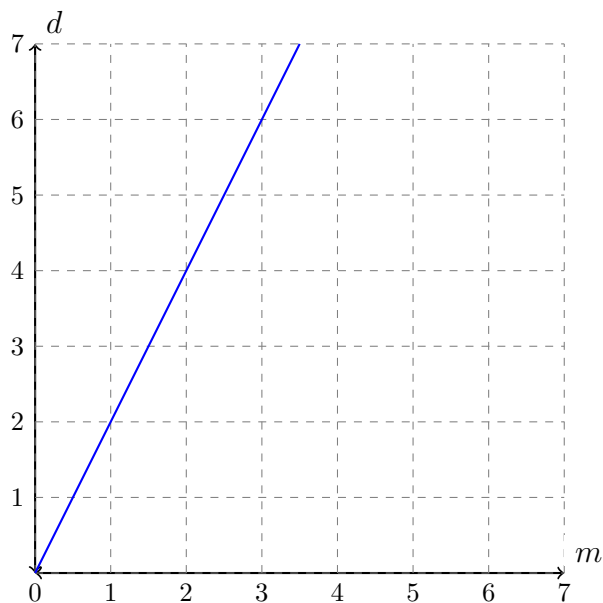
c. $f(x) = -\frac{3}{2}x + 1$

d. $f(x) = x + 5$

(8) 11e1ab81

MULTIPLE CHOICE

One answer only



The graph above shows the distance traveled d , in feet, by a product on a conveyor belt m minutes after the product is placed on the belt. Which of the following equations correctly relates d and m ?

- a. $d = 2m$
- b. $d = m + 2$
- c. $d = \frac{1}{2}m$
- d. $d = 2m + 2$

(9) 4fe4fd7c SHORT ANSWER Case-Insensitive

$$c(x) = mx + 500$$

A company's total cost $c(x)$, in dollars, to produce x shirts is given by the function above, where m is a constant and $x > 0$. The total cost to produce 100 shirts is \$800. What is the total cost, in dollars, to produce 1000 shirts? (Disregard the \$ sign when gridding your answer.)

(10) 868fc236 MULTIPLE CHOICE One answer only

Energy per Gram of Typical Macronutrients

Macronutrient	Food Calories	Kilojoules
Protein	4.0	16.7
Fat	9.0	37.7
Carbohydrate	4.0	16.7

The table above gives the typical amounts of energy per gram, expressed in both food calories and kilojoules, of the three macronutrients in food. If x food calories is equivalent to k kilojoules, of the following, which best represents the relationship between x and k ?

- a. $x = 4.2k$
- b. $k = 4.2x$
- c. $k = 0.24x$
- d. $xk = 4.2$

(11) **042aa429**

MULTIPLE CHOICE

One answer only

If $f(x) = x + 7$ and $g(x) = 7x$, what is the value of $4f(2) - g(2)$?

- a. 28
- b. 22
- c. 1
- d. -5

(12) **113b938e**

MULTIPLE CHOICE

One answer only

$$y = 18 - 5x$$

The equation above represents the speed y , in feet per second, of Sheila's bicycle x seconds after she applied the brakes at the end of a ride. If the equation is graphed in the xy -plane, which of the following is the best interpretation of the x -coordinate of the line's x -intercept in the context of the problem?

- a. The speed of Sheila's bicycle, in feet per second, before Sheila applied the brakes
- b. The number of feet per second the speed of Sheila's bicycle decreased each second after Sheila applied the brakes
- c. The number of seconds it took from the time Sheila began applying the brakes until the bicycle came to a complete stop
- d. The number of feet Sheila's bicycle traveled from the time she began applying the brakes until the bicycle came to a complete stop

(13) **8a6de407** SHORT ANSWER Case-Insensitive

The function f is defined by $f(x) = mx + b$, where m and b are constants. If $f(0) = 18$ and $f(1) = 20$, what is the value of m ?

- (14) 41fdc0b8

MULTIPLE CHOICE

One answer only

Population of Greenleaf, Idaho

Year	Population
2000	862
2010	846

The table above shows the population of Greenleaf, Idaho, for the years 2000 and 2010. If the relationship between population and year is linear, which of the following functions P models the population of Greenleaf t years after 2000?

- a. $P(t) = 862 - 16t$
- b. $P(t) = 862 + 1.6(t - 2000)$
- c. $P(t) = 862 - 1.6(t - 2000)$
- d. $P(t) = 862 - 1.6t$

Hard

(1) **2b15d65f** MULTIPLE CHOICE One answer only

An economist modeled the demand Q for a certain product as a linear function of the selling price P . The demand was 20,000 units when the selling price was \$40 per unit, and the demand was 15,000 units when the selling price was \$60 per unit. Based on the model, what is the demand, in units, when the selling price is \$55 per unit?

- a. 16,250
- b. 17,500
- c. 16,500
- d. 16,750

(2) **2b15d65f** MULTIPLE CHOICE One answer only

The cost of renting a backhoe for up to 10 days is \$270 for the first day and \$135 for each additional day. Which of the following equations gives the cost y , in dollars, of renting the backhoe for x days, where x is a positive integer and $x \leq 10$?

- a. $y = 270x - 135$
- b. $y = 270x + 135$
- c. $y = 135x + 135$
- d. $y = 135x + 270$

(3) **b988eeec** SHORT ANSWER Case-Insensitive

The functions f and g are defined as $f(x) = \frac{1}{4}x - 9$ and $g(x) = \frac{3}{4}x + 21$. If the function h is defined as $h(x) = f(x) + g(x)$, what is the x -coordinate of the x -intercept of the graph of in the xy -plane?

- (4) **af2ba762** MULTIPLE CHOICE One answer only

According to data provided by the US Department of Energy, the average price per gallon of regular gasoline in the United States from September 1, 2014, to December 1, 2014, is modeled by the function F defined below, where is the average price per gallon x months after September 1.

$$F(x) = 2.74 - 0.19(x - 3).$$

The constant 2.74 in this function estimates which of the following?

- a. The average price per gallon on September 1, 2014
- b. The difference in the average price per gallon from September 1, 2014, to December 1, 2014
- c. The average monthly decrease in the price per gallon
- d. The average price per gallon on December 1, 2014

(5) **16889ef3**

MULTIPLE CHOICE

One answer only

Oil and gas production in a certain area dropped from 4 million barrels in 2000 to 1.9 million barrels in 2013. Assuming that the oil and gas production decreased at a constant rate, which of the following linear functions f best models the production, in millions of barrels, t years after the year 2000?

a. $f(t) = \frac{19}{130}t + 4$

b. $f(t) = -\frac{19}{130}t + 4$

c. $f(t) = \frac{21}{130}t + 4$

d. $f(t) = -\frac{21}{130}t + 4$

(6) 78391fcc MULTIPLE CHOICE One answer only

x	-11	-10	-9	-8
$f(x)$	21	18	15	12

The table above shows some values of x and their corresponding values $f(x)$ for the linear function f . What is the x -intercept of the graph of $y = f(x)$ in the xy -plane?

- a. $(-9, 0)$
- b. $(-4, 0)$
- c. $(-3, 0)$
- d. $(-12, 0)$

(7) a04050d8

MULTIPLE CHOICE

One answer only

Energy per Gram of Typical Macronutrients

Macronutrient	Food Calories	Kilojoules
Protein	4.0	16.7
Fat	9.0	37.7
Carbohydrate	4.0	16.7

The table above gives the typical amounts of energy per gram, expressed in both food calories and kilojoules, of the three macronutrients in food. If the 180 food calories in a granola bar come entirely from p grams of protein, f grams of fat, and c grams of carbohydrate, which of the following expresses f in terms of p and c ?

- a. $f = 20 + \frac{9}{4}(p + c)$
- b. $f = 20 - \frac{4}{9}(p + c)$
- c. $f = 20 + \frac{4}{9}(p + c)$
- d. $f = 20 - \frac{4}{9}(p - c)$

(8) **daad7c32** MULTIPLE CHOICE One answer only

An object hangs from a spring. The formula $l = 30 + 2w$ relates the length l , in centimeters, of the spring to the weight w , in newtons, of the object. Which of the following describes the meaning of the 2 in this context?

- a. The increase in the length, in centimeters, of the spring for each one-newton increase in the weight of the object
- b. The weight, in newtons, of an object that will stretch the spring 30 centimeters
- c. The increase in the weight, in newtons, of the object for each one-centimeter increase in the length of the spring
- d. The length, in centimeters, of the spring with no weight attached

(9) **023c0a8d** MULTIPLE CHOICE One answer only

For the function f , if $f(3x) = x - 6$ for all values of x , what is the value of $f(6)$?

- a. 2
- b. 0
- c. -4
- d. -6

Total of marks: 37