TIPS

Tip 01 Linear Function

The functions are called "linear" because they are precisely the functions whose graph in the xy-plane is a straight line.
Such a function can be written as

1) Slope-intercept form
   $f(x) = mx + b$, where m is the slope and b is the y-intercept.

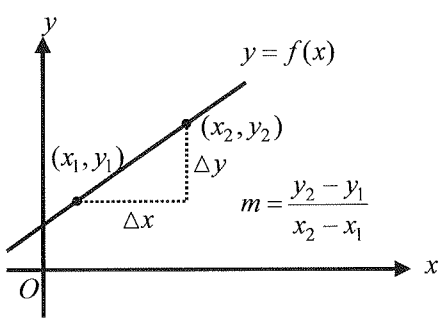
2) Point-slope form
   $y - y_1 = m(x - x_1)$, where (x_1, y_1) is the known point on the line.

3) General form
   $ax + by + c = 0$

4) Standard form
   $Ax + By = C$

The slope between any two points on the line is constant.

$$m = \frac{\triangle y}{\triangle x} = \frac{y_2 - y_1}{x_2 - x_1}$$



SAT Practice

1. For a linear function f, $f(0) = 2$ and $f(3) = 5$. If $k = f(5)$, what is the value of k?

A) 5
B) 6
C) 7
D) 8

x	$f(x)$
0	a
1	12
2	b

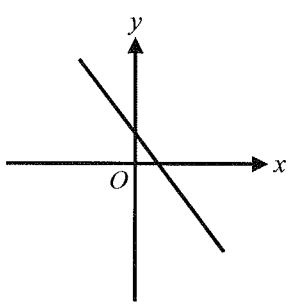
2. The table above shows some values for the function f. If f is a linear function, what is the value of $a+b$?

A) 24
B) 36
C) 48
D) 60

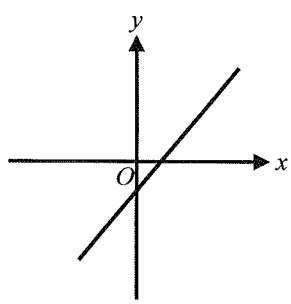
---

3. A linear function is given by $ax+by+c=0$ and $a>0$, $b<0$, and $c>0$. Which of the following graphs best represents the graph of the function?

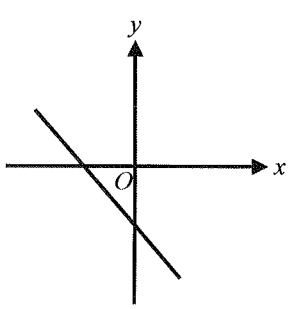
A)



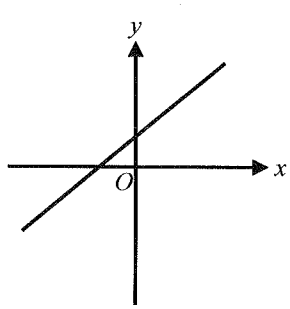
B)



C)



D)



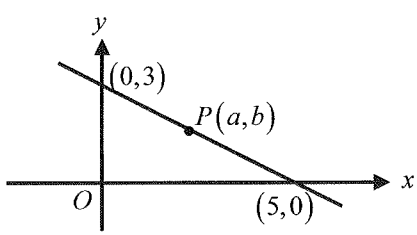
4. If f is a linear function and $f(3)=2$ and $f(5)=6$, what is the y-intercept of the graph of f?

A) 4
B) 2
C) –2
D) –4

---

5. If f is a linear function and $f(3)=-2$ and $f(4)=-4$, what is the x-intercept of the graph of f?

A) 3
B) 2.5
C) 2
D) 0



6. The graph of a function f is shown in the xy-plane above. If $b=2a$, what is the value of a?

A) $\frac{5}{2}$
B) $\frac{5}{4}$
C) $\frac{15}{13}$
D) $\frac{16}{15}$

x	$f(x)$
-1	6
0	4
1	2
2	0

7. The table above shows some values of the linear function f for selected values of x. Which of the following represents the function f?

A) $f(x)=4-x$
B) $f(x)=4-2x$
C) $f(x)=4+2x$
D) $f(x)=4+x$

$$F=\frac{9}{5}C+32$$

8. Fahrenheit (F) and Celsius (C) are related by the equation above. If Fahrenheit temperature increased by 27 degrees, what is the degree increase in Celsius?

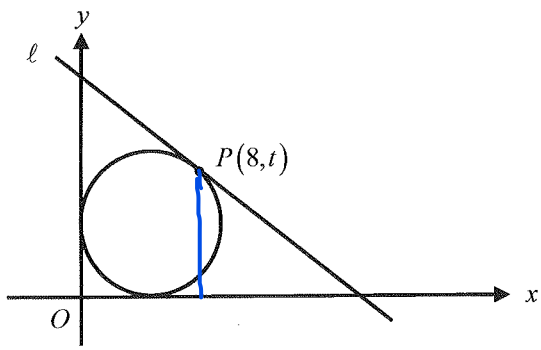
A) 15
B) 20
C) 32
D) 81

---

9. In the formula $P=\frac{7}{12}K+60$, if P is increased by 35, what is the increase in K?

A) 35
B) 60
C) 80
D) 140

TIPS



10. In the xy-plane above, a circle is tangent to line ℓ, the x-axis, and the y-axis. If the radius of the circle is 5, what is the value of t?

A) 7
B) 8
C) 9
D) 10

Tip 02 Slope of a Line

One of the most important properties of a straight line is its angle from the horizontal. This concept is called "**slope**". To find the slope, we need two points from the line.

1) From two points (x_1, y_1) and (x_2, y_2) $\rightarrow$ Slope $m = \dfrac{y_2 - y_1}{x_2 - x_1}$

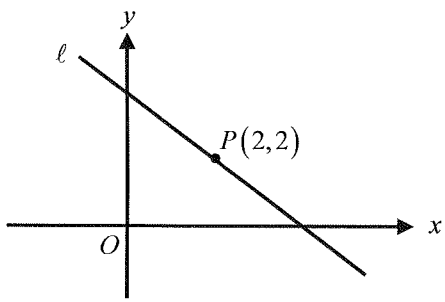
2) From slope-intercept form of a line $y = mx + b$ $\rightarrow$ $m =$ slope and $b = y$-intercept

3) The slope between any two points on the line is constant.

SAT Practice

1. If f is a linear function and $f(3) = 6$ and $f(5) = 12$, what is the slope of the graph of f?

A) 2
B) 3
C) 4
D) 5



2. In the xy-plane above, line ℓ passes through point P and has a slope of $-\frac{1}{2}$. What is the x-intercept of line ℓ?

A) $(4, 0)$
B) $(5, 0)$
C) $(6, 0)$
D) $(7, 0)$

$-\frac{1}{2}x + b$

---

x	$f(x)$
2	5
4	a
8	23
a	b

11

3, −1

$3x - 1$

3. The table above shows values of the linear function f for selected values of x. What is the value of b?

A) 11
B) 22
C) 32
D) 42

---

x	$f(x)$
2	a
5	6
8	b

4. The table above gives values of the linear function f for selected values of x. What is the value of $a+b$?

A) 8
B) 10
C) 12
D) 18

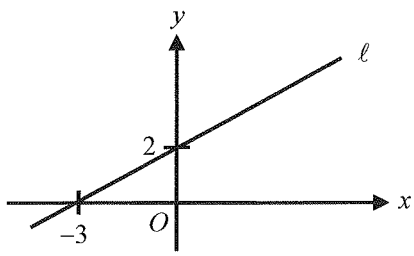
$b = 5m + C$

$a = 2m + C$

$b = 8m + C$

$10m + 2C$

TIPS



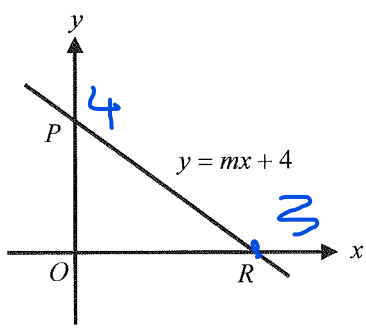
5. In the xy-plane above, point $P(42, m)$ lies on line ℓ. What is the value of m?

A) 24
B) 30
C) 36
D) 42

Tip 03 Area enclosed by Lines

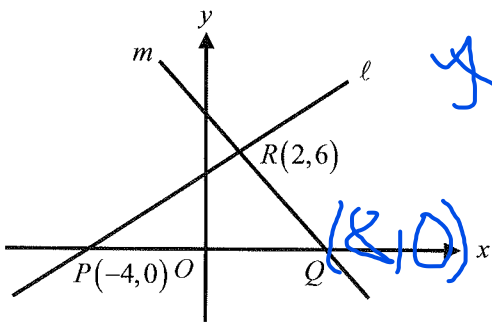
In order to find the area enclosed by lines, mostly we need to find x-intercept, y-intercept, and points of intertsection of lines

SAT Practice



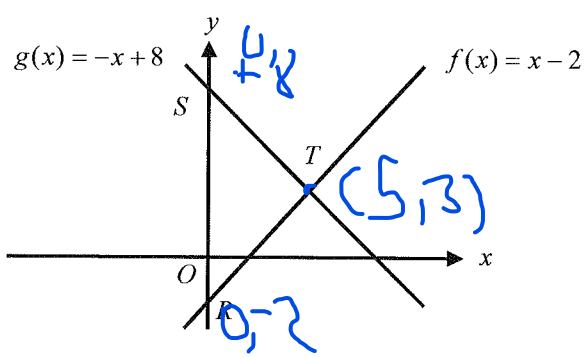
1. The graph of $y = mx + 4$ is shown in the xy-plane above. If the area of triangle POR is 6, what is the value of m?

A) -2
B) $-\frac{4}{3}$
C) $-\frac{3}{4}$
D) $-\frac{1}{4}$



2. In the xy-plane above, line m and line ℓ are perpendicular and intersect at point $R(2,6)$. What is the area of triangle PQR?

A) 18
B) 24
C) 32
D) 36



3. The graphs of the functions f and g are shown in the xy-plane above. What is the area of ΔRST ?

A) 25
B) 50
C) 75
D) 100

TIPS

Tip 04 Midpoint and Distance between Two Points

The midpoint of a line segment: Each coordinate of the midpoint of a line segment is equal to the average of the corresponding coordinates of the endpoints of the line segment. Given the two end points (x_1, y_1) and (x_2, y_2), the coordinates of the midpoint of the line segment are

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right).$$

The distance between two points: The distance d between two points (x_1, y_1) and (x_2, y_2) is given by the formula

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

SAT Practice

1. In the xy-plane, the midpoint of $\overline{AB}$ is $(10, 4)$. If the coordinates of point A are $(5, 1)$, what are the coordinates of point B?

A) $(5, 3)$
B) $(6, 4)$
C) $(15, 7)$
D) $(20, 10)$

---

2. If point $M(5, -3)$ is the midpoint of the line segment connecting point $A(2a, b)$ and point $B(b, a)$, what is the value of a?

$2a+b = 10$

$a+b = -6$

A) 8
B) 12
C) 16
D) 20

---

3. In triangle ABC in the xy-plane, the coordinates of point A are $(-4, 4)$ and the coordinates of point B are $(4, 4)$. If the area of ΔABC is 24, which of the following could be the coordinates of point C?

A) $(3, 8)$
B) $(2, 10)$
C) $(2, -5)$
D) $(-6, -4)$

$h = 6$

24

A $(-4, 4)$ — B $(4, 4)$

24

4. If the distance between $(a, 3)$ and $(b, 8)$ is 13, what is the value of $|a-b|$?

A) 4
B) 8
C) 12
D) 16

$\sqrt{(a-b)^2+25} = 13$

$(a-b)^2 = 144$

Tip 05 Line Reflection

Reflecting across the x-axis : When we reflect a point (x, y) across the x-axis, the x-coordinate remains the same, but the y-coordinate is transformed into its opposite as follows.

Reflecting across the x-axis: $P(x, y) \to P'(x, -y)$

Reflecting across the y-axis: $P(x, y) \to P'(-x, y)$

Reflecting across the $y = x$: $P(x, y) \to P'(y, x)$

Reflecting across the $y = -x$: $P(x, y) \to P'(-y, -x)$

Reflecting across the origin: $P(x, y) \to P'(-x, -y)$

SAT Practice

1. In the xy-plane, line ℓ is the reflection of line m across the x-axis. If the equation of line m is $y = \frac{1}{5}x - 6$, what is the slope of line ℓ?

A) -5 B) $-\frac{1}{5}$ C) $\frac{1}{5}$ D) 5

---

2. In the xy-plane, line ℓ is the reflection of line m across the y-axis. If these two lines intersect at point (a, b), which of the following must be true?

A) $a = -2$ B) $a = 0$ C) $a = 2$ D) $a > 0$

---

3. If the graph of $2x - 3y = 6$ is reflected across the x-axis, which of the following represents the equation of the reflected graph?

A) $2x + 3y = -6$ B) $2x + 3y = 6$ C) $2x - 3y = -6$ D) $-2x - 3y = 6$

TIPS

Tip 06 Parallel and Perpendicular Lines

1. Two non-vertical lines are parallel if and only if their slopes are equal.
2. Two non-vertical lines are perpendicular if and only if the product of their slopes is -1. (Negative reciprocal each other)

SAT Practice

1. Which of the following is an equation for the line passing through the point $(-4, 1)$ that is parallel to $4x - 2y = 3$?

A) $y = 2x - 9$
B) $y = 2x + 9$
C) $y = -2x - 9$
D) $y = -2x + 9$

$4x - 3 = 2y$

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

2. Which of the following is an equation for the line passing through the point $(-4, 1)$ that is perpendicular to $4x - 2y = 3$?

A) $y = -\frac{1}{2}x - 1$
B) $y = -\frac{1}{2}x + 1$
C) $y = \frac{1}{2}x - 1$
D) $y = \frac{1}{2}x + 1$

$y = -\frac{1}{2}$

TIPS

Tip 07 System of Linear Equations

A system of linear equations means two or more linear equations. If two linear equations intersect, that point of intersection is called the solution to the system of equations.

1) **The system has exactly one solution.**
When two lines have different slopes, the system has only one and only one solution.

2) **The system has no solution.**
When two lines are parallel and have different y-intercept, the system has no solution.

3) **The system has infinitely many solutions.**
When two lines are parallel and the lines have the same y-intercept.

From the standard form for the system of equations

$$a_1x+b_1y=c_1 \quad \text{and} \quad a_2x+b_2y=c_2$$

1) If $\frac{a_1}{a_2}\neq\frac{b_1}{b_2}$ One solution

2) If $\frac{a_1}{a_2}=\frac{b_1}{b_2}\neq\frac{c_1}{c_2}$ No solution

3) If $\frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$ Infinitely many solutions

From the slope-intercept form for the system of equations

$$y=m_1x+b_1 \quad \text{and} \quad y=m_2x+b_2$$

1) If $m_1\neq m_2$ one solution
2) If $m_1=m_2$ and $b_1\neq b_2$ no solution
3) If $m_1=m_2$ and $b_1=b_2$ infinitely many solution

SAT Practice

$$2x-5y=8$$
$$4x+ky=17$$

1. For which of the following values of k, will the system of equations above has no solution?

A) 10 B) 5 C) −5 D) −10

$$5x - 2y = 3$$
$$ax + by = 6$$

2. In the system of equations above, a and b are constants. If the system has infinitely many solutions, what is the value of $a + b$?

A) 6 B) 4 C) 0 D) -4

$$3x + by = 3$$
$$ax - 4y = 6$$

3. In the system of equations above, a and b are constants. For which of the following values of $\{a, b\}$ will the system have no solution?

A) $\{-1, 2\}$ B) $\{1, 1\}$ C) $\{2, 1\}$ D) $\{3, -4\}$

$$ax + 3y = 6$$
$$(a-1)x + (a-1)y = 2$$

4. In the system of equations above, a is a constant. If the system has no solution, what is the value of a?

A) -3 B) 1 C) 3 D) 5

---

5. The cost of long distance telephone call is determined by a basic fixed charge for the first 5 minutes and a fixed charge for each additional minute. If a 15-minute call costs \$3.50 and a 20-minute call costs \$4.75, what is the total cost, in dollars, of a 40-minute call?

A) 8.25 B) 9.50 C) 9.75 D) 10.25

---

6. The tickets for a movie cost \$8.00 for adults and \$5.00 for children. If the total of 200 tickets were sold and the total amount of \$1360 was collected, how many adult tickets were sold?