Ch. 2 Slopes & Rates of Change

8. What is the slope of the line in the xy-plane that passes through the points \((-\frac{3}{2}, 2)\) and \((-\frac{3}{2}, 4)\)?

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

\[ m = \frac{y_2 - y_1}{x_2 - x_1} \]

\[ \frac{4 - 1}{-\frac{3}{2} - (-\frac{3}{2})} = \frac{3}{0} \]

\[ \frac{4 - 1}{-\frac{1}{2} + \frac{5}{2}} = 2 \]

12. A line in the xy-plane passes through the origin and has a slope of \(\frac{1}{7}\). Which of the following points lies on the line?

A) \((0, 7)\)  
B) \((1, 7)\)  
C) \((7, 7)\)  
D) \((14, 2)\)

\[ y = \frac{1}{7}x = 0 \]

\[ y = \frac{1}{7}(1) = \frac{1}{7} \]

\[ y = \frac{1}{7}(7) = 1 \]

\[ y = \frac{1}{7}(14) = 2 \checkmark \]
3

A landscaping company estimates the price of a job, in dollars, using the expression $60 + 12nh$, where $n$ is the number of landscapers who will be working and $h$ is the total number of hours the job will take using $n$ landscapers. Which of the following is the best interpretation of the number 12 in the expression?

A) The company charges $12 per hour for each landscaper.
B) A minimum of 12 landscapers will work on each job.
C) The price of every job increases by $12 every hour.
D) Each landscaper works 12 hours a day.

6

In the $xy$-plane above, line $\ell$ is parallel to line $k$. What is the value of $p$?

A) 4
B) 5
C) 8
D) 10

SAME Slope
9. The graph of a line in the $xy$-plane has slope 2 and contains the point $(1, 8)$. The graph of a second line passes through the points $(1, 2)$ and $(2, 1)$. If the two lines intersect at the point $(a, b)$, what is the value of $a + b$?

A) 4  
B) 3  
C) -1  
D) -4

Point-Slope

$y = m(x - x_1) + y_1$

$y = 2(x - 1) + 8$

$y = 2x - 2 + 8$

$y = 2x + 6$

$-1x + 3 = 2x + 6$

$-3 = 3x$

$x = -1$

$y = 4$

$\frac{x}{a} + \frac{y}{b} = 3$

A quality control manager at a factory selects 7 lightbulbs at random for inspection out of every 400 lightbulbs produced. At this rate, how many lightbulbs will be inspected if the factory produces 20,000 lightbulbs?

A) 300  
B) 350  
C) 400  
D) 450

The line $y = kx + 4$, where $k$ is a constant, is graphed in the $xy$-plane. If the line contains the point $(c, d)$, where $c \neq 0$ and $d \neq 0$, what is the slope of the line in terms of $c$ and $d$?

A) $\frac{d - 4}{c}$  
B) $\frac{c - 4}{d}$  
C) $\frac{4 - d}{c}$  
D) $\frac{4 - c}{d}$
15
The distance traveled by Earth in one orbit around the Sun is about 580,000,000 miles. Earth makes one complete orbit around the Sun in one year. Of the following, which is closest to the average speed of Earth, in miles per hour, as it orbits the Sun?

A) 66,000  
B) 93,000  
C) 210,000  
D) 420,000

\[
\text{miles/hour} = \left( \frac{580,000,000 \text{ miles}}{1 \text{ year}} \right) \left( \frac{1 \text{ year}}{365 \text{ days}} \right) \left( \frac{1 \text{ day}}{24 \text{ hours}} \right)
\]

25
The graph of the linear function \( f \) has intercepts at \((a, 0)\) and \((0, b)\) in the xy-plane. If \( a + b = 0 \) and \( a \neq b \), which of the following is true about the slope of the graph of \( f \)?

A) It is positive.  
B) It is negative.  
C) It equals zero.  
D) It is undefined.

So, \( b = -a \)  
\[
\Delta y \quad \Delta x = \frac{b - 0}{0 - a} = \frac{b}{-a} = -\frac{a}{a} = -1
\]

31
A coastal geologist estimates that a certain country’s beaches are eroding at a rate of 1.5 feet per year. According to the geologist’s estimate, how long will it take, in years, for the country’s beaches to erode by 21 feet?

\[
Y = 1.5(x)
\]

\[
\frac{21}{1.5} = \frac{1.5(x)}{1.5} = 14 \text{ years}
\]
26
In the xy-plane, the line determined by the points \((2, k)\) and \((k, 32)\) passes through the origin. Which of the following could be the value of \(k\)?

A) 0  
B) 4  
C) 8  
D) 16

\[
\frac{k}{2} = \frac{32}{k} \quad \frac{\Delta Y}{\Delta X} \\
\Rightarrow k^2 = 64
\]

9
Nate walks 25 meters in 13.7 seconds. If he walks at this same rate, which of the following is closest to the distance he will walk in 4 minutes?

A) 150 meters  
B) 450 meters  
C) 700 meters  
D) 1,400 meters

\[
\left(\frac{25}{13.7}\right) \left( \frac{60}{1} \right) \left( \frac{4}{60} \right) = 437.956
\]

8
Which of the following equations represents a line that is parallel to the line with equation \(y = -3x + 4\)?

A) \(6x + 2y = 15\)  
B) \(3x - y = 7\)  
C) \(2x - 3y = 6\)  
D) \(x + 3y = 1\)

\(\begin{align*}
\text{Same slope } m &= -3 \\
\therefore y &= -6x + 15 \\
-3y &= -3x + 7 \\
-3y &= -2x + 6 \\
3y &= -x + 1
\end{align*}\)

8
Line \(\ell\) in the xy-plane contains points from each of Quadrants II, III, and IV, but no points from Quadrant I. Which of the following must be true?

A) The slope of line \(\ell\) is undefined.  
B) The slope of line \(\ell\) is zero.  
C) The slope of line \(\ell\) is positive.  
D) The slope of line \(\ell\) is negative.
Questions 16 and 17 refer to the following information.

Mr. Martinson is building a concrete patio in his backyard and deciding where to buy the materials and rent the tools needed for the project. The table below shows the materials’ cost and daily rental costs for three different stores.

<table>
<thead>
<tr>
<th>Store</th>
<th>Materials’ Cost, $M$ (dollars)</th>
<th>Rental cost of wheelbarrow, $W$ (dollars per day)</th>
<th>Rental cost of concrete mixer, $K$ (dollars per day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>750</td>
<td>15</td>
<td>65</td>
</tr>
<tr>
<td>B</td>
<td>600</td>
<td>25</td>
<td>80</td>
</tr>
<tr>
<td>C</td>
<td>700</td>
<td>20</td>
<td>70</td>
</tr>
</tbody>
</table>

The total cost, $y$, for buying the materials and renting the tools in terms of the number of days, $x$, is given by $y = M + (W + K)x$.

17

If the relationship between the total cost, $y$, of buying the materials and renting the tools at Store C and the number of days, $x$, for which the tools are rented is graphed in the $xy$-plane, what does the slope of the line represent?

A) The total cost of the project
B) The total cost of the materials
C) The total daily cost of the project
D) The total daily rental costs of the tools