Name _____ Date _____ Class _____

LESSON 12-2

Problem Solving

Slope of a Line

Write the correct answer.

1. The state of Kansas has a fairly steady slope from the east to the west. At the eastern side, the elevation is 771 ft. At the western edge, 413 miles across the state, the elevation is 4039 ft. What is the approximate slope of Kansas?

_____

2. The Feathered Serpent Pyramid in Teotihuacan, Mexico, has a square base. From the center of the base to the center of an edge of the pyramid is 32.5 m. The pyramid is 19.4 m high. What is the slope of each face of the pyramid?

_____

3. On a highway, a 6% grade means a slope of 0.06. If a highway covers a horizontal distance of 0.5 miles and the elevation change is 184.8 feet, what is the grade of the road? (Hint: 5280 feet = 1 mile.)

_____

4. The roof of a house rises vertically 3 feet for every 12 feet of horizontal distance. What is the slope, or pitch of the roof?

_____

Use the graph for Exercises 5–8.

5. Find the slope of the line between 1990 and 1992.

A $\frac{2}{11}$ **C** $\frac{11}{2}$

B $\frac{35}{3982}$ **D** $\frac{11}{1992}$

6. Find the slope of the line between 1994 and 1996.

F $\frac{7}{2}$ **H** $\frac{2}{7}$

G $\frac{37}{3990}$ **J** $\frac{7}{1996}$

7. Find the slope of the line between 1998 and 2000.

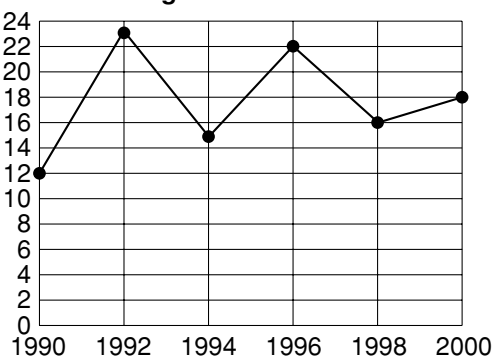
A 1

B $\frac{1}{999}$

C $\frac{1}{1000}$

D 2

Number of Earthquakes Worldwide with a Magnitude of 7.0 or Greater



8. What does it mean when the slope is negative?

F The number of earthquakes stayed the same.

G The number of earthquakes increased.

H The number of earthquakes decreased.

J It means nothing.

LESSON 12-2

Reteach

Slope of a Line

The **slope** of a line is a measure of its tilt, or slant.

The slope of a straight line is a constant ratio, the "rise over run," or the **vertical change** over the **horizontal change**.

You can find the slope of a line by comparing any two of its points. The vertical change is the difference between the two *y*-values. And the horizontal change is the difference between the two *x*-values.

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

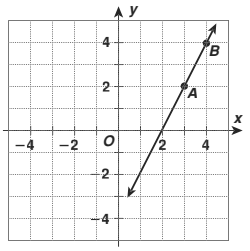
point *A*: (3, 2) point *B*: (4, 4)

Make point *A* (x_1, y_1).
Make point *B* (x_2, y_2).

slope $= \frac{4 - 2}{4 - 3}$

$= \frac{2}{1}$, or 2

So, the slope of the line is 2.



You can make point *A* (x_2, y_2) and point *B* (x_1, y_1).

slope $= \frac{2 - 4}{3 - 4}$

$= \frac{-2}{-1}$, or 2

So, the slope remains 2.

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

1. (1, 5) and (2, 6) — 1

2. (0, 3) and (2, 7) — 2

3. (2, 5) and (3, 4) — −1

4. (6, 9) and (2, 7) — $\frac{1}{2}$

5. (6, 5) and (8, −1) — −3

6. (7, −4) and (4, −2) — $-\frac{2}{3}$

LESSON 12-2

Reteach

Slope of a Line (continued)

A straight line has a constant slope, so it shows a **constant rate of change**. The same change in *y* always results in the same change in *x*.

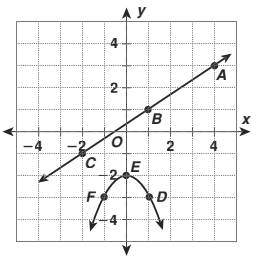
From point *C* to point *B*:

$\frac{\text{change in } y}{\text{change in } x} = \frac{2}{3}$

From point *B* to point *A*:

$\frac{\text{change in } y}{\text{change in } x} = \frac{2}{3}$

A curved line doesn't have a constant slope, so it shows a **variable rate of change**.

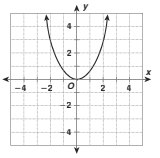


Between point *F* and point *E*, the curved line has a positive slope. Between point *E* and point *D*, the curved line has a negative slope.

So, the curved line has a variable rate of change.

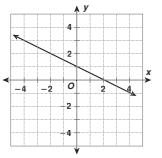
Determine whether each graph shows a constant or a variable rate of change. Write *constant* or *variable*.

7.



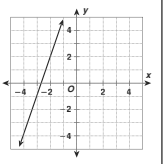
variable

8.



constant

9.



constant

LESSON 12-2

Challenge

Aligned?

1. Points *A*, *B*, and *C* are on the same line. Draw a conclusion about the slope between *A* and *B* and the slope between *B* and *C*.

slope between *A* and *B* = slope between *B* and *C*

2. Determine if the three points are collinear (lie on the same line).

a. *R*(2, 5), *S*(6, 15), *T*(16, 18)

slope between *R* and *S* = $\frac{15 - 5}{6 - 2} = \frac{10}{4} = \frac{5}{2}$

slope between *S* and *T* = $\frac{18 - 15}{16 - 6} = \frac{3}{10}$

R, *S*, *T* are not collinear.

b. *J*(0, −4), *K*(1, −2), *L*(3, 2)

slope between *J* and *K* = $\frac{-2 - (-4)}{1 - 0} = \frac{-2 + 4}{1} = 2$

slope between *K* and *L* = $\frac{2 - (-2)}{3 - 1} = \frac{2 + 2}{2} = \frac{4}{2} = 2$

J, *K*, *L* are collinear.

3. Find the value of *k* so that *U*(−5, −1), *V*(−1, −5), and *W*(5, *k*) are collinear.

a. Find the slope between *U* and *V*. $\frac{-5 - (-1)}{-1 - (-5)} = \frac{-5 + 1}{-1 + 5} = \frac{-4}{4} = -1$

b. Find the slope between *V* and *W*. $\frac{k - (-5)}{5 - (-1)} = \frac{k + 5}{5 + 1} = \frac{k + 5}{6}$

c. Set the results of parts a and b equal to each other and solve for *k*. Justify your result.

$\frac{-1}{1} = \frac{k + 5}{6}$

$(k + 5)(1) = (-1)(6)$

$k + 5 = -6$

$k = -11$

Check: When $k = -11$, the slope between *V* and *W* should equal −1.

$\frac{k + 5}{6} = \frac{-11 + 5}{6} = \frac{-6}{6} = -1$ ✓

4. The points *P*(2, −3), *Q*(2, 3) and *R*(*k*, 0) are collinear. Find *k*. Justify your result.

Since *P* and *Q* have the same *x*-values, $\overleftrightarrow{PQR}$ is a vertical line. So, $k = 2$.

LESSON 12-2

Problem Solving

Slope of a Line

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−0.0015

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$\frac{19.4}{32.5}$

3. On a highway, a 6% grade means a slope of 0.06. If a highway covers a horizontal distance of 0.5 miles and the elevation change is 184.8 feet, what is the grade of the road? (Hint: 5280 feet = 1 mile.)

7%

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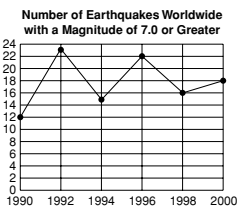
$\frac{1}{4}$

Use the graph for Exercises 5–8.



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