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Word Problem Practice

Rate of Change and Slope

1. **HIGHWAYS** Roadway signs such as the one below are used to warn drivers of an upcoming steep down grade that could lead to a dangerous situation. What is the grade, or slope, of the hill described on the sign?



$$\text{slope} = \frac{8}{100}$$

2. **AMUSEMENT PARKS** The Shrek roller coaster at Busch Gardens in Tampa, Florida, features a 136-foot vertical drop. What is the slope of the coaster track at this part of the ride? Explain.

$$\frac{136}{0} = \text{undefined}$$

A vertical drop goes straight down.

3. **CENSUS** The table shows the population density for the state of Texas in various years. Find the average annual rate of change in the population density from 1990 to 2000.

Population Density	
Year	People Per Square Mile
1990	22.1
1995	59.4
1999	64.3
1990	64.9
2000	79.6

Source: U.S. Census Bureau, U.S. Dept. of Commerce

$$\frac{79.6 - 64.9}{2000 - 1990} = \frac{14.7}{10}$$

$$= \frac{1.47}{1} = 1.47 \text{ people}$$

4. **REAL ESTATE** The median price of an existing home in the United States was \$136,000 in 2000. The median price had risen to \$191,300 by 2004. Find the average annual rate of change in median home price from 2000 to 2004.

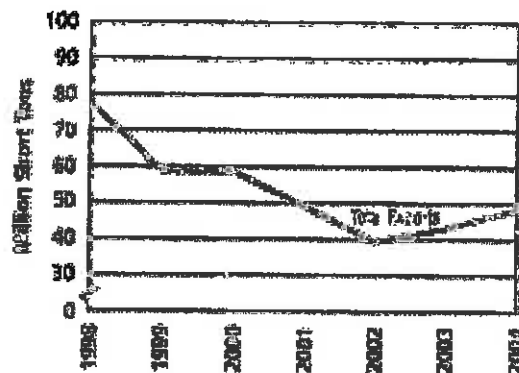
$$\frac{191,300 - 136,000}{2004 - 2000} = \frac{55,300}{4}$$

$$= 13,825$$

$$= \$13,825$$

5. **COAL EXPORTS** For Exercises 5-7, use the following graph.

The graph shows the annual coal exports from U.S. mines in millions of short tons.



Source: U.S. Energy Information Administration

5. What was the rate of change in coal exports between 2001 and 2002?

$$\frac{(2001, 50) (2002, 40)}{2002 - 2001} = \frac{40 - 50}{1} = -10$$

6. How does the rate of change in coal exports from 2003 to 2004 compare to that of 2001 to 2002?

$$\frac{(2003, 42) (2004, 48)}{2004 - 2003} = \frac{48 - 42}{1} = 6$$

It is positive.

7. Explain the meaning of the part of the graph with a slope of zero.

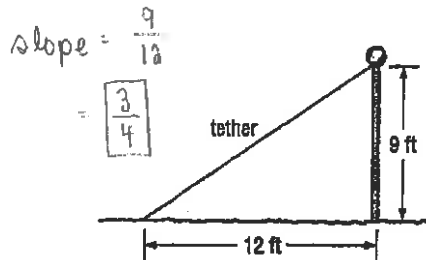
There were no coal exports during this time.

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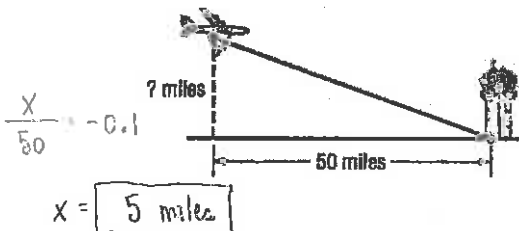
Word Problem Practice

Slope

1. **TETHER** A tether is tied tautly to the top of a pole as shown. What is the slope of the tether?



2. **AVIATION** An airplane descends along a straight-line path with a slope of -0.1 to land at an airport. Use the information in the diagram to determine the initial height of the airplane.



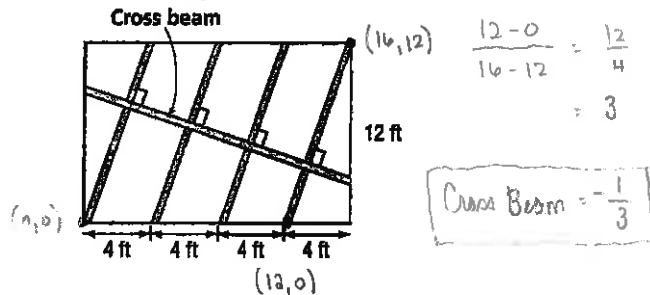
3. **ROCK CLIMBING** The table below shows Gail's altitude above ground during a rock climb up a cliff.

Time	Altitude (m)
10:00	0
10:20	22
10:40	30
11:00	33

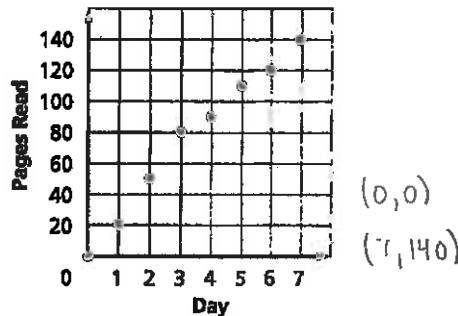
Complete the following table of Gail's average rate of ascent.

Time Period	Average rate of ascent (m/min)
10:00-10:20	$\frac{22}{20} = 1.1$
10:20-10:40	$\frac{8}{20} = 0.4$
10:40-11:00	$\frac{3}{20} = 0.15$

4. **DESIGN** An architect is designing a window with slanted interior bars. The crossbeam is perpendicular to the other four bars. What is the slope of the crossbeam?



- READING** For Exercises 5-7, use the graph that shows how many pages of her book Bridget read each day.



5. Find the average number of pages Bridget read per day.

$\frac{140-0}{7-0} = \frac{140}{7} = 20 \text{ pages}$

6. On which days did Bridget read more pages than her daily average?

Day 2, 3

7. If Bridget had been able to keep up the pace she had on day 3, how many days would it have taken her to finish the book?

$60 - 50 = 10$
 $\frac{140}{30} = 4.67$

5 days