

## Calculating Average Rates of Change

### Instructions:

- Read each problem and determine the coordinates of the two points mentioned.
- Use the coordinates to calculate the slope of a line passing through those two points. Show the difference quotient that leads to your answer.
- Write a sentence interpreting the slope as an average rate of change. Be sure to include units in your answer.

Example: While typing her English essay, Tammy noticed that her clock read 12:32 and the word count for her paper was 568. When she finished the paper, her clock read 12:48 and the final word count was 1128.

$$(32, 568) \text{ and } (48, 1128) \frac{(1128 - 568) \text{ words}}{(48 - 32) \text{ minutes}} = \frac{560 \text{ words}}{16 \text{ minutes}} = 35 \text{ words per minute}$$

During the time interval from 12:32 to 12:48, Tammy was typing at an average rate of 35 words per minute.

1. The population of Austin, Texas in 1990 was 472,000 people. The population in 1980 was 346,000 people.
2. At 3 o'clock, Sharon passes mile marker 295 on Highway 35. At 6 o'clock she passes mile marker 475.
3. The value of my new car after 2 years was \$11,200. When the car is 6 years old, the value has dropped to \$6100.
4. A lab technician is growing a bacteria sample. After one hour, she notes that there are 250 bacteria in the sample. After 3 hours, she notes that there are 1000 bacteria in the sample.
5. Mr. Suarez joined a gym to lose weight. After three weeks of membership, he weighed 189 pounds. When he had been a member for twelve weeks, he weighed 162 pounds.

6. On his fifth birthday, Paul was 42 inches tall. On his seventh birthday, he was 48 inches tall.
  
7. In 1984, the price of a VCR was \$375. In 1996, the price was \$125.
  
8. Dixie left Austin with an odometer reading of 12,584 miles and a full tank of gasoline. When she stopped to buy gasoline in Houston, her odometer reading was 12,792 miles. She filled the tank completely with 8 gallons of gasoline and paid \$31.12.
  
9. Dara works in the clothing department of a large store. When she began her shift at 4 p.m., the register showed sales of \$10,550. When she clocked out at 9 p.m., the register showed sales of \$40,620.
  
10. At one o'clock in the afternoon, the temperature outside registered 85 degrees. At seven o'clock that evening, the temperature was 61 degrees.
  
11. When an amusement park opened, the counter on the turnstile at the entrance read 1278. Seven hours later, the counter read 3672.
  
12. The concession stand at the amusement park begins the day with 500 popcorn containers. When the park closes, twelve hours later, an inventory shows there are only 44 containers left.

13. Scott began printing his history paper at 3:15. At 3:20, he found that it had printed 120 of his 150 pages.

14. The rate at which water flows out of a pipe, in gallons per hour, is given by a continuous function  $R$  of time  $t$ . The table shows the rate as measured every 3 hours for a 24-hour period. Between 3 and 12 hours, the water is flowing out of the pipe at a faster and faster rate. Determine the average increase of this rate for the 9 hour period.

$t$ (hours)	$R(t)$ (gallons per hour)
0	9.6
3	10.4
6	10.8
9	11.2
12	11.4
15	11.3
18	10.7
21	10.2
24	9.6

15. The temperature, in degrees Celsius, of the water in a pond is a continuous function  $W$  of time  $t$ . The table shows the water temperature as recorded every 3 days over a 15-day period. Based on the 3-day intervals shown in the table, over what 3-day interval is the water temperature increasing most rapidly and how fast is it rising? Over what 3-day interval is the water temperature falling most rapidly and how fast is it dropping?

$t$ (days)	$W(t)$ °C
0	20
3	31
6	28
9	24
12	22
15	21