

8.1 Comparing and Interpreting Rates

Rates: these are used as a comparison between two things.

Some quantities that we commonly make comparisons between may include:

- fuel consumption - it costs \$10 to drive 50 km
- prices in supermarkets - it costs \$5 to buy 10 pounds of something
- fees for a cell phone plan - it costs \$50 for 500 minutes of calling/texting

Unit Rate: is a rate in which the numerical value of the second term is 1. For example, typing 240 words in 8 minutes could be expressed as 30 words in one minute.

Notice that the second unit, time, is converted to 1.

Some examples of unit rates are:

- kilometers per hour
- cost per item
- earnings per week

Why would we rather unit rates instead of rates? Lets compare.

In which situation would it be easier to compare rates?

- It costs Mitchell \$10 to drive 50 km and it costs Mark \$12 to drive 48 km.
- It costs Andrew \$0.3 to drive 1 km and it costs Cody \$0.25 to drive 1 km.

What is the advantage of using unit rates as opposed to regular rates?

It's easier to compare two quantities to the same unit.

Example 1: May has 31 days.

In the month of May, Jessica sent 4216 text messages. During a one week period, Patrick sent 1008 texts. Who has the higher text rate per day?

Jessica: $\frac{4216}{\cancel{\text{month}}} \times \frac{\cancel{1 \text{ month}}}{31 \text{ days}} = 136/\text{day}$ Patrick has

Patrick: $\frac{1008}{\cancel{\text{week}}} \times \frac{\cancel{1 \text{ week}}}{7 \text{ days}} = 144/\text{day}$ the higher rate per day.

Unit Rates and Unit Pricing

The unit price is the amount a consumer pays for each unit of the product they are buying. You can use unit pricing to compare prices of items and to determine which price is the better deal.

Example 2:

Paper towels are sold in a 2-roll package for \$2.49 and a 12-roll package for \$12.99.

(A) What package has the lower unit price?

$$\frac{\$2.49}{2} = \$1.25/\text{roll} \quad \frac{\$12.99}{12} = \$1.08/\text{roll} \leftarrow \text{lower}$$

(B) How much would you save by buying a 12-roll package rather than six 2-roll packages?

$$\$1.25/\text{roll} - \$1.08/\text{roll} = \$0.17/\text{roll}$$

(C) When deciding which package size is the better buy for you, what should you consider in addition to unit price?

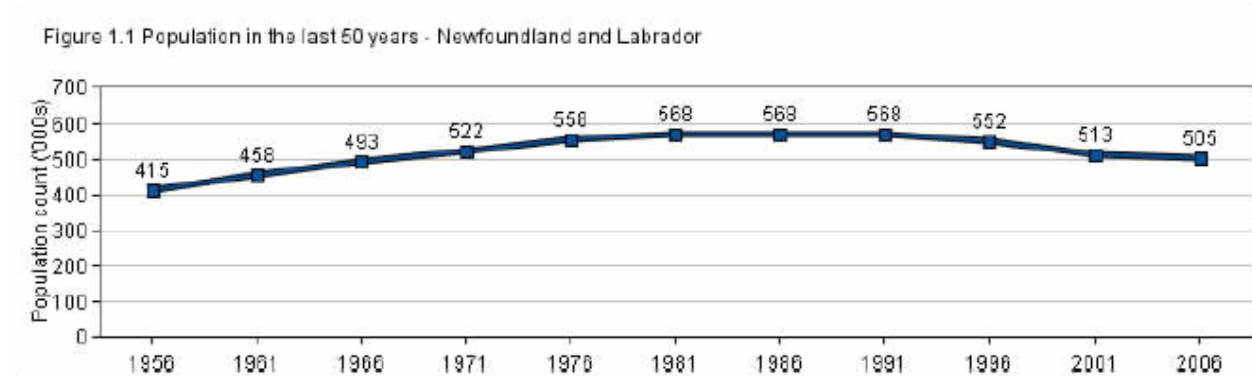
- Storage
- how much you use
- sale prices

Slope and Rate

In Mathematics 1201, you were introduced to the concept of slope and how it measures the rate of change in the dependent variable as the independent variable changes. The concept of slope is important, for example, in economics. Economists often look at how things change and how one item changes in response to a change in another item. They may observe, for example, how demand changes when price changes.

Example 3:

The following graph shows population change of Newfoundland from 1956 to 2006.



(A) What does a positive slope represent?

Increasing population.

(B) A negative slope?

Decreasing population.

(C) What does the slope of a horizontal line represent?

Stagnate population.

(D) What does the steepness of the slope represent?

More steep means faster increase or decrease in population.

Your turn:

1. Sean buys a package of 15 pencils for \$4.50 at Walmart. Angela buys a box of 50 pencils at Costco for \$14.00. Which is the better buy?

Sean: $\frac{\$4.50}{15} = \0.30 Angela $\frac{\$14}{50} = \0.28

2. Each of your finger nails grows at about 0.05 cm/week. Each of your toenails grows at about 0.65 cm/year. Do your toenails or finger nails grow faster?

Fingernail: 0.05 cm/week

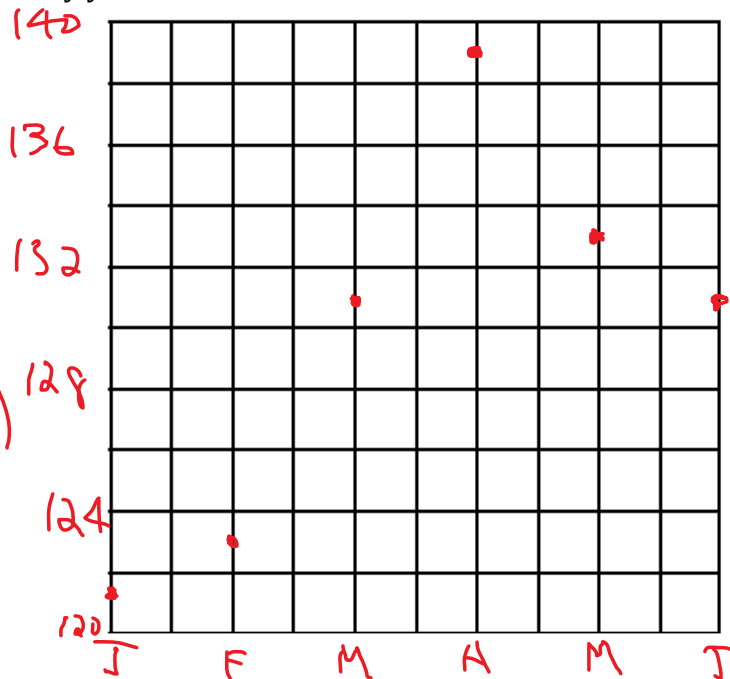
Toenail: $\frac{0.65 \text{ cm} \times 1 \text{ year}}{1 \text{ year} \times 52 \text{ weeks}} = 0.0125 \text{ cm/week}$

3. The following table represents the average cost per litre of regular gasoline in Newfoundland and Labrador for the first six months of 2011.

| Month | January | February | March | April | May | June |
|--------------------|---------|----------|-------|-------|-------|-------|
| Cost/Volume (\$/L) | 121.2 | 123.6 | 131.4 | 139.2 | 133.1 | 131.9 |

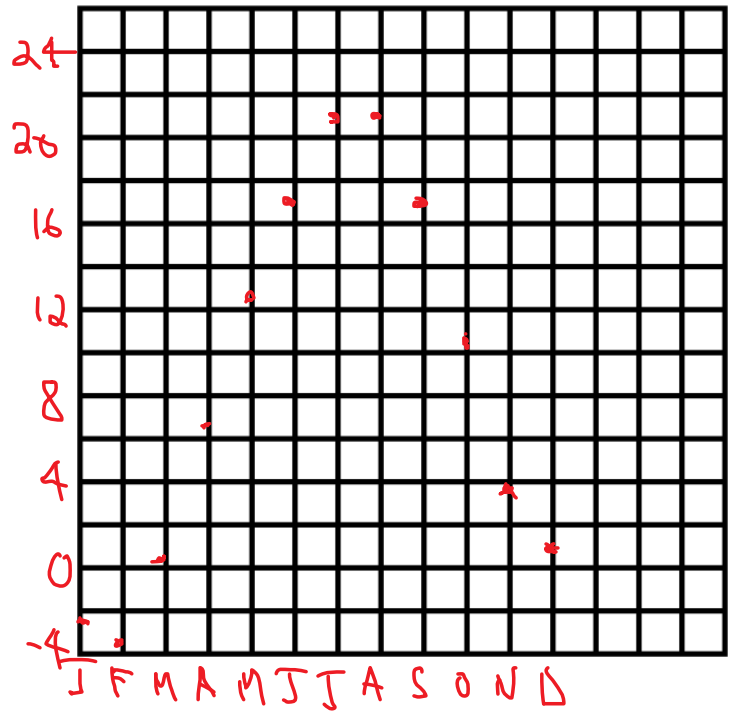
Using a graph, determine between which months the cost per litre of gas decreased the least amount. Give reasons why you think this occurred.

May & June
 • more demand for gas in summer. (more driving)



4. The average monthly temperature in Corner Brook, NL, in $^{\circ}\text{C}$, is recorded in the chart below. The sampling period for this data covers 30 years.

| Month | Average High |
|-----------|--------------|
| January | -2.5 |
| February | -3.2 |
| March | 1.1 |
| April | 6.4 |
| May | 12.1 |
| June | 17.7 |
| July | 21.8 |
| August | 21.1 |
| September | 16.7 |
| October | 10.5 |
| November | 4.0 |
| December | 0.2 |



- (A) Using a graph, identify between which two months the rate of change is the greatest.

Oct $\frac{1}{1}$ Nov

- (B) Between which two months is the rate of change the least?

July $\frac{1}{1}$ August

January $\frac{1}{1}$ February.