

Ratios, Rates and Proportions

Name: _____

Date: _____

Concepts

- Expressing a Decimal Number as a Percentage and Vice Versa
- Percentages and Directly Proportional Situations
- Proportional Situations (theory)
- Proportions
- Rates
- Rational Numbers ($\mathbb{Q}$)
- Ratios
- Recognizing a Directly or Inversely Proportional Situation
- Solving Directly or Inversely Proportional Situations
- Translating a Situation Into a Ratio or Rate

Expressing a Decimal Number as a Percentage and Vice Versa

1. Rewrite each number in the other notation. Give exact values — no rounding is needed.

- a) 0.37 as a percentage
- b) 1.6 as a percentage
- c) 0.045 as a percentage
- d) 8% as a decimal number
- e) 125% as a decimal number
- f) 0.5% as a decimal number

Percentages and Directly Proportional Situations

- 2.** A high-school arts festival sells passes for its two evenings.
- a) 35% of the 840 people in the hall on Friday bought a meal ticket as well. How many meal tickets is that?
 - b) Over the whole festival, 306 student passes were sold, and that was 18% of all the passes sold. How many passes were sold in total?
 - c) Of that total, 425 passes were bought at the door. What percentage of all the passes is that?

Proportional Situations

- 3.** For each situation, state whether the two quantities form a proportional situation, and justify your answer in one sentence.
- a) The mass of maple sugar bought at a cabane and the price paid, when the sugar sells at \$14 per kilogram.
 - b) The number of months a phone plan has run and the total amount paid, when the plan costs \$35 a month plus a one-time \$60 activation fee.
 - c) The side length of a square and its perimeter.
 - d) The side length of a square and its area.

Proportions**4.**

- a) Find the missing term: $\frac{x}{12} = \frac{15}{9}$.
- b) Find the missing term: $\frac{7}{x} = \frac{21}{48}$.
- c) Five packs of collector cards cost \$17.50. At the same price per pack, what do 12 packs cost?
- d) How many packs could you buy with \$63?

Rates**5.**

- a) A grocery sells the same apple juice in three formats: 1.5 L for \$3.60, 2 L for \$4.60, and 3 L for \$7.20. Find the unit rate of each format in dollars per litre, and say which is the best buy.
- b) Sofia cycles 18 km in 45 minutes. Express her average speed in km/h.

Rational Numbers ($\mathbb{Q}$)

6. A rational number is a number that can be written as a quotient of two integers, with a denominator that is not zero.

- a) Write each of 0.6, $2\frac{3}{4}$, 0.05, 1.2 and 7 as a quotient of two integers in lowest terms.
- b) Put 0.7, $\frac{2}{3}$, $\frac{3}{4}$ and 0.66 in increasing order.

Ratios

7.

- a) Write each ratio in simplest form: 24 : 36 and 45 : 27.
- b) A robotics club has 21 members, and the ratio of Secondary 1 members to Secondary 2 members is 3 : 4. How many members are in each year?
- c) A trail mix contains peanuts, raisins and dried cranberries in the ratio 5 : 3 : 2. What mass of raisins is in a 1.5 kg batch?

Recognizing a Directly or Inversely Proportional Situation

8. For each situation, say whether the two quantities are directly proportional, inversely proportional, or neither, and give a one-line reason.

- a) The number of identical buses hired for a trip and the number of students riding in each bus, for a group of exactly 240 students.
- b) The number of hours Ismael babysits at \$13 an hour and the amount he earns.
- c) A person's age and their height.
- d) The number of minutes since a cup of hot chocolate was poured and its temperature.

Solving Directly or Inversely Proportional Situations

9.

- a) The school lab's 3D printer uses 45 g of filament to print 6 identical keychains. How much filament does it need for 22 of them?
- b) The lab must print 240 badges. Four identical printers running together do the job in 9 hours. How long would 6 of the same printers take?

Translating a Situation Into a Ratio or Rate

10. At a library's used-book sale there are 84 novels and 56 comic books on the tables. The sale ran for 4 hours and raised \$210.

- a) Write the ratio of novels to comic books in simplest form.
- b) Write the ratio of comic books to all the books on the tables, in simplest form.
- c) Express the money raised as a rate per hour.
- d) Which of your three answers are ratios and which is a rate? Explain how you can tell.

Synthesis — drawing on several sheets in this topic

11. A school cafeteria buys 45 kg of potatoes for \$58.50.

- a) Find the unit rate, in dollars per kilogram.
- b) One batch of poutine uses 12 kg of potatoes. What do the potatoes for one batch cost?
- c) The supplier raises the price by 10%. Find the new unit rate, then the new cost of the potatoes for one batch.
- d) By what percentage did the cost of one batch go up? Explain why that had to be the answer.

Want the harder problems and the worked solutions?

The *Challenge Problems* set and the *Answer Keys* for Ratios, Rates and Proportions — with the reasoning written out in full — are available at tutorinmontreal.ca.