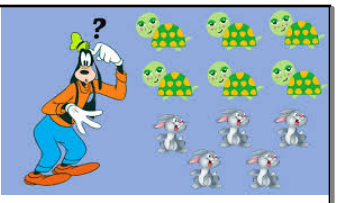
Date: _____



Unit 1: Number Sense

Lesson 4: Rates, Ratios, and Unit Rates

1) Vocabulary

What is a ratio? What is a rate? How are they similar, and what makes them different?

ratio → boys : girls (example)

Definition: comparison of two or more quantities measured in the same unit

rate → comparison of 2 quantities measured in different units

Examples of ratios:

girls : boys in a class

Examples of rates:

tax → % of price, km/h

What is a **unit** rate? How do we find a unit rate from a rate? (For example, if you ran 10 km in 1.5 hours what would your speed be as a unit rate?)

rate where the second number is one.

$\frac{10\text{ km}}{1.5\text{ h}} = \frac{6.67\text{ km}}{1\text{ h}}$ → 6.67 km/h

÷1.5

Examples of unit rates:

km/h, $/g, $/hour

2) Working with Ratios and Rates

multiply all parts by the same number

$\frac{12}{\text{same}} = \frac{30}{75}$

$30 \cdot x = 12 \cdot 75$

$30x = 900$

$x = 30$

What are equivalent ratios? What do we need to do to write equivalent ratios? 2:3 = 4:6 = 12:18

ratios that are the same in lowest terms

Example: A grade 9 academic math class has 13 boys and 15 girls.

a) Write a ratio to model this situation. boys : girls

28 in this class 13 : 15

b) There are seven grade nine academic math classes in the school. Assuming that each one has the same ratio of boys to girls, how many boys and girls are there taking grade nine math? Write a ratio of total boys total girls.

13 : 15 = 91 : 105 (×7)

∴ there are 91 girls + 105 boys

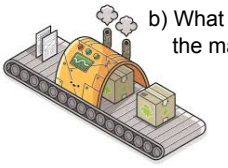
c) What is the total number of students enrolled in grade nine academic math? 91 + 105 = 196 gr. 9 math students

When you are writing rates, you MUST include units. For example, if you were to eat 12 chocolate bars in 6 days, you would write your chocolate consumption rate as 12 chocolate bars/6 days. As a unit rate, this would be 2 chocolate bars/day.

Example: A machine produces 42 items in 12 minutes.

a) Express this as a rate of production.

42 items / 12 minutes



b) What is the unit rate of production? (How many items does the machine produce in one minute?)

3.5 items / 1 minute

3) Applications of Ratios and Rates

In real life you will see ratios, rates, and unit rates. In particular when you are shopping you will see costs as rates quite often. It is important to be able to compare these rates so that you can find the best deal! In this course you will also be asked to compare rates of change in speed, distance, etc.

Tips for Dealing with Ratios and Rates

- Identify if the quantities have the same units (ratio) or different units (rate).
- Pay attention to the order of your numbers when you write your ratio or rate. Writing a general statement in words first, then plug numbers in.
- For ratios, reduce to lowest terms before doing further calculations (equivalent ratios most of the time).
- When you are comparing rates, be sure that you are working with the same quantity of units (price/100g, km/h, etc.).

Practice Problems

1) Mia has 8 apples, 6 oranges, and 4 bananas in the fruit bowl on the kitchen table. Write a ratio in lowest terms comparing apples to oranges to bananas.

a : o : b

8 : 6 : 4

= 4 : 3 : 2

10 : 35 (×5)

2) Write three ratios equivalent to 2:7.

(×10) 20 : 70 4 : 14 (×2) 6 : 21 (×3) 40 : 140 (×20) 8 : 28 (×4)

3) Costco offers two different packages of coffee. One is $39.99 for 1 kg of coffee, while the other is $19.99 for 650g of coffee.

1 kg = 1000g

a) Write each price as a **cost per 100g**.

$39.99 / 1000g ÷10 = $3.999 / 100g

$19.99 / 650g ÷6.5 = $3.08 / 100g

6.5

b) Which one is the better buy?

The second option is the better buy

4) Nolan and Matthew each went for a run on Sunday. Nolan ran 6 km in 40 minutes. Matthew ran 5 km in 30 minutes.

a) Write each person's speed as a rate and as a unit rate, in km/min.

Nolan: 6km / 40min = 0.15km/1min

Matthew: 5km / 30min = 0.17km/1min

b) Who ran faster?

Matthew is moving faster.