Comparing Rates — Name: Notes

Foundations 11 — Block: ___ Date: ________

Rate: a ratio (comparison) of two values which are measured in different units

Ex. 650 km/7h or $3.25/100g

Unit Rate: describing how many units of the first quantity correspond to ONE unit of the 2nd quantity (used to compare rates). Often see unit price in grocery stores.

Ex. $1.95/1lb or 50km/h

Expressing a Rate as a Unit Rate

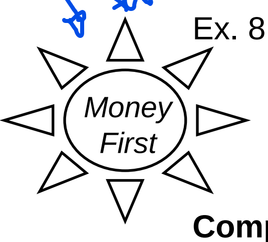
Ex. 240 words/8 min

$\frac{240 \text{ words}}{\div 8 \text{ min}} = \frac{x}{1 \text{ min}}$ $x = 30$ words/min ← time is almost always on the bottom

always $ on top

Ex. 8 kg of veggies for $12

$\frac{\$12}{\div 8\text{kg}} = \frac{x}{1\text{kg}}$ ← unit $x = \$1.50/\text{kg}$



Comparing Rates

Ex. Natasha can buy a 12 kg turkey from her local butcher for $42.89. The local supermarket has turkeys advertised in its weekly flyer for $1.49/lb. There are about 2.2 lb in 1 kg. Which store has the lower price?

① $\frac{\$42.89}{\div 12\text{ kg}} = \frac{\$x}{1\text{kg}}$ $3.57/kg

② $\frac{\$1.49}{1\text{lb}} \times \frac{2.2\text{lb}}{1\text{kg}} = \$3.28/\text{kg}$ ↑ better deal!

Slope and Rates

Slope = $\frac{\text{rise}}{\text{run}}$ $\left(\frac{\text{vertical change}}{\text{horizontal change}}\right)$

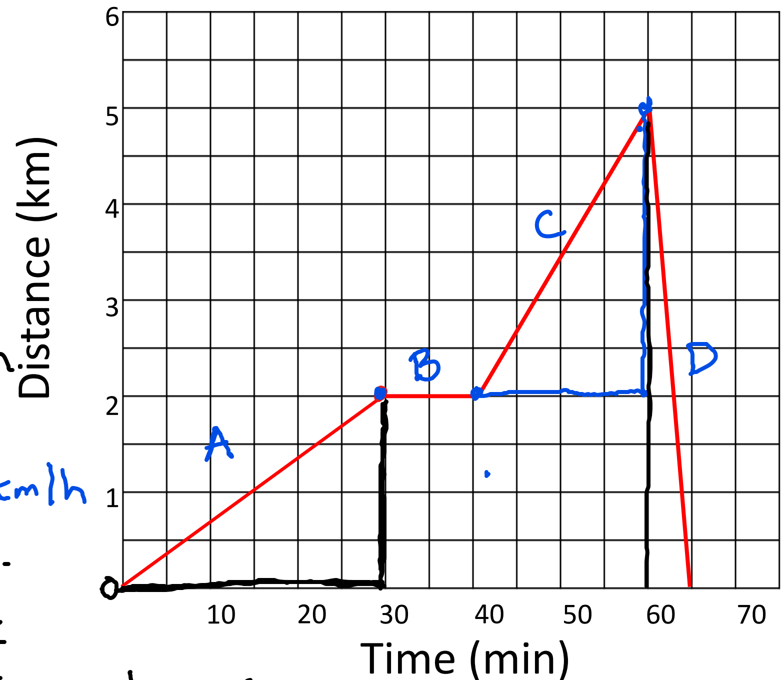
A: slope = $\frac{2\text{ km}}{30\text{ min}} = 0.0\overline{6}\ \frac{\text{km}}{\text{min}}$

$\frac{0.0\overline{6}\text{ km}}{1\text{ min}} \times \frac{60\text{ min}}{1\text{ h}} = 4\text{ km/h}$

B: slope = $\frac{0\text{ km}}{10\text{ min}} = 0\text{ km/min}$ or 0 km/h.

C: slope = $\frac{3\text{ km}}{20\text{ min}} = 0.15\frac{\text{km}}{\text{min}} \times \frac{60\text{ min}}{1\text{ h}} = 9\text{ km/h}$

D: $\frac{-5\text{ km}}{5\text{ min}} = \frac{-1\text{ km}}{\text{min}} \times \frac{60\text{ min}}{\text{h}} = -60\frac{\text{km}}{\text{h}}$ ← negative because going in opposite direction



Solving Problems Involving Rates

Ex. The gas tank of Mario's new car has a capacity of 55 L. The owner's manual claims that the fuel efficiency of Mario's car is 7.6 L/100 km on the highway. Before Mario's first big highway trip, he set his trip meter to 0 km so he could keep track of the total distance he drove. He started with the gas tank full. Each time he stopped to fill up the tank, he recorded the distance he had driven and the amount of gas he purchased:

Fill-up	Total Distance Driven (km)	Quantity of Gas Purchased (L)
1	645	48.0
2	1037	32.1

} 392 km is difference

Rate 1: $\frac{48\text{ L}}{645\text{ km}} = \frac{x}{100\text{ km}}$ 7.44 L/100 km ✓ better because you are using less gas

Rate 2: $\frac{32.1\text{ L}}{392\text{ km}} = \frac{x}{100\text{ km}}$ 8.19 L/100 km ✗

Did the car achieve the manufacturer's fuel efficiency rating of 7.6 L/100 km on either leg of the trip? Yes, on the 1st leg, not the 2nd.

Ex. It takes 4 hours 15 minutes to drain tank A, which holds 300 L of water. It takes 2 hours 10 minutes to drain tank B, which holds 150 L of water. Which has the greater rate?

(A) $\frac{300L}{255min} = 1.18 L/min$ 70.6 L/h ← greater rate

(B) $\frac{150L}{130min} = 1.15 L/min$ 69.2 L/h

Ex. Person A runs 400 m in 1 min 15 sec. Person B runs 1 km (1000m) in 5 min 20 sec. Who is the faster runner? (m/s)

A: $\frac{400m}{75s} = 5.3 m/s$ Person A is faster

B: $\frac{1000m}{320s} = 3.1 m/s$

Rates

Where might the following rates be used?

a) 45 words/min
- typing

b) 98.5 ¢/L
price of gas

c) 7.2 MBps
phones & computers processing speed

d) 35 ppm (parts per million)
science - particle counts
pollution counts

e) 0.05 mg/kg
medication dosage by mass

f) 2500 rpm (rotations per minute)
car engine rotation

Unit Analysis

Ex. A car travels at 80 km/h. Express this as ft/min. (1 km = 3281 ft)

$\frac{80\,km}{1\,hr} \times \frac{1\,hr}{60\,min} \times \frac{3281\,ft}{km} = \frac{80 \times 3281}{60}\frac{ft}{min} = 4374.67\,ft/min$

Solving Problems With Rates

Ex. Paula is asked to order snacks for an office meeting of 180 people. She decides to order dessert squares, which come in boxes of 24. She estimates that she will need 2.5 squares/person. How many boxes should she buy?

$180\,people \times \frac{2.5\,sq.}{person} = 450\,squares \div 24 = 18.75\,boxes$

she will need to buy 19 boxes

Ex. Amelia walks briskly, at ~~6 km/h~~. When she walks at this rate for 2 h, (120 min) she burns 454 Cal. Bruce walks at a slower rate, ~~4 km/h~~, burning 62 Cal in 30 min. If Amelia walks for 3 h, how much longer will Bruce have to walk in order to burn the same amount of Calories?

Bruce $\frac{62\,Cal}{30\,min} = \frac{454\,cal}{x}$

$x = 219.7\,min$

$\sim 3.66\,h$

$219.7 - 120 = 99.7\,min$ longer

$\sim 1.66\,h$ longer

Ex. Jeff lives in a town near the Canada-U.S. border. He can either buy his gas in his town at $1.32/L or travel across the border into the U.S. to fill up at $2.95/gal. Which option makes the most sense economically if the exchange rate today is $1 U.S./$1.32 Cdn?

(1 gallon = 3.79 L)

$\frac{\$2.95\,US}{gallon} \times \frac{\$1.32\,CAN}{\$US} \times \frac{1\,gallon}{3.79\,L} = \frac{2.95 \times 1.32}{3.79}$

$= \$1.03\,CAN/L$

↑ better deal