RATIO AND RATE   09 MAY 2013

Lesson Description

In this lesson, we:

- Discuss ratio.
- Discuss rate.
- Complete calculations with both ratio and rate

Key Concepts

Ratio

A ratio is a comparison of two numbers (called terms of the ratio).
Ratios have no units since the quantities being compared are of the same kind or type.
Ratios can be written in different ways:

- In words → a to b
- With a colon → a:b
- As a fraction → $\frac{a}{b}$

Example: Suppose there are 21 chocolates and 18 toffees in a gift presentation. The ratio of chocolates to toffees can be written

- In words → 21 to 18
- With a colon → 21:18
- As a fraction $\frac{21}{18}$

Ratios can be written in equivalent form and therefore used for comparison.

Rate

A rate is a special kind of ratio in which the two (or more) quantities being compared have different units. Examples of rates include:

- Comparing the distance travelled by a car to the time taken to travel that distance – this gives the speed of the car in kilometres per hour (km/h)
- Comparing the time spent on a telephone call to the total cost of the call – in Rands per minute (R/min).
- Comparing the value of the Rand currency to the US Dollar currency – this gives the exchange rate of the Rand to the Dollar in Rand per Dollar (R/$)

Two important concepts to understand when working with rate are constant rates and unit rates.

- Constant rate: When the quantities being compared are in direct proportion we say that we have a constant rate.
  Example: rates at which telephone calls are charged – R0,99 per minute.
- Unit rate: A useful method for performing calculations involving rates is to use unit rates; this is the rates in which one of the quantities in the rate is compared with a single unit of the second quantity in the rate.
  Example: cost of milk per one litre – R10,99/l

Questions

Question 1

(Solutions for All Maths Literacy, Macmillan, Grade 10, Chapter 2, Page 46, Question 5)

A chef has to cook a meal for 58 people. He uses a recipe for 4 people and adjusts the ingredients.

    a.) What ratio should he use to calculate the ingredients if his recipe is for 4 people and he needs to serve 58 people?

    b.) Complete the table below:

Recipe for 4 People	Recipe for 58 people
2 eggs	
150 g flour	
20 ml	
5 ml sugar	
2 ml vanilla essence	

Question 2

(Solutions for All Maths Literacy, Macmillan, Grade 10, Chapter 2, Page 46, Question 6)

A baker mixes butter and flour in the ratio 1:3 to make dough.

    a.) If she has 50g of butter, how much flour will she need?

    b.) How much butter is required to make 200g dough?

    c.) How much flour is needed for 1 000g (1kg) of dough?

Question 3

(Solutions for All Maths Literacy, Macmillan, Grade 10, Chapter 2, Page 45, Question 7)

The rand-dollar (US$) exchange rate is R7,21 to US$1.

    a.) What would it cost to buy US$50 with rands?

    b.) What would you get if you exchange US$100 for rands?

    c.) If your holiday allowance is R5 000 when you visit the United States, how much money will you have in dollars?

Question 4

(Solutions for All Maths Literacy, Macmillan, Grade 10, Chapter 2, Page 45, Question 8)

Electricity is charged at 76c per unit. There is also a daily surcharge of R1,27. You buy R300 worth of electricity. Surcharge is deducted for 27 days and you are allocated units for the balance of the money.

    a.) Calculate the surcharge amount.

    b.) Calculate the amount of money allocated for units.

    c.) How many units are you allocated?

Question 5

(Adapted from NCS (EC) Sept 2012, Paper 1, Question 1)

You are planning to go on holiday and visit your family over the Christmas season. You have been asked by your aunt to bring your mother's recipe for her milk tart filling as she would like to make it for the family tea on Christmas Day.

You have been given the recipe by your mother and these are the ingredients required:

MILK TART FILLING
540 mℓ milk
85 g flour
1 pinch salt
30g margarine
100g sugar
Cinnamon sugar to taste

Mom's tip –
Secret to get it to set right is in the baking!

Bake at 220 ℃ for 20 minutes and then reduce heat to 200 ℃ for the last 10 minutes.

Your aunt is used to using imperial measures so you are going to have to change the recipe for her before you go on holiday. In the front of the recipe book is the following table:

Mass		
Ounces to grams	1 ounce (oz)	25 grams (g)
Pounds to grams	1 pound (lb)	400 grams (g)
Volume		
Pints to millilitres	1 pint	560 ml
Tablespoons to millilitres	1 tablespoon	12,5 ml
Teaspoons to millilitres	1 teaspoon	5ml

a.) Change the amounts required for the milk, flour, margarine and sugar to imperial measurements using the table above.
b.) Change the degrees Celsius to Fahrenheit using the following formula; $°F = (9/5 \times °C) + 32$
c.) You need pocket money for your holiday. You have decided you want £500 to spend. The exchange rate is £1 = R 12,56. Calculate how much money you need to save to get £500.

Question 6

(Adapted from NCS (DBE) Nov 2011, Paper 1, Question 1)

A South African couple recently visited Botswana and Zambia. The table below shows the exchange rate between the currencies of the two countries and the South African rand (ZAR):

SOUTH AFRICAN RAND TO FOREIGN CURRENCY	
R1,00 (ZAR) =	0,95 Botswana pula (BWP)
R1,00 (ZAR) =	681,07 Zambian kwacha (ZMK)

a.) The couple budgeted to pay R20,00 per person for lunch. How much is this amount in Botswana pula?

b.) The accommodation in Zambia cost 360 286 ZMK per couple per day. They paid a deposit of 1 021 605 ZMK to secure their accommodation. Dinner costs 85 134 ZMK per person and they both had dinner at the hotel restaurant four times.
Use the formula below to calculate the total amount they will pay at the end of their ten-day stay at the hotel in Zambia.
Total amount due = (number of days × A) + (8 × B) – C, where: A = accommodation cost, B = cost per dinner and C = deposit paid

c.) On a particular day they travelled 180 km in 2 hours 15 minutes. Calculate their average speed in kilometres per hour.
Use the formula: $\text{average speed} = \frac{\text{distance}}{\text{time}}$