



Mathematical Sciences: MMSC4
LESSON 10

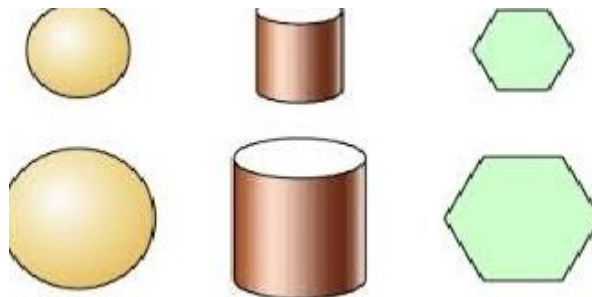
US: 7449 - SO1

LESSON OBJECTIVES

- 1. Learners must be able to identify ratio and proportions in mathematical context.**
- 2. Learners should be able to analyse ratios and proportions in terms of percentages**
- 3. Learners should be able to use ratios and proportions in order to calculate percentages.**
- 4. Learners should be able to calculate rates of increase in various mathematical context**
- 5. Learners should be able to determine measures of central tendency and use them to make decisions**

STEP 1 INTRODUCTION

- Describe the following paired shapes, how do they look?

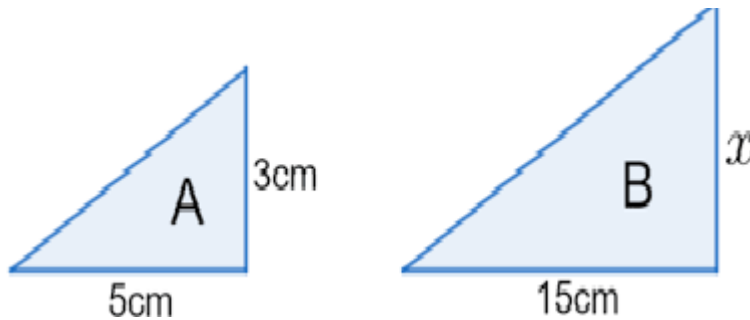


- The paired shapes look very similar to one another.
- You learned about enlargement in transformation, in the previous lessons.
- Enlargements deal with two same shapes but of different sizes.
- Enlargements come about as a result of a scale factor.
- The length of one shape divided by the length of the other, gives us a ratio what is called the scale factor.
- Therefore the shapes are in proportion to one another.



STEP 2 Worked Examples.

- Here are two similar shapes again:



- The ratio of triangle A base length to triangle B base length is $5/15 = 1/3$.
- Therefore side x for triangle B is $3 \times 3/1 = 9\text{cm}$.
- 1. A photograph is 12cm wide and 8cm tall. It is enlarged in the ratio 3: 2. What are the dimensions of the enlarged photograph?
- This means the width is increased in the ratio of 3:2 and so is the height.
- Therefore new width is equal to $12/1 \times 3/2$ which is equal to 18 cm.
- Similarly, the new height is $8/1 \times 3/2$ which is equal to 12cm.
- You can check if the ratio of image to original object is indeed 3 : 2 by just dividing 18 by 12 like $18/12$ which is indeed equal to 3: 2.
- We can comfortably say that the two photographs are in proportion to one another.

STEP 2 Example 1 continued(Expressing the increase in percentage)

- Remember percent means in every 100 or per 100.
- The dimension increased from 12 to 18 an increase of $(18-12) = 6$.
 - As a percentage the increase is at $6/12$ multiply by **100%** which is equal to **50%**.
 - Similarly the increase on the height is also **50%** thus $(4/8 \times 100\%)$



ACTIVITY 1

Work out the following questions.

- A map measuring **60 cm** by **25 cm** is reduced in the ratio of **3 : 5**. Calculate the final dimensions of the map.
- Express the decrease in dimensions of the map above as a percentage

STEP 3 Example 2

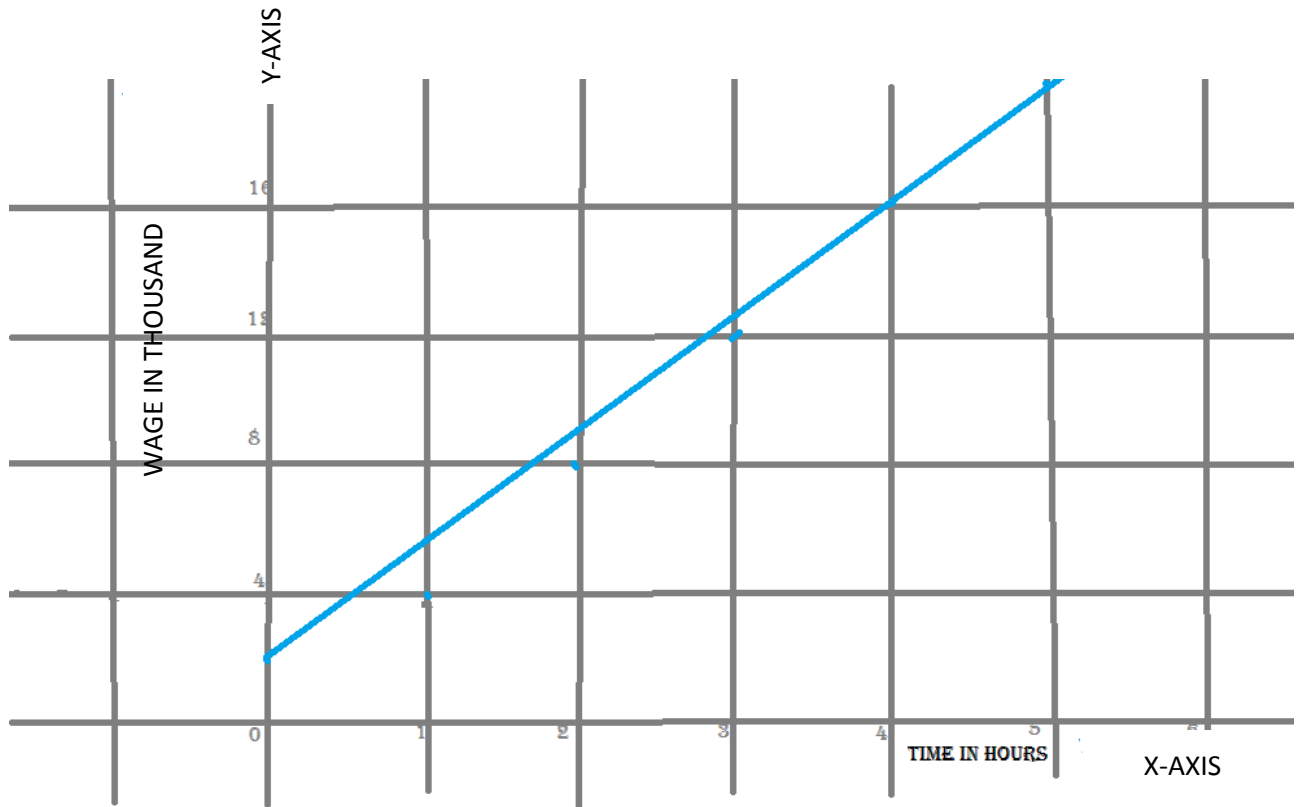
- The salary of a certain technician increased from **R10000** to **R10500** after one year. Express the increase as a percentage.
Increase = R10500 – R10000 = R500
 - Increase % = $\frac{\text{increase}}{\text{original salary}} \times 100\% = \frac{500}{10000} \times 100\%$
 - Which is to **5%**
- If the salary increased at the same rate in the following year, how much was the new salary?
 - New increase is $5\% \times R10500 = \frac{5}{100} \times 10500 = R525$
 - Therefore new **salary = R10500 + R525 = R11025**

ACTIVITY 2

- The graph below shows an engineers wage record in rands. His wage package consists of a fixed minimum charge which is added to an hourly charge and this makes up his monthly earnings.
 - What is the engineers fixed minimum charge?
 - Using the graph determine how much does the engineer earn when he works for five hours in a month?
 - How much is his hourly rate?
 - If the engineers hourly rate is increased by 10% in the following year due to inflation, determine how much the new hourly rate would be.?



GRAPH SHOWING AN ENGINEERS WAGE RECORD



STEP 4 MEASURES OF CENTRAL TENDENCY ANALYSIS

The table below shows the record of temperature for a technician office from 07:00hours to 19:00hours on one of the busiest day and coldest day of the winter season

TIME	TEMPERATURE READING IN DEGREES CELCIUS
07:00	10
09:00	15
11:00	20
13:00	25
15:00	25
17:00	22
19:00	18



- Determine the mean temperature of the day?
- Calculate the median of the temperature readings?
- State the modal temperature reading of this day?

SOLUTIONS

- a) **MEAN (Average)** = sum Divided by number of data items.
= $(10 + 15 + 20 + 25 + 25 + 22 + 18)/7$
= $135/7$
= 19.285
= 19.3 corr to 2dp
- b) **MEDIAN** = First arrange data items in ascending order.
= 10; 15; 18; **20**; 22; 25; 25;
= 20 is the median
- c) **MODE** = 25 Because it appears most than any other

ACTIVITY 3

The table below contains the mathematics exam results of some learners in June and December ;

June Exam	December Exam
85	46
25	65
25	60
30	55
80	54
70	60
40	50
20	50
85	55
90	55



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- a. Determine the mean, mode and median of the learners performance in both exams?
 - b. What do you notice about their performance, motivate your answer?
 - c. In which exam did the learners perform better overall? Give areason for your answer?

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