

MATH SPEAK - TO BE UNDERSTOOD AND MEMORIZED

- 1) **GRAPH** = a visual representation of a relationship between two different quantities.
- 2) **SLOPE** = m = a measure of the steepness of a graph or a part of a graph.
- 3) Δ = a capital Greek letter delta and in mathematics and science it means “the change in”. **i.e.** Δy means “the change in y ”
- 4) **RATE** = a *fraction* composed of two *quantities*. **e.g.** $\frac{100 \text{ km}}{1 \text{ h}}$, $\frac{\$1.69}{100 \text{ g}}$, $\frac{55 \text{ words}}{1 \text{ min}}$, $\frac{2.2 \text{ lbs}}{1 \text{ kg}}$
- 5) **UNIT RATE** = a special *rate* where the *number* of one of the *quantities* is a 1. **e.g.** $\frac{100 \text{ km}}{1 \text{ h}}$, $\frac{55 \text{ words}}{1 \text{ min}}$, $\frac{1 \text{ kg}}{2.2 \text{ lbs}}$
- 6) **CONVERSION FRACTION** = a *fraction* used to convert one *unit* within a *rate* to another *unit*.
e.g. $\frac{1 \text{ km}}{1000 \text{ m}}$, $\frac{60 \text{ s}}{1 \text{ min}}$, $\frac{1 \text{ kg}}{2.2 \text{ lb}}$

I) REVIEW OF SLOPE

A) Study the graph given in **EXAMPLE 2** on page 454 of your text. The graph describes a change in distance over a change in time. The change in time is given on the horizontal axis (x) while the change in distance is given on the vertical axis (y). The graph is composed of 4 different sections, each beginning and ending at specific times and distances. Each line-section has a unique steepness. Mathematicians determine the steepness of a straight-line graph by calculating its **SLOPE**.

1) The **slope** of a straight-line graph is calculated using this formula:

$$\text{slope} = m = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\text{change in the vertical variable}}{\text{change in the horizontal variable}} \quad ; \quad \text{slope is often stated as } = \frac{\text{rise}}{\text{run}}$$

a) In order to calculate the **slope** of a straight-line graph or a part of it, you must know two points that are on the line. The points are always written in the form $P_1(x_1, y_1)$ and $P_2(x_2, y_2)$. The coordinates of these points are substituted into the formula to calculate **slope**.

B) **SAMPLE PROBLEM 1:** Study this example carefully. Be sure you understand and memorize the process used to complete it.

1) List two different sets of points that can be used to calculate the **slope** of the graph found in the top grid on page 296 of your text then calculate the **slope** using each set. What conclusions can you make when you compare the two **slopes**?

Step 1: List two points on the line as P_1 and P_2 :

A)

B)

Step 2: Calculate the slope using P_1 and P_2 :

Step 3: Answer the question:

B) **REQUIRED PRACTICE 1:** Determine the slope of the line found in the graphs indicated below. All page numbers are from your text. **{Answers are on page 4 of these notes.}**

- 1) Most left-hand graph on page 302.
- 2) Graph found in Question 4c on page 303.
- 3) Horizontal line found in the grid on page 308.
- 4) Dashed graph found in the bottom grid on page 313.
- 5) Solid line found in the middle grid on page 322.
- 6) Dashed graph in Question 1 on page 347.

I) DETERMINING A RATE FROM A GRAPH

A) Study the graph titled **Distance vs. Time** on page 454. **NOTICE** that each axis has represents to a different quantity. The horizontal axis represents Time, having units in minutes (min), while the vertical axis represents Distance, having units in kilometres (km). Including the units in the **slope** calculation turns the **slope** into a **rate** and can be used to learn information about the situation described by the graph.

B) **SAMPLE PROBLEMS 2:** Study this example carefully. Be sure you understand and memorize the process used to complete it.

1) Turn your text to page 454 and use the graph given in **EXAMPLE 2** to answer these questions.

a) Determine the **rate**, speed, in km/min and km/h for the first section of the graph: between 0 min and 30 min.

b) Determine the **rate**, speed, in km/min and km/h for the section of the second graph: between 30 min and 40 min.

c) Determine the **rate**, speed, in km/min and km/h for the third section of the graph: between 40 min and 60 min.

d) Determine the **rate**, speed, in km/min and km/h for the fourth section of the graph: between 60 min and 65 min.

2) What is the relationship between the steepness of the graph and the numerical value of the slope?

- 3) Turn your text to page 451 and use the graph titled **Distance vs. Time** to answer these questions.
- a) Which graph represents the faster speed (*rate*)? Explain your answer.
- b) Which graph represents the slower speed (*rate*)? Explain your answer.
- 4) Turn your text to page 457 and use the graph titled **Gas Used vs. Distance Driven for Mario's trip** to answer these questions.
- a) Which graph represents the higher *rate*? Explain your answer.
- b) Which graph represents the slower *rate*? Explain your answer.

B) *REQUIRED PRACTICE 2*

- 1) Pages 458 - 460: Questions 3, 12, 13 & 14. {Answers are on page 580 of the text.}
2) Page 473: Questions 5. {Answers are on page 581 of the text.}
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ANSWERS TO THE REQUIRED PRACTICE**Required Practice 1 from pages 1**

- 1) $m = -2$ 2) $m = 1$ 3) $m = 0$ 4) $m = \frac{-3}{2}$ 5) $m = \frac{1}{2}$ 6) $m = \frac{5}{2}$
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