CHAPTER 3

3.1 PERCENTAGE

Percentages are used as a means of comparison. This comparison is based on 100 parts. Remember that "per cent" means "per hundred". So, 60% really means 60 out of 100.
Any percentage can be converted to a fraction or to a decimal.

To convert a percentage to a fraction:

1 Drop the per cent sign.
2 Write the number over 100.
3 Reduce the fraction formed to its lowest terms.

To convert a percentage to a decimal:

1 Drop the per cent sign.
2 Move the decimal point in the number two places to the left.

Example 1
Write each percentage as a fraction in its lowest terms.

(a) $\frac{1}{4}\%$ (b) $33\frac{1}{3}\%$

Example 2
Express each percentage as a decimal:

(a) 7 % (b) 35.8 %

Sometimes it is necessary to convert a fraction or decimal to a percentage. This can be done easily.

To convert a fraction or decimal to a percentage:

Example 3
Express the following number as percentages:

(a) $\frac{1}{6}$ (b) 0.08

3.2 CALCULATING PERCENTAGES

Many problems which involve percentage require finding a certain percentage of a given number. But other problems require expressing one number as a percentage of another number. Sometimes you must also find a number if the value of a percentage of the number is known.

Example 4
In a group of 90 people, 23 are Malays, 13 are Indians and the rest are Chinese. What is the percentage of Chinese?

Example 5
In a group of people, 45% are men, 30% are women and the rest are children. If there are 15 children in the group, how many men are there?

3.3 MONEY TRANSACTIONS INVOLVING PERCENTAGES

In a sale, a **discount** (reduction) in price is given. Suppose an item is priced at $50. This is called the usual price of the item. If there is a discount of $6 during a sale, the item will cost $44. This reduced price is called the **sale price**.

Sale price = Usual price – Discount

A discount is often expressed as a percentage of the usual price.

Example 6
The usual price of a pair of shoes is $35. At a sale, they were sold at a discount of 10%. What was the sale price?

Example 7
The sale price of a camera after a 15% discount is $255. Find its usual price.

3.4 PROFIT AND LOSS

Suppose a shopkeeper buys an item for $70 and sells it for $90. The price at which he buys the item is called the cost price and the price at which he sells it is called the selling price. Since the selling price ($90) is greater than the cost price ($70), the shopkeeper earns $20. The amount of money earned is called the profit or gain. If the shopkeeper had sold the item for $65, then he would have lost $5. The amount of money lost is called the loss.

Profit = Selling price - Cost price

Loss = Cost price - Selling price

Example 8
A man makes 15% profit on each item that he sells.

a) If an item costs him $60, how much does he sell it for?
b) If he makes a profit of $24 on an item, how much does he sell it for?

Example 9
An article was sold at a 20% loss. If the article was sold for $45, what was the cost price of the article?

3.5 INTEREST

Many people borrow money for business or for other reasons. If you borrow money, you must pay interest. When you deposit money in a bank, the bank pays you interest as it is borrowing money from you. Interest is the cost of borrowing. The money borrowed is called the principal. Borrowed money, together with interest, must be returned within a specified period of time. This period of time is called the time of the loan.

Simple interest is the interest paid on the principal only, for each time period. The rate of interest is always given as a percentage of the principal. This is usually calculated over a period of one year. The term per annum (p.a.) means per year.

The formula below is used to calculate simple interest.

$$I = \frac{PRT}{100}$$ where **I** is the interest

P is the principal
R is the rate of interest
T is the time expressed in years

For a principal amount of \$P at an interest rate of r% per compound period for n compound periods,

$$\text{total amount} = P\left(1 + \frac{r}{100}\right)^n$$

Example 10

A bank pays interest of $6\frac{1}{2}$% per annum. How much interest will be paid on \$450 in 3 years?

Example 11

A man has \$1 000 in a bank which pays interest of 5% per year. After how many years will his interest total \$300?

Example 12
A bank pays interest of 6 % per year. How much interest will be paid on $ 800 in six months?

Example 13
Peter made an investment of $12 000. Calculate the value of his investment after 3 years if the interest is 5% p.a. compounded annually.

TUTORIAL 3

1 A total of 600 students sat for an exam. 72% of the students passed.
   a) What percentage of the students failed?
   b) How many students passed the test?

2 A total of 7 000 workers enrolled for the WISE Maths and English courses. If 65% of the workers enrolled for the English course, how many workers enrolled for the Maths course?

3 There are 800 pupils in a school. 55% of the pupils are boys.
   a) What percentage of the pupils are girls?
   b) Find the number of boys in the schools if 60% of the pupils are girls

4 In a housing block, 30% of the people are men, 28% are women and the rest are children. If there are 120 men, calculate
   a) the number of people in the housing block,
   b) the number of children in the housing block.

5 A man earns $950 a month. He receives a 12% increase in salary. Find
   a) the increase in salary.
   b) the new salary

6 Mr Zhang sold his car at a loss of 25%. If he sold his car for $13 500, what was the cost price of the car?

7 A shopkeeper buys 50 shirts for $1 500. Calculate his total profit if
   a) he sells all 50 shirts for $38.00 each.
   b) he sells 40 shirts for $38.00 and 10 shirts for $29.90 each.

8. David invests $5000 in a savings account which pays compound interest at the rate of 4.8% per year. Calculate the total interest earned in 6 years.

9. A shopkeeper makes 25% profit on each article that he sells.
   a) If an article cost the shopkeeper $30, how much does he sell it for ?
   b) If he sells an article for $15, how much did it cost him?
   c) If he makes a profit of $9 on an article, how much does he sell it for?

CHALLENGING EXERCISE

1 A bank pays simple interest at the rate of 5% per year.
   a) How much simple interest will be paid on $700 in 6 years?
   b) After how many years will the simple interest of $400 be $60?

2 A bank pays simple interest at the rate of 6% per annum. Mr Lee deposits $1 000 in the bank.
   a) What is the total amount he can draw out from the bank if he deposits the $1 000 for 15 months?

   b) After how many years will the total amount be $1 300?

3 A housing agent charges a commission of 1 % of the selling price of a house. A house was sold for $600 000.
   a) Calculate the commission that the housing agent received?

   b) The housing agent has to pay his company 10 % of his commission. How much of the commission remained with the agent?

   c) His advertisement and transport charges amounted to $ 1200. What percentage of the commission did the housing agent finally earn?

4 Eriko bought a watch for $48.
   When he sold it he made a profit of 135% of his cost. Find the selling price.