Unit 11

MATHEMATICAL APPLICATIONS IN BUSINESS

Unit Outcomes:

After completing this unit, you should be able to:

- *know common terms related to business.*
- *know basic concepts in business.*
- *apply mathematical principles and theories to practical situations.*

Main Contents:

INTRODUCTION

IN THIS UNIT YOU WILL LEARN THE BASIC MATHEMATICAL CONCEPTS IN BUSINESS A TECHNIQUES OF COMPUTING COMPOUND INTEREST. FURTHERMORE, YOU WILL OBSERVE I WHY MONEY IS SAVED, INVESTED AND BORROWED. AT THE END, THE CONCEPT OF TAX, THI WHY PEOPLE SHOULD PAY TAX AND HOW TO CALCULATE IT ARE DISCUSSED.

THIS UNIT HAS FOUR SECTIONS. THE FIRST SECTION DEALS WITH THE CONCEPT OF RAT PROPORTION, AND PERCENTAGE. HERE YOU WILL SEE HOW THESE CONCEPTS ARE IMPLEM BUSINESS. THE SECOND SECTION DEALS WITH THE COMPUTATION OF COMPOUND INTEREST, ANNUITY, AND DEPRECIATION OF A FIXED ASSET. THE THIRD SECTION DEALS WITH THE CO SAVING, INVESTING, AND BORROWING MONEY. THE FOURTH SECTION DEALS WITH TAXATIO DIFFERENT TYPES OF TAXES COMMONLY IMPLEMENTED IN ETHIOPIA. EACH SECTION DEA SOLVING PROBLEMS THAT ARE ASSOCIATED WITH BUSINESS ACTIVITIES.

OPENING PROBLEM

YILMA OBTAINED A GIFT OF 10,000 BIRR FROM HIS GRANDMOTHER ON HIS FIRST BIRTHDA PARENTS DECIDED TO DEPOSIT HIS MONEY IN THE COMMERCIAL BANK OF ETHIOPIA FO UNIVERSITY EDUCATION. IT IS NOTED THAT THE BANK PAYS AN INTEREST RATE OF 4% COM SEMIANNUALLY. IF YILMA'S PARENTS DEPOSIT THE MONEY ON HIS FIRST BIRTH DATE, HO WILL HE OBTAIN WHEN HE JOINS THE UNIVERSITY AT THE AGE OF 18 YEARS EXACTLY? WH AMOUNT OF INTEREST HIS MONEY HAS EARNED?

11.1 BASIC MATHEMATICAL CONCEPTS IN BUSINESS

THE CONCEPTS OF RATIO, RATE, PROPORTION AND PERCENTAGE ARE WIDELY USED WHE DEAL WITH BUSINESS IN OUR DAILY LIVE ACTIVITIES. HENCE, WE WILL LOOK AT EACH CONCEPTS AND THEIR APPLICATIONS IN THIS SECTION.

A Ratio

CONSIDER THE FOLLOWING TWO QUESTIONS:

QUESTION 1 *How many students are there in your school?*

QUESTION 2 *How many teachers are there in your school?*

COMPARE YOUR ANSWER WITH THE EXPLANATION GIVEN BELOW

SUPPOSE THE NUMBER OF STUDENTS AND TEACHERS IN A GIVEN SCHOOL ARE 3900 AN RESPECTIVELY. FROM THIS WE CAN MAKE THE STATEMENT THAT "THE RATIO OF TEACHERS IN THE SCHOOL IS 1 TO 52" OR WE CAN SAY THAT "THE RATIO OF STUDENTS TO TEACHE

SCHOOL IS 52 TO 1". THIS TELLS US THAT FOR EVERY 52 STUDENTS IN THE SCHOOL CORRESPONDS ONE TEACHER.

ACTIVITY 11.1

OUT OF 60 STUDENTS IN A CLASS 20 ARE BOYS. WHAT IS

A THE RATIO OF BOYS TO GIRLS?

B THE RATIO OF BOYS TO THE STUDENTS IN A CLASS?

A RATIO OF a TO b IS EXPRESSED AS $a:b$, OR $a \div b$ OR $\frac{a}{b}$ FOR $b \neq 0$.

THE NUMBERS APPEARING IN A RATIO ARE CALLED **terms** OF THE RATIO AND THEY MUST BE EXPRESSED IN THE SAME UNIT OF MEASUREMENT.

A RATIO CAN BE EXPRESSED IN ONE OF TWO WAYS:

I PART-TO-WHOLE RATIO OR PART-TO-PART RATIO

II **Definition 11.1**

III A **ratio** IS A COMPARISON OF TWO OR MORE QUANTITIES EXPRESSED IN THE SAME UNIT OF MEASUREMENT.

Example 1 THE FOLLOWING TABLE GIVES THE NUMBER OF TEACHERS IN A SCHOOL ACCORDING TO THEIR EDUCATION LEVEL AND SEX.

	Diploma holders	Degree Holders	Total
Male	26	46	72
Female	16	12	28
Total	42	58	100

A WHAT IS THE RATIO OF FEMALE DIPLOMA HOLDERS TO THE TOTAL NUMBER OF TEACHERS IN THE SCHOOL?

B WHAT IS THE RATIO OF DIPLOMA HOLDERS TO DEGREE HOLDERS?

Solution:

A THE FIRST QUESTION IS ASKING THE PART-TO-WHOLE RATIO, WHICH IS 16:100 OR 4:25.

B THE SECOND QUESTION IS ASKING THE PART-TO-PART RATIO, WHICH IS 42:58 OR 21:29.

Note:

THE VALUE OF A RATIO IS USUALLY EXPRESSED IN ITS LOWEST TERMS.

Example 2 WHAT IS THE RATIO OF 1.6 METERS TO 180 CENTIMETRES?

Solution: TO COMPARE TWO MEASUREMENTS IN DIFFERENT UNITS, YOU MUST CHANGE ONE OF THE UNITS OF MEASUREMENT TO THE OTHER UNIT.

IF YOU CHANGE 1.6 METERS TO CENTIMETRES; WE GET

1 METER = 100 CENTIMETRES, SO 1.6 METER = 160 CMS

THEREFORE, THE RATIO IS $\frac{160\,\text{CMS}}{180\,\text{CMS}} = \frac{8}{9}$ OR 8: 9

SIMILARLY, IF WE CHANGE 180 CENTIMETRES TO THE UNIT OF METERS:

$180\text{CM} = \frac{180\text{CM} \times 1\text{M}}{100\text{CM}} = 1.8\,\text{M}$. THEREFORE, THE RATIO IS $\frac{1.6\,\text{M}}{1.8\,\text{M}} = \frac{16}{18} = \frac{8}{9}$ OR 8: 9.

NOTE THAT, IN BOTH CASES, THE RATIO IS THE SAME (8: 9).

PEOPLE COMMONLY FORM A GROUP AND INVOLVE ON A GIVEN BUSINESS ACTIVITY ACCO
THEIR INDIVIDUAL CONTRIBUTION FOR THE BUSINESS. IN THIS CASE, THEIR INDIVIDUAL
ALLOCATED ACCORDING TO THE RATIO OF THEIR INVESTMENT.

Example 3 ALLOCATE BIRR 1500 IN THE RATIO 2:3:7.

Solution NOTE THAT THE TERMS IN THE RATIO ARE WHOLE NUMBERS, SO FIRST YOU NEED TO DETERMINE THE TOTAL NUMBER OF PARTS TO BE ALLOCATED.

THAT IS 2 + 3 + 7 = 12.

NOW DETERMINE THE VALUE OF EACH SINGLE PART, WHICH IS OBTAINED BY DIVIDI

TOTAL AMOUNT BY THE TOTAL PARTS TO BE ALLOCATED, $\frac{1500}{12}$ = BIRR 125 PER PART.

TO ALLOCATE, MULTIPLY EACH TERM OF THE RATIO BY THE VALUE OF THE SINGLE PAR
$2 \times 125 = 250$, $3 \times 125 = 375$, AND $7 \times 125 = 875$.

THEREFORE, THE ALLOCATION WILL BE BIRR 250, BIRR 375, AND BIRR 875, RESPECTIVEL

Example 4 ALLOCATE BIRR 800 AMONG THREE WORKERS IN THE RATIO OR $\frac{2}{3} : \frac{1}{4} : \frac{1}{2}$.

Solution IF THE TERMS OF THE RATIO ARE FRACTIONS, THEY MUST BE CONVERTED TO EQUIVALENT FRACTIONS WITH THE SAME DENOMINATOR AND THE AMOUNT IS T ALLOCATED IN THE RATIO OF THE NUMERATORS. SO THAT

$$\frac{2}{3} : \frac{1}{4} : \frac{1}{2} = \frac{8}{12} : \frac{3}{12} : \frac{6}{12}$$

DETERMINE THE TOTAL NUMBER OF PARTS BY ADDING THE NUMERATORS: 8 + 3 + 6 = 17

THEN THE VALUE OF A SINGLE PART IS BIRR $\frac{800}{17}$.

THEN ALLOCATE ACCORDING TO THE RATIO OF THE NUMERATORS TO EACH:

$8\times\frac{800}{17}$ = BIRR 376.47, $3\times\frac{800}{17}$ = BIRR 141.18 AND $6\times\frac{800}{17}$ = BIRR 282.35.

THEREFORE, THE ALLOCATION WILL BE BIRR, 376.47 BIRR, 141.18 AND BIRR, 282.35 RESPECTIVELY.

Exercise 11.1

1. A PROFIT OF BIRR 19,560 IS TO BE DIVIDED BETWEEN FOUR PARTNERS IN THE RATIO OF 3:2:1:6. HOW MUCH SHOULD EACH RECEIVE?
2. A SUM OF MONEY WAS DIVIDED BETWEEN ASTER, ALI, AND MESFIN IN THE RATIO OF $\frac{2}{5}:\frac{4}{3}:2$, RESPECTIVELY. ASTER HAS RECEIVED BIRR 3504. HOW MUCH MONEY WAS THERE TO START WITH?

B Rates

IN CONSTRUCTION ACTIVITY ONE HAS TO KNOW THE RATIO AT WHICH THE AMOUNT OF CEMENT, SAND AND GRAVEL ARE MIXED TO FORM THE APPROPRIATE MIXTURE REQUIRED FOR SPECIFIED PU EXAMPLE, TO MAKE A BEAM OR A COLUMN OF RESIDENTIAL BUILDING, CEMENT, SAND AN ARE MIXED IN THE RATIO 1:2:3, RESPECTIVELY. IN THIS CASE CEMENT IS MEASURED IN QU WHILE SAND AND GRAVEL ARE MEASURED USING $0.4\times0.2\times0.4$ CUBIC METER BOX. HENCE THE RATIO INVOLVES DIFFERENT UNITS OF MEASUREMENT AND THIS WILL LEAD US TO THE DEFINITIONS.

Definition 11.2

A **rate** IS A COMPARISON OF TWO OR MORE QUANTITIES EXPRESSED IN DIFFERENT UNITS OF MEASUREMENT.

THERE ARE A NUMBER OF SITUATIONS WHERE ONE WISHES TO COMPARE "UNLIKE QUANTIT AS THE RATIO OF KILOMETRES TRAVELLED PER LITTER OF GASOLINE, THE AMOUNT OF PROD PER HOUR IN A GIVEN FACTORY, AND SO ON.

✍ Note:

A RATIO CAN BE A RATE.

Example 5 THE DISTANCE FROM ADDIS ABABA TO ADAMA IS 100 KM. MESFIN TRAVELLED BY MINIBUS FROM ADDIS ABABA TO ADAMA EARLY IN THE MORNING AND IT TO HIM 1 HOUR AND 20 MINUTES. WHAT IS THE RATE OF SPEED OF HIS JOURNEY?

Solution THE RATE OF SPEED OF HIS JOURNEY IS THE RATIO OF THE DISTANCE TRAVELLED AND THE TIME IT TOOK. SINCE THE DISTANCE IS 100 KM AND THE TIME TAKEN IS $\frac{4}{3}$ HOURS, THE RATE IS:

$$100 \text{ KMS} : \frac{4}{3} \text{ HRS} = \frac{100 \text{ KMS}}{\frac{4}{3} \text{ HRS}} = \frac{300}{4} \text{ KMS PER HR} = 75 \text{ KMS PER HR}$$

Example 6 FIVE TYRE-REPAIRERS ARE WORKING IN A GROUP AND FIXED 210 TYRES IN A GIVEN DAY OF THE WEEK. WHAT IS THE RATE OF TYRES FIXED PER PERSON?

Solution TOTAL NUMBER OF TYRES FIXED IS 210 AND THE NUMBER OF WORKERS INVOLVED IS 5. HENCE, THE RATE PER PERSON WILL BE THE RATIO OF THE NUMBER OF TYRES TO THE NUMBER OF WORKERS INVOLVED, I.E.,

$$210 : 5 = \frac{210}{5} = 42 \text{ TYRES PER PERSON.}$$

IN DEALING WITH BUSINESS, PRODUCTION, POPULATION, AND SO ON, IT IS COMMON TO DESC WHAT AMOUNT A QUANTITY HAS INCREASED OR DECREASED BASED ON SOME STARTING LEVEL. THIS WILL LEAD US TO THE RATE OF CHANGE OF A GIVEN QUANTITY GIVEN BY THE R

$$\text{RATE OF CHANGE} = \frac{\text{AMOUNT OF CHANGE}}{\text{ORIGINAL AMOUNT}} = \frac{\text{FINAL AMOUNT} - \text{ORIGINAL AMOUNT}}{\text{ORIGINAL AMOUNT}}$$

THE RATE OF CHANGE WILL BE A RATE OF INCREASE IF THE AMOUNT OF CHANGE IS POSIT RATE OF DECREASE IF THE AMOUNT OF CHANGE IS NEGATIVE.

Example 7 THE PRICE OF A QUINTAL OF CEMENT IN ADDIS ABABA IN SEPTEMBER 2008 WAS BIRR 220, AND TEN MONTHS LATER, ON JULY 2009, ITS PRICE WAS BIRR 370. WHAT IS THE RATE OF INCREASE IN THE PRICE OF ONE QUINTAL OF CEMENT FROM SEPTEMBER 2008 TO JULY 2009?

Solution WE ARE GIVEN THAT: THE ORIGINAL PRICE = BIRR 220 AND THE NEW PRICE = BIRR 370. HENCE CHANGE IN PRICE = BIRR 370 – BIRR 220 = BIRR 150

$$\text{RATE OF INCREASE} = \frac{\text{AMOUNT OF INCREASE}}{\text{ORIGINAL AMOUNT}} = \frac{150}{220} = 0.682$$

Example 8 ASTER HAS INVESTED 20,000 BIRR IN A FRUIT FARM. AFTER A YEAR THE AUDIT REPORT ON THE BUSINESS INDICATED THAT THERE WAS 16,200 BIRR AS A BALAN FIND THE RATE OF DECREASE THAT RESULTED IN ONE YEAR.

Solution SINCE THE BALANCE INDICATED THAT THERE IS A DECREASE FROM THE AMOUNT OF CAPITAL INVESTED, WE HAVE A DECREASE RATE.

$$\text{RATE OF DECREASE} = \frac{\text{AMOUNT OF DECREASE}}{\text{ORIGINAL INVESTMENT}} = \frac{-16,200}{20,000} = -0.19$$

THE NEGATIVE SIGN INDICATES THAT THERE IS A DECREASE IN THE INVESTMENT WHICH IS A

Exercise 11.2

1 A CARPENTER'S DAILY PRODUCTION OF SCHOOL CHAIRS INCREASED FROM 20 UNITS TO 40 UNITS. AT THE SAME TIME HIS INCOME (OR REVENUE) INCREASED FROM 1600 BIRR TO 2 BIRR. WHAT IS THE RATE OF CHANGE OF INCOME PER UNIT?

2 A STEEL COMPANY HAS IMPORTED 35 TONS OF RAW MATERIAL FROM AMERICA IN 1995. IN 2008 THE COMPANY IMPORTED 54 TONS OF RAW MATERIAL FROM THE SAME COUN WHAT IS THE RATE OF CHANGE OF AMOUNT IMPORTED?

C Proportion

ACTIVITY 11.2

A COMBINE HARVESTER MACHINE CAN HARVEST THREE HEC WHEAT FIELD IN ONE HOUR AT A RATE OF 150 BIRR PER HOUR. IF A FA S 16.5 HECTARES OF WHEAT FIELD HOW MUCH DOES HE PAY TO HARVEST HIS WHEAT?

Definition 11.3

A **proportion** IS A STATEMENT OF EQUALITY BETWEEN TWO RATIOS.

FOR $a, b, c, d \in \mathbb{R}$, WITH $b \neq 0$ AND $d \neq 0$, ONE WAY OF DENOTING A PROPORTION IS $a:b = c:d$, WHICH IS READ AS "a IS TO b" AS "c IS TO d". OF COURSE, BY DEFINITION, $\frac{a}{b} = \frac{c}{d}$, WHICH MEANS THAT A PROPORTION IS AN EQUATION BETWEEN TWO RATIOS.

IN THE PROPORTION $a:b = c:d$, WITH $b \neq 0$ AND $d \neq 0$, THE FOUR NUMBERS ARE REFERRED AS THE **terms** OF THE PROPORTIONS. THE FIRST AND THE LAST TERMS, a AND d ARE CALLED THE **extremes**; THE SECOND AND THIRD TERMS, b AND c ARE CALLED THE **means**. IN THE PROPORTION $a:b = c:d$, THE PRODUCT OF THE EXTREMES IS EQUAL TO THE PRODUCT OF THE MEANS; THA

$\frac{a}{b} = \frac{c}{d}$ IS EQUIVALENTLY REPRESENTED AS $ad = bc$

FOR THREE QUANTITIES a, b AND c SUCH THAT $\frac{a}{b} = \frac{b}{c}$, WHICH IS EQUIVALENT TO $b^2 = ac$, b IS CALLED THE **mean proportional** BETWEEN a AND c.

Example 9 ON A RESIDENCE PLAN OF ATO ADMASU, 1 CM REPRESENTS 50 CMS ON THE GROUND. FIND THE DISTANCE ON THE GROUND FOR THE DISTANCE REPRESENTED BY 3.20 CMS ON THE PLAN.

Solution ON THE MAP WE HAVE THE RATIO x 1 BE THE DISTANCE ON THE GROUND. THEN THE DISTANCE REPRESENTED BY 3.20 CMS ON THE PLAN CAN BE FOUND BY PROPORTION $\frac{3.20}{x} = \frac{1}{150}$.

HENCE $x = \frac{150\,\text{CM} \times 3.20\,\text{CM}}{1\,\text{CM}} = 480$ CMS ON THE GROUND.

Example 10 A SECRETARIAL POOL (15 SECRETARIES IN ALL) FOR A CORPORATE COMPLEX HAS ACCESS TO 11 TELEPHONES. IF ON A DIFFERENT FLOOR, THERE ARE 23 SECRETARIES, APPROXIMATELY WHAT NUMBER OF TELEPHONES SHOULD BE AVAILABLE?

Solution LET x BE THE NUMBER OF TELEPHONES AVAILABLE ON THE OTHER FLOOR. THEN WE HAVE THE PROPORTION 15 TO 11 AS x TO 23 IS, $\frac{15}{11} = \frac{23}{x}$.

HENCE $x = \frac{11 \times 23}{15} = 16.87$. THEREFORE, 17 TELEPHONES ARE REQUIRED.

Compound proportion

FROM THE ABOVE DISCUSSION YOU HAVE SEEN HOW A VARIABLE QUANTITY DEPENDS ON A CHANGE IN ANOTHER VARIABLE QUANTITY (I.E., SIMPLE PROPORTION). HOWEVER, THE A VARIABLE QUANTITY MOST OFTEN DEPENDS ON THE VALUE OF TWO OR MORE OTHER QUANTITIES. FOR EXAMPLE,

- ✓ THE COST OF SHEET METAL DEPENDS ON THE AREA, THICKNESS OF THE SHEET, AND THE COST PER UNIT AREA OF THE METAL.
- ✓ THE AMOUNT OF INTEREST OBTAINED DEPENDS ON THE AMOUNT DEPOSITED IN A BANK, LENGTH OF TIME IT IS DEPOSITED, AND RATE OF INTEREST PER YEAR.
- ✓ THE AMOUNT OF PRODUCT PRODUCED DEPENDS ON THE TIME AND LABOUR HOUR UNITS USED.

Definition 11.4

A **compound proportion** IS A SITUATION IN WHICH ONE VARIABLE QUANTITY DEPENDS ON TWO OR MORE OTHER VARIABLE QUANTITIES. SPECIFICALLY, IF A VARIABLE QUANTITY y IS PROPORTIONAL TO THE PRODUCT OF TWO OR MORE VARIABLE QUANTITIES, WE SAY THAT y IS **jointly proportional** TO THESE VARIABLE QUANTITIES, OR JOINTLY AS THESE VARIABLES.

IF z IS JOINTLY PROPORTIONAL TO x AND y (OR z IS PROPORTIONAL TO xy), THEN IN SHORT WE WRITE IT AS $z \propto xy$. ITS EQUIVALENT REPRESENTATION IN TERMS OF AN EQUATION IS $z = kxy$, WHERE k IS A CONSTANT OF PROPORTIONALITY.

NOTE THAT IN A COMPOUND PROPORTION, A PROPORTION COMBINATION OF DIRECT AND/OR INVERSE VARIATION MAY OCCUR. IF z IS DIRECTLY PROPORTIONAL TO x AND INVERSELY PROPORTIONAL TO y, THEN WE CAN WRITE IT AS $z \propto \frac{x}{y}$ OR EQUIVALENTLY, $z = k\frac{x}{y}$, WHERE k IS A CONSTANT OF PROPORTIONALITY.

Example 11 IF z IS PROPORTIONAL TO THE SQUARE OF x AND $z = 80$ WHEN $x = 2$ AND $y = 5$, THEN FIND THE EQUATION THAT RELATES THE THREE VARIABLES x, y AND z.

Solution WE ARE GIVEN THAT $z \propto yx^2$ WHICH IS EQUIVALENT TO $z = kyx^2$, WHERE k IS A CONSTANT OF PROPORTIONALITY

TO DETERMINE THE CONSTANT OF PROPORTIONALITY, PUT THE GIVEN VALUES OF THE V

$$80 = k(5)(2^2) = 20k.$$

HENCE $k = 4$. THEREFORE THE EQUATION THAT RELATES THE THREE VARIABLES IS $z = 4yx^2$.

Example 12 THE POWER (P) OF AN ELECTRIC CURRENT VARIES JOINTLY AS THE RESISTANCE (R) AND THE SQUARE OF THE CURRENT (I). IF IT IS GIVEN THAT THE POWER IS 12 WATTS WHEN THE CURRENT IS 0.5 AMPERES AND THE RESISTANCE IS 40 OHMS, FIND THE POWER WHEN THE CURRENT IS 2 AMPERES AND THE RESISTANCE IS 20 OHMS.

Solution $P \propto RI^2$, THAT IS, $P = kRI^2$, WHERE k IS A CONSTANT OF PROPORTIONALITY.

PUTTING THE GIVEN VALUES IN THE EQUATION AND SOLVING FOR k, WE HAVE

$$12 = k(40)(0.5)^2 \Rightarrow k = \frac{12}{(40)(0.5)^2} = 1.2.$$

HENCE THE RELATIONSHIP BETWEEN THE THREE VARIABLES IS $P = 1.2RI^2$. THE REQUIRED POWER IS

$$P = 1.2(20)(2)^2 = 96 \text{ WATTS}.$$

D Percentage

ACTIVITY 11.3

IN A CLASS OF 60 STUDENTS 5 OF THEM WERE ABSENT IN A C

WHAT PERCENT OF THE CLASS WAS ABSENT?

Definition 11.5

A **percentage** IS THE NUMERATOR OF A FRACTION WHOSE DENOMINATOR IS 100. THE WORD PERCENT IS DENOTED BY % WHICH MEANS "PER ONE HUNDRED".

Example 13 EXPRESS EACH OF THE FOLLOWING FRACTIONS AS PERCENTAGES.

A $\frac{4}{5}$ **B** $\frac{5}{200}$ **C** $\frac{61}{50}$

Solution FIRST EXPRESS THE GIVEN FRACTIONS AS DECIMAL NUMBERS BY MULTIPLYING BY 100%.

A YOU KNOW THAT $\frac{4}{5} = 0.8$. HENCE $\frac{4}{5} = 0.8 \times 100\% = 80\%$.

B $\frac{5}{200} = 0.025$. HENCE $\frac{5}{200} = 0.025 \times 100\% = 2.5\%$.

C IF YOU DIVIDE 61 BY 50 YOU WILL HAVE 1.22,

HENCE $\frac{61}{50} = 1.22 \times 100\% = 122\%$.

WHEN PERCENTAGES ARE INVOLVED IN COMPUTATIONS, THE CORRESPONDING DE REPRESENTATION IS USUALLY USED. PERCENTAGE IS OBTAINED BY MULTIPLYING A NUMB THE **base** BY THE **percent**, CALLED THE **rate**.

PERCENTAGE = BASE × RATE

CONSIDER THE FOLLOWING EXAMPLES TO HAVE BETTER UNDERSTANDING OF PERCENTAGE CAN BE APPLIED TO SOLVE PRACTICAL PROBLEMS.

Example 14

A FIND 3% OF BIRR 57? **B** FIND $3\frac{1}{2}\%$ OF BIRR 900?

Solution

A TO FIND 3% OF BIRR 57, THE BASE IS 57 AND THE RATE IS 3% = 0.03, THEN

PERCENTAGE = BASE × RATE $= 57 \times \frac{3}{100} = \frac{171}{100} =$ BIRR 1.71

B TO FIND $3\frac{1}{2}\%$ OF BIRR 900, THE BASE IS BIRR 900 AND THE RATE IS

$3\frac{1}{2}\% = 3.5\% = 0.035$.

THEN PERCENTAGE = BASE × RATE = 9000 × 0.035 = BIRR 31.50.

Example 15

A WHAT IS THE TOTAL AMOUNT WHOSE 15% IS 120?

B BIRR 62.50 IS WHAT PERCENT OF BIRR 25,000?

Solution

A HERE WE ARE LOOKING FOR THE TOTAL AMOUNT, WHICH IS 120 AND THE RATE IS 0.15. THEREFORE,

$$\text{BASE} = \frac{\text{PERCENTAGE}}{\text{RATE}} = \frac{120}{0.15} = 120 \times \frac{100}{15} = 800 \text{ UNITS.}$$

B HERE THE BASE IS BIRR 25, 000 AND THE PERCENTAGE IS BIRR 62.50.

HENCE THE RATE IS

$$\text{RATE} = \frac{\text{PERCENTAGE}}{\text{BASE}} = \frac{62.50}{25{,}000} = 0.0025 = \frac{1}{4}\%.$$

Example 16 IF THE VALUE ADDED TAX (VAT) ON SALES IS 15%, FIND A SALE OF REFRIGERATOR THAT COSTS BIRR 3,800. WHAT IS THE TOTAL COST OF THE REFRIGERATOR?

Solution THE RATE IS 0.15 AND THE BASE IS BIRR 3,800, THE PERCENTAGE WOULD BE

PERCENTAGE = BASE × RATE = 3,800 × 0.15 = BIRR 570.

THE VAT ON THE REFRIGERATOR IS BIRR 570.

THE TOTAL COST OF THE REFRIGERATOR = COST + VAT

= BIRR 3,800 + BIRR 570

= BIRR 4,370.

Commercial Discount

IN BUSINESS ACTIVITIES, IT IS COMMON TO SEE DISCOUNTS DUE TO CLEARANCE OF AVAILABLE STOCK, CHANGING THE BUSINESS ACTIVITY, APPROACHING EXPIRY DATE, AND SUCH CASES THE DISCOUNT OF AN ITEM IS DESCRIBED IN TERMS OF PERCENTAGE. FOR EXAM MAY HAVE 20% DISCOUNT, 30% DISCOUNT, AND SO ON.

IF p IS THE ORIGINAL PRICE OF AN ITEM AND r IS THE PERCENTAGE OF DISCOUNT, THEN THE AMOUNT OF DISCOUNT IS GIVEN BY:

$$\text{DISCOUNT} = r.p$$

THEREFORE, THE SALES PRICE WILL BE GIVEN BY:

$$\text{DISCOUNT SALES PRICE} = \text{ORIGINAL PRICE} - \text{DISCOUNT} = p - r.p = p\,(1 - r)$$

Example 17 A WOOL SUIT, DISCOUNTED BY 30% FOR A CLEARANCE SALE, HAS A PRICE TAG OF BIRR 399. WHAT WAS THE SUIT'S ORIGINAL PRICE? WHAT IS THE AMOUNT OF DISCOUNT

Solution LET p BE THE ORIGINAL PRICE OF THE SUIT. THE AMOUNT OF DISCOUNT IS $0.30p$. HENCE

$$\text{SALES PRICE} = p - 0.30p = 0.70p \Rightarrow 399 = 0.70\,p \Rightarrow p = \frac{399}{0.70} = Birr\ 570$$

THEREFORE, THE ORIGINAL PRICE p = BIRR 570 AND THE AMOUNT OF DISCOUNT IS 570 – 399 = BIRR 171.

Exercise 11.3

1. FROM 250 CANDIDATES WHO SAT FOR A WRITTEN EXAMINATION FOR A JOB, 45 OF THEM SCORED ABOVE 85%. THE PERSONNEL DIVISION SUGGESTED THAT THOSE CANDIDATES HAVE SCORED ABOVE 85% IN THE WRITTEN EXAMINATION COULD SIT FOR INTERVIEW. WHAT PERCENT OF THE CANDIDATES DID NOT HAVE A CHANCE FOR INTERVIEW?
2. A CAR DEALER, AT A YEAR-END CLEARANCE SALE, REDUCES THE PRICE OF LAST YEAR'S MODELS BY A CERTAIN AMOUNT. IF A CERTAIN FOUR-DOOR MODEL HAS BEEN SOLD AT A DISCOUNTED PRICE OF BIRR 51,000, WITH A DISCOUNT OF BIRR 9,000, WHAT IS THE PERCENTAGE OF DISCOUNT?

Markup

IN ORDER TO MAKE A PROFIT, ANY INSTITUTION OR COMPANY MUST SELL ITS PRODUCTS FOR MORE THAN THE PRODUCT COSTS THE COMPANY TO MAKE OR BUY. THE DIFFERENCE BETWEEN A SELLING PRICE AND ITS COST IS CALLED **markup**.

$$\text{MARKUP} = \text{SELLING PRICE} - \text{COST PRICE}$$

Example 18 IF THE PRICE OF CEMENT IS BIRR 250 PER QUINTAL AND THE SELLING PRICE IS BIRR 330 PER QUINTAL, FIND THE MARKUP PER QUINTAL.

Solution MARKUP = SELLING PRICE – COST

= BIRR 330 PER QUINTAL – BIRR 250 PER QUINTAL = BIRR 80 PER QUINTAL

MARKUP IS USUALLY EXPRESSED IN TERMS OF PERCENTAGE WITH RESPECT TO SELLING PRICE AND COST. MARKUP WITH RESPECT TO SELLING PRICE IS GIVEN BY;

$$\text{MARKUP PERCENT} = \frac{\text{MARKUP}}{\text{SELLING PRICE}} \times 100\%$$

SIMILARLY MARKUP WITH RESPECT TO COST IS GIVEN BY:

$$\text{MARKUP PERCENT} = \frac{\text{MARKUP}}{\text{COST}} \times$$

Example 19 IF YOU BUY A GOLD RING FOR 498 BIRR AND SELL IT FOR 750 BIRR, FIND THE MARKUP PERCENT

A WITH RESPECT TO SELLING PRICE. **B** WITH RESPECT TO COST.

Solution: MARKUP = SELLING PRICE – COST PRICE = BIRR 750 – BIRR 498 = BIRR 252.

A THE MARKUP PERCENT WITH RESPECT TO THE SELLING PRICE IS:

$$\text{MARKUP PERCENT} = \frac{\text{MARKUP}}{\text{SELLING PRICE}} \times 100\% = \frac{252}{750} \times 100\% = 33.6\%.$$

B THE MARKUP PERCENT WITH RESPECT TO THE COST IS:

$$\text{MARKUP PERCENT} = \frac{\text{MARKUP}}{\text{COST PRICE}} \times 100\% = \frac{252}{498} \times 100\% = 50.6\%.$$

Example 20 A MERCHANT WANTS TO SELL A SEMI-AUTOMATIC WASHING MACHINE AT BIRR 3,000.35 BIRR WITH 15% MARKUP ON ITS COST. WHAT IS ITS COST FOR THE MERCHANT?

Solution GIVEN SELLING PRICE = BIRR 3,000.35 AND MARKUP PERCENT = 15%. TO FIND, YOU NEED TO FIND COST. BUT FROM THE RELATION

$$\text{MARKUP PERCENT} = \frac{\text{MARKUP}}{\text{COST}} \times 100\%, \text{ WE HAVE,}$$

$$\text{MARKUP PERCENT} = \frac{\text{SELLING PRICE} - \text{COST}}{\text{COST}} \times 100\%.$$

GIVNG MARKUP PERCENT = COST (SELLING PRICE) (HENCE 100%=1)

(MARKUP PERCENT) × COST = SELLING PRICE.

$$\text{HENCE, COST} = \frac{\text{SELLING PRICE}}{\text{MARKUP PERCENT} + 1} = \frac{3,000.35}{0.15 + 1} = \text{BIRR } 2,60$$

Example 21 A BOUTIQUE BUYS A T-SHIRT FOR BIRR 54.25 AND WANTS 30% MARKUP ON RETAIL. WHAT IS THE SELLING PRICE?

Solution GIVEN COST = BIRR 54.25. MARKUP PERCENT IS 30% ON SELLING PRICE. THEN WE NEED TO FIND SELLING PRICE.

COST = SELLING PRICE – MARKUP = 100% – 30% = 70 % OF SELLING PRICE.

THIS IS CALLED THE COMPLEMENT OF MARKUP PERCENT ON SELLING PRICE.

HENCE, THE SELLING PRICE WILL BE:

COST = 0.70 × SELLING PRICE = 54.25 BIRR = 0.70 × SELLING PRICE

$$\Rightarrow \text{SELLING PRICE} = \frac{54.25}{0.70} = \text{BIRR.}$$

IN BUSINESS, IT IS OFTEN NECESSARY TO MAKE CONVERSION BETWEEN PERCENT MARKUPS COST AND SELLING PRICE. TO CONVERT MARKUP PERCENT BASED ON COST TO MARKUP BASED ON SELLING PRICE, USE THE FOLLOWING RELATION:

$$\text{MARKUP PERCENT ON SELLING PRICE} = \frac{\text{MARKUP PERCENT ON COST}}{\text{SELLING PRICE (AS PERCENT OF COST)}} \times 100\%$$

$$= \frac{\text{MARKUP PERCENT ON COST}}{100\% + \text{MARKUP PERCENT ON COST}} \times 100\%$$

SIMILARLY, TO CONVERT MARKUP PERCENT BASED ON SELLING PRICE TO MARKUP PERCENT COST, USE THE RELATION:

$$\text{MARKUP PERCENT ON COST} = \frac{\text{MARKUP PERCENT ON SELLING PRICE}}{\text{COST (AS PERCENT OF SELLING PRICE)}} \times 100\%$$

$$= \frac{\text{MARKUP PERCENT ON COST}}{100\% - \text{MARKUP PERCENT ON SELLING PRICE}} \times 100\%$$

Example22 WHAT IS THE PERCENT MARKUP ON SELLING PRICE IF THE PERCENT MARKUP ON COST IS 25%?

Solution SINCE WE ARE GIVEN THE MARKUP ON COST, WE USE THE RE

$$\text{MARKUP PERCENT ON SELLING PRICE} = \frac{\text{MARKUP PERCENT ON COST}}{\text{SELLING PRICE (AS PERCENT OF COST)}} \times 100\%$$

$$= \frac{\text{MARKUP PERCENT ON COST}}{100\% + \text{MARKUP PERCENT ON COST}} \times 100\%$$

$$= \frac{25\%}{100\% + 25\%} \times 100\% = 20\%$$

Exercise 11.4

1. A PAIR OF SHOES COSTS BIRR 110 AND SELLS FOR BIRR 165. FIND THE MARKUP AND THE MARKUP PERCENT BASED ON THE RETAIL (SELLING PRICE).
2. WHAT IS THE PERCENT MARKUP ON COST, IF THE MARKUP IS 37%?
3. IF W/RO CHALTU PURCHASED A GALLON OF OIL AT BIRR 25 AND SOLD IT FOR BIRR 288, FIND
   - **A** MARKUP
   - **B** MARKUP PERCENT WITH RESPECT TO
4. ATO DECHASSA WANTS TO SELL HIS OX AT A 30% MARKUP ON HIS COST. IF THE MARKUP IS BIRR 3,000, FIND THE COST OF THE OX.
5. MARTHA BOUGHT A SHOE FOR BIRR 280 AND WANTS TO SELL IT WITH A 24% MARKUP. FIND
   - **A** MARKUP
   - **B** SELLING PRICE OF THE SHOE
6. ABEBE SOLD A QUINTAL OF TEFF AT BIRR 1,650 WITH A 45% MARKUP ON SELLING PRICE. FIND THE COST.
7. FIND THE PERCENT MARKUP ON COST, IF MARKUP PRICE IS 30%.

11.2 COMPOUND INTEREST AND DEPRECIATION

ACTIVITY 11.4

SUPPOSE YOU DEPOSIT BIRR 100 IN A BANK.

THE BANK CALCULATES INTEREST FOR YOU AT A RATE OF 4% PER YEAR COMPOUNDED ANNUALLY. WHAT IS YOUR AMOUNT OF MONEY AT THE END OF 2 YEARS?

Simple Interest

WHEN MONEY IS BORROWED, OR YOU DEPOSIT MONEY IN AN ACCOUNT, A FEE IS PAID FOR THE USE OF THE MONEY. A FEE PAID FOR THE USE OF MONEY IS CALLED **interest**. FROM THE INVESTMENT POINT OF VIEW, INTEREST IS INCOME FROM INVESTED CAPITAL. THE CAPITAL ORIGINALLY IS CALLED THE **principal (or present value)**. THE SUM OF THE PRINCIPAL AND INTEREST DUE (OR PAID) IS CALLED THE **amount (or future value or accumulated value)**.

FOR SIMPLE INTEREST, THE INTEREST IS COMPUTED ON THE ORIGINAL PRINCIPAL DURING THE TIME, OR TERM OF THE LOAN; AT THE STATED ANNUAL RATE OF INTEREST. THE COMPUTATION OF INTEREST IS BASED ON THE FOLLOWING FORMULA:

Simple interest: $I = Prt$

WHERE I IS THE SIMPLE INTEREST, P IS THE PRINCIPAL, r IS THE INTEREST RATE PER YEAR OR ANNUAL INTEREST RATE, AND t IS THE TIME IN YEARS.

Note:

THE TIME PERIOD t AND r MUST BE CONSISTENT WITH EACH OTHER. IF r IS EXPRESSED AS PERCENTAGE PER YEAR, THEN t SHOULD BE EXPRESSED IN NUMBER OF YEARS.

IN GENERAL, IF A PRINCIPAL P IS BORROWED AT A SIMPLE INTEREST RATE r FOR t YEARS, THEN THE BORROWER WILL PAY BACK THE LENDER AN AMOUNT A EQUAL TO THE PRINCIPAL PLUS THE AMOUNT OF INTEREST I.

$$A = P + I = P + Prt = P(1 + rt)$$

THEREFORE, TO COMPUTE THE FUTURE VALUE OF A SIMPLE INTEREST, WE USE THE FORMULA

The future value of a simple interest:

$$A = P(1 + rt)$$

WHERE A IS THE FUTURE VALUE, P IS THE PRINCIPAL, r IS THE SIMPLE INTEREST RATE PER YEAR, AND t IS THE TIME IN YEARS.

Example 1 IF BIRR 2,500 IS INVESTED WITH A SIMPLE INTEREST RATE OF 2% PER MONTH, FIND THE AMOUNT OF THE INTEREST AND FUTURE VALUE AT THE END OF THE FOURTH

Solution IN THIS EXAMPLE YOU HAVE THE PRINCIPAL BIRR 2,500, THE INTEREST RATE PER MONTH $r = 0.02$, AND THE TIME $t = 4$ MONTHS.

$I = Prt$ WHERE r IS THE INTEREST RATE PER PERIODS THAT IS PER MONTH.

$I = Prt = 2500 \times 0.02 \times 4 =$ BIRR 200.

THE VALUE OF THE INVESTMENT AFTER FOUR MONTHS IS

$A = P + I = 2{,}500 + 200 =$ BIRR 2,700.

Example 2 ZENEBECH WANTS TO BUY AN ELECTRIC STOVE PRICED AT BIRR 2,500 AND AGREED TO PAY BIRR 700 INITIALLY AND THE REMAINING AMOUNT TO BE EQUALLY PAID MO ON SIMPLE INTEREST RATE OF 13% PER YEAR IN 9 MONTHS (I.E. THE REMAININ AMOUNT PLUS ITS INTEREST). WHAT IS THE MONTHLY PAYMENT SHE HAS TO DO?

Solution THE AMOUNT OF LOAN = BIRR 2,500 – BIRR 700 = BIRR

HENCE, THE PRINCIPAL WILL BE 1,800 BIRR,

INTEREST RATE $r = 0.13$, TIME $t = \frac{9}{12}$ YEARS AND

THE NUMBER OF TIMES PAYMENT IS MADE IS $n = mt = 12 \times \frac{9}{12} = 9$ TIMES,

WHERE m IS THE NUMBER OF TIMES PAYMENT IS MADE PER YEAR.

THEREFORE, THE PERIODIC PAYMENT IS

$$\text{PERIODIC PAYMENT} = \frac{P+I}{n} = \frac{P(1+rt)}{mt} = \frac{1800\left[1+0.13\left(\frac{9}{12}\right)\right]}{12\times\frac{9}{12}}$$

$$= \frac{1975.5}{9} = \text{BIRR } 219.5$$

11.2.1 Compound Interest

IF AT THE END OF A PAYMENT PERIOD THE INTEREST DUE IS REINVESTED AT THE SAME INTEREST AS WELL AS THE ORIGINAL PRINCIPAL WILL EARN INTEREST DURING THE NE PERIOD. INTEREST PAID ON INTEREST REINVESTED IS CALLED **compound interest**.

IF P IS THE PRINCIPAL EARNING INTEREST COMPOUNDED ANNUALLY AT A YEARLY RATE OF r FOR t YEARS, THEN THE AMOUNT AT THE END OF ONE YEAR CAN BE CALCULATED FROM THE SIM RELATION

$$A = P(1+rt)$$

THE AMOUNT AT THE END OF THE FIRST YEAR (A_1 FOR $n = 1$) IS

$$A_1 = P(1+r)$$

SINCE THE AMOUNT AT THE END OF THE FIRST YEAR WILL SERVE AS PRINCIPAL FOR THE SE
AT THE END OF THE SECOND YEAR (A_2 FOR $n = 2$) THE AMOUNT

$$A_2 = A_1(1+r) = P(1+r)(1+r) = P(1+r)^2.$$

SINCE THE AMOUNT AT THE END OF SECOND YEAR WILL SERVE AS PRINCIPAL FOR THE THI
THE END OF THE THIRD YEAR (A_3 FOR $n = 3$) THE AMOUNT

$$A_3 = A_2(1+r) = P(1+r)^2(1+r) = P(1+r)^3.$$

SIMILARLY, SINCE THE AMOUNT AT THE END OF THE THIRD YEAR WILL SERVE AS PRINCIP
FOURTH YEAR, AT THE END OF THE FOURTH YEAR (A_4 FOR $n = 4$) THE AMOUNT;

$$A_4 = A_3(1 + r) = P(1 + r)^3 (1 + r) = P(1 + r)^4$$

CONTINUING THIS PROCESS, WE SEE THAT THE AMOUNT AT THE END OF THE n^{th} YEAR WILL BE

$$A_n = A_{n-1}(1+r) = P(1+r)^{n-1}(1+r) = P(1+r)^n$$

THEREFORE, THE TOTAL AMOUNT AFTER n YEARS WILL BE GIVEN BY

$$A = P(1+r)^n \cdots\cdots\cdots (*)$$

INTEREST IS USUALLY COMPOUNDED MORE THAN ONCE A YEAR. THE QUOTED RATE OF IN
YEAR IS CALLED **annual** OR **nominal rate** AND THE INTERVAL OF TIME BETWEEN SUCCESSIVE
INTEREST CALCULATIONS IS CALLED **conversion period** OR **compound period**.

Example 3 FIND THE AMOUNT OF INTEREST ON A DEPOSIT OF BIRR 1,000 IN AN ACCOUNT
COMPOUNDED ANNUALLY WITH ANNUAL INTEREST RATE OF 6% FOR 5 YEARS.

Solution WE ARE GIVEN P = BIRR 1,000, $r = 0.06$, $t = 5$ YEARS AND WE NEED TO FIND THE
FUTURE VALUE AND THEN THE AMOUNT OF INTEREST.

$A = P(1 + r)^n = 1{,}000(1.06)^5$ = BIRR 1,338.23.

HENCE THE AMOUNT OF THE COMPOUND INTEREST OF THE DEPOSIT IS

$I = A – P$ = 1,338.23 – 1,000.00 = BIRR 3,38.23.

IF INTEREST AT AN ANNUAL RATE r IS COMPOUNDED m TIMES A YEAR ON A PRINCIPAL P,
THEN THE SIMPLE INTEREST RATE PER CONVERSION PERIOD IS

$$i = \frac{\text{annual interest rate}}{\text{number of periods per year}} = \frac{r}{m}$$

SINCE r IS THE ANNUAL INTEREST RATE AND THE INTEREST IS COMPOUNDED m TIMES PER YEAR, THE YEAR IS DIVIDED m EQUAL CONVERSION PERIODS AND THE INTEREST RATE DURING EACH CONVERSION PERIOD IS $\frac{r}{m}$, THAT IS, WE GET INTEREST EVERY $\frac{1}{m}$ YEARS.

NOW, IF THE INTEREST IS COMPOUNDED FOR t YEARS, THEN THERE WILL BE mt CONVERSION PERIODS IN t YEARS. THUS IF YOU PUT $n = mt$ AND REPLACE i BY THE EXPRESSION OF INTEREST RATE PER EACH CONVERSION PERIOD, $i = \frac{r}{m}$ IN EQUATION (*), WE HAVE THE FUTURE VALUE OF COMPOUND INTEREST GIVEN BY;

Future value of a compound interest:

$$A = P\left(1+\frac{r}{m}\right)^{mt}$$

WHERE A IS AMOUNT OR FUTURE VALUE, P IS PRINCIPAL OR PRESENT VALUE, r IS ANNUAL OR NOMINAL RATE, t IS TIME IN YEARS, AND m IS THE NUMBER OF CONVERSION PERIODS PER YEAR.

IN WORKING WITH PROBLEMS INVOLVING INTEREST, WE USE THE TERM OF PAYMENT PER FOLLOWS:

- ✓ ANNUALLY MEANS ONCE A YEAR, I. E. $m = 1$
- ✓ SEMI-ANNUALLY MEANS TWICE A YEAR, I. E. $m = 2$
- ✓ QUARTERLY MEANS FOUR TIMES A YEAR, I. E. $m = 4$
- ✓ MONTHLY MEANS 12 TIMES A YEAR, I. E. $m = 12$

NOW, STUDY THE FOLLOWING EXAMPLES TO UNDERSTAND THE CONCEPTS YOU HAVE D ABOVE.

Example 4 IF BIRR 100 IS DEPOSITED IN THE COMMERCIAL BANK OF ETHIOPIA WITH INTEREST RATE OF 10% PER ANNUM, FIND THE AMOUNT IF IT IS COMPOUNDED ANNUALLY, SEMI-ANNUALLY, QUARTERLY, MONTHLY, AND WEEKLY AT THE END OF ONE YE (NO WITHDRAWAL OR DEPOSIT IS MADE IN THE WHOLE YEAR).

Solution YOU ARE GIVEN THE PRINCIPAL $P = $ BIRR 100, THE ANNUAL INTEREST RATE $r = 0.1$, FOR A PERIOD OF $t = 1$ YEAR, AND COMPOUND PERIOD OF $m = m$:

A ANNUALLY MEANS $m = 1$, SO THAT THE AMOUNT AT THE END OF THE YEAR IS

$$A = P\left(1+\frac{r}{m}\right)^{mt} = 100\left(1+\frac{0.1}{1}\right)^{1(1)} = \text{BIRR } 110$$

B SEMI-ANNUALLY MEANS $m = 2$, SO THAT THE AMOUNT AT THE END OF THE YEAR IS

$$A = P\left(1+\frac{r}{m}\right)^{mt} = 100\left(1+\frac{0.1}{2}\right)^{2(1)} = \text{BIRR } 110.25$$

C QUARTERLY MEANS $m = 4$, SO THAT THE AMOUNT AT THE END OF THE YEAR IS

$$A = P\left(1+\frac{r}{m}\right)^{mt} = 100\left(1+\frac{0.1}{4}\right)^{4(1)} = \text{BIRR } 110.38$$

D MONTHLY MEANS $m = 12$, SO THAT THE AMOUNT AT THE END OF THE YEAR IS

$$A = P\left(1+\frac{r}{m}\right)^{mt} = 100\left(1+\frac{0.1}{12}\right)^{12(1)} = \text{BIRR } 110.47$$

E WEEKLY MEANS $m = 52$, SO THAT THE AMOUNT AT THE END OF THE YEAR IS

$$A = P\left(1+\frac{r}{m}\right)^{mt} = 100\left(1+\frac{0.1}{52}\right)^{52(1)} = \text{BIRR } 110.51$$

WE CAN SUMMARIZE THE ABOVE RESULT IN THE TABLE GIVEN BELOW.

	Number of times interest is compounded	Amount at the end of one year
Annually	1	Birr 110.00
Semi-annually	2	Birr 110.25
Quarterly	4	Birr 110.38
Monthly	12	Birr 110.47
Weekly	52	Birr 110.51

Interest compounded at different time periods in one year

YOU CAN OBSERVE THAT WHEN THE TIME, PRINCIPAL AND INTEREST RATE ARE KEPT FIXED AND THE NUMBER OF TIMES THE INTEREST IS COMPOUNDED INCREASES, THE AMOUNT WILL INCREASE

Example 5 SUPPOSE BIRR 2,300 IS INVESTED AT 8% INTEREST RATE COMPOUNDED

A ANNUALLY **B** MONTHLY.

WHAT IS THE AMOUNT AFTER 5 YEARS? FIND THE AMOUNT OF INTEREST IN EACH CASE.

Solution GIVEN P = BIRR 2,300, $r = 0.08$, AND $t = 5$ YEARS.

A WHEN THE INTEREST IS COMPOUNDED ANNUALLY, $m = 1$, HENCE THE AMOUNT WILL BE

$$A = P\left(1+\frac{r}{m}\right)^{mt} = 2,300\left(1+\frac{0.08}{1}\right)^{1(5)} = 2,300(1.469328) = \text{BIRR } 3,379.45$$

THE INTEREST EARNED IN FIVE YEARS WITHOUT MAKING WITHDRAWAL OR DEPOSIT WI

$I = A - P = 3,379.45 - 2,300 = \text{BIRR } 1,079.45.$

B WHEN THE INTEREST IS COMPOUNDED MONTHLY, $m = 12$, HENCE THE AMOUNT WILL BE

$$A = P\left(1+\frac{r}{m}\right)^{mt} = 2{,}300\left(1+\frac{0.08}{12}\right)^{12(5)} = 2{,}300\left(1+\frac{0.08}{12}\right)^{60} = 2{,}300(1.00667)^{60}$$

= BIRR 3,427.33

THE INTEREST EARNED IN FIVE YEARS WITHOUT MAKING WITHDRAWAL OR DEPOSIT WI

$I = A - P$ = 3,427.33 – 2300 = BIRR 1,127.33.

WHEN PEOPLE ENGAGED IN FINANCE SPEAK OF THE "TIME VALUE OF MONEY", THEY ARE U REFERRING TO THE PRESENT VALUE OF MONEY. THE PRESENT VALUE OF BIRR A FUTURE DATE IS THE PRINCIPAL YOU WOULD NEED TO INVEST NOW SO THAT IT WOULD GR A IN THE SPECIFIED TIME PERIOD. FROM THE FUTURE VALUE OF A COMPOUND INVESTMEN CAN GET A FORMULA FOR THE PRESENT VALUE. IF P IS THE PRESENT VALUE OF BIRR RECEIVED AFTER t YEARS AT ANNUAL INTEREST RATE r COMPOUNDED m TIMES A YEAR, THEN

$$A = P\left(1+\frac{r}{m}\right)^{mt}$$

TO SOLVE FOR P, DIVIDE BOTH SIDES BY $\left(1+\frac{r}{m}\right)^{mt}$, AND WE OBTAIN THE PRESENT VALUE OF A COMPOUND INTEREST EXPRESSED AS:

$$P = A\left(1+\frac{r}{m}\right)^{-mt}$$

Example 6 FIND THE PRESENT VALUE OF AN INVESTMENT WORTH BIRR 600 AFTER TWO YEARS COMPOUNDED QUARTERLY AT THE INTEREST RATE OF 9% PER YEAR

Solution THE GIVEN INFORMATION IS: BIRR 600, $t = 2$ YEARS, $m = 4$, AND $r = 0.09$. WE WANT TO FIND THE PRESENT VALUE. THE PRESENT VALUE IS GIVEN BY

$$P = A\left(1+\frac{r}{m}\right)^{-mt} = 600\left(1+\frac{0.09}{4}\right)^{-4(2)} = 600(1.0225)^{-8} = \text{BIRR } 502.1(\ldots)$$

Example 7 ATO MOHAMMED MADE THE FOLLOWING TRANSACTIONS IN HIS ACCOUNT IN THE COMMERCIAL BANK OF ETHIOPIA. DEPOSITED BIRR 2500 ON 1ST JANUARY 2006; WITHDRAW BIRR 600 ON 1ST JULY 2007; DEPOSITED BIRR 1,800 ON 1ST JANUARY 2008. IF THE ACCOUNT EARNS 4% INTEREST RATE PER YEAR COMPOUNDED SEMI-ANNUALLY, FIND THE BALANCE ON THE ACCOUNT ON 1ST JANUARY 2010.

Solution FROM THE 1ST JANUARY 2006 UP TO 1ST JULY 2007 WE HAVE 18 MONTHS WHICH IS 3 CONVERSION PERIODS. HENCE WE ARE GIVEN P = BIRR 2,500, $t = 1.5$ YEARS, $m = 2$, AND $r = 0.04$. HENCE THE AMOUNT WILL BE:

$$A = P\left(1+\frac{r}{m}\right)^{mt} = 2,500\left(1+\frac{0.04}{2}\right)^{2\left(\frac{3}{2}\right)} = \text{BIRR } 2,653.02$$

THE BALANCE ON 1ST JULY 2007 WILL BE 2653.02 BIRR. IF A WITHDRAWAL OF BIRR 600.00 IS MADE ON THIS DAY, THE BALANCE WILL BE BIRR 2,653.02 − BIRR 600.00 = 2,053.02 BIRR.

FROM THE 1ST JULY 2007 UP TO 1ST JANUARY 2008 WE HAVE 6 MONTHS WHICH IS 1 CONVERSION PERIOD. HENCE WE ARE GIVEN P = BIRR 2,053.02, $t = 0.5$ YEARS, $m = 2$, AND $r = 0.04$. HENCE THE AMOUNT WILL BE:

$$A = P\left(1+\frac{r}{m}\right)^{mt} = 2,053.02\left(1+\frac{0.04}{2}\right)^{2\left(\frac{1}{2}\right)} = \text{BIRR } 2,094.08$$

SINCE HE MADE A DEPOSIT OF BIRR 1,800 ON THIS DAY, THE BALANCE ON 1ST JANUARY 2008 WILL BE BIRR 2094.08 + BIRR 1,800.00 = BIRR 3,894.08.

FROM 1ST JANUARY 2008 UP TO JANUARY 2010 WE HAVE 2 YEARS, 4 CONVERSION PERIODS. HENCE WE ARE GIVEN P = BIRR 3,894.08, $t = 2$ YEARS, $m = 2$, AND $r = 0.04$. HENCE THE AMOUNT WILL BE:

$$A = P\left(1+\frac{r}{m}\right)^{mt} = 3,894.08\left(1+\frac{0.04}{2}\right)^{2(2)} = \text{BIRR } 4,215.08$$

THUS, THE BALANCE ON 1ST JANUARY 2010 WILL BE BIRR 4,215.08.

Ordinary annuity

MANY PEOPLE ARE NOT IN A POSITION TO DEPOSIT A LARGE AMOUNT OF MONEY AT A TIME IN AN ACCOUNT. MOST PEOPLE SAVE MONEY BY DEPOSITING RELATIVELY SMALL AMOUNT AT TIMES. IF A DEPOSITOR MAKES EQUAL DEPOSITS AT REGULAR INTERVALS, HE/SHE IS CONTRI**annuity**. THE DEPOSITS MAY BE MADE WEEKLY, MONTHLY, YEARLY, OR ANY OTHER PERIOD OF TIME.

IF WE DEAL WITH ANNUITIES IN WHICH THE DEPOSITS (OR PAYMENT) ARE MADE AT THE END OF THE DEPOSIT (OR PAYMENT) INTERVALS, WHICH COINCIDES WITH THE COMPOUNDING P INTEREST, THEN THIS TYPE OF ANNUITY IS CALLED **ordinary annuity**. IN THIS SECTION WE WILL DEAL WITH FUTURE VALUE OF AN ORDINARY ANNUITY ONLY AND START THE DISCUSSIO FOLLOWING EXAMPLE.

Example 8 SUPPOSE YOU DEPOSIT BIRR 100 AT THE END OF EVERY SIX MONTHS IN AN ACCOUNT THAT PAYS 4% INTEREST PER YEAR COMPOUNDED SEMI-ANNUALLY. I MADE 8 DEPOSITS, ONE AT THE END OF EACH INTEREST PAYMENT PERIOD OVER YEARS, HOW MUCH MONEY WILL YOU HAVE IN THE ACCOUNT AT THE END OF FOUR YEARS?

Solution IF YOU MAKE THE PAYMENTS AT THE END OF THE EACH SIX MONTHS WITH THE TIME INTEREST IS COMPOUNDED, YOU START THE DISCOUNT FROM THE LAS PAYMENT.

THE EIGHTH PAYMENT HAS NO INTEREST, SO STAYS AT BIRR 100.

THE SEVENTH PAYMENT HAS INTEREST CALCULATED FOR ONE PERIOD, AND IT WILL AC

TO $A = P(1 + it)$, WHERE $P = 100$ PERIODIC PAYMENT, $i = \frac{r}{m} = \frac{0.04}{2} = 0.02$ IS THE

INTEREST RATE PER PERIOD, AND

THEREFORE $A = P(1 + IT) = 100(1 + 0.02(1)) = 100(1 + 0.02)$

THE SIXTH PAYMENT HAS INTEREST COMMUTATED FOR TWO PERIODS, AND IT

ACCUMULATE FOR THE FIRST PERIOD $A = 100(1 + 0.02(1)) = 100(1 + 0.02)$,

AND FOR THE SECOND PERIOD AS THE AMOUNT FOR THE FIRST PERIOD SERVE AS A PR

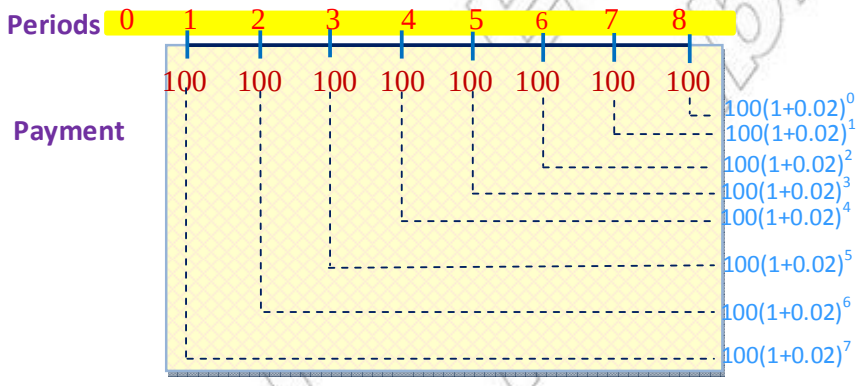
THE SECOND PERIOD $A = P(1 + IT) = 100(1 + 0.02)(1 + 0.02(1)) = 100(1 + 0.02)^2$

THE FIFTH PAYMENT HAS INTEREST COMPUTED FOR THREE PERIODS, AND IT WILL ACC

TO THE AMOUNT $A = 100(1 + 0.02)^3$.

CONTINUING THIS PROCESS THE FIRST PAYMENT HAS INTEREST COMPUTED FOR SEVEN

AND WILL ACCUMULATE TO THE AMOUNT $A = 100(1 + 0.02)^7$ AS ILLUSTRATED IN THE FOLLOWING DIAGRAM.



THE AMOUNT OF THE ORDINARY ANNUITY WOULD BE THE SUM ACCUMULATED FROM EACH DEPOSIT MADE, THAT IS,

$$S = 100 + 100(1+0.02) + 100(1+0.02)^2 + 100(1+0.02)^3 + \ldots + 100(1+0.02)^7$$
$$= 100 + 100(1.02) + 100(1.02)^2 + 100(1.02)^3 + \ldots + 100(1.02)^7$$

TO FIND THE SUM, MULTIPLY BY 1.02 AND SUBTRACT IT TERM BY TERM.

$$1.02S = 100(1.02) + 100(1.02)^2 + 100(1.02)^3 + 100(1.02)^4 + \ldots + 100(1.02)^8$$
$$S = 100 + 100(1.02) + 100(1.02)^2 + 100(1.02)^3 + \ldots + 100(1.02)^7$$
$$0.02S = 100(1.02)^8 - 100 \Rightarrow 0.02S = 100((1.02)^8 - 1)$$

THEREFORE, WE HAVE $S = 100\left(\frac{(1.02)^8 - 1}{0.02}\right) = \text{BIRR } 858.2$ (USING A CALCULATOR)

IN GENERAL, TO DETERMINE THE SUM S THAT A SERIES OF DEPOSITS R WILL GROW TO AFTER n PERIODS, WE HAVE

$$\begin{aligned}(1+i)S &= R(1+i) + R(1+i)^2 + R(1+i)^3 + R(1+i)^4 + \ldots + R(1+i)^N \\ S &= R + R(1+i) + R(1+i)^2 + R(1+i)^3 + \ldots + R(1+i)^{N-1}\end{aligned}$$

$$iS = R(1+i)^n - R$$

$$iS = R\left((1+i)^n - 1\right)$$

THEREFORE, WE HAVE $S = R\left(\frac{(1+i)^n - 1}{i}\right)$.

The future value of an ordinary annuity IS GIVEN BY

$$S = R\left(\frac{(1+i)^n - 1}{i}\right)$$

WHERE R IS THE PERIODIC PAYMENT, i IS THE INTEREST RATE PER PERIOD AND n IS THE NUMBER OF PERIODS.

Note:

THE AMOUNT OF INTEREST OF AN ORDINARY ANNUITY IS $I = S - nR$.

$i = \frac{r}{m}$ AND $n = mt$, IN WHICH r IS THE INTEREST RATE PER YEAR, m IS THE NUMBER OF TIMES INTEREST IS COMPOUNDED PER YEAR AND t IS TIME IN YEARS.

Example 9 ELIZABETH DEPOSITS BIRR 350 AT THE END OF EVERY MONTH INTO A SAVING ACCOUNT THAT PAYS AN INTEREST RATE OF 12% PER YEAR COMPOUNDED MON HOW MUCH MONEY IS IN HER ACCOUNT AT THE END OF 5 YEARS? WHAT IS TH AMOUNT OF INTEREST?

Solution YOU ARE GIVEN R = BIRR 350, r = 0.12, M = 12, AND $t = 5$ YEARS. TO USE THE ABOVE FORMULA WE NEED TO FIND $i = \frac{r}{m} = \frac{0.12}{12} = 0.01$ AND $n = mt = 12(5) = 60$.

A THE ACCUMULATED BALANCE IS GIVEN BY

$$S = R\left(\frac{(1+i)^n - 1}{i}\right) = 350\left(\frac{(1+0.01)^{60} - 1}{0.01}\right) = \text{BIRR } 28{,}584.38$$

B THE AMOUNT OF INTEREST IS $I = S - nR$ = 28,584.38 – 60(350) = BIRR 7,584.38.

Exercise 11.5

1. IF ATO ABEBE DEPOSITS A SUM OF MONEY IN A BANK AT 5% INTEREST RATE PER YEAR COMPOUNDED MONTHLY, THEN HOW LONG WILL IT TAKE TO DOUBLE?
2. ATO LEMMA WORKS IN XYZ-COMPANY EARNING AMONTHLY OF BIRR 2,400. HE IS ALSO A MEMBER OF THE CREDIT ASSOCIATION OF HIS COMPANY AND DEPOSITS 20% O MONTHLY SALARY AT THE END OF EACH MONTH AT 4% COMPOUNDED MONTHLY.
   A. WHAT IS ATO LEMMA'S ACCUMULATED BALANCE AFTER 2 YEARS?
   B. HOW MUCH INTEREST HAS HE EARNED?
3. IF DALELO DEPOSITED BIRR 1,000 SAVING AT 8% PER YEAR, HOW MUCH WILL THE AMOUNT BE AT THE END OF 10TH YEAR?
4. HELEN DEPOSITED BIRR 2,000 AT 8% INTEREST COMPOUNDED ANNUALLY. HOW MANY YEARS WILL IT TAKE HER TO GET BIRR 3,000?
5. SUPPOSE YOU DEPOSIT BIRR 100 IN AN ACCOUNT AT THE END OF EVERY QUARTER WITH 8% INTEREST COMPOUNDED QUARTERLY. HOW MUCH AMOUNT WILL YOU HAVE AT THE EN YEARS?
6. AN AMOUNT OF BIRR 500 IS DEPOSITED IN AN ACCOUNT AT THE END OF EACH SIX-MONTH PERIOD WITH AN INTEREST COMPUTED AT 6% COMPOUNDED SEMI-ANNUALLY. HOW MA YEARS DOES IT TAKE FOR THE AMOUNT TO REACH BIRR 56,398.43?

11.2.2 Depreciation

ANY PHYSICAL THING (TANGIBLE) OR RIGHT (INTANGIBLE SUCH AS, PATENTS, COPYRIG GOODWILL) THAT HAS MONEY VALUE IS AN **asset**. THERE ARE TWO GROUPS OF ASSETS KNOWN AS **current assets** (**financial assets**) AND **plant assets** (OR **fixed assets**).

CASH AND OTHER ASSETS THAT MAY REASONABLY BE EXPECTED TO BE RECOGNIZED IN CA OR CONSUMED WITHIN ONE YEAR OR LESS THROUGH THE NORMAL OPERATION OF THE BU CALLED **current assets**.

TANGIBLE ASSETS USED IN BUSINESS (NOT HELD FOR SALES IN THE ORDINARY COURSE BUSINESS) THAT ARE OF A PERMANENT OR RELATIVELY FIXED NATURE ARE CALLED **plant assets** or **fixed assets**.

SUPPOSE A PHOTOGRAPHIC EQUIPMENT IS USED IN THE OPERATION OF A BUSINESS. IT IS O THAT THE EQUIPMENT DOES WEAR OUT WITH USAGE AND THAT ITS USEFULNESS DECREAS PASSAGE OF TIME. THE DECREASE IN USEFULNESS IS A BUSINESS EXPENSE, CALLED **depreciation**. PLANT ASSETS INCLUDE EQUIPMENT, MACHINERY, BUILDING, AND LAND. WITH THE EXCE LAND, SUCH ASSETS GRADUALLY WEAR OUT OR OTHERWISE LOSE THEIR USEFULNESS WIT TIME, I.E. THEY ARE SAID TO DEPRECIATE. SINCE WE ARE INTERESTED IN THIS SUBSECTION H ASSETS DEPRECIATE, FROM NOW ON YOU CONSIDER PLANT ASSETS TO BE SIMPLY ASSETS.

THE DEPRECIATION OF AN ASSET IS CAUSED MAINLY DUE TO:

A **physical depreciation:-** WEAR OUT FROM USE AND DETERIORATION FROM THE ACTION OF THE ELEMENT

B **functional depreciation:-** INADEQUACY AND OBSOLESCENCE. INADEQUACY RESULTS IF THE CAPACITY DOES NOT MEET THE DEMAND OF INCREASED PRODU WHILE OBSOLESCENCE RESULTS, IF THE COMMODITY PRODUCED IS NO LONGE DEMAND WITH RESPECT TO QUALITY AND COST OF PRODUCTION.

FACTORS TO BE CONSIDERED IN COMPUTING THE PERIODIC DEPRECIATION OF AN ASSET ORIGINAL COST, ITS RECOVERABLE COST AT THE TIME IT IS RETIRED FROM SERVICE, AND T LIFE OF THE ASSET. IT IS EVIDENT THAT NEITHER OF THESE TWO LATTER FACTORS CAN B DETERMINED UNTIL THE ASSET IS RETIRED; THEY MUST BE ESTIMATED AT THE TIME TH PLACED IN SERVICE. THE ESTIMATED RECOVERABLE COST OF DEPRECIABLE ASSET AS OF T ITS REMOVAL FROM SERVICE IS VARIOUSLY TERMED AS **salvage value**, **scrap value**, **salvage value**, OR **trade-in value**.

THERE IS NO SINGLE METHOD OF COMPUTING DEPRECIATION FOR ALL CLASSES OF DEP ASSETS. HERE WE CONSIDER TWO METHODS:

I THE FIXED INSTALMENT METHOD AND

II REDUCING-BALANCE METHOD

The fixed instalment method

THE FIXED INSTALMENT METHOD (OR COST METHOD OR THE STRAIGHT-LINE METHOD) OF DETERMINING DEPRECIATION ALLOWS FOR EQUAL PERIODIC CHARGES TO EXPENSE (OR COS ESTIMATED LIFE OF THE ASSET. THAT IS, UNDER THIS METHOD, THE DEPRECIATION IS CHARG EVERY YEAR THROUGHOUT THE ECONOMIC LIFE OF THE ASSET. THE PERIODIC DEPRECIATI OF AN ASSET IS EXPRESSED AS:

$$\text{DEPRECIATION} = \frac{\text{COST} - \text{SALVAGE}}{\text{ESTIMATED LIFE IN}}$$

THIS METHOD IS QUITE SIMPLE TO APPLY AS THE ARITHMETICAL CALCULATIONS ARE VERY THERE ARE CERTAIN DISADVANTAGES OF THIS METHOD:

I THE METHOD DOES NOT TAKE INTO CONSIDERATION THE FLUCTUATIONS, BOOMS AND DEPRECIATION.

II THE USEFULNESS OF MACHINERY IS MORE IN EARLIER YEARS THAN IN LATER YEARS.

III THE TOTAL CHARGES IN RESPECT OF AN ASSET ARE NOT EVEN EVERY YEAR BECAUSE REPAIRS ARE MUCH LESS IN EARLIER YEARS.

Example 10 A MACHINE COSTING BIRR 35,000 IS ESTIMATED TO HAVE A USEFUL LIFE TIME OF 8 YEARS AND A SALVAGE VALUE OF BIRR 3,000. WHAT IS THE ACCUMULATED DEPRECIATION AT THE END OF 5 YEARS? FIND THE BOOK VALUE OF THE ASSET A TIME, USING THE FIXED INSTALMENT METHOD

(WHERE BOOK VALUE = COST – ACCUMULATED DEPRECIATION)

Solution WE HAVE THE COST = BIRR 35,000, SALVAGE VALUE = BIRR 3,000 AND USEFUL LIFE = 8 YEARS.

THE DEPRECIATION CHARGE PER YEAR IS

$$\text{DEPRECIATION} = \frac{\text{COST} - \text{SALVAGE VALUE}}{\text{ESTIMATED LIFE IN YEARS}} = \frac{35,000 - 3,000}{8} = \text{BIRR } 4,000$$

HENCE THE ACCUMULATED DEPRECIATION INCREASES BY BIRR 4,000 EVERY YEAR.

THE ACCUMULATED DEPRECIATION AT THE END OF 5 YEARS WILL BE:

YEARS × DEPRECIATION CHARGE PER YEAR = 5 × (4,000) = BIRR 20,000.

THE BOOK VALUE OF THE ASSET AT THE END OF 5 YEARS WILL BE:

BOOK VALUE = COST – ACCUMULATED DEPRECIATION = 35,000 – 20,000 = BIRR 15,000.

THE DEPRECIATION SCHEDULE FOR THE ASSET IS SHOWN IN THE FOLLOWING TABLE.

Number of years	Yearly depreciation	Accumulated depreciation	Book value
0	0	0	35,000
1	4,000	4000	31,000
2	4,000	8,000	27,000
3	4,000	12,000	23,000
4	4,000	16,000	19,000
5	4,000	20,000	15,000
6	4,000	24,000	11,000
7	4,000	28,000	7,000
8	4,000	32,000	3,000

Example 11 OFFICE FURNITURE WAS PURCHASED ON SEPTEMBER 2, 2018 FOR B SALVAGE VALUE OF THE FURNITURE IS BIRR 250, AND THE ESTIMATED LIFE I YEARS. WHAT IS THE BOOK VALUE AT THE END OF THE FOURTH YEAR USING TH INSTALLMENT METHOD?

Solution NOTE THAT A CALENDAR MONTH IS THE SMALLEST UNIT OF TIME EMPLOYED TO ESTIMATE THE LIFE OF AN ASSET. WHEN THIS TIME INTERVAL IS ADOPTED, ALL PLACED IN SERVICE OR RETIRED FROM SERVICE DURING THE FIRST HALF OF A MO TREATED AS IF THE EVENT HAS OCCURRED ON THE FIRST DAY OF THAT M

SIMILARLY, ALL PLANT ASSETS (ADDITIONS OR REDUCTIONS) DURING THE SECO
MONTH ARE CONSIDERED TO HAVE OCCURRED ON THE FIRST DAY OF THE NEXT M

SINCE THE DATE OF PURCHASE IS ON SEPTEMBER 18, IT IS CLOSE TO OCTOBER 1. T DEPRECIATION FOR THE FIRST MONTH IS BASED ON OCTOBER 1. THE DEPRECIATION C PER YEAR IS

$$\text{DEPRECIATION} = \frac{\text{COST} - \text{SALVAGE VALUE}}{\text{ESTIMATED LIFE IN YEARS}} = \frac{2020 - 250}{10} = \text{BIRR 177 PER Y}$$

FROM THE YEARLY DEPRECIATION OF BIRR 177, WE CAN FIND THE MONTHLY DEPRECIA DIVIDING IT BY 12 AS FOLLOWS.

BIRR 177 PER YEAR ÷ 12 = BIRR 14.75 PER MONTH.

SINCE FROM OCTOBER 1 THROUGH THE END OF THE YEAR, DECEMBER 31, ENCOMPASS MONTHS, WE MULTIPLY THE MONTHLY DEPRECIATION BY 3 TO GET THE DEPRECIATION FIRST YEAR AS BIRR 14.75 PER MONTH × 3 = BIRR 44.25.

FROM THE SECOND YEAR THROUGH THE TENTH YEAR, THE FULL BIRR 177 PER YEAR IS DEPRECIATION. HENCE THE DEPRECIATION AT THE END OF THE FOURTH YEAR WILL BE

44.25 + 3(177) = BIRR 575.25

HENCE THE BOOK VALUE AT THE END OF THE FOURTH YEAR WILL BE:

BOOK VALUE = COST − DEPRECIATION = 2020 − 575.25 = BIRR 1444.75.

Reducing balance method

THE REDUCING BALANCE METHOD (OR DECLINING-BALANCE METHOD) YIELDS A DECLINING PERIODIC DEPRECIATION CHARGE OVER THE ESTIMATED LIFE OF THE ASSET. OF THE SEVERAL VARIAN THE MOST COMMON IS TO APPLY DOUBLE STRAIGHT-LINE DEPRECIATION RATE, COMPUTED I

$$\textit{Annual percentage rate of depreciation} = 2 \times \frac{100\%}{\textit{Estimated life time}} = \frac{200\%}{\textit{Estimated life time}}$$

THE DOUBLE REDUCING BALANCE METHOD USES THE DOUBLE RATE APPLIED TO THE COST C FOR THE FIRST YEAR OF ITS USE AND THEREAFTER TO THE DECLINING BOOK VALUE AT THE THE YEAR, I.E. COST MINUS THE ACCUMULATED DEPRECIATION.

Example 12 A COMPANY MACHINE IS PURCHASED FOR BIRR 3,727.89. THE EXPECTED LIFE IS 4 YEARS. USE DOUBLE REDUCING BALANCE METHOD TO PREPARE A DEPRECIA SCHEDULE.

Solution THE ANNUAL PERCENTAGE RATE OF DEPRECIATION IS

$$\frac{200\%}{\text{ESTIMATED LIFE TIME}} = \frac{200\%}{\ } = 50\%$$

THE YEARLY DEPRECIATION AND BOOK VALUE ARE SHOWN IN THE FOLLOWING TABLE.

Year	Book value at the beginning of the year	Rate	Depreciation calculation	Depreciation for the year	Accumulated Depreciation	Book value at the end of the year
1	3217.89	0.5	3217.89×0.5	1608.95	1608.94	1608.94
2	1608.94	0.5	1608.94×0.5	804.47	2413.41	804.47
3	804.47	0.5	804.48×0.5	402.24	2815.65	402.24
4	402.24	0.5	402.24×0.5	201.12	3.016.77	201.12

Example 13 USING THE DOUBLE REDUCING BALANCE METHOD, DETERMINE THE BOOK VALUE AT THE END OF THE SECOND YEAR OF AN ITEM THAT WAS BOUGHT MAY 5 FOR BIRR 30,000 AND THAT HAS A SALVAGE VALUE OF BIRR 5,000 AND AN ESTIMATED USEFUL LIFE OF 40 YEARS.

Solution THE DEPRECIATION RATE PER YEAR IS $\frac{200\%}{\text{ESTIMATED LIFE TIME}} = \frac{200\%}{40} = 0.05$

THE DEPRECIATION FOR THE FIRST FULL YEAR IS $0.05 \times$ BIRR 30,000.

HENCE THE DEPRECIATION PER MONTH IS

BIRR 1,500 PER YEAR $\div$ 12 MONTH PER YEAR = BIRR 125 PER MONTH.

SINCE THE ITEM IS BOUGHT ON MAY 5, IT IS CLOSE TO MAY 1. HENCE AT THE END OF FIRST YEAR THE DEPRECIATION IS

BIRR 125 PER MONTH $\times$ 8 MONTHS = BIRR 1000.

THE BOOK VALUE AT THE END OF THE FIRST YEAR IS 30,000 – 1000 = BIRR 29,000.

THEREFORE, THE DEPRECIATION FOR THE SECOND YEAR IS

$29,000 \times 0.05$ = BIRR 1450, AND

THE BOOK VALUE AT THE END OF THE SECOND YEAR IS

BIRR 29,000 – BIRR 1,450 = BIRR 27,550.

Exercise 11.6

NEW EQUIPMENT WAS OBTAINED AT A COST OF BIRR 100,000 ON JANUARY 5. THE EQUIPMENT ESTIMATED LIFETIME OF 5 YEARS AND AN ESTIMATED RESIDUAL VALUE OF BIRR 8,000.

I DETERMINE THE ANNUAL DEPRECIATION FOR EACH OF THE ESTIMATED USEFUL LIFE OF THE EQUIPMENT.

II THE ACCUMULATED DEPRECIATION AT THE END OF EAC

III THE BOOK VALUE OF THE EQUIPMENT AT THE END OF EACH

A THE FIXED INSTALMENT METHOD.

B THE DOUBLE REDUCING BALANCE METHOD.

11.3 SAVING, INVESTING AND BORROWING MONEY

Group Work 11.1

1. WHO MAKES MOST DECISIONS ABOUT HOW MUCH TO INVEST IN A MARKET ECONOMY, AND ABOUT HOW TO SAVE AND BORROW?
2. WHY ARE BANKS AND FINANCIAL MARKETS IMPORTANT TO THE ECONOMY?
3. WHY ARE INDIVIDUALS IN HOUSEHOLDS AND BUSINESSES MORE LIKELY TO MAKE SAVING AND INVESTMENT DECISIONS THAT ADVANCE THEIR OWN ECONOMIC INTERESTS MORE EFFECTIVELY THAN DECISIONS MADE BY GOVERNMENT OFFICIALS?

What is Money?

IT IS VERY DIFFICULT TO GIVE A PRECISE DEFINITION OF MONEY BECAUSE VARIOUS AUTHORITIES DEFINED MONEY DIFFERENTLY. HOWEVER WE MAY DEFINE MONEY IN TERMS OF FUNCTIONS IT PERFORMS, I.E. “MONEY IS THAT WHAT MONEY DOES" OR "ANYTHING WHICH IS GENERALLY ACCEPTED AS A MEDIUM OF EXCHANGE IN THE SETTLEMENT OF ALL TRANSACTIONS INCLUDING DEBTS AND ACTS AS A MEASURE AND STORE OF VALUE".

ACTIVITY 11.5

GIVE REASONS TO MAKE A BIRR MONEY?

Functions of money

MONEY PERFORMS THE FOLLOWING FOUR IMPORTANT FUNCTIONS

A **Money as a medium of exchange:** THE MOST IMPORTANT FUNCTION OF MONEY IS TO SERVE AS A MEDIUM OF EXCHANGE.

B **Money as a measure of value:** MONEY SERVES AS A COMMON MEASURE OF VALUE OR UNIT OF ACCOUNT. IT SERVES AS A STANDARD OR YARDSTICK IN TERMS OF WHICH VALUES OF ALL GOODS AND SERVICES CAN BE EXPRESSED.

C **Money as a standard of deferred payment:** MONEY SERVES AS A STANDARD IN TERMS OF WHICH FUTURE PAYMENTS CAN BE EXPRESSED.

D **Money as a store of value:** MONEY BEING THE MOST LIQUID OF ALL ASSETS IS ACONVENIENT FORM IN WHICH TO STORE WEALTH. FURTHERMORE, MONEY HELPS THE TRANSFER OF VALUE FROM ONE PERSON TO ANOTHER AS WELL AS FROM ONE PLACE TO ANOTHER.

THE FIRST TWO FUNCTIONS ARE CALLED **primary functions of money** AND THE LAST TWO ARE CALLED **secondary functions of money**.

11.3.1 Saving money

A Reasons for saving

YOU MAY BE ASKING YOURSELF WHY THERE IS SO MUCH PRESSURE TO SAVE MONEY. IF YO ENOUGH TO PAY FOR EVERYTHING YOU NEED, WHY SHOULD YOU WORRY ABOUT PUTTING EACH MONTH? THERE ARE A VARIETY OF REASONS TO BEGIN SAVING MONEY. DIFFERENT SAVE FOR DIFFERENT REASONS. HERE ARE SEVEN REASONS THAT YOU MAY CONSIDER FOR S MONEY.

1. Save for emergency funds
2. Save for retirement
3. Save for a down payment on a house
4. Save for vacations and other luxury items
5. Save for a new car
6. Save for sinking funds
7. Save for your education

Group Work 11.2

FORM A GROUP AND STUDY THE FOLLOWING ISSUES.

CONSIDER THE FAMILY OF EACH MEMBER IN YOUR GROU CH STUDENT ASK HIS/HER FAMILY.

I WHETHER THEY SAVE MONEY OR NOT.

II IF YES, WHY DO THEY SAVE?

AFTER COLLECTING THIS DATA DISCUSS

A THE SEVEN REASONS MENTIONED ON WHY WE SAVE MONEY,

B YOUR FINDINGS WITH RESPECT TO THE ABOVE SAVING REASONS OF

B Planning a saving programme

IF YOU THINK YOURSELF AS AN EMPLOYEE OR A BUSINESS MAN, YOU NEED TO PLAN ON HOV SAVE, AND THIS PLANNING IS DIRECTLY RELATED TO THE REASON ON WHY YOU SAVE MONE

ACTIVITY 11.6

IF YOU ARE A GOVERNMENT EMPLOYEE, DISCUSS A PLAN ON OULD SAVE FOR:

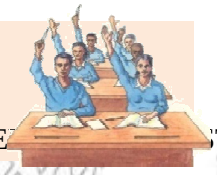
A RETIREMENT,

B VACATIONS,

C A DOWN PAYMENT ON A HOUSE.

C Savings as investment

ACTIVITY 11.7



DISCUSS HOW YOU SHOULD PLAN TO SAVE AND BE INVOLVED IN INVESTMENT.

New issues of corporate stock: NEW CORPORATIONS RAISING FUNDS TO BEGIN OPERATION, OR EXISTING CORPORATIONS THAT WANT TO EXPAND THEIR CURRENT OPER ISSUE NEW SHARES OF STOCK THROUGH THE INVESTMENT BANKING PROCESS. PEOPLE W THESE SHARES OF STOCK HOPE TO MAKE MONEY BY HAVING THE PRICE OF THE STOCK INCR THROUGH DIVIDENDS THAT MAY BE PAID OUT OF FUTURE PROFITS.

New issues of bonds: NEW ISSUES OF BONDS ARE ISSUED BY COMPANIES THAT WAN BORROW FUNDS TO EXPAND BY INVESTING IN NEW FACTORIES, MACHINERY, OR OTHER PRO BY GOVERNMENT AGENCIES THAT WANT TO FINANCE NEW BUILDING, ROADS, SCHOOLS, PROJECTS. THE BONDS ARE PROMISES TO REPAY THE AMOUNT BORROWED, PLUS INTE SPECIFIED TIMES.

INDIVIDUALS, BANKS, OR COMPANIES THAT WANT TO EARN THIS INTEREST PURCHASE THE B

Borrowing from banks and other financial intermediaries: COMPANIES (AND INDIVIDUALS) CAN BORROW FUNDS FROM BANKS, AGREEING TO PAY INTEREST, ON A S SCHEDULE. BANKS AND OTHER FINANCIAL INTERMEDIARIES LEND OUT MONEY THAT DEPOSITED BY OTHER PEOPLE AND FIRMS. IN EFFECT, BANKS AND OTHER INTERMEDIARIES SPECIAL KIND OF "MIDDLEMAN," MAKING IT EASIER FOR THOSE WITH MONEY TO LEND TO FI WHO WANT TO BORROW FUNDS. OF COURSE, BANKS ALSO SCREEN THOSE WHO BORROW M MAKE SURE THEY ARE LIKELY TO REPAY THE LOANS.

D Saving institutions

Group Work 11.3

FORM A GROUP AND DISCUSS THE FOLLOWING.

1. WHAT ARE SAVING INSTITUTIONS?
2. IS THERE ANY SAVING INSTITUTION IN YOUR SURROUNDING?
3. VISIT ANY SAVING INSTITUTION IN YOUR SURROUNDING AND STUDY HOW IT WORKS.
4. PRESENT YOUR FINDINGS TO THE CLASS.

SAVING INSTITUTIONS ARE FINANCIAL INSTITUTIONS THAT RAISE LOANABLE FUNDS BY SEL TO THE PUBLIC. THEY ACCEPT DEPOSITS FROM INDIVIDUALS AND FIRMS AND USE THESE F PARTICIPATE IN THE DEBT MARKET, MAKING LOANS OR PURCHASING OTHER DEBT INSTRU AS TREASURY BILLS. THE MAJOR TYPES OF SAVING FINANCIAL INSTITUTIONS ARE COMMERC SAVING AND LOAN ASSOCIATIONS, MUTUAL SAVING BANKS, AND CREDIT UNIONS. THE LIABILITIES (SOURCES OF FUNDS) ARE DEPOSITS, AND THEIR MAIN ASSETS ARE LOANS.

I Commercial banks

COMMERCIAL BANKS ARE BUSINESS CORPORATIONS THAT ACCEPT DEPOSITS, MAKE LOANS, AND SELL OTHER FINANCIAL SERVICES, ESPECIALLY TO OTHER BUSINESS FIRMS, BUT ALSO TO HOUS GOVERNMENTS.

II Savings and loans associations

SAVINGS AND LOANS ASSOCIATIONS (S & LS) ARE SOMETIMES CALLED AS MUTUAL ASSOCIATIONS, (I.E., OWNED BY DEPOSITORS) TO CONVERT FUNDS FROM SAVINGS ACCOUNTS INTO MORTGAG

III Mutual savings banks

MUTUAL SAVINGS BANKS ARE MUCH LIKE SAVINGS AND LOANS, BUT ARE OWNED COOPERATIVELY BY MEMBERS WITH A COMMON INTEREST, SUCH AS COMPANY EMPLOYEES, UNION MEMBER CONGREGATION MEMBERS.

IV Credit unions

CREDIT UNIONS ARE NON-PROFIT ASSOCIATIONS ACCEPTING DEPOSITS FROM AND MAKING LOANS TO THEIR MEMBERS, ALL OF WHOM HAVE A COMMON BOND, SUCH AS WORKING FOR THE EMPLOYER. CREDIT UNIONS ARE ORGANIZED AS COOPERATIVE DEPOSITORY INSTITUTIONS, MUTUAL SAVINGS BANKS. DEPOSITORS ARE CREDITED WITH PURCHASING SHARES IN THE C WHICH THEY OWN AND OPERATE.

Exercise 11.7

WHAT TYPE OF FINANCIAL INSTITUTIONS WOULD EACH OF THE FOLLOWING PEOPLE BE MOS DO BUSINESS WITH

A A PERSON WITH BIRR 10,000 IN SAVINGS WHO WANTS TO EARN A RECENT RETURN AT LOW RISK AND WHO DOES NOT KNOW MUCH ABOUT THE STOCK AND BOND MA

B A PERSON WITH BIIR 350 WHO NEEDS A CHECKING ACCOUNT,

C A PERSON WHO NEEDS A BIRR 10,000 LOAN TO OPEN A PIZZA SHOP,

D A PERSON WHO IS RECENTLY MARRIED, IS SAVING AND WANTS TO MAKE SURE THAT HIS CHILDREN ARE WELL TAKEN CARE OF IN THE FUTURE,

E THE PRESIDENT OF A SMALL COMPANY WHO WANTS TO LIST ITS STOCK ON THE STOCK EXCHANGE TO OBTAIN ADDITIONAL CAPITAL,

F SOMEONE WHO HAS JUST RECEIVED A LARGE INHERITANCE AND WANTS TO INVEST IT IN THE STOCK MARKET,

G A PERSON WITH NO CREDIT HISTORY WHO IS BUYING HER FIRST CAR,

H A FAMILY NEEDING A MORTAGE LOAN TO BUY A HOUSE,

I A PERSON WHO HAS DECLARED BANKRUPTCY IN THE PAST AND NEEDS A LOAN TO PAY OFF SOME PAST DUE BILLS.

11.3.2 Investment

INVESTMENT IS THE PRODUCTION AND PURCHASE OF CAPITAL GOODS, SUCH AS MACHINES, AND EQUIPMENT THAT CAN BE USED TO PRODUCE MORE GOODS AND SERVICES IN THE PERSONAL INVESTMENT IS PURCHASING FINANCIAL SECURITIES SUCH AS STOCKS AND BON ARE RISKIER THAN SAVINGS ACCOUNTS BECAUSE THEY MAY FALL IN VALUE, BUT IN MOST PAY A HIGH RATE OF RETURN IN THE LONG RUN THAN THE INTEREST PAID ON SAVINGS ACC

Group Work 11.4

1. WHAT IS AN INVESTMENT.
2. DISCUSS ANY INVESTMENT ACTIVITIES IN YOUR SUR
3. DISCUSS ANY RELATION BETWEEN THE FINANCIAL INSTITUTI THE INVESTMENT(S) IN YOUR SURROUNDING.

A Investment strategy

IN FINANCE, AN INVESTMENT STRATEGY IS A SET OF RULES, BEHAVIOURS OR PROCEDURES TO GUIDE AN INVESTOR'S SELECTION OF AN INVESTMENT PORTFOLIO. USUALLY THE STRAT DESIGNED AROUND THE INVESTOR'S RISK-RETURN TRADEOFF. SOME INVESTORS WILL MAXIMIZE EXPECTED RETURNS BY INVESTING IN RISKY ASSETS, OTHERS WILL PREFER TO RISK, BUT MOST WILL SELECT A STRATEGY SOMEWHERE IN BETWEEN.

PASSIVE STRATEGIES ARE OFTEN USED TO MINIMIZE TRANSACTION COSTS, AND ACTIVE SUCH AS MARKET TIMING ARE AN ATTEMPT TO MAXIMIZE RETURNS. ONE OF THE BETTE INVESTMENT STRATEGIES IS BUY AND HOLD. BUY AND HOLD IS A LONG TERM INVESTMENT BASED ON THE CONCEPT THAT IN THE LONG RUN EQUITY MARKETS GIVE A GOOD RATE DESPITE PERIODS OF VOLATILITY OR DECLINE.

B Types of securities

Stocks

STOCKS CAN HELP YOU BUILD LONG-TERM GROWTH INTO YOUR OVERALL FINANCIAL PLAN. REPEATEDLY DEMONSTRATED THAT STOCKS, AS AN ASSET CLASS, HAVE OUTPERFORMED TYPE OF INVESTMENT OVER LONG PERIODS OF TIME. STOCK REPRESENTS AN OWNERSHIP C STAKE IN A CORPORATION. IF YOU ARE A STOCKHOLDER, YOU OWN A PROPORTIONATE SH CORPORATION'S ASSETS AND YOU MAY BE PAID A SHARE OF THE COMPANY'S EARNINGS IN OF DIVIDENDS.

STOCKS ARE CONSIDERED TO BE A RISKIER INVESTMENT THAN BONDS OR CASH. STOCK PRIC FLUCTUATE MORE SHARPLY-BOTH UP AND DOWN THAN OTHER TYPES OF ASSET CLASSES.

ACTIVITY 11.8

1 AFTER READING LITERATURES OF FINANCIAL SECURITIES, LIST AT LEAST FOUR OF THE MAIN CHARACTERISTICS THAT MAY DISTINGUISH PREFERRED STOCK FRO STOCK.

2 AFTER READING ADDITIONAL FINANCIAL SECURITY BOOKS, STATE AT LEAST FOUR B THAT CAN COME FROM OWNERSHIP OF STOCK IN A CORPORATION.

Bonds

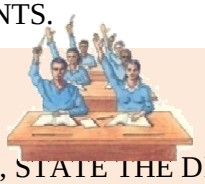
CORPORATIONS, GOVERNMENTS AND MUNICIPALITIES ISSUE BONDS TO RAISE FUNDS, AND THEY TYPICALLY PAY THE BOND OWNERS A FIXED INTEREST RATE. IN THIS WAY, A BOND IS LI

BONDS MAY PROVIDE A REGULAR INCOME STREAM OR DIVERSIFY A PORTFOLIO. BONDS A INCOME INVESTMENTS - MOST PAY PERIODIC INTEREST AND PRINCIPAL AT MATURITY.

INTEREST RATES MAY BE THE MOST SIGNIFICANT FACTOR IN A BOND'S VALUE. WHEN INTEREST RATES FALL, THE VALUE OF EXISTING BONDS RISE BECAUSE THEIR FIXED-INTEREST RATE ATTRACTIVE IN THE MARKET THAN THE RATES FOR NEW ISSUES. SIMILARLY, WHEN INTERE THE VALUE OF EXISTING BONDS WITH LOWER, FIXED-INTEREST RATES TEND TO FALL.

INFLATION MAY ERODE THE PURCHASING POWER OF INTEREST INCOME. GENERALLY, BO LONGER MATURITIES ARE MORE SENSITIVE TO INFLATION THAN BONDS WITH SHORTER ECONOMIC CONDITIONS MAY CAUSE BOND VALUES - PARTICULARLY CORPORATE BONDS-TO AN ECONOMIC CHANGE THAT ADVERSELY AFFECTS A COMPANY'S BUSINESS MAY REDUCE T OF A COMPANY TO MAKE INTEREST OR PRINCIPAL PAYMENTS.

ACTIVITY 11.9



AFTER READING LITERATURES OF FINANCIAL SECURITIES, STATE THE DIFFERENCE BETWEEN PREFERRED STOCK AND BONDS.

C How to invest

AS YOU MAY HAVE NOTICED, THERE ARE SEVERAL CATEGORIES OF INVESTMENTS, AND THOSE CATEGORIES HAVE THOUSANDS OF CHOICES WITHIN THEM. SO FINDING THE RIGHT YOU ISN'T A TRIVIAL MATTER. THE SINGLE GREATEST FACTOR, BY FAR, IN GROWING YOUR WEALTH IS THE RATE OF RETURN YOU GET ON YOUR INVESTMENT. THERE ARE TIMES, THO YOU MAY NEED TO PARK YOUR MONEY SOMEPLACE FOR A SHORT TIME, EVEN THOUGH YO GET VERY GOOD RETURNS. HERE IS A SUMMARY OF THE MOST COMMON SHORT-TERM S VEHICLES:

Short-term savings vehicles

Savings account: OFTEN THE FIRST BANKING PRODUCT PEOPLE USE, A SAVINGS ACCOUNT IS A PLACE TO PUT YOUR MONEY WHERE YOU EARN A SMALL AMOUNT IN INTEREST, SO THEY'RE A LITTLE BETTER THAN THAT DUSTY PIGGY B DRESSER.

Money market funds: THESE ARE A SPECIALIZED TYPE OF MUTUAL FUND THAT INVESTS IN EXTREMELY SHORT-TERM BONDS. MONEY MARKET FUNDS USUALLY PAY BETTER INTERES A CONVENTIONAL SAVINGS ACCOUNT DOES, BUT YOU'LL EARN LESS THAN WHAT YOU CO CERTIFICATES OF DEPOSIT.

Certificate of deposit (CD): THIS IS A SPECIALIZED DEPOSIT YOU MAKE AT A BANK OR OTHER FINANCIAL INSTITUTION. THE INTEREST RATE ON CERTIFICATE OF DEPOSITS IS USUA SAME AS THAT OF SHORT- OR INTERMEDIATE-TERM BONDS, DEPENDING ON THE DURATION INTEREST IS PAID AT REGULAR INTERVALS UNTIL THE CERTIFICATE OF DEPOSIT MATURES, A YOU GET THE MONEY YOU ORIGINALLY DEPOSITED PLUS THE ACCUMULATED INTEREST FOOLS ARE PARTIAL TO INVESTING IN STOCKS, AS OPPOSED TO OTHER LONG-TERM INVESTIN BECAUSE STOCKS HAVE HISTORICALLY OFFERED THE HIGHEST RETURN ON OUR MONEY. H MOST COMMON LONG-TERM INVESTING VEHICLES:

Long-term investing vehicles

Bonds: BONDS COME IN VARIOUS FORMS. THEY ARE KNOWN AS "FIXED-INCOME" SECURITIES BECAUSE THE AMOUNT OF INCOME THE BOND GENERATES EACH YEAR IS "FIXED" OR SET, V BOND IS SOLD. FROM AN INVESTOR'S POINT OF VIEW, BONDS ARE SIMILAR TO CDS, EXCEPT T GOVERNMENT OR CORPORATIONS ISSUE THEM, INSTEAD OF BANKS.

Stocks: STOCKS ARE A WAY FOR INDIVIDUALS TO OWN PARTS OF A BUSINESS. A SHARE OF STOCK REPRESENTS A PROPORTIONAL SHARE OF OWNERSHIP IN A COMPANY. AS THE VALUE OF THE CHANGES, THE VALUE OF THE SHARE IN THAT COMPANY RISES AND FALLS.

Mutual funds: MUTUAL FUNDS ARE A MEANS FOR INVESTORS TO GET INTO A BASKET OF STOCKS, BONDS, OR ANYTHING ELSE THE FUND MANAGER DECIDES IS WORTHWHILE. IN MANAGING YOUR MONEY YOURSELF, YOU TURN OVER THE RESPONSIBILITY OF MANAG MONEY TO A PROFESSIONAL. UNFORTUNATELY, THE VAST MAJORITY OF SUCH "PROFESSIONA UNDER-PERFORM THE MARKET INDEXES.

Exercise 11.8

Direction:- *Mark an S if the situation involves saving, an I, if the situation involves investing, a P if the situation involves personal investing, and an N if the situation involves neither saving nor investing.*

A KASSECH BORROWED BIRR 25,000 FROM A BANK TO PURCHASE COMPUTERS AND OTHER EQUIPMENT AND SUPPLIES TO OPEN HER NEW INTERNET HOME PAGE BUSIN

B BONTU BUYS 100 SHARES OF ALPHA PLC, HOPING THAT THE PRICE OF THE SHARE WILL INCREASE.

C MIKE DIES AND LEAVES HIS ESTATE OF BIRR 500,000 TO HIS CHILDREN. THEY USE IT TO TAKE AN AROUND-THE-WORLD, ONCE-IN-A-LIFETIME, ONE-YEAR CRUISE.

D DAWIT, THE HEAD OF SUNSHINE COMPUTER SYSTEMS, ISSUES SHARES OF STOCK IN HIS COMPANY THROUGH AN INVESTMENT BANKER, AND USES THOSE FUNDS TO BUILD A NEW ASSEMBLY LINE TO PRODUCE THE WORLD'S FASTEST MICROPROCESSORS.

E A WOMAN TAKES A NEW JOB AND HAS BIRR 20 A WEEK FROM EACH PAYCHECK TO BE DEPOSITED DIRECTLY INTO A SAVINGS ACCOUNT AT HER BANK.

F FORD MOTOR COMPANY ISSUES A BIRR 5,000 BOND, WHICH IS PURCHASED BY SARA.

G MEDICAL SYSTEMS, INC. BUILDS A NEW PLANT TO MANUFACTURE EXPERIMENTAL PACEMAKERS.

H MARK QUITS HIS JOB TO GO BACK TO SCHOOL FULL-TIME, HOPING TO EARN MORE MONEY WITH A COLLEGE DEGREE.

11.3.3 Borrowing Money

Group Work 11.5

DISCUSS:

A HOW ONE BORROWS MONEY.

B FROM WHERE ONE CAN BORROW MONEY.

C INSTITUTIONS THAT GIVE LOANS.

D WHY WE BORROW MONEY.

E THE ADVANTAGES AND DISADVANTAGES OF BORROWING MONEY.

LOANS, OVERDRAFTS AND BUYING ON CREDIT ARE ALL WAYS OF BORROWING. DIFFERENT M
BORROWING SUIT DIFFERENT TYPES OF PEOPLE AND SITUATIONS. WHATEVER TYPE OF BORR
CHOOSE, IT IS IMPORTANT TO MAKE SURE YOU WILL BE ABLE TO AFFORD THE REPAYMENTS.

Types of loan

Secured loan

WITH A SECURED LOAN, THE LENDER HAS THE RIGHT TO FORCE THE SALE OF THE ASSET AG
THE LOAN IS SECURED IF YOU FAIL TO KEEP UP THE REPAYMENTS. THE MOST COMMON FO
SECURED LOAN IS CALLED A 'FURTHER ADVANCE' AND IS MADE AGAINST YOUR HOME BY I
EXTRA ON YOUR MORTGAGE. (YOUR MORTGAGE IS ITSELF A SECURED LOAN.) BECAUSE SECU
ARE LESS RISKY FOR THE LENDER, THEY ARE USUALLY CHEAPER THAN UNSECURED LOA
LOANS ARE MOSTLY SUITABLE FOR BORROWING LARGE AMOUNTS OF MONEY OVER A LONG
EXAMPLE, FOR HOME IMPROVEMENTS.

Unsecured loan

AN UNSECURED LOAN MEANS THE LENDER RELIES ON YOUR PROMISE TO PAY IT BACK. THEY'RE TAKING A BIGGER RISK THAN WITH A SECURED LOAN, SO INTEREST RATES FOR UNSECURED TO BE HIGHER. UNSECURED LOANS ARE OFTEN MORE EXPENSIVE AND LESS FLEXIBLE THAN LOANS, BUT SUITABLE IF YOU WANT A SHORT-TERM LOAN (ONE TO FIVE YEARS).

Credit union loan

CREDIT UNIONS ARE MUTUAL FINANCIAL ORGANIZATIONS OWNED AND RUN BY THEIR MEMBERS FOR THEIR MEMBERS. ONCE YOU'VE ESTABLISHED A RECORD AS A RELIABLE SAVER, THEY WILL ALSO LEND YOU MONEY BUT ONLY WHAT THEY KNOW YOU CAN AFFORD TO REPAY. TO BE ABLE TO JOIN A CREDIT UNION, YOU HAVE A COMMON BOND, SUCH AS LIVING IN THE SAME AREA, A COMMON WORKPLACE OR MEMBERSHIP OF A HOUSING ASSOCIATION OR SIMILAR.

Money lines

MONEY LINES ARE COMMUNITY DEVELOPMENT FINANCE INSTITUTIONS (CDFIS) THAT LEND AND INVEST IN DEPRIVED AREAS AND UNDERSERVED MARKETS THAT CANNOT ACCESS MAINSTREAM FINANCE. THEY PROVIDE MONEY FOR PERSONAL LOANS, HOME IMPROVEMENTS, BACK TO WORK LOANS, WORKING CAPITAL, BRIDGING LOANS, PROPERTY AND EQUIPMENT PURCHASE, START UP CAPITAL AND BUSINESS PURCHASE.

Overdraft

OVERDRAFTS ARE LIKE A 'SAFETY NET' ON YOUR CURRENT ACCOUNT THAT ALLOW YOU TO BORROW UP TO A CERTAIN LIMIT WHEN THERE'S NO MONEY IN YOUR ACCOUNT AND CAN BE USEFUL FOR SHORT TERM CASH FLOW PROBLEMS. OVERDRAFTS OFFER MORE FLEXIBLE BORROWING THAN TAKING OUT A LOAN BECAUSE YOU CAN REPAY THEM WHEN IT SUITS YOU, BUT THEY'RE NOT USUALLY SUITABLE FOR BORROWING LARGE AMOUNTS OVER A LONG PERIOD AS THE INTEREST RATE IS GENERALLY HIGHER THAN WITH A PERSONAL LOAN. YOU NEED A BANK ACCOUNT IN ORDER TO GET AN OVERDRAFT.

Buying on credit

BUYING ON CREDIT IS A FORM OF BORROWING IN WHICH PAYMENT FOR GOODS OR SERVICES IS MADE USING CREDIT CARDS OR UNDER SOME OTHER CREDIT AGREEMENT.

A Advantages and disadvantages of borrowing

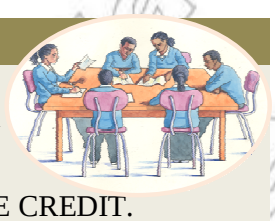
THE INTEREST PAID UP ON BORROWED MONEY IS TAX DEDUCTIBLE. THEREFORE, CHEAPER BIRR IS PAID BACK. TERMS AND CONDITIONS OF BORROWING ARE FIXED AND ARE SUBJECT TO CHANGE IN RELATION TO CHANGES IN MARKET CONDITIONS LIKE PRICE INCREMENTS. AS A RESULT, COST OF DECREASE AND THE VALUE OF THE FIRM WILL INCREASE.

THE DISADVANTAGE OF BORROWING IS THAT, IF PRICES IN THE MONEY MARKET ARE GOING UP, THE BORROWER WILL BE OBLIGED TO PAY MUCH MORE MONEY AS INTEREST ON FUND BORROWED. THIS IS BECAUSE TERMS AND CONDITIONS ARE FIXED. BOND INDENTURES ARE BURDENSOME DUE TO INFLEXIBILITY. IN ADDITION TO THIS INCREASE IN DEBT MAY CAUSE BANKRUPTCY.

B Source of loan

THE MAIN SOURCES OF LOAN ARE SAVING INSTITUTIONS LIKE COMMERCIAL BANKS, SAVING AND LOAN ASSOCIATIONS AND CREDIT UNIONS. OTHERS INCLUDE CONSUMER FINANCE COMPANIES, I COMPANIES AND PRIVATE COMPANIES.

Group Work 11.6



CONSIDER A COMPANY THAT NEED MONEY TO COVER CREDIT.

DISCUSS THE FOLLOWING TWO SITUATIONS TO SET THE CREDIT.

A BORROWING MONEY FROM A BANK.

B USING OVERDRAFT FACILITY FROM A BANK.

11.4 TAXATION

Group Work 11.7

DISCUSS IN SMALL GROUPS AND PRESENT YOUR FINDIN CLASS.

1 WHY DO GOVERNMENTS COLLECT TAXES?

2 LIST OUT THE DIFFERENT TYPES OF TAXATION.

AS GOVERNMENTS HAVE PLAYED A GROWING ROLE IN ALL ECONOMIES, THEY HAVE USED IN AMOUNTS OF RESOURCES FOR THEIR ACTIVITIES, AND TAXES HAVE CONSTITUTED I PERCENTAGES OF NATIONAL INCOME. EITHER DIRECTLY OR INDIRECTLY, THE VARIOUS GOVERNMENT PROVIDE MOST EDUCATION AND PAY A MAJOR PROPORTION OF MEDICAL BI PROVIDE NATIONAL DEFENCE, POLICE AND FIRE PROTECTION AND PROVIDE OR SUPPORT A S AMOUNT OF HOUSING, RECREATION FACILITIES AND PARKLANDS. THEY SET HEALTH STA ENSURE ADEQUATE WATER SUPPLIES, TRANSPORTATION AND OTHER PUBLIC FACILITIES. T ATTAIN A DISTRIBUTION OF INCOME REGARDED AS EQUITABLE, TO STABILIZE THE ECON PERIODS OF EXCESSIVE INFLATION OR UNEMPLOYMENT, AND TO ENSURE AN ADEQUATE GROWTH.

ACCORDING TO RICHARD MUSGRAVE, GOVERNMENTAL ACTIVITIES ARE DIVIDED INTO THRE

1 **Allocation:** THE ACTIVITIES INVOLVING THE PROVISION OF VARIOUS G SERVICES TO SOCIETY AND THUS INVOLVING THE ALLOCATION OF RESOURCES TO THE OF THESE SERVICES. SOME OF THE SERVICES ARE STRICT PUBLIC GOODS (E.G. NAT DEFENCE) SOME ARE ONES INVOLVING EXTERNALITIES (E.G. EDUCATION) SOME ARE PR BY GOVERNMENT TO AVOID PRIVATE MONOPOLY AND COSTS OF COLLECTION OF CHA HIGHWAYS).

2 **Distribution:** THE ACTIVITIES INVOLVING IN THE REDISTRIBUTION OF INCOME SUCH AS WELFARE PROGRAMS, PROGRESSIVE TAX STRUCTURES AND SO FORTH.

3 **Stabilization and growth:** THE ACTIVITIES DESIGNED TO INCREASE ECONOMIC STABILITY BY LESSENING UNEMPLOYMENT AND INFLATION AND INFLUENCING, IF T DESIRABLE, THE RATE OF ECONOMIC GROWTH.

ACTIVITY 11.10

IN ORDER TO DO ALL THE ABOVE MENTIONED ACTIVITIE ES THE GOVERNMENT GET MONEY.

A Objectives of Taxation

GOVERNMENTS IMPOSE AND COLLECT TAXES TO RAISE REVENUE. REVENUE GENERATION H NOT THE ONLY OBJECTIVE OF TAXATION, THOUGH IT IS CLEARLY THE PRIME OBJECTIVE. T FISCAL POLICY INSTRUMENT ARE USED TO ADDRESS SEVERAL OTHER OBJECTIVES SUCH AS:

1 **Removal of inequalities in income and wealth:** GOVERNMENT ADOPTS PROGRESSIVE TAX SYSTEM AND STRESSED ON CANON OF EQUALITY TO REMOVE INEQU INCOME AND WEALTH OF THE PEOPLE.

2 **Ensuring economic stability:** TAXATION AFFECTS THE GENERAL LEVEL OF CONSUMPTION AND PRODUCTION; HENCE IT CAN BE USED AS AN EFFECTIVE TOO ACHIEVING ECONOMIC STABILITY. GOVERNMENTS USE TAXATION TO CONTROL INFLA DEFLATION.

3 **Changing people's behaviors:** THOUGH TAXES ARE IMPOSED FOR COLLECTING REVENUE TO MEET PUBLIC EXPENDITURE, CERTAIN TAXES ARE IMPOSED TO ACHIEVE OBJECTIVES FOR EXAMPLE, TO DISCOURAGE CONSUMPTION OF HARMFUL PROD GOVERNMENTS IMPOSE HEAVY TAXES ON PRODUCTION OF TOBACCO AND ALCOHOL.

4 **Beneficial diversion of resources:** GOVERNMENTS IMPOSE HEAVY TAX ON NON-ESSENTIAL AND LUXURY GOODS TO DISCOURAGE PRODUCERS OF SUCH GOODS AND RATE REDUCTION OR EXEMPTION ON MOST ESSENTIAL GOODS. THIS DIVERTS PROD ATTENTION AND ENABLES THE COUNTRY TO UTILIZE LIMITED RESOURCES FOR PROD ESSENTIAL GOODS ONLY.

5 **Promoting economic growth:** ECONOMIC GROWTH DEPENDS ON THE GENERATION OF INCOME FROM INDUSTRIAL AGRICULTURAL AND OTHER AREAS. THE RATE OF E DEVELOPMENT GOES UP IF MORE INVESTMENT IS AVAILABLE TO ALL SECTORS. TAX PO GOVERNMENT IS A KEY ELEMENT IN PLANNING THE ECONOMIC GROWTH OF A COUNTR

B Principles of taxation

THE COMPULSORY PAYMENT BY INDIVIDUALS AND COMPANIES TO THE STATE IS CALLED **taxation**. GOVERNMENT IMPOSES TAXES TO RAISE REVENUE TO COVER THE COST OF ADMINISTRA MAINTENANCE OF LAW AND ORDER, DEFENSE, EDUCATION, HOUSING, HEALTH, PENSIONS

ALLOWANCES ETC. NOW, THE GOVERNMENT HAS STARTED TO SUBSIDIZE FARMING, INDUSTR
ALL THESE, TAXES ARE IMPOSED TO PROVIDE REVENUE TO COVER GOVERNMENT EXPENDITU

Adam Smith's Cannon of Taxation: ADAM SMITH HAS LAID DOWN PRINCIPLES OR CANNON OF TAXATION IN HIS BOOK "WEALTH AND NATIONS". THESE CANNONS STILL CONST FOUNDATION OF ALL DISCUSSIONS ON THE PRINCIPLES OF TAXATION.

TO CREATE AN EXCELLENT SYSTEM OF TAXATION, IT IS NECESSARY TO FIRST ESTABLISH A STANDARD PRINCIPLES FOR TAXATION. LITTLE OR NO ATTENTION HAS BEEN PAID BY GOVER TO ESTABLISH SUCH IMPORTANT PRINCIPLES.

Group Work 11.8

READ A LITERATURE THAT CAN HELP TO ESTABLISH NCIPLES THAT CREATE GOOD TAXATION SYSTEM.

C Classification of taxes

ACTIVITY 11.11

NAME SOME TYPES OF TAXES YOU KNOW.

IN ETHIOPIA TAXES ARE CLASSIFIED ON THE BASIS OF IMPACT (IMMEDIATE BURDEN) AND IN (ULTIMATE BURDEN) OF TAX. TAXES ARE CLASSIFIED INTO TWO BROAD CATEGORIES. **Direct taxes** AND **Indirect taxes**.

1 Direct taxes

DIRECT TAX IS ONE IN WHICH THE PAYER HIMSELF IS THE ULTIMATE SUFFERER OF ITS CON THIS MEANS THE INCIDENCE CANNOT BE TRANSFERRED TO A THIRD PARTY. DIRECT TAXES TO THE ETHIOPIAN TAX LAW INCLUDE ALL INCOME TAXES SUCH AS EMPLOYMENT INCO BUSINESS INCOME TAX AND LAND USE FEE, MINING INCOME TAX AND OTHER INCOME GENERALLY DIRECT TAXES ARE INCOME BASED TAXES.

Schedules of income

RECENTLY, ETHIOPIA HAS LAUNCHED A TAX REFORM PROGRAM TO ACHIEVE THE OBJECTIVES OF DEMOCRACY BY CONSIDERING TAXATION AS ONE OF THE MOST IMPORTANT AREAS WHERE REQUIRED. IT RESULTED IN THE OUTCOME OF MANY IMPORTANT PROCLAMATIONS. THE INCOME TAX PROCLAMATION (NO 286/2002) PROCLAIMED AFTER THE TAX REFORM PROGRAM COUNTRY, INCORPORATED A NUMBER OF TAX BASES AS PART OF THE DEVELOPMENT ACTIV GOVERNMENT.

THE GOVERNMENT HAS IDENTIFIED MANY TAX BASES FOR DIRECT TAXES. THESE TAX BA
CATEGORIZED INTO DIFFERENT SCHEDULES ACCORDING TO THEIR NATURE IN THE PROCLA
THE FOUR SCHEDULES INCORPORATED IN DIRECT TAXES ARE SCHEDULES 'A' 'B' 'C' AND '
BASES FOR THESE SCHEDULES ARE.

Schedule A: INCOME FROM EMPLOYMENT

Schedule B: INCOME FROM RENTAL OF BUILDING

Schedule C: INCOME FROM BUSINESS

Schedule D: OTHER INCOMES WHICH INCLUDE ROYALTIES, INCOME FROM T SERVICES RENDERED OUTSIDE THE COUNTRY, INCOME FROM GAMES OF CHANCE, DIVIDEND INCOME, CAUSAL RENTAL OF PROPERTY, INTEREST INCOME AND GAINS FROM TRANSFER OF INVESTMENT PROPERTY.

Schedule A: Employment income tax

THE EMPLOYER ASSESSES EMPLOYMENT INCOME TAX AT SOURCE BEFORE PAYING THE MONTHLY SALARY. FOR ASSESSMENT OF TAX THE EMPLOYERS MAKE USE FOLLOWING TAX RATES.

Taxable monthly income (birr)	Tax rate	Amount of tax (in birr)
UP to birr 150	Nil	Nil
151-650	10%	T × 10%-15.00
651-1400	15%	T × 15%-47.50
1401-2350	20%	T × 20%-117.50
2351-3550	25%	T × 25%-235.00
3551-5000	30%	T × 30%-412.50
More than 5000	35%	T × 35%-662.50

Example 1 ASSUME ATO DAGIM EARNS A MONTHLY SALARY OF BIRR 1350 THE INCOME TAX WILL BE CALCULATED AS FOLLOWS.

TOTAL TAXABLE INCOME	1350	
LESS: THE MINIMUM AMOUNT NOT TAXED	150	
REMAINING TAXABLE INCOME	1200	
LESS: FIRST BIRR 500 TAXED AT 10%		500 ×10% = 50.00
REMAINING TAXABLE INCOME BIRR 700 TAXED AT 15%		700 × 15% = 105.00
TOTAL TAX OF THE MONTH		155.00

ATO DAGIM'S NET INCOME IS THEN 1350 – 155 = BIRR 1195.

ACTIVITY 11.12

IF ATO DAGIM WHOSE SALARY WAS BIRR 1350 GOT A SALARY INCREMENT OF BIRR 500,

A CALCULATE THE TAX ON THE NEW INCREMENT.

B WHAT WILL BE HIS NET SALARY AFTER THE INCREMENT?

Schedule B: Rental income tax

WHEN LEASING A BUILDING, CERTAIN ITEMS OF EXPENSES (DEDUCTIBLE EXPENSES) CA SUBTRACTED FROM THE GROSS INCOME IN ORDER TO ARRIVE AT THE AMOUNT THAT IS EXPENSES ALLOWABLE AGAINST THE RENTAL INCOME ARE THOSE INCURRED WHOLLY OR E CONNECTION WITH THE LEASING ACTIVITY. DEDUCTIONS INCLUDE TAXES PAID WITH RESP LAND AND BUILDING LEASED EXCEPT INCOME TAXES AND A TOTAL OF AN ALLOWANCE OF GROSS RENT RECEIVED; FOR REPAIRS, MAINTENANCE AND DEPRECIATION OF SUCH BUILDIN AND EQUIPMENT. THE TAX RATE FOR A BODY IS 30% AND OTHERS ARE AS IN THE FOLLOWING

(T) Annual taxable income (birr)	Rate	Short cut formula
Upto-1800	Nil	Nil
1801-7800	10%	$T \times 10\%-180$
7801-16,800	15%	$T \times 15\%-570$
16,801-28,200	20%	$T \times 20\%-1410$
28,201-42,600	25%	$T \times 25\%-2820$
42,601-60,000	30%	$T \times 30\%-4950$
60,001-and above	35%	$T \times 35\%-7950$

Schedule C: Business income tax

THE INCOME TAX PROCLAMATION (286/2002) PROVIDES THE TAX RATES THAT SHOULD BE USED FOR THIS PURPOSE. THE TAX RATE IS APPLIED ON THE ASSESSED TAXABLE INCOME OF THE UNIT. ONCE THE DECLARATION IS MADE BY THE BUSINESS UNIT, ITS ACCURACY IS CHECKE TAX OFFICE THROUGH A PROCESS CALLED TAX ASSESSMENT. TAX ASSESSMENT IS A TAX R TAX OFFICIAL OF A TAX DECLARATION AND INFORMATION PROVIDED BY A TAXPAY VERIFICATION OF THE ARITHMETICAL AND FINANCIAL ACCURACY OF THE DECLARED TAX PROCEDURE FOR THE ASSESSMENT OF BUSINESS INCOME TAX TAKES TWO FORMS.

- ✓ ASSESSMENT BY BOOKS OF ACCOUNTS AND
- ✓ ASSESSMENT BY ESTIMATION.

TAX OF THOSE TAXPAYERS WHO HAVE DIFFERENT SOURCES OF INCOME UNDER SCHEDULE BE ASSESSED ON THE AGGREGATE OF ALL INCOME.

THE TAX RATES USED FOR COMPUTATION OF INCOME UNDER SCHEDULE "C" ARE THE SAME SCHEDULE "B". UNDER SCHEDULE "C" THERE ARE THREE CATEGORIES WHICH ARE "A", "B" AND "C". A AND B CATEGORIES ARE ASSESSED BY BOOKS WHERE AS CATEGORY "C" IS ASSESSED BY EST

Schedule D: Other income taxes

PEOPLE OFTEN GET INCOME FROM OTHER SOURCES (OR IN ADDITION OTHER THAN) THE INCOME OBTAINED FROM THEIR EMPLOYMENT, THEIR BUSINESS ACTIVITIES OR THEIR RENTING ACT INCOME FROM OTHER ACTIVITIES IS TAXED AT A FLAT RATE AS DESCRIBED BELOW.

SOURCE OF INCOME	RATE
ROYALTY	5%
TECHNICAL SERVICES	10%
DIVIDEND	10%
INTEREST	5%
GAME OF CHANCE	15%
CASUAL RENTAL OF PROPERTY	15%
GAIN ON TRANSFER OF INVESTMENT PROPERTY:	GAIN ON SHARE CAPITAL 30%
	OTHER CAPITAL GAIN 15%

Example 2 ATO TEKLE LEASED HIS PERSONAL CAR FOR TWO MONTHS AT BIRR 6000 PER MONTH. SUCH INCOME IS REFERRED TO AS CASUAL RENTAL INCOME BY THE TAX EXPERT

i HOW MUCH IS THE TAX TO BE PAID? ii WHO IS LIABLE TO PAY THE TAX?

Solution

i TAX ON CASUAL RENTAL OF PROPERTY = 15% OF GROSS RENTAL INCOME

= 15% × (6000×2)

= 15%× 12,000.00 = BIRR 1800.00

ii THE RECEIVER OF THE INCOME, ATO TEKLE, IS LIABLE TO WITHHOLD AND PAYS THE REQUIRED TAX TO TAX AUTHORITY.

Example 3 SELAM OWNED 200,000 SHARES OF COMMON STOCK OF XYZ COMPANY. THE COMPANY DECLARED AND PAID A DIVIDEND OF BIRR 2 PER SHARE.

i HOW MUCH DIVIDEND IS SELAM ENTITLED TO?

ii HOW MUCH IS THE TAX TO BE PAID?

Solution

i DIVIDEND INCOME = 200,000 SHARES × BIRR 2 PER SHARE = BIRR 400,000.

ii TAX ON DIVIDEND INCOME = 10%× 400,000 = BIRR 40,000.

Note:

THE DIVIDEND INCOME AFTER TAX IS PAID = 140,000 – 40,000 = 100,000 AND NILE COMPANY IS LIABLE TO PAY THE INCOME TAX TO THE TAX AUTHORITY.

Example 4 ATO ALEMU HAS A DEPOSIT WITH AWASH BANK SC. WHICH HE GET INTEREST BIRR 140,000 IN A YEAR. HOW MUCH OF THIS IS WITHHELD BY AWASH BANK FOR TAX PURPOSE?

Solution TAX WITHHELD = 140,000 × 5% = BIRR 7,000

Example 5 FITSUM WON BIRR 300.000 FROM THE NATIONAL LOTTERY. WITHHOLDING TAX IS PAID ONLY IF THE AMOUNT EXCEEDS BIRR 100.

REQUIRED:

A WHAT IS THE AMOUNT OF TAX WITHHELD BY THE AUTHORITY?

B HOW MUCH DID FITSUM RECEIVE?

Solution

A TAX WITH HELD = 300,000 × 15%= 45,000

B AMOUNT RECEIVED BY FITSUM = 300,000.00 – 45,000 = BIRR 255,000.00

Example 6 THE AUTHOR OF A BOOK GAVE THE COPY RIGHT TO MEGA PUBLISHERS, ETHIOPIA, FOR ROYALTY OF BIRR 280,000 HOW MUCH TAX WILL MEGA PUBLISHER WITHHOLD ON THIS ROYALTY PAYMENT?

Solution ROYALTY = 280,000 × 5% = BIRR 14,000

Example 7 ATO SAMUEL ACQUIRED 1000 SHARES OF ADMAS CO. FOR BIRR 4,500 EACH AND SOLD THEM AT BIRR 6,000 EACH. HOW MUCH DOES HE PAY AS CAPITAL GAIN TAX

Solution GAIN = (6000 – 4500) × 1000 = BIRR 1,500,000.

CAPITAL GAIN TAX = 1,500,000.00 × 30% = BIRR 450,000.

Example 8 KURTU TRADING CO. SOLD ONE OF ITS BUILDING FOR BIRR 980,000 WHICH IT ACQUIRED FOR 720,000. COMPUTE THE CAPITAL GAIN TAX.

Solution CAPITAL GAIN= 980,000 – 720,000 = BIRR 260,000.

CAPITAL GAIN TAX = 260,000 × 15% = BIRR 39,000.

2 Indirect taxes

INDIRECT TAX IS A TAX IN WHICH THE BURDEN CAN NOT BE SWALLOWED BY BUSINESS; WHICH MEANS, INDIRECT TAXES CAN BE SHIFTED ONTO OTHER PERSONS. GENERALLY THE TA OF INDIRECT TAX IS ON THE ULTIMATE CONSUMER; HOWEVER, SOMETIMES A SELLER MIGH SUCH INDIRECT TAX TO BE COMPETITIVE IN THE MARKET. THIS ACTION REDUCES ITS PROFI TAXES ARE CONSUMPTION BASED TAXES. IN ETHIOPIA THE INDIRECT TAX CATEGORY INCLU ADDED TAX (VAT), EXCISE TAX, TURNOVER TAX (TOT), CUSTOM DUTIES AND STAMP DUTY.

Value Added Tax (VAT)

VAT IS A LEVY IMPOSED ON BUSINESS AT ARODUCTION AND DISTRIBUTION OF GOODS AND SERVICES. IT IS DETERMINED ON THE BASIS OF THE INCREASE IN PRICE, OR VALUE, PRO EACH STAGE IN THE CHAIN OF DISTRIBUTION. IT IS A GENERAL CONSUMPTION TAX ASSESS VALUE ADDED TO GOODS AND SERVICES. SOME GOODS ARE EXEMPTED FROM VAT. SUPI WHICH ARE NOT EXEMPTED ARE CALLED TAXABLE SUPPLIES. TAXABLE SUPPLIES AND IMPO ARE TAXED AT A FLAT RATE OF 15% IN OUR COUNTRY. SOME TAXABLE SUPPLIES ARE ZERO R RATED SUPPLIES ARE THOSE ON WHICH VAT ON SUPPLY/SALE IS CHARGED AT ZERO RATES.

IN ETHIOPIA INVOICE CREDIT METHOD IS USED FOR VAT. UNDER THIS METHOD, VAT PAYABLE IS THE DIFFERENCE BETWEEN THE TAX CHARGED ON TAXABLE TRANSACTIO PAID ON IMPORT OF GOODS OR ON THE PURCHASE OF SUPPLIES WHERE SUCH SUPPLIES ARE TO BE USED FOR THE TAXABLE TRANSACTIONS.

Example 9 NOKIA COMPANY PURCHASED MOBILES FOR BIRR 54,000 NET INVOICED AND WILL PAY THE SUPPLIER BIRR 62,100 OF WHICH 8,100 IS VAT. NOKIA SELL THESE MOBILES FOR 86,250 (BIRR 75,000 + BIRR 11,250 VAT.). THE VAT LIABILITY OF NOKIA COMPANY IS BIRR 3,150 (11,250 – 8,100) THE DETAIL IS ILLUSTRATED BELOW.

Purchase and sale of Mobile			
	Birr	VAT (15%)	Explanation
REVENUE	75,000.00	11250	OUTPUT TAX
COST	54,000.00	8100	INPUT TAX
VALUE ADDED	21,000.00	3150	VAT LIABILITY.

Turnover Tax (TOT)

TO ENHANCE FAIRNESS IN COMMERCIAL DEALINGS AND TO EXTEND COVERAGE OF THE TAX SYSTEM, A TURNOVER TAX IS IMPOSED ON THOSE PERSONS WHO ARE NOT REQUIRED TO RE VAT, BUT SUPPLY GOODS AND SERVICES IN THE COUNTRY. AS A RESULT, PERSONS WH ENGAGED IN THE SUPPLY OF GOODS AND RENDERING OF SERVICE (WHICH ARE TAXABLE) ARE NOT REQUIRED TO REGISTER FOR VAT HAVE TO PAY TURNOVER TAX ON THE VALUE OF SUPPLY OR ON THE VALUE OF SERVICES THEY RENDER. TOT IS COMPUTED AS PER THE PROCL NO 308/2002. THE TOT RATE IS

- ✓ ON GOODS SOLD LOCALLY: 2%
- ✓ ON SERVICES RENDERED LOCALLY:
  - CONTRACTORS, GRAIN MILLS, TRACTORS, AND COMBINE HARVESTERS: 2%
  - OTHERS:10%

Example10 ELSA STATIONERY HAS DAILY SALES OF BIRR 205. IT IS OPEN 280 DAYS PER YEAR. HOW MUCH IS THE TURNOVER TAX PAYABLE BY ELSA?

Solution ANNUAL SALES = 280×205 = BIRR 57,400.

TOT = BIRR 57,400 × 2% = BIRR 1148.

Excise Tax

WITH A VIEW TO INCREASE THE REVENUE OF THE GOVERNMENT FOR PUBLIC GOODS AND SERVICES AND TO REDUCE THE CONSUMPTION OF SPECIFIC GOODS, THE GOVERNMENTS OF LEVIES EXCISE TAX ON SELECTED ITEMS OF GOODS THAT ARE SUPPLIED IN THE COUNTRY. EXCISE TAX PROCLAMATION NO 307/2002, THE ITEMS OF GOODS THAT ARE SUBJECT TO EXCIS ETHIOPIA ARE: GOODS IMPORTED TO THE COUNTRY AND GOODS PRODUCED LOCALLY. T IMPOSED EQUALLY ON BOTH IMPORTED AND LOCALLY PRODUCED GOODS AT A RATE DEFI PROCLAMATION. THE MAJOR ITEMS INCLUDED ARE SUGAR, SALT, TOBACCO, ALCOHOL, TE JEWELERS, VEHICLES AND TELEVISIONS.

Example 11 AWASSA TEXTILE INCURRED THE FOLLOWING COSTS DURING THE MONTH OF 2002 E.C FOR TEXTILE PRODUCTION. COMPUTE THE EXCISE TAX PAYABLE.

MATERIAL USED	BIRR 1,506,000
DIRECT LABOUR	BIRR 404,000
INDIRECT COSTS	BIRR 900,000
Total	BIRR 2,810,000

(Note:- Textile is taxed at a rate of 10%)

Solution EXCISE TAX PAYABLE = 2,810,000 ×10% = BIRR 281,000

Example12 A COMPANY IS IMPORTING SUGAR FROM CHINA NATIONAL SUGAR IMPORTING CO 842,000 BIRR 210,500 AND BIRR 165,500 FOR PURCHASING, INSURANCE AND FREIGHT RESPECTIVELY. COMPUTE THE EXCISE TAX PAYABLE.

(Note:- Sugar is taxed at a rate of 33%)

Solution TOTAL COST (PURCHASE, INSURANCE AND FREIGHT)

(842,000 + 210,500 + 165,500) = BIRR 1,218,000.

EXCISE TAX PAYABLE = 1,218,000 × 33% = BIRR 401,940.

Customs duty

CUSTOMS DUTY REFERS TO THE TAX TARIFF IMPOSED BY THE TAX AUTHORITY DIRECTLY ON THE ACTIVITIES OF IMPORT AND EXPORT OF GOODS AND SERVICES. CUSTOM DUTY IS LEVIED O PRODUCTION FOR LOCALLY PRODUCED GOODS AND COST, INSURANCE AND FREIGHT (CIF IMPORTED ITEMS. DUTIES OF CUSTOMS ARE LEVIED ON GOODS IMPORTED TO OR EXPORT ETHIOPIA AT A RATE RANGING FROM 0 TO 35% AS FOLLOWS.

Imports	Tax rate (%)
RAW MATERIALS, CAPITAL GOODS, CHEMICALS AND	0-20
DURABLE AND NON DURABLE CONSUMER G	20-35
LUXURIES AND GOODS THAT CAN BE PRODUCE	30-35

UTICALS

ITEMS LIKE DIPLOMATIC AND CONSULAR MISSIONS, PERSONAL EFFECTS, GRANTS AND GIFTS ETHIOPIA, FIRE FIGHTING INSTRUMENTS AND APPLIANCES, TRADE SAMPLES, DEFENCE AND P SECURITY EQUIPMENTS, MATERIALS FOR HANDICAPPED AND SIMILAR ITEMS ARE EXEMPTED CUSTOMS DUTY.

Example 13 KENT TOBACCO IMPORTING COMPANY PAID COST OF THE PURCHASE $120,000.00, INSURANCE PREMIUM AND FREIGHT COSTS ARE, RESPECTIVELY, $12,000.00 AND $8,000.00.THE EXCHANGE RATE IS CURRENTLY $1=12.50 BIRR.

COMPUTE THE CUSTOM DUTY. *(Note: Tobacco is taxed at 35%.)*

Solution CIF = (120,000 + 12,000 + 8,000) × BIRR 12.50

= 140,000 × BIRR 12.50 = BIRR 1,750,000.

CUSTOM DUTY = BIRR 1,750,000 ×35% = BIRR 612,500.

Exercise 11.9

1 FIND THE INCOME TAX OF THE FOLLOWING EMPLOYEES OF THE SH. COMPANY.

A W/RO MEBRAT WITH MONTHLY SALARY OF BIRR 850.

B ATO TESFU WITH MONTHLY SALARY OF BIRR 2,390.

C DR. GEBRU WITH MONTHLY SALARY OF BIRR 5,400.

2 BUNA BANK DECLARED TO PAY 20% DIVIDEND TO ITS SHARE HOLDERS. FIND THE DIVIDEND EARNED AND TAX TO BE PAID BY THE FOLLOWING SHARE HOLDERS.

A MESFIN WITH BIRR 300,000 WORTH OF SHARES.

B ASKALE WITH BIRR 100,000 WORTH OF SHARES.

C W/RO ALMAZ WITH BIRR 450,000 WORTH OF SHARES.

3 IF KASSA WON A LOTTERY WORTH OF BIRR 150,000, FIND THE AMOUNT OF TAX HE IS LIABLE TO AND HIS NET INCOME.

4 ZEWDINESH RENTED HER LOADER FOR 10 DAYS AT A RATE OF BIRR 5,000 PER DAY. DETERMINE THE AMOUNT SHE EARNS AFTER TAX.

5 A COMPANY PURCHASED THE FOLLOWING ITEMS FROM A STATI

Item	Quantity	Unit price before VAT	Total price
COMPUTE	5	12,500	
TONEI	5	2,400	
CABLES	5	150	

I COMPLETE THE TABLE

II WHAT IS THE TOTAL VAT TO BE PAID?

III WHAT IS THE TOTAL PRICE OF THE ITEMS INCLUDING VAT?

IV IF THE COMPANY WANT TO PAY FOR THE SUPPLIER AFTER SUBTRACTING 2% WITHHOLDING TAX BEFORE VAT,

A WHAT IS THE AMOUNT THAT WILL BE SUBTRACTED?

B WHAT IS THE AMOUNT THAT THE COMPANY HAS TO PAY FOR THE SUPPLIER AFTER SUBTRACTED BY WITHHOLDING TAX?

6 A COMPANY WANTS TO BUY FIVE CARS FROM MOTOR CO. IF THE PRICE OF EACH CAR INCLUDING VAT IS BIRR 550,000, THEN

I WHAT IS THE TOTAL PRICE OF EACH CAR BEFORE VAT?

II IF THE COMPANY WANTS TO SUBTRACT A 2% WITHHOLDING TAX, WHAT IS THE AMOUNT TO BE SUBTRACTED?

III WHAT IS THE AMOUNT THAT THE COMPANY SHOULD PAY TO MOTOR CO. AFTER WITHHOLDING 2% IS SUBTRACTED?

7 A SHOE DEALER PURCHASED NET BIRR 8,000 WORTH OF SHOE FROM A SHOE COMPANY.

A FIND THE AMOUNT IT IS TO PAY THE COMPANY INCLUDING VAT.

B IF THE DEALER SOLD THE SHOES FOR BIRR 12,000, FIND THE AMOUNT OF VAT LIABLE TO THE DEALER.

8 AN ARTIST SOLD HIS NEW SONG TO A PRODUCER COMPANY FOR BIRR 350,000. WHAT IS THE ROYALTY THAT SHOULD BE PAID BY THE ARTIST.

Key Terms

annually	jointly proportional	rate
base	liquidity	ratio
book value	markup	reducing-balance method
commercial discount	mean proportion	restrictions
compound interest	ordinary annuity	safety
compound proportion	percentage	salvage value/residual value
depreciation	present value	semi-annually
earnings	principal	simple interest
fixed-installment method	proportion	simple proportion
future value	proportionality constant	taxes
interest	quarterly	terms

Summary

1 A **ratio** IS A COMPARISON OF TWO OR MORE QUANTITIES EXPRESSED IN THE SAME UNI MEASUREMENT.

2 A **rate** IS A COMPARISON OF TWO OR MORE QUANTITIES EXPRESSED IN DIFFERENT UN MEASUREMENT.

3 A RATIO CAN BE A RATE.

4 RATE OF CHANGE $= \frac{\text{AMOUNT OF CHANGE}}{\text{ORIGINAL AMOUNT}} = \frac{\text{FINAL AMOUNT - ORIGINAL AMOUNT}}{\text{ORIGINAL AMOUNT}}$

5 A **proportion** IS A STATEMENT OF EQUALITY BETWEEN TWO RATIOS.

6 A **compound proportion** IS A SITUATION IN WHICH ONE VARIABLE QUANTITY DEPENDS ON TWO OR MORE OTHER VARIABLE QUANTITIES.

7 A **percentage** IS THE NUMERATOR OF A FRACTION WHOSE DENOMINATOR IS 100.

8 **Percentage = base $\times$ rate**

9 **Markup = Selling price - Cost**

10 THE **future value of a simple interest** INVESTMENT IS OBTAINED BY

$A = P + I = P + Prt = P(1 + rt)$

11 THE **future value of a compound interest** INVESTMENT IS OBTAINED BY

$$A = P\left(1+\frac{r}{m}\right)^{mt}$$

12 THE **future value of an ordinary annuity** IS GIVEN BY $S = R\left(\frac{(1+i)^n - 1}{i}\right)$ AND THE AMOUNT OF INTEREST IS $I = nR - S$.

13 **Plant assets** OR **fixed assets** ARE TANGIBLE ASSETS USED IN BUSINESS THAT ARE OF A PERMANENT OR RELATIVELY FIXED NATURE.

14 **Depreciation** OF A PLANT ASSET IS DECREASE IN USEFULNESS OF THE ASSET.

Review Exercises on Unit 11

1 WHAT IS THE RATIO OF 1.8 KM TO 800 METER?

2 IN A FAMILY THERE ARE THREE DAUGHTERS AND A SON. WHAT IS THE RATIO OF THE NU

A FEMALES TO THE NUMBER OF PEOPLE IN THE FAMILY?

B MALES TO THE NUMBER OF FEMALES IN THE FAMILY?

3 ALLOCATE A PROFIT OF BIRR 21,400 OF A COMPANY AMONG THREE PARTNERS IN THE RATIO OF THEIR SHARE OF THE COMPANY $1\frac{1}{3}, 2\frac{2}{5}, 2\frac{1}{7}$

4 15 WORKERS CAN ACCOMPLISH A JOB IN 28 DAYS. AT THE SAME RATE, HOW MANY WORKERS CAN THE WORK BE ACCOMPLISH IN 8 DAYS LESS TIME?

5 WHAT PERCENT OF BIRR 52 IS BIRR 3.12?

6 8.35% OF WHAT AMOUNT IS BIRR 18.37?

7 A 6% TAX ON A PAIR OF SHOES AMOUNTS TO BIRR 10.20. WHAT IS THE COST OF THE PAIR OF SHOES?

8 IF THE AVERAGE DAILY WAGE OF A LABOURER INCREASED FROM BIRR 16.80 TO BIRR 21.64 IN THE LAST THREE YEARS, WHAT IS THE RATE OF INCREASE?

9 A RADIO RECORDER SOLD FOR BIRR 210 HAS 5% MARKED ON THE SELLING PRICE. WHAT IS THE COST?

10 ATO ALULA DEPOSITED BIRR 3,000 IN A SAVING ACCOUNT THAT PAYS 6% INTEREST RATE PER YEAR, COMPOUNDED QUARTERLY. WHAT IS THE AMOUNT OF INTEREST OBTAINED AT T SEVEN YEARS? (NO DEPOSIT OR WITHDRAWAL IS MADE IN THESE SEVEN YEARS)

11 ATO ALEMU MAKES REGULAR DEPOSITS OF BIRR 230 AT THE END OF EACH MONTH FOR 3 YEARS. WHAT IS THE FUTURE VALUE OF HIS DEPOSIT, IF INTEREST RATE PER YEAR COMPOUNDED MONTHLY? WHAT IS THE AMOUNT OF INTEREST?

12 AT THE END OF EACH MONTH ATO MOHAMMED DEPOSITS 10% OF HIS SALARY ON A SAVING INSTITUTION THAT PAYS ANNUAL INTEREST RATE OF 6% FOR ONE YEAR AND THEN 15% NEXT 3 YEARS. IF THE SALARY OF ATO MOHAMMED IS BIRR 1800, FIND THE FUTURE VAL HIS DEPOSITS AT THE END OF THE 4 YEARS.

13 A PIECE OF MACHINERY COSTS BIRR 50,000 WITH AN ESTIMATED SALVAGE VALUE OF BIRR 7,000 AND A USEFUL LIFE OF 8 YEARS. IT WAS PLACED IN SERVICE ON APRIL 1 OF THE CU FISCAL YEAR. DETERMINE THE ACCUMULATED DEPRECIATION AND BOOK VALUE AT T THE FOLLOWING FISCAL YEAR USING:

A THE FIXED INSTALLMENT METHOD B THE DOUBLE REDUCING BALANCE METHOD.

MATHEMATICS

STUDENT TEXTBOOK GRADE 11

ISBN 978-99944-2-046-9

FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA
MINISTRY OF EDUCATION

Price ETB 60.90