

Unit

# 9



## MATHEMATICAL APPLICATIONS FOR BUSINESS AND CONSUMERS

### Unit Outcomes:

*After completing this unit, you should be able to:*

- *find unit cost, the most economical purchase price and the total cost.*
- *apply percent decrease to business discounts.*
- *calculate the initial expense of buying a house and the ongoing expenses of owning it.*
- *calculate commissions, total hourly wages and salaries.*

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## INTRODUCTION

THE MAIN GOAL OF THIS UNIT IS TO HELP YOU START THINKING ABOUT HOW TO APPLY COST CALCULATIONS TO YOUR EVERYDAY LIFE. FOR EXAMPLE, BEFORE MAKING PURCHASES, YOU NEED TO KNOW HOW MUCH YOU CAN SPEND, HOW MUCH YOU CAN BUY, AND WHICH ARE THE MOST ECONOMICAL PURCHASES AVAILABLE TO YOU. ON A BIGGER SCALE, YOU NEED TO DETERMINE THE KIND OF LIFESTYLE YOU WANT OR EXPECT, BEFORE YOU CAN IDENTIFY THE TYPE OF JOB YOU NEED IN ORDER TO SUPPORT IT. ALONG THE SAME LINES, WHEN MULTIPLE JOB OPPORTUNITIES PRESENT THEMSELVES TO YOU, YOU NEED TO BE ABLE TO CALCULATE RELATIVE INCOME FROM THE SALARIES, WAGES AND COMMISSIONS THAT YOU COULD EARN.

IN SHORT, YOU NEED TO KNOW YOUR NET INCOME AND YOUR NET WORTH FOR MANY REASONS. ONE OF THE MOST IMPORTANT TIMES FOR KNOWING THIS IS WHEN YOU WANT TO BUY A HOUSE, ESPECIALLY IF YOU ARE CONTEMPLATING TAKING OUT ON A MORTGAGE FOR IT.



### OPENING PROBLEM

MR. GEMECHU WANTS TO PURCHASE A HOUSE FOR BIRR 795,000 FROM SUNSHINE REAL ESTATE. BECAUSE HE CAN'T AFFORD THIS PRICE ALL AT ONCE, HE HAS CHOSEN AN ALTERNATIVE: PAYING 10% OF THE PURCHASE-PRICE NOW AND THEN PAYING THE REMAINDER OVER 30 YEARS AT 9% INTEREST, COMPOUNDED MONTHLY. ACCORDING TO THIS SCHEDULE, CAN YOU CALCULATE THE EXPECTED MONTHLY PAYMENTS?

### 9.1

## APPLICATIONS TO PURCHASING

ONE OF THE MOST DIFFICULT TASKS IN CALCULATING THE FINANCIAL CONSEQUENCES OF A PURCHASE IS ESTIMATING EXACTLY HOW COSTS DIFFER. IN THIS SECTION, YOU WILL LEARN HOW TO USE UNIT COST TO DETERMINE THE MOST ECONOMICAL PURCHASE.

### ACTIVITY 9.1



- 1 SHIFERAW BUYS 6 NOTEBOOKS AT BIRR 6.25 EACH.
  - A HOW MUCH MUST HE PAY?
  - B HOW MUCH CHANGE WILL HE GET, IF HE PAYS WITH A BIRR 50 NOTE?
- 2 FIVE PENS COST BIRR 4.75.
  - A FIND THE COST OF EACH PEN.
  - B HOW MUCH DO 11 PENS COST?

NOTE THAT *unit cost* IS THE COST OF ONE UNIT, AND IS OBTAINED BY MULTIPLYING THE UNIT COST BY THE NUMBER OF UNITS. NOW LOOK AT THE FOLLOWING EXAMPLES.

**Example 1** IF 20 LITRES OF KEROSENE COST BIRR 170.00, WHAT IS THE COST OF KEROSENE PER LITRE?

**Solution** 
$$\text{UNIT COST} = \frac{\text{TOTAL COST}}{\text{NUMBER OF UNITS}} = \frac{\text{BIRR } 170}{20\text{L}} = \text{BIRR } 8.50 \text{ PER L}$$

**Example 2** HOW MUCH WOULD YOU PAY FOR 120 TEXTBOOKS AT BIRR 25.30 EACH, 10 PENS AT BIRR 1.50 EACH AND 30 DOZEN ERASERS AT BIRR 0.75 EACH?

**Solution** TOTAL COST = UNIT COST × NUMBER OF UNITS.

TOTAL PRICE FOR TEXTBOOKS:  $120 \times \text{BIRR } 25.30 = \text{BIRR } 3,036$

TOTAL PRICE FOR PENS:  $10 \times \text{BIRR } 1.50 = \text{BIRR } 15$

TOTAL PRICE FOR ERASERS:  $30 \times 12 \times \text{BIRR } 0.75 = \text{BIRR } 270$

THUS, THE TOTAL COST IS BIRR 3036 + BIRR 15 + BIRR 270 = BIRR 3,321.

**Example 3** ONE STORE SELLS 6 CANS OF COLA FOR BIRR 20.40 EACH, STORE B SELLS 24 CANS OF THE SAME BRAND FOR BIRR 79.20. FIND THE BETTER BUY.

**Solution** TO DETERMINE THE MOST ECONOMICAL PURCHASE, YOU NEED UNIT COST.

$\text{BIRR } 20.40 \div 6 = \text{BIRR } 3.40$

$\text{BIRR } 79.20 \div 24 = \text{BIRR } 3.30$

HENCE, BUYING 24 CANS FOR BIRR 79.20 BETTER VALUE.

### Exercise 9.1

**1** FIND THE TOTAL COST OF 15 ROLLS OF WALL PAPER AT BIRR 12.00 PER ROLL AND 10 LITRES OF PAINT AT BIRR 18.40 PER LITRE AND 5 BRUSHES AT BIRR 6.30 EACH.

**2** FIND THE MORE ECONOMICAL PURCHASE: 5 BUREN NAILS FOR BIRR 25.80 OR 1000 G OF NAILS FOR BIRR 25.80.

**3** A FAMILY BUYS 3 CHILDREN'S MEALS THAT COST BIRR 12.00 EACH AND 32 VALUE MEALS THAT COST BIRR 52.00 EACH. HOW MUCH DOES THE FAMILY SPEND ALTOGETHER?

**4** IMAN WANTS TO BUY 12 BOTTLES OF LEMONADE FOR HER BAT BAMBIS SUPERMARKET, LEMONADE IS ON A "BUY ONE, GET ONE AT HALF PRICE" SPECIAL OFFER. BOTTLES COST BIRR 7.25 EACH.

**A** HOW MUCH DOES IMAN PAY FOR THE 12 BOTTLES OF LEMONADE?

**B** HOW MUCH DOES SHE SAVE BECAUSE OF THE SPECIAL OFFER?

**5** MEGERESSA IS PAID BIRR 35.40 PER HOUR. HOW MANY HOURS PER WEEK SHOULD HE WORK?

**A** WHAT IS THE MAXIMUM AMOUNT OF MONEY HE CAN EARN IN A WEEK?

**B** HOW MANY HOURS PER WEEK SHOULD HE WORK IF HE WANTS TO EARN BIRR 1.20?

## 9.2 PERCENT INCREASE AND PERCENT DECREASE

### 9.2.1 Review of Percentage

THE WORD "CENT" COMES FROM THE LATIN WORD "CENTUM", MEANING ONE HUNDRED. THE "PERCENT" MEANS "FOR EVERY HUNDRED". PERCENT IS DENOTED BY THE SYMBOL %. YOU USE THE TERM "PERCENT" FREQUENTLY. FOR EXAMPLE, TEST GRADES ARE USUALLY EXPRESSED IN PERCENTAGES: "I GOT 85% ON MY MATHEMATICS TEST". INTEREST ON LOANS IS ALSO EXPRESSED USING PERCENTAGES: "I JUST BOUGHT A NEW HOUSE - THE COST OF THE HOUSE IS BIRR 250,000 AND THE INTEREST RATE IS 8.5%." "THE RATE OF INFLATION IS SLOWING. FOR THE LAST QUARTER, THE AVERAGE COST OF LIVING ROSE ONLY 1% PER MONTH."

### ACTIVITY 9.2



- 1 FIND 28% OF 850.
- 2 WHAT PERCENTAGE OF 1500 IS 75?
- 3 MOHAMMED GOT 17 OUT OF 20 IN HIS GEOGRAPHY TEST AND 45 OUT OF 50 IN HIS ENGLISH TEST. IN WHICH SUBJECT DID HE SCORE BEST?
- 4 BEZA SOLD 24 ORANGES. IF THIS WAS 12% OF HIS ORANGES, HOW MANY ORANGES ARE UNSOLD?

### Working out percentages

RECALL THAT  $\text{RATE} \times \text{BASE (B)} = \text{PERCENTAGE (P)}$ .

**Example 1** FIND 15% OF 420.

**Solution** HERE, 15% = 0.15 IS CALLED THE RATE (EXPRESSED IN PERCENT);

420 IS THE BASE (ENTIRE AMOUNT), AND  $P = R \times B$

$$\text{SO } P = 0.15 \times 420 = 63$$

**Example 2** WHAT IS THE NUMBER WHOSE 30% IS 600?

**Solution**

**Given:**  $R = 30\% = 0.30$ ,  $P = 600$ . **Required:** B

$$\text{AS } P = R \times B, \quad B = \frac{P}{R} = \frac{600}{0.30} = 2000$$

**Example 3**  $\frac{7}{10}$  OF THE SURFACE OF THE EARTH IS WATER. EXPRESS THIS AS A PERCENTAGE.

**Solution**  $\frac{7}{10} \times 100\% = 70\%$

## 9.2.2 Percentage Increases and Decreases

**Example 4** MOENCO INCREASES THE PRICE OF A TOYOTA CAR BY 20%. IF THE ORIGINAL PRICE WAS BIRR 170,000, CALCULATE ITS NEW PRICE.

### SOLUTION

#### Method 1

20% OF BIRR 170,000 =  $0.20 \times \text{BIRR } 170,000 = \text{BIRR } 34,000$ .

NOW ADD THIS TO THE ORIGINAL PRICE:

$$\text{NEW PRICE} = \text{BIRR } 170,000 + \text{BIRR } 34,000 = \text{BIRR } 204,000$$

#### Method 2

THE ORIGINAL PRICE REPRESENTS 100%, AND THEREFORE THE NEW PRICE CAN BE REPRESENTED AS 120%:

$$120\% \text{ OF BIRR } 170,000 = 1.20 \times \text{BIRR } 170,000 = \text{BIRR } 204,000$$

**Example 5** A SHOP IS OFFERING A 15% DISCOUNT ON ITS MERCHANDISE. IF THE ORIGINAL PRICE OF A SHIRT IN THE SHOP WAS BIRR 150 BEFORE THE DISCOUNT, WHAT IS THE CURRENT (SALE) PRICE OF THE SHIRT?

### SOLUTION

#### Method 1

**Step 1** FIND THE DISCOUNT, 15% OF BIRR 150:

$$0.15 \times \text{BIRR } 150 = \text{BIRR } 22.50$$

**Step 2** DEDUCT THE DISCOUNT:

$$\text{BIRR } 150 - \text{BIRR } 22.50 = \text{BIRR } 127.50$$

#### Method 2

SINCE THE ORIGINAL PRICE REPRESENTS 100%, THE SHIRT IS NOW SOLD AT 85%.

$$\text{THEREFORE, } 85\% \text{ OF BIRR } 150 = 0.85 \times \text{BIRR } 150 = \text{BIRR } 127.50$$

## 9.2.3 Percentage Profit and Loss

WHEN PEOPLE SELL GOODS FOR A LIVING, THEY TRY TO MAKE SOME MONEY FROM THEIR SALES. IF THE AMOUNT OF MONEY MADE ON THE SALE OF AN ARTICLE IS GREATER THAN THE AMOUNT OF MONEY PAID FOR IT, THE TRADER MAKES A PROFIT. IF THE AMOUNT OF MONEY MADE ON THE SALE OF AN ARTICLE IS LESS THAN THE AMOUNT OF MONEY PAID FOR IT, HE/SHE MAKES A LOSS.

THE PRICE A TRADER PAYS FOR AN ARTICLE IS CALLED THE COST PRICE.

THE PRICE AT WHICH ARTICLES ARE SOLD TO THE PUBLIC IS KNOWN AS THE SELLING PRICE.

IF THE SELLING PRICE IS GREATER THAN THE COST PRICE, THE TRADER MAKES A PROFIT. IF THE SELLING PRICE IS LESS THAN THE COST PRICE, THE TRADER MAKES A LOSS. PROFIT AND LOSS ARE CALCULATED AS PERCENTAGES OF THE COST PRICE, AS SHOWN BELOW:

$$\text{PERCENTAGE PROFIT} = \frac{\text{ACTUAL PROFIT}}{\text{ORIGINAL (COST) PRICE}} \times 100\%$$

$$\text{PERCENTAGE LOSS} = \frac{\text{ACTUAL LOSS}}{\text{ORIGINAL (COST) PRICE}} \times 100\%$$

**Example 6** A MOBILE PHONE IS BOUGHT FOR BIRR 1200 AND SOLD FOR BIRR 1600. WHAT IS THE PERCENTAGE PROFIT?

**Solution** ACTUAL PROFIT = SELLING PRICE - COST PRICE = BIRR 1600 - BIRR 1200 = BIRR 400

$$\therefore \text{PERCENTAGE PROFIT} = \frac{\text{PROFIT}}{\text{COST}} \times 100\% = \frac{\text{BIRR } 400}{\text{BIRR } 1200} \times 100\% = 33\frac{1}{3}\%$$

**Example 7** A PERSON BUYS A CAR FOR BIRR 150,000 AND SELLS IT FOR BIRR 130,000. CALCULATE THE PERCENTAGE LOSS.

**Solution** LOSS = C.P. - S.P = BIRR 150,000 - BIRR 130,000 = BIRR 20,000

$$\text{PERCENTAGE LOSS} = \frac{\text{LOSS}}{\text{COST}} \times 100\% = \frac{\text{BIRR } 20,000}{\text{BIRR } 150,000} \times 100\% = 13\frac{1}{3}\%$$

### Exercise 9.2

- 1 IF 25% OF A NUMBER IS 70, WHAT IS THE NUMBER?
- 2 A SALESMAN EARNED BIRR 600 IN COMMISSION. HIS COMMISSION WAS 10% OF HIS SALES, WHAT WAS THE AMOUNT OF HIS SALES?
- 3 A FOOTBALL TEAM PLAYED 30 MATCHES LAST SEASON. 15% OF THE GAMES AND DREW 20% OF THE GAMES, HOW MANY GAMES DID THEY LOSE?
- 4 8 STUDENTS OUT OF 20 FAILED AN EXAMINATION. WHAT PERCENTAGE OF THE STUDENTS PASSED?
- 5 IN AN EXAMINATION, 10% OF THE CANDIDATES WHO APPEARED PASSED. IF 513 CANDIDATES FAILED, HOW MANY WERE ENROLLED FOR EXAMINATION?
- 6 A CAR DEALER BUYS A CAR FOR BIRR 1,200 AND SELL IT FOR BIRR 1,500. WHAT IS THE PERCENTAGE PROFIT?
- 7 A DAMAGED SOFA WHICH COST BIRR 4,200 WHEN NEW, BIRR 3,000. WHAT IS THE PERCENTAGE LOSS?
- 8 A WOMAN BUYS 200 APPLES FOR BIRR 400. SHE SELLS BIRR 1.75 EACH. CALCULATE THE PERCENTAGE PROFIT OR LOSS MADE.
- 9 IN ORDER TO INCREASE SALES, THE PRICE OF A SHOE WAS REDUCED FROM BIRR 450 TO BIRR 360. WHAT PERCENTAGE REDUCTION IS THIS?
- 10 THE PRICE OF SUGAR INCREASED FROM BIRR 35.50 PER KILOR. WHAT IS THE PERCENTAGE INCREASE?

- 11 A RECTANGLE HAS DIMENSIONS 15CM BY 25CM. THE PERCENTAGE INCREASE IN THE AREA OF THE RECTANGLE AFTER BOTH THE LENGTH AND THE WIDTH ARE INCREASED BY 20% IS?
- 12 THE PRICE OF TEFF HAS INCREASED BY 10%. BY WHAT PERCENTAGE SHOULD CONSUMPTION BE REDUCED SO AS TO KEEP THE EXPENDITURE CONSTANT?
- 13 I AM 10% OLDER THAN MY WIFE. MY WIFE IS 5% YOUNGER THAN ME. FIND THE PERCENTAGE BY WHICH MY AGE IS GREATER THAN MY WIFE'S AGE.
- 14 FIND THE COMPOUND INTEREST ON BIRR 2003 IN 3 YEARS AT 10% INTEREST PER ANNUM.
- 15 A MAN WITH A MONTHLY SALARY OF BIRR 3,000 HAS TO PAY BIRR 250. IF THE INCOME TAX RATE IS 35%, WHAT IS HIS NET INCOME?
- 16 A TELEVISION IS PRICED AT BIRR 2,800.00, INCLUDING ADDED VAT IS 15%, FIND:
  - A THE PRICE OF THE TV BEFORE VAT WAS ADDED;
  - B THE AMOUNT OF VAT PAID.
- 17 AT A SALE, PRICES ARE REDUCED BY 20%. FIND THE ORIGINAL PRICE OF AN ARTICLE THAT HAS A SALE PRICE OF BIRR 90.
- 18 AN ARTICLE COSTING BIRR 250 IS SOLD AT A PROFIT OF 25%. FIND THE SELLING PRICE.
- 19 A BROKER SOLD A SECOND-HAND CAR FOR BIRR 800,000 WITH A PROFIT OF 18% ON HIS COST PRICE. FIND HIS COST PRICE.
- 20 THE POPULATION OF ADDIS ABABA INCREASES BY 5% EACH YEAR. AFTER HOW MANY YEARS WILL THE CURRENT POPULATION BE DOUBLED?
- 21 A WOMAN WITH AN INCOME OF BIRR 2400 AND AN ALLOWANCE OF BIRR 337.50 IN TAX WHAT IS THE RATE OF TAXATION?

### 9.2.4 Merchandising: Markup, Based on Cost and Selling Price

#### Definition 9.1

**Merchandising Business:** A BUSINESS WHOSE MAIN ACTIVITY IS THAT OF BUYING AND SELLING A PRODUCT.

**Cost Price (c.p.)** IS EITHER THE PRICE AT WHICH A DEALER BUYS THE GOODS OR THE COSTS INCURRED BY A COMPANY IN PRODUCING IT.

**Selling Price (s.p.)** IS THE PRICE AT WHICH A DEALER SELLS THE GOODS.

**Mark-up (Mu)** IS THE DIFFERENCE BETWEEN THE SELLING PRICE AND THE COST PRICE.

$$MU = S.P. - C.P.$$

*Do you see the difference between mark-up and profit?*

THE FOLLOWING EXAMPLE SHOULD MAKE IT CLEAR:

ASSUME THAT W/RT SARA OWNS A COSMETIC SHOP WHERE SHE SELLS COSMETICS. BEFORE SELL THE COSMETICS, SHE MUST BUY THEM FROM A WHOLESALER. W/RT SARA MUST ADD AMOUNT OF MONEY (CALLED THE MARK-UP) TO THE COST OF EACH COSMETIC TO ARRIVE DESIRED SELLING PRICE. THE MARK-UP MUST COVER BOTH THE EXPENSES RELATED TO THE TRANSPORT, RENT, WAGES, UTILITIES) AND THE AMOUNT OF PROFIT DESIRED ON EACH COSMETIC. HENCE,

$$\text{MARK-UP} = \text{PROFIT.}$$

ALSO NOTE THAT MARK-UP IS USUALLY EXPRESSED IN TERMS OF A PERCENT:

$$\text{PERCENT} = \frac{\text{PERCENTAGE}}{\text{BASE}} \times 100,$$

WHERE PERCENT = MARK-UP PERCENT

PERCENTAGE = MARK-UP

BASE = SELLING PRICE OR COST PRICE

### Definition 9.2

**Discount (D)** IS A REDUCTION IN THE ORIGINAL SELLING PRICE.

**Regular (Marked) price** IS THE PRICE AT WHICH AN ARTICLE IS OFFERED FOR SALE

**Sale Price** IS THE PRICE THAT THE CUSTOMER PAYS INSTEAD OF THE ORIGINAL PRICE. THE SALES PRICE IS OBTAINED BY DEDUCTING THE DISCOUNT FROM THE MARKED PRICE.

### Note:

THE TERMS **Discount** AND **markdown** CAN BE USED INTERCHANGEABLY.

THE PERCENT OF MARKDOWN IS ALWAYS BASED ON THE ORIGINAL SELLING PRICE.

HENCE, YOU HAVE THE FOLLOWING RELATIONSHIP:

$$\text{DISCOUNT (D)} = \text{MARKED PRICE} - \text{SELLING PRICE (S.P.)}$$

$$\text{DISCOUNT RATE} = \frac{\text{AMOUNT OF DISCOUNT}}{\text{MARKED PRICE}} \times 100\%$$

**Discussion:** Why do merchants offer discounts?

**Example 8** FIND THE MARK-UP, IF COST PRICE AND SELLING PRICE ARE BIRR 20.40 AND BIRR 28.90, RESPECTIVELY.

**Solution** MARK-UP = SELLING PRICE - COST PRICE  
 = BIRR 28.90 - BIRR 20.40 = BIRR 8.50

**Example 9** WHAT IS THE MARK-UP ON AN AUTOMOBILE THAT SELLER SELL FOR BIRR 145,000 AND COSTS THE DEALER BIRR 129,000?

**Solution** MARK-UP = SELLING PRICE - COST PRICE  
 = BIRR 145,000 - BIRR 129,000 = BIRR 16,000



**Example 10** A USED-CAR DEALER ACQUIRED A 2003 OPEL FOR BIRR 80,000, IT FOR BIRR 100,000. WHAT WAS THE RATE OF MARK-UP, BASED ON THE COST?

**Solution**

**Required:** MARK-UP RATE

$$\text{MARKUP RATE (\%)} = \frac{\text{MARK UP}}{\text{COST PRICE}} \times 100\% = \frac{\text{BIRR } 20,000}{\text{BIRR } 80,000} \times 100\% = 25\%$$

**Example 11** A SHIRT SELLING FOR BIRR 180 COST THE SELLER BIRR 150 PERCENT MARKUP BASED ON SELLING PRICE?

**Solution** MARKUP = S.P. - C. BIRR 180 - BIRR 150 = BIRR 30

$$\text{MARKUP \%} = \frac{\text{MARKUP}}{\text{SELLING PRICE}} \times 100\% := \frac{\text{BIRR } 30}{\text{BIRR } 180} \times 100\% = 16\frac{2}{3}\%$$

**Example 12** A PAIR OF SHOES HAS A MARK-UP OF BIRR 80, WHICH IS SELLING PRICE. WHAT IS THE SELLING PRICE?

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

$$15\% = \frac{\text{BIRR } 80}{\text{SELLING PRICE}} \times 100\%$$

$$\text{SELLING PRICE} = \frac{\text{BIRR } 80}{0.15} = \text{BIRR } 533.33$$

**Example 13** CALCULATE THE DISCOUNT AND SELLING PRICE FOR A BIRR 600 RADIO OFFERED AT 18% DISCOUNT.

**Solution** AMOUNT OF DISCOUNT = DISCOUNT RATE (MARKED OR LIST PRICE):  
 $= 18\% \times \text{BIRR } 600 = 0.18 \text{ BIRR } 600 = \text{BIRR } 108$

THE DISCOUNT IS BIRR 108, AND HENCE THE SELLING PRICE FOR THE RADIO IS  
 $\text{BIRR } 600 - \text{BIRR } 108 = \text{BIRR } 492$

**Example 14** CALCULATE THE REGULAR PRICE OF A TELEVISION SET, 20% DISCOUNT WOULD HAVE BEEN WORTH BIRR 400.

**Solution**

$$\text{DISCOUNT RATE} = \frac{\text{DISCOUNT}}{\text{REGULAR PRICE}} \times 100\%$$

$$20\% = \frac{\text{BIRR } 400}{\text{REGULAR PRICE}} \times 100\%$$

$$\text{REGULAR PRICE} = \frac{\text{BIRR } 400}{0.20} = \text{BIRR } 2,000$$

**Exercise 9.3**

Complete the following table.

1 CALCULATE THE SALES DISCOUNT AND THE SALE PRICE FOR THE ITEMS BELOW.

	Purchase	Price	% Discount	Discount	Sale price
<b>A</b>		BIRR 220	10%	BIRR ____	BIRR ____
<b>B</b>		BIRR 450	20%	BIRR ____	BIRR ____
<b>C</b>		BIRR 4,200	____	BIRR ____	BIRR 3,600
<b>D</b>		BIRR 600	____	BIRR 150	BIRR ____
<b>E</b>		____	25%	BIRR ____	BIRR 8,000

2 FILL IN THE MISSING INFORMATION, ASSUMING MARK-UP IS BASED ON THE COST PRICE.

	Selling price	Cost price	Mark-up	Rate of markup
<b>A</b>	BIRR 240	BIRR 220	____	____
<b>B</b>	____	BIRR 160	BIRR 40	____
<b>C</b>	BIRR 1000	____	BIRR 300	____
<b>D</b>	____	BIRR 300	____	10%
<b>E</b>	BIRR 720	____	____	25%
<b>F</b>	____	____	BIRR 100	15%

- 3 A FURNITURE COMPANY DETERMINES THAT A MARKS UP FURNITURE MUST BE MADE IN ORDER TO COVER REASONABLE EXPENSES, WHILE STILL REMAINING COMPETITIVE. IF THE FURNITURE COST THE COMPANY BIRR 950, WHAT SHOULD IT SELL FOR?
- 4 A SOFA WAS PRICED TO SELL AT BIRR 8,000, BUT WAS MARKED DOWN BY 15%. WHAT IS THE NET (SELLING) PRICE?
- 5 A BOOK THAT COSTS BIRR 20, AND THAT WAS MARKED DOWN BY 12%. WHAT IS THE AMOUNT OF THE DISCOUNT?
- 6 HAIMANOT SPENT BIRR 12,000 ON A LAPTOP, 10% SALES TAX INCLUDED. WHAT WAS THE INITIAL MARKED PRICE OF THE LAPTOP?
- 7 WHICH IS THE BEST DEAL?
  - A A 15% DISCOUNT FOLLOWED BY A 45% DISCOUNT?
  - B A 20% DISCOUNT FOLLOWED BY A 40% DISCOUNT?
  - C A 10% DISCOUNT FOLLOWED BY A 50% DISCOUNT?

## 9.3 REAL ESTATE EXPENSES

### 9.3.1 Initial Expenses of Buying a House

A HOUSE IS USUALLY THE MOST EXPENSIVE ITEM THAT SOMEONE WILL PURCHASE IN HIS LIFETIME. SINCE A HOUSE IS EXPENSIVE, THE WAY THAT MANY PEOPLE ARE ABLE TO AFFORD IT IS BY TAKING OUT A LONG-TERM LOAN, ALSO KNOWN AS A MORTGAGE.

#### Mortgage

A MORTGAGE IS AN AMOUNT THAT IS BORROWED FROM A BANK OR OTHER LENDER FOR REAL ESTATE. A PERSON WILL NOT BE ABLE TO GET A LOAN FOR THE FULL PURCHASE PRICE OF THE HOUSE, THE LENDER EXPECTS HIM/HER TO PAY A PERCENTAGE OF THE PURCHASE PRICE IMMEDIATELY.

THE MONEY THAT IS PAID AT THE TIME OF PURCHASE (AS WELL AS USUALLY 20%) AND THE REMAINING MONEY STILL TO BE PAID IS KNOWN AS THE **due**. THUS,

$$\text{MORTGAGE} = \text{PURCHASE PRICE} - \text{DOWN PAYMENT}$$

#### Instalment plan

AN INSTALMENT PLAN IS A SYSTEM IN WHICH ONE CAN BUY AN ITEM BY PAYING A CERTAIN AMOUNT OF MONEY NOW, AS THE CASH PRICE OF THE ITEM, AND THEN PAYING THE REMAINDER LATER IN PERIODIC PAYMENTS (TYPICALLY MONTHLY).

#### Instalment charge

THE INSTALMENT CHARGE IS THE INTEREST PAID ON THE UNPAID BALANCE.

### Monthly payment

THE MONTHLY PAYMENT IS THE AMOUNT OF MONEY YOU MUST PAY

**Example 1** W/O TERESA BOUGHT A HOUSE FROM SUNSHINE REALTY. SHE PAID 20% OF THE PURCHASE (CASH) PRICE, WHICH IS BIRR 450,000.

- A** FIND THE DOWN PAYMENT.
- B** FIND THE MORTGAGE AMOUNT.

**Solution**

**A** DOWN PAYMENT = 20% OF 450,000  $\times$  BIRR 450,00 = BIRR 90,000

**B** MORTGAGE = PURCHASE PRICE - DOWN PAYMENT  
 = BIRR 450,000 - BIRR 90,000 = BIRR 360,000

YOU HAVE SEEN THAT ONE OF THE MAJOR INITIAL EXPENSES IN BUYING A HOUSE IS THE PAYMENT. IN ADDITION, THERE ARE OTHER COSTS (LIKE LOAN-ORINATION FEE, APPRAISAL, HOME-INSPECTION FEE, TITLE INSURANCE, ETC.) THAT YOU MUST PAY TO YOUR LENDER.

THESE EXPENSES ARE CALLED **Closing costs**. OF ALL THESE CLOSING COSTS, THE BIGGEST EXPENSE, AND AN EXPENSE THAT MUST BE PAID AT THE BEGINNING, IS THE **LOAN-ORINATION FEE**. MOST STATES HAVE LAWS GOVERNING THE MAXIMUM AMOUNT OF INTEREST THAT CAN BE CHARGED TO A *private home*.

SINCE THE RATE OF INTEREST THAT LENDING AGENCIES CAN CHARGE IS RESTRICTED BY LAW, SOME LENDERS HAVE FOUND A WAY TO "GET AROUND THE LAW" BY CHARGING **LOAN-ORINATION POINTS**. THESE POINTS ARE USED BY BANKS TO MEAN PERCENT. FOR EXAMPLE, "8 POINTS" MEANS "8%".

THIS LOAN-ORINATION FEE IS USUALLY A PERCENT OF THE MORTGAGE:

$$\text{POINTS} \times \text{MORTGAGE} = \text{LOAN - ORINATION FEE.}$$

FOR EXAMPLE, A LENDER MAY AGREE TO LOAN BIRR 300,000 AT 10%, BUT THE LOAN IS CONTINGENT ON THE BORROWER'S PAYING, SAY, 6 POINTS. THAT MEANS, SPECIFICALLY, THAT THE BORROWER MUST PAY 6% OF BIRR 300, 000 (BIRR 18,000) JUST TO OBTAIN THE LOAN. IN ADDITION, THE BORROWER MUST PAY BACK NOT ONLY THE BIRR 300,000 PURCHASE PRICE BUT ALSO INTEREST AT 10% ACCUMULATED OVER THE TIME PERIOD SPECIFIED.

**Example 2** A HOME IS PURCHASED WITH A MORTGAGE OF BIRR 600,000. THE BORROWER PAYS A LOAN ORINATION FEE OF 2 1/2 POINTS. HOW MUCH IS THE LOAN ORINATION FEE?

**SOLUTION** LOAN ORINATION FEE = MORTGAGE  $\times$  POINTS  
 = BIRR 600,000  $\times$  2 1/2 % = BIRR 15,000

## ACTIVITY 9.3



TIGIST WOULD LIKE TO PURCHASE AN APARTMENT THAT COSTS BIR 795,615 FOR BIR 795,615 FROM ACCESS REAL-ESTATE. A MORTGAGE ON THIS APARTMENT WOULD REQUIRE A 20% DOWN PAYMENT PLUS CLOSING COSTS.

FILL IN THE MISSING ITEMS IN THE FOLLOWING TABLE (ROUND TO THE NEAREST BIR).

HOUSE PRICE	BIR 795,615
DOWN PAYMENT	_____
TOTAL AMOUNT TO BE FINANCED	_____
THE CASH PRICE OF THE ITEM, AND THEN PAYING THE REMAINDER LATER, IN PERIODIC PAYMENTS (TYPICALLY MONTHLY).	
ORIGINATION FEE (3PTS)	_____
APPRAISAL FEE	BIR 1,200
HOME INSPECTION FEE	BIR 2,400
TITLE INSURANCE	BIR 6,700
OTHER FEES	BIR 3,400
TOTAL CLOSING COSTS	_____
TOTAL AMOUNT OF MORTGAGE LOAN (= AMOUNT TO BE FINANCED + TOTAL CLOSING COSTS)	_____

AN IMPORTANT PART OF YOUR DECISION OF WHETHER OR NOT TO PURCHASE A HOUSE THROUGH A MORTGAGE IS THE TOTAL COST OVER THE LIFE OF THE MORTGAGE LOAN. YOU NEED TO CALCULATE THE *total interest* THAT YOU WOULD PAY AND ADD THAT TO THE PURCHASE PRICE OF THE HOUSE ITSELF.

YOU MIGHT BE SURPRISED AT THE LARGE AMOUNT OF INTEREST YOU WOULD PAY OVER THE LIFE OF THE LOAN. FOR EXAMPLE, CONSIDER BUYING THE HOUSE THAT IS DESCRIBED AT THE END OF SECTION 9.3.1 (IN WHICH WE WERE DISCUSSING LOAN-ORIGINATION FEES).

### 9.3.2 Ongoing Expenses of Owning a House

AS YOU CAN RECALL FROM THE PREVIOUS DISCUSSION, YOU HAVE SEEN THAT THE MAJOR EXPENSES IN THE PROCESS OF BUYING A HOME ARE THE DOWN PAYMENT AND THE *origination fee*. IN THIS SECTION, YOU WILL LOOK AT THE CONTINUING MONTHLY EXPENSES INVOLVED IN OWNING A HOUSE. THE MONTHLY MORTGAGE PAYMENT, UTILITIES, INSURANCE, PROPERTY TAXES, HOME INSPECTION FEE, AND TAXES ARE SOME OF THESE ONGOING EXPENSES. OF THESE EXPENSES, THE LARGEST ONE IS NORMALLY THE MONTHLY MORTGAGE PAYMENT.

**Definition 9.3**

**Amortization** IS A PROCESS IN WHICH A DEBT IS “RETIRED” IN A GIVEN LENGTH OF TIME OF EQUAL PAYMENTS. THE PAYMENTS INCLUDE COMPOUND INTEREST AT RETIREMENT, BORROWER HAS PAID THE ENTIRE AMOUNT OF THE PRINCIPAL AND THE INTEREST.

A LOAN IS AMORTIZED, IF BOTH THE PRINCIPAL AND INTEREST ARE PAID OFF WITH A SINGLE PAYMENT WHOSE AMOUNT IS FIXED FOR THE LIFE OF THE LOAN. THE PERCENTAGES OF THE THAT GO TOWARD PAYING THE PRINCIPAL AND THE INTEREST, RESPECTIVELY, ARE NOT FIXED WITHIN THE FIXED PAYMENT.

THE MOST COMMON EXAMPLE OF AN AMORTIZED LOAN IS A HOME MORTGAGE, WHICH IS TYPICALLY PAID OFF IN MONTHLY INSTALMENTS OVER A PERIOD OF 10 TO 30 YEARS.

THE AMOUNT OF THE MONTHLY MORTGAGE PAYMENT DEPENDS ON THREE FACTORS: THE AMOUNT OF THE LOAN, THE INTEREST RATE ON THE LOAN AND THE NUMBER OF YEARS REQUIRED TO PAY BACK THE LOAN. NOTE THAT THE MONTHLY MORTGAGE PAYMENT INCLUDES THE PAYMENT OF BOTH THE PRINCIPAL AND THE INTEREST ON THE MORTGAGE. THE INTEREST CHARGED DURING ANY ONE MONTH IS CHARGED AGAINST THE UNPAID BALANCE OF THE LOAN.

**Note:**

THE AMORTIZATION FORMULA IS GIVEN BY:

$$p.p = p \cdot \frac{i}{1 - (1 + i)^{-n}}$$

WHERE  $p.p \equiv$  PERIODIC PAYMENT

$p \equiv$  PRINCIPAL

$i \equiv$  INTEREST RATE PER PAYMENT INTERVAL

$n \equiv$  NUMBER OF PAYMENTS MADE

**Example 3** CALCULATE THE MONTHLY PAYMENT ON BIRR 200,000 AT AN INTEREST RATE THAT IS AMORTIZED OVER 10 YEARS.

**Solution** PRINCIPAL (P) = BIRR 200,000

INTEREST RATE, PER PAYMENT INTERVAL  $(i) = \frac{6\%}{12} = \frac{0.06}{12} = 0.005$

NUMBER OF PAYMENTS MADE  $(n) = 10 \times 12 = 120$

$$p.P = p \frac{i}{1 - (1 + i)^{-n}}, \text{ WHERE } p = \text{BIRR } 200,000, \text{ AND } i = .005.$$

$$= \text{BIRR } 200,000 \times \frac{0.005}{1 - (1.005)^{-120}} = \text{BIRR } 2,220.41$$

THUS, THE MONTHLY PAYMENT IS BIRR 2,220.41.

NOTE THAT CALCULATING THE MONTHLY PAYMENT USING THE ABOVE METHOD IS FAIRLY COMPLICATED. SO, TABLES GIVEN AT THE END OF THIS BOOK ARE USED TO SIMPLIFY THE CALCULATIONS.

**Exercise 9.4**

- 1 SUPPOSE YOU BORROW BIRR 95,000 FROM A BANK TO BUY A CAR. YOU AGREE TO REPAY THE LOAN IN 48 EQUAL MONTHLY PAYMENTS, INCLUDING ALL INTEREST DUE. IF THE BANK CHARGES 2% PER MONTH ON THE UNPAID BALANCE, COMPOUNDED MONTHLY, HOW MUCH IS EACH MONTHLY PAYMENT REQUIRED TO RETIRE THE TOTAL DEBT INCLUDING THE INTEREST?
- 2 A MORTGAGE OF BIRR 300,000, AT AN INTEREST RATE OF 10% PER ANNUM, IS TO BE REPAYED IN FIVE YEARS BY MAKING EQUAL PAYMENTS OF PRINCIPAL AND INTEREST AT THE END OF EACH YEAR. CALCULATE THE AMOUNT OF EACH PAYMENT.

**Example 4** TO CALCULATE THE MONTHLY PAYMENT ON THE CAR ABOVE USING THE MONTHLY PAYMENT TABLE, WE OBTAIN 0.01110205, CORRESPONDING TO 10 YEARS AND 6.0%.

THEN, BIRR  $200,000 \times 0.01110205 =$  BIRR 2,220.41, (AS ALREADY CALCULATED ABOVE).

**Exercise 9.5**

- 1 USING THE MONTHLY PAYMENT TABLE, CALCULATE THE MONTHLY PAYMENTS.
  - A ON A 30-YEAR BIRR 80,000 MORTGAGE, AT AN INTEREST RATE OF 6% PER ANNUM.
  - B ON A BIRR 150,000 LOAN, AT A RATE OF 8% PER ANNUM, TO BE REPAYED MONTHLY OVER A PERIOD OF 5 YEARS.

2 COMPLETE THE TABLE, ROUNDING YOUR ANSWERS TO THE NEAREST BIRR.

	Amount of loan	Interest rate	Number of years	Monthly payment
A	BIRR 20,000	6%	15	_____
B	BIRR 160,000	$7\frac{1}{2}\%$	25	_____
C	BIRR 450,000	12%	10	_____
D	BIRR 1,000,000	9%	30	_____

- 3 FIND THE MONTHLY PAYMENT ON AN AUTOLOAN OF BIRR 100,000, TO BE REPAYED OVER A 15 YEAR PERIOD AT A RATE OF 10%.
- 4 ATO TOGA PURCHASED A CONDOMINIUM FOR BIRR 1,000,000. HE MADE A DOWN PAYMENT OF 15%. THE SAVINGS-AND-LOAN ASSOCIATION FROM WHICH HE PURCHASED HIS MORTGAGE CHARGES AN ANNUAL INTEREST RATE OF 9.5% ON TOGA'S 20-YEAR MORTGAGE. FIND HIS MONTHLY MORTGAGE PAYMENT.
- 5 W/O YESHI FINANCED A BIRR 2,500 TV. IF SHE MAKES 36 MONTHLY PAYMENTS OF BIRR 82.44, WHAT RATE OF FINANCING DID SHE RECEIVE?

## 9.4 WAGES

### Why do people do work?

THE AMERICAN PSYCHOLOGIST ABRAHAM MASLOW DEVELOPED A MODEL OF HUMAN NEEDS TO SHOW HOW PEOPLE ARE MOTIVATED TO WORK. THIS MODEL IS CALLED A HIERARCHY OF NEEDS BECAUSE IT STARTS WITH BASIC NEEDS AT THE BOTTOM (FOOD, CLOTHES AND SHELTER) AND HIGHER NEEDS AT THE TOP. IN SHORT, MOST OF US WORK FOR ONE OR MORE OF THE FOLLOWING REASONS. TYPICALLY, ACCORDING TO MASLOW, THE REASONS HAVE THIS ORDER OF IMPORTANCE:

- ✓ WE WANT TO EARN MONEY.
- ✓ WE WANT SECURITY - TO KNOW THAT WE WILL HAVE THE MONEY I
- ✓ WE WANT TO HAVE FRIENDS AND A SENSE OF BEING PART OF
- ✓ WE WANT TO FEEL GOOD ABOUT WHAT WE DO AND WHO WE ARE.
- ✓ WE WANT TO BE ENCOURAGED AND ALLOWED TO DO BETTER.

#### Note:

THERE ARE TWO MAJOR TYPES OF EMPLOYMENT: **full time and part time.**

BOTH FULL TIME AND PART-TIME JOBS ARE AVAILABLE. A JOB CAN LAST MANY YEARS OR ONLY A FEW WEEKS, DEPENDING ON THE TYPE OF EMPLOYMENT:

- ✓ PERMANENT – THE JOB CAN LAST AS LONG AS THE BUSINESS IS
- ✓ TEMPORARY – THE JOB LASTS FOR A LIMITED TIME.

AS EXPLAINED ABOVE, THE MAIN REASON WHY EVERYBODY WORKS IS TO GET MONEY. THERE ARE THREE WAYS TO RECEIVE PAYMENT FOR DOING WORK: COMMISSIONS, WAGES AND SALARIES.

### Commission

AT TIMES, IT BECOMES IMPRACTICAL FOR A BUSINESS OWNER TO PERFORM ALL THE FUNCTIONS OF BUYING AND SELLING. TO RELIEVE THEIR WORK LOADS, BUSINESS OWNERS HIRE SALESPEOPLE. ONE MEANS OF PAYING SUCH SALESPEOPLE VARIES. SOME RECEIVE A SALARY, OTHERS RECEIVE A COMMISSION ON THE SALES THEY MAKE, AND STILL OTHERS ARE PAID THROUGH A COMBINATION OF BOTH SALARY AND COMMISSION.

A COMMISSION IS A FEE GIVEN TO SUCH AN EMPLOYEE THAT REPRESENTS A CERTAIN PERCENTAGE OF THE TOTAL SALES MADE BY THE EMPLOYEE. AS YOU ARE PROBABLY AWARE, MANY SALESPEOPLE ARE REWARDED BY COMMISSION. THE COMMISSION IS OFTEN EXPRESSED AS A PERCENTAGE OF SALES AND IT MAY EITHER BE THE SOLE MEANS OF WAGE PAYMENT OR A SUPPLEMENT TO A SALARY.

FOR EXAMPLE, A REAL ESTATE SALESPERSON MAY EARN  $\frac{1}{2}\%$  COMMISSION ON ALL SALES (CALLED A

STRAIGHT COMMISSION BASED ON A SINGLE PERCENTAGE). IN CONTRAST, A SALESPERSON WORKING FOR A MANUFACTURER MAY EARN A MONTHLY SALARY OF BIRR 600 AND A COMMISSION ON ALL SALES (CALLED **plus commission**).



**Example 1** A REAL ESTATE BROKER, KEDIR, RECEIVES A  $\frac{1}{2}\%$  COMMISSION ON THE SELLING PRICE OF A HOUSE. FIND THE COMMISSION HE EARNED FOR SELLING A HOME FOR BIRR 350,000.

**Solution**  $1\frac{1}{2}\%$  OF BIRR 350,000 =  $0.015 \times 350,000 = \text{BIRR } 5,250$

**Example 2** A SALESPERSON EARNS A MONTHLY SALARY OF BIRR 750 AND A 6% COMMISSION ON SALES OVER BIRR 30,000. IF THE TOTAL MONTHLY SALES ARE BIRR 80,000, CALCULATE HIS/HER TOTAL INCOME.

**Solution**

**Step 1** CALCULATE THE AMOUNT OF SALES OVER BIRR 30,000.

$$\text{BIRR } 80,000 - \text{BIRR } 30,000 = \text{BIRR } 50,000$$

**Step 2** MULTIPLY THIS RESULT (I.E BIRR 50,000) BY DETERMINE THE AMOUNT OF THE COMMISSION:

$$\text{BIRR } 50,000 \times 6\% = \text{BIRR } 3,000$$

**Step 3** CALCULATE HIS/HER TOTAL INCOME:

$$\text{BIRR } 750 + \text{BIRR } 3,000 = \text{BIRR } 3,750$$

### Exercise 9.6

- 1 GOSSAYE, A CAR DEALER, RECEIVES A 6% COMMISSION ON ALL SALES. WHAT IS HIS COMMISSION ON BIRR 140,000 OF SALES?
- 2 ETHOF PAYS A 15% COMMISSION ON SALES UP TO BIRR 2,000 ON THE AMOUNT OF SALES ABOVE BIRR 2,000. HOW MUCH DOES A SALESPERSON EARN ON A SALE OF 4,600?
- 3 A SALESPERSON IS PAID 10% OF THE FIRST BIRR 50,000, 15% OF THE NEXT BIRR 50,000 IN SALES, AND 20% OF ALL SALES OVER BIRR 200,000. WHAT ARE THE EMPLOYEE ANNUAL EARNINGS IF SALES ARE BIRR 340,000?
- 4 A SALESPERSON SELLS BIRR 80,000 WORTH OF GOODS IN A WEEK. WHAT IS THE WEEK'S SALARY IF THE BASIC SALARY IS BIRR 400 A WEEK PLUS A 5% COMMISSION ON ALL SALES UP TO BIRR 50,000 AND A 10% COMMISSION ON ALL SALES OVER BIRR 50,000?
- 5 A REAL ESTATE COMPANY PAYS ITS SALESPERSONS COMMISSIONS ON ALL SALES:
  - 3% ON THE FIRST BIRR 600,000
  - 5% ON THE NEXT BIRR 400,000
  - 7.5% ON ANY SALES OVER BIRR 1,000,000

COMMISSIONS ARE PAID MONTHLY. DETERMINE THE COMMISSIONS EARNED BY THE FOLLOWING EMPLOYEES:

Employee	Monthly Sales
ABDULAZIZ	BIRR 521,780.00
YOHANNES	BIRR 814,110.90
SHERIF	BIRR 1.5 MILLION
ELIAS	BIRR 986,352.20

## Wages and salaries

### Definition 9.4

**Wages** A WAGE IS A PAYMENT FOR SERVICES RENDERED BY A WORKER. WORKERS ARE PAID WEEKLY WAGES. THESE ARE CALCULATED ACCORDING TO THE NUMBER OF HOURS WORKED.

**Example 3** REGULAR TIME FOR AN EMPLOYEE IS PER WEEK. IF MORE HOURS ARE WORKED, THE WORKER IS PAID OVERTIME. OVERTIME REFERS TO THE HOURS WORKED IN EXCESS OF REGULAR TIME OR NORMAL WORKING HOURS, WHICH ARE USUALLY 8 HOURS IN A DAY OR 40 HOURS IN A WEEK. OVERTIME IS USUALLY PAID AT 1.5 TIMES THE REGULAR HOURLY RATE. THIS OVERTIME RATE IS CALLED OVERTIME RATE. FOR INSTANCE, IF YOUR HOURLY RATE IS BIRR 40, THE OVERTIME RATE IS

$$1.5 \times \text{BIRR } 40 = \text{BIRR } 60 \text{ PER HOUR.}$$

WORK PERFORMED ON SUNDAYS OR PUBLIC HOLIDAYS IS USUALLY PAID AT 2 TIMES THE REGULAR HOURLY RATE. THIS RATE IS CALLED

ALSO WORKERS MAY GET FRINGE BENEFITS (WHICH ARE NOT INCLUDED IN THEIR PAY PACKAGE). THESE INCLUDE THE USE OF A COMPANY CAR, A COMPANY PENSION, PRIVATE HEALTH CARE, USE OF A SUBSIDIZED CAFETERIA AND DISCOUNTS ON PRODUCTS/GOODS AND SERVICES.

## Salaries

IF, INSTEAD OF BEING PAID ON AN HOURLY BASIS, AN EMPLOYEE IS PAID BY THE WEEK, THE MONTH, OR THE YEAR, HE OR SHE IS SAID TO BE "ON A SALARY". MOST SKILLED WORKERS (PROFESSIONALS) ARE PAID A SALARY. A SALARY IS A FIXED AMOUNT OF MONEY THAT MAY BE PAID MONTHLY, WEEKLY, OR BIWEEKLY, REGARDLESS OF THE NUMBER OF HOURS WORKED. FOR INSTANCE, IF SOMEONE IS CONTRACTED FOR 40 HOURS PER WEEK AND HE/SHE WORKS 60 HOURS, THEN HE/SHE WILL BE PAID FOR THE EXTRA 20 HOURS HE/SHE HAS WORKED. IN SHORT, THE JOB OF A SALARIED EMPLOYEE IS DESIGNED TO TAKE ABOUT 8 HOURS A DAY, 5 DAYS A WEEK, AND IF MORE TIME IS REQUIRED, THE SALARIED EMPLOYEE IS EXPECTED TO PUT IN THAT TIME WITHOUT EXTRA COMPENSATION.

**Examples 4** W/O SERKALEM, AN ADMINISTRATIVE ASSISTANT AT BABA UNIVERSITY, EARNs BIRR 28,800 A YEAR AND WORKS 40 HOURS EACH WEEK. FIND HER MONTHLY SALARY AND HOURLY RATE OF PAY.

**Solution**  $\text{BIRR } 28,800 \div 12 = \text{BIRR } 2,400$

SHE GETS BIRR 2,400 PER MONTH, AND TO GET HER HOURLY RATE OF PAY, YOU PROCEED AS FOLLOWS:

$\text{BIRR } 28,800 \div 52 = \text{BIRR } 553.85$  (Why is it divided by 52?)

BIRR 553.85 IS HER WEEKLY SALARY, AND HENCE,

$\text{BIRR } 553.85 \div 40 = \text{BIRR } 13.85$  IS THE AMOUNT SHE IS PAID PER HOUR.

THE ABOVE FIGURES ARE ROUNDED SENSIBLY.

**Example 5** A PLUMBER RECEIVES AN HOURLY WAGE OF BIRR 15.50. FIND THE PLUMBER'S TOTAL WAGES FOR WORKING 36 HOURS.

**Solution**  $\text{HOURS WORKED} \times \text{HOURLY RATE} = \text{GROSS PAY}$

$36 \times \text{BIRR } 15.50 = \text{BIRR } 558$

**Example 6** TEKLAY WORKED 50 HOURS LAST WEEK AT A BIRR 25 PER HOUR. HE WORKED ONE AND-A-HALF HOURS OVER 40 HOURS PER WEEK. WHAT IS HIS GROSS PAY?

**Solution**  $\text{REGULAR HOURS} \times \text{HOURLY RATE} = \text{Regular pay} = 40 \times \text{BIRR } 25 = \text{BIRR } 1,000$

$\text{OVERTIME HOURS} \times \text{OVERTIME RATE} = \text{Overtime pay} = 10 \times (1.5 \times 25) = \text{BIRR } 375$

(OVERTIME RATE USUALLY  $\frac{1}{2}$  TIMES THE REGULAR RATE)

$\text{GROSS PAY} = \text{regular pay} + \text{overtime pay} = \text{BIRR } 1,000 + \text{BIRR } 375 = \text{BIRR } 1,375.$

**Exercise 9.7**

- 1 FIND THE GROSS PAY OF AN EMPLOYEE WHO WORKS AT AN HOURLY RATE OF BIRR 20.75. (ROUND THE ANSWER SENSIBLY)
- 2 SENESHAW RECEIVED BIRR 604.50 GROSS PAY FOR THE 40 HOURS HE WORKED. WHAT IS HIS HOURLY RATE?
- 3 COMPLETE THE FOLLOWING TABLE:

Name	Mon	Tues	Wed	Thurs	Fri	Hourly rate	Gross pay
Naomi	6	$7\frac{1}{2}$	8	8	$4\frac{1}{2}$	BIRR 30.00	_____
Genet	7	8	7	_____	6	BIRR 40.00	BIRR 1,320
Ayantü	5	8	8	4	4 HOURS 45 MIN	_____	BIRR 743.75

4. ATO LEMMA WORKED THE FOLLOWING HOURS:

Mon	Tues.	Wed	Thurs	Fri	Sat	Sun
$6\frac{1}{2}$	9	10	8	7	0	4

FIND HIS GROSS PAY IF HE IS PAID BIRR 20.00 PER HOUR, PLUS TIME-AND-A-HALF FOR HOURS IN EXCESS OF 40, AND DOUBLE-TIME FOR ANY HOURS WORKED ON SUNDAY.

5. DETERMINE THE ANNUAL SALARY OF AN EMPLOYEE WHO IS PAID BIRR 4500 WEEKLY.



### Key Terms

amortization	marked price	percentage profit
commissions	mark-up	periodic payment
cost price	merchandising business	principal
discount	monthly payment	purchasing
discount rate	mortgage	salaries
down payment	percentage	sale price
initial expenses	percentage decrease	selling price
instalment charge	percentage increase	wages
instalment plan	percentage loss	



### Summary

- 1 THE WORD "Percent" COMES FROM THE LATIN WORD "PER" MEANING "FOR EVERY HUNDRED" AND IS DENOTED BY THE SYMBOL %.
- 2 THE AMOUNT OF MONEY MADE ON THE SALE OF AN ARTICLE IS CALLED PROFIT.
- 3 A merchandising business IS A BUSINESS WHOSE MAIN ACTIVITY IS THAT OF BUYING AND SELLING A PRODUCT.
- 4 The Cost price IS THE PRICE AT WHICH A DEALER BUYS AN ITEM OF GOODS OR IS THE AMOUNT SPENT BY A COMPANY TO PRODUCE IT.
- 5 The Selling price IS A PRICE AT WHICH A DEALER SELLS THE GOODS.
- 6 The Markup IS THE DIFFERENCE BETWEEN THE SELLING PRICE AND THE COST PRICE.
- 7 A Discount IS A REDUCTION IN THE ORIGINAL SELLING PRICE.
- 8 The Regular price (marked price) IS THE PRICE AT WHICH AN ARTICLE IS OFFERED FOR SALE.

- 9** A **mortgage** IS A LOAN FOR A SPECIFIC AMOUNT OF MONEY THAT IS BORROWED TO BUY ESTATE. THE LOAN IS ISSUED BY A BANK OR BY ANOTHER LENDING AGENCY THAT OPERATES ON BEHALF OF A BANK.
- 10** An **Instalment plan** IS A SYSTEM IN WHICH AN ITEM CAN BE BOUGHT BY PAYING AN INITIAL AMOUNT OF MONEY AS A PARTIAL CASH PRICE FOR THE ITEM, AND IN WHICH THE UNPAID BALANCE IS PAID LATER, IN REGULAR PAYMENTS (USUALLY MONTHLY).
- 11** An **Instalment charge** IS THE INTEREST PAID ON THE UNPAID BALANCE OF AN INSTALMENT-PLAN PURCHASE.
- 12** **Amortization** IS A PROCESS IN WHICH A DEBT IS RETIRED IN A GIVEN LENGTH OF TIME BY MAKING EQUAL PAYMENTS THAT INCLUDES THE COMPOUND INTEREST. THE DEBT HAS BEEN COMPLETELY PAID OFF AT THE END OF THAT PERIOD.
- 13** THE AMORTIZATION FORMULA IS GIVEN BY:
- $$P \cdot p = P \cdot \frac{i}{1 - (1+i)^{-n}}$$
- WHERE;  $p \cdot p$  = PERIODIC PAYMENT  $P$  = PRINCIPAL  
 $i$  = INTEREST RATE PER PAYMENT INTERVAL  
 $n$  = NUMBER OF PAYMENTS MADE
- 14** THERE ARE TWO MAJOR TYPES OF WORK AND **part time**.
- 15** A **Wage** IS A PAYMENT FOR SERVICES RENDERED.



## Review Exercises on Unit 9

- 1** PENCILS COST 80 CENTS EACH.
- A** HOW MUCH WOULD 15 PENCILS COST?
- B** HOW MANY PENCILS CAN YOU BUY FOR BIRR 19.20?
- 2** ALI WORKS AS AN ASSISTANT TEACHER, AND EARNES BIRR 1500 PER MONTH. LAST YEAR HE SPENT 20% OF HIS INCOMES ON HOUSE RENT. WHAT WAS THE TOTAL AMOUNT HE SPENT PER WEEK ON RENTING THE HOUSE?
- 3** BETHEL WORKS 40 HOURS PER WEEK, FOR WHICH SHE IS PAID BIRR 1,200 PER WEEK.
- A** HOW MUCH IS SHE PAID PER HOUR?
- HER EARNINGS INCREASED TO BIRR 1,200 PER WEEK.
- B** HOW MUCH IS SHE NOW PAID PER HOUR?
- C** CALCULATE THE PERCENTAGE INCREASE IN HER EARNINGS.

- 4 SENAY BUYS 6 PACKS OF BISCUITS A WEEK, AND SPENDS BIRR 6.50. HE WORKS 20 HOURS A WEEK AT A WAGE OF BIRR 22.00 PER HOUR. WHAT PERCENT OF HIS WEEKLY INCOME DOES SENAY SPEND ON BISCUITS?
- 5 ONE DAY, ZEKARIAS WORKS FROM 8:30 UNTIL 1:00. HE IS PAID BIRR 15.50 PER HOUR. HOW MUCH DOES HE EARN FOR HIS DAY'S WORK?
- 6 ALEMITU'S SALARY IS BIRR 2400, WHICH IS 25% THE SALARY OF HER HUSBAND, WASSIHUN. HOW MUCH IS WASSIHUN'S SALARY?
- 7 BECAUSE OF THE CONSTRUCTION OF THE NEW (THE REFINANCE BRIDGE OVER THE NILE RIVER) FROM ADDIS TO GONDAR, THE DRIVING TIME BETWEEN THE TWO CITIES IS REDUCED FROM 14 HOURS TO 9 HOURS. WHAT PERCENTAGE DECREASE DOES THIS REPRESENT?
- 8 THE VESTEL TV COMPANY LABELS A TV WITH A REGULAR PRICE OF BIRR 4000. A WHOLESALE GETS A 40% DISCOUNT, AN ELECTRICIAN GETS A 30% DISCOUNT AND A CONSUMER GETS A 15% DISCOUNT. HOW MUCH WILL EACH PAY FOR THE TV?
- 9 MOGES WANTS TO BUY A HOUSE THAT COSTS BIRR 250,000. HE WILL USE AS A DEPOSIT, AND WILL FINANCE THE REST OF THE COST BY TAKING A MORTGAGE LOAN. THE LOAN IS TO BE PAID BACK IN EQUAL MONTHLY INSTALMENTS, AMORTIZED OVER 20 YEARS, AT AN ANNUAL INTEREST RATE OF 7%. WHAT WILL HIS MONTHLY PAYMENT BE?
- 10 A BEAUTY SALON HAS 4 EMPLOYEES. ONE EMPLOYEE RECEIVES TIME-AND-A-HALF FOR HOURS WORKED OVER 40. COMPLETE THE FOLLOWING TABLE. CALCULATE THE NUMBER OF HOURS EACH EMPLOYEE WORKED, FOR REGULAR WAGES AND OVERTIME WAGES DURING THE WEEK. ALSO CALCULATE THE NUMBER OF HOURS ON WHICH EACH EMPLOYEE'S GROSS WAGE IS BASED.

Employee	Mon	Tue	Wed	Thu	Fr.	Sat	Total hrs	Regular hrs	Overtime hrs	Regular pay	Overtime pay	Gross pay
ABDISSA	7	9	8	11	10	3						
TEKESTE	8	8	6	10	4	-						
GUI	$8\frac{1}{4}$	-	$7\frac{3}{4}$	9	$5\frac{1}{2}$	$6\frac{1}{2}$						
GIZACHE	9	8	8	11	10	4						

- 11 ABRAHAM DIALLED 200 TELEPHONE CALLS IN A MONTH AT 5 CENTS. THE MONTHLY TELEPHONE RENTAL CHARGE IS BIRR 8.00. IF VAT WAS CHARGED AT 15%, FIND THE TOTAL AMOUNT OF ABRAHAM'S TELEPHONE BILL.
- 12 WHICH IS THE BETTER BUY?
  - A A 600 G BLOCK OF CHOCOLATE FOR BIRR 25.00, PLUS 20% EXTRA FREE, FOR BIRR 28.00.
  - B 200 G PASTA, PLUS 20% EXTRA, FOR BIRR 25.00, PLUS 25% EXTRA, FOR BIRR 30.00.



## TABLE OF MONTHLY PAYMENT

Annual Interest Rate																
Yrs	6.0%	6.5%	7.0%	7.5%	8.0%	8.5%	9.0%	9.5%	10.0%	10.5%	11.0%	11.5%	12.0%	12.5%	13.0%	13.5%
1	0.0860664	0.0862964	0.0865268	0.0867574	0.0869884	0.0872198	0.0874515	0.0876835	0.0879159	0.0881486	0.0883817	0.0886151	0.0888488	0.0890829	0.0893173	0.0895520
2	0.0443206	0.0445463	0.0447726	0.0449959	0.0452273	0.0454557	0.0456847	0.0459145	0.0461449	0.0463760	0.0466078	0.0468403	0.0470735	0.0473073	0.0475418	0.0477770
3	0.0304219	0.0306490	0.0308771	0.0311062	0.0313364	0.0315675	0.0317997	0.0320330	0.0322672	0.0325024	0.0327387	0.0329760	0.0332143	0.0334536	0.0336940	0.0339353
4	0.0234850	0.0237150	0.0239462	0.0241789	0.0244129	0.0246483	0.0248850	0.0251231	0.0253626	0.0256034	0.0258455	0.0260890	0.0263338	0.0265800	0.0268275	0.0270763
5	0.0193328	0.0195662	0.0198001	0.0200380	0.0202769	0.0205165	0.0207584	0.0210019	0.0212470	0.0214939	0.0217424	0.0219926	0.0222445	0.0224979	0.0227531	0.0230099
6	0.0165729	0.0168099	0.0170490	0.0172901	0.0175332	0.0177784	0.0180255	0.0182747	0.0185258	0.0187790	0.0190341	0.0192912	0.0195502	0.0198112	0.0200741	0.0203390
7	0.0146086	0.0148494	0.0150927	0.0153383	0.0155862	0.0158365	0.0160891	0.0163440	0.0166012	0.0168607	0.0171224	0.0173865	0.0176527	0.0179212	0.0181920	0.0184649
8	0.0131414	0.0133862	0.0136337	0.0138839	0.0141367	0.0143921	0.0146502	0.0149109	0.0151742	0.0154400	0.0157084	0.0159794	0.0162528	0.0165288	0.0168073	0.0170882
9	0.0120058	0.0122545	0.0125063	0.0127610	0.0130187	0.0132794	0.0135429	0.0138094	0.0140787	0.0143509	0.0146259	0.0149037	0.0151842	0.0154676	0.0157536	0.0160423
10	0.0111021	0.0113548	0.0116109	0.0118702	0.0121328	0.0123986	0.0126676	0.0129398	0.0132151	0.0134935	0.0137750	0.0140595	0.0143471	0.0146376	0.0149311	0.0152274
11	0.0103670	0.0106238	0.0108841	0.0111480	0.0114155	0.0116864	0.0119608	0.0122387	0.0125199	0.0128045	0.0130924	0.0133835	0.0136779	0.0139754	0.0142761	0.0145799
12	0.0097585	0.0100192	0.0102838	0.0105523	0.0108245	0.0111006	0.0113803	0.0116637	0.0119508	0.0122414	0.0125356	0.0128332	0.0131342	0.0134386	0.0137463	0.0140572
13	0.0092472	0.0095119	0.0097807	0.0100537	0.0103307	0.0106118	0.0108968	0.0111857	0.0114785	0.0117750	0.0120753	0.0123792	0.0126867	0.0129977	0.0133121	0.0136299
14	0.0088124	0.0090810	0.0093540	0.0096314	0.0099132	0.0101992	0.0104894	0.0107837	0.0110820	0.0113843	0.0116905	0.0120006	0.0123143	0.0126317	0.0129526	0.0132771
15	0.0084386	0.0087111	0.0089883	0.0092701	0.0095565	0.0098474	0.0101427	0.0104423	0.0107461	0.0110540	0.0113660	0.0116819	0.0120017	0.0123252	0.0126524	0.0129832
16	0.0081144	0.0083908	0.0086721	0.0089583	0.0092493	0.0095449	0.0098452	0.0101499	0.0104590	0.0107724	0.0110900	0.0114117	0.0117373	0.0120667	0.0123999	0.0127367
17	0.0078310	0.0081112	0.0083966	0.0086871	0.0089826	0.0092829	0.0095880	0.0098978	0.0102121	0.0105308	0.0108538	0.0111810	0.0115122	0.0118473	0.0121862	0.0125287
18	0.0075816	0.0078656	0.0081550	0.0084497	0.0087496	0.0090546	0.0093645	0.0096791	0.0099984	0.0103223	0.0106505	0.0109830	0.0113195	0.0116600	0.0120043	0.0123523
19	0.0073608	0.0076486	0.0079419	0.0082408	0.0085450	0.0088545	0.0091690	0.0094884	0.0098126	0.0101414	0.0104746	0.0108122	0.0111539	0.0114995	0.0118490	0.0122021
20	0.0071643	0.0074557	0.0077530	0.0080559	0.0083644	0.0086782	0.0089973	0.0093213	0.0096502	0.0099838	0.0103219	0.0106643	0.0110109	0.0113614	0.0117158	0.0120738
21	0.0069886	0.0072836	0.0075847	0.0078917	0.0082043	0.0085224	0.0088458	0.0091743	0.0095078	0.0098460	0.0101887	0.0105358	0.0108870	0.0112422	0.0116011	0.0119637
22	0.0068307	0.0071294	0.0074342	0.0077451	0.0080618	0.0083841	0.0087117	0.0090446	0.0093825	0.0097251	0.0100722	0.0104237	0.0107794	0.0111390	0.0115023	0.0118691
23	0.0066885	0.0069907	0.0072992	0.0076139	0.0079345	0.0082609	0.0085927	0.0089297	0.0092718	0.0096187	0.0099701	0.0103258	0.0106857	0.0110494	0.0114168	0.0117876
24	0.0065598	0.0068654	0.0071776	0.0074961	0.0078205	0.0081508	0.0084866	0.0088278	0.0091739	0.0095248	0.0098803	0.0102400	0.0106038	0.0109715	0.0113427	0.0117173
25	0.0064430	0.0067521	0.0070678	0.0073899	0.0077182	0.0080523	0.0083920	0.0087370	0.0090870	0.0094418	0.0098011	0.0101647	0.0105322	0.0109035	0.0112784	0.0116565
26	0.0063368	0.0066492	0.0069684	0.0072941	0.0076260	0.0079638	0.0083072	0.0086560	0.0090098	0.0093683	0.0097313	0.0100984	0.0104695	0.0108443	0.0112224	0.0116038
27	0.0062399	0.0065556	0.0068772	0.0072073	0.0075428	0.0078842	0.0082313	0.0085836	0.0089410	0.0093030	0.0096695	0.0100401	0.0104145	0.0107925	0.0111738	0.0115581
28	0.0061512	0.0064702	0.0067961	0.0071287	0.0074676	0.0078125	0.0081630	0.0085188	0.0088796	0.0092450	0.0096148	0.0099886	0.0103661	0.0107471	0.0111313	0.0115185
29	0.0060701	0.0063921	0.0067130	0.0070572	0.0073995	0.0077477	0.0081016	0.0084607	0.0088248	0.0091934	0.0095663	0.0099431	0.0103236	0.0107074	0.0110943	0.0114841
30	0.0059955	0.0063207	0.0066530	0.0069922	0.0073377	0.0076891	0.0080462	0.0084085	0.0087757	0.0091474	0.0095232	0.0099029	0.0102861	0.0106726	0.0110620	0.0114541



## TABLE OF RANDOM NUMBERS

13962	70992	65172	28053	02190	83634	66012	70305	66761	88344
43905	46941	72300	11641	43548	30455	07686	31840	03261	89139
00504	48658	38051	59408	16508	82979	92002	63606	41078	86326
61274	57238	47267	35303	29066	02140	60867	39847	50968	96719
43753	21159	16239	50595	62509	61207	86816	29902	23395	72640
83503	51662	21636	68192	84294	38754	84755	34053	94582	29215
36807	71420	35804	44862	23577	79551	42003	58684	09271	68396
19110	55680	18792	41487	16614	83053	00812	16749	45347	88199
82615	86984	93290	87971	60022	35415	20852	02909	99476	45568
05621	26584	36493	63013	68181	57702	49510	75304	38724	15712
06936	37293	55875	71213	83025	46063	74665	12178	10741	58362
84981	60458	16194	92403	80951	80068	47076	23310	74899	87929
66354	88441	96191	04794	14714	64749	43097	83976	83281	72038
49602	94109	36460	62353	00721	66980	82554	90270	12312	56299
78430	72391	96973	70437	97803	78683	04670	70667	58912	21883
33331	51803	15934	75807	46561	80188	78984	29317	27971	16440
62843	84445	56652	91797	45284	25842	96246	73504	21631	81223
19528	15445	77764	33446	41204	70067	33354	70680	66664	75486
16737	01887	50934	43306	75190	86997	56561	79018	34273	25196
99389	06685	45945	62000	76228	60645	87750	46329	46544	95665
36160	38196	77705	28891	12106	56281	86222	66116	39626	06080
05505	45420	44016	79662	92069	27628	50002	32540	19848	27319
85962	19758	92795	00458	71289	05884	37963	23322	73243	98185
28763	04900	54460	22083	89279	43492	00066	40857	86568	49336
42222	40446	82240	79159	44168	38213	46839	26598	29983	67645
43626	40039	51492	36488	70280	24218	14596	04744	89336	35630
97761	43444	95895	24102	07006	71923	04800	32062	41425	66862
49275	44270	52512	03951	21651	53867	73531	70073	45542	22831
15797	75134	39856	73527	78417	36208	59510	76913	22499	68467
04497	24853	43879	07613	26400	17180	18880	66083	02196	10638
95468	87411	30647	88711	01765	57688	60665	57636	36070	37285
01420	74218	71047	14401	74537	14820	45248	78007	65911	38583
74633	40171	97092	79137	30698	97915	36305	42613	87251	75608
46662	99688	59576	04887	02310	35508	69481	30300	94047	57096
10853	10393	03013	90372	89639	65800	88532	71789	59964	50681
68583	01032	67938	29733	71176	35699	10551	15091	52947	20134
75818	78982	24258	93051	02081	83890	66944	99856	87950	13952
16395	16837	00538	57133	89398	78205	72122	99655	25294	20941
53892	15105	40963	69267	85534	00533	27130	90420	72584	84576
66009	26869	91829	65078	89616	49016	14200	97469	88307	92282
45292	93427	92326	70206	15847	14302	60043	30530	57149	08642
34033	45008	41621	79437	98745	84455	66769	94729	17975	50963
13364	09937	00535	88122	47278	90758	23542	35273	67912	97670
03343	62593	93332	09921	25306	57483	98115	33460	55304	43572
46145	24476	62507	19530	41257	97919	02290	40357	38408	50031
37703	51658	17420	30593	39637	64220	45486	03698	80220	12139
12622	98083	17689	59677	56603	93316	79858	52548	67367	72416
56043	00251	70085	28067	78135	53000	18138	40564	77086	49557
43401	35924	28308	55140	07515	53854	23023	70268	80435	24269
18053	53460	32125	81357	26935	67234	78460	47833	20496	35645



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