

CHAPTER FIVE

BUSINESS MATHEMATICS

- Business mathematics involves the application of various topics such as percentage, simple interest and ratio.
- It also requires basic business knowledge.
- Before solving questions based on this topic, the question must be analyzed and solved systematically or step by step.

Billing by utility companies:

- A utility company such as the electricity company has its own mode or method, used in billing its customers.
- There may be a fixed charge a customer may be required to pay monthly, whether or not he uses electrical power or not.
- Under certain circumstances, this fixed charge will not exist.
- There may also be a charge for each unit used, which may change with reference to number of units used.
- In fact, there are countless methods which can be used to determine the amount that consumers have to pay.

(Q1.) Within a certain city, electricity billing is as follows:

First 20 units is at 2p per unit.

Next ten units is at 4p per unit.

Any extra unit is at 7p per unit.

(a) Determine the June bill for Mr. Adu, who used 70 units of electricity during that month.

(b) Assuming the electricity company had increased its charges by 12½%, find how much Mr. Adu will pay for the electricity used in June.

Soln

Since the first 20 units is at 2p per unit \Rightarrow cost of the first 20 units = $20 \times 2 = 40p$.

Since the next ten units is at 4p per unit \Rightarrow cost of the next 10 units = $10 \times 4p = 40p$.

The number of units used so far = $20 + 10 = 30$ units.

Total number of units used by Mr. Adu = 70 units.

\Rightarrow The number of extra units used by Mr. Adu = $70 - 30 = 40$ units.

Since cost of each extra unit is 7p \Rightarrow the cost of the extra 40 units used by Mr. Adu = $40 \times 7 = 280p$.

Cost of electricity used by Mr. Adu = the cost of the first 20 units + the cost of the next 10 units + the cost of the extra units = $40p + 40p + 280p = 360p$ (GHc 3.60p).

(Q2.) Within a certain community, electricity charges are as follows:

Fixed charge = 10p.

Cost of the first 30 units is at 3p per unit.

Cost of the next 20 units is at 6p per unit.

Cost of the next 15 units is at 7p per unit.

Cost of each additional unit is 8p.

(a) If Prince Agbo used 120 units of electricity two months ago, how much did he pay for that particular month?

(b) Last month Mr. Raymond Quaye was brought a bill of GH¢ 3.65. Determine the number of units of electricity he used.

Soln

(a) Fixed charge = 10p.

Cost of the first 30 units = $30 \times 3 = 90p$.

Cost of the next 20 units = $20 \times 6 = 120p$.

Cost of the next 15 units = $15 \times 7 = 105p$.

Number of units used so far = $30 + 20 + 15 = 65$ units.

Number of units used by Mr. Agbo = 120 units.

Extra units he used = $120 - 65 = 55$ units.

Cost of these extra units = $55 \times 8p = 440p$.

Amount paid by Mr. Agbo = Fixed charge + cost of the first 30 units + the cost of the next 20 units + the cost of the next 15 units + the cost of the extra units = $10p + 90p + 120p + 105p + 440p = 765p$ (GHc 7.65).

(b) Amount paid by Mr. Quaye = GH¢ 3.65 = 365P.

Since the fixed charged = 10p \Rightarrow the actual cost of the units used = $365 - 10 = 355p$.

Since the cost of the first 30 units = 90p, cost of the next 20 units = 120p and the cost of the next 15 units = 105p, \Rightarrow the cost of the first $(30 + 20 + 15)$ units = $90p + 120p + 105p, \Rightarrow$ cost of the first 65 units = 315p.

But the cost of the first 65 units + the cost of the additional units = the actual cost of the units.

$\Rightarrow 315 + \text{cost of extra units used} = 355,$

\Rightarrow Cost of extra units used = $355 - 315 = 40p$.

But cost of each extra unit = $8p$, $\Rightarrow 8p = 1$ unit therefore $40p = \frac{40 \times 1}{8} = 5$ units.

Since the number of extra units used by Raymond Quaye = 5 units, \Rightarrow the total number of units used by Mr. Quaye = $65 + 5 = 70$ units.

(Q3) In Axim, the customers of the electricity company are charged as follows:

(i) There is a fixed charge of 20p.

(ii) The cost of the first 10 units is at 3p per unit.

(iii) Cost of the next 40 units is at 5p per unit.

(iv) Cost of any extra unit used is 9p.

(a) Determine the bill of Sister Naana, who used 7 units of electricity.

(b) How much will be paid by uncle Ebo, who used 80 units of electricity.

(c) Determine the number of units used by uncle Ato, whose bill was GH¢ 3.40.

Soln:

(a) Cost of the first 10 units is at 3p per unit,

\Rightarrow the cost of the 7 units used by Sister Naana = $7 \times 3 = 21p$.

The bill of sister Naana = the fixed charge + $21p = 20p + 21p = 41p$.

(b) Number of units used by uncle Ebo = 80 units.

Cost of the first 10 units = $3 \times 10 = 30p$.

Cost of the next 40 units = $5 \times 40 = 200p$.

Number of units used so far = $10 + 40 = 50$ units.

Total number of units used by uncle Ebo = 80 units.

Extra units used by uncle Ebo = $80 - 50 = 30$ units.

Cost of these extra units = $9 \times 30 = 270p$.

Amount paid by uncle Ebo = the fixed charged + cost of the first 10 units + cost of the next 40 units + the cost of the extra units = $20p + 30p + 200p + 270p = 520p = \text{GH¢ } 5.20$.

(c) Amount paid by uncle Ato = GH¢ 3.40 = 340p.

Since the fixed charge = 20p \Rightarrow the amount paid for the actual number of units used = 340 – 20 = 320p.

Since the cost of the first 10 units = 30p and the cost of the next 40 units = 200p, then the cost of the first (10+40) units = 30p + 200p.

\Rightarrow Cost of the first 50 units = 230p.

Cost of the first 50 units + cost of the extra units used = the actual cost of the units used,

\Rightarrow 230 + cost of extra units = 320p,

\Rightarrow cost of extra units used = 320 – 230 = 90p.

But cost of each unit = 9p , \Rightarrow 9p = 1 unit

therefore $90p = \frac{90 \times 1}{9} = 10$ units, \Rightarrow number of extra units = 10 units. Total number of units used = 50 + 10 = 60 units.

Q4. The method used by an electrical energy supplying company, to determine how much its consumers must pay is as follows:

First 20 units is at 2p per unit.

Next 40 units is at 3p per unit.

Next 10 units is at 10p per unit, and the cost of each extra unit used is 10p.

1. Determine the bill for a small company which made use of 100 units of electrical energy.

11. If Kwamena Bilson paid a bill of ₵3 for a particular month, find the number of electrical units he used.

Solution

1. a cost of the first 20 units

= 20 x 2 = 40p.

Cost of the next 40 units = 3 x 40 = 120p.

Cost of the next 10 units = 10 x 10 = 100p.

Number of units accounted for so far = 20 + 40 + 10 = 70 units. Total number of units used by the company = 100 units.

The number of extra units used = 100 – 70 = 30.

Cost of these extra units used = 10 x 30 = 300p.

Bill for the company = cost of the first 20 units + cost of the next 40 units + the cost of the next 10 units + the cost of the extra units used,

$$= 40p + 120p + 100p + 300p$$

$$= 560p = \text{¢}5.60.$$

11. Amount paid by Kwamena Bilson = ¢3 = 300p.

Since the cost of first 20 units = 40p, cost of next 40 units = 120p and cost of the next 10 units = 100p, then the cost of (20 + 40 + 10) units = 40p + 120p + 100p = 260p,

⇒ cost of the first 70 units = 260p.

But cost of the 70 units + cost of the extra units used = amount paid by Mr. Bilson (since there is no fixed charge).

Therefore 260p + cost of the extra units = 300p.

Therefore cost of the extra units used = 300 – 260 = 40p.

But cost of each extra unit = 10p.

if 10p = 1 unit

then $40p = \frac{40 \times 1}{10} = 4 \text{ units.}$

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The number of extra units therefore used by Mr. Bilson = 4 units.

The total number of units he used = 70 + 4 = 74 units.

Q5. Within a certain town, electricity billing is as follows:

First 20 units - - - Nil.

Next 30 units - - - 2p per unit, and any extra used unit - - - 8p per unit.

a. If Mr. Kwame used 80 units of electricity last June, determine the amount he paid in June.

b. If Sir Jonas paid a bill of ¢1.50, determine the number of units he used.

Solution

Cost of first 20 units = 0p (Since it is free).

Cost of the next 30 units = $2 \times 30 = 60p$.

Cost of the next 10 units = $10 \times 5 = 50p$.

Number of units accounted for so far = $20 + 30 + 10 = 60$ units.

Number of units used by Mr. Kwame = 80 units.

Extra units used by Mr. Kwame = $80 - 60 = 20$ units.

Cost of these extra units = $8 \times 20 = 160p$.

Amount paid by Mr. Kwame = cost of the first 20 units + cost of the next 30 units + cost of the next 10 units + cost of the extra units used = $0 + 60 + 50 + 160 = 270p = \text{¢}2.70$.

b. Cost of the first 20 units = 0p, cost of the next 30 units = 60p and the cost of the next 10 units = 50p.

Cost of $(20 + 30 + 10)$ units = $0p + 60p + 50p = 110p$,

\Rightarrow cost of the first 60 units = 110p.

But the cost of the first 60 units + the cost of the extra units = bill paid by sir Jonas.

$\therefore 110p + \text{cost of the extra units} = 150p, \Rightarrow \text{cost of the extra units} = 150p - 110 = 40p$.

But the cost of each extra unit = 8p.

If $8p = 1 \text{ unit} \Rightarrow 40p = \frac{40 \times 1}{8}$

= 5 units.

The number of units used by Sir Jonas = $60 + 5 = 65$ units.

Q6. In a household, the meter reading for water at the end of October, 1999 was 7848 thousand litres. The meter reading at the end of November, 1999 was 7908 thousand litres. The household was charged for the consumption at the following rates:

1. The first 10 thousand litres at $\text{¢}500$ per thousand litres.

The next 30 thousand litres at $\text{¢}1,300$ per thousand litres.

The next 40 thousand litres at ¢1820 per thousand litres.

Calculate a. the consumption at the end of November.

b. the total charge for the consumption.

Solution.

a. Meter reading at October ending = 7848 thousand litres.

. Meter reading at November ending = 7908 thousand litres.

**Consumption at the end of November, or for the month of November =
7908 – 7848 = 60 thousand litres.**

b. total consumption = 60 thousand litres.

1. Since the first 10 thousand litres is at ¢ 500 per thousand litre,

Charge for the first 10 thousand litres = $10 \times 500 = \text{¢}5000$.

Value of consumption yet to be charged = $60 - 10 = 50$ thousand litres.

**2. Since the next 30 thousand litres is charged at ¢1,300 per
thousand litres , \Rightarrow charge for this next 30 thousand litres = 30×1300
= ¢39,000.**

Value of consumption yet to be charged = $50 - 30 = 20$ thousand litres.

**3. Since the next 40 thousand litres is charged at ¢1820 per thousand
litre, the charge for this 20 thousand litres = $20 \times 1820 = \text{¢}36400$.**

Total charge for the consumption = $\text{¢}5000 + 39000 + 36400 = \text{¢}80400$.

Taxation

This is the manner in which ruling authorities generate funds, to run a country or an area under their control. Business entities such as companies, industries as well as workers may be required to pay tax.

Q1. The format of taxing Mr. Asare who has six children, and who is on a monthly salary of ₵2,000 is such that his tax free allowance is as follows:

- a. He is entitled to a tax free allowance of 20%, with reference to his salary.**
- b. There is a further tax free allowance of ₵100.**
- c. Wife allowance ₵30.**
- d. Child allowance₵3 per child up to 6 children.**
- e. Dependent relatives ₵40.**

After the deduction of these, whatever remains is taxed as follows:

- i. First ₵50 ₵2 in a cedi.**
- ii. Next ₵60 ₵3 in a cedi.**
- iii. Next ₵40 ₵5 in a cedi.**

1. Calculate his tax free income.

2. Determine

- i. his monthly gross.**
- ii. his monthly net.**

NB. The tax free allowance or the tax free income is the portion of the salary, for which one is not taxed, and the taxable income is the portion of the salary for which one is required to pay tax.

The monthly net is the portion of the salary, which remains after the deduction of taxes. The monthly gross is the monthly salary of a worker, which is yet to be taxed.

Solution

Monthly salary = ₵2,000.

Tax free allowances:

a. 20% of salary

1st tax free allowance

$$= \frac{20}{100} \times 2000$$

$$= ₵400.$$

b. 2nd further tax free allowance = ₵100.

c. 3rd tax free allowance = the wife allowance = ₵30.

d. Child allowance is ₵3 per child up to 6 children.

Total child allowance = 3 x 6 = ₵18, since he has 6 children,

⇒ 4th tax free allowance = ₵18.

e. 5th tax free allowance, which is the dependent relative allowance = ₵40.

The total tax free allowance of Mr. Asare = ₵400 + ₵100 + ₵30 + ₵18 + ₵40 = ₵588.

Monthly tax free income = ₵588

**i. Monthly taxable income = monthly salary – monthly tax free income
= ₵ 2,000 - ₵588 = ₵1412.**

Mode of taxation:

i. First ₵50 ₵2 in a , ⇒ tax paid = 50 x 2 = ₵100.

ii. Next ₵60 ₵3 in the cedi, ⇒ tax paid = 60 x 3 = ₵180.

iii. Next ₵40 ₵5 in cedi, ⇒ tax paid = 40 x 5 = ₵200.

**The total amount of the taxable income which have been taxed so far
= ₵50 + 60 + 40 = ₵150.**

The reminder = ₵588 - ₵150 = ₵438.

For this remainder, taxation is at 10% and tax paid = $\frac{10}{100} \times 438 = ₵43.8$

Monthly tax paid by Mr. Asare = ₵100 + ₵180 + ₵200 + ₵43.8 = ₵524.

i. His monthly gross = ₦2000

ii. His monthly net = monthly gross – monthly tax = ₦2000 - ₦524 = ₦1476.

Q2. A company's director who is married with six children is on an annual salary of ₦18000. His tax free allowance is as follows: personal allowance – ₦1,200 plus 10% of the excess of salary over ₦10,000. Wife allowance – ₦600.

Children allowance – ₦250 per child for the first four children. Dependent relative – ₦500. On the taxable income, the rates of tax are as follows: 10k in the naira on the first ₦2000. 15K in the naira on the next ₦4000. 22 1/2k in the naira on the next ₦5000. 37 1/2k in the naira on the rest. Calculate

a. his taxable income .

b. the average monthly tax he pays to the nearest kobo.

c. the percentage of his monthly salary he pays as tax.

NB. Since the salary is ₦18,000, then we can say that

the excess of the salary over ₦10,000 = 18000 – 10,000

= ₦8,000.

Annual salary = ₦18,000.

Tax free allowance:

1. Personal allowance = ₦1,200 + 10% of excess of salary over ₦10,00 = ₦1,200 + 10% × 8000 = 1.200 + 800 = ₦2000.

2. Wife allowance = ₦600.

3. Children allowance = ₦ 250 per child for the first four children, ⇒ total child allowance he is entitled to = 250 × 4 = ₦1000, since this is meant for up to only four children.

4. Dependent relative = N550

Total tax free income = N2,000 + N600 + N1,000 + N550 = N4150 . (ie yearly tax free allowance).

a. His taxable income (ie yearly taxable income) = 18000 – 4150 = N13850

Mode of taxation:

1. 10K in the naira on the first N2000, \Rightarrow tax paid = 2000 x 10 = 20,000k = N200.

2. 15k in the naira on the next N4000, \Rightarrow tax paid = 15 x 4000 = 60 000k = N600.

3. 22 ½ k in the naira for the next N5000, \Rightarrow tax paid = 5000 x 22.5 = 112500k = N1125.

4. 30k in the naira on the next N1, 000, \Rightarrow tax paid = 30x1000 = 30000k = N300.

5. 37 ½ K in the naira on rest. Since we do not know the rest of the taxable income yet to be taxed, we have to determine it. So far the portion of the yearly taxable income which have been taxed = N2000 + N4000 + N 5000 + N1, 000 = N12, 000.

The portion of the taxable income which is yet to be taxed = the rest = 13850 – 12,000 = N1, 850.

Since taxation is at 37 ½ k in the naira on the rest ie. N1,850, tax paid = 37 ½ x 1850 = 37.5x1850 = 69375k = N693.7 = N694. Total yearly tax paid = N200 + N600 + N1125 + N300 + N694 = N2919.

(b) Yearly tax paid = 2919.

Monthly tax paid = $\frac{2919}{12}$ = N243

12

Since annual salary = N1800 \Rightarrow monthly salary = $\frac{18000}{12}$ = N1500.

C. The percentage of the monthly salary paid, as tax by the director
= $\frac{\text{monthly tax}}{\text{monthly salary}} \times 100$

Monthly pay

$$= \frac{243 \times 100}{1500} = 16\%$$

Method 2.

Annual salary = N18000.

Tax free allowance.

1. Personal allowance = N 1,200 + 10% of excess of salary over N10,000 = N1,200 + 10% of N8000 = N1,200 + N800 = N 2,000.

2. Wife allowance = N600.

3. Children allowance = N250 per child for the first four children, total children allowance he is entitled to = 250 x 4 = N1,000.

4. Dependent relative = N550.

Total tax free income = N2,000 + N600 + N550 + N 1000 = N4150 (i.e yearly tax free allowance).

a. His yearly taxable income = 18000 – 4150 = N 13850

MODE OF TAXATION:

1. 10K in the naira on the first N2000, \Rightarrow tax paid = 2000 x 10 = 20000k = N200.

Taxable income left = N13850 – N2000 = N11850.

2. 15K in the naira on the next N4000, \Rightarrow tax paid = 15 x 4000 = 60,000k = N6000.

Taxable income left = N11850 – N4000 = N7850.

3. 22 ½ K in the naira for the next N5000, \Rightarrow tax paid

= 5000 x 22.5 = 112500k = N1125, \Rightarrow taxable income left, = 7850 – 5000 = N2850.

4. 30k in the naira on the next N1000, \Rightarrow tax paid = 30 x 1000 = 30000k = N 300.

Taxable income left = N 2850 – N1.000 = N1850.

5. 37 ½ K in the naira on the rest. The rest refers in this case to the N1850. Tax paid = 37.5k x 1850 = N694.

Total yearly tax paid = N200 + N600 + N1125 + N300 + N694 = 2919.

Monthly tax paid = $\frac{2919}{12}$ = N 243

12

Since the annual salary = N 18000, the monthly salary = $\frac{1800}{12}$ = N1500.

C. The percentage of the monthly salary paid as tax by the director = $\frac{\text{monthly tax}}{\text{monthly pay}} \times 100$

Monthly pay

= $\frac{243}{1500} \times 100$ = 16%

1500

NB. If the children allowance is N250 per child, and the director has only two children, then the children allowance which he is entitled to is 2 x 250 = N500.

If he has three children, then the allowance which he will be entitled to will be 3 x 250 = N750.

Assuming he had more than four children, then only four of them will be considered, when the children allowance is under consideration.

For example assuming that the director had 10 children, then the children allowance that he will be entitled to = 250 x 4 = N 1,000.

Q3. A man's salary is ₦36900. He is entitled of 2/9 (two ninth) of this amount free of tax, and to a further tax free allowance of ₦7,700. On the remaining income after these deductions, he pays 10p in the cedi on the first ₦6,000, 40p in the cedi on the next ₦4500 and 70p in the cedi on the balance, if any.

A. How much tax does he pay?

b. If his salary is increased by ₵500, find his net income.

Solution

Man's salary = ₵36900.

Tax free allowances:

The first tax free allowance = 2 / 9 of salary = $2 / 9 \times 36900 = \text{₵}8200$.

The second tax free allowance = ₵7,700.

Total tax free allowance = $\text{₵}8200 + \text{₵}7,700 = \text{₵}15900$.

**The taxable income = what remains = salary – total tax free allowance
or income = $36900 - 15900 = \text{₵}21000$.**

Mode of taxation:

1. 10p in the cedi on the first ₵6,000, \Rightarrow tax paid = $10 \times 6000 = 60000\text{p} = \text{₵}600$.

ii. 40p in the cedi on the next ₵4500, \Rightarrow tax paid = $40 \times 4500 = 180000\text{p} = \text{₵}1,800$.

**iii. 70p in the cedi on the balance, if any. We must first find this balance.
So far the portion of the taxable income which has been taxed = $6000 + 4500 = \text{₵}10500$. The portion of the taxable income which is yet to be taxed = the balance = the taxable income – the portion of the taxable income which has already been taxed = $21000 - 10500 = \text{₵}10500$.**

With reference to the balance, the tax paid = 70p in the cedi, \Rightarrow tax paid = $70 \times 10500 = 735000\text{p} = \text{₵}7350$.

a) Tax (i.e total tax) paid by the man = $\text{₵}600 + \text{₵}1800 + \text{₵}7350 = \text{₵}9750$.

b. Net income = salary – tax paid = $\text{₵}36900 - \text{₵}9750 = \text{₵}27150$.

If the salary is increased by ₵500, then his net income = $\text{₵}27150 + \text{₵}500 = \text{₵}27650$.

METHOD 2:

Man's salary = ₵3690.

Tax free allowance:

First tax free allowance = $2 / 9 \times 3690 = \text{¢}8200$.

Second tax free allowance = $\text{¢}7,700$.

Total tax free allowance or income = $8200 + 7700 = \text{¢}15900$.

Remaining income or taxable income = salary – tax free income = $\text{¢}36900 - \text{¢}15900 = \text{¢}21000$.

Mode of taxation:

1. 10p in the cedi on the first $\text{¢}6000$, \Rightarrow tax paid = $10 \times 6000 = 60000\text{p} = \text{¢}600$, \Rightarrow taxable income left = $21000 - 6000 = \text{¢}15,000$.

ii. 40p in the cedi on next $\text{¢}4500$, \Rightarrow tax paid = $40 \times 4500 = 180000\text{p} = \text{¢}1,800$, \Rightarrow taxable income left = $15,000 - 4500 = \text{¢}10500$.

iii. The taxable income of $\text{¢}10500$ = the balance and for this, taxation is at 70p in the cedi, \Rightarrow tax paid = $70 \times 10500 = 735000\text{p} = \text{¢}7,350$.

a. Tax paid by the man = $\text{¢}600 + \text{¢}1800 + \text{¢}7,350 = \text{¢}9750$.

b. Net income = salary – tax paid = $\text{¢}36900 - \text{¢}9750 = \text{¢}27150$.

If the salary is increased by $\text{¢}500$, then his net income = $\text{¢}27150 + \text{¢}500 = \text{¢}27650$.

Q4. A man is on a monthly salary of $\text{¢}40,000$ and is entitled to $1/4$ of this free of tax. He enjoys a further tax free allowance of $\text{¢}8000$. On the remaining income after these deductions, taxation is as follows:

i. First $\text{¢}8000$, 40p in the cedi.

ii. Next $\text{¢}10,000$, 40p in the cedi.

iii. Next $\text{¢}12000$, 30p in the cedi.

iv. Next $\text{¢}6000$, 15p in the cedi.

a. How much tax does he pay?

b. Assuming he decides to add $\text{¢}20,000$ to his monthly take home pay to buy a car, which will later on be sold at a profit of 40%, determine the selling price of the car.

Solution

Monthly pay = ₵40,000. First tax free allowance = $\frac{1}{4} \times 40,000 =$ ₵10,000.

Second tax free allowance = ₵8000.

Total tax free allowance = ₵10,000 + ₵8000 = ₵18,000.

Taxable income = ₵40,000 - ₵18,000 = ₵22,000.

Mode of taxation:

1. First ₵8000 is at 40p in the cedi, \Rightarrow tax paid = $8000 \times 40 = 320000p =$ ₵3200.

Taxable income left or yet to be taxed = ₵22,000 - ₵8,000 = ₵14,000.

ii. Next ₵12,000 is at 30p in the cedi, \Rightarrow tax paid = $12,000 \times 30 = 360000p =$ ₵3,600.

Taxable income left or yet to be taxed = ₵14,000 - ₵12,000 = ₵2000.

iii. Next ₵6000 is at 15P in the cedi. But since the taxable income left to be taxed is ₵2000, tax paid = $2000 \times 15p = 30000p =$ ₵300 (i.e taxation is limited only to the available or the taxable income left in this case).

a. Total tax paid = ₵3,200 + ₵3,600 + ₵300 = ₵7,100.

b. Take home pay for the month = salary – tax paid = ₵40,000 - ₵7100 = ₵32900.

Since he added ₵20,000 to this amount to buy the car, the cost price of the car = ₵32900 + 20,000 = ₵52,900.

40% of ₵52900

= $\frac{40}{100} \times 52900$

100 = ₵21,160.

The selling price of the car in order to make a profit of 40% = ₵52900 + ₵21160 = ₵74060.

Q5 A clerk working at a town's post office is on a monthly salary of ₵2000, and is entitled to a tax free allowance of 20%, with respect to his salary. He also enjoys a further tax free allowance of ₵100. With reference to his taxable income, taxation is as follows:

Income tax 12%.

Ground tax 10%.

Road maintenance tax 5%.

A. Find his tax free income.

b. How much tax does he pay?

Solution

Salary = ₦2000.

(a). The first tax free allowance = 20% of salary = $\frac{20 \times 2000}{100} = ₦400$.

**Second tax free allowance = ₦100. Total tax free allowance or income =
400 + 100 = ₦500.**

Taxable income = 2000 – 500 = ₦1500.

Mode of taxation:

1. Income tax = 12% of the taxable income = $\frac{12}{100} \times 1500$

= ₦180.

ii. Ground tax = 10% of the taxable income = $\frac{10}{100} \times 1500$

= ₦150.

iii. Road maintenance tax = 5% of taxable income = $\frac{5}{100} \times 1500$

= ₦75.

Total tax paid = 180 + 150 + 75 = ₦405.

Q6. A man has a wife and two children. Two years ago his total income for the year was N8,500. He was allowed the following free of tax:

PersonalN1,200

WifeN300

Dependent relativeN400

Each childN250 for a maximum of 4

InsuranceN250.

The rest was taxed as follows:

1. The first N2,000 at 10%.

2. The next N2,300 at 15%.

3. The next N2,000 at 20%.

4. The next N2000 at 25%.

Calculate

a. his tax free pay.

b. his taxable income.

c. his monthly tax.

d. his net monthly pay.

Solution

The man's tax free allowance are :

PersonalN1,200.

WifeN300.

Dependent relativeN400.

His two children = 2 x 250 = N500.

Insurance = N250.

**a. The total tax free allowance =N1,200 + ~~N300~~ + ~~N400~~ + ~~N500~~ + ~~N250~~
=N2,650 (ie yearly tax free allowance).**

**b. His yearly taxable income = yearly pay – yearly tax free income =
8500 – 2650 =N5850.**

Mode of taxation (yearly):

i. The firsts N2000 is at 10%, \Rightarrow tax paid = $\frac{10 \times 2000}{100}$

=N 200.

The taxable income now = N 5850 – N2000 = N3,850.

ii. The next N2,300 is at 15% , \Rightarrow tax paid = $\frac{15 \times 2300}{100}$

=N345.

The taxable income now = N3,850 – N2,300 = N1550.

iii. Next N2,000 is at 20%, \Rightarrow tax paid = $\frac{20 \times 1550}{100}$

= ₦310.

(Since the taxable income which is ₦1550 is less than the required N2,000, taxation is made with reference to the 20%). At this stage also, taxation stops since there is no more any taxable income, even though the taxation process has not yet been completed . Total yearly tax paid = N200 + N345 + N310 = N855

C. His monthly tax = $\frac{855}{12}$

= N71.

D. Yearly net pay = yearly pay – yearly tax = N8500 – N855 = N7645

Monthly net pay = $\frac{7645}{12}$

= N 637.

NB. This second method of solving questions on taxation, is more recommended for use than the first one, even though both can be used.

BUSINESS PARTNERSHIP:

This is the type of business, in which two or more people team up through contribution towards the establishment of a business entity, and agree to share future profit in a particular manner.

(Q1) Two friends John and Eric entered into a business partnership, for which John contributed ₦200 and Eric contributed ₦600 toward the working capital. They agreed to share the profit as follows:

John as the director takes 10% of the profit in addition to ₦100, while Eric takes ₦200 for his role as a travelling agent. 20% of what ever will be left will be used for basic maintenance, and the remainder will then be shared in accordance with the ratio of their contribution. Given that the profit at the end of the year was ₦1,400, how much did each of them get?

Solution

Profit = ₦1,400

John first takes 10% of 1400 in addition to ₦100,

⇒ amount John first gets = $\frac{10}{100} \times 1400$, in addition to 100

100

= ₦140 + ₦100 = ₦240. Amount Eric first gets = ₦200.

Amount of profit left = $1400 - 240 - 200 = 960$. 20% of the profit left was used for maintenance ⇒ amount used for maintenance = $20\% \text{ of } 960 = ₦192$.

Amount of profit now left = $960 - 192 = ₦768$. Finally this amount was shared in the ratio of the contribution.

John: Eric

Contributions 200 : 600

Ratio 1 : 3

Total ratio = $1+3 = 4$.

John's share = $\frac{1}{4} \times 768 = ₦192$.

Eric's share = $\frac{3}{4} \times 768 = ₦576$.

1. Amount had by John = $240 + 1912 = \text{¢}432$.

11. Amount had by Eric = $576 + 200 = \text{¢}776$.

(Q2). A, B and C entered into a business partnership, and their ratio of contribution toward the working capital respectively is 2:3:5, for which B contributed $\text{¢}600$. At the end of the year, the profit made was twice their working capital. That year, rent cost was $\text{¢}500$ and maintenance cost amounted to $\text{¢}400$. They also decided to share their profit in the following manner:

(i) First, A take 10% of it, B take 5% of it and C takes 15% of it.

(ii) A then receives $\text{¢}200$ for his role as the manager and C gets $\text{¢}100$, for acting as a security officer.

(iii) The rest of the profit was to be shared equally among the three partners.

(a) Determine the share of each of them.

(b) If A deposited his share of the profit at a bank for 2 years at a rate of 14% per annum, how much interest did he get?

Soln:

$$\begin{array}{ccccc} A & : & B & : & C \\ 2 & : & 3 & : & 5 \\ & & \downarrow & & \\ & & \text{¢}600 & & \end{array}$$

Since B's ratio which was 3 amounted to $\text{¢}600 \Rightarrow 3 = \text{¢}600$

If $3 = \text{¢}600$,

$$\Rightarrow 2 = \frac{2}{3} \times 600 = \text{¢}400,$$

\Rightarrow A's contribution = $\text{¢}400$.

Also since $3 = \text{¢}600$,

$$\Rightarrow 5 = \frac{5}{3} \times 600 = \text{¢}1,000,$$

\Rightarrow C's contribution = $\text{¢}1,000$.

Their working capital = $\text{¢}400 + \text{¢}1000 + \text{¢}600 = \text{¢}2000$.

Profit = twice their working capital = $2 \times 2000 = \text{¢}4000$.

Total expenses made = rent cost + maintenance cost = ₦500 + ₦400 = ₦900.

The portion of profit which can be shared = Profit – expenses = ₦4000 – ₦900 = ₦3100.

For this profit A takes 10% \Rightarrow amount had by A

$$= \frac{10}{100} \times 3100 = ₦310.$$

100

B takes 5% \Rightarrow amount had by B = $\frac{5}{100} \times 3100 = ₦155.$

100

C takes 15% \Rightarrow amount had by C = $\frac{15}{100} \times 3100 = ₦465.$

100

Since A then get ₦200 and C gets ₦100, then the rest of the profit left

$$= ₦3100 - ₦310 - ₦155 - ₦465 - ₦200 - ₦100 = ₦1870.$$

This amount was equally shared among the three partners \Rightarrow each of them will get

$$\frac{1870}{3} = ₦623.$$

3

(a) Amount had by A = ₦310 + ₦200 + ₦623 = ₦1133.

Amount had by B = ₦155 + ₦623 = ₦778.

Amount had by C = ₦465 + ₦100 + ₦623 = ₦1188.

(b) P = ₦1133, T = 2 years and R = 14%.

$$S.I = \frac{P \times R \times T}{100} = \frac{1133 \times 14 \times 2}{100}$$

100

100

$$= ₦317.$$

(Q3) Abubakar and Babatunde entered into a business partnership. The capital for the business is made up of ₦7,000 from Babatunde and ₦25,000 from Abubakar. They agreed to share the yearly profit in the following manner: Babatunde as managing director, is paid ₦1000 in addition to 7½% of the total profit. Each partner is paid a sum equal to 3% of the capital he invested. The remainder of the profit is shared between the partners in the ratio of their contribution to the capital. If the profit at the end of the year was ₦6,400, determine the total amount received by each from the profit.

Solution:

Money invested by Abubakar and Babatunde is ₦2500 and ₦700 respectively.

The ratio of their contribution is

Abubakar : Babatunde

25000 : 7000

25 : 7

Total ratio = $25 + 7 = 32$.

Since the total profit = N6400,

$\Rightarrow 7\frac{1}{2}\%$ of total profit = $\frac{7.5}{100} \times 6400 = \text{N } 480$.

100

First, Babatunde collected N1000 and $7\frac{1}{2}\%$ of the total profit \Rightarrow amount collected by Babatunde = N1000 + N480 = N1480 (i.e. for acting as the managing director).

After this payment, each partner received a sum equal to 3% of the capital he invested.

\Rightarrow Amount received by Babatunde = $\frac{3}{100} \times 7000 = \text{N } 210$.

100

Also the amount received by Abubakar = $\frac{3}{100} \times 25,000 = \text{N } 750$.

100

The total amount received by Abubakar and Babatunde out of the profit made = N1,000 + N480 + N210 + N750 = N2440.

Amount of the profit which now remains = N6400 — N2440 = N3,960.

This amount was shared between the two partners in the ratio of their contribution.

The amount received by Abubakar = His ratio the amount

Total ratio

= $\frac{25}{32} \times 3960 = \text{N } 3094$.

32

The amount received by Babatunde = $\frac{7}{32} \times 3960 = \text{N } 866$,

32

The total amount received by Babatunde = N1000 + N480 + N210 + N866 = N 2556

Also the amount received by Abubakar = N 750 + N 3094 = N 3844.

(Q3) Jonas, George and Green are partners in a business, and their contribution to the capital are respectively Le 15000, Le 25,000 and Le 30,000. They agreed to share 40% of the net profit in the ratio of their contribution to the capital. In a particular year, their profit before taxation was Le16800 and 45% of this was paid to the government as tax.

- (a) Calculate the share of the profit received by each partner.
- (b) Green invested his share of the profit at 12% per annum. Calculate the interest earned in 8 years. Express also Green's share of the profit together with the interest earned that year as a percentage of his initial contribution.

Solution

(a) The ratio of their contribution is given by:

Jonas : George : Green

$$= 15,000 : 25,000 : 30,000$$

$$= 3 : 5 : 6$$

$$\text{Total ratio} = 3 + 5 + 6 = 14.$$

Their profit before taxation = Le 16,800.

Amount paid as tax to government = 45% of Le 16800

$$= \frac{45}{100} \times 16800 = \text{Le } 7,560,$$

100

⇒ the only expenses made = Le 7,560.

The net profit = Profit – expenses

$$= 16800 - 7,560 = \text{Le } 9,240.$$

$$40\% \text{ of net profit} = \frac{40}{100} \times 9240 = \text{Le } 3696.$$

100

This amount was shared in the ratio of their contribution.

$$\text{The portion of this amount received by Jonas} = \frac{3}{14} \times 3696 = \text{Le } 792.$$

14

$$\text{The share of George} = \frac{5}{14} \times 3696 = \text{Le } 1,320.$$

14

$$\text{The share of Green} = \frac{6}{14} \times 3696 = \text{Le } 1584.$$

14

(b) The interest earned

$$= \frac{P \times R \times T}{100} = \frac{1584 \times 12 \times 8}{100} = \text{Le } 1521.$$

Greens share of the profit together with the interest

$$= 1584 + 1521 = 3105$$

Green initial contribution = Le 30,000.

Hence Greens share of the profit together with the interest earned in 8 years, as a percentage of his initial contribution = $\frac{3105}{30,000} \times 100 = 10.3\%$.

30,000.

(Q4) John and Alex entered into business partnership last year. Their total contributed working capital was ₦12,000 which was contributed in the ratio 1 : 3 respectively. They agreed to share their profit as follows: Alex is to take 11.1% of this profit for acting as the manager, and whatever was left was to be shared in the ratio of their contribution. If Alex got ₦14,000 out of the total profit, determine

(a) the total profit.

(b) John's share of the profit as a percentage of his contribution towards the capital.

(c) The amount of tax paid by Alex is thrice that paid by John. If John paid 3% of the amount he received as tax, find the total tax paid by the two of them.

Solution.

Let X = the total profit.

Since Alex first received 11.1% of this profit \Rightarrow the amount which Alex first received = $\frac{11.1 \times X}{100} = 0.11X$.

The amount of profit which is left to be shared by the two of them

$$= X - 0.11X$$

$$= 1X - 0.11X = X(1 - 0.11)$$

$$= X(0.89) = 0.89X.$$

This amount was shared in the ratio of their contribution.

John : Alex

Ratio: 1 : 3

Total ratio = 1 + 3 = 4.

$$\text{Alex's share} = \frac{3}{4} \times 0.89X = 0.668X.$$

4

$$\text{Alex's total share of the profit} = \text{his first share} + \text{his second share} = 0.11X + 0.668X = 0.78X.$$

$$\text{Since the amount received by Alex as his share} = \text{¢}14,000, \Rightarrow 0.78x = 14000$$

$$\Rightarrow X = \frac{14000}{0.78} = \text{¢}17949.$$

0.78

$$(a) \text{ The total profit} = X = \text{¢}17949.$$

$$(b) \text{ In sharing the profit of } \text{¢}17949, \text{ Alex first received } 11.1\% \Rightarrow \text{Alex first took } \frac{11.1}{100} \times 17949$$

100

$$= \text{¢}1992.$$

$$\text{Profit left to be shared by the two of them} = \text{¢}17949 - \text{¢}1992 = \text{¢}15957.$$

$$\text{Since this amount was shared in the ratio of their contribution} \Rightarrow \text{John's share}$$

$$= \frac{1}{4} \times 15957$$

4

$$= \text{¢}3,989.$$

$$\text{Total capital} = \text{¢}12000.$$

$$\text{Ratio of contribution is John: Alex} = 1: 3,$$

$$\Rightarrow \text{total ratio} = 1 + 3 = 4.$$

$$\text{John's contribution} = \frac{1}{4} \times 12000$$

$$= \text{¢}3,000.$$

$$\text{John's share of the profit as a percentage of his contribution towards the capital}$$

$$= \frac{3989}{3000} \times 100$$

$$= 133\%.$$

$$(d) \text{ Tax paid by John} = 3\% \text{ of his share} = \frac{3}{100} \times 3989 = \text{¢}120.$$

$$\text{Since tax paid by Alex is thrice that paid by John,}$$

$$\Rightarrow \text{tax paid by Alex} = 3 \times 120 = \text{¢}360.$$

$$\text{Total tax paid by the two of them} = \text{¢}120 + \text{¢}360 = \text{¢}480.$$

(5) Yaw starts a company with ₦2,400. After 6 months, he was joined by Esi who contributed ₦3,000. Two months later, Yaw and Esi were joined by Kwasi who contributed ₦3,300. They agreed to share the profit as follows:

20% to Yaw as manager of the company and 4% to Kwasi as assistant manager.

The rest of the profit will be shared in the ratio of the product of their capitals in the company, and the time elapsing since each of them joined the company. If the profit at the end of the first year after Yaw had started the company was ₦12,000, calculate the total amount received by each of these three partners of the company.

Solution

Profit at the end of the first year = ₦12,000 .

Mode of sharing this profit:

$$\begin{aligned} \text{(i) Yaw first took 20\% of it} &\Rightarrow \text{amount had by Yaw} = \frac{20}{100} \times 12,000 \\ &= \text{₦}2400. \end{aligned}$$

$$\begin{aligned} \text{(ii) 4\% of this amount also went to Kwesi} &\Rightarrow \text{amount received by Kwesi} \\ &= \frac{4}{100} \times 12,000 \\ &= \text{₦}480. \end{aligned}$$

Amount of profit left which is yet to be shared

$$= \text{₦}12,000 - \text{₦}2400 - \text{₦}480 = \text{₦}9120.$$

This amount of ₦9120 was then shared in the ratio of the product of their capitals in the company, and the time elapsing since each of them joined the company.

Time Yaw started the company = 1st January.

Since Esi joined Yaw 6 months later, \Rightarrow time that Esi joined the company = 1st July.

Lastly since Kwesi joined the company two months after Esi joined the company, \Rightarrow the time that Kwesi joined the company = 1st September.

Time elapsing before the end of the year:

- (a) With reference to Yaw, this time is 12 months.
- (b) With reference to Esi, this time = 6 months.
- (c) With reference to Kwesi, this time is 4 months.

N/B- Since Kwesi joined the group in September, then he was with the company for only 4 months before the year ended. Also Esi who joined in July was with the company for 6 months before the year ended.

Ratio of their contribution

Yaw : Esi : Kwesi

¢2400 : ¢3000 : ¢3,300

8 : 10 : 11

The ratio of the product of their capitals in the company, and the time elapsing since each of them joined the company are as follows:

Yaw : Esi : Kwesi

12 x 8 : 10 x 6 : 4 x 11

96 : 60 : 44

24 : 15 : 11

Total ratio = 24 + 15 + 11 = 50.

Profit made = ¢ 12,000.

Yaw's share = $\frac{24}{50} \times 12000$

= ¢5760.

Esi's share = $\frac{15}{50} \times 12000$

= ¢3600

Kwesi's share = $\frac{11}{50} \times 12000$

= ¢2640.

Business related issues:

(Q1) A man bought a house for ¢2000 and used ¢500 to renovate it. Electricity was brought into the house at a cost of ¢200, and the cost of extension made to the building amounted to ¢100:

- (a) At what price must he sell the building in order to make a profit of 20%.
- (b) If he sold the building for ¢3900, determine the percentage profit.
- (c) Assuming he sold the house at a lost of 20% and shared the amount had between his two sons, Kofi and John in the ratio 3 : 2 respectively, find the share of each.

Solution:

Cost of building = ¢2,000.

Cost of extension, the bringing of electricity into the building and renovation = ¢200 + ¢100 + ¢500 = ¢800, \Rightarrow the actual cost of the building = ¢2000 + ¢800 = ¢2,800.

$$\begin{aligned} \text{(a) 20\% of the actual cost of the building} &= \frac{20}{100} \times 2,800 \\ &= \text{¢}560. \end{aligned}$$

Price at which the building must be sold, so as to make a profit of 20% = ¢2,800 + ¢560 = ¢3360.

b) Actual cost price of the building = ¢2,800.

Selling price = ¢3,900.

Profit = selling price – actual cost = 3900 – 2800 = ¢1100.

Profit percent = $\frac{\text{Profit} \times 100}{\text{Actual cost price}}$

$$\begin{aligned} &= \frac{1100}{2,800} \times 100 \\ &= 39\%. \end{aligned}$$

$$\begin{aligned} \text{(b) 20\% of the actual cost of the building} &= \frac{20}{100} \times 2800 \\ &= \text{¢}560. \end{aligned}$$

If the building was sold at a lost of 20% \Rightarrow its selling price = ¢2800 – ¢560 = ¢2240.

This amount was then shared between his two sons.

Kofi : John

3 : 2

Total ratio = 3 + 2 = 5.

$$\text{Kofi's share} = \frac{3}{5} \times 2240$$

= ¢1344.

$$\text{John's share} = \frac{2}{5} \times 2240$$

= ¢896.

N/B:- The actual cost of an item or a structure includes any amount spent on it, after its purchase.

-In questions such as the one just solved, it is the actual cost which must be used.

(Q2) A man buys a house at ¢250,00. He paid 20% of the cost out of his own resources and takes a loan for the remaining at 2½% simple interest per annum. Calculate

- (a) the total amount the man pays for the house, if he pays the loan in 8 years.
- (b) the percentage increase in the cost of the house to the man, as a result of the loan.
- (c) his percentage gain, if after settling the loan, he renovated the house at a cost of ₦10,000 and sells it for ₦400,000.

Solution:

Original cost of the house = ₦250,000.

Amount paid by the man out of his own resources = 20% of the cost of the house
= $\frac{20}{100} \times 250,000$

100
= ₦50,000.

Amount taken as loan = ₦250,000 – ₦50,000 = ₦200,000.

(a) Principal = ₦200,000.

Rate = $2\frac{1}{2}\%$ = 2.5%.

Time = 8 years.

S.I = $\frac{P \times R \times T}{100} = \frac{200,000 \times 2.5 \times 8}{100}$

= ₦40,000.

The total amount the man pays for the house due to the loan = Cost of the house + the interest due to the loan = ₦250,000 + ₦40,000 = ₦290,000.

(b) Original cost of the house = ₦250,000.

Actual cost of the house due to the loan = ₦290,000.

Increase in the cost of the house due to the loan = ₦290,000 – ₦250,000 = ₦40,000.

The percentage increase in the cost of the house as a result of the loan

= $\frac{\text{Increase in cost}}{\text{Original cost}} \times 100$

Original cost

= $\frac{40,000}{250,000} \times 100$

250,000 = 16%.

c) Cost of renovation = ₦10,000.

The actual cost of the house = its original cost + the interest due to the loan + the cost of the renovation

$$= \text{¢}250,000 + \text{¢}40,000 + \text{¢}10,000 = \text{¢}300,00.$$

Selling price = ¢400,000.

$$\text{Gain or profit} = \text{¢}400,000 - \text{¢}300,000 = \text{¢}100,000.$$

Percentage gain =

$$\frac{\text{Gain}}{\text{Original cost}} \times 100$$

Original cost

$$= \frac{100,000}{250,000} \times 100$$

$$= 40\%.$$

(Q3) A labourer who receives wages is paid ¢20 per each working day. With respect to over time, he receives ¢3 per hour. For a two week period last month, he worked from Monday to Friday each week. For two different days, he did an over time of 3 hours and on one occasion, the over time done was 5 hours. Determine the total amount he received from his boss.

Solution:

The total number of days he worked within the two week period = 10 days.

Wages received for this 10 day working period = $10 \times 20 = \text{¢}200$.

For two different days, the overtime done = 3 hours,

$$\Rightarrow \text{number of hours of overtime done} = 3 \times 2 = 6 \text{ hours.}$$

Since on a different occasion, he did an overtime of 5 hours, \Rightarrow total number of hours of doing over time = $6 + 5 = 11$ hrs.

Amount received for doing the over time = $11 \times 3 = \text{¢}33$.

Total amount received for the two week working period = $\text{¢}200 + \text{¢}33 = \text{¢}233$.

(Q4) A man invested a certain amount of money in two separate projects in the ratio 3 : 2. His profit was calculated on interest rates of 5% and 4% simple interest respectively. If after two years, he received a sum of GH¢9200.00 as his profit for the two projects, calculate the total amount he invested in the two projects.

Solution:

Let X = the amount invested in the two projects, and let these projects be project (1) and project (2).

Project 1 : Project 2

Ratio of amount invested: = 3 : 2

$$\text{Total ratio} = 3 + 2 = 5.$$

Amount invested in any of these projects

$$= \frac{\text{The ratio}}{\text{Total ratio}} \times \text{amount invested}$$

Total ratio

Since X = the total amount invested, then the amount invested in project (1)

$$= \frac{3}{5} \times X$$

$$= 0.6X.$$

Also the amount invested in project (2)

$$= \frac{2}{5} \times X$$

$$= 0.4X.$$

Profit received by the man from project (1) = 5% of the amount invested

$$= \frac{5}{100} \times 0.6X$$

$$= 0.03X.$$

Also profit received by the man from project (2) = 4% of the amount invested

$$= \frac{4}{100} \times 0.4X$$

$$= 0.016X.$$

Therefore the total profit received by the man, for the 2 year period for the two projects = $0.03X + 0.016X = 0.046X$.

Since for this same 2 year period, the man received GH¢ 9200.00 as profit for these two projects, then $0.046X = 9200.00$

$$\Rightarrow X = \frac{9200.00}{0.046} = 200,000.$$

$$0.046$$

Amount invested in the two projects = $X = \text{GH¢ } 200,000$.

(Q5) The table shown in percentage, is the monthly expenditure of an employer whose gross monthly salary is ¢ 10800.

Items	Percentage
Social Security	5
Income Tax	25

Food	40
Transport	10
Rent	12.5
Others	7.5

(a) Draw a pie chart to illustrate the data.

(b) If Social security contribution and income tax are deducted from the gross monthly salary before payment, calculate to the nearest whole number, the expenditure on rent as a percentage of the employers take home pay.

Solution:

(a) The angle representing the amount spent on social security = $\frac{5}{100} \times 360 = 18^\circ$

The angle representing the amount spent on income tax = $\frac{25}{100} \times 360 = 90^\circ$

The angle representing the amount spent on food = $\frac{40}{100} \times 360 = 144^\circ$

The angle representing the amount spent on transport = $\frac{10}{100} \times 360 = 36^\circ$

The angle representing the amount spent on rent = $\frac{12.5}{100} \times 360 = 45^\circ$

The angle representing the amount spent on other items = $\frac{7.5}{100} \times 360 = 27^\circ$

We then draw the pie chart using these calculated values.

(b) Gross monthly salary = ₦10,800.

Amount deducted as social security = 5% of ₦10,800

= $\frac{5}{100} \times 10,800$
= ₦540

Amount deducted as income tax = 25% of ₦10,800

= $\frac{25}{100} \times 10,800$

$$100 = \text{¢ } 2700^0$$

Total amount deducted from gross = ¢540 + ¢2700 = ¢3240.

Take home pay = 10,800 – 3240 = ¢7560.

Expenditure on rent = 12.5% of gross pay

$$= \frac{12.5}{100} \times 10,800$$

$$= \text{¢ } 1350^0$$

Expenditure on rent as a percentage of the employer's take home pay

$$= \frac{\text{Expenditure on rent}}{\text{Take home pay}} \times 100$$

Take home pay

$$= \frac{1350}{7560} \times 100$$

$$= 18\%.$$

(Q6) Two commodities A and B cost c70 and c80 per kilogram respectively. If 34.5 kg of A is mixed with 26kg of B and the mixture is sold for c85 per kilogram, find the profit percent.

Solution:

Cost of commodity A per kg = c70.

Amount of commodity A found in the mixture = 34.5 kg.

Cost of commodity A used in the manufacture of the mixture = 70 x 34.5 = ¢2415.

Cost of commodity B per kilogram = c80.

Amount of commodity B used in the manufacture or found in the mixture = 26 kg.

Cost of commodity B used in the manufacture of the mixture = 80 x 26 = ¢2080.

Total amount spent in the manufacture of the mixture = Cost of the quantity of commodity A found in the mixture + Cost of the quantity of commodity B found in the mixture

$$= \text{¢ } 2415 + \text{¢ } 2080 = \text{¢ } 4495.$$

$$\Rightarrow \text{The cost price of the mixture} = \text{¢ } 4493$$

Total weight of the mixture = weight of the amount of commodity A found within the mixture + weight of the amount of commodity B found within the mixture

$$= 34.5 + 26 = 60.5 \text{ kg.}$$

Selling price of the mixture = c85 per kg.

If 1kg = c85

$$\text{then } 60.5\text{kg} = \underline{60.5} \times 85$$

$$= \text{¢ } 5143,$$

$$\Rightarrow \text{the selling price of the mixture} = \text{¢ } 5143.$$

$$\text{Profit} = \text{S.P} - \text{C.P} = 5143 - 4493 = \text{c}650$$

$$\text{Profit percent} = \frac{\text{Profit}}{\text{Cost price}} \times 100 = \frac{650}{4495} \times 100 = 14.5\%.$$

(Q7) A company buys a car for ₦ 27,000 and sells it to Mr. Fosu for ₦36000 after a discount of 10% on the marked price. Calculate

- (a) i. the marked price.
ii. the percentage profit made by the company.
- (b) If Mr. Fosu sells the car after covering a mileage of 12800 km, find
 - I) the value of the car if the rate of depreciation is ₦ 0.03 per kilometer.
 - II) the range of values for which Mr. Fosu could sell the car, so that he does not lose more than ₦200 or gain more than ₦3000 on the depreciated value.

Solution:

- (a) i. The marked price of the car is represented by 100%, i.e. the marked price= 100%.
Since the car was sold to Mr. Fosu (for ₦36,000) at a discount of 10%, then the percentage representing the selling price = $100 - 10 = 90\%$.

Since the car was sold to Mr. Fosu at ₦36,000 $\Rightarrow 90\% = \text{₦}36,000$.

Now if $90\% = \text{₦}36,000$ then $100\% = \frac{100}{90} \times 36,000$

$$100\% = \text{₦} 40,000.$$

Since the $100\% =$ the marked price then the marked price = ₦40,000.

- III) Price at which the company bought the car = ₦27000.

Price at which the company sold the car to Mr. Fosu = ₦36,000.

$$\text{Profit} = 36,000 - 27,000 = \text{₦}9,000.$$

$$\text{Profit percent} = \frac{\text{P}}{\text{C.P}} \times 100$$

$$= \frac{9,000}{27,000} \times 100 = 33\%.$$

- (b) i. Price at which Mr. Fosu bought the car = ₦36,000'

Mileage travelled by the car before it was sold by Mr. Fosu = 128000 km.

Rate of depreciation = ₦0.03 per km.

$$\text{Now if } 1\text{km} = \text{₦}0.03\text{km then, } 128,000\text{km} = \frac{128,000 \times 0.03}{1} = \text{₦}3,840,$$

\Rightarrow depreciation = ₦3840.

Price at which Mr. Fosu sold the car, or the value of car after covering the distance of 128000km = $36,000 - 3840 = \text{¢}32160$.

ii.

Price at which Mr. Fosu must sell the car, so that he does not lose more than $\text{¢}200 = 32160 - 200 = \text{¢}31960$.

Price at which he must sell the car, so that the gain made is not more than $\text{¢}3000 = 31960 + 3000 = \text{¢}34960$.

The car must therefore be sold between $\text{¢}31960$ and $\text{¢}34960$.

Questions:

- (1) Within the village community of Abona, consumers of electricity are charged as follows:

Fixed charge = 50p.

First 20 units is at 2p per unit.

Next 40 units is at 4p per unit.

Any additional unit is at 10p per unit.

- (a) Determine how much will be paid by Mr. Ackom, who used 80 units of electricity.

Ans: 450p or $\text{¢}4.50$

- (b) If the bill of Mr. Abossey was $\text{¢}6.50$, how many units did he use? Ans: 100units.

- (2) The electricity corporation of Kenya charges as follows:

First 20 units Nil (Free).

Next 40 units 5 cent per unit.

Next 30 units 10 cent per unit.

Any extra unit used is at 2 cent per unit.

- (a) If Auntie Esi used 200 units of electricity, how much did she pay? . . .

Ans: 720 cents.

- (b) Determine how much John will pay, if he used 18 units of electricity. Ans: He will pay nothing.

- (c) If Abu used 120 units, determine his bill. Ans: 560 cents.

(d) John's bill was ₵564. How many units did he use? Ans: 122 units

(e) Given that Amina paid a bill of 540 cents, find the number of extra units used.
Ans: 20 units.

(3) The electricity charges within a town are as follows:

First 10 units cost ₵50.

Next 40 units is at a cost of ₵2 per unit.

Next 20 units is at a cost of ₵4 per unit.

Any additional unit used cost ₵7 per unit.

(a) John Atiema used 60 units of electricity. Determine his bill. Ans: ₵170

(b) Find the bill of Sister Akos who used 80 units of electricity. Ans: ₵280

(c) Madam Mimi paid a bill of ₵350. Determine

i. the number of extra units used

Ans: 20units.

ii. the total number of units she used.

Ans: 90units.

(Q4) Mr. Adu, the director of a company who is married with 3 kids, is on a yearly salary of ₵24000. His yearly tax free allowances are as follows:

i. Personal 10% of the salary in addition to ₵200.

ii. Entertainment..... 1/8 of the salary.

iii. Children..... ₵200 per child up to 2 kids.

After these deductions, the remainder is taxed as follows:

First ₵3000, at ₵2 per cedi.

Next ₵7000, at ₵1 per cedi.

Next ₵400, at ₵5 per cedi.

Remainder, at 20%. Calculate

i. his total tax free allowance.

Ans: ₵600.

ii. his taxable income

Ans: ₵18,000.

iii. his yearly tax
Ans: ₦16520.

iv. his monthly tax
Ans: ₦1377.

v. his monthly net
Ans: ₦623.

(Q5) Mr. Sam accepted the position of the headmaster of a school, on these terms:

He is to enjoy a monthly salary of ₦4000, in addition to 50% of the canteen fees collected, as well as half of the cost of petrol he used within his car, within a given month. In June last year, the canteen fee collected was ₦12,000, and the amount of fuel used was ₦10,000. His monthly taxable income is $\frac{2}{3}$ of his monthly pay, and this is subjected to taxation as follows:

First ₦2000 10%.

Next ₦500 20%.

The rest 15%.

Determine

- (a) his June take home pay .**
Ans: ₦1,468.
- (b) his June taxable income.**
Ans: ₦2,667.
- (c) his total tax paid for June.**
Ans: ₦325.

(Q6) Brother Joe who works as a storekeeper receives a monthly salary of ₦2000, in addition to a commission of 40%, with reference to the value of goods sold. Last month, the value of goods sold was ₦1200. He enjoys a tax free allowance of 12% with reference to his salary, in addition to a further tax free allowance of ₦100. With reference to his taxable income, taxation is as follows:

- i. First ₦50..... 20p in the cedi,**
- ii. Next ₦40..... 10p in the cedi,**
- iii. Remainder..... 2p in the cedi. Calculate**

- (a) his take home pay.**
Ans: ₦2,435.
- (b) his taxable income for last month.**

Ans: ₦1,660.

(c) his total tax paid last month

Ans: ₦45.

(Q7) Dr. Tony Addei who works with the health ministry, is on a monthly salary of ₦20,000, of which only 80% of it is taxable. With regard to his taxable income, taxation is as follows:

10% is deducted as rent tax and 20% of what ever remains is removed as welfare tax. Finally 2% of what ever remains is removed as road maintenance tax. Determine

(a) his taxable monthly income.

Ans: ₦16000.

(b) his monthly tax free income.

Ans: ₦4000.

(c) his monthly tax paid.

Ans: ₦4710.

(d) his yearly tax paid.

Ans: ₦56,520.

(e) his yearly net income.

Ans: ₦183,480.

(Q8) Adu, Beatrice and Akos entered into a business partnership and the ratio of their initial contribution respectively is 3 : 5 : 1, for which Akos contributed ₦1000. They decided to share only 70% of the net profit as follows:

₦500 will be given to Adu for his role as acting director, whilst Akos gets ₦200 for acting as the secretary. For what remains, Adu takes 10%, Beatrice takes 20% and Akos takes only 5%. The rest of the amount left is to be shared in the ratio of their contribution. At the end of the year, the profit declared was ₦22,000. The cost of yearly maintenance was ₦2000 and the cost of running the company's two cars for that year amounted to ₦1500. The yearly tax paid amounted to ₦500. Calculate

(a) their working capital.

Ans: ₦900.

(b) the share had by each of them.

Ans: Adu.....₦4,268.

Beatrice.....₦6,677.

Akos..... ₦1,654.

(c) Express Adu's contribution as a percentage of his share of the profit.

Ans:70%

(Q9) A, B and C entered into a business partnership and contributed to get a working capital of ₦80,000, for which A contributed ₦30,000, C contributed ₦10,000 and the rest came from B. The profit made at the end of the year was ₦50,000, and 10% of it was used for the payment of tax. ₦2000 out of this same amount was used to renovate their offices, and ₦1000 was used for the entertainment of their office business guests. They agreed to share the profit as follows:

A first takes $\frac{1}{4}$ of it in addition to an amount of ₦1200. For the remainder, B takes 20% and C takes 40%. Finally whatever remains was to be shared in the ratio of their contribution. Determine the share of each one of them.

Ans: A's share =₦16245.

B's share =₦12120.

C's share =₦13635.

(10) Mr. Kumi deposited ₦1200 at a bank for 20 years at a rate of 10% p. a. He withdrew this amount together with the interest and added ₦30,000 to it in order to buy a car . In order to bring the car on the road, he had to spent an amount of ₦10,000. He later sold the car at a profit of 40% and shared the amount had between his two sons, John and Ben in the ratio 3 : 5 respectively. Ben added an amount of ₦10,000 to his share in order to buy a building, which he renovated at a cost of ₦5000. If he sold this building at a lost 30%, determine

(a) (i) the cost of the car. (ii) the actual cost of the car.

Ans: ₦66,000.

Ans: ₦76,000.

c) the selling price of the car.

Ans: ₦106400.

(d)the price at which Ben sold the building.

Ans: ₦57,050.

(Q11) A storekeeper's monthly pay is ₦8000 and receives a commission of 5% of sales made. For the first three months of assuming duty, the sales made were respectively ₦400, ₦900 and ₦800. At the end of the third month he collected all his three month salaries, together with the various commission earned, and used the total amount had to buy one thousand plastic barrels. If he later sold each barrel at a price of ₦43, find

(a) his total profit.

Ans: ₱18895.

(b) his profit percent. Ans: 78%.

(c) Assuming he previously decided to deposit his initial capital used in buying the barrels at a bank, at a rate of 15% p. a., in order to earn an interest of ₱7232, how long must he keep the amount at the bank.

(d) Ans: 2 yrs.