1. Rates, Ratio and percentages

1. Mary has 21 coins whose total value is shs 72. There are twice as many five shillings coins as there are ten shillings coins. The rest are one shilling coins. Find the number of ten shillings coins that Mary has. (3mks)

2. (a) Divide $100cm^3$ in the ratio $\frac{1}{4}:\frac{1}{2}:\frac{1}{5}$ to the nearest whole number. (3mks)

(b) In a chemistry experiment, a boy mixed some acid solution of 45% concentration with an acid solution of 25% concentration. In what proportion should the two acids be mixed in order to get $100cm^3$ of solution of 30% concentration. (3mks)

(c) (i) Two blends of tea costing sh 140 and sh 160 per kg respectively are mixed in the proportion of 2:3 by mass. The mixture is then sold at sh 240 per kg. Find the gain percent (2mks)

(ii) In what ratio should the two blends be mixed to get a mixture that costs sh 148 per kg. (2mks)

3. A cylindrical water tank is of diameter 14 metres and height 3.5 metres.

(a) Find the capacity of the water tank in litre. (3mks)

(b) Six members of a family use 20 litres each per day. Each day 80 litre are used for cooking and washing. A further 50 litres is wasted daily. Find the number of complete days a full tank would last the family. (3mks)

(c) Two members of the family were absent for 90 days. During this time, wasting was reduced by 20% as cooking and washing remained the same. Calculate the number of days a full tank would now last the family. (4mks)

4. The length of a rectangle is increased by 20% while the width is decreased by 10%. Find the percentage change in area. (2 mks)

5. (a) Divide $1000cm^3$ in the ratio $\frac{1}{4}:\frac{1}{2}:\frac{1}{5}$, leaving your answer to the nearest 1 cm (3mks)

(b) In a Chemistry experiment, a boy mixed some acid solution of 45% concentration with an acid solution of 25% concentration. In what proportion should the two acids be mixed in order to get $100cm^3$ of solution of 30% concentration? (3 mks)

(c) (i) Two blends of tea costing ksh. 140 and ksh. 160 per kilogram respectively are mixed in the proportion of 2:3 by mass. The mixture is sold at ksh. 240 per kilogram. Find the gain percent (2 mks)

(ii) In what ratio should the two blends be mixed to get a mixture that costs ksh. 148 per kilogram (2 mks)

6. Senjeni and Mkimwa entered into a business partnership in which they contributed ksh. 120,000 and ksh 150,000 every year respectively. After one year, Kuku joined the business and contributed ksh. 90,000.
   (a) Calculate the ratio of their investment after 3 years of business (3mks)
   (b) It was agreed that 30% of the profits after 3 years be used to cater for the cost of running the business, while the remaining would be shared proportionally. Calculate each persons share, if the profit made after three years was ksh. 187,000 (4mks)
   (c) If each of them invested their shares back in the business, find their new individual investments at the beginning of the fourth year (3mks)

7. The population of elephants in Kenya's game reserves is 40,000 at present. If their population increase is estimated to be 30% every 10 years, calculate their population in 30 years time to the nearest 10. (3mks)

8. Fifteen men working for eight hours a day can complete a certain job in exactly 24 days. For how many hours a day must sixteen men work inorder to complete the same job in exactly 20 .days. (2mks)

9. Mwandime and Mwashuma working together do a piece of work in 22/5 days. Mwandime working alone takes 2 days less than Mwashuma. How long does it take Mwashuma to do the work alone. (4 mks)

10. 20 women working four hours a day take 12 days to complete a job. If 8 of the women wish to do the same for 12 days, how many hours a day would they have to do work? (2 marks)

11. If 5 men can erect 2 cottages in 21days, how many more men, working at the same rate will be needed to erect 2 cottages in the same period?

12. The length and width of a rectangular paper were measured to the nearest centimeter and found to be 18cm and 12cm respectively. Find the percentage error in its perimeter in 6 hrs.

13. a) Two pipes **A** and **B** can fill a tank in 3hrs and 4 hrs respectively. Pipe **C** can empty the full tank
   i) How long would it take pipes **A** and **B** to fill the tank if pipe **C** is closed?
   ii) Starting with an empty tank, how long would it take to fill the tank with all pipes running?
   b) The high quality Kencoffee is a mixture of pure Arabica coffee and pure Robusta coffee in the ratio 1 : 3 by mass. Pure Arabica coffee costs shs. 180 per kg and pure Robusta coffee costs sh 120 per kg. Calculate the percentage profit when the coffee is sold at sh 162 per kg.

14. A number of nurses working at Sotik Health Centre decided to raise shs.144,000 to buy a plot of land. Each person was to contribute the same amount. Before the contributions were collected five of the nurses retired. This meant that the remaining contributors had to pay more to meet the target.
   (a) If there were **n** nurses originally, find the expression of the increase in contribution per person
   (b) If the increase in the contribution per person was shs.2,400, find the number of nurses originally at the health centre
   (c) How much would each person have contributed to nearest shilling if the 5 people had not retired
   (d) Calculate the percentage increase in the contribution per person because of the retirement

15. 3 taps **X,Y** and **Z** can fill a tank in 40 hours, 15 hours and 20 hours respectively. The three taps are turned on at 8.00a.m when the tank is empty for five hours then **Z** is turned off. After two hours tap **Y** is turned off. Work out ;-

(a) The proportion of water in the tank after seven hours
(b) The proportion of water in the tank after seven hours
(c) The time the tank will be completely full

16. Jane and Philip working together can do a piece of work in 6 days. Jane working alone takes 5 days longer than Philip. How many days does it take Philip to do the work alone?

17. Sixteen men working 9 hours a day can complete a piece of work in 14 days. How many more men working 7 hours a day would complete the same job in 12 days?

18. A group of people planned to contribute equally towards buying land at a price of shs.180000. However 3 members of the group withdrew from the project. As a result, each of the remaining members were to contribute kshs.3000 more.
(a) find the original number of members in the group
(b) How much would each person have contributed if the 3 people had not withdrew
(c) Calculate the percentage increase in the contribution per person caused by the withdrawal

19. Kori and Mue decided to start a business. Korir contributed shs.40,000 and Mue shs.64000. The two men agreed that in any year, 15% of the profit shall be divided equally between them and 20% of the profit will be used to meet the cost of running the business the following year. They also agreed to share the rest of the profit in the ratio of their contributions. The profit made after the first year was shs.43200.
a) How much did they set aside towards the cost of running the business for the second year?*
b) How much did Mue receive at the end of the first year?
(c) Korir bought cows with his share of the profit. If each cow cost shs.1800, how many cows did he buy?

20. Given the ratio x : y = 2:3, find the ratio (7x – 3y) : (2x + 3y)

21. Abdul bought five bulls and thirty goats at an auction spending a total of Kshs.117000. His friend Ali bought four bulls and twenty five goats at the same auction and spent Kshs.22,250 less.
(a) Find the cost of each animal at the auction (b)
Abdul later sold all his animals at a profit of 40% per bull and 30% per goat. Ali sold all his animals at a profit of 50% per bull and 40% per goat. Determine who made more profit and by how much?

22. The cost of providing a commodity consists of transport, labour and raw material in the ratio 8:4:12 respectively. If the transport cost increases by 12% labour cost 18% and raw materials by 40%, find the percentage increase of producing the new commodity

23. A mother is now 2½ times as old as her daughter Mary; four years ago the ratio of their ages was 3:1. Find the present age of the mother

24. Sixteen men working at the rate of 9hrs a day can complete a piece of work in 14 days. How many more men working at the rate of 7 hours a day would complete the same job in 12 days

25. Two business partners, Kago and Beatrice contributed 90, 000/= and 120,000/= in order to start a business. They agreed that 25% of the profit made after end of the year will be put back into the business. They also estimated that 40% of the profit will cover salaries and other expenses for

the year. The remainder would be shared between the partners in the ratio of their contributions. At the end of the first year the business realized a gross profit of shs.181,300.

a) Calculate how much each received after end of the year.

b) At the end of 2nd year the business realized the same gross profit as the previous year and the partners decided to dissolve the business and share everything . Determine how much money each received.

26. A number is such that the product of its digits is 24. When the digits are reversed, the number so formed exceeds the original number by 27. Find the number

27. The radius of a cylinder is increased by 30% while its height is decreased by 20%. Find the percentage change in the volume of the cylinder

28. Tap **A** fills a tank in 6 hours, tap **B** fills it in 8 hours and tap **C** empties it in10 hours. Starting with an empty tank and all the three taps are opened at the same time, how long will it take to fill the tank?

29. Sixteen men working 9 hours a day can complete a piece of work in 14 days. How many more men working 7 hours a day would complete the same job in 12 days?

30. Three businessmen Langat, Korir and Koech contributed shs.160,000, Shs.200,000 and shs.240,000 respectively and started a business. They agreed that 30% of the profit each year will go to expenses, 15% of the reminder would go back to the business. The rest of the profit would be shared in the ratio of their contribution. At the end of the first year, the business realized a profit of kshs.60,000.
Calculate how much;
(a) (i) Langat received
(ii) Korir received
(iii) Koech received
(b) Express what Korir received as a percentage of the total profit

31. The price of a book is increased by 25%.
(a) In what ratio has the price increased?
(b) What is the new price if the book was shs.400 before the change?

32. (a) A chemist added 120 liters of a solution A containing 25% alcohol to 180 liters of solution **B** containing 20% alcohol. What percentage of the resulting solution in alcohol?
(b) He removed **X** liters of resulting mixture and added an equal amount of pure alcohol to the resulting mixture. If the new mixture contains 22% of the alcohol, find the value of **X**

33. The length and width of a rectangular paper were measured to the nearest centimeter and found to be 18cm and 12cm respectively. Find the percentage error in its perimeter

34. Given that a:b = 1: 2 and b:c = 3:4. Find a:b:c