A ratio indicates how many times one number contains another.

For example, if there are eight oranges and six lemons in a bowl of fruit, then the ratio of oranges to lemons is eight to six (that is, 8∶6)

Ratios may be scaled up by multiplying with a constant value or scaled down by dividing with a constant value.

Thus (8:6) is equivalent to (8 x 2: 6 x 2) = (16: 12)

Or (8:6) is equivalent to (8/2:6/2) = (4:3)

Similarly, the ratio of lemons to oranges is 6∶8 (or 3∶4) and the ratio of oranges to the total amount of fruit is 8∶14 (or 4∶7).

Example 1

A Recipe for pancakes uses 3 cups of flour and 2 cups of milk. Find the ratio of flour to milk

So the ratio of flour to milk is **3 : 2**

Example 2

In a class of 42 pupils, the ratio of girls to boys is 2:1. How many girls are in the class?

Solution

Total ratio = 2 +1 = 3

Number of girls = $\frac{2}{3}\ x\ 42 =\ 28$

Example 3

If $\frac{1}{3}$ of Gala's salary is shs 16,000. What is his salary?

Solution

Let the salary be x

$\frac{1}{3}x = 16000$

X = 16000 x 3 = 48000

Exercise

1. 12 kg of flour is made up of a mixture of millet and cassava in the ratio of 1:2. What is the weight of the millet in the mixture?

2. Water and milk are mixed in the ratio 3:1 to make tea for a party. How many litres of milk are in 20 litres of tea?

3. Okello divided his money among his daughters: Anne, Barbra and Christine in the ratio 4:5:6 respectively. If Anne got Shs 600,000 find the amount of money that Okello had at the beginning.

4. There are 45 pupils in a class. The ratio of the girls to the boys is 2:3. Find the number of girls in the class.

5. If $\frac{2}{5}$ of a number is 10. Find the number.

6. Out of 120 students who took a test, $^1/_3$ were girls.

   (a) How many girls took the test?

   (b) If 40 % of the boys failed and 55% of the girls passed the test, how many students altogether passed the test?

7. A tank has two taps that pour water into it. Tap A turned alone, fills the tank in 20 minutes. Tap B turned on alone fills the tank in 10 minutes.

   (a) How long will the two taps turned on at the same time take to fill the tank?

(b) If both taps pour 36 litres of water per minute, what amount of water does the tank hold when full?

8. The average length of three strings is 38cm. Two of the strings measure 44cm each. Find the length of the third string.

9. The average age of 3 girls is 12 years. If one of them is 10 years old, what is the average of the other two girls?

10. Kirya is 3 times as old as his daughter. The difference between their ages is 36 years. How old is the daughter.

11. In Moshi Primary School $\frac{3}{4}$ of the pupils who sat for the Primary Leaving Examination passed.

a) If those who failed were 30, find the number of pupils who passed.

b) What percentage of pupils failed the examination?

12. A tank is 2/3 full of water. When 600 litres of water are added, the tank is 5/6 full. How many litres of water does it contain when it is 3/4 full?

14. The mean age of 3 children is 13 years. The total age of two of the children is 25 years. Find the age of the third child.

13. In class of 80 pupils, the ratio of boys to girls is 2:3. Find the number of girls.

14. Okello had 30km still to cover after travelling $\frac{3}{5}$ of the journey. How long was the journey?

15. In a feed factory, crushed fish is mixed with maize flour in the ratio 1:3 The feed are packed in 80kg bags.
    a) How many Kilograms of fish are used in one bag of the feeds?

    b) If one Kilogram of maize flour costs Sh 400, how much does it cost to buy maize flour to make feeds weigh l000Kg?

16. A man spends $\frac{1}{4}$ of his salary on food, $\frac{1}{3}$ on clothing, $\frac{1}{6}$ on fees, $\frac{1}{12}$ on entertainment and banks the rest which is sh 27,000.
    a) What fraction of the salary does he bank?

b) How much money does he earn as his salary?

17. . Corona Primary School, $^{1}/_{3}$ of the pupils in P. 7 like Matooke, $^{2}/_{5}$ of the remainder like rice. The rest of the pupils like posho. If those who like posho are 42, find the total number of pupils inP.7.

18. A school has a total of 400 pupils. If there are 240 girls in the school, what is the ratio of boys to girls?

19. $\frac{5}{8}$ of water in a tank lasts a family 45 days.

(a) How long will $\frac{2}{3}$ of the water in that tank last the family?

(b) If the family spends shs 300 per day on water, how much does it spend on a full tank?

20. In a school of 600 pupils, the ration of boys to girls is 1: 2. what is the number of girls in the school?

21. A primary school has population of 1080 pupils. Of these $\frac{3}{5}$ are girls and $\frac{1}{4}$ of the boys are in the upper primary classes.

(a) Find the number of boys in upper primary classes (3 marks)

(b) Express the number of boys in the lower primary classes as a percentage of the whole school population (2 marks)

22. Milk was mixed with water to make tea. If 14 litres of milk was used and this was 40% more than the amount of water in the tea, how much tea was prepared?

(05 marks)

(b). Barbara is 4 times as old as Mukasa. In 10 years' time, Barbara will be twice as old as Mukasa will be. How old is Barbara and Mukasa now? (4marks)

23. A Certain country in Uganda has population of 300,000 people. Of these people $\frac{3}{5}$ are females and $\frac{5}{6}$ of the females are girls.

(a) If $\frac{2}{3}$ of the males among the population are boys, find the ratio of boys to girls. (4marks)

(b) What the total number of boys and girls in the country? (2marks)

24. On a mixed farm $\frac{1}{3}$ of the land is used for growing food crops while $\frac{1}{4}$ of the remaining lands is for cash crops, the rest of the land is for cattle grazing.

a) What fraction of the land is used for cattle grazing? (02 marks)

b) If 15 hectares are used for cash crops, what is the total area of the farm? (03 marks)

25. In a P7 class, $\frac{2}{5}$ of the pupils are girls, if there are 150 pupils in the class, find the number of boys?

26. A man spends $\frac{1}{3}$ his salary on food, $\frac{1}{9}$ on clothing on medical, $\frac{1}{6}$ on house rent and bank the rest which is shs. 35,000.
    (a) What fraction of his salary does he bank? (3marks)

(b) How much money he earns as salary? (2marks)

27. In jumbo primary school, $\frac{1}{4}$ of the pupils in p7 like science, $\frac{2}{3}$ of the remainder like mathematics. The rest of the pupil like English. If those who like English are 33, find the total number of pupil in p7. (05marks)

28. A tank was $\frac{2}{3}$ full of water. When $^1/_4$ of the water in the tank was drawn, 2,500 litres remained Find the capacity of the tank when full.

(04 marks)

29. A bucket was $\frac{3}{4}$ full of water. When 4 liters were removed, it become $\frac{1}{2}$. What is the capacity of the bucket?

30. Two taps F and E are connected to water tank. Tap F can fill the tank in 2 hours while E can empty it in 3hours, one day when the tank was $\frac{1}{2}$ full of water; the taps were opened at the same time.
    How long did it take to fill the tank?

31. A house can be built by 3 men in 20 days. How many men working at the same rate can build the same house in 12 days?

32. In a class, $\frac{1}{5}$ of the girls are boarders while $\frac{1}{3}$ of the boys are day scholars. The percentage of the girls in the class is 60%. The class has 10 boys who are day scholars.
    (a) How many pupils are in the class? (03marks)

(b) Find the number of girls who are boarders (2marks)

33. Joyce, peter and Hannah shared pencils in the ratio 3:5:7 respectively

(a) If Hannah got 12 more pencils than Joyce, how many pencils did they share altogether? (04marks)

(b) Find the number of pencils Peter got. (02 marks)

Suggested answers

1. 12 kg of flour is made up of a mixture of millet and cassava in the ratio of 1:2. What is the weight of the millet in the mixture?

Total ratio = 1+ 2 = 3

Weight of millet = $\frac{1}{3}\ of\ 12$

$= \frac{1}{3}\ x\ 12 = 4kg$

2. Water and milk are mixed in the ratio 3:1 to make tea for a party. How many litres of milk are in 20 litres of tea?

Total ratio = 3+1 =4

Liters of milk = $\frac{1}{4}\ x\ 20 = 5l$

3. Okello divided his money among his daughters: Anne, Barbra and Christine in the ratio 4:5:6 respectively. If Anne got Shs 600,000 find the amount of money that Okello had at the beginning.

Total ratio = 4 + 5 +6

= 15

Let the money be x

⇨ $\frac{4}{15}x = 600000$

$x = \frac{600000\ x\ 15}{4}$

$= shs.\ 2{,}250{,}000$

4. There are 45 pupils in a class. The ratio of the girls to the boys is 2:3. Find the number of girls in the class.

Total ratio = 2+3 = 5

Number of girls = $\frac{2}{5}\ x\ 45 = 18$

5. If $\frac{2}{5}$ of a number is 10. Find the number.

   Let the number be X

   $\frac{2}{5}$ of x = 10

   $\frac{2}{5}\ x = 0$

   X = 10 x $\frac{5}{2}$ = 25

6. Out of 120 students who took a test, $^1/_3$ were girls.

   (c) How many girls took the test?

   Number of girls = $\frac{1}{3}\ of\ 120 = \frac{1}{3}\ x\ 120 = 40$

   (d) If 40 % of the boys failed and 55% of the girls passed the test, how many students altogether passed the test?

   Total number of boys 120 – 40 = 80

   The percentage of boys that passed = 100- 40 = 60%

   Number of boys that passed = $\frac{60}{100}\ x\ 80 = 48$

   Number of girls that passed = $\frac{55}{100}\ x\ 40 = 22$

   Total students that passed = 48 + 22 = 70

7. A tank has two taps that pour water into it. Tap A turned alone, fills the tank in 20 minutes. Tap B turned on alone fills the tank in 10 minutes.

   (a) How long will the two taps turned on at the same time take to fill the tank?

   Time taken = $\frac{product}{sum} = \frac{20\ x\ 10}{20+10} = \frac{200}{30} = 6\frac{2}{3}\ minutes$

(b) If ter does the tank hold when full?

   1min = 36litres

   $6\frac{2}{3}\ minutes$ = 36 x $6\frac{2}{3}$ = 240 litres

8. The average length of three strings is 38cm. Two of the strings measure 44cm each. Find the length of the third string.

Total length of the string = 38 x 3 = 44 + 44+ x

The length of the third string, x = 114 – (88)

= 26

9. The average age of 3 girls is 12 years. If one of them is 10 years old, what is the average of the other two girls?

Total age of three girls = 3 x 12 = 36

Age of two girls = 36 – 10 = 26

Average age of two girls = $\frac{26}{2} = 13\ years$

10. Kirya is 3 times as old as his daughter. The difference between their ages is 36 years. How old is the daughter.

Let the age of the daughter be x

Age of Kirya = 3x

But 3x – x = 36

2x = 36

X = 18

∴ Daughter's age = 18 year

11. In Moshi Primary School $\frac{3}{4}$ of the pupils who sat for the Primary Leaving Examination passed.

c) If those who failed were 30, find the number of pupils who passed.

Fraction of pupils that failed = 1 - $\frac{3}{4} = \frac{1}{4}$

Let total number of pupil be x

⇨ $\frac{1}{4}x = 30$

⇨ $x = 120$

The number of pupils that passed = 120 – 30 = 90

d) What percentage of pupils failed the examination?

Percentage failed $\frac{1}{4}\ x\ 100$ = 25%

12. A tank is 2/3 full of water. When 600 litres of water are added, the tank is 5/6 full. How many litres of water does it contain when it is 3/4 full?

Let the capacity of the tank be x

$\frac{2}{3}\ of\ x + 600 = \frac{5}{6}x$

$\frac{2}{3}\ x + 600 = \frac{5}{6}x$

Collect like terms

$\frac{5}{6}x$ - $\frac{2}{3}\ x$ = 600

$\frac{(5-4)x}{6} = 600$

$\frac{x}{6} = 600$

X = 3600

The number of litres is $\frac{3}{4}\ full\ tank = \frac{3}{4}\ x\ 3600$

= 1800litres

15. The mean age of 3 children is 13 years. The total age of two of the children is 25 years. Find the age of the third child.

Total age for children = 13 x 3 = 39 years

Age for third child = 39 – 25 = 14years

13. In class of 80 pupils, the ratio of boys to girls is 2:3. Find the number of girls.

Total ratio = 2 + 3 5= 5

Number of girls = $\frac{3}{5}\ x\ 80 = 48\ girls$

14. Okello had 30km still to cover after travelling $\frac{3}{5}$ of the journey. How long was the journey?

The fraction of uncovered journey = 1- $\frac{3}{5} = \frac{2}{5}$

Let the journey be x

$\frac{2}{5}\ of\ x = 30$

x = 30 x $\frac{5}{2}$ = 75

15. In a feed factory, crushed fish is mixed with maize flour in the ratio 1:3 The feed are packed in 80kg bags.

c) How many Kilograms of fish are used in one bag of the feeds?

Total ratio = 1 + 3 = 4

Mass of fish = $\frac{1}{4}\ x\ 80 = 20\ kg$

d) If one Kilogram of maize flour costs Sh 400, how much does it cost to buy maize flour to make feeds weigh l000Kg?

Mass of fish = $\frac{1}{4}\ x\ 1000 = 250kg$

Mass of maize = 1000 – 250 = 750kg

Cost of maize in 1000kg of feed = 750 x 400 = shs 300,000

16. A man spends $\frac{1}{4}$ of his salary on food, $\frac{1}{3}$ on clothing, $\frac{1}{6}$ on fees, $\frac{1}{12}$ on entertainment and banks the rest which is sh 27,000.

c) What fraction of the salary does he bank?

Fraction banked = $(1 - (\frac{1}{4} + \frac{1}{3} + \frac{1}{6} + \frac{1}{12}))$

$= \frac{(1\ x\ 12) - ((1\ x\ 3) + (1\ x\ 4) + (1\ x\ 2) + (1\ x\ 1))}{12}$

$= \frac{2}{12} = \frac{1}{6}$

d) How much money does he earn as his salary?

Let the salary = X

$\frac{1}{6}$ of X = 27000

X = 27000 x 6 = 162000/=

17. Corona Primary School, $^1/_3$ of the pupils in P. 7 like Matooke, $^2/_5$ of the remainder like rice. The rest of the pupils like posho. If those who like posho are 42, find the total number of pupils inP.7.

Fraction of pupils that does not like matooke = $1 - \frac{1}{3} = \frac{2}{3}$

Fraction of student that like rice = $\frac{2}{5}$ $of\ those\ that\ \ do\ not\ like\ matooke$

$= \frac{2}{5}\ x\ \frac{2}{3} = \frac{4}{15}$

Fraction of students that like rice = 1- $(\frac{1}{3} + \frac{4}{15}) = \frac{15-((1\ x5)+(4\ x\ 1))}{15} = \frac{15-(5+4)}{15} = \frac{6}{15} = \frac{2}{5}$

Let the total number of student be x

$\frac{2}{5}\ of\ x = 42$

$\frac{2x}{5} = 42$

x = 105

18. A school has a total of 400 pupils. If there are 240 girls in the school, what is the ratio of boys to girls?

Number of boy: 400 – 240 = 160

Ratio of boys: girls = 160: 240

Divide by 80 throughout = 2: 3

19. $\frac{5}{8}$ of water in a tank lasts a family 45 days.

(c) How long will $\frac{2}{3}$ of the water in that tank last the family?

Let the capacity of the tank be y

$\frac{5y}{8}$ $last\ 45\ days$

$\therefore$ $\frac{2y}{3}$ $wil\ last\ [45\ x\ \frac{2y}{3}]\ \div \frac{5y}{8}$

$= [45\ x\ \frac{2y}{3}]\ x \frac{8}{5y}$

$= 45\ x\ \frac{16}{15}$

$= 48\ days$

(d) If the family spends shs 300 per day on water, how much does it spend on a full tank?

A full tank y lasts $\frac{45\ x\ 8}{5} = 72 days$

1day costs shs 300

72 days will cost 72 x 300 = shs. 21600

20. In a school of 600 pupils, the ration of boys to girls is 1: 2. what is the number of girls in the school?

Total ratio = 1 + 2 = 3

Number of girls = $\frac{2}{3}\ x\ 600 = 400$

21. A primary school has population of 1080 pupils. Of these $\frac{3}{5}$ are girls and $\frac{1}{4}$ of the boys are in the upper primary classes.

(a) Find the number of boys in upper primary classes (3 marks)

The fraction of boys = 1 - $\frac{3}{5} = \frac{5-3}{5} = \frac{2}{5}$

Fraction of boys in upper class = $\frac{2}{5}\ x\ \frac{1}{4} = \frac{1}{10}$

Number of boys in upper class = $\frac{1}{10}\ x\ 1080 = 108$

(b) Express the number of boys in the lower primary classes as a percentage of the whole school population (2 marks)

Fraction of boys in lower primary = $\frac{2}{5}x\ \frac{3}{4} = \frac{3}{10}$

Percentage of boys in lower primary = $\frac{3}{10}\ x\ 100 = 30\%$

22. Milk was mixed with water to make tea. If 14 litres of milk was used and this was 40% more than the amount of water in the tea, how much tea was prepared?

(05 marks)

Let the percentage of water in the tea = x, then the percentage of milk = x + 40

x + x + 40 = 100
2x + 40 = 100
2x = 100 – 40
2x = 60
$\frac{2x}{2} = \frac{60}{2}$
x = 30

Percentage of milk = 30 + 40 =70%

Let the amount of tea prepared be Y

$\frac{70}{100}Y = 14$

Y = $\frac{14\ x\ 100}{7o} = 20l$

∴ the amount of tea = 20l

(b). Barbara is 4 times as old as Mukasa. In 10 years' time, Barbara will be twice as old as Mukasa will be. How old is Barbara and Mukasa now? (4marks)

Let Barbra's age be 4x

Mukasa's age = $\frac{4x}{4} = x$

In 10 years times Barbara's will be 4x+ 10

Mukasa's ages will be x + 10

It implies that 4x + 10 = 2(x + 10)

4x + 10 = 2x + 20

Collecting like terms:

4x – 2x = 20 - 10

2x = 10

X = 5

∴ the age of Barbra = 4 x 5 = 20years

23. A Certain country in Uganda has population of 300,000 people. Of these people $\frac{3}{5}$ are females and $\frac{5}{6}$ of the females are girls.

(c) If $\frac{2}{3}$ of the males among the population are boys, find the ratio of boys to girls. (4marks)

Fraction of boys = $\frac{2}{3}(1-\frac{3}{5}) = \frac{2}{3}\ x\ \frac{2}{5} = \frac{4}{15}$

Fraction of girls = $\frac{3}{5}\ x\ \frac{5}{6} = \frac{1}{2}$

Ratio of boys to girls: $\frac{4}{15} \div \frac{1}{2} = \frac{4}{15}\ x\ \frac{2}{1} = \frac{8}{15}$ or 8:15

(d) What the total number of boys and girls in the country? (2marks)

Number of girls = $\frac{1}{2}\ x\ 300000 = 150000$

Number of boys = $\frac{4}{15}\ x\ 300000 = 80000$

Total boys and girls = 80000 + 150000 = 230000

24. On a mixed farm $\frac{1}{3}$ of the land is used for growing food crops while $\frac{1}{4}$ of the remaining lands is for cash crops, the rest of the land is for cattle grazing.

a) What fraction of the land is used for cattle grazing? (02 marks)

Land for growing of food crops = $\frac{1}{3}$

Land for growing of cash crop = $\frac{1}{4}$ of the remaining land

$$= \frac{1}{4}\left(1 - \frac{1}{3}\right)$$

$$= \frac{1}{4}\ x\ \frac{2}{3}$$

$$= \frac{1}{6}$$

b) If 15 hectares are used for cash crops, what is the total area of the farm? (03 marks)

Let the total be X

$\frac{1}{6}X = 15$

X = 15 x 6

X = 90 hecteres

25. In a P7 class, $\frac{2}{5}$ of the pupils are girls, if there are 150 pupils in the class, find the number of boys?

Fraction of boys = $1 - \frac{2}{5} = \frac{5-2}{5} = \frac{3}{5}$

Number of boys = $\frac{3}{5}\ x\ 150 = 90\ boys$

26. A man spends $\frac{1}{3}$ his salary on food, $\frac{1}{9}$ on clothing on medical, $\frac{1}{6}$ on house rent and bank the rest which is shs. 35,000.

(a) What fraction of his salary does he bank? (3marks)

Food $\frac{1}{3}$

Clothing $\frac{1}{9}$

Medical $\frac{1}{6}$

Rent $\frac{1}{18}$

Used fraction = $\frac{1}{3} + \frac{1}{9} + \frac{1}{6} + \frac{1}{18} = \frac{12}{18} = \frac{2}{3}$

Banked fraction = $1 - \frac{2}{3} = \frac{1}{3}$

(b) How much money he earns as salary? (2marks)

Let the total salary be Q

$\frac{1}{3}\ of\ Q = 35000$

Q = 105,000

27. In jumbo primary school, $\frac{1}{4}$ of the pupils in p7 like science, $\frac{2}{3}$ of the remainder like mathematics. The rest of the pupil like English. If those who like English are 33, find the total number of pupil in p7. (05marks)

Students that like science $\frac{1}{4}$

Remainder = 1- $\frac{1}{4} = \frac{3}{4}$

Mathematics = $\frac{2}{3}\ of\ \frac{3}{4} = \frac{1}{2}$

(mathematics and science) = $(\frac{1}{2} + \frac{1}{4}) = \frac{2+1}{4} = \frac{3}{4}$

Rest = 1 - $\frac{3}{4} = \frac{4-3}{4} = \frac{1}{4}$

Let the total number be Q

$\frac{1}{4}\ of\ Q = 33$

Q = 33 x 4 = 132 pupils

28. A tank was $\frac{2}{3}$ full of water. When $1/4$ of the water in the tank was drawn, 2,500 litres remained Find the capacity of the tank when full.

(04 marks)

Let the volume the total volume be V

$(\frac{2}{3}\left(1-\frac{1}{4}\right) x\ V = 2{,}500 litres$

V = 5000litres

29. A bucket was $\frac{3}{4}$ full of water. When 4 liters were removed, it become $\frac{1}{2}$. What is the capacity of the bucket?

Let the capacity of bucket be X

$\frac{3}{4}X - 4 = \frac{1}{2}X$

Multiply be 4 throughout

3X -16 = 2X

Collect like terms

X = 16

30. Two taps F and E are connected to water tank. Tap F can fill the tank in 2 hours while E can empty it in 3hours, one day when the tank was $\frac{1}{2}$ full of water; the taps were opened at the same time.

How long did it take to fill the tank?

Let the volume of the tank be V

Rate of filling the tank $= \frac{V}{2} - \frac{V}{3} = \frac{1}{6}V$

Time take = $\frac{volume}{rate} = \frac{1}{2}V \div \frac{1}{6}V = \frac{6}{2} = 3hours$

31. A house can be built by 3 men in 20 days. How many men working at the same rate can build the same house in 12 days?

Days taken by 1 man = 3 x 20 = 60 days

It implies that number of men required to work in 12 days = $\frac{60}{12}$ = 5men

32. In a class, $\frac{1}{5}$ of the girls are boarders while $\frac{1}{3}$ of the boys are day scholars. The percentage of the girls in the class is 60%. The class has 10 boys who are day scholars.

(c) How many pupils are in the class? (03marks)

Let the number of boys in the class be X

$\frac{1}{3}\ X\ = 10\ boys\ in\ day$

X = 30 boys

The percentage of boys = 100 – percentage of girls

= 100 – 60

= 40%

Let the total number of children be Y

$\frac{40}{100}Y = 30boys$

Y = 75 pupils

(d) Find the number of girls who are boarders (2marks)

Total Number of girls = 75 – 30 = 55

The number of girls that are boarder = $\frac{1}{5}\ x\ 55 = 11$

33. Joyce, peter and Hannah shared pencils in the ratio 3:5:7 respectively

(c) If Hannah got 12 more pencils than Joyce, how many pencils did they share altogether? (04marks)

Total ratio = 3 + 5 + 7 = 15

Fraction of Hannah = $\frac{7}{15}$

Fraction of Joyce = $\frac{3}{15}$

Let total number of pencils be Y

12 = Y($\frac{7}{15}$ - $\frac{3}{15}$) = $\frac{4}{15}\ Y$

Y = 45 pencils

(d) Find the number of pencils Peter got. (02 marks)

Peter got = $\frac{5}{15}\ x\ 45$ = 15 pencil