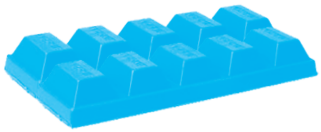
3 Fractions

By studying this lesson you will be able to

- identify situations in which fractions are applied
- solve problems involving fractions.

Fractions



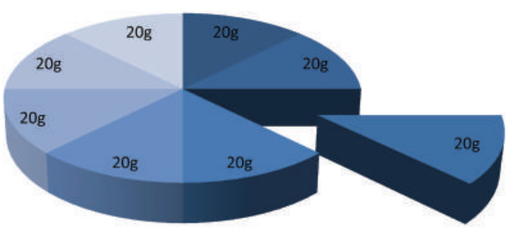
The figure depicts a slab of a certain type of chocolate. It has been divided into ten equal sized pieces such that the pieces can easily be broken off.

When the whole slab of chocolate is considered as one unit,

- one piece of chocolate that is broken off is considered as $\frac{1}{10}$ of the slab,
- two pieces of chocolate that are broken off is considered as $\frac{2}{10}$ of the slab,
- three pieces of chocolate that are broken off is considered as $\frac{3}{10}$ of the slab.

$\frac{1}{10}, \frac{2}{10}, \frac{3}{10}$ etc., which are used to represent portions of a whole unit, are examples of fractions.

Now let us consider another example.



The above figure depicts how pieces of cheese have been arranged in a container. There are 8 equal pieces. One of the pieces has been removed from the container. This piece is $\frac{1}{8}$ of the amount of cheese in the container. If the total mass of all the pieces of cheese in the container is 160 g, then the piece that was removed which is $\frac{1}{8}$ of the total quantity of cheese in the container, is of mass 20 g.

The unit that has been considered here is the total mass of the cheese in the container which is 160 g.

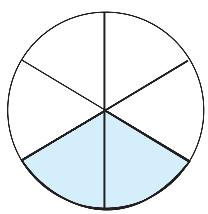
When talking about fractions, it is important to be aware of the unit from which the factions are obtained.

For example, in the statement "$\frac{2}{3}$ of all the students in the class are girls", the fraction $\frac{2}{3}$ is applied by taking "the total number of students in the class" as the unit.

In the following table, the units relevant to several statements involving fractions are given.

Situation	Total Unit
(*a*) $\frac{1}{5}$ of the atmosphere consists of oxygen.	The volume of the atmosphere
(*b*) $\frac{1}{4}$ of the 50 litres of water has been used up.	50 litres of water
(*c*) $\frac{2}{3}$ of a 200 m^2 plot of land has been used to cultivate vegetables.	200 m^2 plot of land
(*d*) $\frac{1}{4}$ of the harvest was kept for consumption.	The total harvest
(*e*) $\frac{3}{4}$ of a piece of wire of length 5 m was cut.	The piece of wire of length 5 m
(*f*) $\frac{1}{5}$ of the fruits in a collection of 25 oranges were ripe.	25 oranges
(*g*) A father wrote half ($\frac{1}{2}$) of his land in his son's name.	Area of the whole land

The circular shape illustrated in the following figure has been divided into 6 equal parts. We know that the fraction that has been shaded is $\frac{2}{6}$ of the shape.

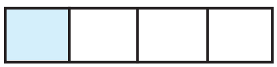


The denominator of $\frac{2}{6}$ is 6 and the numerator is 2. The total number of parts into which the unit has been divided is the denominator, and the number of parts being considered is the numerator. Here, the numerator is smaller than the denominator. Such fractions are called **proper fractions**. Fractions such as $\frac{1}{3}, \frac{1}{2}, \frac{1}{5}, \frac{1}{7}$ with numerator equal to 1 are called **unit fractions**.

In the following figures, quantities equal to $\frac{1}{2}, \frac{1}{3}$ and $\frac{1}{4}$ of the same unit have been shaded. Here the area of the rectangle has been taken as the unit.

$\frac{1}{2}$ 

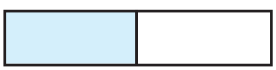
$\frac{1}{3}$ 

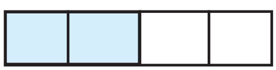
$\frac{1}{4}$ 

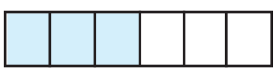
It is clear from the above figures that $\frac{1}{2} > \frac{1}{3} > \frac{1}{4}$.

Further, considering fractions such as $\frac{2}{3}, \frac{2}{4}, \frac{2}{5}, \frac{2}{6}$, where the numerators are equal and the denominators are not, as the denominator increases, the value represented by the fraction decreases. That is, $\frac{2}{3} > \frac{2}{4} > \frac{2}{5} > \frac{2}{6}$

The following figure illustrates the three fractions $\frac{1}{2}, \frac{2}{4}$ and $\frac{3}{6}$ obtained from the same unit.

$\frac{1}{2}$ 

$\frac{2}{4}$ 

$\frac{3}{6}$ 

According to the figure, the quantities represented by the three fractions are equal. That is, $\frac{1}{2} = \frac{2}{4} = \frac{3}{6}$.

Such fractions which are equal to each other are called **equivalent fractions**. Observe that fractions which are equivalent to a given fraction are obtained when

both the numerator and the denominator are multiplied by the same number.
For example,

$$\frac{1}{2}=\frac{1\times 2}{2\times 2}=\frac{2}{4}, \qquad \frac{1}{2}=\frac{1\times 3}{2\times 3}=\frac{3}{6}, \qquad \frac{1}{2}=\frac{1\times 5}{2\times 5}=\frac{5}{10}$$

Equivalent fractions are also obtained when the numerator and the denominator of the given fraction are divided by the same number.
For example,

$$\frac{5}{10}=\frac{5\div 5}{10\div 5}=\frac{1}{2}, \qquad \frac{3}{6}=\frac{3\div 3}{6\div 3}=\frac{1}{2}, \qquad \frac{8}{16}=\frac{8\div 8}{16\div 8}=\frac{1}{2}$$

Now let us consider the two fractions $\frac{2}{3}$ and $\frac{3}{4}$ obtained from the same unit, which are unequal to each other.

First let us write down several fractions which are equivalent to each of the fractions $\frac{2}{3}$ and $\frac{3}{4}$.

$$\frac{2}{3}=\frac{4}{6}=\frac{6}{9}=\frac{8}{12}=\frac{10}{15}=\frac{12}{18}=\frac{14}{21}=\frac{16}{24}=\frac{18}{27}=\ldots\ldots$$

$$\frac{3}{4}=\frac{6}{8}=\frac{9}{12}=\frac{12}{16}=\frac{15}{20}=\frac{18}{24}=\frac{21}{28}=\ldots\ldots$$

It can be observed that among the fractions which are equivalent to $\frac{2}{3}$ and $\frac{3}{4}$, there are some which have the same denominator. $\frac{8}{12}$ and $\frac{9}{12}$ are two such fractions. $\frac{16}{24}$ and $\frac{18}{24}$ are two more such fractions.
For convenience, let us select $\frac{8}{12}$ and $\frac{9}{12}$ which have the smallest common denominator.

Comparing $\frac{8}{12}$ and $\frac{9}{12}$ we obtain $\frac{9}{12}>\frac{8}{12}$.

However, since $\frac{2}{3}=\frac{8}{12}$ and $\frac{3}{4}=\frac{9}{12}$, we can conclude that $\frac{3}{4}>\frac{2}{3}$.

Let us explain the comparison of $\frac{3}{4}$ and $\frac{2}{3}$ done above with equivalent fractions, using figures.

$\frac{2}{3}$ 

$\frac{3}{4}$  It is clear from the figure too that $\frac{3}{4} > \frac{2}{3}$.

Accordingly, it is clear that it is suitable to write equivalent fractions having a common denominator when comparing fractions.

Now let us consider the addition and subtraction of fractions.

You have learnt in earlier grades to add fractions with equal denominators, as for example

$\frac{2}{10} + \frac{3}{10} = \frac{5}{10}$.

Similarly, you know that fractions with equal denominators can be subtracted as for example,

$\frac{6}{7} - \frac{2}{7} = \frac{4}{7}$.

When adding and subtracting fractions of unequal denominators, the relevant fractions can first be converted into equivalent fractions of equal denominators. For example,

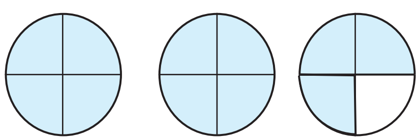
$$\begin{aligned}\frac{2}{3} + \frac{1}{4} &= \frac{2 \times 4}{3 \times 4} + \frac{1 \times 3}{4 \times 3} \\ &= \frac{8}{12} + \frac{3}{12} \\ &= \underline{\underline{\frac{11}{12}}}\end{aligned}$$

$$\begin{aligned}\frac{3}{5} - \frac{1}{3} &= \frac{3 \times 3}{5 \times 3} - \frac{1 \times 5}{3 \times 5} \\ &= \frac{9}{15} - \frac{5}{15} \\ &= \underline{\underline{\frac{4}{15}}}\end{aligned}$$

Fractions can also be used to represent quantities which are greater than a unit.

For example, let us see what quantity $\frac{3}{2}$ of a loaf of bread is. This is the amount that is obtained when a loaf of bread is divided into two equal parts and three such parts are considered. This quantity is one and a half loaves of bread. That is, $1 + \frac{1}{2}$ loaves of bread, which in short, is a quantity of $1\frac{1}{2}$.

As another example, let us illustrate $2\frac{3}{4}$ of a circle by a figure.



If these three figures are considered together as one unit instead of separately, then the shaded region represents $\frac{11}{12}$ of the unit. However, if any one of these circles is taken as the unit, then the shaded region represents $\frac{11}{4}$ of the unit. It is clear therefore that the mixed number $2\frac{3}{4}$ can also be written as the fraction $\frac{11}{4}$.

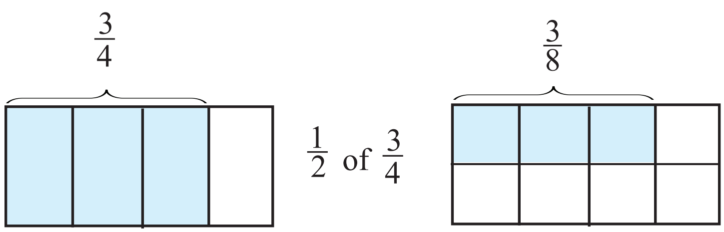
Another way in which the equality $2\frac{3}{4} = \frac{11}{4}$ can be obtained is given below.

$$
\begin{aligned}
2\frac{3}{4} &= 1 + 1 + \frac{3}{4} \\
&= \frac{4}{4} + \frac{4}{4} + \frac{3}{4} \\
&= \frac{11}{4}
\end{aligned}
$$

Accordingly, it is clear that $2\frac{3}{4} = \frac{11}{4}$. When this amount is denoted by $2\frac{3}{4}$, it is called a **mixed number**. When it is written as $\frac{11}{4}$, it is called an **improper fraction**.

You have learnt in previous grades how a mixed number is converted into an improper fraction and how an improper fraction is converted into a mixed number.

Now let us recall what has been learnt about multiplying fractions. To do this, let us draw figures in the following manner to find out how much $\frac{1}{2}$ of $\frac{3}{4}$ is.



According to the figure, it is clear that $\frac{1}{2}$ of $\frac{3}{4}$ is equal to $\frac{3}{8}$

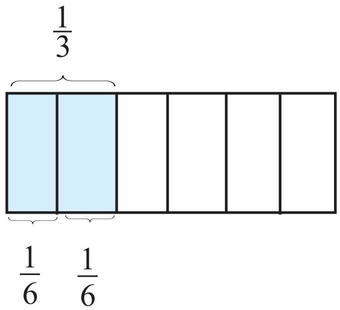
The above answer can be obtained by simplifying this in the following manner too.

$$
\begin{aligned}
\frac{1}{2} \text{ of } \frac{3}{4} &= \frac{1}{2} \times \frac{3}{4} \\
&= \underline{\underline{\frac{3}{8}}}
\end{aligned}
$$

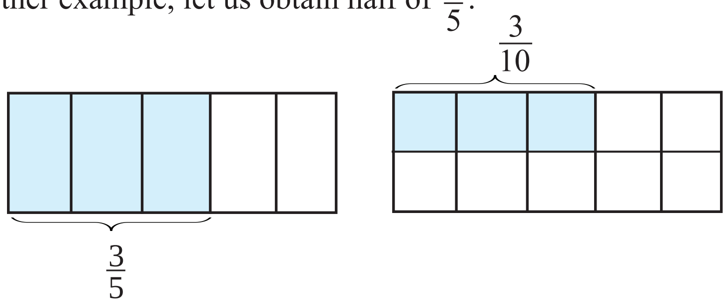
It is clear that 'of' in $\frac{1}{2}$ of $\frac{3}{4}$ denotes the mathematical operation multiplication and that the numerator can be taken as 1×3 and the denominator as 2×4.

Now let us consider the situation of dividing fractions.

Let us find how many $\frac{1}{6}$ there are in $\frac{1}{3}$. This is denoted by $\frac{1}{3} \div \frac{1}{6}$. It is clear from the following figure that this value is 2.



As another example, let us obtain half of $\frac{3}{5}$.



According to the figure, half of $\frac{3}{5}$ is equal to $\frac{3}{10}$.

However, since half of any quantity, is the amount that is obtained when the quantity is divided by 2,

$$\frac{3}{5} \div 2 = \frac{3}{10}$$

It is not convenient to draw figures every time we divide fractions. We need to identify a different method to do this. The above division of fractions which was done using figures, can also be presented in the following manner.

$$\frac{3}{5} \div 2 = \frac{3}{5} \div \frac{2}{1} \qquad \text{(Since } 2 = \frac{2}{1}\text{)}$$

$$= \frac{3}{5} \times \frac{1}{2} \qquad \text{(Multiplying by } \tfrac{1}{2} \text{ which is the same as dividing by 2)}$$

$$= \underline{\underline{\frac{3}{10}}}$$

That is, the same answer that was obtained with the figures is obtained using this method too.

Let us see whether this method works for $\frac{1}{3} \div \frac{1}{6}$.

$$\frac{1}{3} \div \frac{1}{6} = \frac{1}{\cancel{3}_1} \times \frac{\cancel{6}^2}{1}$$

$$= \underline{\underline{2}}$$

That is, the same answer that was obtained with the figures is obtained here.

When the numerator and the denominator of the fraction $\frac{1}{6}$ are interchanged we obtain $\frac{6}{1}$. We say that the reciprocal of $\frac{1}{6}$ is $\frac{6}{1}$; that is 6.

The reciprocal of a general term $\frac{a}{b}$ is $\frac{b}{a}$.

In general, when a fraction needs to be divided by another fraction, the first fraction can be multiplied by the reciprocal of the second fraction.

Let us recall all the facts that have been learnt so far regarding fractions by working out the following example.

$$\left(2\frac{2}{3} - 1\frac{1}{2} + \frac{5}{6}\right) \div \left(\frac{4}{5} \text{ of } 1\frac{2}{3}\right)$$

$$= \left(\frac{8}{3} - \frac{3}{2} + \frac{5}{6}\right) \div \left(\frac{4}{\cancel{5}_1} \times \frac{\cancel{5}^1}{3}\right)$$

$$\left(\frac{16 - 9 + 5}{6}\right) \div \frac{4}{3}$$

$$= \frac{12}{6} \div \frac{4}{3}$$

$$= 2 \div \frac{4}{3}$$

$$= \frac{{}^1\cancel{2}}{1} \times \frac{3}{\cancel{4}_2}$$

$$= \frac{3}{2}$$

$$= \underline{\underline{1\frac{1}{2}}}$$

The order in which the mathematical operations are manipulated when simplifying fractions, is as follows:

B – Brackets
O – Of
D – Division
M – Multiplication
A – Addition
S – Subtraction

This order is named BODMAS

Do the following exercise to further recall the facts that have been learnt about fractions.

Review Exercise

1. Complete the second table using the fractions in the first table.

$\frac{4}{5}, \frac{1}{7}, \frac{5}{7}, \frac{4}{9}, \frac{9}{4}, \frac{19}{15}, \frac{7}{12}, \frac{1}{15}, \frac{7}{8}, \frac{11}{9}, \frac{23}{50}, \frac{22}{7}, \frac{1}{3}, \frac{8}{7}, \frac{6}{5}$

Unit Fractions	
Proper Fractions	
Improper Fractions	

2. Fill in the blanks in the following table.

Mixed number	$2\frac{1}{2}$	$1\frac{3}{5}$	$3\frac{5}{6}$	......	....	......
Improper fraction	......	......	......	$\frac{7}{2}$	$\frac{16}{3}$	$\frac{22}{5}$

3. Fill in the blanks.

a. $\frac{1}{4} = \frac{1 \times \ldots}{4 \times 3} = \frac{..}{12}$ **b.** $\frac{2}{3} = \frac{\ldots}{12}$ **c.** $\frac{2}{7} = \frac{\ldots}{14}$ **d.** $\frac{4}{16} = \frac{\ldots}{\ldots}$

e. $\frac{8}{20} = \frac{\ldots \div \ldots}{\ldots \div \ldots} = \frac{\ldots}{5}$ **f.** $\frac{10}{12} = \frac{5}{\ldots}$ **g.** $\frac{21}{30} = \frac{7}{\ldots}$ **h.** $\frac{75}{100} = \frac{\ldots}{\ldots}$

4. Write the fractions in each of the following parts in ascending order.

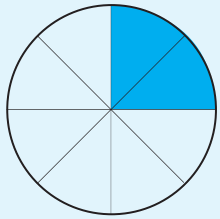
(i) $\frac{1}{7}, \frac{1}{3}, \frac{1}{10}, \frac{1}{2}$ (ii) $\frac{2}{5}, \frac{2}{9}, \frac{2}{11}, \frac{2}{3}$

(iii) $\frac{2}{3}, \frac{5}{6}, \frac{1}{2}, \frac{3}{4}$ (iv) $\frac{4}{5}, \frac{5}{8}, \frac{3}{4}, \frac{1}{2}$

5. If $\frac{3}{4}$ of a tank which was completely filled with water was used by a household for its needs on a certain day, what fraction of the tank still held water by the end of the day?

6. If the two pieces of wire A and B are of unequal length, is $\frac{1}{3}$ of the length of A equal to $\frac{1}{3}$ of the length of B, or are they unequal? Give reasons for your answer.

7. If the two shaded regions of the circular lamina that has been divided into eight equal parts as shown in the figure, are cut out and discarded,



(i) what fraction of the total lamina is remaining?

(ii) what fraction of the total lamina is exactly half the remaining portion equal to?

8. Simplify:

(i) $\frac{2}{5}+\frac{3}{5}+\frac{4}{5}$ (ii) $\frac{1}{2}+\frac{2}{3}+\frac{4}{5}$ (iii) $1\frac{1}{2}+2\frac{1}{4}-1\frac{2}{3}$

(iv) $\frac{1}{2}$ of $\left(\frac{4}{5}+\frac{2}{3}\right)$ (v) $\left(4\frac{1}{2}-\frac{3}{5}\right)\times 1\frac{2}{13}$ (vi) $\left(1\frac{2}{5}\times\frac{5}{7}\right)+\left(\frac{3}{4}\div\frac{1}{2}\right)$

(vii) $\frac{4}{5}$ of $2\frac{2}{5}\div 1\frac{1}{2}$ (viii) $2\frac{2}{5}\div 1\frac{1}{2}\times\frac{4}{5}$

9. Mother, who went to the market with Rs 500 in hand, spent Rs 300 to buy vegetables and Rs 150 to buy fruits.

(i) What fraction of the money in hand did she spend on vegetables?

(ii) What fraction of the money in hand did she spend on fruits?

(iii) If she had planned to save $\frac{1}{4}$ of the money she had taken to the market, was she able to fulfill her plan? Give reasons for your answer.

10. Sathis, who left home on a journey, travelled $\frac{1}{4}$ of the journey by bicycle, $\frac{2}{3}$ by bus and the remaining portion by a three wheeler.

(i) What fraction of the total journey did he travel by both bicycle and bus?

(ii) What fraction of the whole journey remained for him to travel by three wheeler?

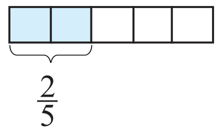
3.1 Applications of fractions

Fractions are used in many calculations that come up in day to day life. These calculations can easily be carried out with a correct understanding of fractions. Given below are several examples of such situations.

Example 1

$\frac{2}{5}$ of a mixture of flour prepared to make a certain type of food consists of kurakkan flour, while the remaining portion consists of wheat flour. A cook wishes to prepare 50 kg of this mixture to make the food item, to cater to an order. Find the amount of kurakkan flour and wheat flour required for this mixture.

Fraction of kurakkan flour in the mixture $= \frac{2}{5}$



The quantity of kurakkan flour in the mixture $= \frac{2}{5}$ of 50 kg

$= 50 \text{ kg} \times \frac{2}{5}$

Quantity of kurakkan flour in the mixture $= \underline{\underline{20 \text{ kg}}}$

The quantity of wheat flour in the mixture $= 50 - 20 \text{ kg}$

$= \underline{\underline{30 \text{ kg}}}$

Example 2

It takes 12 minutes to fill $\frac{1}{4}$ of a certain tank using a pipe through which water flows at a uniform rate. Find the time it takes to fill the whole tank with water using this pipe.

Time taken to fill $\frac{1}{4}$ of the tank $= 12$ minutes

$\therefore$ Time taken to fill $\frac{4}{4}$ of the tank (that is, the whole tank) $= 12 \times 4$ minutes

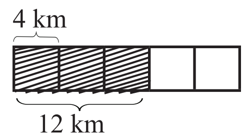
$= \underline{\underline{48 \text{ minutes}}}$

Example 3

Selva can travel $\frac{3}{5}$ of the distance from his home to the school by bus. This distance is 12 km. Find the distance from his home to the school.

$\frac{3}{5}$ of the distance from Selva's home to the school = 12 km

$\frac{1}{5}$ of the distance from Selva's home to the school $= 12 \text{ km} \div 3$



$= 4$ km

$\therefore$ Total distance to the school (that is, $\frac{5}{5}$ of the distance to the school) $= 4 \text{ km} \times 5$

$= \underline{\underline{20 \text{ km}}}$

Example 4

A tank was filled with water up to a $\frac{4}{5}$ of its capacity. After consuming 350 l of this amount, the quantity of water remaining filled $\frac{1}{3}$ of the tank.

(i) What fraction of the whole tank was used?

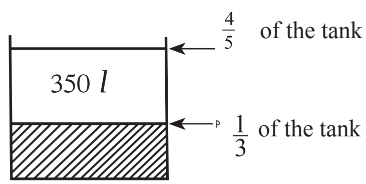
(ii) Find the capacity of the tank.

(i) The quantity of water used as a fraction of the whole tank $\Big\}$ $= \frac{4}{5} - \frac{1}{3}$

$= \frac{12-5}{15}$

$= \underline{\underline{\frac{7}{15}}}$

(ii) $\frac{7}{15}$ of the whole tank $= 350\ l$



$\therefore$ $\frac{1}{15}$ of the whole tank $= \frac{350\ l}{7}$

$\therefore$ Capacity of the tank $= \frac{\cancel{350}^{50}}{\cancel{7}_{1}} \times 15\ l$

$= \underline{\underline{750\ l}}$

Do the following exercise on problems involving fractions.

Exercise 3.1

1. Calculate the following quantities.

(i) $\frac{1}{2}$ of Rs 5 000 (iii) $\frac{3}{4}$ of 200 m (v) $\frac{2}{3}$ of 2.4 l

(ii) $\frac{1}{4}$ of 2000 ml (iv) $\frac{3}{5}$ of 250 kg (vi) $\frac{3}{4}$ of 4.8 km

2. Mr. Upul received Rs 24 000 as his salary last month. He spent $\frac{3}{8}$ of it for travel expenses. Find the amount he spent for travel expenses.

3. A household water tank was filled with water. When $\frac{3}{4}$ of its volume was used up, there was 200 l of water remaining in the tank.

(i) What fraction of the whole tank was the remaining volume of water equal to?

(ii) Find the capacity of the tank.

4. $\frac{3}{7}$ of a plot of land belonged to Pradeep. He bought $\frac{1}{4}$ of the portion of land which did not belong to him, and annexed it to his plot.

(i) What fraction of the total plot of land did Pradeep buy?

(ii) Show that Pradeep now owns more than half the plot of land.

(iii) If the area of the portion remaining after Pradeep had bought a part of it is 240 m^2, what is the area of the land owned by Pradeep in square metres?

5. Vishwa, who is saving money to buy a bicycle, has been able to save $\frac{5}{8}$ of the required amount. He requires Rs 2 700 more to buy the bicycle.

(i) What fraction of the value of the bicycle does he now need to save?

(ii) Find the value of the bicycle.

6. Mohamed wrote exactly half of his land in his daughter's name and $\frac{1}{3}$ of his land in his son's name. He donated the remaining 10 acres to a charity.

(i) What fraction of the total plot of land did Mohamed donate to charity?

(ii) How many acres is the whole plot of land?

(iii) Since the land that was donated to charity was not sufficient, his daughter was willing to give a portion of what she received, so that the land that the charity received would be double the initial amount. Show that when this is done, the plots that the daughter and the son have are equal in area.

7. Black pepper and cloves have been cultivated in $\frac{7}{8}$ of a plot of land. Black pepper has been cultivated in 450 m^2 while cloves have been cultivated in $\frac{1}{4}$ of the land. Find,

(i) the fraction of land on which black pepper has been cultivated.
(ii) the area of the whole land.
(iii) the area in which cloves have been cultivated.

8. A piece of wire was cut into three equal parts. One of the three parts was cut again into four equal pieces.

(i) What fraction of the length of the whole piece of wire is the length of one small piece?
(ii) Illustrate the above division of the wire by a figure and compare the answer you obtain with the answer in (i) above.
(iii) If a small piece of wire is 70 cm in length, find the length of the whole wire.

3.2 Further applications of fractions

After a portion of a unit has been separated, dividing the remaining portion repeatedly occurs in certain instances as applications of fractions. Such an instance is given in the following example.

Example 1

From the money that Raj received from his father, he spent $\frac{2}{3}$ on books and $\frac{1}{4}$ of the remaining amount on travel expenses. After that he had a balance of Rs 500.

(i) What fraction of the amount Raj received from his father was remaining after buying the books?
(ii) What fraction of the amount the father gave did he spend on travelling?
(iii) Find the amount he obtained from his father.

(i) The fraction that was spent to buy books $= \frac{2}{3}$

Fraction that remained after buying the books $= 1 - \frac{2}{3}$

$= \underline{\underline{\frac{1}{3}}}$

(ii) Fraction spent on travelling $= \frac{1}{4}$ of the remaining portion

$$= \frac{1}{4} \text{ of } \frac{1}{3}$$

$$= \frac{1}{4} \times \frac{1}{3}$$

$$= \underline{\underline{\frac{1}{12}}}$$

(iii) Fraction spent on buying books and on travelling $= \frac{2}{3} + \frac{1}{12}$

$$= \frac{8+1}{12}$$

$$= \frac{9}{12}$$

$$= \underline{\underline{\frac{3}{4}}}$$

Fraction remaining after both the above expenses were met $= 1 - \frac{3}{4}$

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

It is given that the balance is Rs 500.

$\frac{1}{4}$ of what the father gave = Rs 500

$\therefore$ Amount the father gave $=$ Rs $500 \times 4 =$ $\underline{\underline{\text{Rs } 2\,000}}$

Exercise 3.2

1. Mr. Austin who works in an office in the city, spends $\frac{2}{5}$ of his salary on food and sends $\frac{2}{3}$ of the remaining amount to his wife.

(i) What fraction of his salary remains after he has spent for his food?

(ii) What fraction of his salary does he send his wife?

(iii) What fraction of his salary is left over after these expenses are met?

2. From a certain amount of money, $\frac{1}{2}$ was given to A, $\frac{1}{3}$ of the remaining amount was given to B, and the rest was given to C.

(i) Find the fraction that C received from the amount that was distributed.

(ii) If instead of dividing the amount in the above manner, it was divided equally between the three, show that the amount that B would receive is twice the amount that he received initially.

(iii) If C received Rs 1000 through the initial distribution, find the total amount that was distributed among the three.

3. It has been decided to allocate $\frac{2}{3}$ of the floor area of a certain hall for classrooms, $\frac{2}{3}$ of the remaining portion for an office, and the rest of the floor area, which is 200 m^2 for the library.

(i) What fraction of the whole area has been allocated for the office?

(ii) What fraction of the whole area has been allocated for the library?

(iii) Find the floor area of the hall.

(iv) Find separately the floor area that is allocated for the classrooms and the office.

4. Of the amount that Anil spent on a trip, $\frac{4}{7}$ was spent on food and $\frac{2}{3}$ of the remaining amount on travelling. If Rs 800 was spent on other expenses, find how much Anil spent in total on the trip.

5. Saroja read $\frac{1}{3}$ of a book she borrowed from the library on the first day. On the second day she was only able to read $\frac{1}{2}$ of the remaining portion. On the third day, she finished the book by reading the remaining 75 pages. How many pages were there in total in the book?

Miscellaneous Exercise

1. Find the fraction suitable for the blank space: $3\frac{1}{2} + (1\frac{1}{2} \times .....) = 4\frac{1}{2}$

2. Simplify: $\frac{4}{5}$ of $\dfrac{2\frac{1}{2} + 1\frac{2}{3}}{1\frac{1}{5} \div \frac{4}{15} + \frac{1}{2}}$

3. *A*, *B* and *C* are the three owners of a business. The profit from the business was divided between the three of them based on the amount they each invested. *A* received $\frac{2}{7}$ of the profit, *B* received twice the amount *A* received, and *C* received the remaining portion. If the total amount that *A* and *B* received together is Rs 72 000, find the profit from the business.

4. An election was held between two persons to select a representative to a certain institution. All the voters who were registered cast their votes. The winner received $\frac{7}{12}$ of the votes and won by a majority of 120 votes.

(i) What fraction of the total votes did the person who lost receive?
(ii) How many registered voters were there?
(iii) Find the number of votes the winner received.