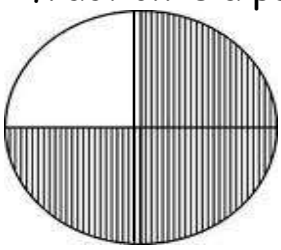
P.5

THEME: **NUMERACY**

TOPIC: FRACTIONS

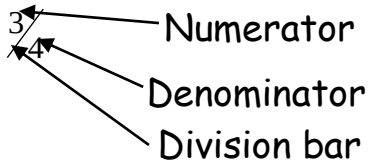
A fraction is a part of a whole.eg.



Shaded fraction → $\frac{3}{4}$

Unshaded fractions → $\frac{1}{4}$

Parts of fractions



The top number is called the **numerator**.

The bottom number is called the **denominator**

For a mixed number, e.g. $7\frac{8}{10}$

7 is a whole number.

8 is a numerator.

10 is a denominator

Types of fractions

1) **Proper fractions:** These are fractions with the numerator is less than the denominator e.g. $\frac{1}{5}$, $\frac{1}{10}$, $\frac{3}{9}$

2) **Improper fraction:** These are fractions with the numerator is greater than the denominator e.g. $\frac{7}{2}$, $\frac{14}{10}$, $\frac{17}{9}$

3) **Mixed numbers**: These are fractions with both the whole number and a proper fraction e.g. $3\frac{1}{2}$, $3\frac{1}{2}$, $7\frac{3}{5}$

Equivalent fraction

These are fractions which have the same value but having different numerators and denominator.

Equivalent fractions form the same fraction when expressed in their lowest terms.

We find equivalent fractions by multiplying both a numerator and a denominator by the same counting number apart from one.

Finding equivalent fractions

Examples

Write the next 3 equivalent fractions for each of the following fractions.

a) $\frac{2}{7}$ =

$\frac{2\times2}{7\times2}=\frac{4}{14}$ $\frac{2\times3}{7\times3}=\frac{6}{21}$ $\frac{2\times4}{7\times4}=\frac{8}{28}$

$\frac{2}{7}=\frac{4}{14},\frac{6}{21},\frac{8}{28}$

b) $\frac{2}{3}$

$\frac{2}{3}=\frac{2\times2}{3\times2}=\frac{4}{6}$ $\frac{2\times3}{3\times3}=\frac{6}{9}$ $\frac{2\times4}{3\times4}=\frac{8}{12}$

$\frac{2}{3}=\frac{4}{6},\frac{6}{9},\frac{8}{12}$

c) $1\frac{1}{3}$

$\frac{5}{3}=\frac{5\times2}{3\times2}=\frac{10}{6}$ $\frac{5\times3}{3\times3}=\frac{15}{9}$ $\frac{5\times4}{3\times4}=\frac{20}{12}$

$1\frac{1}{3}=1\frac{4}{6},1\frac{6}{9},\ 1\frac{15}{9},\ 1\frac{8}{12}$

Activity

Find the next three equivalent fractions to the following:

a) $\frac{2}{5}$ b) $\frac{1}{10}$ c) $\frac{4}{9}$ d) $\frac{3}{7}$ e) $\frac{1}{4}$f) $2\frac{1}{3}$

REDUCING FRACTIONS

Fractions are reduced using common (GCF). However, any common factor can be used to reduce fractions to their simplest form.

Examples

1. Reduce $\frac{12}{18}$ to its simplest form.

2 Find the GCF of 12 and 18

GCF = 6

$\frac{12\div6}{18\div6} = \frac{2}{3}$

$\frac{12}{18} = \frac{2}{3}$

2. Reduce $\frac{48}{72}$ to its lowest terms.

Find the GCF of 72 and 48
GCF = 24

$\frac{48\div24}{72\div24} = \frac{2}{3}$

$\frac{48}{72} = \frac{2}{3}$

3. Reduce $\frac{36}{54}$ to its lowest terms.

$\frac{36\div9}{54\div9} = \frac{4}{6}$

$\frac{4\div2}{6\div2} = \frac{2}{3}$

$\frac{36}{54} = \frac{2}{3}$

Activity

Reduce the following fractions to their lowest terms:

i) $\frac{8}{24}$ ii) $\frac{8}{40}$ iii) $\frac{30}{60}$ iv) $\frac{16}{32}$ v) $\frac{14}{42}$ vi) $\frac{25}{100}$

Ordering fractions

This involves arranging in either ascending or descending order.

Ascending order

Means arranging fractions from the lowest to the highest.

Descending Order

Means arranging fractions from the highest to the lowest.

Examples

1. Arrange $\frac{1}{3}, \frac{1}{2}, \frac{1}{4}$ in ascending order.

Method I (using LCM)

$M_3 = \{3, 6, 9, \textcircled{12}, 15\ldots\}$

$M_2 = \{2, 4, 6, 8, 10, \textcircled{12}, 14,\ldots\}$

$M_4 = \{4, 8, \textcircled{12}, 16, \ldots\ldots\ldots\}$

L.C.M = 12

$\frac{1}{\cancel{3}} \times \cancel{12} \Rightarrow 1 \times 4 = 4$

$\frac{1}{\cancel{2}} \times \cancel{12} \Rightarrow 1 \times 6 = 6$

$\frac{1}{\cancel{4}} \times \cancel{12} \Rightarrow 1 \times 3 = 3$

In ascending order

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

Method II (**using equivalent fractions**)

$\frac{1}{2} = \frac{2}{4}, \frac{3}{6}, \frac{4}{8}, \frac{5}{10}, \boxed{\frac{6}{12}}$

$\frac{1}{3} = \frac{2}{6}, \frac{3}{9}, \boxed{\frac{4}{12}}, \frac{5}{15}, \frac{6}{18}$

$\frac{1}{4} = \frac{2}{8}, \boxed{\frac{3}{12}}, \frac{4}{16}, \frac{5}{20}, \frac{6}{24}$

Note: The lower the numerator, the smaller the fraction and vice versa.

Ascending order== $\frac{1}{4}, \frac{1}{3}, \frac{1}{2}$

2. Arrange $\frac{5}{8}, \frac{3}{4}, \frac{4}{6}$ in descending order.

Method I

Renaming (equivalent fractions)

$\frac{5}{8} = \frac{10}{16} = \boxed{\frac{15}{24}} = \frac{20}{32} = \frac{25}{40} = \frac{30}{48}$

$\frac{3}{4} = \frac{6}{8} = \frac{9}{12} = \frac{12}{16} = \frac{15}{20} = \boxed{\frac{20}{24}}$

$\frac{4}{6} = \frac{8}{12} = \frac{12}{18} = \boxed{\frac{16}{24}} = \frac{20}{30} = \frac{24}{36}$

Note: The lower the numerator, the smaller the fraction and vice versa.

In descending order = $\frac{3}{4}, \frac{4}{6}, \frac{5}{8}$

Method II (LCM)

Multiply each fraction by LCM to determine their values

2	8	4	6
2	4	2	3
2	2	1	3
3	1	1	3
	1	1	1

LCM = (2x2x2x3)

LCM = 24

$\frac{5}{8}$ x ~~24~~ ⟹ 5 x 3 = 15 3rd

$\frac{3}{4}$ x ~~24~~ ⟹ 3 x 6 = 18 1st

$\frac{4}{6}$ x ~~24~~ ⟹ 4 x 6 = 16 2nd

In descending order = $\frac{3}{4}, \frac{4}{6}, \frac{5}{8}$

Determine the positions basing on the products.

Activity

1. Arrange the following fractions in ascending order

a) $\frac{1}{2}, \frac{1}{8}, \frac{1}{4}$ b) $\frac{7}{10}, \frac{3}{4}, \frac{3}{5}$ c) $\frac{5}{8}, \frac{5}{6}, \frac{5}{12}$ d) $\frac{1}{5}, \frac{1}{2}, \frac{1}{6}, \frac{1}{3}$

2. Arrange the following fractions in descending order.

i) $\frac{1}{4}, \frac{3}{4}, \frac{5}{8}$ ii) $\frac{3}{8}, \frac{7}{12}, \frac{7}{12}$ iii) $\frac{2}{3}, \frac{3}{4}, \frac{5}{6}$ d) $\frac{1}{4}, \frac{2}{3}, \frac{5}{6}, \frac{1}{2}$

Comparing fractions using <, > or =

Example

Use **>, < or =**

$\frac{1}{3}$ **>** $\frac{1}{4}$

$\frac{1}{3}$ x ~~12~~

= **4**

M_3 = 3, 6, 9, (12)

M_4 = 4, 8, (12), 16

$\frac{1}{4}$ x ~~12~~ = **3**

- You can also use diagrams
- Also apply equivalent fractions

ii) Which is smaller $\frac{5}{6}$ or $\frac{1}{2}$

L.C.M of 2 and 6.

= 6

$\frac{5}{6}$ x ~~6~~ = 5 $\frac{1}{2}$ x ~~6~~ = 3

$\frac{1}{2} < \frac{5}{6}$

Activity

1. Use <, > or = to compare the following fractions

a) $\frac{5}{8}$ ___ $\frac{5}{6}$ **b)** $\frac{1}{3}$ ___ $\frac{1}{2}$ **c)** $\frac{6}{12}$ ___ $\frac{3}{6}$ **d)** $\frac{1}{3}$ ___ $\frac{3}{6}$

2. Which is greater $\frac{1}{2}$ **or** $\frac{4}{8}$ **?**

3. Which is smaller $\frac{6}{12}$ **or** $\frac{3}{4}$ **?**

ADDITION OF FRACTIONS

Examples

1. Work out: $\frac{1}{4} + \frac{1}{2}$

$\frac{1}{4} = \boxed{\frac{2}{8}}, \frac{3}{12}$

$\frac{1}{2} = \frac{2}{4}, \frac{3}{6}, \boxed{\frac{4}{8}},$

$\frac{2}{8} + \frac{4}{8}$

$\frac{2+4}{8}$

$\frac{6}{8}$ 3

4

$\frac{3}{4}$

Method II

LCD = 8

$\frac{\left(\frac{1}{4} \times 8\right) + \left(\frac{1}{2} \times 8\right)}{8}$ 2 4

$\frac{2+4}{8}$

$\frac{6}{8}$

$\frac{3}{4}$

3. Work out: $\frac{5}{6} + \frac{3}{8}$

LCD =24

$$\frac{\left(\frac{5}{\cancel{6}} \times \cancel{24}^{4}\right) + \left(\frac{3}{\cancel{8}} \times \cancel{24}^{3}\right)}{24}$$

$$\frac{20 + 9}{24}$$

$\frac{\cancel{29}^{1}}{\cancel{24}}$ r 5 $= 1\frac{5}{24}$

Method II

$\frac{5}{6} = \frac{10}{12}, \frac{15}{18}, \boxed{\frac{20}{24}}, \frac{25}{30}$

$\frac{3}{8} = \frac{6}{16}, \boxed{\frac{9}{24}}$

$$\frac{20}{24} + \frac{9}{24}$$

$\frac{\cancel{29}^{1}}{\cancel{24}}$ r5

$$1\frac{5}{24}$$

4. John filled $\frac{1}{2}$ of a tank in the morning and $\frac{2}{5}$ in the afternoon, what fraction did he fill altogether?

$\frac{1}{2} + \frac{2}{5}$

$M_2 = \{ 2, 4, 6, 8, 10, 12, \ldots\}$

$M_5 = \{ 5, 10, 15, 20, \ldots\}$

LCD=10

$$\frac{\left(\frac{1}{\cancel{2}} \times \cancel{10}^{5}\right) + \left(\frac{2}{\cancel{5}} \times \cancel{10}^{2}\right)}{10}$$

$$\frac{5 + 4}{10}$$

$$\frac{9}{10}$$

Method II

$\frac{1}{2} = \frac{2}{4}, \frac{3}{6}, \frac{4}{8}, \boxed{\frac{5}{10}}$

$\frac{2}{5} = \boxed{\frac{4}{10}},$

$$\frac{5}{10} + \frac{4}{10}$$

$$\frac{5+4}{10}$$

$$\frac{9}{10}$$

ACTIVITY

1. Find the sum of the following fractions.
   a) $\frac{2}{9} + \frac{3}{9}$ b) $\frac{1}{3} + \frac{1}{5}$ c) $\frac{2}{5} + \frac{1}{6}$ d) $\frac{5}{8} + \frac{1}{6}$ e) $\frac{1}{7} + \frac{2}{3}$
2. $\frac{2}{3}$ of the seats in a church were occupied by adults and $\frac{1}{4}$ by children. What fraction of the seats in the church is occupied?
3. Mpala spends, $\frac{1}{3}$ of her pocket money on eats, $\frac{1}{8}$ on medical and $\frac{1}{6}$ on stationery. What fraction of her pocket money is spent?
4. Work out: $\frac{1}{4} - \frac{1}{6} + \frac{1}{3}$

ADDITION OF MIXED NUMBERS

Examples

1. Add: $1\frac{1}{8} + 3\frac{1}{12}$

   Method I

   (1+3)+($\frac{1}{8} + \frac{1}{12}$)

   4 + ($\frac{1}{8} + \frac{1}{12}$)

   $m_8 = \{8, 16, \textcircled{24}, 32 \ldots\}$

   $m_{12} = \{12, \textcircled{24}, \ldots\}$

   LCD = 24

   3 2

$$4 + \frac{\left(\frac{1}{8}\times 24\right)+\left(\frac{1}{12}\times 24\right)}{24}$$

$4 + \frac{3+2}{24}$

$4 + \frac{5}{24}$

$4\frac{5}{24}$

Method II

$\frac{9}{8} + \frac{37}{12}$

$\frac{9}{8} = \frac{18}{16}, \boxed{\frac{27}{24}}, \frac{36}{32}$

$\frac{37}{12} = \boxed{\frac{74}{24}}$

$\frac{27}{24} + \frac{74}{24}$

$\frac{27+74}{24}$

4 r 5

$\frac{101}{24}$

$4\frac{5}{24}$

2. Akulo had $1\frac{1}{2}$ cakes, Janat $2\frac{3}{4}$ cakes and Kenty had $\frac{3}{4}$ cake. How many cakes did the three children have?

$(1+2) + (\frac{3}{4} + \frac{3}{4} + \frac{1}{2})$

$3 + (\frac{6}{12} + \frac{6}{12})$

$3 + \frac{6+6}{12}$

$3 + \frac{12}{12}$ (1)

$3 + 1$ (1)

4 cakes

$\frac{1}{2} = \frac{2}{4}, \frac{3}{6}, \frac{4}{8}, \frac{5}{10}, \frac{6}{12}$

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

ACTIVITY

1. Work out the sum of the following:

a) $2 + \frac{2}{7}$ b) $1\frac{1}{4} + \frac{3}{8}$ c) $6\frac{2}{3} + 2\frac{1}{4}$ d) $1\frac{1}{2} + 3\frac{1}{4} + \frac{5}{6}$

2. A father gave sugar cane to her children. Esther got $1\frac{1}{2}$ and Robert got $2\frac{1}{4}$. How many sugar canes did both children get?

A worker painted $3\frac{1}{9}$ walls on Monday and $\frac{6}{9}$ on Tuesday. How much was painted in two days? Subtraction of fractions

SUBTRACTION OF FRACTIONS

Examples

1. Work out: $\frac{1}{2} - \frac{1}{8}$

   m_2= { 2, 4, 6, 8, 10, 12, 14, 16…}

   m_8= { 8, 16, 24, 32, 40…}

   LCD = 8

   $$\frac{\left(\frac{1}{2}\times 8^{4}\right) - \left(\frac{1}{8}\times 8^{1}\right)}{8}$$

   $$\frac{\frac{(1\times 4)-(1\times 1)}{8}}{}$$

   $$\frac{4-1}{8}$$

   $$\frac{3}{8}$$

   Method II

   $\frac{1}{2}$ = $\frac{2}{4}$, $\frac{3}{6}$, $\boxed{\frac{4}{8}}$, $\frac{6}{12}$

   $\boxed{\frac{1}{8}}$ = $\frac{2}{16}$, $\frac{3}{24}$

   $$\frac{4}{8} - \frac{1}{8}$$

   $$\frac{4-1}{8}$$

   $$\frac{3}{8}$$

2. Work out the difference between $\frac{3}{4}$ and $\frac{3}{5}$.

   m_4= { 4, 8, 12, 16, 20, 24…}

   m_5= { 5, 10, 15, 20, 25,

LCD = 20

$$\frac{\left(\frac{3}{4}\times 20^{5}\right)-\left(\frac{3}{5}\times 20^{4}\right)}{20}$$

$$\frac{(3\times 5)-(3\times 4)}{20}$$

$$\frac{15-12}{20}$$

$$\frac{3}{20}$$

Method II

$\frac{3}{4} = \frac{6}{8}, \frac{9}{12}, \frac{12}{16}, \boxed{\frac{15}{20}}$

$\frac{3}{5} = \frac{6}{10}, \frac{9}{15}, \boxed{\frac{12}{20}}$

$$\frac{15}{20}-\frac{12}{20}$$

$$\frac{15-12}{20}$$

$$\frac{3}{20}$$

3. A baby was given $\frac{5}{6}$ litres of milk and drunk $\frac{7}{12}$ litres. How much milk remained?

$\frac{5}{6} = \boxed{\frac{10}{12}}, \frac{15}{18}, \frac{20}{24}, \frac{25}{30}, \frac{30}{36}, \frac{3}{42}$

$\boxed{\frac{7}{12}} = \frac{14}{24}, \frac{21}{36},$

$$\frac{10}{12}-\frac{7}{12}$$

$$\frac{10-7}{12}$$

$$\frac{3^{1}}{12_{4}}$$

$\frac{1}{4}$ litre

Activity

1. Work out the difference of the following:

a) $\frac{4}{5}-\frac{1}{5}$ b) $\frac{3}{4}-\frac{2}{3}$ c) $\frac{3}{7}-\frac{1}{6}$ d) $\frac{2}{3}-\frac{5}{12}$ e) $\frac{1}{3}-\frac{1}{5}$ f) $\frac{3}{5}-\frac{3}{8}$

2. Adam had a half a glass of water and used $\frac{1}{3}$ to take medicine. What of water he had did he remain with?

3. Ongom was given $\frac{3}{4}$ of sugar cane. He gave $\frac{1}{6}$ to his friend. What fraction of the sugar cane did he remain with?

4. Kempo had tom plant $\frac{7}{8}$ of a garden. He planted $\frac{3}{4}$ in the morning and the rest in the evening. What portion of the garden was planted in the evening?

MULTIPLICATION INVOLVING FRACTION

Examples

Work out the product of the following:

a) $\frac{2}{3}\times\frac{1}{2}=\frac{N\times N}{D\times D}$

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

b) $\frac{2}{8}\times\frac{3}{12}\times\frac{2}{9}$

$\frac{\cancel{2}^{1}}{\cancel{8}_{4}}\times\frac{\cancel{3}^{1}}{\cancel{12}_{6}}\times\frac{\cancel{2}^{1}}{\cancel{9}_{3}}$

$\frac{1\times 1\times 1}{4\times 6\times 3}=\frac{1}{72}$

c) $36\times\frac{4}{9}$

$\frac{\cancel{36}^{4}}{1}\times\frac{4}{\cancel{9}_{1}}$ = 4 x 4

= 16

d) $\frac{3}{50} \times 100$

$\frac{3}{\cancel{50}_{1}} \times \cancel{100}^{2}$

= 3 x 2

= 6

e) $4\frac{3}{8} \times 40$

$\frac{35}{\cancel{8}_{1}} \times \cancel{40}^{5}$

= 35 x 5

= 175

2) What is $\frac{2}{5}$ of 20 books?

$\frac{2}{\cancel{5}_{1}} \times \cancel{20}^{4}$

2 x 4 = **8 books**

3) What is $2\frac{1}{2}$ of 2 dozen books?

1 doz = 12books

2 dozens = 12 x 2

= 24 books

$2\frac{1}{2} x 24$

$\frac{5}{\cancel{2}_{1}} \times \cancel{24}^{4}$ = **60 books**

ACTIVITY

1. Work out the following:

a) $\frac{2}{3} \times \frac{9}{12}$ b) $\frac{4}{15} \times \frac{5}{18}$ c) $\frac{11}{18} \times \frac{9}{22}$ d) $2\frac{3}{5} \times \frac{10}{15}$

e) $\frac{3}{4} \times \frac{1}{2} \times \frac{7}{12}$ e) $4\frac{1}{2} \times 5\frac{1}{5}$

2. What is $\frac{3}{4}$ of 48 pens?

3. What is $3\frac{1}{2}$ of $4\frac{2}{7}$ weeks?

Ref: New MK pupils book 5 pages 61-62

RECIPROCALS OF FRACTIONS/MULTIPLICATIVE INVERSE

A **reciprocal** is a number that is multiplied by a different number to give 1.

The Reciprocal of $\frac{2}{3}$ is $\frac{3}{2}$

I.e. $\frac{2}{3} \times \frac{3}{2} = \frac{6}{6}^{1}$

$= 1$

Therefore, a fraction multiplied by its reciprocal gives a product of 1.

Example:

1. Find the reciprocal of $\frac{3}{4}$

Let the reciprocal be m

Fraction x ric. = 1

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

$^{1}\cancel{4} \times \frac{3}{\cancel{4}_{1}} m = 1 \times 4$

$3m = 4$

$\frac{\cancel{3}m}{\cancel{3}} = \frac{4}{3}$

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

2. What is the reciprocal of $1\frac{2}{7}$?

Let the reciprocal be k

F x r = 1

$1\frac{2}{7} \times m = 1$

$\frac{9}{7} m = 1$

$^{1}\cancel{7} \times \frac{9}{\cancel{7}} m = 1 \times 7$

$^{1}9m = 7$

$\frac{^{1}\cancel{9}}{\cancel{9}_{1}} m = \frac{7}{9}$

$m = \frac{7}{9}$

3. Find the reciprocal of 5.

Let the reciprocal of w.

F x w = 1

$5 \times w = 1$

$5w = 1$

$\frac{5w}{5} = \frac{1}{5}$

$w = \frac{1}{5}$

3. What is the reciprocal of 0.4?

Let the reciprocal be m

$F \times r = 1$

$0.4 \times m = \frac{4}{10} \times m = 1$

$10 \times \frac{4}{10} m = 1 \times 10$

$4m = 10$

$\frac{4}{4} m = \frac{10}{4}$

$m = \frac{10}{4}$

Activity

1. Find the multiplicative inverse of the following numbers:

a) $1\frac{1}{3}$ b) $\frac{9}{15}$ c) $\frac{21}{8}$ d) 3 0.6 e) 0.25 f) 2.4

2. Find the missing number in the following:

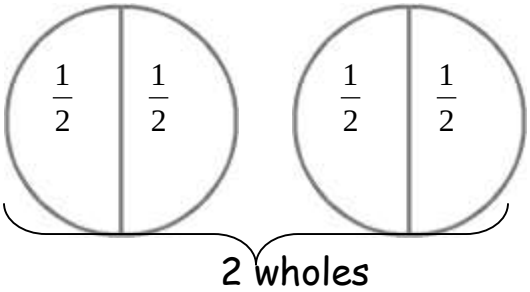
i) $\frac{1}{7} \times \square = 1$ ii) $\frac{3}{11} \times \square = 1$

Ref: New MK pupils book 5 page 63

DIVISION OF WHOLES BY FRACTIONS

Wholes by fractions

1) $2 \div \frac{1}{2}$ (Use of diagrams)



$\therefore 2 \div \frac{1}{2} = \mathbf{4}$

Method II (reciprocal)

$2 \div \frac{1}{2}$

$\frac{2}{1} \times \frac{2}{1}$

$\frac{2 \times 2}{1 \times 1}$

$\frac{4}{1}$

4

2. Work out: $3 \div \frac{1}{4}$

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

$= \frac{12}{1}$

$\Longrightarrow 12$

3. Work out: $\frac{2}{3} \div 18$

$= \frac{\cancel{2}^{1}}{3} \times \frac{1}{\cancel{18}_{9}}$

$= \frac{1}{27}$

$= \frac{1}{27}$

3. How many half litre cups are in a 20 litre jerry can?

$20 \div \frac{1}{2}$

$\frac{20}{1} \times \frac{2}{1}$

$\frac{20 \times 2}{1 \times 1}$

$\frac{40}{1}$

40

= 40 cups

Method II

1litre $\longrightarrow$ 2 half litres

20litres $\longrightarrow$ (2 x 20) half litres

20 litres $\longrightarrow$ 40 half litre cups

4. How many $\frac{1}{4}$ kg packets of sugar can be packed from 30kg?

1kg $\longrightarrow$ 4 quarter kg

30kg $\longrightarrow$ (4 x 30) quarter kg

30kg $\longrightarrow$ 120 quarter kg packets

120 kg packets can be packed

Method II

$30 \div \frac{1}{4}$

$\frac{30}{1} \times \frac{4}{1}$

$\frac{30 \times 4}{1 \times 1}$

$\frac{120}{1}$

120 packets

120 kg packets can be packed

5. Walyenge shared $\frac{2}{3}$ a sugar cane among her 5 friends. What fraction did each get?

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

$\frac{2}{3} \times \frac{1}{5}$

$\frac{2 \times 1}{3 \times 5}$

$\frac{2}{15}$

Ref: New MK pupils book 5 pages 64 & 65

Activity

1. Work out the following:
   a) $10 \div \frac{1}{2}$ b) $24 \div \frac{3}{5}$ c) $35 \div \frac{5}{10}$ d) $\frac{3}{4} \div 15$ e) $\frac{5}{6} \div 20$
2. A seamstress uses $\frac{1}{2}$ metre piece of cloth to make a dress.How many such dresses can he make from 16 metres of cloth.
3. Mark uses $\frac{1}{8}$ litre of cooking oil every day. If she buys a 20-litre jerrycans of cooking oil, how long will it last?
4. Muko served $\frac{5}{6}$ of a water melon to her visitors and each got an equal share. If there were 10 visitors, what fraction was each piece?

DIVISION OF FRACTION BY FRACTION

1. Work out: $\frac{2}{3} \div \frac{4}{5}$

$\frac{2}{3} \div \frac{4}{5} \Longrightarrow \frac{2}{3} \times \frac{5}{4}$

$= \frac{\cancel{10}^{5}}{\cancel{12}_{6}} = \frac{5}{6}$

Ref: New MK pupils book 5 pages 66

2. Work out $\frac{3}{4} \div \frac{1}{3}$

$\frac{3}{4} \times \frac{3}{1} = \frac{9}{4}$ 2r1

$2\frac{1}{4}$

4. Work out: $2\frac{1}{3} \div 1\frac{7}{12}$

$\frac{7}{3} \div \frac{19}{12}$

$\frac{7}{3_1} \times \frac{12^4}{19}$

$\frac{28}{19}$ 1 r 9

$1\frac{9}{19}$

ACTIVITY

1. Work out the following:

a) $\frac{2}{5} \div \frac{2}{3}$ b) $\frac{5}{8} \div \frac{5}{12}$ c) $\frac{12}{15} \div 1\frac{3}{5}$ d) $\frac{8}{10} \div \frac{4}{5}$

3. How many $\frac{3}{5}$ litres of milk are in $\frac{2}{3}$ litres of milk?
4. A lady packed $\frac{1}{2}$ kilogram packets of tea leaves in smaller packets of $\frac{1}{6}$ kilogram each. How many smaller packets did he obtain

MIXED OPERATIONS WITH FRACTIONS (BODMAS)

Examples

1. Work out: $\frac{1}{2} + \frac{1}{4} - \frac{1}{3}$ **apply BODMAS**

m_4= { 4, 8, 12, 16, 20, 24…}

m_2= { 2, 4, 6, 8, 10, 12,…}

m_3= { 3, 6, 9, 12, 15, …}

LCD = 12

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

$$\frac{(1\times 6 + 1\times 3) - 1\times 4}{12}$$

$$\frac{(6+3)-4}{12}$$

$$\frac{9-4}{12}$$

$$\frac{5}{12}$$

2. Simplify: $\frac{5}{6} - \frac{5}{9} + \frac{7}{18}$

Rearrange according to BODMAS

ii) $\frac{5}{6} - \frac{5}{9} + \frac{7}{18}$

$$\frac{(\frac{5}{6} + \frac{7}{18} - \frac{5}{9}}{18}$$

$$\frac{(\frac{5}{6}\times 18 + \frac{7}{18}\times 18) - \frac{5}{9}\times 18}{18}$$

$$\frac{(5\times 3 + 7\times 1) - 5\times 2}{18}$$

$$\frac{(15+7)-10}{12}$$

$$\frac{22-10}{18}$$

$$\frac{12}{18}$$

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

2	6	9	18
2	3	9	9
3	1	3	3
3	1	1	1

LCD =2 x 3 x 3
LCD = 18

3. Simplify: $\frac{2}{3}$ of $(\frac{3}{4}-\frac{1}{3})$ rearrange according to BODMAS

$(\frac{3}{4}-\frac{1}{3})$ of $\frac{2}{3}$ LCD = 12

$$\frac{\left(\frac{3}{4}\times 12\right)-\left(\frac{1}{3}\times 12\right)}{12}\text{ of }\frac{2}{3}$$

$$\frac{(9-4)}{12}\text{ of }\frac{2}{3}$$

$$\frac{5}{12}\times\frac{2}{3}$$

$$\frac{5}{18}$$

4. Work out: $\frac{5}{6}-\frac{3}{4}\div 1\frac{1}{2}$ note: deal with division first

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

$$\frac{5}{6}-\left(\frac{3}{4}\times\frac{2}{3}\right)$$

$$\frac{5}{6}-\frac{1}{2}\qquad \text{LCD} = 6$$

$$\frac{\left(\frac{5}{6}\times 6\right)-\left(\frac{1}{2}\times 6\right)}{6}$$

$$\frac{(5-3)}{6}$$

$$\frac{2}{6}$$

$$\frac{1}{3}$$

Ref: New MK pupils book 6 pages 113

ACTIVITY

Work out the following:

a) $\frac{1}{3}\times\frac{1}{4}+\frac{1}{2}$ **b)** $(\frac{1}{3}\times\frac{1}{2})\times\frac{1}{4}$ **c)** $\frac{3}{4}\times\frac{2}{3}-\frac{1}{2}$ **d)** $\frac{5}{6}\div(\frac{3}{4}\text{ of }3)$

e) $\frac{7}{12}-\frac{1}{2}\text{ of }\frac{1}{3}$ **f)** $\frac{1}{2}-\frac{4}{5}\text{ of }\frac{5}{6}+\frac{1}{4}$ **g)** $(\frac{1}{6}-\frac{1}{7})\div(\frac{1}{6}+\frac{1}{7})$

DECIMAL FRACTIONS

PLACE VALUES AND VALUES OF DECIMALS

EXAMPLES

1. Find the place value of each digit in 234.0678.

H	T	O		t	h	th	T th
2	3	4	.	0	6	7	8

Ten thousandths
Thousandths
Hundredths
Tenths
Ones
Tens
Hundreds

1. Find the place value of 4 and 6 in 249.867.

H	T	O		t	h	th
2	4	9	.	8	6	7

Hundredths
Tens

2. What is the values of each digit in 903.2567?

H	T	O		t	h	th	T th
9	0	3	.	2	5	6	7

(7x 0.0001) = 0.0007
(6x 0.001) =0.006
(5x 0.01) = 0.05
(2 x 0.1) = 0.2
(3 x 1) = 3
(0 x 10) = 0
(9 x 100) = 900

3. Find the value of 8 and 3 in 587.0934

H	T	O		t	h	th	T th
5	8	7	.	0	9	3	4

(3 x 0.001) = 0.003

(8 x 10) = 80

4. Find the product of the value of 4 and the value of 8 in 835.6479.

H	T	O		t	h	th	T th
8	3	5	.	6	4	7	9

(4 x 0.01) = 0.04

(8 x 100) = 800

Product

800 x 0.04

$800 \times \frac{4}{100}$

Product is 32

Activity

1. Find the place values of each underlined digits in the following numerals.

a) 0.8634 b) 986.4732 c) 984.6531

2. Find the value of each underlined digit in the following numerals.

i) 42.1659 ii) 9064.5731 iii) 0.40345

3. Find the sum of the value of 2 and the value of 9 in 72.694.

4. What is the difference of the value of 4 and the value of 5 in 2.465?

5. Find the product of the value of 3 and the value of 7 in 238.974.

WRITING DECIMAL IN WORDS

EXAMPLES

1. Write 0.4 in words.

   0.4 zero point four

   Or

   0.4

   Tenths

0.4 = Four tenths

2. Write 0.27 in words.

0.27= zero point two seven

Or

0.27

↓ Hundredths

0.27 =Twenty-seven hundredths.

3. Write 0.048 in words.

0.048 = zero point zero four eight

Or

0.048

↓ Thousandths

0.048 = forty-eight thousandths

4. Express 6.0378 in words.

O	and	t	h	th	T th
6	.	0	3	7	8

↓ Ten thousandths

6.0378 = six point three seven eight

Or

6.0378 = six and three hundred seventy-eight ten thousandths

5. Write 406.308 in words.

406.308 = four hundred six point three zero eight

Or

H	T	O	and	t	h	th
4	0	6	.	3	0	8

↓ Thousandths

406.308 =four hundred six and three hundred eight thousandths.

Activity

1. Write the following figures in words:

a) 0.7 b) 0.09 c) 0.123 d) 2.54 e) 0.0086 f) 862.459

2. What digit is in the place value of thousandths in 236.8097?

3. Represent 98.345 on an abacus

WRITING DECIMAL WORDS IN FIGURES

Examples

1. Write eight tenths in figures.

Eight tenths = $\frac{8}{10}$

= 0.8

2. Write twenty-nine hundredths in figures.

Twenty-nine hundredths = $\frac{29}{100}$

= 0.29

3. Write thirty-five thousandths in figures.

Thirty-five thousandths = $\frac{35}{1000}$

= 0.035

4. Write two and fourteen hundredths in words.

Two + fourteen hundredths

$2 + \frac{14}{100}$

2 + 0.14

Two and fourteen hundredths = 2.14

5. Express three hundred eighty-four and five hundred ninety-eight thousandths in figures.

Three hundred eighty-four + five hundred ninety-eight thousandths

$384 + \frac{598}{1000}$

384 + 0.598

384.598

Three hundred eighty-four +and five hundred ninety-eight thousandths =384.598

Activity

Express the following decimal words in figures;

1. Three tenths
2. Two hundredths
3. Fifteen thousandths
4. Four and forty-six hundredths
5. Twenty-three and three hundred ninety-five thousandths

6. One thousand two hundred nine and seven hundred twenty-eight ten thousandths.

CONVERTING DECIMALS TO COMMON FRACTIONS

NB: The No. of decimal places determine the number of zeroes in the denominator.

Examples

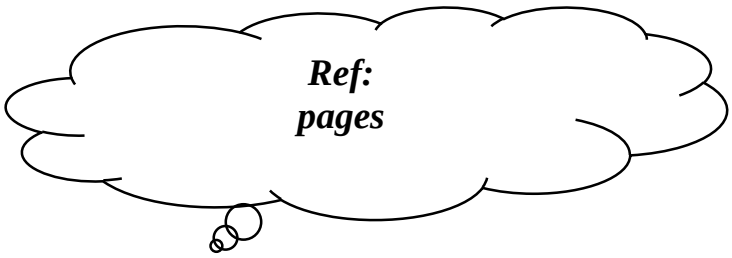
Convert the following decimals into common fractions;

i) $0.4 = \frac{4}{10} = \frac{2}{5}$

ii) $0.05 = \frac{5}{100} = \frac{1}{20}$

iii) $0.25 = \frac{25}{100} = \frac{5}{20} = \frac{1}{4}$

iv) $6.9 = 6\frac{9}{10}$



Activity

Convert the following decimals int0 simplified common fractions

a) 0.2 b) 0.8 c) 0.15 d) 0.45 e) 0.075 f) 3.25

COMPARING AND ARRANGING DECIMALS

Examples

Comparing decimals

Use **<, > or = to compare the following decimals**

a) 0.11 __ 0.2

$\frac{11}{100}$ ____ $\frac{2}{10}$ LCD = 100

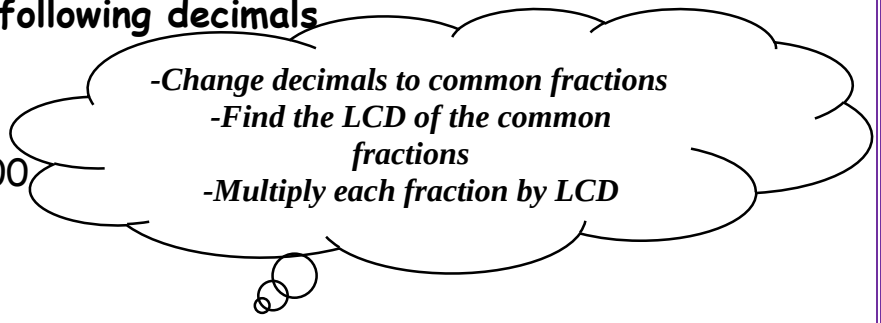
$\frac{11}{100} \times \frac{100}{1} = 11$

$\frac{2}{10} \times \frac{100}{1} = 20$

0.11 < 0.2

b) 0.5__ 0.08

$\frac{5}{10}$ ____ $\frac{8}{100}$ LCD = 100



$\frac{5}{\cancel{10}_{1}} \times \cancel{100}^{10} = 50$

$\frac{8}{\cancel{100}_{1}} \times \cancel{100}^{1} = 8$

$\frac{5}{10} > \frac{8}{100}$

Ordering decimals

Examples

1. Arrange 0.4, 0.44, 4.4 in ascending order.

As common fractions $\Longrightarrow \frac{4}{10}, \frac{44}{100}, \frac{44}{10}$

LCD = 100 (biggest denominator)

$\frac{4}{\cancel{10}_{1}} \times \cancel{100}^{10} = 40$

$\frac{44}{\cancel{100}_{1}} \times \cancel{100}^{1} = 44$

$\frac{44}{\cancel{10}_{1}} \times \cancel{100}^{10} = 440$

In ascending order, **0.4, 0.44, 4.4**

3. Arrange 0.1, 1.1 and 0.01 in descending order.

As common fractions $\frac{1}{10}, \frac{11}{10}, \frac{1}{100}$

LCD = 100

$\frac{1}{\cancel{10}} \times \cancel{100}^{10} = 10$

$\frac{11}{\cancel{10}_{1}} \times \cancel{100}^{10} = 110$

$\frac{1}{\cancel{100}_{1}} \times \cancel{100}^{1} = 1$

Descending order is 1.1, 0.1 and 0.01

Activity

1. Use >, < or = to compare the following pairs of decimals

a) 0.2 __ 0.3 b) 0.9 _____ 0.8 c) 8.6 _____ 8.4 d) 6.7 _____ 7.4

2. Arrange the decimals below in ascending order.

i) 0.5, 5.55, 0.55 ii) 2.2 , 0.22, 0.02 iii) 3.5, 0.35, 0.5

3. Arrange the following decimals in descending order.

a) 1.8, 1.08,8.01 b) 0.08 , 0.8 , 8.0 c) 0.1 , 0.3 , 0.33

b)

Ref: Mk pupils' bk5 pages 145- 146

CHANGING COMMON FRACTIONS TO DECIMALS

EXAMPLES

1. Convert $\frac{5}{10}$ into a decimal fraction.

$\frac{5}{10}$ = 0.5

Method II (long division)

$\frac{5}{10}$ = 5 ÷10

$$\begin{array}{r} 0.5 \\ 10\overline{)\,5.0} \\ 0\text{x}10 = \underline{0} \\ 5\,0 \\ 5\text{ x}10 = \underline{5\,0} \\ 0\,0 \end{array}$$

$$\frac{5}{10} = 0.5$$

2. Change $\frac{8}{100}$ into a decim

$\frac{8}{100}$ = 0.08

Method II (long division)

$\frac{8}{100}$ = 8÷100

$$\begin{array}{r} 0.08 \\ 100\overline{)\,8.00} \\ 0\text{ x}100 = \underline{0} \\ 8\,0 \\ 0\text{ x}100 = \underline{0\,0} \end{array}$$

$$\begin{array}{rr} & 800 \\ 8 \times 100 = & \underline{800} \\ & 000 \end{array}$$

$\frac{8}{100}$ = 0.08

3.Express $\frac{3}{4}$ as a decimal fraction.

N÷D

3÷4

$$\begin{array}{rr} & 0.75 \\ 4\overline{)} & 3.00 \\ 0 \times 4 = & \underline{0} \\ & 30 \\ 7 \times 4 = & \underline{28} \\ & 020 \\ 5 \times 4 = & \underline{20} \\ & 000 \end{array}$$

$\frac{3}{4}$ = 0.75

Activity

Convert the following common fractions into decimals

a) $\frac{8}{10}$ b) $\frac{13}{100}$ c) $\frac{45}{1000}$ d) $\frac{207}{100}$ e) $\frac{1}{2}$ f) $\frac{4}{5}$ g) $\frac{1}{4}$

ADDITION AND SUBTRACTION OF DECIMALS

Examples

1. Work out 14.9 + 8.02 + 36.48

$$\begin{array}{r} {\scriptstyle 1\ 1\ 1} \\ 14.90 \\ 08.02 \\ +36.48 \\ \hline 59.40 \end{array}$$

2. Add: 0 . 45 + 13 . 2 + 52 . 00

$$\begin{array}{r} 0.45 \\ 13.20 \\ +52.00 \\ \hline 65.65 \end{array}$$

EXERCISE

1. 4.96 + 1.7 + 0.36
2. 2.7 + 8.92 + 0.37
3. 2.76 + 3.85 + 1.09

4.) 65.5 + 4.5 + 20.8

5) 0.56 + 5.8 + 58.00

6) 0.22 + 2.22 + 22.22

1. Work out: 97 .4 – 13. 69

$$\begin{array}{r} {\scriptstyle 6\quad 13\ 10} \\ 9\,\not{7}.\ 4\,\not{0} \\ -1\ 3.\ 6\ 9 \\ \hline 8\ 3.\ 7\ 1 \\ \hline \end{array}$$

2. Work out: 63 – 19. 78

$$\begin{array}{r} {\scriptstyle 5\ 12\ 9\ 10} \\ \not{6}\ \not{3}.\ 0\ \not{0} \\ -1\ \ 9.\ 7\ 8 \\ \hline 4\ \ 3.2\ 2 \\ \hline \end{array}$$

Ref: Mk pupils' bk5 page147

2. A rope is 12.41m long. If 6.345m length is cut, what length of the wire remains?

$$\begin{array}{r} {\scriptstyle 12\ \ 3\ 10\ 10} \\ \not{1}\ \ 2.\ \not{4}\ \not{1}\ \not{0} \\ -0\ \ 6.\ 3\ 4\ 5 \\ \hline 0\ \ 6.\ 0\ 6\ 5 \\ \hline \end{array}$$

6.065 m length remained

Activity

1. Work out the following

a) 79.8 – 19.5
b) 7.9– 4.5
c) 57.9 – 3.51
d) 8.54 – 2.34
e) 166 – 66.9
f) 14.9 – 3.51

2. The distance between two rooms is 12.416m. If the third room is 6.416m away from the first room. What is the distance between the first and third?
3. A nurse draws 1.415 mi of medicine from a bottle containing 5ml.What amount of medicine remains in the bottle?

MULTIPLICATION INVOLVING DECIMALS

Examples

Work out the following;

a) 0.4 x 0.2

$\frac{4}{10} \times \frac{2}{10} = \frac{8}{100}$

= 0.08

b) 0.12 x 0.03

$\frac{12}{100} \times \frac{3}{100} = \frac{36}{10000}$

= 0.0036

C) 0.48 x 6

$\frac{48}{100} \times 6$

$\frac{288}{100}$

2.88

d) 15 x 0.03

$15 \times \frac{3}{100}$

$\frac{45}{100}$

0.45

e) $(0.08)^2$

0.08 x 0.08

$\frac{8}{100} \times \frac{8}{100} = \frac{16}{10000}$

= 0.0016

Activity

1. Work out the following

i) 0.4 x 0.3 ii) 0.6 x 0.5 iii) 10 x 0.5 iv) 0.9 x 2

v) $(0.4)^3$ vi) 13.25 x 0.06 vii) 16.08 x 4 viii) 14.7 x 0.9

3. A cylinder carries 4.350ml of water. If there are 4 similar cylinders, how much water do they carry

Activity

Ref: Mk pupils' bk7 pages 85-87

DIVISION INVOLVING DECIMALS

Examples

Simplify the following:

a) 0.2 ÷ 0.6

$\frac{2}{10} \div \frac{6}{10}$

$\frac{2}{10} \times \frac{10}{6}$

1 3

b) 0.072÷0.8

$\frac{72}{1000} \div \frac{8}{10}$

$\frac{72}{1000} \times \frac{10}{8}$ (9)

$\frac{9}{100}$

$\frac{1}{3}$

c) 0.32 ÷ 4

$\frac{32}{100} \div \frac{4}{1}$

$\frac{32}{100} \times \frac{1}{4}$

$\frac{2}{25}$

d) 50 ÷ 0.18

$\frac{50}{1} \div \frac{18}{100}$

$\frac{1}{50} \times \frac{100}{18}$

$\frac{1}{9}$

d) 3.6 ÷ 0.18

$\frac{36}{10} \div \frac{18}{100}$

$\frac{36}{10} \times \frac{100}{18}$

2 x 10

20

Ref: Mk pupils' bk7 pages 85-87

2. A rope measuring 3.75m was cut into 5 equal parts. What was the length of each part?

3.75 ÷ 5

$\frac{375}{100} \div \frac{5}{1}$

$\frac{375}{100} \times \frac{1}{5}$

$\frac{75}{100}$

0.75 m long

Activity

1. Simplify the following:

a) 0.4 ÷ 0.16 b) 0.8 ÷ 20 c) 40 ÷0.5 d) 2.8 ÷2 e) 25.75 ÷2.25

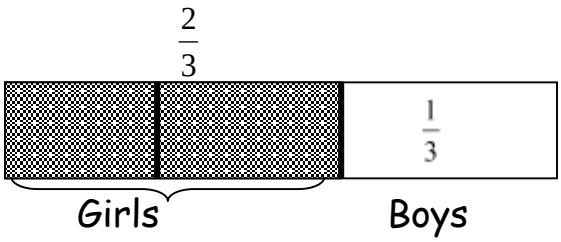
f) 1.08 ÷0.12 g) 100 ÷0.5 h) 0.07 ÷ 56

2. Kapalaga has 8.75kg of salt to be packed in packets of 0.25kg each. How many packets will he make?

APPLICATION OF FRACTIONS

Examples

1. In a class of 60 pupils $\frac{2}{3}$ are girls and the rest are boys.



a) Find the fraction of the boys.

$1 - \frac{2}{3}$ ‖ $\frac{3}{3} - \frac{2}{3} = \frac{3-2}{3} = \frac{1}{3}$

b) How many boys are there?

$\frac{1}{\cancel{3}_{1}} \times \cancel{60}^{20}$

1×20

= 20 boys

c) How many girls are there?

$\frac{2}{3} \times \cancel{60}^{20}$

2×20

40 girls

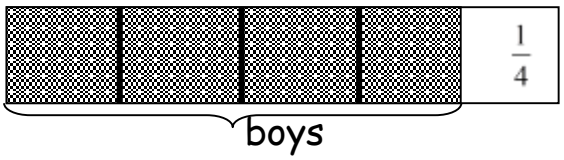
d) How many more girls are there than the boys?

$$\begin{array}{r} 40 \\ -\ 20 \\ \hline \end{array}$$

20 more girls

3. In a class of 270 boys, $\frac{3}{4}$ are boys and the rest are girls.

a) Find the fraction of girls



$\frac{1}{4}$ are girls

Method II

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

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

$= \frac{1}{4}$

b) How many pupils are there in the class?

Method I

3 parts ⟶ 270pupils

1 part ⟶ (270 ÷ 3) pupils

1 parts ⟶ 90 pupils

4 parts ⟶ (90 x 4) pupils

4 parts ⟶ 360 pupils

Method II

Let m be the total number of pupils

$\frac{3}{4}$ of m = 270

$\frac{3}{4} \times m = 270$

$\frac{3m}{4} = 270$

$\frac{3m}{\cancel{4}_1} \times \cancel{4}^1 = 270 \times 4$

$\frac{\cancel{3}m^m}{\cancel{3}_1} = \frac{\cancel{270}^{90} \times 4}{\cancel{3}_1}$

m = 360

c) How many more boys than girls are in the class?

(360 – 270) girls (270 – 90)

90 girls 180 more boys

Activity

1. Mary ate $\frac{2}{9}$ of a cake in the morning, $\frac{3}{9}$ in the afternoon and the rest in evening.
   a) What portion of a cake did she eat in both morning and afternoon?
   b) What fraction did she eat in the evening?
2. In a school of 560 pupils, $\frac{3}{8}$ are girls and the rest are boys.
   a) Find the fraction of boys.
   b) How many girls are in the class?
   c) How many more girls than boys are in the class?
3. There are 320boys in a school. If $\frac{3}{8}$ are girls.
   a) Find the fraction of girls
   b) How many pupils are in the school?
   c) Find the number of girls.