








Warm Up

A. Match the columns. **ANS**

1. $\frac{2}{3}$ a.  i. half
2. $\frac{1}{4}$ b.  ii. two-thirds
3. $\frac{1}{2}$ c.  iii. three-fourths
4. $\frac{3}{4}$ d.  iv. one-fourth or a quarter

A fraction is a part of a whole or a collection.

B. Fill in the blanks. **ANS**

1. $\frac{4}{5}$ of 20 is _____
2. $\frac{2}{3}$ of a dozen is _____
3. $\frac{1}{4}$ of an hour is _____
4. $\frac{6 \div 2}{10 \div 2} = \frac{\square}{\square}$
5. $\frac{9}{12}$ in lowest term is $\frac{\square}{\square}$
6. $\frac{1}{9}$  $\frac{3}{9}$ (>, < or =)
7. $\frac{15}{10}$ as mixed number is $\frac{\square}{\square}$
8. $3\frac{2}{3}$ as improper fraction is $\frac{\square}{\square}$

C. Sevaram had 30 eggs in his shop. $\frac{1}{2}$ of them were sold and $\frac{1}{3}$ of them were broken. How many eggs were left? **ANS**

TYPES OF FRACTIONS

- Like fractions have the same denominator. For example, $\frac{2}{5}$, $\frac{3}{5}$, $\frac{7}{5}$ and $\frac{9}{5}$ are like fractions.
- Unlike fractions have different denominators. For example, $\frac{1}{3}$, $\frac{2}{7}$ and $\frac{5}{4}$ are unlike fractions.
- Proper fractions have the numerator always less than the denominator. For example, $\frac{3}{4}$, $\frac{1}{2}$ and $\frac{2}{3}$ are proper fractions.
- Unit fractions are proper fractions with 1 as the numerator. For example, $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$ and $\frac{1}{5}$ are unit fractions.
- Improper fractions have the numerator always greater than the denominator. For example, $\frac{5}{2}$, $\frac{8}{3}$ and $\frac{7}{3}$ are improper fractions. Improper fractions can be written as mixed fractions or mixed numbers. For example, $\frac{5}{2} = 2\frac{1}{2}$ and $\frac{8}{3} = 2\frac{2}{3}$ are mixed fractions or mixed numbers.

EQUIVALENT FRACTIONS

Sukhmeet and Geetika have taken part in a craft competition. They get one sheet each of coloured paper. Sukhmeet cuts her paper into 2 equal parts and uses 1 part of it. Geetika cuts her paper into 4 equal parts and uses 2 parts of it.

The fraction of the drawing paper used by Sukhmeet is one part out of two equal parts. This means $\frac{1}{2}$ of the paper. The fraction of the drawing paper used by Geetika is two parts out of four equal parts. This means $\frac{2}{4}$ of the paper.

Since the part of the paper used by both Sukhmeet and Geetika are equal, therefore, $\frac{1}{2} = \frac{2}{4}$. So, $\frac{1}{2}$ and $\frac{2}{4}$ are called equivalent fractions.

Writing equivalent fractions

In higher terms
Multiply both the numerator and the denominator by the same number.

$$\frac{2}{4} = \frac{2 \times 2}{4 \times 2}$$

To get equivalent fractions, multiply or divide the numerator and the denominator by the same number.



In lower terms

Divide both the numerator and the denominator by one of their common factors.

$$\frac{12}{8} = \frac{12 \div 4}{8 \div 4} = \frac{3}{2}$$

EXAMPLE 1 Make equivalent fractions by multiplying the numerator and denominator by the given number.

a. $\frac{2}{3}$ by 2

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

ANS. $\frac{2}{3}$ and $\frac{4}{6}$ are equivalent fractions.

b. $\frac{3}{7}$ by 5

$$\frac{3}{7} = \frac{3 \times 5}{7 \times 5} = \frac{15}{35}$$

ANS. $\frac{3}{7}$ and $\frac{15}{35}$ are equivalent fractions.

EXAMPLE 2 Make equivalent fractions by dividing the numerator and denominator by the given number.

a. $\frac{12}{36}$ by 3

$$\frac{12}{36} = \frac{12 \div 3}{36 \div 3} = \frac{4}{12}$$

ANS. $\frac{12}{36}$ and $\frac{4}{12}$ are equivalent fractions.

b. $\frac{13}{65}$ by 13

$$\frac{13}{65} = \frac{13 \div 13}{65 \div 13} = \frac{1}{5}$$

ANS. $\frac{13}{65}$ and $\frac{1}{5}$ are equivalent fractions.

EXAMPLE 3 Fill in each box to make equivalent fractions.

a. $\frac{1}{2} = \frac{\square}{10}$

$$\frac{1 \times 5}{2 \times 5} = \frac{5}{10}$$

($2 \times 5 = 10$, hence 1×5)

ANS. $\frac{5}{10}$

b. $\frac{7}{11} = \frac{21}{\square}$

$$\frac{7 \times 3}{11 \times 3} = \frac{21}{33}$$

($7 \times 3 = 21$, hence 11×3)

ANS. $\frac{21}{33}$

c. $\frac{6}{14} = \frac{\square}{7} = \frac{9}{\square}$

$$\frac{6 \div 2}{14 \div 2} = \frac{3}{7}, \frac{3 \times 3}{7 \times 3} = \frac{9}{21}, \frac{3 \times 5}{7 \times 5} = \frac{15}{35}$$

$$\frac{6}{14} = \frac{3}{7} = \frac{9}{21} = \frac{15}{35}$$

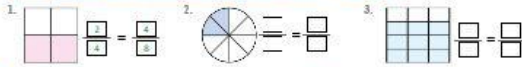
ANS. $\frac{6}{14} = \frac{3}{7} = \frac{9}{21} = \frac{15}{35}$





Exercise 4.1

A. Type two equivalent fractions for each coloured region. **ANS**



B. Complete each table of equivalent fractions. **ANS**

TABLE A

	Multiply the numerator and denominator by			
	2	3	5	6
1. $\frac{1}{2}$	$\frac{2}{4}$	$\frac{3}{6}$	$\frac{5}{10}$	$\frac{6}{12}$
2. $\frac{1}{3}$	$\frac{2}{6}$	$\frac{3}{9}$	$\frac{4}{12}$	$\frac{5}{15}$
3. $\frac{2}{5}$	$\frac{4}{10}$	$\frac{6}{15}$	$\frac{8}{20}$	$\frac{12}{30}$

TABLE B

	Divide the numerator and denominator by			
	2	3	5	6
1. $\frac{30}{60}$	$\frac{15}{30}$	$\frac{10}{20}$	$\frac{6}{12}$	$\frac{5}{10}$
2. $\frac{120}{150}$	$\frac{8}{10}$	$\frac{4}{5}$	$\frac{4}{5}$	$\frac{4}{5}$
3. $\frac{30}{900}$	$\frac{1}{30}$	$\frac{1}{30}$	$\frac{1}{30}$	$\frac{1}{300}$

C. Fill in each box to make an equivalent fraction. **ANS**

1. $\frac{1}{4} = \frac{\square}{8}$ 2. $\frac{4}{9} = \frac{\square}{9}$ 3. $\frac{3}{6} = \frac{\square}{16}$ 4. $\frac{3}{4} = \frac{\square}{16}$

5. $\frac{1}{3} = \frac{\square}{15}$ 6. $\frac{1}{6} = \frac{5}{\square}$ 7. $\frac{2}{7} = \frac{4}{\square}$ 8. $\frac{3}{5} = \frac{15}{\square}$

D. Complete the following. **ANS**

1. $\frac{2}{3} = \frac{\square}{6} = \frac{6}{\square} = \frac{8}{\square} = \frac{\square}{15}$ 2. $\frac{1}{8} = \frac{2}{\square} = \frac{3}{\square} = \frac{\square}{24} = \frac{\square}{30}$

E. Type each fraction in lower term. **ANS**

1. $\frac{3}{12} = \frac{\square}{\square}$ 2. $\frac{8}{40} = \frac{\square}{\square}$ 3. $\frac{15}{25} = \frac{\square}{\square}$ 4. $\frac{14}{21} = \frac{\square}{\square}$

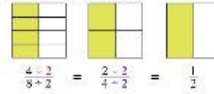
5. $\frac{11}{22} = \frac{\square}{\square}$ 6. $\frac{12}{24} = \frac{\square}{\square}$ 7. $\frac{18}{81} = \frac{\square}{\square}$ 8. $\frac{30}{30} = \frac{\square}{\square}$

F. Find the equivalent fraction of $\frac{3}{5}$ with the **ANS**

1. denominator 20. $\frac{\square}{\square}$ 2. numerator 9. $\frac{\square}{\square}$ 3. denominator 25. $\frac{\square}{\square}$

REDUCING A FRACTION TO ITS LOWEST TERM

A fraction is in its lowest term when the numerator and denominator have no common factor except 1.



Here, the fractions $\frac{4}{8}$, $\frac{2}{4}$ and $\frac{1}{2}$ are all equivalent fractions but $\frac{1}{2}$ is in its lowest term.

Method 1

Keep dividing the numerator and denominator by one of their common factors greater than 1 till no further division is possible.

Method 2

Divide the numerator and denominator by their highest common factor (HCF).

EXAMPLE 4 Reduce $\frac{16}{48}$ to its lowest term.

Method 1

$\frac{16 \div 2}{48 \div 2} = \frac{8}{24}$; $\frac{8 \div 2}{24 \div 2} = \frac{4}{12}$; $\frac{4 \div 2}{12 \div 2} = \frac{2}{6}$; $\frac{2 \div 2}{6 \div 2} = \frac{1}{3}$

Method 2

$\frac{16 \div 16}{48 \div 16} = \frac{1}{3}$

ANS: $\frac{1}{3}$



Exercise 4.2

A. Reduce to the lowest term. **ANS**

1. $\frac{5}{10} = \frac{\square}{\square}$ 2. $\frac{3}{9} = \frac{\square}{\square}$ 3. $\frac{6}{12} = \frac{\square}{\square}$ 4. $\frac{4}{12} = \frac{\square}{\square}$

B. Reduce to the lowest term by dividing the numerator and denominator by their common factors. **ANS**

1. $\frac{2}{10} = \frac{\square}{\square}$ 2. $\frac{3}{9} = \frac{\square}{\square}$ 3. $\frac{5}{10} = \frac{\square}{\square}$ 4. $\frac{6}{18} = \frac{\square}{\square}$ 5. $\frac{18}{27} = \frac{\square}{\square}$ 6. $\frac{14}{21} = \frac{\square}{\square}$

7. $\frac{14}{49} = \frac{\square}{\square}$ 8. $\frac{8}{16} = \frac{\square}{\square}$ 9. $\frac{15}{20} = \frac{\square}{\square}$ 10. $\frac{10}{40} = \frac{\square}{\square}$ 11. $\frac{12}{18} = \frac{\square}{\square}$ 12. $\frac{24}{36} = \frac{\square}{\square}$



C. Reduce to the lowest term by dividing the numerator and denominator by their HCF. **ANS**

1. $\frac{42}{56} = \frac{\square}{\square}$ 2. $\frac{27}{36} = \frac{\square}{\square}$ 3. $\frac{25}{45} = \frac{\square}{\square}$ 4. $\frac{18}{30} = \frac{\square}{\square}$ 5. $\frac{36}{81} = \frac{\square}{\square}$ 6. $\frac{66}{54} = \frac{\square}{\square}$

COMPARING AND ORDERING FRACTIONS

Comparing like fractions

EXAMPLE 5 Write $\frac{6}{10}$, $\frac{5}{10}$, $\frac{2}{10}$ and $\frac{7}{10}$ in ascending order.

The fractions $\frac{6}{10}$, $\frac{5}{10}$, $\frac{2}{10}$ and $\frac{7}{10}$ are like fractions. Let us compare their numerators.

$2 < 5 < 6 < 7$

Therefore, $\frac{2}{10} < \frac{5}{10} < \frac{6}{10} < \frac{7}{10}$

ANS. The ascending order of the fractions is $\frac{2}{10} < \frac{5}{10} < \frac{6}{10} < \frac{7}{10}$.

Compare the numerators of like fractions. The fraction with the greater numerator is greater.



Comparing unlike fractions

With the same numerator

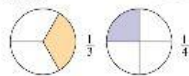
EXAMPLE 6 Compare $\frac{1}{3}$ and $\frac{1}{4}$.

The fractions $\frac{1}{3}$ and $\frac{1}{4}$ have the same numerator. Compare their denominators.

$3 < 4$

Therefore, $\frac{1}{3} > \frac{1}{4}$

ANS. $\frac{1}{3} > \frac{1}{4}$.



Compare the denominators of unlike fractions with the same numerator. The fraction with the smaller denominator is greater.



EXAMPLE 7 Write $\frac{3}{9}$, $\frac{3}{2}$, $\frac{3}{7}$ and $\frac{3}{5}$ in descending order.

The given fractions have the same numerators. Compare their denominators.

Here, $9 > 7 > 5 > 2$

Therefore, $\frac{3}{4} > \frac{3}{5} > \frac{3}{7} > \frac{3}{9}$

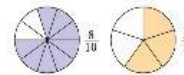
ANS. The descending order of the fractions is $\frac{3}{4} > \frac{3}{5} > \frac{3}{7} > \frac{3}{9}$.



With different numerators

To compare unlike fractions with different numerators, first change the fractions into like fractions and then compare the numerators.

EXAMPLE 8 Chitra coloured $\frac{8}{10}$ of a circle while Mitra coloured $\frac{3}{5}$ of a circle.



Who coloured more?

Step 1 Find the LCM of 10 and 5. It is 10.

Step 2 Change the fractions to equivalent fractions with the denominator 10.

$\frac{1}{5} = \frac{1 \times 2}{5 \times 2} = \frac{2}{10}$

Step 3 Compare the numerators, $8 > 6$.

So, $\frac{8}{10} > \frac{6}{10} \rightarrow \frac{8}{10} > \frac{3}{5}$

ANS. Chitra coloured more.

EXAMPLE 9 Compare $\frac{7}{8}$ and $\frac{9}{10}$.

Step 1 The LCM of the denominators 8 and 10 is 40.

Step 2 $\frac{7}{8} = \frac{7 \times 5}{8 \times 5} = \frac{35}{40}$; $\frac{9}{10} = \frac{9 \times 4}{10 \times 4} = \frac{36}{40}$

Step 3 $35 < 36$, therefore, $\frac{35}{40} < \frac{36}{40}$.

So, $\frac{7}{8} < \frac{9}{10}$.

ANS. $\frac{7}{8} < \frac{9}{10}$.

I used the prime factorization method to find the LCM of the denominators 8 and 10.



Cross-multiply to compare

EXAMPLE 10 Compare $\frac{2}{3}$ and $\frac{5}{6}$.

$2 \times 6 = 12$; $5 \times 3 = 15$

$12 < 15$, so $\frac{2}{3} < \frac{5}{6}$.

ANS. $\frac{2}{3} < \frac{5}{6}$.

Wow! This is a shortcut.



EXAMPLE 11 Compare $\frac{3}{4}$ and $\frac{2}{3}$.

$3 \times 3 = 9$; $4 \times 2 = 8$

$9 > 8$, so $\frac{3}{4} > \frac{2}{3}$.

ANS. $\frac{3}{4} > \frac{2}{3}$.





I Can Do It!

Compare the following fractions. Put $>$, $<$ or $=$ in the **ANS**.

1. $\frac{1}{5}$ $\frac{3}{15}$ 2. $\frac{1}{2}$ $\frac{3}{4}$ 3. $\frac{2}{7}$ $\frac{7}{12}$ 4. $\frac{5}{6}$ $\frac{1}{2}$
 5. $\frac{1}{4}$ $\frac{3}{8}$ 6. $\frac{3}{3}$ $\frac{4}{4}$ 7. $\frac{5}{4}$ $\frac{4}{3}$ 8. $\frac{3}{4}$ $\frac{2}{2}$

EXAMPLE 12 Arrange the fractions $\frac{7}{8}$, $\frac{5}{6}$, $\frac{3}{4}$, $\frac{2}{3}$ in ascending order.

The LCM of the denominators 8, 6, 4 and 3 is 24.

$$\frac{7}{8} = \frac{7 \times 3}{8 \times 3} = \frac{21}{24}$$

$$\frac{5}{6} = \frac{5 \times 4}{6 \times 4} = \frac{20}{24}$$

$$\frac{3}{4} = \frac{3 \times 6}{4 \times 6} = \frac{18}{24}$$

$$\frac{2}{3} = \frac{2 \times 8}{3 \times 8} = \frac{16}{24}$$

$$16 < 18 < 20 < 21$$

So, $\frac{16}{24} < \frac{18}{24} < \frac{20}{24} < \frac{21}{24}$

or, $\frac{2}{3} < \frac{3}{4} < \frac{5}{6} < \frac{7}{8}$

ANS. $\frac{2}{3} < \frac{3}{4} < \frac{5}{6} < \frac{7}{8}$

Convert the fractions to like fractions.



EXAMPLE 13 Arrange the fractions $\frac{2}{3}$, $\frac{1}{5}$, $\frac{3}{4}$, $\frac{5}{6}$ in descending order.

The LCM of the denominators 3, 5, 4 and 6 is 60.

$$\frac{2}{3} = \frac{2 \times 20}{3 \times 20} = \frac{40}{60}$$

$$\frac{1}{5} = \frac{1 \times 12}{5 \times 12} = \frac{12}{60}$$

$$\frac{3}{4} = \frac{3 \times 15}{4 \times 15} = \frac{45}{60}$$

$$\frac{5}{6} = \frac{5 \times 10}{6 \times 10} = \frac{50}{60}$$

$$50 > 45 > 40 > 12$$

So, $\frac{50}{60} > \frac{45}{60} > \frac{40}{60} > \frac{12}{60}$

or, $\frac{5}{6} > \frac{3}{4} > \frac{2}{3} > \frac{1}{5}$

ANS. $\frac{5}{6} > \frac{3}{4} > \frac{2}{3} > \frac{1}{5}$



Exercise 4.3



A. Type the following fractions in ascending order. **ANS**

1. $\frac{3}{5}$, $\frac{1}{5}$, $\frac{4}{5}$, $\frac{2}{5}$ 2. $\frac{3}{8}$, $\frac{3}{12}$, $\frac{3}{6}$, $\frac{3}{4}$ 3. $\frac{2}{5}$, $\frac{3}{4}$, $\frac{1}{2}$, $\frac{3}{5}$ 4. $\frac{4}{6}$, $\frac{3}{8}$, $\frac{5}{16}$, $\frac{6}{12}$

B. Type the following fractions in descending order. **ANS**

1. $\frac{8}{10}$, $\frac{8}{9}$, $\frac{8}{5}$, $\frac{8}{7}$ 2. $\frac{7}{10}$, $\frac{5}{10}$, $\frac{9}{10}$, $\frac{3}{10}$ 3. $\frac{5}{4}$, $\frac{3}{12}$, $\frac{1}{3}$, $\frac{4}{15}$ 4. $\frac{2}{7}$, $\frac{9}{14}$, $\frac{11}{14}$, $\frac{13}{28}$

C. Compare each pair of the following fractions by cross-multiplication. **ANS**

1. $\frac{2}{3}$, $\frac{5}{8}$ 2. $\frac{4}{7}$, $\frac{5}{8}$ 3. $\frac{5}{9}$, $\frac{6}{11}$ 4. $\frac{2}{9}$, $\frac{3}{13}$ 5. $\frac{11}{18}$, $\frac{13}{17}$

ADDITION OF FRACTIONS

Adding like fractions

EXAMPLE 14 Add $\frac{3}{8}$ and $\frac{4}{8}$.

$\frac{3}{8}$ and $\frac{4}{8}$ are like fractions.

To add like fractions, add the numerators and keep the denominator same.

$$\frac{3}{8} + \frac{4}{8} = \frac{3+4}{8} = \frac{7}{8} \quad \text{ANS. } \frac{7}{8}$$

Get It Right!

$$\frac{3}{8} + \frac{4}{8} = \frac{7}{16} \quad \text{X}$$

$$\frac{3}{8} + \frac{4}{8} = \frac{7}{8} \quad \text{✓}$$

Do not add the denominators.

Adding unlike fractions

EXAMPLE 15 Add $\frac{1}{4}$ and $\frac{1}{3}$.

The fractions $\frac{1}{4}$ and $\frac{1}{3}$ are unlike fractions. Convert unlike fractions to like fractions and then add them. The LCM of 4 and 3 is 12.

$$\frac{1}{4} = \frac{1 \times 3}{4 \times 3} = \frac{3}{12}; \quad \frac{1}{3} = \frac{1 \times 4}{3 \times 4} = \frac{4}{12}$$

$$\frac{3}{12} + \frac{4}{12} = \frac{3+4}{12} = \frac{7}{12} \quad \text{ANS. } \frac{7}{12}$$

To convert unlike fractions to like fractions, take the LCM of the denominators, 4 and 3.

Adding mixed numbers

EXAMPLE 16 Add $3\frac{1}{2}$ and $4\frac{1}{5}$.

Step 1 Change mixed numbers to improper fractions, that is, $3\frac{1}{2} = \frac{7}{2}$ and $4\frac{1}{5} = \frac{21}{5}$.

Step 2 Convert unlike fractions to like fractions and then add them.

$$\frac{7}{2} \times \frac{5}{5} = \frac{35}{10}; \quad \frac{21}{5} \times \frac{2}{2} = \frac{42}{10} \quad \rightarrow \quad \frac{35}{10} + \frac{42}{10} = \frac{77}{10} = 7\frac{7}{10} \quad \text{ANS. } 7\frac{7}{10}$$





Exercise 4.4

10 Solve the sums. **ANS**

1. $\frac{2}{5} + \frac{4}{9}$

2. $\frac{6}{7} + \frac{5}{7}$

3. $\frac{5}{8} + \frac{5}{6}$

4. $\frac{3}{5} + \frac{7}{10}$

5. $1\frac{1}{3} + 2\frac{1}{4}$

6. $\frac{1}{4} + \frac{2}{3} + \frac{7}{8}$

7. $2\frac{3}{4} + 4\frac{2}{3} + 1$

8. $1\frac{2}{7} + 4\frac{1}{2} + 2$

9. $4\frac{1}{6} + 2\frac{1}{2} + 1\frac{1}{7}$

STORY SUMS

EXAMPLE 17 Raja covered $\frac{5}{6}$ km by cycle and $\frac{3}{4}$ km by car. How much distance did he cover?

Distance covered by cycle = $\frac{5}{6}$ km

Distance covered by car = $\frac{3}{4}$ km

Total distance covered = $\frac{5}{6}$ km + $\frac{3}{4}$ km

The LCM of 6 and 4 is 12.

$$\frac{5}{6} = \frac{5 \times 2}{6 \times 2} = \frac{10}{12}, \quad \frac{3}{4} = \frac{3 \times 3}{4 \times 3} = \frac{9}{12}$$

$$\text{So, } \frac{5}{6} + \frac{3}{4} = \frac{10}{12} + \frac{9}{12} = \frac{10+9}{12} = \frac{19}{12} = 1\frac{7}{12}$$

ANS. Raja covered $1\frac{7}{12}$ km.

Change improper fraction to mixed number.



EXAMPLE 18 Aditya mixed $2\frac{1}{8}$ L of green paint with $3\frac{5}{10}$ L of red paint.

How much paint does he have now?

Quantity of green paint = $2\frac{1}{8}$ L

Quantity of red paint = $3\frac{5}{10}$ L

Total quantity of paint = $2\frac{1}{8}$ L + $3\frac{5}{10}$ L = $\frac{17}{8}$ L + $\frac{53}{10}$ L

The LCM of 8 and 10 is 40; $\frac{17}{8} = \frac{17 \times 5}{8 \times 5} = \frac{34}{40}$

$$\text{So, } \frac{17}{8} + \frac{53}{10} = \frac{34}{40} + \frac{53}{40} = \frac{34+53}{40} = \frac{87}{40} = 2\frac{7}{40}$$

ANS. Aditya has $2\frac{7}{40}$ L of paint.



Exercise 4.5

10 Solve these story sums. **ANS**

1. Amina bought $\frac{3}{8}$ metre of red ribbon and $\frac{1}{2}$ metre of blue ribbon. What is the total length of ribbon that she bought?



2. Raj ate $1\frac{1}{2}$ apples while Vicky ate $\frac{3}{4}$ of an apple. How many apples did they eat together?

3. Ali read $\frac{1}{8}$ of a book on Monday, $\frac{1}{4}$ of the book on Tuesday and $\frac{1}{2}$ of the book on Wednesday. What fraction of the book did he read during these three days?



SUBTRACTION OF FRACTIONS

Subtracting like fractions

EXAMPLE 19 Subtract $\frac{1}{4}$ from $\frac{3}{4}$.

$\frac{3}{4}$ and $\frac{1}{4}$ are like fractions.

To subtract like fractions, subtract the smaller numerator from the bigger numerator and keep the denominator same.

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

ANS. $\frac{1}{2}$

Reduce $\frac{2}{4}$ to its lowest term.



Subtracting unlike fractions

EXAMPLE 20 Solve $\frac{4}{5} - \frac{2}{7}$.

$\frac{4}{5}$ and $\frac{2}{7}$ are unlike fractions. Convert unlike fractions to like fractions and then subtract them. The LCM of 5 and 7 is 35.

$$\frac{4}{5} = \frac{4 \times 7}{5 \times 7} = \frac{28}{35}, \quad \frac{2}{7} = \frac{2 \times 5}{7 \times 5} = \frac{10}{35}$$

$$\text{So, } \frac{4}{5} - \frac{2}{7} = \frac{28}{35} - \frac{10}{35} = \frac{28-10}{35} = \frac{18}{35}$$

ANS. $\frac{18}{35}$



Subtracting mixed fractions

EXAMPLE 21 Solve $6\frac{1}{4} - 2\frac{1}{6}$.

- Step 1 Convert mixed numbers to improper fractions. $6\frac{1}{4} = \frac{25}{4}$; $2\frac{1}{6} = \frac{13}{6}$
- Step 2 Convert unlike fractions to like fractions using the LCM of the denominators. The LCM of 4 and 6 is 12.
 $\frac{25}{4} = \frac{25 \times 3}{4 \times 3} = \frac{75}{12}$; $\frac{13}{6} = \frac{13 \times 2}{6 \times 2} = \frac{26}{12}$
- Step 3 Subtract the fractions and convert the difference to a mixed fraction.
 So, $\frac{75}{12} - \frac{26}{12} = \frac{75-26}{12} = \frac{49}{12} = 4\frac{1}{12}$ **ANS.** $4\frac{1}{12}$

EXAMPLE 22 Solve $3\frac{1}{4} - 1\frac{1}{2} + 4$.

Change all fractions to improper fractions.

$$3\frac{1}{4} = \frac{13}{4}; \quad 1\frac{1}{2} = \frac{3}{2}; \quad 4 = \frac{4}{1}$$

Change all fractions to like fractions.

The LCM of 4, 2 and 1 is 4.

$$\frac{13}{4} = \frac{13 \times 1}{4 \times 1} = \frac{13}{4}; \quad \frac{3}{2} = \frac{3 \times 2}{2 \times 2} = \frac{6}{4}; \quad \frac{4}{1} = \frac{4 \times 4}{1 \times 4} = \frac{16}{4}$$

$$\frac{13}{4} - \frac{6}{4} + \frac{16}{4} = \frac{13+16}{4} - \frac{6}{4} \text{ (First add)}$$

$$= \frac{29}{4} - \frac{6}{4} \text{ (Subtract)}$$

$$= \frac{29-6}{4} = \frac{23}{4} = 5\frac{3}{4} \quad \text{ANS. } 5\frac{3}{4}$$



Exercise 4.6

10 Solve the sums. **ANS.**

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

2. $\frac{7}{8} - \frac{3}{8}$

3. $\frac{1}{2} - \frac{3}{8}$

4. $\frac{5}{6} - \frac{1}{3}$

5. $3 - \frac{3}{4}$

6. $5 - \frac{1}{2}$

7. $2 - 1\frac{1}{4}$

8. $1\frac{1}{4} - \frac{3}{4}$

9. $2\frac{3}{8} - 1\frac{1}{4}$

10. $4\frac{1}{3} - 1\frac{2}{3} + 5$

11. $12\frac{1}{5} - 3\frac{1}{4} + 2\frac{1}{20}$



STORY SUMS

EXAMPLE 23 Mongia cut $3\frac{2}{3}$ m from a $5\frac{1}{2}$ m long rope. How much rope is left with him?

Total length of rope = $5\frac{1}{2}$ m

The length of rope cut = $3\frac{2}{3}$ m

The length of rope left = $5\frac{1}{2}$ m - $3\frac{2}{3}$ m = $\frac{11}{2}$ m - $\frac{11}{3}$ m

The LCM of 2 and 3 = 6

Now, $\frac{11}{2} = \frac{11 \times 3}{2 \times 3} = \frac{33}{6}$; $\frac{11}{3} = \frac{11 \times 2}{3 \times 2} = \frac{22}{6}$

So, $\frac{11}{2} - \frac{11}{3} = \frac{33}{6} - \frac{22}{6}$
 $= \frac{33-22}{6} = \frac{11}{6} = 1\frac{5}{6}$

ANS. The length of rope left with Mongia is $1\frac{5}{6}$ m.



EXAMPLE 24 On a Metro route, $\frac{5}{8}$ of the Metro line is above the ground and $\frac{2}{7}$ of it is underground. How much longer is the line above the ground than the line underground?

The part of Metro line above the ground = $\frac{5}{8}$

The part of Metro line underground = $\frac{2}{7}$

The difference between the length of the line above

the ground and the line underground = $\frac{5}{8} - \frac{2}{7}$

The LCM of 8 and 7 is 56.

Now, $\frac{5 \times 7}{8 \times 7} = \frac{35}{56}$; $\frac{2 \times 8}{7 \times 8} = \frac{16}{56}$

So, $\frac{5}{8} - \frac{2}{7} = \frac{35}{56} - \frac{16}{56} = \frac{35-16}{56} = \frac{19}{56}$

ANS. The line above the ground is $\frac{19}{56}$ longer than the line underground.



To convert unlike fractions to like fractions, find the LCM of the denominators.





Exercise 4.7

10 Solve these story sums. **ANS**

- A store had $\frac{2}{3}$ dozen eggs. $\frac{1}{6}$ dozen eggs were used to bake a cake. What fraction of a dozen eggs was left?
- There was 40 L of milk in a store on a Sunday morning. At night only $1\frac{1}{4}$ L of milk was left. How much milk was sold?
- A carton contains $20\frac{1}{2}$ kg of bread. If $4\frac{1}{4}$ kg of the bread was left, how much bread was sold?

MULTIPLICATION OF FRACTIONS

Multiplying a fraction by a whole number

EXAMPLE 25 Multiply $\frac{3}{4}$ by 12.

- Step 1 Write the whole number as a fraction. $12 = \frac{12}{1}$
- Step 2 Multiply the numerators and the denominators. $\frac{3}{4} \times \frac{12}{1} = \frac{12 \times 3}{1 \times 4} = \frac{12}{1}$
- Step 3 Reduce to the lowest terms. $\frac{12}{1} = 12$
- ANS.** 3

EXAMPLE 26 Solve $\frac{3}{7} \times 0$.

Since any fraction multiplied by 0 gives 0,
 $\frac{3}{7} \times 0 = 0$ **ANS.** 0

EXAMPLE 27 Find $\frac{1}{3}$ of 123 kg.

$\frac{1}{3}$ of 123 = $\frac{1}{3} \times 123 = \frac{1 \times 123}{3 \times 1} = 41$ kg
ANS. 41 kg



Quick TIP

On multiplying a fraction
▶ by 0, we get 0.
▶ by 1, we get the same fraction.



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- $\frac{7}{8} \times \frac{21}{35}$
- $\frac{15}{16} \times \frac{10}{12}$
- $\frac{7}{12} \times \frac{3}{14}$
- $\frac{18}{3} \times \frac{15}{27}$
- $\frac{1}{2} \times \frac{2}{3} \times \frac{3}{4}$
- $\frac{4}{5} \times \frac{3}{5} \times \frac{1}{8}$
- $\frac{1}{6} \times \frac{2}{5} \times \frac{3}{4}$
- $\frac{2}{7} \times \frac{6}{2} \times \frac{3}{5}$
- $6 \times \frac{2}{7} \times \frac{1}{8}$
- $\frac{24}{18} \times \frac{15}{12} \times \frac{4}{5}$
- $\frac{1}{7} \times 7 \times \frac{6}{8}$
- $\frac{3}{4} \times \frac{8}{5} \times \frac{1}{9}$

STORY SUMS

EXAMPLE 30 Rani made a chapatti. She ate half of it. She gave the other half to three puppies. Each of them ate $\frac{1}{3}$ of it. What fraction of the whole chapatti did each puppy eat?



The part of chapatti eaten by Rani = $\frac{1}{2}$
The part of chapatti left = $\frac{1}{2}$
The part of chapatti eaten by each puppy = $\frac{1}{3}$ of $\frac{1}{2}$
 $\frac{1}{3} \times \frac{1}{2} = \frac{1 \times 1}{3 \times 2} = \frac{1}{6}$



ANS. Each puppy ate $\frac{1}{6}$ of the whole chapatti.



Exercise 4.10

11 Solve these story sums. **ANS**

- A designer used $1\frac{1}{2}$ m cloth to stitch a shirt. How much cloth does she need to stitch 5 such shirts?
- $\frac{3}{4}$ cups of cocoa is needed to make a chocolate bar. If Rohan wants to make 16 such chocolate bars, how many cups of cocoa are required?
- $2\frac{3}{4}$ L of paint is needed to colour 1 square metre of a wall. How much paint is required to colour $3\frac{1}{2}$ square metres of the same wall?



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Exercise 4.8

A. Multiply. **ANS**

- $\frac{1}{2} \times 50$
- $\frac{1}{3} \times 24$
- $\frac{1}{5} \times 100$
- $\frac{3}{4} \times 16$
- $\frac{3}{2} \times 18$
- $\frac{3}{8} \times 1$
- $\frac{2}{25} \times 100$
- $\frac{4}{9} \times 0$

B. Solve. **ANS**

- $\frac{4}{9} \times 353$
- $\frac{5}{10} \times 320$
- $\frac{3}{8} \times 48$ km
- $\frac{8}{5} \times 50$ paise
- $\frac{7}{3}$ of 2800
- $\frac{2}{5}$ of 550 mL
- $\frac{6}{8}$ of 48 g
- $\frac{5}{4}$ of 20 cm

Multiplying a fraction by a fraction

EXAMPLE 28 Multiply $\frac{15}{16}$ and $\frac{8}{10}$

$$\frac{15}{16} \times \frac{8}{10} = \frac{15 \times 8}{16 \times 10}$$

$$= \frac{120}{160} = \frac{3}{4}$$

ANS. $\frac{3}{4}$

Short method

$$\frac{15}{16} \times \frac{8}{10}$$

$$= \frac{15 \times 8}{16 \times 10} = \frac{3 \times 1}{2 \times 2} = \frac{3}{4}$$

Divide the numerators and the denominators by common factors and then multiply.



EXAMPLE 29 Multiply 5 , $\frac{3}{20}$ and $\frac{2}{15}$

$$5 \times \frac{3}{20} \times \frac{2}{15} = \frac{5}{1} \times \frac{3}{20} \times \frac{2}{15} = \frac{5 \times 3 \times 2}{1 \times 20 \times 15} = \frac{1 \times 1 \times 1}{1 \times 10 \times 1} = \frac{1}{10}$$

ANS. $\frac{1}{10}$

I should revise my multiplication tables.



Exercise 4.9

10 Multiply and type the product in its lowest terms. Use the short method wherever possible. **ANS**

- $\frac{8}{9} \times \frac{3}{4}$
- $\frac{9}{20} \times \frac{1}{5}$
- $\frac{6}{13} \times \frac{1}{4}$
- $\frac{5}{7} \times \frac{1}{25}$
- $\frac{3}{5} \times \frac{0}{4}$
- $\frac{2}{3} \times \frac{0}{4}$
- $\frac{2}{3} \times \frac{4}{5}$
- $\frac{3}{5} \times \frac{4}{5}$



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DIVISION OF FRACTIONS

Reciprocals

Two numbers are the reciprocal of each other if their product is 1. A reciprocal is also called multiplicative inverse.

For example, $\frac{3}{4} \times \frac{4}{3} = 1$

So, $\frac{4}{3}$ is the reciprocal of $\frac{3}{4}$.

We can also say that $\frac{3}{4}$ is the reciprocal of $\frac{4}{3}$.

EXAMPLE 31 Write the reciprocal of

- $\frac{2}{7}$
- 5

We know that $\frac{2}{7} \times \frac{7}{2} = 1$

$$\frac{2}{7} \rightarrow \frac{7}{2}$$

Hence, the reciprocal of $\frac{2}{7}$ is $\frac{7}{2}$.

ANS. $\frac{7}{2}$

Write 5 as a fraction. $5 = \frac{5}{1}$

We know that $\frac{5}{1} \times \frac{1}{5} = 1$

Hence, the reciprocal of 5 is $\frac{1}{5}$.

ANS. $\frac{1}{5}$

To find the reciprocal of a fraction, interchange the numerator and denominator of the fraction.



I Can Do It!

12 Type the reciprocal of each fraction. **ANS**

- $\frac{2}{5}$
- $\frac{4}{7}$
- $\frac{1}{2}$
- $\frac{6}{7}$
- $\frac{8}{9}$

Dividing a whole number by a fraction

EXAMPLE 32 Divide 3 by $\frac{15}{4}$

Dividing a number by a fraction is the same as multiplying the number by the reciprocal of the fraction.

$$\text{Reciprocal of } \frac{15}{4} = \frac{4}{15} \rightarrow 3 \div \frac{15}{4} = \frac{3}{1} \times \frac{4}{15} = \frac{4}{5}$$

ANS. $\frac{4}{5}$



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Dividing a fraction by a whole number

EXAMPLE 33 Divide $\frac{2}{9}$ by 6.

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

$$\frac{2}{9} \div 6 = \frac{2}{9} \times \frac{1}{6} = \frac{2}{54} = \frac{1}{27}$$

ANS. $\frac{1}{27}$

Dividing a fraction by a fraction

EXAMPLE 34 Divide $\frac{4}{7}$ by $\frac{6}{28}$.

Reciprocal of $\frac{6}{28} = \frac{28}{6}$

$$\frac{4}{7} \div \frac{6}{28} = \frac{4}{7} \times \frac{28}{6} = \frac{8}{3} = 2\frac{2}{3}$$

ANS. $2\frac{2}{3}$



HOTS Questions



Anjana bought a cake for her daughters, Rinky and Pinky. She divided the cake equally between them. **ANS**

Pinky found her piece of cake too big to eat. So, Anjana divided it further into equal halves. What fraction of the cake was each piece now?

Pinky wanted even smaller pieces. So she divided the pieces into equal halves again. What fraction of the cake was each piece now?



Exercise 4.11

1 Divide and type the answer in the lowest term. **ANS**

- | | | | |
|-----------------------------------------------------------|----------------------------------------------------------|----------------------------------------------------------|-----------------------------------------------------------|
| 1. $\frac{3}{8} \div \frac{1}{8}$ <input type="text"/> | 2. $\frac{5}{9} \div \frac{1}{9}$ <input type="text"/> | 3. $\frac{3}{8} \div \frac{5}{8}$ <input type="text"/> | 4. $\frac{7}{10} \div \frac{14}{10}$ <input type="text"/> |
| 5. $\frac{8}{9} \div \frac{2}{9}$ <input type="text"/> | 6. $\frac{3}{8} \div \frac{4}{6}$ <input type="text"/> | 7. $\frac{3}{4} \div \frac{3}{2}$ <input type="text"/> | 8. $\frac{4}{9} \div \frac{15}{9}$ <input type="text"/> |
| 9. $\frac{32}{11} \div \frac{8}{35}$ <input type="text"/> | 10. $\frac{2}{9} \div \frac{10}{3}$ <input type="text"/> | 11. $\frac{5}{2} \div \frac{20}{8}$ <input type="text"/> | 12. $\frac{5}{6} \div \frac{2}{3}$ <input type="text"/> |
| 13. $5 \div \frac{5}{8}$ <input type="text"/> | 14. $3 \div \frac{2}{3}$ <input type="text"/> | 15. $8 \div \frac{2}{3}$ <input type="text"/> | 16. $2 \div \frac{1}{4}$ <input type="text"/> |
| 17. $2 \div \frac{4}{9}$ <input type="text"/> | 18. $8 \div \frac{4}{6}$ <input type="text"/> | 19. $1 \div \frac{1}{10}$ <input type="text"/> | 20. $\frac{2}{3} \div 2$ <input type="text"/> |
| 21. $\frac{1}{20} \div 4$ <input type="text"/> | 22. $\frac{2}{9} \div 6$ <input type="text"/> | 23. $\frac{6}{5} \div 3$ <input type="text"/> | 24. $\frac{1}{4} \div 12$ <input type="text"/> |



STORY SUMS

EXAMPLE 35 Shilpa has bought 3 kg of dry fruits. She wants to pack them in gift packs of $\frac{1}{4}$ kg each. How many gift packs will she be able to make?

Quantity of dry fruits bought by Shilpa = 3 kg

Quantity she wants to pack in each gift pack = $\frac{1}{4}$ kg

Number of gift packs she will be able to make = $3 \div \frac{1}{4} = 3 \times \frac{4}{1}$

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

So, $3 \div \frac{1}{4} = 3 \times \frac{4}{1} = 12$

ANS. Shilpa will be able to make 12 gift packs.

EXAMPLE 36 An express train is $\frac{9}{10}$ km away from a tunnel. If it covers $\frac{1}{10}$ km in each second, how many seconds will it take to enter the tunnel?

Distance between the train and the tunnel = $\frac{9}{10}$ km

Distance covered by the train in 1 second = $\frac{1}{10}$ km

Time taken by the train to enter the tunnel = $\frac{9}{10} \div \frac{1}{10}$ seconds

Reciprocal of $\frac{1}{10} = \frac{10}{1} = 10 \rightarrow \frac{9}{10} \div \frac{1}{10} = \frac{9}{10} \times \frac{10}{1} = 9$

ANS. The train will enter the tunnel in 9 seconds.



Exercise 4.12

1 Solve these story sums. **ANS**

1. $\frac{1}{5}$ m of a ribbon is needed to make a flower. How many such flowers can Shruti make from a 5 m ribbon?

2. $5\frac{1}{2}$ kg of onions are to be packed in small bags. If each bag can hold $\frac{1}{4}$ kg, how many such bags can be packed?

3. How many equal pieces of $\frac{1}{4}$ m can Shreya cut from a tape of length $6\frac{1}{2}$ m?



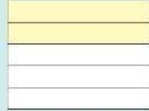
Aim: To multiply fractions

You will need: Paper, coloured pencils

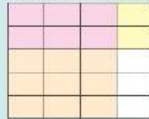
Preparation: Teacher will give each student two fractions to multiply. For example, $\frac{2}{5}$ and $\frac{3}{4}$.

Steps

- To represent the first fraction, that is $\frac{2}{5}$, draw a rectangle and divide it into five equal rows. Colour two out of the five rows.



- To represent the second fraction, that is $\frac{3}{4}$, divide the same rectangle into four equal columns. Colour three of the four columns with another colour.



- Count the number of overlapping boxes in the rectangle. Here, it is 6. This is the product of the numerators of the two fractions, $2 \times 3 = 6$. Count the total number of boxes the rectangle divides into. Here, it is 20. This is the product of the denominators of the two fractions, $5 \times 4 = 20$.

Hence, the product of $\frac{2}{5} \times \frac{3}{4} = \frac{6}{20}$

Similarly, find the product of each of the following fractions.

- a. $\frac{1}{7} \times \frac{4}{9}$ b. $3 \times \frac{1}{5}$ c. $\frac{2}{3} \times 2$



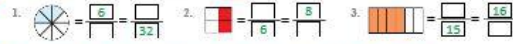
- Mahima and her friends shared pizzas. Shown below are some leftovers. Type each as a mixed fraction. **ANS**



- Type each as an improper fraction. **ANS**



- Complete equivalent fractions. **ANS**



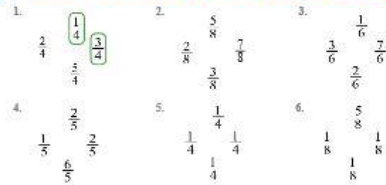
- Compare the following fractions and put > or < in the . **ANS**



- Type the following fractions in ascending order. **ANS**



- Make 1! Click to circle the fractions that together make 1. **ANS**



It is easy to add like fractions.





Worksheet

A. Fill in the blanks. **ANS**

1. $\frac{1}{3} = \frac{1}{21}$

2. $\frac{14}{35} = \frac{1}{5} = \frac{6}{\square}$

3. $\frac{48}{84}$ in its lowest term is $\frac{\square}{\square}$

4. $\frac{4}{7} \circ \frac{2}{3}$ ($>$, $<$ or $=$).

5. $\frac{1}{2} + \frac{1}{4} = \frac{\square}{\square}$

6. $\frac{1}{2} - \frac{1}{4} = \frac{\square}{\square}$

7. $1 - \frac{\square}{\square} = \frac{2}{3}$

8. $2 - \frac{3}{4} = \frac{\square}{\square}$

9. A unit fraction with the denominator 7 is $\frac{\square}{\square}$

10. $\frac{33}{5}$ as a mixed fraction is $\frac{\square}{\square}$

11. $\frac{16}{55} \times \frac{7}{8} = \frac{\square}{\square}$

12. $\frac{3}{10} \times \frac{2}{18} \times \frac{6}{7} = \frac{\square}{\square}$

13. $\frac{22}{88} \times 0 = \frac{\square}{\square}$

14. $9 \div \frac{1}{3} = 1$

15. $\frac{15}{21} \div \frac{3}{7} = \frac{1}{\square}$

16. $\frac{1}{21} \div 3 = \frac{1}{\square}$

B. Arrange $\frac{3}{9}$, $\frac{3}{7}$, $\frac{3}{11}$ and $\frac{3}{13}$ in ascending order. **ANS**

C. Arrange $\frac{4}{60}$, $\frac{2}{15}$, $\frac{2}{10}$ and $\frac{3}{5}$ in descending order. **ANS**

D. Solve these story sums. **ANS**

- Kavita purchased $25\frac{1}{4}$ kg of vegetables and fruit together. If the vegetables weigh $12\frac{1}{3}$ kg, find the mass of the fruit.
- A drum holds $100\frac{4}{5}$ L of water. If $38\frac{7}{10}$ L of water was drawn away, how many litres of water is left in the drum?
- Amit runs $\frac{1}{4}$ of 20 km, Priyanka runs $\frac{1}{2}$ of 12 km and Tejas runs $\frac{1}{3}$ of 40 km. How many kilometres did they run in all?
- A rope $4\frac{1}{2}$ m long has to be cut into 3 equal parts. What will be the length of each part?