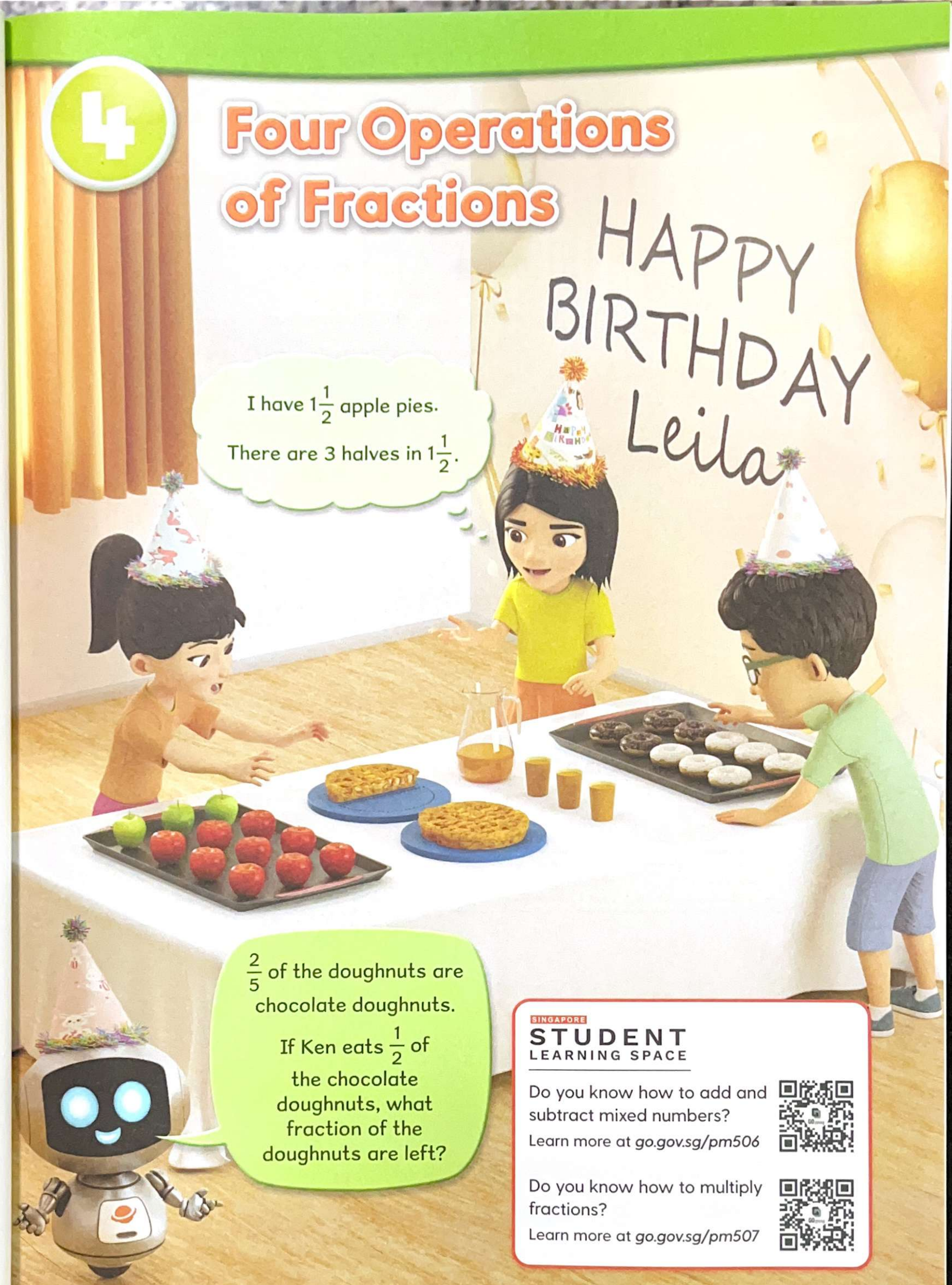
g 0) that can be written

$\frac{5}{\square} > 0.5$

$$
\begin{array}{r}
0.222 \\
9\overline{)2.000} \\
-0 \\
\hline
20 \\
-18 \\
\hline
20 \\
-18 \\
\hline
20 \\
-18 \\
\hline
2
\end{array}
$$

$$
\begin{array}{r}
2.5 \\
2\overline{)5.0} \\
-4 \\
\hline
10 \\
-10 \\
\hline
0
\end{array}
$$

4 Four Operations of Fractions



SINGAPORE
STUDENT LEARNING SPACE

Do you know how to add and subtract mixed numbers?
Learn more at *go.gov.sg/pm506*

Do you know how to multiply fractions?
Learn more at *go.gov.sg/pm507*

Addition and Subtraction of Mixed Numbers

Recall

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

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

$$= \square$$

Make the denominator the same before adding or subtracting the fractions.

2 Subtract $\frac{3}{4}$ from $\frac{5}{6}$.

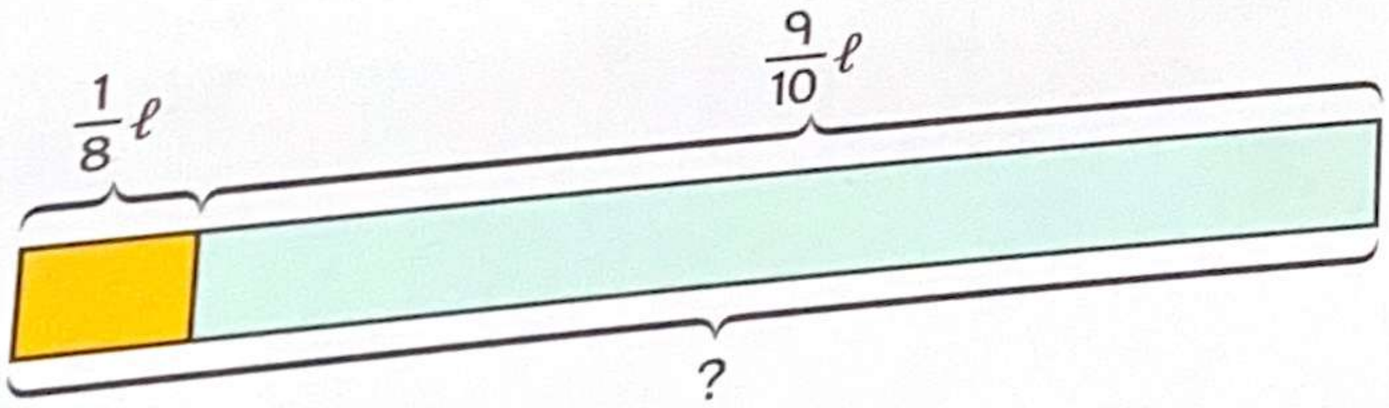
$$\frac{5}{6} - \frac{3}{4} = \frac{10}{12} - \frac{9}{12}$$

$$= \square$$

The first common multiple of 4 and 6 is 12.

$$\frac{5}{6} \xrightarrow{\times 2} \frac{10}{12} \qquad \frac{3}{4} \xrightarrow{\times 3} \frac{9}{12}$$

3 A jug contained $\frac{1}{8}$ ℓ of orange syrup. Mary mixed $\frac{9}{10}$ ℓ of water with the orange syrup to make a drink. What was the volume of the drink? Give your answer as a mixed number.

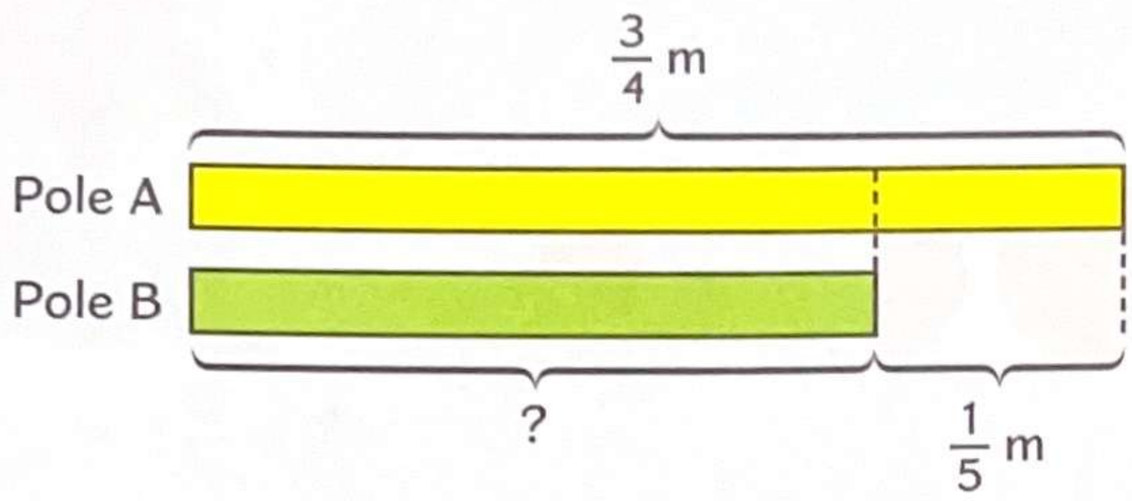


$$\frac{1}{8} + \frac{9}{10} = \square + \square$$

$$= \square$$

The volume of the drink in the jug was $\square$ ℓ.

4 Pole A is $\frac{3}{4}$ m long. It is $\frac{1}{5}$ m longer than Pole B.
What is the length of Pole B?

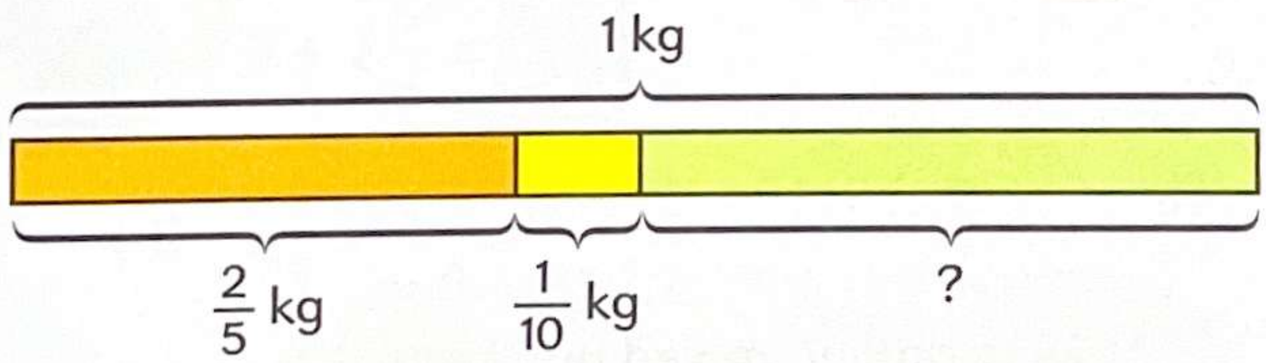


$\frac{3}{4} - \frac{1}{5} = \square - \square$

$= \square$

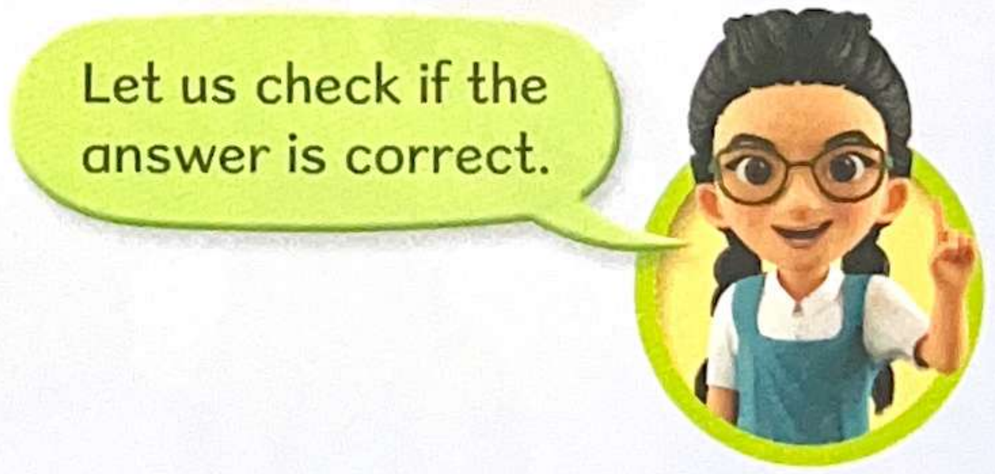
The length of Pole B is $\square$ m.

5 Mrs Toh bought 1 kg of potatoes. She used $\frac{2}{5}$ kg of potatoes to cook chicken curry. She gave her neighbour $\frac{1}{10}$ kg of potatoes.
What was the mass of potatoes she had left?
Express your answer in its simplest form.



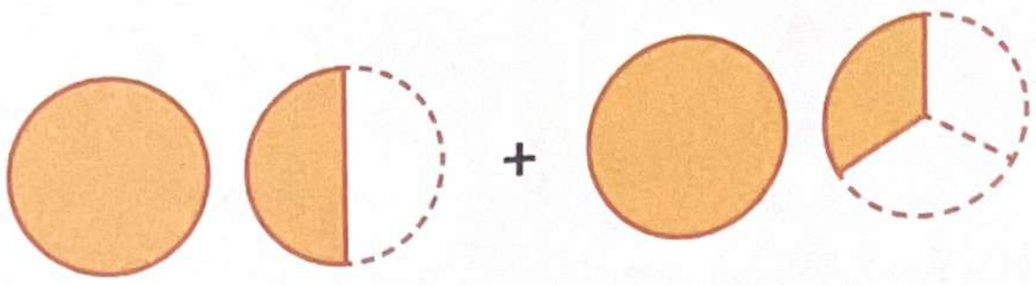
$1 - \frac{2}{5} = \frac{3}{5}$

$\frac{3}{5} - \square = \square$

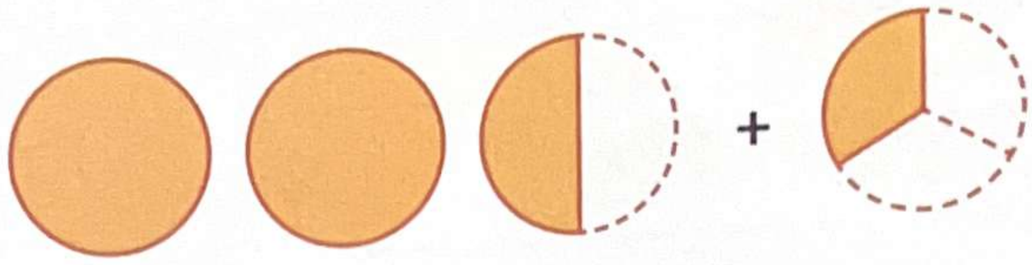


She had $\square$ kg of potatoes left.

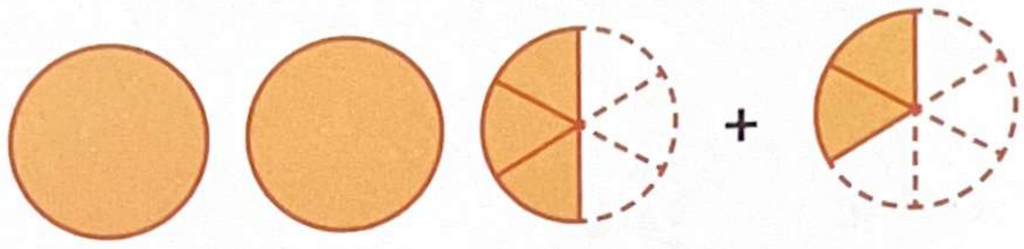
Add $1\frac{1}{2}$ and $1\frac{1}{3}$.



$1\frac{1}{2} + 1\frac{1}{3} = 2\frac{1}{2} + \frac{1}{3}$



$= 2\frac{3}{6} + \frac{2}{6}$



Next, add the fractional parts. The first common multiple of 2 and 3 is 6.

$\frac{1}{2} = \frac{3}{6}$ (×3)

$\frac{1}{3} = \frac{2}{6}$ (×2)

$= 2\frac{5}{6}$

How is adding mixed numbers similar to adding fractions?

Subtract $1\frac{5}{8}$ from $3\frac{1}{4}$.

$3\frac{1}{4} - 1\frac{5}{8} = 2\frac{1}{4} - \frac{5}{8}$

$= 2\frac{2}{8} - \frac{5}{8}$

$= 1\frac{10}{8} - \frac{5}{8}$

$= 1\frac{5}{8}$

We rename $2\frac{2}{8}$ so that we can take away $\frac{5}{8}$.

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

$= 1 + \frac{8}{8} + \frac{2}{8}$

$= 1\frac{10}{8}$

Let's Try! 2

(a) Subtract. Give your answer as a mixed number.

(i) $5 - 1\frac{3}{7} =$ ☐

(ii) $3\frac{4}{9} - 1\frac{5}{6} =$ ☐

(b) Subtract. Give your answer as a mixed number in its simplest form.

(i) $4\frac{5}{12} - 1\frac{1}{6} =$ ☐

(ii) $7\frac{1}{10} - 3\frac{1}{2} =$ ☐

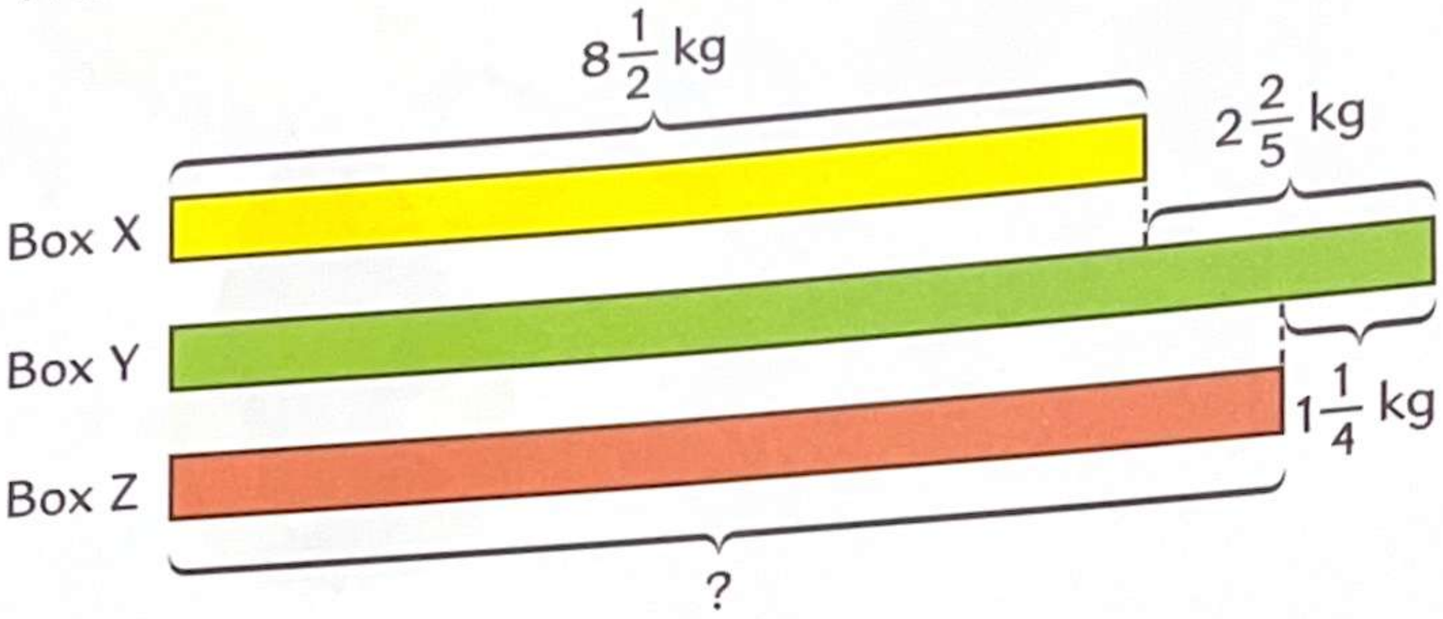
Go to PB 5A Practice 2

The mass of Box X is $8\frac{1}{2}$ kg.

The mass of Box X is $2\frac{2}{5}$ kg less than the mass of Box Y.

The mass of Box Y is $1\frac{1}{4}$ kg more than the mass of Box Z.

What is the mass of Box Z?



$$8\frac{1}{2} + 2\frac{2}{5} = 10\frac{5}{10} + \frac{4}{10}$$
$$= 10\frac{9}{10}$$

The mass of Box Y is $10\frac{9}{10}$ kg.

$$10\frac{9}{10} - 1\frac{1}{4} = 9\frac{9}{10} - \frac{1}{4}$$
$$= 9\frac{18}{20} - \frac{5}{20}$$
$$= 9\frac{13}{20}$$

The mass of Box Z is $\mathbf{9\frac{13}{20}}$ **kg**.

Let's Try! 3

A flask contained some water.

Leila drank $1\frac{3}{8}$ ℓ of water.

She then filled the flask with $1\frac{3}{4}$ ℓ of water.

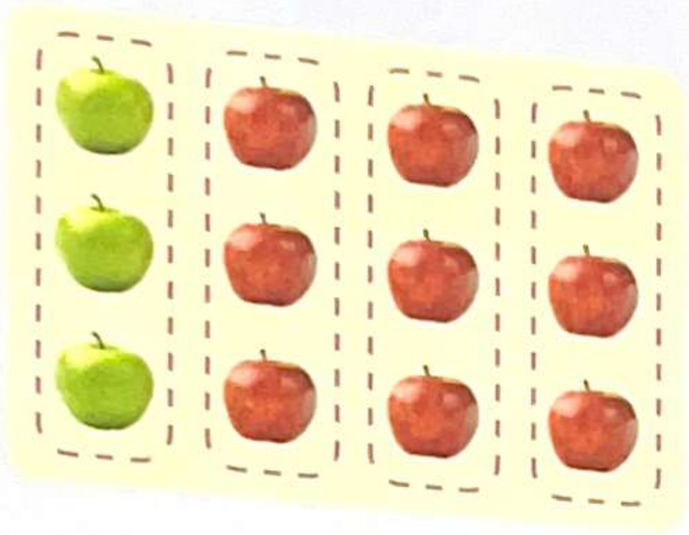
There was 4 ℓ of water left in the flask.

How much water was in the flask at first?

Go to PB 5A Practice 3

Recall

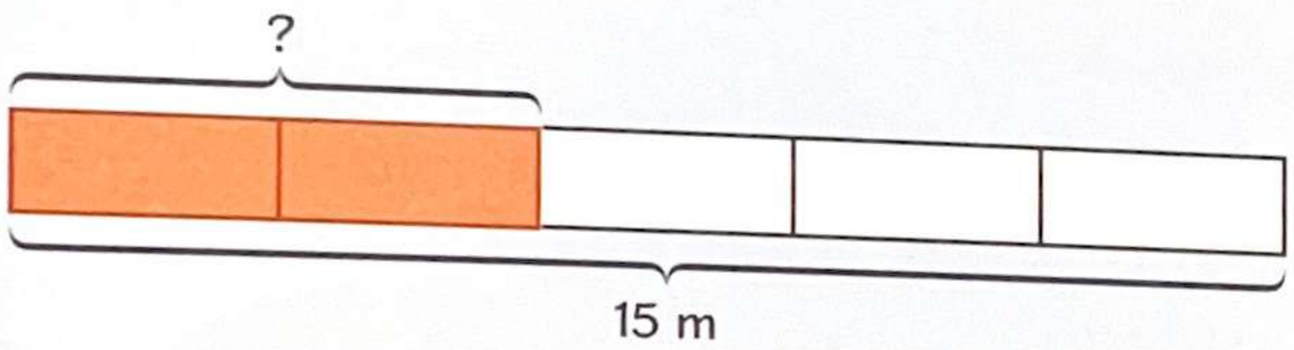
1 What is $\frac{3}{4}$ of 12?



Can you draw a bar model to represent $\frac{3}{4}$ of 12?

$\frac{3}{4}$ of 12 = ☐

2 A pole is 15 m long. $\frac{2}{5}$ of the pole is painted red.
What is the length of the pole that is painted red?



5 units = ☐ m
1 unit = ☐ m ÷ 5
= ☐ m

2 units = 2 × ☐ m
= ☐ m

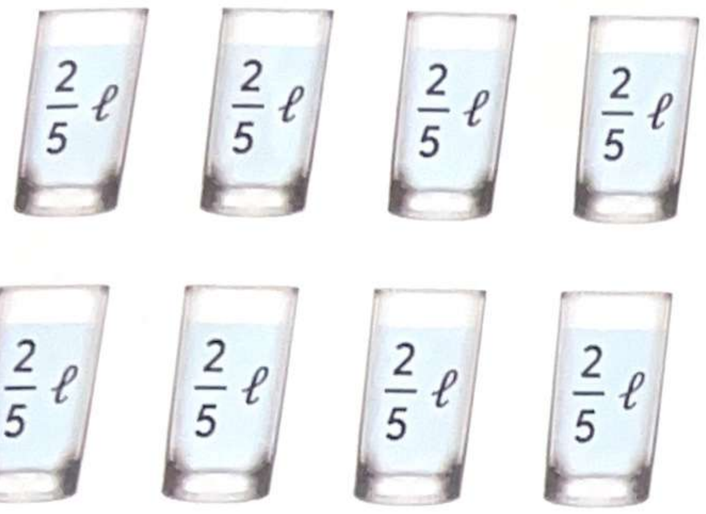
The length of the pole that is painted red is ☐ m.

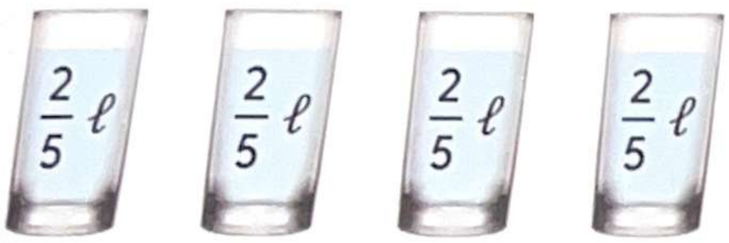
There are 12 glasses.

Each glass contains $\frac{2}{5}\ \ell$ of water.

The water in each glass is poured into a jug.

How much water is there in the jug?





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

$$= \frac{24}{5}$$

$$= 4\frac{4}{5}$$

There is $4\frac{4}{5}\ \ell$ of water in the jug.

We know that 4×3 has the same value as 3×4.

So $\frac{2}{5} \times 12$ also has the same value as $12 \times \frac{2}{5}$.

Let's Try! 4

(a) Find each value.

(i) $\frac{3}{7}$ of $28 = \square$

(ii) $20 \times \frac{7}{10} = \square$

(b) Mrs Lee has 120 buttons. $\frac{4}{5}$ of the buttons are red.

How many red buttons does she have?

(c) A block of butter has a mass of $\frac{3}{10}$ kg.

Sarah needs 3 blocks of butter to bake a cake.

How much butter does Sarah need?

Give your answer in kilograms.

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

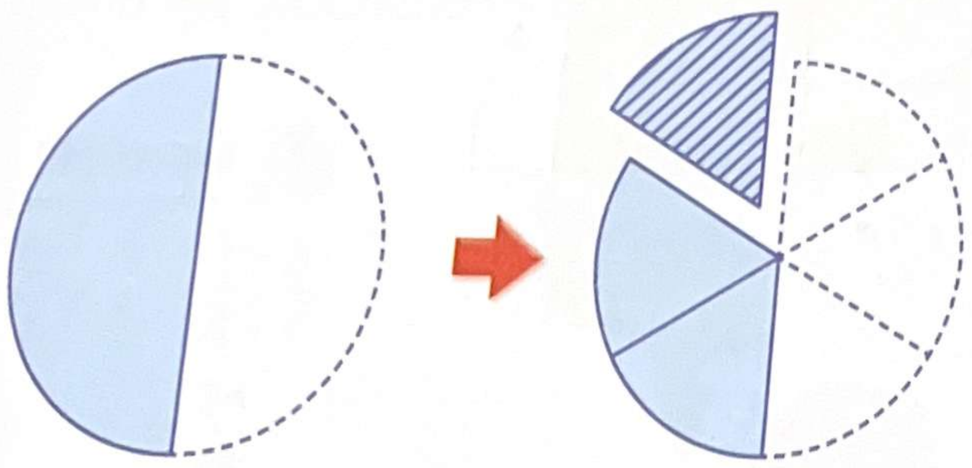
$= 3 \times 1$

$= 3$

Multiplying Two Fractions

Siti had $\frac{1}{2}$ of a pizza at first. She gave $\frac{1}{3}$ of it to her friend.

How much pizza did she give her friend?



We can use fraction discs to help us find the fraction of the pizza Siti gave her friend.

6 parts = 1 pizza

1 part = $\frac{1}{6}$ of the pizza

$\frac{1}{3}$ of $\frac{1}{2} = \frac{1}{3} \times \frac{1}{2}$

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

$= \frac{1}{6}$

Multiply the numerators and then multiply the denominators.

$\frac{1}{3}$ of $\frac{1}{2}$ is the same as $\frac{1}{2}$ of $\frac{1}{3}$.

Siti gave her friend $\frac{1}{6}$ of a pizza.

Find the value of $\frac{1}{3} \times \frac{5}{4}$.

$\frac{1}{3} \times \frac{5}{4} = \frac{5}{12}$

Find the product of $\frac{3}{4}$ and $\frac{8}{7}$.

Method 1

$\frac{3}{4} \times \frac{8}{7} = \frac{3 \times 8}{4 \times 7}$

$= \frac{24}{28}$

$= \frac{6}{7}$

Method 2

$\frac{3}{4} \times \frac{8}{7} = \frac{3 \times \cancel{8}^{2}}{\cancel{4}_{1} \times 7}$

$= \frac{3 \times 2}{1 \times 7}$

$= \frac{6}{7}$

Express $\frac{24}{28}$ in its simplest form.

I can also do it this way:

$\frac{3}{\cancel{4}_{1}} \times \frac{\cancel{8}^{2}}{7} = \frac{3 \times 2}{1 \times 7}$

$= \frac{6}{7}$

Let's Try! 7

Find the product.

(a) $\frac{2}{5}$ and $\frac{9}{5}$

(b) $\frac{7}{6}$ and $\frac{2}{3}$

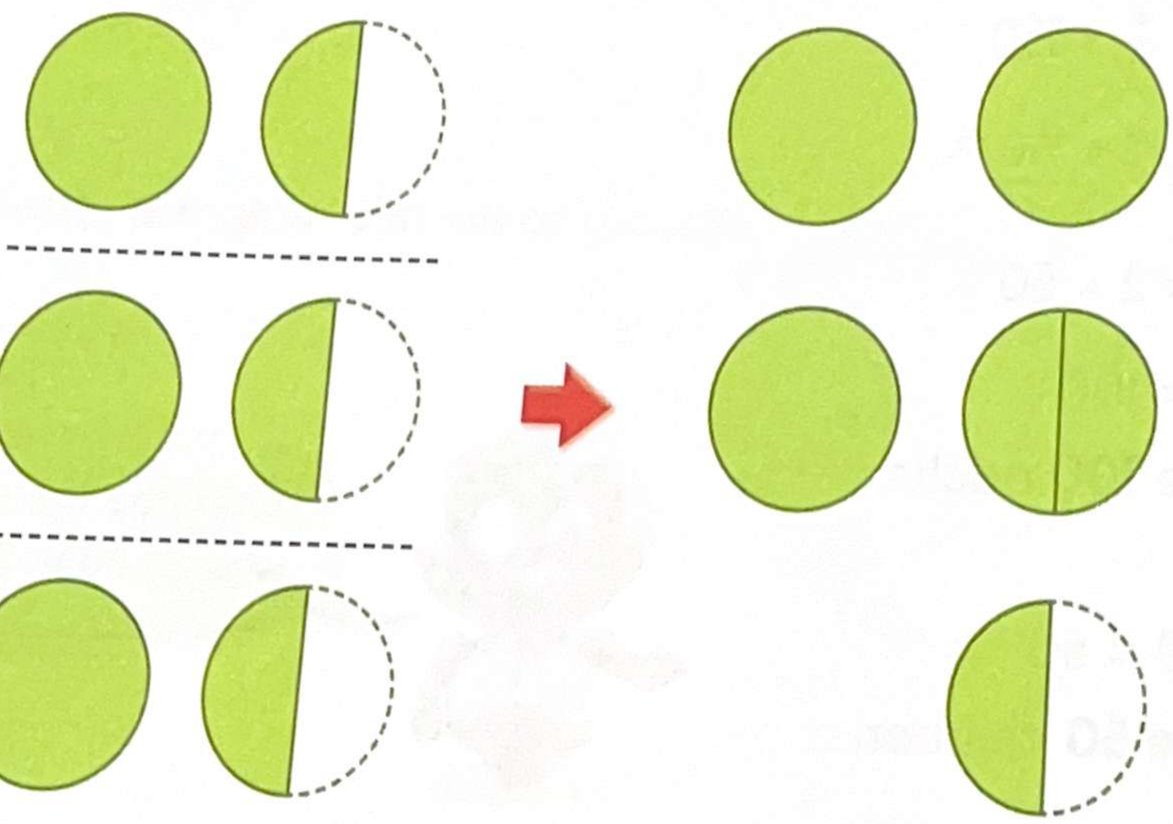
What are the advantages of doing 'cancellation' before multiplying the fractions?

Multiplying a Mixed Number and a Whole Number

Mrs Li has 3 children.

She gives each child $1\frac{1}{2}$ pies.

How many pies do they have altogether?
Give your answer as a mixed number.



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

$= \frac{9}{2}$

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

They have $\mathbf{4\frac{1}{2}}$ pies altogether.

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

Let's Try! 9

(a) $6 \times 1\frac{2}{9} =$ ☐

(b) The length of a piece of rope is $2\frac{1}{5}$ m.

What is the total length of 4 such identical pieces of rope?

Go to PB 5A Practice 7

Word Problems

There are 150 people at a concert. $\frac{2}{3}$ of them are adults and the rest are children.

(a) How many adults are there?

(b) How many children are there?

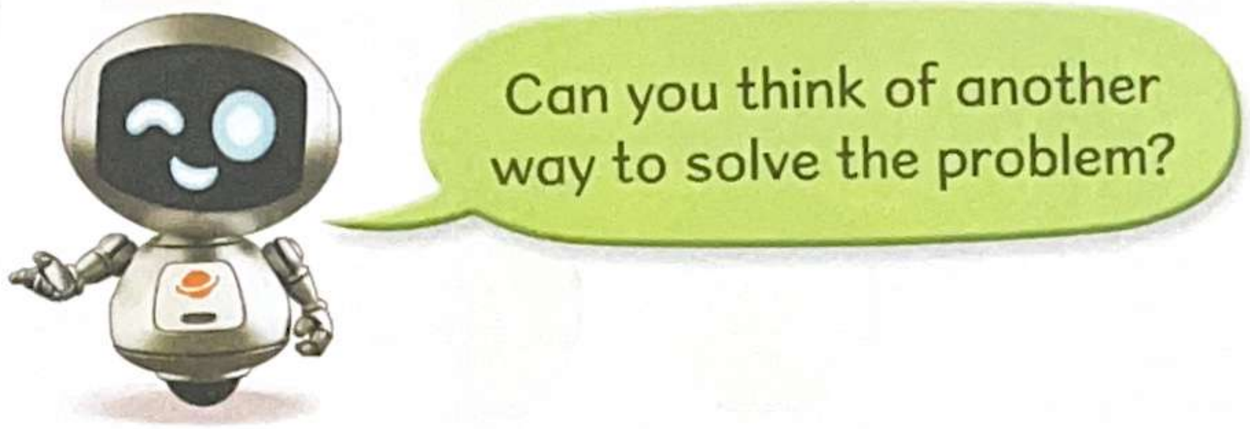
(a) $\frac{2}{3}$ of $150 = \frac{2}{3} \times 150$

$= \frac{2 \times \cancel{150}^{50}}{\cancel{3}_{1}}$

$= 2 \times 50$

$= 100$

There are **100** adults.



(b) $150 - 100 = 50$

There are **50** children.

Mrs Tan had $\frac{3}{4}$ kg of flour. She used $\frac{1}{3}$ of the flour to bake a cake.

(a) How much flour did she use?

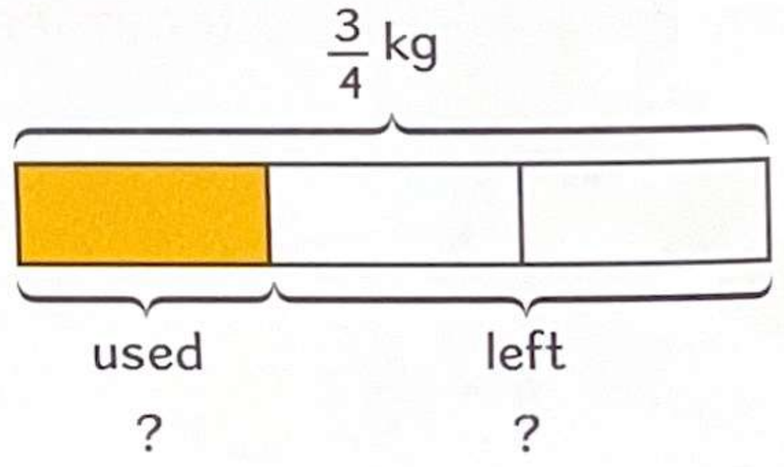
(b) How much flour was left?

Give your answers as fractions in the simplest form.

(a) $\frac{1}{3}$ of $\frac{3}{4}$ kg $= \frac{1}{\cancel{3}^{1}} \times \frac{\cancel{3}^{1}}{4}$ kg

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

Mrs Tan used $\frac{1}{4}$ **kg** of flour.



(b) $\frac{3}{4}$ kg $- \frac{1}{4}$ kg $= \frac{2}{4}$ kg

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

$\frac{1}{2}$ **kg** of flour was left.

There are 480 students in a hall.

$\frac{3}{5}$ of the students are girls.

$\frac{1}{4}$ of the girls wear glasses.

How many girls wear glasses?

Method 1

$\frac{1}{4} \times \frac{3}{5} = \frac{3}{20}$

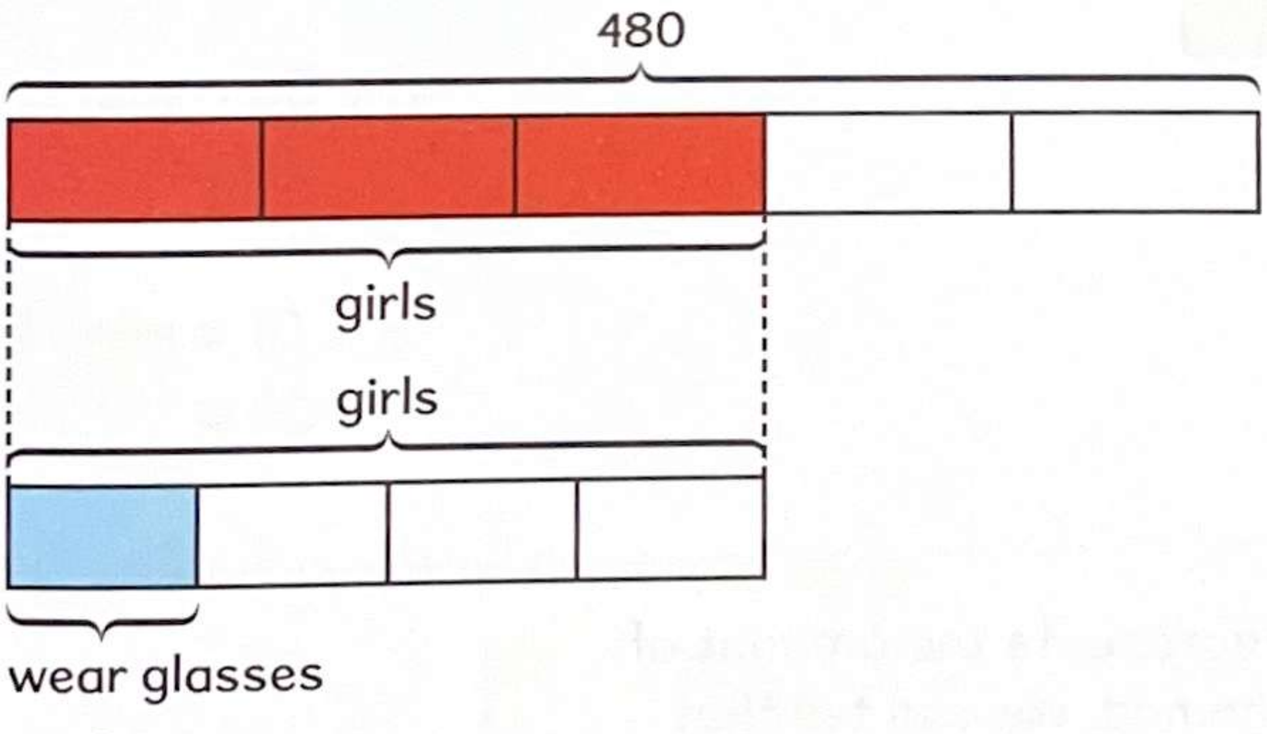
$\frac{3}{20}$ of the students are girls who wear glasses.

$\frac{3}{20} \times 480 = \frac{3 \times \cancel{480}^{24}}{\cancel{20}_{1}}$

$= 72$

72 girls wear glasses.

Method 2



$\frac{3}{5} \times 480 = 288$

There are 288 girls in the hall.

$\frac{1}{4} \times 288 = 72$

72 girls wear glasses.

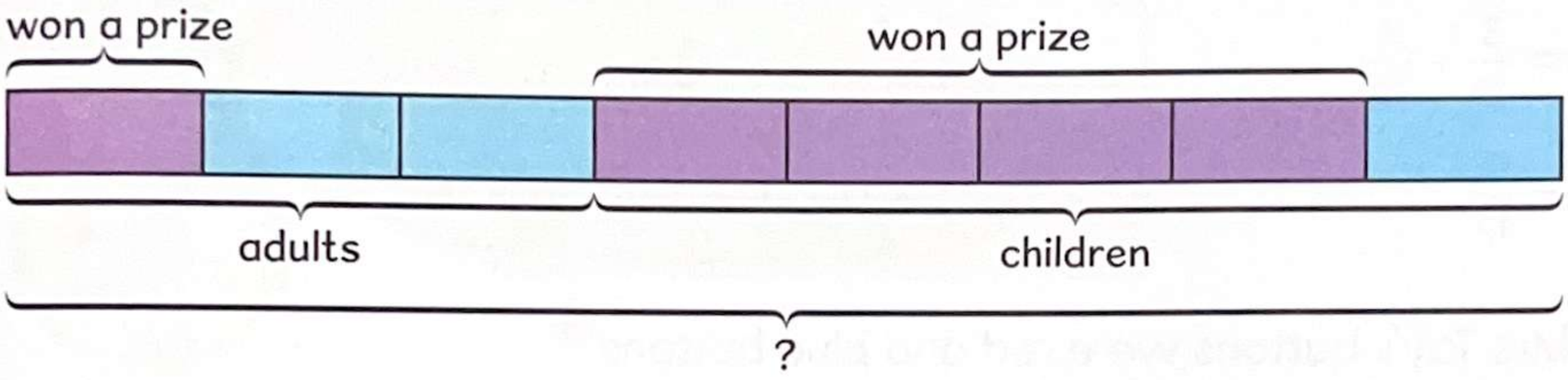
A group of visitors went to a carnival.

$\frac{3}{8}$ of the visitors were adults and the rest were children.

$\frac{1}{3}$ of the adults and $\frac{4}{5}$ of the children won a prize in the carnival.

50 visitors won prizes at the carnival.

How many visitors went to the carnival?



1 unit + 4 units = 5 units

5 units represent the total number of visitors who won prizes at the carnival.

5 units = 50

1 unit = 50 ÷ 5
= 10

8 units = 10 × 8
= 80

80 visitors went to the carnival.

Mrs Tay had a box of red, blue, green and white buttons.

$\frac{1}{4}$ of the buttons were red and $\frac{1}{3}$ of the buttons were blue.

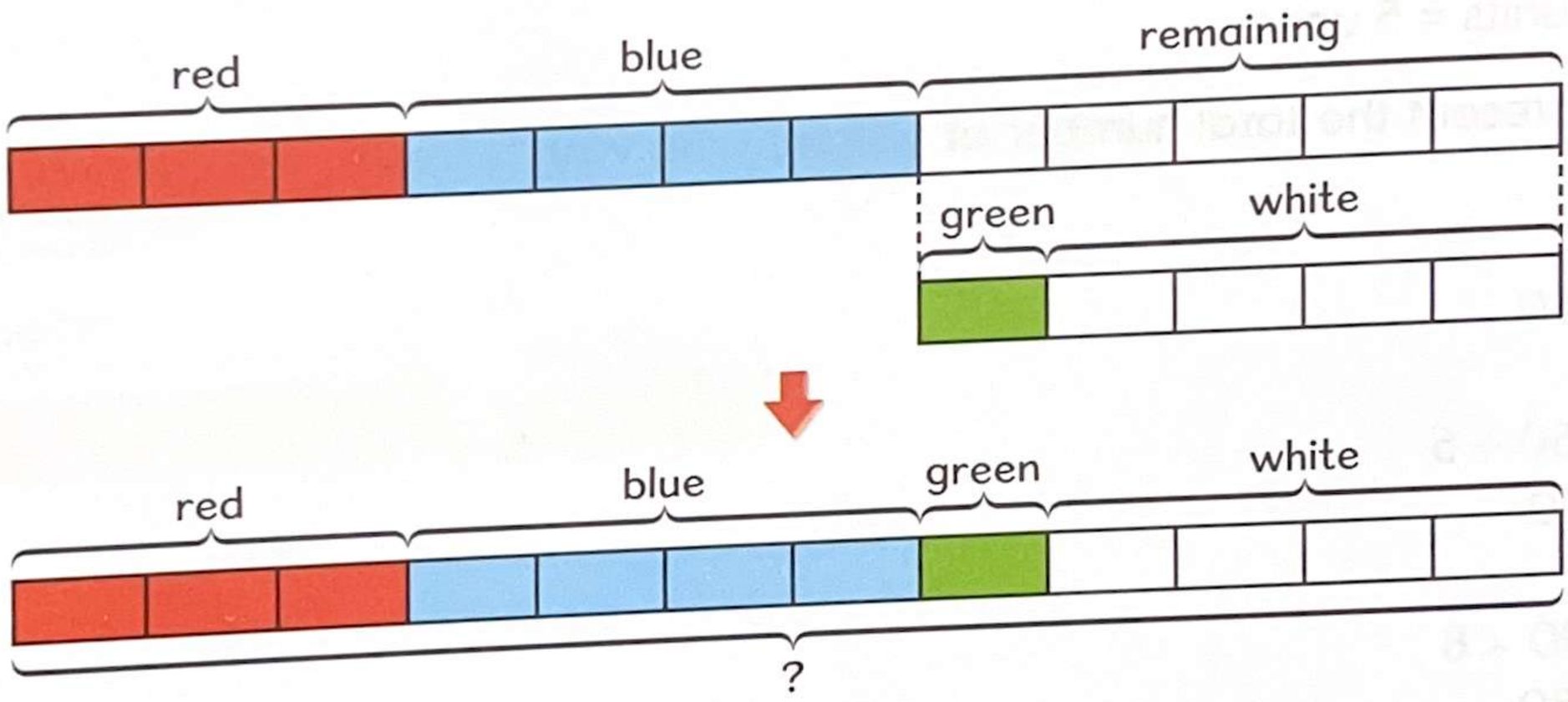
$\frac{1}{5}$ of the remaining buttons were green. The rest of the buttons were white.

(a) What fraction of the buttons were green?

(b) There were 36 more white buttons than green buttons.
How many buttons did Mrs Tay have altogether?

$$\frac{1}{4} + \frac{1}{3} = \frac{3}{12} + \frac{4}{12}$$
$$= \frac{7}{12}$$

$\frac{7}{12}$ of Mrs Tay's buttons were red and blue buttons.



(a) $\frac{1}{12}$ of the buttons were green.

(b) 4 units − 1 unit = 3 units

3 units = 36

1 unit = 36 ÷ 3
= 12

12 units = 12 × 12
= 144

Mrs Tay had **144** buttons altogether.

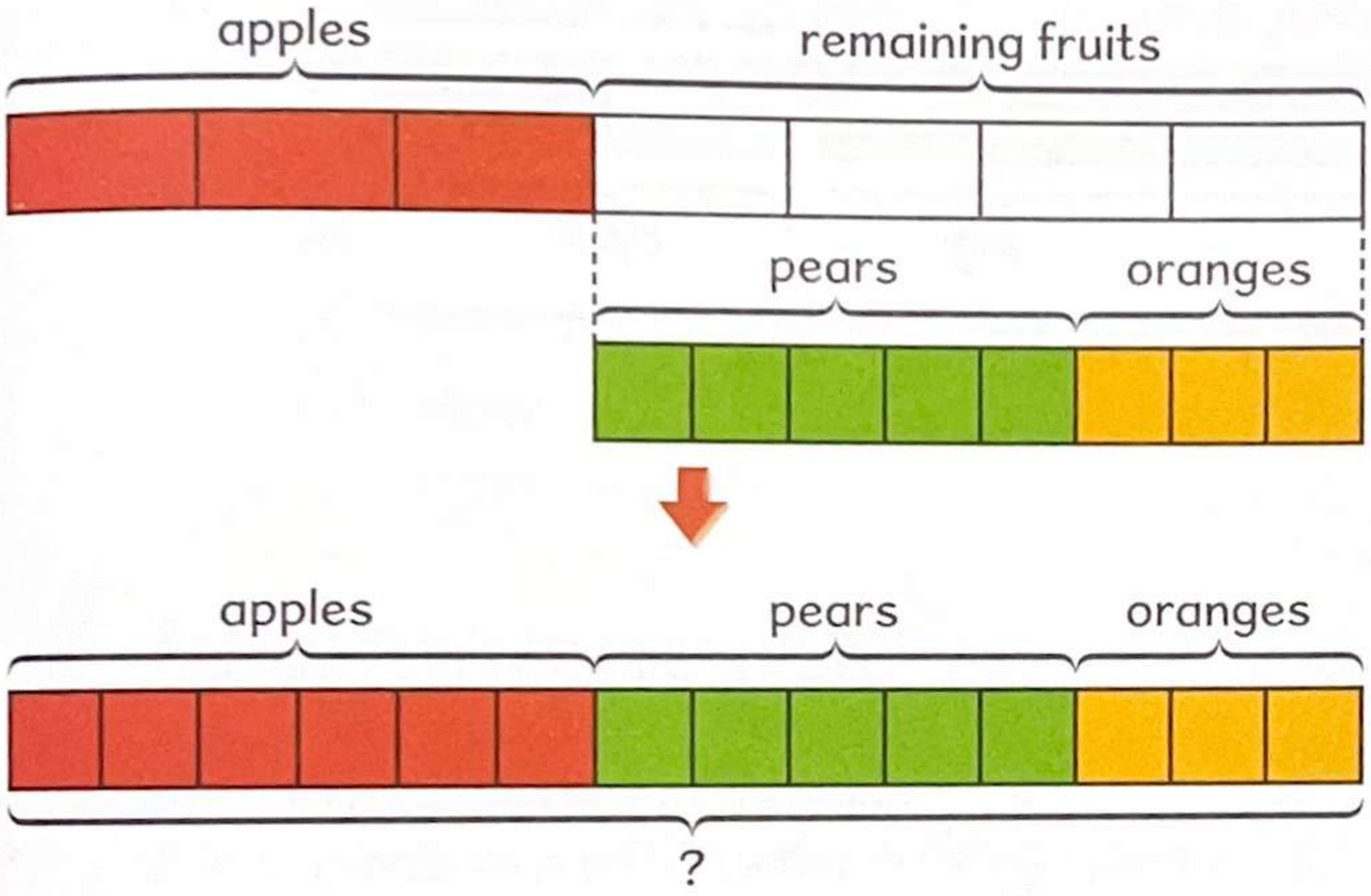
There were some fruits in a crate.

$\frac{3}{7}$ of them were apples and $\frac{5}{8}$ of the remainder were pears.

The rest of them were oranges.

There were 42 more pears than oranges.

How many fruits were there in the crate?



5 units – 3 units = 2 units

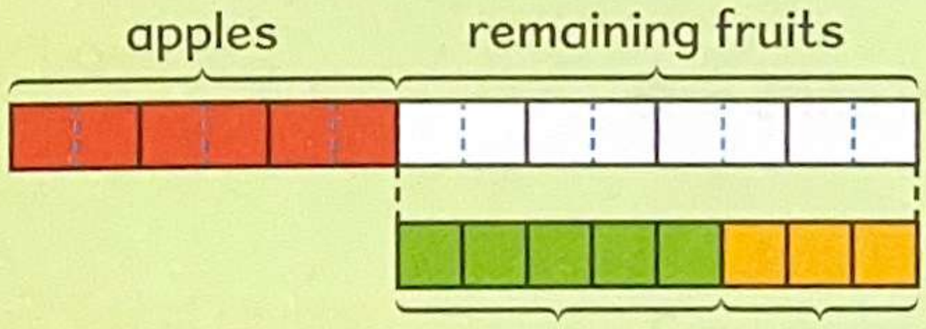
2 units = 42

1 unit = 42 ÷ 2
= 21

14 units = 14 × 21
= 294

There were **294** fruits in the crate.

In order to make the units identical in size, we need to divide the units represented by the apples and the remaining fruits.



ing children like to jog.

cle.

total

number
nt all the
using the
er which

total.

Let's Try! 10

(a) Wendy made $\frac{7}{8}\ \ell$ of fruit juice.

She drank $\frac{4}{5}$ of it.

How much fruit juice did she drink?

(b) There were 280 green ribbons and yellow ribbons in a box altogether.

$\frac{9}{10}$ of the ribbons were green.

(i) How many green ribbons were there?

(ii) How many more green ribbons than yellow ribbons were there?

(c) Farah had some pens.

$\frac{2}{7}$ of them were blue pens. $\frac{7}{10}$ of the remainder were red pens.

The rest of them were green pens.

What fraction of the pens were green pens?

(d) Mr Ling had $210.

He gave $\frac{3}{5}$ of it to his wife and spent $\frac{1}{3}$ of the remainder.

(i) How much money did he spend?

(ii) How much money did he have left?

(e) Maria had 2 kg of nuts.

She used $\frac{3}{5}$ of it to make salad for a party.

At the party, her guests ate $\frac{1}{4}$ of the remaining nuts.

How much nuts did her guests eat?

Give your answer in grams.

Go to PB 5A Practice 8