

Mathematics Stage 4

FRACTIONS DECIMALS PERCENTAGES

Book 7 Solve problems that involve the
addition and subtraction of fractions

Version: 260207

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OVERVIEW

SYLLABUS CONTENT

MA4-FRC-C-01 represents and operates with fractions, decimals and percentages to solve problems

Solve problems that involve the addition and subtraction of fractions

- Represent addition and subtraction of fractions with the same or unrelated denominators
- Solve problems involving adding and subtracting fractions and mixed numbers, including finding a common denominator
- Solve problems that involve subtracting a fraction from a whole number, with and without the use of digital tools

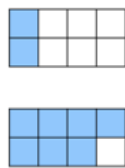
SUMMARY

Add and Subtract Fractions

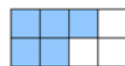
Same Denominator

1. Add or subtract the numerators; the denominator does not change.

$$\begin{array}{l} \frac{2}{5} + \frac{5}{5} \\ = \frac{2+5}{5} \\ = \frac{7}{5} \end{array}$$



+



$$\begin{array}{l} \frac{5}{6} - \frac{2}{6} \\ = \frac{5-2}{6} \\ = \frac{3}{6} \\ = \frac{1}{2} \end{array}$$



Different Denominator

1. Rewrite fractions with the lowest common multiple of the denominators.
2. Add or subtract the denominators; the denominator does not change.

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

1. $\frac{\square}{20} + \frac{\square}{20}$

$$\frac{4}{20} + \frac{15}{20}$$

2. $\frac{19}{20}$

$$\frac{9}{5} - \frac{5}{7}$$

1. $\frac{\square}{35} - \frac{\square}{35}$

$$\frac{63}{35} - \frac{25}{35}$$

2. $\frac{38}{35}$

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

1. $\frac{13}{4} - \frac{7}{3}$

2. $\frac{39}{12} - \frac{28}{12}$

3. $\frac{11}{12}$

REVIEW OF PRIOR KNOWLEDGE

1 From this list, circle the fractions that have the same denominator.

$$\frac{1}{12} \quad \frac{3}{8} \quad \frac{5}{12} \quad \frac{1}{2} \quad \frac{12}{12}$$

2 Which of these fractions are equivalent to one whole?

$$\frac{1}{9} \quad \frac{3}{3} \quad \frac{7}{2} \quad \frac{4}{4} \quad \frac{11}{11} \quad 1\frac{3}{4}$$

3 Show the first 6 multiples of each number.

a 5, 10,

b 3, 6,

c 7, 14,

4 Which of these numbers is a multiple of 8?

1 4 18 40

5 Find the lowest common multiple of:

a 4 and 6

b 3 and 6

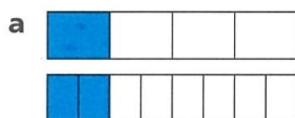
c 6 and 8

d 6 and 12

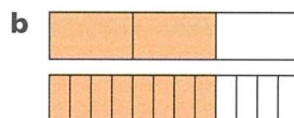
e 4 and 5

f 5 and 10

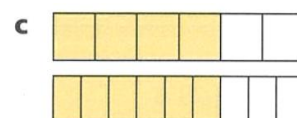
6 Write down the equivalent fractions shown by each diagram



$$\frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}}$$



$$\frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}}$$



$$\frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}}$$

7 Complete these equivalent fractions.

a $\frac{1}{3} = \frac{5}{\boxed{}}$

b $\frac{5}{6} = \frac{25}{\boxed{}}$

c $\frac{3}{4} = \frac{\boxed{}}{20}$

d $\frac{1}{\boxed{}} = \frac{5}{35}$

e $\frac{\boxed{}}{20} = \frac{30}{200}$

f $\frac{4}{12} = \frac{\boxed{}}{15}$

8 Compare these fractions using relational symbols <, >, and =

a $\frac{3}{5} \bigcirc \frac{6}{10}$

b $\frac{2}{3} \bigcirc \frac{20}{30}$

c $\frac{1}{7} \bigcirc \frac{7}{1}$

d $\frac{8}{8} \bigcirc \frac{2}{2}$

e $\frac{3}{4} \bigcirc \frac{3}{5}$

f $\frac{1}{3} \bigcirc \frac{11}{31}$

9 Determine the lowest common multiple of these numbers:

a 4 and 6

b 3 and 8

c 6 and 8

d 2 and 5

e 4 and 12

f 5 and 6

g 7 and 3

h 9 and 6

i 12 and 15

10 Write these mixed numbers as improper fractions.

a $1\frac{2}{3}$

b $1\frac{7}{8}$

c $2\frac{1}{9}$

d $4\frac{3}{5}$

e $3\frac{4}{5}$

f $2\frac{1}{9}$

FRACTION ADDITION: SAME DENOMINATOR

- When working with fractions that have the **same denominator**:
 - To **add** fractions, add the **numerators**.
 - To **subtract** fractions, subtract the **numerators**.
 - The denominator stays the same.

Example Add and subtract fractions with the same denominator.

$\frac{2}{8} + \frac{5}{8}$ $= \frac{7}{8}$		+		Explain why the denominators stay the same when adding and subtracting fractions. <i>The denominator represents the of the equal parts.</i> <i>Adding and subtracting the parts does the change the of the equal parts.</i>
$\frac{5}{6} - \frac{2}{6}$ $= \frac{3}{6}$				

Add and subtract these fractions.

a $\frac{1}{4} + \frac{2}{4}$ $= \frac{\quad}{4}$		+		$\frac{3}{4}$
b $\frac{3}{4} - \frac{2}{4}$ $= \frac{\quad}{4}$				$\frac{1}{4}$
c $\frac{2}{6} + \frac{4}{6}$		+		1
d $\frac{4}{5} - \frac{1}{5}$				$\frac{3}{5}$
e $\frac{2}{6} + \frac{3}{6}$				$\frac{5}{6}$
f $\frac{4}{5} - \frac{3}{5}$				$\frac{1}{5}$

Rule for Adding and Subtracting Fractions	
The denominators must be the same	
Adding fractions $\frac{a}{n} + \frac{b}{n} = \frac{a + b}{n}$	Subtracting fractions $\frac{a}{n} - \frac{b}{n} = \frac{a - b}{n}$

Example Add and subtract fractions with the same denominator.

$\frac{2}{5} + \frac{6}{5}$ $= \frac{8}{5}$	What is the rule for adding and subtracting fractions with the same denominator? <i>Add or subtract the, the denominators</i>
$\frac{9}{12} - \frac{5}{12}$ $= \frac{4}{12}$ $= \frac{1}{3}$	Explain how you know when a fraction can be simplified. <i>A fraction can be simplified if the numerator and denominator share</i>

a

$$\frac{12}{19} + \frac{5}{19}$$

$$= \frac{\quad}{19}$$

$\frac{17}{19}$

b

$$\frac{9}{11} - \frac{8}{11}$$

$$= \frac{\quad}{\quad}$$

$\frac{1}{11}$

c

$$\frac{9}{28} + \frac{17}{28}$$

$\frac{13}{14}$

d

$$\frac{12}{22} - \frac{16}{22}$$

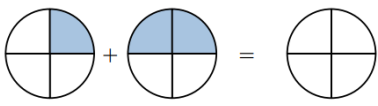
$-\frac{2}{11}$

Key ideas

1. When adding or subtracting fractions with the same denominator, we add or subtract the and keep the the same.
2. The denominator stays the same because the size of the parts does not

1 Add and subtract these fractions using the diagrams.

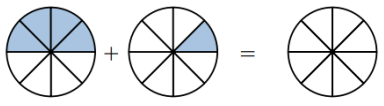
a



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

$\frac{3}{4}$

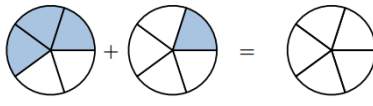
b



$$\frac{4}{8} + \frac{1}{8} = \frac{\boxed{}}{\boxed{}}$$

$\frac{5}{8}$

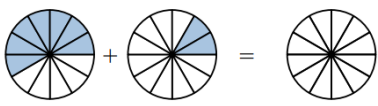
c



$$\frac{3}{5} + \frac{1}{5} = \frac{\boxed{}}{\boxed{}}$$

$\frac{4}{5}$

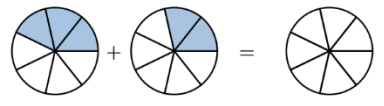
d



$$\frac{7}{12} + \frac{2}{12} = \frac{\boxed{}}{\boxed{}}$$

$\frac{9}{12} = \frac{3}{4}$

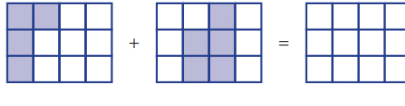
e



$$\frac{3}{7} + \frac{2}{7} = \frac{\boxed{}}{\boxed{}}$$

$\frac{5}{7}$

f



$$\frac{4}{12} + \frac{5}{12} = \frac{\boxed{}}{\boxed{}}$$

$\frac{9}{12} = \frac{3}{4}$

2 Add or subtract these fractions.

a

$$\frac{1}{10} + \frac{2}{10} = \frac{\boxed{}}{\boxed{}}$$

$\frac{3}{10}$

b

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

$\frac{3}{8}$

c

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

$\frac{3}{5}$

d

$$\frac{4}{7} - \frac{3}{7} = \frac{\boxed{}}{\boxed{}}$$

$\frac{1}{7}$

e

$$\frac{2}{11} + \frac{7}{11} = \frac{\boxed{}}{\boxed{}}$$

$\frac{9}{11}$

f

$$\frac{1}{9} + \frac{4}{9} = \frac{\boxed{}}{\boxed{}}$$

$\frac{5}{9}$

g

$$\frac{7}{5} - \frac{4}{5} = \frac{\boxed{}}{\boxed{}}$$

$\frac{3}{5}$

h

$$\frac{8}{6} - \frac{3}{6} = \frac{\boxed{}}{\boxed{}}$$

$\frac{5}{6}$

i

$$\frac{17}{12} - \frac{6}{12} = \frac{\boxed{}}{\boxed{}}$$

$\frac{11}{12}$

3 Add or subtract these fractions. You will need to simplify.

a

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

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

b

$$\frac{1}{6} + \frac{3}{6} = \frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}}$$

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

c

$$\frac{5}{10} + \frac{1}{10} = \frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}}$$

$\frac{6}{10} = \frac{3}{5}$

d

$$\frac{10}{9} - \frac{7}{9} = \frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}}$$

$\frac{3}{9} = \frac{1}{3}$

e

$$\frac{7}{12} - \frac{5}{12} = \frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}}$$

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

f

$$\frac{3}{8} + \frac{5}{8} = \frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}}$$

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

g

$$\frac{13}{20} - \frac{7}{20} = \frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}}$$

$\frac{6}{20} = \frac{3}{10}$

h

$$\frac{4}{14} + \frac{3}{14} = \frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}}$$

$\frac{7}{14} = \frac{1}{2}$

i

$$\frac{7}{9} - \frac{1}{9} = \frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}}$$

$\frac{6}{9} = \frac{2}{3}$

4 Add or subtract these fractions. You will need to simplify, then write as a mixed number.

a

$$\frac{9}{6} + \frac{5}{6} = \frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}} = \boxed{} \frac{\boxed{}}{\boxed{}}$$

$$\frac{14}{6} = \frac{7}{3} = 2\frac{1}{3}$$

b

$$\frac{9}{12} + \frac{7}{12} = \frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}} = \boxed{} \frac{\boxed{}}{\boxed{}}$$

$$\frac{16}{12} = \frac{4}{3} = 1\frac{1}{3}$$

c

$$\frac{29}{12} - \frac{5}{12} = \frac{\boxed{}}{\boxed{}} = \boxed{}$$

$$\frac{24}{12} = 2$$

d

$$\frac{44}{9} - \frac{11}{9} = \frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}} = \boxed{} \frac{\boxed{}}{\boxed{}}$$

$$\frac{33}{9} = \frac{11}{3} = 3\frac{2}{3}$$

e

$$\frac{50}{18} - \frac{11}{18} = \frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}} = \boxed{} \frac{\boxed{}}{\boxed{}}$$

$$\frac{39}{18} = \frac{13}{6} = 2\frac{1}{6}$$

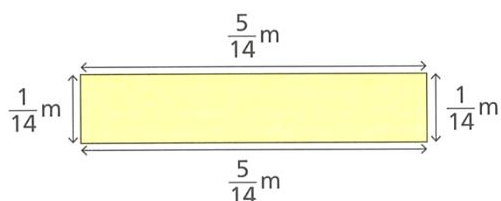
f

$$\frac{50}{8} + \frac{10}{8} = \frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}} = \boxed{} \frac{\boxed{}}{\boxed{}}$$

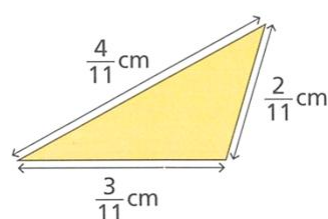
$$\frac{60}{8} = \frac{15}{2} = 7\frac{1}{2}$$

5 Work out the perimeter of each shape.

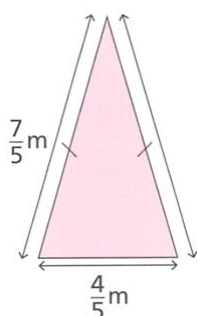
a



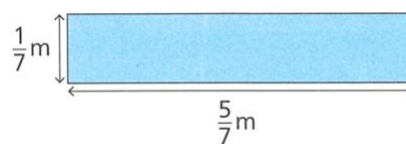
b



c



d



$$\frac{6}{7}\text{ m}$$

$$\frac{9}{11}\text{ cm}$$

$$\frac{18}{5}\text{ m}$$

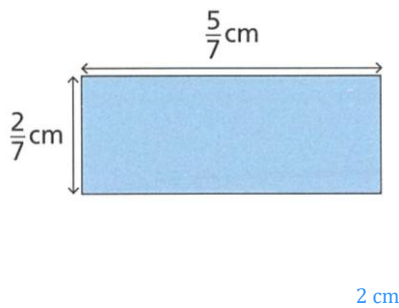
$$\frac{12}{7}\text{ m}$$

6 Work out the following, leave your answer as an improper fraction.

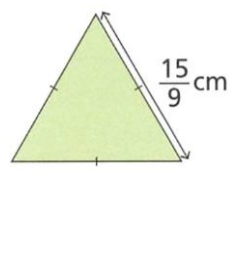
a $\frac{5}{7} + \frac{1}{7}$	b $\frac{2}{15} + \frac{8}{15} + \frac{1}{15}$	c $\frac{5}{9} - \frac{4}{9}$
$\frac{6}{7}$	$\frac{11}{15}$	$\frac{1}{9}$
d $\frac{5}{6} + \frac{5}{6}$	e $\frac{5}{6} - \frac{5}{6}$	f $\frac{4}{11} - \frac{3}{11} + \frac{5}{11}$
$\frac{5}{3}$	0	$\frac{6}{11}$
g $1 - \frac{1}{3}$	h $\frac{3}{8} + \frac{5}{8}$	i $\frac{6}{7} - \frac{2}{7} - \frac{4}{7}$
$\frac{2}{3}$	1	0
j $1 - \frac{1}{5}$	k $1 - \frac{1}{4}$	l $1 - \frac{8}{9}$
$\frac{4}{5}$	$\frac{3}{4}$	$\frac{1}{9}$
m $1 - \frac{4}{9}$	n $1 - \frac{3}{5}$	o $2 - \frac{1}{5}$
$\frac{5}{9}$	$\frac{2}{5}$	$\frac{9}{5}$
p $2 - \frac{6}{7}$	q $2 - \frac{12}{17}$	r $2 - \frac{15}{19}$
$\frac{8}{7}$	$\frac{22}{17}$	$\frac{23}{19}$
s $3 - \frac{1}{4}$	t $6 - \frac{3}{5}$	u $10 - \frac{7}{8}$
$\frac{11}{4}$	$\frac{21}{4}$	$\frac{73}{8}$

7 Calculate the perimeter of these shapes.

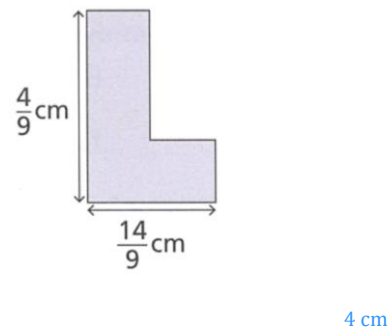
a



b



c

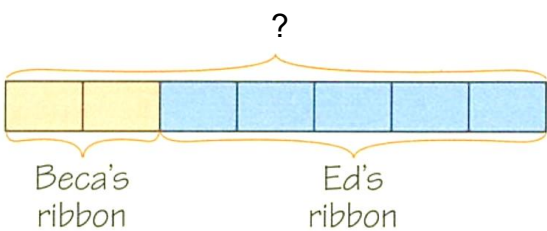


8 Beca and Ed each have a piece of ribbon.

Beca's ribbon is $\frac{2}{7}$ of a metre.

Ed's ribbon is $\frac{5}{7}$ of a metre.

What is the total length of their ribbon?

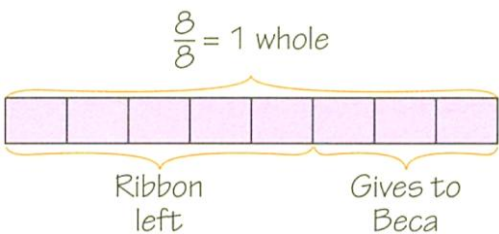


1 m

9 Ed has a piece of ribbon that is a metre long.

He cuts off $\frac{3}{8}$ of a metre and gives it to Beca.

How much ribbon does he have left?



$\frac{5}{8}$ m

10 Emily and Marta each have a piece of ribbon.

Emily's piece is $\frac{3}{11}$ of a metre and Marta's piece is $\frac{2}{11}$ of a metre.

What fraction of a metre of ribbon do Emily and Marta have in total?

$\frac{5}{11}$ m

11 Ali is $\frac{4}{26}$ of his way through a journey. What fraction of the journey does he have left?

$\frac{11}{13}$

- 12** Ed, Marta and Jakub are sharing a large pizza.

Ed eats $\frac{2}{9}$ of the pizza.

Marta eats $\frac{2}{9}$ of the pizza.

Jakub eats $\frac{4}{9}$ of the pizza.

What fraction of the whole pizza did they eat?

$\frac{8}{9}$

What fraction of the whole pizza is left?

$\frac{1}{9}$

- 13** Ed eats $\frac{1}{9}$ of a cake. Flo eats $\frac{4}{9}$ of the same cake. What fraction of the cake is left?

$\frac{4}{9}$

- 14** Consider this equation:

$$\frac{2}{w} + \frac{a}{w} = \frac{9}{w}$$

- a** Work out the value of a

7

- b** Explain why the value of w doesn't matter.

All the denominators are the same, so we only add the numerators.

- c** w is a positive integer. For what values of w is $\frac{9}{w}$ an improper fraction?

3, 6, 9

- 15** Find the missing numbers.

a $\frac{1}{4} + \dots = 1$

$\frac{3}{4}$

b $1 = \dots + \frac{3}{5}$

$\frac{2}{5}$

c $\frac{8}{5} - \dots = 1$

$\frac{3}{5}$

d $1 = \dots + \frac{3}{5}$

$\frac{2}{5}$

e $\frac{12}{19} + \dots = 1$

$\frac{7}{19}$

f $1 = \dots - \frac{5}{7}$

$\frac{12}{7}$

g $\frac{2}{7} + \dots = 2$

$\frac{12}{7}$

h $3 = \dots + \frac{5}{9}$

$\frac{22}{9}$

i $\frac{14}{3} - \dots = 4$

$\frac{2}{3}$

- 16** Find the missing integers.

a $\square - \frac{1}{9} = \frac{17}{9}$

2

b $\square - \frac{5}{12} = \frac{3}{12} + \frac{4}{12}$

1

c $\frac{2}{3} + \square = 3\frac{2}{3}$

3

FRACTION ADDITION: RELATED DENOMINATORS

- To add or subtract fractions with different denominators:
 - Rewrite the fractions with the **lowest common multiple** of the denominators.
 - Add or subtract the numerators.

Example Add and subtract fractions with related denominators.

$\frac{1}{4} + \frac{3}{8}$ $= \frac{2}{8} + \frac{3}{8}$ $= \frac{5}{8}$		Why can't we know the result of $\frac{1}{4} + \frac{1}{8}$? The are not the same. Why did we change the denominator to 8? 8 is the of 4 and 8
$\frac{5}{12} - \frac{1}{4}$ $= \frac{5}{12} - \frac{3}{12}$ $= \frac{2}{12}$		How did we change $\frac{1}{4}$ to a fraction with denominator of 8? We the numerator and denominator by

Add and subtract these fractions.

a

$$\frac{1}{3} + \frac{1}{6}$$

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

$$= \underline{\quad}$$

$\frac{1}{2}$

b

$$\frac{7}{10} - \frac{2}{5}$$

$$= \frac{7}{10} - \frac{\quad}{10}$$

$$= \underline{\quad}$$

$\frac{3}{10}$

c

$$\frac{3}{6} + \frac{1}{3}$$

$$= \underline{\quad} + \underline{\quad}$$

$$= \underline{\quad}$$

$\frac{5}{6}$

d

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

$$= \underline{\quad} - \underline{\quad}$$

$$= \underline{\quad}$$

$\frac{1}{4}$

Example Add and subtract fractions with related denominators.

1. Same denominators 2. Add numerators	$\frac{1}{5} + \frac{3}{10}$ $\frac{2}{10} + \frac{3}{10}$ $\frac{5}{10}$	What do we need to do before adding/subtracting fractions? <i>The must make the the same before adding or subtracting fractions.</i> How do we decide what denominator to change to?
1. Same denominators 2. Subtract numerators	$\frac{9}{12} - \frac{5}{6}$ $\frac{9}{12} - \frac{10}{12}$ $- \frac{1}{12}$	<i>We make the denominator the</i> How do we change the denominators of fractions while keeping its value equivalent? <i>We multiply the and by the same number.</i>

Add and subtract these fractions.

a

$$\frac{2}{3} + \frac{1}{9}$$

$$= \frac{2}{9} + \frac{1}{9}$$

$$= \frac{3}{9}$$

$\frac{7}{9}$

b

$$\frac{17}{20} - \frac{3}{5}$$

$$= \frac{17}{20} - \frac{12}{20}$$

$$=$$

$\frac{1}{4}$

c

$$\frac{3}{4} + \frac{5}{12}$$

$$= \frac{3}{4} + \frac{5}{12}$$

$$=$$

$\frac{7}{6}$

d

$$\frac{8}{6} - \frac{5}{36}$$

$$=$$

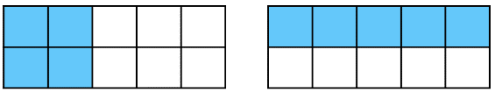
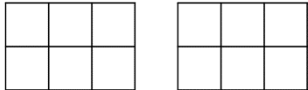
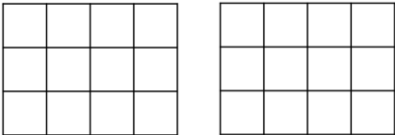
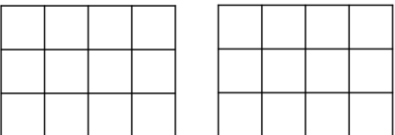
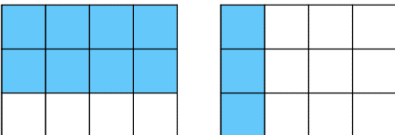
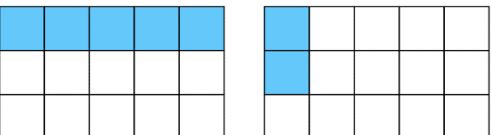
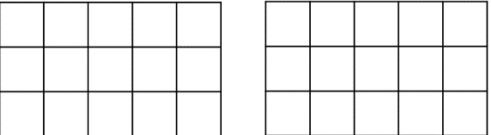
$$=$$

$\frac{43}{36}$

Key ideas

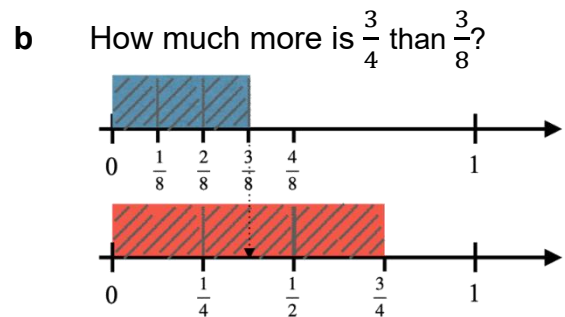
1. To add and subtract fractions, their must be the same.
2. If two fractions don't have the same denominator, we should change their denominators to a common
3. To change denominators of fractions, use your knowledge of fractions.

1 Complete the table.

Question	Diagram	Rewritten Denominators	Answer
$\frac{2}{5} + \frac{1}{2}$		$\frac{4}{10} + \frac{5}{10}$	$\frac{9}{10}$
$\frac{1}{2} + \frac{1}{3}$		$\frac{3}{6} + \frac{2}{6}$	$\frac{5}{6}$
$\frac{2}{3} + \frac{1}{6}$		$\frac{4}{6} + \frac{1}{6}$	$\frac{5}{6}$
$\frac{1}{3} + \frac{5}{12}$		$\frac{4}{12} + \frac{5}{12}$	$\frac{9}{12} = \frac{3}{4}$
$\frac{1}{4} + \frac{7}{12}$		$\frac{3}{12} + \frac{7}{12}$	$\frac{10}{12} = \frac{5}{6}$
$\frac{2}{3} + \frac{1}{4}$		$\frac{8}{12} + \frac{3}{12}$	$\frac{11}{12}$
$\frac{1}{3} + \frac{2}{15}$		$\frac{5}{15} + \frac{2}{15}$	$\frac{7}{15}$
$\frac{2}{3} + \frac{2}{5}$		$\frac{10}{15} + \frac{6}{15}$	$\frac{16}{15}$

2

a Work out $\frac{7}{9} - \frac{1}{3}$



$\frac{4}{9}$

$\frac{3}{8}$

3 Add and subtract these fractions but rewriting them with the lowest common denominator.

a

$$\frac{1}{2} + \frac{3}{8}$$

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

$\frac{7}{8}$

b

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

$$= \frac{\boxed{}}{\boxed{6}} + \frac{\boxed{}}{\boxed{6}} = \frac{\boxed{}}{\boxed{}}$$

$\frac{5}{6}$

c

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

$$= \frac{\boxed{}}{\boxed{15}} - \frac{\boxed{}}{\boxed{15}} = \frac{\boxed{}}{\boxed{}}$$

$\frac{4}{15}$

d

$$\frac{3}{14} + \frac{5}{7}$$

$\frac{13}{14}$

e

$$\frac{2}{3} - \frac{4}{9}$$

$\frac{2}{9}$

f

$$\frac{3}{16} + \frac{1}{8}$$

$\frac{5}{16}$

4 Read the example carefully and answer the questions.

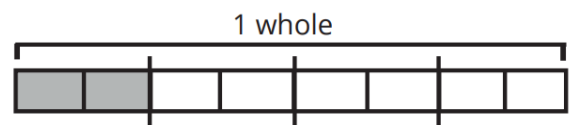
X Name: Denny

Solve.

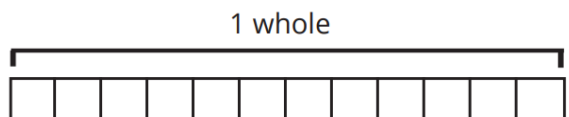
$$\frac{1}{4} + \frac{1}{8} = \frac{2}{12}$$

$$\frac{1+1}{4+8} = \frac{2}{12}$$

Add $\frac{1}{8}$ to $\frac{1}{4}$ represented on the diagram below by shading



Shade $\frac{2}{12}$ on the diagram below



Compare the two diagrams to explain why $\frac{1}{4} + \frac{1}{8}$ is not equal to $\frac{2}{12}$

Hence solve $\frac{6}{12} + \frac{2}{6}$

$\frac{5}{6}$



Name: Nate

Solve.

$$\frac{6}{10} + \frac{8}{100} = \frac{68}{100}$$

$$\rightarrow \frac{60}{100} + \frac{8}{100} = \frac{68}{100}$$

Look at the step marked with an arrow. Why did Nate rewrite the first fraction as $\frac{60}{100}$?

The common of 10 and 100 is

Denominator, 100

How do you know $\frac{6}{10}$ is equivalent to $\frac{60}{100}$?

We multiply the numerator and denominator by

10

Hence solve:

$$\frac{5}{10} + \frac{7}{100}$$

$\frac{57}{10}$



Name: Jing

Solve. Write your answer as a decimal.

$$\frac{8}{10} + \frac{33}{100} = 0.113$$

$$\frac{80}{100} + \frac{33}{100} = \frac{113}{100} = 0.113$$

Explain why Jing's final answer, 0.113, is not equivalent to $\frac{113}{100}$

0.113 is less than one whole $\frac{113}{100}$ is more than one whole

In the step marked with an arrow, look at the values of the numerator and the denominator. How could Jing have known the answer should be greater than 1?

The numerator is greater than the denominator, so the decimal must be greater than one.

Solve. Write your answer as a decimal.

$$\frac{4}{10} + \frac{95}{100}$$

1.35

5 Add these fractions.

a $\frac{3}{5} + \frac{2}{5}$

b $\frac{3}{5} - \frac{2}{5}$

c $\frac{3}{5} + \frac{3}{5} + \frac{2}{15}$

1

 $\frac{1}{5}$ $\frac{4}{3}$

d $\frac{7}{20} + \frac{5}{10}$

e $\frac{7}{8} - \frac{3}{4}$

f $\frac{5}{6} - \frac{1}{3}$

 $\frac{17}{20}$ $\frac{1}{8}$ $\frac{1}{2}$

g $\frac{1}{4} + \frac{3}{8}$

h $\frac{2}{5} + \frac{4}{15}$

i $\frac{7}{10} - \frac{2}{5}$

 $\frac{5}{8}$ $\frac{2}{3}$ $\frac{3}{10}$

j $\frac{11}{12} - \frac{1}{3} - \frac{1}{4}$

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

l $\frac{1}{3} + \frac{5}{12} - \frac{1}{6}$

 $\frac{1}{3}$ $\frac{19}{30}$ $\frac{7}{12}$

6 Chloe eats $\frac{1}{10}$ of her birthday cake. She gives her friends $\frac{3}{5}$ of the cake.

She gives her family $\frac{3}{10}$ of the cake. Does Chloe have any cake left?

No cake left :(

7 Beca has some football cards.

She gives $\frac{1}{8}$ of them to her friend Benji and $\frac{1}{2}$ of them to her friend Becky.

What fraction of the cards does Beca have left?

 $\frac{3}{8}$

- 8** Marta has a chocolate bar. She eats $\frac{2}{3}$ of the chocolate bar and gives her friend $\frac{1}{6}$ of it.
- a** What fraction of the chocolate bar is eaten?

 $\frac{5}{6}$

- b** What fraction of the chocolate bar is left?

 $\frac{1}{6}$

- 9** Jakub cycles $1\frac{3}{4}$ km on Monday, and $2\frac{1}{8}$ km on Tuesday. How far does he cycle in total?

 $\frac{31}{8}$

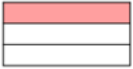
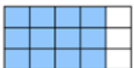
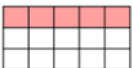
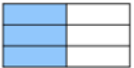
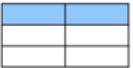
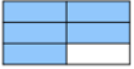
- 10** A barrel holds $12\frac{1}{4}$ litres of water. A bucket holds $3\frac{11}{12}$ litres of water.
- Max fills up the bucket with water from the barrel. How much water is left in the barrel?

 $8\frac{1}{3}$

FRACTION ADDITION: UNRELATED DENOMINATORS

- To add or subtract fractions with different denominators:
 - Rewrite the fractions with the **lowest common multiple** of the denominators.
Do this by multiplying each fraction by the other's denominator
 - Add or subtract the numerators.

Example Add and subtract fractions unrelated denominators.

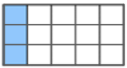
$\frac{4}{5} - \frac{1}{3}$  $-$ 	How did we know to make the denominators 15?
$= \frac{12}{15} - \frac{5}{15}$  $-$ 	To make the denominators the same, we need to find the
$= \frac{7}{15}$ 	 of the denominators. For 5 and 3, the is 15.
$\frac{1}{2} + \frac{1}{3}$  $+$ 	How did we know to make the denominators 6? How does this relate to the diagrams?
$= \frac{3}{6} + \frac{2}{6}$  $+$ 	To make the denominators the same, we need to find the
$= \frac{5}{6}$ 	 of the denominators. For 2 and 3, the is 6.

Add and subtract these fractions.

a

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

 $+$


$$= \frac{\quad}{15} + \frac{\quad}{15}$$

 $+$

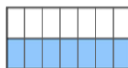
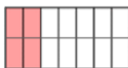

$$= \frac{\quad}{\quad}$$

$\frac{13}{15}$

b

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

 $-$

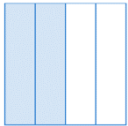

$$= \frac{\quad}{14} - \frac{\quad}{14}$$

 $-$


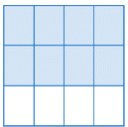
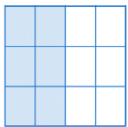
$$= \frac{\quad}{\quad}$$

$\frac{3}{14}$

c

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

 $+$


$$= \frac{\quad}{\quad} + \frac{\quad}{\quad}$$

 $+$


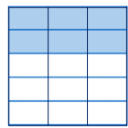
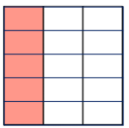
$$= \frac{\quad}{\quad}$$

$\frac{7}{6}$

d

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

 $-$


$$= \frac{\quad}{\quad} - \frac{\quad}{\quad}$$

 $-$


$$= \frac{\quad}{\quad}$$

$\frac{1}{15}$

Example Add and subtract fractions with unrelated denominators.

$\frac{1}{5} + \frac{3}{4}$		What is an easy way to make the denominators the same?
1. Same denominators	$\frac{\quad}{20} + \frac{\quad}{20}$ $\frac{4}{20} + \frac{15}{20}$	 each fraction by the of the other fraction.
2. Add numerators	$\frac{19}{20}$	Why is the rule “multiply each fraction by the denominator of the other fraction” not always efficient?
$\frac{9}{5} - \frac{5}{7}$		$\frac{\quad}{6} + \frac{\quad}{9}$
1. Same denominators	$\frac{\quad}{35} - \frac{\quad}{35}$ $\frac{63}{35} - \frac{25}{35}$	The rule would be to make the denominator, but the LCM of 6 and 9 is
2. Subtract numerators	$\frac{38}{35}$	

Add and subtract these fractions.

a	b	c	d
$\frac{1}{4} + \frac{1}{3}$	$\frac{5}{4} - \frac{6}{7}$	$\frac{3}{7} + \frac{2}{5}$	$\frac{7}{8} - \frac{2}{3}$
$= \frac{\quad}{12} + \frac{\quad}{12}$	$= \frac{\quad}{28} - \frac{\quad}{28}$	$= \frac{\quad}{\quad} + \frac{\quad}{\quad}$	$= \frac{\quad}{\quad} - \frac{\quad}{\quad}$
$= \frac{\quad}{12}$	$= \frac{\quad}{28}$	$=$	$=$
$\frac{7}{12}$	$\frac{11}{28}$	$\frac{29}{35}$	$\frac{5}{24}$

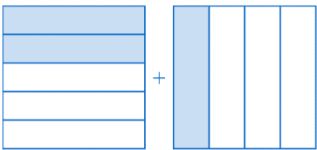
Key ideas

1. To add or subtract fractions, the must be the same.
2. To make the denominators the same, determine a of the two denominators.
3. A quick way to make the denominators the same is to multiply the numerator and denominator of each fraction by the of the other.

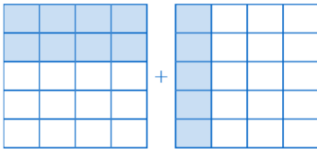
1 Add and subtract these fractions using the visual models.

a

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



$= \frac{\quad}{20} + \frac{\quad}{20}$

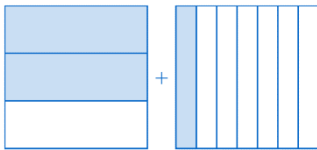


$= \frac{\quad}{\quad}$

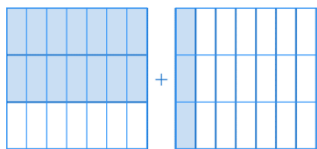
$\frac{13}{20}$

b

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



$= \frac{\quad}{21} + \frac{\quad}{21}$

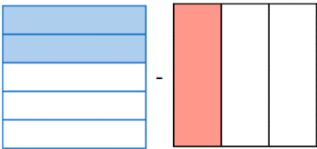


$= \frac{\quad}{\quad}$

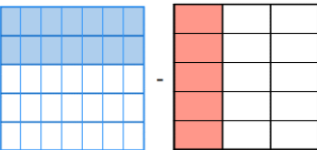
$\frac{17}{21}$

c

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



$= \frac{\quad}{\quad} - \frac{\quad}{\quad}$

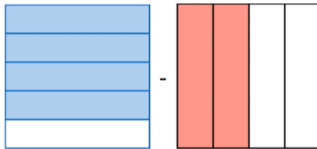


$= \frac{\quad}{\quad}$

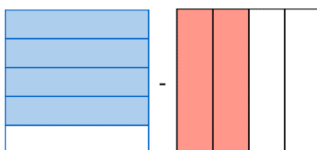
$\frac{1}{15}$

d

$\frac{4}{5} - \frac{2}{4}$



$= \frac{\quad}{\quad} - \frac{\quad}{\quad}$

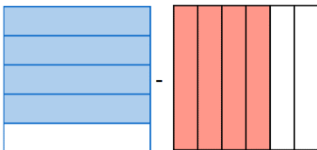


$= \frac{\quad}{\quad}$

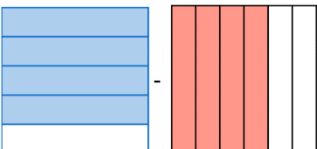
$\frac{3}{10}$

e

$\frac{4}{5} - \frac{4}{6}$



$= \frac{\quad}{\quad} - \frac{\quad}{\quad}$

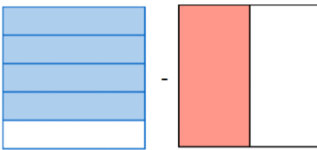


$= \frac{\quad}{\quad}$

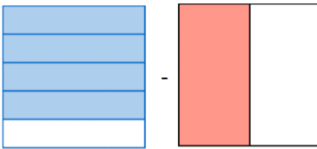
$\frac{2}{15}$

f

$\frac{4}{5} - \frac{1}{2}$



$= \frac{\quad}{\quad} - \frac{\quad}{\quad}$



$= \frac{\quad}{\quad}$

$\frac{3}{10}$

2 Read Yetta's work carefully and answer the questions.

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


$$\frac{2}{5} + \frac{3}{4} = \frac{5}{9}$$

What did Yetta do wrong while adding the fractions?

She added the numerator and denominator, which you can't do.
You must make the denominators the same.

Is Yetta's answer bigger or smaller than the correct answer? How can you tell?

Smaller. Five-ninths is less than three-quarters, the answer should be greater than three-quarters

3 Add and subtract these fractions by first making the denominators the same.

a

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

$$= \frac{\boxed{}}{\boxed{}} - \frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}}$$

$\frac{1}{6}$

b

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

$$= \frac{\boxed{}}{\boxed{}} + \frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}}$$

$\frac{11}{12}$

c

$$\frac{7}{10} - \frac{1}{4}$$

$$= \frac{\boxed{}}{\boxed{}} - \frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}}$$

$\frac{9}{20}$

d

$$\frac{3}{5} + \frac{1}{6}$$

$$= \frac{\boxed{}}{\boxed{}} + \frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}}$$

$\frac{23}{30}$

e

$$\frac{1}{4} - \frac{2}{9}$$

$$= \frac{\boxed{}}{\boxed{}} - \frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}}$$

$\frac{1}{36}$

f

$$\frac{7}{10} - \frac{1}{6}$$

$$= \frac{\boxed{}}{\boxed{}} - \frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}}$$

$\frac{8}{15}$

g

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

$$= \frac{\boxed{}}{\boxed{}} + \frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}}$$

$\frac{7}{12}$

h

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

$$= \frac{\boxed{}}{\boxed{}} + \frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}}$$

$\frac{13}{20}$

i

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

$$= \frac{\boxed{}}{\boxed{}} + \frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}}$$

$\frac{13}{21}$

j

$$\frac{3}{8} + \frac{1}{5}$$

$$= \frac{\boxed{}}{\boxed{}} + \frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}}$$

$\frac{23}{40}$

k

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

$$= \frac{\boxed{}}{\boxed{}} + \frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}}$$

$\frac{43}{30}$

l

$$\frac{4}{7} + \frac{3}{4}$$

$$= \frac{\boxed{}}{\boxed{}} + \frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}}$$

$\frac{37}{28}$

m

$$\frac{8}{11} + \frac{2}{3}$$

$$= \frac{\boxed{}}{\boxed{}} + \frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}}$$

$\frac{46}{33}$

n

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

$$= \frac{\boxed{}}{\boxed{}} + \frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}}$$

$\frac{17}{12}$

o

$$\frac{5}{12} + \frac{2}{5}$$

$$= \frac{\boxed{}}{\boxed{}} + \frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}}$$

$\frac{49}{60}$

4 Add these fractions.

a $\frac{1}{7} + \frac{2}{5}$

d $\frac{2}{5} + \frac{2}{3}$

g $\frac{3}{4} + \frac{2}{5}$

b $\frac{2}{5} + \frac{1}{7}$

$$\frac{19}{35}$$

e $\frac{1}{4} + \frac{2}{3}$

$$\frac{16}{15}$$

h $\frac{3}{40} + \frac{2}{5}$

$$\frac{23}{20}$$

c $\frac{2}{5} + \frac{2}{7}$

$$\frac{19}{35}$$

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

$$\frac{11}{12}$$

i $\frac{3}{40} + \frac{6}{10}$

$$\frac{19}{40}$$

$$\frac{24}{35}$$

$$\frac{17}{12}$$

$$\frac{27}{40}$$

5 Subtract these fractions.

a $\frac{2}{5} - \frac{1}{7}$

d $\frac{2}{3} - \frac{2}{5}$

g $\frac{3}{4} - \frac{2}{3}$

b $\frac{1}{7} - \frac{2}{5}$

$$\frac{9}{35}$$

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

$$\frac{4}{15}$$

h $\frac{3}{4} - \frac{2}{30}$

$$\frac{1}{12}$$

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

$$-\frac{9}{35}$$

f $\frac{2}{3} - \frac{3}{4}$

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

i $\frac{3}{4} - \frac{1}{15}$

$$\frac{41}{60}$$

$$\frac{4}{35}$$

$$-\frac{1}{12}$$

$$\frac{41}{60}$$

6 Add these fractions.

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

g $\frac{1}{4} + \frac{2}{5}$

m $\frac{4}{9} + \frac{2}{5}$

b $\frac{1}{8} + \frac{4}{8}$

h $\frac{1}{4} + \frac{3}{5}$

n $\frac{4}{9} + \frac{2}{7}$

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

i $\frac{1}{9} + \frac{3}{5}$

o $\frac{4}{9} + \frac{3}{7}$

d $\frac{1}{4} + \frac{1}{2}$

j $\frac{1}{9} + \frac{2}{5}$

p $\frac{3}{9} + \frac{3}{7}$

e $\frac{1}{4} + \frac{1}{3}$

k $\frac{2}{9} + \frac{2}{5}$

q $\frac{2}{9} + \frac{3}{7}$

f $\frac{1}{4} + \frac{1}{5}$

l $\frac{3}{9} + \frac{2}{5}$

r $\frac{x}{9} + \frac{3}{7}$

$\frac{3}{8}$

$\frac{13}{20}$

$\frac{38}{45}$

$\frac{5}{8}$

$\frac{17}{20}$

$\frac{46}{63}$

$\frac{5}{8}$

$\frac{32}{45}$

$\frac{55}{63}$

$\frac{3}{4}$

$\frac{23}{45}$

$\frac{16}{21}$

$\frac{7}{12}$

$\frac{28}{45}$

$\frac{41}{63}$

$\frac{9}{20}$

$\frac{11}{15}$

$\frac{7x+27}{63}$

7 A survey of Year 7 students' favourite sport is carried out.
One fifth reply that netball is their favourite, one-quarter rugby and one-third soccer.
The remainder of students leave the question unanswered.

a What fraction of the Year 7 students answered the survey question?

b What fraction of the Year 7 students left the question unanswered?

$\frac{47}{60}$

$\frac{13}{60}$

- 8 Seb reads $\frac{5}{36}$ of his book on Monday.
He reads $\frac{1}{9}$ of his book on Tuesday.
He reads $\frac{1}{6}$ of his book on Wednesday.
He reads the rest over the weekend.
How much of the book did he read over the weekend?

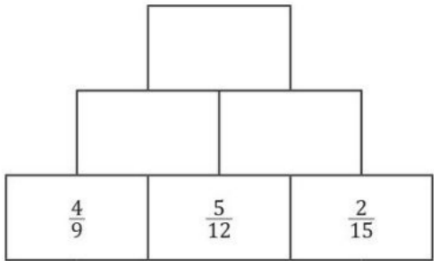
$\frac{7}{12}$

- 9 Work out
- $$\frac{3}{7} + \frac{4}{13} + \frac{5}{8} + \frac{9}{13} + \frac{4}{7} + \frac{1}{8}$$
- Explain the most efficient method.

Do operators with fractions that have like numerators. The answer is $2\frac{3}{4}$.

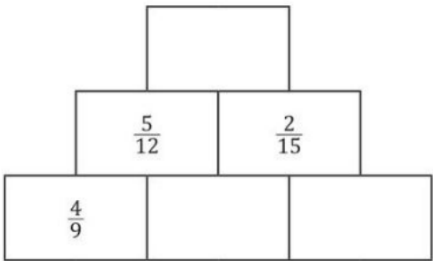
- 10 Complete these expression pyramids. Each brick is the sum of the two below it.

a



$\frac{16}{9}$
 $\frac{31}{36}, \frac{11}{20}$

b



$\frac{11}{20}$
 $-\frac{1}{36}, \frac{29}{180}$

- 11 A runner covered $\frac{5}{9}$ of a marathon in 2 hours, then $\frac{1}{8}$ in half an hour.
What fraction of the course has he covered?

$\frac{49}{72}$

- 12 A farmer sold $\frac{1}{3}$ of her cows then sent $\frac{2}{5}$ to another ranch for the winter.
What fraction of her herd is *left*?

$\frac{4}{15}$

- 13** Two milk bottles are partially filled. Both milk bottles can hold 0.9 litres.

One bottle is $\frac{3}{8}$ full and the other is $\frac{5}{12}$ full.

Is it possible to combine the two partially filled bottles into a single bottle without overflowing?

$$\frac{3}{8} + \frac{5}{12} = \frac{19}{24}$$

Yes, they can fit into a single bottle

- 14** There is a bag of sugar in a storage room. The bag contained $\frac{9}{10}$ kilograms of sugar.

The chef filled up a can with $\frac{1}{8}$ kilogram of sugar then used $\frac{3}{5}$ of a kilogram of sugar for cake.

How much sugar was left in the bag?

$$\frac{7}{40}$$

- 15** Find the missing denominators.

a $\frac{1}{5} + \frac{2}{\square} = \frac{1}{3}$

15

b $\frac{3}{\square} + \frac{5}{21} = \frac{2}{3}$

7

c $\frac{5}{12} - \frac{1}{\square} = \frac{1}{6}$

4

- 16** Fill in the empty boxes to make the equations correct.

a $\frac{1}{\square} + \frac{1}{\square} = \frac{7}{10}$

2, 5

b $\frac{1}{\square} + \frac{1}{\square} + \frac{1}{\square} = \frac{7}{8}$

2, 4, 8

c $\frac{3}{\square} + \frac{\square}{4} = \frac{17}{20}$

5, 1

d $\frac{2}{\square} + \frac{\square}{3} + \frac{4}{\square} = 1$

6, 1, 12

FRACTION ADDITION: MIXED NUMBERS

- To add or subtract mixed numbers:
 - Convert mixed numbers to improper fractions using the rule:

$$a\frac{b}{n} = \frac{a \times n + b}{n}$$

- Make the denominators the same.
- Add or subtract the numerators.
- Simplify if possible.

Example Add and subtract mixed numbers.

	$4\frac{1}{5} + 2\frac{3}{10}$		$3\frac{1}{4} - 2\frac{1}{3}$
1. Convert to improper	$\frac{21}{5} + \frac{23}{10}$	1. Convert to improper	$\frac{13}{4} - \frac{7}{3}$
2. Same denominators	$\frac{42}{10} + \frac{23}{10}$	2. Same denominators	$\frac{39}{12} - \frac{28}{12}$
3. Add numerators	$\frac{65}{10}$	3. Subtract numerators	$\frac{11}{12}$
4. Simplify	$\frac{13}{2} = 6\frac{1}{2}$		

a

$$2\frac{3}{4} + 1\frac{2}{8}$$

$$= \frac{3}{4} + \frac{2}{8}$$

$$= \frac{3}{8} + \frac{2}{8}$$

$$=$$

4

b

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

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

$$= - - -$$

$$=$$

$$\frac{29}{20} = 1\frac{9}{20}$$

c

$$3\frac{2}{5} - 2\frac{3}{4}$$

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

$$= - - -$$

$$=$$

$$\frac{13}{20}$$

d

$$1\frac{2}{3} + 6\frac{1}{2}$$

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

$$=$$

$$\frac{49}{6} = 8\frac{1}{6}$$

Key ideas

- To add and subtract fractions, the must be the same.
- To make the denominators the same, determine a of the denominators.
- When operating with mixed numbers, it is best to convert them to

1 Add and subtract these mixed numbers.

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

= $\frac{\square}{3} + \frac{\square}{4}$ Change to improper fractions

= $\frac{\square}{12} + \frac{\square}{12} = \frac{\square}{12} = \square \frac{\square}{12}$

Create equivalent fractions Total Write as mixed numeral

$5\frac{5}{12}$

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

= $\frac{\square}{5} + \frac{\square}{2}$

= $\frac{\square}{10} + \frac{\square}{10} = \frac{\square}{10} = \square \frac{\square}{10}$

$6\frac{3}{10}$

c $2\frac{3}{4} - 1\frac{2}{5}$

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

= $\frac{\square}{20} - \frac{\square}{20} = \frac{\square}{20} = \square \frac{\square}{20}$

$1\frac{7}{20}$

d $3\frac{7}{10} - 1\frac{4}{5}$

= $\frac{\square}{10} - \frac{\square}{5}$

= $\frac{\square}{10} - \frac{\square}{10} = \frac{\square}{10} = \square \frac{\square}{10}$

$1\frac{9}{10}$

e $1\frac{1}{5} + 1\frac{2}{7}$

= $\frac{\square}{5} + \frac{\square}{7}$

= $\frac{\square}{35} + \frac{\square}{35} = \frac{\square}{35} = \square \frac{\square}{35}$

$2\frac{17}{35}$

f $2\frac{3}{4} + 3\frac{2}{12}$

= $\frac{\square}{4} + \frac{\square}{12}$

= $\frac{\square}{12} + \frac{\square}{12} = \frac{\square}{12} = \square \frac{\square}{12}$

$5\frac{11}{12}$

2 Add and subtract these fractions.

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

$2\frac{5}{6}$

b $1\frac{1}{2} + 1\frac{1}{4}$

$2\frac{3}{4}$

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

$2\frac{7}{10}$

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

$3\frac{7}{10}$

e $2\frac{1}{7} + 1\frac{1}{3}$

f $2\frac{1}{7} - 1\frac{1}{3}$

g $2\frac{1}{2} - 1\frac{1}{3}$

h $2\frac{1}{2} - 1\frac{1}{4}$

i $2\frac{1}{2} - 2\frac{1}{4}$

$3\frac{10}{21}$

j $2\frac{1}{4} - 2\frac{1}{2}$

$\frac{17}{21}$

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

$1\frac{1}{6}$

l $3\frac{1}{5} + 2\frac{1}{2}$

$1\frac{1}{4}$

$\frac{1}{4}$

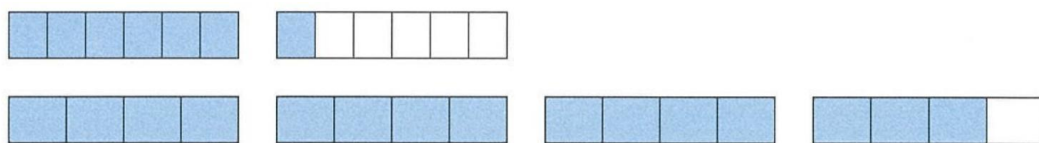
$-\frac{1}{4}$

$\frac{7}{10}$

$5\frac{7}{10}$

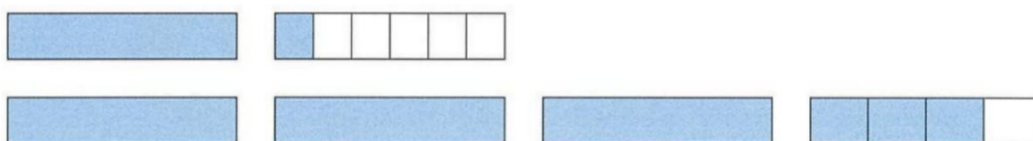
3

- a Work out $1\frac{1}{6} + 3\frac{3}{4}$ by converting each mixed number into an improper fraction.



$$\begin{aligned} 1\frac{1}{6} + 3\frac{3}{4} \\ &= \frac{7}{6} + \frac{15}{4} \\ &= \frac{14}{12} + \frac{45}{12} \\ &= \frac{59}{12} \\ &= 4\frac{11}{12} \end{aligned}$$

- b Work out $1\frac{1}{6} + 3\frac{3}{4}$ by first adding the wholes and then adding the fractions.



$$\begin{aligned} 1 + 3 + \frac{1}{6} + \frac{3}{4} \\ &= 4 + \frac{2}{12} + \frac{9}{12} \\ &= 4\frac{11}{12} \end{aligned}$$

- c Which method do you prefer?

The second method is a bit easier as you work with smaller numbers.

- 4 It is also possible to subtract fractions by subtracting the wholes, subtracting the parts.

Worked Example	Your Turn
$5\frac{2}{10} - 4\frac{3}{10}$ $5 - 4 = 1$ $\frac{2}{10} - \frac{3}{10} = -\frac{1}{10}$ So, the answer is $1 - \frac{1}{10} = \frac{9}{10}$	$4\frac{1}{5} - 2\frac{3}{5}$

8
5

5 Use your preferred method to answer these questions.

a

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

$$4\frac{7}{12}$$

b

$$3\frac{2}{7} + 1\frac{2}{5}$$

$$4\frac{24}{35}$$

c

$$4\frac{7}{9} + 3\frac{2}{3}$$

$$8\frac{4}{9}$$

d

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

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

e

$$3\frac{7}{12} - 1\frac{3}{8}$$

$$2\frac{5}{24}$$

f

$$2\frac{4}{5} - 2\frac{7}{9}$$

$$\frac{1}{45}$$

g

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

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

h

$$3\frac{1}{5} + 1\frac{7}{15}$$

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

i

$$5\frac{1}{10} + 6\frac{7}{15}$$

$$11\frac{17}{30}$$

j

$$12\frac{3}{10} + 23\frac{7}{15}$$

$$35\frac{23}{30}$$

k

$$9\frac{3}{4} + 10\frac{5}{6}$$

$$20\frac{7}{12}$$

l

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

$$7\frac{4}{15}$$

m

$$5\frac{3}{10} - 3\frac{1}{5}$$

$$2\frac{1}{10}$$

n

$$6\frac{7}{15} - 1\frac{1}{5}$$

$$5\frac{4}{15}$$

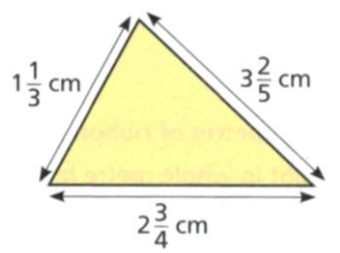
o

$$3\frac{7}{15} - 2\frac{1}{10}$$

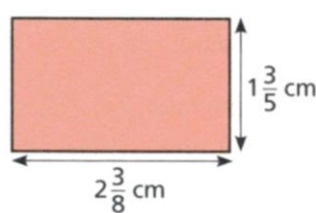
$$1\frac{11}{30}$$

6 Work out the perimeter of each shape.

a



b



$$7\frac{29}{60}$$

$$7\frac{19}{20}$$

7 Martine ran for $2\frac{1}{4}$ kilometres, walked for $5\frac{2}{5}$ kilometres, and skipped for $\frac{1}{2}$ a kilometre. What was the total distance that Martine ran, walked, and skipped?

$$8\frac{3}{20}$$

8 Ed is calculating $3\frac{2}{5} - 1\frac{7}{8}$

He says: First I'll subtract the wholes, then I'll subtract the fractions.

a Complete the subtraction using Ed's method.

$$1\frac{21}{40}$$

b Check your answer by redoing the question using the improper fractions method.

9 Alexis runs part of a journey then walks the rest. She runs $4\frac{6}{7}$ km then walks for $2\frac{3}{4}$ km.

a How far is the journey altogether?

$$7\frac{17}{28}$$

b How much further does she run than walk?

$$2\frac{3}{28}$$

10 Find the missing numbers to make the equations true.

a

$$\frac{1}{\square} - \frac{1}{\square} = \frac{1}{12}$$

4, 3

b

$$\frac{\square}{5} - \frac{\square}{2} = \frac{1}{10}$$

3, 1

c

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

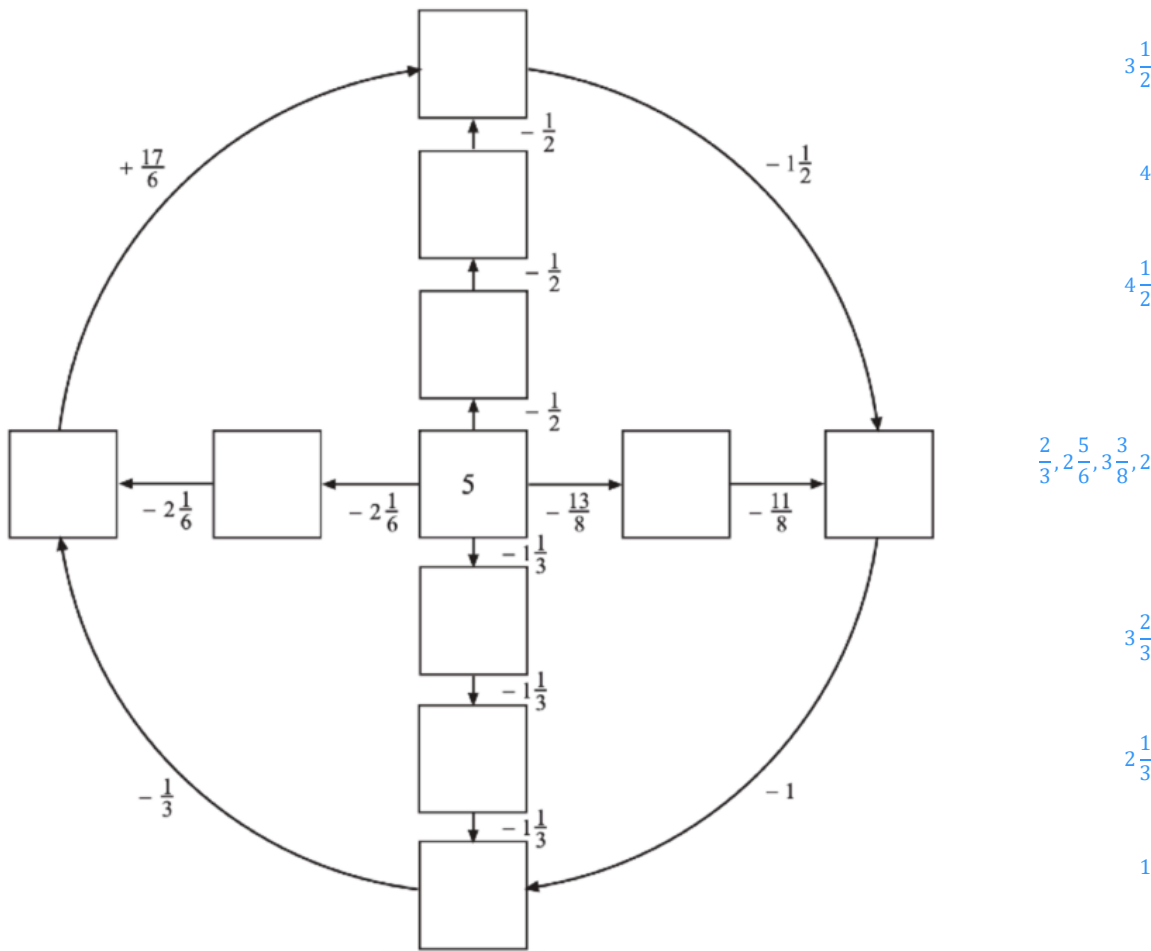
1, 2

d

$$8\frac{1}{\square} - 6\frac{\square}{4} = 1\frac{1}{2}$$

4, 3

11 Fill in the diagram. Start from the centre and work outwards.



12 Consider the number line below.



a C lies halfway between A and B. Determine the value of C.

3 3/5

b B lies halfway between A and C. Determine the value of B.

6 9/10

13 Calculate the following:

a $1 - \frac{11}{12}$ $\frac{1}{12}$	b $\frac{11}{12} - 1$ $-\frac{1}{12}$	c $-1 + \frac{11}{12}$ $-\frac{1}{12}$	d $\frac{11}{12} - (-1)$ $\frac{23}{12}$
e $2 - \frac{7}{5}$ $\frac{3}{5}$	f $\frac{7}{5} - 2$ $-\frac{3}{5}$	g $-2 - \frac{7}{5}$ $-\frac{17}{5}$	h $-2 + \frac{7}{5}$ $-\frac{3}{5}$
i $5 - \frac{17}{5}$ $\frac{8}{5}$	j $\frac{17}{9} - 5$ $-\frac{28}{9}$	k $-5 - \frac{17}{9}$ $-\frac{62}{9}$	l $-\frac{17}{9} - 5$ $-\frac{62}{9}$
m $-\frac{6}{7} + \frac{2}{7}$ $-\frac{4}{7}$	n $-\frac{5}{9} - \frac{2}{9}$ $-\frac{7}{9}$	o $\frac{1}{3} + \left(-\frac{2}{3}\right)$ $-\frac{2}{3}$	p $\frac{1}{4} - \left(-\frac{5}{4}\right)$ $\frac{3}{2}$
q $\frac{1}{4} + \left(-\frac{1}{3}\right)$ $-\frac{1}{12}$	r $\frac{1}{2} - \left(-\frac{3}{5}\right)$ $\frac{11}{10}$	s $-\frac{3}{2} - \left(-\frac{5}{4}\right)$ $-\frac{1}{4}$	t $-\frac{7}{5} - \left(-1\frac{1}{4}\right)$ $-\frac{3}{20}$
u $\frac{13}{5} - \left(-\frac{17}{5}\right)$ 6	v $-\frac{7}{13} + \left(-4\frac{2}{3}\right)$ $-\frac{203}{39}$	w $-\frac{8}{3} - \left(-2\frac{2}{5}\right)$ $-\frac{4}{15}$	x $-\frac{3}{2} - \left(-\frac{5}{2}\right)$ 1

MIXED PRACTICE

FOUNDATION

1 Complete the following.

$$\begin{aligned} \text{a} \quad & \frac{2}{3} + \frac{1}{4} \\ &= \frac{8}{12} + \frac{\square}{12} \\ &= \frac{11}{\square} \end{aligned}$$

$$\begin{aligned} \text{b} \quad & \frac{7}{8} - \frac{9}{16} \\ &= \frac{\square}{16} - \frac{9}{16} \\ &= \frac{\square}{16} \end{aligned}$$

$$\begin{aligned} \text{c} \quad & 1\frac{4}{7} \times \frac{3}{5} \\ &= \frac{\square}{7} \times \frac{3}{5} \\ &= \frac{\square}{35} \end{aligned}$$

$$\begin{aligned} \text{d} \quad & \frac{5}{7} \div \frac{2}{3} \\ &= \frac{5}{7} \square \frac{3}{2} \\ &= \frac{15}{\square} = \square \frac{\square}{14} \end{aligned}$$

2 Complete the following.

$$\begin{aligned} \text{a} \quad & \frac{3}{10} + \frac{2}{5} \\ &= \frac{3}{10} + \frac{\square}{10} \\ &= \square \end{aligned}$$

$$\begin{aligned} \text{b} \quad & \frac{1}{2} - \frac{3}{8} \\ &= \frac{\square}{8} - \frac{3}{8} \\ &= \frac{\square}{8} \end{aligned}$$

$$\begin{aligned} \text{c} \quad & 1\frac{1}{2} + \frac{1}{4} \\ &= 1\frac{2}{\square} + \frac{1}{4} \\ &= 1\frac{\square}{\square} \end{aligned}$$

3 Work out the following, using your knowledge of FDP conversions.

a

$$7.36 + \frac{17}{10}$$

b

$$7.36 + \frac{17}{100}$$

c

$$7.36 + \frac{17}{1000}$$

d

$$7.36 + \frac{17}{10\,000}$$

e

$$6.72 - \frac{8}{10}$$

f

$$6.72 - \frac{8}{100}$$

g

$$6.72 - \frac{3}{5}$$

h

$$6.72 - \frac{3}{4}$$

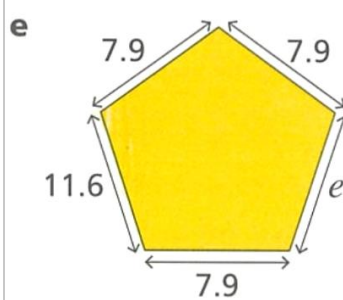
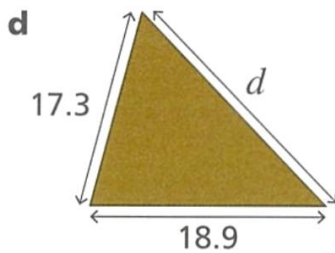
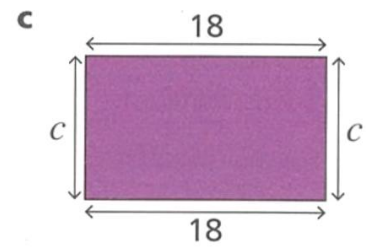
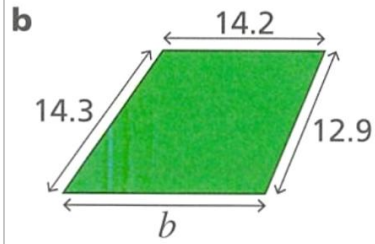
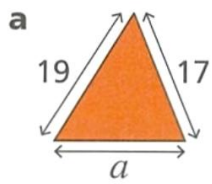
4 Work out

a	b	c	d
$1 - \frac{11}{12}$	$\frac{11}{12} - 1$	$-1 + \frac{11}{12}$	$\frac{11}{12} - (-1)$
e	f	g	h
$2 - \frac{7}{5}$	$\frac{7}{5} - 2$	$-2 + \frac{7}{5}$	$-2 + \frac{7}{5}$
i	j	k	l
$5 - \frac{17}{9}$	$\frac{17}{9} - 5$	$-5 - \frac{17}{9}$	$-\frac{17}{9} - 5$

5 Calculate the numbers in the empty boxes by adding the adjacent boxes.
Answer as either a fraction, decimal, or percentage.

		0.2		$\frac{9}{20}$		
	$\frac{1}{2}$		30%		15%	
$\frac{1}{4}$		$\frac{1}{5}$		0.1		$2\frac{1}{4}$
	$66\frac{2}{3}\%$		$33\frac{1}{3}\%$		35%	
50%		0.6		$\frac{2}{5}$		0.75
	14%		0.9		1.2	
		2%		6%		

- 6 All of these shapes have perimeter 50 cm. Find the lengths of the missing sides.
All lengths are given in centimetres.



- 7 A jug contains $2\frac{1}{2}$ litres of juice. Marta pours herself 0.75 of a litre of juice from the jug. Ed pours himself $\frac{2}{5}$ of a litre of juice from the jug. How much juice is left in the jug?

- 8 Use the fact that $4 + 9 = 13$ to work out

a $400 + 900$

b $0.4 + 0.9$

c $\frac{9}{100} + 0.04$

d $\frac{9}{10} + 0.4$

- 9 Calculate the following.

a $6.72 + \frac{8}{100}$

b $6.72 + \frac{8}{10}$

c $6.72 + 8$

d $6.72 + \frac{3}{4}$

10 Add these numbers.

a

$$\frac{4}{10} + \frac{3}{10}$$

b

$$0.4 + \frac{3}{10}$$

c

$$0.4 + \frac{30}{100}$$

d

$$0.4 + \frac{3}{100}$$

e

$$0.04 + \frac{3}{100}$$

f

$$0.04 - \frac{3}{100}$$

g

$$\frac{40}{100} - \frac{3}{100}$$

h

$$\frac{40}{100} - 0.33$$

i

$$\frac{4}{10} - \frac{33}{100}$$

j

$$0.44 + \frac{7}{100} + \frac{3}{10}$$

k

$$0.44 + \frac{7}{10} + \frac{3}{100}$$

l

$$1 - \frac{7}{10} - \frac{3}{100}$$

m

$$1 - \left(\frac{7}{10} + \frac{3}{100} \right)$$

n

$$1 - \frac{7}{10} + \frac{3}{100}$$

o

$$0.76 - 0.3 + \frac{4}{100}$$

p

$$0.76 - \left(0.4 + \frac{3}{10} \right)$$

q

$$0.76 - \left(0.49 + \frac{3}{10} \right)$$

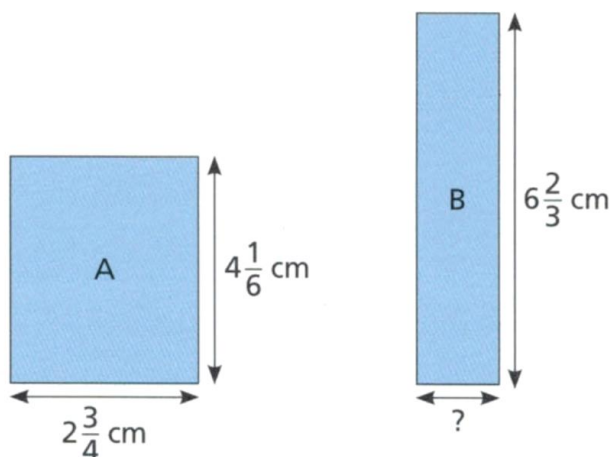
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$$0.49 - \left(0.76 + \frac{3}{10} \right)$$

11 Complete the addition table.

+		0.05		
0.3				1.72
0.75			1.13	
	1.21		1.58	
				3.03

- 12 Rectangles A and B have the same perimeter. Find the missing length.



- 13 Find the missing numbers.

a $\frac{1}{\square} - \frac{1}{\square} = \frac{1}{12}$

b $\frac{\square}{5} - \frac{\square}{2} = \frac{1}{10}$

c $2\frac{\square}{3} - 1\frac{\square}{3} = \frac{2}{3}$

d $8\frac{1}{\square} - 6\frac{\square}{4} = 1\frac{1}{2}$

- 14 Fill in the missing numbers to make the calculation true.

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

a $\frac{\square}{4} \times \frac{5}{6} = \frac{\square}{12}$

b $\frac{11}{7} - \frac{\square}{3} = \frac{5}{21}$

b $\frac{\square}{21} \div \frac{3}{7} = 2$

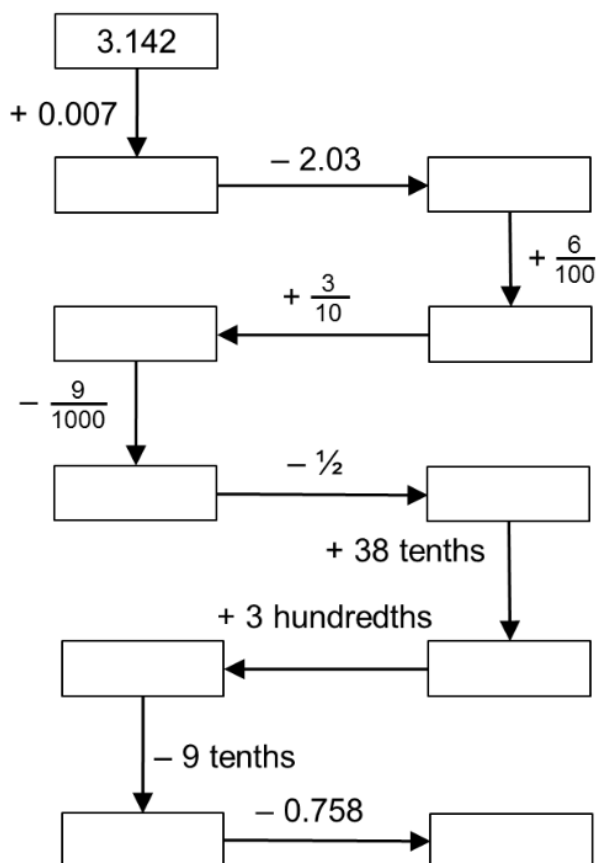
c $\frac{1}{\square} + \frac{\square}{3} = \frac{13}{15}$

c $\frac{2}{\square} + \frac{\square}{5} = \frac{2}{5}$

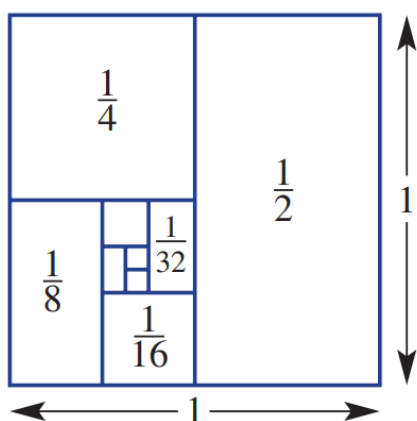
d $5\frac{\square}{4} - 3\frac{\square}{2} = 1\frac{3}{4}$

d $1\frac{1}{4} \times \square\frac{\square}{\square} = 4\frac{1}{12}$

- 15 Complete the diagram. What do you notice about your answer?



- 16 The square given below, which has an area of 1 unit, is divided to show the areas of $\frac{1}{2}, \frac{1}{4}, \frac{1}{8} \dots$



- a Write the next 5 numbers in this number pattern.

$$\frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \dots, \dots, \dots$$

- b What is the total area of the starting square?

- c What does that tell you about the total of

$$\frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \dots \text{(forever)}$$

CHECK YOUR UNDERSTANDING

Adding and subtracting fractions same denominator

1 What is $\frac{3}{9} + \frac{2}{9}$

a $\frac{5}{18}$

b $\frac{6}{9}$

c $\frac{5}{9}$

d $\frac{6}{81}$

2 What is $\frac{2}{7} + \frac{3}{7}$

a $\frac{5}{7}$

b $\frac{5}{14}$

c $\frac{6}{7}$

d $\frac{6}{49}$

3 What is $\frac{7}{11} - \frac{3}{11}$

a $\frac{5}{11}$

b $\frac{2}{11}$

c $\frac{4}{11}$

d $\frac{10}{11}$

4 What is $\frac{3}{5}$ more than $\frac{4}{5}$

a $\frac{4}{5}$

b $\frac{3}{5}$

c $\frac{7}{5}$

d $\frac{1}{5}$

5 What is the difference between $\frac{10}{3}$ and $\frac{2}{3}$

a $\frac{10}{3}$

b $\frac{2}{3}$

c $\frac{12}{3}$

d $\frac{8}{3}$

Adding and subtracting fractions related denominator

1	Complete the equation: $\frac{3}{5} - \frac{5}{10} = \frac{?}{10}$	a	11	b	4	c	1	d	2
2	Work out: $\frac{1}{4} + \frac{5}{12}$	a	$\frac{5}{16}$	b	$\frac{8}{12}$	c	$\frac{6}{16}$	d	$\frac{6}{12}$
3	Work out: $\frac{3}{12} + \frac{1}{3}$	a	$\frac{7}{12}$	b	$\frac{4}{12}$	c	$\frac{4}{15}$	d	$\frac{4}{24}$
4	Work out: $\frac{1}{2} + \frac{1}{10}$	a	$\frac{1}{20}$	b	$\frac{1}{12}$	c	$\frac{3}{5}$	d	$\frac{1}{8}$
5	Work out: $1 - \frac{7}{11}$	a	$\frac{6}{11}$	b	$\frac{18}{11}$	c	$\frac{4}{11}$	d	$\frac{6}{10}$
6	Complete the equation: $\frac{3}{10} + ? = \frac{37}{100}$	a	$\frac{7}{10}$	b	$\frac{7}{100}$	c	$\frac{3}{10}$	d	$\frac{3}{100}$
7	Complete the equation: $\frac{87}{100} = ? + \frac{8}{10}$	a	$\frac{70}{100}$	b	$\frac{87}{100}$	c	$\frac{7}{100}$	d	$\frac{80}{100}$

Adding and subtracting fractions unrelated denominator

1	Complete the equation: $\frac{1}{2} + \frac{1}{9} = \frac{?}{18}$	a 10	b 3	c 11	d 2
2	Work out: $\frac{3}{4} - \frac{1}{3}$	a $\frac{2}{12}$	b $\frac{5}{12}$	c $\frac{2}{1}$	d $\frac{9}{4}$
3	Work out: $\frac{1}{3} + \frac{2}{5}$	a $\frac{3}{8}$	b $\frac{3}{15}$	c $\frac{11}{30}$	d $\frac{11}{15}$
4	Work out: $\frac{2}{5} + \frac{3}{7}$	a $\frac{5}{12}$	b $\frac{6}{35}$	c $\frac{29}{35}$	d $\frac{5}{7}$
5	Work out: $\frac{5}{6} + \frac{11}{9}$	a $2\frac{1}{18}$	b $\frac{8}{9}$	c $1\frac{17}{18}$	d $1\frac{1}{15}$
6	Work out: $\frac{8}{9} - \frac{1}{3}$	a $\frac{11}{9}$	b $\frac{5}{9}$	c $\frac{7}{9}$	d $\frac{7}{6}$

Adding and subtracting mixed numbers

1 $7\frac{8}{9} + 3\frac{4}{9}$

a $10\frac{4}{3}$

b $4\frac{4}{9}$

c $11\frac{1}{3}$

d $4\frac{2}{9}$

2 $2\frac{5}{9} - 1\frac{1}{3}$

a $1\frac{2}{3}$

b $1\frac{4}{9}$

c $1\frac{2}{9}$

d $3\frac{8}{9}$

3 $4\frac{8}{15} + 3\frac{2}{3}$

a $7\frac{18}{15}$

b $\frac{13}{15}$

c $7\frac{5}{9}$

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

4 $6\frac{3}{4} + 3\frac{1}{5}$

a $3\frac{1}{10}$

b $3\frac{11}{20}$

c $3\frac{7}{10}$

d $9\frac{19}{20}$

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

a $\frac{23}{24}$

b $4\frac{17}{24}$

c 2

d $1\frac{1}{24}$

6 $4\frac{1}{5} - 2\frac{1}{4}$

a $2\frac{-1}{20}$

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

c 2

d $1\frac{1}{24}$