

Student Name

Mathematics Stage 4

FRACTIONS DECIMALS PERCENTAGES

Book 8 Solve problems that involve the
multiplication and division of
fractions and decimals

Version: 260207

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OVERVIEW

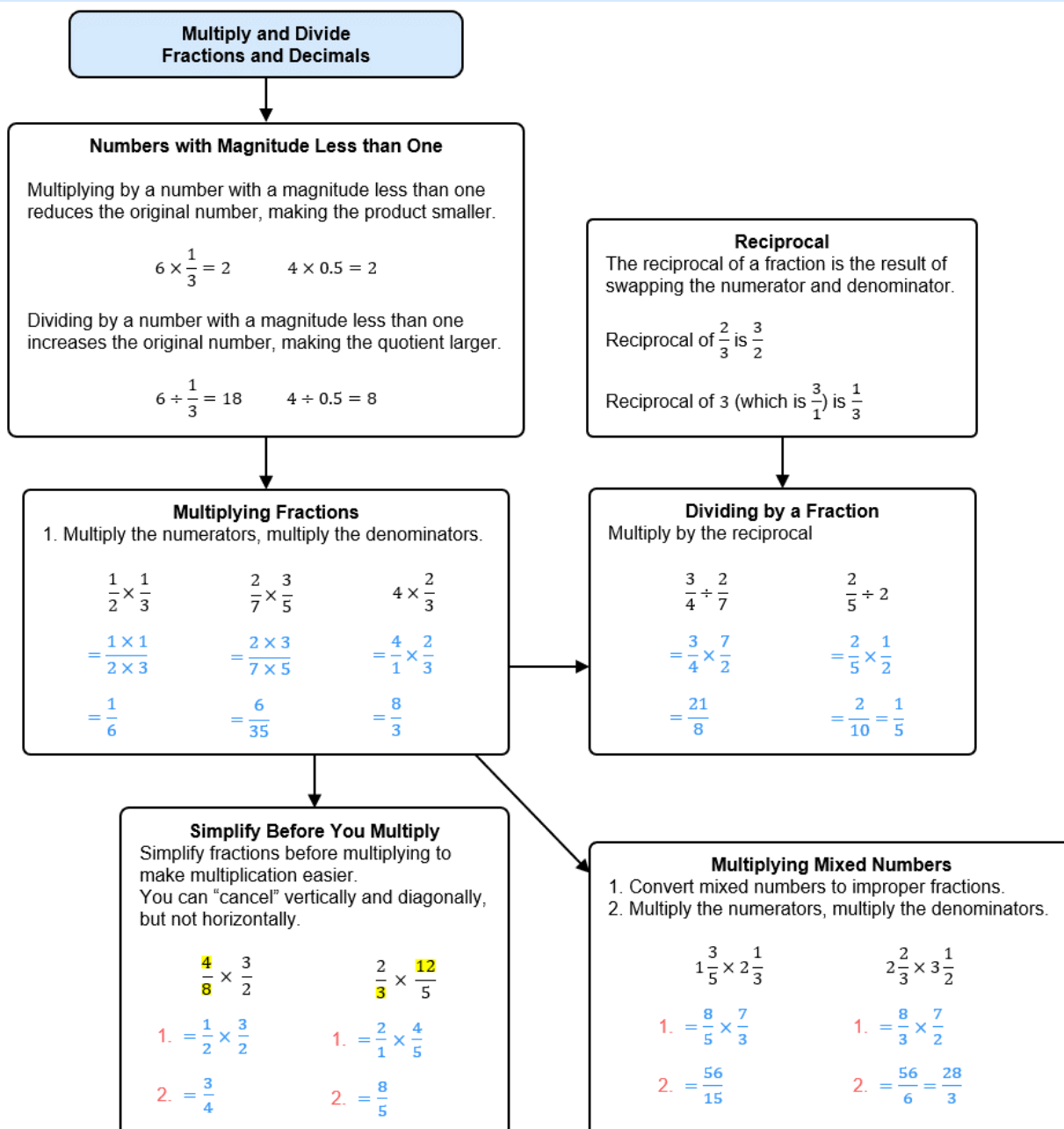
SYLLABUS CONTENT

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

Solve problems that involve the multiplication and division of fractions and decimals

- Compare and generalise the effect of multiplying or dividing by a number with magnitude between zero and one
- Represent multiplication and division of decimals
- Represent multiplication and division of fractions, including mixed numbers
- Multiply and divide decimals, using digital tools to solve problems
- Multiply and divide fractions and mixed numbers, with and without using digital tools to solve problems
- Compare initial estimates with the results of calculations
- Apply knowledge of fractions and decimals of quantities to solve problems
- Apply knowledge of multiplication and division of fractions and decimals to solve problems

SUMMARY



REVIEW OF PRIOR KNOWLEDGE

1 Find these products:

a 12×6

b 7×9

c 3×15

d 11×8

e 5×26

f 6×8

2 Complete these calculations:

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

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

c $\frac{2}{11} + \frac{2}{11} + \frac{2}{11}$

3 Convert these mixed numbers to improper fractions.

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

b $6\frac{1}{4}$

c $7\frac{6}{11}$

4 Simplify these fractions.

a $\frac{15}{20}$

b $\frac{12}{15}$

c $\frac{24}{40}$

d $\frac{36}{90}$

e $\frac{25}{5}$

f $\frac{80}{16}$

5 What is $\frac{1}{2}$ of 2?

6 What is $\frac{1}{2}$ of 1?

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

8 Convert these fractions to improper fractions.

a $1\frac{6}{7}$

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

c $10\frac{9}{13}$

d $8\frac{5}{6}$

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

f $13\frac{3}{4}$

9 Convert these fractions to mixed numbers.

a $\frac{9}{4}$

b $\frac{32}{5}$

c $\frac{76}{8}$

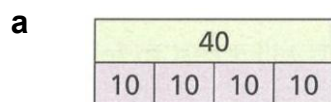
d $\frac{50}{4}$

e $\frac{18}{9}$

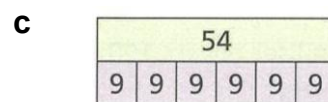
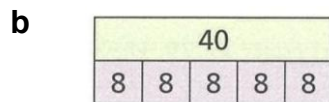
f $\frac{103}{9}$

1 Which two division calculations can be seen from each bar model?

The first one has been done for you.



$40 \div 4 = 10$
 $40 \div 10 = 4$



2 Complete each fraction so that it is equivalent to one whole.

a $\frac{\square}{5}$

b $\frac{7}{\square}$

c $\frac{\square}{10}$

d $\frac{\square}{19}$

e $\frac{135}{\square}$

f $\frac{\square}{999}$

3 Complete each equivalent fraction.

a $\frac{7}{8} = \frac{\square}{16}$

b $\frac{5}{9} = \frac{\square}{27}$

c $\frac{\square}{6} = \frac{5}{30}$

d $\frac{\square}{21} = \frac{3}{7}$

e $\frac{3}{4} = \frac{\square}{20}$

f $\frac{\square}{10} = \frac{35}{50}$

MULTIPLYING BY RATIONAL NUMBERS

- When you multiply a number by:
 - A number less than 1, your answer is smaller than your starting number.
 - The number 1, your answer equals your starting number.
 - A number greater than 1, your answer is larger than your starting number.

FOUNDATION

1 Using a calculator, or mentally, complete the table.

Original number	Multiplier	Product	Smaller, equal, or larger compared to original?		
12	$\times 0.5$	= 6	smaller	equal	larger
7	$\times 1$	=	smaller	equal	larger
15	$\times 1.5$	=	smaller	equal	larger
20	$\times 0.2$	=	smaller	equal	larger
10	$\times 2.5$	=	smaller	equal	larger
5	$\times 0.2$	=	smaller	equal	larger
40	$\times 0.9$	=	smaller	equal	larger
6	$\times 1.1$	=	smaller	equal	larger
12	$\times \frac{1}{3}$	=	smaller	equal	larger
20	$\times \frac{3}{4}$	=	smaller	equal	larger
40	$\times \frac{8}{8}$	=	smaller	equal	larger
6	$\times \frac{5}{4}$	=	smaller	equal	larger
15	$\times \frac{11}{5}$	=	smaller	equal	larger
16	$\times \frac{13}{13}$	=	smaller	equal	larger

2 Complete these sentences:

Word bank (reusing allowed): less, greater, smaller, equal, proper, improper, one

When we multiply numbers, the result depends on the multiplier involved.

If we multiply a number by a number that is than 1, such as a fraction like $\frac{3}{4}$ or a decimal like 0.8, the product will always be than the original number.

If we multiply a number by a factor than 1, such as an fraction like $\frac{5}{4}$ or a whole number greater than 1, the product will always be than the original number.

When we multiply a number by exactly the product is to the original number.

This is true whether we express 1 as a whole number, a fraction like $\frac{5}{5}$, or a decimal like 1.00.

3 Predict whether the product will be smaller than, equal to, or larger than the original.

Multiplier	Smaller, equal, or larger compared to original?		
$\times 0.99$	smaller	equal	larger
$\times 1.01$	smaller	equal	larger
$\times 1.0$	smaller	equal	larger
$\times 2.35$	smaller	equal	larger
$\times 0.82$	smaller	equal	larger
$\times \frac{89}{100}$	smaller	equal	larger
$\times \frac{7}{4}$	smaller	equal	larger
$\times \frac{19}{19}$	smaller	equal	larger
$\times \frac{3}{2}$	smaller	equal	larger
$\times \frac{5}{6}$	smaller	equal	larger

DIVIDING BY RATIONAL NUMBERS

- When you divide a number by:
 - A number less than 1, your answer is larger than your starting number.
 - The number 1, your answer equals your starting number.
 - A number greater than 1, your answer is smaller than your starting number.

FOUNDATION

1 Using a calculator, or mentally, complete the table.

Original number	Divisor	Quotient	Smaller, equal, or larger compared to original?		
6	$\div 0.5$	= 12	smaller	equal	larger
7	$\div 1$	=	smaller	equal	larger
15	$\div 1.5$	=	smaller	equal	larger
4	$\div 0.2$	=	smaller	equal	larger
25	$\div 2.5$	=	smaller	equal	larger
2	$\div 0.2$	=	smaller	equal	larger
36	$\div 0.9$	=	smaller	equal	larger
6.6	$\div 1.1$	=	smaller	equal	larger
8	$\div \frac{2}{3}$	=	smaller	equal	larger
15	$\div \frac{3}{4}$	=	smaller	equal	larger
30	$\div \frac{4}{4}$	=	smaller	equal	larger
9	$\div \frac{5}{4}$	=	smaller	equal	larger
16	$\div \frac{11}{8}$	=	smaller	equal	larger
13	$\div \frac{2}{2}$	=	smaller	equal	larger

2 Complete these sentences:

Word bank: less, greater, smaller, equal, proper, improper, one, opposite

When we divide numbers, the result depends on the divisor involved.

If we divide a number by a number that is than 1, such as a fraction like $\frac{3}{4}$ or a decimal like 0.8, the quotient will always be than the original number.

If we divide a number by a number than 1, such as an fraction like $\frac{5}{4}$ or a whole number greater than 1, the quotient will always be than the original number.

When we divide a number by exactly the quotient is to the original number. This is true whether we express 1 as a whole number, a fraction like $\frac{5}{5}$, or a decimal like 1.00.

It's important to note that these rules for division are the of those for multiplication. While multiplication by a number less than 1 makes the result smaller, division by a number less than 1 makes the result larger.

4 Predict whether the quotient will be smaller than, equal to, or larger than the original.

Multiplier	Smaller, equal, or larger compared to original?		
$\div 0.5$	smaller	equal	larger
$\div 1.6$	smaller	equal	larger
$\div 1.0$	smaller	equal	larger
$\div 3.21$	smaller	equal	larger
$\div 0.26$	smaller	equal	larger
$\div \frac{28}{41}$	smaller	equal	larger
$\div \frac{8}{3}$	smaller	equal	larger
$\div \frac{23}{23}$	smaller	equal	larger
$\div \frac{3}{2}$	smaller	equal	larger
$\div \frac{5}{9}$	smaller	equal	larger

MULTIPLYING FRACTIONS AND INTEGERS

- When multiplying a fraction and a whole number, we can think of it as repeated addition.

Multiplying Fractions by Whole Numbers

$$\frac{a}{b} \times c = \frac{a \times c}{b}$$

Example Multiply fractions using visual models.

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



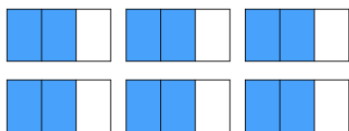
$$= \frac{6}{5}$$



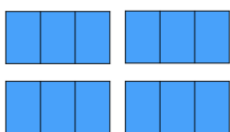
Why does the denominator not change when multiplying fractions by whole numbers?

Multiplying by a whole number means repeated; when we fractions, we do not change the denominator.

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



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



$$= 4$$

Why does the order not matter when multiplying integers and fractions?

We can numbers in any order and the answer is the same.

$$\mathbf{a} \quad \frac{3}{4} \times 3$$



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



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

$$\mathbf{b} \quad 5 \times \frac{3}{5}$$

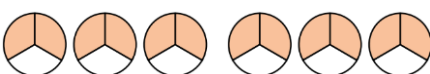


$$= \frac{15}{5}$$

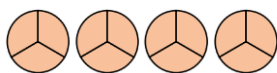


$$3$$

$$\mathbf{c} \quad 6 \times \frac{2}{3}$$



$$=$$

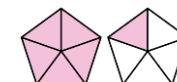


$$4$$

$$\mathbf{d} \quad \frac{2}{5} \times 3$$



$$=$$



$$\frac{6}{5} = 1\frac{1}{5}$$

e

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

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

f

$$\frac{2}{3} \times 13$$

$$\frac{26}{3} = 8\frac{2}{3}$$

Key ideas

- To multiply a fraction by an integer, we can multiply the integer by the of the fraction and keep the denominator the same.

1 Multiply these fractions using the diagrams.

a

$$\frac{1}{6} \times 4$$



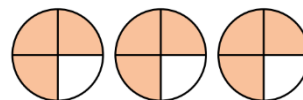
$$= \frac{4}{6}$$



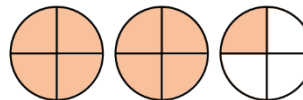
$$\frac{4}{6} = \frac{2}{3}$$

b

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



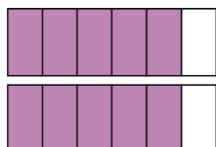
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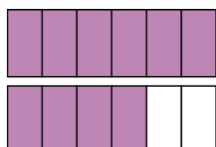
$$\frac{9}{4} = 2\frac{1}{4}$$

c

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



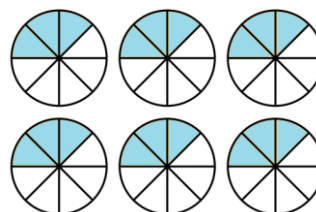
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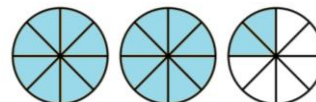
$$\frac{10}{6} = \frac{5}{3}$$

d

$$6 \times \frac{3}{8}$$



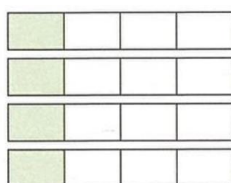
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$$\frac{18}{8} = \frac{9}{4} = 2\frac{1}{4}$$

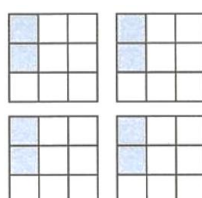
2 Write down the multiplication represented in each diagram and write down the answer.

a



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

b



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

c



$$\frac{3}{10} \times 2 = \frac{6}{10} = \frac{3}{5}$$

3 Multiply these fractions.

a

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

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

b

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

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

c

$$\frac{1}{16} \times 3$$

$$\frac{3}{16}$$

d

$$7 \times \frac{1}{19}$$

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

e

$$\frac{1}{100} \times 9$$

$$\frac{9}{100}$$

f

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

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

g

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

$$\frac{6}{7}$$

h

$$3 \times \frac{5}{13}$$

$$\frac{15}{13} = 1\frac{2}{13}$$

i

$$\frac{2}{19} \times 7$$

$$\frac{14}{19}$$

- 4 Read the example carefully and answer the questions.



Name: Eric

Solve.

$$\frac{4}{6} \times 5 = \frac{20}{30}$$

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

$$\frac{4}{6} \times \frac{5}{5} = \frac{20}{30}$$

What whole number is equivalent to $\frac{5}{5}$?

1

Why is it not correct to multiply by $\frac{5}{5}$ if we want to multiply by 5?

If we multiply by $\frac{5}{5}$, we are multiplying by 1, which has no effect.

Work out:

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

 $\frac{21}{4}$

- 5 Multiply these fractions.

a $6 \times \frac{1}{3}$

2

b $6 \times \frac{2}{3}$

4

c $6 \times \frac{4}{3}$

8

d $6 \times \frac{6}{3}$

12

e $6 \times \frac{5}{3}$

10

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

-2

g $-6 \times \frac{1}{3}$

h $6 \times \frac{0.1}{3}$

i $6 \times \frac{-0.1}{3}$

j $6 \times \frac{1}{0.3}$

k $\frac{1}{3} \times 6$

l $\frac{2}{3} \times 6$

m $\frac{-7}{3} \times 6$

-2

n $\frac{-0.2}{3} \times 6$

 $\frac{1}{5}$

o $\frac{x}{3} \times 6$

 $-\frac{1}{5}$

p $\frac{2x}{3} \times -6$

20

q $\frac{0.2x}{3} \times 6$

2

r $\frac{-0.2x}{3} \times -6$

4

-14

 $-\frac{3}{10}$

2x

-4x

 $\frac{2x}{5}$
 $\frac{2x}{5}$

- 6 There are 9 identical pieces of ribbon, each $\frac{7}{20}$ metres long.
The 9 pieces of ribbon are placed end to end. What is the total length of the ribbon?
Give your answer as a mixed number.

 $3\frac{3}{20}$

- 7 Tom spends $\frac{3}{4}$ of an hour doing homework 5 times a week.
How long does he spend doing homework in 6 weeks? Answer as a mixed number.

 $22\frac{1}{2}$

8 Work out the missing numbers.

a	$\frac{1}{7} \times \square = \frac{5}{7}$	b	$\square \times \frac{1}{7} = 1$	c	$6 \times \frac{\square}{7} = \frac{18}{7}$	d	$\frac{4}{7} \times \square = 5\frac{1}{7}$
	4		7		3		9

9 When multiplying by a fraction, we can multiply by the numerator then divide by the denominator, or we can do it the other way around.

a	$10 \times \frac{4}{5} = 10 \times 4 \div 5$	$10 \times \frac{4}{5} = 10 \div 5 \times 4$	b	$6 \times \frac{4}{5} = 6 \times 4 \div 5$	$6 \times \frac{4}{5} = 6 \div 5 \times 4$
	$= \underline{\hspace{2cm}} \div 5$	$= \underline{\hspace{2cm}} \times 4$		$= \underline{\hspace{2cm}} \div 5$	$= \underline{\hspace{2cm}} \times 4$
	$= \underline{\hspace{2cm}}$	$= \underline{\hspace{2cm}}$		$= \underline{\hspace{2cm}}$	$= \underline{\hspace{2cm}}$

Which method was easiest for $10 \times \frac{4}{5}$?

Divide, then multiply

Which method was easiest for $6 \times \frac{4}{5}$?

Multiply, then divide

How might you decide whether to multiply first or divide first?

Divide first if the quotient will be a whole number.

Solve these problems, choosing whether to divide or multiply first.

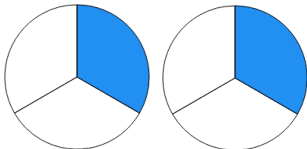
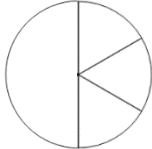
a	$40 \times \frac{3}{4}$	b	$18 \times \frac{2}{3}$	c	$5 \times \frac{5}{6}$
	30		12		$\frac{25}{6}$
d	$\frac{6}{7} \times 21$	e	$\frac{7}{9} \times 90$	f	$\frac{5}{8} \times 30$
	18		70		$\frac{75}{4}$

10 Calculate these answers by splitting the mixed numeral, then using the distributive law.

a	$8 \times 5\frac{1}{2} = 8 \times \left(5 + \frac{1}{2}\right)$	b	$20 \times 3\frac{1}{4}$
	$= (8 \times 5) + \left(8 \times \frac{1}{2}\right)$		
	$= \dots\dots\dots$		
	44		65
c	$12 \times 2\frac{1}{3}$	d	$60 \times 1\frac{1}{10}$
	28		66

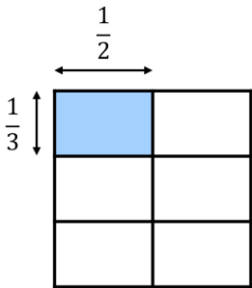
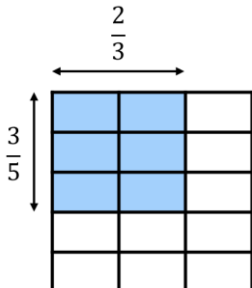
MULTIPLYING FRACTIONS USING MODELS

- Multiplication can be thought about in two ways:

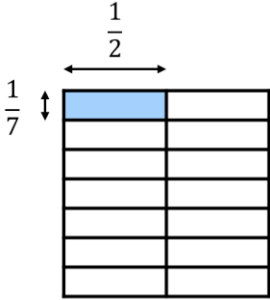
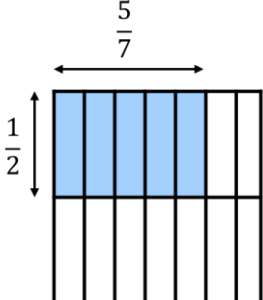
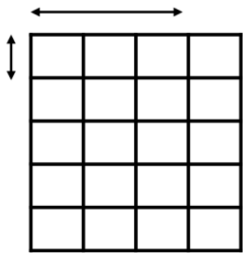
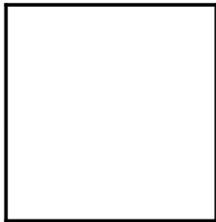
Multiplication as repeated addition (when a factor is a whole number)	Multiplication as part of a part (when neither factor is a whole number)
$2 \times \frac{1}{3} = \frac{2}{3}$ “what is two lots of one third?” 	$\frac{1}{3} \times \frac{1}{2} = \frac{1}{6}$ “what is one-third of one-half?” 

 Fraction Multiplication: <https://www.geogebra.org/m/f526fmeh>

Example Multiply fractions using visual models.

$\frac{1}{2} \times \frac{1}{3}$ $= \frac{1}{6}$ 	$\frac{2}{3} \times \frac{3}{5}$ $= \frac{6}{15}$ 
--	---

Multiply these fractions using the area models.

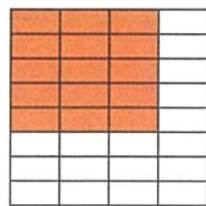
a $\frac{1}{2} \times \frac{1}{7}$ $= \text{—}$  $\frac{1}{14}$	b $\frac{5}{7} \times \frac{1}{2}$ $= \text{—}$  $\frac{5}{14}$
c $\frac{3}{4} \times \frac{1}{5}$ $= \text{—}$  $\frac{3}{20}$	d $\frac{2}{3} \times \frac{1}{4}$ $= \text{—}$  $\frac{1}{3}$

1 Use the diagrams to help you complete these calculations.

a

$$\frac{3}{4} \times \frac{5}{8}$$

$$= \frac{\quad}{32}$$

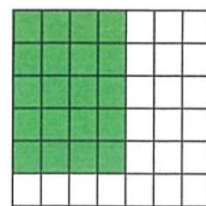


$$\frac{15}{32}$$

b

$$\frac{5}{6} \times \frac{4}{7}$$

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

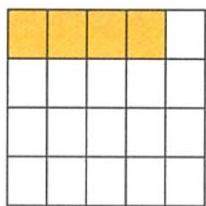


$$\frac{20}{42} = \frac{10}{21}$$

c

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

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

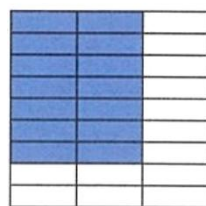


$$\frac{1}{5}$$

d

$$\frac{2}{3} \times \frac{8}{9}$$

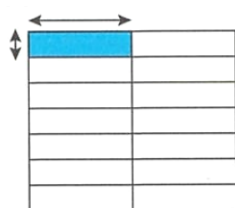
$$= \frac{\quad}{\quad}$$



$$\frac{16}{27}$$

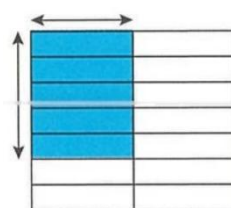
2 What multiplication does this represent?

a



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

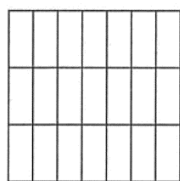
b



$$\frac{5}{7} \times \frac{1}{2}$$

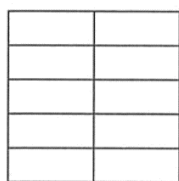
3 Complete these calculations using the diagrams.

a $\frac{1}{3} \times \frac{1}{7}$



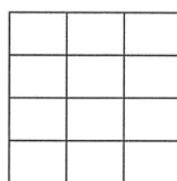
$$\frac{1}{21}$$

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



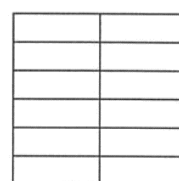
$$\frac{1}{10}$$

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



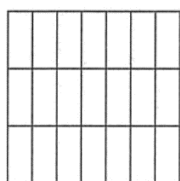
$$\frac{1}{12}$$

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



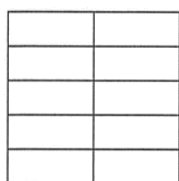
$$\frac{1}{12}$$

e $\frac{2}{3} \times \frac{5}{7}$



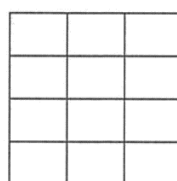
$$\frac{10}{21}$$

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



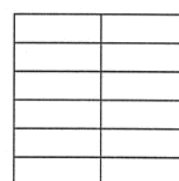
$$\frac{3}{10}$$

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



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

h $\frac{5}{6} \times \frac{1}{2}$



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

MULTIPLYING FRACTIONS USING THE RULE

- To multiply fractions, multiply the numerators and multiply the denominators.

Rule for Multiplying Fractions

$$\frac{a}{b} \times \frac{c}{d} = \frac{a \times c}{b \times d}$$

Example Multiply fractions using the rule.

$\frac{1}{2} \times \frac{1}{3}$ $= \frac{1 \times 1}{2 \times 3}$ $= \frac{1}{6}$	$\frac{2}{3} \times \frac{3}{5}$ $= \frac{2 \times 3}{3 \times 5}$ $= \frac{6}{15} = \frac{2}{5}$
--	---

Multiply these fractions.

a

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

$$= \frac{\times}{\times}$$

$$= \text{---}$$

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

b

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

$$= \frac{\times}{\times}$$

$$= \text{---}$$

c

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

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

$$\frac{6}{5} = 1\frac{1}{5}$$

d

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

$$3$$

e

$$\frac{1}{3} \text{ of } 12$$

f

$$\frac{3}{4} \text{ of } 46$$

$$4$$

$$\frac{69}{2} = 34\frac{1}{2}$$

Key ideas

- To multiply two fractions, multiply the and multiply the

1 Multiply these fractions

a

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

$\frac{2}{3}$

b

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

$\frac{6}{7}$

c

$$7 \times \frac{2}{15} = \frac{\boxed{}}{\boxed{}}$$

$\frac{14}{15}$

d

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

$\frac{2}{15}$

e

$$\frac{1}{2} \times \frac{3}{4} = \frac{\boxed{}}{\boxed{}}$$

$\frac{3}{8}$

f

$$\frac{5}{7} \times \frac{2}{3} = \frac{\boxed{}}{\boxed{}}$$

$\frac{10}{21}$

g

$$\frac{5}{7} \times \frac{2}{3} = \frac{\boxed{}}{\boxed{}}$$

$\frac{10}{21}$

h

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

$\frac{1}{9}$

i

$$\frac{5}{6} \times \frac{5}{7} = \frac{\boxed{}}{\boxed{}}$$

$\frac{25}{42}$

j

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

$\frac{1}{30}$

k

$$\frac{3}{5} \times \frac{1}{4} \times \frac{1}{2} = \frac{\boxed{}}{\boxed{}}$$

$\frac{3}{40}$

l

$$\frac{5}{9} \times \frac{2}{3} \times 2 = \frac{\boxed{}}{\boxed{}}$$

$\frac{20}{27}$

2 Multiply these fractions then simplify the result.

a

$$\frac{4}{15} \times 3 = \frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}}$$

$\frac{4}{5}$

b

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

$\frac{3}{5}$

c

$$\frac{2}{3} \times \frac{3}{5} = \frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}}$$

$\frac{2}{5}$

d

$$\frac{5}{6} \times \frac{4}{7} = \frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}}$$

$\frac{10}{21}$

e

$$\frac{3}{10} \times \frac{5}{8} = \frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}}$$

$\frac{3}{16}$

f

$$\frac{5}{9} \times \frac{3}{4} = \frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}}$$

$\frac{5}{12}$

3 "of" means to multiply. Find:

a

$$\frac{1}{2} \text{ of } \frac{1}{3}$$

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

$\frac{1}{6}$

b

$$\frac{1}{3} \text{ of } \frac{1}{5}$$

$\frac{1}{15}$

c

$$\frac{2}{3} \text{ of } \frac{5}{7}$$

$\frac{10}{21}$

d

$$\frac{2}{3} \text{ of } \frac{3}{5}$$

$\frac{2}{5}$

e

$$\frac{1}{3} \text{ of } 18$$

6

f

$$\frac{4}{5} \text{ of } 100$$

80

4 Show these multiplications by writing the whole number as a fraction over 1.

a

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

=

 $\frac{5}{2}$

b

$$\frac{2}{3} \times 24$$

16

c

$$25 \times \frac{3}{5}$$

15

d

$$\frac{2}{7} \text{ of } 42$$

12

e

$$\frac{1}{4} \text{ of } 16$$

4

f

$$\frac{1}{5} \text{ of } 45$$

9

Explain why the rule “multiply by the numerator and keep the denominator the same” works when multiplying a whole number and a fraction.

When multiplying by a whole number, you can think of it as repeated addition. When you add fractions, the denominator doesn't change.

5 Multiply these fractions.

a

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

 $\frac{1}{5}$

b

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

 $\frac{1}{5}$

c

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

 $\frac{2}{15}$

d

$$\frac{2}{5} \times \frac{1}{4} =$$

 $\frac{1}{10}$

e

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

 $\frac{3}{10}$

f

$$\left(\frac{3}{4}\right)^2 =$$

 $\frac{9}{16}$

g

$$\frac{0}{5} \times \frac{3}{4}$$

0

h

$$\frac{2}{3} \times \frac{5}{7}$$

 $\frac{10}{21}$

i

$$\frac{2}{3} \times \frac{5}{3} = \frac{10}{12}$$

4

j

$$\frac{2}{3} \times \text{—} = \frac{2}{6}$$

 $\frac{1}{2}$

k

$$\text{—} \times \frac{5}{3} = \frac{10}{9}$$

3, 3

l

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

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

m

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

 $\frac{a^2}{b^2}$

n

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

1

o

$$\frac{2}{3} \times \frac{3}{5} \times \frac{4}{7} =$$

 $\frac{8}{35}$

p

$$\frac{2}{3} \times \frac{3}{5} \times \frac{9}{11} =$$

 $\frac{18}{55}$

q

$$\left(\frac{2}{3}\right)^2 =$$

 $\frac{4}{9}$

r

$$\frac{2}{3} \times \left(\frac{3}{5}\right)^2 =$$

 $\frac{6}{25}$

6 Work out the missing numbers.

a $\frac{1}{8} \times \frac{1}{\square} = \frac{1}{80}$

10

b $\frac{1}{75} = \frac{1}{25} \times \frac{\square}{3}$

1

c $\frac{1}{63} = \frac{1}{\square} \times \frac{1}{9}$

7

d $\frac{1}{200} \times \frac{1}{8} = \frac{1}{\square}$

1600

e $\frac{\square}{8} \times \frac{1}{\square} = \frac{7}{80}$

7, 10

f $\frac{5}{63} = \frac{1}{\square} \times \frac{\square}{9}$

7, 5

g $\frac{11}{75} = \frac{11}{\square} \times \frac{\square}{3}$

25, 1

h $\frac{\square}{20} \times \frac{7}{8} = \frac{49}{\square}$

7, 160

7 Find the missing number in each calculation.

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

3

b $\frac{2}{3} \times \square = \frac{10}{3}$

5

c $\frac{3}{4} \times \square = 3\frac{3}{4}$

5

d $\frac{7}{10} \times \frac{\square}{\square} = \frac{7}{20}$

$\frac{1}{2}$

e $\frac{5}{\square} \times \frac{\square}{3} = \frac{20}{27}$

9, 4

f $\frac{3}{1729} \times \square = \frac{15}{1729}$

5

8 Determine the missing values in these equations.

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

Any pair of numbers where the first number is double the second.

b $\frac{7}{9} \times \square = 3\frac{8}{9}$

5

c $\frac{7}{10} \times \frac{\square}{\square} = \frac{1}{2}$

$\frac{5}{7}$

d $\frac{9}{\square} \times \frac{2}{\square} = \frac{1}{8}$

Any factor pair of 144 will work

9 [JMO 1996 A4] Evaluate

$$\left[\left(\frac{1}{2} + \frac{1}{3} \right) + \frac{1}{4} \right] \times \frac{1}{5} - \frac{1}{6}$$

$$\begin{aligned} & \left[\left(\frac{3}{6} + \frac{2}{6} \right) + \frac{1}{4} \right] \times \frac{1}{5} - \frac{1}{6} \\ &= \left(\frac{5}{6} + \frac{1}{4} \right) \times \frac{1}{5} - \frac{1}{6} \\ &= \left(\frac{20}{24} + \frac{6}{24} \right) \times \frac{1}{5} - \frac{1}{6} \\ &= \frac{26}{24} \times \frac{1}{5} - \frac{1}{6} \\ &= \frac{13}{12} \times \frac{1}{5} - \frac{1}{6} \\ &= \frac{13}{60} - \frac{1}{6} \\ &= \frac{13}{60} - \frac{10}{60} \\ &= \frac{3}{60} \\ &= \frac{1}{20} \end{aligned}$$

10 To find half of a fraction, you can either halve the numerator or double the denominator:

$$\text{Half of } \frac{4}{5} = \frac{2}{5} \quad (\text{halve the numerator})$$

$$\text{Half of } \frac{7}{10} = \frac{3.5}{10} \quad (\text{halve the numerator})$$

$$= \frac{7}{20} \quad (\text{simplify})$$

$$\text{Half of } \frac{4}{5} = \frac{1}{2} \times \frac{4}{5}$$

$$= \frac{4}{10} \quad (\text{double the denominator})$$

$$= \frac{2}{5} \quad (\text{simplify})$$

$$\text{Half of } \frac{7}{10} = \frac{1}{2} \times \frac{7}{10}$$

$$= \frac{7}{20} \quad (\text{double the denominator})$$

Find half of these fractions by either halving the denominator or multiplying by $\frac{1}{2}$

a Half of $\frac{8}{9}$

Halve the numerator:

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

Double the denominator:

$$\frac{8}{18} = \frac{4}{9}$$

b Half of $\frac{5}{9}$

Halve the numerator:

$$\frac{2.5}{9} = \frac{5}{18}$$

Double the denominator:

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

When might it be easier to halve the numerator and when might it be easier to double the denominator?

Halve the numerator if the quotient will be a whole number.

Calculate the following using the easier method:

a Half of $\frac{3}{4}$

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

b Half of $\frac{20}{21}$

$$\frac{10}{21}$$

c Half of $8\frac{9}{11}$

$$4\frac{9}{22}$$

d A third of $\frac{3}{4}$

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

e A third of $\frac{7}{10}$

$$\frac{7}{30}$$

f A quarter of $\frac{1}{5}$

$$\frac{1}{20}$$

g A quarter of $\frac{12}{13}$

$$\frac{3}{13}$$

h A fifth of $\frac{15}{16}$

$$\frac{3}{16}$$

i A fifth of $20\frac{1}{3}$

$$4\frac{1}{15}$$

MULTIPLYING MIXED NUMERALS

1. Convert mixed numbers to improper fractions: $a\frac{b}{n} = \frac{a \times n + b}{n}$
2. Multiply the numerators and multiply the denominators.
3. Simplify if possible.

Example Multiply mixed numbers using the rule.

	$1\frac{3}{5} \times 2\frac{1}{3}$		$2\frac{2}{3} \times 3\frac{1}{2}$
1. Convert to improper	$\frac{8}{5} \times \frac{7}{3}$	1. Convert to improper	$\frac{8}{3} \times \frac{7}{2}$
2. Multiply	$\frac{56}{15}$	2. Multiply	$\frac{56}{6}$
		3. Simplify	$\frac{28}{3}$

a

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

$$= \frac{6}{5} \times \frac{11}{4}$$

$$= \text{---}$$

$$= \text{---}$$

$$\frac{33}{10} = 3\frac{3}{10}$$

b

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

$$= \frac{\quad}{5} \times \frac{\quad}{6}$$

$$= \text{---}$$

$$= \text{---}$$

$$\frac{42}{15} = 2\frac{12}{15}$$

c

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

$$\frac{46}{7} = 6\frac{4}{7}$$

d

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

$$\frac{209}{20} = 10\frac{9}{20}$$

Key ideas

1. It is most efficient to convert any mixed numbers to before multiplying.

1 Multiply these fractions.

a

$$4\frac{2}{3} \times \frac{5}{6}$$

Convert to Improper

$$= \frac{14}{3} \times \frac{5}{6}$$

$$= \frac{70}{18} = \frac{35}{9}$$

Simplified: $\div$ by 2

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

b

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

$$= \frac{\square}{\square} \times \frac{\square}{\square}$$

$$= \frac{\square}{\square} = \frac{\square}{\square}$$

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

c

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

$$= \frac{\square}{\square} \times \frac{\square}{\square}$$

$$= \frac{\square}{\square} = \frac{\square}{\square}$$

$$= 1\frac{9}{10}$$

d

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

$$= \frac{\square}{\square} \times \frac{\square}{\square}$$

$$= \frac{\square}{\square} = \frac{\square}{\square}$$

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

e

$$6\frac{1}{2} \times \frac{2}{7}$$

$$= \frac{\square}{\square} \times \frac{\square}{\square}$$

$$= \frac{\square}{\square} = \frac{\square}{\square}$$

$$= 1\frac{6}{7}$$

f

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

$$= \frac{\square}{\square} \times \frac{\square}{\square}$$

$$= \frac{\square}{\square} = \frac{\square}{\square}$$

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

g

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

$$= 8$$

h

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

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

i

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

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

2 To paint one classroom, $2\frac{1}{3}$ litres of paint are required.
How many litres of paint are required to paint five identical classrooms?

$11\frac{2}{3}$ litres

3 A scone recipe requires $1\frac{3}{4}$ cups of flour and $\frac{3}{4}$ of a cup of cream.
Jamie is catering for a large group and needs to quadruple the recipe.
How much flour and how much cream will she need?

7 cups flour and 3 cups cream

- 4 It takes $2\frac{1}{4}$ hours to paint a fence. One quarter of this time is spent sanding the wood down. What fraction of an hour is spent in sanding the wood?

$\frac{9}{16}$ hours

- 5 $\frac{3}{5}$ of a road is to be resurfaced.
If the road is $1\frac{1}{2}$ km long, what length in kilometres is to be resurfaced?

$\frac{9}{10}$

- 6 If you spent $1\frac{1}{2}$ hours on homework last night and $\frac{1}{4}$ of that time was on history, how long did you spend on history?

$\frac{3}{8}$

- 7 Read the example carefully and answer the questions.

X Name: Jermaine

Solve. Write your answer in sentence form.

A man has 4 cats. Each cat eats 3 meals every day. If each cat eats $\frac{1}{2}$ cup of cat food per meal, how much food does each cat eat per day?

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

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

Each cat eats 2 cups of food each day.

Circle the pieces of information below that Jermaine used to solve the problem.

4 cats 3 meals per day $\frac{1}{2}$ cup of cat food per meal

What does Jermaine's answer actually represent?

How many cups of food is eaten by all the cats each day.

Circle the pieces of information below that Jermaine should have used.

4 cats 3 meals per day $\frac{1}{2}$ cup of cat food per meal

There should be one piece of information that you did not circle. Explain why that information is not needed.

4 cats. You are only interested in how much 1 cat eats per day.

A man is baking 5 cakes. Each cake has 2 layers of frosting. If each layer of frosting uses $\frac{1}{3}$ teaspoon of food colouring, how much food colouring does he need for one cake?

$\frac{2}{3}$ teaspoon

SIMPLIFY BEFORE YOU MULTIPLY

- Fraction multiplication is easier if you simplify or “cancel” the fractions before multiplying.
- Simplifying means to divide the numerator and denominator by a common factor.

	$\frac{3}{5} \times \frac{4^1}{8_2}$	cancelling vertically ✓
	$\frac{1^1 3}{5} \times \frac{4}{6_2}$	cancelling diagonally ✓
Never do this! →	$\frac{1^1 3}{5} \times \frac{6^2}{7}$	cancelling horizontally ✗

Example Simplifying fractions before multiplying.

	$\frac{4}{8} \times \frac{3}{2}$	What is happening when you “cancel” fractions?
1. Simplify	$\frac{1}{2} \times \frac{3}{2}$	“Cancelling” means to the numerator and denominator by a common
2. Multiply	$\frac{3}{4}$	
	$\frac{2}{3} \times \frac{12}{5}$	Why is it efficient to simplify fractions before multiplying?
1. Simplify	$\frac{2}{1} \times \frac{4}{5}$	By simplifying, you work with numbers.
2. Multiply	$\frac{8}{5}$	

Simplify these fractions before multiplying them.

a $\frac{7}{3} \times \frac{2}{6}$ $= \frac{7}{3} \times \frac{1}{3}$ $=$	b $\frac{3}{4} \times \frac{4}{7}$ $= \frac{3}{1} \times \frac{1}{7}$ $=$	c $\frac{5}{9} \times \frac{7}{10}$ $=$	d $\frac{8}{11} \times \frac{3}{4}$ $=$
$\frac{7}{9}$	$\frac{3}{7}$	$\frac{7}{18}$	$\frac{6}{11}$

Key ideas

- It is most efficient to simplify fractions before you so you work with smaller numbers.
- Simplifying means to divide the and of a fraction by a common
- You can simplify or, but not

1 Multiply by simplifying the highlighted values first.

a $\frac{5}{7} \times \frac{13}{15} =$ $\frac{13}{21}$	b $\frac{3}{8} \times \frac{11}{12} =$ $\frac{11}{32}$	c $\frac{12}{18} \times \frac{5}{7} =$ $\frac{10}{21}$	d $\frac{4}{16} \times \frac{2}{3} =$ $\frac{1}{6}$
e $\frac{3}{4} \times \frac{12}{48} =$ $\frac{3}{16}$	f $\frac{2}{5} \times \frac{15}{24} =$ $\frac{1}{4}$	g $\frac{8}{12} \times \frac{4}{64} =$ $\frac{1}{24}$	h $\frac{6}{56} \times \frac{7}{12} =$ $\frac{1}{16}$

2 Simplify these fractions by cancelling.

a $\frac{4}{3} \times \frac{1}{4} = \frac{\boxed{4}}{\boxed{3}}$	b $\frac{3}{2} \times \frac{11}{6} = \frac{\boxed{}}{\boxed{}}$ $\frac{11}{4}$	c $\frac{21}{5} \times \frac{4}{7} = \frac{\boxed{}}{\boxed{}}$ $\frac{12}{5}$
d $\frac{7}{6} \times \frac{18}{5} = \frac{\boxed{}}{\boxed{}}$ $\frac{21}{5}$	e $\frac{5}{2} \times \frac{11}{15} = \frac{\boxed{}}{\boxed{}}$ $\frac{11}{6}$	f $\frac{5}{2} \times \frac{8}{15} = \frac{\boxed{}}{\boxed{}}$ $\frac{4}{3}$
g $\frac{10}{3} \times \frac{9}{20} = \frac{\boxed{}}{\boxed{}}$ $\frac{3}{2}$	h $\frac{12}{5} \times \frac{25}{6} = \frac{\boxed{}}{\boxed{}}$ $\frac{10}{1}$	i $\frac{3}{4} \times \frac{16}{9} = \frac{\boxed{}}{\boxed{}}$ $\frac{4}{3}$

3 "fraction of" questions can be turned into multiplication.

a $\frac{3}{7}$ of 42 $= \frac{3}{7} \times \frac{42}{1}$	b $\frac{1}{4}$ of 32 4	c $\frac{4}{5}$ of 120 80	d $\frac{3}{7}$ of 77 33
e $\frac{5}{10}$ of $\frac{4}{7}$ $\frac{2}{7}$	f $\frac{6}{9}$ of $\frac{3}{12}$ $\frac{1}{6}$	g $\frac{3}{4}$ of $\frac{2}{5}$ $\frac{3}{10}$	h $\frac{2}{5}$ of $\frac{10}{11}$ $\frac{4}{11}$

4 Multiply these mixed numbers by first converting to an improper fraction.

a $3\frac{1}{2} \times \frac{4}{5}$ $\frac{\square}{\square} \times \frac{\square}{\square} = \frac{\square}{\square}$	b $\frac{7}{9} \times 1\frac{4}{5}$ $\frac{\square}{\square} \times \frac{\square}{\square} = \frac{\square}{\square}$	c $2\frac{1}{3} \times \frac{11}{14}$ $\frac{\square}{\square} \times \frac{\square}{\square} = \frac{\square}{\square}$
d $\frac{8}{11} \times 3\frac{1}{4}$ $\frac{\square}{\square} \times \frac{\square}{\square} = \frac{\square}{\square}$	e $4\frac{4}{9} \times \frac{3}{10}$ $\frac{\square}{\square} \times \frac{\square}{\square} = \frac{\square}{\square}$	f $3\frac{3}{4} \times \frac{12}{25}$ $\frac{\square}{\square} \times \frac{\square}{\square} = \frac{\square}{\square}$
g $1\frac{19}{26} \times 1\frac{3}{10}$ 	h $1\frac{9}{35} \times 4\frac{1}{11}$ 	i $2\frac{4}{5} \times 1\frac{3}{7}$
j $1\frac{1}{12} \times 1\frac{5}{13}$ 	k $2\frac{4}{5} \times 4\frac{1}{6}$ 	l $1\frac{5}{7} \times 2\frac{5}{8}$
$\frac{14}{5}$	$\frac{7}{5}$	$\frac{11}{6}$
$\frac{14}{11}$	$\frac{4}{3}$	$\frac{9}{5}$
$\frac{9}{4}$	$\frac{36}{7}$	4
$\frac{3}{2}$	$\frac{35}{3}$	$\frac{9}{2}$

5 Multiply these fractions by cancelling first.

a $\frac{2}{9} \times \frac{3}{4}$ 	e $\frac{4}{27} \times \frac{9}{16}$ 	i $\frac{27}{8} \times \frac{16}{15}$
b $\frac{2}{9} \times \frac{3}{8}$ 	f $\frac{8}{27} \times \frac{9}{16}$ 	j $3\frac{3}{8} \times \frac{16}{15}$
c $\frac{4}{9} \times \frac{3}{16}$ 	g $\frac{8}{27} \times \frac{15}{16}$ 	k $3\frac{3}{8} \times 1\frac{1}{15}$
d $\frac{4}{27} \times \frac{3}{16}$ 	h $\frac{16}{27} \times \frac{15}{16}$ 	l $3\frac{3}{8} \times 1\frac{2}{30}$
$\frac{1}{6}$	$\frac{1}{12}$	$\frac{18}{15}$
$\frac{1}{12}$	$\frac{1}{6}$	$\frac{18}{5}$
$\frac{1}{12}$	$\frac{5}{18}$	$\frac{18}{5}$
$\frac{1}{36}$	$\frac{5}{9}$	$\frac{36}{10}$

- 6 Multiply these fractions. It is a good idea to simplify first.
Your final answer should be fully simplified.

a

$$\frac{12}{16} \times \frac{15}{20}$$

$$\frac{9}{16}$$

b

$$\frac{15}{12} \times \frac{24}{45}$$

c

$$\frac{6}{8} \times \frac{17}{5} \times \frac{10}{17}$$

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

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

- 7 Find the value of:

$$2 \times \frac{25}{9} \times \frac{16}{26} \times \frac{18}{8} \times \frac{13}{50} \times \frac{1}{2}$$

$$1$$

- 8 Simplify:

$$\frac{1}{2} \times \frac{2}{3} \times \frac{3}{4} \times \dots \times \frac{n-1}{n}$$

$$\frac{1}{n}$$

- 9 **[JMC 2004 Q15]** Granny spends one third of her weekly pension on Thursday night, and one quarter of what remains on Friday.
What fraction of the original amount is left for her big night out on Saturday?

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

She has half remaining.

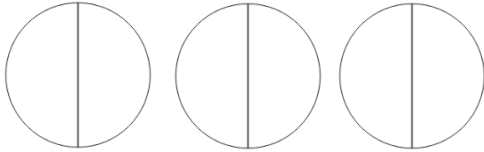
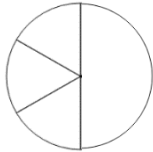
- 10 **[JMO 2014 A10]** My four pet monkeys and I harvested a large pile of peanuts.
Monkey A woke in the night and ate half of them;
then Monkey B woke and ate one third of what remained;
then Monkey C woke and ate one quarter of the rest;
finally Monkey D ate one fifth of the much diminished remaining pile.
What fraction of the original harvest was left in the morning?

$$\frac{1}{2} \times \frac{2}{3} \times \frac{3}{4} \times \frac{4}{5} = \frac{1}{5}$$

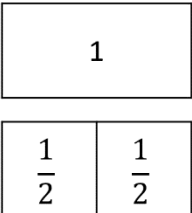
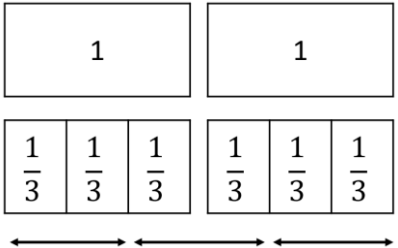
One fifth remains

DIVIDING FRACTIONS USING VISUAL MODELS

- Division can be thought about in two ways:

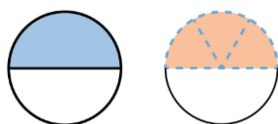
Quotition division (divisor less than original) how many parts are there?	Partition division (divisor greater than original) what is the size of each part?
$3 \div \frac{1}{2} = 6$ “how many halves are in three wholes?” 	$\frac{1}{2} \div 3 = \frac{1}{6}$ “If I divide half into three pieces, what is the size of each part?” 

Example Divide by fractions using quotition division.

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

a “how many sixths in a half?”

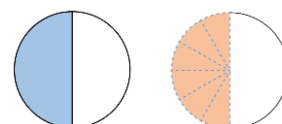
$$\frac{1}{2} \div \frac{1}{6}$$



3

b “how many twelfths in a half?”

$$\frac{1}{2} \div \frac{1}{12}$$



6

c “.....”

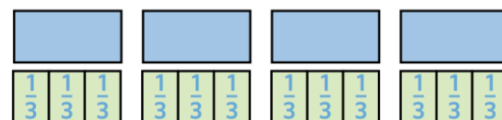
$$\frac{1}{2} \div \frac{1}{4}$$



2

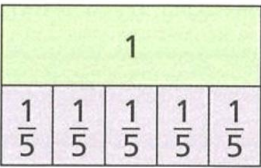
d “.....”

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



6

1 Using the diagram, how many fifths are there in



- a 1 whole?
b 2 wholes?
c 4 wholes?
d 10 wholes?

5
10
20
50

Hence complete these calculations.

a $1 \div \frac{1}{5}$

b $2 \div \frac{1}{5}$

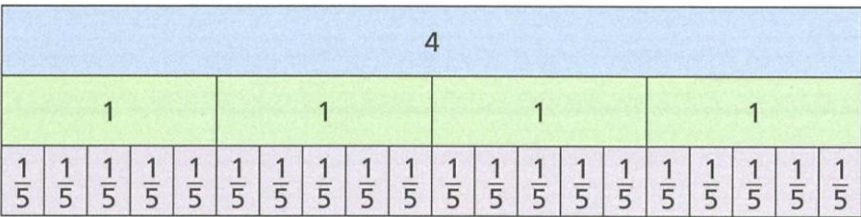
c $4 \div \frac{1}{5}$

d $10 \div \frac{1}{5}$

5
20

10
50

2 Consider the diagram.



- a How many fifths are there in 4 wholes?
b How many two-fifths are there in 4 wholes?

20
10

Hence complete these calculations.

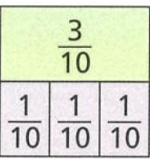
c $4 \div \frac{1}{5}$

d $4 \div \frac{2}{5}$

20

10

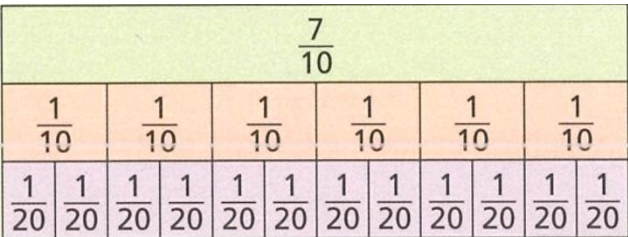
3 Consider the diagram.



- a How many lots of one-tenth are in three-tenths?
b Calculate $\frac{3}{10} \div \frac{1}{10}$

3
3

4 Consider the diagram.

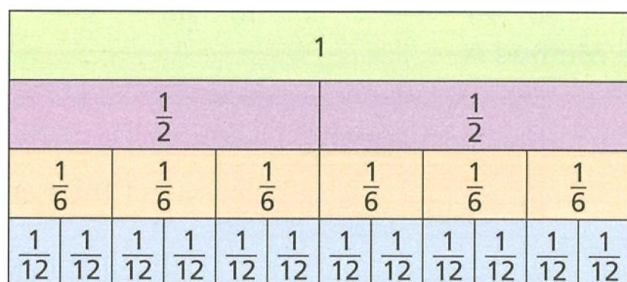


- a Calculate $\frac{7}{10} \div \frac{1}{10}$
b Calculate $\frac{7}{10} \div \frac{1}{20}$

7
14

5 Consider the fraction wall.

a Complete these sentences



i There are lots of $\frac{1}{6}$ in $\frac{1}{2}$ 3

ii There are lots of $\frac{1}{12}$ in $\frac{1}{6}$ 2

iii There are lots of $\frac{1}{12}$ in $\frac{1}{2}$ 6

iv There are lots of $\frac{1}{12}$ in $\frac{5}{6}$ 10

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

3

c $\frac{1}{6} \div \frac{1}{12}$

6

d $\frac{1}{2} \div \frac{1}{12}$

6

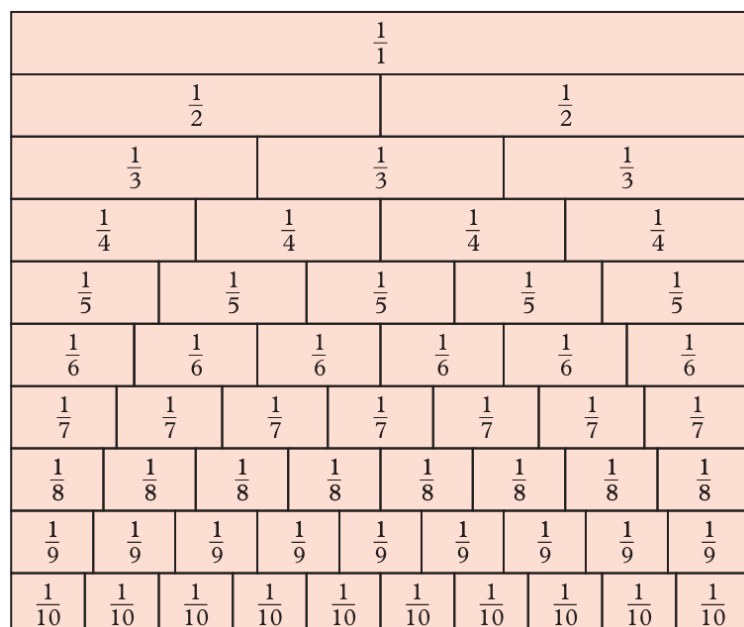
e $\frac{5}{6} \div \frac{1}{12}$

10

6 Complete the table.

Division	Diagram	Meaning	Answer
$\frac{3}{4} \div \frac{1}{4}$		How many are in <i>How many quarters in three quarters?</i>	$\frac{3}{4} \div \frac{1}{4} = 3$
$\frac{3}{4} \div \frac{3}{8}$		How many are in? <i>How many three-eighths in three quarters?</i>	2
$\frac{3}{4} \div \frac{1}{2}$		How many are in? <i>How many halves in three-quarters?</i>	$1\frac{1}{2}$

7 Use the fraction wall to find the quotient.



a $\frac{2}{3} \div \frac{1}{9} =$

6

b $\frac{8}{10} \div \frac{1}{5} =$

4

c $\frac{4}{6} \div \frac{2}{9} =$

3

d $1 \div \frac{3}{8} =$

$2\frac{2}{3}$

e $\frac{5}{6} \div \frac{1}{3} =$

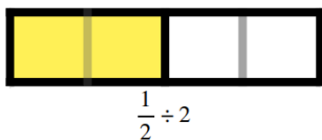
$2\frac{1}{2}$

f $\frac{9}{10} \div \frac{2}{5} =$

$2\frac{1}{4}$

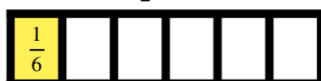
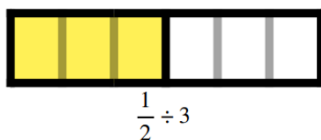
8 Complete the pattern below. These show partition division. "what is the size of each part?"

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



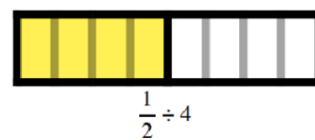
$$\frac{1}{2} \div 2 = \frac{1}{4}$$

b $\frac{1}{2} \div 3$



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

c $\frac{1}{2} \div 4$

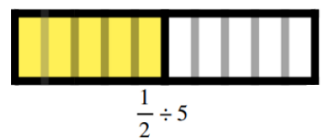


$$\frac{1}{2} \div 4 = \frac{\square}{\square}$$

$\frac{1}{6}$

$\frac{1}{8}$

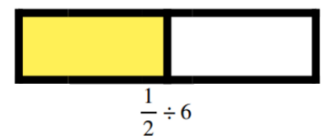
d $\frac{1}{2} \div 5$



$$\frac{1}{2} \div 5 = \frac{\square}{\square}$$

$\frac{1}{10}$

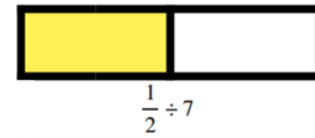
e $\frac{1}{2} \div 6$



$$\frac{1}{2} \div 6 = \frac{\square}{\square}$$

$\frac{1}{12}$

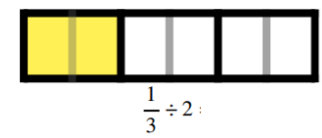
f $\frac{1}{2} \div 7$



$$\frac{1}{2} \div 7 = \frac{\square}{\square}$$

$\frac{1}{14}$

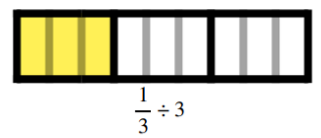
g $\frac{1}{3} \div 2$



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

$\frac{1}{6}$

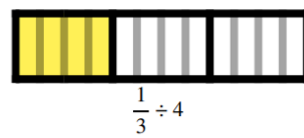
h $\frac{1}{3} \div 3$



$$\frac{1}{3} \div 3 = \frac{\square}{\square}$$

$\frac{1}{9}$

i $\frac{1}{3} \div 4$



$$\frac{1}{3} \div 4 = \frac{\square}{\square}$$

$\frac{1}{12}$

RECIPROCAL

- If we are dividing by a fraction, then we multiply by the **reciprocal** instead.
- Dividing by 3 is the same as multiplying by one third.

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

- The product of a number and the reciprocal is always 1.

Example Identify the reciprocal.

$\frac{1}{8} \times 8 = 1$	The reciprocal of $\frac{1}{8}$ is 8	Describe what a reciprocal of a fraction is. A reciprocal of a number is a value that, when multiplied by the original number, results in the product of For a fraction, you can think of it as “.....” the numerator and denominator
$\frac{2}{3} \times \frac{3}{2} = \frac{6}{6}$	The reciprocal of $\frac{2}{3}$ is $\frac{3}{2}$.	

Identify the reciprocal of these fractions.

a 5

b 3

c 113

d 1

e $\frac{1}{5}$

f $\frac{1}{7}$

g $\frac{1}{2754}$

h $\frac{5}{2}$

i $\frac{5}{3}$

j $\frac{514}{3}$

k $\frac{3}{1}$

l $\frac{3}{3}$

m $\frac{4}{3}$

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

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

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

q 0.5

r n

s $\frac{1}{n}$

t $\frac{a}{b}$

1 Write the reciprocals of these fractions.

a $\frac{1}{3} \rightarrow$ $\frac{3}{1}$	b $\frac{4}{3} \rightarrow$ $\frac{3}{4}$	c $\frac{4}{5} \rightarrow$ $\frac{5}{4}$	d $\frac{7}{2} \rightarrow$ $\frac{2}{7}$
e $\frac{3}{1} \rightarrow$ $\frac{1}{3}$	f $3 \rightarrow$ $\frac{1}{3}$	g $5 \rightarrow$ $\frac{1}{5}$	h $12 \rightarrow$ $\frac{1}{12}$
i $\frac{3}{2} \rightarrow$ $\frac{2}{3}$	j $1\frac{1}{2} \rightarrow$ $\frac{2}{3}$	k $2\frac{1}{2} \rightarrow$ $\frac{2}{5}$	l $2\frac{3}{4} \rightarrow$ $\frac{4}{11}$
m $5\frac{3}{4} \rightarrow$ $\frac{4}{23}$	n $7 \rightarrow$ $\frac{1}{7}$	o $9\frac{2}{3} \rightarrow$ $\frac{3}{29}$	p $5\frac{5}{8} \rightarrow$ $\frac{8}{45}$

2 Work out the missing numbers

a $\frac{1}{8} \times \square = 1$ 8	b $\square \times \frac{1}{7} = 1$ 7	c $15 \times \square = 1$ $\frac{1}{15}$
d $\square \times 3 = 1$ $\frac{1}{3}$	e $\frac{1}{5} \times \square = 1$ 5	f $5 \times \square = 1$ $\frac{1}{5}$
g $\frac{2}{3} \times \square = \frac{6}{6}$ $\frac{3}{2}$	h $\square \times \frac{4}{5} = \frac{20}{20}$ $\frac{5}{4}$	i $\frac{4}{3} \times \square = \frac{12}{12}$ $\frac{3}{4}$
j $\square \times \frac{7}{8} = \frac{56}{56}$ $\frac{8}{7}$	k $\frac{9}{10} \times \square = \frac{90}{90}$ $\frac{10}{9}$	l $\frac{10}{9} \times \square = \frac{90}{90}$ $\frac{9}{10}$
m $\frac{2}{3} \times \square = 1$ $\frac{3}{2}$	n $\square \times \frac{4}{5} = 1$ $\frac{5}{4}$	o $\frac{4}{3} \times \square = 1$ $\frac{3}{4}$
p $\square \times \frac{7}{8} = 1$ $\frac{8}{7}$	q $\frac{9}{10} \times \square = 1$ $\frac{10}{9}$	r $\frac{10}{9} \times \square = 1$ $\frac{9}{10}$

DIVIDING FRACTIONS USING THE RULE

- If we are dividing by a fraction, then we multiply by the **reciprocal** instead.

Rule for Dividing Fractions

$$\frac{a}{b} \div \frac{c}{d}$$

$$= \frac{a}{b} \times \frac{d}{c}$$

Example Dividing fractions using the rule.

$\frac{3}{4} \div \frac{2}{7}$ $= \frac{3}{4} \times \frac{7}{2}$ $= \frac{21}{8}$	$\frac{2}{5} \div 2$ $= \frac{2}{5} \times \frac{1}{2}$ $= \frac{2}{10} = \frac{1}{5}$
--	--

Evaluate these divisions.

a

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

$$= \frac{1}{1} \times \text{—}$$

$$=$$

2

b

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

$$= \frac{2}{1} \times \text{—}$$

$$=$$

8

c

$$\frac{6}{13} \div 3$$

$$= \text{—} \times \text{—}$$

$$=$$

$\frac{2}{13}$

d

$$\frac{5}{7} \div \frac{3}{10}$$

$$= \text{—} \times \text{—}$$

$$=$$

$\frac{50}{21} = 2\frac{8}{21}$

e

$$\frac{7}{8} \div \frac{14}{2}$$

$$= \text{—} \times \text{—}$$

$$=$$

$\frac{1}{8}$

f

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

$$= \text{—} \times \text{—} \times \text{—}$$

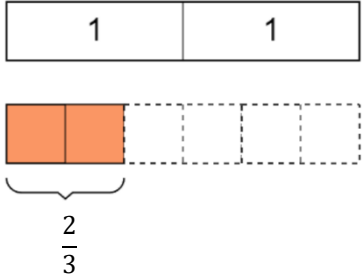
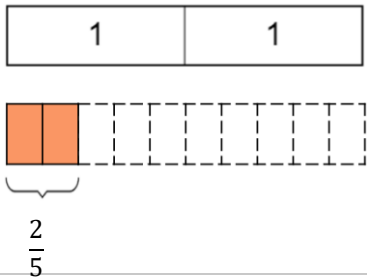
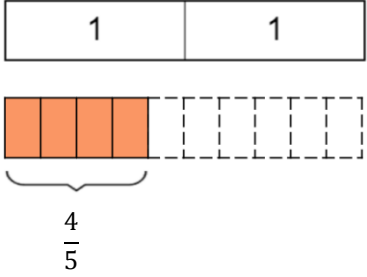
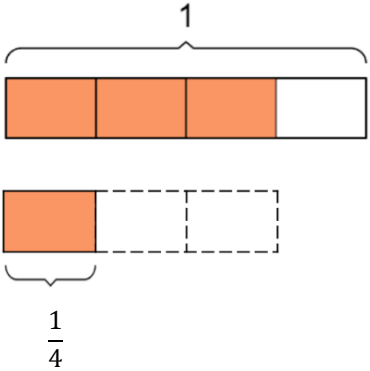
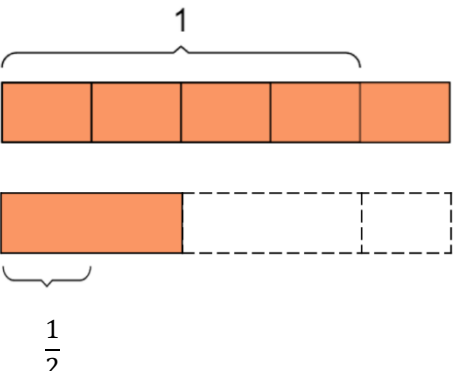
$$=$$

$\frac{25}{6} = 4\frac{1}{6}$

Key ideas

- The product of a number and its is 1.
- Dividing a number by a fraction is the same as by the reciprocal.
- An easy way to determine the reciprocal of a number is to “.....” the fraction.

1 Complete the table.

Fraction Division	Diagram	Meaning
$2 \div \frac{2}{3}$ $= \frac{2}{1} \times \frac{3}{2}$ $=$		$\frac{2}{3}$ fits into 2 wholes times
$2 \div \frac{2}{5}$ $= \frac{2}{1} \times \frac{5}{2}$ $=$		$\frac{2}{5}$ fits into 2 wholes times
$2 \div \frac{4}{5}$ $= \frac{2}{1} \times \frac{5}{4}$ $=$		$\frac{4}{5}$ fits into 2 wholes times
$\frac{3}{4} \div \frac{1}{4}$ $= \frac{3}{4} \times \frac{4}{1}$ $=$		$\frac{1}{4}$ fits into $\frac{3}{4}$ times
$\frac{5}{4} \div \frac{1}{2}$ $= \frac{5}{4} \times \frac{2}{1}$ $=$		$\frac{1}{2}$ fits into $\frac{5}{4}$ times

2 Complete each calculation by first rewriting it as a multiplication.

a

$$6 \div \frac{1}{5} = \frac{\boxed{}}{\boxed{}} \times \frac{\boxed{}}{\boxed{}} \\ =$$

30

b

$$9 \div \frac{1}{4} = \frac{\boxed{}}{\boxed{}} \times \frac{\boxed{}}{\boxed{}} \\ =$$

36

c

$$4 \div \frac{1}{9} = \frac{\boxed{}}{\boxed{}} \times \frac{\boxed{}}{\boxed{}} \\ =$$

36

d

$$10 \div \frac{1}{8} = \frac{\boxed{}}{\boxed{}} \times \frac{\boxed{}}{\boxed{}} \\ =$$

80

e

$$24 \div \frac{1}{7} = \frac{\boxed{}}{\boxed{}} \times \frac{\boxed{}}{\boxed{}} \\ =$$

168

f

$$15 \div \frac{1}{6} = \frac{\boxed{}}{\boxed{}} \times \frac{\boxed{}}{\boxed{}} \\ =$$

90

3 Complete each calculation by first rewriting it as a multiplication.

a

$$6 \div \frac{2}{5} = \frac{\boxed{}}{\boxed{}} \times \frac{\boxed{}}{\boxed{}} \\ =$$

15

b

$$9 \div \frac{3}{4} = \frac{\boxed{}}{\boxed{}} \times \frac{\boxed{}}{\boxed{}} \\ =$$

12

c

$$4 \div \frac{4}{9} = \frac{\boxed{}}{\boxed{}} \times \frac{\boxed{}}{\boxed{}} \\ =$$

9

d

$$10 \div \frac{5}{8} = \frac{\boxed{}}{\boxed{}} \times \frac{\boxed{}}{\boxed{}} \\ =$$

16

e

$$24 \div \frac{6}{7} = \frac{\boxed{}}{\boxed{}} \times \frac{\boxed{}}{\boxed{}} \\ =$$

28

f

$$15 \div \frac{5}{6} = \frac{\boxed{}}{\boxed{}} \times \frac{\boxed{}}{\boxed{}} \\ =$$

18

4 Complete each calculation by first rewriting it as a multiplication.

a

$$\frac{1}{4} \div \frac{3}{5} = \frac{\boxed{}}{\boxed{}} \times \frac{\boxed{}}{\boxed{}} \\ = \frac{\boxed{}}{\boxed{}}$$

$\frac{5}{12}$

b

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

$\frac{21}{32}$

c

$$\frac{1}{2} \div \frac{5}{9} = \frac{\boxed{}}{\boxed{}} \times \frac{\boxed{}}{\boxed{}} \\ = \frac{\boxed{}}{\boxed{}}$$

$\frac{9}{10}$

d

$$\frac{2}{5} \div \frac{7}{5} = \frac{\boxed{}}{\boxed{}} \times \frac{\boxed{}}{\boxed{}} \\ = \frac{\boxed{}}{\boxed{}}$$

$\frac{2}{7}$

e

$$\frac{7}{11} \div \frac{3}{4} = \frac{\boxed{}}{\boxed{}} \times \frac{\boxed{}}{\boxed{}} \\ = \frac{\boxed{}}{\boxed{}}$$

$\frac{28}{33}$

f

$$\frac{4}{9} \div \frac{10}{15} = \frac{\boxed{}}{\boxed{}} \times \frac{\boxed{}}{\boxed{}} \\ = \frac{\boxed{}}{\boxed{}}$$

$\frac{2}{3}$

5 Complete each calculation by first rewriting it as a multiplication. It will be useful to cancel first.

a $\frac{3}{4} \div \frac{7}{12} = \frac{\boxed{3}}{\boxed{4}} \times \frac{\boxed{12}}{\boxed{7}}$
 $= \frac{\boxed{}}{\boxed{}}$ $\frac{8}{7}$

b $\frac{3}{4} \div \frac{6}{11} = \frac{\boxed{}}{\boxed{}} \times \frac{\boxed{}}{\boxed{}}$
 $= \frac{\boxed{}}{\boxed{}}$ $\frac{11}{8}$

c $\frac{8}{5} \div \frac{8}{11} = \frac{\boxed{}}{\boxed{}} \times \frac{\boxed{}}{\boxed{}}$
 $= \frac{\boxed{}}{\boxed{}}$ $\frac{11}{5}$

d $\frac{15}{4} \div \frac{20}{7} = \frac{\boxed{}}{\boxed{}} \times \frac{\boxed{}}{\boxed{}}$
 $= \frac{\boxed{}}{\boxed{}}$ $\frac{21}{16}$

e $\frac{9}{8} \div \frac{1}{2} = \frac{\boxed{}}{\boxed{}} \times \frac{\boxed{}}{\boxed{}}$
 $= \frac{\boxed{}}{\boxed{}}$ $\frac{9}{4}$

f $\frac{6}{5} \div \frac{18}{15} = \frac{\boxed{}}{\boxed{}} \times \frac{\boxed{}}{\boxed{}}$
 $= \frac{\boxed{}}{\boxed{}}$ 1

6 Divide these fractions.

a $\frac{2}{5} \div 3$ $\frac{2}{15}$
 b $\frac{3}{5} \div 3$ $\frac{1}{5}$
 c $\frac{5}{3} \div 3$ $\frac{5}{9}$
 d $\frac{3}{6} \div 3$ $\frac{1}{6}$

e $\frac{5}{6} \div 3$ $\frac{5}{18}$
 f $\frac{10}{12} \div 3$ $\frac{5}{18}$
 g $\frac{10}{12} \div 30$ $\frac{1}{36}$
 h $\frac{5}{6} \div 30$ $\frac{1}{36}$

h $\frac{5}{6} \div 15$ $\frac{1}{18}$
 i $\frac{10}{6} \div 15$ $\frac{1}{9}$
 j $\frac{8}{6} \div 15$ $\frac{4}{45}$

7 Divide these fractions.

a $3 \div \frac{2}{5}$ $\frac{15}{2}$
 b $3 \div \frac{3}{5}$ 5
 c $3 \div \frac{5}{3}$ $\frac{9}{5}$
 d $3 \div \frac{3}{6}$ 6

e $3 \div \frac{5}{6}$ $\frac{18}{5}$
 f $3 \div \frac{10}{12}$ $\frac{18}{5}$
 g $30 \div \frac{10}{12}$ 36
 h $30 \div \frac{5}{6}$ 36

h $15 \div \frac{5}{6}$ 18
 i $15 \div \frac{10}{6}$ 9
 j $15 \div \frac{8}{6}$ $\frac{45}{4}$

8 Complete the pattern:

$12 \div 4 = \dots\dots\dots$

3

$12 \div 2 = \dots\dots\dots$

6

$12 \div 1 = \dots\dots\dots$

12

$12 \div \frac{1}{2} = \dots\dots\dots$

24

$12 \div \frac{1}{4} = \dots\dots\dots$

48

Circle the correct word in each sentence:

When dividing by a number more than one, the result is *greater* | *less* than the original number.

less

When dividing by a number less than one, the result is *greater* | *less* than the original number.

greater

9 Complete the following sentences with *greater* or *less* without calculating the answer.

a $5 \times \frac{3}{2}$ gives an answer that is than 5.

greater

b $5 \times \frac{2}{3}$ gives an answer that is than 5.

less

c $5 \div \frac{3}{2}$ gives an answer that is than 5.

less

d $5 \div \frac{2}{3}$ gives an answer that is than 5.

greater

10 Fill in the missing numbers to make these equations true.

a $7 \div \boxed{} = 14$

$\frac{1}{2}$

b $2 \div \boxed{} = 10$

$\frac{1}{5}$

c $20 \div \boxed{} = 80$

$\frac{1}{4}$

d $\boxed{} \div \frac{1}{2} = 30$

15

e $\boxed{} \div \frac{1}{3} = 33$

11

f $\boxed{} \div \frac{1}{10} = 10$

1

11 If $2\frac{1}{4}$ of a pizza is to be shared between three friends.
What fraction of pizza will each friend receive?

$\frac{3}{4}$

12 A carpenter takes $\frac{3}{4}$ of an hour to make a chair. How many chairs can he make in 6 hours?

8

13 Divide these fractions

a

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

$\frac{5}{6}$

b

$$\frac{4}{6} \div \frac{4}{5} =$$

$\frac{5}{6}$

c

$$\frac{4}{3} \div \frac{4}{5} =$$

$\frac{5}{3}$

d

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

$\frac{10}{3}$

e

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

$\frac{15}{8}$

f

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

$\frac{3}{10}$

g

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

$\frac{3}{2}$

h

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

$\frac{2}{3}$

i

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

2

j

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

$\frac{1}{8}$

k

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

$\frac{1}{12}$

l

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

12

m

$$4 \div \frac{7}{3} =$$

$\frac{12}{7}$

n

$$20 \div \frac{7}{3} =$$

$\frac{60}{7}$

o

$$5 \div \frac{7}{12} =$$

$\frac{60}{7}$

p

$$\frac{1}{5} \div \frac{7}{15} =$$

$\frac{3}{7}$

q

$$\frac{1}{5} \div 1\frac{13}{15} =$$

$\frac{3}{28}$

r

$$\frac{1}{5} \div 1\frac{15}{13} =$$

$\frac{13}{140}$

s

$$1\frac{13}{15} \div \frac{1}{5} =$$

$\frac{28}{3}$

t

$$2\frac{13}{15} \div \frac{1}{5} =$$

$\frac{43}{3}$

u

$$2\frac{13}{15} \div 1\frac{1}{5} =$$

$\frac{43}{18}$

- 14** Apples are sold in bags weighing $1\frac{1}{2}$ kg. How many bags can be made from 45 kg of apples?

30

- 15** James takes $2\frac{3}{4}$ minutes to assemble a wooden train.

How many trains can he assembled in one and a half hours?

$32\frac{8}{11}$

16 Calculate the following:**a**

$$\frac{3}{8} \times \frac{4}{5} \div \frac{2}{3}$$

$$\frac{9}{20}$$

b

$$\frac{3}{8} \div \frac{4}{5} \times \frac{2}{3}$$

$$\frac{5}{16}$$

c

$$\frac{3}{8} \div \frac{4}{5} \div \frac{2}{3}$$

$$\frac{45}{64}$$

17 Find the missing number.**a**

$$9 \div \boxed{} = 18$$

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

b

$$3 \div \boxed{} = 15$$

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

c

$$\boxed{} \div \frac{1}{5} = 45$$

$$9$$

d

$$\boxed{} \div 5 = \frac{1}{30}$$

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

e

$$\boxed{} \div 7 = \frac{1}{56}$$

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

f

$$\frac{1}{6} \div \boxed{} = 30$$

$$\frac{1}{180}$$

g

$$\boxed{} \div \frac{1}{4} + 3 = 27$$

$$6$$

h

$$\boxed{} \div \frac{1}{3} = 4\frac{1}{2}$$

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

i

$$\boxed{} \div \frac{1}{10} = 13$$

$$\frac{13}{10}$$

18 For each equation, write at least two different solutions that make them true.**a**

$$\boxed{} \div \frac{1}{\boxed{}} = 24 \quad \boxed{} \div \frac{1}{\boxed{}} = 24$$

The two numbers should be a factor pair of 24

b

$$\boxed{} \div \frac{1}{\boxed{}} = 36 \quad \boxed{} \div \frac{1}{\boxed{}} = 36$$

The two numbers should be a factor pair of 36

19 Mary asks her dad to buy 18 bottles of soft drink for her party.Each bottle contains $1\frac{1}{4}$ litres.The glasses they have for the party can hold $\frac{1}{5}$ of a litre.

How many glasses could be filled from the 18 bottles of soft drink?

$$112\frac{1}{2} \text{ glasses}$$

20 Evaluate

$$\left[\left(\frac{1}{9} - \frac{1}{10}\right) \div \frac{1}{8}\right] \times \frac{1}{7} + \frac{1}{6}$$

$$\begin{aligned} & \left[\left(\frac{10}{90} - \frac{1}{90}\right) \div \frac{1}{8}\right] \times \frac{1}{7} + \frac{1}{6} \\ &= \left(\frac{1}{90} \div \frac{1}{8}\right) \times \frac{1}{7} + \frac{1}{6} \\ &= \left(\frac{1}{90} \times \frac{8}{1}\right) \times \frac{1}{7} + \frac{1}{6} \\ &= \frac{8}{90} \times \frac{1}{7} + \frac{1}{6} \\ &= \frac{8}{630} + \frac{1}{6} \\ &= \frac{8}{630} + \frac{105}{630} = \frac{113}{630} \end{aligned}$$

21 [JMC 1997] What is the value of:

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

$$\frac{4}{\left(\frac{1}{4}\right)} = 4 \div \frac{1}{4} = 16$$

22 [JMO 2010] What is the value of:

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

$$1 + 4 + 9 + 16 + 25 = 55$$

23 Calculate

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

$$\begin{aligned} \frac{3}{\frac{1}{12} + \frac{1}{12}} &= \frac{3}{\left(\frac{2}{12}\right)} \\ &= 3 \div \frac{2}{12} \\ &= 3 \times \frac{12}{2} \\ &= \frac{36}{2} \end{aligned}$$

24 Calculate

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

$$\begin{aligned} & \frac{3}{1 - \frac{1}{\left(\frac{2}{3}\right)}} \\ &= \frac{3}{1 - \frac{3}{2}} \\ &= \frac{3}{\left(-\frac{1}{2}\right)} \\ &= -6 \end{aligned}$$

MULTIPLYING AND DIVIDING DECIMALS BY POWERS OF 10

Powers of 10	Expanded Form	Value
10^1	10	10
10^2	10×10	100
10^3	$10 \times 10 \times 10$	1000
10^4	$10 \times 10 \times 10 \times 10$	10 000

MULTIPLYING BY POWERS OF 10

- When multiplying by 10^n , the digits move n place values to the left.

Example Multiply decimals by powers of 10.

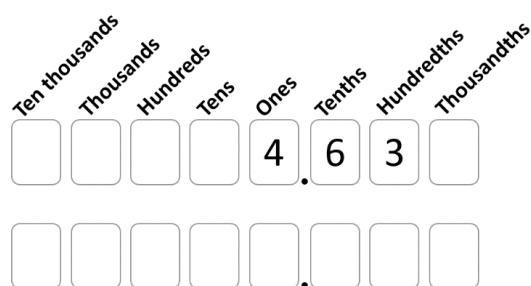
6.7×10

= 67

4.63×1000

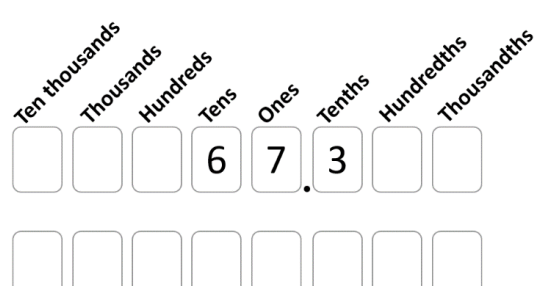
= 4630

a 4.63×10



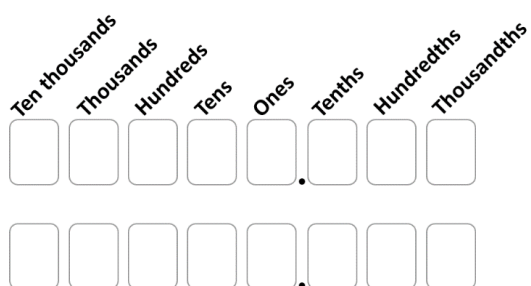
46.3

b 67.3×100



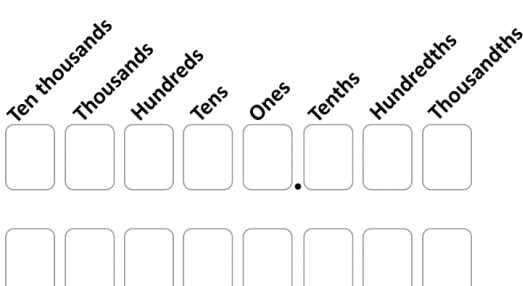
6730

c 0.05×1000



50

d 0.23×10



2.3

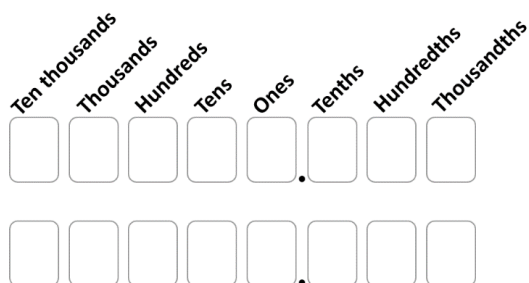
DIVIDING BY POWERS OF 10

- When dividing by 10^n , the digits move n place values to the right.

Example Divide decimals by powers of 10.

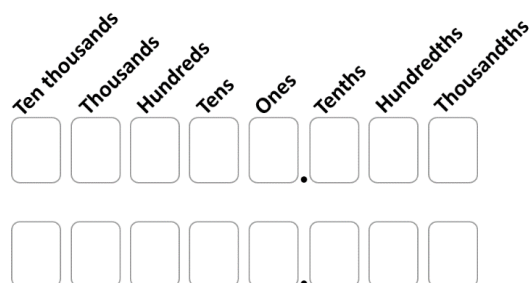
$6.7 \div 10$ <table style="margin: auto;"> <tr> <td>Ten thousands</td><td>Thousands</td><td>Hundreds</td><td>Tens</td><td>Ones</td><td>Tenths</td><td>Hundredths</td><td>Thousandths</td></tr> <tr> <td></td><td></td><td></td><td>0</td><td>6</td><td>7</td><td></td><td></td></tr> <tr> <td></td><td></td><td></td><td></td><td>.</td><td></td><td></td><td></td></tr> <tr> <td></td><td></td><td></td><td></td><td>0</td><td>6</td><td>7</td><td></td></tr> </table> $\div 10$ $= 0.67$	Ten thousands	Thousands	Hundreds	Tens	Ones	Tenths	Hundredths	Thousandths				0	6	7							.								0	6	7		$4.6 \div 100$ <table style="margin: auto;"> <tr> <td>Ten thousands</td><td>Thousands</td><td>Hundreds</td><td>Tens</td><td>Ones</td><td>Tenths</td><td>Hundredths</td><td>Thousandths</td></tr> <tr> <td></td><td></td><td>0</td><td>0</td><td>4</td><td>6</td><td></td><td></td></tr> <tr> <td></td><td></td><td></td><td></td><td>.</td><td></td><td></td><td></td></tr> <tr> <td></td><td></td><td></td><td></td><td>0</td><td>0</td><td>4</td><td>6</td></tr> </table> $\div 100$ $= 0.046$	Ten thousands	Thousands	Hundreds	Tens	Ones	Tenths	Hundredths	Thousandths			0	0	4	6							.								0	0	4	6
Ten thousands	Thousands	Hundreds	Tens	Ones	Tenths	Hundredths	Thousandths																																																										
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		0	0	4	6																																																												
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				0	0	4	6																																																										

a $4.63 \div 10$



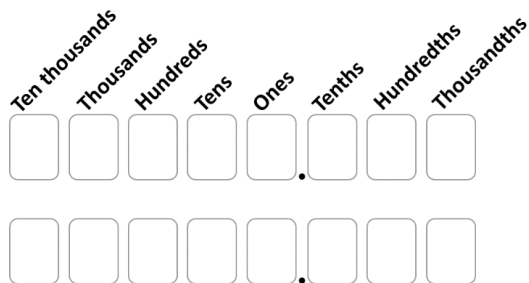
0.463

b $67.3 \div 100$



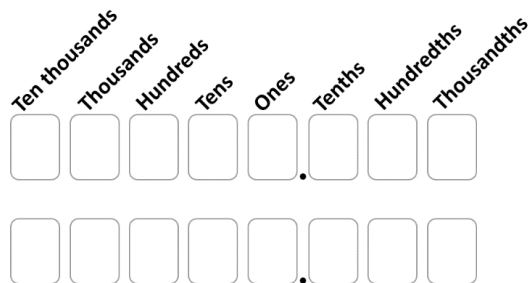
0.673

c $0.23 \div 10$



0.023

d $59 \div 1000$



0.059

1 Use the place value tables to multiply or divide these numbers.

a 5.718×10

Ten thousands	Thousands	Hundreds	Tens	Ones	Tenths	Hundredths	Thousandths

57.18

b 0.837×100

Ten thousands	Thousands	Hundreds	Tens	Ones	Tenths	Hundredths	Thousandths

83.7

c 12.97×100

Ten thousands	Thousands	Hundreds	Tens	Ones	Tenths	Hundredths	Thousandths

1297

d 98.03×1000

Ten thousands	Thousands	Hundreds	Tens	Ones	Tenths	Hundredths	Thousandths

98030

e $59.76 \div 10$

Ten thousands	Thousands	Hundreds	Tens	Ones	Tenths	Hundredths	Thousandths

5.976

f $2351 \div 100$

Ten thousands	Thousands	Hundreds	Tens	Ones	Tenths	Hundredths	Thousandths

23.51

g $4.93 \div 100$

Ten thousands	Thousands	Hundreds	Tens	Ones	Tenths	Hundredths	Thousandths

0.0493

h $57240 \div 100$

Ten thousands	Thousands	Hundreds	Tens	Ones	Tenths	Hundredths	Thousandths

572.4

MULTIPLYING AND DIVIDING POWERS OF 10 USING THE RULE

MULTIPLYING BY POWERS OF 10 USING THE RULE

- When multiplying by 10^n , move the decimal point n places to the right.
- Additional zeros may be required.

Example Multiply by powers of 10.

23.758×1000 $= 23758.$	$4.31 \times 10\ 000$ $= 43100.$
------------------------------------	-------------------------------------

a 72.3×100

=

7230

b 0.3×1000

=

300

c 25.2×1000

=

25200

d 0.676×10

=

7.76

DIVIDING BY POWERS OF 10 USING THE RULE

- When dividing by 10^n , move the decimal point n places to the left.
- Additional zeros may be required.

Example Divide by powers of 10.

$268.15 \div 10$ $= 26.815$	$7.82 \div 1000$ $= 0.00782$
--------------------------------	---------------------------------

a $425.3 \div 100$

=

4.253

b $82\ 162 \div 100$

=

821.62

c $34 \div 1000$

=

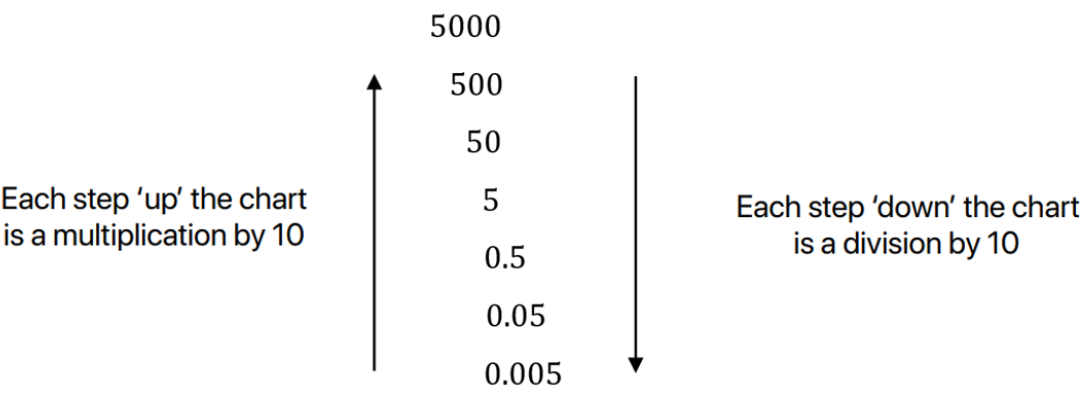
0.034

d $388.13 \div 10\ 000$

=

0.038813

1 Consider the chart:



Use the diagram above to help you answer these questions:

a	50×10	b	500×10	c	0.005×10	d	0.5×10
	500		5000		0.05		5
e	$50 \div 10$	f	$5000 \div 10$	g	$5 \div 10$	h	$0.05 \div 10$
	5		500		0.5		0.005

2 Complete the following, stating how many steps up or down the chart. The first one is done for you.

a	5×100	=	$5 \times 10 \times 10$	=	500	(2 steps up)	500
b	0.05×100	=		=		()	5
c	0.5×1000	=		=		()	500
d	0.005×1000	=		=		()	5
e	$5000 \div 100$	=		=		()	50
f	$5 \div 100$	=		=		()	0.05
g	$500 \div 1000$	=		=		()	0.5
h	$0.5 \div 1000$	=		=		()	0.0005

- 3** What is the overall effect if you
- a** multiply a number by 10 and then multiply the result by 10
multiply by 100
- b** multiply a number by 10 and then divide the result by 10
multiply by 1, no change
- c** multiply a number by 10, multiply the result by 10, and then multiply that result by 10?
multiply by 1000

- 4** What is the overall effect if you
- a** divide a number by 10 and then divide the result by 10
divide by 100
- b** divide a number by 10 and then divide the result by 100
divide by 1000
- c** divide a number by 10, divide the result by 10, and then multiply that result by 100?
Multiply/divide by 1, no change.

5 Multiply each number by 10.

a 37	b 0.37	c 307	d 30.7
370	3.7	3070	307
e 3.07	f 0.0307	g 370	h 0.0037
30.7	0.307	3700	0.037

6 Divide each number by 10.

a 37	b 0.37	c 307	d 30.7
3.7	0.037	30.7	3.07
e 3.07	f 0.0307	g 370	h 0.0037
0.307	0.00307	37	0.00037

7 Work out the following.

a 46×100	b 4.06×100	c 406×10	d 460×100
4600	406	4060	46000
e 4.6×1000	f 4.06×1000	g 10×4.006	h 1000×0.46
4600	4060	40.06	460

8 Work out the following.

a $46 \div 100$	b $4.06 \div 100$	c $406 \div 10$	d $460 \div 100$
0.46	0.0406	40.6	4.6
e $4.6 \div 1000$	f $4.06 \div 1000$	g $4.006 \div 10$	h $0.46 \div 1000$
0.0046	0.00406	0.4006	0.00046

9 Calculate each of the following mentally.

a 76×10	b $56 \div 10$	c 230×100	d $48000 \div 100$
760	5.6	23000	480
e 4.5×100	f $312 \div 10$	g 50.59×100	h $0.9 \div 10$
450	31.2	5059	0.09
i 3.005×10	j $8001 \div 1000$	k 0.028×100	l $25 \div 100$
30.05	8.001	2.8	0.25
m $3094.5 \div 100$	n 0.005×100	o $39.01 \div 1000$	p 4.99×100
30.945	0.5	0.03901	499

10 Determine the answer to the following:

a 4.87×100	b 35.283×10	c 5.69923×1000	d $42.7 \div 100$
487	352.83	5699.23	0.427
e $353.1 \div 10$	f $24.422 \div 10$	g 12.7×1000	h $1215.18 \div 1000$
35.31	2.4422	12700	1.21518

11 A large bee farm produces 1200 litres of honey per day.

a If there are 1000 millilitres in 1 litre, how many millilitres of honey can the farm's bees produce in one day?

1 200 000 mL

b The farm's honey is sold in 100-millilitre jars. How many jars of honey can the farm's bees fill in one day?

12 000 jars

12 A service station charges 147 cents per litre of petrol. How much will it cost Trish to fill her car with 100 litres of petrol? Answer in dollars.

147 dollars

13 Determine the answer to the following, using the order of operations.

a $1.56 \times 100 + 24 \div 10$

158.4

b $16 \div 100 + 32 \div 10$

3.36

c $3 + 10 \times (24 \div 100 + 8)$

85.4

d $10 \times (6.734 \times 100 + 32)$

7054

e $35.4 + 4.2 \times 10 - 63.4 \div 10$

71.06

f $4.7 - 24 \div 10 + 0.52 \times 10$

7.5

g $14 \div 100 + 1897 \div 1000$

2.037

h $78.1 - 10 \times (64 \div 100 + 5)$

30.7

14

a $5.8 \times \square = 580$

100

b $5.8 \times \square = 5800$

1000

c $\square \times 100 = 58$

0.58

d $0.58 \times \square = 5.8$

10

e $\square \times 100 = 508$

5.08

f $\square \times 1000 = 50.8$

0.0508

15

a $92 \div \square = 0.92$

100

b $9.2 \div \square = 0.092$

100

c $\square \div 100 = 9.2$

920

d $92 \div \square = 0.092$

1000

e $\square \div 100 = 92$

0.92

f $\square \div 1000 = 9.02$

9020

16

a $67 \bigcirc \square = 670$

$\times 10$

b $67 \bigcirc \square = 0.67$

$\div 100$

c $6.7 \bigcirc \square = 0.067$

$\div 100$

d $670 \bigcirc \square = 6.7$

$\div 100$

e $670 \bigcirc \square = 6700$

$\times 10$

f $0.0067 \bigcirc \square = 6.7$

$\times 1000$

17

a $17 \times 100 = 1.7 \times \square$

1000

b $2.6 \times \square = 0.26 \times 100$

10

c $4 \times \square = 400 \div 10$

10

d $700 \div \square = 0.7 \div 10$

10 000

e $700 \div \square = 0.7 \times 10$

100

f $53 \times 100 = \square \div 100$

530 000

18 The weight of a matchstick is 0.00015 kg.
Find the weight of 10 000 boxes of matches, with each box containing 100 matches.
The weight of one empty match box is 0.0075 kg.

76.5 kg

MULTIPLYING DECIMALS

Review of prior knowledge

1 Multiply these fractions. Do not simplify the answer.

a $\frac{2}{10} \times \frac{3}{10}$

b $\frac{5}{10} \times \frac{8}{10}$

c $\frac{21}{100} \times \frac{3}{10}$

d $\frac{5}{10} \times \frac{7}{100}$

e $\frac{80}{100} \times \frac{12}{100}$

f $\frac{192}{1000} \times \frac{2}{100}$

2 Complete these calculations.

a 27×10

b 2.7×10

c 0.27×100

d $5700 \div 10$

e $570 \div 10$

f $57 \div 100$

g $10 \div 2$

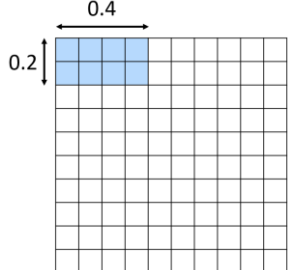
h $1 \div 2$

i $1 \div 0.2$

MULTIPLYING DECIMALS

- To multiply decimals:
 - Convert decimals to fractions.
 - Multiply the fractions.
Use the algorithm if necessary.
Do not simplify the fraction; keep the denominator a power of 10.
 - Convert back to decimal.

Example Multiply and divide decimals by converting to fractions.

0.4×0.2 $1. = \frac{4}{10} \times \frac{2}{10}$ $2. = \frac{8}{100}$ $3. = 0.08$		2.31×7 $1. = \frac{231}{100} \times \frac{7}{1}$ $2. = \frac{1617}{100}$ $3. = 16.17$
--	---	---

Complete these decimal multiplications.

a 0.3×0.7

$$= \frac{3}{10} \times \frac{7}{10}$$

=

b 0.4×0.03

c 0.06×0.02

d 0.04×1.3

0.21

0.012

0.0012

0.052

1 Complete these decimal multiplications.

a 0.1×0.3

b 0.2×0.5

c 0.12×0.02

d 2.25×1.2

0.03

e 4.3×1.2

0.1

f 12.45×0.2

0.0024

g 4×0.2

2.7

h 6×0.5

5.16

i 3.11×6

2.49

j 0.126×0.3

0.8

k 12.2×4.6

3

l 46.2×5.4

18.66

0.0378

56.12

249.48

[Algorithmic method for multiplying decimals]

1. Ignore the decimal points and perform the multiplication as usual.
2. Place the decimal point in the correct position.
 - a. Count the total number of decimal places in the numbers in the question.
 - b. The position of the decimal point in the answer should match this total count.

Worked Solution	Your Turn
5.34×1.2 1. $\begin{array}{r} 534 \\ \times 12 \\ \hline 1068 \\ 5340 \\ \hline 6408 \end{array}$ 2. 5.34 has 2 decimal places. 1.2 has 1 decimal place. The answer should have 3 decimal places. $\therefore 5.34 \times 1.2 = 6.408$	12.31×0.07 1. $\begin{array}{r} 1231 \\ \times 7 \\ \hline \end{array}$ 2. 12.31 has decimal places. 0.07 has decimal places. The answer should have decimal places. $\therefore 12.31 \times 0.07 = \dots\dots\dots$ 0.8617

2 Multiply these decimals using the algorithm method.

a 5.21×4

b 3.8×7

c 22.93×8

20.84

26.6

183.44

d 3.4×6.8

e 5.4×2.3

f 0.34×16

23.12

12.42

5.44

g 14×7.2

h 3×72.8

i 1.29×12

100.8

218.4

15.48

j 3.21×7.2

k 0.023×0.042

l 8.61×0.07

23.112

0.000 966

0.6027

3 Desmond is a casual worker, earning \$20.50 per hour.
How much does earn in a week if he works 7.6 hours?

\$155.80

4 Using fractions, show that:

a Multiplying by 0.1 is the same as dividing by 10.

$$1500 \times 0.1 = 1500 \times \frac{1}{10}$$

$$=$$

b Multiplying by 0.01 is the same as dividing by 100.

$$1500 \times 0.01 = 1500 \times \frac{1}{100}$$

$$=$$

5 Multiply each number by 0.1. This is the same as dividing by 10.

a 2000×0.1

200

b 204×0.1

20.4

c 24×0.1

2.4

d 2.04×0.1

0.204

e 0.24×0.1

0.024

f 0.0204×0.1

0.00204

6 Multiply each number by 0.01. This is the same as dividing by 100.

a 70×0.01

0.7

b 7000×0.01

70

c 78×0.01

0.78

d 708×0.01

7.08

e 7.8×0.01

0.078

f 0.708×0.01

0.00708

7 Consider the “factorisation” strategy for multiplying:

$$17 \times 20 = 17 \times 2 \times 10$$

$$= 34 \times 10$$

$$= 340$$

Use the above strategy to work out:

a 36×20

720

b 14×30

420

c 59×20

1180

d 31×40

1240

8 Consider the “factorisation” strategy for dividing:

$$64 \div 20 = 64 \div 2 \div 10$$

$$= 32 \div 10$$

$$= 3.2$$

Use the above strategy to work out:

a $36 \div 20$

1.8

b $45 \div 30$

1.5

c $28 \div 400$

0.07

d $8 \div 4000$

0.002

- 9 Consider the following strategy for multiplying by a decimal.

$$\begin{aligned} 24 \times 0.2 &= 24 \times 2 \times 0.1 \\ &= 48 \times 0.1 \\ &= 4.8 \end{aligned}$$

Use the above strategy to work out:

a 430×0.2	b 12×0.3	c 31×0.03	d 22×0.4
e 13×0.04	f 0.2×24	g 0.03×21	h 0.004×12

86

3.6

0.93

8.8

0.52

4.8

0.63

0.048

- 10 Work out these calculations.

a $30 \times 4 = 120$ $30 \times 0.4 = \dots\dots\dots$	b $6 \times 40 = \dots\dots\dots$ $0.6 \times 40 = \dots\dots\dots$	c $7 \times 400 = \dots\dots\dots$ $0.07 \times 400 = \dots\dots\dots$
d 800×0.04	e 9000×0.7	f 400×0.07
g 0.08×70	h 6000×0.3	i 0.04×6000

12

24

28

32

6300

28

5.6

1800

240

- 11 Calculate the following:

a 7×6	b 7×0.6	c 0.7×0.6	d 0.07×0.6

42

4.2

0.42

0.042

Count the number of decimal places in each question and the number of decimal places in each answer. What do you notice?

They're the same.

Calculate the following:

e 0.07×6	f 0.007×6	g 0.007×0.006	h 70×0.6

0.42

0.042

0.000042

42

In part **h**, explain why there are no decimal places in the answer.

$$70 \times 6 = 420,$$

$$70 \times 0.6 = 42.0 = 42$$

12 Use the fact that $7 \times 8 = 56$ to write down the answers to

a 70×8 560	b 7×80 560	c 70×80 5600	d 7×800 5600
e 70×800 56 000	f 80×7 560	g 800×70 56000	h 0.7×8 5.6
i 0.8×0.7 0.56	j 0.08×0.07 0.0056		

13 Work out:

a 30×400 12 000	b 60×30 1800	c 0.7×4 2.8	d 8×0.3 2.4
e 9×0.7 6.3	f 60×7 420	g 0.8×0.9 0.72	h 0.3×0.7 0.21
i 20×700 14 000	j 0.07×0.6 0.042		

14 Given that $67 \times 28 = 1876$, work out:

a 67×2.8 187.6	b 0.67×28 18.76	c 6.7×0.28 1.876
d 28×0.067 1.876	e 2.8×0.067 0.1876	f 0.067×280 18.76

15 Complete these calculations using known facts.

a 3×4 12	j 6×5 30	s 0.7×50 35
b 3×0.4 1.2	k 6×0.5 3	t 0.7×5 3.5
c 3×0.04 0.12	l 60×0.5 30	u 0.7×0.5 0.35
d 0.3×4 1.2	m 60×0.05 3	v 7×0.05 0.35
e 0.03×4 0.12	n 6×0.05 0.3	w 0.7×0.05 0.035
f 0.003×4 0.012	o 0.6×0.05 0.03	x 0.07×0.05 0.0035
g 0.003×0.4 0.0012	p 0.6×0.5 0.3	y 0.007×0.5 0.0035
h 0.03×0.4 0.012	q 0.06×0.5 0.03	z 0.0007×5 0.0035
i 0.03×40 1.2	r 0.06×5 0.3	aa 0.00007×50 0.0035

DIVIDING DECIMALS

$$\begin{array}{ccc} \text{Dividend} & \text{Divisor} & \text{Quotient} \\ \textcircled{0.8} & \div \textcircled{4} = & \textcircled{0.2} \end{array}$$

- To divide decimals:
 - If the divisor is a decimal,
 - Adjust the divisor to a whole number by multiplying the dividend and divisor by a power of 10.
 - Divide using the algorithm, keeping the decimal point lined up.

Example Divide decimals by whole numbers.

$2.4 \div 6$ $\begin{array}{r} 2.4 \\ 6 \overline{) 2.4} \\ \underline{6) 2.4} \\ 0.4 \end{array}$ $2.4 \div 6 = 0.4$	$5.085 \div 0.03$ $\begin{array}{r} 5.085 \\ \downarrow \times 100 \quad \downarrow \times 100 \\ 508.5 \div 3 \\ \begin{array}{r} 508.5 \\ 3 \overline{) 508.5} \\ \underline{169.5} \\ 3 \overline{) 169.5} \\ \underline{169.5} \\ 0.0 \end{array} \end{array}$ $5.085 \div 0.03 = 169.5$
--	---

Complete these decimal multiplications.

a $6.3 \div 7$

$$\begin{array}{r} 6.3 \\ 7 \overline{) 6.3} \end{array}$$

0.9

b $13.125 \div 5$

$$\begin{array}{r} 13.125 \\ 5 \overline{) 13.125} \end{array}$$

2.625

c $0.486 \div 0.3$

$$\begin{array}{r} \downarrow \quad \downarrow \times \dots \\ 4.86 \div 3 \end{array}$$

$$\begin{array}{r} 4.86 \\ 3 \overline{) 4.86} \end{array}$$

1.62

d $0.063 \div 0.03$

2.1

1 Divide these decimals.

a $1.56 \div 4$

$$4 \overline{) 1.56}$$

0.39

b $2.56 \div 8$

0.32

c $9.45 \div 3$

3.15

d $0.572 \div 4$

0.143

e $45.87 \div 3$

15.29

f $105.6 \div 8$

13.2

g $3.45 \div 8$

0.43125

h $2.63 \div 5$

0.526

i $19.3 \div 4$

4.825

2 Divide these decimals.

a $52.1 \div 0.8$

65.125

b $17 \div 0.4$

42.5

c $0.72 \div 0.5$

1.44

d $1.16 \div 0.04$

29

e $18.32 \div 0.08$

229

f $23.457 \div 0.07$

335.1

3 Divide these decimals; the answer will be a recurring decimal.

a $35.5 \div 3$

11.8 $\bar{3}$

b $7.1 \div 0.3$

23. $\bar{6}$

c $287 \div 1.2$

239.1 $\bar{6}$

4 Divide these decimals, find the third decimal place then round your answer to 2 decimal places.

a $14.531 \div 9$

1.61

b $1.736 \div 0.9$

1.93

c $2.54 \div 1.3$

1.95

- 5 Place either a multiplication $\times$ or division $\div$ sign in the box to make the equation true.

$$80 \boxed{\times} 0.5 = 40$$

$$80 \boxed{\div} 0.5 = 160$$

$$8 \boxed{\div} 0.5 = 16$$

$$8 \boxed{\times} 0.5 = 4$$

$$0.8 \boxed{\div} 0.5 = 1.6$$

$$0.08 \boxed{\div} 0.5 = 0.16$$

$$0.08 \boxed{\times} 0.5 = 0.04$$

- 6 Using fractions, show that:

- a Dividing by 0.1 is the same as multiplying by 10.

$$1500 \div 0.1 = 1500 \div \frac{1}{10} \\ = 1500 \times$$

- b Dividing by 0.01 is the same as multiplying by 100.

$$1500 \times 0.01 = 1500 \div \frac{1}{100} \\ =$$

- 7 Dividing by 0.1 is the same as multiplying by

10

Write down the answers to:

a $6 \div 0.1$

60

b $0.2 \div 0.1$

2

c $6.2 \div 0.1$

62

d $0.07 \div 0.1$

0.7

e $0.083 \div 0.01$

8.3

- 8 Complete these calculations using known facts.

a $80 \div 2$

40

e $8 \div 2$

4

i $0.8 \div 2$

0.4

m $0.08 \div 2$

0.04

b $80 \div 0.2$

400

f $8 \div 0.2$

40

j $0.8 \div 0.2$

4

n $0.08 \div 0.2$

0.4

c $80 \div 0.02$

4000

g $8 \div 0.02$

400

k $0.8 \div 0.02$

40

o $0.08 \div 0.02$

4

d $80 \div 0.002$

40000

h $8 \div 0.002$

4000

l $0.8 \div 0.002$

400

p $0.08 \div 0.002$

40

9 Match the cards that show equivalent calculations.

÷ 1000

÷ 10

÷ 100

× 0.1

× 0.01

× 0.001

÷ 1000 → × 0.00
 ÷ 10 → × 0.1
 ÷ 100 → × 0.01

10 Find the missing numbers.

a $48 \div 100 = 4.8 \times \square$	b $2.6 \times 0.1 = \square \div 1000$
c $4 \times \square = 400 \div 1000$	d $80 \div \square = 0.8 \times 0.01$

11 Divide these numbers using your multiplication knowledge.

a $48 \div 6$	b $4.8 \div 6$	c $0.48 \div 6$	d $7.2 \div 12$
e $9.5 \div 5$	f $0.42 \div 7$	g $3.3 \div 11$	h $0.63 \div 9$
i $9.63 \div 9$	j $909.63 \div 9$		

12 $204 \div 6 = 34$. Write down the answer to

a $20.4 \div 6$	b $2.04 \div 6$	c $2040 \div 6$	d $408 \div 6$

13 Given that $2.7 \times 4.8 = 12.96$, work out:

a	27×4.8	e	0.27×0.48	i	$12.96 \div 4.8$	m	$12.96 \div 2.7$
b	2.7×48	f	2.7×0.48	j	$129.6 \div 4.8$	n	$12.96 \div 27$
c	0.27×48	g	270×0.48	k	$129.6 \div 48$	o	$1.296 \div 27$
d	0.27×4.8	h	2700×0.48	l	$129.6 \div 0.48$	p	$1.296 \div 0.27$

14 Given that $2.7 \times 4.8 = 12.96$, work out:

a	$\dots \times 4.8 = 129.6$	b	$\dots \times 0.48 = 129.6$	c	$\dots \times 0.48 = 1.296$
d	$2.7 \times \dots = 1296$	e	$27 \times \dots = 12.96$	f	$0.27 \times \dots = 12.96$

15 Divide these numbers.

a	$50 \div 10$	g	$0.5 \div 0.1$	m	$0.1 \div 0.05$
b	$50 \div 20$	h	$0.5 \div 1$	n	$0.2 \div 0.05$
c	$50 \div 2$	i	$5 \div 0.1$	o	$0.2 \div 5$
d	$50 \div 0.2$	j	$1 \div 0.5$	p	$5 \div 0.2$
e	$5 \div 0.2$	k	$0.1 \div 0.5$	q	$0.5 \div 0.2$
f	$0.5 \div 0.2$	l	$0.1 \div 5$	r	$0.05 \div 0.2$

16 Complete the multiplication table.

$\times$		0.6	
	0.8		0.1
	1.6	1.2	0.2
5.5	4.4	3.3	0.55
0.35	0.28	0.21	0.035

MIXED PRACTICE

FOUNDATION

1 Work out:

a

$$\frac{3}{4} \times \frac{2}{7}$$

b

$$\frac{3}{4} \div \frac{2}{7}$$

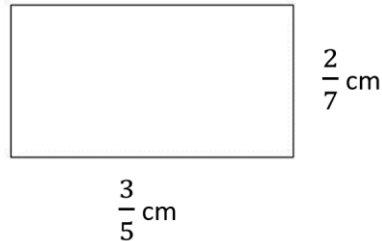
c

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

d

$$\frac{3}{4} - \frac{2}{7}$$

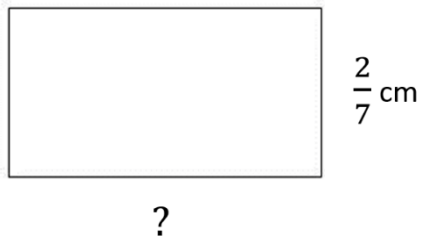
2 Consider the rectangle.



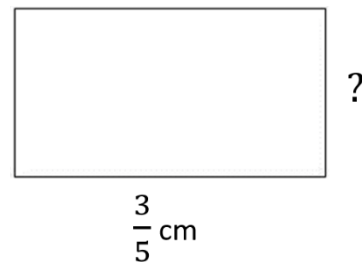
a Find the area of the rectangle

b Find the perimeter of the rectangle

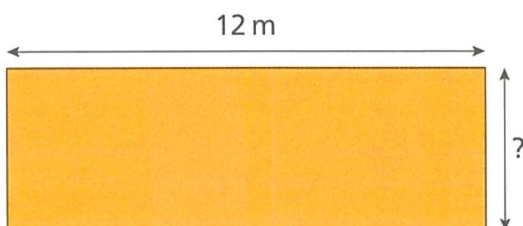
c The area of the rectangle is 8 cm^2 . Find the missing length.



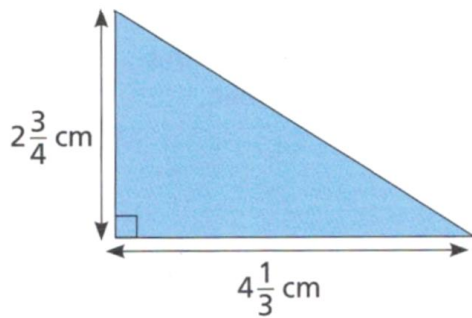
d The perimeter of the rectangle is 12 cm. Find the missing length.



3 The area of the rectangle is 10 m^2 . What fraction of a metre is the width of the rectangle?



- 4 Find the area of the triangle. The area of a triangle is: $\text{Area} = \frac{1}{2} \times \text{Base} \times \text{Height}$



- 5 Fill in the empty boxes to make these fraction operations true.

a

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

b

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

c

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

d

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

e

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

f

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

g

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

h

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

- 6 Using the unitary method, find the number if

a $\frac{3}{7}$ of the number is 9

$\frac{1}{7}$ of the number is

So, the number is

b $\frac{5}{8}$ of the number is 40

$\frac{1}{8}$ of the number is

So, the number is

c $\frac{4}{9}$ of the number is 28

d $\frac{4}{5}$ of the number is 100

e $\frac{7}{10}$ of the number is 21

f $\frac{5}{11}$ of the number is 35

7 Find the answer to each calculation. Follow the order of operations.

a

$$\frac{11}{12} - \left(\frac{1}{12} + \frac{7}{12} \right)$$

b

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

c

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

d

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

e

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

f

$$5 - \frac{4}{9} \times \frac{1}{4} + \frac{1}{5}$$

g

$$5 - \frac{4}{9} \times \left(\frac{1}{4} + \frac{1}{5} \right)$$

h

$$\left(5 - \frac{4}{9} \right) \times \left(\frac{1}{4} + \frac{1}{5} \right)$$

i

$$1\frac{7}{8} \times 2 + \frac{1}{4} \div 2$$

j

$$1\frac{7}{8} \times \left(2 + \frac{1}{4} \right) \div 2$$

8 Find the operation that makes these operations true.

a

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

b

$$4 \square \frac{2}{3} \square 5 = 3\frac{13}{15}$$

c

$$2\frac{1}{2} \square 1\frac{1}{2} \square 3 \square 3 = 0$$

9 Evaluate the following:

a

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

b

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

c

$$-\frac{3}{8} \div \left(-\frac{1}{10} \right)$$

d

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

e

$$\left(-\frac{3}{4} \right)^2$$

f

$$-5\frac{5}{6} + \left(-4\frac{1}{4} \right)$$

10 Using the clues provided, work out which two fractions are being discussed.

- We are two proper fractions.
- Altogether we consist of four different digits.
- When added together our answer will still be a proper fraction.
- When multiplied together you could carry out some cancelling.
- The result of our product, when simplified, contains no new digits from our original four.
- Three of our digits are prime numbers and the fourth digit is a cube number.

$$\frac{2}{5} \text{ and } \frac{3}{8}$$

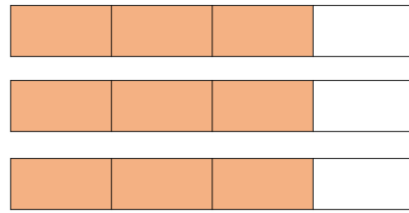
CHECK YOUR UNDERSTANDING

Fraction of a quantity

1	What is $\frac{1}{5}$ of 30?				
	i 5	j 6	k 15	l 30	
2	$\frac{2}{3}$ of 18				
	a 6	b 12	c 9	d 27	
3	$\frac{3}{4}$ of 28				
	a 40	b 21	c 28	d 12	
4	$\frac{4}{5}$ of 30				
	a 4	b 6	c 10	d 24	
5	$\frac{3}{8}$ of 16				
	a 2	b 6	c 19	d 48	
6	$\frac{3}{4}$ of 28				
	a 21	b 63	c 42	d 112	
7	$\frac{3}{8}$ of 0.8				
	a 3	b 2.4	c 0.3	d 0.1	
8	$\frac{1}{5}$ of ? = 5				
	a 10	b 85	c 50	d 25	

Multiplying fractions and integers

1 Use the diagram to calculate $\frac{3}{4} \times 3$



a $\frac{9}{4}$

b $9\frac{3}{4}$

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

d $12\frac{3}{4}$

2 $\frac{4}{10} \times 20$

a 9

b 8

c $\frac{80}{200}$

d 5

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

e $\frac{14}{21}$

f $\frac{2}{21}$

g $7\frac{2}{3}$

h $\frac{14}{3}$

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

a $\frac{10}{15}$

b $\frac{2}{15}$

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

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

5 $\frac{3}{7} \times 9$ in simplest form:

a 21

b $\frac{3}{63}$

c $3\frac{6}{7}$

d $\frac{7}{27}$

6 $\frac{1}{6} \times ? = 8$

a 40

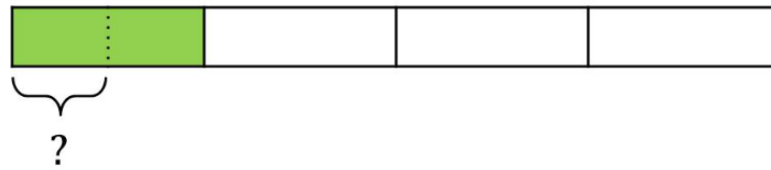
b 48

c 72

d 35

Multiplying fractions with fractions

1 What fraction should replace the question mark?



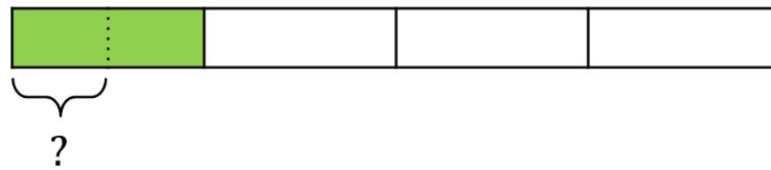
a $\frac{1}{5}$

b $\frac{2}{5}$

c $\frac{1}{8}$

d $\frac{1}{4}$

2 Which calculation should replace the question mark?



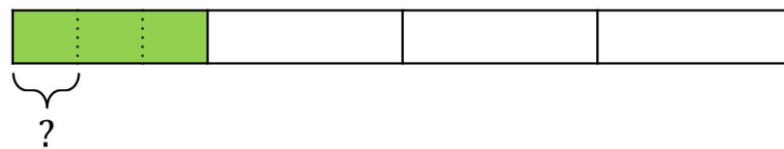
a $\frac{2}{5} \times \frac{1}{2}$

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

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

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

3 What fraction should replace the question mark?



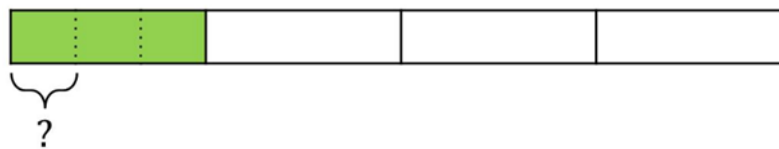
a $\frac{3}{6}$

b $\frac{1}{6}$

c $\frac{1}{12}$

d $\frac{1}{4}$

4 Which calculation should replace the question mark?



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

b $\frac{3}{6} \div 3$

c $\frac{1}{4} \div \frac{1}{3}$

d $\frac{3}{6} \times \frac{1}{3}$

Multiplying fractions with fractions

1	$\frac{1}{5} \times \frac{1}{5}$	a	$\frac{1}{25}$	b	$\frac{1}{10}$	c	$\frac{2}{25}$	d	$\frac{2}{10}$
2	$\frac{1}{2}$ of $\frac{1}{6}$	a	$\frac{1}{3}$	b	3	c	$\frac{1}{12}$	d	$\frac{1}{8}$
3	$\frac{3}{4} \times \frac{2}{3}$	a	$\frac{5}{7}$	b	$\frac{1}{2}$	c	$\frac{6}{7}$	d	$\frac{5}{12}$
4	$\frac{2}{5} \times \frac{3}{4}$	a	$\frac{8}{15}$	b	$\frac{6}{20}$	c	$\frac{5}{20}$	d	$\frac{23}{20}$
5	$\frac{3}{5} \times \frac{6}{7}$	a	$\frac{28}{30}$	b	$\frac{24}{35}$	c	$\frac{10}{35}$	d	None of these
6	$\frac{7}{8} \times \frac{4}{5}$	a	$\frac{11}{13}$	b	$\frac{7}{10}$	c	$\frac{3}{3}$	d	$\frac{35}{32}$
7	Sally has $\frac{2}{3}$ of a whole cake and eats $\frac{1}{3}$ of this piece. What fraction of the whole cake was eaten?								
	a	$\frac{1}{2} + \frac{2}{3}$	b	$\frac{1}{3} \times \frac{2}{3}$	c	$\frac{2}{3} \div \frac{1}{3}$	d	$\frac{2}{3} - \frac{1}{3}$	

Multiplying mixed numerals

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

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

b $\frac{5}{9}$

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

d $\frac{4}{9}$

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

a $1\frac{5}{12}$

b $5\frac{1}{6}$

c $\frac{11}{12}$

d $22\frac{2}{3}$

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

a $3\frac{5}{12}$

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

c $2\frac{11}{12}$

d $1\frac{6}{12}$

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

a $\frac{90}{12}$

b $\frac{73}{12}$

c $\frac{6}{12}$

d $\frac{15}{2}$

5 Work out the missing number. $1\frac{1}{2} \times 3\frac{2}{3} = ?\frac{3}{6}$

a 3

b 7

c 4

d 5

6 Work out the missing number. $1\frac{2}{3} \times 2\frac{3}{4} = ?\frac{7}{12}$

a 3

b 2

c 5

d 4

Simplify before you multiply

For all of these questions, answer in **simplest form**.

1 $\frac{7}{12} \times \frac{8}{21}$

a 2

b $\frac{8}{36}$

c $\frac{15}{33}$

d $\frac{2}{9}$

2 $\frac{10}{14} \times \frac{21}{45}$

a $\frac{31}{59}$

b $\frac{210}{630}$

c $\frac{1}{3}$

d $\frac{7}{21}$

3 $\frac{20}{49} \times \frac{21}{28}$

a $\frac{420}{1372}$

b $\frac{41}{49}$

c $\frac{8}{49}$

d $\frac{15}{49}$

4 $\frac{15}{39} \times \frac{26}{80}$

e $\frac{6}{48}$

f $\frac{1}{8}$

g $\frac{3}{52}$

h $\frac{390}{3120}$

5 $\frac{3}{4} \times \frac{5}{9} \times \frac{24}{25}$

a $\frac{2}{5}$

b $\frac{2}{45}$

c $\frac{3}{9}$

d $\frac{8}{12}$

6 $\frac{6}{10} \times \frac{5}{9} \times \frac{8}{11}$

a $\frac{8}{33}$

b $\frac{16}{66}$

c $\frac{19}{30}$

d $\frac{1}{6}$

Dividing fractions

1 Calculate $2 \div \frac{1}{4}$

a 8

b 2

c $\frac{1}{2}$

d $\frac{2}{4}$

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

a $\frac{1}{3}$

b 3

c $\frac{1}{12}$

d $\frac{6}{2}$

3 Calculate $\frac{3}{7} \div 4$

a $\frac{3}{28}$

b $\frac{12}{7}$

c $\frac{3}{11}$

d $\frac{12}{28}$

4 Calculate $\frac{3}{7} \div \frac{6}{11}$

a $\frac{77}{18}$

b $\frac{18}{77}$

c $\frac{11}{14}$

d $\frac{14}{11}$

5 Calculate $\frac{1}{12} \div \frac{3}{8}$

a $\frac{2}{9}$

b 32

c $\frac{1}{32}$

d $\frac{9}{2}$

6 Calculate $\frac{9}{10} \div \frac{3}{4}$

a $\frac{6}{5}$

b $\frac{40}{27}$

c $\frac{30}{36}$

d $\frac{27}{40}$

7 Calculate $2\frac{1}{4} \div \frac{1}{3}$

a $6\frac{3}{4}$

b $2\frac{1}{12}$

c 2

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