Fraction

A mathematical expression representing the division of one integer by another.

Fractions are written as **two numbers separated by a horizontal line**.

$\frac{2}{7}$ is a 'proper' fraction

$\frac{9}{4}$ is an 'improper' or 'top-heavy' fraction

Numerator

The **top number** of a fraction

In the fraction $\frac{3}{5}$, **3 is the numerator**

Denominator

The **bottom number** of a fraction

In the fraction $\frac{3}{5}$, **5 is the denominator**

Unit Fraction

A fraction where the **numerator is one** and the denominator is positive integer.

$\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$ etc. are examples of **unit fractions**

Mixed Number

A number formed of both an **integer part** and a **fraction part**

$3\frac{2}{5}$ is an example of a **mixed number**

Calculating with Mixed Numbers

You need to change a **mixed number** into an **improper fraction** so you can calculate with it. **Multiply denominator** by the whole number then add **numerator** this is the new **numerator**

$3\frac{2}{5}$ new numerator = 5x3+2 = 17

$3\frac{2}{5} = \frac{17}{5}$

Simplifying Fractions

Divide the numerator and denominator by the highest common factor.

$\frac{20}{45} = \frac{4}{9}$

Equivalent Fractions

Fractions which represent the same value

$\frac{2}{5} = \frac{4}{10} = \frac{20}{50} = \frac{60}{150}$ etc.

Comparing Fractions

To compare fractions, they each need to be rewritten so that they have a **common denominator**.

Ascending means **smallest to biggest**

Descending means **biggest to smallest**

Put in to ascending order: $\frac{3}{4}$, $\frac{2}{3}$, $\frac{5}{6}$, $\frac{1}{2}$

Equivalent: $\frac{9}{12}$, $\frac{8}{12}$, $\frac{10}{12}$, $\frac{6}{12}$ Correct Order : $\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{4}$, $\frac{5}{6}$

Fraction of an amount

Divide by the **bottom**, **multiply** by the **top**

Find $\frac{2}{5}$ of £60 $60 \div 5 = 12$
$12 \times 2 = 24$

Adding or Subtracting Fractions

Find the **LCM of the denominators** to find a common denominator.
Use equivalent fractions to change each fraction to the **common denominator.**
Then just **add or subtract the numerators** and keep the **dominator the same.**

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

Multiples of 3: 3, 6, 9, 12, **15** . . .
Multiples of 5: 5, 10, **15** . . .
LCM of 3 and 5 = 15

$\frac{2}{3} = \frac{10}{15}$ $\frac{4}{5} = \frac{12}{15}$

$\frac{10}{15} + \frac{12}{15} = \frac{22}{15} = 1\frac{7}{15}$

Multiplying Fractions

Multiply the **numerators** together and **multiply** the **denominators** together

$$\frac{3}{8} \ x \ \frac{2}{9} \ = \ \frac{6}{72} \ = \ \frac{1}{12}$$

Dividing Fractions

'Keep it, Flip, Change it – KFC'

Keep the first fraction the same.
Flip the second fraction upside down.
Change the divide to a multiply.

$$\frac{3}{4} \ \div \ \frac{5}{6} \ = \ \frac{3}{4} \ x \ \frac{6}{5} \ = \ \frac{18}{20} \ = \ \frac{9}{10}$$

Multiply by the reciprocal of the second fraction

Try these……

1 Work out these additions

a) $\frac{5}{7} + \frac{1}{4} =$

b) $1\frac{4}{9} + 2\frac{2}{3} =$

2 Subtract these pairs of fractions

a) $\frac{2}{5} - \frac{3}{8} =$

b) $6\frac{2}{5} - 5\frac{2}{3} =$

3 Work out

a) $\frac{7}{8} \ x \ 24 =$

b) $\frac{4}{9} \ x \ \frac{2}{3} =$

c) $\frac{22}{15} \ x \ \frac{5}{11} =$

d) $\frac{1}{5} \ x \ 2\frac{1}{2} =$

4 Serena is saving up for an Xbox.
She gets paid £21.60 a week for her paper round. She spends $\frac{1}{4}$ of this on snacks and she saves $\frac{3}{5}$ of the remainder.

How much does she have left each week to spend on other things?

5 Work out

a) $10 \div \frac{2}{5} =$

b) $\frac{5}{8} \div \frac{2}{3} =$

c) $\frac{3}{4} \div \frac{5}{16} =$

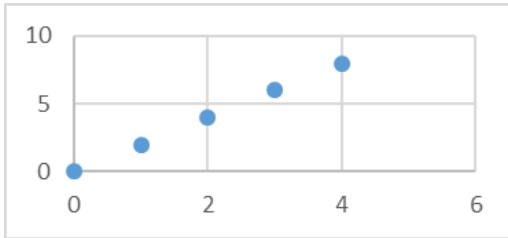d) $2\frac{1}{3} \div \frac{4}{5} =$

6

a) Round each number to the nearest integer to find an estimate of $6\frac{3}{8} - 3\frac{3}{5} \div \frac{9}{10}$

b) Use your calculator to find the exact answer

Recognising direct proportion

- Plot graphs – A straight line passing through (0,0)

- Spot simple direction proportion from a table – always (0,0) included in plot in direct proportion

- Recognising doubling tripling … of linked x and y values

x	0	1	2	3	4
y	0	2	4	6	8

Solving problems with direct proportion using direct proportion graphs

Read from plots and be able to work out outside the points with calculation, e.g. 50g price would be £1000!

Complete calculations that show direct proportion

Recognise from a table direct proportion through quick calculation check.

6/4=12/ 8=18/12=1.5

Reasoning   The table shows the amounts of CO_2 emitted from burning LPG (liquid petroleum gas).

LPG (litres)	0	6	12	18
CO_2 (kg)	0	4	8	12

Complete calculations that **do not** show direct proportion

Recognise from a table values not in direct proportion through calculation

45/30=75/50 (140/120 – different values – 1.5 and 1.16!)

Problem-solving The table shows the cost of perfume in different size bottles.
Are the price and volume in direct proportion?

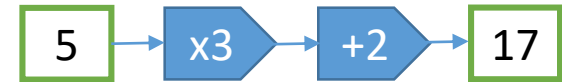| Volume (ml)	30	50	120
Price (£)	45	75	140

Plot a line given a function

| 5 | → | x3 | +2 | → | 17 |

- Calculate values in tables – 3x and add 2 for the value of y from x

- 3 x (5) + 2 = 17

- Plot co-ordinates and link the line with gradient (3) and cuts the y axis at (2)

- Y = (3) x + (2)

a) Complete the table of values below for y = 3x + 2

x	-5	-4	-3	-2	-1	0	1	2	3	4	5
y	-13	-10	-7	-4	-1	2	5	8	11	14	17

b) Plot the graph of y = 3x + 2

c) Use your graph to estimate the value of x when y = 4

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Gradient definition and calculation

What is the gradient of A? $\frac{change\ in\ y}{change\ in\ x}$

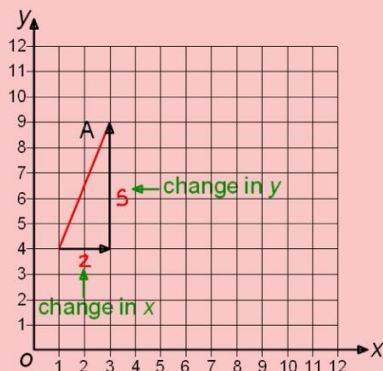Definition of gradient as the steepness of a line gradient has a-value and sign
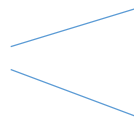
m=change in y/change in x
m=5/2
Use symbol m for gradient

m=2.5 (as 5 divided by 2)

m can be a fraction/whole or a decimal

What is the gradient of A? $\frac{change\ in\ y}{change\ in\ x}$ $\frac{5}{2} = 2.5$
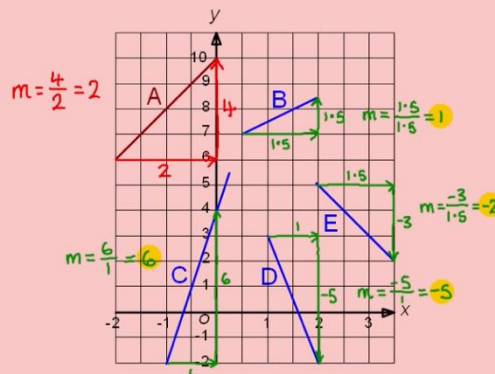
Gradients (positive/negative)

Gradients can be either positive, negative or 0 (zero)

D and E negative

Horizontal line = m = 0

Vertical line = undefined

Find the gradients of the lines A to E

The straight line

$y = mx + c$

Finding m and c on any given line

Constructing triangles on lines to find m
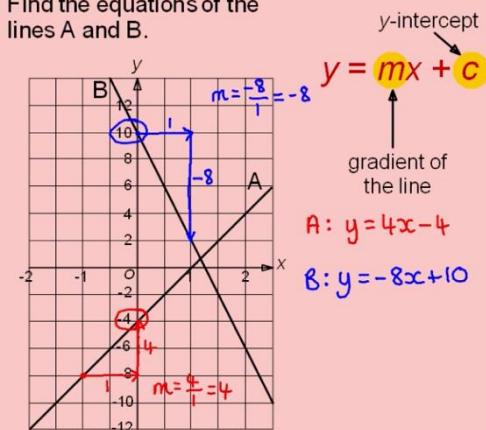
and

Locating c on the y axis (intercept)

A – positive gradient

Intercept c = 4

B – negative gradient

Intercept c = 10

Find the equations of the lines A and B.
$y = mx + c$
A: $y = 4x - 4$
B: $y = -8x + 10$

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Try these……

1

A

Minutes	Cost
1	£0.04
5	£0.20
40	£1.60

B

Minutes	Cost
2	£0.24
10	£1.00
100	£7.00

C

Minutes	Cost
10	£0.70
50	£3.50
60	£4.20

In which of the offers are the numbers in direct proportion?
In each case, explain your answer.

2

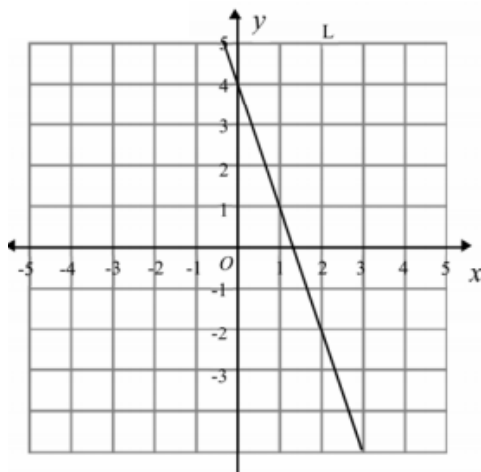| Miles	Kilometres
5	8
10	
	24
	32
50	

a) Use direct proportion to complete this conversion table.

b) The distance between London and Birmingham is 120 miles. Use the table to work out this distance in kilometres.

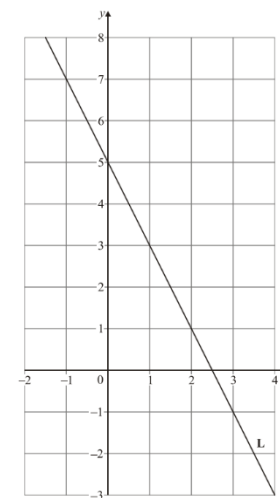c) The distance between London and Paris is 460 kilometres. Use the table to out this distance in miles.

3

The line L is drawn on the grid below.

Find the gradient of the line.

4

Find the equation of line L

Percentage

Number of parts per 100

$$31\% \ means \ \frac{31}{100}$$

Finding 10%

To find 10%, **divide by 10**

$$10\% \ of \ £36 = 36 \div 10 = £3.60$$

Finding 1%

To find 1%, **divide by 100**

$$1\% \ of \ £8 = 8 \div 100 = £0.08$$

Percentage Change

$$\frac{difference}{original} \textbf{ x 100\%}$$

A games console is bought for £200 and sold for £250

$$\% \ change = \frac{50}{200} \ x \ 100 = 25\%$$

Fractions to Decimals

Divide the numerator by the denominator using the bus stop method

$$\frac{3}{8} = 3 \div 8 = 0.375$$

Decimals to Fractions

Write as a fraction over 10,100 or 1000 and simplify

$$0.36 = \frac{36}{100} = \frac{9}{25}$$

Percentages to Decimals

Divide by 100

$$8\% = 8 \div 100 = 0.08$$

Decimals to Percentages

Multiply by 100

$$0.04 = 0.4 \ x \ 100\% = 40\%$$

Fractions to Percentages

Percentage is just a fraction out of 100. **Make the denominator 100 using equivalent fractions**. When the denominator does not go in to 100, use a calculator and **multiply the fraction by 100**

$$\frac{3}{25} = \frac{12}{100} = 12\%$$

$$\frac{9}{17} \ x \ 100 = 52.9\%$$

Percentages to Fractions

Percentage is just a fraction out of 100. **Write the percentage over 100** and simplify

$$14\% = \frac{14}{100} = \frac{7}{50}$$

Try these……

1   Complete the table

Fraction	Decimal	Percentage
$\frac{1}{5}$		
		37%
	0.54	

2   Express the first quantity as a percentage of the second.

a)   45cm   125cm

. . . . %

b)   24 minutes   3 hours 20 minutes

. . . . %