MATHEMATICS PI 3 UNIT 1

1.1 - Adding, subtracting, multiplying and dividing

Key Concepts

To add and subtract – **use column method** and line up the hundreds, tens, units, tenths, hundredths etc.

When multiplying decimals remember the answer should have the same number of figures after the decimal point as the number of figures after the decimal point points in the question.

When dividing by decimals remember to keep multiplying both numbers by 10 until the number you are dividing by is an integer, then use the bus stop method or long division.

Positive x positive = positive, positive x negative = negative, negative x negative = positive, negative x positive = negative.

Positive ÷ positive = positive, positive negative = negative, negative negative = positive, negative positive = negative

Examples

Don't forget to carry over: when adding and to borrow when subtracting:

H	T	O
4	2	2
+1	9	9
6	2	1
1	1	

H	T	O
7	~~8~~ 1	1 2
−1	4	1
6	7	1

3.2 x 3 = 9.6
3.4 x 4.2 = 14.28
4.66 x 9.2 = 42.872

32.8 ÷ 0.8 (x10)
= 328 ÷ 8 = 41 (use bus stop method)

7 x 8 = 56 -7 x -8 = 56
7 x -8 = -56 -7 x 8 = -56
64 ÷ 8 = 8 -64 ÷ -8 = 8
64 ÷ -8 = -8 -64 ÷ 8 = -8

Questions:

1 a) 7.46 + 8.75 b) 34.45 + 23.68 + 3.79 c) **2.32 – 1.78** d) 232.14 – 89.55

2 a) 4.6 x 5 b) 3.46 x 5.32 c) 452 x 0.2 d) 34.1 x 0.11

3 a) 42.4 ÷ 0.2 b) 45.5 ÷ 0.05 c) 56.4 ÷ 1.2

4 a) 9 x 12 b) -9 x 13 c) -8 x -10 d) 14 x – 7 e) -15 x -16

Answers

1 a) 16.21 b) 61.89 c) 0.54 d) 142.59
2 a) 23 b) 18.4072 c) 90.4 d) 3.751
3 a) 212 b) 910 c) 47
4 a) 108 b) -117 c) 80 d) -98 e) -240

Resources:

MyMaths – Number - Add/Subtract written:
3 Adding in columns
3 Subtraction columns

MyMaths - Number - Decimals:
4 multiply two decimals
6 dividing a decimal by a decimal

Corbettmaths
Videos 206 and 207

https://corbettmaths.com/contents/

1.2 - Squares, cubes, roots and order of operations

Key Concepts

The symbol ² means **square** – to square a number multiply the number by itself.
The symbol √ means **square root**, numbers have **positive and negative** square roots.
The symbol ³ means **cube.** Multiply the number by itself then by itself again.
The symbol ³√ means **cube root**.
BIDMAS: Brackets, Indices (powers and roots), Division, Multiplication, Addition, Subtraction.

Examples

$1 \times 1 = 1^2 = 1$, $\sqrt{1} = 1, -1$,
$2 \times 2 = 2^2 = 4$, $\sqrt{4} = 2, -2$
$3 \times 3 = 3^2 = 9$, $\sqrt{9} = 3, -3$

$1 \times 1 \times 1 = 1^3 = 1$, $\sqrt[3]{1} = 1$
$2 \times 2 \times 2 = 2^3 = 8$, $\sqrt[3]{8} = 2$
$3 \times 3 \times 3 = 3^3 = 27$, $\sqrt[3]{27} = 3$

$(20 - 3^2) \times 4$
$= (20 – 9) \times 4$
$= 11 \times 4 = 44$

$24 \div (12 – 2 \times 4)$
$= 24 \div (12 – 8)$
$= 24 \div 4 = 6$

$\sqrt{(30 + 6)} – 4$
$= \sqrt{36} – 4$
$= 6 – 4 = 2$

Questions:

1. Write out all the square numbers from 1^2 to 16^2.
2. Write out all the pairs of square roots of the square numbers from 1 to 100.
3. Write the cube numbers from 1^3 to 5^3.

Evaluate:

4. $4^2 + \sqrt{36} – 2$ 5. $\sqrt{100} + \sqrt[3]{8}$ 6. $(12 - 3^2) \times 4$

7. $(11 - \sqrt{9}) \times (12 – 3 \times 2)$ 8. $20 - \sqrt{(9 \times 4)}$

Answers

1. 1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169, 196, 225, 256
2. 1 -1, 2 -2, 3 -3, 4 -4, 5 -5, 6 -6, 7 -7, 8 -8, 9 -9, 10 -10
3. 1, 8, 27, 64, 125
4. 20 5. 12 6. 12 7. 48 8. 14

Resources

MyMaths - Number - Powers and Roots – Squares and Cubes

MyMaths – Number – Order of Operations

1.3 – LCM, HCF and prime factor decompostion

Key Concepts

A Multiple is in the times table of a number.
A Factor is a number that divides exactly into another number.
A **Prime number** has only two factors, itself and 1. **1 is not a Prime number**. 2,3,5,7,11, 13, 17 are the first 7 Prime numbers
The **Lowest Common Multiple, LCM,** of two numbers is the smallest number that is a multiple of both numbers.
The **Highest Common Factor, HCF,** of two numbers is the largest number that is a factor of both numbers.
Prime factor decomposition is a number written as a product (multiplication) of Prime numbers.

Examples

Find the LCM of 3 and 4
3, 6, 9, **12**, 15
4, 8, **12**, 16, 20
LCM is 12

Find the HCF of 18 and 30
Factors of 18: 1,2,3,**6**,9,18
Factors of 30: 1,2,3,5,**6**,10,15,30
HCF is 6

Prime factor decomposition of 75:

75
3 25
5 5

3 x 5 x 5
3 x 5²

Questions:

Find the LCM of: 5&6, 7&8, 9&10

Find the HCF of: 9&12, 15&20, 12&16

Write out the prime factor decomposition of 60

Answers

30, 56, 90
3, 5, 4

60
2 30
2 15
3 5

2 x 2 x 3 x 5
2² x 3 x 5

Resources

MyMaths – Number – Powers and roots - Lowest Common Multiple

MyMaths - Number - Powers and Roots - Highest Common Factor

1.4 - Index laws, laws of indices

Key Concepts

Any number is written to the power of 1 in index form: $a = a^1$
Any number raised to the power of zero is 1. $a^0 = 1$
$a \times a \times a = a^3$
To multiply powers, add the indices: $a^m \times a^n = a^{m+n}$
To divide powers, subtract the indices: $a^m \div a^n = a^{m-n}$
To work out the power of a power, multiply the indices: $(a^m)^n = a^{m \times n}$

Examples

1) $3^6 \times 3^5 = 3^{6+5} = 3^{11}$
2) $9^6 \div 9^3 = 9^{6-3} = 9^3$
3) $(5^6)^4 = 5^{6 \times 4} = 5^{24}$
4) $9 \times 9 \times 9 = 9^3$
5) $8^4 \div 8^4 = 1$
6) $(7^4)^3 =$ 7to the power of 3 x 4

Questions:

Write as a single power:

1) $5^3 \times 5^2$ 2) $6^4 \times 6$ 3) $9^6 \div 9^2$ 4) $7^4 \div 7^4$

5) $\frac{8^4 \times 8^5}{8^6}$ 6) $\frac{4^9 \times 4}{4^3}$) 7) $(3^2)^5$

Answers

1) 5^5 2) 6^5 3) 9^4 4) $7^0 = 1$ 5) 8^8 6) 4^7 7) 3^{10}

Resources

My Maths – Number –Powers and roots- Indices 1

MATHEMATICS PI 3 UNIT 2

2.1 – Algebraic Expressions

Key Concepts
An **expression** is a sentence in algebra that does NOT have an equals sign.
Be able to write an expression given a description in words.
To **simplify** an expression involving addition or subtraction, **collect like terms** by adding/subtracting the numbers in front of the letters.
If the terms are multiplied, multiply the numbers in front of the letters and put the letters next to each other.
If the terms are divided, divide the numbers in front of the letters

Questions
Simplify:
1) 7p + 3q + p – 3q 2) 5 + 4t + 3p – 2t + 7
3) m – 8g – 5m 4) $b^2 – 7b^2 + 2b^2$
5) 2a × 5b × 4c 6) 8m × 3n × 2m
7) $\frac{36p}{12}$ 8) $\frac{6t}{18}$

Write expressions for the following:
9) James buys 2 packs of x stamps. He gives 7 away.
10) Pat as 30 stamps. She gives away 4 packs of x stamps.

Examples
5m – 7 is an expression since there is no equals sign.
Simplify the following expressions:
1) 4p + 6t + p – 2t = 5p + 4t
2) 3 + 2t + p – t + 2 = 5 + t + p
3) f + 3g – 4f = 3g – 3g
4) $f^2 + 4f^2 - 2f^2 = 3f^2$
5) 6a × 3b × 2c = 36abc
6) $\frac{9b}{3}$ = 3b
7) Sam buys 9 packs of x stamps. He adds them to his collection of 10 stamps.
S = 9x + 10

Resources
MyMaths – Algebra – Algebraic Manipulation – Simplifying.
-

Answers
1) 8p 2) 12 + 2t + 3p 3) -4m – 8g 4) $-4b^2$ 5) 40abc 6) $48m^2n$ 7) 3p 8) $\frac{t}{3}$
9) S = 2x - 7 10) S = 30 – 4x

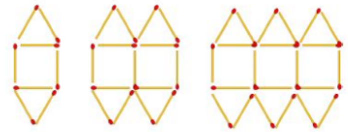
2.2 Finding and using the nth term

Key Concepts
Arithmetic or linear sequences increase or decrease by a common amount each time.
Geometric series has a common multiple between each term.
Quadratic sequences include an n^2. It has a common second difference.
Fibonacci sequences are where you add the two previous terms to find the next term.

Resources
MyMaths - Algebra - Sequences – Generating Sequences

Linear/arithmetic sequence:
-3 +3 +3 +3 +3
+1 4 7 10 13 16.....
a) State the nth term
$3n + 1$
Difference The 0th term
b) What is the 100th term in the sequence?
$3n + 1$
$3 \times 100 + 1 = 301$
c) Is 100 in this sequence?
$3n + 1 = 100$
$3n = 99$
$n = 33$
Yes as 33 is an integer.

Pattern 1 Pattern 2 Pattern 3



Examples
Linear sequences with a picture:
State the nth term.

Hint: Firstly write down the number of matchsticks in each image:

Pattern 1	Pattern 2	Pattern 3
8	15	22

+1 -7 +7 +7
$7n + 1$

Geometric sequence e.g. ×3 ×3 ×3
4 12 36 108...

Quadratic sequence e.g. $n^2 + 4$ Find the first 3 numbers in the sequence
First term: $1^2 + 4 = 5$
Second term: $2^2 + 4 = 8$
Third term: $3^2 + 4 = 13$

Questions
1) 1, 8, 15, 22, ...
a) Find the nth term b) Calculate the 50th term c) Is 120 in the sequence?
2) $n^2 - 5$ Find the first 4 terms in this sequence.

Answers: 1a) 7n – 6 b) 344 c) 18 so yes as n is an integer 2) -4, -1, 4, 11

2.3 – Solving equations

Key Concepts
Use **function machines** to solve equations by working with **inverse operations** to find the value of a variable.
The inverse of addition is subtraction The inverse of subtraction is addition.
The inverse of multiplication is division. The inverse of division is multiplication

Examples
1) 4x – 7 = 1
$x \rightarrow \boxed{\times 4} \rightarrow \boxed{-7} \rightarrow 1$
$2 \leftarrow \boxed{\div 4} \leftarrow \boxed{+7} \leftarrow 1$
So x = 2
2) 4x + 4 = 20
$x \rightarrow \boxed{\times 4} \rightarrow \boxed{+4} \rightarrow 20$
$4 \leftarrow \boxed{\div 4} \leftarrow \boxed{-4} \leftarrow 20$
So x = 4
3) 3x – 8 = 1
$x \rightarrow \boxed{\times 3} \rightarrow \boxed{-8} \rightarrow 1$
$3 \leftarrow \boxed{\div 3} \leftarrow \boxed{+8} \leftarrow 1$
So x = 3

Questions:
Use function machines and inverse operations to solve these equations:
1) 102x = 10 2) 3y + 2 = 8 3) 10a – 4 = 26
4) x/3 + 2 = 11 5) 2a – 8 = -2 6) 4x – 20 = 20
7) 6c ÷ 5 = 6 8) 14x ÷ 2 = 14

Resources
MyMaths - Algebra - Equations Linear – Equations 2 – multi-step.

Answers
1) x = 5 2) y = 6 3) a = 3 4) x = 9 5) a = 3 6) x = 10
7) c = 5 8) x = 2

3.1 –Planning a survey, statistics from frequency tables

Key Concepts

Bias – a biased dice is more likely to land on one number than another.
Primary data is data you collect yourself. **Secondary data** is data collected by someone else.
The total number of items in a survey is called the **population, a sample** is usually about 10% of the population.
The sample should be **unbiased and random** (everyone in the sample has an equal chance of being surveyed).
The median is the middle item of data**. The range** is largest value subtract smallest value. **The mode or modal value** is the most common value. **The mean** is (sum of values) ÷ (total number of values).

Examples 1) Mean from a frequency table

Worked example
In a game a 4-sided spinner is spun 20 times.
The frequency table shows the results.
Work out the mean score.

Score	Frequency	Total score
1	4	$1 \times 4 = 4$
2	3	$2 \times 3 = 6$
3	8	$3 \times 8 = 24$
4	5	$4 \times 5 = 20$
Total	20	54

Draw a third column to work out the total score for the whole game. Work out score × frequency for each row.

Mean = 54 ÷ 20 = 2.7

Divide the total score by the number of times the spinner was spun.

2) Data is sometimes organised into classes or class intervals:

Number of spectators	Frequency
0–9	5
10–19	8
20–29	10
30–39	2

a How many netball matches were played?
b What is the modal **class**?

a) Total = 5+8+10+2 = 25

b) The modal class is 20 – 29 – this has the largest frequency of 10.

Questions:

Look at this set of data.
1 7 3 3 9 5 6 1 1
a Order the numbers from smallest to largest.
b What is the **median**?
c What is the **mode**?
d What is the **range**?
e Work out the **mean**.

The table shows the numbers of siblings of students in a Year 9 class.
a How many students are there in the class?
b How many siblings were counted altogether?
c Work out the mean number of siblings.

Siblings	Frequency
0	2
1	3
2	4
3	1
4	3

Answers
1a) 1,1,1,3,3,5,6,7,9
b)3 c)1 d)8
e) 4
2a) 13 b)26
c)2

Resources
MyMaths - Statistics – Collecting data - Sampling and questionnaires.

MyMaths - Statistics – Processing data - mean, median and mode from frequency table.

3.2 – Using two-way tables, group discrete and continuous data.

Key Concepts

A two-way table divides data into two groups, the end of each row is the total for that row. The bottom of each column is the total for that column.
Discrete data is data you can **count,** eg number of pupils in a class, number of pets in a household.
Continuous data is **measured** and could be a decimal number eg height, length, mass, time.
Continuous data has to be grouped so there are no gaps in the groups. for the group $10 \le h < 20$, 10 is included but 20 is not.

Examples

The table shows the hair and eye colour of people in Suzie's fam

		Hair colour			
		Black	Brown	Blond	Total
Eye colour	Blue		5		18
	Brown	4		1	
	Total	7			30

a Copy and complete the table.
b How many people had blond hair and blue eyes?

		Hair colour			
		Black	Brown	Blond	Total
Eye colour	Blue	3	5	10	18
	Brown	4	7	1	12
	Total	7	12	11	30

For these sets of data
a list the discrete data b list the continuous data.

Length of a pencil; Time taken to run 100 m; Mass of a car; Favourite colour; Type of vegetable; Number of students in a class; Number of siblings; Price of an MP3 player; Shoe sizes; Heights of students in your class

a Discrete data – shoe sizes, favourite colour, number of siblings, price of a mp3 player, number of students in a class, type of vegetable.
b Continuous data – heights of students in your class, time it takes to run 100 m, mass of a car, length of a pencil

A farmer recorded the mass *m* of lambs when they were born.
3.8 5.2 4.3 3.8 3.1 4.5 4.2
5.4 3.9 4.0 4.1 3.7 3.5 4.1
a Copy and complete the grouped frequency table.
b What is the modal class?

Mass, *m* (kg)	Tally	Frequency
$3.0 \le m < 3.5$		
$3.5 \le m < 4.0$		
$4.0 \le m < 4.5$		
$4.5 \le m < 5.0$		
$5.0 \le m < 5.5$		

Mass, *m* (kg)	Tally	Frequency
$3.0 \le m < 3.5$	I	1
$3.5 \le m < 4.0$	IIII	5
$4.0 \le m < 4.5$	IIII	5
$4.5 \le m < 5.0$	I	1
$5.0 \le m < 5.5$	II	2

b $3.5 \le m < 4.0$ and $4.0 \le m < 4.5$

Questions

The distances *d*, in metres, achieved in a welly-throwing competition were
15.8 21.9 39.5 28.3 19.7 30.0 42.1 35.0 19.9 27.5
39.9 29.7 17.3 24.1 46.2 27.3 37.3 27.4 38.8 32.0
a Copy and complete the grouped frequency table.
b What is the modal group?

Distance, *d* (m)	Frequency
$10 \le d < 20$	
$20 \le d < 30$	
$30 \le d < 40$	
$40 \le d < 50$	

The table shows the audience at the cinema one evening.
a Copy and complete the two-way table.
b How many people attended the cinema in total?

	Male	Female	Total
Adults	10		22
Children		16	
Total	22		

Answers

Distance, *d* (m)	Frequency
$10 \le d < 20$	4
$20 \le d < 30$	7
$30 \le d < 40$	7
$40 \le d < 50$	2

b $20 \le d < 30$, $30 \le d < 40$

	Male	Female	Total
Adults	10	12	22
Children	12	16	28
Total	22	28	50

b 50

Resources
MyMaths – Statistics – Presenting data – Two-way tables and Grouping data

3.3 – Pie Charts and scatter graphs

Key Concepts

Be able to construct and interpret pie charts.
A **scatter graph** shows two sets of data on the same graph. The shape of the graph shows if there is relationship, or **correlation**, between the two sets of data. There can be positive, negative or no correlation between the sets of data.

Examples – how to construct a pie chart:

Worked example
Draw a pie chart to show this data about the types of cars in a car park.

Type of car	Frequency
Diesel	6
Petrol	2
Hybrid electric	4

Total number of cars = 6 + 2 + 4 = 12 — Work out the total number of cars.

12 cars is 360°
÷12 ÷12
1 car is 30°

The whole pie chart (360°) represents 12 cars. Work out what angle represents 1 car.

Type of car	Frequency	Angle
Diesel	6	$6 \times 30° = 180°$
Petrol	2	$2 \times 30° = 60°$
Hybrid electric	4	$4 \times 30° = 120°$

Add a new column to the table with the heading 'Angle'. Multiply the number of each type of car by 30° to work out the angle for each sector.

Check: 180 + 60 + 120 = 360 — Check that the angles add up to 360°.

Draw a circle, and split it into each of the angles. Label each sector and give your pie chart a title.

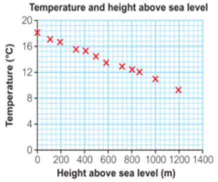
Scatter Graphs - there are three types of correlation

Questions:

1)
The table shows the number of boys, girls and adults in a table tennis club.
a Work out the total number of people in the club.
b Copy and complete: Angle for 1 person: 360° ÷ ☐ = ☐°
c Work out the angle for boys, girls and adults.
d Draw a pie chart to show the data.

Members	Frequency	Angle
Boys	12	
Girls	3	
Adults	9	

2)
Reasoning The scatter graph shows height above sea level and temperature in the west of Scotland on one day.
a Describe what happens to the temperature as the height increases.
b Describe the correlation shown on the graph.
c Carole is going to climb a mountain that is 1100 m high. She says that she will be warm enough in her T-shirt. Is she correct? Explain your reasoning.



Answers 1)
a 24
b 1 person: 360° ÷ 24 = 15°
c

Members	Frequency	Angle
Boys	12	180
Girls	3	45
Adults	9	135

2a As the height increases the temperature decreases
b Negative correlation
c No – at 1100m it will be 10°C which is too cold for just a T-shirt

Resources
MyMaths – Statistics – Presenting data - Reading and drawing pie charts.

MyMaths – Statistics – Scatter graphs – Scatter graphs.

3.4 Write a report to show survey results.

Key Concepts

A report should include: the hypothesis you are testing; data shown in a graph or chart; averages and range; a conclusion; what else you could investigate.
An **hypothesis** is a statement you can test by collecting data.
You should choose the chart according to what your data shows - a pie chart for dividing data or showing proportions; a line graph for data that varies over time; a frequency diagram for comparing frequencies; a grouped frequency diagram when you have lots of data; a scatter graph to show how two variables are related.

Examples

Reasoning Two students recorded how many emails they sent in 10 days.

Michael	3	5	8	8	8	10	15	16	17	20
Theresa	5	6	6	9	9	9	10	12	13	16

a Work out the median, mean and range for
i Michael's data ii Theresa's data.
b Write two sentences comparing the number of emails they sent.
c Theresa says, 'I send more emails than Michael.'
Do you think this is true? Use your data to explain.
d Draw graphs to show the number of emails for each person.

a i Median = 9, Mean = 11, Range = 17
ii Median = 9, Mean = 11, Range = 11
b Students' own answers. For example: The mean number of emails Michael sent was 11 which is greater than the mean number of email Theresa sent.
Michael had a larger range than Theresa so Theresa's data is more consistent
c No, Theresa has sent fewer emails than Michael if comparing the mean number of emails

Questions:

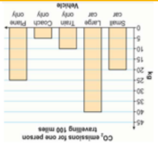
Reasoning / STEM Petra is investigating how environmentally friendly different modes of transport are.
Petra says 'Travelling by plane is much more environmentally friendly than travelling by car.'
The table shows the carbon emissions for each method of transport for travelling 100 km.

Vehicle	Carbon dioxide emissions per traveller (kg)
Small car	20
Large car	40
Train only	10
Coach only	5
Plane only	25

a Draw a graph to show this information.
b Write two sentences comparing the carbon dioxide emissions.
c Do you think Petra's statement is true?
d What other data could Petra gather for this investigation?

Resources

Answers



b Students' own answers describing the carbon dioxide emissions. For example:
A large car produces more carbon dioxide emissions than any other mode of transport.
Travelling in a small car produces twice as many carbon dioxide emissions than travelling by train.
c No. A small car is more environmentally friendly than travelling by plane for that distance.
d Students' own answers. For example:
Does the number of people travelling for each mode of transport cause the carbon emissions per traveller to decrease or increase?
How do people travel to the airport or station?
How far is the distance of travellers to get to the station or airport?

MATHEMATICS PI 3 UNIT 3

MATHEMATICS PI 3 UNIT 4

4.1 - Fractions, decimals and percentages

Key Concepts

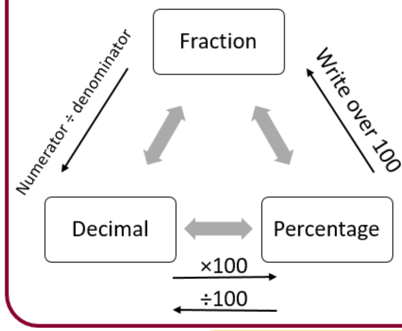
A **fraction** is a numerical quantity that is not a whole number.

A **decimal** is a number written using a system of counting based on the number 10.

Thousands	Hundreds	Tens	Ones	.	Tenths	Hundredths	Thousandths
8	7	6	5	.	4	3	2

A **percentage** is an amount out of 100.

Examples



Order the following in ascending order:

$\frac{3}{5}$ 62% 0.67 $\frac{7}{10}$ 0.665

$\frac{3}{5} \xrightarrow{\times 20} \frac{60}{100} \to$ 60%

62% → 62%

$0.67 \xrightarrow{\times 100}$ 67%

$\frac{7}{10} \xrightarrow{\times 10} \frac{70}{100} \to$ 70%

$0.665 \xrightarrow{\times 100}$ 66.5%

$\frac{3}{5}$ 62% 0.665 0.67 $\frac{7}{10}$

Resources

MyMaths – Number – Percentages - Frac Dec Per 1 and 2

1) Convert the following into percentages:
   a) 0.4 b) 0.08 c) $\frac{6}{20}$ d) $\frac{3}{25}$
2) Compare and order the following in ascending order:
   $\frac{3}{4}$ 76% 0.72 $\frac{4}{5}$ 0.706

ANSWERS 1a) 40% b) 8% c) 30% d) 12% 2) 0.706 0.72 $\frac{3}{4}$ 76% $\frac{4}{5}$

4.2 – Fractions, equivalent fractions, finding the fraction of amount and ordering.

Key Concepts

$\frac{x}{y}$ → Numerator / Denominator

Equivalent fractions have the same value as one another.

Eg. $\frac{1}{4} = \frac{2}{8} = \frac{3}{12}$

Examples

Calculate $\frac{4}{5}$ of 65:

$65 \div 5 = 13$ — Divide by the denominator

$13 \times 4 = 52$ — Multiply this by the numerator

$\frac{4}{5}$ of a number is 52, what is the original number?

$52 \div 4 = 13$ — Divide by the numerator

$13 \times 5 = 65$ — Multiply this by the denominator

Order these fractions in ascending order:

$\frac{2}{5}$	$\frac{1}{2}$	$\frac{5}{6}$	$\frac{7}{15}$
×6	×15	×5	×2
$\frac{12}{30}$	$\frac{15}{30}$	$\frac{25}{30}$	$\frac{14}{30}$
1	3	4	2

To be able to compare fractions we must have a **common denominator**

Resources

MyMaths - Number – Fractions – Modelling Equivalent fractions
MyMaths – Number - Fractions – Modelling fractions of amounts
MyMaths – Number – Fractions – Ordering and simplifying fractions

1) Calculate $\frac{2}{7}$ of 56.
2) $\frac{3}{8}$ of a number is 36, what is the original number?
3) Order the following in ascending order: $\frac{2}{3}$ $\frac{5}{6}$ $\frac{3}{8}$ $\frac{7}{12}$

ANSWERS A 1) 16 2) 96 3) $\frac{3}{8}$ $\frac{7}{12}$ $\frac{2}{3}$ $\frac{5}{6}$

4.3 - Operations with fractions, adding, subtracting, multiplying and dividing

Key Concepts

An **improper fraction** is when the numerator is larger than the denominator e.g. $\frac{20}{12}$

Converting from a mixed number into an improper fraction:

$2\frac{3}{5} = \frac{(2 \times 5) + 3}{5} = \frac{13}{5}$

A **reciprocal** is the value that when multiplied by another gives the answer of 1.

Eg. $\frac{1}{8}$ is the reciprocal of 8.
$\frac{2}{5}$ is the reciprocal of $\frac{5}{2}$

Examples

$$1\frac{2}{3} + 2\frac{1}{4} = \frac{5}{3} + \frac{9}{4} = \frac{20}{12} + \frac{27}{12} = \frac{47}{12} = 3\frac{11}{12}$$

$$2\frac{2}{3} - 1\frac{1}{4} = \frac{8}{3} - \frac{5}{4} = \frac{32}{12} - \frac{15}{12} = \frac{17}{12} = 1\frac{5}{12}$$

Convert into an improper fraction

Find a common denominator

Convert back into a mixed number

$$1\frac{1}{3} \times 2\frac{3}{4} = \frac{4}{3} \times \frac{11}{4} = \frac{44}{12} = 3\frac{8}{12}$$

$$2\frac{1}{3} \div 1\frac{3}{5} = \frac{7}{3} \div \frac{8}{5} = \frac{7}{3} \times \frac{5}{8} = \frac{35}{24} = 1\frac{11}{24}$$

Find the reciprocal of the second fraction....

...and multiply

Resources

MyMaths – Number - Adding and subtraction fractions,

MyMaths – Number – Multiply and divide fractions.

Calculate:

1) $1\frac{2}{3} + 2\frac{3}{4}$
2) $3\frac{3}{4} - 1\frac{1}{3}$
3) $3\frac{1}{5} \times 1\frac{2}{3}$
4) $1\frac{3}{5} \div 2\frac{7}{10}$

What is the reciprocal of:

5) $\frac{2}{3}$
6) 9
7) 0.75

ANSWERS A 1) $4\frac{5}{12}$ 2) $2\frac{5}{12}$ 3) $5\frac{1}{3}$ 4) $\frac{16}{27}$ 5) $\frac{3}{2}$ 6) $\frac{1}{9}$ 7) $\frac{4}{3}$

4.4 - Percentage increase and decrease

Key Concepts

Calculating percentages of an amount without a calculator:

10% = divide the value by 10
1% = divide the value by 100

Calculating percentages of an amount with a calculator:

Amount × percentage as a decimal

Calculating percentage increase/decrease:

Amount × (1 ± percentage as a decimal)

Examples

Calculating a percentage – non calculator:

Calculate 32% of 500g:

10% → 500 ÷ 10 = 50
30% → 50 × 3 = 150
1% → 500 ÷ 100 = 5
2% → 5 × 2 = 10

32% = 150 + 10 = 160g

Calculating a percentage – calculator:

Calculate 32% of 500g:

$Value \times (percentage \div 100)$
= 500 × 0.32
= 160g

Percentage change:

A dress is reduced in price by 35% from £80. What is it's **new price**?

$Value \times (1 - percentage\ as\ a\ decimal)$
= 80 × (1 − 0.35)
= £52

A house price appreciates by 8% in a year. It originally costs £120,000, what is the **new value** of the house?

$Value \times (1 + percentage\ as\ a\ decimal)$
= 120,000 × (1 + 0.08)
= £129,600

Resources

MyMaths – Number – Percentages – Modelling percentage increase and decrease

1) Write the following as a decimal multiplier: a) 45% b) 3% c) 2.7%
2) Calculate 43% of 600 without using a calculator
3) Calculate 72% of 450 using a calculator
4a) Decrease £500 by 6%
   b) Increase 65g by 24%
   c) Increase 70m by 8.5%

ANSWERS 1a) 0.45 b) 0.03 c) 0.027 2) 258 3) 324 4a) £470 b) 80.6g c) 75.95m

MATHEMATICS PI 3 UNIT 5

5.1 – Types of angles and angles in polygons

Key Concepts

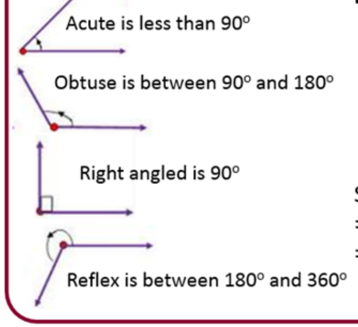
Regular polygons have equal lengths of sides and equal angles.

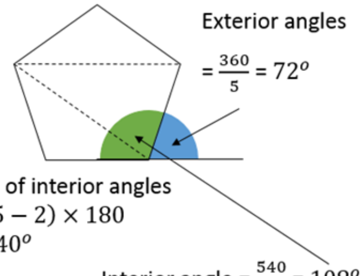
Angles in polygons
Sum of interior angles
$= (number\ of\ sides - 2) \times 180$

Exterior angles of **regular** polygons $= \frac{360}{number\ of\ sides}$

Types of angle
There are four types which need to be identified – acute, obtuse, reflex and right angled.

Examples





$= \frac{360}{5} = 72^o$

Sum of interior angles
$= (5-2) \times 180$
$= 540^o$

Interior angle $= \frac{540}{5} = 108^o$

Resources

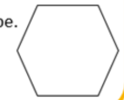
MyMaths – Shape – Angles – Angles 2 Lesson, Angles 3 Lesson

Key Words

Polygon
Interior angle
Exterior angle
Acute
Obtuse
Right angle
Reflex

Questions

1) Calculate the sum of the interior angles for this regular shape.
2) Calculate the exterior angle for this regular shape.
3) Calculate the size of one interior angle in this regular shape.



ANSWERS: 1) 720° 2) 60° 3) 120°

5.2 - Angle facts including on parallel lines

Key Concepts

Angles in a **triangle equal 180°**.

Angles in a **quadrilateral equal 360°**.

Vertically opposite angles are equal in size.

Angles on a **straight line equal 180°**.

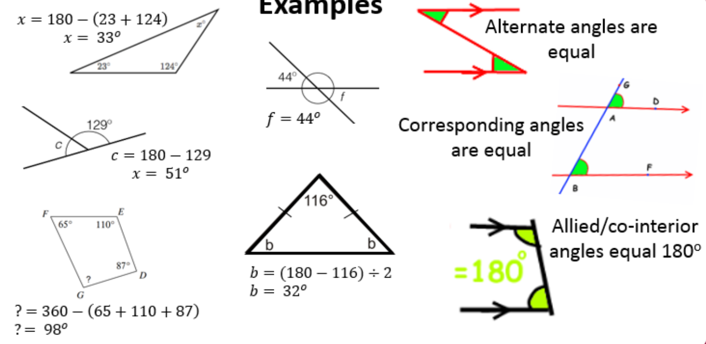
Base angles in an isosceles triangle are equal.

Alternate angles are equal in size.

Corresponding angles are equal in size.

Allied/co-interior angles are equal 180°.

Examples



Resources

MyMaths – Shape – Angles – Angles in parallel lines - Lesson

Key Words

Angle
Vertically opposite
Straight line
Alternate
Corresponding
Allied
Co-interior

Questions

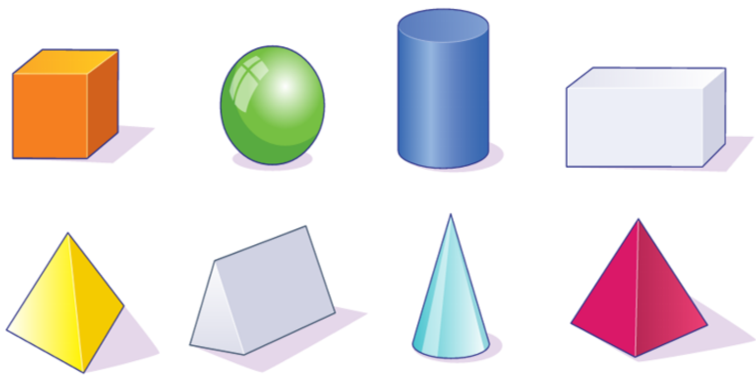
Calculate the missing angle:

a) b) c)

ANSWERS: 1) a=50° 2) b=122° c=57° 3) d=130° e=130° f=50°

5.3 – 3D Shape names

Questions - Name each of the 3D shapes below:



ANSWERS: a) cube b) sphere, c) cylinder, d), tetrahedron (triangular based pyramid) e) triangular prism, f) cone, h) tetrahedron (square based pyramid)

5.4 – Pythagoras' theorum

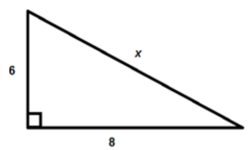
Key Concepts

Pythagoras' theorem and basic trigonometry both only work with **right angled triangles**.

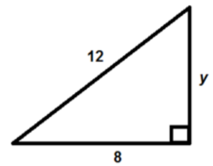
Pythagoras' Theorem – used to find a missing length when two sides are known:
$$a^2 + b^2 = c^2$$
c is always the hypotenuse (longest side)

Examples

Pythagoras' Theorem



$$a^2 + b^2 = c^2$$
$$6^2 + 8^2 = x^2$$
$$100 = x^2$$
$$\sqrt{100} = x$$
$$10 = x$$



$$a^2 + b^2 = c^2$$
$$y^2 + 8^2 = 12^2$$
$$y^2 = 12^2 - 8^2$$
$$y^2 = 80$$
$$y = \sqrt{80}$$
$$y = 8.9$$

Resources

MyMaths – Shape – Pythagoras – Pythagoras' theorem - Lesson

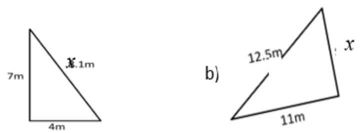
Key Words

Right angled triangle
Hypotenuse
Opposite
Adjacent

Questions

Find the value of x.

a) b)



ANSWERS: a) 8.06m b) 5.94m

6.1 – Reading graphs

Key point

The shape of the graph will tell you whether quantities are increasing or decreasing.

Examples

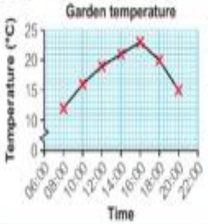
The graph shows the temperature in a garden over one day.

a Look at the vertical axis. What values have been replaced by ⚡?

b What was the maximum temperature?

c When was the temperature 15°?

d How often was the temperature measured?



a 0 – 10

b 23°C

c 09.30 and 20.00

d every 2 hours

Resources

MyMaths – Algebra – Graphs – Real life graphs – Fill the bath 1

Fill the bath 2

Fill the bath 3

Key Words

Increasing

Decreasing

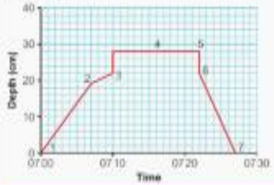
Gradient

(steepness)

Questions

Bethan runs a bath. The line graph shows the depth of water in the bath over time.

Match each point on the graph, labelled 1–6, to one of the statements, labelled A–F.



A Bethan gets in the bath.

B Bethan gets out the bath.

C Bethan turns both taps on.

D Bethan takes out the plug.

E Bethan turns off one of the taps.

F Bethan is in the bath.

ANSWERS: A3, B5, C1, D6, E2, F4

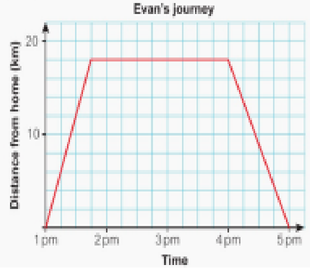
6.2 – Distance – time graphs

Key Concepts

Key point

In a **distance–time graph**, the vertical axis represents the distance from the starting point. The horizontal axis represents the time taken.

Reasoning Evan drives from his house to visit a friend. He stays there for a while, and then drives home. The **distance–time graph** shows his journey.



a How far is Evan's house from his friend's house?

b What time does Evan arrive at his friend's house?

c How long does he take to drive to the house?

d How long does he stay at his friend's house for?

e How long does he take to drive home?

f Was Evan driving faster on the way there or on the way back?

a 18km

b 1:45 pm

c 45 mins

d 2 hours 15 mins

e On his way there – that's when the gradient is steepest.

Resources

MyMaths

Algebra

Graphs

Distance-time graphs

Key Words

Gradient

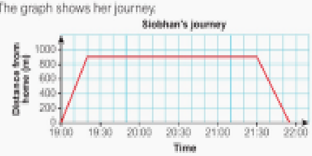
(steepness)

Distance

Time

One evening Siobhan walks to the theatre.

The graph shows her journey.



a How far is the theatre from Siobhan's home?

b How far does Siobhan walk in total?

ANSWERS:

a 900 metres

b 1800 metres or 1.8 km

6.3 - Midpoints

Key point

The **midpoint** of a line segment is a point exactly in the middle.

A straight line between two points is called a **line segment**. These are *line segments* and not just lines because they have a definite beginning and end.

Worked example

Work out the midpoint of this line segment.

x: $(6 + 10) \div 2 = 8$ — Add the two x-coordinates together and divide by 2.

y: $(3 + 7) \div 2 = 5$ — Add the two y-coordinates together and divide by 2.

Midpoint = (8, 5) — These are the x- and y-coordinates of the midpoint.

ANSWERS:

a (2,1)

b (-1.5, 6)

c (-4, -0.5)

Resources

MyMaths

Algebra

Graphs

Distance-time graphs

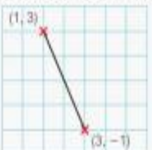
Key Words

Midpoint

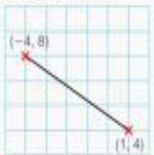
Line segment

Work out the midpoint of each line segment.

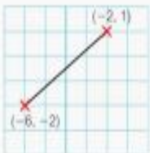
a



b



c



6.4 – Intercepts and gradients

Key point

The **y-intercept** of a line is where it crosses the y-axis.

The line $y = 3x + 2$ intercepts the y-axis at the point (0, 2).

Key point

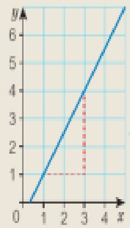
The steepness of the graph is called the **gradient**.

To find the gradient, work out how many units the graph goes up for every one unit across.

Lines with the same gradient are parallel.

Worked example

Work out the **gradient** of this line.



Divide the vertical distance by the horizontal distance.

The graph goes 3 units up every 2 units across.

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

Worked example

Copy and complete the table of values for $y = 2x + 1$

x	−2	−1	0	1	2	3
y	−3	−1	1	3	5	7

When $x = -2$ — Substitute each value of x into $y = 2x + 1$.

$y = 2 \times (-2) + 1 = -3$

Resources

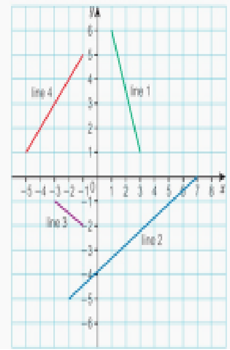
MyMaths

Algebra

Graphs

y = mx + c

Work out the gradient of each line segment in the diagram.



ANSWERS:

gradient line 1 = $-2\frac{1}{2}$; gradient line 2 = $\frac{5}{9}$

gradient line 3 = $-\frac{1}{2}$; gradient line 4 = 1

Key Words

y-intercept

gradient

MATHEMATICS PI 3 UNIT 6

7.1 – Dividing or sharing an amount into a given ratio

Key Concepts

An amount can be divided into a given ratio.

Red : Green
1 : 3

For every 1 red there are 3 greens.

A ratio can be converted into fractions.

Red : Green
1 : 3

$\frac{1}{4}$ are red and $\frac{3}{4}$ are green.

Examples

A woman has £400. She is going to split her money between her two children in the ratio 2:3. How much does each child receive?

No. of boxes (2+3)

2 : 3

80	80
80	80
	80
£160	£240

400 ÷ 5
= 80

Child 1 receives £160 and Child 2 receives £240.

There are boys and girls at a party in the ratio 5:2.
There are 15 more boys than girls.
Calculate the number of people at the party.

No. of extra Boxes (5-2)

5 : 2

5	5
5	5
5	
5	
5	

15 ÷ 3
= 5

7 × 5
= 35 people

Resources

MyMaths – Number – Ratio and proportion – Modelling ratios.

Key Words

Ratio
Divide
Parts

1) Ann made some cakes. She made vanilla cakes and chocolate cakes in the ratio 2:9. What fraction of the cakes were chocolate?
2) Share £25 in the ratio 7:3
3) Katy and Becky share some money in the ratio 2:1. Katy receives £10 more than Becky. How much do they each receive?
4) Claire and John share some money in the ratio 3:2. Claire receives £18. How much does John receive?

ANSWERS 1) $\frac{9}{11}$ 2) £17.50, £7.50 3) £20, £10 4) £12

7.2 - Simplifying ratios

Key Concepts

Simplifying ratios is very similar to simplifying fractions.

To simplify a ratio find the highest common factor (HCF) of the numbers in the ratio.

There may be more than two numbers in a ratio:
5:15:30
5:4:6:2

Examples

Simplify
15:20
HCF = 5
Divide each side by 5 this gives the simplified ratio of 3:4

12:24:16
HCF = 4
Divide each number by 4, this gives the simplified ratio of 3:6:4

A drink contains 200ml of orange juice and 600ml of lemonade. Write the ratio of orange juice to lemonade it it's simplest terms.
Write the ratio in words in the **correct order**:
Orange juice:lemonade
Write the ratio in the **correct order**:
200:600
Divide by 100
2:6
Now divide by 2 to give the simplified ratio of 1:3

Resources

MyMaths – Number – Ratio and proportion – Ratio introduction

Key Words

Simplify
Common factor

Questions

Simplify these ratios:
1) 6:10 2) 5:15:30 3) 4:16:32:64

ANSWERS: 1) 3:5 2) 1:3:6 3) 1:4:8:16

7.3 – Ratio and proportion

Key Concepts

To calculate the **value** for a single item we can use the **unitary method**.

When working with best value in monetary terms we use:

$$\text{Price per unit} = \frac{\text{price}}{\text{quantity}}$$

In recipe terms we use:

$$\text{Weight per unit} = \frac{\text{weight}}{\text{quantity}}$$

Examples

If 20 apples weigh 600g. How much would 28 apples weigh?

600 ÷ 20 = 30g ⟶ weight of 1 apple

30 × 28 = **840g**

Box A has 8 fish fingers costing £1.40.
Box B has 20 fish fingers costing £ 3.40.
Which box is the better value?

$A = \frac{£1.40}{8} = £0.175$ $B = \frac{£3.40}{20} = £0.17$

Therefore Box B is better value as each fish finger costs less.

The recipe shows the ingredients needed to make 10 Flapjacks.
How much of each will be needed to make 25 flapjacks?

Ingredients for 10 Flapjacks
80 g rolled oats
60 g butter
30 ml golden syrup
36 g light brown sugar

Method 1: Unitary
80 ÷ 10 = 8
8 × 25 = **200g**

30 ÷ 10 = 3
3 × 25 = **75g**

60 ÷ 10 = 6
6 × 25 = **150g**

36 ÷ 10 = 3.6
3.6 × 25 = **90g**

Method 2: 5 flapjacks
80 ÷ 2 = 40
40 × 5 = **200g**

30 ÷ 2 = 15
15 × 5 = **75g**

60 ÷ 2 = 30
30 × 5 = **150g**

36 ÷ 2 = 18
18 × 5 = **90g**

Resources

MyMaths – Number – Ratio and proportion – Proportion introduction

Key Words

Unitary
Best Value
Proportion
Quantity

Ingredients to make 16 gingerbread men
180 g flour
40 g ginger
110 g butter
30 g sugar

1) How much will we need to make 24 gingerbread men?

2) Packet A has 10 toilet rolls costing £3.50. Packet B has 12 toilet rolls costing £3.60. Which is better value for money?

3) If 15 oranges weigh 300g. What will 25 oranges weigh?

ANSWERS 1) 270g flour, 60g ginger, 165g butter, 45g sugar 2) Packet B 30p per roll 3) 500g

7.4 - Conversion of metric units

Key Concept

Metric units of **length**:
mm, cm, m, km

Metric units of **weight**:
g, kg

Metric units of **capacity**:
ml, l

All of these units are **metric** units. They will always use conversions of multiples of 10, eg.10, 100, 1000 etc.

Examples

Length: mm ⇄ cm (÷ 10 / × 10), cm ⇄ m (÷ 100 / × 100), m ⇄ km (÷ 1000 / × 1000)

Capacity: ml ⇄ l (÷ 1000 / × 1000)

Weight: g ⇄ kg (÷ 1000 / × 1000)

Converting areas

1m by 1m: Area = 1m²
100cm by 100cm: Area = 10000cm²
$\times 100^2$ / $\div 100^2$

Converting volumes

1m by 1m by 1m: Volume = 1m³
100cm by 100cm by 100cm: Volume = 1000000cm³
$\times 100^3$ / $\div 100^3$

Resources

MyMaths – Number – Ratio and proportion – Converting compound units

Key Words

Length
Weight
Capacity
Metric

Convert each of the following:
a) 12cm into mm
b) 1783g into kg
c) 2.5 litres into ml
d) 6.8m into mm
e) 5000000cm³ into m³
f) 2m² into cm²

ANSWERS: a) 120mm b) 1.783kg c) 2500ml d) 6800mm e) 5m³ f) 20000cm²

MATHEMATICS PI 3 UNIT 7

8.1 – Equations, expressions identities and substituting into formulae.

Key Concepts

A **formula** involves two or more letters, where one letter equals an **expression** of other letters.

An **expression** is a sentence in algebra that does NOT have an equals sign.

An **identity** is where one side is the equivalent to the other side.

When **substituting** a number into an expression, replace the letter with the given value.

Examples

1) $5(y + 6) \equiv 6y + 30$ is an identity as when the brackets are expanded we get the answer on the right hand side
2) $5m - 7$ is an expression since there is no equals sign
3) $3x - 6 = 12$ is an equation as it can be solved to give a solution
4) $C = \frac{5(F-32)}{9}$ is a formula (involves more than one letter and includes an equal sign)
5) Find the value of $3x + 2$ when $x = 5$
   $(3 \times 5) + 2 = 17$
6) Where $A = b^2 + c$, find A when $b = 2$ and $c = 3$
   $A = 2^2 + 3$
   $A = 4 + 3$
   $A = 7$

Resources

My Maths – Algebra – Expressions and formulae – introduction to algebra

Key Words

Substitute
Equation
Formula
Identity
Expression

Questions

1) **Identify the equation, expression, identity, formula from the list** (a) $v = u + at$ (b) $u^2 - 2as$ (c) $4x(x-2) = x^2 - 8x$ (d) $5b - 2 = 13$
2) Find the value of $5x - 7$ when $x = 3$
3) Where $A = d^2 + e$, find A when $d = 5$ and $e = 2$

ANSWERS: 1) (a) formula (b) expression (c) identity (d) equation 2) 8 3) A = 27

8.2 – Formulae in geometry

Key Concepts

Area of a triangle = (base ÷ 2) x height

Perimeter of a shape = distance around the outside

Key words

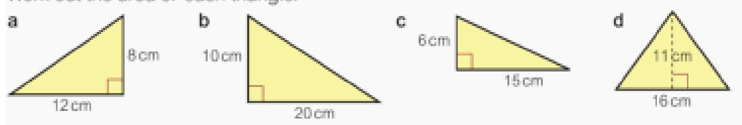
Area
Perimeter
Base
Height
Width
Length

Resources

My Maths – Shape – Area and Perimeter – Area of a triangle

Examples

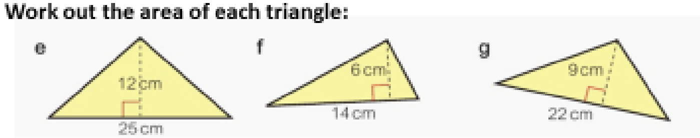
Work out the area of each triangle.



a) (0.5 x 12) x 8 = 48cm² b) (0.5 x 20) x 10 = 100 cm² c) (0.5 x 15) x 6 = 45 cm² d) (0.5 x 16) x 11 = 88 cm²

Questions

Work out the area of each triangle:



ANSWERS: e) 150 cm² f) 42cm² g) 99cm²

8.3 – Compound shapes

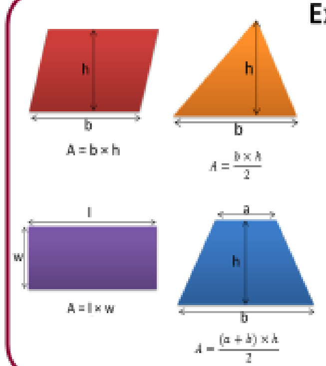
Key Concepts

The **area** of a 2D shape is the space inside it. It is measured in units squared e.g. cm²

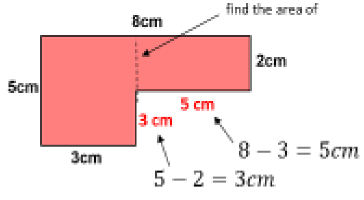
The **perimeter** of a shape is the distance around the edge of the shape. Units of length are used to measure perimeter e.g. mm, cm, m

A **compound shape** is a shape made up of others joined together.

Examples



Split the shape into shapes that you can find the area of



$8 - 3 = 5cm$

$5 - 2 = 3cm$

$$Area = (5 \times 3) + (2 \times 5) = 25cm^2$$

$$Perimeter = 3 + 5 + 8 + 2 + 5 + 3 = 26cm$$

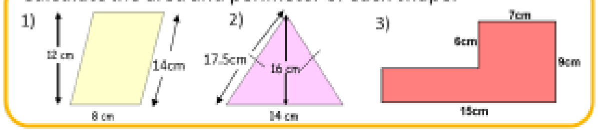
Resources

MyMaths – Shape – Area and Perimeter – Area of a rectangle and trapezium

Key words

Area
Perimeter
Base
Height
Width
Length

Calculate the area and perimeter of each shape:



ANSWERS: 1) A = 96 cm² p = 44cm 2) A = 112 cm² p = 49cm 3) A = 87 cm² p = 48cm

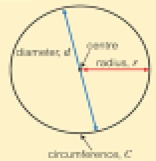
8.4 - Circles

Key Concepts

Area = πr²
Circumference = 2πr or πd
Diameter = 2r
Radius = d/2

Key point

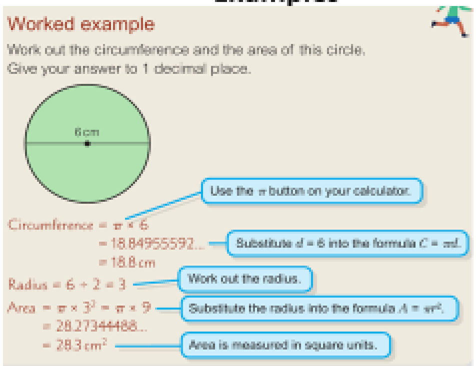
The perimeter of a circle is called the **circumference**.
The **centre** of a circle is usually marked with a dot.
The distance from the centre to the circle edge is called the **radius**.
The distance from edge to edge through the centre is called the **diameter**.



Resources

My Maths – Shape – Area and perimeter – Area and Circumference of a circle

Examples

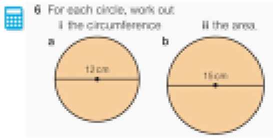


Key words

Radius
Diameter
Area
Circumference

Questions

6 For each circle, work out
i the circumference
ii the area.



ANSWERS: 6ai) 37.44 cm ii) 46.85 cm² 6bi) 46.8 cm ii) 176.63cm²

MATHEMATICS PI 3 UNIT 8

9.1 – Probability experiments

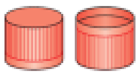
Key Concepts

Experimental probability = $\frac{\text{frequency of event}}{\text{total frequency}}$

The **theoretical probability** of an event is the probability of an event happening based on the number of outcomes.

Examples

2 Modelling Carrie drops a bottle top lots of times. It lands either flat side up or flat side down. She records her results in a frequency table.



Position	Frequency
Flat side up	12
Flat side down	38

a How many times did Carrie drop the bottle top?
b Work out the experimental probability of the bottle top landing
i flat side up ii flat side down.
c Carrie is going to drop the bottle top 200 times. How many times do you expect it to land flat side up?

2a) 12 + 38 = 50 bi) 12/50 ii) 38/50
c) 4 x 12 = 48

Resources

My Maths – Data – Probability – Probability Introduction

Key Words

Experimental Probability
Theoretical Probability
Frequency
Bias

1 Erica spins a 3-coloured spinner. She records the colour it lands on in this frequency table.

Colour	Frequency
White	49
Black	27
Red	24
Total frequency	

a How many times did Erica spin the spinner?
b Write down the experimental probability of landing on
i white ii black iii red.

ANSWERS: 1a) 100 bi) 49/100 ii) 27/100 iii) 24/100 or 6/25

9.2 – Sample space diagrams

Key Concepts

A **sample space diagram** shows all the possible outcomes of two events.

Example

Sally spins these two spinners and adds the scores.

What is the probability of getting a total score of 8?

Green spinner			
4	8	9	10
3	7	8	9
2	6	7	8
	4	5	6
	Yellow spinner		

Draw a sample space diagram and fill in the total score for each outcome.

There are 3 outcomes which give a total score of 8.

Probability of 8 = $\frac{\text{number of outcomes with a score of 8}}{\text{total number of possible outcomes}} = \frac{3}{9} = \frac{1}{3}$

All of the outcomes are equally likely.

Resources

https://corbettmaths.com/contents/

Watch video 246

Key Words

Outcome
Event
Theoretical
Probability
Fair

These dominoes are placed face down. Alice picks one black and one white domino. She multiplies the total number of spots on the white domino by the total number of spots on the black domino.

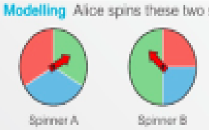
a Draw a sample space diagram to show all the possible outcomes.
b What is
i P(5)
ii P(10)
iii P(more than 15)
iv P(even)?

Q8b hint: P(5) means the probability of getting a score of 5.

9.3 - Two way tables

Example

4 Modelling Alice spins these two spinners at the same time.



This two-way table shows her results.

		Spinner B		
		Blue	Red	Green
Spinner A	Blue	7	6	11
	Red	5	9	12
	Green	8	4	10

Work out the experimental probability of getting
a red with both spinners
b blue with spinner A and green with spinner B
c green with spinner A
d green with one spinner and blue with the other.

1a) 9/72 or 1/8
b) 11/75
c) 22/72 or 11/36
d) 19/72

Questions

3 Modelling Zach flips a gold coin and a silver coin at the same time. He records his results in a **two-way table**.

		Silver coin		
		Heads	Tails	Total
Gold coin	Heads	23	30	
	Tails	26	21	
	Total			

a Copy and complete the table.
b How many times did Zach flip the coins?
c Work out the experimental probability of getting
i heads with the gold coin and tails with the silver coin
ii tails with the gold coin.
Discussion Do you think both coins are fair?

ANSWERS:
3 a

		Silver coin		
		Heads	Tails	Total
Gold coin	Heads	23	30	53
	Tails	26	21	47
	Total	49	51	100

b) 100 c) i) 30/100 or 3/10 ii) 47/100

Resources

MyMaths – Data – Presenting data – Line graphs and two way tables

Key Concepts

When the outcomes of an experiment are pairs of results, the frequencies can be shown in a **two-way table**.

Key Words

Experimental probability

9.4 - Tree diagrams

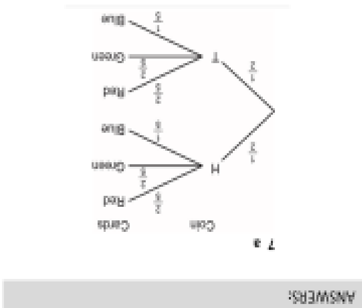
Key Concepts

A tree diagram shows two or more events and their probabilities.

7 Ben flips a coin and picks a coloured card.

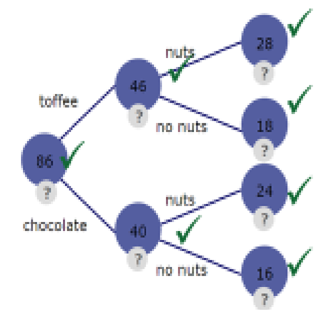
a Draw a tree diagram to show all the possible outcomes.
b How many outcomes are there altogether?
c What is the probability of
i heads and red
ii tails and blue?

ANSWERS:



Examples

James has 86 sweets. 46 are toffee. 28 toffees and 24 chocolates have nuts. Complete the frequency tree. Click on the question mark for a hint.



How many sweets have no nuts? 34
How many toffees have no nuts? 18

Key Words

event
outcome

Resources

MyMaths – Data – Probability – Frequency trees

MATHEMATICS PI 3 UNIT 9

10.1 – Quadrilaterals

Key point

The **properties** of a shape are facts about its sides, angles, diagonals and symmetry.
Here are some of the properties of some well-known quadrilaterals.

Square	• all sides are equal in length • opposite sides are parallel • all angles are 90° • diagonals bisect each other at 90°	Rectangle	• opposite sides are equal in length • opposite sides are parallel • all angles are 90° • diagonals bisect each other
Rhombus	• all sides are equal in length • opposite sides are parallel • opposite angles are equal • diagonals bisect each other at 90°	Parallelogram	• opposite sides are equal in length • opposite sides are parallel • opposite angles are equal • diagonals bisect each other
Kite	• 2 pairs of sides are equal in length • no parallel sides • 1 pair of equal angles • diagonals cross each other at 90°	Trapezium	• 1 pair of parallel sides
		Isosceles trapezium	• 2 sides are equal in length • 1 pair of parallel sides • 2 pairs of equal angles

10.2 - Triangles

Key Concepts

The angles in a triangle add up to 180°.

The angles ion a straight line add up to 180°.

Examples

Work out the size of angle a. Give reasons for your answer.

The two small lines indicate that the sides have equal length, so the triangle is isosceles.

$b = 68°$ (The base angles of an isosceles triangle are equal)

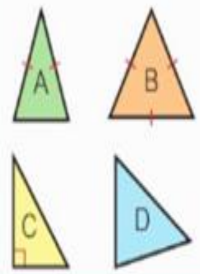
$a = 180° - (2 \times 68°)$ (The angles in a triangle sum to 180°.)

$= 180° - 136°$

$= 44°$

Fluency

Name each triangle.



Resources

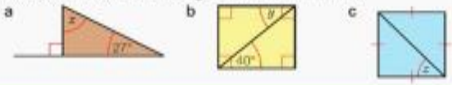
MyMaths – Shape – 2D and 3D Shapes – Properties of triangles

Key Words

Isosceles
Equilateral
Right angled
Scalene

Questions

Work out the size of the angles marked with letters.



ANSWERS: a) 70° b) 120° c) 58° d) 35° A) Isosceles B) Equilateral c) Right angled D) Scalene

10.3 - Enlargement

Key point

An **enlargement** is a type of transformation. The **scale factor** tells you how much to enlarge the shape by.
For example, to enlarge a shape by scale factor 2, multiply the lengths of each side by 2.

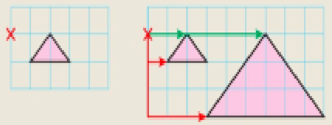
Key point

Enlargement produces **similar** shapes. The angles and proportions are the same.

Real A photograph measuring 15 cm by 10 cm is enlarged by scale factor 3. What is the new length and width?

Worked example

Enlarge this triangle by scale factor 3 and the marked centre of enlargement.



Multiply all the distances from the centre by the scale factor. Count the squares from the centre of enlargement:

- The top vertex of the triangle changes from 2 right to 6 right.
- The bottom left vertex changes from 1 down and 1 right to 3 down and 3 right.

Resources

MyMaths – Shape – Transformations – Enlarging shapes

Key Words

Scale factor
Centre of enlargement

Questions

Real A photograph measuring 15 cm by 10 cm is enlarged by scale factor 3. What is the new length and width?

ANSWERS: 45 cm and 30 cm

10.4 – Congruent shapes

Key Concepts

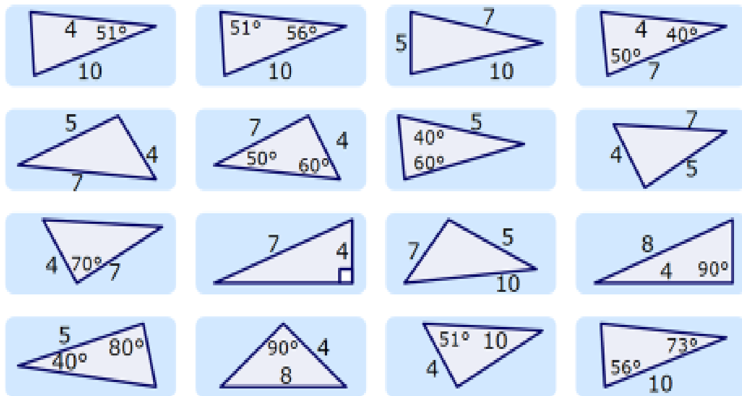
Congruent shapes are exactly the same.

Resources

MyMaths – Shape – 2D and 3D Shapes – Congruent triangles.

Questions

Match up pairs of congruent triangles (i.e. pairs that are the same shape and size).



ANSWERS:

MATHEMATICS PI 3 UNIT 10