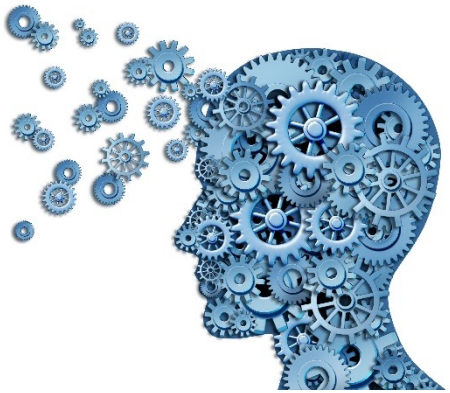
Kettlethorpe
HIGH SCHOOL

MATHS

Year 8 | Theta

Name:

Set:



Unit	Topic	Complete
1	Number	
2	Area and Volume	
3	Expressions and Equations	
4	Fractions, Decimals and Percentages	
5	Experimental Probability	
6	Decimals and Ratio	
7	Fractions	
8	Real-life Graphs	
9	Graphs	
10	Lines and Angles	
11	Analysing and Displaying Data	
12	Statistics	

Theta Unit 1: Number

POWERS AND ROOTS

Square root:
$\sqrt{81} = 9$ (9 x 9 = 81)
$\sqrt{25} = 5$ (5 x 5 = 25)

Cube:
$2^3 = 2 \times 2 \times 2 = 8$
$10^3 = 10 \times 10 \times 10 = 1000$

Cube root:
$\sqrt[3]{64} = 4$ (4 x 4 x 4 = 64)
$\sqrt[3]{27} = 3$ (3 x 3 x 3 = 27)

HCF AND LCM

Highest Common Factor, list the factors of each number and find the largest number which is in both lists

E.g. HCF of 18 and 24: = 6
18: 1, 2, 3, 6, 9, 18 24: 1, 2, 3, 4, 6, 8, 12, 24

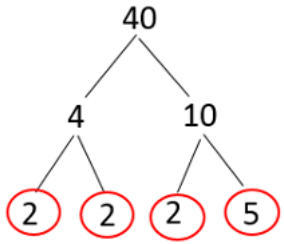
Lowest Common Multiple, list the multiples of each number and find the smallest which is in both lists

E.g. LCM of 8 and 14: = 56
8: 8, 16, 24, 32, 40, 48, 56, 64 14: 14, 28, 42, 56, 70

PRIME FACTORISATION

Write the number as a product of primes (prime numbers that multiply together to make the number)

E.g.
40 = 2 x 2 x 2 x 5
$= 2^3 \times 5$



Division

Use short division (bus stop).

$$\begin{array}{r} 182 \\ 3\overline{)\,5^{2}46} \end{array}$$

5 ÷ 3 = 1 remainder 2

546 ÷ 3 = 182

Multiplication

Use the column method to multiply numbers.

$$\begin{array}{r} 45 \\ \times\ 23 \\ \hline 13^{1}5 \\ +\ 9^{1}00 \\ \hline 1035 \end{array}$$

Remember the place holder 0

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Year 8 | Half-term 1: *Number*

Literacy

Unscramble the words and give definitions:

limutpel

cafrot

dopruct

Fluency

1) Find the products of prime factors of the following numbers:

a) 18 b) 27 c) 36

2) Find the highest common factor and lowest common multiple of 18 and 27

3) Find the highest common factor and lowest common multiple of 18 and 36

Problem Solving

Bus A leaves Wakefield at 8am and leaves again every 1 5minutes.

Bus B leaves Wakefield at 8am as well but then leaves again every 12 minutes.

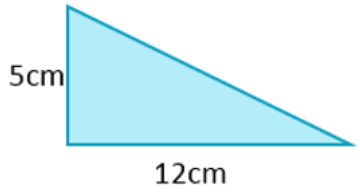
What is the next time they will leave at the same time?

Reasoning

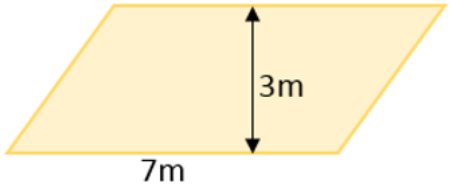
Zoe has completed her maths homework.
Can you spot any mistakes.
Find the highest common factor of 12 and 24
Factors of 12: 2,3,4,6
Factors of 24: 2, 3, 4, 6, 8, 12
Highest common factor is 6.

Theta Unit 2: Area and Volume

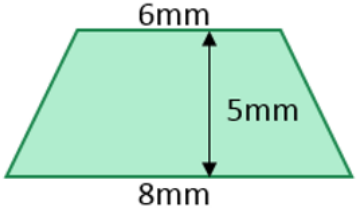
AREA



Area of triangle = ½ x base x height
= ½ x 12 x 5 = 30cm^2

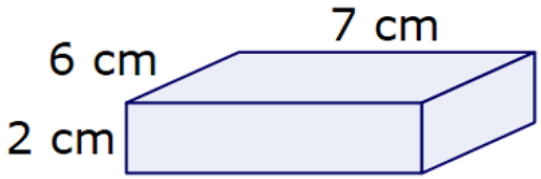


Area of parallelogram = base x height
= 7 x 3 = 21m^2



Area of trapezium = ½(a + b) x height
= ½(8 + 6) x 5
= ½ x 14 x 5
= 35mm^2

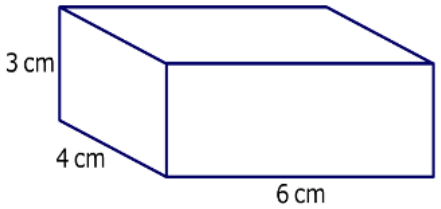
VOLUME OF CUBE/CUBOID



Volume = length x width x height
= 6 x 2 x 7 = 84cm^3

SURFACE AREA OF CUBE/CUBOID

Find the area of each face then add them together.



Front = 6 x 3 = 18cm^2
Back = 6 x 3 = 18cm^2
Top = 6 x 4 = 24cm^2
Bottom = 6 x 4 = 24cm^2
Left = 4 x 3 = 12cm^2
Front = 4 x 3 = 12cm^2

Total Surface Area = 18 + 18 + 24 + 24 + 12 + 12
= 108cm^2

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Year 8| Half-term 2: *Area and Volume*

Literacy

Write the definition of the following words:

Area –

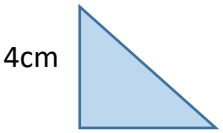
Perimeter –

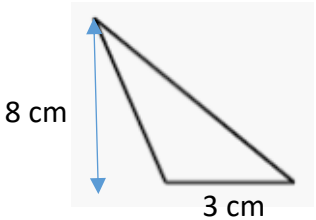
Volume –

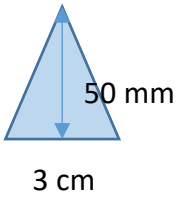
Surface area –

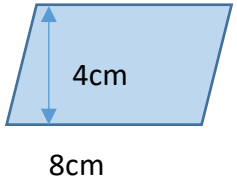
Fluency

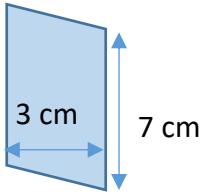
Find the area of the following shapes:

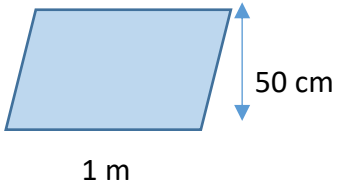












Problem Solving

The following wall needs to be painted.

A tin of paint costs £7.50 and will cover $10m^2$.

How much will it cost to paint the wall?

Reasoning

James has answered the following question. Comment on his answer

$10 \times 25 = 250\ cm^2$

Theta Unit 3: Expressions and Equations

Expanding Brackets

Use the grid method to multiply everything inside the bracket by the term in front of the bracket:

E.g. $3(5a - 2) = 15a - 6$

	5a	-2
3	15a	-6

Solving 1-step Equations

Do the inverse to balance the equation to solve:

E.g. $e + 5 = 7$
$-5 \quad -5$
$e = 2$

$3k = 15$
$\div 3 \quad \div 3$
$k = 5$

$\frac{m}{2} = 6$
$x2 \quad x2$
$m = 12$

Factorising

Find the **highest common factor** of the expression to put the brackets back in:

E.g. $24h + 16 = 8(3h + 2)$
(8 is the HCF of 24h and 16)

$12x^2 - 9x = 3x(4x - 3)$
(3x is the HCF of $12x^2$ and 9x)

Solving Equations

Do the inverse to balance the equation to solve:

E.g. $2h - 7 = 11$
$+7 \quad +7$
$2h = 18$
$\div 2 = \div 2$
$h = 9$

$5x - 4 = 2x + 20$
$-2x \quad -2x$
$3x - 4 = 20$
$+4 \quad +4$
$3x = 24$
$\div 3 \quad \div 3$
$x = 8$

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Year 8 | Half-term 2: *Expressions and Equations*

Literacy

The following words have had the vowels taken out, what should they say:

xprssn

qtn

xpnd

Fctrs

Slv

Fluency

Solve the following one step equations

1) $4x = 16$ 2) $17 + x = 25$ 3) $x - 13 = 15$

Solve the following two step equations

1) $2x + 4 = 10$ 2) $7x - 4 = 18$ 3) $3x + 18 = 15$

Problem Solving

Alice is x years old. Her friend Bob is 3 years older than her. Bob is 24 years old.

(a) Write down an equation for this information.
(b) Solve your equation to find how old Alice is.

Courtney is y years old. Her friend David is 5 years younger than her. David is 18.

(a) Write down an equation for this information.

(b) Solve your equation to find how old Courtney is.

Reasoning

Alice has answered the following question. Comment on her method.

$3h - 11 = 29$

$-11 \quad -11$

$3h = 18$

$\div 3 = \div 3$

$h = 6$

Theta Unit 4: Fractions, Decimals and Percentages

Percentages of amounts

Non Calculator:

50% = ÷2 10% = ÷10 1% = ÷100

E.G

Find 21% of 600:

10% = 600 ÷ 10 = 60
1% = 600 ÷ 100 = 6
21% = 60 x 2 + 6 = 126

Using a multiplier:

CHANGE THE PERCENTAGE TO A DECIMAL THEN MULTIPLY

E.G.

Find 21% of 600

21% ÷ 100 = 0.21 600 x 0.21 = 126

Percentage change

$$\frac{difference}{original} \times 100$$

E.G.

Find the percentage increase from £60 to £81.

$$81 - 60 = 21 \qquad \frac{21}{60} \times 100 = 35\%$$

Percentage Increase/decrease

Non-calculator:

FIND THE PERCENTAGE THEN ADD/SUBTRACT

E.G.

Increase 450 by 10%:

10% = 450 ÷ 10 = 45
450 + 45 = 495

E.G.

Decrease 700 by 28%:

10% = 700 ÷ 10 = 70
1% = 700 ÷ 100 = 7
28% = 70 x 2 + 7 x 8 = 196
700 – 196 = 504

Using a multiplier:

ADD/SUBTRACT THE PERCENTAGE TO/FROM 100, CHANGE TO A DECIMAL AND MULTIPLY

E.G.

Increase 450 by 10%:

100% + 10% = 110%
110% ÷ 100 = 1.1
450 x 1.1 = 495

E.G.

Decrease 700 by 28%:

100% - 28% = 72%
72% ÷ 100 = 0.72
700 x 0.72 = 504

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MATHS

Year 8 | Half-term 2: *Fractions, Decimals and Percentages*

Literacy

Fill in the blanks to spell the following key words:

M___p__r

P__c____e

De_____

Di_____

Fluency

Find the following percentage of amounts:

1) 30% of 130

2) 40% of 60

3) 22% of 150

Use a decimal multiplier to apply the following percentage increase or decrease.

1) Increase 40 by 30%

2) Decrease 80 by 28%

Problem Solving

Anthony organises a charity raffle. He sells 500 tickets for £2 each. 6% of the tickets win a prize that costs £10. 65% of the profit goes to Charity A and the rest goes to Charity B. How much money does Anthony raise for Charity B?

Reasoning

There are 80 teachers in a school. The headteacher says that exactly 89% of the teachers drive to work. Explain why the headteacher is wrong.

Theta Unit 5: Experimental Probability

Calculating Probability

$$P(\text{event}) = \frac{\text{Number of ways the event can occur}}{\text{Total number of outcomes}}$$

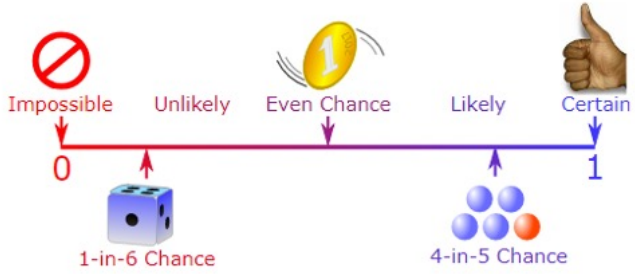
E.g.

The probability of getting a heads when flipping a coin is $\frac{1}{2}$ = 0.5.

The probability of picking a heart (13 cards) from a full deck of cards (52 cards) = $\frac{13}{52} = \frac{1}{4} = 0.25$.

The Probability Scale

The probability scale is between 0 and 1.
Probabilities may be written as fractions, decimals or percentages.



Experimental Probability

Calculating the probability of an outcome based on data that has been collected.

E.G. A dice has been rolled 60 times.

Result	1	2	3	4	5	6
Frequency	20	5	12	10	7	6
Experimental Probability	$\frac{20}{60}$	$\frac{5}{60}$	$\frac{12}{60}$	$\frac{10}{60}$	$\frac{7}{60}$	$\frac{6}{60}$

$$Probability = \frac{Number\ of\ times\ event\ occured}{Total\ number\ of\ trials}$$

Is this experiment fair?

No, the dice isn't fair. All numbers should appear around 10 times, but the number 1 appears 20 times.

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MATHS

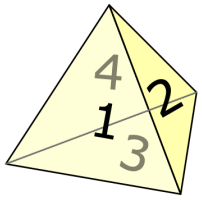
Year 8 | Half-term 3: *Experimental Probability*

Literacy

What does the word biased mean?

Fluency

This dice is rolled a large number of times. The results are in the table.



score	freq
1	103
2	93
3	100
4	104

Use these results to estimate the probability of scoring more than 2

Here is a spinner.
It is spun 900 times and the colour it lands on is recorded.

The table shows how the spinner landed.
Work out the relative frequencies for each colour.

colour	frequency	P(colour)
red	108	
green	306	
blue	81	
pink	189	
yellow	216	

At a factory, a sample of batteries is tested to check how long they can last.
Here are the results:

hours	frequency
$0 < h \leq 5$	14
$5 < h \leq 10$	19
$10 < h \leq 20$	42
$20 < h \leq 30$	14
$30 < h \leq 50$	11

Estimate the probability that a battery of this type will

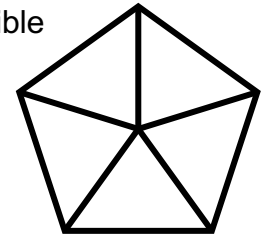
last 30 hours or less [2]

last between 20 and 30 hours [2]

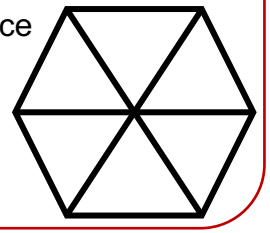
Problem Solving

Complete the spinners below:

Even number is impossible
3 is likely
5 is unlikely

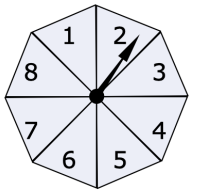


A square number is impossible
Odd number is even chance
Less then 10 is certain



Reasoning

This spinner is spun a large number of times. The results are in the table.



score	freq
1	62
2	61
3	56
4	60
5	63
6	56
7	63
8	59

Is this spinner fair?
Explain your answer.

Theta Unit 6: Decimals and Ratio

Rounding to Decimal Places

E.G.
Round 2.6483 to 1 decimal place:
Look at the 1st and 2nd number after the decimal point
2.6|483
4 is smaller than 5 so the number rounds down to 2.6

Further examples:
7.1893 (2 d.p.) = 7.19
53.645 (1 d.p.) = 53.6

Adding and Subtracting Decimals

Use column method - make sure you line up the decimal point for the correct place value.

2.35 + 4.5:

$$\begin{array}{r} 2 \cdot 3\ 5 \\ +\ 4 \cdot 5 \\ \hline 6 \cdot 8\ 5 \end{array}$$

9.67 – 6.2:

$$\begin{array}{r} 9 \cdot 6\ 7 \\ -\ 6 \cdot 2 \\ \hline 3 \cdot 4\ 7 \end{array}$$

Multiplying Decimals

Use the column method – multiply without the decimal points - estimate first for place value
E.G.
2.8 x 9.4

This is roughly 3 x 9 = 27

$$\begin{array}{rrrr} & & 2 & 8 \\ & \times & 9 & 4 \\ \hline & 1 & 1 & 2 \\ 2 & 5 & 2 & 0 \\ \hline 2 & 6 & 3 & 2 \end{array}$$

So to make 2632 near to 27 we make the answer 26.32

Dividing Decimals

Use your short division to divide:

E.G.
32.7 ÷ 3 = 1.09

$$\begin{array}{r} 1 \cdot 0\ 9 \\ 3\overline{)\ 3 \cdot 2\ 7} \end{array}$$

4.65 ÷ 0.5 = 46.5 ÷ 5 = 9.3

$$\begin{array}{r} 0\ 9 \cdot 3 \\ 5\overline{)\ 4\ 6 \cdot 5} \end{array}$$

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MATHS

Year 8 | Half-term 3: *Decimals and Ratio*

Literacy

What does the word biased mean?

Fluency

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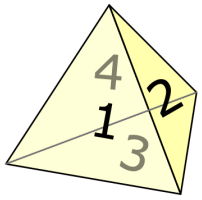

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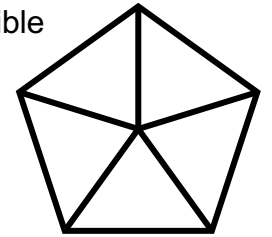

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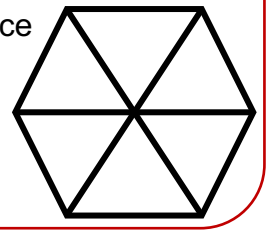

Reasoning

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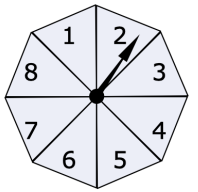

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3	56
4	60
5	63
6	56
7	63
8	59

Is this spinner fair?
Explain your answer.

Theta Unit 7: Fractions

Fractions of Amounts

E.G.
Find $\frac{3}{5}$ of 400

Step 1: Divide by the denominator.

$$400 \div 5 = 80$$

Step 2: Multiply by the numerator

$$80 \times 3 = 240$$

Multiplying Fractions

You do not need common denominators.

When multiplying: multiply numerators together, multiply denominators together.

E.G.

$$\frac{2}{5} \times \frac{3}{7} = \frac{2 \times 3}{5 \times 7} = \frac{6}{35}$$

Remember to simplify.

Adding and subtracting fractions

Remember you need to make a common denominator.
Do not add the denominators together, this will stay the same.

E.G.

Multiply the first fraction by 5.

Multiply the second fraction by 3.

$$\frac{2}{3} + \frac{1}{5} = \frac{10}{15} + \frac{3}{15} = \frac{13}{15}$$

LCM of 3 and 5 is 15.

Dividing Fractions

You do not need common denominators.

When dividing: use the reciprocal of the second fraction, then multiply.

E.G.

Multiply numerators.

Reciprocal of 4/7.

$$\frac{2}{3} \div \frac{4}{7} = \frac{2}{3} \times \frac{7}{4} = \frac{14}{12} = \frac{7}{6}$$

Multiply denominators.

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MATHS

Year 8 | Half-term 4: *Fractions*

Literacy

Give the definition and an example of these key words:

1) denominator
2) numerator
3) simplifying
4) mixed number

Fluency

1a) $\frac{2}{5}+\frac{4}{7}=$

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

2a) $\frac{5}{8}\times\frac{2}{7}=$

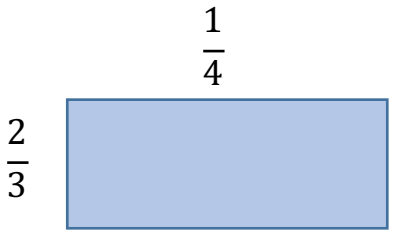
2b) $3\frac{2}{5}\times\frac{2}{3}=$

3a) $\frac{8}{11}\div\frac{1}{5}=$

2b) $2\frac{1}{3}\div1\frac{4}{5}=$

Problem Solving

Calculate the area and perimeter of this shape



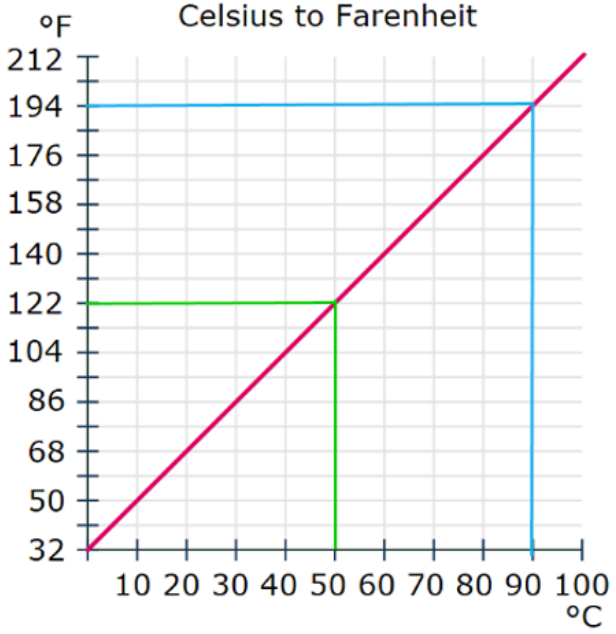
Reasoning

Explain how you know which of these fractions is the greatest.

$2\frac{2}{3}$ $\frac{7}{3}$ $\frac{9}{4}$ $2\frac{1}{5}$ $2\frac{5}{8}$

Theta Unit 8: Real-life Graphs

Conversion Graphs



Using the graph:
Convert 50°C into °F

Answer: 122°F

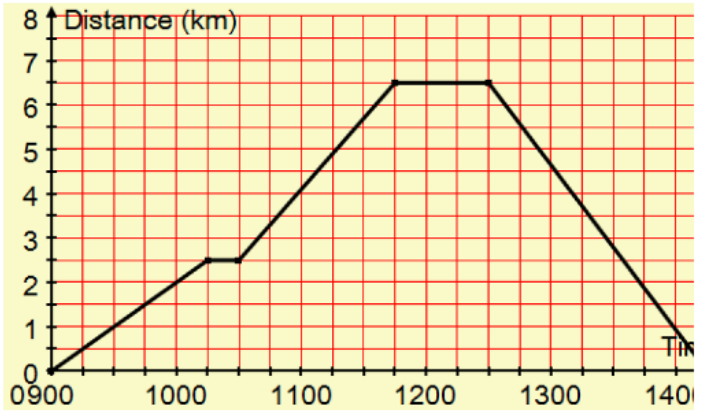
Convert 150°C into °F

50°C x 3 = 150°C so 122°F x 3 = 366°F

Convert 194°F into °C

Answer: 90°C

Distance-time Graphs



This graphs shows a walking group's hike.

At what time did the group stop to check directions?
10.15

How far did the group walk to their furthest destination?
6.5km

How long did they spend at their furthest destination?
45mins

At what time was the group walking quickest?
10.30 – 11.45 (steepest line)

What was the average speed for the return journey?
Speed = distance ÷ time
6.5 ÷ 1.75 = 3.7km/h

Literacy

Can you identify these key words that have been jumbled up. Give their definitions.

exas

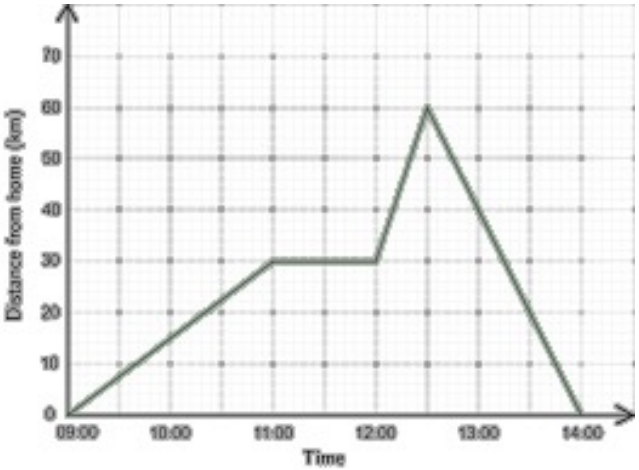
phrag

laces

donatecori

Fluency

This graph shows Richard's bike ride.



1) What time did Richard stop to by a pond?

2) How long did Richard stop for?

3) What part of Richard's journey was he going the quickest?

Problem Solving

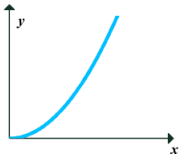
1) For the graph of Richard's walk how much faster was he travelling on the return part of his journey than the first part of his bike ride?

2) What was Richard's average speed for the whole bike ride?

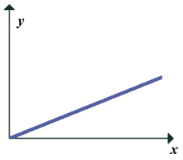
Reasoning

Which of these graphs shows direct proportion?

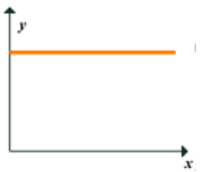
A



B



C



How do you know?

Theta Unit 8: Graphs

Plotting a linear graph

Using x values from 0 to 5, draw the graph of y = 2x + 3

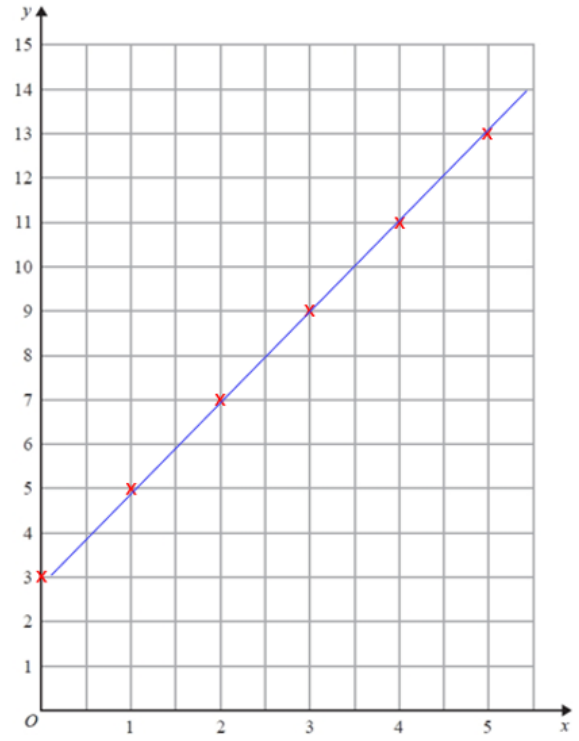
First substitute to find coordinates:

0	1	2	3	4	5
3	5	7	9	11	13

2 x 0 + 3 = 3

2 x 4 + 3 = 11

Then plot coordinates and join with a straight line:



Equation of a straight line

$y = mx + c$

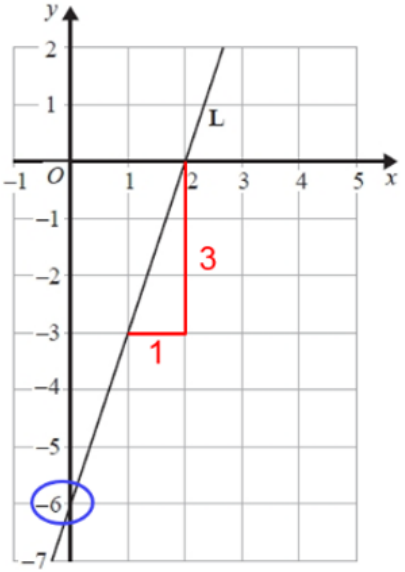
gradient

y intercept

m = 3 ÷ 1 = 3

c = -6 (crosses y-axis)

So y = 3x - 6



Midpoint of a line

Find the midpoint of the coordinates (3, 7) and (9, 1)

Find the mean of the x-values and the y-values:

$\frac{3+9}{2} = \frac{12}{2} = 6$ $\frac{7+1}{2} = \frac{8}{2} = 4$

So the midpoint is (6, 4)

Kettlethorpe HIGH SCHOOL

MATHS

Year 8 | Half-term 5: *Graphs*

Literacy

What are the definitions of the following key words:

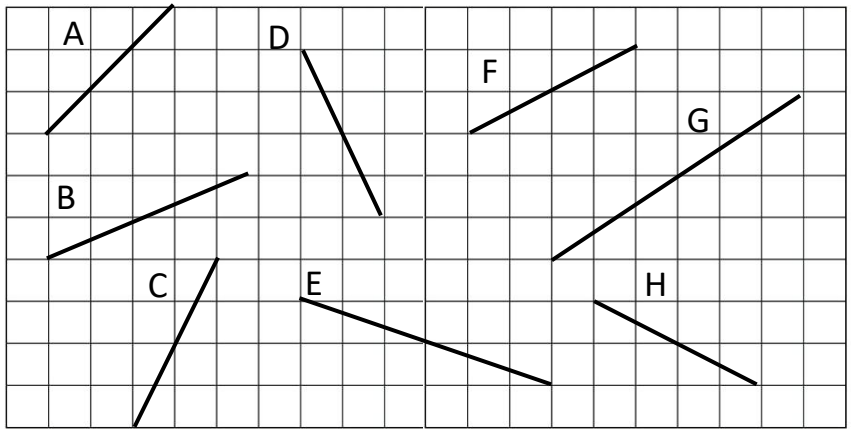
Gradient –

Y-intercept –

Midpoint -

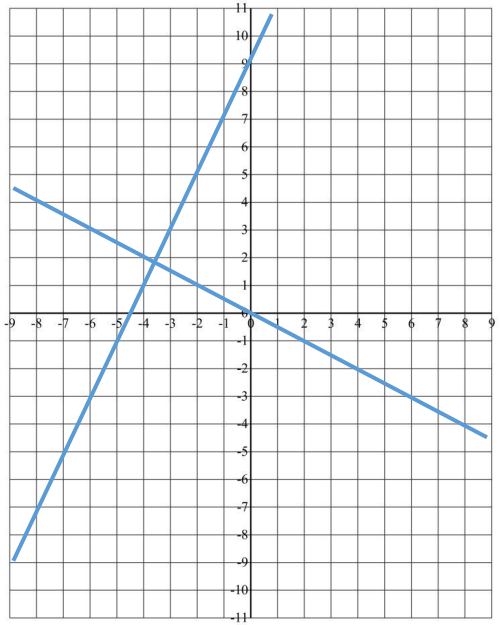
Fluency

Find the gradient of the following lines



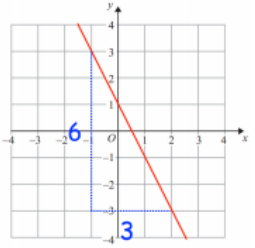
Problem Solving

Find the equation of the following lines



Reasoning

Alisha says that the gradient of the line is 2.
Explain her mistake.



Theta Unit 10: Lines and Angles

Quadrilaterals

	Equal sides	Opposite sides Parallel	Right angles	Lines of symmetry	Rotational symmetry	Diagonals equal length	Diagonals cross right angles
Square	✓	✓	✓	4	4	✓	✓
Rectangle	opposite	✓	✓	2	2	✓	x
Rhombus	✓	✓	x	2	2	x	✓
Parallelogram	opposite	✓	x	0	2	x	x
Trapezium	2 can	1 pair	can	can	1	can	x
Kite	2 pairs	x	x	1	1	x	✓

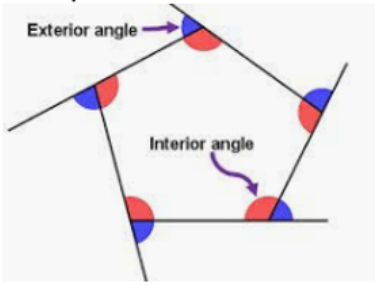
Angles in Polygons

Exterior angles sum to 360°

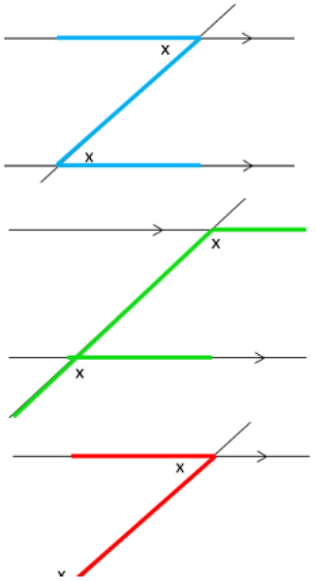
Sum of interior angles:
(no.sides – 2) x 180°

Exterior + interior = 180°
(straight line)

REGULAR means all sides and angles equal



Angles in Parallel lines



ALTERNATE ANGLES
(Z SHAPE)
ARE EQUAL

CORRESPONDING ANGLES
(F SHAPE)
ARE EQUAL

COINTERIOR ANGLES
(C SHAPE)
SUM TO 180°

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MATHS

Year 8 | Half-term 5: *Lines and Angles*

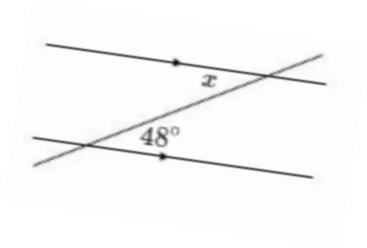
Literacy

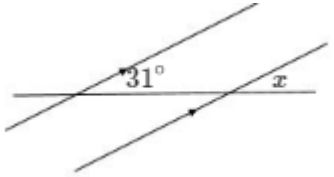
Explain what the difference between a regular pentagon and an irregular pentagon.

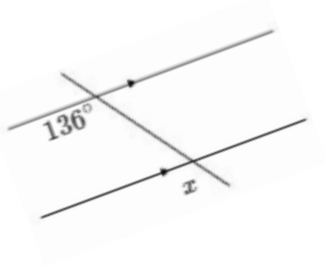
Give key facts about the size of angles.

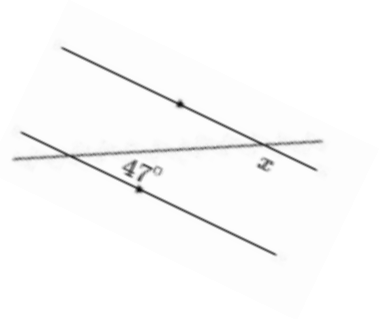
Fluency

For the following questions find the missing angle and say what rule you have used.



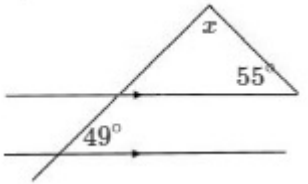






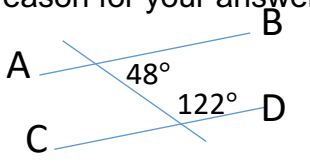
Problem Solving

1) For the following questions find the missing angles giving reasons for each angle.



Reasoning

Are lines AB and CD parallel. Give a reason for your answer



Theta Unit 11: Analysing and Displaying Data

Two-way table

Felicity asked 100 students how they came to school one day.
Each student walked or came by bicycle or came by car.

49 of the 100 students are girls.
10 of the girls came by car.
16 boys walked.
21 of the 41 students who came by bicycle are boys.

Work out the total number of students who walked to school.

49 - 20 - 10 = 19

51 - 21 - 16 = 14

	Walk	Bike	Car	Total
Boys	16	21	14	51
Girls	19	20	10	49
Total	35	41	24	100

16 + 19 = 35

41 - 20 = 21

100 - 49 = 51

Pictograms

Example, put the following information into a pictogram.

Week	No of people at a football club
1	55
2	60
3	65
4	40
5	70

Week	Number of people at football club
1	
2	
3	
4	
5	

= 20 people

Note: 1 football is 20 people, so half a ball is 10 people!

Averages and Range

5. 5. 8. 9. 11. 15. 17

Mode is the most common — Mode = 5

Median is the middle when arranged in size order. — Median = 9

Mean is when you find the sum and divide by the amount of values. — Mean = 10

Range is the biggest subtract the smallest. — Range = 12

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MATHS

Year 8 | Half-term 6: *Analysing and Displaying Data*

Literacy

The following maths words are missing their vowels, can you fill in the vowels to find the words?

- br chrt
- pctgrm
- vrgs

Fluency

Type of drink	Water	Soda	Juice	Milk
Number of votes	9	15	7	4

Complete the pictogram

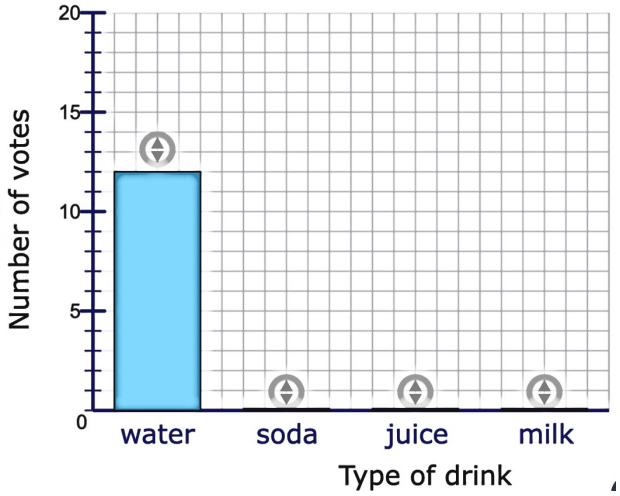
Key: = 2 votes

Survey of preferred drinks

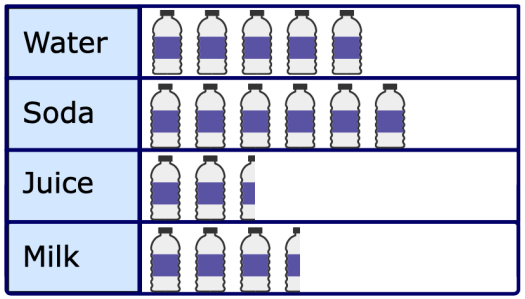
Water	
Soda	
Juice	
Milk	

Type of drink	Water	Soda	Juice	Milk
Number of votes	12	13	9	1

Complete the bar chart



Problem Solving

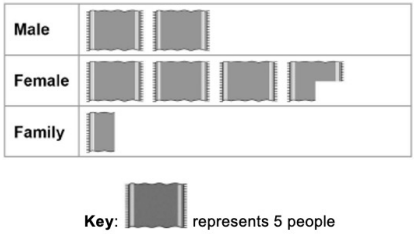


From the survey 9 people preferred water.

a) How many people were in the survey?

b) How many more people preferred soda to milk?

Reasoning

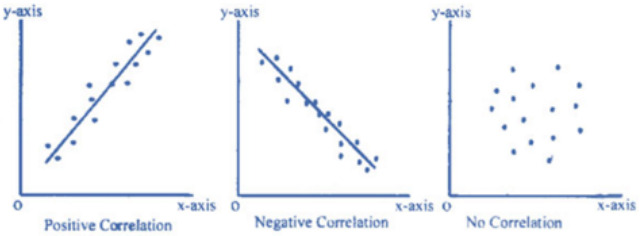


Why might it not be useful to have a key representing 5 people?

Theta Unit 12: Statistics

Scatter Graphs

- Make sure scale is easy to read.
- Plot points.
- Draw a straight line of best fit. Avoid anomalies.
- Describe correlation: Positive/Negative/None



Tally Chart

Tally chart is used to sort data into groups
A line is drawn for each item in a group, with a diagonal line to group every five items making it easier to count

Jack records the car colours in a car park.

Red	Silver	Black	Blue
Blue	Silver	Green	Silver
Silver	Blue	Red	Red
Silver	Red	Silver	Green

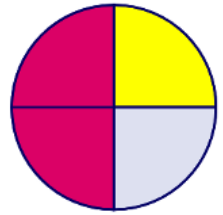
Colour	Tally	Total
Red	𝍸	4
Black	|	1
Blue	|||	3
Green	||	2
Silver	𝍸 |	6

Comparing Distributions

Use these sentence starters:

- The mean/median for _____ is higher showing that on average they score more.
- The range for _____ is bigger showing that the data is more spread and so less consistent.

Pie Chart



cola
lemonade
squash

The pie chart shows the favourite drink of 20 people.

1) How many prefer cola?
½ of people = 20 ÷ 2 = 10

2) How many prefer squash?
¼ of people = 20 ÷ 4 = 5

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MATHS

Year 8 | Half-term 6: *Statistics*

Literacy

Find definitions of these words

1. Sector
2. Degrees
3. Frequency

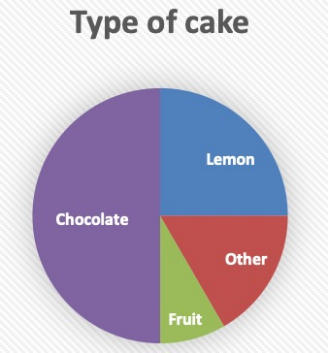
How are the words used when describing a pie chart?

Problem Solving

The favourite cakes of some teachers is shown in the pie chart. 60 preferred chocolate.

a) How many teachers are there in total?

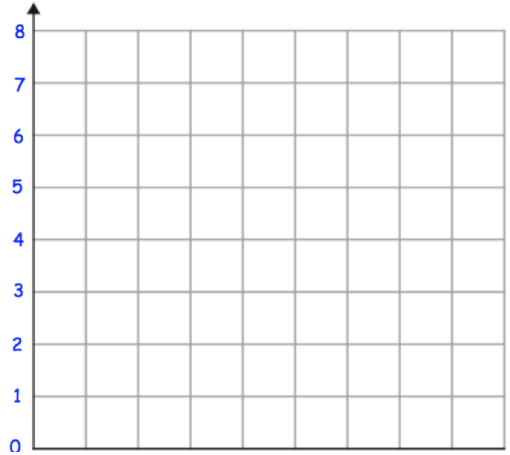
b) How many preferred Lemon cake



Fluency

1) Draw a bar chart for this information

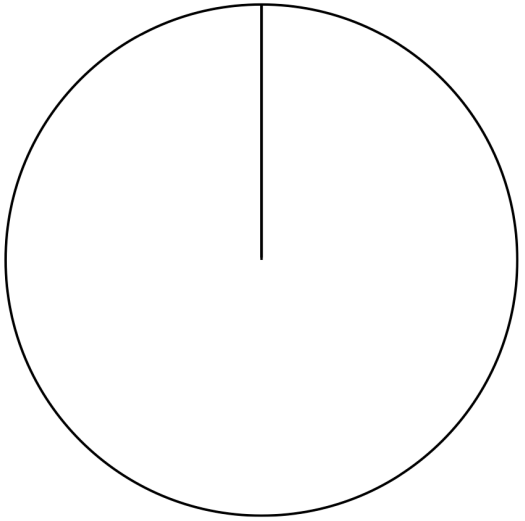
Colour	Frequency
Blue	4
White	5
Red	2
Green	7



2) Draw a pie chart for this information

Type	Frequency	Angle
Car	45	
Walk	15	
Bus	20	
Bike	10	

90 360°



Reasoning

Team A played 100 games and Team B played 400 games.
Who won the most games ?
How can you tell?

Team A

Team B