

Unit 6

Probability and Statistics

PROBABILITY

probability	the likelihood or chance of something happening it is given on a scale between 0 (impossible) and 1 (certain) , and can be a fraction , decimal , or sometimes a percentage
theoretical probability	the probability of something in theory
relative frequency	the probability of something worked out from real life data , also called empirical probability
experiment (in probability)	when a number of trials are conducted to determine the probability of an event
event	one possible outcome in a probability experiment, <i>e.g. getting a 6 on a die</i>
expectation	what you predict will happen in a probability experiment, you multiply the probability by the number of trials

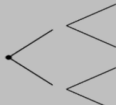
LIKELIHOOD VOCABULARY

impossible	when there is no chance – it will not happen an outcome with a probability of 0
unlikely	when it will probably not happen an outcome with a probability between 0 and 0.5
even	when there is an equal chance of something happening or not happening an outcome with a probability of 0.5
likely	when it will probably happen an outcome with a probability between 0.5 and 1
certain	when it is inevitable – it will definitely happen an outcome with a probability of 1
fair	when all outcomes are equally likely
bias	when something is not fair

PROBABILITY NOTATION

$P(A) =$	the probability of an event A =
$P(A') =$	the probability that event A will not occur = the complement of A

REPRESENTING PROBABILITIES

sample space	the set of all possible outcomes of an experiment	
probability tree	a diagram shaped like a tree used to display a sample space by using one branch for each possible outcome	

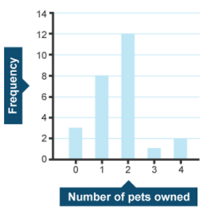
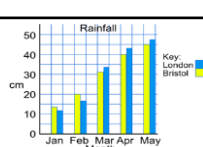













SYSTEMATIC LISTING

product rule for counting	if there are x ways of doing something and y ways of doing something else, then there are xy ways of performing both (the product of the two numbers)
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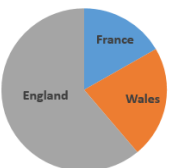
AVERAGES AND SPREAD

mean	add up all the amounts, and then divide the total by the number of amounts
mode	the value which occurs the most
median	the middle value . Method: put the data in numerical order , cross off from the beginning and end until you find the middle value if there are two middle values , find half-way between them
range	largest value – smallest value the spread of the data

DISPLAYING CATEGORICAL DATA

data	a collection of information a set of numbers giving information about a context									
frequency	the number of times an event or a value occurs									
frequency table	usually a tally , showing the totals of data collect data using this before displaying it in a chart	<table><tr><th>Country</th><th>Frequency</th></tr><tr><td>France</td><td>3</td></tr><tr><td>Wales</td><td>4</td></tr><tr><td>England</td><td>11</td></tr></table>	Country	Frequency	France	3	Wales	4	England	11
Country	Frequency									
France	3									
Wales	4									
England	11									
bar chart	the height of the bars represents the frequency (y-axis) , x-axis is the thing we are measuring , there are gaps between bars , all bars are equal width and axes are labelled									
comparative / dual bar chart	a bar chart showing data side by side good for comparing data									
pictogram	each picture represents a set frequency it has a key to tell you what each picture is worth	<p>Black   </p> <p>Red   </p> <p>Green </p> <p>Others     </p> <p> = 4 c</p>								

PIE CHARTS

how to draw	the size of the sector of the circle represents the frequency Steps: divide 360 by the total frequency , this is the value of one unit multiply this by each individual frequency to get the angle size for that section draw the pie chart using your protractor , always measure from the line you just drew, starting from zero on your scale	
example	England is the largest sector so has the highest frequency	

Unit 7: Number

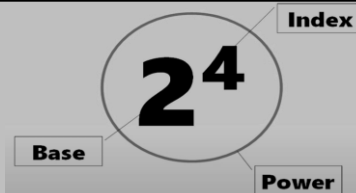
INDEX NOTATION

$$a = b^n$$

a is the power

b is the base

n is the index



INDEX LAWS: MULTIPLICATION AND DIVISION

when the **base** is the **same**, we use the following laws when multiplying and dividing

multiplying add the **powers**
e.g. $a^m \times a^n = a^{m+n}$

dividing subtract the **powers**
e.g. $a^m \div a^n = a^{m-n}$

raising a power by another power multiply the **powers**
e.g. $(a^m)^n = a^{mn}$

SQUARES AND ROOTS

index tells us **how many times** to use the number in a **repeated multiplication**

root (fractional index) the **inverse** of an **index**

POSITIVE INTEGER POWERS

square numbers the **answer** when you **multiply a number by itself**: n^2
1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144...

cube numbers the **answer** when you **multiply a number by itself, and then by itself again**: n^3
1, 8, 27, 64, 125, 216, 343, 512, 729, 1000...

powers of 10 10^n
10, 100, 1000, 10 000, 100 000...

Pythagoras's Theorem

Pythagoras' theorem a **relationship** between the **3 sides** on a **right angled triangle**

Pythagoras' theorem $a^2 + b^2 = c^2$
'c' is always the **hypotenuse**

STANDARD FORM: NOTATION

notation allows us to write **very large** or **very small** numbers without lots of zeros
numbers written in the form $A \times 10^n$
'A' is **between 1 and 10**
'n' is any **integer**

'n' is **positive** large number (≥ 1)

'n' is **negative** small number (< 1)

MULTIPLES, FACTORS AND PRIME NUMBERS

multiple the result of **multiplying** a number by an integer, e.g. the **3rd multiple** of 7 is **21**

lowest common multiple (LCM) the **lowest common number** in the **multiplication tables** of two or more different numbers

factor a quantity which **divides equally** into a number, e.g. **factors** of 8 are **1, 2, 4 and 8**

highest common factor (HCF) the **highest factor** which belongs to two or more numbers

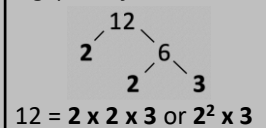
prime number an integer greater than 1 that has **exactly two factors**, **1 and itself**
2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31...

prime factor a **factor** of a number which is also **prime**

decomposition to **break something down**

product of prime factors (prime factorisation) a set of **prime factors** which **multiply** to give a number

e.g. **prime factor tree**



unique factorisation theorem the fundamental theorem of arithmetic
Each integer can be written as a **unique product of prime factors**.
This is why 1 is not a prime number.

SETS

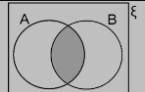
set	a collection of items with one of each member
{ }	brackets are written at the start and end when listing elements in the set
ξ	the universal set : everything we are interested in
\in	' element of a set ' or member of a set (a value in the set)
\notin	' not an element of a set '
\emptyset	the ' empty set '
$n(A)$	the number of elements in a set A

VENN DIAGRAMS

Venn diagram a diagram using circles or other shapes, to **show the relationship between sets**

set a **collection of items** with one of each member

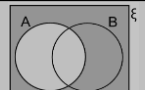
the intersection $(A \cap B)$
in A and in B


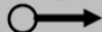




the union $(A \cup B)$
in A or in B or in both



the complement A'
not in A



INEQUALITIES	
where two expressions are not equal in value	
strict	$<$ less than  $>$ greater than 
non-strict	\leq less than or equal to  \geq greater than or equal to 

ALGEBRAIC NOTATION	
like terms	terms which are the same apart from their numerical coefficients: they are the same variable and have the same power
collect like terms	you can add or subtract like terms using the coefficients
simplifying algebraic fractions	factorise the numerator and denominator and cancel common factors , sometimes requires factorisation

INSTRUCTIONS: GENERAL	
evaluate	find the value of
form	to write or produce
substitute	replacing letters with numbers to calculate the numerical value
simplify	to reduce to its simplest form
expand	multiply terms inside a bracket by those outside the bracket, remove the brackets using the grid method

FACTORISING	
factorise	finding the factors of an expression the reverse of expand , it is when we write an expression using brackets , use reverse grid
factor	a quantity which divides equally into a number, e.g. <i>factors of 8 are 1, 2, 4 and 8</i>
factorising a general quadratic	quadratic: $x^2 + bx + c$, factorised form: $(x + ?)(x + ?)$ '?' are two numbers whose product is 'c' and sum is 'b', split the middle term and put into a reverse grid to find the brackets
difference of two squares	quadratic: $a^2 - b^2$ factorised form: $(a - b)(a + b)$ square root each number from the original expression

Links to: LAWS OF INDICES	
When the base is the same , we use the following rules:	
multiplying	add the powers e.g. $x^a \times x^b = x^{a+b}$
dividing	subtract the powers e.g. $x^a \div x^b = x^{a-b}$
raising indices to other indices	multiply the powers. e.g. $(x^a)^b = x^{a \times b}$

Unit 8: Algebra

INSTRUCTIONS: EQUATIONS	
solve	find the value of an unknown or variable , use inverse operations and the balancing method
rearrange	changing the subject of a formula sometimes called transposing use inverse operations and the balancing method , like when we solve an equation
inverse	the opposite
balance <i>an equation</i>	do the same to both sides of the " = " use to solve an equation, or rearrange a formula
subject <i>of an equation</i>	a single unknown or variable that everything else is equal to
solution <i>of an equation</i>	a value we can put in place of a variable that makes the equation true
order of operations	the laws regarding the order in which to calculate , used in algebra too brackets, other, multiply and divide, add and subtract

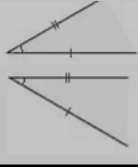
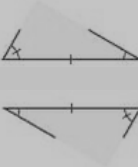
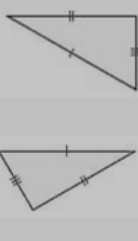
SEQUENCES	
linear sequences	a sequence where the difference between terms increases or decreases by the same amount each time also known as an arithmetic sequence use DiNO to find the nth term to generate a sequence substitute values of 'n' in, e.g. 2nd term, $n=2$ <i>algebraically:</i> $x_n = an + b$
common difference	the amount we add or subtract each time in a linear sequence
quadratic sequences	a sequence of numbers with an n^2 in the position to term rule (nth term) the second difference between consecutive terms is constant <i>algebraically:</i> $x_n = an^2 + bn + c$
geometric sequences	a sequence of numbers where each term is found by multiplying the previous one by a number called the common ratio 'r' <i>algebraically:</i> $x_n = ar^{n-1}$ increasing: the ratio is an integer , decreasing: the ratio is a fraction
common ratio (r)	the amount we multiply by each time in a geometric sequence, can be a fraction

LINEAR SEQUENCES links to: LINEAR GRAPHS	
$y = mx + c$	the general equation of a linear graph m is the gradient c is the y-intercept

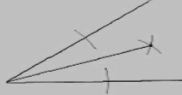
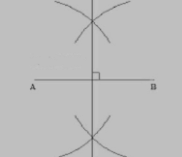
Unit 9: 2D Geometry

CONSTRUCTING TRIANGLES

there are three ways to be able to construct a triangle

side, angle, side	use a ruler and protractor , draw one side , then measure the angle and mark it , measure second side and join them	
angle, side, angle	use a ruler and protractor , draw one side , then measure both angles from each end and mark them , draw lines through the marks until they meet	
side, side, side	use a ruler and compass , draw one side , open compass to length of the second side and draw an arc , open compass to length of third side and draw an arc , join where they meet	

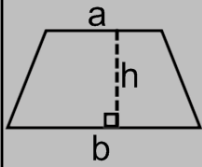
CONSTRUCTIONS

construct	to build or make an accurate drawing using a ruler and protractor or compass	
angle bisector	cut an angle exactly in half	
perpendicular bisector of a line segment	cut a line exactly in half , making a right angle	

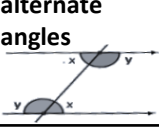
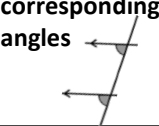
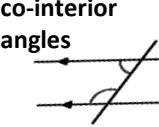
CONSTRUCTIONS VOCABULARY

point	a defined location in space
line segment	a part of a line (mathematical language for 'line')
parallel lines	lines with the same gradient they never meet they are always the same distance apart
perpendicular lines	lines are perpendicular when they meet or intersect at a right angle (90°)
bisect	cut exactly in half

AREA

area of a trapezium	$A = \frac{1}{2}(a + b)h$ area = half the sum of the parallel sides , multiplied by the distance between them	
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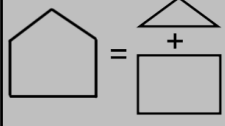
ANGLES IN PARALLEL LINES

alternate angles	are equal a pair of angles on opposite sides of the transversal , inside the parallel lines	
corresponding angles	are equal a pair of angles on the same side of the transversal in the same position of the intersection	
co-interior angles	add to 180° a pair of angles on the same side of the transversal , inside the parallel lines	

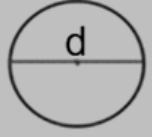
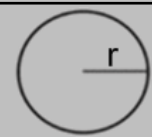
UNITS

unit	a standard amount used to measure something	
metric units	an international system of units based on 10s, 100s and 1000s	
metric length/area conversions	1cm = 10mm 1m = 100cm 1km = 1000m	1cm ² = 100mm² 1m ² = 100,00cm² 1km ² = 1,000,000m²
metric capacity conversions	1 litre = 1000ml	
metric mass conversions	1kg = 1000g 1 tonne = 1000kg	

COMPOUND SHAPES

compound shape	a shape made up of a combination of other known shapes put together	
area of a compound shape	split it up into known shapes calculate the area of each shape add together	
perimeter of a compound shape	find all the lengths around the outside of the shape and add them up	

CIRCLE CALCULATIONS

circumference of a circle	circumference = pi x diameter $C = \pi d$ OR $C = 2\pi r$	
circle area	area = pi x radius² $A = \pi r^2$	
Semi-circle area and perimeter	area = pi x radius² 2 perimeter = pi x diameter + diameter 2	

PERCENTAGE CALCULATIONS

multiplier	a percentage written as a decimal you can then use multiplication to find the percentage
percentage increase	adding a percentage to the original amount, multiplier method: use 1.__ and multiply by original
percentage decrease	subtracting a percentage from the original amount, multiplier method: do 100 - % to give 0.__ and multiply by original
percentage change	the change between the old value and the new value as a percentage, put change in amount over original amount and multiply by 100 to give a percentage change
reverse percentage	working backwards to find 100%
simple interest	the same amount is added each year , find the percentage , x by years and add on
compound interest	exponential growth, accumulated interest paid on the original amount, each year a larger amount of interest is paid. final total = principal x multiplierⁿ principal = original / starting amount multiplier = % increase / decrease n = number of time periods (per annum = per year)

COMMON PERCENTAGES

percentage	parts per 100 , symbol %
find 10%	divide by 10 (because 100% ÷ 10 = 10%)
find 1%	divide by 100 (because 100% ÷ 100 = 1%)
find 50%	divide by 2 (because 100% ÷ 2 = 50%)
find 25%	divide by 4 (because 100% ÷ 4 = 25%)
find 75%	add together 50% and 25%

STANDARD UNITS: TIME

time	how to quantify the passing of events
time conversions	1 minute = 60 seconds 1 hour = 60 minutes
hours to minutes	half an hour = 0.5 hours = 30mins quarter of an hour = 0.25 hours = 15mins

FDP CONVERSIONS

