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Year 10 – Maths Higher / Unit 9: Equations & Inequalities – HT2

Quadratic: V325

A quadratic expression is of the form $ax^2 + bx + c$
where a, b and c are numbers, $a \neq 0$
Examples of quadratic expressions: x^2 or $8x^2 - 3x + 7$

Factorising Quadratics: V118 V119

When a quadratic expression is in the form $x^2 + bx + c$ find the 2 numbers that add to give b & multiply to give c.
e.g. $x^2 + 7x + 10 = (x+5)(x+2)$
(because 5 and 2 add to give 7 and multiply to give 10)

Difference of Two Squares V120

An expression of the form a^2-b^2 can be factorised to give $(a+b)(a-b)$.
e.g. $x^2 – 25 = (x+5)(x-5)$ or $16x^2 – 81 = (4x+9)(4x-9)$

Solving Quadratics ($ax^2 = b$)

Isolate the x^2 term and square root both sides.
e.g. $2x^2 = 98$
$x^2 = 49$
$x = \pm 7$
Remember there will be a positive and a negative solution.

Solving Quadratics ($ax^2 + bx = 0$)

Factorise and then **solve = 0** V266

e.g. $x^2 - 3x = 0$
$x(x-3) = 0$
$x = 0$ or $x = 3$

e.g. Solve $x^2 + 3x – 10 = 0$
Factorise: $(x+5)(x-2) = 0$
$x=-5$ or $x=2$

Simultaneous Equations:

A set of two or more equations, each involving two or more variables (letters).
The solutions to simultaneous equations satisfy both/all of the equations.
V295 V296 V297
e.g. $2x + y = 7$
$3x – y = 8$
$x=3$, $y=1$

Factorising Quadratics when a ≠ 1 V266

When a quadratic is in the form $ax^2 + bx + c$
1. Multiply a by c = ac
2. Find two numbers that add to give b and multiply to give ac.
3. Re-write the quadratic, replacing bx with the two numbers you found.
4. Factorise in pairs – you should get the same bracket twice
5. Write your two brackets – one will be the repeated bracket, the other will be made of the factors outside each of the two brackets.

Completing the Square V267a V371

A quadratic in the form $ax^2 + bx + c$ can be written in the form $(x + p)^2 + q$
1. Write a set of brackets with x in and half the value of b.
2. Square the bracket.
3. Subtract $(b/2)^2$ and add c.
4. Simplify the expression.

Solving Quadratics using the Quadratic Formula: V267

A quadratic in the form $ax^2 + bx + c$ can be solved using the formula:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

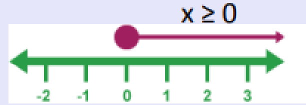
Use the formula if the quadratic does not factorise easily.

Inequality symbols: V176 V177 V178 V179

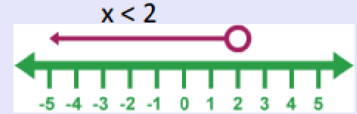
x>2 means x is **greater than** 2
x≥1 means x is **greater than or equal to** 1
x<3 means x is **less than** 3
x≤6 means x is **less than or equal to** 6

Inequalities can be shown on a number line.
Open circles are used for numbers that are **less than or greater than** (< or >)
Closed circles are used for numbers that are **less than or equal or greater than or equal** (≤ or ≥)

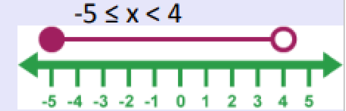
$x \geq 0$



$x < 2$



$-5 \leq x < 4$



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Corbett Maths video links V244 V250 V247

TECHNICAL LANGUAGE:

P("something") means *probability of "something" happening*

"Mutually exclusive" means that if one thing happens, the other cannot. E.g. being alive and dead are mutually exclusive states!

"Bias" = unfairness. It would be biased to roll a die that has 2 sixes on it and no zeroes in a normal dice game.

If outcomes A and B are mutually exclusive, P(A) + P(B) = 1 or 1-P(A) = P(B)

E.g. If there is no draw allowed, and P(win) = 0.7, B(lose) must be 0.3

Sometimes bias is difficult to spot in experiments. If you flip a coin 100 times, you expect 50 heads and 50 tails, but does that mean your coin is biased if you get 60:40? What about 90:10?? What about 99:1????

On fair dice, opposite faces *should* add up to 7.

COMBINING PROBABILITIES:

If you want to find the probability of 2 things happening, MULTIPLY the individual probabilities.

One of the reasons why fractions are convenient for probability is That they are so easy to multiply; ½ x ⅚ = 5/16

Multiply numerators, multiply denominators

Remember to simplify whenever possible

Example:

P(win) = 2/5 P(win) = 3/10 P(win both) = 2/5 x 3/10 = 6/50 = 3/25

The LANGUAGE of probability:

P("something") means *probability of "something" happening*

Eg. When tossing a coin P(heads) = 0.5 or ½

P(tails) = 0.5 or ½

P(heads or tails) = 1 (certain)

P(coin flying off into outer space) = 0 (impossible)

It's often easiest to write probabilities as **fractions***, especially if you want to combine probabilities in tree diagrams...

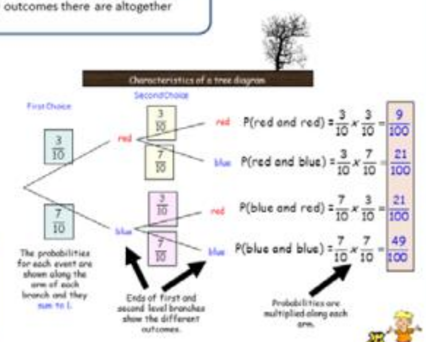
* how many ways it can happen / How many outcomes there are altogether

Sample Space Diagrams:
Often used to find all the possible combinations of 2 events being combined:

Roll a die

Roll a die	1	2	3	4	5	6
1						
2						
3						
4						
5						
6						

If we're adding, The value in the (6,6) box of the SSD would be 12



You can use two-way tables to help solve probability problems:

	France	Holland	Elsewhere	Total
June	6	18	5	29
July	10	19	2	31
August	15	15	10	40
Total	31	52	17	100

What is the probability that a person selected at random:

1. Went to Holland on holiday?	52/100
2. Went on holiday in July?	31/100
3. Went to France in August?	15/100
4. Did not visit either France or Holland?	17/100
5. Went on holiday in June?	29/100

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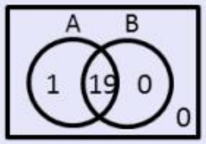
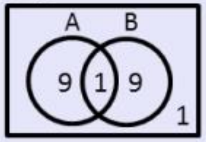
VENN DIAGRAMS

$P(A \cap B) = \frac{19}{20}$



20 people chose A, and 19 chose B.

$P(A \cup B) = \frac{19}{20}$



1 person opts out of choosing either A or B.

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