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Page 28-34: Week 4 – Quadratic and Cubic Graphs

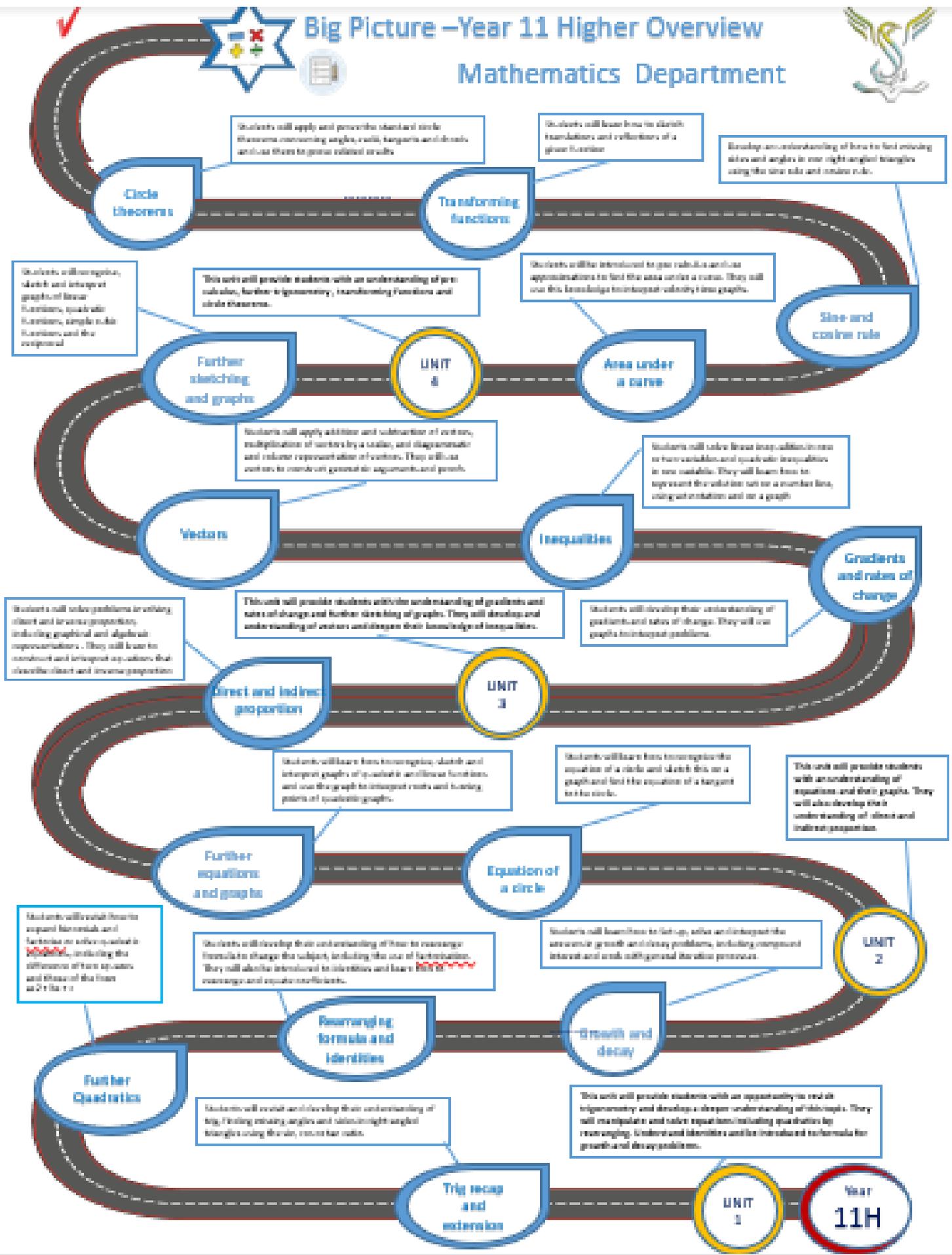
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Big Picture – Year 11 Higher Overview

Mathematics Department



Year 11 – Higher

Spring One

Sketching Further Graphs, Inequalities, Vectors

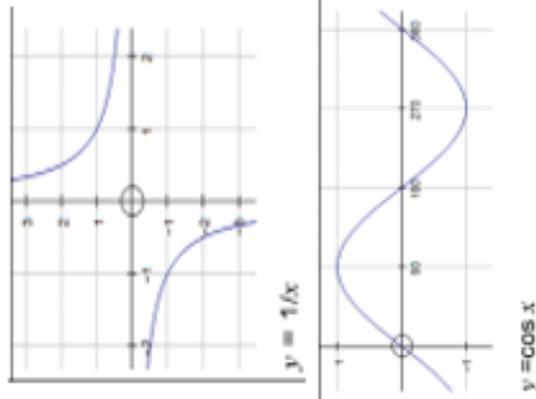
Revision Guide pages:

Further Graphs – 56

Inequalities – 44, 45

Vectors – 95

Task 4 – True or False?



Task 7

Solve

$$2x + 5 < x + 11$$

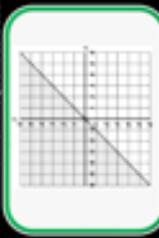
Solve

$$5x - 2 > 3x + 4$$

Task 1



Which inequalities describe the shaded regions?



Task 2

Work out

$$a = \begin{bmatrix} -1 \\ 2 \end{bmatrix}, b = \begin{bmatrix} -2 \\ 2 \end{bmatrix}, c = \begin{bmatrix} -1 \\ -1 \end{bmatrix}$$

$$4c$$

Work out

$$a = \begin{bmatrix} -1 \\ 2 \end{bmatrix}, b = \begin{bmatrix} -2 \\ 2 \end{bmatrix}, c = \begin{bmatrix} -1 \\ -1 \end{bmatrix}$$

$$b - 3a$$

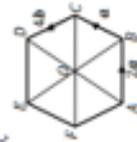
Task 3

ABCDEF is a regular hexagon, with centre O.

a) Write the vector \vec{AD}

b) Write the vector \vec{AO}

c) Write the vector \vec{OC}



Silver ★

Task 6

Solve

$$x^2 + 3x - 18 < 0$$

Solve

$$x^2 - 7x + 10 > 0$$

Task 8



Diagram NOT accurately drawn

OAC is a parallelogram.

P is the point on AC such that $AP = \frac{2}{3}AC$.

$$\vec{OA} = 6\mathbf{a}, \vec{OC} = 6\mathbf{c}.$$

(a) Find the vector \vec{OP} .

Give your answer in terms of \mathbf{a} and \mathbf{c} .

Task 9

1) What is the vector \vec{AB} ?

2) What is the vector \vec{BA} ?



Week 1:

- LI: TO be able to understand, solve and graph linear and quadratic inequalities

Demonstration Videos:

<https://corbettmaths.com/2013/05/18/inequalities/>

<https://corbettmaths.com/2013/05/18/inequalities-on-a-number-line/>

<https://corbettmaths.com/2013/05/07/solving-inequalities-one-sign-corbettmaths/>

<https://corbettmaths.com/2013/05/12/solving-inequalities-two-signs/>

Tasks:

	LINK	Left & Right	
A	x is greater than 5	$x < 5$	
B	x is greater or equal to 5	$5 < x \leq 8$	
C	x is less than or equal to 5	$9 > x \geq 5$	
D	x is greater than 2 and less than 5	$9 > x > 5$	
E	x is greater than or equal to 5 and less than 9	$x > 5$	
F	x is less than or equal to 9 and greater than 5	$5 \leq x \leq 9$	
G	x is less than 9 and greater than 5	$x < 5$	
H	x is greater than or equal to 5 and less than or equal to 9	$5 \leq x$	
I	x is less than or equal to 9 and greater than 4	$5 < x < 7$	
J	$2x$ is less than 10	$9 \geq x > 4$	
K	$3x$ is greater than 15 and less than 21	$2 < x < 5$	
L	$x + 4$ is greater than 9 and less than or equal to 12	$5 < x \leq 9$	

Name

List the integer solutions

4, 5, 6, 7	-1, 0	5, 6, 7	-4, -3, -2	1, 2, 3
-3, -2, -1	-1, 0	7, 8	4, 5	-3, -2
0, 1, 2	2, 3	0, 1	1, 2	4, 5, 6
3, 4	-2, -1	-2, -1	-2, -1, 0, 1	3, 4, 5
5, 6, 7, 8	0, 1, 2, 3	0, 1	6, 7, 8	-1, 0, 1

$0 < x < 3$

$3 \leq x < 6$

$0 \leq x \leq 2$

$0 \leq x \leq 3$

$2 < x < 5$

$-2 \leq x < 0$

$-4 \leq x < -1$

$-2 \leq x \leq 1$

$-4 < x \leq -1$

$3 < x < 6$

$4 < x < 8$

$4 \leq x \leq 7$

$4 < x \leq 8$

$-1 \leq x < 1$

$-1 \leq x \leq 1$

$0 \leq x < 2$

$6 < x \leq 8$

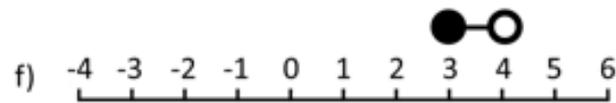
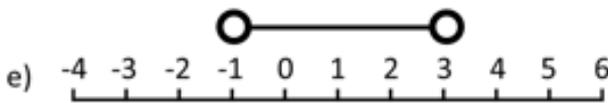
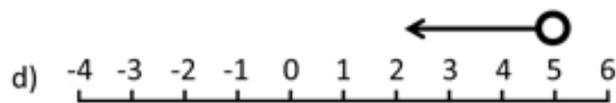
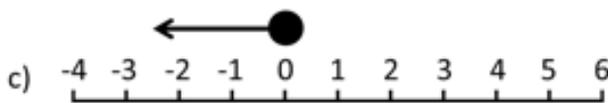
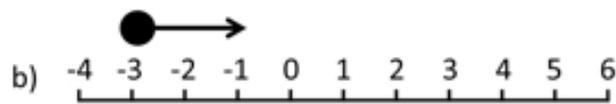
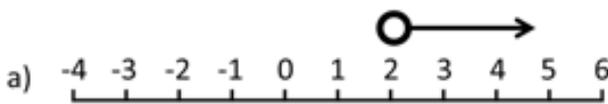
$5 < x \leq 8$

$3 < x \leq 6$

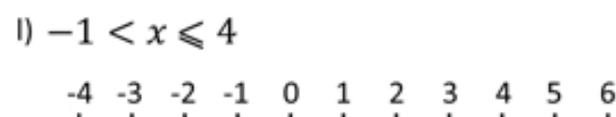
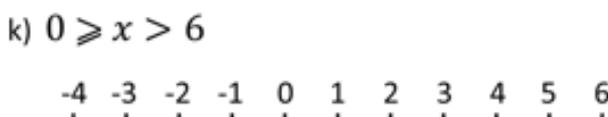
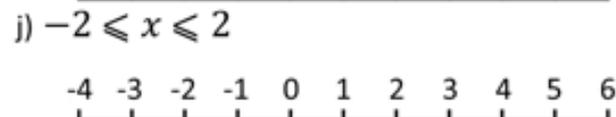
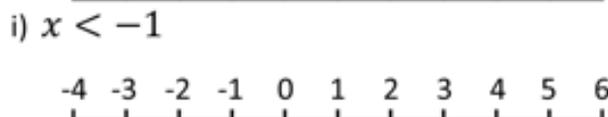
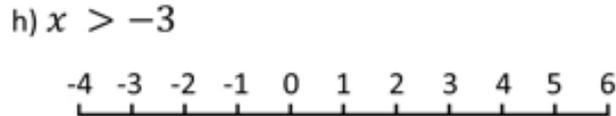
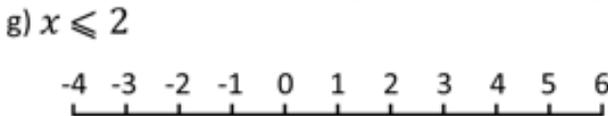
$0 < x \leq 3$

Missing values

What inequalities do these diagrams represent?



Represent these inequalities on a number line.





Solve

- 1) $2x < 4$
- 2) $x + 3 > 5$
- 3) $x - 5 \leq 10$
- 4) $4x \geq 2$
- 5) $\frac{x}{4} < 6$
- 6) $5 > 2 - x$
- 7) $4 < 6 + x$
- 8) $x + 2 \geq -1$



Solve

- 1) $2x - 5 > 7$
- 2) $4x + 3 > 15$
- 3) $3x - 5 < 19$
- 4) $\frac{x}{4} - 1 \geq 2$
- 5) $6 - x \leq 1$
- 6) $6 > 2 - 4x$
- 7) $5 < 6 + 2x$
- 8) $2x + 5 \geq -1$



Solve

- 1) $2x + 1 > x + 6$
- 2) $4x - 10 < 2x + 8$
- 3) $3x + 1 \geq 2x - 3$
- 4) $4x - 2 < 2x + 8$
- 5) $3x - 1 \geq 4 - 2x$
- 6) $5x + 6 < 2 - 3x$
- 7) $x + 3 > 9 - 2x$
- 8) $5 - x < 4 - 2x$

SPOT the MISTAKE!

Can you find the mistakes?
Correct them when you do!

Question 8: Solve each of the inequalities below

(a) $6 < x + 3 < 10$

(b) $4 \leq 2x \leq 7$

(c) $1 \leq 3x < 9$

(d) $4 < \frac{x}{5} < 6$

(e) $9 \leq 2x + 3 \leq 25$

(f) $-3 \leq \frac{x}{4} - 1 < 0$

Question 9: Find the integers that satisfy each of the inequalities below

(a) $5 < x < 9$

(b) $-3 < x \leq 1$

(c) $4 \leq 2x \leq 8$

(d) $16 \leq 5x + 1 < 31$

(e) $0 \leq \frac{x-6}{2} < 2$

(f) $-9 < \frac{x}{4} - 1 < -8$

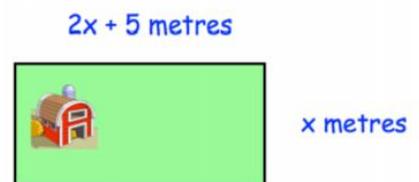
Worded Problems:

Question 1: Lauren goes shopping and has £50 to spend. She bought a T-shirt and 3 pairs of leggings. The T-shirt cost £23. Each pair of leggings cost £x

- (a) Form an inequality in terms of x.
- (b) Solve the inequality to find the possible price of the leggings.

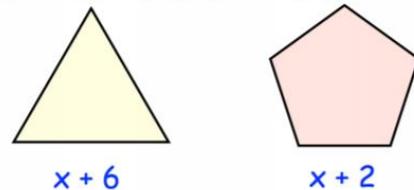
Question 2: Farmer Taylor is placing a fence around his field. He has 300 metres of fencing but this is not enough.

- (a) Form an inequality in terms of x.
- (b) Solve the inequality to find the possible width of the field.



Question 3: The perimeter of the regular pentagon is larger than the perimeter of the equilateral triangle.

- (a) Form an inequality in terms of x
- (b) Solve the inequality to find the possible range of values for x.



Question 4: Find the range of values of x that satisfies **both**

$$3(x + 2) \leq 30 \quad \text{and} \quad 4x + 3 > 21$$

Question 5: y is a prime number and also satisfies $7 < 2y - 3 \leq 25$

List the possible values of y.

Demonstration Videos:

<https://corbettmaths.com/2016/08/07/quadratic-inequalities/>

<https://www.mathsgenie.co.uk/quadratic-inequalities.html>

https://www.youtube.com/watch?v=8J_m-hMp8IY

Tasks:

Determine the range of values that x can take for each of the following:
(Ensure that you sketch a quadratic graph for every question)

1. $(x - 5)(x + 3) \geq 0$

7. $x^2 + 7x + 12 \geq 0$

2. $(x - 3)(x - 5) < 0$

8. $x^2 - 12x + 35 \leq 0$

3. $(x + 4)(x - 7) > 0$

9. $x^2 + x - 6 \leq 0$

4. $x^2 + 10x + 21 \geq 0$

10. $x^2 \geq 4x + 21$

5. $x^2 + 6x + 5 > 0$

11. $5x^2 - 11x + 2 \leq 0$

6. $x^2 - 3x + 2 < 0$

12. $18 + 3x - x^2 > 0$

For which values of x is the following inequality true?

$$x^2 - 3x + 4 > 2$$

$x = 0$

$x = 2$

$x = 1$

$x = 3$

For which inequality is the value of x true?

$x = 7$

$x^2 - 7x + 7 < 7$

$-x^2 + 7x + 7 < 7$

$x^2 + 7x - 7 < 7$

$-x^2 + 7x - 7 < 7$

1. Solve the inequality $x^2 + 6x + 8 < 0$ (3)
2. Solve the inequality $x^2 + 2x - 35 > 0$ (3)
3. Solve the inequality $x^2 - 9x + 14 \leq 0$ (3)
4. Solve the inequality $x^2 - x - 30 \geq 0$ (3)
5. Solve the inequality $x^2 > 4(8 - x)$ (4)
6. Solve the inequality $3x^2 - 5x - 1 < 4x^2 + 7x + 19$ (4)
7. Solve the inequality $2x^2 + 9x + 10 > 0$ (4)
8. Solve the inequality $7x^2 - 22x + 16 \leq 0$ (4)
9. Find the set of values of x for which $x^2 - 2x - 24 < 0$ and $12 - 5x \geq x + 9$ (6)
10. Find the set of values of x for which $x^2 - 100 > 0$ and $x^2 + 8x - 105 > 0$ (6)

Exam Practice:

- <https://corbettmaths.com/wp-content/uploads/2013/02/quadratic-inequalities-pdf.pdf>
- <https://www.mathsgenie.co.uk/resources/quadraticinequalities.pdf>
- <https://www.tes.com/teaching-resource/gcse-maths-worksheet-on-quadratic-inequalities-6139718>
- <https://mathsmadeeasy.co.uk/gcse-maths-revision/quadratic-inequalities-gcse-maths-revision-worksheets>

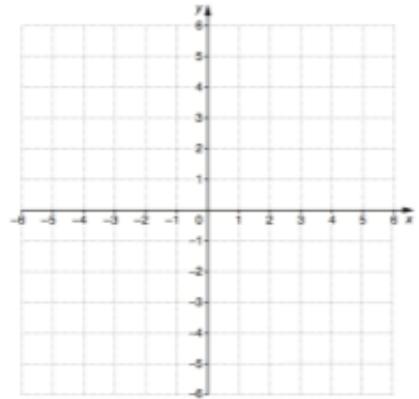
Demonstration Videos:

- <https://corbettmaths.com/2013/05/27/graphical-inequalities-part-1/>
- <https://corbettmaths.com/2013/05/27/graphical-inequalities-part-2/>
- <https://corbettmaths.com/2013/05/27/inequalities-and-regions/>

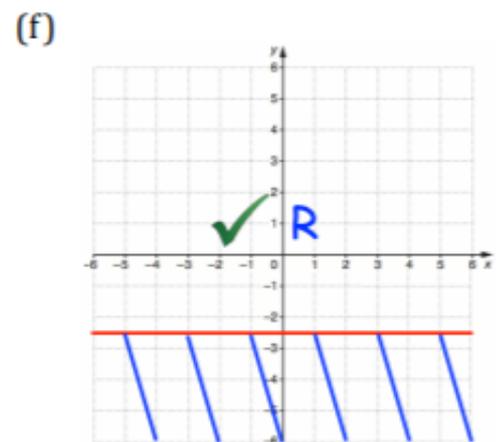
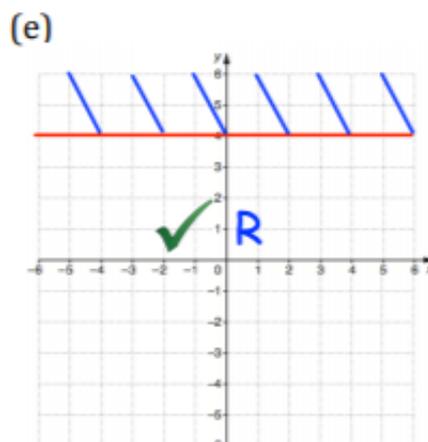
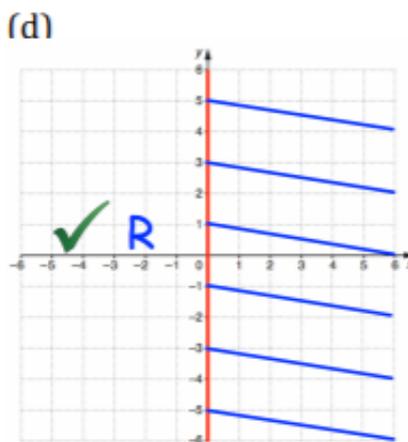
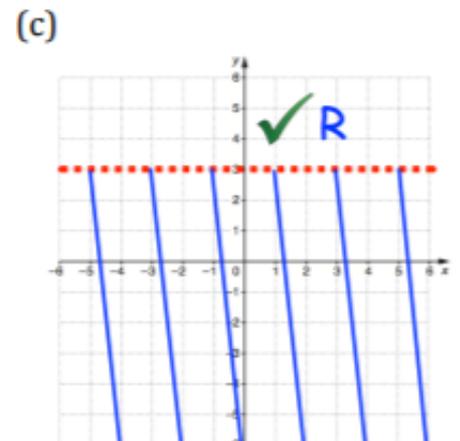
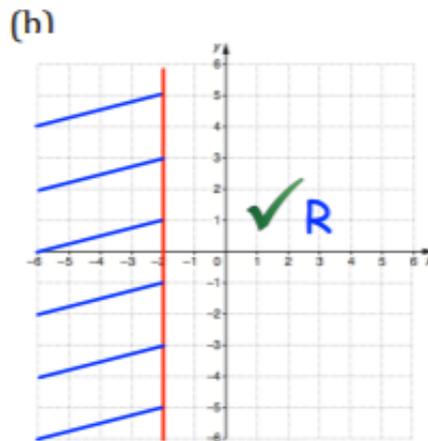
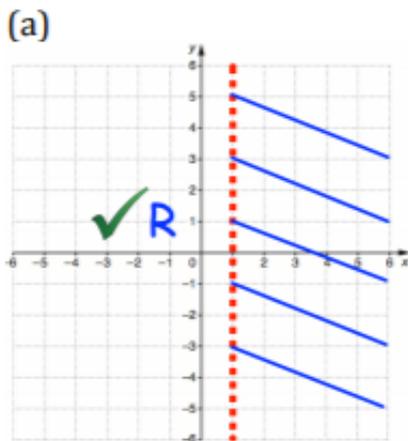
Tasks:

Question 1: On copies of the grid below, clearly indicate the region that satisfies each inequality.

- (a) $x > 2$ (b) $x < 4$ (c) $x \leq -1$ (d) $x > 0$
 (e) $x \geq -3$ (f) $y < 1$ (g) $y \geq -2$ (h) $y \leq 4$
 (i) $y > 2$ (j) $x \geq 3$ (k) $y < 0$ (l) $x < -5$

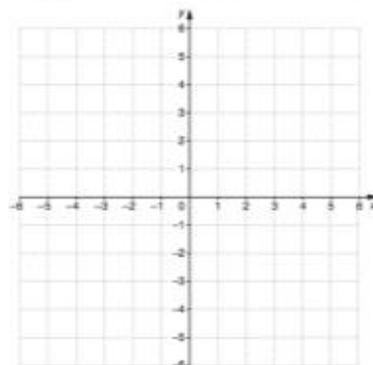


Question 2: Write down the inequality represented in each diagram below.

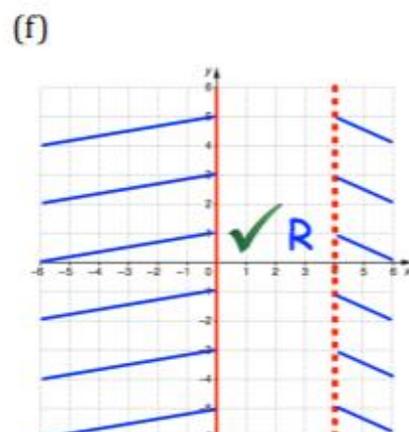
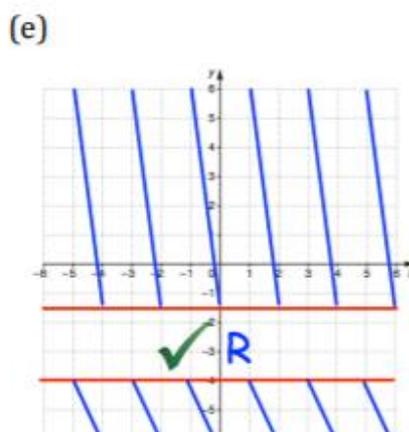
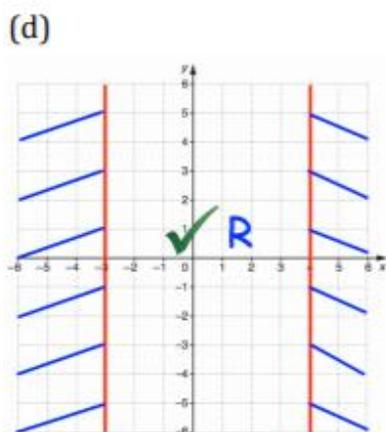
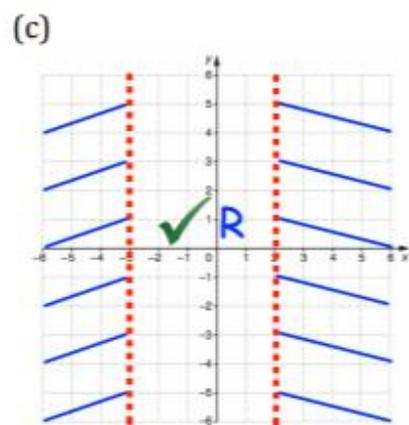
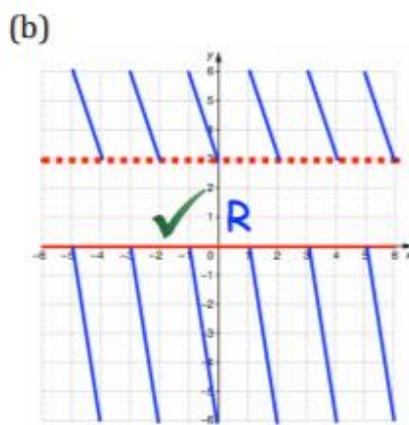
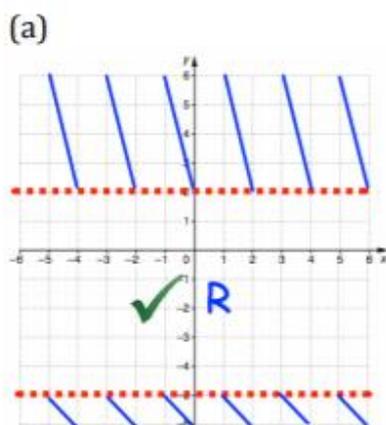


Question 3: On copies of the grid below, clearly indicate the region that satisfies each inequality.

- (a) $-4 < x < 1$ (b) $0 \leq x \leq 5$ (c) $-3 \leq x < 3$
 (d) $-5 \leq y \leq -2$ (e) $-1 < y < 4$ (f) $-1 < y \leq 2.5$
 (g) $-2 < x \leq 3$ (h) $-4 \leq y \leq 2$ (i) $-2 \leq y < 2$



Question 4: Write down the inequality represented in each diagram below.

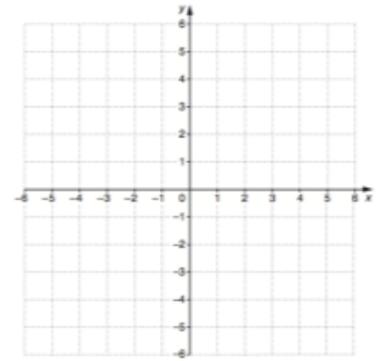


Question 5: On a grid, clearly indicate the region that satisfies the following inequalities.

- (a) $-2 < x < 3$ and $y \geq -1$ (b) $-5 \leq y \leq 1$ and $x < 3$ (c) $1 < x \leq 3$ and $-2 \leq y < 0$

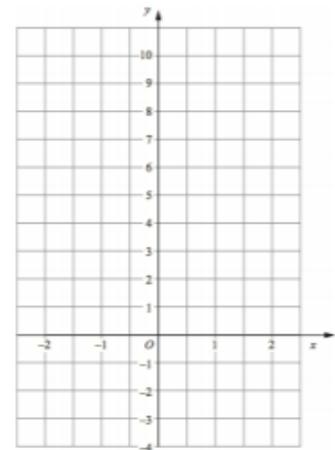
Question 1: On copies of the grid below, clearly indicate the region that satisfies each inequality.

- (a) $y < x + 1$ (b) $y \leq 2x + 2$ (c) $y > 3x - 1$
 (d) $y \geq x + 3$ (e) $y > 2x$ (f) $y \leq 4x$
 (g) $y < -2x + 1$ (h) $y \geq \frac{1}{2}x + 2$ (i) $x + y < 4$

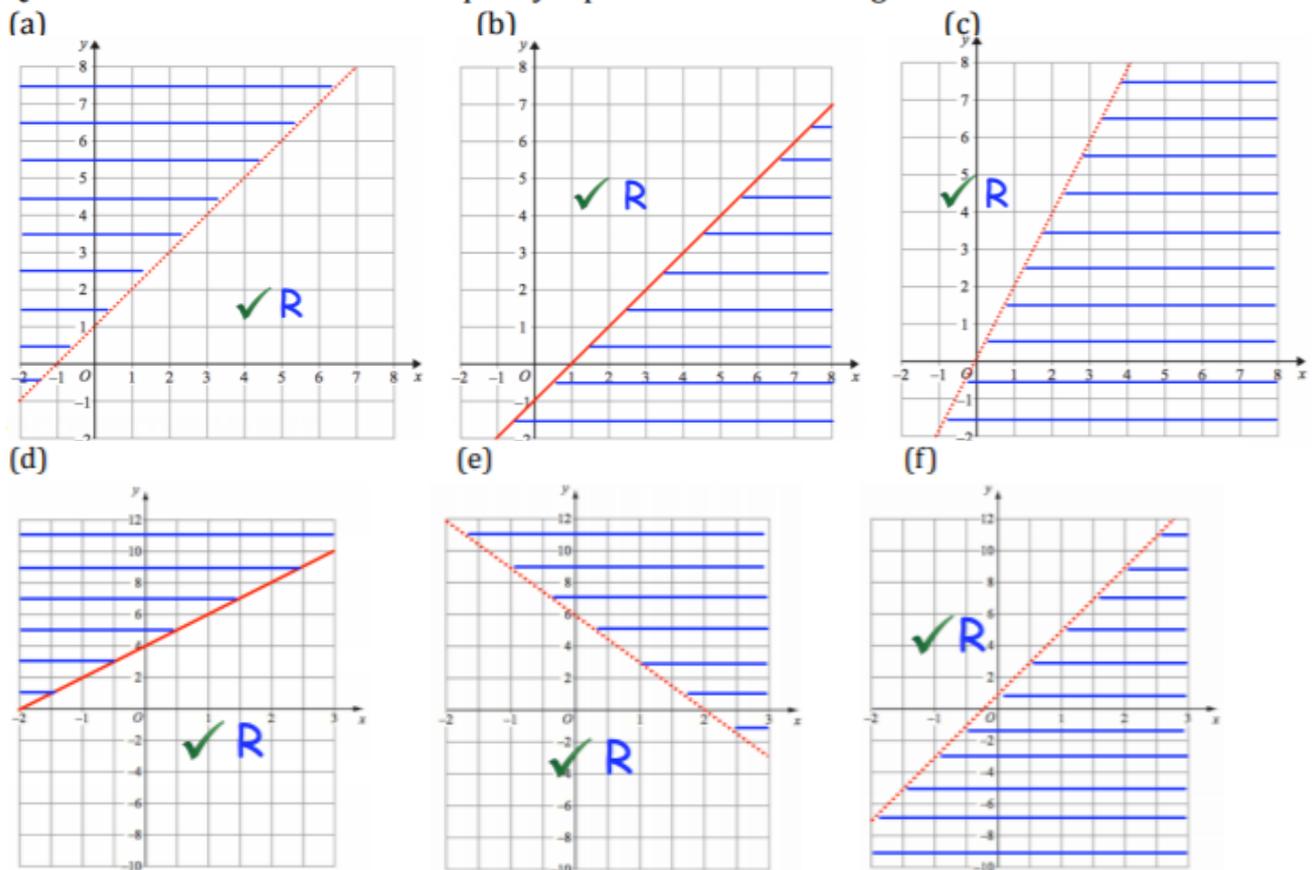


Question 2: On copies of the grid below, clearly indicate the region that satisfies each inequality.

- (a) $y > 3x + 4$ (b) $y \geq 5x - 1$
 (c) $y \leq 4x + 1$ (d) $y < -2x + 5$
 (e) $x + y < 2$ (f) $y > -x - 2$
 (g) $y \geq 5 - 2x$ (h) $x + y \geq 7$
 (i) $3x + y > 3$ (j) $5x + 2y > 4$

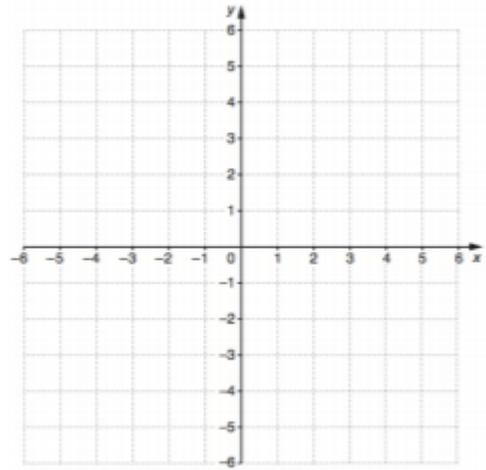


Question 3: Write down the inequality represented in each diagram below.



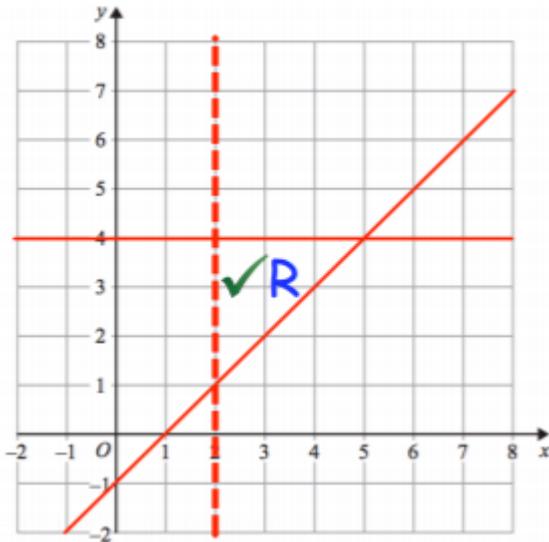
Question 4: On copies of the grid below, clearly indicate the region that satisfies the following inequalities.

- (a) $y > x - 1$, $x \geq -2$ and $y < 2$
- (b) $y \leq 2x$, $x \leq 2$ and $y > -4$
- (c) $y \leq -2x + 2$, $x \geq 0$ and $y > x - 4$
- (d) $x + y < 3$, $-2 \leq x < 3$ and $y \geq 0$
- (e) $y \leq 5x - 4$, $y > x - 4$ and $y \leq -\frac{1}{2}x + 2$
- (f) $y \leq -2x + 4$, $y < 2x - 6$ and $-4 < y < -3$

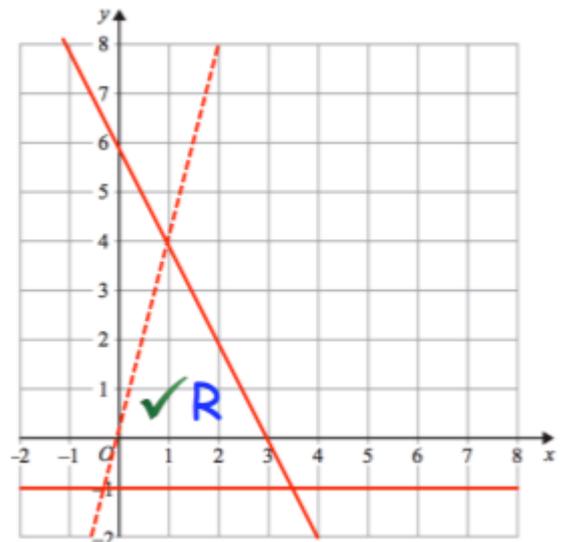


Question 5: State the inequalities that the region labelled R satisfies.

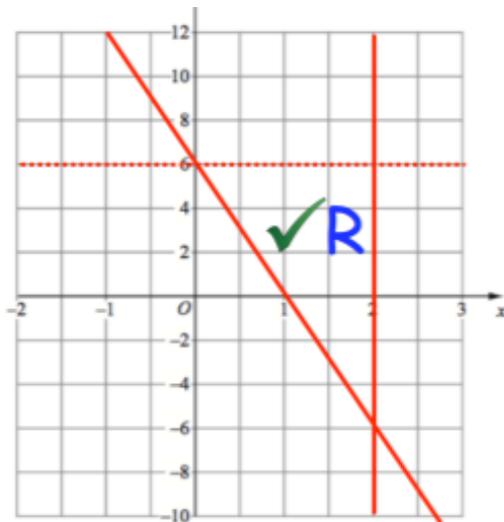
(a)



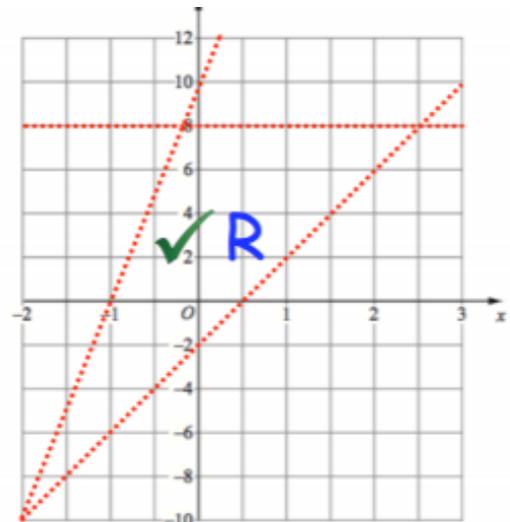
(b)



(c)



(d)



Week 2:

- LI: To be able to calculate probabilities of independent and dependent events

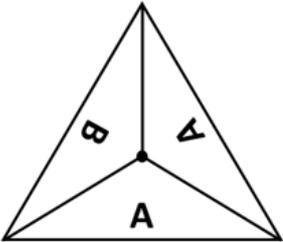
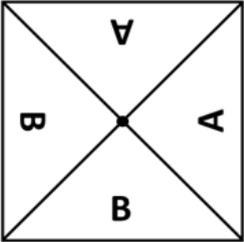
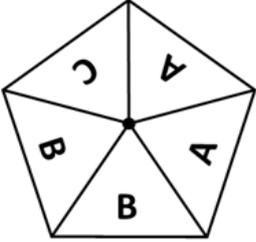
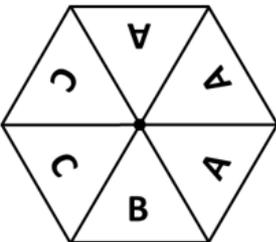
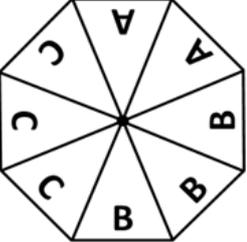
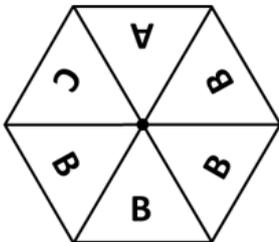
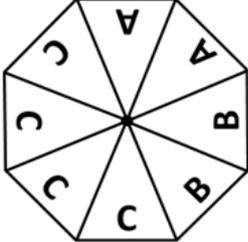
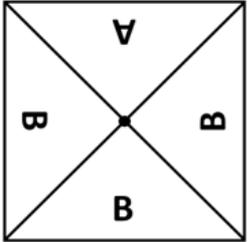
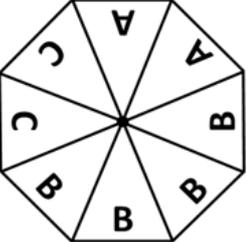
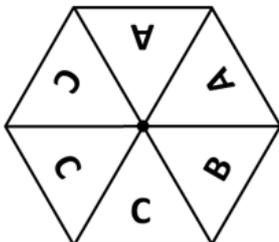
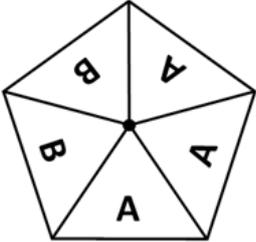
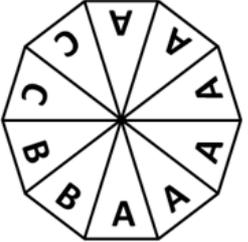
Demonstration Videos:

- <https://corbettmaths.com/2013/06/15/probability/>
- <https://corbettmaths.com/2013/06/18/sample-space-diagrams/>
- <https://corbettmaths.com/2013/05/15/probability-of-not-happening/>
- <https://corbettmaths.com/2013/05/04/listing-outcomes/>
- <https://corbettmaths.com/2016/09/18/17416/>
- <https://corbettmaths.com/2013/06/20/relative-frequency/>
- <https://corbettmaths.com/2012/08/10/two-way-tables/>

Tasks:

Card Match:

Match each diagram with the correct probability below

1		2		3		4	
5		6		7		8	
9		10		11		12	
<input type="checkbox"/> $P(A) = 1/3$		<input type="checkbox"/> $P(B) = 1/4$		<input type="checkbox"/> $P(A) = 1/2$		<input type="checkbox"/> $P(B) = 3/4$	
<input type="checkbox"/> $P(B) = P(C)$		<input type="checkbox"/> $P(B) = 2/5$		<input type="checkbox"/> $P(A) = P(C)$		<input type="checkbox"/> $P(A) = P(B)$	
<input type="checkbox"/> $P(C) = 3/8$		<input type="checkbox"/> $P(B) = 1/2$		<input type="checkbox"/> $P(A) = 2/3$		<input type="checkbox"/> $P(B) = 2/3$	

Complete the answer maze to get from the start to finish going through the cards with the correct answers only.

START! $P(\text{not a 6}) =$	$\frac{5}{6}$ $P(\text{not more than 4}) =$	$\frac{1}{3}$ In a bag there are 6 green, 12 pink and 9 blue cubes. $P(\text{not green}) =$	$\frac{11}{13}$ In a bag there are 4 red, 12 black and 2 blue cubes. $P(\text{not black}) =$	$\frac{2}{3}$ In a bag there are 9 red, 4 black and 2 blue cubes. $P(\text{not red}) =$
$\frac{3}{6}$ $P(\text{not more than 3}) =$	$\frac{2}{3}$ $P(\text{not a king}) =$	$\frac{7}{9}$ $P(\text{not grey or black}) =$	$\frac{9}{13}$ $P(\text{not ace or queen}) =$	$\frac{5}{12}$ $P(\text{not 9 or 7}) =$
$\frac{4}{5}$ $P(\text{not a queen}) =$	$\frac{12}{13}$ $P(\text{not B}) =$	$\frac{4}{9}$ $P(\text{not grey}) =$	$\frac{3}{8}$ $P(\text{not black and not less than 4}) =$	$\frac{10}{26}$ $P(\text{not black}) =$
$\frac{3}{5}$ $P(\text{not a face card}) =$	$\frac{10}{13}$ $P(\text{not white}) =$	$\frac{3}{9}$ $P(\text{not vowel}) =$	$\frac{7}{8}$ $P(\text{not A}) =$	FINISH!

TRUE or FALSE? Cut out all 12 cards. Complete the Sample Space Diagrams and sort them into two piles: **TRUE & FALSE**

A Two coins are flipped. <table border="1"> <tr><td></td><td>H</td><td>T</td></tr> <tr><td>H</td><td>HH</td><td>HT</td></tr> <tr><td>T</td><td></td><td></td></tr> </table> $P(\text{Tails & Tails}) = 0.25$		H	T	H	HH	HT	T			B Two coins are flipped. <table border="1"> <tr><td></td><td>H</td><td>T</td></tr> <tr><td>H</td><td></td><td></td></tr> <tr><td>T</td><td></td><td></td></tr> </table> $P(\text{At least 1 Tails}) = 0.5$		H	T	H			T			C A coin is flipped & a dice is thrown. <table border="1"> <tr><td></td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr> <tr><td>H</td><td>H, 1</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>T</td><td>T, 1</td><td></td><td></td><td></td><td></td><td></td></tr> </table> $P(\text{Tails & Odd}) = 1/4$		1	2	3	4	5	6	H	H, 1						T	T, 1																																																			
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D Two 4-sided spinners are spun & their scores added. <table border="1"> <tr><td></td><td>1</td><td>2</td><td>3</td><td>4</td></tr> <tr><td>1</td><td>2</td><td></td><td></td><td></td></tr> <tr><td>2</td><td>3</td><td></td><td></td><td></td></tr> <tr><td>3</td><td></td><td></td><td></td><td></td></tr> <tr><td>4</td><td></td><td></td><td></td><td></td></tr> </table> $P(6) = 4/16$		1	2	3	4	1	2				2	3				3					4					E Two 4-sided spinners are spun & their scores multiplied. <table border="1"> <tr><td></td><td>1</td><td>2</td><td>3</td><td>4</td></tr> <tr><td>1</td><td>1</td><td>2</td><td>3</td><td>4</td></tr> <tr><td>2</td><td></td><td></td><td></td><td></td></tr> <tr><td>3</td><td></td><td></td><td></td><td></td></tr> <tr><td>4</td><td></td><td></td><td></td><td></td></tr> </table> $P(\text{More than 4}) = 11/16$		1	2	3	4	1	1	2	3	4	2					3					4					F A 6-sided dice and a 4-sided spinner: scores added. <table border="1"> <tr><td></td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr> <tr><td>1</td><td>2</td><td>3</td><td></td><td></td><td></td><td></td></tr> <tr><td>2</td><td>3</td><td>4</td><td></td><td></td><td></td><td></td></tr> <tr><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>4</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </table> $P(7 \text{ or less}) = 0.75$		1	2	3	4	5	6	1	2	3					2	3	4					3							4						
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G A 3-sided & a 8-sided spinner are spun & their scores added. <table border="1"> <tr><td></td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td></tr> <tr><td>1</td><td>2</td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>2</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </table> $P(4 \text{ or } 9) = 1/4$		1	2	3	4	5	6	7	8	1	2	3							2									3									H 2 cube dice are rolled & their scores added. $P(\text{Less than 6}) = 5/12$	I A 6-sided dice & a tetrahedron dice are rolled & their scores are multiplied. $P(\text{More than 8}) = 0.5$																																																	
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TRUE or FALSE?

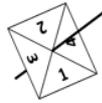
Cut out all 12 cards. Sort them into two piles: TRUE & FALSE

<p>A</p> <p>6 marbles can be arranged in 720 ways.</p>	<p>B</p> <p>The 10 outfield players (not goalkeeper) on a football team can be arranged into 36288 different formations.</p>
<p>C</p> <p>A 4-digit (zero to nine) phone PIN has 1,000 combinations.</p>	<p>D</p> <p>20 people meet. If they all bow to each other once, there are a total of 190 bows.</p>
<p>E</p> <p>"My 4-digit phone PIN is either an odd number below 3000... or it is any number equal or greater than 3000." The possibility of guessing this PIN in one try is 1/4000.</p>	<p>F</p> <p>The digits to unlock a 5-wheel combination lock are all different and all greater than 2. The combination lock has 2520 possible codes.</p>
<p>G</p> <p>At a restaurant there are 3 starters, 6 main courses & 5 types of dessert. If you pick one of each, there are 90 combinations of meals available.</p>	<p>H</p> <p>A sandwich shop offers 8 types of filling for a sandwich. If you pick 3 fillings there are 336 different types of sandwich you could order.</p>
<p>I</p> <p>A robot factory gives a unique code to each robot. It is either letter-letter-digit OR letter-letter-letter-digit. The factory can produce 182,520 robots before it needs to introduce a new code.</p>	<p>J</p> <p>15 students audition for the school play. There are 5 different roles available in the play. The roles could be filled in 360,360 different ways.</p>
<p>K</p> <p>There are 12 different toppings available at a pizza restaurant. If you pick 4 for your pizza, there are 990 different combinations of pizza available.</p>	<p>L</p> <p>A headteacher wants to choose 2 students from Year 10 to represent the school. There are 120 students in Year 10, so there are 14,280 possible pairs of students to choose from.</p>

Relative Frequency

1) Sarah conducts an experiment & spins the spinner 20 times.

4 2 3 4 2 2 1 3 2 3
3 4 2 4 1 4 2 2 4 2



Score	1	2	3	4
Frequency				
Relative Frequency				

- a) Complete the table with frequencies & relative frequencies.
- b) What is the **theoretical** probability of the spinner landing on four?
- c) Do you think the spinner is **biased**? Explain why.

2) A dice is rolled 30 times. It lands on four 12 times.
a) What is the relative frequency of the dice landing on four?
b) Do you think the dice is biased? Explain why.

3) Toby spins the spinner 50 times and records his results. Complete his table.



Score	1	2	3	4	5
Frequency	12	14		8	
Relative Frequency			0.2	0.16	

- 4) Sam rolls a biased dice 200 times.
He calculates that the relative frequency of scoring a six is 0.2
How many times did Sam roll a six during his experiment?
- 5) Mack records the meals bought at lunch. 60 students buy a sandwich.
He calculated the relative frequency of a student buying a sandwich was 0.8 How many meals did Mack record?

6) Dan records his wins & losses playing online & compares his results with Alice's results.



Alice says she's the better player.
Do you agree?

	Dan		Alice	
Result	Win	Loss	Win	Loss
Frequency	13	7	66	54
Relative Frequency				

- Over the next 40 games...
...how many games does Dan expect to win?
...how many games does Alice expect to win?

7) Ash records the speed that cars are driving on the road by his home that has a 30 mph speed limit.

Speed (mph)	1-10	11-20	21-30	30+
Frequency	30		63	24
Relative Frequency	0.2	0.22		

- a) What is the probability the next car is breaking the law?
- b) What is the probability the next car is driving legally?
- c) 300 cars passed by his home over the next weekend.
Estimate how many were driving faster than 20 mph.

8) A factory records faults in the three types of robots it makes.

Robot	Type-A	Type-B	Type-C
Fault Relative Frequency		0.16	0.12

Type-A robots have 50% more faults compared to Type-B robots.
3 times the amount of Type-C robots are manufactured compared to Type-A robots & compared to Type-B robots.

What is the probability that the factory produces a faulty robot?

1 The two way table gives information about how 100 students travelled to school.

	Walk	Car	Other	Total
Boys	15			52
Girls		22	8	
Total			19	100

(a) Copy and complete the two way table. (3)

One of the students is picked at random.

(b) Write down the probability they walk to school. (1)

(4 marks)

2 The two way table gives information about the favourite sport of 150 students.

	Football	Rugby	Other	Total
Boys		17		73
Girls			31	
Total	77	21		

Copy and complete the two way table.

(3 marks)

5 A football team played 38 games.
19 games were played at home and the rest were played away.

The team won a total of 21 games.

They drew 4 games away.

2 of the 10 games they lost were at home.

Copy and complete the two way table.

	Won	Drawn	Lost	Total
Home				
Away				
Total				

(3 marks)

6 100 students attended a revision lesson at the weekend.

Each student went to Maths or English or Science.

55 of these students attended on Saturday.

Over the weekend a total of 40 students went to Maths.

12 of the 27 students that went to Science went on Sunday.

10 students went to English on Saturday.

How many students went to the Maths revision lesson on Saturday?

(4 marks)

3 The two way table gives information about the favourite subject of 200 students.

	Maths	English	Other	Total
Year 10			26	98
Year 11	47			
Total	88	41		

(a) Copy and complete the two way table. (3)

One of the students is picked at random.

(b) Write down the probability they are a year 10 student whose favourite subject is maths. (1)

(4 marks)

4 There are 170 students in year 7 at a school.
All of these students either walk to school, get the bus to school or cycle to school.

82 of the students are boys.

33 of the students get the bus to school.

19 of the 41 students that walk to school are boys.

56 girls cycle to school.

Copy and complete the two way table.

	Walk	Bus	Cycle	Total
Boys				
Girls				
Total				

(3 marks)

7 120 students are asked whether they like biology or chemistry or physics best.

52 of the students are in year 11, the rest are in year 10.

45 students like physics best.

20 of the year 11 students like biology best

16 of the 30 students who like chemistry best are in year 10.

Work out how many year 10 students like physics best. (4 marks)

8 100 students in year 7 either study French or German or Spanish.
45 of the students are boys and the rest are girls.

12 boys study German.

15 boys and 17 girls study French.

A total of 30 students study Spanish.

Work out how many girls study Spanish. (4 marks)

9 Two different schools, school A and school B, attended a conference.

12% of the attendees were teachers, the rest were students.

47% of the attendees were from school A.

48% of the attendees were **students** from school B.

One of the attendees is selected at random.

Find the probability that they are a teacher from school A.

(4 marks)

10 300 students are asked how they get to school.
All of the students either walk to school or get the bus to school.

58% of the students walk to school.

45% of the students are boys.

21% of the students are boys who get the bus to school.

Work out how many girls walk to school. (4 marks)

Match the events on the left to the answers on the right using the letters.

LINK Left & Right

A	Flipping a fair coin: How many tails in 500 flips?	90	
B	Rolling a fair dice: How many 6s in 300 rolls?	70	
C	Rolling a fair dice: How many 3s in 420 rolls?	160	
D	Picking a card: How many Kings in 130 picks?	75	
E	Picking a card: How many picture cards in 390 picks?	60	
F	In a bag of 16 blue & 24 green buttons: How many blue buttons in 500 picks?	250	
G	In a bag of 13 yellow, 37 black & 20 black buttons: How many black buttons in 560 picks?	140	
H	In a bag of 14 red, 25 white & 21 green buttons: How many red or green buttons in 240 picks?	50	
I	In a TV factory: $P(\text{no fault}) = 0.98$ How many faulty TVs out of 3000?	200	
J	Rolling a biased dice: $P(2, 3, 4, 5 \text{ or } 6) = 0.85$. How many 1s in 500 rolls?	10	

Demonstration Videos:

- <https://corbettmaths.com/2013/06/16/independent-events/>
- <https://corbettmaths.com/2013/06/18/conditional-probability/>
- <https://corbettmaths.com/2013/05/07/tree-diagrams/>

Tasks:

1. The probability Mark passes his driving test is $\frac{1}{3}$. The probability Diana passes is $\frac{5}{6}$. Complete the Tree Diagram and find the probability they both pass their tests.

Mark

Results

2. The probability Sally passes her history test is $\frac{4}{5}$. The probability Jim passes is $\frac{2}{3}$.

Sally

Results

3. The probability Jim passes his maths test is $\frac{7}{10}$. The probability he passes English is $\frac{4}{5}$.

- a) Complete a Tree Diagram and find the probability he passes both tests.
- b) What is the probability he fails both tests?
- c) What is the probability he passes only one test?

4. The probability Helen passes her English test is $\frac{4}{9}$. The probability she passes History is $\frac{3}{7}$.

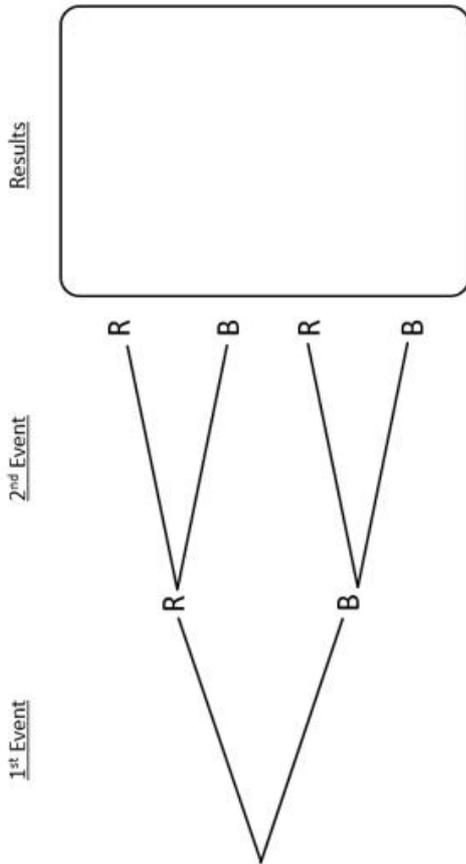
Complete a Tree Diagram and find the probability she passes at least one test.

Conditional Tree Diagrams



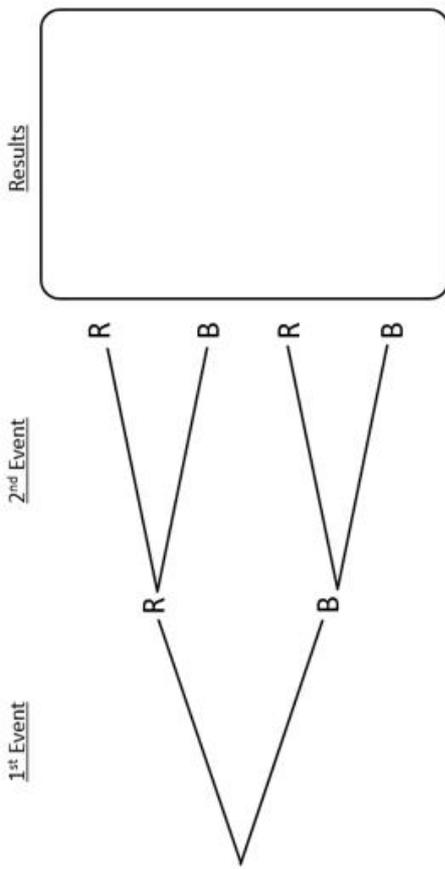
There are 5 red and 3 blue buttons in a sack.

A button is taken out and not replaced. Then another button is taken out. What is the probability both buttons are blue?



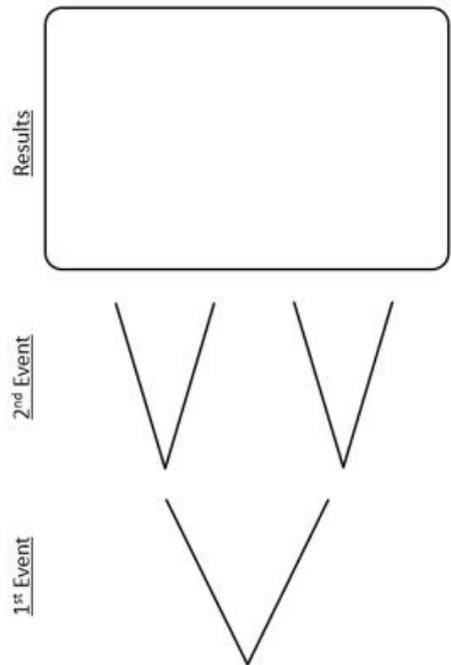
There are 2 red and 6 blue buttons in a sack.

A button is taken out and not replaced. Then another button is taken out. What is the probability both buttons are red? What is the probability of choosing at least one red button?



There are 4 red and 5 green buttons in a sack.

A button is taken out and not replaced. Then another button is taken out. What is the probability of choosing at least one red button? What is the probability of choosing only one red button?



d)

A science assessment has a practical and written test. Students have an 80% chance of passing the written test. If they pass the written test there is a 60% chance they pass the practical test. If they fail the written test, there is a 30% chance they will pass the practical test.

- 1) Draw a Probability Tree to show these events.
- 2) What is the probability a student passes both tests?
- 3) What is the probability a student passes only one of the tests?

- 1 Tina has two bags of counters, Bag A and Bag B.
- There are 5 red counters and 3 blue counters in bag A.
There are 4 red counters and 5 blue counters in bag B.
- Tina takes at random a counter from each bag.
- (a) Draw a probability tree to represent this information (2)
- (b) Work out the probability that Tina takes two blue counters. (2)
- (Total for question 1 is 4 marks)**

- 2 Hannah is going to play one game of chess and one game of backgammon.
- The probability she will win the game of chess is 0.6
The probability she will win the game of backgammon is 0.7.
- (a) Draw a probability tree to represent this information (2)
- (b) Work out the probability that Hannah will win both games. (2)
- (Total for question 2 is 4 marks)**

- 5 Each day Paul wears either a black tie or a red tie to work.
- On any day the probability he wears a black tie is $\frac{5}{9}$
- (a) Draw a probability tree for Monday and Tuesday. (2)
- (b) Work out the probability Paul wears different coloured ties on Monday and Tuesday. (2)
- (Total for question 5 is 4 marks)**

- 6 Jon plays a game where he can win, draw or lose.
- The probability Jon wins any game 0.5.
The probability Jon draws any game is 0.3
- Jon plays two games.
- (a) Draw a probability tree to represent this information (2)
- (b) Work out the probability Jon wins both games. (2)
- (Total for question 6 is 4 marks)**

- 3 Rachel has two bags.
- In the first bag there are 4 red balls and 6 green balls.
In the second bag there are 3 red balls and 5 green balls.
- Rachel takes at random a ball from the first bag.
She then takes at random a ball from the second bag.
- (a) Draw a probability tree to represent this information (2)
- (b) Work out the probability that Rachel takes two green balls. (2)
- (Total for question 3 is 4 marks)**

- 4 Jo is going to play one tennis match and match of squash.
- The probability she will win the tennis match is $\frac{4}{5}$
- The probability she will win the squash match is $\frac{7}{10}$
- (a) Draw a probability tree to represent this information (2)
- (b) Work out the probability that Jo will win both matches. (2)
- (Total for question 4 is 4 marks)**

- 7 Bradley gets the bus on Saturday and Sunday.
- The probability that Bradley's bus will be late on any day is 0.2
- (a) Draw a probability tree to represent this information (2)
- (b) Work out the probability that Bradley's bus is late on at least one of these days. (2)
- (Total for question 7 is 4 marks)**

Exam Practice:

<https://corbettmaths.com/wp-content/uploads/2013/02/probability-pdf.pdf>

<https://corbettmaths.com/wp-content/uploads/2013/02/relative-frequency-pdf.pdf>

<https://corbettmaths.com/wp-content/uploads/2019/10/Product-Rule-for-Counting.pdf>

<https://corbettmaths.com/wp-content/uploads/2013/02/tree-diagrams-pdf.pdf>

Week 3:

- LI: To be able to understand and finding missing values in Venn Diagrams

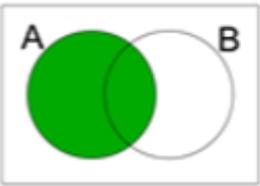
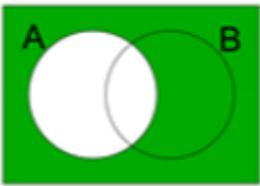
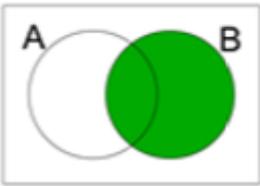
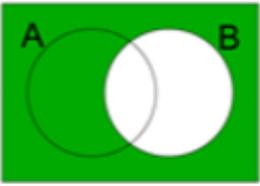
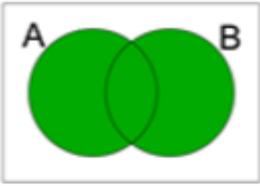
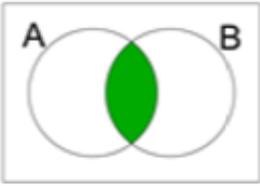
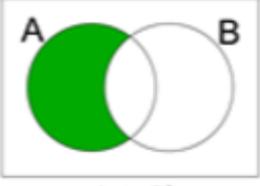
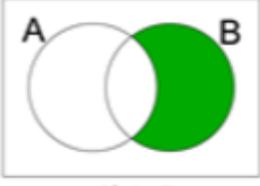
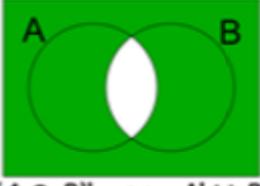
Demonstration Videos:

<https://corbettmaths.com/2016/08/07/venn-diagrams/>

<https://www.mathsgenie.co.uk/venn-diagrams.html>

Helpful Information:

2 Circle Venn Diagram Shading

 A	 A'	 B
 B'	 $A \cup B$	 $A \cap B$
 $A \cap B'$	 $A' \cap B$	 $(A \cap B)'$ or $A' \cup B'$
 $A' \cap B'$ or $(A \cup B)'$	 $A' \cup B$ or $(A \cap B)'$	 $A \cup B'$ or $(A' \cap B)'$
 $(A' \cap B') \cup (A \cap B)$	 $(A \cap B') \cup (A' \cap B)$	

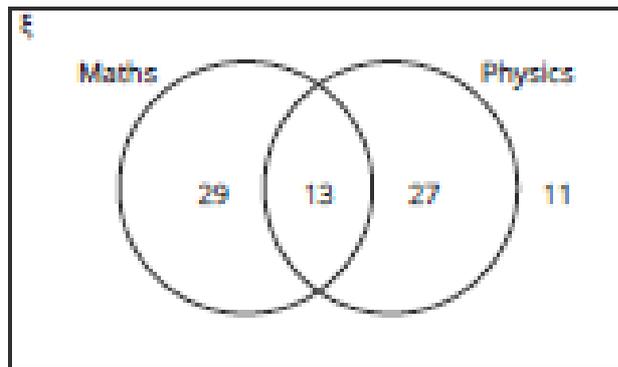
Tasks:

TRUE or FALSE?		Cut out all 16 cards. Sort them into two piles: TRUE & FALSE	
1 $\xi = \{1 \text{ to } 20 \text{ Inclusive}\}$ $A = \{\text{Square Numbers}\}$ $B = \{\text{Odd Numbers}\}$ $A \cap B = \{1, 9\}$	2 $\xi = \{1 \text{ to } 30 \text{ Inclusive}\}$ $A = \{\text{Cube Numbers}\}$ $B = \{\text{Square Numbers}\}$ $A \cup B = \{1, 4, 8, 9, 16, 25, 27\}$	3 $\xi = \{3, 5, 8, 9, 10, 12, 14\}$ $A = \{3, 5, 9, 12\}$ $B = \{5, 8, 10, 14\}$ $A \cap B = \{3, 5, 9, 12\}$	4 $\xi = \{1 \text{ to } 10 \text{ Inclusive}\}$ $A = \{\text{Even Numbers}\}$ $B = \{\text{Odd Numbers}\}$ $A' = \{1, 3, 5, 7, 9\} = B$
5 $\xi = \{15 \text{ to } 20 \text{ Inclusive}\}$ $A = \{\text{Odd Numbers}\}$ $B = \{\text{Square Numbers}\}$ $B' = \{15, 17, 18, 19\}$	6 $\xi = \{0, 4, 6, 7, 8, 11, 14\}$ $A = \{4, 7, 8\}$ $B = \{0, 4, 11\}$ $A \cup B = \{0, 4, 7, 8, 11\}$	7 $\xi = \{\text{INTELLIGENT}\}$ $A = \{\text{Vowels}\}$ $B = \{\text{IITLLEE}\}$ $A \cup B = \{\text{ITLLIT}\}$	8 $\xi = \{\text{MISSISSIPPI}\}$ $A = \{\text{MSSSS}\}$ $B = \{\text{IIII}\}$ $(A \cup B)' = \{\text{PP}\}$
9 $\xi = \{1 \text{ to } 20 \text{ Inclusive}\}$ $A = \{\text{Prime Numbers}\}$ $B = \{\text{Odd Numbers}\}$ $A \cap B = \{1, 3, 5, 7, 11, 13, 17, 19\}$	10 $\xi = \{\text{MAXIMUM}\}$ $A = \{\text{MAX}\}$ $B = \{\text{Vowels}\}$ $A' \cap B' = \{\text{MM}\}$	11 $\xi = \{25, 28, 31, 44, 45, 48\}$ $A = \{\text{Numbers} > 30\}$ $B = \{\text{Numbers} < 40\}$ $A = \{31, 44, 45, 48\}$	12 $\xi = \{0 \text{ to } 20 \text{ Inclusive}\}$ $A = \{\text{Even Numbers}\}$ $B = \{\text{Factors of } 24\}$ $B = \{2, 3, 6, 8, 12\}$
13 $\xi = \{\text{GIRAFFE}\}$ $A = \{\text{GRAFF}\}$ $B = \{\text{IE}\}$ $A \cap B = \{ \}$	14 $\xi = \{1 \text{ to } 20 \text{ Inclusive}\}$ $A = \{\text{Factors of } 18\}$ $B = \{\text{Odd Numbers}\}$ $A \cap B' = \{1, 3, 9\}$	15 $\xi = \{1 \text{ to } 10 \text{ Inclusive}\}$ $A = \{3, 5, 6, 8, 10\}$ $B = \{2, 4, 5, 8, 9\}$ $A' \cup B = \{1, 2, 4, 5, 7, 8, 9\}$	16 $\xi = \{\text{ELEPHANT}\}$ $A = \{\text{Consonants}\}$ $B = \{\text{EELPAT}\}$ $A \cap B = \{\text{LPHNT}\}$

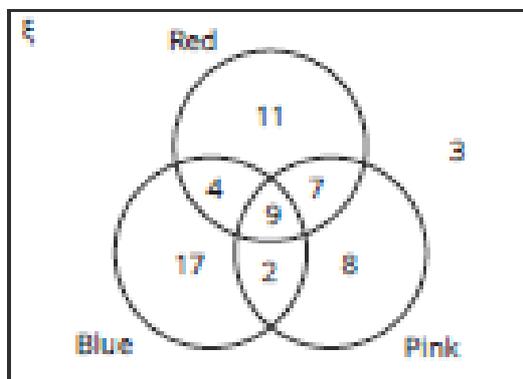
Match up the statements with the correct part of the Venn diagram. You will need to complete the blank statement and the blank Venn diagram with the missing answers.

People who have brown hair and wear glasses.	People who do not have brown hair.	People who do not have brown hair or glasses.	People who wear glasses.	People who wear glasses but do not have brown hair.	

1. The Venn diagram shows the number of students who study maths and physics at a college.



- a. Write down the number of students who study both maths and physics.
- b. Work out the number of students who study maths.
- c. Work out the probability that a randomly chosen student studies neither maths nor physics.
2. Becca asked her friends which colours they like out of red, blue and pink. She records the results in a Venn diagram.



- a. How many people did Becca ask?
- b. A person is chosen at random. Work out the probability that the person likes blue but not pink.
- c. A person is chosen at random. Find the probability that the person likes pink.
- d. A person who likes red is chosen at random. Find the probability that they like at least one other colour.

3. A group of 50 people were asked if they like running or cycling. 19 people said they like running, 22 people said they like cycling, 9 people said they like both.
- How many people said they like neither running nor cycling?
 - A person is chosen at random. Find the probability that they like either cycling or running, but not both.
4. A group of 100 people were asked if they like pasta or pizza. 62 people said they like pasta, 57 people said they like pizza and 8 people said they like neither.
- Draw a Venn diagram showing this information.
 - A person is chosen at random from the people who like pizza. Work out the probability they also like pasta.
5. 60 people were asked which vegetables they like out of broccoli, spinach and sweetcorn.
- 19 people like broccoli.
 - 21 people like spinach.
 - 32 people like sweetcorn.
 - 7 people like broccoli and spinach.
 - 12 people like spinach and sweetcorn.
 - 9 people like sweetcorn and broccoli.
 - 3 people like all three.

Work out the probability that a randomly chosen person doesn't like any of these vegetables.

6. 60 people were asked if they buy sweet or savoury snacks at the cinema.

$\frac{2}{3}$ of the people said they buy sweet snacks.

70% of the people said they buy savoury snacks.

The number of people who said they don't buy any snacks at the cinema was $\frac{1}{14}$ of the number of people who said they buy savoury snacks.

Work out the probability that a randomly chosen person buys both sweet and savoury snacks at the cinema.

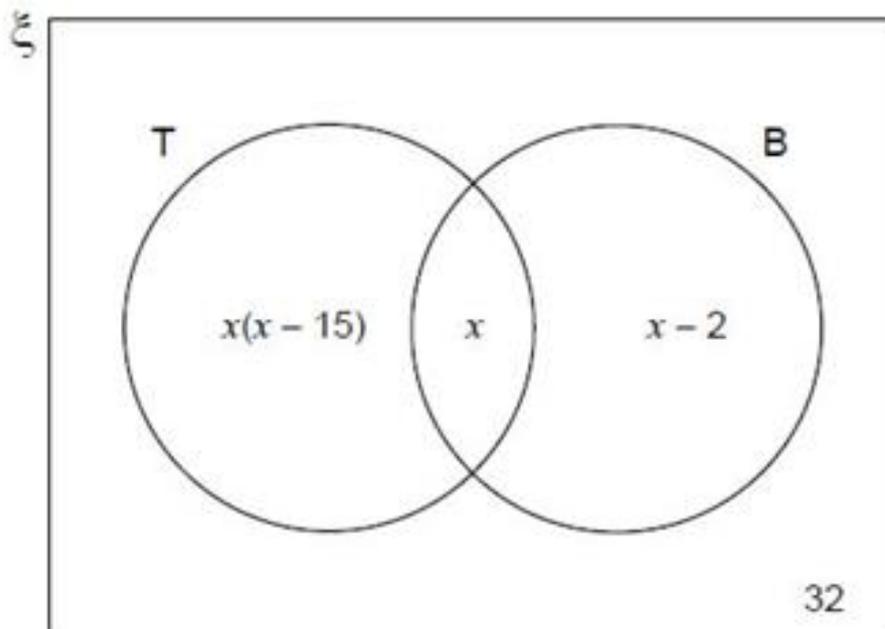
Exam Question Challenge:

The Venn diagram shows information about a coin collection.

ξ = 120 coins in the collection

T = coins from the 20th century

B = British coins



A coin is chosen at random.
It is British.

Work out the probability that it is from the 20th century.

Exam Practice:

<https://corbettmaths.com/wp-content/uploads/2013/02/venn-diagrams-pdf.pdf>

<https://www.mathsgenie.co.uk/resources/5-venn-diagrams.pdf>

Week 4:

- LI: To be able to recognise, sketch and draw quadratic and cubic graphs

Demonstration Videos:

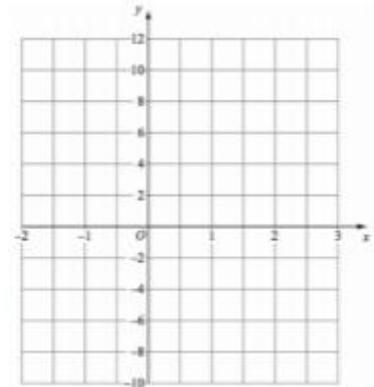
<https://corbettmaths.com/2013/06/23/drawing-quadratics/>
<https://www.mathsgenie.co.uk/quadratic-graphs.html>
<https://corbettmaths.com/2013/06/22/sketching-quadratics/>
/

Question 4:

(a) Complete the table of values for $y = x^2 + x$

x	-2	-1	0	1	2	3
y	2			2		12

(b) On the grid, draw the graph of $y = x^2 + x$ for the values of x from -2 to 3

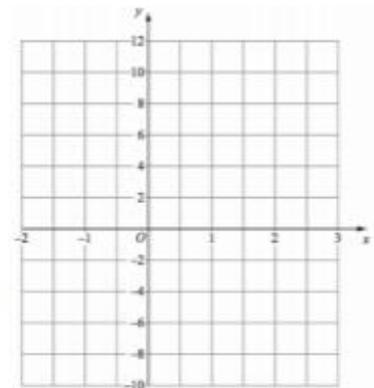


Question 5:

(a) Complete the table of values for $y = x^2 - 2x$

x	-2	-1	0	1	2	3
y		3			0	

(b) On the grid, draw the graph of $y = x^2 - 2x$ for the values of x from -2 to 3

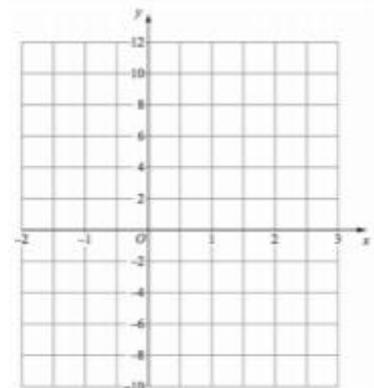


Question 6:

(a) Complete the table of values for $y = x^2 + x - 4$

x	-2	-1	0	1	2	3
y						

(b) On the grid, draw the graph of $y = x^2 + x - 4$ for the values of x from -2 to 3

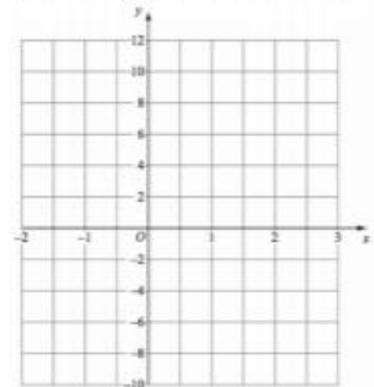


Question 7:

(a) Complete the table of values for $y = x^2 - 3x + 2$

x	-2	-1	0	1	2	3
y	12				0	

(b) On the grid, draw the graph of $y = x^2 - 3x + 2$ for the values of x from -2 to 3

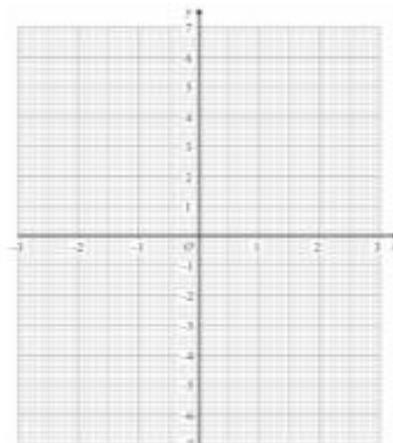


Question 8:

(a) Complete the table of values for $y = x^2 - x - 5$

x	-3	-2	-1	0	1	2	3
y							

(b) On the grid, draw the graph of $y = x^2 - x - 5$ for the values of x from -3 to 3

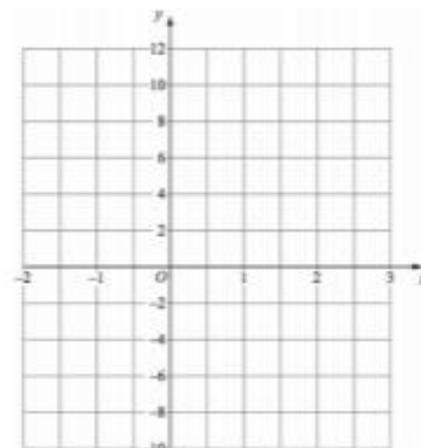


Question 9:

(a) Complete the table of values for $y = x^2 + 3x - 6$

x	-2	-1	0	1	2	3
y						

(b) On the grid, draw the graph of $y = x^2 + 3x - 6$ for the values of x from -2 to 3

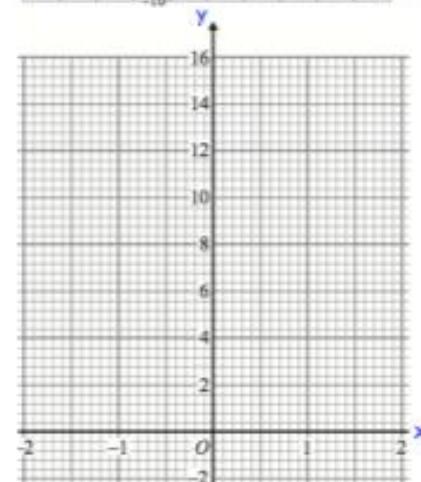


Question 10:

(a) Complete the table of values for $y = 2x^2$

x	-2	-1	0	1	2
y					

(b) On the grid, draw the graph of $y = 2x^2$ for the values of x from -2 to 2

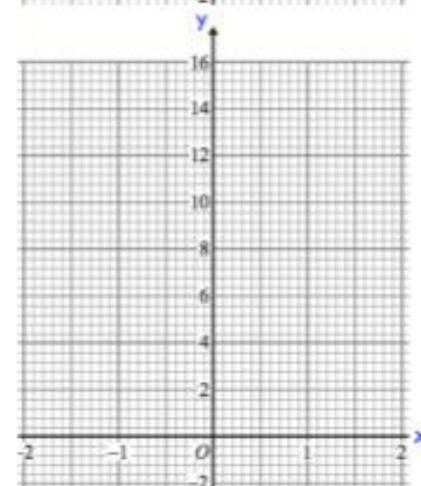


Question 11:

(a) Complete the table of values for $y = 3x^2$

x	-2	-1	0	1	2
y					

(b) On the grid, draw the graph of $y = 3x^2$ for the values of x from -2 to 2

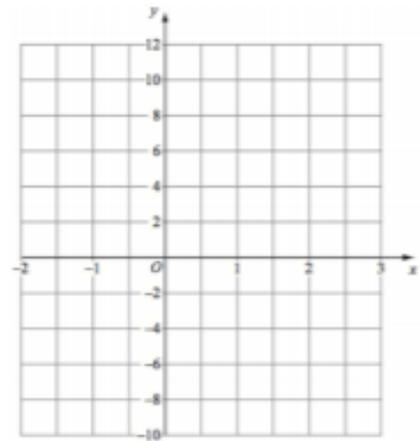


Question 12:

(a) Complete the table of values for $y = 2x^2 - x - 3$

x	-2	-1	0	1	2	3
y						

(b) On the grid, draw the graph of $y = 2x^2 - x - 3$ for the values of x from -2 to 3

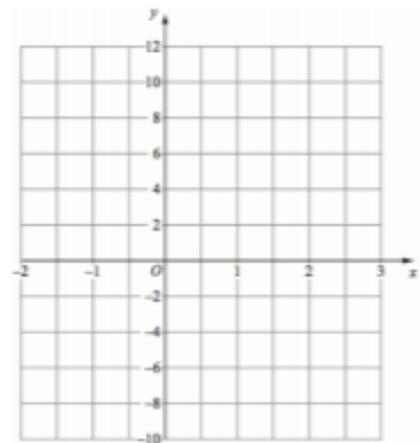


Question 13:

(a) Complete the table of values for $y = 8 - x^2$

x	-2	-1	0	1	2	3
y						

(b) On the grid, draw the graph of $y = 8 - x^2$ for the values of x from -2 to 3



Question 14: Draw the following graphs for the values of x from -3 to 3
Use suitable grids for each.

(a) $y = x^2 + 4x - 10$

(b) $y = x^2 - 5x + 1$

(c) $y = \frac{1}{2}x^2$

(d) $y = 2x^2 - 3x + 1$

(e) $y = 2x - x^2$

(f) $y = -x^2 + 2x - 3$



Sketching Quadratics

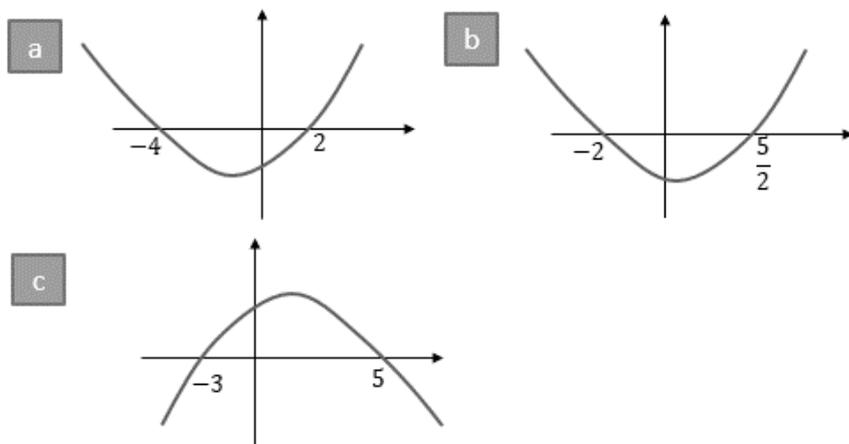
1. Sketch the following parabolas, ensuring you indicate any intersections with the coordinate axes. If the graph has no roots, indicate the minimum/maximum point.

- (a) $y = x^2 - 2x$
 (b) $y = x^2 + 4x - 5$
 (c) $y = x^2 - 2x + 1$
 (d) $y = 3 - x^2$
 (e) $y = 4 + 3x - x^2$

2. Sketch the following parabolas. These have no roots, so complete the square to identify the minimum/maximum point.

- (a) $y = x^2 + 2x + 6$
 (b) $y = x^2 - 4x + 7$

3. Find equations for the following graphs, giving your answer in the form $ax^2 + bx + c = 0$



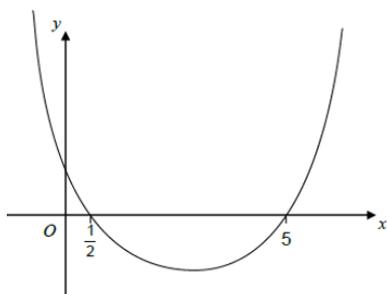
4. [C1 May 2010 Q4]

(a) Show that $x^2 + 6x + 11$ can be written as $(x + p)^2 + q$, where p and q are integers to be found. (2)

(b) Sketch the curve with equation $y = x^2 + 6x + 11$, clearly showing any intersections with the coordinate axes. (2)

(c) Find the value of the discriminant of $x^2 + 6x + 11$. (2)

5. [AQA] The diagram shows a quadratic graph that intersects the x -axis when $x = \frac{1}{2}$ and $x = 5$.



Work out the equation of the quadratic graph,

Demonstration Videos:

<https://corbettmaths.com/2016/08/07/cubic-graphs/>

<https://www.youtube.com/watch?v=LvhJzITdIH0>

<https://www.youtube.com/watch?v=SVQ2lq-VRkM&feature=youtu.be>

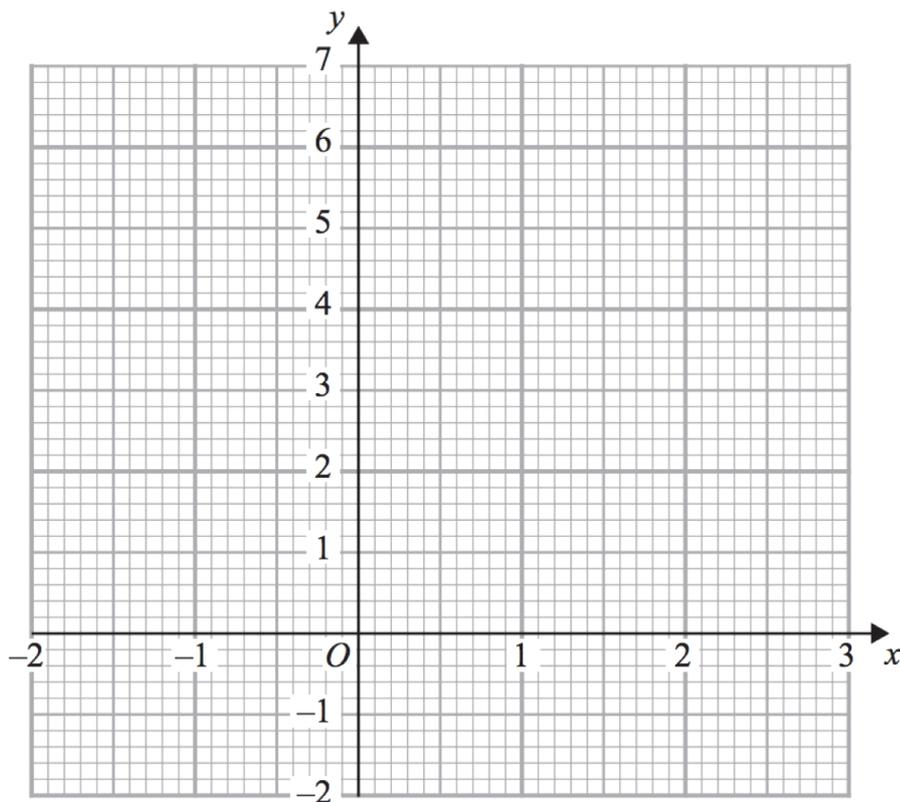
Tasks:

1. (a) Complete the table of values for $y = x^3 - 2x + 3$

x	-2	-1	0	1	2
y					

(2)

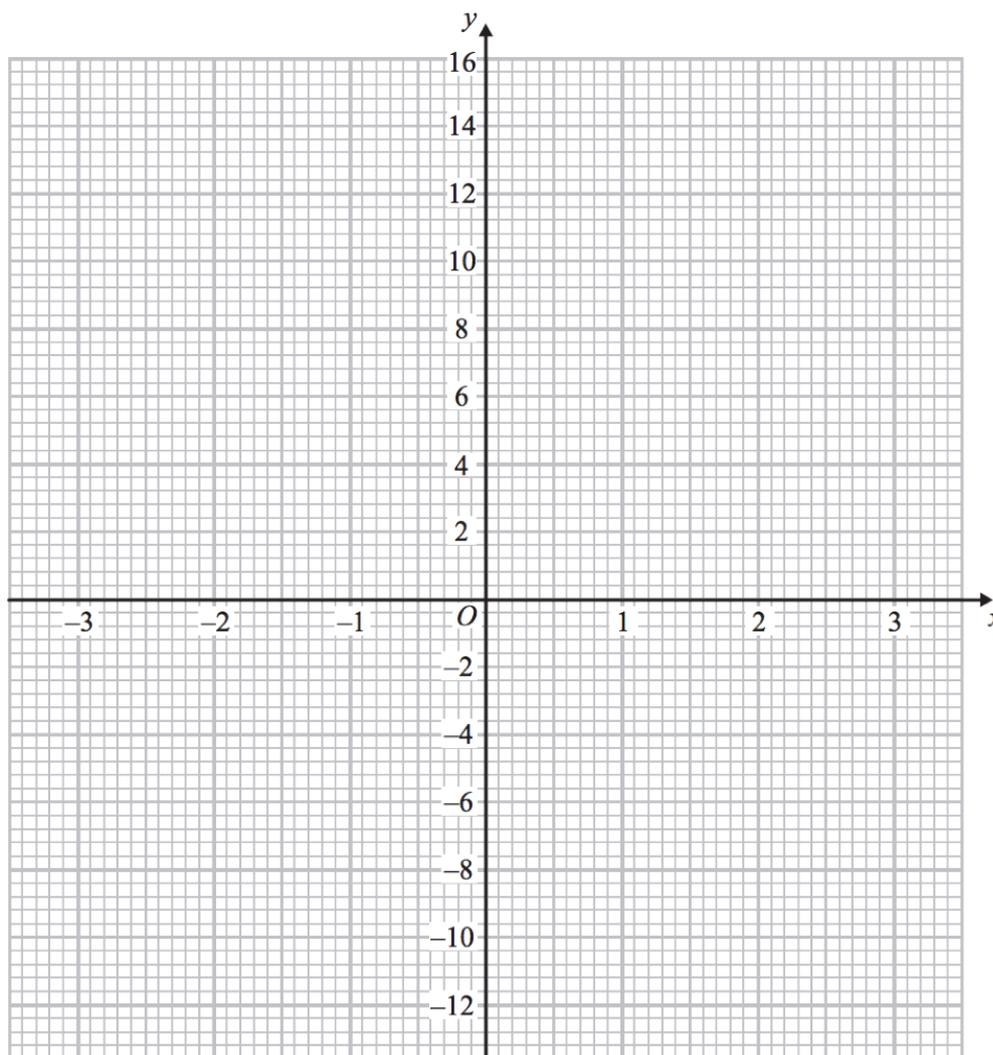
- (b) On the grid, draw the graph of $y = x^3 - 2x + 3$ for the values of x from $x = -2$ to $x = 2$



2. (a) Complete the table of values for $y = x^3 + 2x^2 - 1$

x	-3	-2	-1	0	1	2
y						

(b) On the grid, draw the graph of $y = x^3 + 2x^2 - 1$ for the values of x from -3 to $x = 2$



3) Make up your own x values and draw the graphs of the following:

a) $x^3 + 2$

b) $x^3 + 5$

c) $x^3 - 4x$

d) $x^3 + 3x^2 - 4$

e) $2x^3 + 3x^2 + 1$

f) $3x^3 - 2x - 2$

g) $5x^3 + 2x^2 - 3$

h) $x^3 - 4x^2 + 1$

i) $3x^3 + 4x^2 + 2$

j) $x^3 - 4x^2 - 7$

k) $2x^3 + 5x^2 - 3x$

l) $3x^3 + 2x^2 - 5$

m) $2x^3 - x^2 - 1$

Week 5:

- LI: To be able to recognise and plot reciprocal, exponential and trigonometric graphs

Demonstration Videos:

<https://corbettmaths.com/2013/10/24/reciprocal-graphs/>

<https://www.mathsgenie.co.uk/cubic-reciprocal.html>

<https://www.youtube.com/watch?v=kTTTkMwXqrg>

Tasks:

Part 1 – What is a reciprocal?

Match each number in the table below with its reciprocal, calculating the reciprocal of the numbers that don't match:

2	$\frac{1}{5}$	10	$\frac{9}{7}$	$\frac{2}{3}$	1.25	0.375
	5	$\frac{7}{9}$	$\frac{1}{2}$	0.8	1.5	

What is the reciprocal of x ?

What about the reciprocal of $3x$?

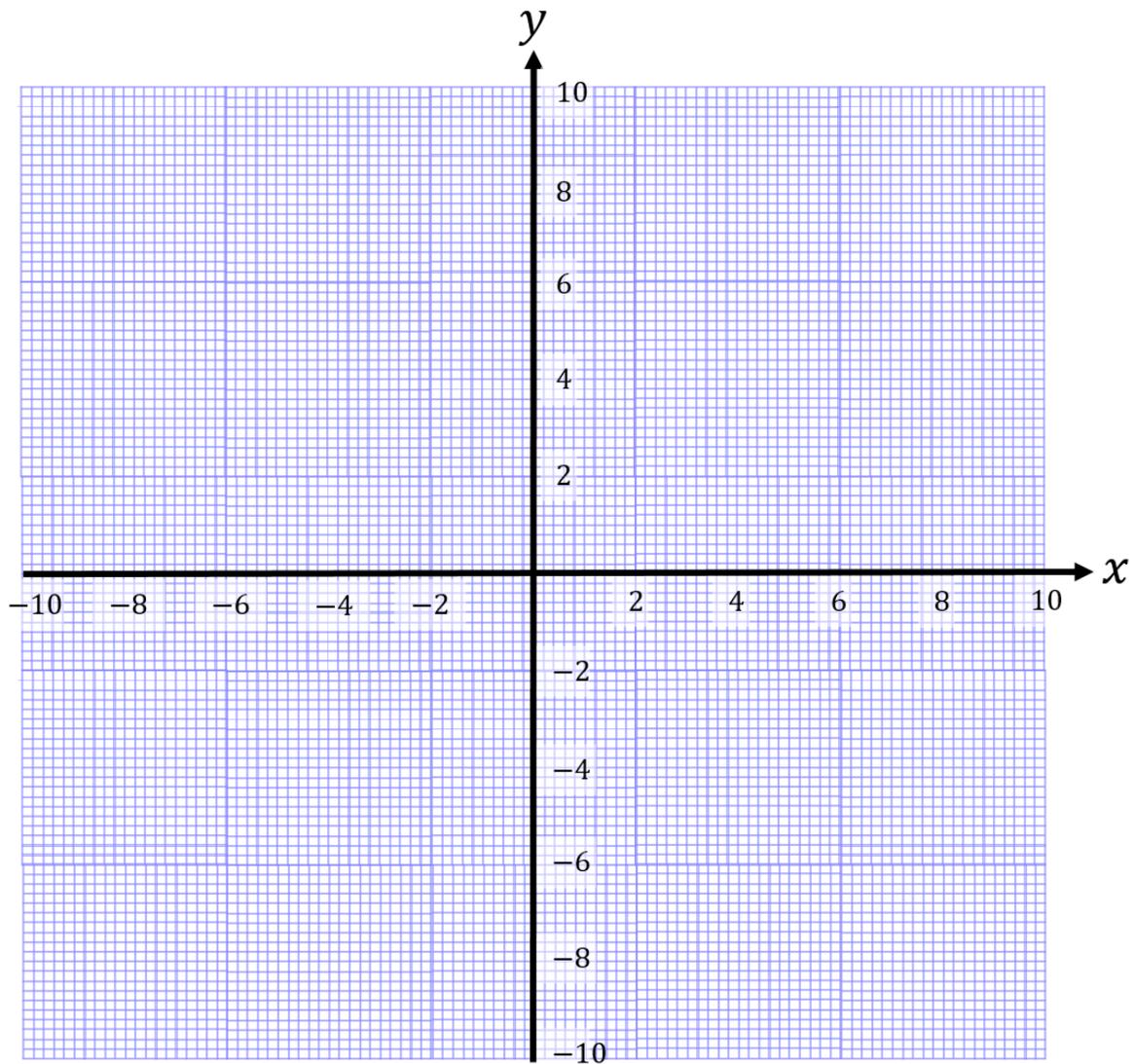
And $x + 2$?

Part 2 – Can I find coordinates on a reciprocal graph?

Fill in the table and draw the graph of $y = \frac{1}{x}$

x	-2	-1	$-\frac{1}{2}$	$-\frac{1}{4}$	0	$\frac{1}{4}$	$\frac{1}{2}$	1	2
y									

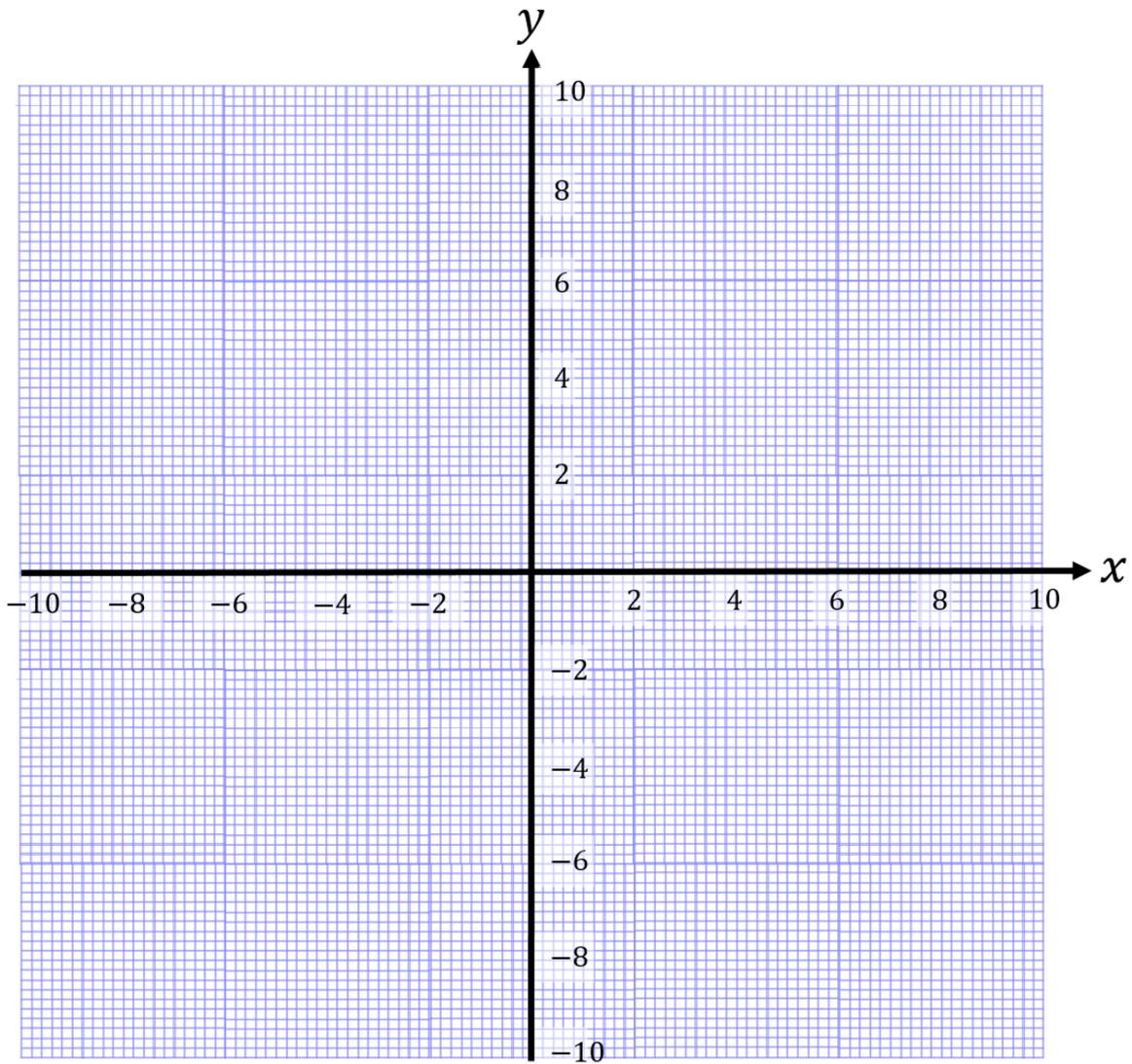
Workings:



Fill in the table and draw the graph of $y = \frac{2}{x}$

x	-8	-4	-2	-1	$-\frac{1}{2}$	$-\frac{1}{4}$	0	$\frac{1}{4}$	$\frac{1}{2}$	1	2	4	8
y													

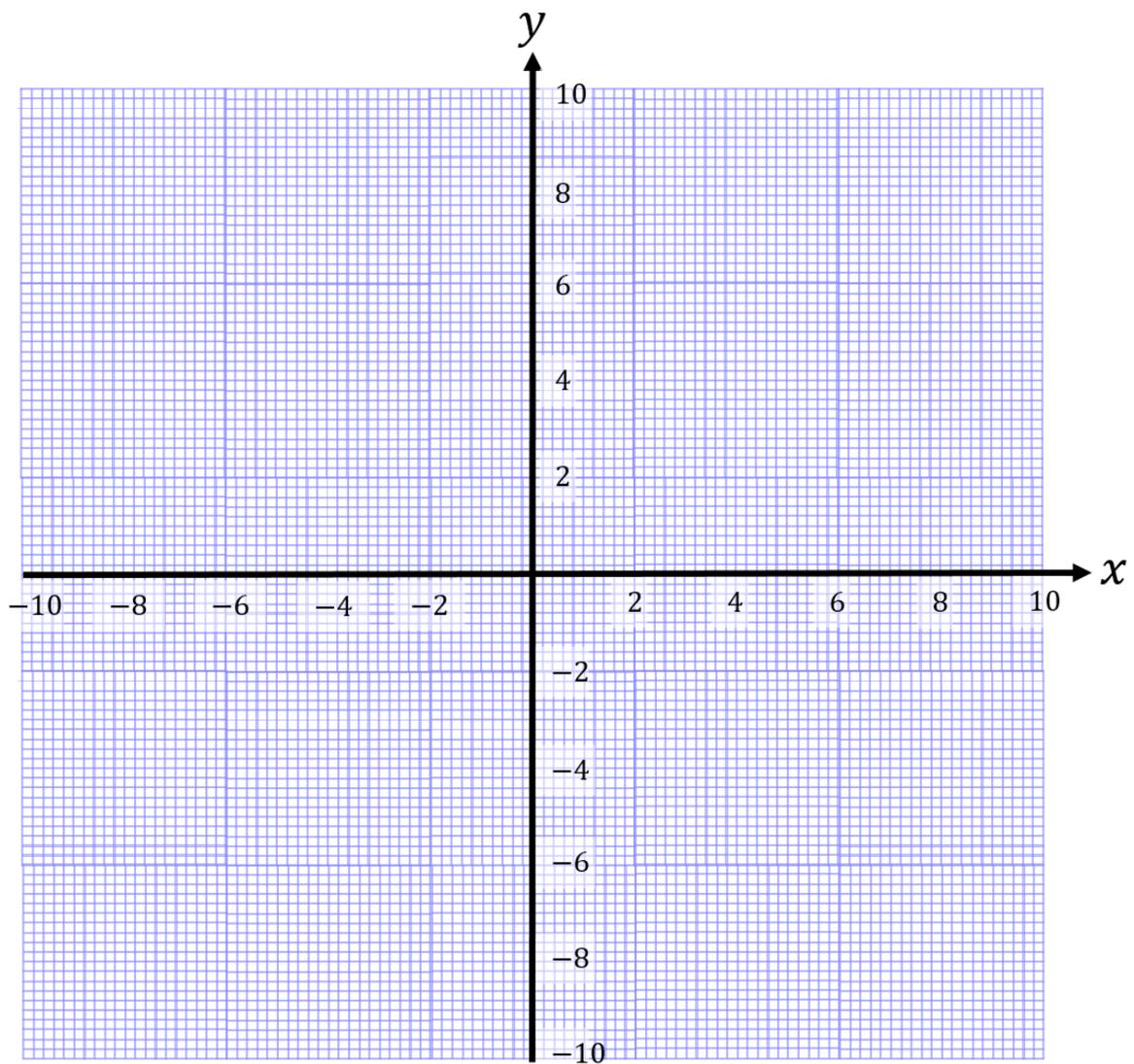
Workings:



Fill in the table and draw the graph of $y = \frac{1}{2x}$

x	-2	-1	$-\frac{1}{2}$	$-\frac{1}{4}$	0	$\frac{1}{4}$	$\frac{1}{2}$	1	2
y									

Workings:



Reciprocal Graphs Codebreaker

A	B	C	D	E	F	G	H	I	J	K	L	M
$-\frac{1}{3}$	-4	$\frac{1}{7}$	5	$-\frac{6}{5}$	-3	$\frac{3}{4}$	$-\frac{4}{5}$	$\frac{1}{5}$	$-\frac{2}{3}$	8	2	$\frac{1}{2}$

N	O	P	Q	R	S	T	U	V	W	X	Y	Z
1	$-\frac{1}{2}$	$\frac{3}{2}$	-2	$\frac{1}{4}$	4	-1	6	$\frac{1}{6}$	-5	$-\frac{1}{7}$	3	$\frac{3}{8}$

Find the coordinates below, link your answers to the table above to reveal what happened to my claim against the airline over my missing luggage:

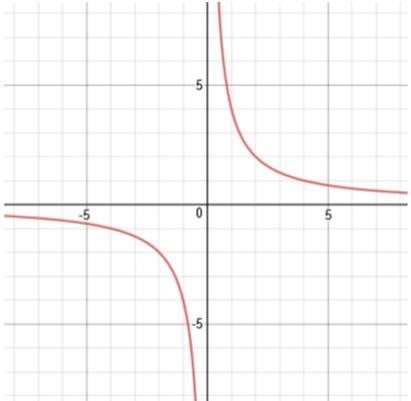
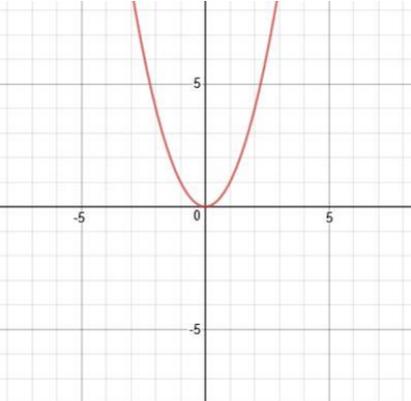
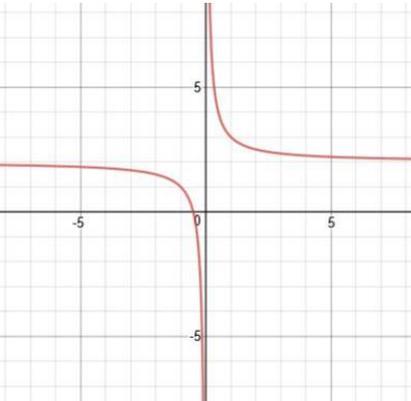
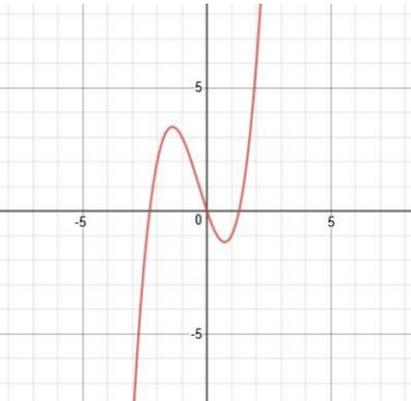
If $y = \frac{1}{x}$, find the y coordinate when $x =$ 5.	If $y = \frac{1}{x}$, find the y coordinate when $x = \frac{1}{2}$.	If $y = \frac{3}{x}$, find the y coordinate when $x =$ -6.	If $y = \frac{2}{x}$, find the y coordinate when $x = \frac{1}{2}$.	If $y = \frac{1}{x+2}$, find the y coordinate when $x =$ -3.	If $y = \frac{1}{x-3}$, find the y coordinate when $x =$ 5.

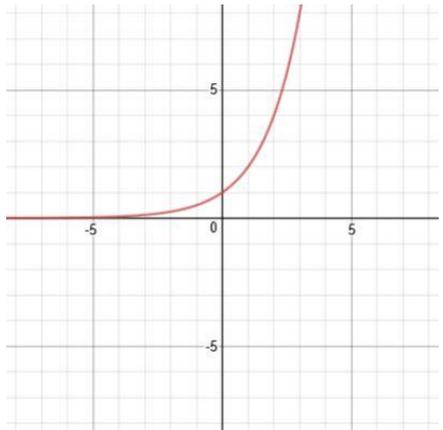
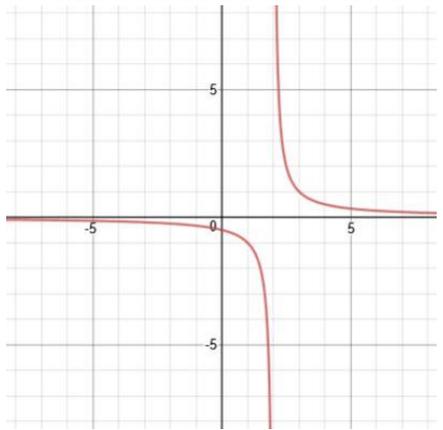
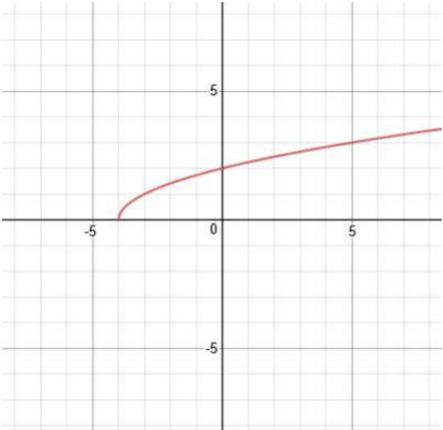
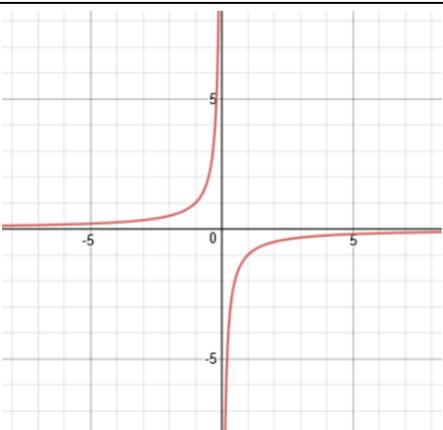
If $y = \frac{1}{5x}$, find the y coordinate when $x =$ $\frac{1}{15}$.	If $y = \frac{1}{2x+1}$, find the y coordinate when $x =$ 3.	If $y = \frac{3}{2x-1}$, find the y coordinate when $x =$ -4.	If $y = \frac{1}{2x}$, find the y coordinate when $x = \frac{1}{8}$.	If $y = \frac{3}{x-1}$, find the y coordinate when $x =$ -1.5.

Part 3 – Can I recognise a reciprocal graph?

Which of these is a reciprocal graph?

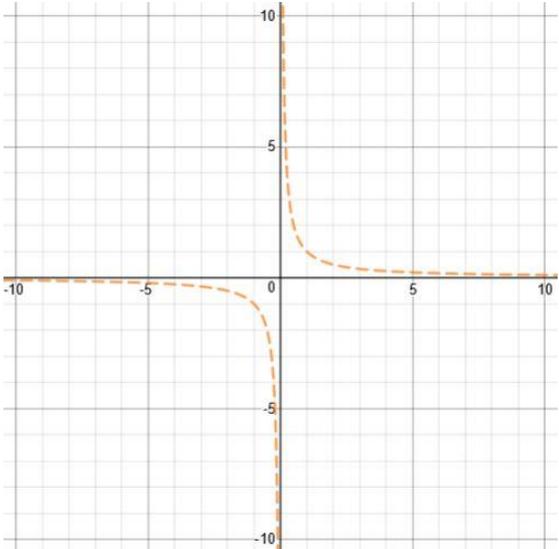
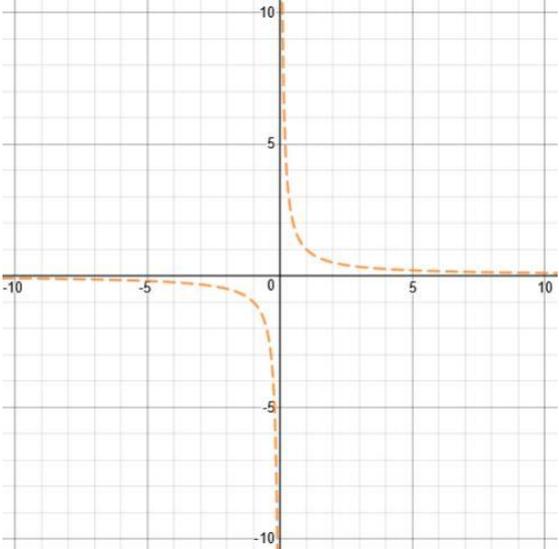
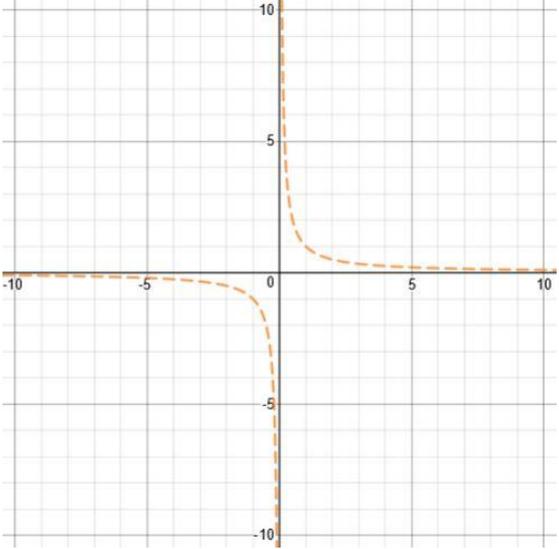
Explain how you know whether they are or aren't reciprocal graphs:

	Graph	Reciprocal or not?	How can you tell?
A			
B			
C			
D			

	Graph	Reciprocal or not?	How can you tell?
E			
F			
G			
H			

Part 4 – Can I describe how to transform a reciprocal graph?

Plot the graphs below; on each grid the graph of $y = \frac{1}{x}$ is drawn to help you describe what has happened.

Graph:	What it looks like:	Describe what's happened:
$y = \frac{1}{x} + 2$		
$y = \frac{1}{x + 2}$		
$y = \frac{1}{x - 3}$		

Demonstration Video:

<https://corbettmaths.com/2019/12/31/exponential-graphs-video/>

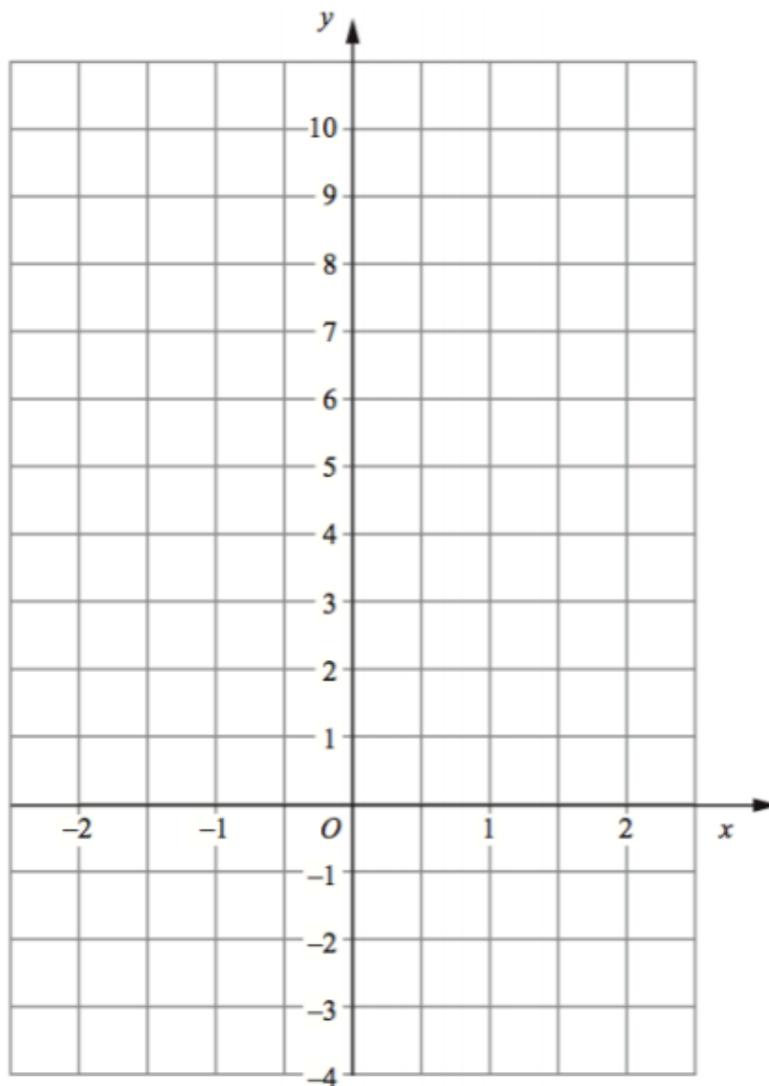
Tasks:

1. (a) Complete the table of values for $y = 3^x$

x	-2	-1	0	1	2
y					

(2)

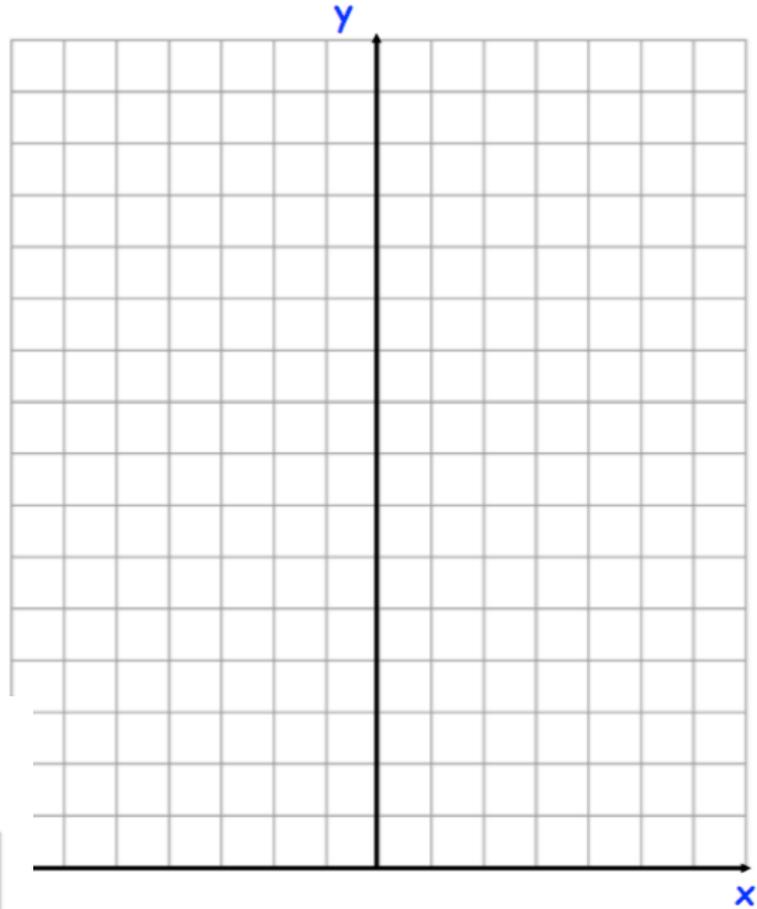
- (b) Draw the graph of $y = 3^x$ for values of x from -2 to 2



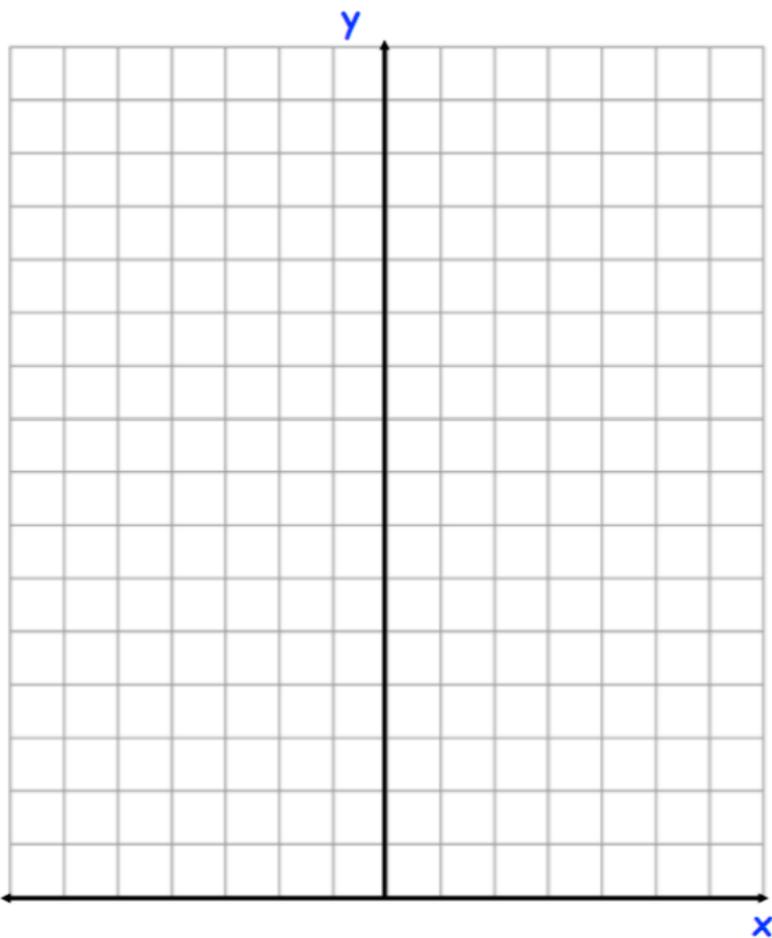
(2)



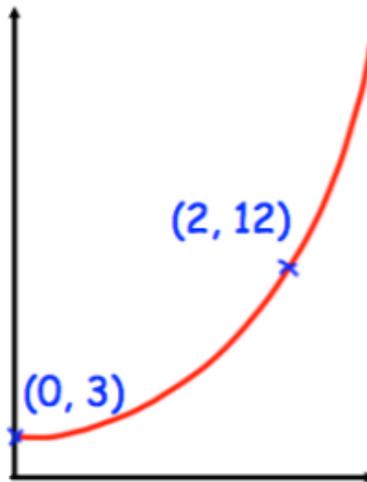
2. Draw the graph of $y = 2^x$ for values of x from -4 to 4



3. Draw the graph of $y = (\frac{1}{2})^x$ for values of x from -4 to 4



4.

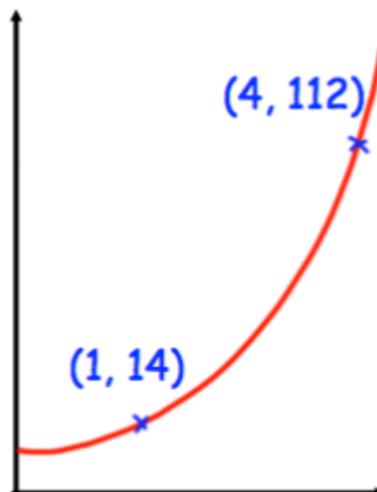


The sketch shows a curve with equation $y = ab^x$ where a and b are constants and $b > 0$

The curve passes through the points $(0, 3)$ and $(2, 12)$

Calculate the value of a and b

5.

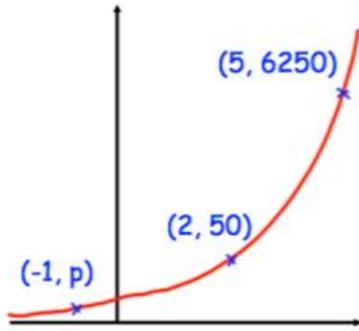


The sketch shows a curve with equation $y = ab^x$ where a and b are constants and $b > 0$

The curve passes through the points $(1, 14)$ and $(4, 112)$

Calculate the value of a and b

7.

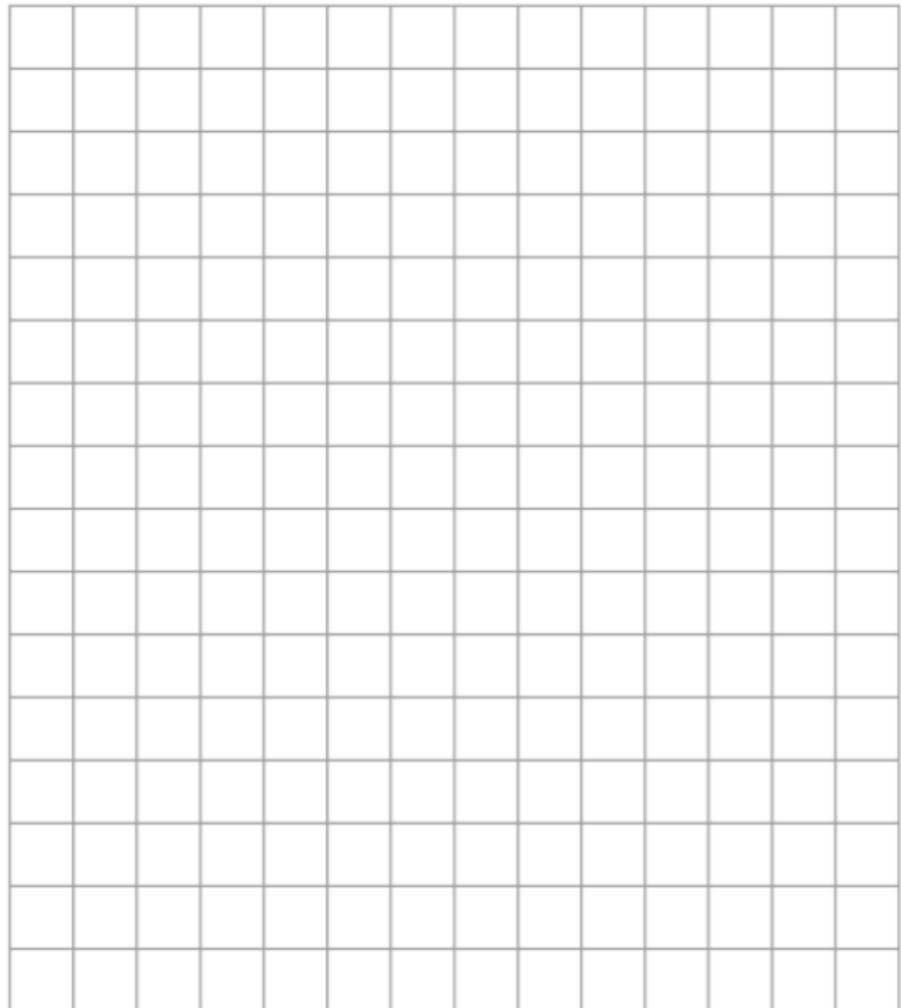


The sketch shows a curve with equation $y = ab^x$ where a and b are constants and $b > 0$

The curve passes through the points $(2, 50)$, $(5, 6250)$ and $(-1, p)$

Calculate the value of p

8. Draw the graph $y = (0.25)^x$ for values of x from -3 to 3



(4)

Demonstration Video:

<https://corbettmaths.com/2013/04/20/ysinx-graph/>
<https://corbettmaths.com/2013/05/07/cosine-graph/>
<https://corbettmaths.com/2013/05/12/tangent-graph/>
<https://corbettmaths.com/2013/04/20/exact-trigonometric-values/>
<https://www.youtube.com/watch?v=NGILmqWOdSc>

Tasks:

Plot the graphs of the trigonometric identities; *sine*, *cosine* and *tangent*.

Sine

$\Theta(^{\circ})$	0	30	60	90	120	150	180	210	240	270	300	330	360	390	420
Sin(Θ)	0	0.5		1			0			-1				0.5	

Cosine

Θ	0	30	60	90	120	150	180	210	240	270	300	330	360	390	420
Cos(Θ)	1									0	0.5				

Tangent

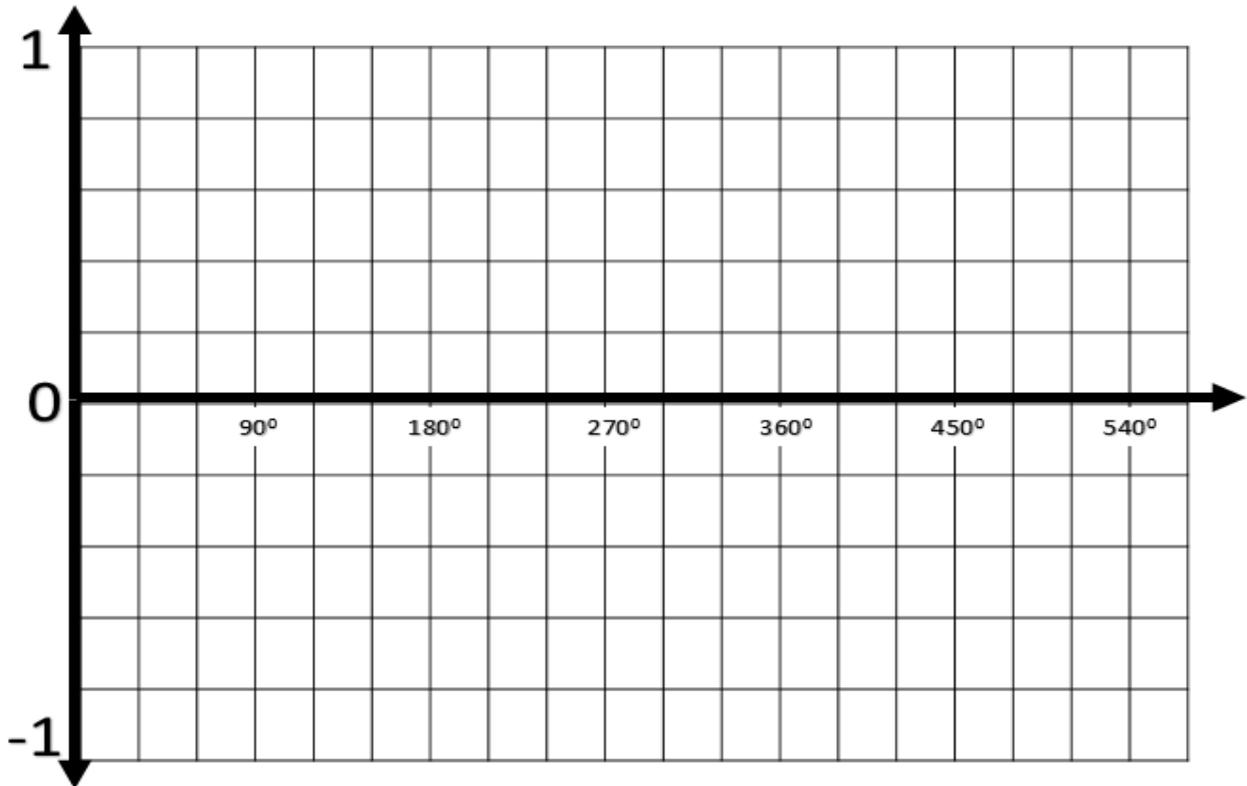
Θ	0	30	60	90	120	150	180	210	240	270	300	330	360	390	420
Tan(Θ)															

Extension

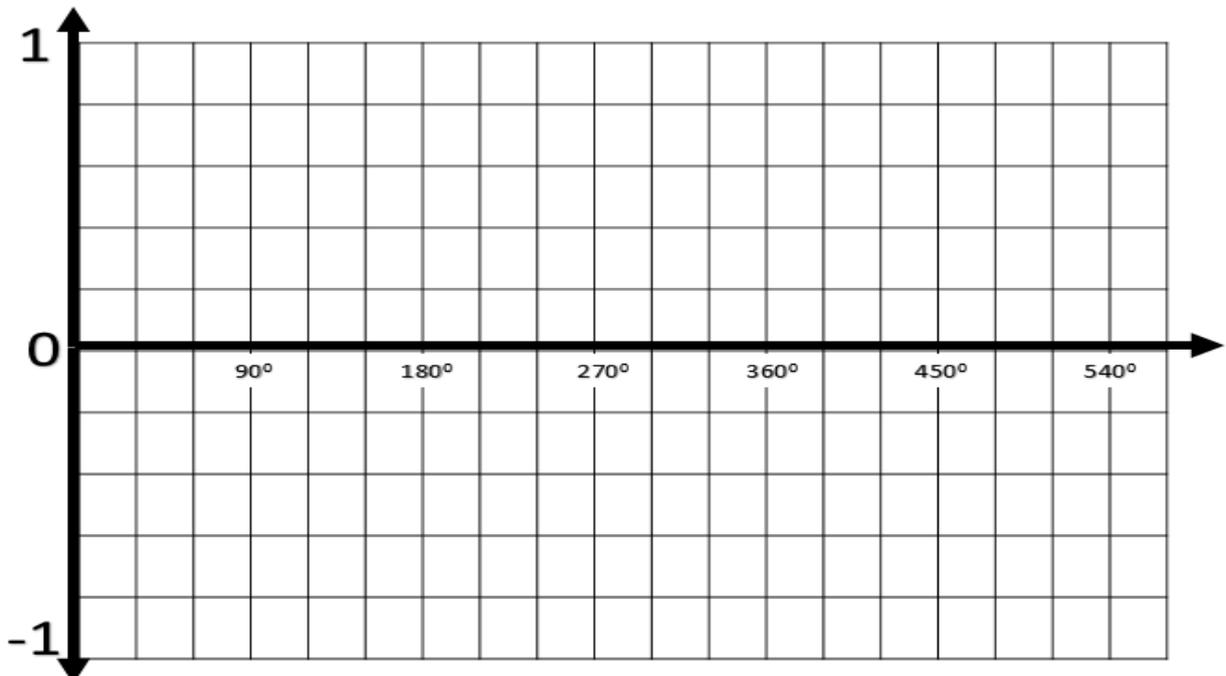
- i) What do you notice when the graphs get to 360° ?
- ii) Can you describe the relationship between the graphs of Sine and Cosine?

Sketch the sin, cosine and tangent graphs using the tables above

Sin(θ)

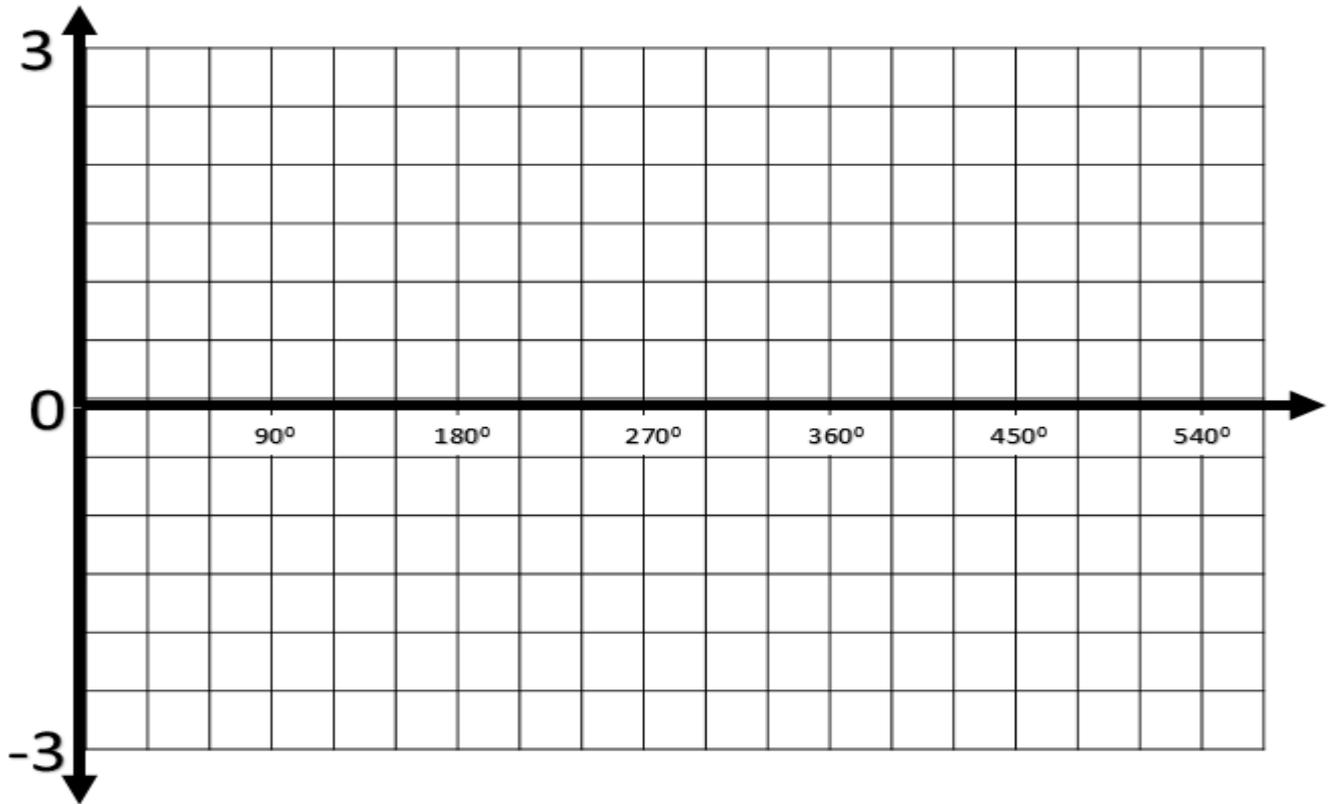


Cosine(θ)



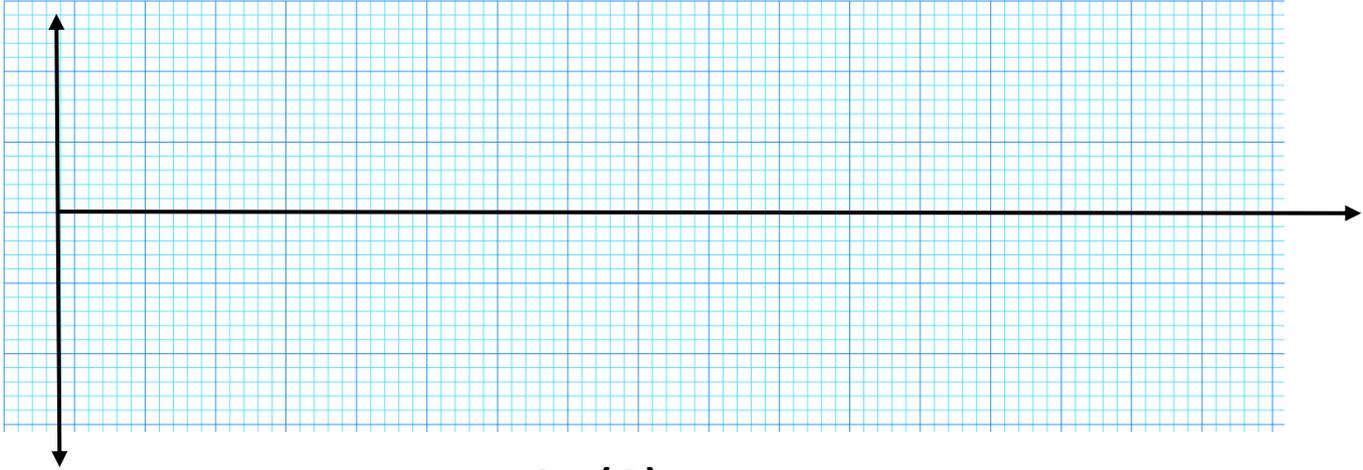


Tangent(θ)



Sketch the trigonometric graphs

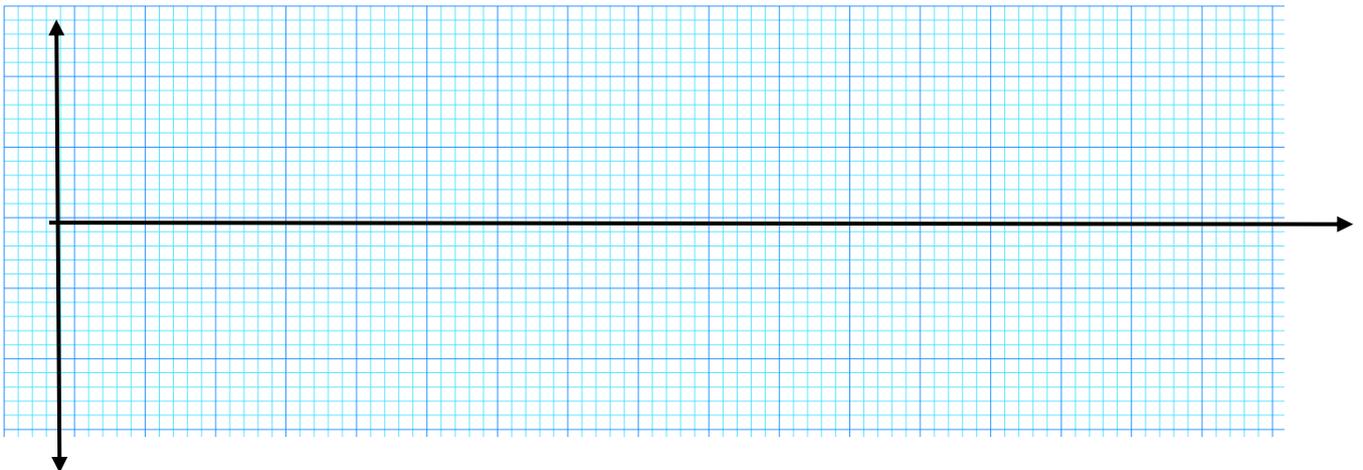
Sin(θ)



Cos(θ)



Tan(θ)



Week 6:

- LI: To be able to solve problems using vectors

Demonstration Videos:

<https://corbettmaths.com/2016/04/25/vectors/>

<https://www.mathsgenie.co.uk/column-vectors.html>

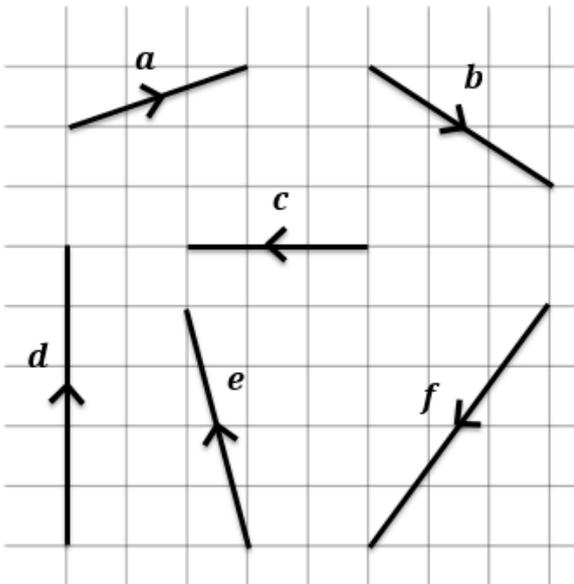
<https://www.tes.com/teaching-resource/gcse-maths-vectors-in-2d-video-lesson-6086924>

www.drfrostmaths.com

Tasks:

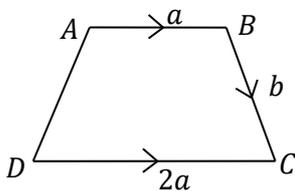
Exercise 1 (Basic Addition/Subtraction)

1. State the value of each vector.



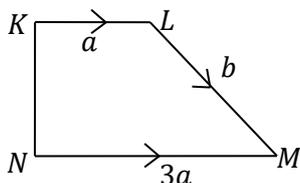
2. Write each vector in terms of a and/or b .

a. \overrightarrow{BA} b. \overrightarrow{AC} c. \overrightarrow{DB} d. \overrightarrow{AD}

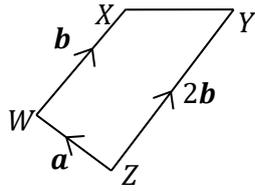


3. Write each vector in terms of a and/or b .

a. \overrightarrow{MK} b. \overrightarrow{NL} c. \overrightarrow{NK} d. \overrightarrow{KN}

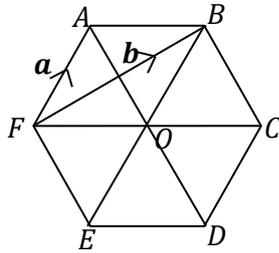


4. Write each vector in terms of a and/or b .



- \vec{ZX}
- \vec{YW}
- \vec{XY}
- \vec{XZ}

5. $ABCDEF$ is a regular hexagon with centre O . $\vec{FA} = \mathbf{a}$ and $\vec{FB} = \mathbf{b}$.



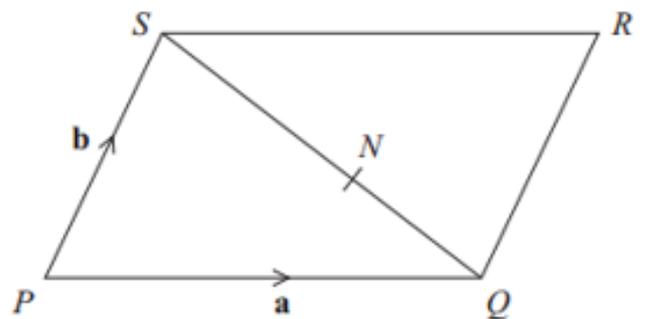
Express in terms of \mathbf{a} and/or \mathbf{b} :

- \vec{AB}
- \vec{FO}
- \vec{AO}
- \vec{FD}

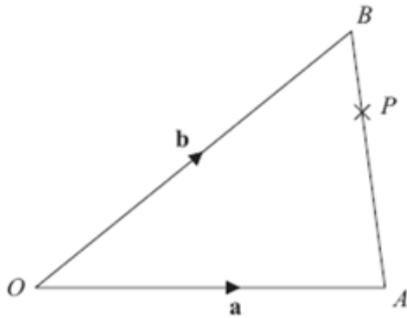
6.

$PQRS$ is a parallelogram. N is on SQ such that $SN:NQ = 3:2$.

a) Write an expression for \vec{SQ} in terms of \mathbf{a} , \mathbf{b} .



b) Express \vec{NR} in terms of \mathbf{a} and \mathbf{b} .



Test Your Understanding

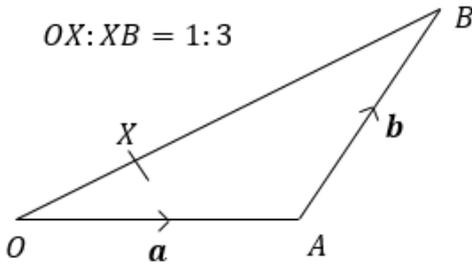
a) Find \overrightarrow{AB} in terms of \mathbf{a} and \mathbf{b} .

b) P is a point on AB such that $AP:PB = 3:1$. Find \overrightarrow{OP} in terms of \mathbf{a} and \mathbf{b} , giving your answer in its simplest form.

Further Practice

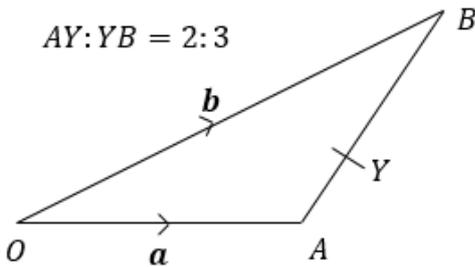
A) Determine \overrightarrow{AX}

$$OX:XB = 1:3$$



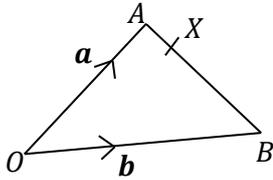
B) Determine \overrightarrow{OY}

$$AY:YB = 2:3$$



Exercise 2 (Using Ratios)

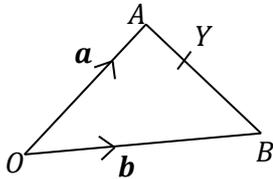
1. In the following diagram $\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$. X is a point such that $AX:XB = 1:4$



What is:

- a. \overrightarrow{AB} b. \overrightarrow{AX} c. \overrightarrow{OX} d. \overrightarrow{BX}

2. Again $\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$. Y is a point such that $YB = 2AY$



What is:

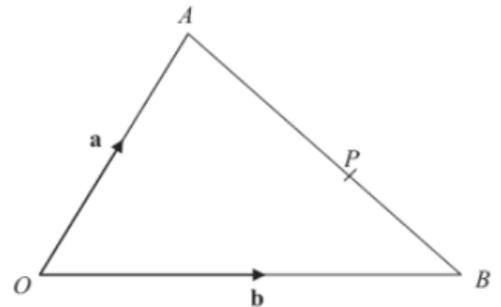
- a. \overrightarrow{AY} c. \overrightarrow{OY} d. \overrightarrow{YO}

3. [June 2009 2H Q23]

a) Find \overrightarrow{AB} in terms of \mathbf{a} and \mathbf{b} .

b) P is on AB such that $AP:PB = 3:2$.

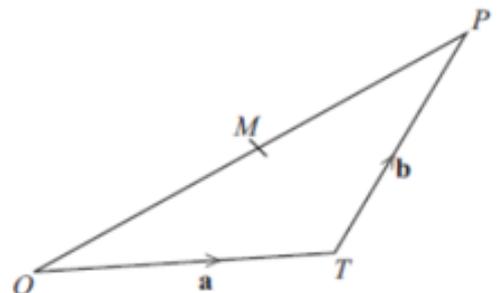
Show that $\overrightarrow{OP} = \frac{1}{5}(2\mathbf{a} + 3\mathbf{b})$



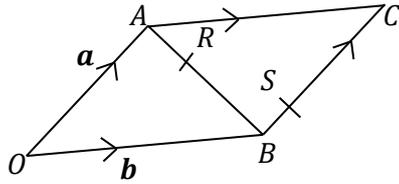
4. [Nov 2010 1H Q27] M is the midpoint of OP .

a) Express \overrightarrow{OM} in terms of \mathbf{a} and \mathbf{b} .

b) Express \overrightarrow{TM} in terms of \mathbf{a} and \mathbf{b} giving your answer in its simplest form.

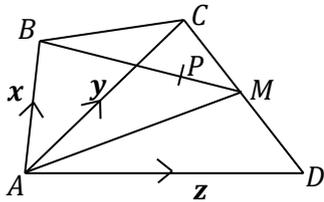


5. $OACB$ is a parallelogram. R is a point such that $AR:RB = 2:3$. S is a point such that $BS:SC = 1:3$. Determine:



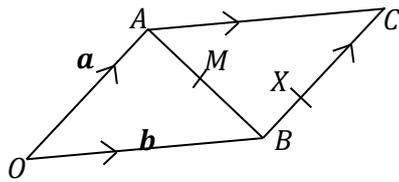
- a. \overrightarrow{OR} b. \overrightarrow{BS} c. \overrightarrow{OS} d. \overrightarrow{RS}

6. In the diagram, M is the midpoint of CD , $BP:PM = 2:1$, $\overrightarrow{AB} = x$, and $\overrightarrow{AC} = y$ and $\overrightarrow{AD} = z$. Express each of (a) to (f) in terms of x , y and z .



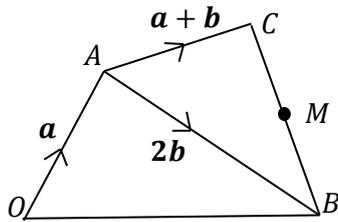
- a. \overrightarrow{DC} b. \overrightarrow{DM} c. \overrightarrow{AM} d. \overrightarrow{BM}
e. \overrightarrow{BP} f. \overrightarrow{AP}

7. $OACB$ is a parallelogram. M is the midpoint of AB . X is a point such that $BX:XC = 1:2$. Determine:



- a. \overrightarrow{AB} b. \overrightarrow{BC} c. \overrightarrow{MB} d. \overrightarrow{MX} e. \overrightarrow{XA} f. \overrightarrow{CM} g. \overrightarrow{XO}

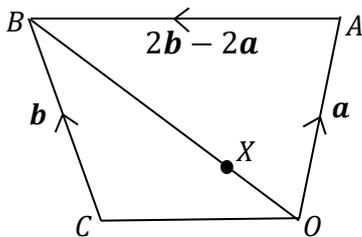
8. M is the midpoint of BC .



Determine the vectors:

- a. \vec{OB} b. \vec{BC} c. \vec{AM} d. \vec{OM}

9. In the following diagram, X is a point such that $OX:XB = 1:3$.



- a. \vec{OC} b. \vec{XC} c. \vec{AX}

Exam Practice:

<https://www.mathsgenie.co.uk/resources/5-vectors.pdf>

<https://corbettmaths.com/wp-content/uploads/2013/02/vectors-pdf.pdf>

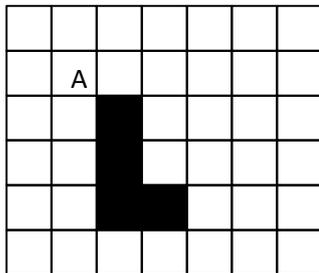
Challenge:

Video: <https://www.mathsgenie.co.uk/vectors.html>

Task: <https://www.mathsgenie.co.uk/resources/9-vectors.pdf>

Column Vectors

1.



a) Copy this shape into your book and label it A.

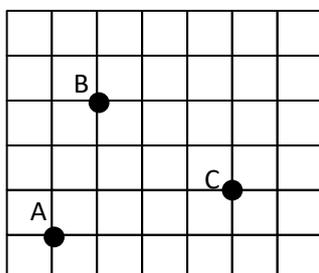
b) Translate shape A by the vector $\begin{pmatrix} 2 \\ 1 \end{pmatrix}$ and label it B.

c) Translate shape B by the vector $\begin{pmatrix} 1 \\ 3 \end{pmatrix}$ and label it C.

d) What vector would translate shape A to shape C?

e) What do you get if you add $\begin{pmatrix} 2 \\ 1 \end{pmatrix}$ and $\begin{pmatrix} 1 \\ 3 \end{pmatrix}$? What do you notice?

2.



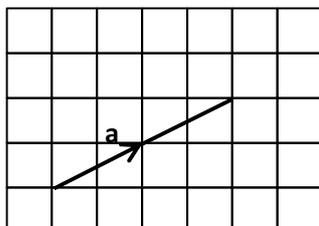
a) What is the vector \vec{AB} ?

b) What is the vector \vec{BA} ?

c) What is the vector \vec{BC} ?

d) What is the vector \vec{CA} ?

3. The diagram below shows the vector **a**.



a) Write **a** as a column vector.

b) Write **2a** as a column vector.

c) Write **-a** as a column vector.

4. The vector $\mathbf{p} = \begin{pmatrix} 3 \\ -2 \end{pmatrix}$

a) Draw **p** in your book.

b) Draw **2p**

c) Draw **-p**

5. The vector $\mathbf{w} = \begin{pmatrix} 2 \\ 3 \end{pmatrix}$ and $\mathbf{v} = \begin{pmatrix} 1 \\ 4 \end{pmatrix}$

- Draw \mathbf{w} and \mathbf{v} in your book.
- Find $\mathbf{w} + \mathbf{v}$. Write your answer as a column vector.
- Find $2\mathbf{w} + 2\mathbf{v}$. Write your answer as a column vector.

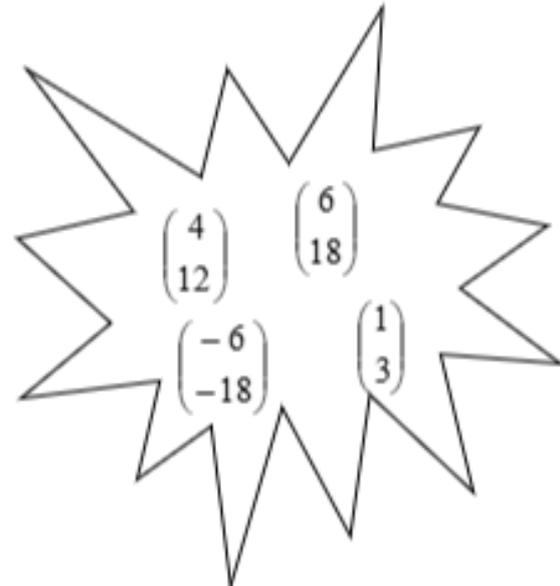
6. Three vectors are defined as: $\mathbf{a} = \begin{pmatrix} 3 \\ 1 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} 4 \\ -2 \end{pmatrix}$ $\mathbf{c} = \begin{pmatrix} 2 \\ 5 \end{pmatrix}$

- Draw lines to represent \mathbf{a} , \mathbf{b} and \mathbf{c} in your book.
- Find $\mathbf{a} + \mathbf{c}$. Write your answer as a column vector.
- Find $\mathbf{b} + \mathbf{c}$
- Find $2\mathbf{a} + \mathbf{b}$
- Find $3\mathbf{a} + 2\mathbf{c}$
- Find $\mathbf{a} - \mathbf{b}$
- Find $3\mathbf{b} - \mathbf{a}$

7. The vector $\mathbf{m} = \begin{pmatrix} 2 \\ 6 \end{pmatrix}$.

From the vectors in the star, find a vector which is:

- Twice as long as \mathbf{m} .
- Half as long as \mathbf{m} .
- Three times as long as \mathbf{m} and in the opposite direction.
- Parallel to \mathbf{m} .



8. Three vectors are defined as: $\mathbf{a} = \begin{pmatrix} -4 \\ 3 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} -5 \\ -2 \end{pmatrix}$ $\mathbf{c} = \begin{pmatrix} 3 \\ -2 \end{pmatrix}$

- Find $\mathbf{a} + \mathbf{c}$. Write your answer as a column vector.
- Find $2\mathbf{b} + \mathbf{c}$
- Find $2\mathbf{a} + 3\mathbf{b}$
- Find $3\mathbf{a} + 2\mathbf{c}$
- Find $2\mathbf{a} - \mathbf{b}$
- Find $5\mathbf{b} - 2\mathbf{c}$
- Find $4\mathbf{c} + 3\mathbf{a} - 2\mathbf{b}$

Questions	Question Title
1	Convert fractions to decimals
2	Integer solutions to inequalities
3	Compare decimal numbers, recurring decimals
4	Exterior angles in polygons
5	HCF, LCM
6	Similar polygons
7	Compound interest, best buys
8a	Straight line graphs (parallel lines)
8b	Straight line graphs (check if a point is on a line)
9	Reverse percentages
10	Prime numbers, linear sequences (nth term)
11a	Combining vectors
11b	Combining vectors, multiplying by scalars
12	Pressure
13	Quadrilaterals
14	Exponential graphs
15	Writing algebraic expressions
16	Solving equations and straight lines
17	Multiples, odd and even numbers, problem solving
18	Expressions with algebraic fractions
19	Straight line graphs (find x-intercept)
20	Pythagoras theorem with algebra
21a/b	Algebraic direct proportion
22	Circle theorems
23	Recurrence relations
24a/b	Estimating area under a curve
25a/b	3D trigonometry
26a/b	Histograms
27	Conditional probability
28	Circles, normals and tangents