Mathematics
Topic 6: Algebra

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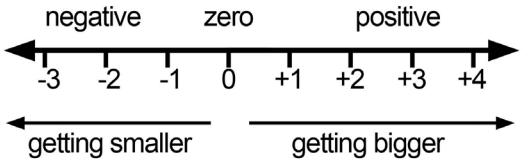
1. The number line below shows how integers (or whole numbers) can be positive or negative and how they relate to zero. Match the beginnings and endings of the sentences in the table below to make sentences about **integers**.



a)	Positive integers are	1	3 steps to the right of -1.
b)	The integer -3 is	2	the same as 5 + 3 = 8.
c)	The integer +2 is	3	always move left on the number line.
d)	Zero is	4	always move to the right.
e)	5 and -5 are	5	a double negative.
f)	The number to the right of another on a number line is	6	found to the right of zero.
g)	To add a positive integer	7	always the bigger of the two numbers.
h)	To add a negative integer is	8	neither positive nor negative.
i)	5 + (-3) is	9	opposites or inverses.
j)	To subtract,	10	the same as 5 - 3 = 2.
k)	To subtract a negative integer is	11	5 steps to the left of +2.
l)	5 - (-3) is	12	to subtract.

a)	b)	c)	d)	e)	f)	g)	h)	i)	j)	k)	l)

2. Choose the correct words from the list to fill the gaps in the text about **simultaneous equations**. The words are used more than once.

values	value	equation	equations	unknowns

Simultaneous [a] _____ are ones where there are two or more [b] _____ in one [c] _____ . For example, if there is an [d] _____ in the form of 3x + y = 5, there are two [e] _____ , x and y. Variables like x and y can have many possible [f] _____ . When two [g] _____ appear together

and these two [h] _____ are both true at the same time (that is, they are simultaneously true) then x has only one [i] _____ and y has only one [j] _____ as well.

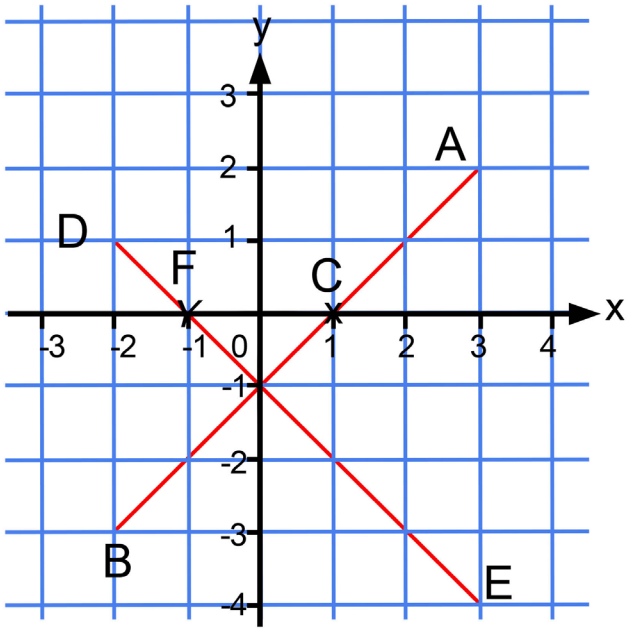
For example:

x + y = 11

x - y = 1

For the simultaneous [k] _____ above, x = 6, and y = 5. There are no other [l] _____ of x and y that satisfy the above [m] _____ .

3. Mark each sentence about the **axis system** true (T) or false (F) based on the diagram.



		True/False
a)	The coordinates for point C are (-1, 0).	
b)	The line A-B intersects the y-axis at point (1, 1).	
c)	The y-intercept of line A-B has coordinates (0, -1).	
d)	The x-intercept of line D-E is point F at (-1, 0).	
e)	Point B has coordinates (-2, -3).	

4. Underline the correct word to make sentences about **equations for a line**.

a) The [a] **horizontal / perpendicular / unknown** axis is called the *x*-axis.

b) The [b] **inverse / vertical / positive** axis is called the *y*-axis.

c) The point (0, 0) is called the [c] **graph / origin / slope** and every point has coordinates (*x*, *y*).

d) A straight line through two points, each with *x*-, *y*-coordinates on the Cartesian [d] **label / addition / plane**, can be represented by an equation of the form: $y = ax + b$. *a* represents the [e] **gradient / emphasis / product** of a line.

e) The [f] **opposite / slope / drop** is the quotient of the difference between *y*-coordinates and the difference between *x*-coordinates. *b* represents the *y*-[g] **intercept / label / shape**, which is the point where the line crosses the *y*-axis.

5. Match the compound phrases about **algebraic problems** with their correct definition. Write your answers in the grid below.

a)	algebraic expression	1	A statement or equation that is characterised by having a single variable raised to the first power.
b)	first degree equation	2	Different tasks or problems to be solved.
c)	numeric value	3	A group of signs and numbers that show a particular quantity or idea.
d)	relative integers	4	A mathematical expression containing multiple variables.
e)	simultaneous equation	5	A mathematical quantity that is known and is represented by a number.
f)	cross multiply	6	Whole numbers that can be positive, negative or zero.
g)	various exercises	7	Given an equation between two fractions or rational expressions, we do this to simplify the equation or determine the value of a variable.

Write your answers here:

a)	b)	c)	d)	e)	f)	g)

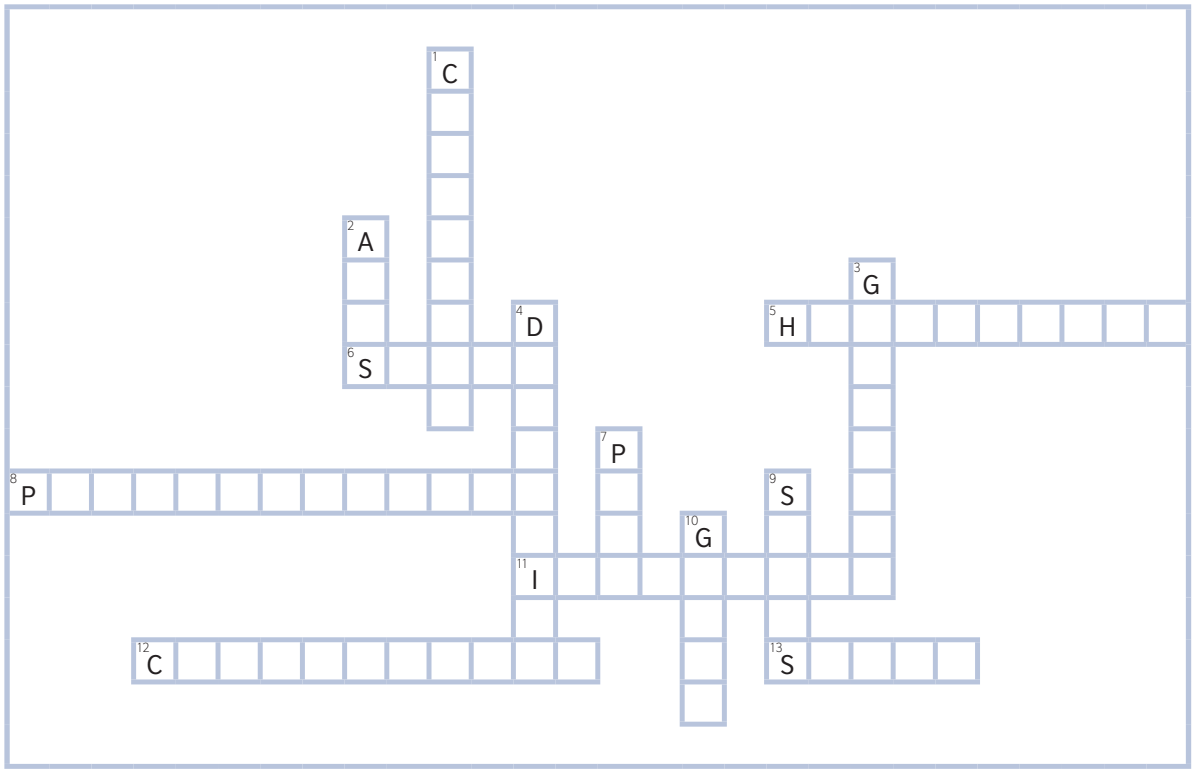
6. Complete the crossword by answering the following questions. All the correct answers are about **graphical representations**.

Across

5. A fixed line that goes from left to right and is used for showing measurements or for finding the position of points on a graph.
6. The outer form of an object.
8. A line forming a ninety degree angle with another surface or line.
11. The point where a line crosses one of the axes on a graph.
12. Sets of numbers that give the exact position of something on a graph.
13. The angle of incline of a surface.

Down

1. A flat surface in which a straight line between any two points will lie completely on that surface, named after a famous mathematician.
2. The two fixed lines used for showing measurements or finding the position of points on a graph.
3. The rate of change in height, also known as slope.
4. Calculate something or find the solution to a problem.
7. Mark points on a graph.
9. Short movements made in stages or the smaller tasks completed to solve a problem.
10. A picture that uses lines or curves to show the relationship between numbers or measurements.



7. Unscramble the letters to make words about mathematical processes to go with the definitions. Write your answers in the grid below.

a)	coectll	To put two or more numbers together or combine them to form a single number: bring together.
b)	sinert	To put something into something else, or into a hole or space.
c)	otabin	To get something, or to achieve a desired result by going through a specific process.
d)	wunonkn	Not famous, undefined or unfamiliar.
e)	pdrouct	A number that is the result of multiplying two other numbers.
f)	qtieuont	The number that is the result of dividing one number by another.
g)	isfysat	To supply a solution to a problem.
h)	sveol	To find the answer to a problem in mathematics.
i)	tutesubsti	To use something in place of something else (for example, using the letter x as a variable in algebra).
j)	mitenaeli	To get rid of something that is not wanted or needed.
k)	exionpress	A group of signs and numbers that show a particular quantity.
l)	suiontractb	The process of taking one number or amount from another.
m)	itionadd	Putting two or more numbers together to make a total.

Write answers below:

a)		b)		c)	
d)		e)		f)	
g)		h)		i)	
j)		k)		l)	
m)					

8. Find the words related to **algebra** in the word search.

Y J A G J L K K O E L O I M U D C M J E N X X E I T E S A A T M F U T L E G Z C S S H N E S O N N G L G U E F G O L P T B D O Z H M P E O O I L I N V O L V E I G X D E L C R H Z Q N T L P C F M L R R N N R C I G W E O E E Q I J E V O U P F E S S R C R T C N T T L V T L E T R D S A T E E D C M I J N M S E H R P T O T U G R T X Y Q J V Y E M R I O A H L O E I J E N E G O E U N I T C E E M G D I E E C G I G G D Y I D I G I H S T R E T C H T F M M S D N W Z N N L E M P H A S I S L X L T I A D N R E E D N G D D	compare connect drop emphasis integers inverse involve let locating lose note stretch unit

Glossary

<	one value is smaller than another, we can use a “less than” sign.
>	one value is bigger than another, we can use a “greater than” sign.
addition	/əˈdɪʃ(ə)n/ noun [C/U] putting two or more numbers together to make a total.
algebra expression	/ˈældʒɪbrə ɪkˈspreʃ(ə)n/ noun phrase a group of signs and numbers that show a particular quantity or idea.
altogether	/ˌɔːltəˈgeðə(r)/ adv showing that a total number or amount includes everyone or everything.
axis system	/ˈæksɪs ˈsɪstəm/ noun phrase the two fixed lines used for showing measurements or finding the position of points on a graph.
brackets	/ˈbrækɪts/ noun plural the symbols { }, used especially in mathematics and computer programs for showing that things written between them should be considered together.
carry out	/ˈkæri aʊt/ phrasal verb do a particular piece of work, research etc; solve.
Cartesian plane	/kɑː(r)ˌtiːʒ(ə)n pleɪn/ noun [C/U] a flat surface in which a straight line between any two points will lie completely on that surface, named after the mathematician Rene Descartes.
change the sign	/tʃeɪndʒ ðə saɪn/ verb phrase alter a written symbol that has a particular meaning, for exaxmple the symbol ‘–’ used for negative numbers, to the positive one ‘+’.
collect together	/kəˈlekt təˈgeðə(r)/ verb phrase if you put two or more numbers together, you combine them to form a single number: *bring together*.
compare	/kəmˈpeə(r)/ verb [I/T] consider how things are similar and how they are different.
composed of	/kəmˈpəʊzd əv/ adj formed of something, compiled.
connect	/kəˈnekt/ verb [I/T] join two things together.
coordinates	/kəʊˈɔː(r)dɪnəts/ noun plural sets of numbers that give the exact position of something on a map or graph.
cross multiply	/krɒs ˈmʌltɪplaɪ/ verb phrase given an equation between two fractions or rational expressions, one can cross-multiply to simplify the equation or determine the value of a variable.
determine	/dɪˈtɜː(r)mɪn/ verb [I/T] calculate something or find the solution to a problem.
double negative	/ˈdʌb(ə)l ˈnegətɪv/ noun phrase an equation in which two negative signs are used.
drop	/drɒp/ verb [I/T] move downwards: *the temperature dropped quickly*.
eliminate	/ɪˈlɪmɪneɪt/ verb [T] get rid of something that is not wanted or needed.
emphasis	/ˈemfəsɪs/ noun [C/U] special importance or attention that is given to one thing in particular.
equal distance	/ˈiːkwəl ˈdɪstəns/ noun phrase the same in length.

expression	/ɪkˈspreʃ(ə)n/ noun [C/U] a group of signs and numbers that show a particular quantity.
first degree equation	/fɜː(r)st dɪˈgriː ɪˈkweɪʒ(ə)n/ noun phrase a statement or equation which is characterised by having a single variable raised to the first power.
fraction of the 1st degree	/ˈfrækʃ(ə)n əv ðə fɜː(r)st dɪˈgriː/ noun phrase a fraction with numerators and denominators raised only to the power of 1.
function of the 1st degree	/ˈfʌŋkʃ(ə)n əv ðə fɜː(r)st dɪˈgriː/ noun phrase mathematical equations with exponents of 1 are said to be first degree functions.
get bigger	/get bɪgə(r)/ verb phrase to become more in amount or number: opposite /get smɔːlə(r)/ to become less in amount or number.
given	/ˈgɪv(ə)n/ adj referring to a particular thing or number that has been mentioned before.
going up in 1s	/ˈgəʊɪŋ ʌp/ verb phrase to increase in single units.
gradient	/ˈgreɪdiənt/ noun [C] the rate of change height, also known as slope.
graph	/grɑːf/ noun [C] a picture that uses lines or curves to show the relationship between numbers or measurements that change.
horizontal axis	/ˌhɒrɪˈzɒnt(ə)l ˈæksɪs/ noun phrase a fixed line that goes from left to right and is used for showing measurements or for finding the position of points on a graph, parallel to the horizon, opposite of vertical.
insert	/ɪnˈsɜː(r)t/ verb [T] put something into something else, or into a hole or space.
integers	/ˈɪntɪdʒə(r)z/ noun plural whole numbers that can be positive, negative, or zero.
inverse	/ˌɪnˈvɜː(r)s/ adj completely opposite.
involve	/ɪnˈvɒlv/ [I] verb to include something as a necessary part of an activity, event, or situation.
label	/ˈleɪb(ə)l/ verb [T] use a word or phrase to describe someone or something.
let	/let/ verb [I/T] allow something to happen.
like terms	/laɪk tɜː(r)mz/ similar numbers or symbols used in a calculation in mathematics: opposite unlike terms / ʌnˈlaɪk tɜː(r)mz/.
locating	/ləʊˈkeɪtɪŋ/ verb phrase finding out the exact place where someone or something is.
lose	/luːz/ verb [T] have less of something than before because some of it has gone; gain /geɪn/ verb [I/T] get more of something, usually as a result of a gradual process.
negative	/ˈnegətɪv/ adj expressing a number or a sign in mathematics less than zero.
neither ... nor ...	/ˈniːðə(r) nɔː(r)/ phrase used for showing that something is not true of two or more people, things, actions, qualities, or ideas.
note	/nəʊt/ verb [T] notice or realize something.
numeric value	/njuːˌmerɪk ˈvæljuː/ noun phrase a mathematical number that is known and is represented by a number.

obtain	/əbˈteɪn/ verb [T] get a desired result by going through a specific process.
opposite	/ˈɒpəzɪt/ adj completely different.
origin	/ˈɒrɪdʒɪn/ noun [C] in algebra the point of intersection of the *x*-axis and *y*-axis.
perpendicular line	/ˌpɜː(r)pənˈdɪkjʊlə(r) laɪn/ noun [C] a long thin mark forming a 90° angle with another surface or line.
plot	/plɒt/ verb [I/T] mark points on a graph.
positive	/ˈpɒzətɪv/ adj expressing a number or a sign in mathematics more than zero.
product	/ˈprɒdʌkt/ noun [C/U] a number that is the result of multiplying two other numbers.
quotient	/ˈkwəʊʃ(ə)nt/ noun [C] the number that is the result of dividing one number by another.
relative integers	/ˈrelətɪv ˈɪntɪdʒə(r)z/ noun plural whole numbers that can be positive, negative, or zero.
remove brackets	/rɪˈmuːv ˈbrækɪts/ verb phrase take the maths symbols () away to give a solution to an equation.
satisfy	/ˈsætɪsfaɪ/ verb [T] supply a solution to a problem: *satisfy the equation*.
shape	/ʃeɪp/ noun [C/U] the features or qualities of something, the outer form of something.
simultaneous equation	/ˌsɪm(ə)lˈteɪniəs ɪˈkweɪʒ(ə)n/ noun [C] in mathematics equations containing multiple variables.
simultaneously	/ˌsɪm(ə)lˈteɪniəsli/ adv happening or done at the same time.
slope	/sləʊp/ noun [C] the angle of incline of a surface.
solve	/sɒlv/ verb [T] find the answer to a problem in mathematics.
square root	/skweə(r) ruːt/ noun phrase a number that you multiply by itself to produce a particular number. For example, the square root of 9 is 3.
steps	/steps/ noun plural short movements made in stages, sequences, units in solving a problem: *two steps to to the left*.
stretch	/stretʃ/ verb [I/T] pull something to make it longer or wider.
substitute	/ˈsʌbstɪˌtjuːt ˈɪntuː/ verb [T] remove one thing and put something else in its place.
subtraction	/səbˈtrækʃ(ə)n/ noun [U] the process of subtracting one number or amount from another. The process of adding numbers or amounts together is addition.
the following...	/ðiː ˈfɒləʊɪŋ/ phrase the next one, the next example, the next in a series.
the same as	/ðiː seɪm æz/ phrase saying two or more things are similar and not different from each other.
unit	/ˈjuːnɪt/ noun [C] a quantity of measurement, a whole number less than 10.

unknown	/ʌnˈnəʊn/ adj not known, not famous, unfamiliar .
various exercises	/ˈveəriəs ˈeksə(r)saɪziz/ noun plural different tasks, problems to be solved.
x-axis	/eks ˈæksɪs/ noun singular a fixed line that goes from left to right and is used for showing measurements or for finding the position of points on a graph.
y-axis	/waɪ æksɪs/ noun singular a fixed line that goes from top to bottom and is used for showing measurements or for finding the position of points on a graph.
y-intercept	/waɪ ˌɪntə(r)ˈsept/ noun usually in singular the point where the line crosses the y axis.

Key:

1. a) 6, b) 11, c) 1, d) 8, e) 9, f) 7, g) 4, h) 12, i) 10, j) 3, k) 5, l) 2

2. a) equations, b) unknowns, c) equation, d) equation, e) unknowns, f) values, g) equations, h) equations, i) value, j) value, k) equations, l) values, m) equations

3. a) F – the coordinates for point C are (1, 0), b) F – line A-B intersects the y-axis at (0, -1), c) T, d) T, e) T

4. a) horizontal, b) vertical, c) origin, d) plane, e) gradient, f) slope, g) intercept

5. a) 3, b) 1, c) 5, d) 6, e) 4, f) 7, g) 2

6. **Across:** 5. horizontal, 6. shape, 8. perpendicular, 11. intercept, 12. coordinates, 13. slope; **Down:** 1. Cartesian, 2. axes, 3. gradient, 4. determine, 7. plot, 9. steps, 10. graph

7. a) collect, b) insert, c) obtain, d) unknown, e) product, f) quotient, g) satisfy, h) solve, i) substitute, j) eliminate, k) expression, l) subtraction, m) addition

8.