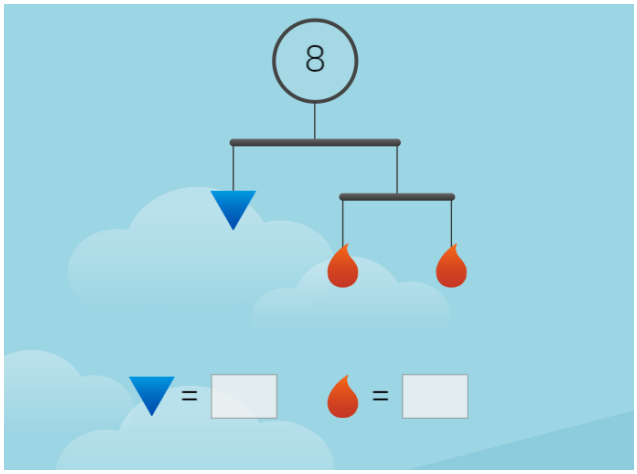
Grade 9 KC Math

Algebra November/December 2024

Name:



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Grade 9 KC: Algebra I NAME:

Lesson 1: INTRODUCTION

Algebra is a method for solving number problems.

Algebra was developed in the middle ages. The name comes from the title of a book, written in 813 ACE.

The Arabic title is: "*al-Kitāb al-mukhtaṣar fī ḥisāb al-jabr wa'l-muqābala*", *which translates to "The Compendious Book on Balancing and Completing." The author's name was* Muḥammad ibn Mūsā al-Khwārizmī.

It's possible to solve number problems in different ways. However Algebra – the use of letters to represent numbers we don't know and the use of balancing to calculate them - continues to be developed and is a powerful mathematical method.



The Persian mathematician **Muhammad Al-Khwarizmi** (780 محمد بن موسى الخوارزمي, – 850) lived during the golden age of the Muslim Abbasid regime in Baghdad. He worked at the "House of Wisdom", which contained the first large collection of academic books since the destruction of the Library of Alexandria.

Al-Khwarizmi has been called the "Father of algebra" – in fact, the word *algebra* comes from the Arabic title of his most important book: "The Compendious Book on Calculation by Completion and Balancing". In it, he showed how to solve linear and quadratic equations, and for many centuries, it was the main mathematics textbook at European universities.

Al-Khwarizmi also worked in astronomy and geography, and the word "algorithm" is named after him. https://mathigon.org/timeline/al-khwarizmi

Go to: https://solveme.edc.org/mobiles/

Solve some puzzles. Write down the numbers of the puzzles you solve correctly here:

I solved it!

These puzzles can help us understand the balancing method of solving equations.

The balancing method assumes that you can visualize numbers as heavy objects.

Choose one of the puzzles you have solved and draw it here. Use colour. Use the box below to explain how you solved it.

Puzzle #

Solution:

Solving Number problems with Number Knowledge

Using number knowledge is a way to solve number problems. It's an excellent technique when you are already familiar with the numbers involved. Use your number knowledge and/or a multiplication table to complete the blanks.

Here are the first few questions from four worksheets. Choose the worksheet you want to work on.

https://www.math-salamanders.com/balancing-math-equations.html

BALANCING EQUATION 3A



Fill in the missing numbers to balance the equations.

1)	12	+	___	=	16	
2)	10	−	___	=	2	
3)	___	+	4	=	11	
4)	___	x	2	=	10	

BALANCING EQUATION 3C



Fill in the missing numbers to balance the equations.

1)	12	+	___	=	3	x	5	
2)	10	−	___	=	2	+	4	
3)	___	+	4	=	11	−	5	
4)	___	x	2	=	10	+	6	

BALANCING EQUATION 4B



Fill in the missing numbers to balance the equations.

1)	12	÷	3	=	10	−	___	
2)	7	+	___	=	24	÷	2	
3)	8	x	5	=	17	+	___	
4)	20	÷	4	=	19	−	___	

Grade 9 KC Algebra I NAME:

Lesson 2: Using letters for numbers.

In this exercise, re-write the problem using a letter for the missing number. Figure out the value of the letter. Use a different letter of the alphabet for each question.

	Missing number	Rewrite using a letter	State the value of the letter as shown:
1	$16 =\quad + 14$	$16 = a + 14$	$a = 2$
2	$+ 20 = 25$		
3	$12 \times \quad = 36$	$12c = 36$	$c =$
4	$12 \div \quad = 6$	$\frac{12}{d} = 6$	$d =$
5	$4 \times \quad = 20$		
6	$5 \times \quad = 55$		
7	$15 \div \quad = 5$		
8	$\div 3 = 11$		
9	$13 + \quad = 20$		
10	$57 + \quad = 100$		
11	$9 + \quad = 100$		
12	$15 - \quad = 1$		
13	$- 12 = 5$		
14	$\sqrt{} = 7$		

Using algebra is a powerful way to solve numerical problems. Other ways can be useful too. Here are some.

Number Recall

This is when you remember a number fact that solves the problem.
E.g.

Guess and Check

This is when you guess a number and see if it works. If it doesn't, guess again.
E.g.

Working backwards

If one side of the equation is a number, we can usually work backwards.

A flow chart can help keep track.

E.g.

Balancing like a mobile

This method can solve many, many different kinds of equations. Equations can be exceedingly complex but step by step, by balancing and completing, they can be solved.
E.g.

$$2a + 22 = 5a + 1$$

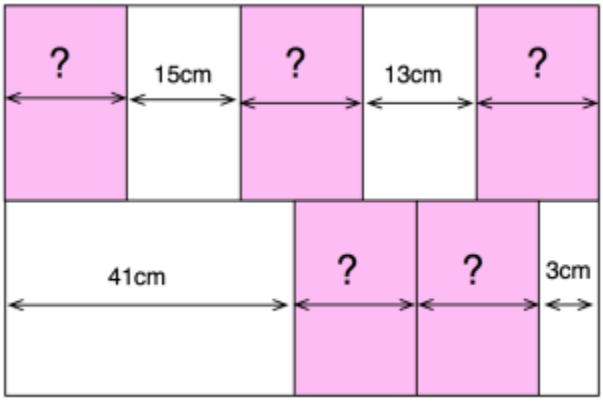
A mobile diagram can help:

One Step Equations In this exercise, use any technique to calculate the value the letter stands for.

Write the solution under each equation. Line up the = sign in your answer with the = in the equation.

$x + 9 = 19$	$x + 4 = 16$	$x + 4 = 0$	$x + 5 = 12$
$x - 5 = 6$	$x - 6 = 1$	$x - 8 = 3$	$x - 2 = 9$
$3x = 18$	$4x = -20$	$3x = 12$	$10x = 50$
$\frac{x}{6} = 5$	$\frac{x}{2} = 5$	$\frac{x}{7} = 9$	$\frac{x}{8} = 3$
$x + 7 = 17$	$3x = 30$	$x - 5 = 5$	$\frac{x}{5} = 4$
$x - 4 = -10$	$\frac{x}{10} = 4$	$x + 6 = 11$	$8x = -24$
$-5x = 20$	$x + 4 = -1$	$\frac{x}{2} = 7$	$x - 8 = -3$
$\frac{x}{3} = 5$	$-9x = -45$	$x - 7 = -12$	$x + 8 = 13$

Here is a puzzle about the width of a rectangle.



Before reading all the questions below, what do you notice about the diagram?

All the question mark sections are the same width. Let's call that width a

The top of the rectangle measures

$$a + 15 + a + 13 + a.$$

This simplifies to

$$3a + 28$$

The lower half of the rectangle measures

$$41 + a + a + 3$$

This simplifies to:

Because the upper and lower half of the rectangle have the same width, we can make an equation.

$$\text{upper width} = \text{lower width}$$

$$3a + 28 =$$

Complete the equation and solve it.

How wide is the rectangle?

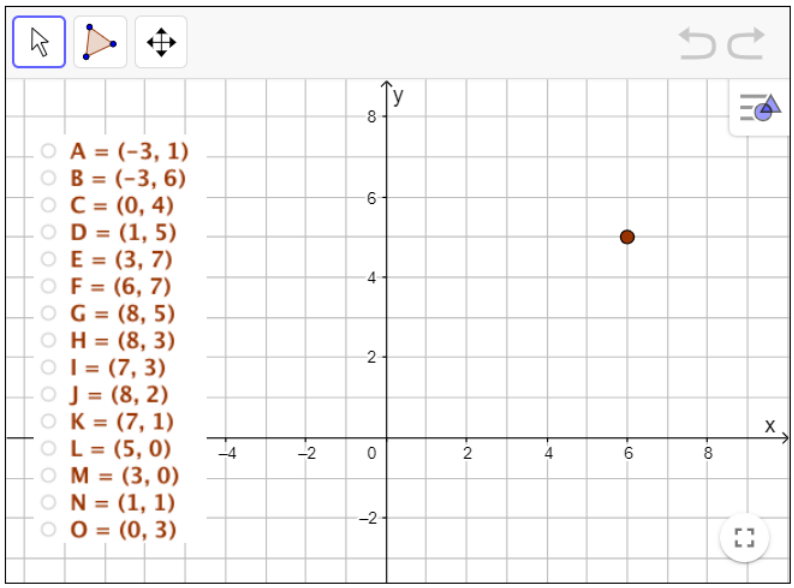
Lesson 3: Points on the Cartesian Plane

Algebra (solving number problems) developed into the study of Functions (using equations to describe real life behaviour of things that change). We draw functions on the Cartesian Plane.

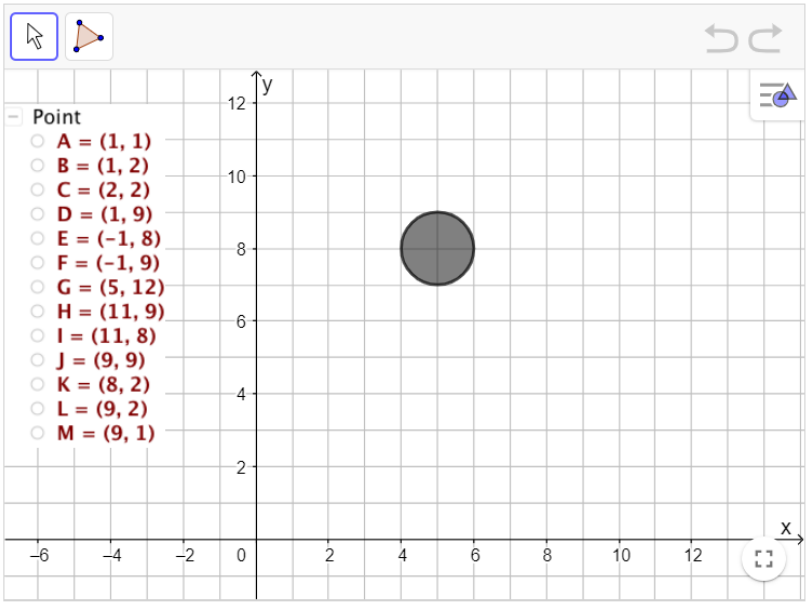
In this lesson, we practice drawing points and pictures on the Cartesian plane.

Plot points in order. Join the points with a line as you go. Finish by joining the last point to the first point.

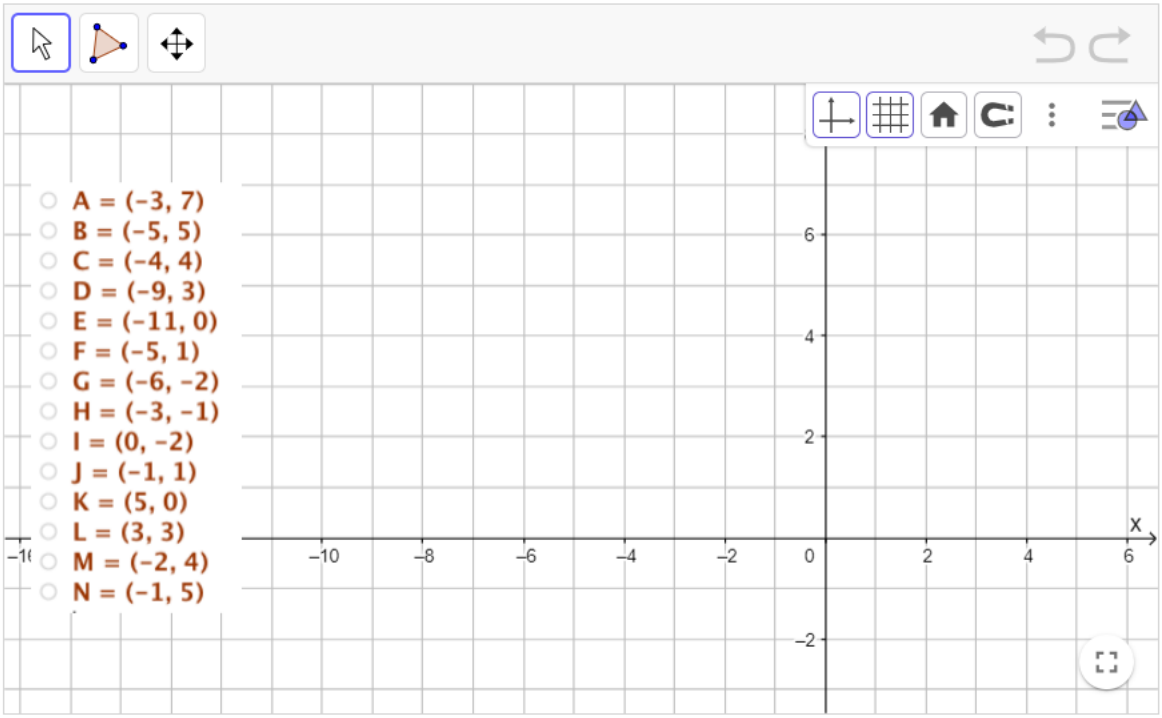
Fish



Birdhouse

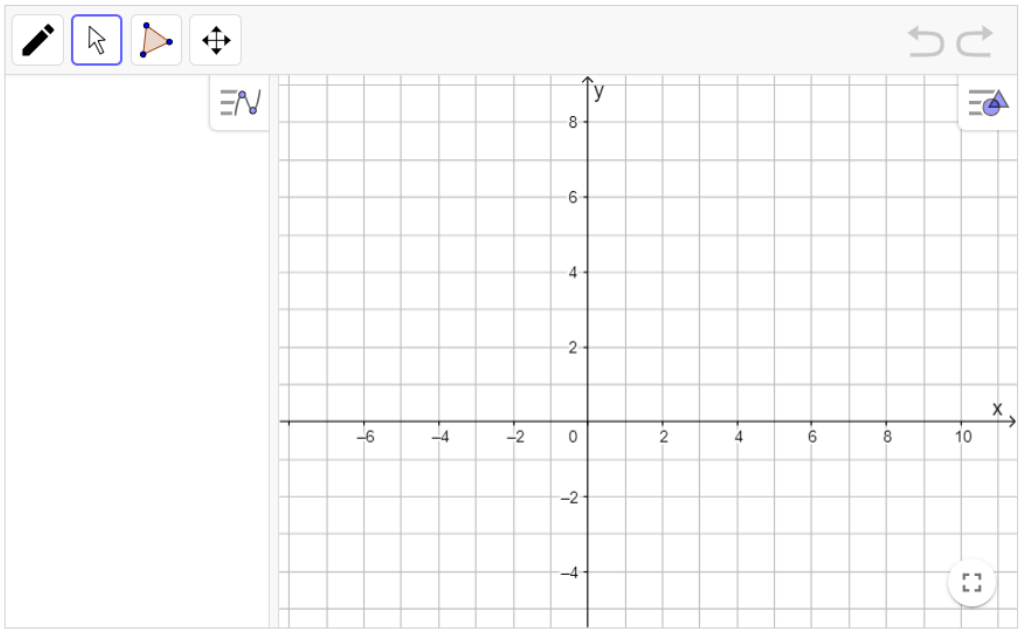


Wings



Use between 10 and 20 points to create your own picture below. List the points on the left. You may use more than one polygon.

Create



Now look up the GeoGebra lesson on the google classroom to create the same pictures digitally.

Lesson 4: Mathematizing equations (ii)

FLOW CHARTS: REVERSE ORDER, INVERSE OPERATORS

$4a - 3 = 17$	$9b + 1 = 100$

$3c - 2 = 22$	$5d + 3 = -12$

Draw a flow chart to solve these equations:

$6e + 3 = 33$	$7f - 4 = 66$

$2g + 7 = 19$	$7h - 4 = 10$

Use any method to solve these equations:

$11a = 55$	$2b = 21$	$\frac{c}{3} = 2.5$
$5d + 15 = 35$	$6e - 2 = 58$	$8f - 4 = 28$

Make up an equation that has the answer $a = 5$

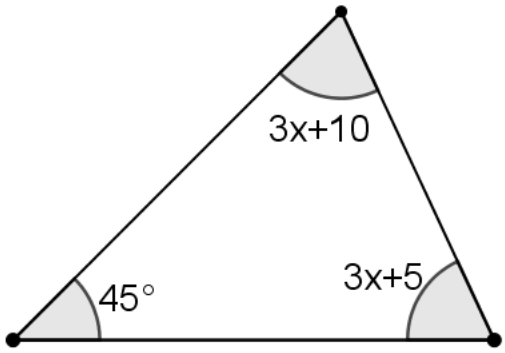
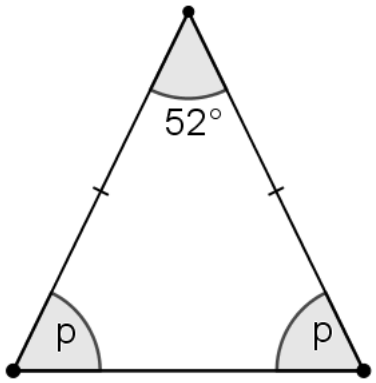
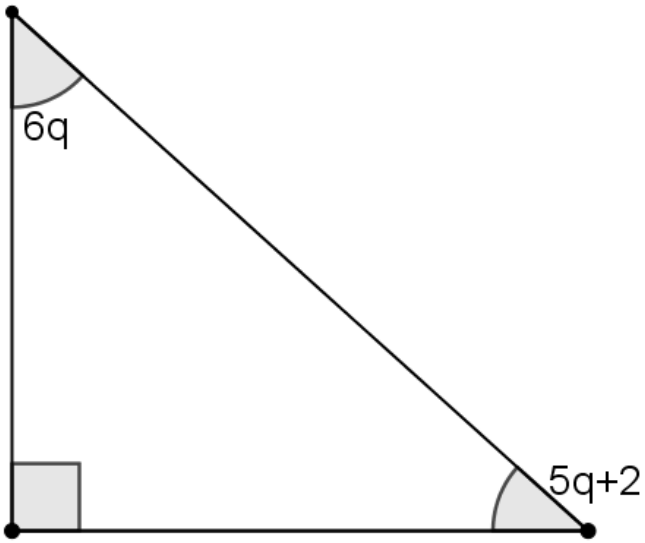
Write your solution to your equation:

Make up an equation that has the answer $b = 3$

Write your solution to your equation:

The three angles in any triangle add up to 180 degrees.

Write an equation for the angles in each of these triangles. Solve your equation to find out the value of the letter in each diagram. Then calculate the size of each angle. Check your answer using a protractor.

	$3x + 10 + 3x + 5 + 45 = 180$ $6x + 60 = 180$ $6x =$ $x =$
	
	

Lesson 5: Solving Equations with Balancing. Letters on both sides.



The idea of algebra (completing and balancing) comes from making scales balance. Left and right sides of an equation need to have the same 'weight'. This is the same idea as an algebra mobile – a mobile balances when both sides weigh the same.

What number goes into this equation to make left and right sides 'balance'?

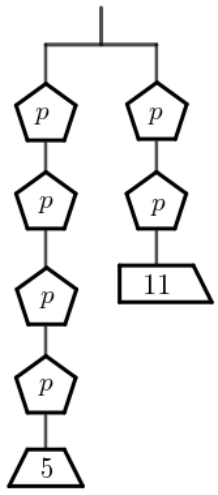
$$+ 3 = 8 \times 2$$

How about this one:

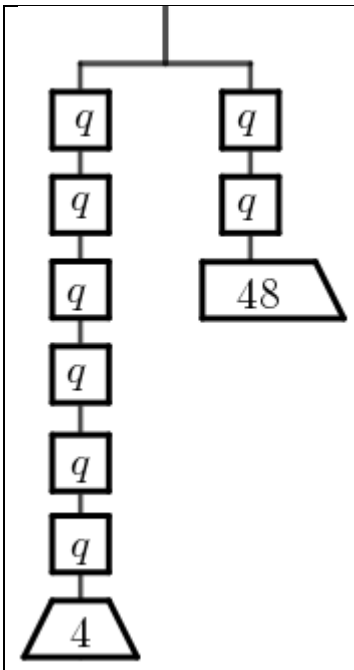
$$4(3 \times 8 + 1) = 11 - 5 \times 2 + 3 + 9 \times 10 +$$

The method of solving equations with balancing is this:

- Simplify both sides if possible.
- Remove (subtract) anything that is common to both sides.
- Add on to both sides anything that is missing.
- Finish up by either multiplying or dividing if needed.

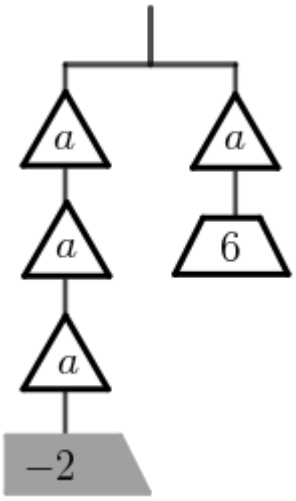


Example 2:



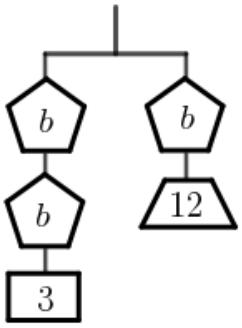
Example 3:

The balancing idea works for negative numbers. In this example, we add to 2 to both sides.

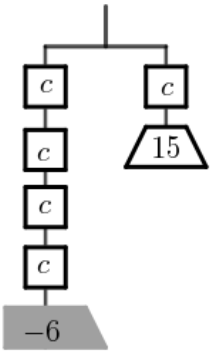


Solve to find the value of the letter in each mobile puzzle. Write the algebra. Line up the $'='$ signs.

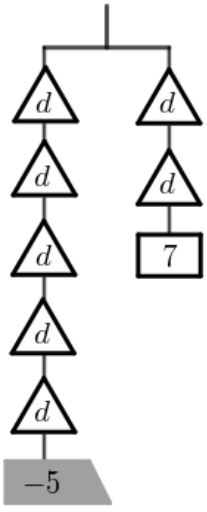
1.



2.



3.



Use any method to solve:

5. $e + 11 = 3e + 1$	6. $f + 7 = 2f + 2$
7. $3g + 1 = 2g + 7$	8. $3h + 2 = 6h - 3$
9. $3i + 4 = 4i - 9$	10. $10j + 6 = 8j + 14$

Grade 9 KC Algebra I NAME:

Lesson 6: Review lessons 1-5

A. Using letters as numbers.

Let $a = 5$, $b = 7$, $c = 10$ and $d = -3$. Calculate the value of each expression.

Expression	Value
$2 + a$	
$10 - b$	
$2c + 1$	
$100 - b$	
$a + b + c + d$	

Expression	Value
$4a + 2b$	
$3d$	
$6(a + 1)$	
$3b^2$	
$\frac{3c}{a} + 2d$	

B. Balancing Equations.

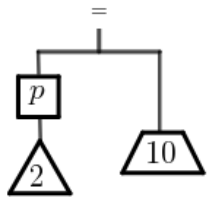
Write a number in the [ ] so that the left-hand side balances with the right-hand side.

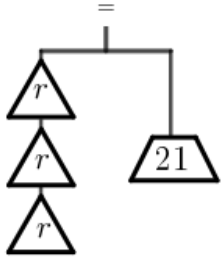
$5 + 8 = 10 + [\ \ ]$	$3 \times 12 = 9 \times [\ \ ]$	$\frac{21}{3} = 11 - [\ \ ]$
$12 - [\ \ ] = 1 + 8$	$3 \times 10 = 50 - [\ \ ]$	$\frac{1}{2} \times 30 = \frac{1}{4} \times [\ \ ]$

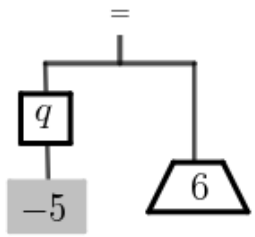
Let $a = 5$, $b = 7$, $c = 10$ and $d = -3$

$a + 3 = [\ \ ]$	$2b + 1 = [\ \ ]$	$19 = [\ \ ]c - 1$
$5a - 4 = 4a + [\ \ ]$	$3b - 1 = 2b + [\ \ ]$	$5d + 20 = d + [\ \ ]$

C. Equations with Mobiles.

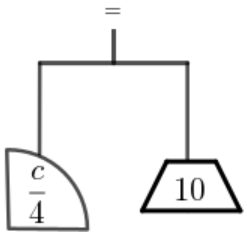
 Take 2 from both sides.	$p + 2 = 10$

 Divide both sides by 3	$3r = 21$



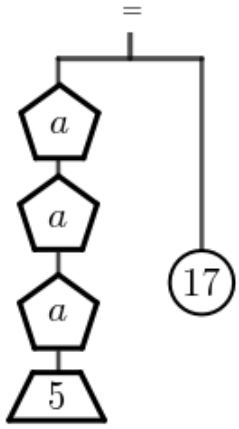
Add 5 to both sides.

$q - 5 = 6$

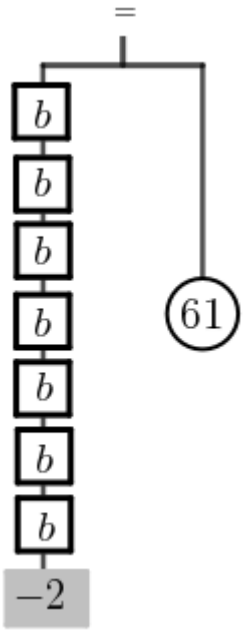


Multiply both sides by 4

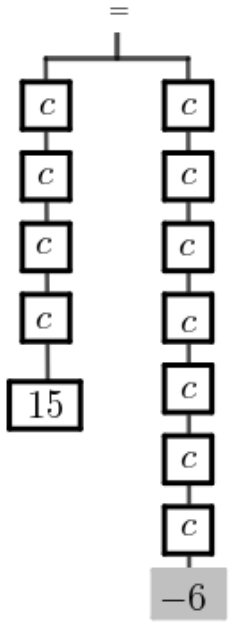
$\frac{c}{4} = 10$



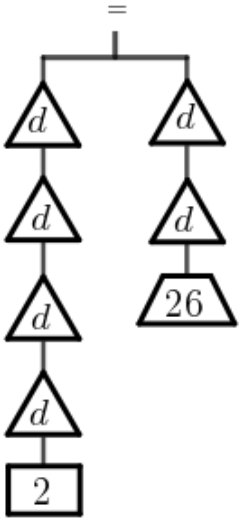
$3a + 5 = 17$



$7b - 2 = 61$



$4c + 15 = 7c - 6$

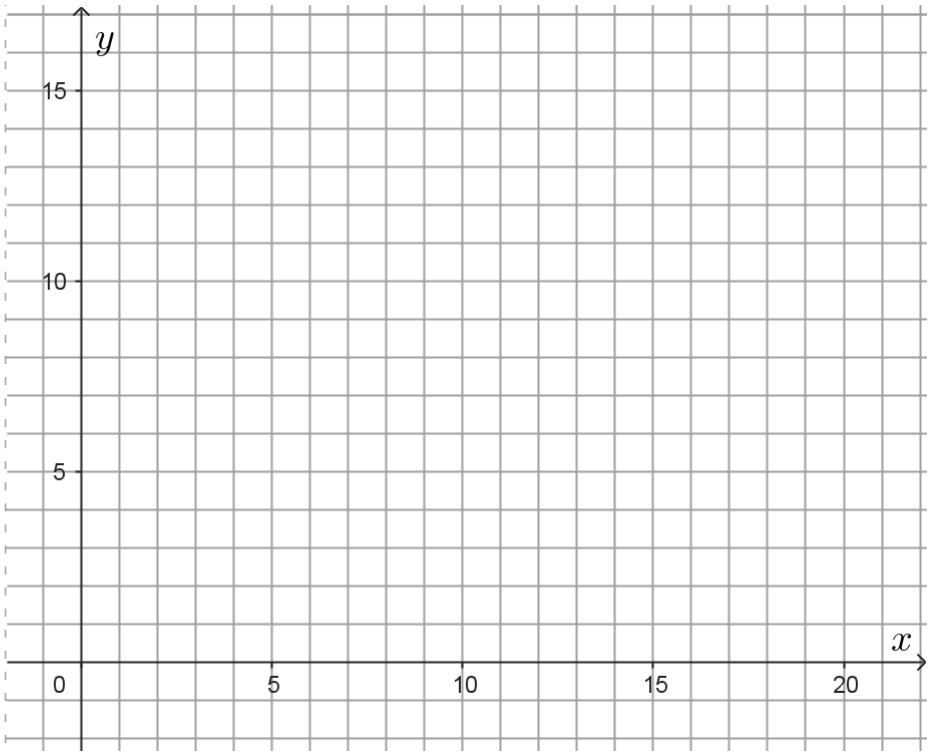


$4d + 2 = 2d + 26$

D. Plot the points in order. Join each new point to the previous point.

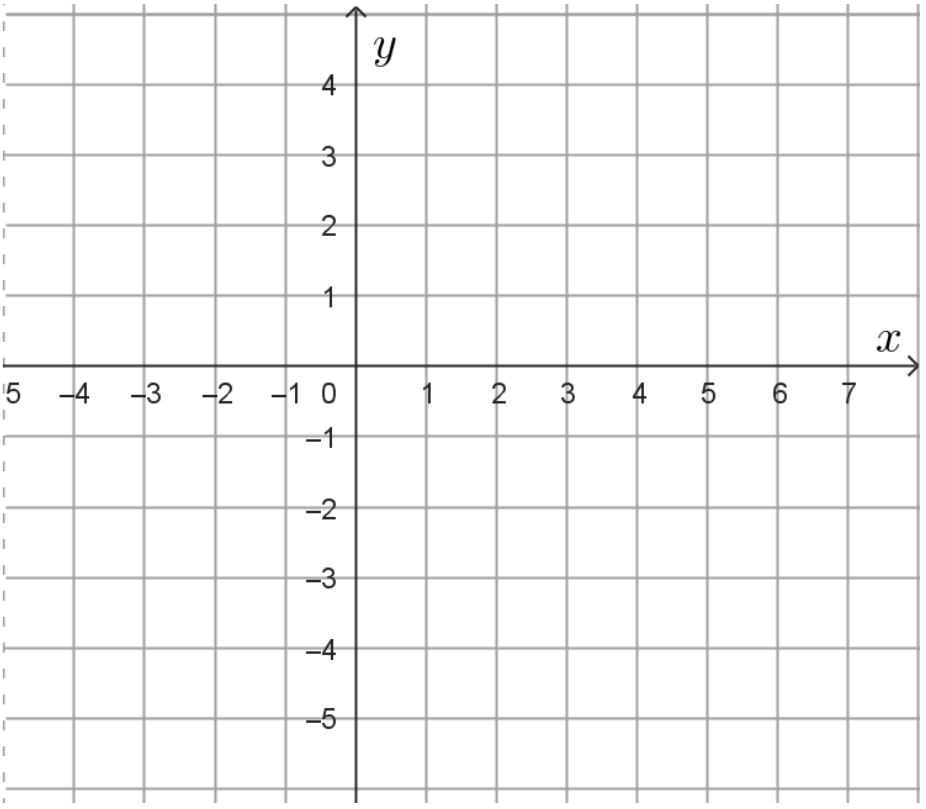
(a) Asymmetric heart

$(7, 1)$
$(3, 5)$
$(2, 7)$
$(2, 10)$
$(3, 12)$
$(5, 13)$
$(7, 13)$
$(9, 11)$
$(12, 13)$
$(14, 13)$
$(16, 12)$
$(17, 10)$
$(17, 8)$
$(16, 6)$
$(14, 4)$
$(7, 1)$



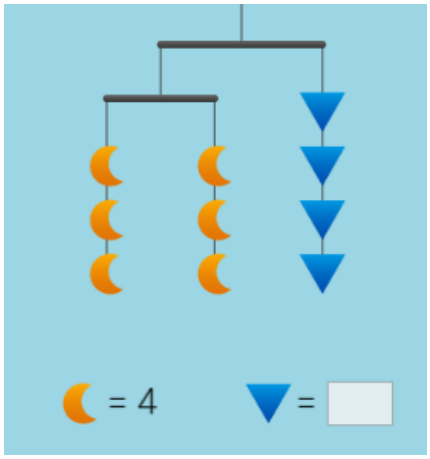
(b) Letter 'W'

$(-2, -4)$
$(0, -4)$
$(1, 0)$
$(2, -4)$
$(4, -4)$
$(6, 4)$
$(4, 4)$
$(3, 0)$
$(2, 4)$
$(0, 4)$
$(-1, 0)$
$(-2, 4)$
$(-4, 4)$
$(-2, -4)$



E. Solve these one step equations using onestep flow charts.

$x + 9 = 19$	$2x = 16$	$x - 4 = 10$	$\frac{x}{5} = 9$
$x - 5 = 13$	$\frac{x}{3} = 7$	$x + 8 = 20$	$6x = -18$
$-5x = -15$	$x + 3 = -5$	$\frac{x}{2} = 100$	$x - 9 = -1$
$\frac{x}{7} = 3$	$-10x = 80$	$x - 1 = 0$	$x + 8 = 0$



Grade 9 KC Algebra I NAME:

Lesson 7: Identifying the steps

In elementary school, an "=" sign usually meant "what's the answer?"

Eg:

$$5 \times 4 =$$

$$9 + 3 =$$

More broadly speaking, an "=" sign in math represents **balance**.

The total value of the left-hand side must be equal to the total value on the right-hand side of the = sign.

What number goes in the box to make balance in this equation?

$$1 + 2 + 3 + 4 = 15 + 3 - \square$$

To **solve** an equation means to figure out the numerical value of the letter in the equation.

To **maintain balance** in an equation, we must perform the same math action to both sides.

The principles of maintaining balance are the same if the equation is super easy:

$$x + 5 = 6$$

… or super complicated:

$$\frac{x+5}{2} - \frac{9-x}{5} = \frac{3x+2}{20} + \frac{14}{5}$$

We learn the principles using super easy equations. Then we apply the principles to more complicated equations.

The six basic math operations:

OPERATION	INVERSE OPERATION
Add	
Subtract	
Multiply	
Divide	
Square	
Square Root	

The letter x or x?

Practice writing the algebraic x here:

Some actions are written, some answers are written. Complete all actions and answers.

$x + 5 = 6$ Action: $-5 \quad -5$ $x = 1$	$3x = 21$ Action: $\div 3 \quad \div 3$ $x =$	$x - 8 = 10$ Action: $+8 \quad +8$ $x =$
$\frac{x}{3} = 4$ Action: $\times 3 \quad \times 3$ $x =$	$\sqrt{x} = 4$ Action: $square \quad square$ $x =$	$x^2 = 49$ Action: $\sqrt{\ } \quad \sqrt{\ }$ $x =$
$x + 2 = 6$ Action: $x = 4$	$x - 1 = 6$ Action: $x = 7$	$4x = 20$ Action: $x = 5$
$\frac{x}{7} = 4$ Action $x = 28$	$x^2 = 36$ Action $x = 6$ (x could also = -6)	$\sqrt{x} = 10$ Action $x = 100$

TWO STEPS:

$2x + 5 = 19$ Action: $-5 \quad -5$ $2x = 14$ Action: $\div 2 \quad \div 2$ $x = 7$	$3x - 2 = 28$ Action: $3x = 30$ Action: $x = 10$	$4x + 5 = 49$ Action: $4x = 44$ Action: $x = 11$
$3x + 12 = 36$ Action: $3x =$ Action $x =$	$\frac{x}{5} + 3 = 11$ Action: $\frac{x}{5} =$ Action: $x =$	$\sqrt{x} + 5 = 11$ Action: $\sqrt{x} =$ Action: $x =$

Equation Practice Sheet 1

Circe six questions to answer. Practice your answers on this page. Demonstrate the completing and balancing method on the next page.

Corbett maths

Solving Equations
Video 110 on Corbettmaths

$x - 4 = 5$

$\frac{w}{2} = 6$

$2x = 34$

$\frac{x}{10} = 5$

$\frac{x}{3} = 1.5$

$v + 2 = -6$

$7y + 2 = 30$

$8m - 4 = 20$

$9w - 5 = 67$

$7w + 1 = 1$

$\frac{x}{3} + 1 = 5$

$\frac{n}{9} - 8 = 1$

Choose six questions from Algebra practice sheet #1. In each box, write the equation, the action lines and solution. Take care to line up your '=' sign.

Write a 'checking line' (substitute your answer into the original equation) in the box provided with each question.

1.	2.
Check:	Check:

3.	4.
Check:	Check:

5.	6.
Check:	Check:

Lesson 8: Using the Pearson 'Math Makes Sense' Textbook

Find the chapter about solving equations. Chapter …… page …… to page ……

Choose twelve equation questions to solve. Write the page number, the exercise number and the question number in the box before you begin. Copy the equation carefully and write each line of solution.

Write a 'checking line' (substitute your answer into the original equation) in the box provided with each question.

Check:	Check:

Check:	Check:

Check:	Check:

Remember to write the page, exercise number and question number for each problem you solve.

Check:	Check:

Check:	Check:

Check:	Check:

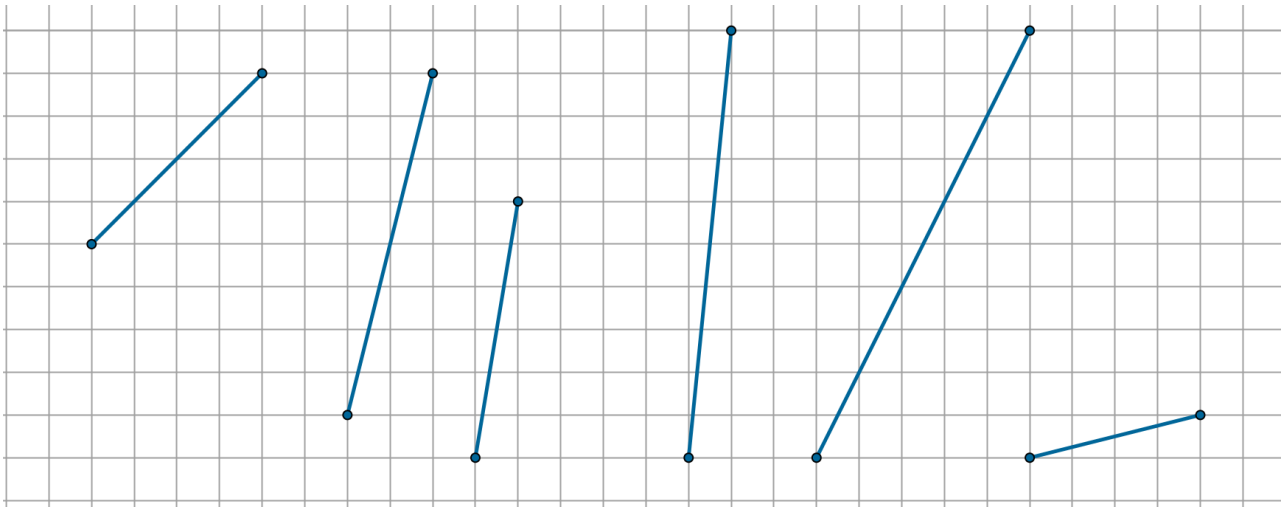
Now look up the answers to the questions that you solved. Mark your work clearly, find any mistakes or put a cross with a question mark if you can't find your own mistake. Make sure to ask the teacher about that question.

Grade 9KC Algebra II NAME:

Lesson 9: Slope of Line Segments & 'Run-Rise' Triangles

1. A line on a grid or a graph has a 'slope'. The slope is a measure of steepness.

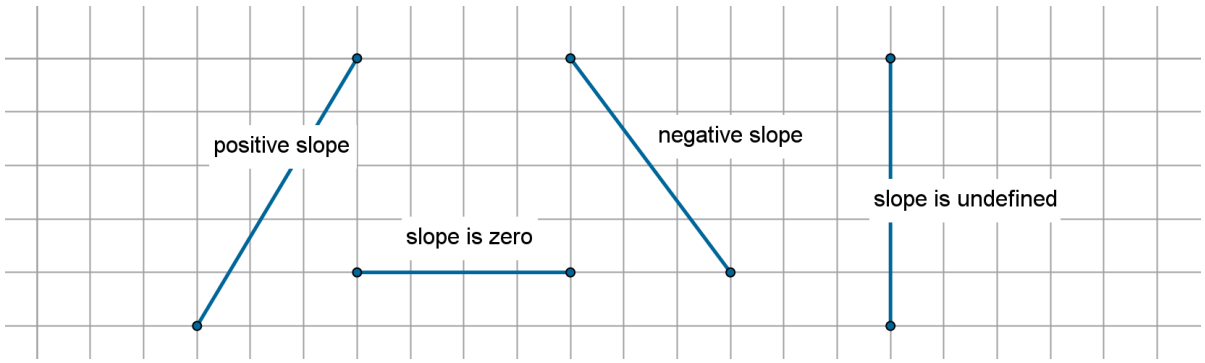
   Write the slope of each line segment below:



2. On this grid, draw 8 different line segments that have slope = 1. The line segments should have different lengths.



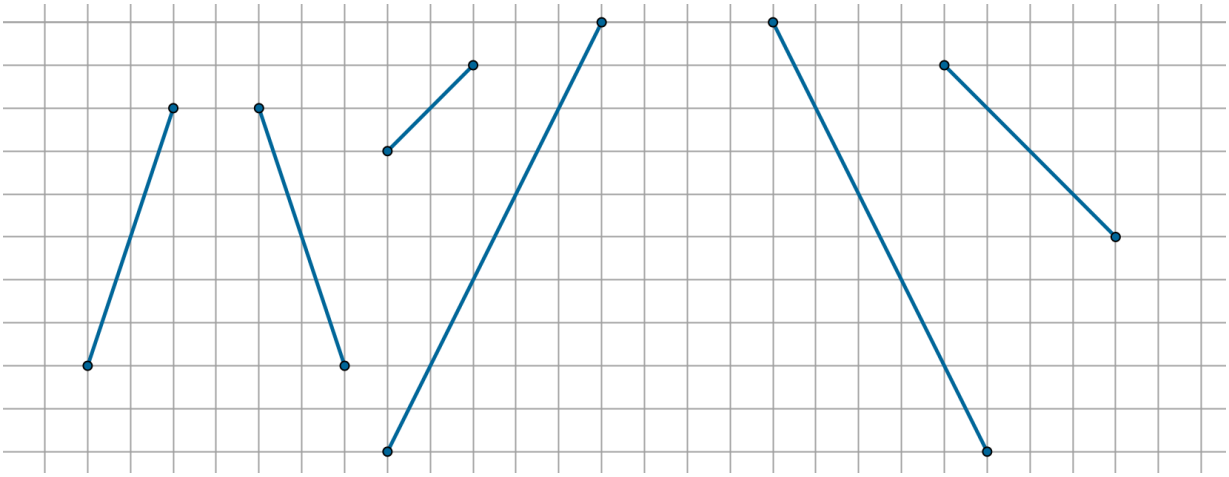
Slope can be positive, negative, zero or 'undefined'.



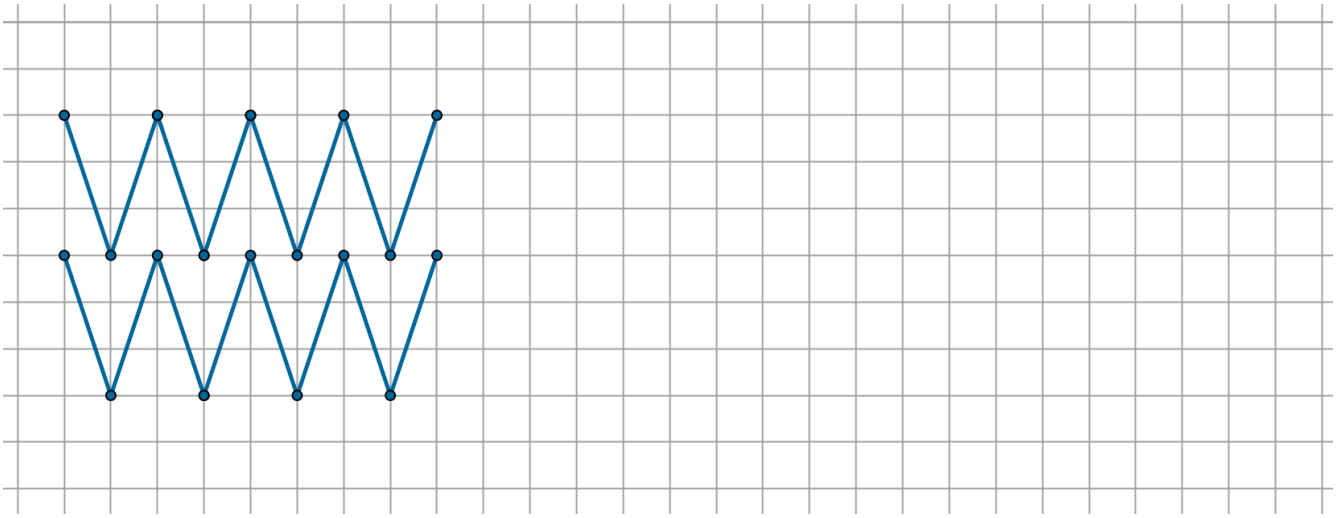
3. On this grid, draw four different line segments that have slope = 2, and four line segments with slope = -2 and one line segment with slope = 0.



4. The line segments on this grid have slopes 1 or -1, 2 or -2, 3 or -3. Write the slope of each line segment on each line.

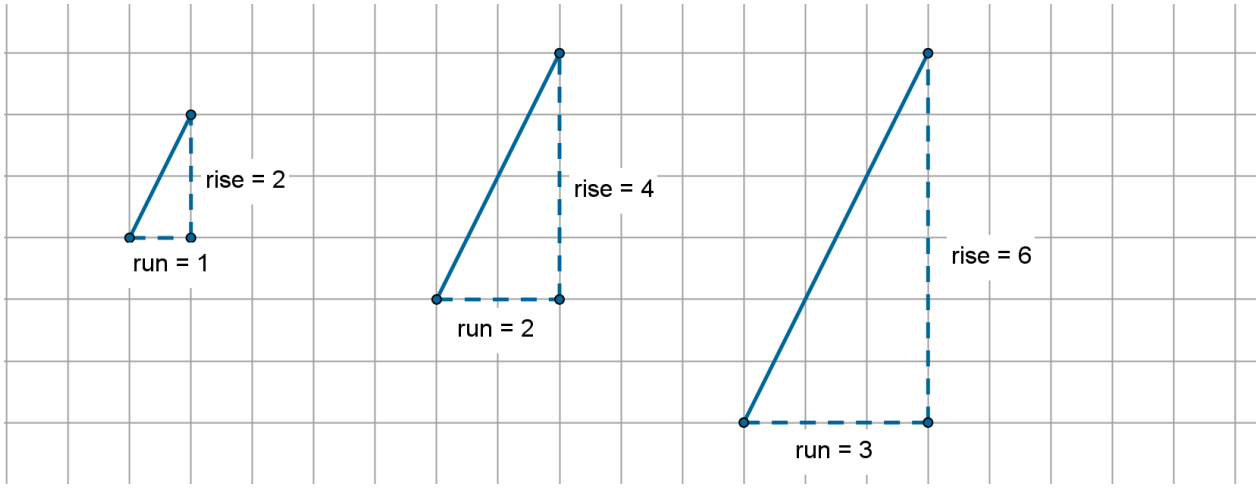


5. Here is a pattern drawn using line segments with slopes ± 3. Draw your own pattern using line segments with slopes = ± 2

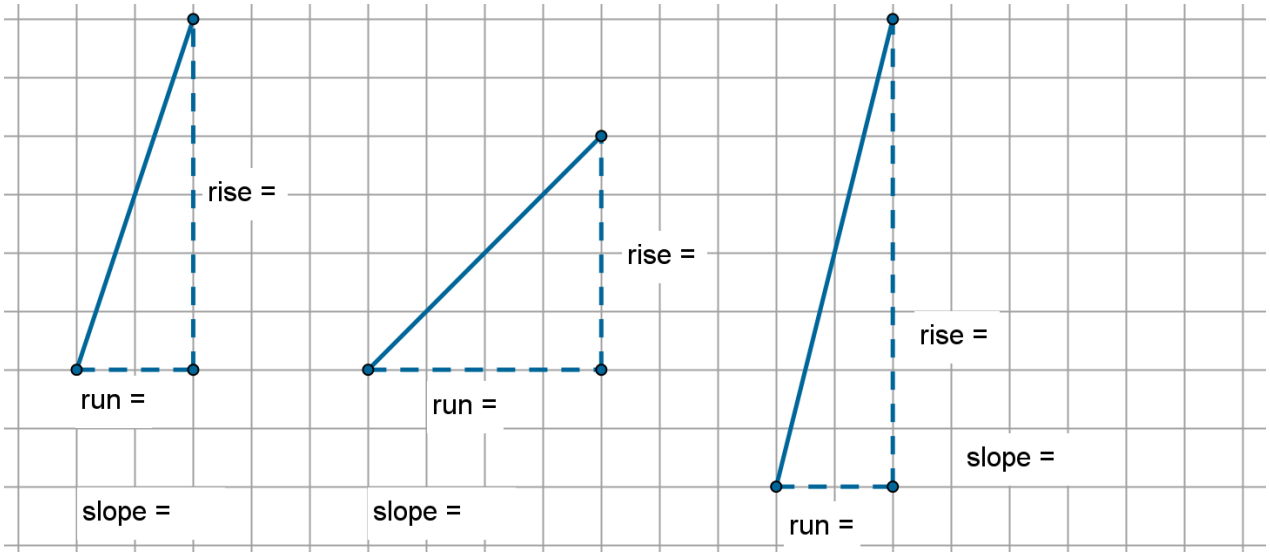


6. Slope is a kind of ratio. There are two numbers required to draw, count or calculate slope. These numbers are commonly referred to as ‘run’ and ‘rise’.

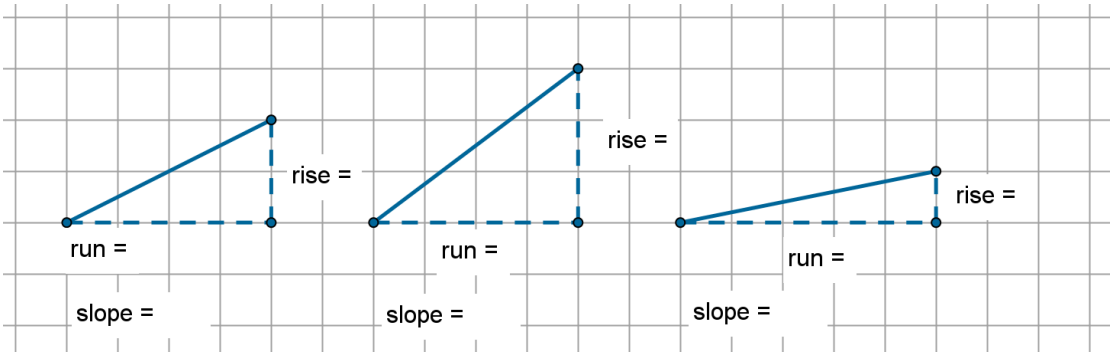
Here are line segments that all have slope = 2. Notice how the ‘run’ and ‘rise’ help to calculate slope = 2.



7. Complete the labels on these ‘run rise’ triangles on each of these line segments. Use the ‘run rise’ triangles to calculate slope.



8 ‘Run rise’ triangles help when the slope is a fraction. Calculate the slope of these line segments.



Collect Algebra II Practice Sheet 2. Choose six equations to solve. Practice solving on a whiteboard. Write your solution for each equation in the boxes below. Write the equation and each line of algebra. Take care to line up your '=' sign.

Write a 'checking line' (substitute your answer into the original equation) in the box provided with each question.

1.	2.
Check:	Check:

3.	4.
Check:	Check:

5.	6.
Check:	Check:

Grade 9KC Algebra II NAME:

Lesson 11: Number patterns and slopes

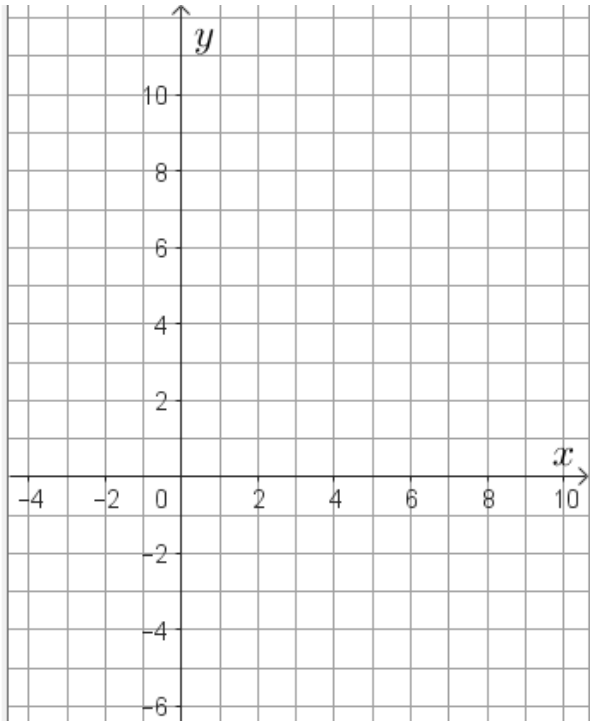
1. The table below shows a list of x, y coordinates. The first point has coordinates $(1,1)$ etc.

   Plot the points. Join the points using a ruler. Write the slope.

x	y
1	1
2	2
3	3
4	4
5	5
6	6
7	7

$\text{Slope} =$

$y = x$

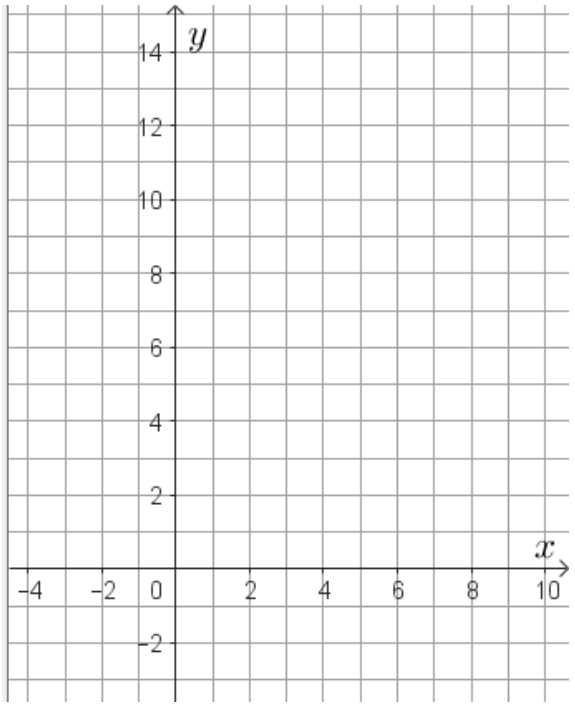


2. Complete the table, plot the points. Join the points using a ruler. Write the slope of the line.

x	y
1	3
2	5
3	
4	9
5	11
6	
7	

$\text{Slope} =$

$y = 2x + 1$



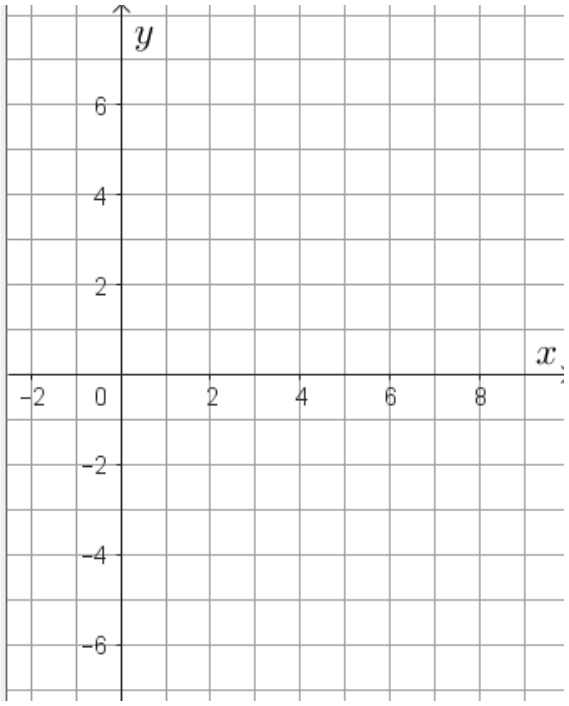
3. Each set of points follows a number pattern. Complete the number pattern. Plot the points. Join the points with a ruler. Write the slope. Write the equation.

(a)

x	y
1	-5
2	-4
3	-3
4	
5	
6	
7	1

$\text{Slope} =$

$y =$

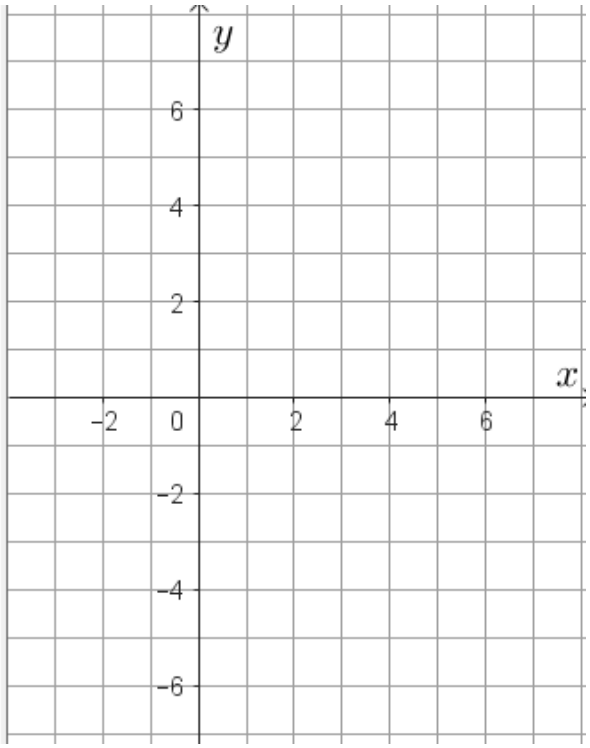


(b)

x	y
-2	-4
-1	-2
0	0
1	
2	
3	
4	8

$\text{Slope} =$

$y =$

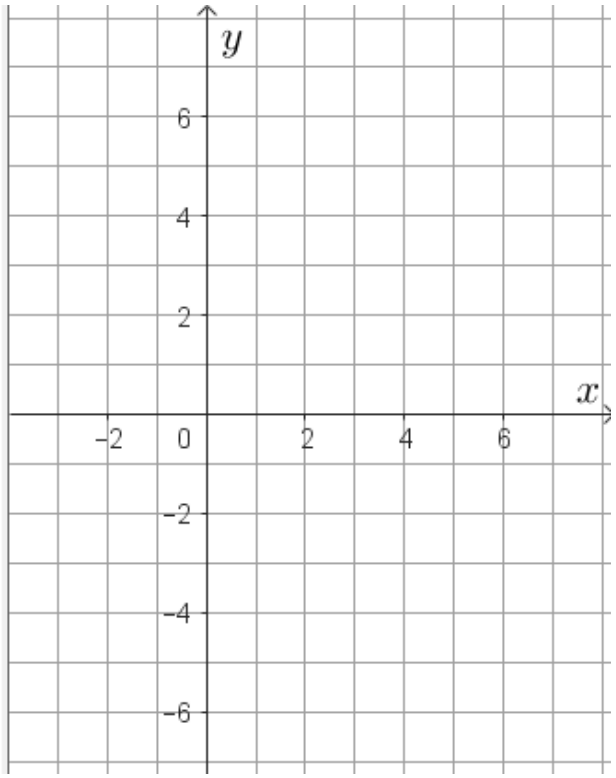


(c)

x	y
-2	-7
-1	-5
0	-3
1	
2	
3	
4	5

Slope $=$

$y =$

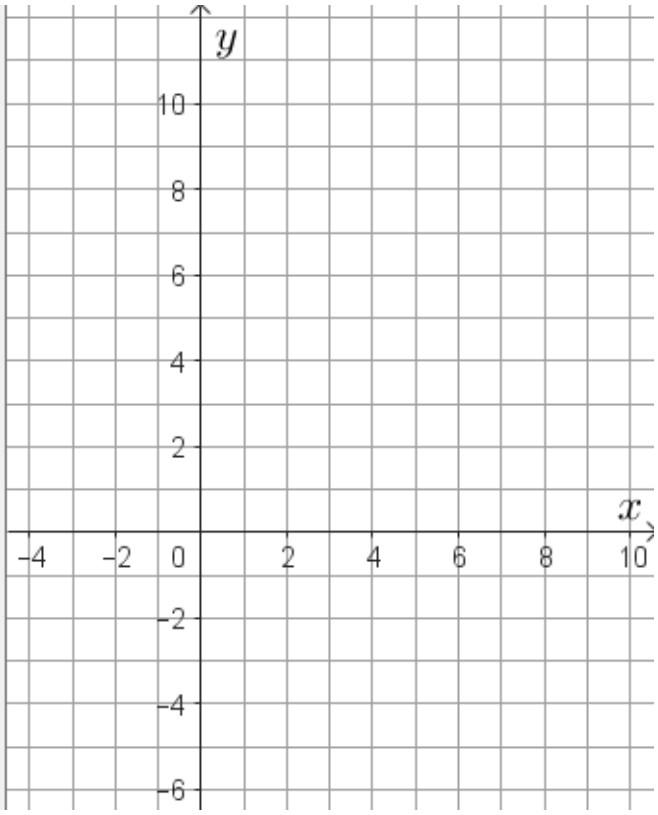


(d)

x	y
1	9
2	8
3	7
4	
5	
6	
7	3

Slope $=$

$y =$



Collect Algebra II Practice Sheet 3. Choose six equations to solve. Practice solving on the sheet. Write your solution for each equation in the boxes below. Write the equation and each line of algebra. Take care to line up your '=' sign.

Write a 'checking line' (substitute your answer into the original equation) in the box provided with each question.

1.	2.
Check:	Check:

3.	4.
Check:	Check:

5.	6.
Check:	Check:

Grade 9KC Algebra II NAME:

Lesson 13: From equation to graph

The equation $y =$ gives the instruction for how to calculate the y coordinate.

The x coordinates are already written in the table.

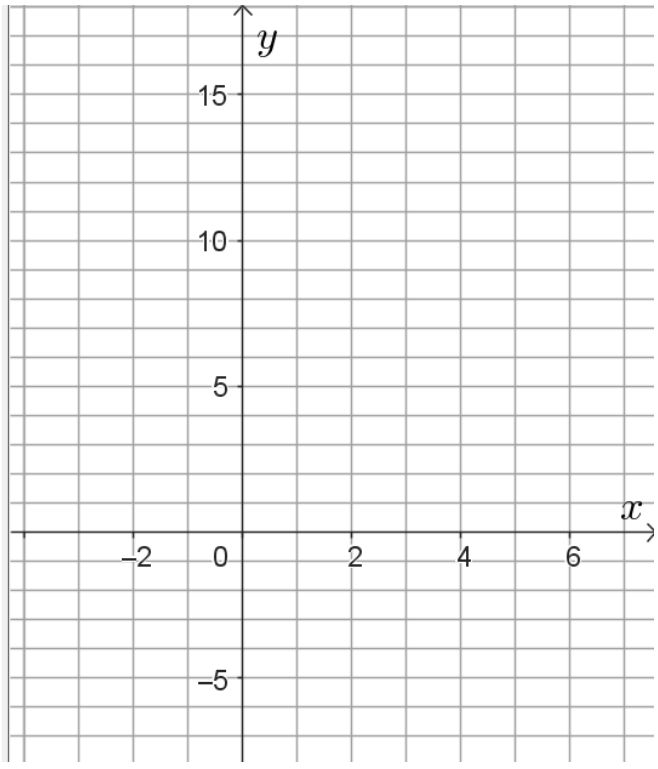
- Use the equation to calculate the y coordinates.
  (After you calculate two or three consecutive points, you can use the number pattern to complete the rest)
- Plot the points.
  (After you have plotted two or three consecutive points, you can use the points pattern to plot the rest)
- If the points all line up, draw a line with a ruler that goes all the way over the edges of the graph.
- If the points don't all line up, try to figure out why not.

GRAPH 1

$$y = x - 5$$

x	y
0	
1	
2	
3	
4	-1
5	
6	
7	

$$\text{Slope} =$$

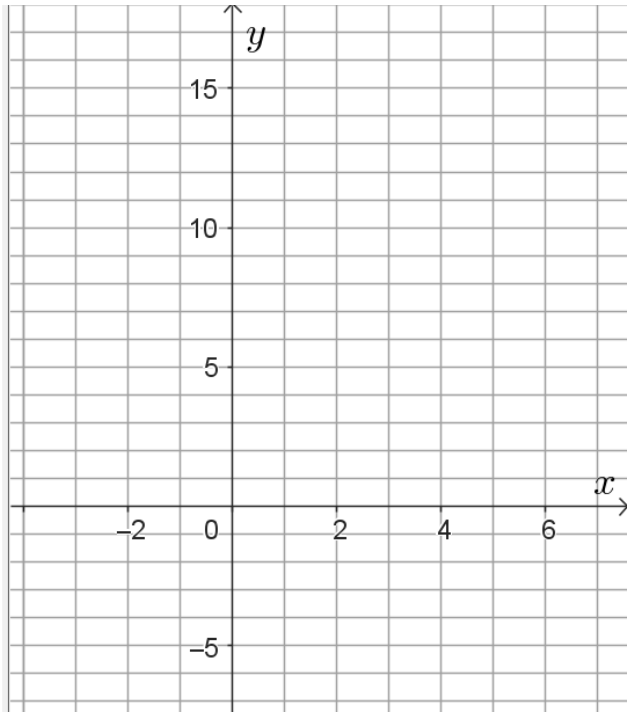


GRAPH 2

$$y = \frac{1}{2}x$$

x	y
0	
1	
2	
3	
4	2
5	
6	
7	

Slope =

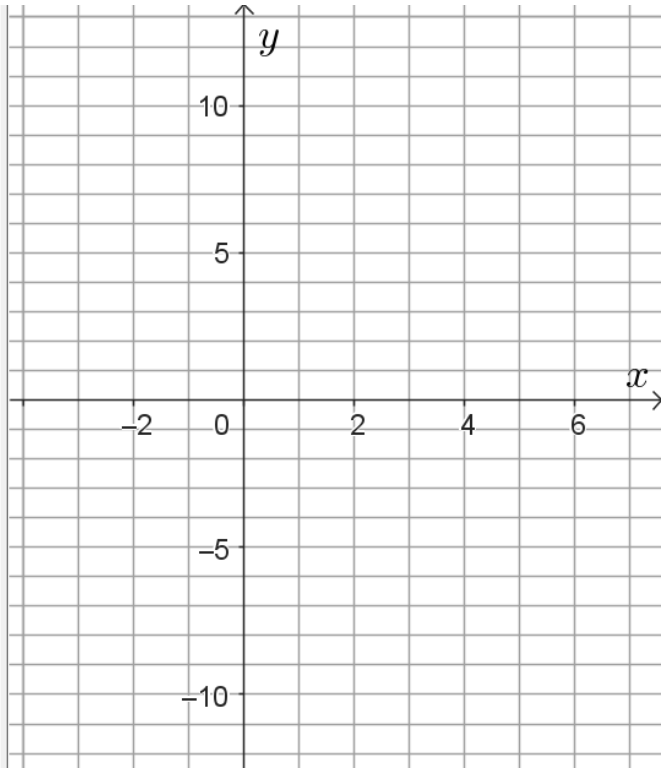


GRAPH 3

$$y = 2x - 7$$

x	y
0	
1	
2	
3	
4	1
5	
6	
7	

Slope =



GRAPHS 4 & 5

$y = 2x - 3$

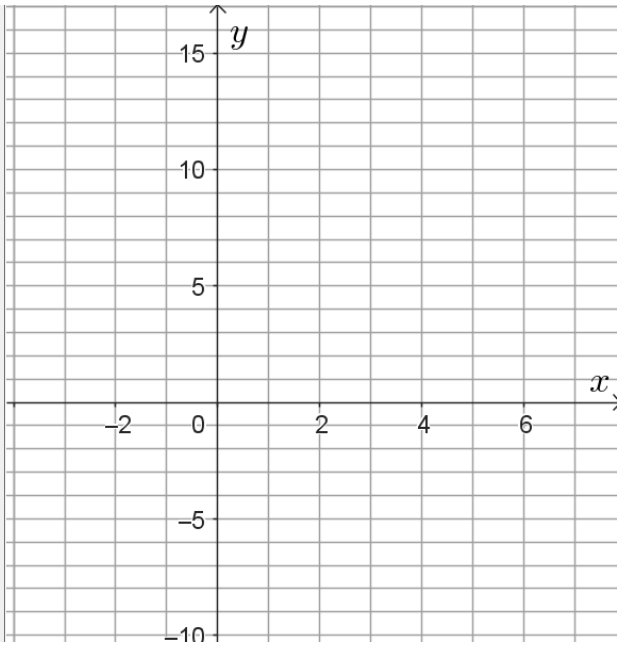
x	y
0	
1	
2	
3	
4	5
5	
6	
7	

Slope =

$y = 2x - 10$

x	y
0	
1	
2	
3	
4	-2
5	
6	
7	

Slope =



What is the same about graphs 4 & 5?
What is different about graphs 4 & 5?

GRAPHS 6 & 7

$y = 5 + \frac{1}{2}x$

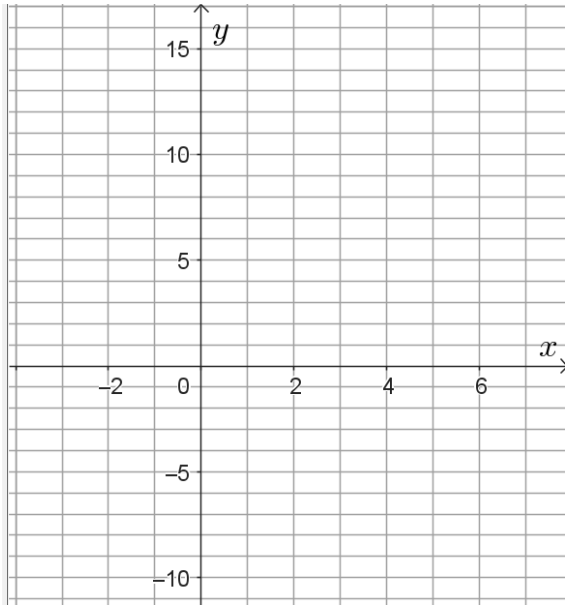
x	y
0	
1	
2	
3	
4	7
5	
6	
7	

Slope =

$y = 5 - \frac{1}{2}x$

x	y
0	
1	
2	
3	
4	3
5	
6	
7	

Slope =



What is the same about graphs 6 & 7?
What is different about graphs 6 & 7?

Algebra equations practice:

Solve these equations showing all lines of work and the check line.

1. $8a + 10 = 42$	2. $2099 = 7b - 1$
Check:	Check:

3. $\frac{c}{6} + 5 = 15$	4. $9d - 5 = 2d + 9$
Check:	Check:

5. $8e + 2 = 4e + 30$	6. $7f - 9 = 2c - 24$
Check:	Check:

Grade 9 KC Algebra 1 Creative Task

Create a poster to explain 'completing and balancing' using 4 different equations as examples.

---

1. Find a piece of blank paper and choose a piece of construction paper, stick them together. Take as many as you need to write the solutions clearly for four equations.
2. Write the title "Solving Equations" by <<name>> or another title on your poster.
3. Your poster should demonstrate and explain the solution to four equations. You should choose four equations from the applets we have been using in class, or from the textbook pages. Either way, you should already know that your working is correct because you have the answers.
4. At least one of your equations should demonstrate the flow chart method.
5. At least one of your equations should be illustrated with a mobile diagram.

You will be given grades for your work as follows:

	Emerging	Developing	Proficient
Design	Your poster shows some attention to page layout.		Your poster is easy to read. The examples are well organised and attractive due to thoughtful design.
Math Accuracy	Your poster shows some correct algebra.		Your examples are complete and correct. Although you might have got help with this task, your examples are your own original and independent work.
Math Explanation	Your poster shows some correct notation and vocabulary.		You have used the correct writing and notation for math. Your explanation is clear because you used colours/diagrams or some other technique for explaining.

A. Using letters as numbers.

Let $a = 10$, $b = 2$, $c = 3$ and $d = -5$. Calculate the value of each expression.

Expression	Value
$a + 8$	
$10 - b$	

Expression	Value
$5c - 2b$	
$d + 9$	

B. Balancing Equations.

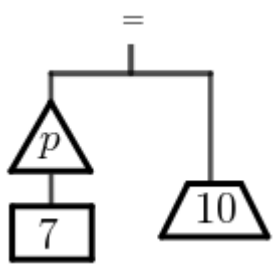
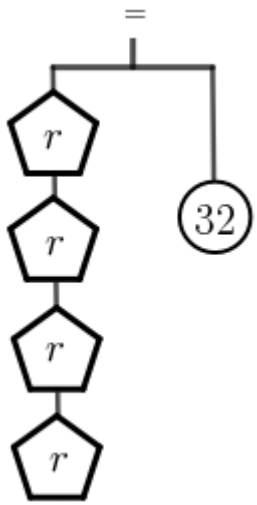
Write a number in the [ ] so that the left-hand side balances with the right-hand side.

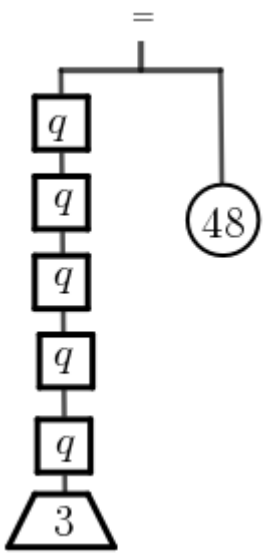
$6 + 3 = 1 + [\ \ ]$	$3 \times 12 = 40 - [\ \ ]$	$\frac{24}{3} = 10 - [\ \ ]$

Let $a = 10$, and $b = 2$

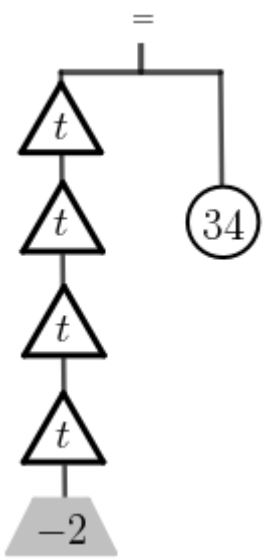
$a + 3 = 2a - [\ \ ]$	$9b + 1 = 6b + [\ \ ]$

C. Equations with Mobiles.

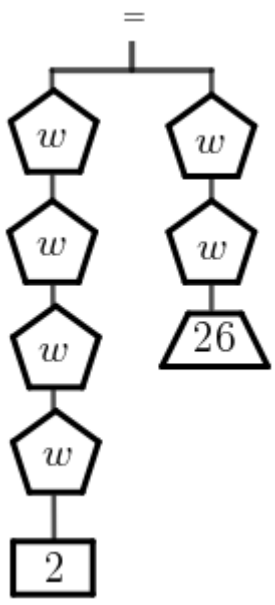
	$p + 7 = 10$
	$4r = 32$



$5q + 3 = 48$



$4t - 2 = 34$

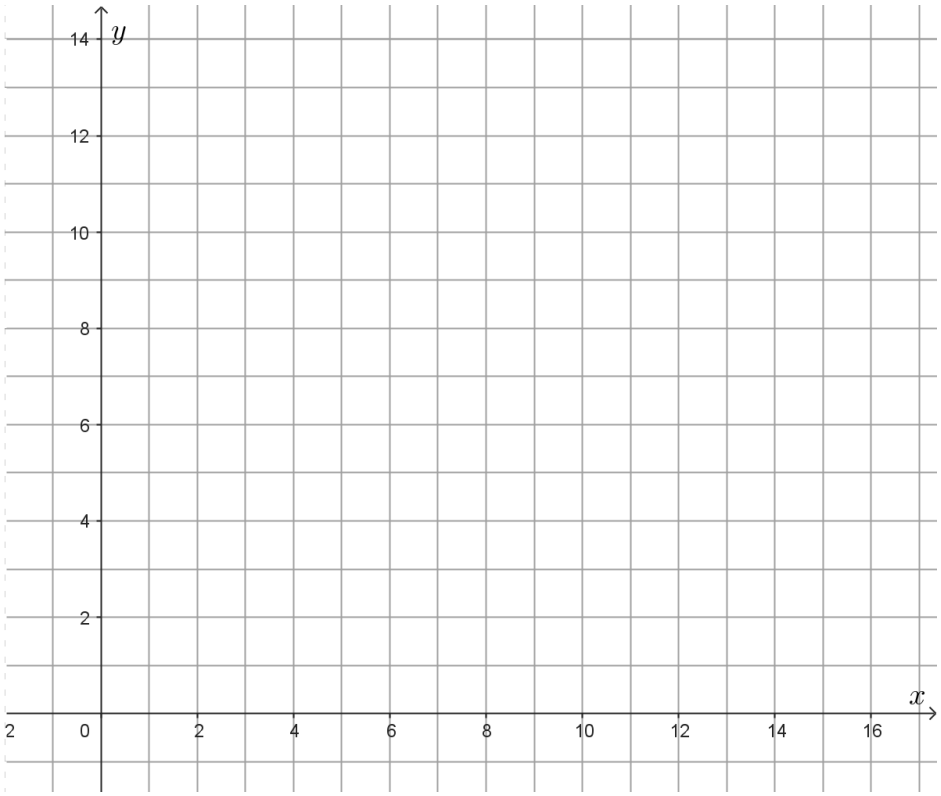


$4w + 2 = 2w + 26$

D. Plot the points in order. Join each new point to the previous point.

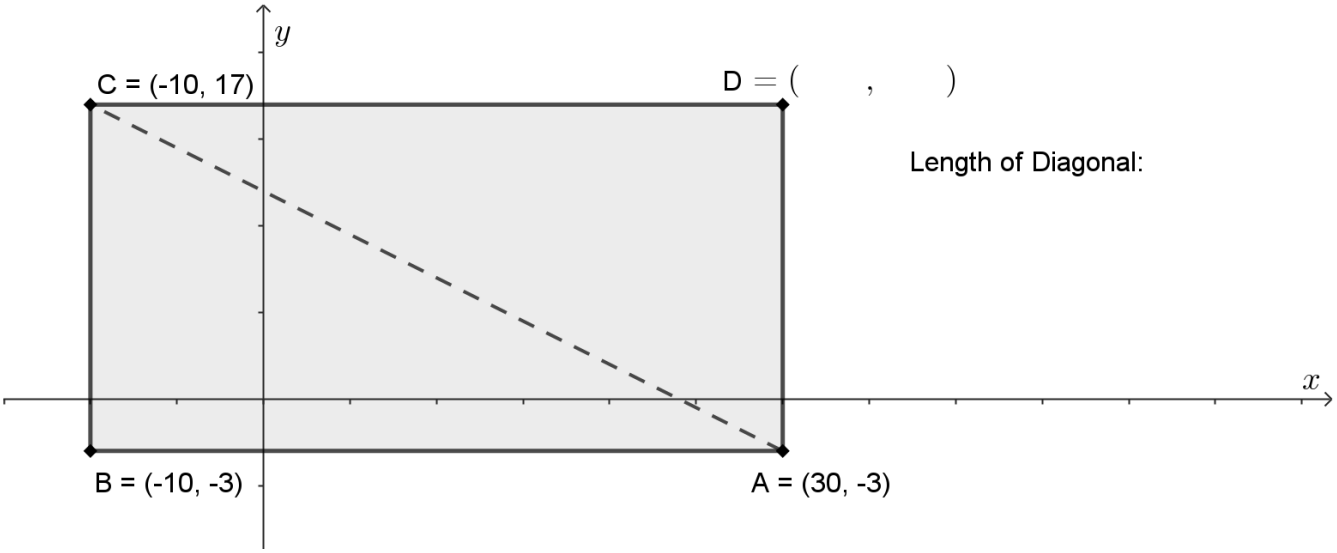
The Fish Returns.

(14, 2)
(14, 8)
(11, 6)
(9, 9)
(7, 10)
(4, 10)
(2, 9)
(1, 7)
(1, 5)
(4, 5)
(1, 4)
(1, 3)
(3, 1)
(9, 1)
(11, 4)
(14, 2)



When you are done plotting the fish, plot a point for an eye. EYE = (,)

b) Rectangle Study. Write the coordinates of point D. Calculate the length of the diagonal.



F. Equations, no mobiles. Show lines of algebra. Box the answer. Write a 'check'.

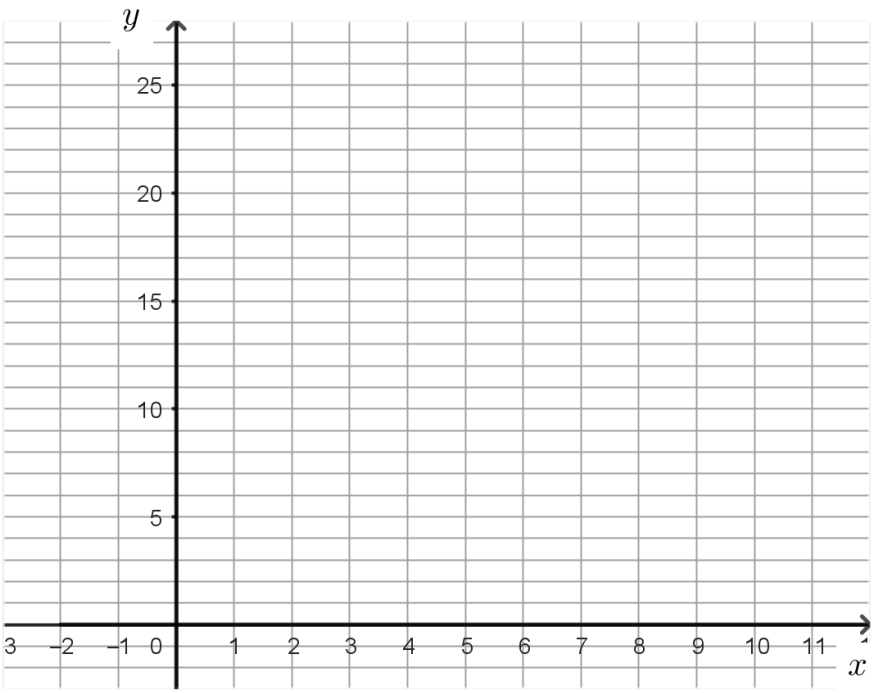
$3x = 12$	$6x = -18$
$7x - 3 = 25$	$9x + 3 = 39$
$\frac{24}{x} = 8$	$\frac{x}{5} + 10 = 16$
$3x + 20 = 5x + 4$	$6x + 20 = x + 5$

G Graphing: Complete the table. Plot the points. Write the slope. Calculate the formula.

x	y
-2	1
-1	4
0	7
1	
2	
3	
4	
5	22

slope =

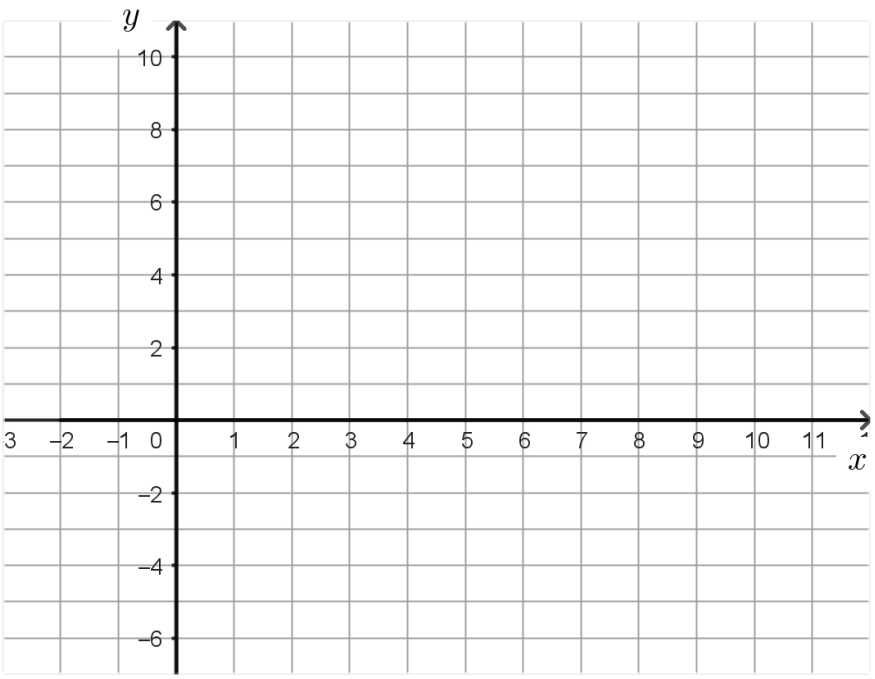
$y =$



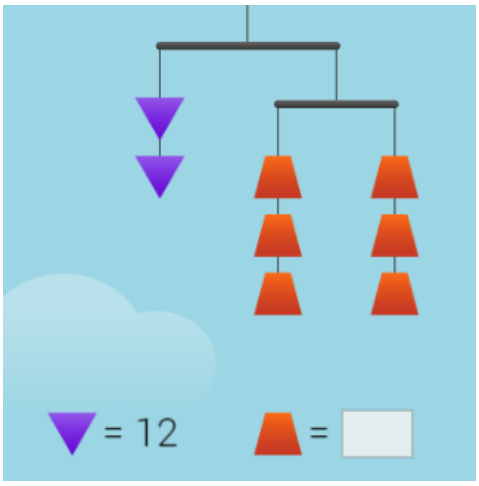
x	y
-2	11
-1	9
0	7
1	
2	
3	
4	
5	-3

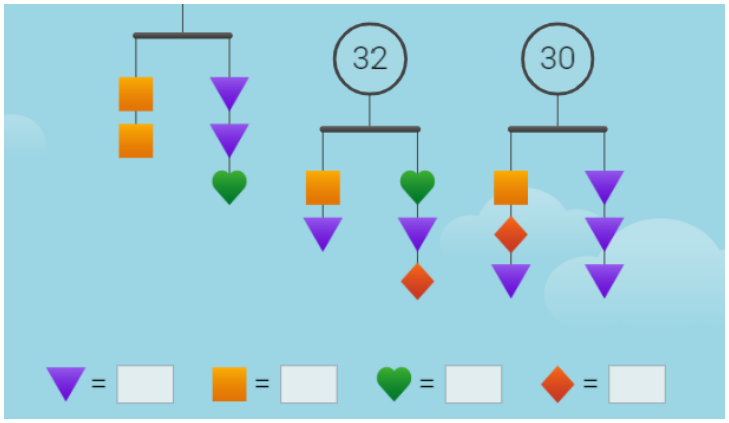
slope =

$y =$



H Solve the mobile puzzles!





Grade 9 KC Algebra: TEST DEC 2024

Using letters as numbers	Equations with mobiles	Cartesian Plane math	Cartesian plane linear functions	Equations no mobiles	Mobiles
E D P	E D P	E D P	E D P	E D P X	E D P

NAME:

A. Using letters as numbers.

Let $a = 10$, $b = 2$, $c = 3$ and $d = -5$. Calculate the value of each expression.

Expression	Value
$a - 3$	
$8b + 4$	

Expression	Value
$6c + b$	
$d - 2$	

B. Balancing Equations.

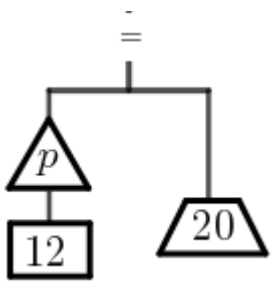
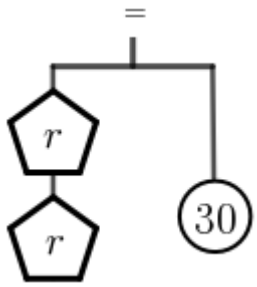
Write a number in the [ ] so that the left-hand side balances with the right-hand side.

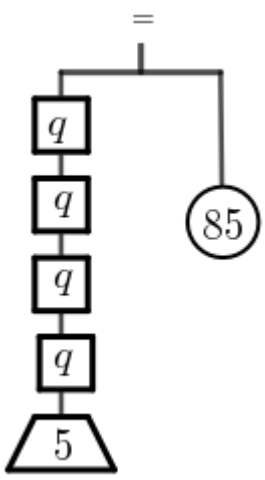
$9 - 5 = 1 + [\ \ ]$	$4 \times 9 = 2 \times [\ \ ]$	$\frac{20}{5} = 11 - [\ \ ]$

Let $a = 10$, and $b = 2$

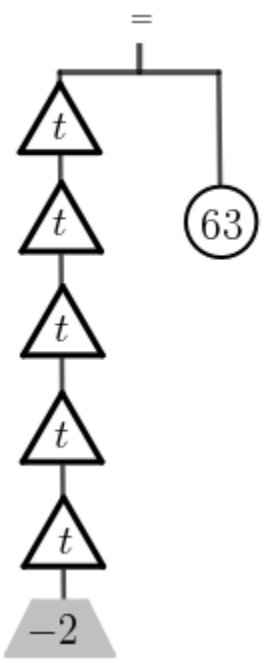
$a + 3 = 2a - [\ \ ]$	$9b + 1 = 6b + [\ \ ]$

C. Equations with Mobiles. Calculate the value of the letter. Use any technique. Show your working or explain your thinking.

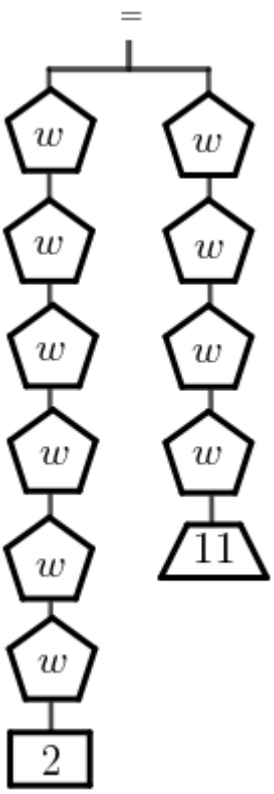
	$p + 12 = 20$		$2r = 30$



$4q + 5 = 85$



$5t - 2 = 63$



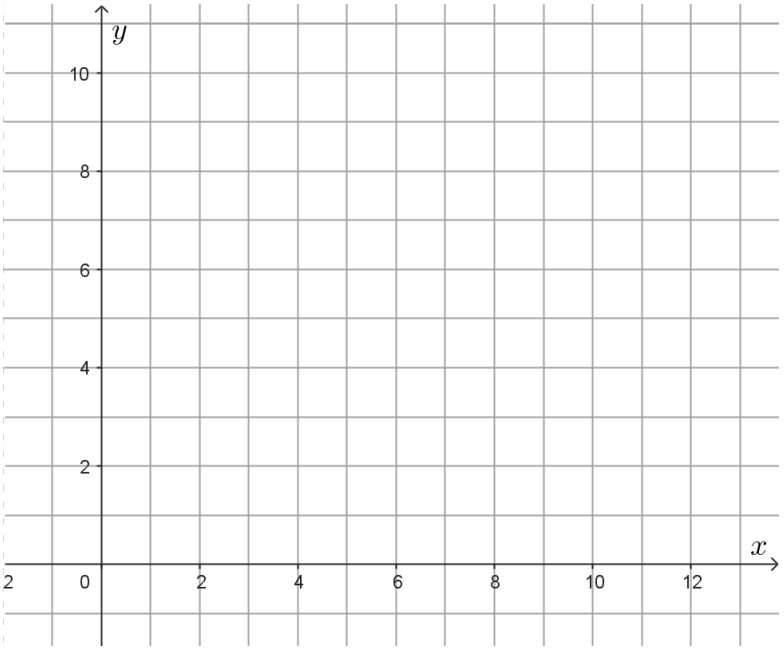
$6w + 2 = 4w + 11$

D. Cartesian Plane

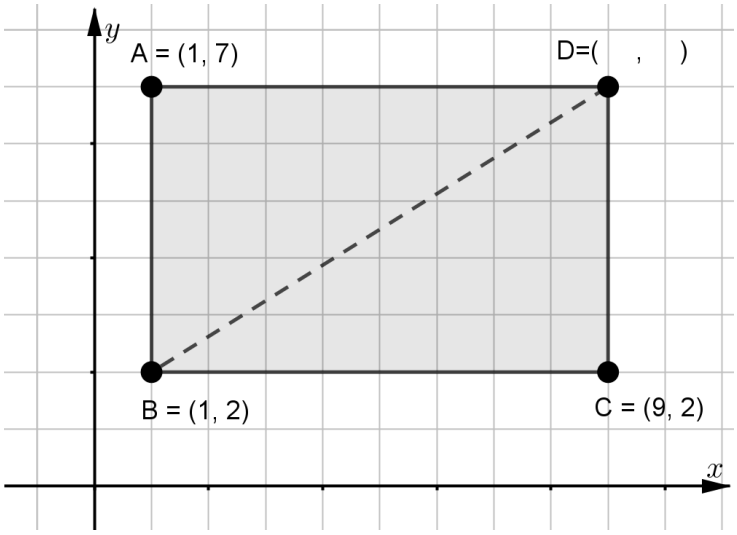
(i) Plot the points in order. Join each new point to the previous point.

The letter N

$(2, 1)$
$(2, 11)$
$(4, 11)$
$(7, 5)$
$(7, 11)$
$(9, 11)$
$(9, 1)$
$(7, 1)$
$(4, 7)$
$(4, 1)$
$(2, 1)$



(ii) Rectangle Study.



Coordinates of D = (,)

Area of the rectangle:

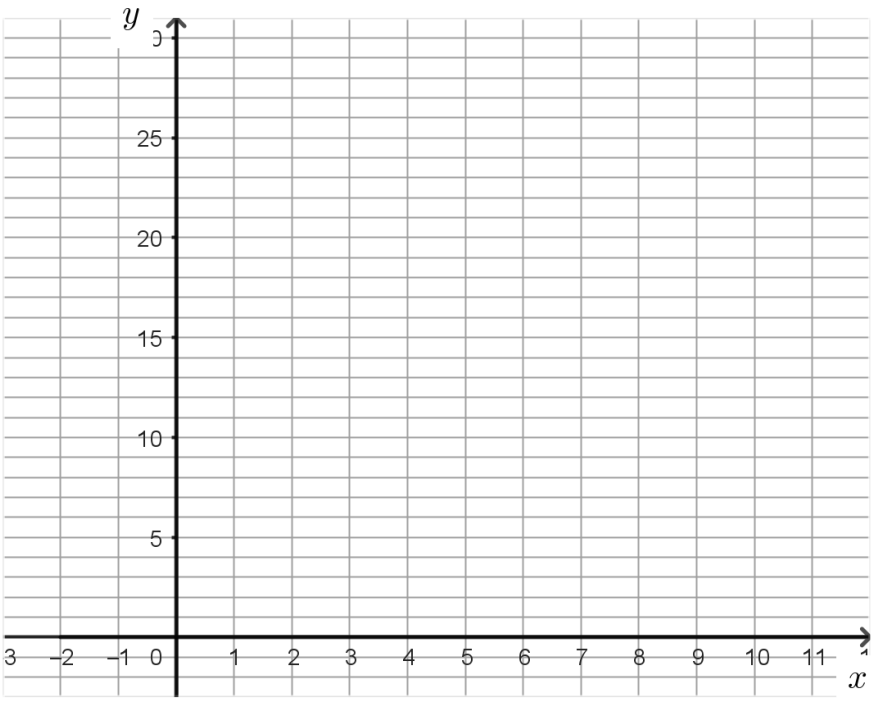
Length of the diagonal:

(iii) Use the number pattern to complete the table. Plot the points and draw a line through your points. Calculate the slope and the equation of the line.

x	y
-2	4
-1	7
0	10
1	
2	
3	
4	
5	25

slope =

$y =$

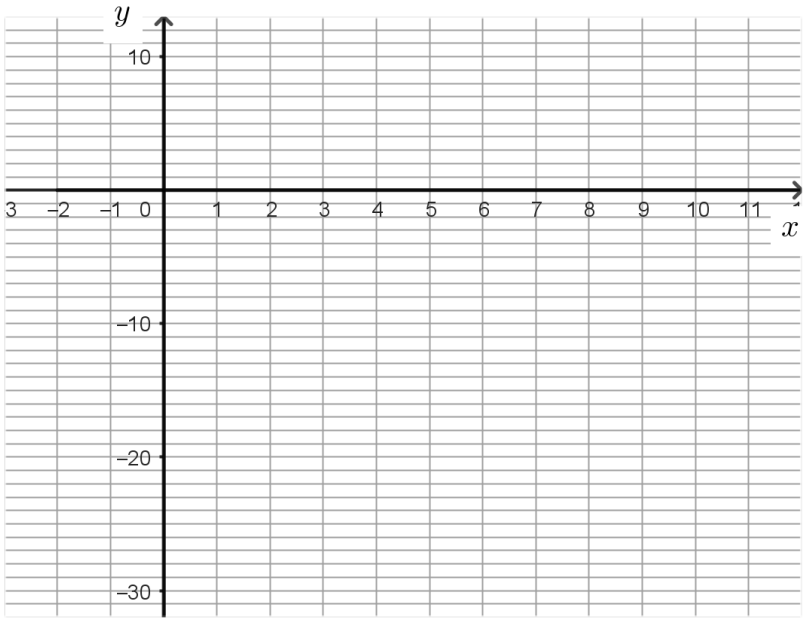


(iv) Use the number pattern to complete the table. Plot the points and draw a line through your points. Calculate the slope and the equation of the line.

x	y
-2	13
-1	8
0	3
1	
2	
3	
4	
5	-22

slope =

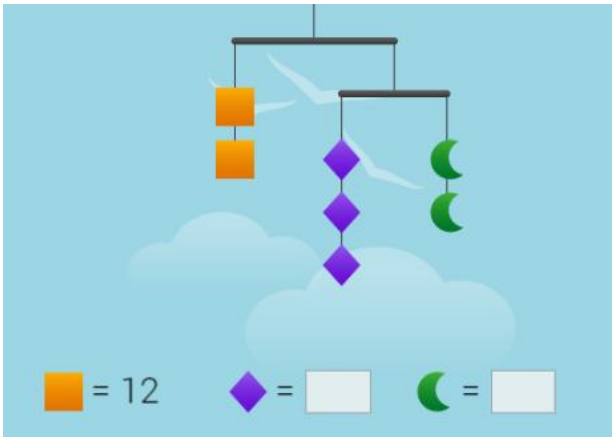
$y =$

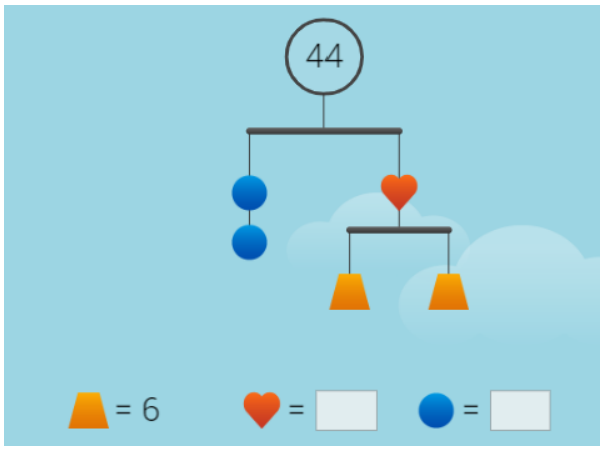


F. Equations, no mobiles. Show lines of algebra using 'completing and balancing'. Line up your equals signs. Write a 'check'.

$7x = 21$	$x + 12 = 19$
$11x - 4 = 51$	$6x + 5 = 29$
$\frac{x}{4} = 7$	$\frac{x}{2} - 3 = 9$
$9x - 3 = 4x + 32$	$x + 2 = 3x + 12$

G. MOBILES





Using letters as numbers	Equations with mobiles	Cartesian Plane math	Cartesian plane linear functions	Equations no mobiles	Mobiles
E D P	E D P	E D P	E D P	E D P X	E D P