

Term 3 Content for Grade 7 - 9

Sponsored by Sharp and SMD Technologies

Agenda

- Sharpies
- Basics
- Topics
 - Algebraic Expressions
 - Algebraic Equations
 - Construction of Geometric Figures
 - Geometry of Straight Lines
 - Geometry of 2D Shapes
 - Transformation Geometry
 - Functions and Relationships
 - Graphs

Sharpies

- A reward program just for teachers
- Earn points for attending this webinar.
- Exchange your points for gifts.
- Sign up – [link](#)
- Tell all your friends - [link](#)

SHARPIES

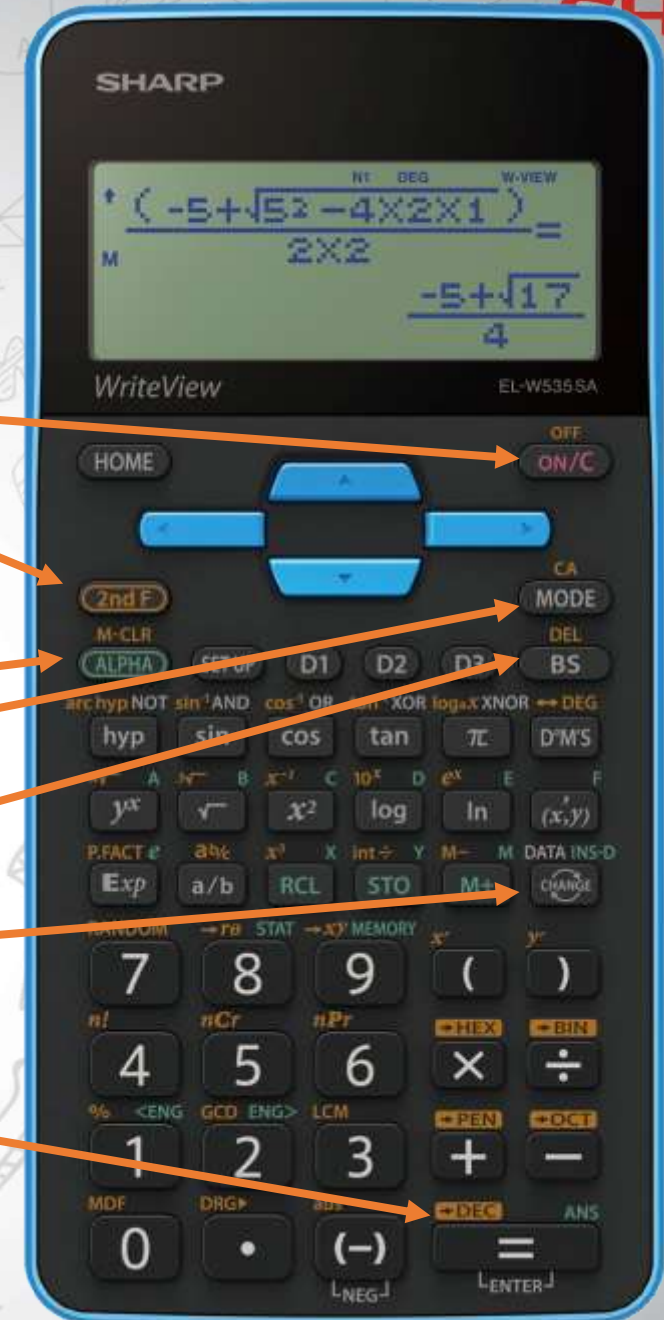


Free Downloads and Resources

- **Download the simulator**
 - [Link](#)
- **Download Geogebra**
 - [Link](#)
- **Worksheets**
 - www.mathsatsharp.co.za
 - www.e-classroom.co.za
 - www.math-drills.com
 - <https://www.mathx.net/>
 - <https://www.worksheetworks.com/> (one of my favourites for younger grades and fully customisable)
 - <https://www.mathwarehouse.com/sheets/> (FET mostly)
- **ATP documents ([link](#))**
- **My maths blog – www.themathsjourney.com**

Calculator Basics

- Turn the calculator on
- 2nd Function – used to activate orange functions
 - Turn the calculator off by pressing 2nd F and ON
- ALPHA – used to activate teal functions
- Mode – change to different modes
- BS – backspace – to delete something.
- Change – change between mixed, improper and decimal answers.
- Equals – to find an answer or used as enter.



Modes

- Press
- 0: Normal
 - Fractions, integers, probability, trigonometry and much more
- 1: Stat
 - Single data, linear regression and more
- 2: Table
 - Functions but can also be used for teaching finance
- 3: Drill
 - Mental maths fun!



Algebraic Expressions

Grade 7 and 8

Some theory

- What are variables?
 - They are letters that can represent different values (numbers). They can change.
- What are constants?
 - They are numbers that stay the same. They do not change.
- Like Terms and unlike terms
 - Like terms have the same variables **AND** the same exponents.
 - Remember: terms are separated by pluses and minuses.



Teaching the Difference between Variables and constants.







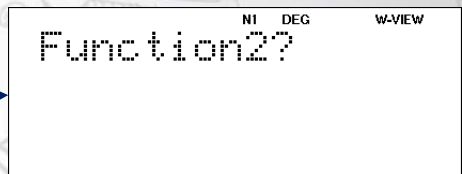
- Go to table mode (press  )
- In function 1, press 5 (or any other number).
- Press  until you reach the table.
- Use your  and  buttons to scroll through the table.
- What do you notice?



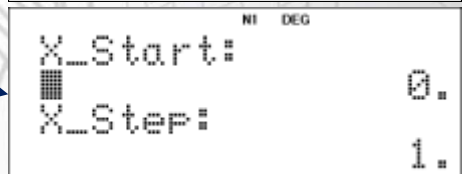
TABLE MODE
Function1?



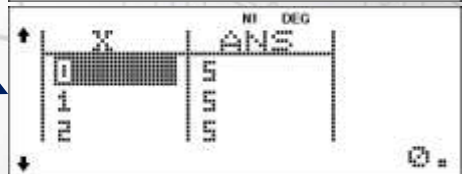
5_



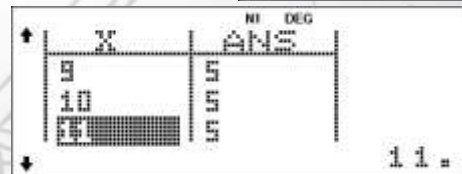
Function2?



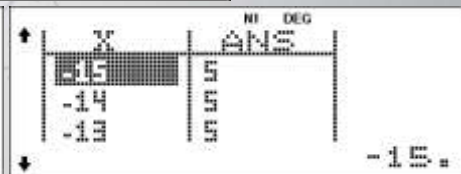
X_Start: 0.
X_Step: 1.



X	ANS
0	5

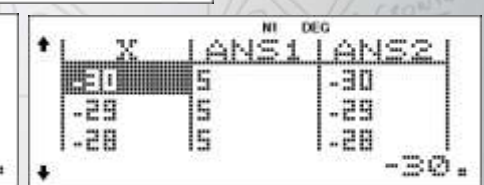
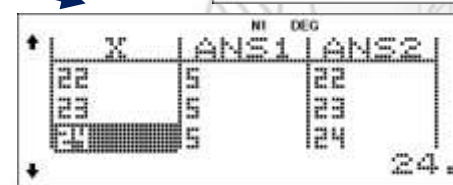
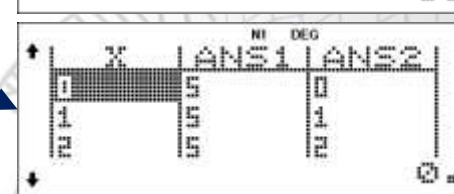
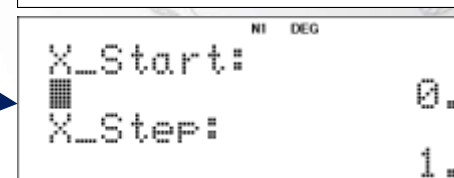
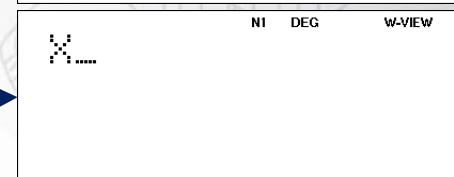
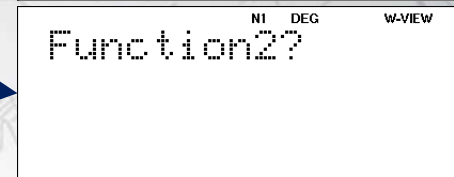


X	ANS
5	5
10	5
15	5



X	ANS
-15	5
-14	5
-13	5

- Now press **ON/C** once.
- Press **=** to leave your 5 in Function 1.
- In Function 2 make an X (so press **RCL** **RCL**)
- Press **=** 3 times (until you reach the table).
- Scroll through your table using your **▲** and **▼** buttons.
- What do you notice?



Simplifying Algebraic Expressions

- In grade 8 we need to
 - Multiply and divide monomials, binomials and trinomials with integers and monomials
 - Add and subtract like terms
 - Find the squares, cubes and roots of algebraic terms
 - And use substitution
- [Worksheet 1](#)
- [Worksheet 2](#)
- Common Issues
 - Learners struggle to identify like and unlike terms
 - Learners struggle with exponents and roots
 - Learners struggle with the definition of a term.
 - And from this learners also struggle with substitution – because they don't understand what belongs with what.

Demonstrating Like and Unlike Terms

- Go to table mode (Press **CA** **MODE** **2**).
- In function 1, type in **RCL** **X** **RCL** **X**
- Press **=**
- In function 2, type in **RCL** **X** **RCL** **X** **x⁻¹** **C**
- Press **=**
- Leave start and step as is so press **=** **=**
- Scroll through your table using the **▲** and **▼** buttons

TABLE MODE
Function1?

X_

Function2?

X^2_

X_Start: 0.
X_Step: 1.

X	ANS1	ANS2
0	0	0
1	1	1
2	4	4

X	ANS1	ANS2
9	9	81
10	10	100
11	11	121

Substitution

- E.g. if $a = 1$ and $b = -3$ find the value of $ab^2 + a^2b$
- Press **HOME**
- Store the values of a and b by pressing **1** **STO** **y^x**

abs

(-) **3** **STO** **$\sqrt{\quad}$**

[NEG]

- Now we type in the expression so press **M-CLR** **ALPHA** **y^x**

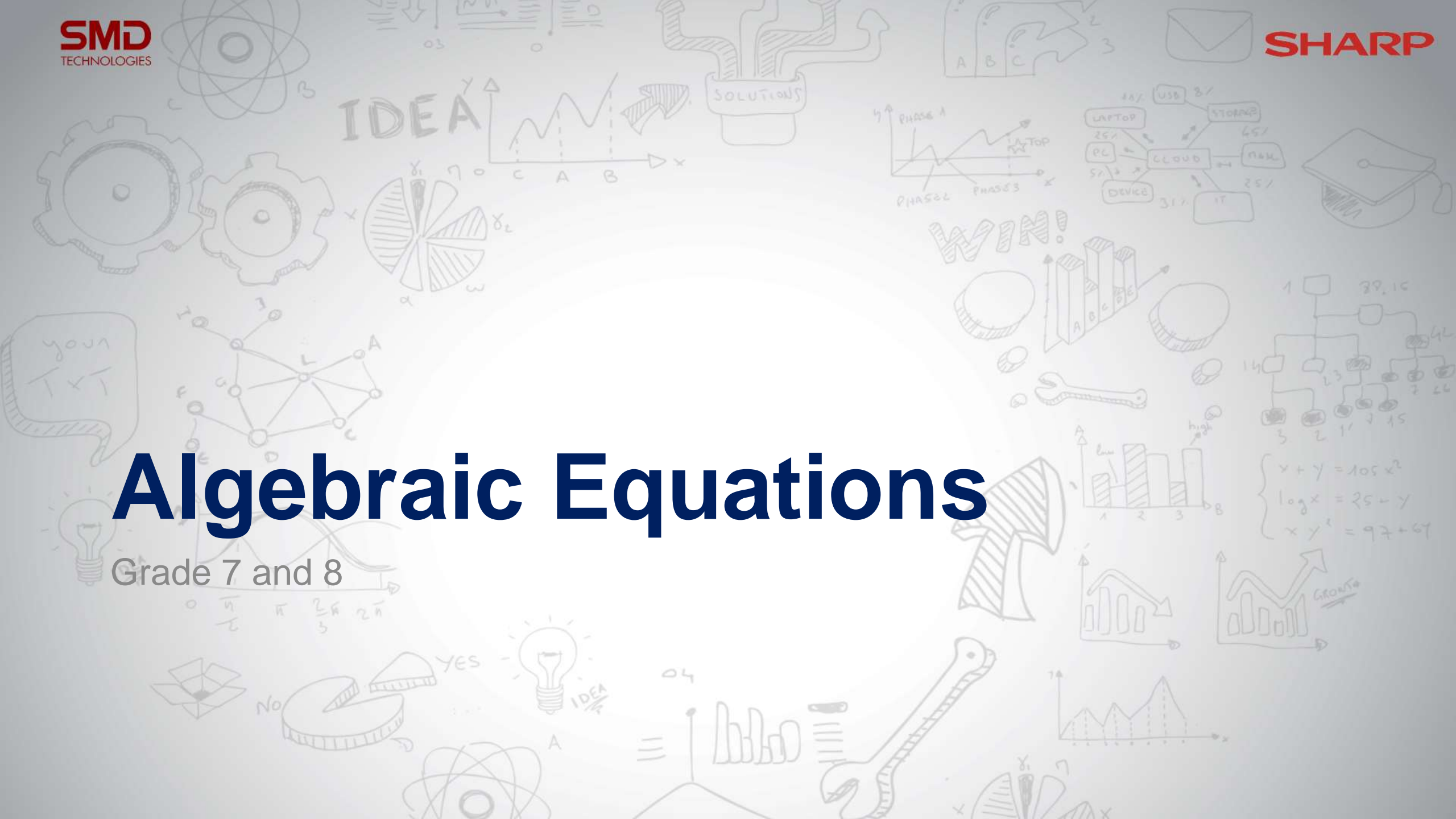
M-CLR **ALPHA** **$\sqrt{\quad}$** **x^2** **+** **M-CLR** **ALPHA** **y^x** **x^2**

M-CLR **ALPHA** **$\sqrt{\quad}$**

=

Algebraic Equations

Grade 7 and 8



Algebraic Equations

- Grade 7
 - Number sentences
 - Problem situations
 - Variables and Constants
 - Solving by inspection, trial and error, and substitution.
- Grade 8
 - Substitution to create ordered pairs.
- [Worksheet 1](#)
- [Worksheet 2](#)
- Grade 7
 - [Verbal Expressions](#)
 - [Lots of options](#)
- Common Issues
 - Understanding mathematical language
 - Use a maths dictionary
 - Or create your own with your students and add to it daily as part of the warm up / summary of the lesson (very important for non-first language speakers)
 - Use simple language
 - Do “vocab” tests
 - Make sure you encourage reading 😊
 - Remembering what variables and constants are
 - Solving by trial and error.

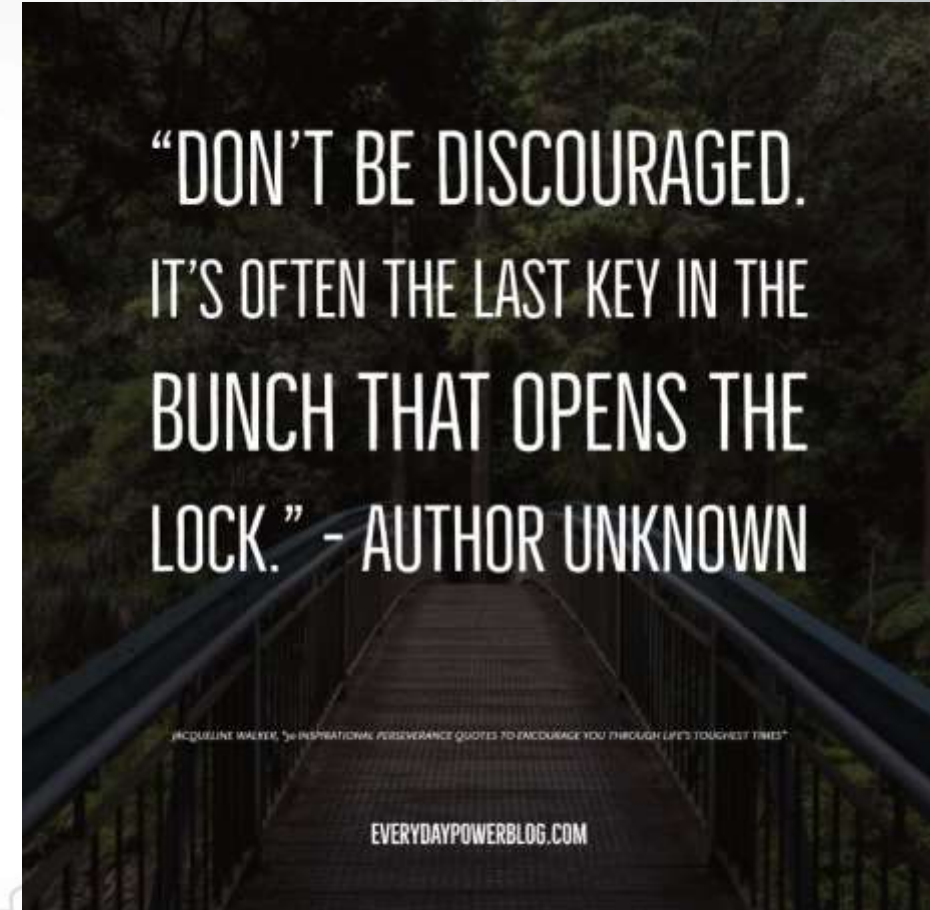
Solving by Inspection

- E.g. $\underline{\quad} = 5 \times 10$
- Or $50 = \underline{\quad} \times 10$
- Or $50 = 5 \times \underline{\quad}$

- Need to know our mental maths really well.

Solving by Trial and Error

- Wiki – Fundamental method of problem solving
- Repetition is key
- Struggle is important
- Teaches the core aspects of problem solving
 - Very important for future work and future maths
 - Think programming and the light bulb.



Example with Trial and Error

• $\underline{\quad} \div 7 + 2 = 10$

• $\underline{\quad} \times 4 - 5 = 11$

Creating Ordered Pairs

- (This is a great introduction to graphs 😊)
- E.g. _____ = 5 x _____ +2 ?
- So we go to table mode by pressing **MODE** **2**
- Type in **5** **X** **RCL** **RCL** **+** **2**
- Press **=** 4 times
- Scroll through your table to see the ordered pairs.

N1 DEG W-VIEW
TABLE MODE
Function1?

N1 DEG W-VIEW
5X \bar{X} +2

N1 DEG

X	ANS
0	2
1	7
2	12

0.

N1 DEG

X	ANS
7	37
8	42
9	47

9.

N1 DEG

X	ANS
-6	-28
-5	-23
-4	-18

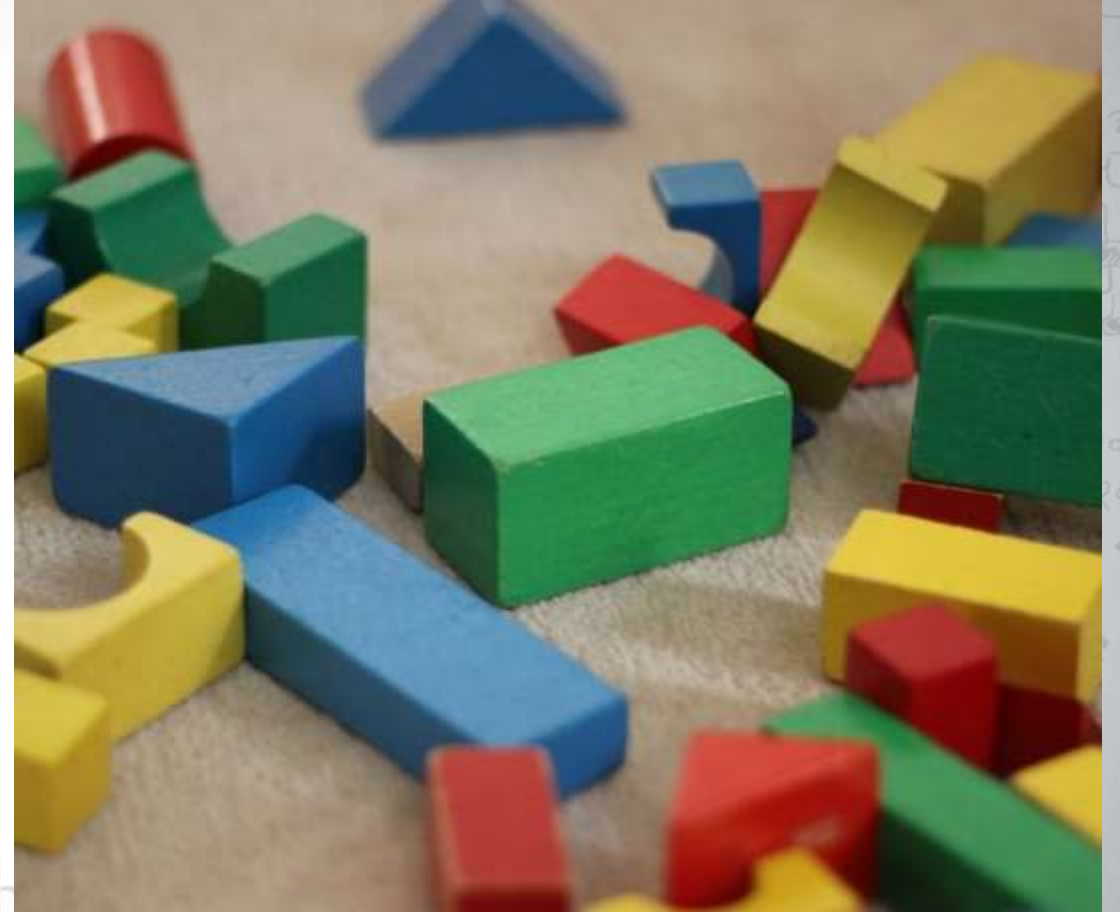
-6.

Construction of Geometric Figures

Grade 7, 8 and 9

Constructions

- In grade 8 and 9 these need to be given to the students (according to the ATP)
- Still actually do constructions in grade 7
 - Constructing various angles
 - Circles, parallel lines and perpendicular lines
 - Need to be able to name the parts of the circle.



Tips

- Students need to have the tools but this is often not the case.
- We need a compass and protractor.
 - Compass – use a length of string tied to 2 pencils.
 - For protractor, [print a protractor](#) onto [clear plastic sheets \(like projector sheets\)](#) and cut them out.
- How to do the constructions
 - [Mathsisfun.com](#)
- Use Geogebra and the computer centre if you have access
- [Khan academy](#) videos
- An interactive construction pad - [maths pad](#)

Geometry of Straight Lines

Grade 7, 8, and 9

Theory

- Line segment
 - A line that has 2 endpoints
- Ray
 - A line that has 1 endpoint, and gives direction
- Straight Line
 - The set of all points between and extending two other points
 - It has no curves
- Parallel lines
 - Two lines that are always equally distant from each other
- Perpendicular lines
 - Two lines that are at right angles to each.

Parallel Lines - Geometry Rules

The diagrams illustrate the following rules:

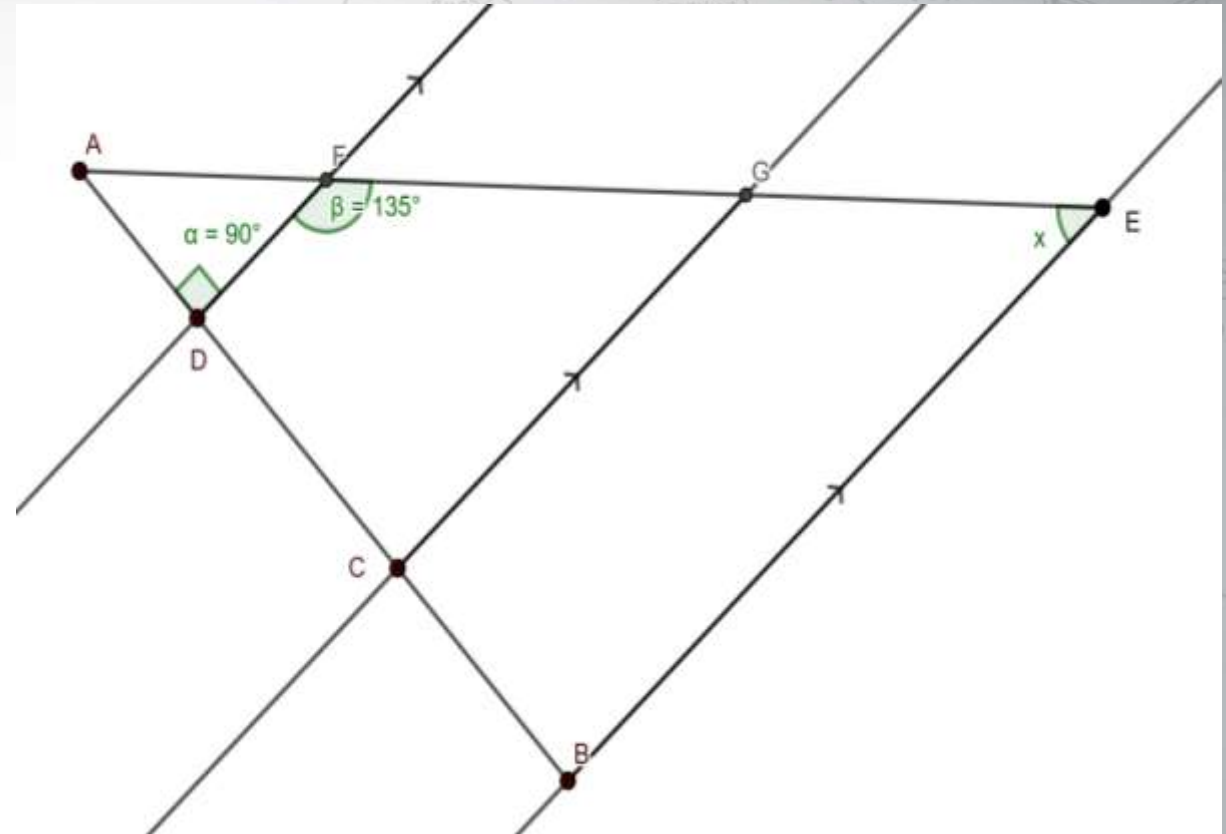
- Top Left (Green border):** Angles adjacent (next to) to each other on a straight line add up to 180° . (Maths Statement: straight L)
- Top Middle (Orange border):** When a third line crosses two parallel lines, the angles in the F shape are equal. (Maths Statement: 2 lines, corr. LL)
- Top Right (Green border):** When a third line crosses two parallel lines, the angles in the U shape add up to 180° . (Maths Statement: 2 lines, alt. int. LL)
- Bottom Left (Cyan border):** When two lines intersect, their opposite angles are equal. (Maths Statement: int. opp. LL)
- Bottom Right (Red border):** When a third line crosses two parallel lines, the angles in the corners of the N shape are equal. (Maths Statement: 2 lines, alt. LL)

FUN with the CIA

- **F = Corresponding angles**
- **U = co-Interior**
- **N = Alternating angles**

Tips and Tricks

- [Worksheets](#)
- Use Geogebra to draw angles and explore angles
- [Mathsisfun.com](#) to the rescue
- Use a string
- Project or game – create a maze using the different types of angles and lines.
- Project or game – create a dance with the different types of angles and lines
- Remember this is a very visual topic.

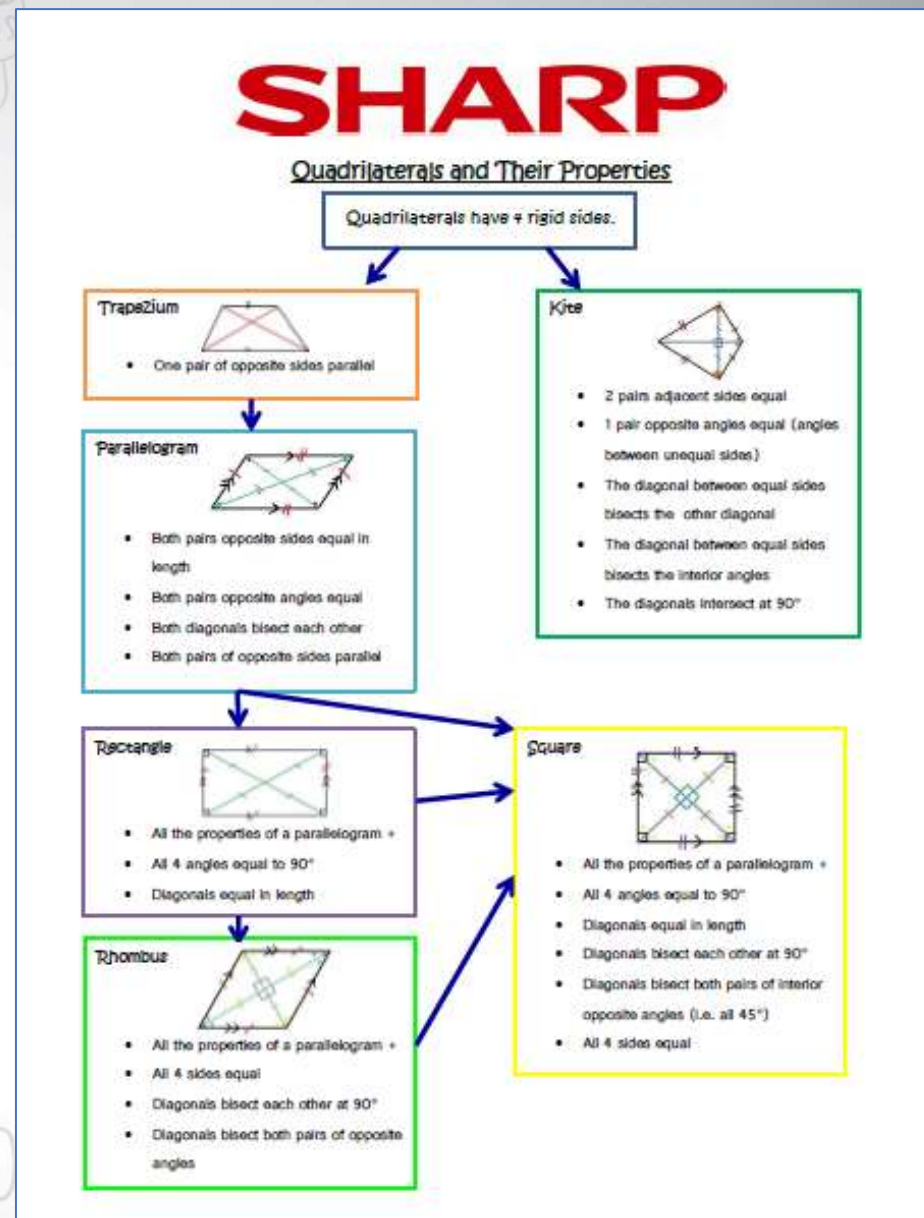


Geometry of 2D Shapes

Grade 7, 8 and 9

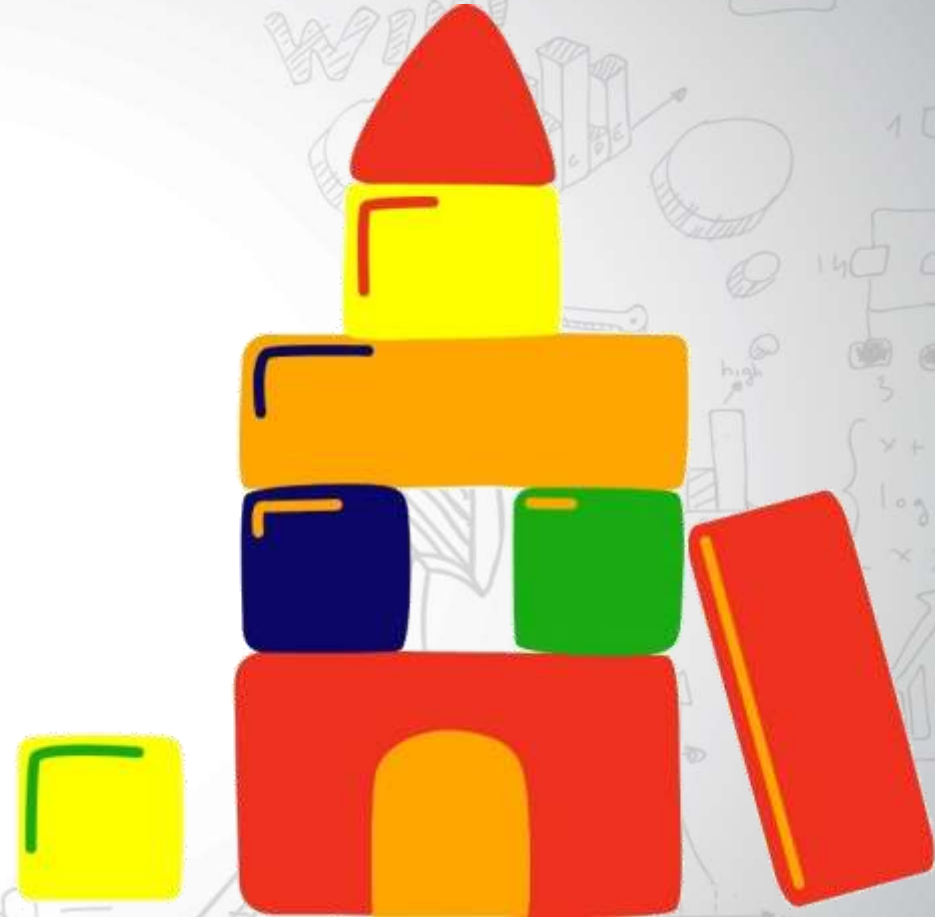
Theory

- Grade 7
 - Classifying triangles and quadrilaterals
 - Similarity and congruency
- Grade 8 – proof through construction
 - Sum of angles in triangle
 - Angles and sides in an isosceles triangle
 - Size of angles in an equilateral triangle
- Grade 9
 - Exterior angles of a triangle
 - Investigate the sides, angles and diagonals of quadrilaterals.
- [Worksheets](#)



Some ideas

- Play shape snap
 - Similarity and congruency introduction
- Shapes around us
- Tangrams
- Write a story about the journey of a quadrilateral from a trapezium to rectangle (or something else).

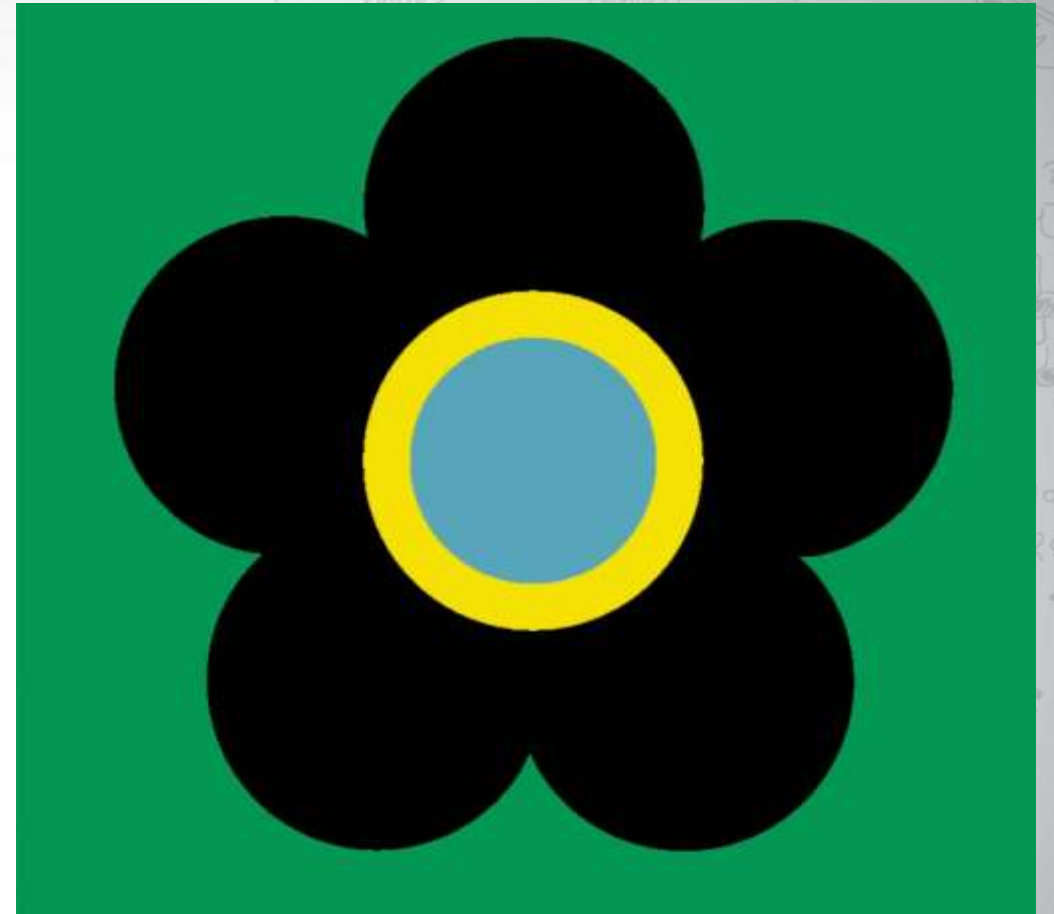


Transformation Geometry

Grade 7 and 9

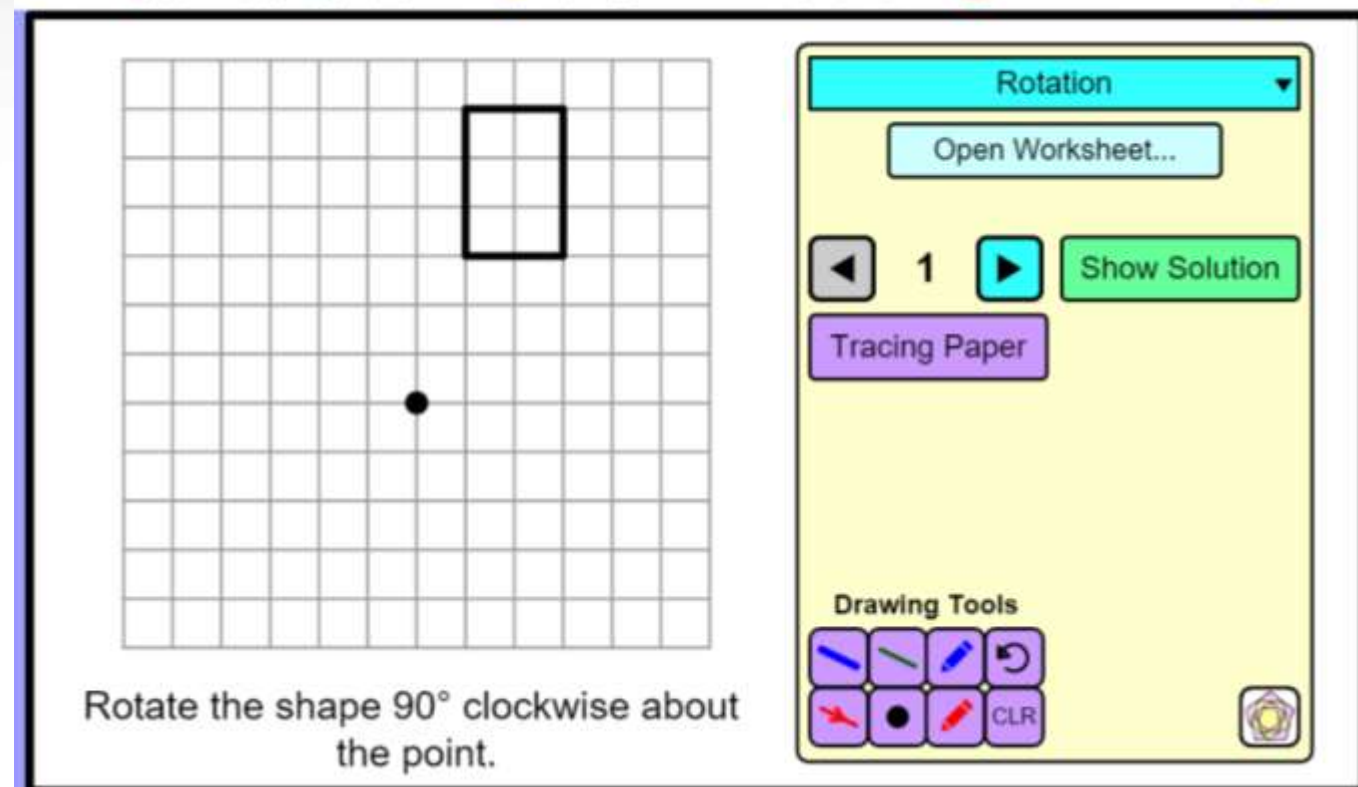
Transformations

- Need graph paper? [Download from here.](#)
- Translations
 - Moving a point or shape up, down, left or right
- Reflections
 - Reflecting a shape around a line
 - Creating a mirror image around a line
- Rotations
 - Twisting a shape or point around another point
- Lines of Symmetry
 - Lines that create mirror images of the image
- Enlargement
 - Making a shape or point bigger
- Reduction
 - Making a shape or point smaller



Suggestions

- [Mathsisfun.com](https://www.mathsisfun.com) has some great tools.
- Geogebra is also great
- [Interactive Maths](https://www.interactivemaths.com)
 - Uses geogebra
- [Mathspad](https://www.mathspad.com) also has options
- [Worksheets](#)



The screenshot shows a digital workspace for geometry. On the left, a grid contains a black rectangle and a single black dot. Below the grid, the text reads: "Rotate the shape 90° clockwise about the point." On the right, a control panel is visible. At the top, there is a dropdown menu labeled "Rotation" with a downward arrow. Below it is a button labeled "Open Worksheet...". Further down, there are navigation arrows, a page number "1", and a green button labeled "Show Solution". Below that is a purple button labeled "Tracing Paper". At the bottom, there is a section titled "Drawing Tools" with several icons for drawing lines, arcs, and other shapes, along with a "CLR" button. A small icon of a lightbulb is in the bottom right corner of the panel.

Functions and Relationships

Grade 9

[Helpful article](#)

Theory

- Input Values
 - Values that change the result (or answer)
 - Independent
- Output values
 - The final value or result from the expression (the answer)
 - Dependent
- Flow diagrams
 - A diagram that shows what happens to the input value



More theory

- Tables
 - A set of corresponding input and output values in a table format
- Equations
 - Are the relationship in variables that shows what happens to the input value in order to get the output value
- Formulae
 - Are equations specific to situations, like the area of different shapes.
- [Worksheets](#)



Creating a table from an equation

- Go to table mode (**CA MODE** **2**)
- Equation is: $y = 3x + 2$
- Type in **3** **RCL** **RCL** **+** **2**

=

=

=

=

TABLE MODE
Function1?

3X+2

Function2?

X_Start: 0.
X_Step: 1.

X_Start: 0.
X_Step: 1.

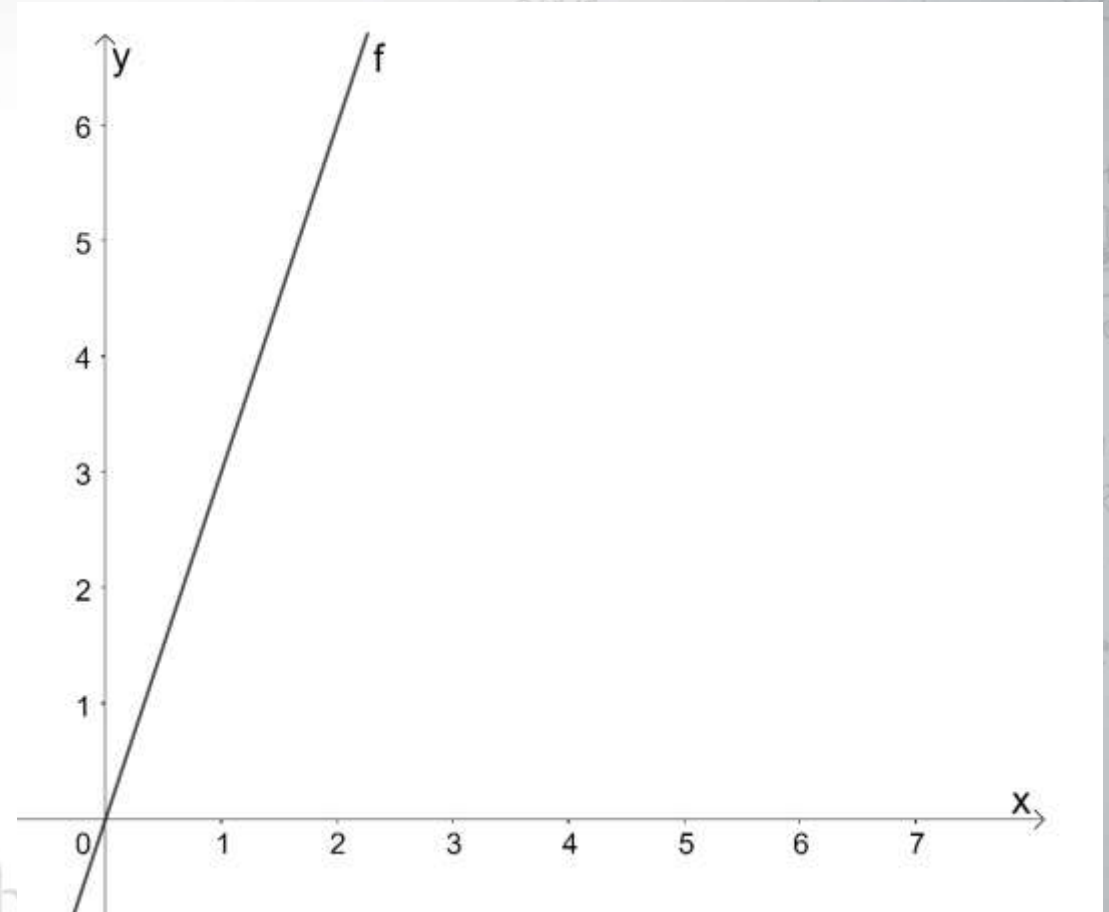
X	ANS
0	2

X	ANS
11	35
12	38
13	41

X	ANS
25	-73
-24	-70
-23	-67

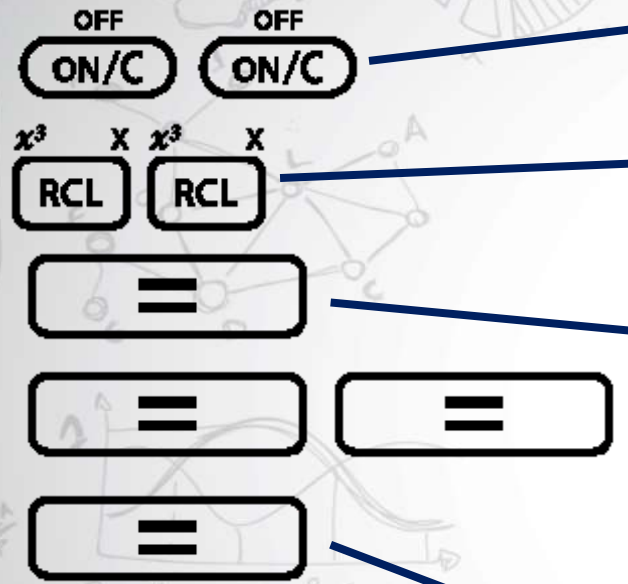
Graphs are an extension of functions and relationships

- We need to be able to interpret graphs
 - Are they increasing?
 - Decreasing?
 - Staying the same?
 - What does this tell us about the gradient?
- And draw straight line graphs
 - Using tables
 - And from a given equation
- And finding the equations of a given graph



Teaching Graphs

- Let's start with X: so press



NI DEG W-VIEW

TABLE MODE
Function1?

NI DEG W-VIEW

X_

NI DEG W-VIEW

Function2?

NI DEG

X_Start: 0.

X_Step: 1.

NI DEG

X	ANS
0	0
1	1
2	4

0.

What if we multiply X with 2?

- Press **ON/C**
- Leave X as is, so press **=**
- In function 2, type in

2 **RCL** **RCL**

= **=**

=

X_ NI DEG W-VIEW

Function2? NI DEG W-VIEW

2X_ NI DEG W-VIEW

X_Start: NI DEG 0.
X_Step: 1.

X	ANS1	ANS2
0	0	0
1	2	0
2	4	0
3	6	0
4	8	0
5	10	0

X	ANS1	ANS2
11	22	0
12	24	0
13	26	0
14	28	0
15	30	0

X	ANS1	ANS2
1.5	3.0	0
1.6	3.2	0
1.7	3.4	0
1.8	3.6	0
1.9	3.8	0

What if we multiply by -2?

- Press **ON/C**
- Leave X as is, so press **=**
- In function 2, press **ON/C**

(-) **2** **RCL** **RCL**

-NEG x³ x x³ x

= **=**

=

X_ NI DEG W-VIEW

2X_ NI DEG W-VIEW

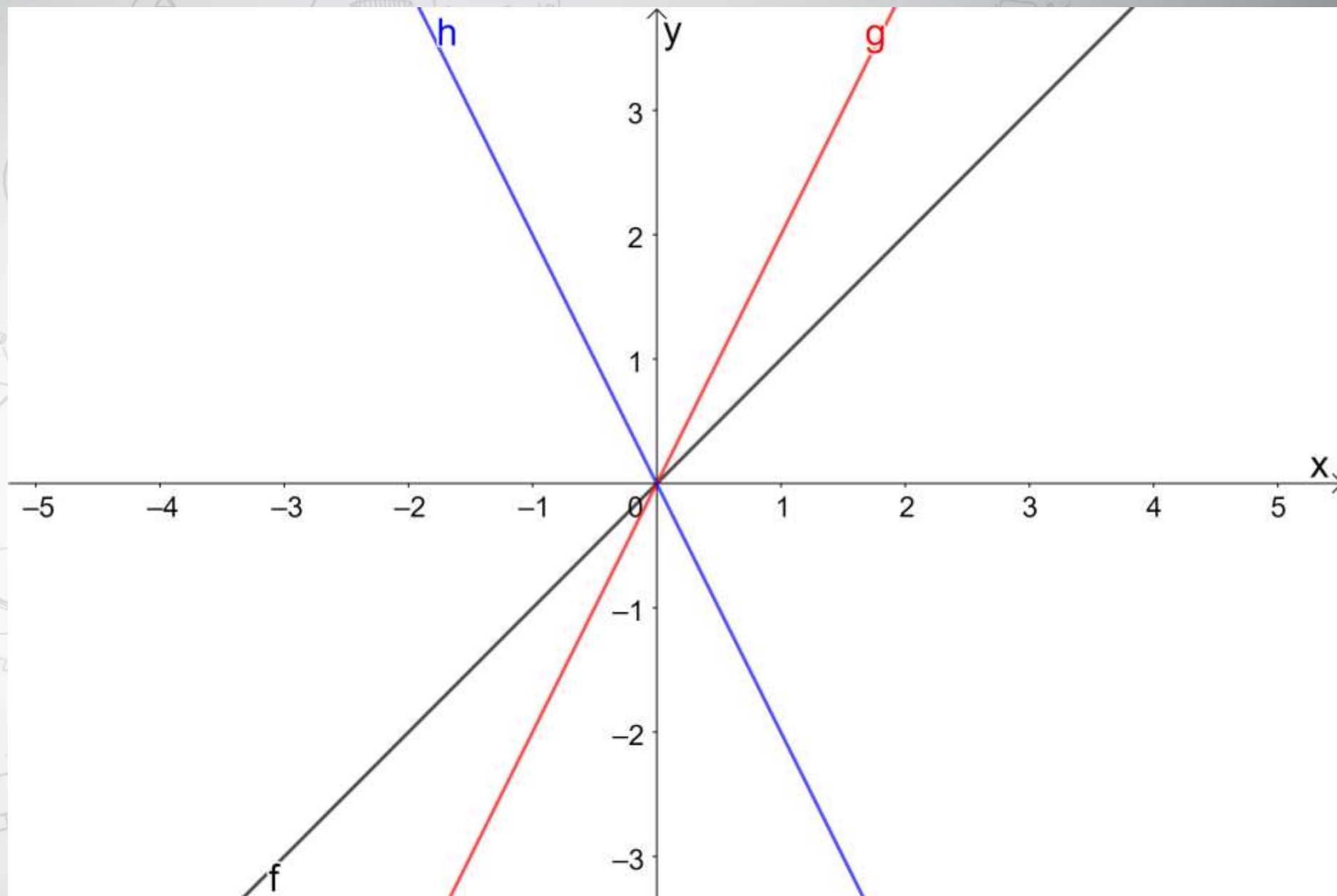
Function2? NI DEG W-VIEW

-2X_ NI DEG W-VIEW

X_Start: 0.
X_Step: 1.

X	Y	Y'	Y''
0.	0.	0.	0.
1.	1.	2.	0.

So
what
have we
learnt?



What about shifting the graph up?

- Press **ON/C**
- Leave X as is, so press **=**
- In function 2, press **ON/C**

x^3 x x^3 x
RCL **RCL** **+** **1**
= **=**
=

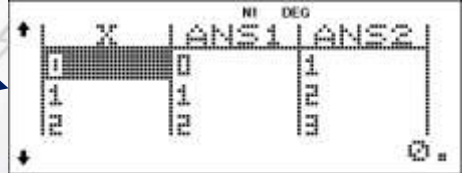
X_ NI DEG W-VIEW

-2X_ NI DEG W-VIEW

Function2? NI DEG W-VIEW

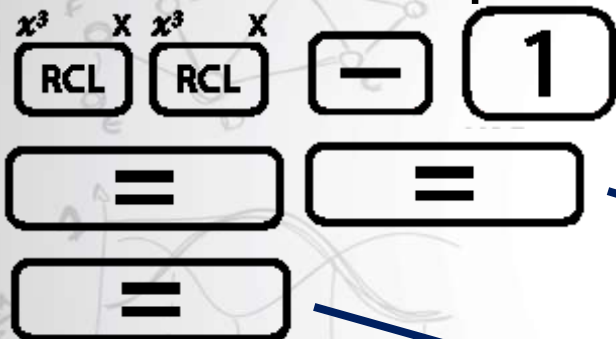
X+1_ NI DEG W-VIEW

X_Start: 0.
X_Step: 1.



And what about shifting the graph down?

- Press **ON/C**
- Leave X as is, so press **=**
- In function 2, press **ON/C**



X_ NI DEG W-VIEW

X+1_ NI DEG W-VIEW

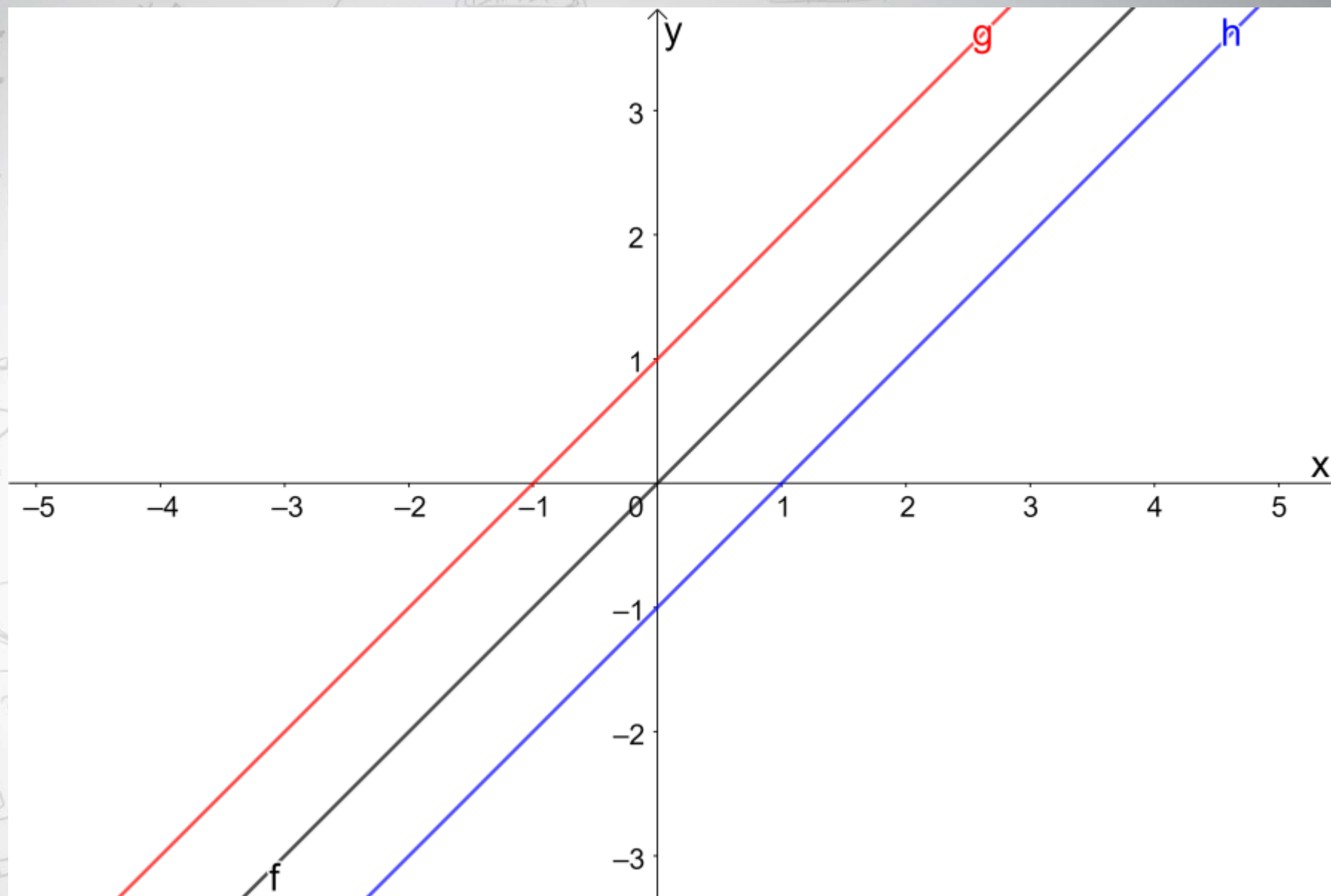
Function2? NI DEG W-VIEW

X-1_ NI DEG W-VIEW

X_Start: 0.
X_Step: 1.

X	ANS1	ANS2
0	0	-1
1	1	0
2	2	1

So
what
have we
learnt?



Thank you for your valuable time!

Free worksheets and simulator:

www.mathsatsharp.co.za

