7-9: REMOTE MATHS

EDITION 3

NUMBER AND ALGEBRA

Mathematical language: Parameter, coefficient, operation, transformation, equation, pronumeral, parallel, perpendicular, linear graph.

TASK 1: FOUR FOURS

Write the whole numbers from 0 – 20 as calculations, each using exactly four of the number 4 and as many (as required) of the operations:

+ - × ÷ (and brackets)

- Enabling prompt: 16 = 4+ 4+ 4 + 4
- You wish to draw a table and summarise your results as follows:

Number	0 =	1 =	2 =	16 =	etc
Solution				4 + 4 + 4 +4	

- Six of the whole numbers from 0 → 20 cannot be done. Which numbers are they?
- Extending prompt: Can you find an additional mathematical operation that will also make the remaining 6 numbers possible?

TASK 2: EXPLORING LINEAR GRAPHS

- Materials: Graph paper, pen, pencil ruler
- Using graph paper, graph the following rules on the same set of Cartesian axes

$y = x + 2$	$y = 2x + 2$	$y = 3x + 2$	$y = \frac{1}{2}x + 2$	$y = -2x + 2$

- Which number in the rule is changing?
- What effect does changing this number in the rule have on the graph?
- Using a new sheet of graph paper, graph the following rules on the same set of Cartesian axes

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

- Which number in the rule is changing?
- What effect does changing this number in the rule have on the graph?

TASK 3: EXPLORING LINEAR GRAPHS - USING GEOGEBRA

Download and install GeoGebra Classic 6 by visiting: https://www.geogebra.org/download

This dynamic applet is designed to help you understand how linear graphs can be transformed. One way of writing a linear equation is in the standard form: $y = mx + c$. But what do all those pronumerals do?

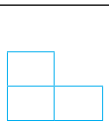
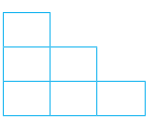
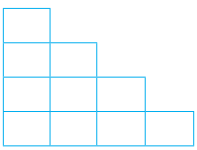
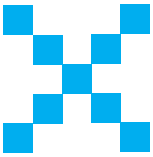
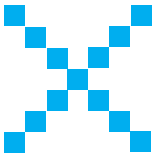
- Open a new GeoGebra Graphing file. In the equation field, type in $y = mx + c$
- Using the sliders, explore what the parameters 'm' and 'c' do to a linear graph
  - What does the coefficient of x (m) control? What does the parameter 'c' control?

TASK 4: GEOGEBRA - PARALLEL AND PERPENDICULAR LINEAR GRAPHS

- Adding to your file from Task 3, enter a new equation: $y = ax + b$
  - Keep the coefficient of x the same in both equations but change the other parameter. What do you notice?
  - Keep the constant parameter (c and b) the same in both equations but change the coefficient of x. What do you notice?
- Can you create lines that are perpendicular?
- Can you create a few different perpendicular lines?
  - What do you notice about the parameters in perpendicular lines?

TASK 5: WHAT'S THE RULE? *Sourced from* www.visualpatterns.org

- Look for the pattern and find the rule for each of the following. How will you know how many shapes will be in the nth image?
- Supporting tasks: Explore more patterns at www.visualpatterns.org

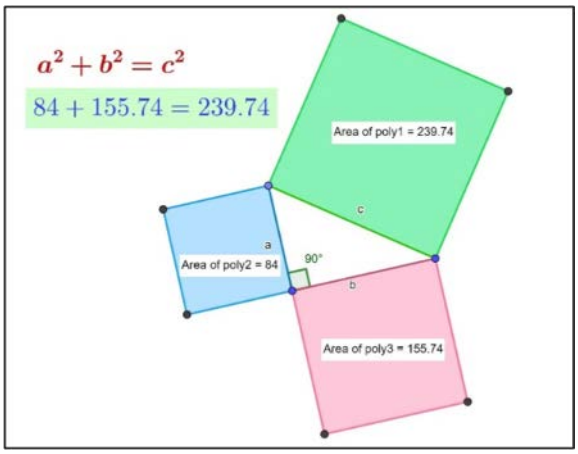
1	2	3	*n*
			
			

MEASUREMENT AND GEOMETRY

Mathematical language: Möbius Strip, Pentomino, hypotenuse, polygon, variables, volume, surface area.

TASK 1: GEOGEBRA – PYTHAGORAS' THEOREM

Your goal is to create a dynamic Pythagoras' Theorem. Use the picture here as a guide to what you are aiming for. You should be able to move the triangle's vertices to change the size and orientation of the triangle, and in doing so, the squares and formula should adjust accordingly. The steps below will be a guide but will not tell you exactly how to create this. You are encouraged to play around with GeoGebra and figure it out for yourself – it's the best way to learn! If you are really stuck, ask your teacher



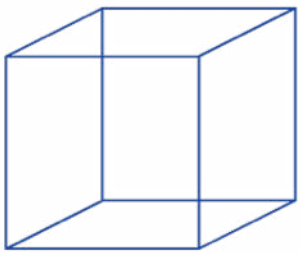
- **GeoGebra tip:** you can hide objects from view without deleting them.
- Open a new GeoGebra file and hange to the Geometry Perspective
- Using segments, perpendicular lines, and angles, make a right-angled triangle with the 90° angle clearly shown
- Name one of the shorter sides *a*, the other *b*, and the hypotenuse *c*
- Create 3 squares using the 'Regular Polygon' tool, with one of their sides being *a*, *b*, and *c* respectively (You can change the colours of the squares if you wish)
- Using the 'Area' tool, label the squares with the value of area
- Create an equation that shows that the area of the square created with side *a*, added to the area of the square created with side *b*, equals the area of the square created with side *c*
- Summarise this in an algebraic equation featuring variables *a*, *b* and *c*.

Extending prompt: Can you create the same interactive graphic without using the 'Regular Polygon' tool? Some handy tools you may consider using are the 'Perpendicular Line' tool, and the 'Circle' tool.

TASK2: ALWAYS/SOMETIMES/NEVER

Is the volume of a cube *Always/Sometimes/Never* less than its surface area?

- Explain your thinking.
- Rephrase the statement so that it is either always or never true.



EDITION 3: MEASUREMENT AND GEOMETRY (CONT.)

TASK 3: PENTOMINOS

Materials: 5 square tiles (or cut outs provided on the top of grid paper downloadable PDF), Grid paper (provided as downloadable pdf), pencil

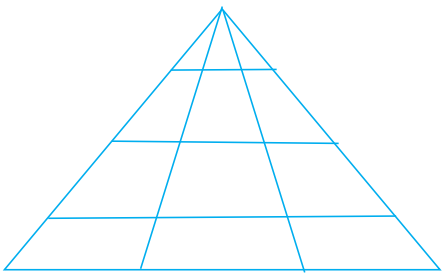
Instructions:

- A Pentomino contains five squares. Each square must share a full side with at least one other square. Example:

- How many possible ways are there to arrange five square tiles into a pentomino?
- As you find each Pentomino draw its outline on the grid paper. Download Grid paper.
- Can you find all 12 shapes? *Note*: Check for flips, turns and rotations - is it really a new shape?
- **Extending prompt:** If you find all 12 shapes cut them out and try to arrange them into a 6 x 10 rectangle. Now try the app PentoMind.

TASK 4: TRIANGLES

- How many triangles can you find in this picture? Challenge yourself.



MATHS APP OF THE WEEK: PENTOMIND

The puzzle consists of a rectangular checkerboard and twelve pieces called pentominoes. These pieces represent all the possible ways to arrange five-unit squares together so that their edges align. Your objective is to cover the board using the pentominoes.

iOS: https://apps.apple.com/au/app/pentomind-pentomino-puzzles/id320952194

Cost: $1.49

Look out for more tasks next week!