



Student Name SOLUTIONS

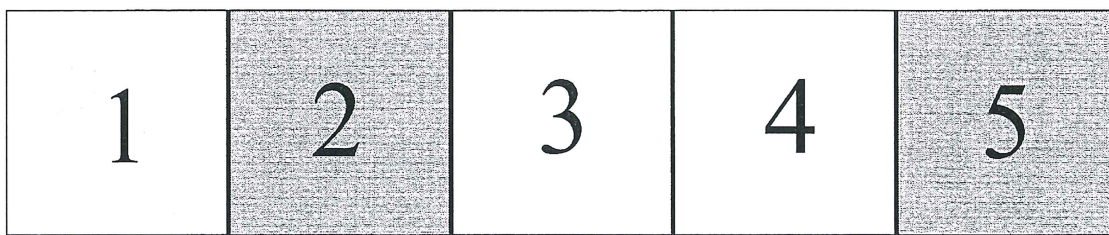
Eastern Goldfields College

Mathematics *Methods*

Investigation 1 Shading Squares Part A

There are two parts to this investigation. Part A is a take-home assignment, of which you have six days to complete. You will be awarded 0, 1 or 2 marks for Part A by your teacher prior to them going through the answers to Part A in class on *Tuesday 10th March*.

Part B is an in-class investigation which is worth 96% of your final mark for this assessment. You will be allowed to use your Part A while completing the validation on *Thursday 12th March*.



Two-fifths ($\frac{2}{5}$) of this shape has been shaded.

1. How many different ways can $\frac{2}{5}$ of this shape be shaded?

List the possibilities.

(Hint: let the squares be 1, 2, 3, 4 and 5, therefore the shading of the shape above could be coded as 2, 5).

1,2 1,3 1,4 1,5 2,3 2,4 2,5 3,4 3,5 4,5

2. Complete the table below for $\frac{2}{n}$ of a shape. (Note: you completed this for homework and one of them is done for you)

n	Possible ways of shading shape	Total number of ways (S) of shading $\frac{2}{n}$ of the shape
2	1,2	1
3	1,2 1,3 2,3	3
4	1,2 1,3 1,4 2,3 2,4 3,4	6
5	1,2 1,3 1,4 1,5 2,3 2,4 2,5 3,4 3,5 4,5	10
6	1,2 1,3 1,4 1,5 1,6 2,3 2,4 2,5 2,6 3,4 3,5 3,6 4,5 4,6 5,6	15

(Remember to do it systematically)

3. Write a rule for S in terms of n, ie, $S(n) = ?$ $\frac{1}{2}n(n-1)$ or $\frac{1}{2}n^2 - \frac{1}{2}n$
4. Complete the table below using your answers above from the table for $\frac{2}{n}$ and calculating the indicated difference patterns.

n	S(n)	1 st Diff	2 nd Diff
2	1		
3	3	2	
4	6	3	1
5	10	4	1
6	15	5	1

What type of function is S(n)? quadratic - constant second difference pattern

5. Complete the table below for the general quadratic $y = ax^2 + bx + c$

x	y	1 st Diff		2 nd Diff	
2	$4a + 2b + c$	$5a + b$	$7a + b$	$2a$	
3	$9a + 3b + c$				
4	$16a + 4b + c$			$2a$	
5	$25a + 5b + c$			$2a$	
6	$36a + 6b + c$	$11a + b$			

6. Compare your tables from questions 4 and 5 and write down a system of three equations to solve for variables a, b and c

$$\begin{aligned} 4a + 2b + c &= 1 \\ 5a + b &= 2 \\ 2a &= 1 \end{aligned}$$

7. Solve these equations

$$\begin{aligned} a &= \frac{1}{2} \\ 5 \cdot \frac{1}{2} + b &= 2 \\ b &= -\frac{1}{2} \\ 4 \cdot \frac{1}{2} + 2 \cdot -\frac{1}{2} + c &= 1 \\ 2 - 1 + c &= 1 \\ c &= 0 \end{aligned}$$

Make sure you know how to solve simultaneous equations on CAS calc

Main

Keyboard

2D, calc

{  (hit twice for 3 equations)

Have calculator in standard for fraction results.

8. Use these values of a, b and c to write a quadratic rule for S(n):

$$S(n) = an^2 + bn + c$$

$$= \frac{1}{2}n^2 - \frac{1}{2}n$$

9. Factorise your rule from question 8.

$$\frac{1}{2}n(n-1)$$

← Make sure you know how to factorise on CAS.

Main
Action
Transformation
Factor

10. Compare this rule with the rule you found via another method in question 3.

Same.

* Anything you can't understand make sure to see Miss Palmer
Wednesday between 8-30 and 12 noon *