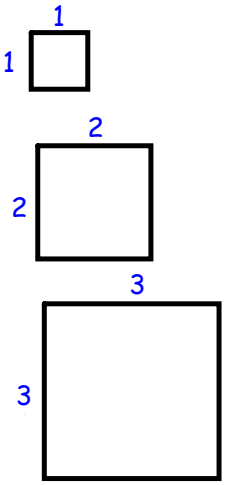
3.7 First Differences (Recognizing Linear vs. Non-Linear Relations)

3.7.1: First Differences

Perimeter

Problem 1

A. Jody works at a factory that produces square tiles for bathrooms and kitchens. She helps determine shipping costs by calculating the perimeter of each tile.



i) **Calculate** the perimeter and record your answers in the Perimeter column of the table.

Side Length (cm)	Perimeter (cm)	First Differences
1	4	
2	8	8 − 4 = 4
3	12	12 − 8 = 4
4	16	16 − 12 = 4
5	20	20 − 16 = 4

ii) **Describe** what happens to the perimeter of each tile when the side length increases by one centimetre. it goes up by 4

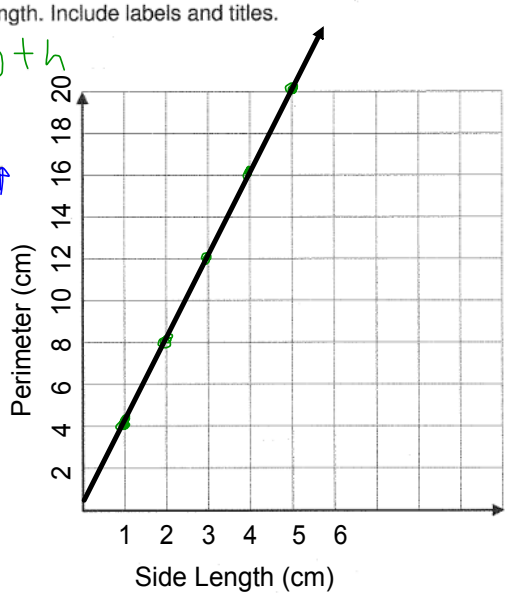
iii) **Construct** a graph of the perimeter vs. the side length. Include labels and titles.

a) Which variable is the independent variable? side length

b) Which variable is the dependent variable? perimeter

c) Use the graph to describe the relationship between the perimeter and side length of a tile. as side length ↑ perimeter ↑

d) Describe the shape of the graph. → straight line (linear)



iv) **Calculate** the first differences in the First Differences column of the table. What do you notice about the first differences?

☆ Found by subtracting consecutive numbers in the second column

v) **Summarize** your observations.

a) When the side length increases by one centimetre, the perimeter increases by 4.

b) The plotted points suggest a... linear relationship

c) The first differences are... the same

Hand In: 1. Height vs Arm Span Graph

2. Little Assignment

Tomorrow: Review (1 Day!)

Wednesday: TEST

Example 2: page 79 from Blue Workbook.

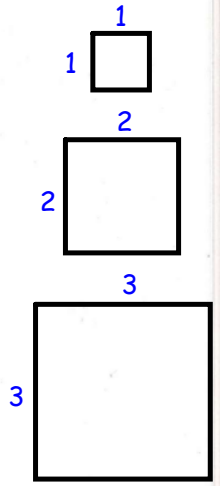
3.7.1: First Differences (continued)

$A = l \cdot w$

C. Raj, another employee at the factory, also works with the tiles. He helps to determine the shipping costs by calculating the area of each tile.

i) **Calculate** the area and record your answers in the Area column of the table.

Length of sides (cm)	Area (cm^2)	First Differences
1	1	
2	4	4 − 1 = 3
3	9	9 − 4 = 5
4	16	16 − 9 = 7
5	25	25 − 16 = 9



ii) **Describe** what happens to the area of each tile when the side length of a tile increases by one centimetre. It increases by a changing amount

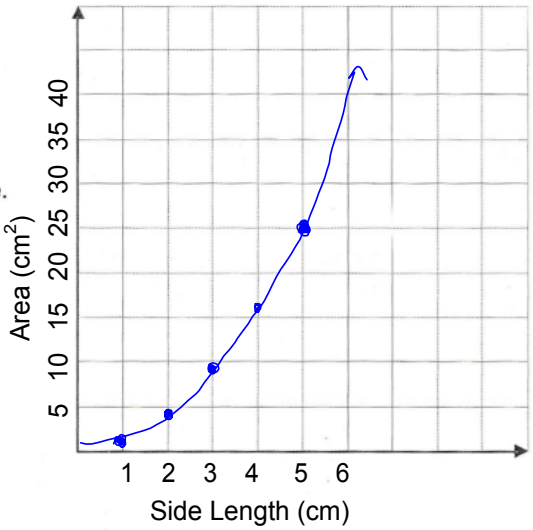
iii) **Construct** a graph of the area vs. the length of the sides of the tiles. Include labels and titles.

a) Which variable is the independent variable? side length

b) Which variable is the dependent variable? area

c) Use the graph to describe the relationship between the area and the side length of the tile. as side length ↑ area ↑

d) Describe the shape of the graph. non-linear curved



iv) **Calculate** the first differences in the First Differences column of the table. What do you notice about the first differences? NOT SAME

v) **Summarize** your observations.

a) When the side length increases by one centimetre, the area increases by a changing amount

b) The plotted points suggest a... non-linear relationship

c) The first differences are... NOT the SAME

Ex. 3: Linear or Non-linear?

Linear – first differences are THE SAME

Non Linear – first differences are NOT THE SAME

a)

x	y
0	2
1	5
2	8
3	11
4	14

$\rightarrow 5-2=3$
$\rightarrow 8-5=3$
$\rightarrow 11-8=3$
$\rightarrow 14-11=3$

Linear

b)

x	y
-1	2
0	1
1	2
2	5
3	10

$\rightarrow 1-2=-1$
$\rightarrow 2-1=1$
$\rightarrow 5-2=3$
$\rightarrow 10-5=10$

Non-linear

c)

x	y
0	500
1	450
2	400
3	350
4	300

$\rightarrow -50$
$\rightarrow -50$
$\rightarrow -50$
$\rightarrow -50$

Linear

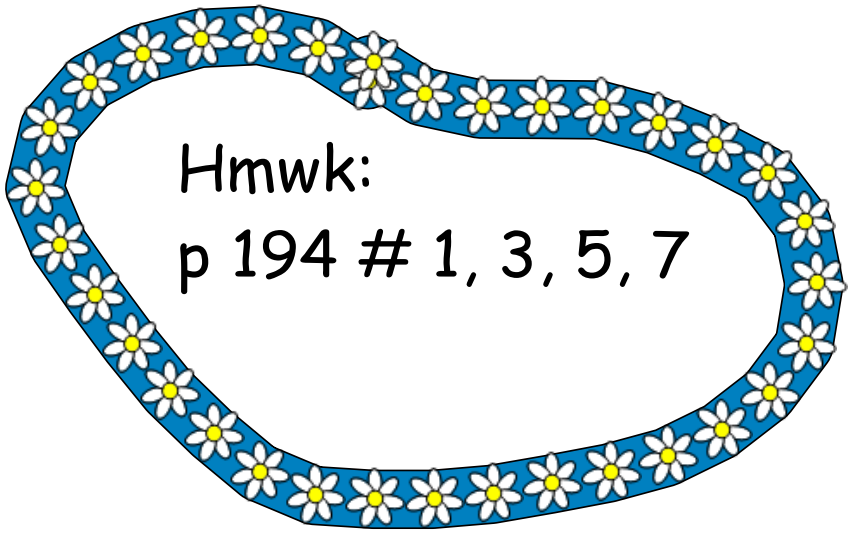
d)

x	y
0	10
2	16
4	22
6	28
8	34

$\rightarrow 16-10=6$
$\rightarrow 22-16=6$
$\rightarrow 28-22=6$
$\rightarrow 34-28=6$

Linear

Hmwk:
p 194 # 1, 3, 5, 7


Hmwk:
p 194 # 1, 3, 5, 7