

Linear Relations and First Differences

MFM1P

Problem 1

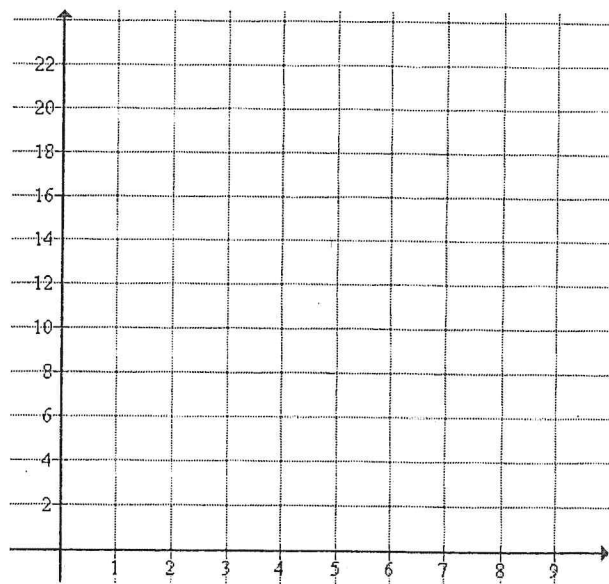
A. Jody works at a factory that produces square tiles for bathrooms and kitchens. She helps determine shipping costs by calculating the perimeter of each tile.

- i) Calculate the perimeter and record your answers in the Perimeter column of the table.
- ii) Describe what happens to the perimeter of each tile when the side length increases by one centimetre.

Side Length (cm)	Perimeter (cm)	First Differences
1		
2		
3		
4		
5		

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

- a) Which variable is the independent variable?
- b) Which variable is the dependent variable?
- c) Use the graph to describe the relationship between the side length and the perimeter of a tile.
- d) Describe the shape of the graph.



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

- v) Summarize your observations.
 - a) When the side length increases by one centimetre, the perimeter increases by _____.
 - b) The plotted points suggest a _____ relationship.
 - c) The first differences are _____.

B. Jody is paid \$8.50/hour to calculate perimeters.

i) Calculate her pay and record your answers in the Pay column of the table.

Number of Hours	Pay (\$)	First Differences
1		
2		
3		
4		
5		

ii) Describe what happens to her pay when the number of hours she works increases by one hour.

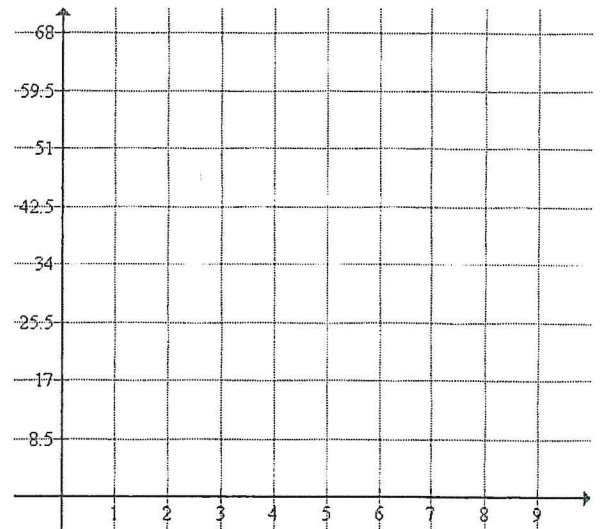
iii) Construct a graph of her pay vs. the number of hours she works. Include labels and titles.

a) Which variable is the independent variable?

b) Which variable is the dependent variable?

c) Use the graph to describe the relationship between her pay and the number of hours she works.

d) Describe the shape of the graph.



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

v) Summarize your observations.

a) When the number of hours worked increases by one, the pay increases by _____.

b) The plotted points suggest a _____ relationship.

c) The first differences are _____.

Linear Relations and First Differences

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.

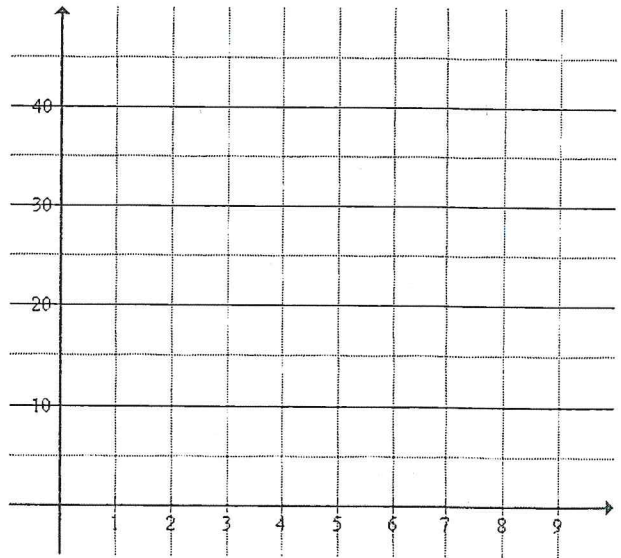
i) Calculate the area and record your answers in the Area column of the table.

Length of sides (cm)	Area (cm ²)	
1		First Differences
2		
3		
4		
5		

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

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?
- b) Which variable is the dependent variable?
- c) Use the graph to describe the relationship between the area and the side length of the tile.
- d) Describe the shape of the graph.



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

v) Summarize your observations.

- a) When the side length increases by one centimetre, the area increases by _____.
- b) The plotted points suggest a _____ relationship.
- c) The first differences are _____.

Summary:

Given a table of values, if you want to see if the relation is linear or non-linear, what must you calculate?

If the first differences are equal, the relation is a _____ relationship.

If the first differences are not equal, the relation is a _____ relationship.

Finding First Differences

Determine if the following relations are linear or non-linear.

x	y	First Differences
-6	6	
-3	3	
0	0	
3	-3	
6	-6	
9	-9	

Linear Non-Linear

x	y	First Differences
0	1	
0.25	2	
0.5	4	
0.75	8	
1	16	
1.25	32	

Linear Non-Linear