

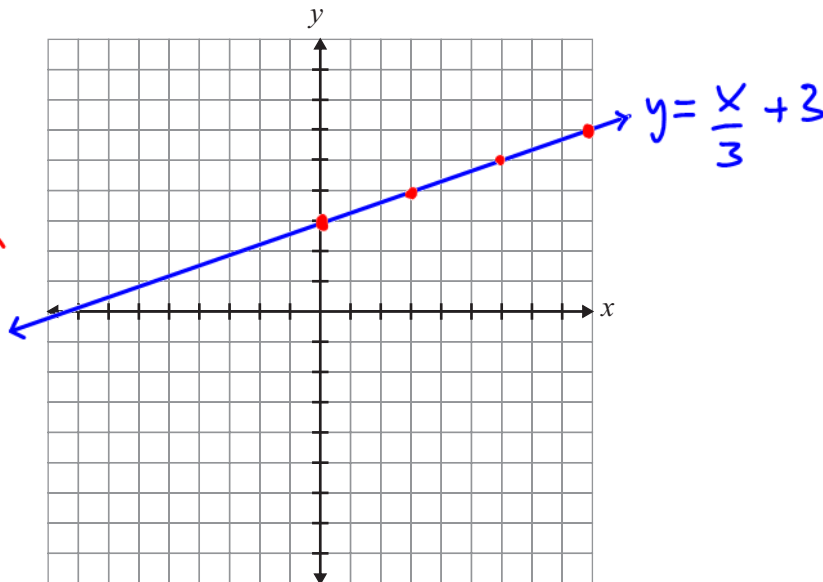
22 Is It a Line?

Determine whether each of the relations in the chart below is linear or non-linear.

Justify your answers. You may use the grid if you wish.

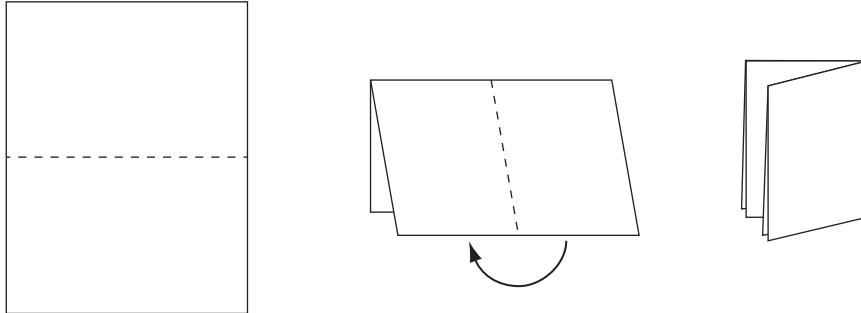
| | |
|--|---|
| $-2x + 6y = 18$ | $y = 4x^2 + 3$ |
| Circle one: Linear Non-linear | Circle one: Linear Non-linear |
| <p>Justification</p> $-2x + 6y = 18$ $6y = 2x + 18$ $\cancel{6}y = \frac{2x}{\cancel{6}} + \frac{18}{\cancel{6}}$ $y = \frac{x}{3} + 3$ | <p>Justification</p> $y = 4x^2 + 3$ <p>It is non linear because it is not in the form of $y = mx + b$, there is an exponent on the x which makes it non-linear</p> |

It is linear because it is in the form of $y = mx + b$ which is the form of an equation of a line



10 Folding Time

A piece of paper is folded in half, which results in two layers of paper. Then the paper is folded in half again to make four layers, and so on.



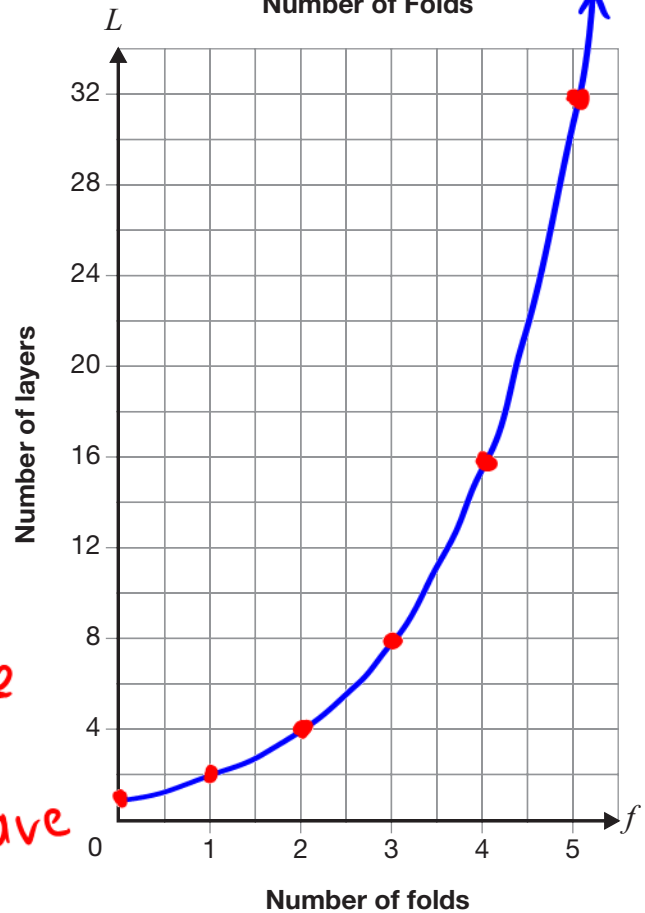
The number of layers and the number of folds are recorded in the chart.

| Number of folds | Number of layers |
|-----------------|------------------|
| 0 | 1 |
| 1 | 2 |
| 2 | 4 |
| 3 | 8 |
| 4 | 16 |

+1
+1
+1
+1

+1
+2
+4
+8

Number of Layers vs. Number of Folds



Determine whether this relationship is linear or non-linear.

Circle one: Linear **Non-linear**

Justify your answer.

You have the option of using the grid if you wish.

1. the first differences are not the same
2. the graph does not have a constant rate nor does it create a straight line

10 Fabric Purchase

Two companies sell fabric online. The total cost, C , in dollars, for n metres of fabric for each company is given below.

- Fabric Fun: $C = 4.25n + 3.00$
- Sew-a-Lot: $C = 6.50n$

Complete the chart below by determining the initial value, rate of change and type of variation for the relationship for each company.

Justify the type of variation you have selected.

| Fabric Fun | Sew-a-Lot |
|--|---|
| Initial value: <u>3.00</u> Rate of change: <u>4.25</u> | Initial value: <u>0</u> Rate of change: <u>6.50</u> |
| Type of variation Circle one: <input checked="" type="radio"/> Partial <input type="radio"/> Direct Justification partial variation because there is a fixed cost (3.00) and in the form of $y = mx + b$ | Type of variation Circle one: <input type="radio"/> Partial <input checked="" type="radio"/> Direct Justification direct variation because there is no fixed cost and in the form of $y = mx$ |

1.5 In Hot Water

Demetrius's science class is performing an experiment. Demetrius fills a beaker with **room temperature** water. He slowly **heats** the water over a source of constant heat and records the **water temperature** at **different times** in the table below.



| Time elapsed, x (min) | Water temperature, y (°C) | First differences |
|----------------------------|--------------------------------|-------------------|
| 2 | 30 | |
| 4 | 43 | 13 |
| 6 | 54 | 11 |
| 8 | 66 | 12 |
| 10 | 77 | 11 |

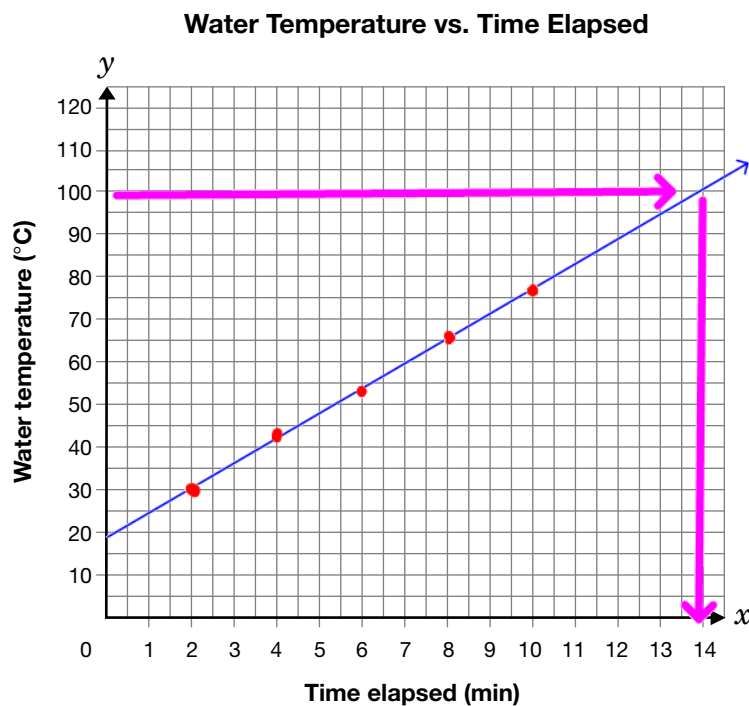
- a) i) Complete the **first differences** column in the table of values above.
- ii) Is the **relationship** between the **water temperature** and the **time elapsed** linear or non-linear?

Check one: linear or non-linear

Give reasons for your answer.

first differences are not the same

- b) Graph the **data** from question a) on the grid below.
Draw a **line of best fit**.



- c) Water **boils** when it reaches a temperature of **100 °C**.

Predict **how long** it will take the water in Demetrius's beaker to **boil**.

Justify your answer.

At 100°C, the time elapsed is 14 minutes

- d) Suppose that Demetrius repeats the above experiment but fills his beaker with **cold** water taken from the refrigerator instead of **room temperature** water.

Compare **the line of best fit** for the data from this **new** experiment with the line in question b).

The new line for cold water will have the same slope (be parallel to) the first line, but will be below the first line because the initial temperature (vertical intercept) is below