

## 6.2 Linear Relations

Ex 2.

$$\begin{aligned} a) & \begin{cases} -9 & -10 \\ -7 & -5 \\ -5 & 0 \\ -3 & 5 \\ -1 & 10 \end{cases} \begin{matrix} +5 \\ +5 \\ +5 \\ +5 \end{matrix} \\ & \begin{matrix} +2 \\ +2 \\ +2 \\ +2 \end{matrix} \end{aligned}$$

Linear Relation  
- consistent change

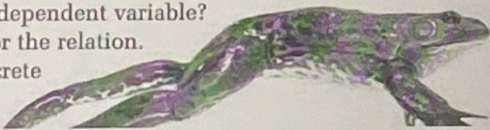
b) Non-linear  $\rightarrow$  it does not form a straight line when graphed.

c)  $m - 17 = 0.8n$   
both variables have a degree 1, therefore the relation is linear.

### Example 1 Describe a Relation in a Variety of Ways

The Canadian National Frog Jumping Championship is part of Les Folies Grenouilles. This annual festival is in St-Pierre-Jolys, MB. The first champion, a frog named Georges, jumped a distance of just over 2 m in a single leap. Assume that Georges could maintain a distance of 2 m on every jump and that the total distance travelled from the start is measured after every jump. Consider the relationship between the number of jumps Georges takes and the total distance the frog travels.

- Identify the relationship as linear or a non-linear. Explain how you know. *linear  $\rightarrow$  consistent jump lengths.*
- Create a variable to represent each quantity in the relation. Which is the dependent variable? Which is the independent variable? *d - distance (dependent) j - jumps (independent)*
- Create a table of values for this relation. What are appropriate values for the independent variable?
- Create a graph for the relation. Are the data discrete or continuous?



| j | d (m) |
|---|-------|
| 0 | 0     |
| 1 | 2     |
| 2 | 4     |
| 3 | 6     |
| 4 | 8     |

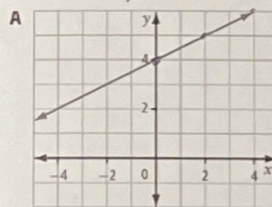
d) Discrete data  
- cannot do  $\frac{1}{2}$  jumps

### Example 3 Match Representations of a Linear Relation

Match each linear relation with possible representations in the selections that are given. Justify your choices.

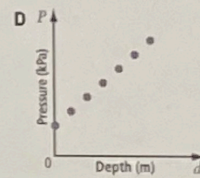
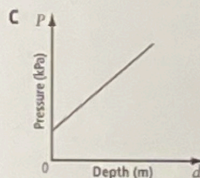
a) The pressure,  $P$ , that a scuba diver experiences under water increases at a constant rate relative to the diver's depth,  $d$ , below the surface. *C  $\rightarrow$  continuous data situation*

b)  $y = \frac{1}{2}x + 4$  *A, E (describes in words)*



B

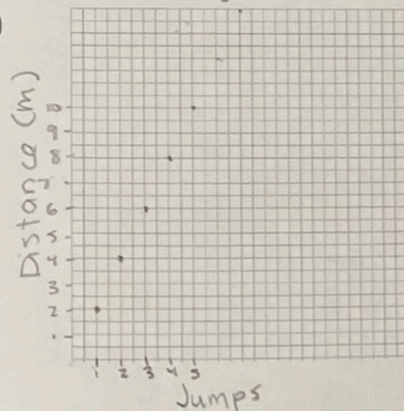
| x | y  |
|---|----|
| 0 | 4  |
| 1 | 8  |
| 2 | 12 |
| 3 | 16 |



- One number is half another number increased by four.
- $(0, 101), (25, 176), (50, 251), (75, 326), (100, 401), (125, 476)$

Georges' Jumps.

Ex. 1 d)



Discrete:  
Isolated to specific data points.  
(cannot have  $\frac{1}{2}$  values)

Continuous:  
All data points between given can be included

### Example 2 Determine Whether a Relation Is Linear or Non-linear

Consider each relation. Determine whether the relation is linear. Explain why or why not.

- the relation described by  $\{ \dots, (-9, -10), (-7, -5), (-5, 0), (-3, 5), (-1, 10), \dots \}$
- The graph shows the relationship between the amount,  $A$ , of a radioactive isotope present and the age of a rock sample over time,  $t$ , in years.
- the relation described by the equation  $m - 17 = 0.8n$

