**RATE OF CHANGE (ROC)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| The rate at which something is changing. The ROC is often indicated by the **slope** of a graph.ABWe can determine an average rate of change using a table or graph

|  |  |
| --- | --- |
| **Independent Variable (x)** | **Dependent Variable (y)** |
| x1 | y1 |
| x2 | y2 |

 **Table**: **Graph**: POINT A 🡪POINT B 🡪**Average ROC (slope) =** $\frac{rise}{run}=\frac{y\_{2}-y\_{1}}{x\_{2}-x\_{1}}$  |

**CALCULATING AND INTERPRETING RATES OF CHANGE**

**EXAMPLE 1: Calculate** the average rate of change between each pair of points. **Explain** what the rate of change means.

1. ******Altitude of an Airplane **b)**

|  |  |
| --- | --- |
| **Time (min)** | **Airplane Height (m)** |
| 0 | 2000 |
| 4 | 1400 |

**EXAMPLE 2:** The graph below represents the relationship between the number of hours worked and the weekly salary an employee earns.

|  |  |
| --- | --- |
| **Calculate** both rates of pay from the graph. |  |

**COMPARING RATES OF CHANGE**

**EXAMPLE 3:** The distance required to stop a car depends on the speed at which the car is travelling. Use the tables below (showing the reaction distance and breaking distance needed to stop a car on dry pavement for given speed) to answer the following.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Speed (km/h)** | **Reaction Distance (m)** | $$\frac{change in distance}{change in speed}$$ |  | **Speed (km/h)** | **Stopping Distance (m)** | $$\frac{change in distance}{change in speed}$$ |
| 0 | 0 | $$\frac{2-0}{10-0}=\frac{2}{10}=0.2$$ |  | 0 | 0.0 | $$\frac{0.5-0}{10-0}=\frac{0.5}{10}=0.05$$ |
| 10 | 2 |  |  | 10 | 0.5 |  |
| 20 | 4 |  |  | 20 | 2.0 |  |
| 30 | 6 |  |  | 30 | 4.5 |  |
| 40 | 8 |  |  | 40 | 8.0 |  |
| 50 | 10 |  |  | 50 | 12.5 |  |

1. Calculate the average rate of change between consecutive points in each table. Describe the rates of change revealed in each table.

The rates of change are \_\_\_\_\_\_\_\_\_ at 0.2. The rates of change are **\_\_\_\_\_\_\_\_\_\_\_\_\_**.
The reaction distance increases by \_\_\_\_\_\_ m for 1 km/h

1. **Graph** the data in the tables. **Describe** how the graph reflects the rates of change across the data.

|  |  |
| --- | --- |
| 108642Reaction Distance10 20 30 40 50 Speed | 108642Stopping Distance10 20 30 40 50 Speed |

**EXAMPLE 4**The table below shows the change in height of a tomato plant from germination until the tomato ripens.

|  |  |
| --- | --- |
| **Time (weeks)** | **Height** **(cm)** |
| 0 | 0 |
| 2 | 5 |
| 4 | 10 |
| 6 | 20 |
| 8 | 40 |
| 10 | 58 |
| 12 | 75 |
| 14 | 86 |
| 16 | 90 |
| 18 | 90 |

1. Graph the data then determine when the **rate of change** (slope) in the height is:

i) **Zero**: ii) **Constant**: iii) **Changing**:

1. When is the rate of change in height the greatest?
2. Describe the growth of the plant.



**EXAMPLE 5:** Conservationists introduce a small number of trout into a pond. The graph below illustrates the population growth over many years.

a) Is the rate of change of the population constant? Explain how you reasoning.

b) When is the population growing the slowest and fastest? Why might the population growth follow this pattern?