

Calculations

You must be able to do the following calculations:

1. Averages

To calculate the average: Add the sets of numbers together and divide by the amount of numbers added together.

Example:

The average of 2, 4, 6 en 8

$$2+4+6+8=20$$

$$20 \div 4 = 5 \text{ is the average}$$

2. Percentage increase / increase or decrease / decrease

% increase or decrease = $\frac{\text{difference}}{\text{first number}} \times 100$ (You have to know the formula and write it in any problem)

Example 1:

Pieter is a macadamia nut farmer. In 2018 het Pieter planted 200 trees. Since then he planted more trees and the amount increased to 350.

Calculate the percentage increase in the amount of trees.

$$\begin{aligned}\% \text{ increase} &= \frac{\text{difference}}{\text{first number}} \times 100 \\ &= \frac{150}{200} \times 100 \\ &= 75\% \text{ increase}\end{aligned}$$

Example 2:

Nadine weighed 55 kg when se was 16 years old. At 21 years of age she weighs 49 kg.

What is the percentage decrease in her weight?

$$\begin{aligned}\% \text{ decrease} &= \frac{\text{difference}}{\text{first number}} \times 100 \\ &= \frac{6}{55} \times 100 \\ &= 11\% \text{ decrease}\end{aligned}$$

Example 3:

A table showing the mass of the different recycled materials in 2009 and 2015

Type of material	Mass (in million tons)	
	2009	2015
Paper	2,5	3,0
Glass	1,0	1,7
Plastic	0,4	0,6
Wood	0,8	0,9

Calculate the percentage increase in the amount of recycled materials from 2009 to 2015.

Answer

$$\begin{aligned}\% \text{ increase} &= \frac{\text{difference}}{\text{first number}} \times 100 \\ &= \frac{3,0-2,5}{2,5} \times 100 \quad \text{OR} \quad \frac{0,5}{2,5} \times 100 \\ &= 20\% \text{ increase} \\ (2)\end{aligned}$$

3. Ratios

Numbers must be in their simplest forms.

Remember the order of the ratio was given in the question.

Example 1

14 boys en 16 girls

7 : 8

Example 2: Morgan has 9 cows, 3 dogs en 27 cats on her farm. What is the ratio of animals on the farm?

3 : 1 : 9

4. Trends

A one variable increases or decreases, the other variable will also increase / decrease / show no change.

****DO NOT use directly proportional in Life Sciences!!!**

Year	Total amount of solid waste (in million ton)	Amount of renewable wastes in solid waste (in million ton)
2003	1,49	0,78
2004	1,59	0,82
2005	1,80	1,20
2006	1,93	1,30

Describe the general trend in the total amount of waste produced and the amount of renewable waste disposed of from 2003 to 2006. (5)

Answer

The total amount of solid wastes disposed increases ✓ from 1,49 to 1,93 ✓ in 2003 to 2006 and the amount of renewable wastes increases ✓ from 0,78 to 1,30 ✓ in 2003 to 2006. ✓ (5)

You can use words like increase, decrease or remain constant.

Describe an increase or decrease by using words like: gradually, slowly or drastic.

Also use the numbers to show how in increases or decreases.

5. Relationships

As the one variable increases or decreases, the other variable will increase or decrease.

**** DO NOT use words like directly or indirectly proportional!!**

Amount of nitrate fertiliser added to crops (kg/hectare)	Yield of grass (100 kg/hectare)
0	8
225	14
425	18
650	20
700	20
750	19

Describe the relationship between the amount of nitrate fertilisers added and the yield of grass. (3)

Answer

As the amount of fertilisers increase ✓ there is an increase in the yield of grass ✓ up to a certain point where the yield remains constant. ✓ (3)

6. Outer surface

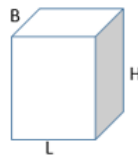
- The rate of gaseous exchange depends on the outer surface of the organism.
- The outer surface of the organism is the area that is in contact with the surrounding environment.
- Smaller organisms have a larger outer surface compared to their volume.
- Larger organisms have a smaller outer surface compared to their volume.
- Therefore, a smaller surface is exposed to atmospheric gasses for gaseous exchange.
- A transport system must be present to transport gasses away from the gaseous exchange surface to ensure the whole organism receives enough oxygen and enough carbon dioxide is transported to the gaseous exchange surface.

Volume : Outer surface

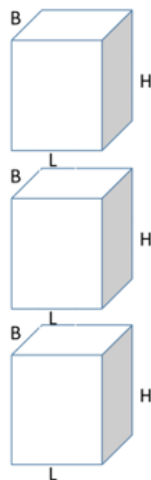
- Volume = $L \times B \times H$

- Outer surface = **H**enry **L**ikes **B**ooks

- Outer surface = $2(H \times L) + 2(B \times H) + 2(B \times L)$



Volume : Outer surface



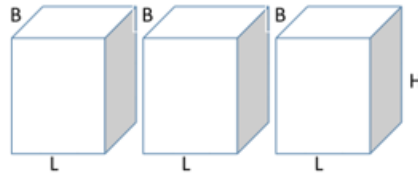
- Volume = $L \times B \times 3(H)$

- Henry Likes Books

- Outer surface = $3[2(L \times H)] + 3[2(B \times H)] + 2(L \times B)$

Volume : Outer surface

- Volume = $3(L) \times B \times H$
- Outer surface = $3[2(h \times l)] + 2(b \times h) + 3[2(l \times b)]$



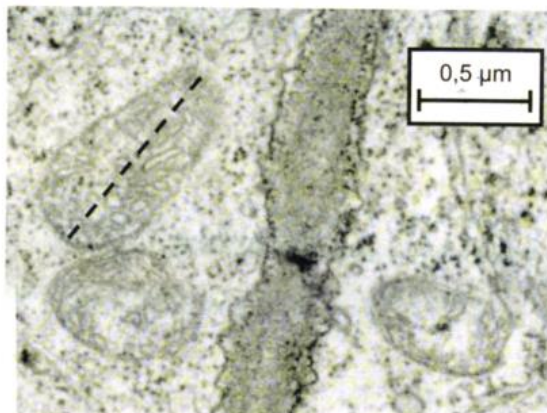
7. Magnification

A. Magnification by a normal microscope

Total magnification = ocular magnification X objective lens magnification
 = 10×40
 = $400 \times$

B. Total magnification of a cell/organelle/object as seen on a micrograph when a scale is used.

Remember: $1\,000\mu m = 1\,mm$



Micrograph of transverse section through cell organelles

Method:

- Measure the scale on the diagram with a ruler (e.g. 15mm). Therefore, each 15mm is equal to $5\mu m$
- Measure the diameter of the object (e.g. 30mm). Therefore, actual length of the object

$$= \frac{\text{measured length of object (mm)} \times \text{length on the scale } (\mu m)}{\text{Measured length of scale (mm)}}$$

$$= \frac{30mm \times 0,5\mu m}{15mm}$$

$$= 1\mu m$$

8. Averages, percentage and differences

The table below shows the amount of TB cases in a hospital between 1998 and 2002.

<u>Year</u>	<u>TB cases</u>
1998	75
1999	82
2000	95
2001	101
2002	121

A. Difference:

Calculate the difference in the amount of cases reported between 2000 and 2001.

$$\text{Difference} = 101 - 95$$

$$= 6 \text{ TB cases reported}$$

B. Average

Calculate the average amount of yearly TB cases reported from 1998 to 2002

$$= \frac{75 + 82 + 95 + 101 + 121}{5}$$

$$= 94.8 \text{ reported TB cases}$$

C. Percentage

What percentage of TB cases were reported in 2001? Show all calculations.

- Calculate total amount of TB cases: $75 + 82 + 95 + 101 + 121 = 474$
- Amount of cases in 2001 = 101
- Percentage = $\frac{101}{474} \times 100$

$$= \frac{101}{474} \times 100$$

$$= 21.3 \% \text{ TB cases}$$