# Maths skills – M0.3 Use ratios, fractions and percentages

## Teacher answers

### Quiz – Percentages: Practice calculations

Learners may be tested on their ability to:

• Calculate percentage yields

• Calculate surface area to volume ratio

• Use scales for measuring

• Represent phenotypic ratios (monohybrid and dihybrid crosses)

1. Ventricular systole lasts for 0.3 s. The cardiac cycle lasts for 0.8 s. What percentage of the cardiac cycle is ventricular systole?

The part is 0.3 s

The whole is 0.8 s

$$\frac{0.3 s}{0.8 s} ×100=37.5 \%$$

So 37.5% of the cardiac cycle is ventricular systole

1. In an onion root tip squash, 200 cells were observed and each cell was assigned to a stage of the cell cycle. Here are the results:

|  |  |
| --- | --- |
| **Stage** | **Number of cells** |
| Interphase | 150 |
| Prophase | 20 |
| Metaphase | 12 |
| Anaphase | 4 |
| Telophase | 8 |
| Cytokinesis | 6 |

What percentage of cells were at each stage of the cell cycle?

Using Interphase as an example, 150 is the part, 200 is the whole.

$$\frac{150}{200}×100=75 \%$$

Interphase 75%

Prophase 10%

Metaphase 6%

Anaphase 2%

Telophase 4%

Cytokinesis 3%

1. A soil sample weighed 2.4 g. After heating at 100 0C in an oven to evaporate the water, it weighed 1.8 g. What percentage of the soil sample was water?

$$\frac{1.8}{2.4} ×100=75 \%$$

$$100-75=25 \%$$

Or you can do this another way: $\frac{2.4-1.8}{2.4}×100=25 \%$

1. Stearic acid has the formula C17H35COOH. What percentage of the atoms in stearic
acid are:

Stearic acid has 56 atoms (18 carbons, 36 hydrogens and 2 oxygens)

So, for carbon, 18 is the part, 56 is the whole.

 $\frac{18}{56} ×100=32 \%$

| (a) | carbon? | 32% |
| --- | --- | --- |
| (b) | hydrogen? | 64% |
| (c) | oxygen? | 4% |

### Quiz – Percentage yield: Practice calculations

1. In the following examples you are given the actual yield and the theoretical yield. Calculate the percentage yield.

$\frac{actual yield}{theoretical yield} x 100$

| (a) | Actual yield = 40 g | Theoretical yield = 60 g | 67% |
| --- | --- | --- | --- |
| (b) | Actual yield = 60 g | Theoretical yield = 100 g | 60% |
| (c) | Actual yield = 90 g | Theoretical yield = 130 g | 69% |
| (d) | Actual yield = 23 g | Theoretical yield = 60 g | 38% |

1. In the hydrolysis of a sample of triglycerides, the theoretical yield of fatty acids is 9.0 g. The actual yield was 7.2 g. What was the percentage yield for this synthesis?

$\frac{actual yield}{theoretical yield} x 100= \frac{7.2}{9.0} x 100=80 \%$

### Quiz – Ratio: Practice calculations

1. Calculate the surface area-to-volume ratios of the following cuboids:

a) Sum of the sides: one side = 2 x 2 = 4 cm2 There are six sides,
so 4 x 6 = 24 cm2

The volume is 2 x 2 x 2 = 8 cm3

The surface area divided by volume = $\frac{24}{8}=3$ So the ratio is 3:1

b) Two sides are 1 x 2 m, two are 2 x 4 m and two are 1 x 4 m.
So 4 m2 + 16 m2 + 8 m2 = 28 m2

 The volume is 1 x 2 x 4 = 8 m3

$\frac{28}{8}=3.5$ The ratio is 3.5:1

1. Two sides are 1 x 1 mm, and four are 1 x 8 mm. So 2 mm2 + 32 mm2 = 34 mm2

The volume is 1 x 1 x 8 = 8 mm3

Surface area divided by volume = $\frac{34}{8}=4.25$ The ratio is 4.25:1

| (a) | A cuboid with sides: 2 cm x 2 cm x 2 cm | 3:1 |
| --- | --- | --- |
| (b) | A cuboid with sides: 1 m x 2 m x 4 m | 3.5:1 |
| (c) | A cuboid with sides: 1 mm x 1 mm x 8 mm | 4.25:1 |

### Quiz – Phenotypic ratio: practice calculations

1. Plants were grown either in the light or the dark and the length of the stem was measured.

|  |  |
| --- | --- |
| **Growing conditions** | **Stem length (cm)** |
| Light | 10 |
| Dark | 25 |

1. What was the ratio of stem length, light to dark?

| $\frac{Length in the light}{Length in the dark}= \frac{10}{25}=0.4$ So the ratio is 0.4:1 |
| --- |

1. What was the ratio of stem length, dark to light?

| $\frac{Length in the dark}{Length in the light}= \frac{25}{10}=2.5$ So the ratio is 2.5:1 |
| --- |

1. The stem length experiment was repeated by growing plants under four different coloured lights:

|  |  |
| --- | --- |
| **Light used for growth** | **Stem length (cm)** |
| Blue | 25 |
| Green | 3 |
| Yellow | 10 |
| Red | 15 |

What was the ratio of blue to green to yellow to red?

| If the last in the ratio must be 1, then divide all the others by 15 (the value for the last one)For blue $\frac{25}{15}=1.7$For green $\frac{3}{15}=0.2$For yellow $\frac{10}{15}=0.67$So the answer is 1.7 : 0.2 : 0.7 :1 |
| --- |

1. Let’s say colour of naked mole rats is determined by a single gene and brown colour (B) is dominant to white colour (b). If two heterozygous (Bb) naked mole rats were mated, what is the expected ratio of brown naked mole rats to white naked mole rats?

| A standard genetic cross will give the following:

|  |  |  |
| --- | --- | --- |
|  | **B** | **b** |
| **B** | BB | Bb |
| **b** | Bb | bb |

B is dominant to b. Therefore both BB and Bb genotype will produce a brown naked mole rat phenotype, whereas bb will produce a white phenotype. So there are three browns to each white, so the ratio will be 3:1. |

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