# Maths skills – M2.3 Substitute numerical values into algebraic equations using appropriate units for physical quantities

# Maths skills – M2.4 Solve algebraic equations

Qu**iz**

1. Use the Simpson’s index of diversity for the following questions to work out which sample has   
   the higher diversity.
2. Using quadrats, samples were taken from two fields giving the following results.

|  |  |  |
| --- | --- | --- |
|  | **Number of individuals** | |
| **Plant species** | **Field A** | **Field B** |
| Daisy | 300 | 20 |
| Buttercup | 335 | 49 |
| Dandelion | 365 | 931 |
| Total | 1000 | 1000 |

Calculate Simpson’s index of diversity (D) for each field using the formula:

Field A

Field B

Which field **A** or **B** has higher diversity?

1. Two areas of embryo dunes were sampled giving the following results.

|  |  |  |
| --- | --- | --- |
|  | **Number of individuals** | |
| **Plant species** | **Area A** | **Area B** |
| Saltwort | 40 | 20 |
| Sandwort | 55 | 15 |
| Frosted orache | 30 | 75 |
| Sea rocket | 90 | 80 |
| Total | **215** | **190** |

Calculate Simpson’s index of diversity (D) for each area using the formula:

Area A

Area B

Which area **A** or **B** has higher diversity?

1. Ventilation rate is the volume of air exchanged in one minute. Breathing rate is the number of breaths per minute. Tidal volume is the volume of air exchanged in one breath.

This gives the equation:

If tidal volume is 0.5 dm3 and ventilation rate is 6 dm3 min-1, what is the breathing rate?

1. If the mean number of daisies in a quadrat 0.5 m x 0.5 m is 10, what will be the total number of daisies in a field measuring 100 m x 50 m?

1. When water flows along a tube, such as a blood capillary, the flow of liquid can either be laminar or turbulent.

This can be calculated by putting numbers into the following equation.

If the result for NR is greater than 3000 flow is turbulent, and less than 2000 flow is laminar.

The equation is:

Where

ρ = the density of the fluid (kg m-3)

= flow velocity (m s-1)

D= the diameter of the tube (m)

µ = the viscosity (kg m-1s-1)

Calculate NR for the following:

1. The velocity through an aorta of diameter 2 x 10-2 m is 0.3 m s-1.   
     
   The density of blood is 103 kg m-3.

The viscosity of blood is 4 x 10-3 kg m-1s-1

NR =

Is the flow laminar or turbulent?

1. Flow of water through a tube of diameter 4 x 10-2 m, supplying a fish tank, was found to be   
   0.5 m s-1.   
     
   The density of water is 103 kg m-3.   
     
   The viscosity of water is 10-3 kg m-1 s-1.

NR =

Is the flow laminar or turbulent?

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