Below are some example tutorials and problems from the app. Are you able to follow the tutorials and solve the problems?

TUTORIAL:
SURFACE AREA AND VOLUME LEVEL 1
Surface Area is the measure of the covering of a figure, such as a cube or a human. It is measured in square units. Volume is the measure of how much a three-dimensional figure can hold. It is measured in cubic units. These are important concepts in biology because gases and nutrients diffuse through the covering of an organism or a cell and the amount of surface area determines the rate at which substances can diffuse into and out of an organism. The volume determines how much space there is inside the organism that needs to receive the nutrients and gases from the outside. If the volume is too great, compared to the surface area, it is difficult for organisms or cells to receive sufficient nutrients and rid themselves of wastes.

The formula for surface area of a cuboid (includes a cube) is SA = 2LW + 2WH + 2HL, where L = length, W = width, and H = height.
The formula for volume of a cuboid (includes a cube) is V = L x W x H.

As an organism increases in size, its volume and surface area do not change proportionately. This means that without complex organ systems, organisms would have to remain very small, as their ability to provide gases and nutrients to their interior would be quickly limited by their much smaller surface area.

Key Terms:
Diameter
Radius
Surface Area
Volume

PRACTICE PROBLEM 1:
CALCULATING THE SURFACE AREA OF A CUBE
A cube has equal sides of 2 centimetres (cm). What is its surface area (SA)?
Remember, SA of a cube = 2LW + 2WH + 2HL

Key Term:
Surface Area

PRACTICE PROBLEM 2:
CALCULATING THE SURFACE AREA OF A RECTANGLE
A rectangle has the following measurements: width (W) = 2 cm, height (H) = 4 cm, and length (L) = 3 cm. What is its surface area (SA)?
Remember, SA of a rectangle = 2LW + 2WH + 2HL

Key Terms:
Surface Area
1. Why do you think Susan put together a team from different backgrounds to build the app, rather than just hiring a professional app developer?

2. How is maths useful to a) genetics and b) physiology?

3. How might maths be applied to other areas of biology? Think about areas like molecular biology, ecology and biomedicine.

PRACTICE PROBLEM 3:
CALCULATING THE SURFACE AREA OF A SPHERE
The diameter (D) is the distance from one point on the surface to another, through the centre.

A sphere has a diameter of 5cm. What is its surface area (SA)?
Remember, radius (r) is half the diameter, and SA of a sphere = \(4 \times \pi r^2\)

Key Term:
Diameter
Radius
Surface Area

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PROBABILITY LEVEL 1
TUTORIAL:
PROBABILITY LEVEL 1
Statistical inquiry is a study or an experiment with well defined (but random) outcomes. For example, if we toss a coin, it is certain that the outcome will be either a head or a tail. So, the outcomes are well defined, but when a coin is tossed, it is impossible to predict the final outcome, i.e. whether a specific coin toss will be a head or a tail. In this sense outcomes are random. There is a fifty-fifty chance for each head or tail outcome. Statistically, we say that the probability of getting a head (or tail) is \(\frac{1}{2}\). The number of outcomes may be a finite set or infinite.

When we have a finite number of equally likely outcomes, the probability of a single outcome \(x\) is:

\[ p(x) = \frac{1}{\text{number of outcomes}} \]

An event consists of all possible outcomes of interest. The probability of an event is the sum of probabilities of all the members of the event.

Tip: To find a probability we should be able to count the number of favorable outcomes and total number of outcomes. Even though we don’t need to, listing them helps. Level 2 will include a counting tutorial.

Vocabulary Words:
Random
Outcome
Finite
Infinite
Event

EXAMPLE 1:
CALCULATING THE PROBABILITY OF A SINGLE OUTCOME
Two coins are tossed simultaneously. The sample space contains all the possible results. Denote H for head and T for tail. Then the sample space is \(\{HH, HT, TH, TT\}\). Notice that the outcomes HT and TH are considered different outcomes.

The outcome of getting a tail on both coins is denoted by TT, which is one outcome out of four outcomes. Therefore the probability of getting a tail on both coins is \(p(TT) = \frac{1}{4}\).

PRACTICE PROBLEM:
Two coins are tossed simultaneously. The sample space is \(\{HH, HT, TH, TT\}\) as shown below.

a) What is the probability of getting H on the first coin and T on the second coin (HT)?

b) What is the probability of getting one H and one T in any order?