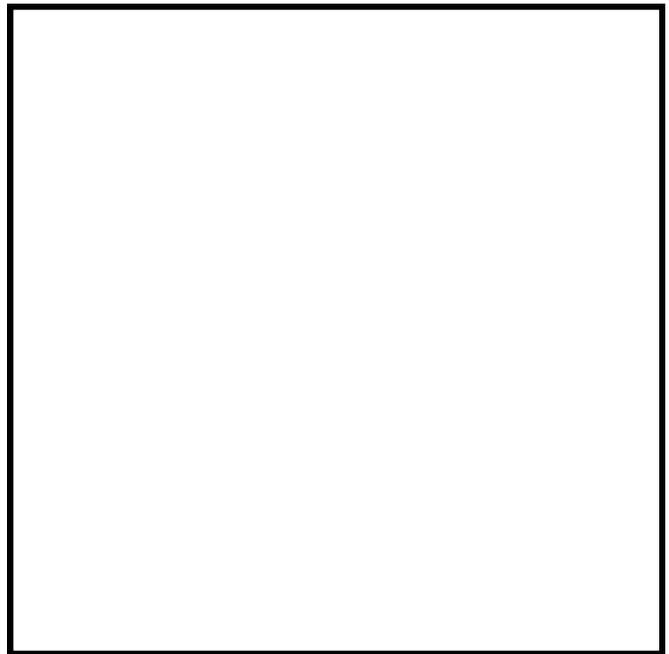
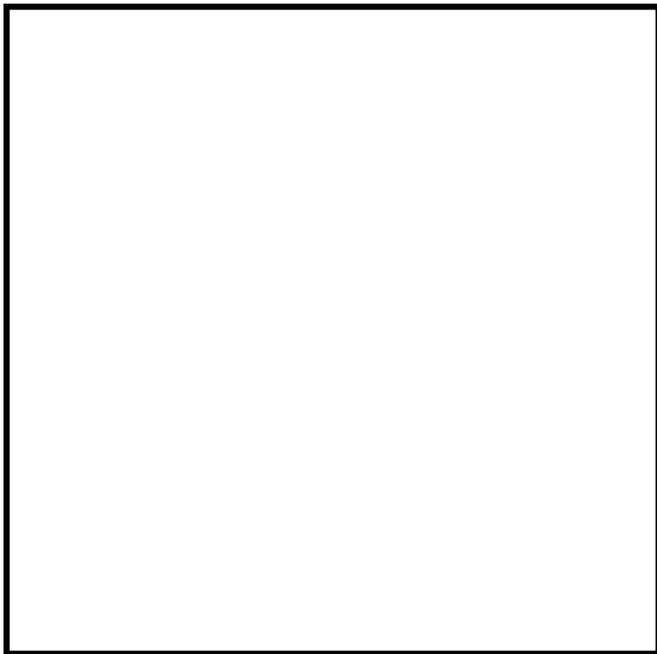


Write the name of your favourite fruit and vegetable.  
Then draw them in the squares.



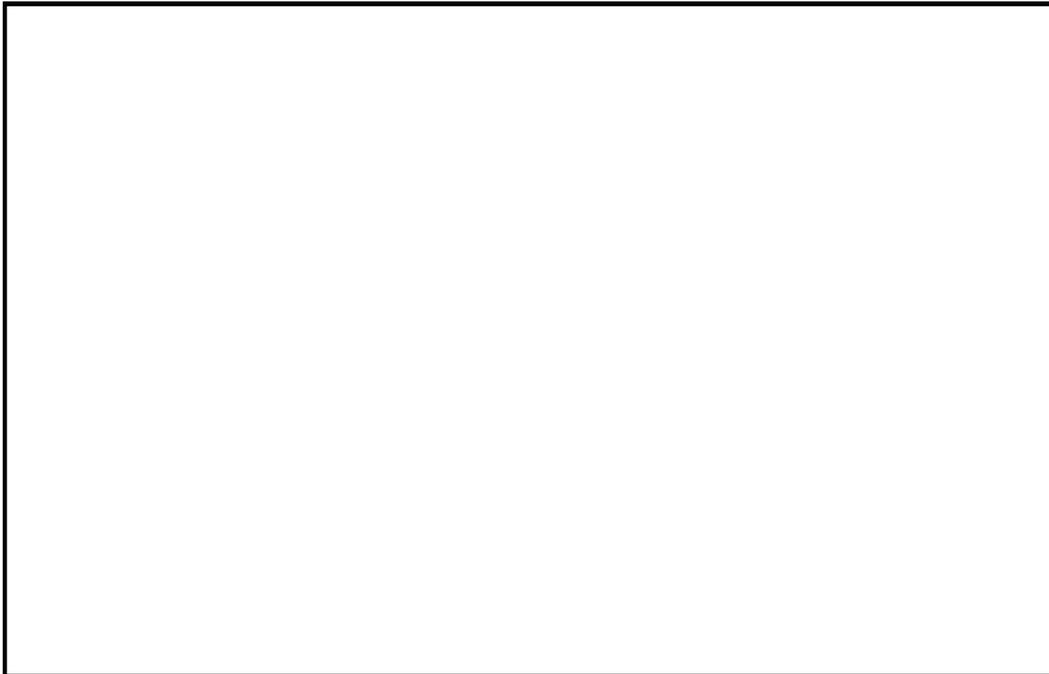
What do you do with the energy you get from this fruit and vegetable? Write it and draw it in the rectangle below.



# Coloured cabbage experiment

## DAY 1

1. Draw a picture of your cabbage



2. How tall is your cabbage?

.....cm

3. How much water (in cm) is in the cup?

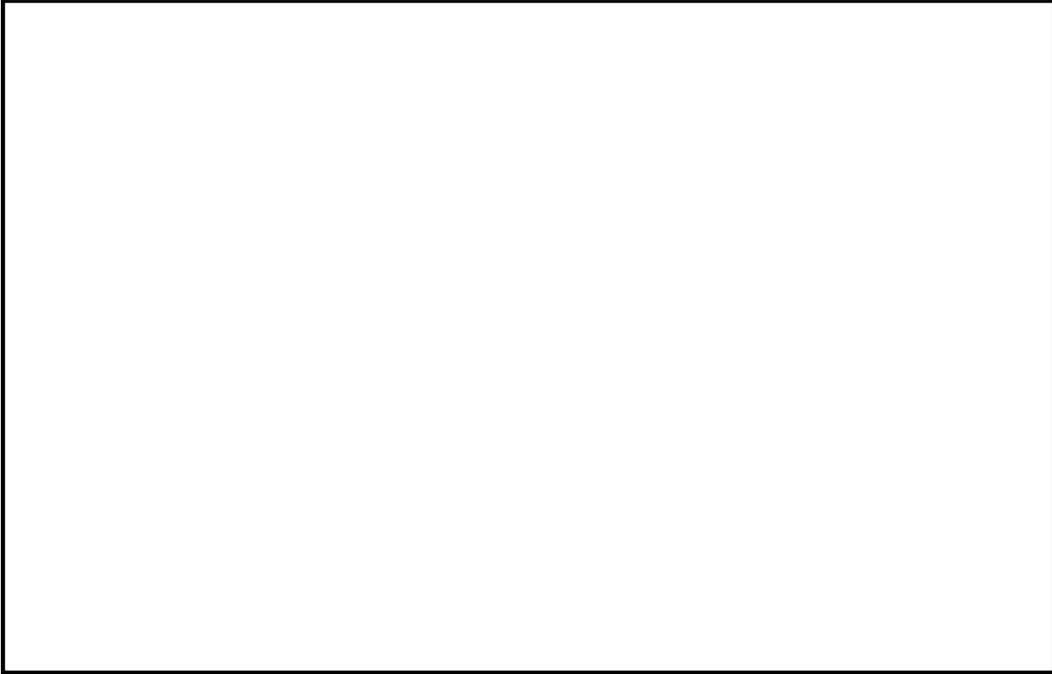
.....cm

4. What colour is the cabbage leaf?

.....

**DAY 2**

5. Draw a picture of your cabbage



6. How tall is your cabbage?

.....cm

7. How much water (in cm) is in the cup?

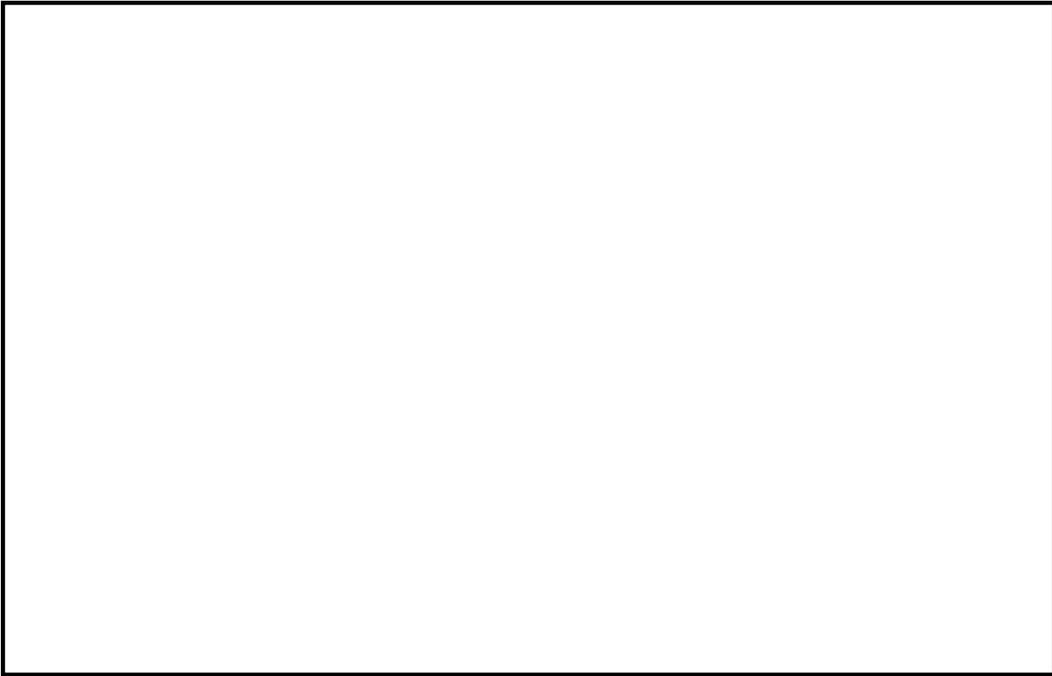
.....cm

8. What colour is the cabbage leaf?

.....

**DAY 3**

9. Draw a picture of your cabbage



10. How tall is your cabbage?

.....cm

11. How much water (in cm) is in the cup?

.....cm

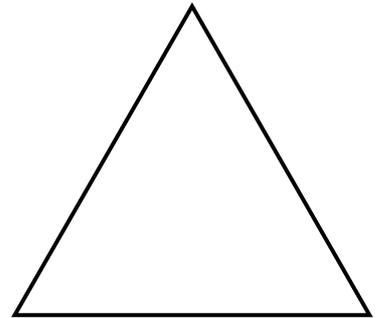
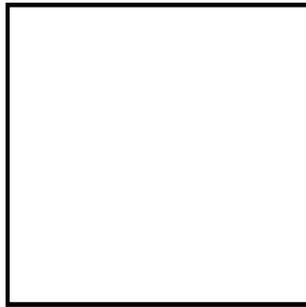
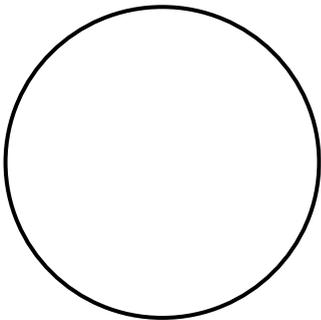
12. What colour is the cabbage leaf?

.....

# Counting with your Crunch & Sip

1. Count the total number of fruits in your class: .....
2. Count the total number of vegetables in your class: .....
3. Are there more fruits or vegetables? .....
4. How many more? .....
5. Draw below:

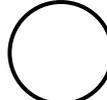
- 3 strawberries in the TRIANGLE
- 2 bananas in the CIRCLE
- 4 apples in the SQUARE

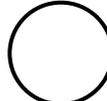


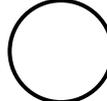
6. What shape is your Crunch & Sip fruit or vegetable?

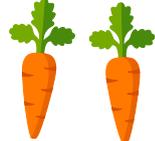
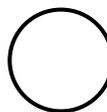
.....

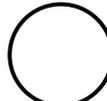
7. Solve the additions below and write the answers in the circles:

 +  = 

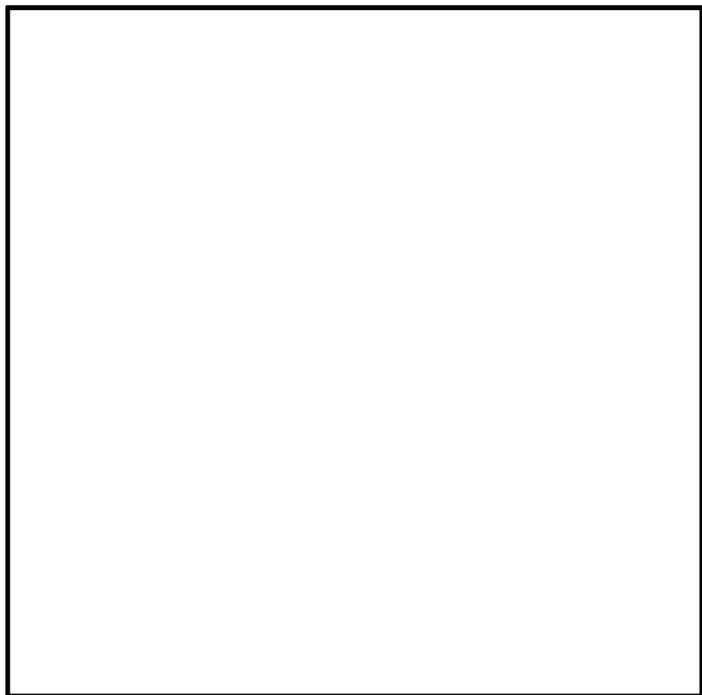
 +  = 

 +  = 

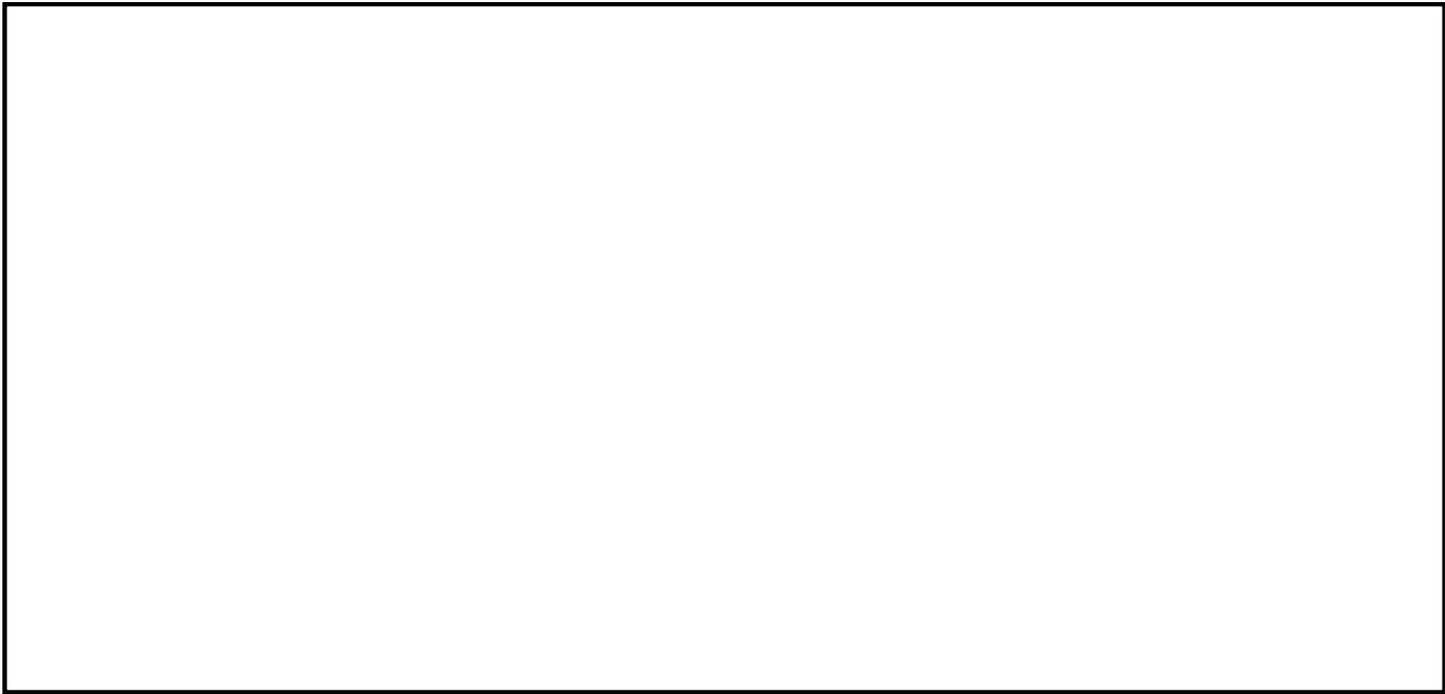
 +  = 

 +  = 

Write the name of your favourite fruit or vegetable. Draw it in the square below:



Draw how your favourite fruit or vegetable grows from seed to plant:



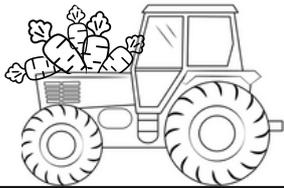
What are 3 things a plant needs to grow?



# Carrot supply chain

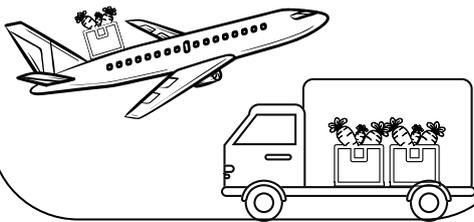
A supply chain shows the steps of something going from where it is made, to where it is used or eaten. Can you put the steps of carrots going from farm, to your lunchbox? Cut out the boxes and arrows, and paste them in your workbook in the correct order.

The carrots are transported from the farm, to be sorted

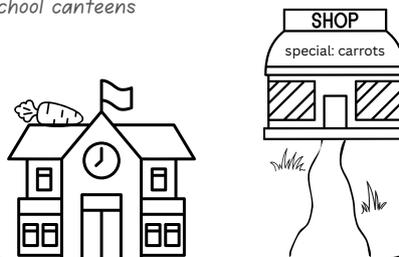


The good carrots are packed up in the packing centre. They are put into pallets for transport

Carrots are transported to places where they can be sold



Carrots are sold in the shops or school canteens



The carrots are sorted for colour, size and shape



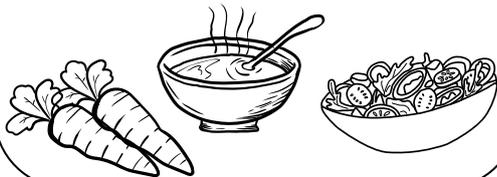
The good carrots will go to the packing centre

The bad carrots will go ...



The carrots are grown and harvested

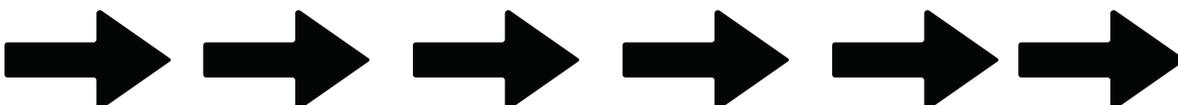
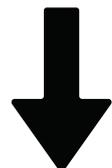
Bad carrots: some are not good to eat and will be thrown out. But some will be cut up and sold in pre-made salads or soups



You buy the carrots and take them for Crunch & Sip



Draw yourself here



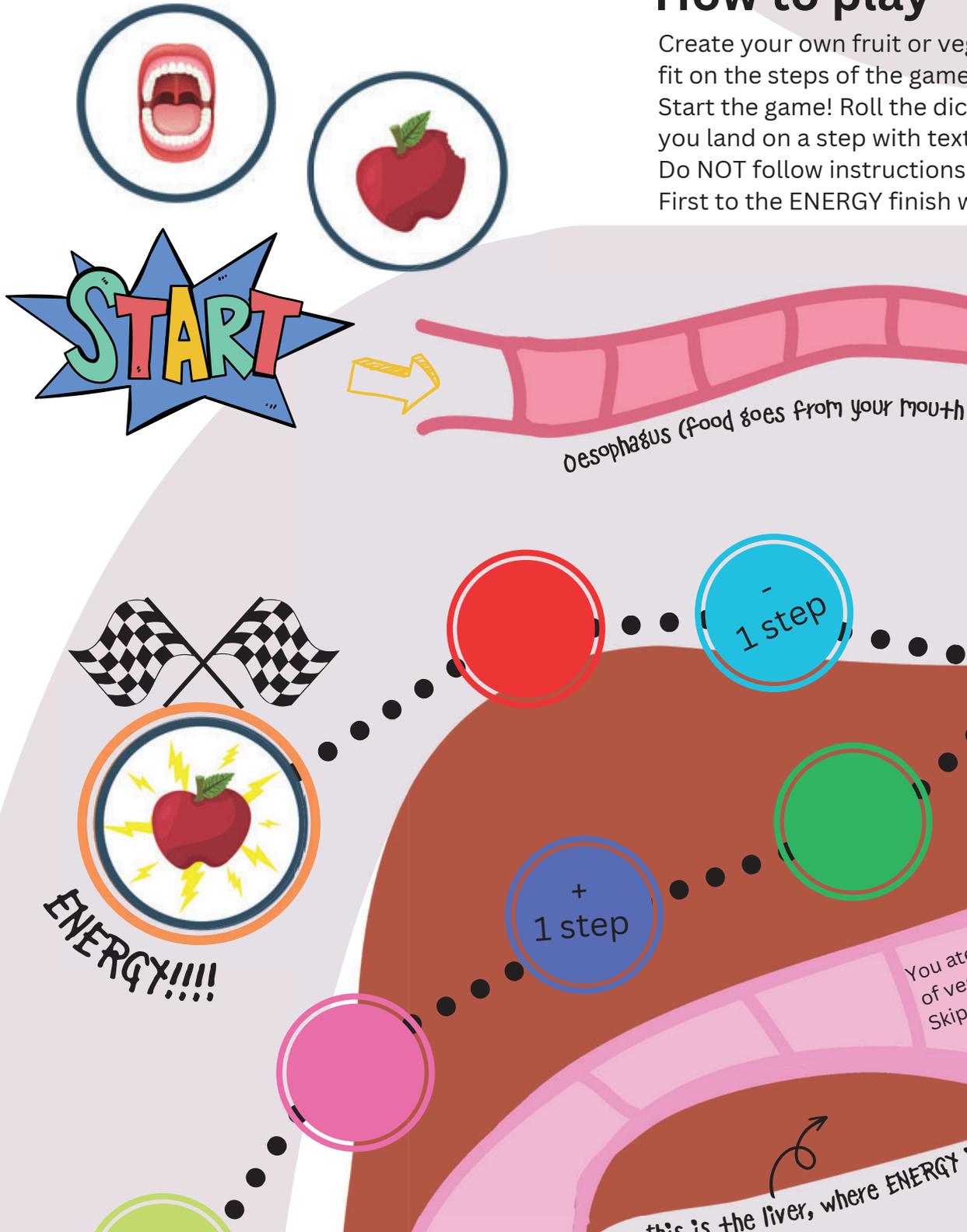


# WORKSHEET 6

# Digestion

## How to play

Create your own fruit or vegetable  
fit on the steps of the game  
Start the game! Roll the dice  
you land on a step with text  
Do NOT follow instructions  
First to the ENERGY finish v



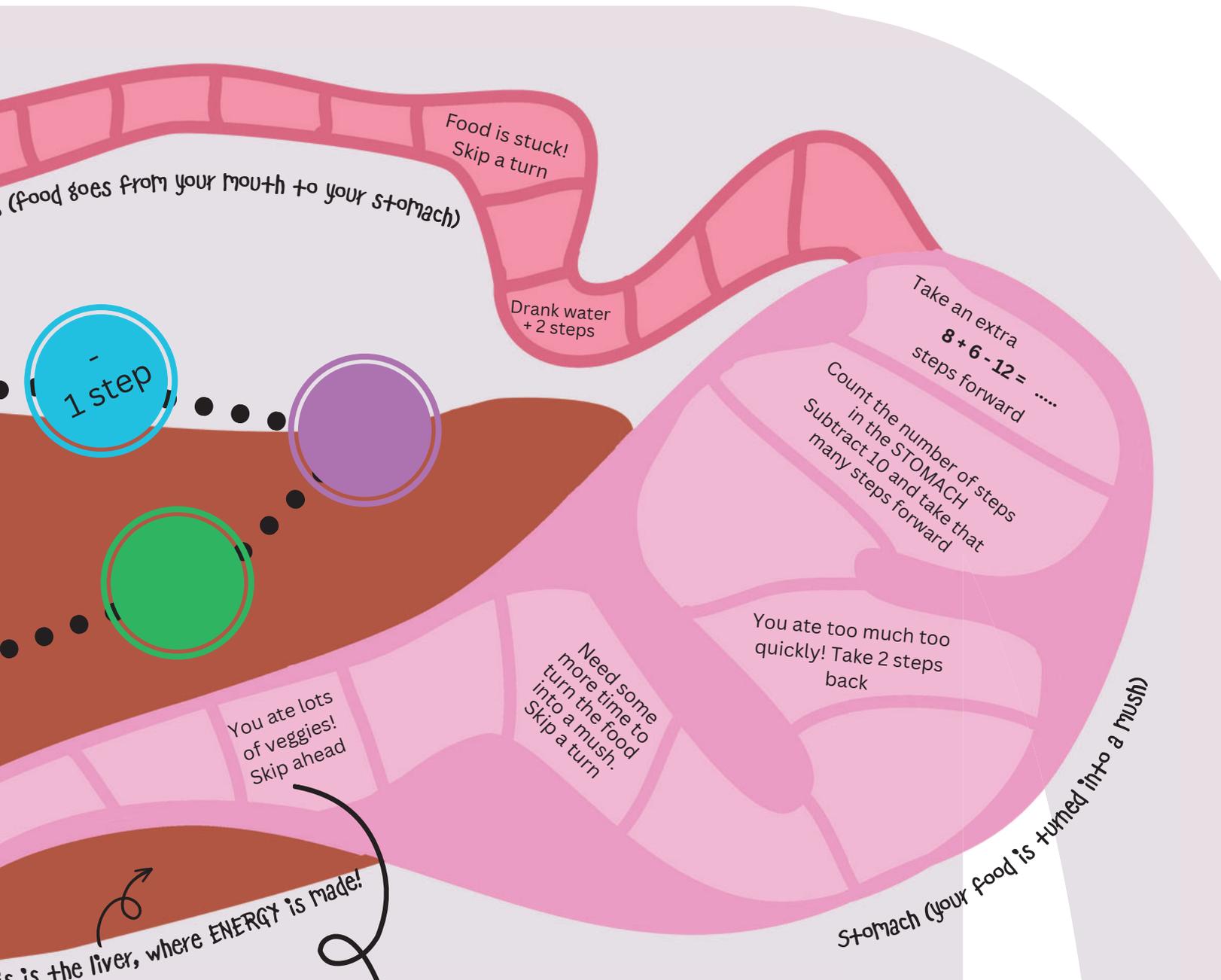
# Digestion board game

## How to play

Create your own fruit or vegetable pawn to play with: take a very small piece of paper (that will fit on the steps of the game) and draw your favourite fruit or vegetable.

Start the game! Roll the dice and move along the digestion system. Follow the instructions when you land on a step with text. Once you have followed the instructions, that's the end of your turn. Do NOT follow instructions on the step you land on again.

First to the ENERGY finish wins!



ENERGY!!!!

You ate  
of ve  
Skip

this is the liver, where ENERGY

Ate lots of fruit! 3 steps forward

Count the number of steps in the LARGE COLON (these big brown steps in the bowels). Subtract 15 and take that many steps forward

Use a ruler to measure the width of this piece of bowel. How many centimeters? Take as many steps as centimeters backward

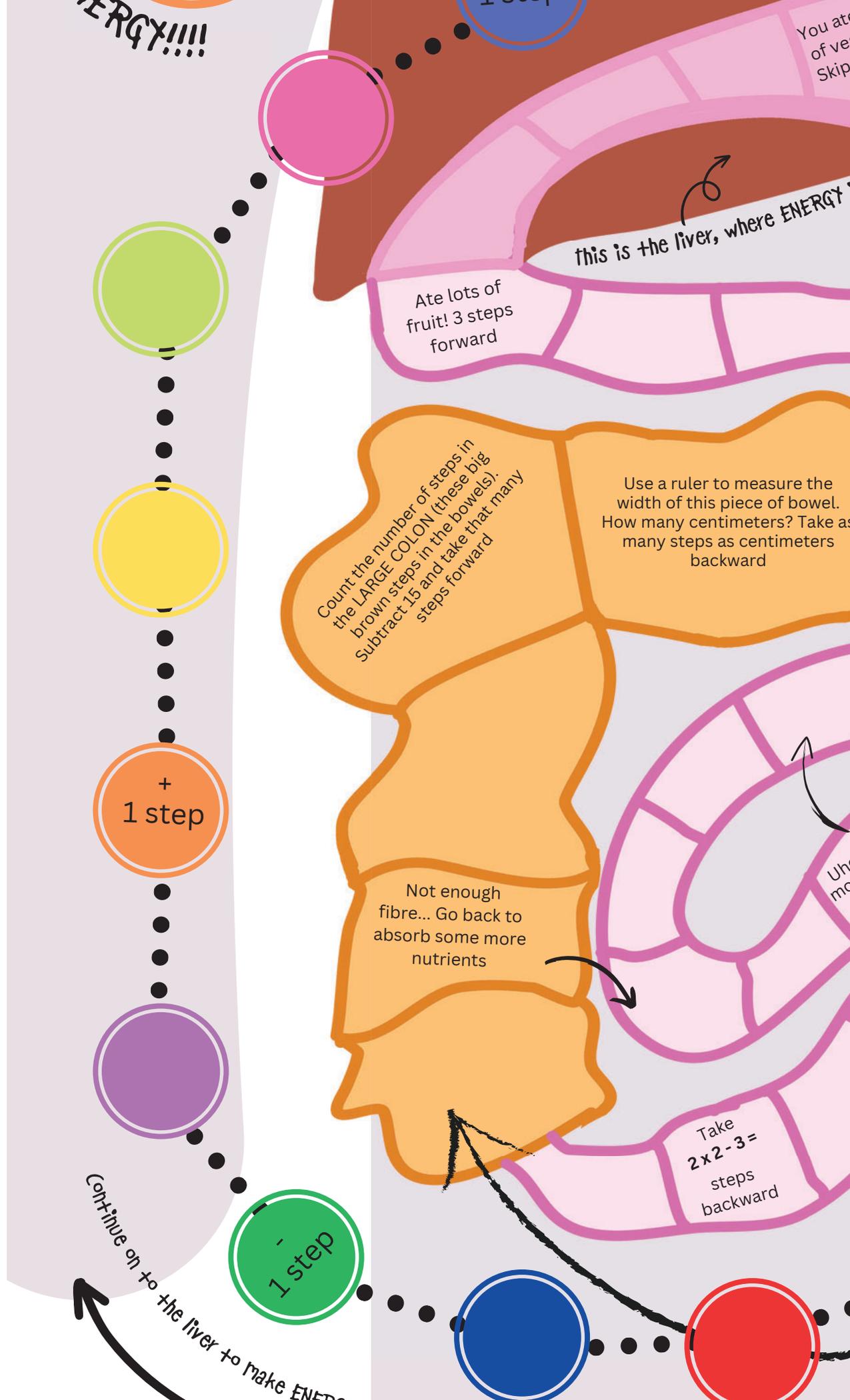
+ 1 step

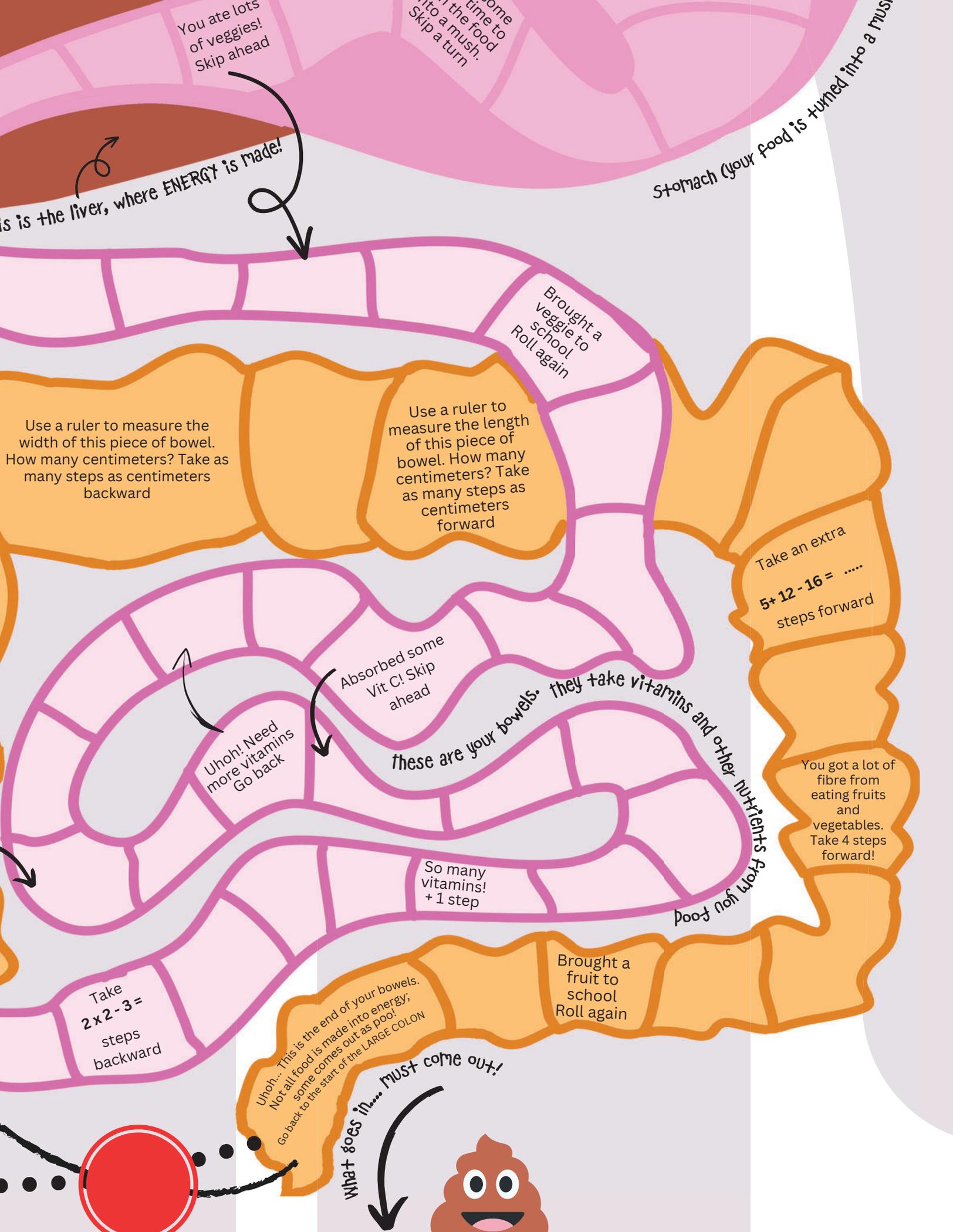
Not enough fibre... Go back to absorb some more nutrients

Take  $2 \times 2 - 3 =$  steps backward

- 1 step

Continue on to the liver to make ENERGY





You ate lots of veggies! Skip ahead

It's time to turn the food into a mush. Skip a turn

Stomach (your food is turned into a mush)

This is the liver, where ENERGY is made!

Brought a veggie to school! Roll again

Use a ruler to measure the width of this piece of bowel. How many centimeters? Take as many steps as centimeters backward

Use a ruler to measure the length of this piece of bowel. How many centimeters? Take as many steps as centimeters forward

Take an extra  $5 + 12 - 16 = \dots$  steps forward

Uhoh! Need more vitamins Go back

Absorbed some Vit C! Skip ahead

these are your bowels. they take vitamins and other nutrients from your food

You got a lot of fibre from eating fruits and vegetables. Take 4 steps forward!

So many vitamins! +1 step

Take  $2 \times 2 - 3 =$  steps backward

Brought a fruit to school Roll again

Uhoh.. This is the end of your bowels. Not all food is made into energy; some comes out as poo! Go back to the start of the LARGE COLON

What goes in... MUST come out!



Complete the text below and draw a line to the body part.

Words to use: energy teeth bowels stomach vitamins.

Your ..... chomp  
your fruit/veg  
into small pieces



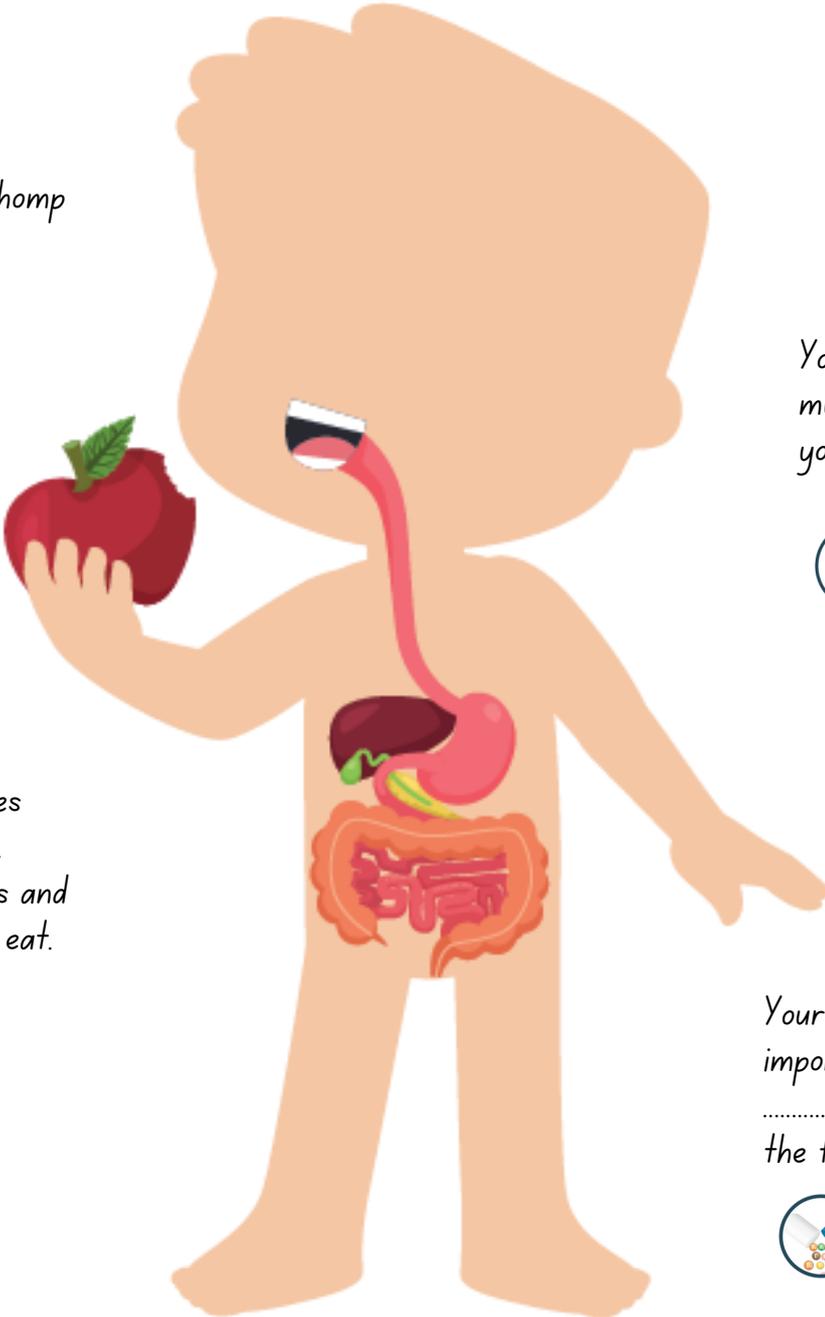
Your ..... makes a  
mush that can go into  
your bowels



Your liver makes  
.....  
from the fruits and  
vegetables you eat.



Your ..... take  
important  
..... from  
the fruit/veg mush



What is your favourite fruit or vegetable? What do you like to do with the energy you get from eating it?

.....

.....

.....

.....

# Option 1: Celery stems, cabbage leaves and flowers

Give your experiment a name

.....

**1** What do you want to find out from your experiment?

I want to test what happens when I put a ..... in coloured water.

**2** What will you measure? And what do you need?

I will measure:

1) ..... 2) ..... 3) .....

I will need:

.....  
.....

**3** What colour is your water?

.....

**4** What do you think will happen?

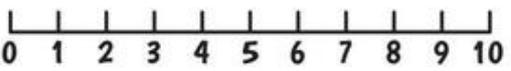
.....  
.....  
.....  
.....

**5** Day ..... measurements and observations

- 1. Draw a picture of your experiment:
- 2. How much water is in the cup?  
.....cm
- 3. How much time has the leaf/flower been in the coloured water?  
.....
- 4. Rate the colour of the leaf/flower

On a scale of 0 to 10, how much has your leaf or flower changed colour?  
0 is not at all and 10 is completely.

.....



Write here the colour in your cup.

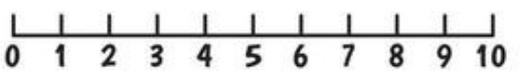


**6** Day ..... measurements and observations

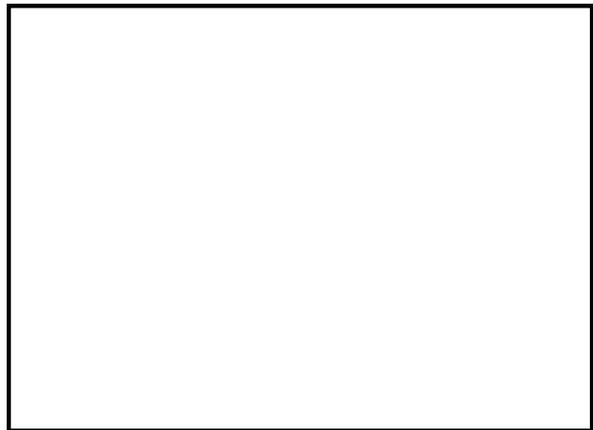
- 1. Draw a picture of your experiment:
- 2. How much water in in the cup?  
.....cm
- 3. How much time has the leaf/flower been in the coloured water?  
.....
- 4. Rate the colour of the leaf/flower

On a scale of 0 to 10, how much has your leaf or flower changed colour?  
0 is not at all and 10 is completely.

.....



Write here the colour in your cup.



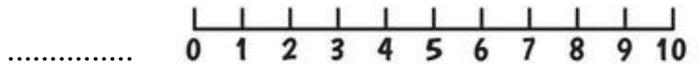
**7** Day ..... measurements and observations

- 1. Draw a picture of your experiment:
- 2. How much water is in the cup?  
.....cm
- 3. How much time has the leaf/flower been in the coloured water?  
.....



4. Rate the colour of the leaf/flower

On a scale of 0 to 10, how much has your leaf or flower changed colour?  
0 is not at all and 10 is completely.



Write here the colour in your cup.

**8** Findings

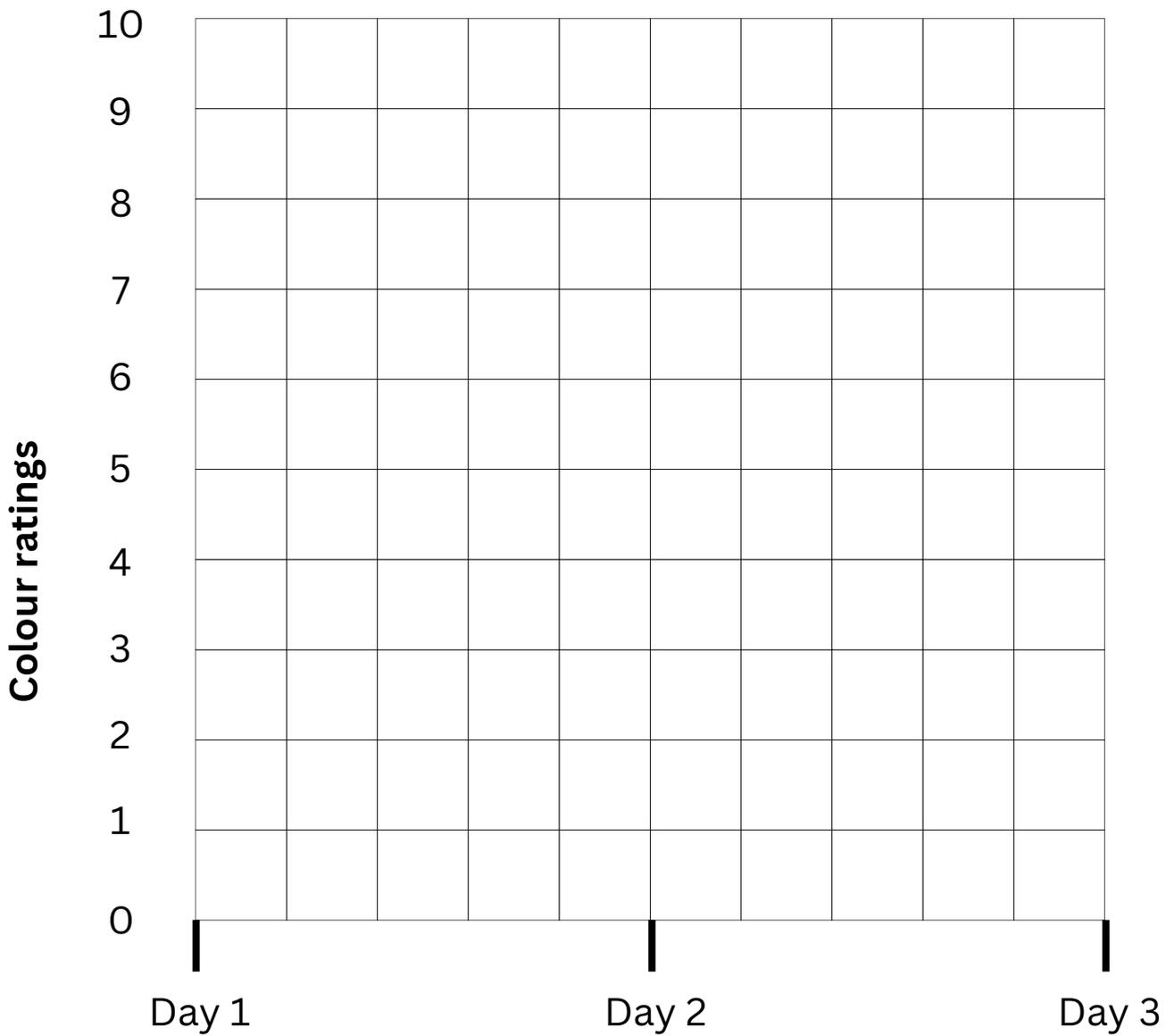
1. What happened to your flower or leaf?

.....  
.....

2. What happened to the leaves and flowers of the other groups?

.....  
.....

3. Can you put your data in a graph?



4. Take a look at the graphs of other groups that used another leaf or flower. Write down any differences you can see between your graph and theirs.

.....

.....

.....

5. Together with your teacher, compare all the graphs.  
Which one got the highest colour ratings?

.....

6. Which one changed colour the quickest?

.....

7. Check the data on each day and write down the centimeters of water in the cup for each day:

DAY 1: ..... cm

DAY 2: ..... cm

DAY 3: ..... cm

Did the water level go down, up or stay the same? Why do you think that happened?

.....  
.....  
.....

## Option 2: Storage experiment

*Give your experiment a name*

.....

**1** What do you want to find out from your experiment?

*I want to test what happens when I store  
a fruit or vegetable in a .....*

**2** What will you measure? And what do you need?

*I will measure:*

1) ..... 2) ..... 3) .....

*I will need:*

.....  
.....

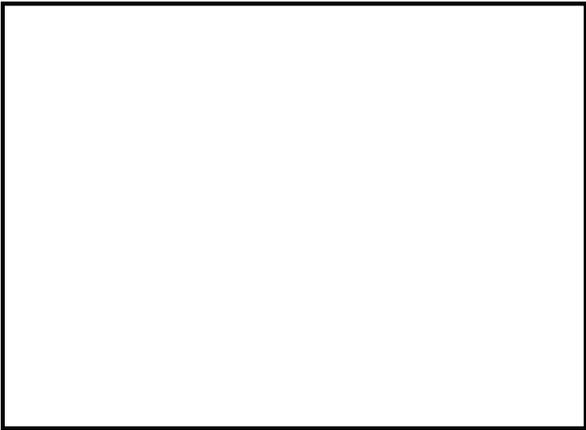
**3** What fruit or vegetable are you using?

.....

**4** What do you think will happen?

.....  
.....  
.....  
.....

**5** Day ..... measurements and observations



- 1. Draw a picture of your experiment:
- 2. How much time has the fruit/vegetable been stored?  
.....

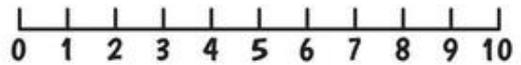
3. Describe what you see (any changes from the last measurement?):

.....

.....

.....

4. Rate the state of the fruit/vegetable .....



On a scale of 0 to 10, how much has your fruit/vegetable rotted?  
0 is not at all and 10 is completely.

Write here what you are rating

5. Write any other measurements or observations

.....

**6** Day ..... measurements and observations



- 1. Draw a picture of your experiment:
- 2. How much time has the fruit/vegetable been stored?  
.....

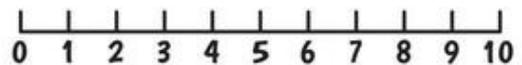
3. Describe what you see (any changes from the last measurement?):

.....

.....

.....

4. Rate the state of the fruit/vegetable .....



On a scale of 0 to 10, how much has your fruit/vegetable rotted?  
0 is not at all and 10 is completely.

Write here what you are rating

5. Write any other measurements or observations

.....

**8**

**Findings**

1. What happened to your fruit/vegetable?

.....

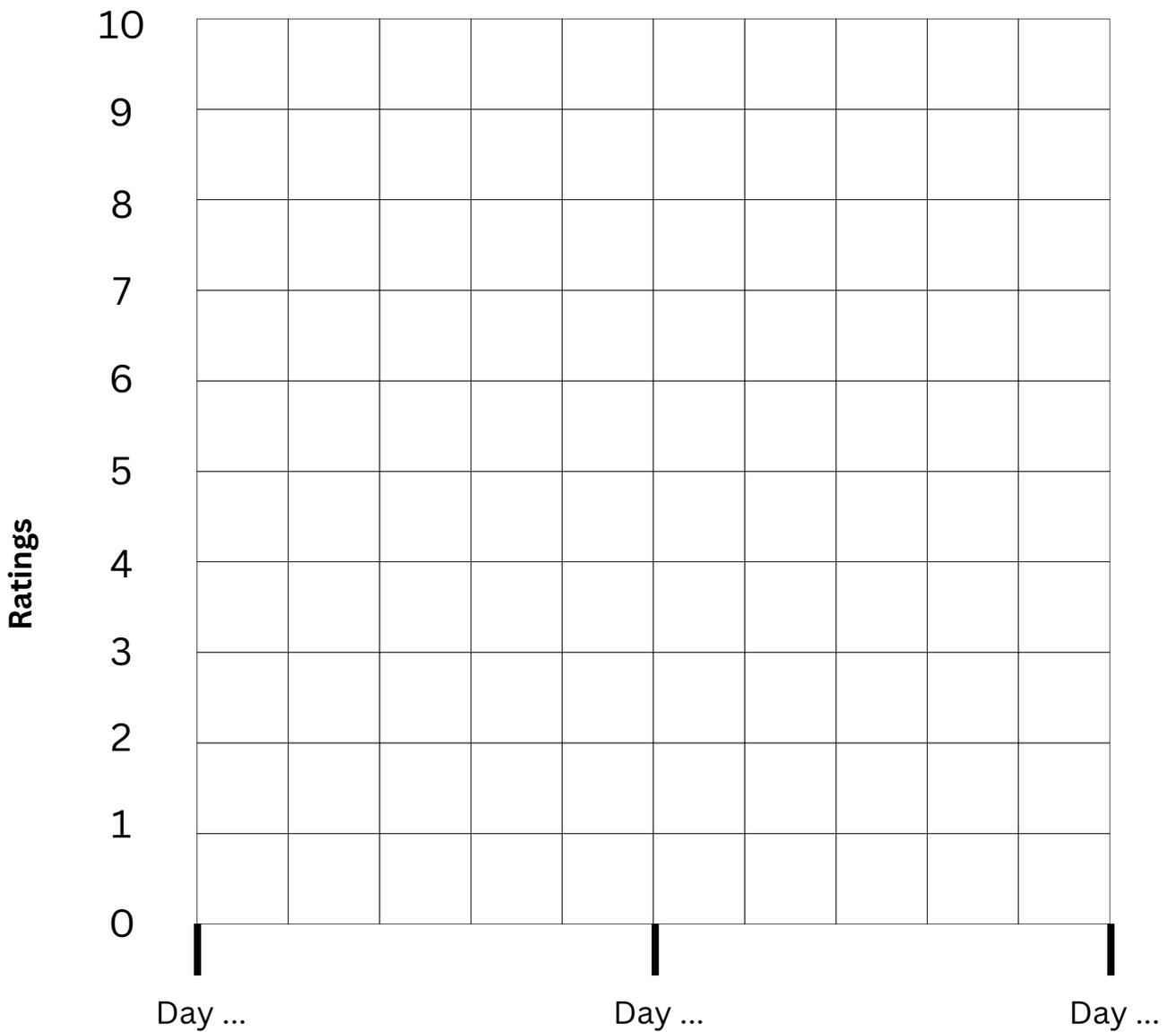
.....

2. What happened to the fruit/vegetable of other groups?

.....

.....

3. Can you put your data in a graph?



4. Compare your graph to those of groups with another storage method. Write down any differences you see.

.....

.....

.....

5. Together with your teacher, compare all the graphs. Which one got the highest ratings?

.....

6. Which one rotted/changed the quickest?

.....

7. What storage method was the best to stop the fruit/vegetable rotting?

.....

What do you think that means? How would you store this fruit or vegetable?

.....

.....

.....

### Option 3: Growing seeds

Give your experiment a name

.....

**1** What do you want to find out from your experiment?

*I want to test what happens when I ..... to my plant*

**2** What will you measure? And what do you need?

*I will measure:*

1) ..... 2) ..... 3) .....

*I will need:*

.....

.....

**3** What fruit/vegetable are you growing?

.....

**4** What do you think will happen?

.....

.....

.....

.....

5

**Day ..... measurements and observations**

1. Draw a picture of your experiment:

2. How tall is your seedling?

.....cm

3. How much time has passed since planting the seed?

.....

4. Note down any other observations:

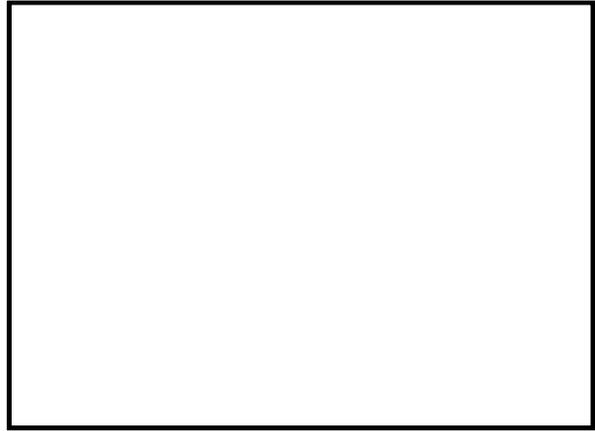
.....

.....

5. Write what you will do to the plant today and for how long:

.....

.....



6

**Day ..... measurements and observations**

1. Draw a picture of your experiment:

2. How tall is your seedling?

.....cm

3. How much time has passed since planting the seed?

.....

4. Note down any other observations:

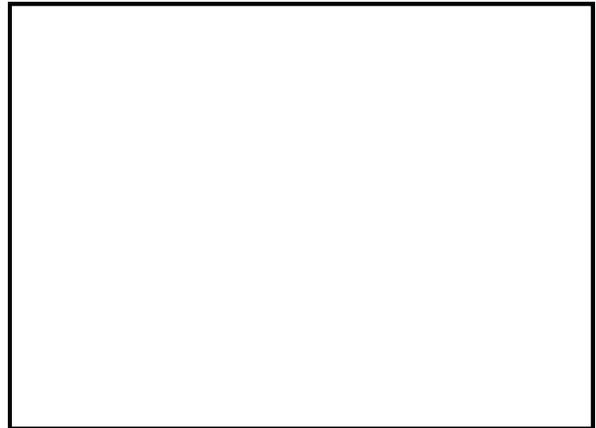
.....

.....

5. Write what you will do to the plant today and for how long:

.....

.....





**Findings**

1. *What happened to your seed?*

.....

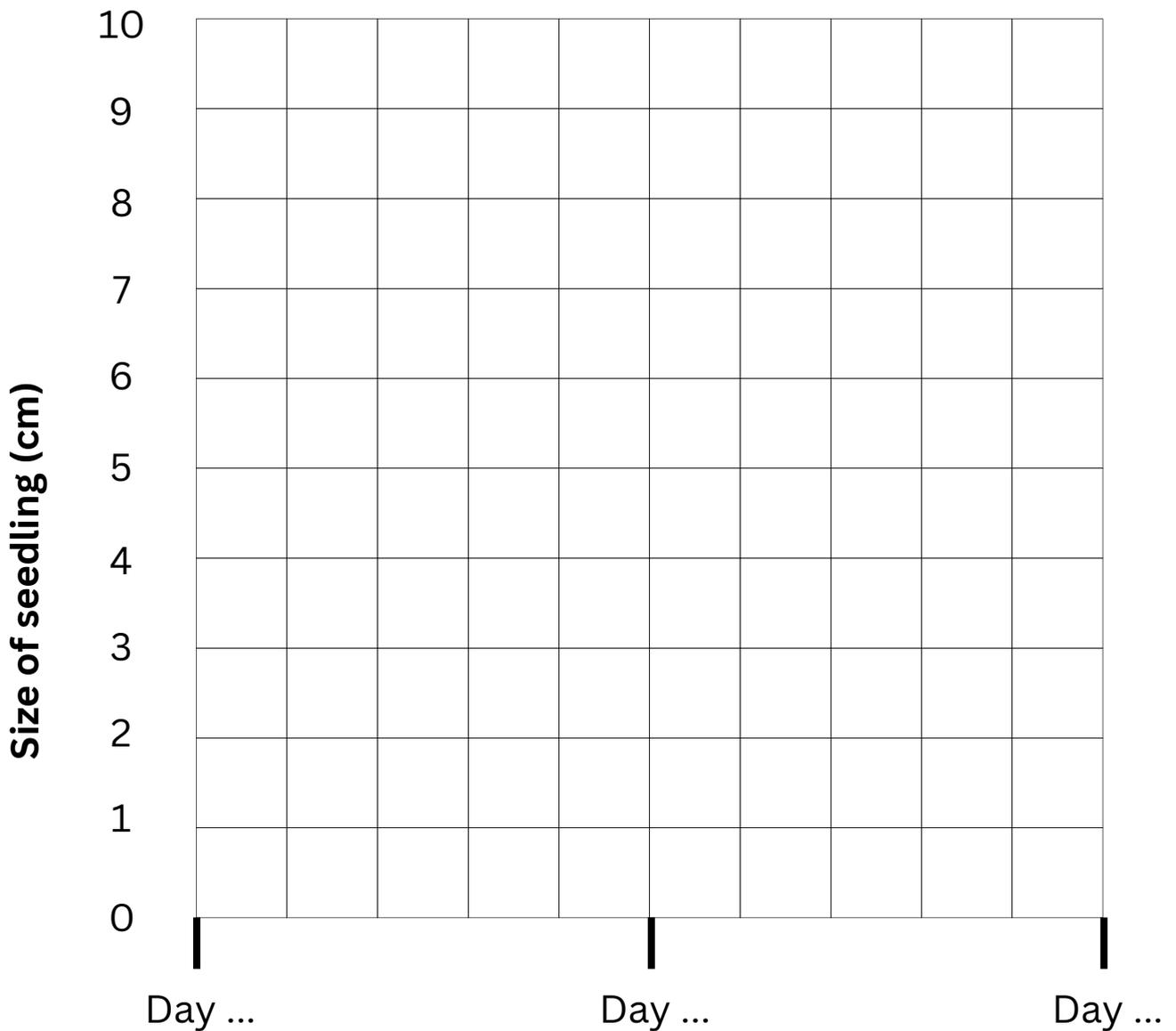
.....

2. *What happened to seeds of the other groups?*

.....

.....

3. *Can you put your data in a graph?*



4. Compare your graph to those of other groups. What differences can you see?

.....

.....

.....

5. Together with your teacher, compare all the graphs.  
What plant got the tallest?

.....

6. Which one got the tallest the quickest?

.....

7. What was done to the plant that grew the tallest?

.....

What do you think that means? How would you grow your fruit/vegetable plants?

.....

.....

.....

## Counting with your Crunch & Sip

1. Count the total number of fruits in your class: .....
2. Count the total number of vegetables in your class: .....
3. Are there more fruits or vegetables? .....
4. How many more? .....
5. Sort them by colour.  
How many orange + red are there? .....
- How many green x red? .....

### 6. Draw below:

- A triangle with 3 x 2 bananas
- A circle with 12 + 15 - 20 carrots
- A square with 5 x 10 - 45 apples
- A hexagon with 1/2 avocado and 3 x 6 peas

7. Solve the fruit & veg math problems below and write the answers in the circles:



 $\times$ 


 $=$


 $+$ 

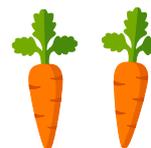
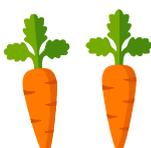
 $-$ 

 $=$


 $\times$ 

 $-$ 

 $=$


 $\times$ 

 $+$ 

 $=$


 $\times$ 

 $+$ 

 $=$

8. Jake is at the farmers market and would like to buy some fruit and vegetables. Can you help him calculate his totals?



List 1:

- 2 carrots
  - 2 apples
  - 3 strawberries
- Total: \$.....

List 2:

- 3 broccoli
  - 1 cucumber
  - 6 strawberries
- Total: \$.....

List 3:

- 4 apples
  - 2 bananas
  - 4 carrots
  - 1 cucumber
- Total: \$.....

List 4:

- 2 broccoli
  - 3 carrots
  - 5 apples
  - 3 cucumbers
- Total: \$.....

# All about growing fruit & veg plants

9. What are the 4 things that plants need to grow? Match them to the explanation of why plants need it.

1.....

Many of the nutrients plants need to grow are found in here

2.....

Plants use the energy from this to make their own food (photosynthesis)

3.....

Plants need this for their photosynthesis (making food)

4.....

This helps the nutrients from the soil, go up into the plant

10. What are two other things that influence the growth of a plant?

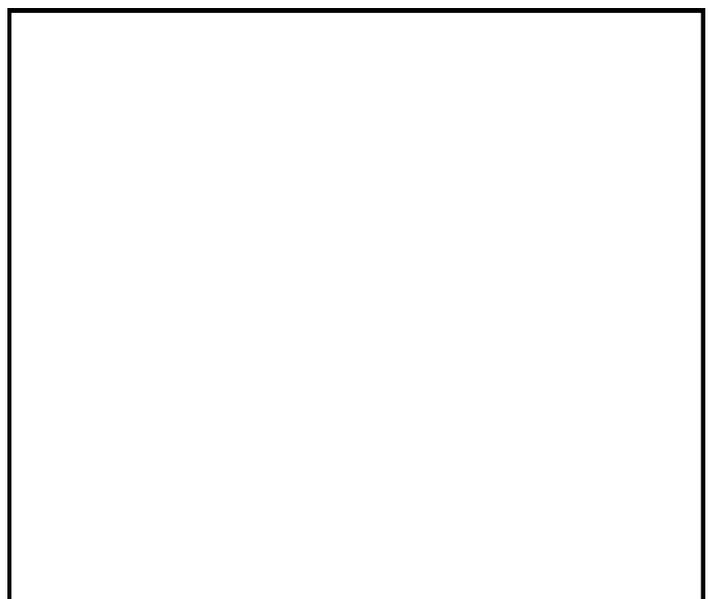
1..... (hint: some plants can't grow in places where this is really high or really low)

2..... (hint: a seed only needs a little of this, but as the plants grows it will need more and more)

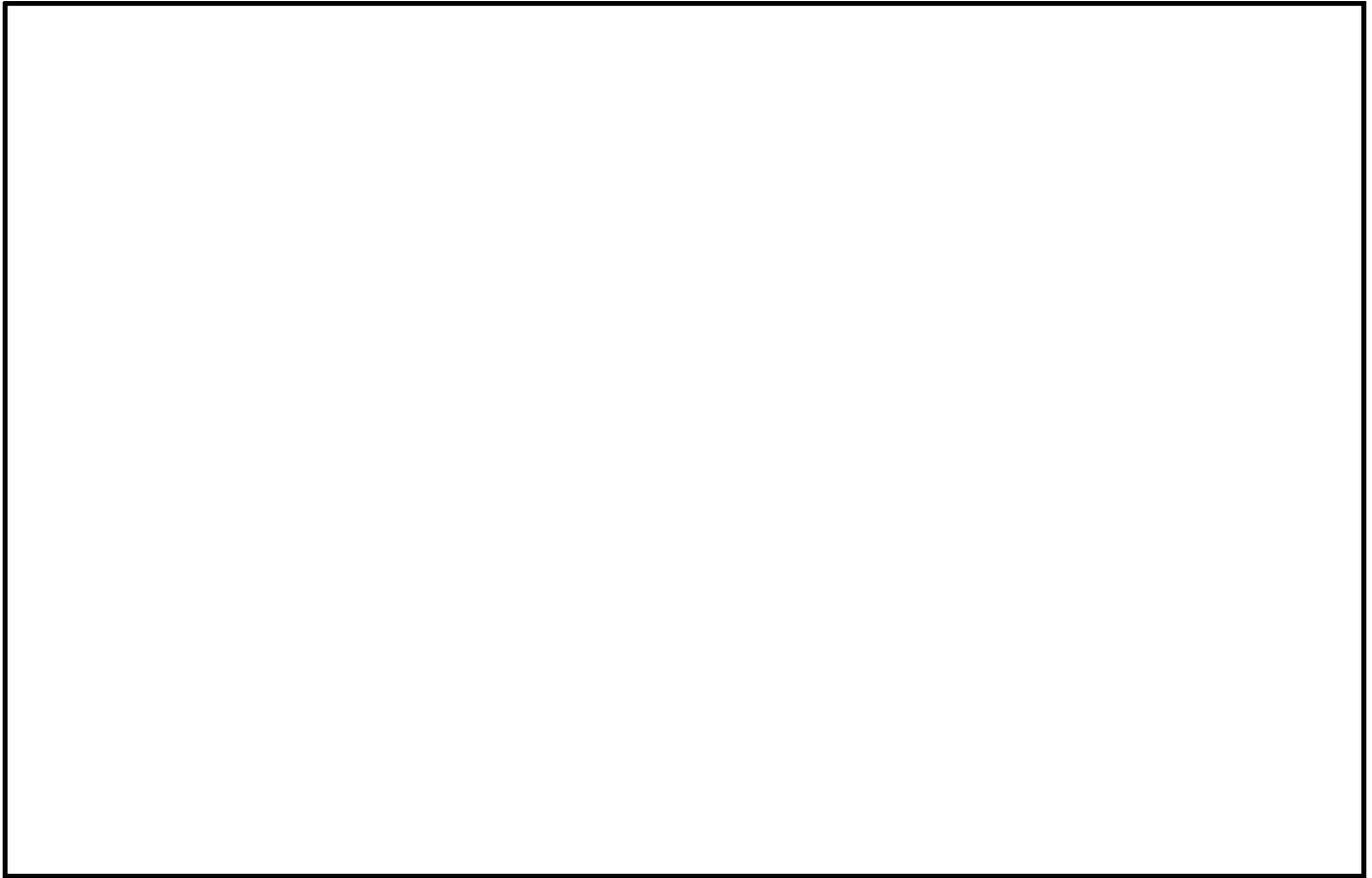
11. Write the name of your favourite fruit or vegetable.

Draw it in the square:

-----



**12. Draw how your favourite fruit or vegetable grows from seed to plant:**

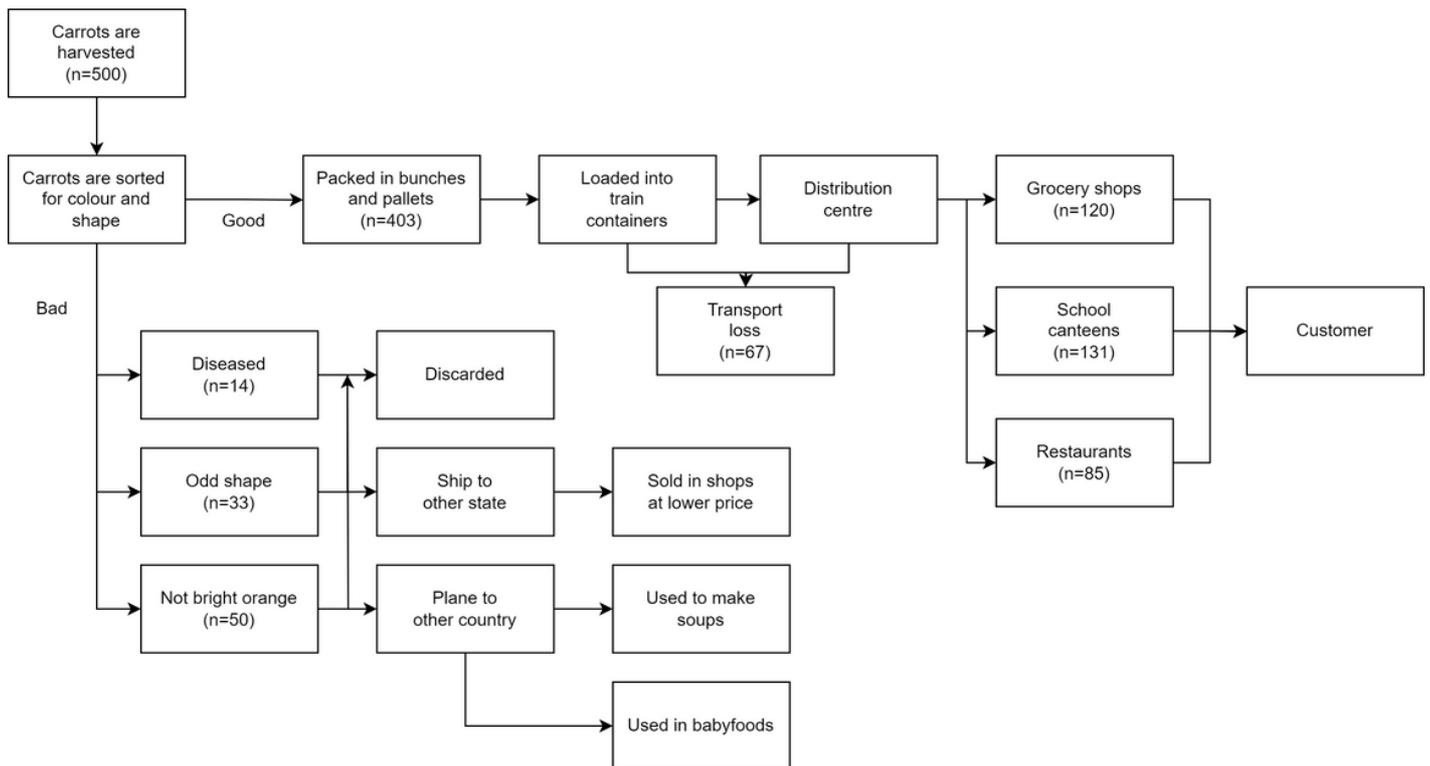


# Banana flowchart

In this lesson you will make a flowchart for the transport of bananas going from 'farm to fork'. A flowchart shows you, in one picture, the process of this. It shows for example:

- harvesting the fruit or vegetable: when/how/where
- decisions made about the fruit or vegetable (for example: where will it be shipped to? Is it good enough to go to the grocery store?)
- how it will be processed and packaged
- how it will be transported (different for each destination)
- what the different destinations are

This is an example of a flowchart for carrots:



You can make a flowchart on the website [draw.io](https://draw.io)

In the left hand menu, click on the square. If you click in the square you can write. If you hover your cursor over the sides of the square, you'll see a green circle. Click, hold down and drag: you'll see an arrow coming from the square. You can connect the arrow by holding it near another square and releasing when you see the green circle on the other square.

**The following decisions and steps should be in the flowchart:**

Follow the number of bananas as well and write the numbers in the flowchart. The numbers in the steps below are written as  $n=...$ . So if there are 40 bananas in that step, it will be written as  $n=40$ . If you have to calculate the number, it says ' $n=?$ '

The bananas are harvested. A total of  $n=1000$  bananas are harvested.

The bananas are inspected and sorted three ways: 1) signs of disease, 2) yellow colour and 3) green colour. Those with signs of disease are thrown out ( $n=95$ ). Those that are green are treated with a gas to ripen it a bit further ( $n=420$ ). Once ripe, they can go to next step. The yellow ones are already ripe and will go to the next step ( $n=?$ ).

Next, the bananas are sorted for size and shape. There are two options:

- 1) bananas are good size and shape, or
- 2) bananas are not a good size and shape.

The good bananas will go onto the next step ( $n=?$ ).

The bad bananas ( $n=?$ ) follow the steps below:

The bad bananas go one of 4 ways:

- 1) 45 will be transported by truck to a local facility that makes baby food
- 2) 86 bananas will be transported by train to another state to be dried and made into banana chips
- 3) 34 bananas will be transported by ship to a factory abroad that uses bananas and banana peels to make hydrating body creams
- 4) 88 bananas will be transported by a plane to shops across the country that will sell oddly shaped bananas. Before they are transported, a sticker will be placed

The good bananas go on to receive a sticker and are packaged up in bunches and pallets.

The bananas are loaded into the containers, and the containers onto a ship. Unfortunately, there was a storm at sea and one of the containers dropped into the ocean. 62 bananas were lost.

More steps on the next page -->

The ship brings the bananas to a distribution center. There, the banana orders are fulfilled:

- 1) Half of the bananas left are going to a grocery shop (n=?)
- 2) A quarter of the bananas left are going to restaurants (n=?)
- 3) The rest of the bananas go to school canteens (n=?)

The flowchart ends with the customers buying the bananas.

**Answer the following questions:**

How many total bananas have been sold? .....

How many total bananas had to be thrown out or were lost? .....

A banana in the shop, canteen or restaurant costs \$0.75.

How much money was made? .....

If 30% of the customers at the end of the flowchart throw out their banana without eating it, how many people is that?

.....

# Topic 1: Vitamins

## What are vitamins?

Vitamins and minerals are substances that are found in foods we eat. Your body needs them to work properly, so you grow and stay healthy.

Only two vitamins are made in the human body. For the other vitamins, that's where food comes in. Your body is able to get the vitamins it needs from the foods you eat because different foods contain different vitamins. The key is to eat different foods to get a variety of vitamins.

Scientists have identified 13 vitamins: A, eight B vitamins, C, D, E, and K. These vitamins can be come from a healthy diet filled with a variety of foods, including plenty of fruits and vegetables. The digestive system extracts the vitamins and minerals in the digested food, absorbing it into the bloodstream. These nutrients are delivered to the cells, which then absorb the ones they need.

The human body makes vitamins D and K on its own. The body makes vitamin D when the skin is exposed to sunlight. Bacteria in the intestines make vitamin K. Certain vitamins (the B vitamins and vitamin C) dissolve in water. The body stores a small amount of these vitamins but gets rid of most of those it does not use. Other vitamins (A, D, E, and K) do not dissolve in water. The vitamins that the body does not use right away are stored in the body's fat and liver. Getting too much of these vitamins can be dangerous over time.

Each vitamin has a special role to play. For example:

- Vitamin D in milk helps your bones.
- Vitamin A in carrots helps you see at night.
- Vitamin C in oranges helps your body heal if you get a cut.
- B vitamins in whole grains help your body make energy from food.

## To research:

- How can we make sure to get enough vitamins?
- Are canned or frozen fruit and vegetables also a good source of vitamins?
- What type/group of foods have very little vitamins?
- What happens if we don't get enough vitamins?

## Topic 2: Energy

### What is energy from food?

Fruits and vegetables provide energy to your body. When you eat them, they are digested and your body makes energy out of them. The energy allows us to do many activities such as walking, sitting, speaking, playing, etc. Children also need energy to grow! But if an adult breaks their leg, they will also need energy to heal their bone. Or if you get sick, you use energy to fight the virus in your body! That's why you get so tired when you're sick: all the energy is used for making you better.

We can measure the amount of energy you get from your food! The unit of measure is kilojoules, or kj, or calories. You might have seen this on packages of food.

Energy comes from substances present in the food, called macronutrients. You get energy from carbohydrates, protein or fat. Each of these provide your body with different levels of energy.

So not every food gives you the same amount of energy!

This is the energy you get per macronutrient:

- Carbohydrates: 1 gram of carbohydrates gives you 17 kj
- Protein: 1 gram of protein gives you 17 kj
- Fat: 1 gram of fat gives you 38 kj

Foods are not 100% just one of the macronutrients above. They are often combinations and contain many more important nutrients that are also important to eat. Fruits and vegetables have carbohydrates, but they also have a lot of other things that help you grow and stay healthy. For example water, fibre, and vitamins. This makes fruits and vegetables an excellent and healthy source for energy!

### To research:

- What type/group of foods give us the most energy? Why is it not good to only eat those type of foods?
- What fruit or vegetable will give you the most energy?
- How much energy should a child your age get from your food every day?
- How does it make you feel when you don't get enough energy from food?

## Topic 3: Fibre

### What is fibre?

Fibre is a type of carbohydrate found in plants that our digestive tract doesn't break down or absorb like other carbohydrates. It might sound like fibre doesn't play a huge role in your health, but it actually does.

There are two different types of fibre, soluble and insoluble. Both types are found in a variety of different plant foods, and each has its unique health benefits.

Soluble fibre dissolves in water and forms a gel-like substance that can help slow digestion. Soluble fibre is found in foods like oatmeal, nuts, beans, lentils, seeds, and some fruits and vegetables, like apples, blueberries, and brussels sprouts.

Insoluble fibre cannot dissolve in water. Instead, it helps give your stool some form that keeps our digestive system regular. Insoluble fibre is found in foods like wheat, whole-wheat bread, whole-grain products, brown rice, legumes (beans), and vegetables like carrots, cucumbers, and tomatoes.

Because insoluble fibre creates some form in our stools, it helps food move more easily through our digestive tract. This keeps our bowels regular and comfortable!

In addition to the specific benefits above, fibre can help:

- lower inflammation which can prevent disease in our gut (or digestive system)
- slow digestion which helps you not get hungry very quickly after eating
- help keep a healthy weight
- reduce the risk for certain types of cancers, heart disease, and obesity
- increase and improve healthy gut bacteria

### To research:

- What type/group of foods give us the most fibre?
- What fruit or vegetable will give you the most fibre?
- How much fibre should a child your age get from your food every day?
- How does it make you feel when you don't get enough fibre from food?

## Topic 4: Vitamin C

### What is vitamin C?

Vitamin C, also known as ascorbic acid, is a vitamin. It is found in fruits and vegetables. It is one of the water-soluble vitamins.

Without enough vitamin C, a person can get a sickness called scurvy. Lack of vitamin C was a serious health problem on long ocean trips where supplies of fresh fruit were quickly used up. Many people died from scurvy on such trips. Vitamin C was first discovered in 1928. In 1932, it was proved to stop the sickness called scurvy. The fact that fruit was a cure for scurvy was known long before vitamins were known to exist, but it took a little while longer to understand it was vitamin C and how it works in the body.

Most animals make their own vitamin C. Some mammals, like monkeys and humans, cannot. Bats, capybaras and bats also cannot make vitamin C in their body. That means we have to make sure we get vitamin C from our food!

Vitamin C is important for keeping body tissues, such as gums, bones, and blood vessels in good shape. Vitamin C is important in wound healing: it helps you to heal any cut, scrapes and wounds. It also helps the body absorb iron from food. Iron is also important because that helps get oxygen to your cells!

Vitamin C may also help your body fight off infections. If you get a cold, for instance, vitamin C can help shorten the amount of time you are sick.

### To research:

- What vegetables will give you the most vitamin C?
- What fruits will give you the most vitamin C?
- How much vitamin C should a child your age get from your food every day?  
(can you find how many strawberries you would need to eat in a day to reach that level?)
- What happens if you don't get enough vitamin C from food?

## Topic 5: Vitamin B

### What is vitamin B?

There's more than one B vitamin. Here's the list: B1, B2, B6, B12, niacin, folic acid, biotin, and pantothenic acid. Whew – that's quite a group!

The B vitamins are important in metabolic (say: meh-tuh-BAH-lik) activity – this means that they help get energy from the food you eat and set it free when your body needs it. So the next time you're running to third base, thank those B vitamins.

This group of vitamins also helps make red blood cells, which carry oxygen throughout your body. Every part of your body needs oxygen to work properly, so these B vitamins have a really important job.

Vitamins B are water-soluble, meaning you can't really have too much in your body (because if there is too much, it will just come out with your pee!). If you don't have enough though, you'll get into trouble. A vitamin B deficiency can make you really tired, unable to sleep, get tingling in your hands and feet, and you might even get some problems with your heart. But don't worry; eating a balanced diet with fruits and vegetables is enough to get enough vitamins!

### To research:

- What vegetables will give you the most vitamin B?
- What fruits will give you the most vitamin B?
- How much vitamin B should a child your age get from your food every day?  
(can you find how much spinach you would need to eat in a day to reach that level?)
- What happens if you don't get enough vitamin B from food?

# Fruit & vegetable science experiment

When food scientists do a science experiment, they follow the *scientific method*.

These are the scientific method steps:

1. Think of your question: what do you want to know?
2. Write down what you think will happen
3. Make a plan for your experiment, gather everything you need and start your experiment
4. Carefully gather your data: write down your measurements and observations
5. When finished, you can write your findings and make graphs and tables. Look at your data and observations and see if you can answer your question from step 1.
6. Look at what you thought would happen in step 2: did that happen? Or was it different?
7. Share and discuss your findings

**Follow the steps below to do your own experiment!**

## Step 1

Think of a fruit or vegetable science question to answer in your experiment. Write it down below.

## Step 2

Write down what you think will happen. What do you *expect* the answer to step 1 will be?

**Step 3**

Make a plan for your experiment: answer the questions below:

- **Write in detail HOW you will do your experiment:**

(How are you going to answer the question in step 1?)

- **What exactly will you measure?**

*(Think about your units of measurement. For example: if you are measuring 'level of mould', how will you measure that? You could for example rate the level of mould from 0 to 10, with 0 being no mould and 10 being ALL mold. But as long as you keep it the same every measurement, you can think of your own unit of measurement)  
(you can measure multiple things!)*

- **How many times will you do measurements?**

*(Your experiment might take a few days, so you can do multiple measurements.)*

- **What materials will you need for your experiment?**

(Write anything down you will need)

**Step 4**

Write down your measurements and observations in the table (you might need another blank page for additional measurements)

Other observations						
Measurement 3: .....						
Measurement 2: .....						
Measurement 1: .....						
Date, time						

**Step 5**

Use your observations from step 4 and write your findings below. Answer the questions below and make graphs on the next page

- **What were the differences in measurements at the start and at the end of your experiment?**

(It is clear to see the results of your experiment by writing the measurements at the start and the finish. you can then also calculate and write down the difference)

	Start	Finish	Difference
Measurement 1 .....			
Measurement 2 .....			
Measurement 3 .....			

- **If you compared two things, was there a difference between those measurements?**

(For example, if you compared the mould formation between an apple in a container versus one out in the open; was there a difference between the measurements above?)

- **If you did multiple measurements, did the numbers increase the same between each measurements?**

(For example, did the apples go mouldy at the same rate between the measurements? Or did it for example go slower in the beginning and faster at the end?)



**Step 5**

- **In a few sentences, what were your findings?**
  
  
  
  
  
  
  
  
  
  
- **What does that mean?**  
(Now that you know the results, what will you do with that information?)

**Step 6**

- **Were your findings the same as your prediction in step 2? If not, what was different?**
  
  
  
  
  
  
  
  
  
  
- **Can you think of any follow up experiments? Is there anything else you'd like to know?**

**Step 7**

When we do experiments and learn something new, it's important to tell others about it. So tell your teachers, classmates, parents and friends about your findings!

# Technologies and growing fruit & veg

## Problem 1: Pests

Effective pest control for farms and agricultural premises is essential. Pest species are cause for major concern, not only due to the potential loss of revenue due to crop damage but, if left untreated, they can also cause significant damage to machinery, equipment and property as well. Pest species can include insects, birds and rodents.

You can start your research here: <https://www.csiro.au/en/news/all/articles/2021/may/durable-agripest-solutions>

**Explain the problems pests cause to farms and crops:**

**What are the current solutions to pests? Are there any major disadvantages?**

**What are the 'solutions of the future' for solving the problem of pests?**

# Technologies and growing fruit & veg

## Problem 2: Irrigation

Irrigation is known to help improve agricultural production. It allows farmers to grow crops in areas with less rainfall than required and to supplement with water in times of drought. However, due to climate change and the following increase in number and duration of droughts, irrigation has become a major concern in agricultural crop production.

You can start your research here: <https://education.nationalgeographic.org/resource/irrigation/>

**Explain the problems droughts/lack of irrigation cause to farms and crops:**

**What are the current solutions to irrigation issues? Are there any major disadvantages?**

**What are the 'solutions of the future' for solving the problem of irrigation?**

# Technologies and growing fruit & veg

## Problem 3: Lack of agricultural space

One of the major farmers problems has to be the loss of agricultural land, as when more land is lost, it becomes increasingly difficult to produce the right volume of food required to feed the entire population.

You can start your research here: <https://www.theguardian.com/news/2019/jan/28/can-we-ditch-intensive-farming-and-still-feed-the-world>

**Explain why there is a lack of agricultural space and what the consequences are.**

**What are the current solutions to lack of space? Are there any major disadvantages?**

**What are the 'solutions of the future' for solving the problem of agricultural space?**

# Technologies and growing fruit & veg

## Problem 4: Climate change

Climate change can disrupt food availability, reduce access to food, and affect food quality. For example, projected increases in temperatures, changes in precipitation patterns, changes in extreme weather events, and reductions in water availability may all result in reduced agricultural productivity.

You can start your research here: <https://www.wri.org/insights/4-ways-farmers-can-adapt-climate-change-and-generate-income>

**Explain what effects climate change has on agriculture**

**What is one current solution to a agricultural problem cause by climate change?? Are there any major disadvantages to this solution?**

**What are the 'solutions of the future' for solving an agricultural problem caused by climate change?**

# Technologies and growing fruit & veg

## Problem 5: Loss of biodiversity

Our global food system is the primary cause of biodiversity loss, with agriculture alone being the identified threat to 24,000 of the 28,000 (86%) species at risk of extinction. As agriculture fields cover about one third of the habitable land, that doesn't leave much space for species that need other plants and trees to survive.

You can start your research here: <https://foodprint.org/issues/biodiversity-and-agriculture/>

**Explain what effects agriculture has on biodiversity and why this is a problem.**

**What is one current solution to biodiversity loss due to agriculture? Are there any major disadvantages to this solution?**

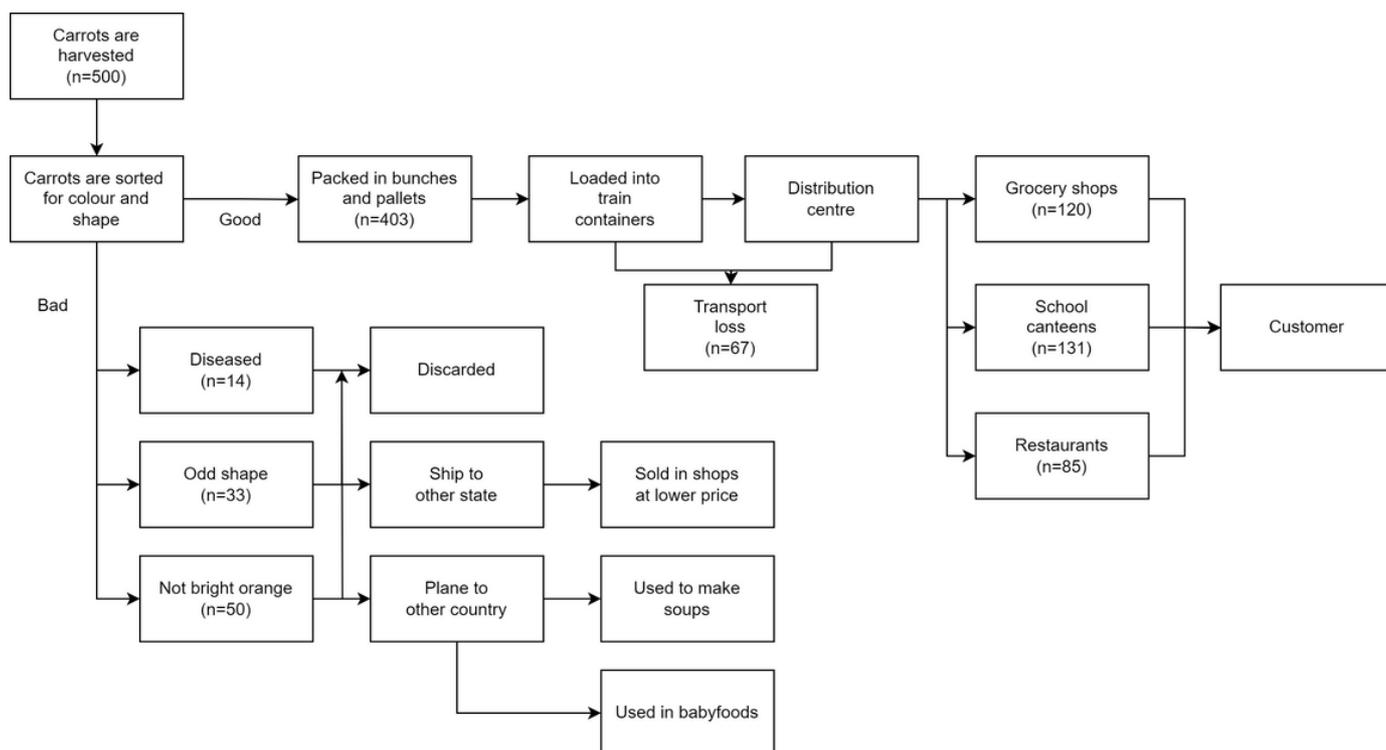
**What are the 'solutions of the future' for solving biodiversity loss caused by agriculture?**

# Banana flowchart

In this lesson you will make a flowchart for the transport of bananas going from 'farm to fork'. A flowchart shows you, in one picture, the process of this. It shows for example:

- harvesting the fruit or vegetable: when/how/where
- decisions made about the fruit or vegetable (for example: where will it be shipped to? Is it good enough to go to the grocery store?)
- how it will be processed and packaged
- how it will be transported (different for each destination)
- what the different destinations are

This is an example of a flowchart for carrots:



You can make a flowchart on the website [draw.io](https://draw.io)

In the left hand menu, click on the square. If you click in the square you can write. If you hover your cursor over the sides of the square, you'll see a green circle. Click, hold down and drag: you'll see an arrow coming from the square. You can connect the arrow by holding it near another square and releasing when you see the green circle on the other square.

**The following decisions and steps should be in the flowchart:**

Follow the number of bananas as well and write the numbers in the flowchart. The numbers in the steps below are written as  $n=...$ . So if there are 40 bananas in that step, it will be written as  $n=40$ . If you have to calculate the number, it says ' $n=?$ '

The bananas are harvested. A total of  $n=1000$  bananas are harvested.

The bananas are inspected and sorted three ways: 1) signs of disease, 2) yellow colour and 3) green colour. Those with signs of disease are thrown out ( $n=95$ ). Those that are green are treated with a gas to ripen it a bit further ( $n=420$ ). Once ripe, they can go to next step. The yellow ones are already ripe and will go to the next step ( $n=?$ ).

Next, the bananas are sorted for size and shape. There are two options:

- 1) bananas are good size and shape, or
- 2) bananas are not a good size and shape.

The good bananas will go onto the next step ( $n=?$ ).

The bad bananas ( $n=?$ ) follow the steps below:

The bad bananas go one of 4 ways:

- 1) 45 will be transported by truck to a local facility that makes baby food
- 2) 86 bananas will be transported by train to another state to be dried and made into banana chips
- 3) 34 bananas will be transported by ship to a factory abroad that uses bananas and banana peels to make hydrating body creams
- 4) 88 bananas will be transported by a plane to shops across the country that will sell oddly shaped bananas. Before they are transported, a sticker will be placed

The good bananas go on to receive a sticker and are packaged up in bunches and pallets.

The bananas are loaded into the containers, and the containers onto a ship. Unfortunately, there was a storm at sea and one of the containers dropped into the ocean. 62 bananas were lost.

More steps on the next page -->

The ship brings the bananas to a distribution center. There, the banana orders are fulfilled:

- 1) 30% of the bananas left are going to a grocery shop (n=?)
- 2) 20% of the bananas left are going to restaurants (n=?)
- 3) The rest of the bananas go to school canteens (n=?)

The flowchart ends with the customers buying the bananas.

**Answer the following questions:**

How many total bananas have been sold? .....

How many total bananas had to be thrown out or were lost? .....

A banana in the shop cost \$0.85, in the canteen \$0.55 and in a restaurant \$0.75.

How much money was made? .....

If 35% of the customers at the end of the flowchart throw out their banana without eating it, how many people is that? .....

**If there is time, add to following to your flowchart:**

- Some bananas are also sold straight from the farm on a farmer's market
- Some bananas which are not the right colour or shape will also be discarded
- There is some loss of bananas during the transport from the distribution centre to the shops, canteens and restaurants. On top of that, those sellers (plus also the consumers) waste some bananas (they turn brown or get thrown out)
- The process of growing the bananas can also be added to the flowchart:
  - The growth and quality of the banana is monitored
  - Banana plants are watered and kept safe from pests
  - While growing several sample tests are done
  - When bananas are grown a certain size, they are cut from trees
  - Bananas are cut into bunches of 5-6 bananas
  - They are washed and inspected

# Fruit & vegetable science experiment

When food scientists do a science experiment, they follow the *scientific method*.

These are the scientific method steps:

1. Think of your question: what do you want to know?
2. Write down what you think will happen
3. Make a plan for your experiment, gather everything you need and start your experiment
4. Carefully gather your data: write down your measurements and observations
5. When finished, you can write your findings and make graphs and tables. Look at your data and observations and see if you can answer your question from step 1.
6. Look at what you thought would happen in step 2: did that happen? Or was it different?
7. Share and discuss your findings

**Follow the steps below to do your own experiment!**

## Step 1

Think of a fruit or vegetable science question to answer in your experiment. Write it down below.

## Step 2

Write down what you think will happen. What do you *expect* the answer to step 1 will be?

**Step 3**

Make a plan for your experiment: answer the questions below:

- **Write in detail HOW you will do your experiment:**

*(How are you going to answer the question in step 1?)*

- **What exactly will you measure?**

*(Think about your units of measurement. For example: if you are measuring 'level of mould', how will you measure that? You could for example rate the level of mould from 0 to 10, with 0 being no mold and 10 being ALL mould. But as long as you keep it the same every measurement, you can think of your own unit of measurement. You can measure multiple things!)*

- **How many times will you do measurements?**

*(Your experiment might take a few days, so you can do multiple measurements.)*

- **What materials will you need for your experiment?**

*(Write anything down you will need)*

**Step 4**

Make a table to note down your observations and measurements.

**Step 5**

Use your observations from step 4 and write your findings below. Answer the questions below and make graphs on the next page

- **What were the differences in measurements at the start and at the end of your experiment? Make a summary table**

*(It is best to see the results of your experiment clearly by writing the measurements at the start and the finish. you can then also calculate and write down the difference)*

- **If you compared two conditions, was there a difference between those measurements?**

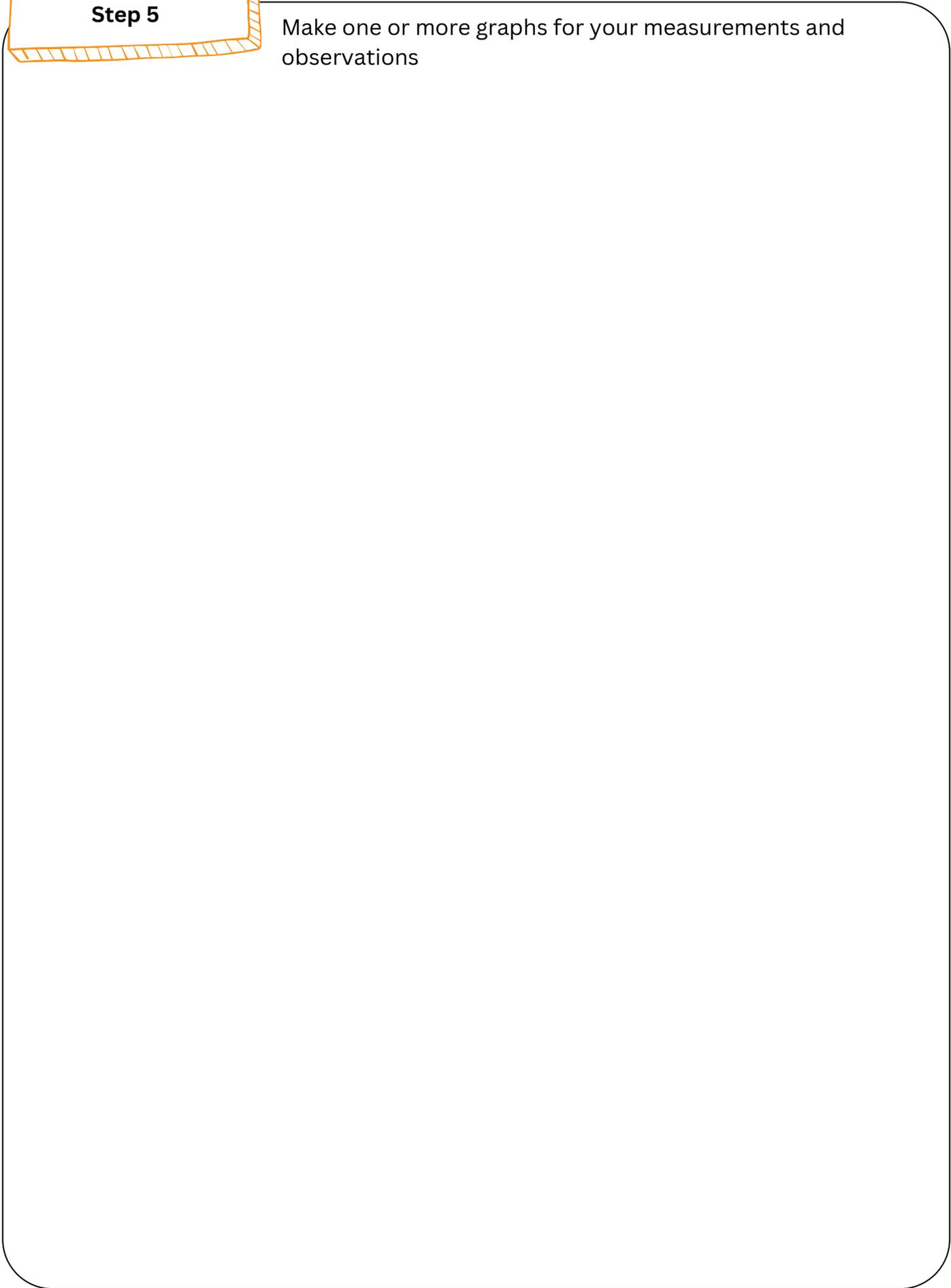
*(For example, if you compared the mold formation between an apple in a container versus one out in the open; was there a difference between the measurements above?)*

- **If you did multiple measurements, did the numbers increase the same between each of the measurements?**

*(for example, did the apples go mouldy at the same rate between the measurements? Or did it for example go slower in the beginning and faster at the end?)*

**Step 5**

Make one or more graphs for your measurements and observations



**Step 5**

- In a few sentences, what were your findings?

- **What does that mean?**

*(Now that you know the results, what will you do with that information?)*

**Step 6**

- **Were your findings the same as your prediction in step 2? If not, what was different?**
- **Can you think of any follow up experiments? Is there anything else you'd like to know?**

**Step 7**

When we do experiments and learn something new, it's important to tell others about it. So tell your teachers, classmates, parents and friends about your findings!