●●○○○ **Level 2 · Science** S2.1

How plants grow

How a seed becomes a plant that makes its own food.

Find the jobs of the parts of a plant. Grow seeds, run a fair test, see what light and water do, learn how leaves make food, and follow a plant from seed to seed.

YOU ARE READY FOR THIS BOOK IF

You can name the root, stem, leaf and flower on a real plant.

One step up	S3.1 Cells
This book	**S2.1 How plants grow**
One step down	S1.2 Animals and where they live

Contents

S2.1.1 Plant parts and their jobs

S2.1.2 From seed to seedling

S2.1.3 A fair test with plants

S2.1.4 Light, water and plant health

S2.1.5 Leaves make food

S2.1.6 Flowers and pollination

S2.1.7 How seeds travel

S2.1.8 The life cycle of a plant

Key words, A to Z

Written and drawn by attnom. Free to read, print and share.

S2.1.1 CHAPTER 1

Plant parts and their jobs

What does each part of a plant do?

YOUR GUESS

Pick one before you read on. It is fine to be wrong.

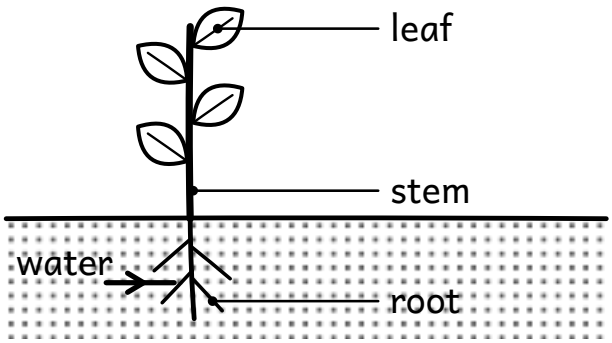
- ☐ **A** The stem only makes the plant look tall.
- ☐ **B** The stem makes the seeds.
- ☐ **C** The stem takes in food from the soil.
- ☐ **D** The stem holds the plant up and carries water.

BY THE END YOU CAN

- Explain the jobs of the root, stem, leaf and flower
- Show water moving up a stem with coloured water or ink

Look at a plant by the road or in a garden. It has four main parts. Each part has a job.

The **root** grows under the ground. It holds the plant in the soil. It takes in water and minerals. Minerals are tiny bits in the soil that a plant needs.



The root holds the plant in the soil. It takes water in.

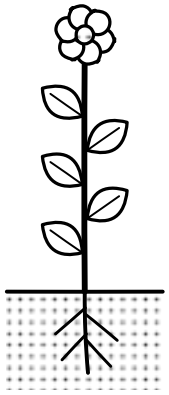
The **stem** holds the plant up. It carries water from the roots to the leaves.

The **leaf** makes food for the plant. It uses light to do this.

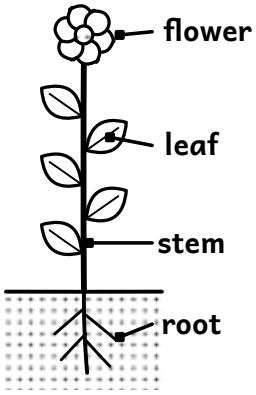
The **flower** makes seeds. New plants can grow from seeds.

DRAW IT FIRST

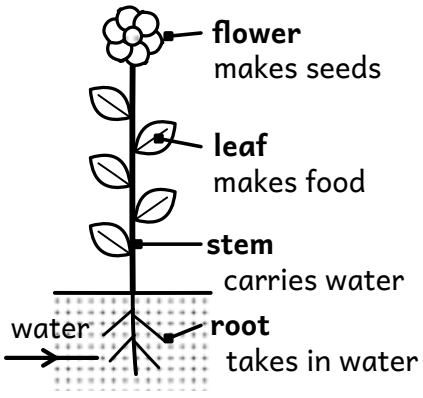
Draw a plant and its jobs



1 Draw a plant in the soil. Give it a root, a stem, leaves and a flower.



2 Write flower, leaf, stem and root. Join each name to its part.



3 Under each name write its job. Draw an arrow into the root. Write water.

Water goes in at the root. It goes up the stem. It reaches the leaves. The plant does not drink with its leaves.

SEE IT THREE WAYS

As a picture

Part	Job
root	takes in water
stem	carries water up
leaf	makes food
flower	makes seeds

In words

The root holds the plant in the soil and takes in water. The stem holds the plant up and carries water. The leaf makes food. The flower makes seeds.

You cannot see water move inside a stem. But you can colour it. Then you can watch the colour climb.

TRY IT

Watch water climb a stem

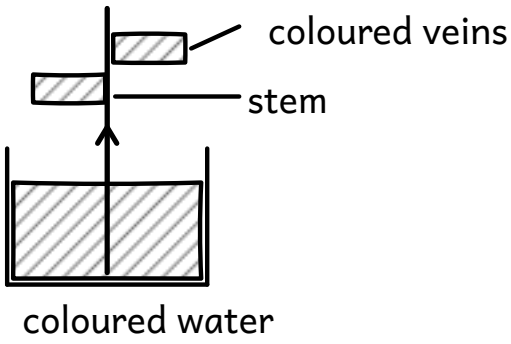
You need: a white flower, or a pale leafy stem from a plant, a clear cup or glass, water, a little ink, scissors.

Be safe: A grown up cuts the stem. Never drink or taste the ink water. Do not taste any plant. Wash your hands after you touch plants and ink.

1. Put a little water in the cup. Add ink until the water is dark.
2. A grown up cuts a fresh slice off the bottom.
3. Stand the stem in the cup. Keep the leaves and flower dry.
4. Leave it for some hours. Look again the next day.
5. Look at the veins in the leaves, or in the petals.

What you will see: The colour shows in the leaf veins or the petals. It climbed up the stem from the cut end at the bottom. The ink only gets in at the bottom. The leaves stayed dry above the cup.

If you cannot try it, this is what happens.



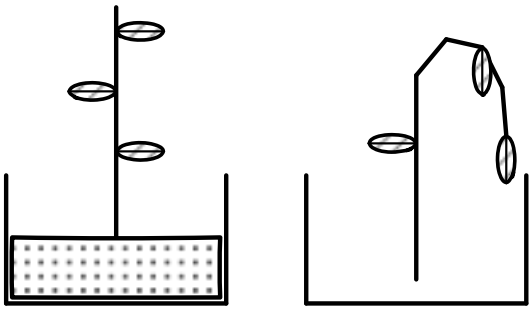
A WRONG IDEA MANY PEOPLE HAVE

~~A plant drinks the rain through its leaves.~~

Why it feels right: Rain falls on the leaves. After rain, the plant looks fresh.

The test that breaks it: Cut two leafy stems from the same plant. Stand one in a cup of water. Stand the other in an empty cup. Wet its leaves with drops often. By the next day the second stem droops. The first stays firm.

What is true: Water goes in at the roots and up the stem. A plant gets its water from the soil.



Both stems are alike. Only the left one has its cut end in water.

KEY WORDS

root
the part under the ground. It holds the plant and takes in water.

stem
the part that holds the plant up and carries water.

leaf
the part that makes food for the plant, using light.

flower
the part that makes seeds.

BACK TO YOUR GUESS

The answer is D: The stem holds the plant up and carries water.

The stem holds the plant up. It also carries water from the roots to the leaves.

CHECK YOURSELF

Try each one before you look. A wrong answer tells you where to go next.

1. Which part takes in water from the soil?

   A The root

   B The leaf

   C The flower

   Answer at the back of the book.

2. Which part of a plant makes seeds?

   A The stem

   B The root

   C The flower

   Answer at the back of the book.

3. Kofi stands a white flower in ink water. Next day the petals have colour. How did the colour get there?

   A It soaked in through the petals from the air.

   B It went up the stem from the cut end.

   C The flower made the colour itself.

   Answer at the back of the book.

4. Lucía says a plant drinks rain through its leaves. What is the best answer?

   A Water goes in at the roots and up the stem.

   B She is right. Leaves drink the rain.

   C Water goes into the flower first.

   Answer at the back of the book.

5. Draw a plant. Label the root, stem, leaf and flower. Write one job for each.

   Answer at the back of the book.

6. Sipho says roots only hold a plant up. What is the best answer?

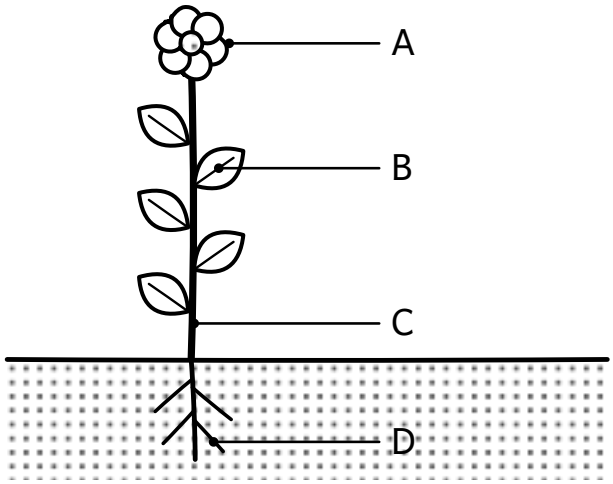
   A He is right. Roots only hold the plant up.

   B Roots hold the plant in the soil and take in water.

   C Roots make the food for the plant.

   Answer at the back of the book.

7. Look at the picture. Which letter shows the part that carries water up to the leaves?



   A A

   B B

   C C

   D D

   Answer at the back of the book.

KEEP IT

Copy this into your exercise book.

The root takes in water and holds the plant. The stem holds the plant up and carries water. The leaf makes food. The flower makes seeds.

Draw: A plant with four labels: root, stem, leaf, flower. Write its job by each.

S2.1.2 CHAPTER 2

From seed to seedling

What is inside a seed, and how does it start to grow?

YOUR GUESS

Pick one before you read on. It is fine to be wrong.

- ☐ **A** Nothing. A seed is a hard little stone.
- ☐ **B** A tiny plant and its food.
- ☐ **C** A tiny flower.

BY THE END YOU CAN

- Name the parts of a seed: coat, food store and tiny plant
- Test whether seeds need water to start growing, using two cups

A dry bean looks dead. It is alive. Inside is a tiny plant.

The **seed coat** is the skin on the outside. It protects the seed.

Inside are two halves. They are the **food store**. They feed the tiny plant until its leaves can make food.

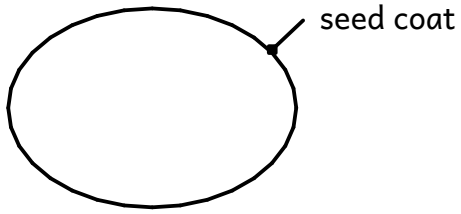
Between the halves lies the tiny plant. It has a tiny root and a tiny **shoot**. The shoot is the part that grows up.

You can see this. Soak a dry bean in water overnight. Peel off the coat. Gently split the bean in two. Look for the tiny plant.

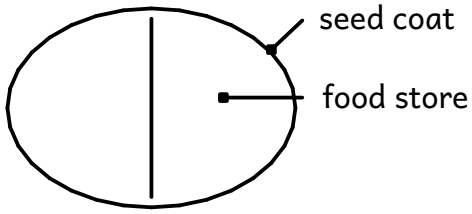
Be safe. Never eat or taste the beans from an activity. Wash your hands after you touch seeds, soil or plants.

DRAW IT FIRST

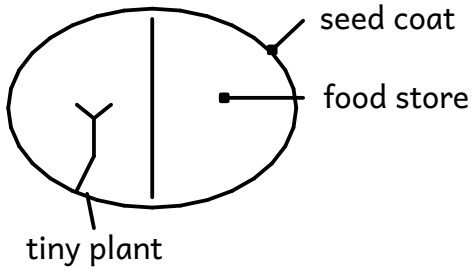
Draw the inside of a bean



1 Draw a big bean shape. Write seed coat. This is the outside.

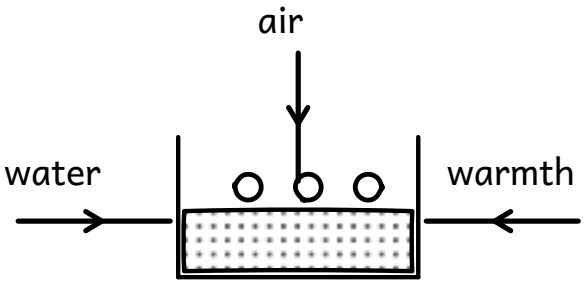


2 Draw a line down the middle. Write food store. These are the two halves.



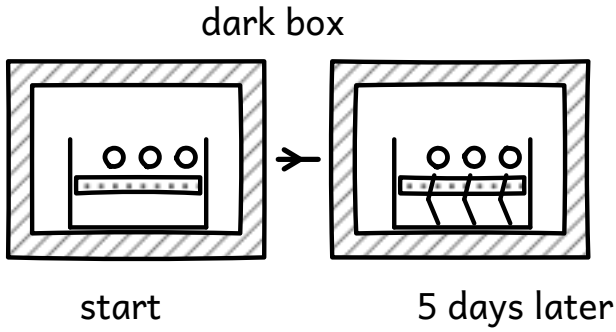
3 Draw a tiny root and shoot in one half. Write tiny plant.

A seed can wait a long time. It starts to grow when it gets water, air and warmth. Most seeds do not need light or soil to start.



A seed needs water, air and warmth to start.

Many seeds start in the dark, under the ground. A bean can start in a dark box too.

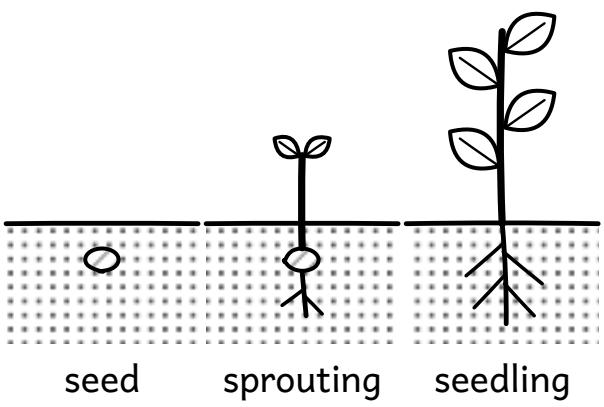


Wet beans grow roots inside a dark box.

First the seed takes in water. It swells, and the coat splits. The root comes out first. Then the shoot grows up. A young plant like this is a **seedling**.

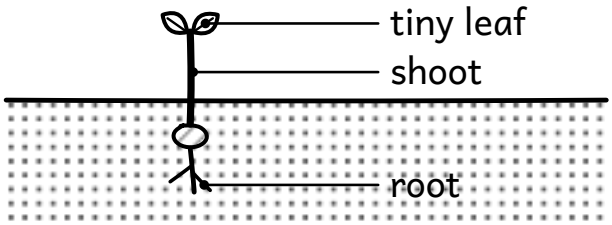
SEE IT THREE WAYS

As a picture



In words

The seed takes in water. The root comes out first and goes down. The shoot grows up and the leaves open. Now it is a seedling.



The root goes down. The shoot goes up.

Do seeds need water to start? Test it. Use two cups. Only one thing will be different: the water.

TRY IT

Do seeds need water to start?

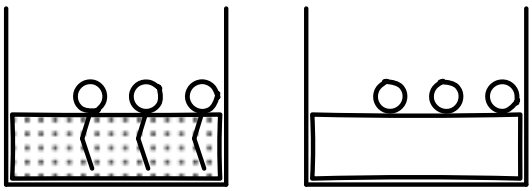
You need: two cups, paper or a cloth, enough to fill the bottom of each cup, a few dry beans, the same kind, water, a warm place.

Be safe: Do not eat the beans. If white fuzz grows on the paper, throw it away. Then wash your hands.

1. Put paper or cloth in the bottom of each cup.
2. Put the same number of beans on the paper in each cup.
3. Wet the paper in one cup. Keep it wet every day.
4. Leave the other cup dry. Stand both cups in the same place.
5. Look every day for about five days. Where do the beans change?

What you will see: Only the wet beans start to grow. They swell, the coat splits, and a root comes out first. The dry beans stay as they were. Seeds need water to start. These beans grew with no soil. It may take more days if the place is cool.

If you cannot try it, this is what happens.



wet: roots grow dry: no roots

A WRONG IDEA MANY PEOPLE HAVE

~~A seed needs soil to start growing.~~

Why it feels right: People plant seeds in soil. We always see seedlings come up from the ground.

The test that breaks it: Put wet paper in a cup. Lay a few beans on it. Add no soil. Keep the paper wet. After some days, roots come out of the beans. Then the shoots grow.

What is true: A seed needs water, air and warmth to start. The food store feeds the seedling at first. Soil is not needed to start.

KEY WORDS

seed coat
the skin on the outside of a seed. It protects the seed.

food store
the part of a seed that feeds the tiny plant.

shoot
the part of a plant that grows up from the seed.

seedling
a young plant that has just started to grow.

BACK TO YOUR GUESS

The answer is B: A tiny plant and its food.

A seed holds a tiny plant and food for it. A coat covers them both.

CHECK YOURSELF

Try each one before you look. A wrong answer tells you where to go next.

1. Which part of a bean seed protects the tiny plant?

    A The food store

    B The shoot

    C The soil around it

    D The seed coat

    Answer at the back of the book.

2. What is the food store for?

    A It feeds the tiny plant until its leaves can make food.

    B It keeps the seed dry.

    C It turns into the flower.

    Answer at the back of the book.

3. Mei keeps one cup of beans wet and one cup dry. Only the wet beans grow. What does this show?

    A Seeds need soil to start growing.

    B Seeds need light to start growing.

    C Seeds need water to start growing.

    Answer at the back of the book.

4. What comes out of a growing bean first?

    A The flower

    B The root

    C The leaves

    Answer at the back of the book.

5. **From an earlier chapter**

   Which part of a plant takes in water from the soil?

   A The root

   B The stem

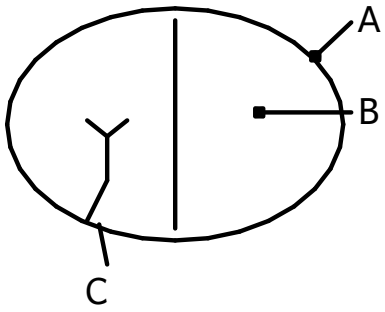
   C The leaf

   Answer at the back of the book.

6. Draw a bean seed cut open. Label the seed coat, the food store and the tiny plant.

   Answer at the back of the book.

7. Look at the picture. Which letter shows the tiny plant?



   A A

   B B

   C C

   Answer at the back of the book.

8. Ana lays wet beans on wet paper in a dark box. After five days roots come out. What does this show?

   A Beans can start to grow in the dark.

   B Beans need light to start growing.

   C Beans need soil to start growing.

   Answer at the back of the book.

KEEP IT

Copy this into your exercise book.

Seed parts: a seed coat, a food store and a tiny plant. With water, air and warmth it starts to grow. The root comes out first, then the shoot. Seeds need no soil to start.

Draw: A bean cut open. Label the seed coat, food store and tiny plant.

S2.1.3 CHAPTER 3

A fair test with plants

How can I test what a plant needs?

YOUR GUESS

Pick one before you read on. It is fine to be wrong.

- ☐ **A** Change many things at once.
- ☐ **B** Plant one seed and watch it.
- ☐ **C** Pick the plants that look best.
- ☐ **D** Change one thing. Keep the rest the same.

BY THE END YOU CAN

- Plan a test that changes only one thing
- Record plant height in centimetres in a table

Tariq has a question. Do beans grow better in garden soil or in sand?

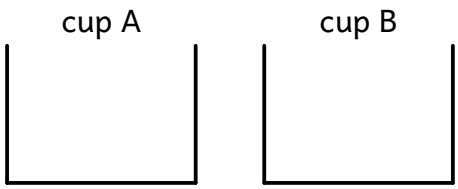
He needs a **fair test**. In a fair test you change only one thing. You keep everything else the same.

Tariq changes the soil. One cup gets garden soil. One cup gets sand.

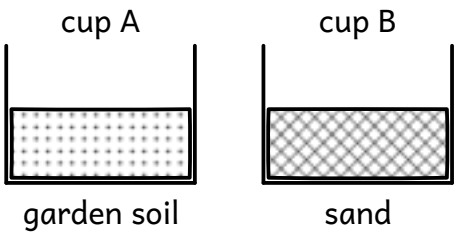
The rest stays the same. Same kind of bean. Same cup. Same water. Same place.

DRAW IT FIRST

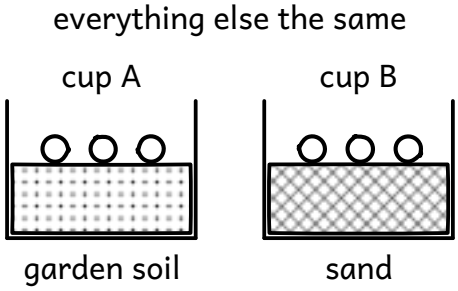
Draw Tariq's two cups



1 Draw two cups the same size. Write cup A and cup B.



2 Fill cup A with garden soil. Fill cup B with sand. Write what is in each.



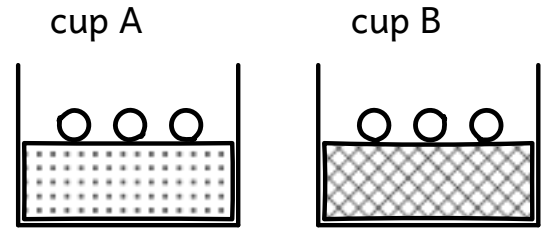
3 Put three beans in each cup. Write everything else the same.

Now only the soil is different. If the plants grow differently, the soil is the reason.

Look at a test that is not fair. Cup A has garden soil and stands by the window. Cup B has sand and stands in a cupboard.

Two things are different, the soil and the light. If cup A grows better, you cannot tell why.

two things changed



Two things changed, so this is not a fair test.

Tariq plants three beans in each cup, not one. One seed may be weak. A weak seed would spoil the test.

SEE IT THREE WAYS

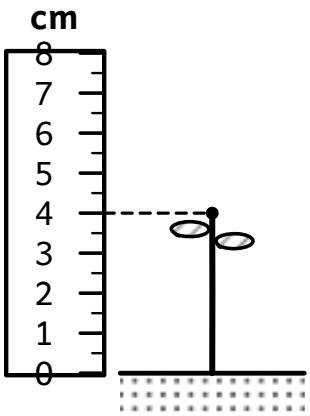
As a picture

What	Cup A	Cup B
soil	garden soil	sand
beans	3	3
water	1 spoon	1 spoon
place	same	same

In words

Only the soil is different. Everything else is the same in both cups.

Now measure. The **height** of a plant is how tall it is. Measure from the soil to the tip. Use a ruler marked in centimetres. We write cm.



Measure from the soil to the tip. This seedling is 4 cm tall.

Measure the tallest seedling in each cup. Measure on the same days. Write each number in a **table**. A table is a grid of rows and columns.

TRY IT

Run a fair test with beans

You need: two cups the same size, and a plate or tray, garden soil, sand, or soil from another place, six dry beans, the same kind, water and a spoon, a ruler marked in centimetres, paper and a pen for your table.

Be safe: A grown up makes the holes. Wash your hands after you touch soil or sand. Do not eat the beans.

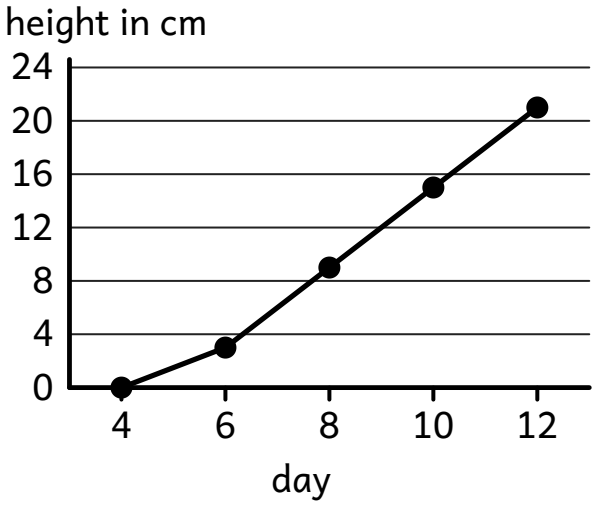
1. A grown up makes two holes in the bottom of each cup.
2. Fill one cup with garden soil. Fill the other with sand.
3. Push three beans into each cup, about 2 cm deep.
4. Pour the same water on each cup, until just damp.
5. Then give each cup one spoon of water a day. Keep both in the same place.
6. Every two days, measure the tallest seedling in each cup.
7. Write the height in your table. Mark 0 if nothing shows yet.

What you will see: The table shows example numbers. Yours will not match them. For some days nothing shows above the soil. Then the seedlings come up. Look at all the rows, not just one. Then say what you see.

If you cannot try it, this is what happens.

Day	A cm	B cm
4	0	0
6	3	3
8	9	8
10	15	12
12	21	15

You can also draw the numbers as a line graph. Here is cup A from the example table. It shows each height on its day.



Cup A as a line graph. The line climbs as the plant grows.

A WRONG IDEA MANY PEOPLE HAVE

~~One seed in each cup is enough for a fair test.~~

Why it feels right: Each cup has one plant. If they differ, it must be the soil.

The test that breaks it: Plant six beans in one cup of soil. Give them all the same water in the same place. After a week, measure each one. The heights are not all the same. One weak seed would mislead you.

What is true: Seeds are not all alike. Use three or more in each cup. Then one weak seed cannot spoil the test.

KEY WORDS

fair test
a test that changes one thing and keeps the rest the same.

height
how tall a plant is, from the soil to the tip.

table
a grid of rows and columns for writing numbers.

BACK TO YOUR GUESS

The answer is D: Change one thing. Keep the rest the same.

A fair test changes only one thing. Then you know what made the difference.

CHECK YOURSELF

Try each one before you look. A wrong answer tells you where to go next.

1. Tariq tests garden soil and sand. What does he change?

   A The kind of soil

   B The kind of bean

   C The place

   Answer at the back of the book.

2. Which of these must stay the same in Tariq's test?

   A The kind of soil

   B The amount of water

   C The height of the seedlings

   Answer at the back of the book.

3. Why does Tariq plant three beans in each cup?

   A Three beans grow faster than one.

   B A fair test must have three.

   C One seed may be weak and spoil the test.

   Answer at the back of the book.

4. Look at the table. How tall was the seedling in cup A on day 10?

Day	A cm	B cm
4	0	0
6	3	3
8	9	8
10	15	12
12	21	15

A 15 cm

B 9 cm

C 12 cm

Answer at the back of the book.

5. Look at the table. How much did cup B grow from day 6 to day 12?

Day	A cm	B cm
4	0	0
6	3	3
8	9	8
10	15	12
12	21	15

Answer at the back of the book.

6. **From an earlier chapter**

What does the food store in a bean do?

A It keeps the water out.

B It feeds the tiny plant until its leaves can make food.

C It makes the flower.

Answer at the back of the book.

7. Diego plants beans in two cups. Cup A has garden soil and gets water every day. Cup B has sand and gets water once a week. Cup A grows taller. Can Diego say the soil made the difference?

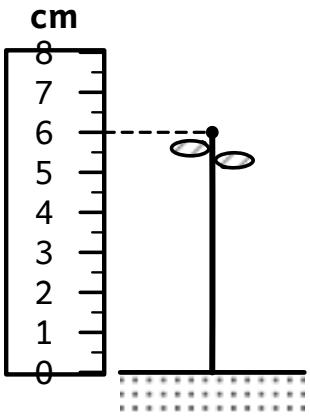
   A Yes. Cup A had garden soil.

   B No. He needed more beans in each cup.

   C No. He changed the soil and the water, so he cannot tell.

   Answer at the back of the book.

8. Look at the ruler. How tall is the seedling?



   A 6 cm

   B 2 cm

   C 7 cm

   Answer at the back of the book.

KEEP IT

Copy this into your exercise book.

A fair test changes only one thing. Keep everything else the same. Use a few seeds in each cup. Measure height in cm, soil to tip, on the same days. Write it in a table.

Draw: Two cups. Write what is different and what is the same.

S2.1.4 CHAPTER 4

Light, water and plant health

What do light and water do to a plant?

YOUR GUESS

Pick one before you read on. It is fine to be wrong.

- ☐ **A** A seedling in the dark stays short and green.
- ☐ **B** A seedling in the dark does not grow at all.
- ☐ **C** A seedling in the dark grows tall, thin and pale.

BY THE END YOU CAN

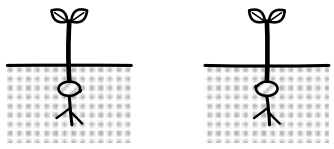
- Compare plants grown with and without light
- Describe what too little or too much water does to a plant

Plants need light. What happens to a plant that gets none?

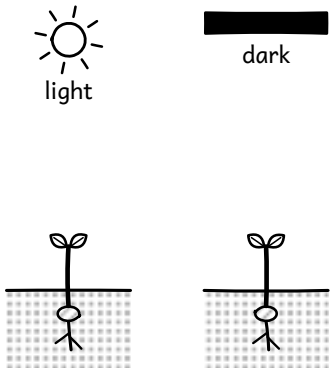
Amina grows two bean seedlings of the same size. One stands by a window. The other stands in a dark box.

DRAW IT FIRST

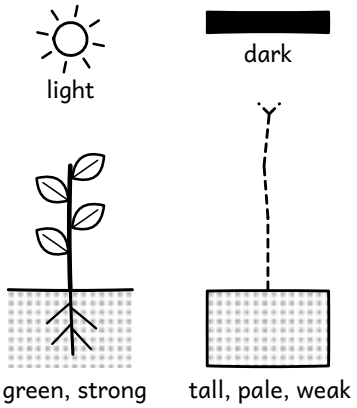
Draw a seedling in light and in the dark



1 Draw two small seedlings in soil.



2 Put a sun over one. Put a black box over the other. Write light and dark.



3 A week later, draw both. The one in the dark is tall, thin and dashed.

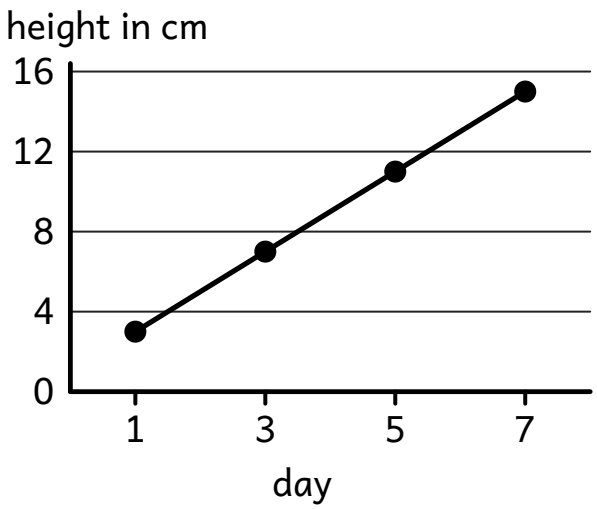
A week later they look very different. The seedling in the dark is taller. It is thin and pale, and its leaves are small.

It stretched tall. It used the food in its seed. But it cannot make food without light. So it stays weak. If it stays in the dark, it dies.

The seedling by the window is green and strong. It is shorter. This is a **healthy** plant.

SEE IT THREE WAYS

As a picture



In words

The dark seedling gets taller each day. On day 7 it is 15 cm. But it is pale and weak.

TRY IT

Light or dark?

You need: two cups of bean seedlings, the same size, a box with a lid, or a dark cupboard, a bright window, water and a spoon, a ruler marked in centimetres.

Be safe: Never look at the Sun, not even through a window. Wash your hands after you touch soil or plants. Do not eat the beans or seedlings.

1. Measure both seedlings. They should be the same size.
2. Stand one cup by the window. Put the other in the dark box.
3. Give both the same water each day. Open the box for a moment only.
4. After a week, take both out. Measure them.
5. Look at their colour and their leaves.

What you will see: The table shows example numbers. Yours will differ. The seedling from the dark is taller and thin. It is pale, with small leaves. The seedling by the window is green, shorter and strong. Do not leave the dark one in the dark. It will die.

If you cannot try it, this is what happens.

Plant	Height	Colour
light	9 cm	green
dark	15 cm	pale

A WRONG IDEA MANY PEOPLE HAVE

~~A plant in the dark grows less.~~

Why it feels right: Plants need light. So with no light, a plant should not grow.

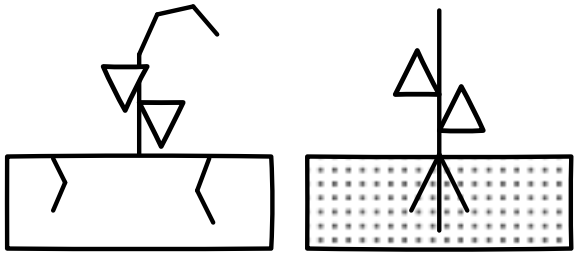
The test that breaks it: Put two bean seedlings of the same size in two cups. Stand one in the light. Put the other in a dark box. Measure both after a week. The dark one is taller.

What is true: A seedling in the dark stretches tall and thin. But it is pale and weak. It cannot make food without light. If it stays in the dark, it dies.

Water matters too. A plant needs the right amount.

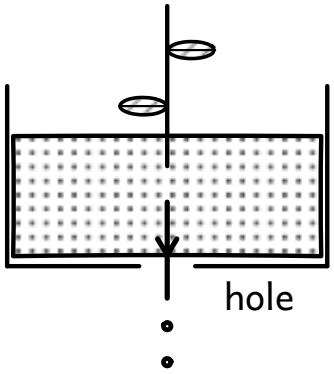
With too little water, a plant will **wilt**. To wilt is to droop. Its leaves dry out and go brown.

With too much water, the soil stays soaked. The roots cannot get air. They **rot**. Rotting means going soft and dying. The leaves go yellow. The plant can die.



Too little water and too much water both harm a plant.

Push a finger into the soil. If the top feels dry, give water. If it feels soaked, wait. A pot needs a hole at the bottom. Then extra water runs out.



The hole lets extra water run out. The roots keep their air.

KEY WORDS

healthy
green and strong, and growing well.

wilt
to droop because there is too little water.

rot
to go soft and die. Roots rot in soaked soil.

BACK TO YOUR GUESS

The answer is C: A seedling in the dark grows tall, thin and pale.

A seedling in the dark stretches tall and thin. It turns pale and weak.

CHECK YOURSELF

Try each one before you look. A wrong answer tells you where to go next.

1. A bean seedling stays in a dark cupboard for a week. What does it look like?

   A Short, thick and green

   B It does not grow at all

   C Short and pale

   D Tall, thin and pale

   Answer at the back of the book.

2. A plant droops. Its leaves are dry and brown. What is wrong?

   A It has too little water.

   B It has too much water.

   C It has too much light.

   Answer at the back of the book.

3. Why do roots rot in soaked soil?

   A They get too little water.

   B They cannot get air.

   C They get too much light.

   Answer at the back of the book.

4. Look at the table. How much taller is the dark seedling than the light one?

Plant	Height	Colour
light	9 cm	green
dark	15 cm	pale

   Answer at the back of the book.

5. **From an earlier chapter**

   Amina tests light on two seedlings. What must stay the same?

   A The amount of water

   B The amount of light

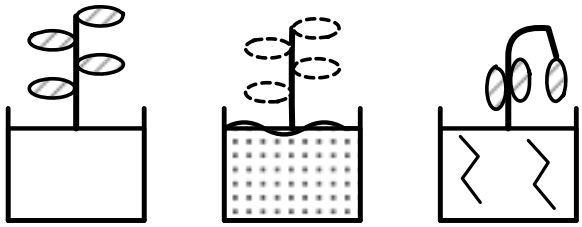
   C The height at the end

   Answer at the back of the book.

6. Draw a plant with too little water and one with too much. Write what happens to each.

   Answer at the back of the book.

7. Hana looks at three plants in cups. Leaves drawn with a dashed line are yellow. Which plant needs water?



   A A

   B B

   C C

   Answer at the back of the book.

8. Seedling X is tall, thin and pale. Seedling Y is shorter and green. Which one is healthy?

   A Seedling X, because it is taller.

   B Seedling Y. Green leaves mean it makes food.

   C Both, because both of them grew.

   Answer at the back of the book.

KEEP IT

Copy this into your exercise book.

A seedling in the dark grows tall, thin and pale, then dies. A plant in light is green, shorter and strong. Too little water makes a plant droop. Too much water rots the roots.

Draw: Two seedlings, one in light and one in the dark. Label green and pale.

S2.1.5 CHAPTER 5

Leaves make food

How does a plant get its food?

YOUR GUESS

Pick one before you read on. It is fine to be wrong.

- ☐ **A** It makes its food in its leaves.
- ☐ **B** It takes its food from the soil.
- ☐ **C** It drinks its food from the rain.

BY THE END YOU CAN

- Explain that green leaves use sunlight, air and water to make food
- Explain why animals depend on plants for food

You eat food to grow and to move. A plant needs food too. A plant has no mouth. So how does it get food?

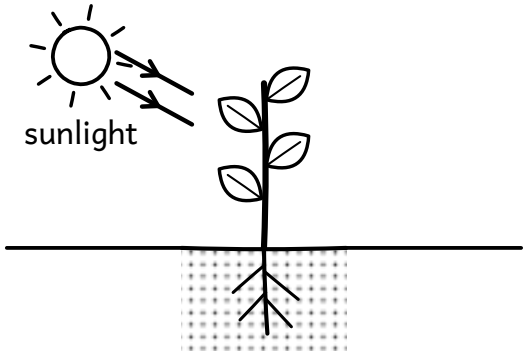
A green plant makes its own food. It makes the food in its green leaves.

A leaf needs three things. The first is sunlight. The second is water. The third is a gas from the air.

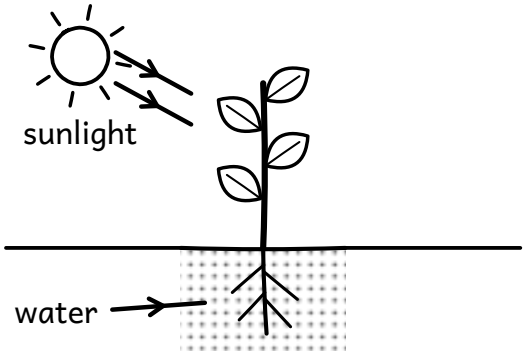
The roots take in water from the soil. The water goes up the stem to the leaf.

DRAW IT FIRST

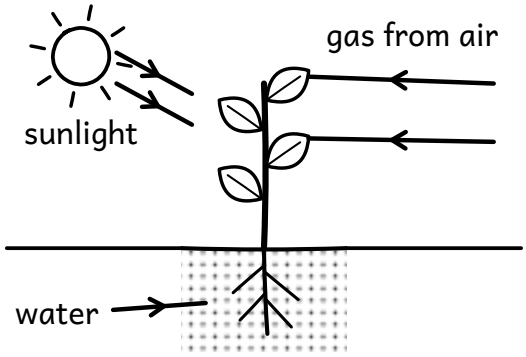
Draw what a leaf needs



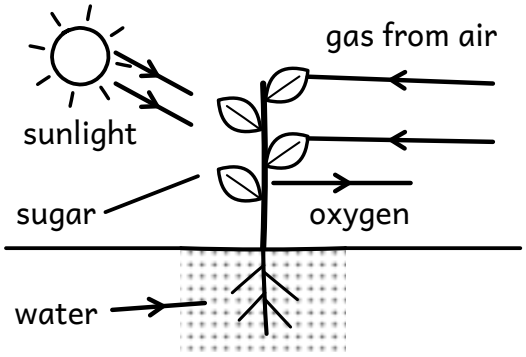
1 Draw a plant. Draw the Sun and arrows to the leaves. Write sunlight.



2 Draw an arrow to the roots. Write water.



3 Draw arrows from the air to the leaves. Write gas from air.

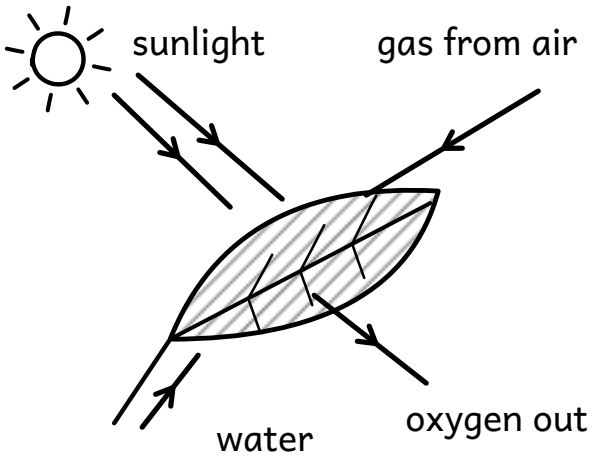


4 Write sugar by a leaf. Draw an arrow out. Write oxygen.

The leaf uses the three things to make **sugar**. Sugar is the food of the plant. The plant uses it to grow.

The leaf also gives out **oxygen**. Oxygen is a gas in the air. People and animals need it to breathe.

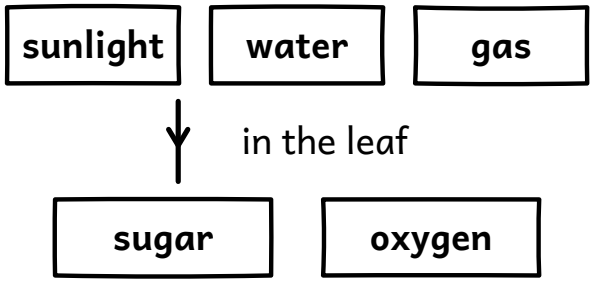
The gas the leaf takes in is a different gas. It is called carbon dioxide. A leaf does not take in oxygen to make food.



Three things go in. Oxygen comes out.

SEE IT THREE WAYS

As a picture

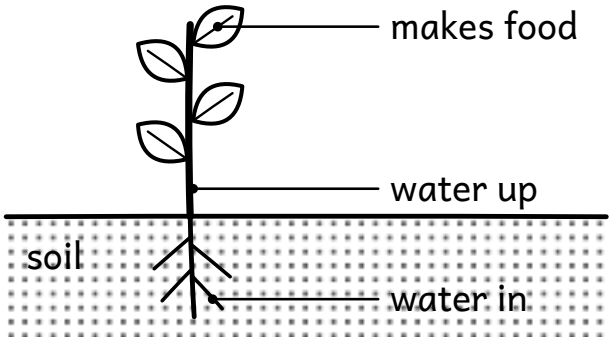


In words

Sunlight, water and a gas from the air go into the leaf. Sugar and oxygen come out.

Soil does not feed a plant. It holds the plant up. It gives water. It also gives small amounts of **minerals**.

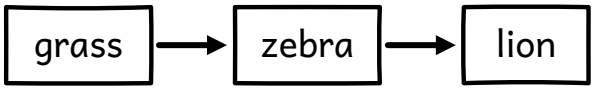
Minerals are like vitamins for people. They help a plant stay well. They are not its food.



The soil gives water, not food. The leaf makes the food.

Animals cannot make their own food. They eat plants. Or they eat animals that ate plants.

A **food chain** shows who eats what. The arrows point to the eater.



The food starts with the grass.

A lion eats only meat. But the zebra it eats ate grass. So the lion's food starts with a plant too.

TRY IT

What happens to grass with no light?

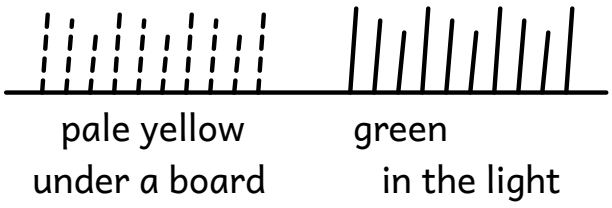
You need: a small patch of grass in the light, a flat board or a flat stone, a week.

Be safe: Let a grown up lift the board or stone. Snakes, scorpions, spiders and stinging insects can hide under it. Wash your hands after touching soil or plants.

1. Pick a small patch of grass in the light. Look at its colour.
2. Cover the patch with the flat board or stone.
3. Leave it for a week.
4. Ask a grown up to lift the board. Look at the grass under it. Look at the grass beside it.
5. Leave the board off. Look again after a few days.

What you will see: The grass under the board is pale yellow. The grass in the light is green. With no light, the grass cannot make food. After a few days in the light, it slowly turns green again.

If you cannot try it, this is what happens.



A WRONG IDEA MANY PEOPLE HAVE

~~A plant gets its food from the soil.~~

Why it feels right: Roots go into the soil. A plant grows in soil. So the soil must be its food.

The test that breaks it: Long ago a man grew a willow tree in a tub. The tub held soil, and he weighed the soil first. He gave the tree only rain water. After five years the tree had gained about 75 kg. The soil had lost less than 100 g. At home, cover grass with a board for a week. It still has soil and water. With no light it goes pale.

What is true: A plant makes its food in its leaves. It uses sunlight, water and a gas from the air. Soil gives water and minerals, not food.

KEY WORDS

sugar
the food a green leaf makes.

oxygen
a gas in the air. A leaf gives it out. We breathe it.

minerals
tiny bits in soil that help a plant stay well. Not its food.

food chain
a line that shows who eats what. The arrows point to the eater.

BACK TO YOUR GUESS

The answer is A: It makes its food in its leaves.

A plant makes its own food in its green leaves. It uses sunlight, water and a gas from the air.

CHECK YOURSELF

Try each one before you look. A wrong answer tells you where to go next.

1. What does a green leaf use to make food?

    A Soil, stones and sand

    B Only water from the soil

    C Only sunlight

    D Sunlight, water and a gas from the air

    Answer at the back of the book.

2. Where does a plant make most of its food?

    A In its roots

    B In its leaves

    C In the soil

    Answer at the back of the book.

3. Kofi covers a patch of grass with a board for a week. What does he see when he lifts it?

    A Pale yellow grass

    B Dark green grass

    C Grass that has grown taller and greener

    Answer at the back of the book.

4. A lion eats only meat. Does it depend on plants?

    A No. It does not eat any plants.

    B Only when the lion eats grass itself.

    C Yes. The animals it eats ate plants.

    Answer at the back of the book.

5. **From an earlier chapter**

   Which part of a plant takes in water from the soil?

   A The leaves

   B The roots

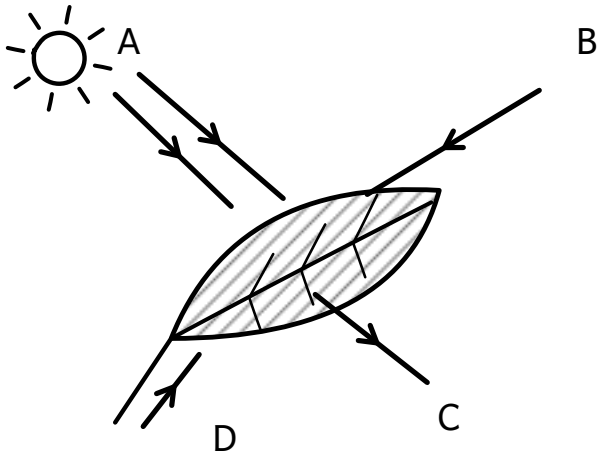
   C The flower

   Answer at the back of the book.

6. Draw a leaf making food. Show what goes in and what comes out.

   Answer at the back of the book.

7. Look at the picture. Which letter shows oxygen leaving the leaf?



   A A

   B B

   C C

   D D

   Answer at the back of the book.

KEEP IT

Copy this into your exercise book.

Leaves use sunlight, water and a gas from air to make sugar. Sugar is the plant's food. Leaves give out oxygen. Soil gives water, not food. Animals eat plants, or animals that ate plants.

Draw: A leaf. Arrows in: sunlight, water, gas. Arrows out: sugar, oxygen.

S2.1.6 CHAPTER 6

Flowers and pollination

Why do plants have flowers?

YOUR GUESS

Pick one before you read on. It is fine to be wrong.

- ☐ **A** Flowers are only there to look nice.
- ☐ **B** Flowers catch the rain for the plant.
- ☐ **C** Flowers are only there to feed insects.
- ☐ **D** Flowers help a plant make seeds and fruit.

BY THE END YOU CAN

- Point to the petals, stamens and the part that becomes the fruit
- Explain how insects, birds and wind carry pollen between flowers

A flower is not only for looking at. A flower is how many plants make seeds.

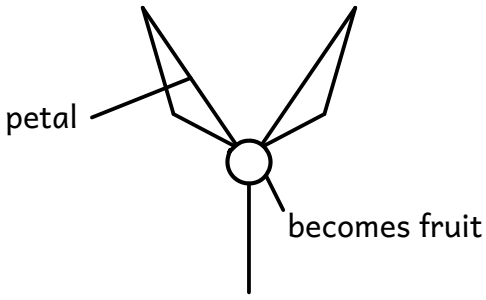
Petals are often bright. They bring insects and birds to the flower.

Inside the flower are the **stamens**. They make **pollen**. Pollen is a fine dust.

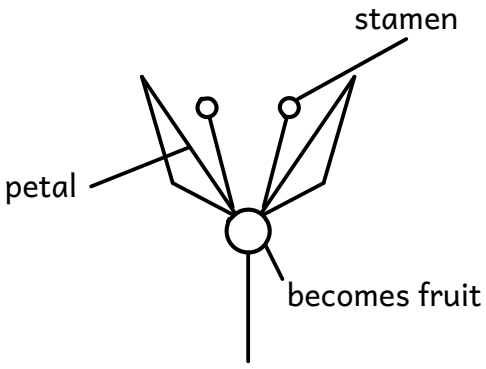
In the middle is the pistil. Its top is sticky, and it catches pollen. At its base is the part that becomes the **fruit**. A fruit holds the seeds.

DRAW IT FIRST

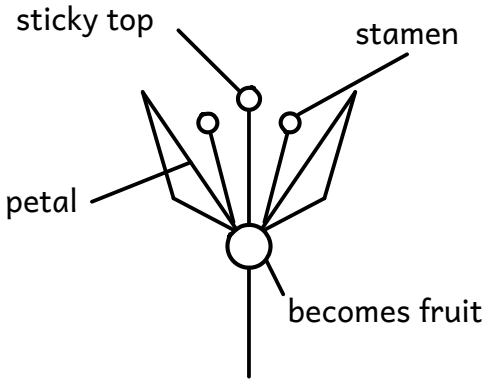
Draw the parts of a flower



1 Draw a stem, a round base and two petals. Write petal and becomes fruit.



2 Draw two stamens with a dot on top. Write stamen.



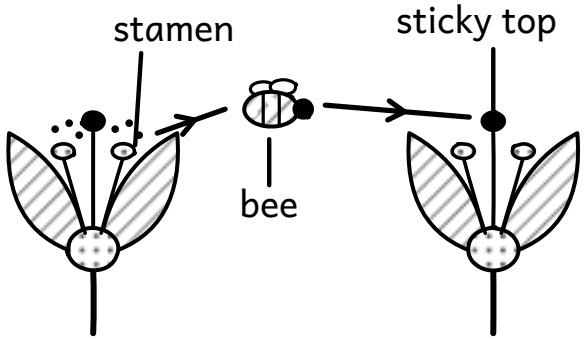
3 Draw a stalk from the base. Add a small round sticky top. Write sticky top.

Pollination is pollen reaching the sticky top of a flower. The pollen comes from a flower of the same kind.

Pollen cannot walk. Something has to carry it.

Bees and butterflies visit flowers for sweet nectar. Birds such as sunbirds and hummingbirds do too.

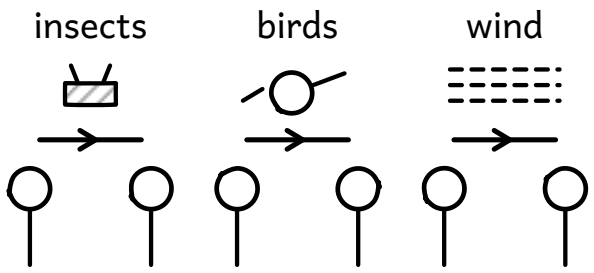
Pollen sticks to their bodies. They do not mean to carry it. At the next flower, some rubs off on the sticky top.



Pollen goes from a stamen to a sticky top.

SEE IT THREE WAYS

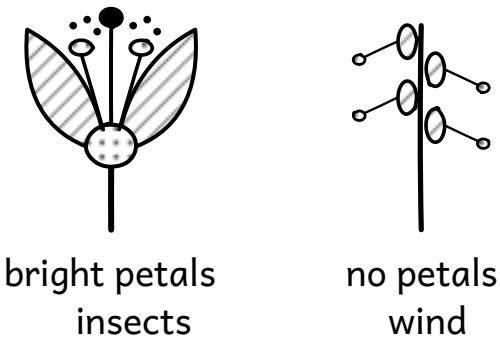
As a picture



In words

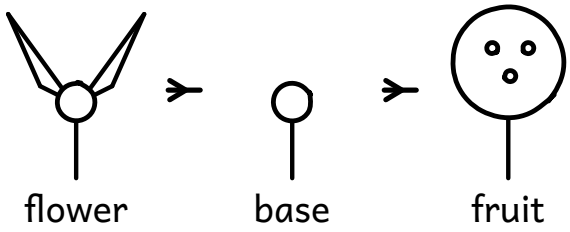
Insects and birds carry pollen on their bodies. Wind blows pollen from flower to flower.

Grasses, maize, rice and wheat use the wind. Their flowers are small and dull. They have no bright petals. They make a lot of pollen.



Bright petals bring insects and birds. A grass flower uses the wind.

After pollination, seeds start to grow. The petals fall. The base swells into a fruit.



The base of the flower swells into a fruit.

In science, a bean pod, a tomato and a mango are fruits. Each one holds seeds.

TRY IT

Find the pollen of *a* wind flower

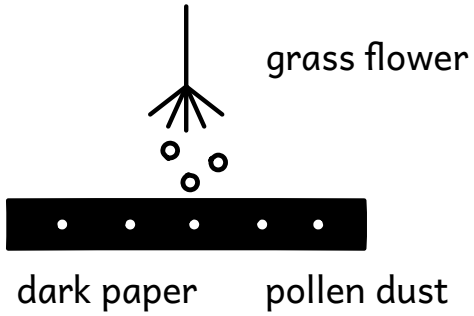
You need: grass, maize, rice or wheat in flower, *a* sheet of dark paper, *a* dry day.

Be safe: Never smell or taste the pollen. Some people sneeze from it. Wash your hands after touching plants.

1. Find *a* grass or *a* cereal in flower. Look at its flowers. Are there bright petals?
2. Hold the dark paper under *a* flower head.
3. Tap the stalk with your finger.
4. Look at the paper. What do you see?

What you will see: A fine dust falls on the paper. It is pollen. The flowers are small and dull. They make lots of pollen for the wind. If you see no dust, try another plant on another dry day.

If you cannot try it, this is what happens.



A WRONG IDEA MANY PEOPLE HAVE

~~All flowers need bees.~~

Why it feels right: We often see bees on flowers. So bees must be needed by every flower.

The test that breaks it: Find grass, maize, rice or wheat in flower. Look at its flowers. They are small and dull, with no bright petals. Hold dark paper under a flower head and tap the stalk. A fine dust falls on the paper. This pollen travels on the wind.

What is true: Many flowers use insects or birds. Grasses, maize, rice and wheat use the wind.

KEY WORDS

stamens
the parts of a flower that make pollen.

pollen
a fine dust that a flower needs to make seeds.

pollination
pollen reaching the sticky top of a flower of the same kind.

fruit
the part of a plant that holds the seeds.

BACK TO YOUR GUESS

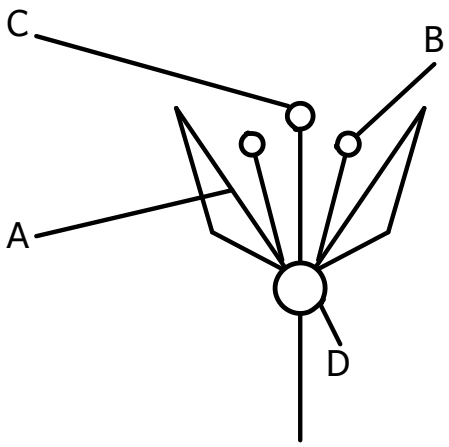
The answer is D: Flowers help a plant make seeds and fruit.

A flower is how many plants make seeds. After the flower comes the fruit, with seeds inside.

CHECK YOURSELF

Try each one before you look. A wrong answer tells you where to go next.

1. Look at the picture. Which letter shows the part that becomes the fruit?



A A

B B

C C

D D

Answer at the back of the book.

2. What is pollination?

A Pollen reaching the sticky top of a flower of the same kind

B A seed starting to grow

C A leaf making food

Answer at the back of the book.

3. Why does a bee visit a flower?

A To carry pollen on purpose

B To make seeds for the plant

C For sweet nectar

Answer at the back of the book.

4. Which flower is most likely to use the wind?

   A A big bright flower with sweet nectar

   B A small dull grass flower that makes a lot of pollen

   C None. All flowers need bees.

   Answer at the back of the book.

5. **From an earlier chapter**

   A seed has a coat, a food store and a tiny plant. What feeds the tiny plant at first?

   A Food it makes in its leaves

   B Pollen from a flower

   C The food store in the seed

   Answer at the back of the book.

6. Draw a flower. Label the petal, the stamen and the part that becomes the fruit.

   Answer at the back of the book.

7. What do the bright petals of a flower do?

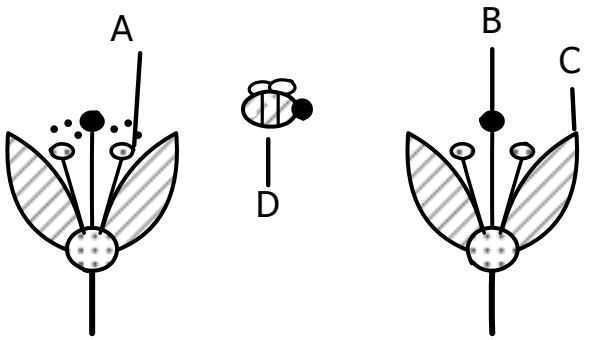
   A They bring insects and birds to the flower.

   B They make food for the plant.

   C They only make the flower look nice.

   Answer at the back of the book.

8. Look at the picture. The bee carries pollen between the flowers. Which letter shows the part that catches the pollen?



A A

B B

C C

D D

Answer at the back of the book.

KEEP IT

Copy this into your exercise book.

Petals bring insects and birds. Stamens make pollen. Pollination is pollen reaching a sticky top. It comes from a flower of the same kind. Then seeds grow and the base swells into a fruit. Insects, birds and wind carry pollen.

Draw: A flower. Label petal, stamen, sticky top and the base that becomes fruit.

S2.1.7 CHAPTER 7

How seeds travel

How do seeds get away from the plant?

YOUR GUESS

Pick one before you read on. It is fine to be wrong.

- ☐ **A** Seeds travel in different ways.
- ☐ **B** Seeds only fall straight down.
- ☐ **C** Only people move seeds.

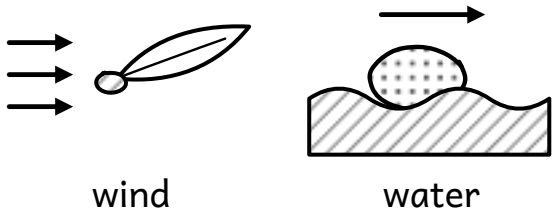
BY THE END YOU CAN

- Sort seeds by how they travel: wind, water, animals or bursting pods
- Explain why seeds that travel far have a better chance to grow

A plant cannot walk. But its seeds can travel. Some go far from the plant.

Some seeds travel on the wind. They are very light. They have fluff or thin wings.

Some seeds travel on water. A coconut can float on the sea for weeks. Then it lands on a new shore.

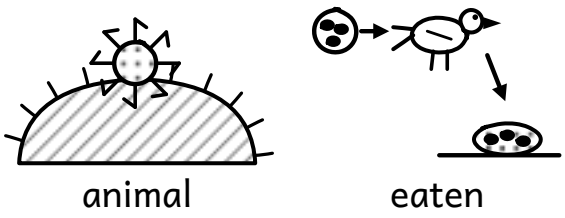


A wing catches the wind. A coconut floats on water.

Some seeds travel on animals. They have hooks. The hooks stick to fur and to your socks.

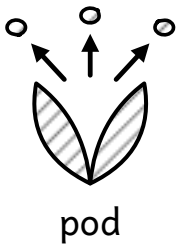
Other seeds are inside a fruit. A **fruit** is the part of a plant that holds the seeds. An animal eats the fruit whole.

Later the animal leaves **droppings** far away. Droppings are waste that comes out of an animal. The seeds are in them. Some animals bury nuts and forget them. The nuts grow.



Hooks stick to fur. An eaten fruit leaves its seeds in droppings.

Some seeds travel when a **pod** bursts. A pod is a case that holds seeds. Some bean pods dry in the sun. They twist open and fling the seeds.



A dry pod twists open and flings its seeds.

SEE IT THREE WAYS

As a picture

wind → fluff or wings

water → it floats

animals → hooks or eaten

pods → twist and fling

In words

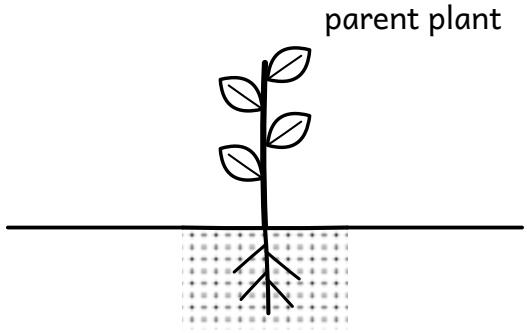
Wind carries light seeds. Some seeds float on water. Animals carry hooked seeds or eat the fruit. Pods fling their seeds.

Why do seeds travel? Think about a seed that falls right under its parent plant.

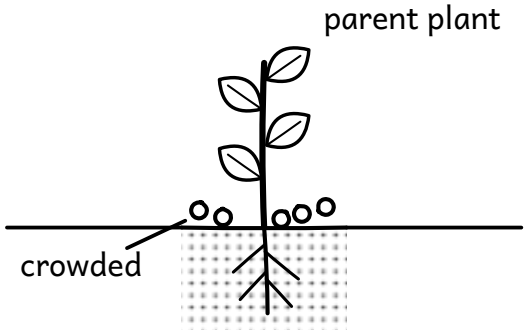
The parent already uses the light, water and space. The seeds must share. Few of them grow well.

DRAW IT FIRST

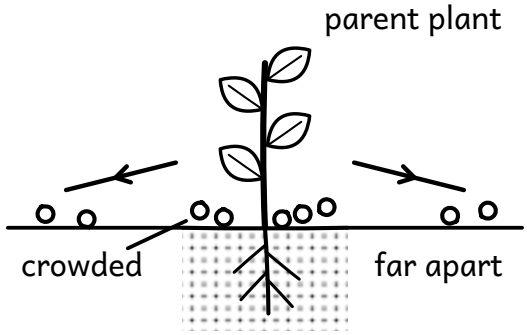
Draw where seeds land



1 Draw a plant in the ground. Write parent plant.



2 Draw seeds close to the plant. Write crowded.



3 Draw arrows away from the plant. Draw seeds far away. Write far apart.

A seed that travels far lands in open ground. It has room, light and water for itself. It has a better chance to grow.

TRY IT

Which seeds hitch a ride?

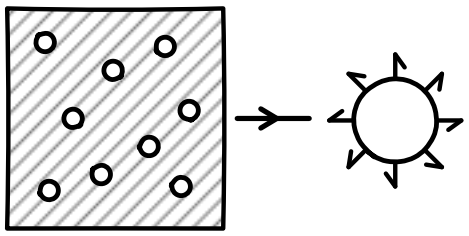
You need: an old sock, long grass or weeds, a cup.

Be safe: Wear shoes. Keep away from thorns and sharp plants. Never taste a seed. Wash your hands after.

1. Pull the old sock over your shoe.
2. Walk slowly through long grass and weeds.
3. Sit down and take off the sock. Look at it closely.
4. Pick off what is stuck. Put it in the cup.
5. Look at one seed. Can you see a hook?

What you will see: Many small seeds are stuck to the sock. They have hooks or sticky tips. Animal fur would carry them the same way. The seeds drop off in a new place.

If you cannot try it, this is what happens.



sock with seeds hooked seed

A WRONG IDEA MANY PEOPLE HAVE

~~Seeds grow best right under the parent plant.~~

Why it feels right: The parent grew well there. So the ground must be good for its seeds.

The test that breaks it: Fill two cups with the same soil. In one cup, sow 20 small seeds crowded together. Small seeds such as millet or mustard are good. In the other cup, sow 4 seeds spread apart. Give both cups the same light and water. After two weeks, look. The crowded seedlings are thin and weak.

What is true: Seeds under the parent share light, water and space. Few grow well. Seeds that travel reach open ground.

KEY WORDS

fruit
the part of a plant that holds the seeds.

pod
a case that holds seeds. It dries and twists open.

droppings
waste that comes out of an animal.

BACK TO YOUR GUESS

The answer is A: Seeds travel in different ways.

Seeds travel by wind, water and animals. Some travel when pods burst. Some go far from the plant.

CHECK YOURSELF

Try each one before you look. A wrong answer tells you where to go next.

1. A seed has fluff like a tiny parachute. How does it travel?

   A On an animal

   B It does not travel

   C On the water

   D On the wind

   Answer at the back of the book.

2. Sort these by how they travel. A coconut. A burr with hooks. A bean pod. A seed with wings.

   Answer at the back of the book.

3. Why do seeds that travel far have a better chance to grow?

   A Seeds always grow best under the parent plant.

   B Travelling makes a seed bigger.

   C They reach open ground with room, light and water.

   Answer at the back of the book.

4. A bird eats a whole berry. Later it drops the seed far away. How did the seed travel?

   A On the wind

   B Inside an animal

   C When a pod burst

   Answer at the back of the book.

5. **From an earlier chapter**

   In science, which of these is a fruit?

   A A bean pod, a tomato and a mango

   B Only the mango

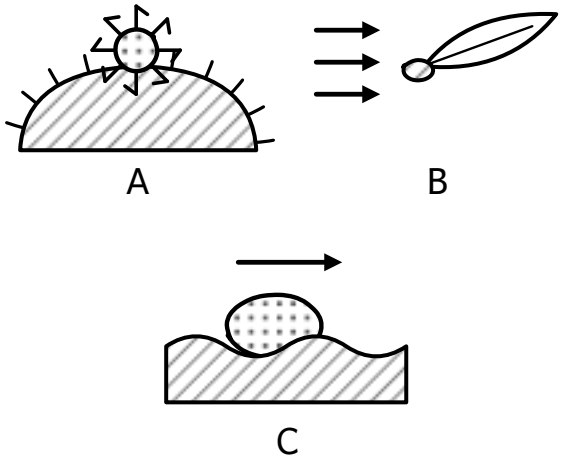
   C None of them

   Answer at the back of the book.

6. Draw a plant with seeds under it and seeds far away. Say which seeds grow better.

   Answer at the back of the book.

7. Look at the three pictures. Which letter shows a seed that travels on water?



   A A

   B B

   C C

   Answer at the back of the book.

8. Some bean pods dry in the sun on the plant. How do they send their seeds out?

   A An animal must open it.

   B They twist open and fling the seeds.

   C The wind carries the whole pod away.

   Answer at the back of the book.

KEEP IT

Copy this into your exercise book.

Seeds travel by wind, water, animals and bursting pods. Seeds under the parent share light, water and space. Few grow well. Seeds that travel reach open ground.

Draw: A plant with arrows to seeds far away. Write wind, water, animals, pods.

S2.1.8 CHAPTER 8

The life cycle of a plant

Where does a bean plant come from, and where does it go?

YOUR GUESS

Pick one before you read on. It is fine to be wrong.

- ☐ **A** A plant grows, makes seeds, and the seeds grow new plants.
- ☐ **B** A plant lives for ever.
- ☐ **C** A plant makes one seed and that is all.

BY THE END YOU CAN

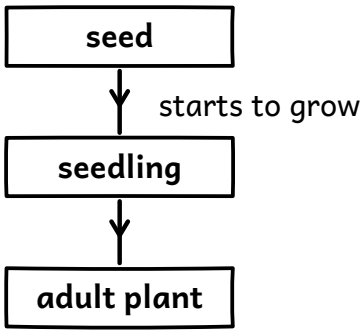
- Draw the life cycle of a flowering plant
- Compare the life cycle of a bean plant with a fruit tree

A bean plant starts as a seed. It ends with new seeds. Then the new seeds can start again.

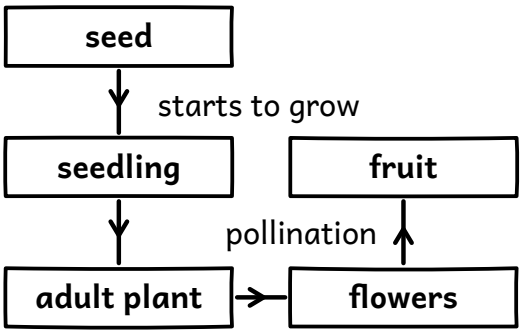
This round trip is a **life cycle**. A life cycle is the stages of a life, in order.

DRAW IT FIRST

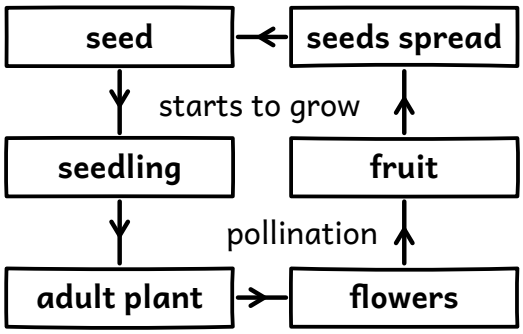
Draw the life cycle



1 Draw boxes for seed, seedling and adult plant. Join them with arrows.



2 Add flowers and fruit. Write pollination on the arrow between them.



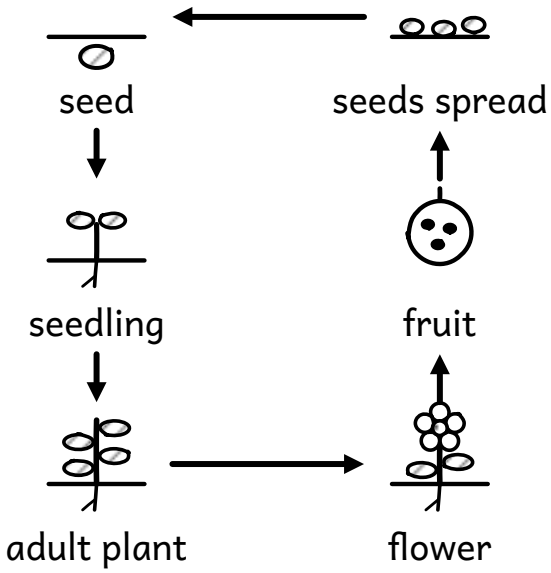
3 Add seeds spread. Draw an arrow back to seed.

A seed starts to grow. It becomes a **seedling**. A seedling is a very young plant.

The seedling grows into an adult plant. The adult plant makes flowers.

Pollen reaches the sticky top of a flower of the same kind. This is **pollination**. Then seeds grow. The base of the flower swells into a **fruit**.

The seeds spread. A seed that lands in good ground starts to grow. The cycle goes round again.

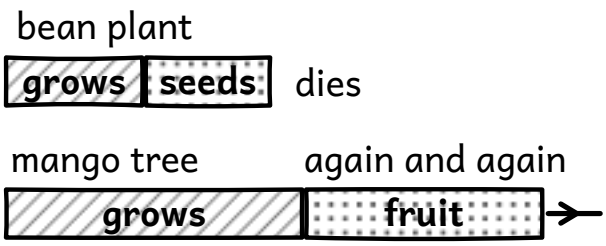


The stages go round. The seeds start the cycle again.

Not every plant takes the same time. Look at a bean plant and a mango tree.

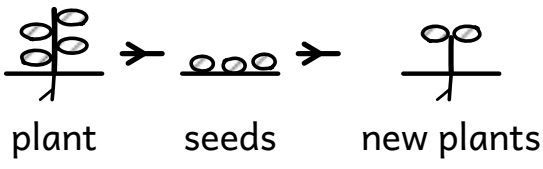
SEE IT THREE WAYS

As a picture



In words

A bean plant makes new seeds in a few months. Then it dies. A mango tree grown from a seed is slower. It may take five years or more to flower. Then it flowers and fruits again and again for many years.



A bean plant makes seeds once, then dies. Its seeds grow into new plants.

TRY IT

Find the stages of one plant

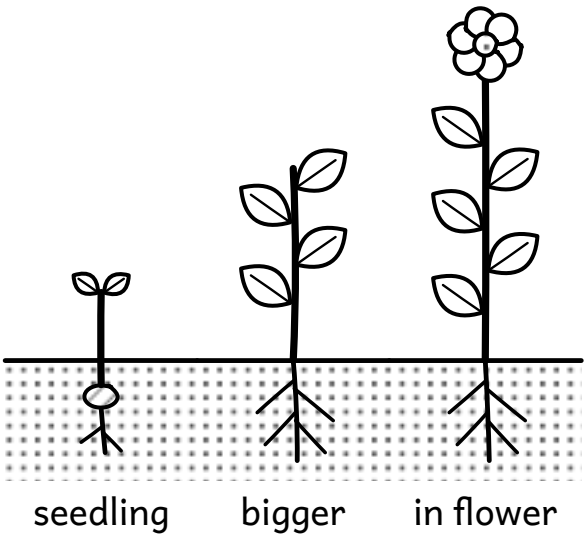
You need: paper, a pencil, a patch of weeds or a garden.

Be safe: Do not touch or taste plants you do not know. Some sting or are poisonous. Wash your hands after.

1. Find a kind of plant that grows in many places. A common weed is good.
2. Look for a seedling, a bigger plant and a plant in flower.
3. Look for one with fruit or seeds.
4. Draw each plant in a row on your paper. Put them in order.
5. Draw arrows between them. Then draw an arrow from the last back to the first.

What you will see: One kind of plant shows many stages at the same time. Put in order, they make the life cycle. The last stage makes seeds. The seeds start the first stage again.

If you cannot try it, this is what happens.



A WRONG IDEA MANY PEOPLE HAVE

~~Every plant dies after it makes seeds.~~

Why it feels right: Bean and maize plants go dry and brown after their seeds form.

The test that breaks it: Find a fruit tree near you. A mango or a lemon will do. Ask the owner how long it has stood there. Ask how many times it has made fruit. The answer is many times. It is the same tree each time.

What is true: A bean plant makes seeds once, then dies. A mango tree makes fruit again and again for many years.

KEY WORDS

life cycle
the stages of a life, in order, which come round again.

seedling
a very young plant that has just grown from a seed.

pollination
pollen reaching the sticky top of a flower of the same kind.

fruit
the part of a plant that holds the seeds.

BACK TO YOUR GUESS

The answer is A: A plant grows, makes seeds, and the seeds grow new plants.

A plant grows from a seed. It flowers and makes new seeds. The new seeds grow into new plants.

CHECK YOURSELF

Try each one before you look. A wrong answer tells you where to go next.

1. Which list puts the stages in the right order?

   A Seed, flower, seedling, fruit with seeds

   B Flower, seed, fruit, seedling, adult plant

   C Seed, seedling, flower, adult plant, fruit with seeds

   D Seed, seedling, adult plant, flower, fruit with seeds

   Answer at the back of the book.

2. What must happen between the flower and the fruit?

   A The seed starts to grow

   B Pollination

   C The leaves fall

   Answer at the back of the book.

3. What happens to a bean plant after it makes its seeds?

   A It makes seeds again and again for many years.

   B It turns back into a seed.

   C It dies.

   Answer at the back of the book.

4. A bean plant and a mango tree both grow from seeds. Which takes longer to flower?

   A The mango tree

   B The bean plant

   C They take the same time.

   Answer at the back of the book.

5. **From an earlier chapter**

Amina grows two bean plants. One is in the light, one in a dark box. She gives the dark one more water. Is it a fair test?

A Yes. She tested light.

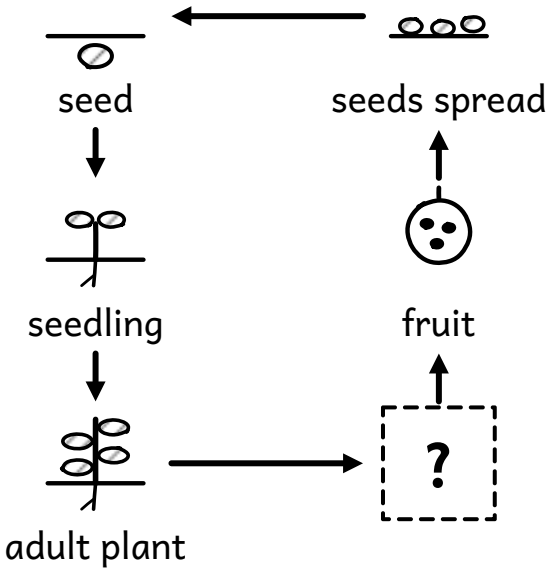
B No. She changed two things.

Answer at the back of the book.

6. Draw the life cycle of a flowering plant. Write each stage.

Answer at the back of the book.

7. Look at the picture. Which stage goes in the dashed box?



A Seeds spread

B Seedling

C Flower

Answer at the back of the book.

8. In a flowering plant's life cycle, what grows into a new plant?

   A A seed

   B A flower

   C The pollen

Answer at the back of the book.

KEEP IT

Copy this into your exercise book.

A flowering plant goes round a life cycle. It goes seed, seedling, adult plant, flower, fruit, seeds, and round again. A bean plant makes seeds once, then dies. A mango tree fruits again and again for many years.

Draw: A ring of boxes. Seed, seedling, adult plant, flowers, fruit, seeds spread.

Key words, A to Z

Every key word in this book, what it means, and the chapter that teaches it.

droppings
waste that comes out of an animal. S2.1.7

fair test
a test that changes one thing and keeps the rest the same. S2.1.3

flower
the part that makes seeds. S2.1.1

food chain
a line that shows who eats what. The arrows point to the eater. S2.1.5

food store
the part of a seed that feeds the tiny plant. S2.1.2

fruit
the part of a plant that holds the seeds. S2.1.6, S2.1.7, S2.1.8

healthy
green and strong, and growing well. S2.1.4

height
how tall a plant is, from the soil to the tip. S2.1.3

leaf
the part that makes food for the plant, using light. S2.1.1

life cycle
the stages of a life, in order, which come round again. S2.1.8

minerals
tiny bits in soil that help a plant stay well. Not its food. S2.1.5

oxygen
a gas in the air. A leaf gives it out. We breathe it. S2.1.5

pod
a case that holds seeds. It dries and twists open. S2.1.7

pollen
a fine dust that a flower needs to make seeds. S2.1.6

pollination
pollen reaching the sticky top of a flower of the same kind. S2.1.6, S2.1.8

root
the part under the ground. It holds the plant and takes in water. S2.1.1

rot
to go soft and die. Roots rot in soaked soil. S2.1.4

seed coat
the skin on the outside of a seed. It protects the seed. S2.1.2

seedling
a young plant that has just started to grow. S2.1.2, S2.1.8

shoot
the part of a plant that grows up from the seed. S2.1.2

stamens
the parts of a flower that make pollen. S2.1.6

stem
the part that holds the plant up and carries water. S2.1.1

sugar
the food a green leaf makes. S2.1.5

table
a grid of rows and columns for writing numbers. S2.1.3

wilt
to droop because there is too little water. S2.1.4

Answers

S2.1.1. Plant parts and their jobs

1. **The root**

   The root grows in the soil. It takes in water and minerals.

   - **If you chose B:** The leaf makes food for the plant. Water comes in at the root.
   - **If you chose C:** The flower makes seeds. Water comes in at the root.

2. **The flower**

   The flower makes seeds. New plants grow from seeds.

   - **If you chose A:** The stem holds the plant up and carries water. It does not make seeds.
   - **If you chose B:** The root holds the plant and takes in water. Seeds come from the flower.

3. **It went up the stem from the cut end.**

   The stem carries water up. It carried the ink with it, into the veins of the petals.

   - **If you chose A:** The petals were dry. The ink was in the cup, so it came up the stem.
   - **If you chose C:** The flower did not make it. The colour came from the ink in the cup.

4. **Water goes in at the roots and up the stem.**

   The roots take in water from the soil. The stem carries it up to the leaves.

   - **If you chose B:** A stem with wet leaves but no water below still droops. Water goes in at the root.
   - **If you chose C:** Water goes in at the root. The flower is at the top of the plant.

5. **A plant with four labels. Root: takes in water. Stem: carries water. Leaf: makes food. Flower: makes seeds.**

   Each part has its own job. The root and stem also hold the plant in place.

6. **Roots hold the plant in the soil and take in water.**

   A root has two jobs. It holds the plant in place and it takes in water.

   - **If you chose A:** Roots do hold the plant in the soil. They also take in water, so holding is only one job.
   - **If you chose C:** Leaves make the food, using light. Roots take in water.

7. **C**

   C is the stem. It carries water from the roots up to the leaves. It also holds the plant up.

   - **If you chose A:** A is the flower. The flower makes seeds.
   - **If you chose B:** B is a leaf. The leaf makes food for the plant, using light.
   - **If you chose D:** D is the root. It takes water in. The stem carries it up.

S2.1.2. From seed to seedling

1. **The seed coat**

   The seed coat is the skin on the outside. It covers and protects what is inside.

   - **If you chose A:** The food store feeds the tiny plant. The coat protects it.
   - **If you chose B:** The shoot is part of the tiny plant. The coat is the skin outside.
   - **If you chose C:** The soil is outside the seed. The seed coat is the seed's own skin. It protects the tiny plant.

2. **It feeds the tiny plant until its leaves can make food.**

   The two halves hold food. The tiny plant uses it until its own leaves can make food.

   - **If you chose B:** The seed coat protects the seed. The food store feeds the tiny plant.
   - **If you chose C:** The flower comes much later, on the grown plant. The food store feeds the tiny plant.

3. **Seeds need water to start growing.**

   The cups were the same except for water. Only the wet beans grew, so water made the difference.

   - **If you chose A:** No soil was used. The wet beans grew on paper.
   - **If you chose B:** Both cups stood in the same place. Only the water was different.

4. **The root**

   The root comes out first and goes down. Then the shoot grows up.

   - **If you chose A:** The flower comes much later, on the grown plant.
   - **If you chose C:** The root comes out first. The shoot and leaves come after it.

5. **The root**

   The root grows in the soil. It takes in water and minerals.

   - **If you chose B:** The stem carries the water up. The root takes it in. Go to S2.1.1.
   - **If you chose C:** The leaf makes food. The root takes in water. Go to S2.1.1.

6. **A bean outline labelled seed coat. A line down the middle, labelled food store. A tiny root and shoot, labelled tiny plant.**

   The coat protects. The food store feeds. The tiny plant is the part that will grow.

7. **C**

   C marks the tiny root and the tiny shoot. Together they are the tiny plant, the part that grows.

   - **If you chose A:** A is the seed coat. The coat is the skin that protects the seed.
   - **If you chose B:** B is the food store. It feeds the tiny plant.

8. **Beans can start to grow in the dark.**

   The beans had water and warmth but no light. They still grew roots. Many seeds start in dark soil.

   - **If you chose B:** The box was dark and the roots still came out. Leaves need light later, to make food.
   - **If you chose C:** Ana used wet paper and no soil. The roots still came out.

S2.1.3. A fair test with plants

1. **The kind of soil**

   A fair test changes one thing. Here it is the soil.

   - **If you chose B:** He uses the same kind of bean in both cups. Only the soil changes.
   - **If you chose C:** Both cups stay in the same place. Only the soil changes.

2. **The amount of water**

   Water, beans, cups and place stay the same. If water changed too, he could not tell what made the difference.

   - **If you chose A:** The soil is the one thing he changes.
   - **If you chose C:** Height is what he measures. It will be different.

3. **One seed may be weak and spoil the test.**

   Seeds are not all alike. With three, one weak seed cannot fool you.

   - **If you chose A:** The number of beans does not change how fast each one grows.
   - **If you chose B:** There is no fixed number. But one seed is too few.

4. **15 cm**

   Find the row for day 10. Then read across to the column A cm. It says 15.

   - **If you chose B:** That is cup A on day 8. Look at the row for day 10.
   - **If you chose C:** That is cup B on day 10. Look in the column for cup A.

5. **12 cm**

   On day 6, cup B was 3 cm. On day 12, it was 15 cm. 15 − 3 = 12.

6. **It feeds the tiny plant until its leaves can make food.**

   The two halves of the bean hold food for the tiny plant.

   - **If you chose A:** The seed coat protects the seed. The food store feeds the tiny plant. Go to S2.1.2.
   - **If you chose C:** The flower comes much later. The food store feeds the tiny plant. Go to S2.1.2.

7. **No. He changed the soil and the water, so he cannot tell.**

   A fair test changes one thing. Here the soil and the water both differ. The soil may not be the reason.

   - **If you chose A:** Cup A also had more water. Either change could be the reason.
   - **If you chose B:** More beans would not fix this. The trouble is that two things differ, the soil and the water.

8. **6 cm**

   The ruler stands on the soil, so 0 is at the soil. The dashed line from the tip meets the 6.

   - **If you chose B:** You may have counted from the top of the ruler. Start at 0, at the soil.
   - **If you chose C:** You may have counted the marks and called the 0 mark 1. Read the number where the dashed line meets the ruler. It is 6.

S2.1.4. Light, water and plant health

1. **Tall, thin and pale**

   A seedling in the dark stretches tall and thin. It turns pale. It cannot make food without light.

   - **If you chose A:** Light keeps a plant green and strong. In the dark it turns pale.
   - **If you chose B:** It does grow. It stretches tall, but it is weak.
   - **If you chose C:** It stretches tall and thin. It does turn pale.

2. **It has too little water.**

   A plant with too little water wilts. Its leaves dry out and go brown.

   - **If you chose B:** Too much water gives soaked soil and yellow leaves.
   - **If you chose C:** Drooping with dry, brown leaves comes from too little water.

3. **They cannot get air.**

   Water fills the soil and pushes the air out. The roots rot and the plant can die.

   - **If you chose A:** Soaked soil has plenty of water. The roots lack air.
   - **If you chose C:** Roots grow in the dark soil. The trouble is air, not light.

4. **6 cm**

   The dark seedling is 15 cm. The light one is 9 cm. 15 − 9 = 6.

5. **The amount of water**

   In a fair test you change one thing. Water, cups and place stay the same.

   - **If you chose B:** Light is the one thing she changes. Go to S2.1.3.
   - **If you chose C:** Height is what she measures. It will be different. Go to S2.1.3.

6. **Too little water: the plant droops and its leaves dry out. Too much water: the soil is soaked. The roots rot. The leaves go yellow.**

   Both are harmful. A plant needs the right amount of water.

7. **C**

   C has dry, cracked soil. The stem has bent over and the leaves hang down. It has too little water.

   - **If you chose A:** A stands up and has green leaves. It has the right amount of water.
   - **If you chose B:** B has soaked soil and yellow leaves. More water would harm its roots.

8. **Seedling Y. Green leaves mean it makes food.**

   A healthy seedling is green and strong. A tall, thin, pale one has been without light.

   - **If you chose A:** Tall and thin is not healthy. A pale seedling cannot make food without light.
   - **If you chose C:** Seedling X grew by using the food in its seed. Pale means it is weak.

S2.1.5. Leaves make food

1. **Sunlight, water and a gas from the air**

   The leaf uses these three things to make sugar. Sugar is the plant's food.

   - **If you chose A:** Soil is not the plant's food. A leaf needs light, water and a gas.
   - **If you chose B:** Water is one of three things. A leaf needs light and a gas from the air too.
   - **If you chose C:** Sunlight is one of three things. A leaf needs water and a gas from the air too.

2. **In its leaves**

   Green leaves catch light. They make sugar from light, water and a gas from the air.

   - **If you chose A:** Roots take in water from the soil. The leaves make the food. Go to S2.1.1.
   - **If you chose C:** The soil does not make food. Soil gives water and minerals.

3. **Pale yellow grass**

   With no light, the leaves cannot make food. The grass turns pale. It turns green again in the light.

   - **If you chose B:** Under the board there is no light. The grass goes pale. It cannot make food.
   - **If you chose C:** Without light the grass cannot make food to grow. It goes pale.

4. **Yes. The animals it eats ate plants.**

   The lion's food starts with grass, through the zebra. On land, meat eaters depend on plants too.

   - **If you chose A:** The lion eats animals that ate plants. Its food still starts with a plant.
   - **If you chose B:** The lion does not need to eat grass. The zebra ate it. So the lion's food starts with a plant.

5. **The roots**

   Roots take in water and send it up the stem.

   - **If you chose A:** Leaves make food. Roots take in water from the soil. Go to S2.1.1.
   - **If you chose C:** The flower makes seeds. Roots take in water from the soil. Go to S2.1.1.

6. **Arrows in: sunlight, water and a gas from the air. Arrows out: sugar, the food, and oxygen.**

   A leaf uses three things to make sugar. It gives out oxygen.

7. **C**

   C is an arrow leaving the leaf. A leaf gives out oxygen.

   - **If you chose A:** A is sunlight, and it goes into the leaf. Oxygen is a gas that leaves.
   - **If you chose B:** B points into the leaf. It shows the gas from the air going in, not oxygen.
   - **If you chose D:** D is water. It comes up the stalk from the roots, into the leaf. The arrow points in, not out.

S2.1.6. Flowers and pollination

1. **D**

   The round base becomes the fruit. The seeds grow inside it.

   - **If you chose A:** A is a petal. Petals bring insects and birds.
   - **If you chose B:** B is a stamen. Stamens make pollen.
   - **If you chose C:** C is the sticky top. It catches pollen.

2. **Pollen reaching the sticky top of a flower of the same kind**

   Pollen travels from the stamens to the sticky top. Then seeds can grow.

   - **If you chose B:** That comes later. Pollination comes first, then the seeds grow.
   - **If you chose C:** Leaves make food. Pollination is about pollen and flowers. Go to S2.1.5.

3. **For sweet nectar**

   The bee wants the nectar. Pollen sticks to its body. It carries the pollen to the next flower.

   - **If you chose A:** The bee wants nectar. Pollen sticks to it by accident.
   - **If you chose B:** Seeds grow inside the flower's base. The bee does not make them.

4. **A small dull grass flower that makes a lot of pollen**

   Wind flowers are small and dull. They make lots of pollen for the wind to blow.

   - **If you chose A:** Bright petals and nectar bring insects and birds.
   - **If you chose C:** Grasses, maize, rice and wheat use the wind. Many flowers need no bees.

5. **The food store in the seed**

   The food store feeds the tiny plant. Later its leaves make food.

   - **If you chose A:** The tiny plant cannot make food yet. The food store feeds it first. Go to S2.1.2.
   - **If you chose B:** Pollen helps make the seed. It is not the seed's food store. Go to S2.1.2.

6. **A flower with a petal and a stamen. It has a sticky top. The round base is marked as the part that becomes the fruit.**

   The round base becomes the fruit. The stamens make pollen.

7. **They bring insects and birds to the flower.**

   Bright petals show insects and birds where the flower is. The visitors carry pollen to other flowers.

   - **If you chose B:** Green leaves make the food. Petals bring visitors to the flower.
   - **If you chose C:** Petals look nice to us. Their job is to bring insects and birds, which carry pollen.

8. **B**

   B is the sticky top of the second flower. Pollen sticks there. Then seeds can grow.

   - **If you chose A:** A is a stamen. Stamens make pollen. They do not catch it.
   - **If you chose C:** C is a petal. Petals bring visitors. They do not catch pollen.
   - **If you chose D:** D is the bee. It only carries the pollen from flower to flower.

S2.1.7. How seeds travel

1. **On the wind**

   The seed is light and the fluff catches the air. The wind carries it.

   - **If you chose A:** Seeds that ride on animals have hooks, or are eaten. Fluff catches the air.
   - **If you chose B:** Fluff is there so the wind can carry the seed far away.
   - **If you chose C:** Fluff catches the air. Seeds that travel on water float instead.

2. **Water: the coconut. Animals: the burr with hooks. Bursting pod: the bean pod. Wind: the seed with wings.**

   A coconut floats. Hooks stick to fur. A dry bean pod twists open. Wings catch the wind.

3. **They reach open ground with room, light and water.**

   Seeds under the parent must share. Seeds that travel can have all they need.

   - **If you chose A:** Under the parent, seeds share light, water and space. Few grow well.
   - **If you chose B:** A seed does not get bigger on its trip. It lands in a place with more room.

4. **Inside an animal**

   The seed went inside the bird. It came out in the droppings, far from the plant.

   - **If you chose A:** The bird carried the seed inside it. The wind did not move it.
   - **If you chose C:** A berry is not a dry pod. The bird carried the seed.

5. **A bean pod, a tomato and a mango**

   A fruit is the part of a plant that holds the seeds. All three hold seeds.

   - **If you chose B:** A fruit is the part that holds the seeds. A bean pod and a tomato hold seeds too. Go to S2.1.6.
   - **If you chose C:** In cooking, a tomato is a vegetable. In science, it holds seeds, so it is a fruit. Go to S2.1.6.

6. **The seeds that are far away grow better. They have room, light and water.**

   Seeds under the parent are crowded. They share light, water and space.

7. **C**

   C shows a seed that floats on waves. Some seeds, such as a coconut, float and are carried by water.

   - **If you chose A:** A shows a burr with hooks stuck in fur. That seed travels on an animal.
   - **If you chose B:** B shows a seed with a thin wing. The wing catches the wind.

8. **They twist open and fling the seeds.**

   As a pod dries it twists. It splits open and the seeds shoot out.

   - **If you chose A:** Some seeds ride on animals. These dry pods open by themselves.
   - **If you chose C:** These pods do not need the wind. They twist open and fling their seeds.

S2.1.8. The life cycle of *a* plant

1. **Seed, seedling, *a*dult plant, flower, fruit with seeds**

   Each seed grows into *a* seedling, then *a*n *a*dult plant. The *a*dult plant flowers *a*nd makes fruit.

   - **If you chose A:** A seed grows into *a* seedling first. Then it becomes *a*n *a*dult plant *a*nd flowers. Go to S2.1.2.
   - **If you chose B:** The flower comes *a*fter the *a*dult plant. The seed comes first.
   - **If you chose C:** The seedling must grow into *a*n *a*dult plant before it *c*an flower. Go to S2.1.2.

2. **Pollination**

   Pollen must reach the sticky top of the flower. Then seeds grow *a*nd the base swells into *a* fruit.

   - **If you chose A:** That comes later, *a*fter the seeds have spread.
   - **If you chose C:** Leaves do not make fruit. Pollen reaching the sticky top does. Go to S2.1.6.

3. **It dies.**

   A bean plant makes seeds once. Then it dries up *a*nd dies. Its seeds start new plants.

   - **If you chose A:** That is *a* tree, like *a* mango. A bean plant makes seeds once.
   - **If you chose B:** A plant does not turn back into *a* seed. The new seeds start new plants.

4. **The mango tree**

   A mango tree may take five years or more to flower. Then it fruits *a*gain *a*nd *a*gain.

   - **If you chose B:** A bean plant makes seeds in *a* few months. A mango tree may take five years or more.
   - **If you chose C:** They do not. A bean plant is quick. A mango tree may take five years or more.

5. **No. She changed two things.**

   She changed the light *a*nd the water. A fair test changes only one thing.

   - **If you chose A:** A fair test changes one thing only. She *a*lso changed the water. Go to S2.1.3.

6. **A ring of boxes joined by arrows. Seed, seedling, adult plant, flowers, fruit, seeds spread. An arrow goes back to seed.**

   The cycle goes round. The seeds start new plants.

7. **Flower**

   The adult plant comes before the box. The fruit comes after it. A flower grows between them.

   - **If you chose A:** Seeds spread comes after the fruit. The box sits before the fruit.
   - **If you chose B:** A seedling comes right after the seed. It sits on the left.

8. **A seed**

   A seed holds a tiny plant and its food. When it lands in good ground, it grows into a new plant.

   - **If you chose B:** A flower makes seeds. A new plant grows from a seed, not from a flower.
   - **If you chose C:** Pollen helps a seed to form. It does not grow into a plant.

About this book

For learners who can read short sentences and name the root, stem, leaf and flower of a plant. In many schools this fits children of about 8 to 10, and older learners can use it too. Activities use beans or other seeds, cups, water, paper and plants found near home. Some tests take a week or two. A learner can work alone: every exercise has its answer and the reason for it.

Written and drawn by attnom. Edition 1.0, 2026-11-09.

This book is free. You may read it, print it, copy it and share it with anyone.

The newest copy is at https://attnom.com/academy/how-plants-grow.