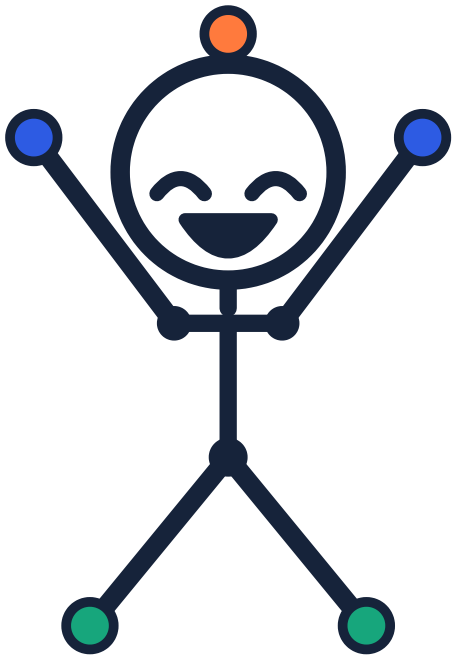
Young Innovators
FOR CHANGE
innovateyouth.org

A FULL-YEAR SCIENCE PROGRAM · GRADE 3

What Made That Happen?

36 weekly investigations into causes:
forces, life cycles, habitats and weather.



This book belongs to

_____

Something I tested _____ What caused it _____

Teacher _____ School year _____

Free to print, copy and use. No license, no account, no cost to any student or school.

START HERE HOW THIS BOOK WORKS

Every change has a cause.

Two pages a week, front and back. About thirty-five minutes.

The shape of a week

Page 1 teaches one idea, and most weeks it gives you a small investigation to try. **Page 2** has a table of results to think about, two questions to talk about and a harder challenge, and many weeks add a page for your Field Book. No computer needed.

Part 1 is forces: what makes things start, stop and turn. Part 2 is life cycles and the traits young living things get from their parents. Part 3 is habitats, and what happens to living things when a place changes. Part 4 is weather, and how people protect themselves from it.

The boxes on the page

SITS BESIDE	The California science standard the week teaches. This book sits beside your science lessons, not instead of them.
NOTICE FIRST	Two minutes of looking before any explaining. Every scientist starts by noticing.
TRY IT	What you need for the week's investigation. Almost everything is already in a classroom or a kitchen.
WORDS TO KEEP	One or two words pinned down properly.
PRACTICE DATA	Results made up for the page so everyone can answer the same questions. Your own results will be different, and yours are the real ones.
FIELD BOOK	The one thing you build all year, in a notebook your teacher gives you: 20 pages of your own observations.
TALK ABOUT IT	Two questions to talk over with someone at home or at school.
STUCK? TRY THIS	A way in when the page stops making sense.
CHALLENGE ZONE	Harder, and usually open. For whoever finishes early.

The one rule of the whole year

Change one thing at a time. If you change two things and something happens, you cannot tell which one caused it. That is called a fair test, and it is the most useful idea in this book.

WEEK	TITLE	TOPIC	STANDARD
PART 1 · WEEKS 1–12 · PLAYGROUND FORCES			
1	**Push or Pull**	Forces	3-PS2-1
2	**Balanced**	Forces	3-PS2-1
3	**Unbalanced**	Forces	3-PS2-1
4	**Rub and Slow**	Forces	3-PS2-1
5	**Change One Thing**	Forces	3-PS2-1
6	**The Swing Keeps Time**	Forces	3-PS2-2
7	**Predict the Roll**	Forces	3-PS2-2
8	**Without Touching**	Forces	3-PS2-3
9	**The Balloon Trick**	Forces	3-PS2-3
10	**A Job for a Magnet**	Forces	3-PS2-4
11	**Two Ideas, One Problem**	Forces	3-5-ETS1-2
12	**What Made It Move?**	Review	3-PS2-1
PART 2 · WEEKS 13–21 · LIFE CYCLES FOR SURVIVAL			
13	**Born, Grow, Make More**	Life Cycles	3-LS1-1
14	**The Frog and the Bean**	Life Cycles	3-LS1-1
15	**A Whole New Body**	Life Cycles	3-LS1-1
16	**Like Their Parents**	Traits	3-LS3-1
17	**Not Exactly Alike**	Traits	3-LS3-1
18	**A Little Different Helps**	Traits	3-LS4-2

WEEK	TITLE	TOPIC	STANDARD
19	**Safety in Numbers**	Groups	3-LS2-1
20	**Jobs in the Group**	Groups	3-LS2-1
21	**Why Make More?**	Review	3-LS1-1
PART 3 · WEEKS 22–29 · SURVIVING IN DIFFERENT ENVIRONMENTS			
22	**Grown, Not Born**	Environments	3-LS3-2
23	**Parent or Place?**	Environments	3-LS3-2
24	**Who Lives Here?**	Environments	3-LS4-3
25	**When the Place Changes**	Environments	3-LS4-3
26	**Stone Clues**	Environments	3-LS4-1
27	**A Fish on a Mountain**	Environments	3-LS4-1
28	**A Problem When Things Change**	Environments	3-LS4-4
29	**Judge the Fix**	Environments	3-LS4-4
PART 4 · WEEKS 30–36 · WEATHER AND WHAT IT DOES			
30	**Weather in a Table**	Weather	3-ESS2-1
31	**A Season in a Graph**	Weather	3-ESS2-1
32	**Climate Is the Pattern**	Weather	3-ESS2-2
33	**Climates Far Away**	Weather	3-ESS2-2
34	**When Weather Is Dangerous**	Weather	3-ESS3-1
35	**Design Against the Weather**	Weather	3-ESS3-1
36	**What Made That Happen?**	Review	3-5-ETS1-3

WEEK 1 FORCES

Push or Pull

Nothing starts moving on its own. Something pushed it or pulled it.

SITS BESIDE
Forces and motion (3-PS2-1)

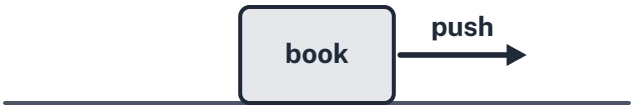
NOTICE FIRST · 2 MINUTES
Watch somebody open a door. Did they push it or pull it? Which way did the door move?

TRY IT · YOU WILL NEED

- a book
- a table or desk
- a piece of string as long as your arm

WORDS TO KEEP

force A push or a push. Every force has a direction and a strength.



Every force points somewhere

A force is a push or a pull. When you push a book across a table, the force points the way you push.

Tie the string around the book and pull it. Now the force points the way you pull. A force also has a **strength**. A gentle push and a hard push point the same way, but they are not the same force, and the book can tell the difference.

Scientists draw a force as an arrow. The arrow points where the force points, and a longer arrow means a stronger force.

MY INVESTIGATION

I predict: _____

What happened: _____

What I think caused it: _____

Push or pull?

	What happens	Push or pull?
a	a girl kicks a soccer ball	
b	a boy lifts a backpack by its strap	
c	a fisher drags a net along the beach	
d	a finger presses a doorbell	
e	a tow truck moves a car with a chain	
f	a bulldozer moves dirt with its blade	

How many of these are pulls? _____

In one row the force pulls something UP. Which row? _____

▶ ADD TO YOUR FIELD BOOK

Start your Field Book. Draw two forces you saw today, one push and one pull. Give each one an arrow that points the way the force pointed.

💬 TALK ABOUT IT

Name one thing you push every day and one thing you pull.

Is a hug a push or a pull? Could it be both?



STUCK? TRY THIS

Ask: does the thing move toward whoever is making the force, or away? Toward is usually a pull. Away is usually a push.

★ CHALLENGE ZONE

A door has a handle on one side and a flat metal plate on the other. Which side is for pushing, which is for pulling, and why would a builder do that?

WEEK 2 FORCES

Balanced

Two forces can push and pull as hard as they like and change nothing at all.

SITS BESIDE
Forces and motion (3-PS2-1)

NOTICE FIRST · 2 MINUTES
Look at something sitting still on a shelf. Is anything pushing or pulling it?

TRY IT · YOU WILL NEED

- a rope or a long scarf
- a partner

Safely: Pull gently, and never let go suddenly. Your partner could fall.

WORDS TO KEEP

balanced — Forces that are equal and point opposite ways. Together they change nothing about how something moves.



Same strength, opposite ways

In a tug of war, when both teams pull just as hard, the rope does not move.

Two forces are acting on the knot. They are the same strength and they point in opposite directions, so they cancel. Forces like that are called **balanced**.

A book resting on a table has balanced forces on it too. Earth pulls it down and the table pushes it up just as hard. That is why something sitting still is not a thing with no forces on it. It is a thing whose forces cancel.

MY INVESTIGATION

I predict: _____

What happened: _____

What I think caused it: _____

A tug of war, five games

PRACTICE DATA · MADE UP FOR THIS PAGE, NOT MEASURED

In this game every player pulls with the same strength.

Game	Players on the left	Players on the right	Does the rope move? Which way?
a	3	3	
b	4	2	
c	5	5	
d	2	6	
e	4	4	

In how many games does the rope stay still? _____

In one game the rope moves most strongly toward one team. Which game? _____

TALK ABOUT IT

When you lean on a wall, why does the wall not move?

Can you think of something that is still, but has two forces on it?



STUCK? TRY THIS

Count each side. If the two numbers are the same, the forces are balanced and the rope stays where it is.

★ CHALLENGE ZONE

In game c, one player on the left lets go. Which way does the rope move? Then find two different ways to balance it again.

WEEK 3 FORCES

Unbalanced

When the forces do not cancel, something changes: it starts, stops, speeds up, slows down or turns.

SITS BESIDE
Forces and motion (3-PS2-1)

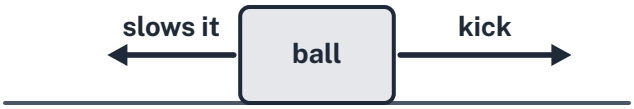
NOTICE FIRST · 2 MINUTES
Roll a ball gently across the floor. What finally stops it?

TRY IT · YOU WILL NEED

- a ball
- an open stretch of floor
- a tape measure or meter stick

WORDS TO KEEP

unbalanced Forces that do not cancel. They make something start, stop, speed up, slow down or turn.



Five ways motion changes

A force that nothing cancels out changes how something moves.

Kick a ball that is sitting still and it **starts**. Catch it and it **stops**. Kick it again while it rolls and it **speeds up**. Roll it uphill and it **slows down**. Tap it from the side and it **turns**.

Each time, a force acted that nothing pushed back against just as hard. That is what **unbalanced** means, and it is the cause behind every change of motion you will ever see.

MY INVESTIGATION

I predict: _____

What happened: _____

What I think caused it: _____

A toy car and a launcher

PRACTICE DATA · MADE UP FOR THIS PAGE, NOT MEASURED

A class pulled a launcher back 1 to 5 notches and measured how far a toy car rolled.

Notches pulled back	How far the car rolled
1	20 cm
2	38 cm
3	61 cm
4	80 cm
5	98 cm

How much farther did the car roll with 4 notches than with 2? _____

Between which two rows did the distance grow the most? _____

Which row rolled farther than 75 cm but less than 90 cm? _____

TALK ABOUT IT

Name the five ways motion can change. Can you show each one with a ball?

Why does a bike slow down when you stop pedaling?



STUCK? TRY THIS

If the motion changed, look for the force that was bigger than the others.

★ CHALLENGE ZONE

A soccer ball rolls across grass, slows down and stops, and nobody touches it. So what force stopped it? You will meet it by name next week.

WEEK 4 FORCES

Rub and Slow

The force nobody sees: two surfaces rubbing, pushing back against the motion.

SITS BESIDE
Forces and motion (3-PS2-1)

NOTICE FIRST · 2 MINUTES
Rub your hands together fast. What do you feel? Now press them together harder and rub.

TRY IT · YOU WILL NEED

- a book
- a towel
- a sheet of paper
- a ruler

WORDS TO KEEP

friction A force between two surfaces rubbing together. It pushes against the motion.



Why things slow down

When two surfaces rub, a force called friction pushes against the motion.

Give a book the same push on a bare table and then on a towel. On the towel it stops sooner. The push was the same, so something else must be different, and that something is friction.

Rough surfaces usually have more friction than smooth ones. Friction is not always the enemy: without it you could not walk, hold a pencil, or stop a bike.

MY INVESTIGATION

I predict: _____

What happened: _____

What I think caused it: _____

One push, five surfaces

PRACTICE DATA · MADE UP FOR THIS PAGE, NOT MEASURED

A class gave a wooden block the same push every time and measured how far it slid.

Surface	How far it slid
tile	46 cm
wood	39 cm
carpet	12 cm
paper	41 cm
towel	9 cm

Which surface had the most friction? How do you know? _____

How much farther did the block slide on tile than on carpet? _____

List the surfaces from least friction to most.

_____

▶ ADD TO YOUR FIELD BOOK

Add a page called Friction Hunt: three surfaces you can find, which one you think has the most friction, and how you could test it.

💬 TALK ABOUT IT

Why do sneakers have bumpy soles?

Where is friction helpful at home, and where is it a nuisance?



STUCK? TRY THIS

A longer slide means less rubbing. A shorter slide means more.

★ CHALLENGE ZONE

Ice has very little friction. So why is it so hard to walk on? Think about what your feet need friction for.

WEEK 5 FORCES

Change One Thing

If you change two things at once, you cannot tell which one made the difference.

SITS BESIDE
Forces and motion (3-PS2-1)

NOTICE FIRST · 2 MINUTES
Two friends race toy cars. One car wins. Can you tell why it won, just from that?

TRY IT · YOU WILL NEED

- a toy car
- books to stack
- a piece of stiff cardboard for a ramp
- a tape measure

WORDS TO KEEP

fair test A test where you change only ONE thing and keep everything else the same.



The question: does a higher ramp make a car roll farther?

To find out, change the height, and only the height.

Use the same car every time, the same floor, and the same start: just let go, never push. Then the height is the only thing that is different, so if the distance changes, the height caused it.

If you changed the car AND the height, and the car went farther, you could not say which change did it. That is not a test. It is a guess with measuring in it.

MY INVESTIGATION

I predict: _____

What happened: _____

What I think caused it: _____

Five tests. Which ones are fair?

PRACTICE DATA · MADE UP FOR THIS PAGE, NOT MEASURED

Test	Ramp height	Car	Floor	How far
T1	2 books	red	tile	90 cm
T2	4 books	blue	carpet	60 cm
T3	4 books	red	tile	150 cm
T4	2 books	red	carpet	40 cm
T5	3 books	blue	tile	115 cm

Which two tests are a fair test of the ramp's height? _____

Which two tests are a fair test of the floor? _____

In your fair test of height, how much farther did the car go from the higher ramp?

_____

▶ ADD TO YOUR FIELD BOOK

Add a page called My Fair Test: a question, the ONE thing you will change, and three things you will keep the same.

💬 TALK ABOUT IT

Have you ever heard someone say one thing was better, when they had changed two things at once?

Why is it hard to be sure what caused something?



STUCK? TRY THIS

Cover the last column. Look for two rows that are the same in every box except one.

★ CHALLENGE ZONE

Plan a fair test of whether a heavier car rolls farther. Write what you will change and three things you will keep the same.

WEEK 6 FORCES

The Swing Keeps Time

Some motions repeat so steadily that you can count on them.

SITS BESIDE
Patterns of motion (3-PS2-2)

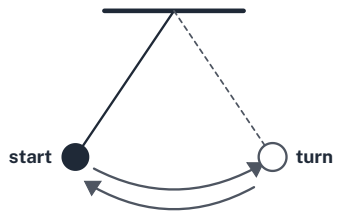
NOTICE FIRST · 2 MINUTES
Watch a playground swing with nobody pumping it. Does each swing take about the same time?

TRY IT · YOU WILL NEED

- string, about as long as your arm
- a washer or five paper clips for a weight
- tape
- a clock or timer with seconds

WORDS TO KEEP

pattern — Something that repeats in a way you can count on, so you can predict what comes next.



one swing: over and back to the start

Count the swings

A weight on a string is called a pendulum. Tape the string to the edge of a desk and let the weight go.

Count the swings in 30 seconds, then do it again. Your two counts will be nearly the same, because the swinging is a **pattern**: it repeats in a way you can count on.

Now make the string shorter and count again. Something changes, and the table on the next page shows what.

MY INVESTIGATION

I predict: _____

What happened: _____

What I think caused it: _____

String length and swings

PRACTICE DATA · MADE UP FOR THIS PAGE, NOT MEASURED

A class counted the swings in 30 seconds for five string lengths, using the same weight each time.

String length	Swings in 30 seconds
20 cm	33
40 cm	24
60 cm	19
80 cm	17
100 cm	15

As the string gets longer, what happens to the number of swings?

_____

How many more swings did the 20 cm string make than the 100 cm string? _____

Predict: will a 120 cm string make more or fewer than 15 swings? _____

▶ ADD TO YOUR FIELD BOOK

Add a page called Swing Count: your string length and your count in 30 seconds, done three times.

💬 TALK ABOUT IT

A tall old clock has a long pendulum. Why would a clockmaker care that every swing takes the same time?

What else repeats so steadily that you could tell time by it?



STUCK? TRY THIS

Read the table from top to bottom and say out loud what happens to each column.

★ CHALLENGE ZONE

Does a heavier weight change the count? Plan a fair test. What has to stay the same?

WEEK 7 FORCES

Predict the Roll

A pattern is only useful if you can use it to say what happens next.

SITS BESIDE
Patterns of motion (3-PS2-2)

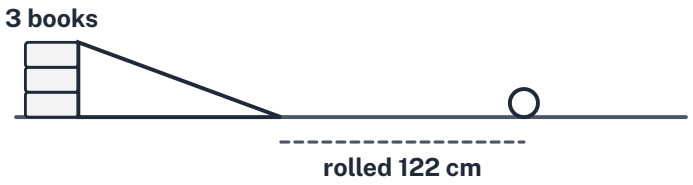
NOTICE FIRST · 2 MINUTES
Before you roll a ball down a slide, say where it will stop. Then roll it.

TRY IT · YOU WILL NEED

- a toy car
- books
- stiff cardboard
- a tape measure
- tape to mark the floor

WORDS TO KEEP

predict Say what will happen before it happens, using a pattern, and then check.



Find the pattern, then use it

Roll the car from a ramp 1 book high, then 2, then 3. Measure each roll.

Look at the distances. Each extra book adds about the same amount. That is a pattern, and a pattern lets you **predict**: say what a ramp 5 books high will do before you build it.

Write your prediction down first. Then test it. If you were close, your pattern works. If you were far off, you have learned something too: the pattern stops somewhere.

MY INVESTIGATION

I predict: _____

What happened: _____

What I think caused it: _____

Ramp height and roll

PRACTICE DATA · MADE UP FOR THIS PAGE, NOT MEASURED

Ramp height	How far the car rolled
1 book	41 cm
2 books	79 cm
3 books	122 cm
4 books	158 cm

Each extra book adds about how many centimeters? _____

Predict how far the car will roll from a ramp 5 books high. _____

About how high would the ramp need to be for a roll of about 100 cm?

_____

▶ ADD TO YOUR FIELD BOOK

Add a page called Before and After: a prediction you wrote BEFORE you tested something, and what really happened.

💬 TALK ABOUT IT

Weather forecasters, coaches and bus drivers all predict. What patterns do they use?

Is a prediction the same as a guess?



STUCK? TRY THIS

Find the difference between each row and the next. If those differences are close to each other, add one more of them to predict the next row.

★ CHALLENGE ZONE

Would a ramp 20 books high make the car roll 800 cm? Give two reasons the pattern might stop working.

WEEK 8 FORCES

Without Touching

A magnet can push or pull through empty air.

SITS BESIDE
Electric and magnetic forces (3-PS2-3)

NOTICE FIRST · 2 MINUTES
Hold a magnet close to a paper clip, but not touching. What happens?

TRY IT · YOU WILL NEED

- two magnets
- paper clips
- a ruler
- a sheet of paper

Safely: Small magnets must never go in anyone's mouth. Keep them away from little children.

WORDS TO KEEP

magnet An object that pulls iron and steel without touching them. Two magnets can push or pull each other.



Opposite ends pull, same ends push

Every magnet has two ends, called poles: north and south.

Turn two magnets so a north end faces a south end and they pull together. Turn one around so north faces north and they push apart, and you can feel it in your fingers before they ever touch.

A magnet's pull gets weaker the farther away it is. That is a cause and effect you can measure with a ruler and a box of paper clips.

MY INVESTIGATION

I predict: _____

What happened: _____

What I think caused it: _____

How far does the pull reach?

PRACTICE DATA · MADE UP FOR THIS PAGE, NOT MEASURED

A class held a magnet above a pile of paper clips and counted how many it picked up at each distance.

Distance above the clips	Clips picked up
1 cm	6
2 cm	4
3 cm	2
4 cm	1
5 cm	0

At what distance did the magnet stop picking up any clips? _____

How many fewer clips at 3 cm than at 1 cm? _____

Finish the sentence: the farther away the magnet is, _____

TALK ABOUT IT

Where are magnets hiding at school or at home? Look at doors and boards.

Can you think of a job a magnet does better than glue?



STUCK? TRY THIS

Read down the distance column and watch what happens to the number of clips.

★ CHALLENGE ZONE

Can a magnet pull a clip through your hand? Through a book? Through a cookie sheet that a magnet sticks to? Plan how to find out, and predict before you test.

WEEK 9 FORCES

The Balloon Trick

Rubbing two things together can make a force that pulls without touching.

SITS BESIDE
Electric and magnetic forces (3-PS2-3)

NOTICE FIRST · 2 MINUTES
Have you ever pulled off a sweater and heard a crackle? What was rubbing?

TRY IT · YOU WILL NEED

- a balloon
- a wool sweater, or your own dry hair
- tiny bits of tissue paper

Safely: Check for latex allergies first. Never put a balloon or a piece of a popped one in your mouth.

WORDS TO KEEP

static — A charge that builds up when some materials rub together. It can pull light things without touching them.

Rub, then hold it close

Rub a balloon on your hair or a wool sweater about ten times. Then hold it just above some tiny bits of tissue paper.

The bits jump up and cling to the balloon, and the balloon never touched them. Rubbing made a charge called **static electricity**, and the charge pulls on light things nearby.

Rub two balloons and hang them side by side on strings. They push each other away. Like a magnet, static can pull or push without touching.

DRAW IT

Draw what the tissue paper did when the balloon came close.

MY INVESTIGATION

I predict: _____

What happened: _____

What I think caused it: _____

Does more rubbing help?

PRACTICE DATA · MADE UP FOR THIS PAGE, NOT MEASURED

A class rubbed a balloon a different number of times and counted the bits of tissue it lifted.

Times rubbed	Bits of tissue lifted
5	3
10	7
15	11
20	12
25	12

How many more bits did 10 rubs lift than 5 rubs? _____

What is the fewest rubs that lifted the most tissue? _____

▶ ADD TO YOUR FIELD BOOK

Add a page called Without Touching: one thing a magnet moved and one thing a rubbed balloon moved, with an arrow for each force.

💬 TALK ABOUT IT

Have you ever felt a tiny shock touching a doorknob? What had you been doing just before? Why might static be worse on a dry day?



STUCK? TRY THIS

Find the biggest number in the second column. Then find the first row that reaches it.

★ CHALLENGE ZONE

A rubbed balloon and a magnet both pull without touching. Name one way they are different. Think about what each one can pull.

WEEK 10 FORCES

A Job for a Magnet

Before you build anything, say what it has to do and what you are not allowed to use.

SITS BESIDE
Solving a problem with magnets (3-PS2-4)

NOTICE FIRST · 2 MINUTES
Look at a cabinet door that stays shut. What keeps it shut? What would happen without it?

TRY IT · YOU WILL NEED

- a magnet
- a paper clip
- tape
- a cardboard box with a flap

Safely: Small magnets must never go in anyone's mouth.

WORDS TO KEEP

criteria	What a solution has to do to count as working.
constraints	The limits you work inside: time, materials, size, cost.

The problem: a cabinet door keeps swinging open

A magnet latch could fix it. But first, write down what “fixed” means.

The **criteria** are what a solution has to do. Here: the door opens with one hand, and it stays shut when somebody bumps the cabinet.

The **constraints** are the limits. Here: you may use only one magnet, and the latch must not stick out past the door.

Writing both down first is what turns a good idea into a design you can test. Without them, everyone just argues about whose idea is best.

DRAW IT
Sketch a magnet latch for the box flap. Label the magnet and the clip.

MY INVESTIGATION

I predict: _____

What happened: _____

What I think caused it: _____

Four latches, tested

PRACTICE DATA · MADE UP FOR THIS PAGE, NOT MEASURED

Each latch was bumped 10 times. A good latch stays shut at least 8 times out of 10.

Latch	Opens with one hand?	Stayed shut (out of 10)	Magnets used	Sticks out past the door?
A	yes	9	1	no
B	yes	10	2	no
C	no	8	1	no
D	yes	6	1	no

Which latch meets every criterion and every constraint? _____

Which latch stayed shut best but broke a constraint? _____

Pick one latch that failed. Which rule did it fail? _____

TALK ABOUT IT

Where at home do magnets hold something shut?

Why is it useful to write the rules down before anyone starts building?



STUCK? TRY THIS

Check each latch against each rule, one at a time. A latch has to pass all of them, not most of them.

★ CHALLENGE ZONE

Latch D only stayed shut 6 times. Suggest one change that might help, and say how you would test whether it did.

WEEK 11 FORCES

Two Ideas, One Problem

There is almost always more than one solution. The job is to compare them fairly.

SITS BESIDE
Comparing design solutions (3-5-ETS1-2)

NOTICE FIRST · 2 MINUTES
Hold a sheet of paper flat by one edge. It flops. Fold it in half. What changes?

TRY IT · YOU WILL NEED

- two books of the same height
- paper
- pennies or other coins

WORDS TO KEEP

solution One way to solve a problem. There is almost always more than one.

The problem: a paper bridge

Lay a sheet of paper across a gap between two books. Put pennies on it, one at a time, until it falls.

A flat sheet holds almost nothing. Now change its shape: fold it, pleat it like a fan, roll it into a tube. Each shape is a different **solution** to the same problem, and some are much stronger than others even though the paper is the same.

To compare them fairly, keep the gap, the books and the pennies the same, and change only the shape.

DRAW IT

Draw the shape you think will hold the most pennies, and predict how many.

MY INVESTIGATION

I predict: _____

What happened: _____

What I think caused it: _____

Four bridges

PRACTICE DATA · MADE UP FOR THIS PAGE, NOT MEASURED

The bridge must hold at least 20 pennies and use only one sheet of paper.

Shape	Pennies held	Sheets used
flat	3	1
folded once	11	1
folded like a fan	38	1
rolled into tubes	24	2

Which bridge meets both rules? _____

How many more pennies did the fan hold than the flat sheet? _____

The tubes held a lot. Why do they still not meet the rules? _____

💬 TALK ABOUT IT

Where do you see folded or pleated shapes making something stronger? Look at cardboard edges.

Is the strongest solution always the best one?



STUCK? TRY THIS

Read the two rules first. Then cross out every bridge that breaks one.

★ CHALLENGE ZONE

Design a bridge from one sheet that you think beats the fan. Draw it and predict a number before you test it.

WEEK 12 REVIEW

What Made It Move?

Every change in motion had a cause. Twelve weeks of finding it.

SITS BESIDE
Forces and motion (3-PS2-1)

NOTICE FIRST · 2 MINUTES
Push your chair a little. Name every force on it while it slides and when it stops.



Part 1 on one card

A **force** is a push or a pull, with a direction and a strength.

Balanced forces cancel and change nothing. **Unbalanced** forces start, stop, speed up, slow down or turn something.

Friction pushes against sliding. **Magnets** and **static** push or pull without touching.

To find out what caused a change, run a **fair test**: change one thing and keep everything else the same.

Which way, and why?

In the drawing, a push of 6 comes from the left and points right, and a push of 2 comes from the right and points left. Which way does the box move? _____

What one change would make the forces balanced? _____

NOTES AND DRAWINGS

Pushes from both sides

PRACTICE DATA · MADE UP FOR THIS PAGE, NOT MEASURED

Each box is pushed from the left and from the right. A push from the left moves a box to the right.

Box	Push from the left	Push from the right	Moves left, right, or stays?
a	4	4	
b	6	2	
c	3	5	
d	7	7	
e	1	6	

How many boxes stay still? _____

Which TWO boxes move to the left? _____

Which moving box is closest to balanced? _____

▶ ADD TO YOUR FIELD BOOK

Add a page called Forces I Can Name: push, pull, friction, magnet and static, each with one example you saw yourself.

💬 TALK ABOUT IT

Explain a fair test to someone at home using a toy, a ball or a paper airplane.

Which force from Part 1 surprised you most?



STUCK? TRY THIS

For each box, find the bigger push. The box moves away from it.

★ CHALLENGE ZONE

Box e is pushed 1 from the left and 6 from the right. Add one more push, of any size, on one side so that it stays still. Which side, and how big?

Born, Grow, Make More

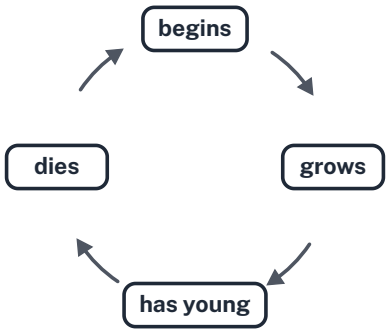
Every living thing has a life cycle. The stages are the same; the timing is wildly different.

SITS BESIDE
Life cycles (3-LS1-1)

NOTICE FIRST · 2 MINUTES
Think of a baby animal you have seen. How was it different from the grown-up?

WORDS TO KEEP

life cycle	The stages a kind of living thing goes through: it begins, grows, has young of its own, and dies.
reproduce	To make young of the same kind.



Four stages, every time

A dog, a sunflower, a frog and a person look nothing alike. Their life cycles have the same four stages.

A living thing **begins**: it is born, hatches or sprouts. It **grows**. If it survives long enough, it **reproduces**: it has young of its own. And in time it **dies**.

The young begin the cycle again. That is why the drawing is a circle: a life cycle is how a kind of living thing keeps going. Some cycles take weeks and some take many years, but the stages always come in the same order.

NOTES AND DRAWINGS

A classroom watched for one school year

PRACTICE DATA · MADE UP FOR THIS PAGE, NOT MEASURED

A class kept five kinds of living things and marked every stage they saw happen during the year.

Living thing	Began	Grew	Had young	Died
bean plant	yes	yes	yes	yes
class goldfish	no	yes	no	no
mealworms	no	yes	no	no
radish plant	yes	yes	yes	no
garden snails	no	yes	yes	no

Which living thing did the class see go through all four stages?

_____

How many of the five did the class see have young? _____

The goldfish never had young in class. Does that mean goldfish do not reproduce? Explain.

_____

▶ ADD TO YOUR FIELD BOOK

Add a page called Life Cycles I Have Seen: one living thing, and every stage of its life cycle you have seen with your own eyes.

💬 TALK ABOUT IT

Which living thing near you has the shortest life cycle you know? The longest?

Why might a class see a bean plant's whole life cycle, but not a goldfish's?



STUCK? TRY THIS

Look along each row. A stage the class did not see is not a stage the animal does not have.

★ CHALLENGE ZONE

Draw the life cycle of an animal you choose. Use the four stages and give each one a picture.

The Frog and the Bean

Two life cycles that share stages and look nothing alike.

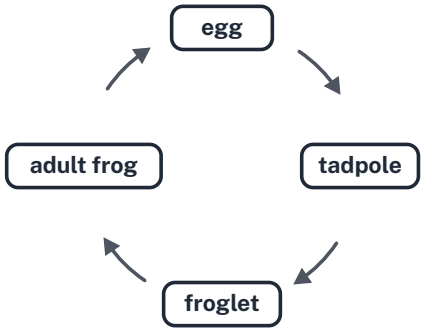
SITS BESIDE
Life cycles (3-LS1-1)

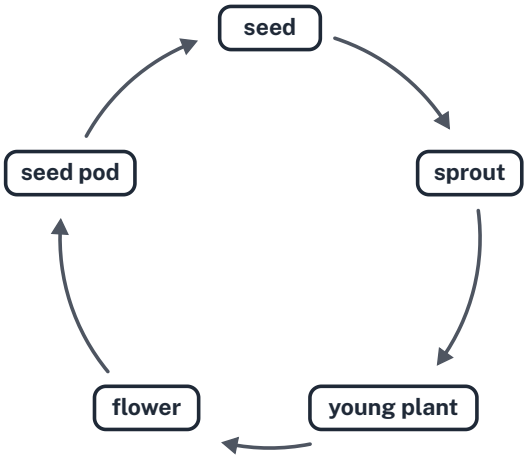
NOTICE FIRST · 2 MINUTES
Look at a dry bean. Is it alive? How could you find out?

TRY IT · YOU WILL NEED

- three dry beans, soaked overnight
- a paper towel
- a clear zip bag
- a ruler

Safely: Dry beans are for growing, never eating. If mold grows, an adult throws out the bag unopened.





Same stages, different stories

A frog begins as an egg in water. A bean plant begins as a seed in soil.

The tadpole grows legs and loses its tail. The bean sprouts, grows leaves, then flowers, and the flowers make pods with new seeds in them. A grown frog lays eggs. Both make young, both eventually die, and the young begin again.

Wrap the soaked beans in a damp paper towel inside the bag. In a few days you will see the first stage of a bean's life cycle begin.

MY INVESTIGATION

I predict: _____

What happened: _____

What I think caused it: _____

One bean plant, measured every week

PRACTICE DATA · MADE UP FOR THIS PAGE, NOT MEASURED

Week	Height
1	0 cm
2	2 cm
3	5 cm
4	9 cm
5	14 cm
6	18 cm
7	21 cm

How much did the plant grow from week 2 to week 7? _____

Between which two weeks did it grow the most? _____

The plant flowered in week 7. In the bean life cycle on page 1, which stage comes next?

_____

▶ ADD TO YOUR FIELD BOOK

Add a page called My Bean: draw your sprouting bean every two days and write the date under each drawing.

💬 TALK ABOUT IT

Have you seen tadpoles, or frog eggs, or a bean sprouting? Where?

What does a seed need to start growing?



STUCK? TRY THIS

Subtract each week's height from the next week's. The biggest difference is the biggest week of growing.

★ CHALLENGE ZONE

A frog and a bean plant both make young. Name two ways their young are different and one way they are the same.

WEEK 15 LIFE CYCLES

A Whole New Body

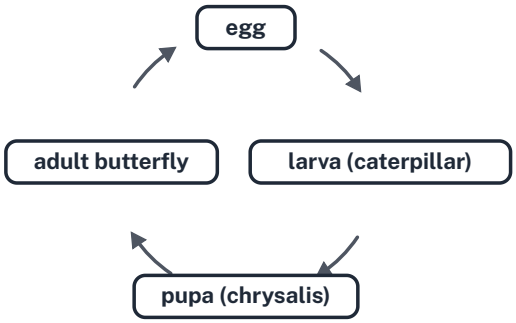
Some animals change shape so completely that the young and the adult look like different animals.

SITS BESIDE
Life cycles (3-LS1-1)

NOTICE FIRST · 2 MINUTES
A caterpillar and a butterfly are the same animal. What is the biggest difference you can think of?

WORDS TO KEEP

metamorphosis A big change in body shape during a life cycle, like a caterpillar becoming a butterfly.



Egg, larva, pupa, adult

Like every kind of living thing, a butterfly begins, grows, has young if it survives long enough, and dies. But it grows up through four different bodies.

The egg hatches into a **larva**, the caterpillar, which mostly eats and grows. Then the caterpillar sheds its skin one last time, and underneath is a hard shell called a **chrysalis**. This stage is the **pupa**, and inside it the body changes completely. An adult butterfly comes out, with wings, and lays eggs.

That change of body shape is called **metamorphosis**. Frogs do it too, from tadpole to frog. Dogs and people do not: a puppy is already shaped like a dog.

NOTES AND DRAWINGS

Five caterpillars

PRACTICE DATA · MADE UP FOR THIS PAGE, NOT MEASURED

A class raised five caterpillars and counted the days each one spent as a caterpillar, then as a pupa.

Caterpillar	Days as a caterpillar	Days as a pupa	Days in all
A	9	8	
B	10	7	
C	8	9	
D	11	8	
E	9	9	

Which caterpillar took the longest to become a butterfly? _____

How many of the five took exactly 17 days? _____

TALK ABOUT IT

Have you ever seen a chrysalis or a cocoon? Where was it?

Why might it help a butterfly to look so different from its caterpillar?



STUCK? TRY THIS

Fill in the last column first by adding the two numbers in each row.

★ CHALLENGE ZONE

The five caterpillars were all the same kind, raised in the same room, and still took different numbers of days. Give one reason that might happen.

WEEK 16 TRAITS

Like Their Parents

Young living things look like their parents, but not exactly like them.

SITS BESIDE
Inherited traits (3-LS3-1)

NOTICE FIRST · 2 MINUTES
Look at a litter of kittens or puppies in a picture. Are they all the same?

WORDS TO KEEP

trait	A feature of a living thing, like ear shape or flower color.
inherited	Passed from parents to their young.

Traits are passed on

A **trait** is a feature of a living thing, like fur color, ear shape or the color of a flower.

Many traits are **inherited**: passed from parents to their young. That is why puppies look like dogs and not like cats, and why a sunflower's seeds grow into sunflowers.

But young do not get every trait from one parent. A puppy can have its mother's fur and its father's ears, and two puppies from the same parents can look quite different from each other.

The parents

Mother: black fur, floppy ears. **Father:** brown fur, pointed ears.

Draw one puppy that could come from these two parents.

NOTES AND DRAWINGS

Five puppies from these two parents

PRACTICE DATA · MADE UP FOR THIS PAGE, NOT MEASURED

Puppy	Fur	Ears
Puppy 1	black	floppy
Puppy 2	brown	pointed
Puppy 3	black	pointed
Puppy 4	black	floppy
Puppy 5	brown	floppy

How many puppies have their mother's ears? _____

Which puppy has the father's fur AND the father's ears? _____

Is any puppy exactly like its mother in both traits? How many? _____

TALK ABOUT IT

Think of a pet or a garden plant you know. Which of its traits came from its parents?

Can a puppy get a trait from a grandparent dog? Ask an adult what they think.



STUCK? TRY THIS

Read one trait at a time. First count fur, then count ears.

★ CHALLENGE ZONE

Two black dogs have a brown puppy. Is that possible? What does it tell you about where traits come from?

WEEK 17 TRAITS

Not Exactly Alike

Measure ten of the same thing and they will not all match.

SITS BESIDE
Variation in traits (3-LS3-1)

NOTICE FIRST · 2 MINUTES
Look at the leaves on one tree, or the beans in one bag. Are any two exactly the same?

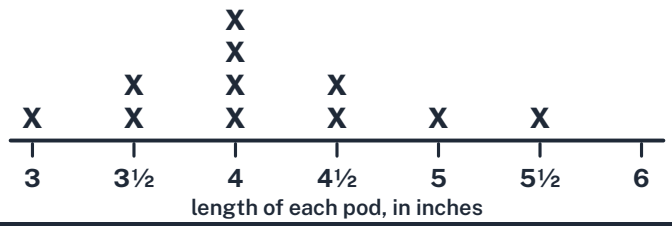
TRY IT · YOU WILL NEED

- ten leaves from one kind of plant, or ten green bean pods
- a ruler marked in inches

Safely: Pick leaves only from a plant an adult has checked. Wash your hands afterward.

WORDS TO KEEP

variation The differences among living things of the same kind.



The same kind, measured

All of these bean pods came from one kind of bean plant. Each X is one pod.

They are not all the same length. Living things of the same kind always differ a little: in size, color, shape. Those differences are called **variation**, and they are everywhere once you start measuring.

A line plot shows variation at a glance. Most pods cluster in the middle, and a few are shorter or longer.

MY INVESTIGATION

I predict: _____

What happened: _____

What I think caused it: _____

Reading the line plot

PRACTICE DATA · MADE UP FOR THIS PAGE, NOT MEASURED

Use the line plot on page 1. It shows the eleven pods.

Which length is the most common? _____

How much longer is the longest pod than the shortest? _____

How many pods are longer than 4 inches? _____

Now measure your own ten leaves or pods to the nearest half inch and make your own line plot.



your measurements, in inches

▶ ADD TO YOUR FIELD BOOK

Add a page called Not Exactly Alike: your own line plot of ten measurements of one kind of living thing.

💬 TALK ABOUT IT

Why do you think pods from the same plant are different lengths?

Name a trait that varies among dogs, or among the leaves you measured.



STUCK? TRY THIS

Count the X's above each number. The tallest stack is the most common length.

★ CHALLENGE ZONE

If you measured 100 pods instead of 11, do you think the line plot would look the same shape? Draw what you predict.

WEEK 18 TRAITS

A Little Different Helps

A small difference can decide which animals survive.

SITS BESIDE
Variation and survival (3-LS4-2)

NOTICE FIRST · 2 MINUTES
A brown rabbit and a white rabbit sit on brown grass. Which one would a hawk spot first?

TRY IT · YOU WILL NEED

- newspaper
- white paper
- scissors
- a timer

WORDS TO KEEP

advantage A difference that helps a living thing survive, find a mate or have young.

The hiding game

Cut 20 small paper “moths” from white paper and 20 from newspaper. Scatter all of them on an open newspaper.

Your partner is a hungry bird. They get 15 seconds to pick up every moth they can see. Count each color. Put them back and play again.

The newspaper moths are harder to see on newspaper. Being harder to see is an **advantage**: a difference that helps an animal survive. In the real world, the moths that survive are the ones that have young, so the advantage gets passed on.

DRAW IT

Draw your two kinds of moth on their newspaper background.

MY INVESTIGATION

I predict: _____

What happened: _____

What I think caused it: _____

Five rounds of the hiding game

PRACTICE DATA · MADE UP FOR THIS PAGE, NOT MEASURED

Round	White moths found	Newspaper moths found
1	8	3
2	7	2
3	9	4
4	6	3
5	8	2

Which color of moth survived better? How do you know?

_____

How many white moths were found in all five rounds? _____ Newspaper moths? _____

How many more white moths were found than newspaper moths? _____

▶ ADD TO YOUR FIELD BOOK

Add a page called The Hiding Game: your own five rounds, both totals, and which color had the advantage.

💬 TALK ABOUT IT

Name an animal whose color helps it hide where it lives.

Is being easy to see ever an advantage? Think of a bright flower or a bird showing off.



STUCK? TRY THIS

Total each column. The color that was found LESS is the color that survived more.

★ CHALLENGE ZONE

Play the game on white paper instead. Predict which color will survive better now, and explain why the advantage changed.

WEEK 19 GROUPS

Safety in Numbers

Some animals survive better together than alone.

SITS BESIDE
Groups help animals survive (3-LS2-1)

NOTICE FIRST · 2 MINUTES
Watch birds on the ground. When one flies off suddenly, what do the others do?

WORDS TO KEEP

group	Animals of one kind living together, like a flock, a herd or a school of fish.

Why live in a group?

Fish swim in schools. Birds fly in flocks. Zebras graze in herds. Living together helps them survive in four ways.

More eyes: a group spots danger sooner than one animal alone. **Finding food:** one member finds it and the others follow. **Keeping warm:** some animals huddle in the cold. **Raising young:** adults can take turns guarding them.

A group has costs too. Members have to share the food, and a crowd is easy for a hunter to find. An animal lives in a group when the help is bigger than the cost.

DRAW IT
Draw an animal group you have seen or read about. Label one way the group helps.

Who notices the cat first?

PRACTICE DATA · MADE UP FOR THIS PAGE, NOT MEASURED

A class watched a bird feeder. Each time a cat walked out, they timed how long until the first bird noticed it.

Visit	One bird alone (seconds)	A flock of six (seconds)
1	9	3
2	11	2
3	8	4
4	13	3

In every visit, which noticed the cat sooner, the lone bird or the flock?

_____

What was the quickest noticing time of all? _____

In which visit was the difference between the lone bird and the flock the biggest?

_____

TALK ABOUT IT

What groups are you part of? How does each one help you?

Can you think of an animal that lives alone? Why might that suit it?



STUCK? TRY THIS

Compare the two numbers in each row. A smaller number of seconds means quicker.

★ CHALLENGE ZONE

A flock spots danger sooner, but has to share food. Describe a place where a bird might be better off alone.

WEEK 20 GROUPS

Jobs in the Group

In some groups every member has a job, and the group survives because of it.

SITS BESIDE
Groups help animals survive (3-LS2-1)

NOTICE FIRST · 2 MINUTES
Watch an ant trail for one minute, without touching it: some ants sting. Are all the ants doing the same thing?

WORDS TO KEEP

colony	A group where members have different jobs, like ants or honey bees.

A colony at work

Ants and honey bees live in **colonies**, groups where different members do different jobs.

In an ant colony, some ants find and carry food, some build and repair the nest, some guard the entrance, and a queen lays the eggs. No single ant could survive alone for long. The colony survives because the jobs are shared.

Watch any ant trail and you will see it: ants going out empty, ants coming back carrying something, and a few that seem to stand still at the hole.

NOTES AND DRAWINGS

Ten minutes at an ant hole

PRACTICE DATA · MADE UP FOR THIS PAGE, NOT MEASURED

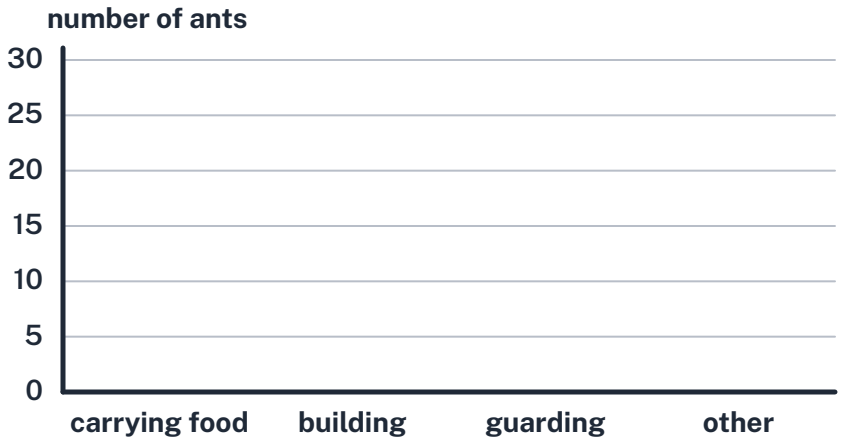
A class watched one ant hole for ten minutes and counted the ants doing each job.

Job	Number of ants
carrying food	26
building	9
guarding	5
other	12

How many ants did they count in all? _____

How many more ants carried food than guarded? _____

Draw a bar graph of the table. Each line on the scale counts 5 ants.



💬 TALK ABOUT IT

What jobs do people in a family or a school share so that everything gets done?

Why might a colony need more food carriers than guards?



STUCK? TRY THIS

For the graph: find each number on the scale first, then draw the bar up to it. 26 is just above the 25 line.

★ CHALLENGE ZONE

Honey bees also live in colonies. Find out one job a honey bee can do that an ant does not, and add it to your Field Book.

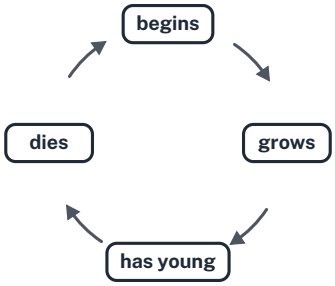
WEEK 21 REVIEW

Why Make More?

Life cycles, traits and groups: three answers to one question.

SITS BESIDE
Life cycles (3-LS1-1)

NOTICE FIRST · 2 MINUTES
Name three living things you saw today. Are any of them young?



Part 2 in four sentences

Every kind of living thing has a **life cycle**: it begins, grows, has young, and dies.

Some animals go through **metamorphosis** and change body shape completely on the way.

Young inherit **traits** from their parents, and there is always **variation**: no two are exactly alike.

A difference that gives an **advantage** helps an animal survive and have young, and living in a **group** can help too.

NOTES AND DRAWINGS

Six life cycles

Living thing	Plant or animal?	Metamorphosis?
frog	animal	yes
butterfly	animal	yes
bean	plant	no
dog	animal	no
beetle	animal	yes
chicken	animal	no

How many of these go through metamorphosis? _____

Which one is a plant? _____

A chicken hatches from an egg. Why is that not metamorphosis?

_____

▶ ADD TO YOUR FIELD BOOK

Add a page called Why Make More: your own answer, in two sentences, to why every kind of living thing reproduces.

💬 TALK ABOUT IT

Explain to someone at home why a life cycle is drawn as a circle.

Which animal from Part 2 would you most like to watch grow up?



STUCK? TRY THIS

Metamorphosis means the body shape changes completely. A chick already has the shape of a chicken.

★ CHALLENGE ZONE

Choose one living thing and write its whole story in five sentences: how it begins, how it grows, one trait it inherits, how it has young, and how its young begin again.

WEEK 22 ENVIRONMENTS

Grown, Not Born

Some traits come from parents. Some come from where a living thing grows up.

SITS BESIDE
Environment and traits (3-LS3-2)

NOTICE FIRST · 2 MINUTES
Find a plant growing in a dark corner and the same kind in the sun. Do they look the same?

TRY IT · YOU WILL NEED

- six bean seeds from one packet
- two cups of soil
- water
- a dark closet
- a sunny window

Safely: Bean seeds are for growing, not eating. Wash your hands after handling the soil and seeds.

WORDS TO KEEP

environment Everything around a living thing: light, water, soil, temperature and food.

Same seeds, different places

Plant three bean seeds in a cup by a sunny window and three in a cup in a dark closet. Water them the same.

The seeds came from one packet, so they inherited the same kinds of traits. The difference you meant to make is light. After two weeks the plants look very different, and the difference was caused by the **environment**, not by their parents.

The results may surprise you. Write your prediction below before you look at the table: which cup will grow taller?

MY INVESTIGATION

I predict: _____

What happened: _____

What I think caused it: _____

Two weeks later

PRACTICE DATA · MADE UP FOR THIS PAGE, NOT MEASURED

Where it grew	Plant 1	Plant 2	Plant 3	Color
sunny window	12 cm	14 cm	13 cm	green
dark closet	18 cm	17 cm	19 cm	pale yellow

Which group grew taller? _____

How much taller is the tallest dark plant than the tallest sunny plant? _____

Taller is not always healthier. Which plants would you rather have? Use the color column.

_____

▶ ADD TO YOUR FIELD BOOK

Add a page called Grown, Not Born: your two cups, drawn side by side, with the height of the tallest plant in each.

💬 TALK ABOUT IT

Name a trait of a person that comes from practice, not parents, like strong legs from running.

Why might a plant in the dark grow tall and thin?



STUCK? TRY THIS

Compare the biggest number in one row with the biggest number in the other.

★ CHALLENGE ZONE

Is this a perfectly fair test? Name the thing that was meant to change, two things that stayed the same, and one more thing that might have changed by accident.

WEEK 23 ENVIRONMENTS

Parent or Place?

Sorting traits by where they came from, and admitting when it is both.

SITS BESIDE
Environment and traits (3-LS3-2)

NOTICE FIRST · 2 MINUTES
A dog can learn tricks. Will its puppies be born knowing them?

Two causes of a trait

Some traits are inherited from parents. Some are caused by the environment: what happened to the living thing, what it ate, where it grew, what it learned.

A spider is born with eight legs whatever happens to it. A dog is not born knowing how to sit; somebody taught it. A hydrangea bush can grow pink flowers in one soil and blue flowers in another.

Many traits are caused by both. A tree's parents decide what kind of tree it is; the sunlight and water it gets decide how tall it grows. When you are not sure, say so, and say what you would need to find out.

DRAW IT
Draw one trait that comes from parents and one that comes from the place. Label each.

Parent or place?

	The trait	Parents, place, or both?
a	the number of legs on a spider	
b	a scar on a dog's leg	
c	the color of a cat's eyes	
d	a dog that knows how to sit when asked	
e	that a robin has feathers	
f	a pink or blue flower on the same kind of bush, depending on the soil	

How many of these traits come from the parents only? _____

Pick one row and explain how you decided.

_____

💬 TALK ABOUT IT

Name a skill a person learned rather than inherited.

Do you think a parrot's talking is inherited, learned, or both?



STUCK? TRY THIS

Ask: would this trait be there if the animal or plant had grown up somewhere else, or been treated differently? If yes, it is probably from the parents.

★ CHALLENGE ZONE

Think of a trait that is caused by BOTH parents and place. Explain each part.

WEEK 24 ENVIRONMENTS

Who Lives Here?

Every habitat suits some living things well, some less well, and some not at all.

SITS BESIDE
Survival in a habitat (3-LS4-3)

NOTICE FIRST · 2 MINUTES
With an adult: the adult rolls a log or rock toward themselves, so anything underneath moves away. What lives there?

TRY IT · YOU WILL NEED

- an adult to roll the log or rock
- a magnifying glass if you have one

Safely: Stand back while the adult rolls it. Look, but never touch, and never reach under a log or rock with your hands. Put everything back the way you found it, and wash your hands after. Never look at the sun through a magnifying glass, and never use one to make a hot spot.

WORDS TO KEEP

habitat The place where a living thing gets what it needs: food, water, shelter and space.

What a habitat gives

A **habitat** is the place a living thing gets food, water, shelter and space.

A frog needs water nearby for its eggs and its skin. A grasshopper needs open, sunny grass to eat. A worm needs damp, dark soil. Put each one in the wrong habitat and it will not survive for long.

So when you find an animal somewhere, the place itself is evidence. It tells you what the animal needs.

DRAW IT

Draw the habitat you looked at, and every living thing you found there.

MY INVESTIGATION

I predict: _____

What happened: _____

What I think caused it: _____

Ten minutes in three places

PRACTICE DATA · MADE UP FOR THIS PAGE, NOT MEASURED

A class searched three places for ten minutes each and counted the animals they found.

Animal	pond edge	dry field	under a log
beetles	2	5	9
worms	0	1	12
frogs	4	0	0
grasshoppers	0	11	0

Which place had the most animals in all? _____

Which animal was found in all three places? _____

Which TWO animals were found in only one place? _____

▶ ADD TO YOUR FIELD BOOK

Add a page called Who Lives Here: one habitat near you, what lives there, and one thing the place gives each living thing.

💬 TALK ABOUT IT

What does the land around our school give the animals that live there?

Why might a beetle survive in more places than a frog?



STUCK? TRY THIS

Add down each column for the totals. Then read across each row for where each animal was found.

★ CHALLENGE ZONE

Worms were found under the log but almost never in the dry field. Write two things the log gives a worm that the field does not.

WEEK 25 ENVIRONMENTS

When the Place Changes

Change the habitat, and you change who can survive in it.

SITS BESIDE
Survival in a changing habitat (3-LS4-3)

NOTICE FIRST · 2 MINUTES
Think of a puddle after rain. What is there a week later?

WORDS TO KEEP

survive	To stay alive. In a changed place some kinds survive well, some less well, and some not at all.

A pond in a dry summer

A habitat does not stay the same forever. A dry summer can shrink a pond to mud.

As the water drops, the living things that need deep water are in trouble first. Some move away. Some **survive** in what is left. Some do not survive at all. Others, like beetles that can live on mud, may do better than before.

That is the pattern this week: when the place changes, some kinds survive well, some less well, and some not at all.

NOTES AND DRAWINGS

Five weeks of one pond

PRACTICE DATA · MADE UP FOR THIS PAGE, NOT MEASURED

Week	Water depth	Frogs counted
1	40 cm	12
2	31 cm	10
3	22 cm	7
4	12 cm	3
5	4 cm	0

In which week did the frog count first reach zero? _____

How much did the water drop from week 1 to week 4? _____

Between which two weeks did the frog count drop the most? _____

TALK ABOUT IT

Has a place near you changed: a new building, a dry creek, a cut tree? What lived there before?

Where might the frogs have gone?



STUCK? TRY THIS

Subtract each week from the one before it. Look for the biggest drop.

★ CHALLENGE ZONE

When the pond becomes mud, name a living thing that might do BETTER than before, and explain why.

WEEK 26 ENVIRONMENTS

Stone Clues

A fossil is a message from a living thing that died long ago, and from the place it lived.

SITS BESIDE
Fossils as evidence (3-LS4-1)

NOTICE FIRST · 2 MINUTES
Press your thumb into a piece of clay. What is left behind when you lift it?

TRY IT · YOU WILL NEED

- modeling clay or play dough
- a shell, a leaf or a small toy

WORDS TO KEEP

fossil The remains or traces of a living thing from long ago, kept in rock.



Layers and fossils

Press a shell into clay and lift it out. The print is a model of a fossil.

Real fossils form when a living thing is buried in mud or sand that slowly turns to rock. Sometimes the bones or shell are kept; sometimes only a print or a footprint is.

Rock like this forms in layers, one on top of another, so the lower layers are usually older. A fossil tells you what lived there, and also what the place was like: a fish fossil means there was once water.

MY INVESTIGATION

I predict: _____

What happened: _____

What I think caused it: _____

A dig, layer by layer

PRACTICE DATA · MADE UP FOR THIS PAGE, NOT MEASURED

A class read about a dig. The drawing on page 1 shows the layers in order, top to bottom.

Which layer is most likely the oldest? _____

Which TWO layers have fossils of animals that live in water? _____

The top two layers tell a story. Was this place wet first and then dry, or dry first and then wet? Use what is in each layer as evidence.

_____

_____

▶ ADD TO YOUR FIELD BOOK

Add a page called Stone Clues: your clay fossil drawn life size, and what someone a long time from now could learn from it.

💬 TALK ABOUT IT

Have you ever seen a fossil, in a museum, a book or a stone?

Why do you think most living things never become fossils?



STUCK? TRY THIS

The bottom layer was laid down first. Then read upward, like turning pages forward in time.

★ CHALLENGE ZONE

Draw your own four layers that tell a story: a forest, then a lake, then a desert, then a town. Put a fossil in each.

WEEK 27 ENVIRONMENTS

A Fish on a Mountain

Fossils of sea animals are found on dry land, high up. The land has changed.

SITS BESIDE
Fossils as evidence (3-LS4-1)

NOTICE FIRST · 2 MINUTES
If you found a seashell on top of a hill, how might it have gotten there?

What fossils say about places

Fossils of sea animals have been found high on mountains, far from any ocean.

A fish cannot climb a mountain. The best explanation is that the rock formed under the sea, long ago, and over a very long time the land was pushed up. The fossil did not move to the mountain. The mountain rose with the fossil in it.

So a fossil is evidence twice over: of the living thing, and of the environment it lived in, which may be nothing like the place today.

DRAW IT
Draw a mountain with a sea fossil near the top. Beside it, draw what the same place looked like long ago.

Four places, four sets of fossils

PRACTICE DATA · MADE UP FOR THIS PAGE, NOT MEASURED

Place	Fossils found	The place was once…
A	shark tooth, clam shell	
B	fern leaf, tree trunk	
C	coral, fish skeleton	
D	palm leaf, crocodile tooth	

Which places were once under the sea? _____

Which place was most likely a forest? _____

Place D has a crocodile tooth and a palm leaf, but it is cold there today. What does that tell you?

_____

TALK ABOUT IT

What do you think your town was like a very long time ago? What evidence could you look for? Why do scientists say “most likely” instead of “definitely”?



STUCK? TRY THIS

Ask what each fossil needed to live. A shark needs the sea. A fern needs land and rain.

★ CHALLENGE ZONE

One fossil alone can mislead you: a bird could drop a fish on a hill. Explain why finding many fossils in one layer is stronger evidence.

WEEK 28 ENVIRONMENTS

A Problem When Things Change

A road cuts through a forest. The animals did not move; their habitat was split in two.

SITS BESIDE
Solutions to a changed environment (3-LS4-4)

NOTICE FIRST · 2 MINUTES
Look at a busy road near you. What would an animal need to get across it?

The problem

When a new road is built through a forest, deer, foxes and smaller animals still need to reach food and water on both sides.

Crossing the road is dangerous for them and for drivers. One solution some places use is a wildlife crossing: a tunnel under the road or a bridge over it, planted to look like the forest, with fences that guide the animals toward it.

A solution is a claim: *this will help*. The only way to judge a claim is to count something before and after.

DRAW IT
Design a crossing for a road near a forest. Label how the animals find it.

Before and after a tunnel

PRACTICE DATA · MADE UP FOR THIS PAGE, NOT MEASURED

A town counted how many animals were seen crossing a road safely each week, four weeks before a tunnel was built and four weeks after.

Week	1	2	3	4	Total
Before the tunnel	3	2	4	3	
After the tunnel	9	11	10	12	

How many more safe crossings were counted in the four weeks after than the four weeks before? _____

Was every week after the tunnel better than every week before it? _____

Name one other thing that could have changed the count.

_____

TALK ABOUT IT

What has changed near your school that might have changed things for animals?

Why is counting before AND after better than counting only after?



STUCK? TRY THIS

Fill in the Total column first. Then compare the smallest number after with the biggest number before.

★ CHALLENGE ZONE

Four weeks is a short time. Design a better way to check whether the tunnel works. How long would you count, and what would you keep the same?

WEEK 29 ENVIRONMENTS

Judge the Fix

Three solutions, two rules, and the evidence to choose between them.

SITS BESIDE
Solutions to a changed environment (3-LS4-4)

NOTICE FIRST · 2 MINUTES
After a storm, is the water in a creek clear or muddy? Why?

A muddy creek

Since the trees beside a creek were cut, rain washes soil off the banks and the water has turned muddy. Fish need clear water.

A town tried three fixes on three stretches of the creek and scored how clear the water was afterward, from 1, very muddy, to 10, perfectly clear.

The town's rules: the water must score at least 7, and the fix must cost less than 50 dollars a meter. A fix that breaks either rule is out, however good it looks.

DRAW IT
Draw the creek bank with your favorite fix. Show where the soil goes when it rains.

Three fixes

PRACTICE DATA · MADE UP FOR THIS PAGE, NOT MEASURED

Fix	Clear-water score	Cost per meter
plant grass on the banks	8	$20
build a wooden fence	5	$30
pile rocks along the edge	7	$60

Which fix meets both rules? _____

Which fix made the water clear enough, but cost too much? _____

Why do you think grass on the banks helps keep the water clear?

_____

▶ ADD TO YOUR FIELD BOOK

Add a page called Judge the Fix: a problem near you, two possible fixes, and the rules you would use to choose.

💬 TALK ABOUT IT

When you choose between two things, what are your rules?

Is the cheapest fix always the best one?



STUCK? TRY THIS

Check every fix against both rules. Cross out each one that fails either.

★ CHALLENGE ZONE

Grass takes a few months to grow thick. Rocks work the first day. Would that change your choice? Write the town a short note explaining what you would do.

WEEK 30 WEATHER

Weather in a Table

One day's weather is a fact. Two weeks of it, written down, is evidence.

SITS BESIDE
Weather data in tables and graphs (3-ESS2-1)

NOTICE FIRST · 2 MINUTES
Look out the window. Describe the weather in three words. Was it the same yesterday?

TRY IT · YOU WILL NEED

- an outdoor thermometer, if your class has one
- your Field Book

WORDS TO KEEP

weather What the air is doing at one place at one time: hot or cold, wet or dry, windy or still.

Measure it, write it down

Weather is what the air is doing at one place at one time.

Scientists describe weather with measurements: the temperature, how much rain fell, how windy it was. One day's numbers do not tell you much. Many days of numbers, kept in a table, show you what is usual and what is not.

This week, record the weather at the same time every school day: the temperature if you can measure it, and whether it rained.

My weather this week

Day	Temperature	Rain?	Wind?	Clouds?
Mon				
Tue				
Wed				
Thu				
Fri				

NOTES AND DRAWINGS

Two weeks in one town

PRACTICE DATA · MADE UP FOR THIS PAGE, NOT MEASURED

The daily high temperature, in degrees Fahrenheit, and whether it rained.

Day	High	Rain?	Day	High	Rain?
Mon	64°	no	Mon	63°	no
Tue	66°	no	Tue	67°	no
Wed	61°	yes	Wed	70°	no
Thu	58°	yes	Thu	68°	no
Fri	59°	yes	Fri	65°	yes

What was the highest high? _____ The lowest? _____ The difference? _____

How many days did it rain? _____

On how many rainy days was the high below 62°? _____

▶ ADD TO YOUR FIELD BOOK

Add a page called My Weather: your own five days, copied from page 1, and one pattern you noticed.

💬 TALK ABOUT IT

What is the hottest day you remember? What did you do?

Why might a farmer keep a weather table for many years?



STUCK? TRY THIS

The left half is the first week and the right half is the second. Look at all ten days before you answer.

★ CHALLENGE ZONE

Look at the rainy days and the dry days. Were rainy days usually warmer or cooler? Is two weeks enough to be sure?

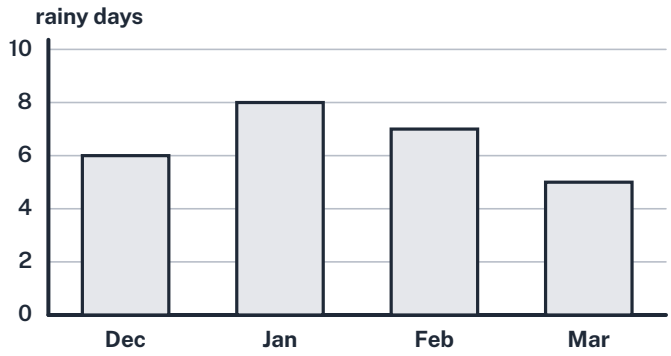
WEEK 31 WEATHER

A Season in a Graph

A bar graph turns a season of weather into a picture you can read in one look.

SITS BESIDE
Weather data in tables and graphs (3-ESS2-1)

NOTICE FIRST · 2 MINUTES
Is your town's weather the same in winter and summer? What changes most?



Reading a season

The graph shows the number of rainy days in four months of one rainy season in a town.

Each line on the scale counts 2 days. A bar that ends halfway between two lines is an odd number: halfway between 4 and 6 is 5.

A graph like this is how scientists describe the weather of a season. Not one rainy day, but the pattern of all of them.

NOTES AND DRAWINGS

Questions about the graph

PRACTICE DATA · MADE UP FOR THIS PAGE, NOT MEASURED

Use the graph on page 1. Write each month's number first.

Month	Dec	Jan	Feb	Mar
Rainy days				

Which month had the most rainy days? _____

How many rainy days in all four months? _____

How many more rainy days in January than in March? _____

💬 TALK ABOUT IT

Which month is the rainiest where you live? How could you find out for sure?

Why might one winter be rainier than the next?



STUCK? TRY THIS

Put your finger on the top of a bar and slide it left to the scale.

★ CHALLENGE ZONE

Draw a bar graph of your own five days of weather from last week. Choose what to count and choose your scale.

WEEK 32 WEATHER

Climate Is the Pattern

Weather is today. Climate is what usually happens, year after year.

SITS BESIDE
Climates of different regions (3-ESS2-2)

NOTICE FIRST · 2 MINUTES
Is it hot every single day of summer where you live? Is it still a hot season?

WORDS TO KEEP

climate	The usual weather of a place over many years. Weather is one day; climate is the pattern.

One day against many years

A cold day in summer does not change the fact that summer is usually warm. That "usually" is **climate**.

Climate is the pattern of weather in a place over many years: how hot or cold it usually gets, how much rain usually falls, and in which seasons. Two places can have the same weather on one day and very different climates.

This is the difference between one row of a table and the whole table. Weather is a measurement. Climate is a pattern.

NOTES AND DRAWINGS

Two towns, typical highs

PRACTICE DATA · MADE UP FOR THIS PAGE, NOT MEASURED

The typical high temperature in each season, over many years, in degrees Fahrenheit.

Town	Winter	Spring	Summer	Fall
A	45°	60°	80°	62°
B	72°	76°	82°	78°

How much warmer is summer than winter in Town A? _____ In Town B? _____

Which town has a bigger change between seasons? _____

How far apart are the two towns' summer highs? _____

▶ ADD TO YOUR FIELD BOOK

Add a page called Weather or Climate: three sentences about where you live, and a W or a C beside each to say which it is about.

💬 TALK ABOUT IT

What is a climate you have read about or seen in a picture? How is it different from here?

If you moved to Town A, what clothes would you need that you might not need in Town B?



STUCK? TRY THIS

Weather questions are about one day. Climate questions are about what usually happens. Read the question for the word “usually.”

★ CHALLENGE ZONE

Somebody says: “It snowed in my town today, so the climate must be getting colder.” What would you say back?

WEEK 33 WEATHER

Climates Far Away

Deserts, rainforests and icy places: the same Earth, very different patterns.

SITS BESIDE
Climates of different regions (3-ESS2-2)

NOTICE FIRST · 2 MINUTES
Think of a picture of a desert and a picture of a jungle. What is the biggest difference?

Three kinds of climate

A **desert** gets very little rain. A **rainforest** is warm and wet all year. A **polar** place is cold for most of the year.

Here is the surprise: many polar places get very little rain or snow, so they are dry too. Some scientists call them cold deserts. To tell a hot desert from a polar one you need two clues, not one: how much rain, and how warm.

The plants and animals in each place match its climate. A cactus stores water; a rainforest tree has huge leaves; a polar bear has thick fur.

Many places are none of the three. They are in between: mild, with some rain, and warm and cool seasons.

DRAW IT
Draw one plant or animal and the climate it is suited to. Label what helps it survive there.

Four places

PRACTICE DATA · MADE UP FOR THIS PAGE, NOT MEASURED

Rain in a typical year, in inches, and how warm each place usually is.

Place	Rain in a year	Usually	Most likely climate
P	4 in	hot	
Q	90 in	warm	
R	8 in	freezing	
S	40 in	mild	

Which place is most likely a hot desert? _____

Which TWO places get less than 10 inches of rain a year? _____

Which place is most likely a rainforest? _____

TALK ABOUT IT

Which climate would you most like to visit? What would you need to bring?

Is your town's climate more like P, Q, R or S?



STUCK? TRY THIS

Use both columns. Dry and hot is a hot desert. Dry and freezing is a polar place.

★ CHALLENGE ZONE

A camel lives where it is very hot and a polar bear where it is very cold. Name one trait each has that suits its climate, and explain why they could not swap homes.

WEEK 34 WEATHER

When Weather Is Dangerous

Most weather is ordinary. Some becomes a hazard, and people can prepare for it.

SITS BESIDE
Reducing the impact of weather hazards (3-ESS3-1)

NOTICE FIRST · 2 MINUTES
What does your school do to keep everyone safe on a very hot day?

WORDS TO KEEP

hazard	Something in nature that can cause harm, like a flood, a heat wave or a wildfire.

Hazards in California

A **hazard** is something in nature that can cause harm. In California the weather hazards include heat waves, floods, strong storms, and hot, dry winds that spread wildfires.

Nobody can stop a storm. People can reduce the harm it does: a levee is a wall of earth that keeps a river in its banks, a shade structure keeps a playground cool, and an air filter keeps wildfire smoke out of a classroom.

Each of those is a design, and like every design it has criteria and constraints. Next week you design one.

NOTES AND DRAWINGS

Six days of rain and a river

PRACTICE DATA · MADE UP FOR THIS PAGE, NOT MEASURED

A town's river floods when it rises higher than 12 feet.

Day	Rain that day	River height
1	0 in	6 ft
2	2 in	8 ft
3	3 in	11 ft
4	1 in	13 ft
5	0 in	12 ft
6	0 in	10 ft

On which day was the river higher than 12 feet? _____

On which day did the most rain fall? _____

The river was highest the day AFTER the most rain. Why might that happen?

_____

TALK ABOUT IT

What can people do to get ready for a very hot day or a big storm?

Why do weather forecasts help keep people safe?



STUCK? TRY THIS

Read the river column and find the one number bigger than 12. Then read across for the day.

★ CHALLENGE ZONE

Choose one hazard. Write a three-step plan your class could follow when it happens.

WEEK 35 WEATHER

Design Against the Weather

Sun on a playground bench is a hazard you can measure, and a problem you can solve.

SITS BESIDE
Reducing the impact of weather hazards (3-ESS3-1)

NOTICE FIRST · 2 MINUTES
Hold your hand just above, not on, a metal surface in the sun and one in the shade. What do you feel?

TRY IT · YOU WILL NEED

- two pieces of paper, one dark and one white
- a sunny spot
- a thermometer if you have one

Safely: Do not touch metal that has been in the sun. Use a thermometer, or ask an adult.

The problem: a bench too hot to sit on

On a sunny afternoon, a metal bench in full sun can get hot enough to burn skin.

Criterion: the bench must stay below 100°F on a sunny afternoon. Constraint: the shade must cost less than 40 dollars.

Before you build, test the idea: lay a dark sheet of paper and a white one in the sun for ten minutes, then feel each one. Paper is safe to touch. Color and shade both change how hot a surface gets.

DRAW IT
Design a shade for a bench. Label the materials, and say what it would cost.

MY INVESTIGATION

I predict:

What happened:

What I think caused it:

Four benches on a sunny afternoon

PRACTICE DATA · MADE UP FOR THIS PAGE, NOT MEASURED

Design	Bench temperature	Cost
no shade	118°F	$0
big umbrella	96°F	$45
cloth sail	92°F	$30
vine-covered frame	99°F	$10

Which TWO designs meet both the criterion and the constraint?

_____

Of those two, which kept the bench coolest? _____

How many degrees cooler was the cloth sail than no shade? _____

▶ ADD TO YOUR FIELD BOOK

Add a page called Design Against the Weather: your bench shade, its criteria, its constraints, and how you would test it.

💬 TALK ABOUT IT

Where at your school is the hottest place on a sunny day? What would you change?

Why might a town choose the vine-covered frame even though it is not the coolest?



STUCK? TRY THIS

Cross out every design hotter than 100°. Then cross out every one that costs 40 dollars or more.

★ CHALLENGE ZONE

Write a note to your principal recommending one shade design. Use one number from the table as your evidence.

WEEK 36 REVIEW

What Made That Happen?

Thirty-six weeks, one question. Every change you saw this year had a cause.

SITS BESIDE
Planning a fair test (3-5-ETS1-3)

NOTICE FIRST · 2 MINUTES
Look around the room. Find one thing that changed today. What caused it?

The year in one question

A car rolled farther. A plant grew pale. A pond dried up. A moth was not eaten. Every time, you asked: what made that happen?

This year the book asked you to look at causes. A **force** causes every change in motion. **Parents** and **environment** both cause traits. A changed **habitat** causes changes in who survives. **Weather** causes hazards people can design against.

And you practiced how to find out: a **fair test**, changing one thing at a time, with the results written down. That is the most useful thing in this book, and it works on questions this book never asked.

NOTES AND DRAWINGS

Match the cause

Choose each cause from this list: **friction**, **magnet**, **inherited**, **environment**, **ramp height**. Here, environment means what is around a living thing.

	What happened	What caused it?
a	a ball rolls more slowly on carpet	
b	a bean plant in a dark closet grows pale and tall	
c	a magnet picks up a clip from 2 cm away	
d	a puppy has its mother's floppy ears	
e	a pond dries up and the frogs leave	
f	a toy car rolls farther from a higher ramp	

How many of these were caused by a living thing's environment? _____

Pick row a, b, c or f and describe a fair test that would check its cause.

_____

▶ ADD TO YOUR FIELD BOOK

Finish your Field Book with a page called My Next Question: one thing you still wonder about, and the first step to finding out.

💬 TALK ABOUT IT

Tell someone at home about the investigation you liked most this year.

What question do you still want to answer?



STUCK? TRY THIS

For each row, ask: what one thing would you change to make it NOT happen?

★ CHALLENGE ZONE

Pick one design from this year: the magnet latch, the paper bridge or the bench shade. Plan a fair test to make it better: the ONE thing you would change, what you would keep the same, and what result would tell you it failed.

Young Innovators
FOR CHANGE
innovateyouth.org

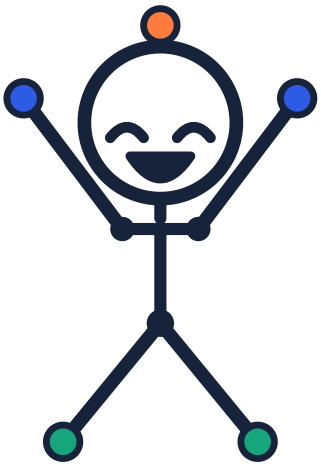
Grade 3 · What Made That Happen?

Certificate of Completion

This is to certify that

_____

practiced finding causes for thirty-six weeks.



_____ _____

Teacher Date

Young Innovators for Change · innovateyouth.org