

Years 3 – 4

Worms

Teacher booklet



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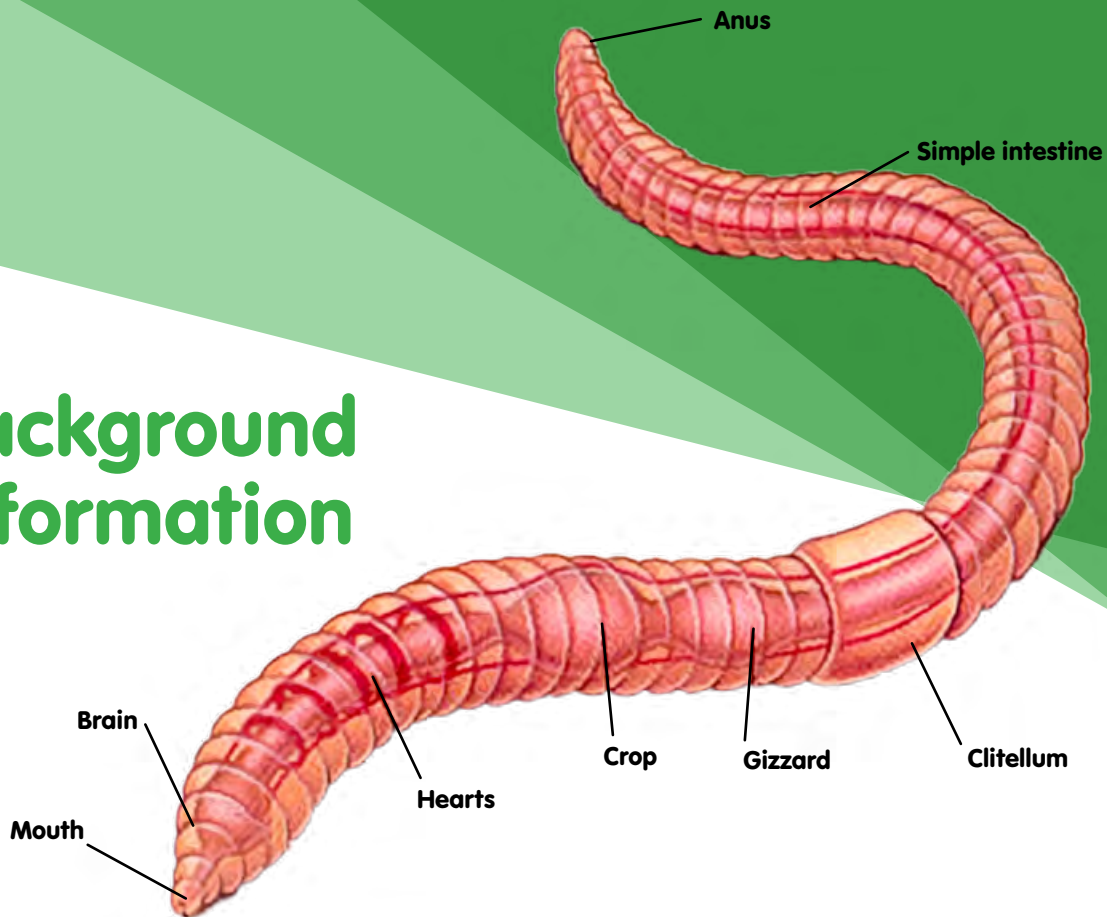
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Worm science

Years 3 – 4



Background information



Why do we have worms?

Worms are often considered to be little 'soil farmers' and by simply living, eating and reproducing they provide a wonderful service to plants and to us. Worms eat a wide variety of items including old plant material and food scraps. Their castings are expelled into the soil and provide nutrients for plants. As the worms move through the soil, their tunnels enable air and water to filter into the ground and loosen up the soil for plant roots, allowing easier absorption of oxygen and water by the plants.

The earthworms that we use in worm farms are a different species to those we find in our gardens. The best worms for worm farming are European worms such as the Red Wiggler (*Lumbricus rubellus*) and the Tiger Worm (*Eisenia fetida*). Another good composting worm is the Indian Blue (*Perionyx excavatus*) that comes from Asia. These species are accustomed to soils high in nutrients. They are used in worm farming because they eat and breed much faster than other earthworms and can quickly transform our waste scraps into worm castings.

Description and characteristics of worms

Earthworms are invertebrates, which means they have no backbone. They belong to the phylum Annelida, which also includes leeches and marine worms. Annelids are different from most other invertebrates because they have long cylindrical bodies made up of many similar segments, and lack appendages, antennae and an obvious head.

The earthworm is blind, but sensitive to light. Its instinct is to move away from light due to its two 'photoreceptors' which are sensitive nerve endings located near the saddle at the anterior (Murphy 2005).

It has three to five hearts depending on the species, and breathes through its skin which is a mucous membrane.

We can identify its 'head' (anterior) as it is the end closest to the clitellum, a band around the worm near the centre and commonly referred to as the saddle. It feeds by using its mouth or prostomium.

It moves through the soil by contracting and expanding its muscles and using its setae (bristles) to grip the soil.

Worms in food chains

Worms' main role in the food chain is as decomposers. In a food chain, decomposers usually sit at the bottom, recycling nutrients so plants can grow. Worms break down dead plants, leaves, and organic matter. By doing this, they release nutrients back into the soil. This makes them essential for soil health and nutrient cycling.

Many animals also rely on worms as a food source including birds, reptiles, invertebrates and amphibians. This places worms low in the food chain but makes them a crucial link for higher-level consumers.

Worms also act as soil ecosystem engineers. This role is important to food chains as worm burrowing improves aeration and water flow in soil and castings (worm poo) enrich soil nutrients. Both of these actions help plants grow, which are the base of every terrestrial food chain.



Worm key words

Adaptations: Any behavioural or physical characteristics of an animal that help it to survive in its environment.

Annelida: A large phylum of segmented worms including earthworms and leeches. They are also less-formally known as annelids, the name coming from the Latin 'annelus', meaning 'little ring'.

Clitellum: A clitellum is part of the reproductive system of an annelid (a worm with small rings or segments). The clitellum is a thick, saddle-like ring found in the epidermis (skin) of the worm.

Consumer: Animals that eat plants or other animals.

Decomposer: Organisms that break down dead plants and animals (e.g. worms, fungi, bacteria, millipedes).

Invertebrates: Animals without a backbone.

Leachate: See worm leachate.

Photoreceptors: Nerve endings that are extremely sensitive to light.

Producer: Plants that make their own food (e.g. leaves, grass).

Saddle: See clitellum.

Segmented: The body is divided into successive segments, as in earthworms or lobsters.

Seta (plural-setae): Stiff hair made of solid keratin that worms have on each segment of their bodies and use for grip and as sensors.

Worm science

Curriculum links

Learning area: Science

Science understanding

Year 3

- Living things can be distinguished from non-living and once-living things, and grouped by their characteristics (WA3SSUB1)

Year 4

- Producers, consumers and decomposers have roles within an ecosystem and interact in ways that can be represented by food chains (WA4SSUB1)

Science inquiry skills

Years 3 – 4

- Pose questions and make predictions based on planned observations of phenomena that include variables to be measured and changed (WA3SSIQ1)
- Plan and conduct investigations, including elements of fair tests, and consider the material and equipment risks (WA3SSIPL1)
- Make and record observations, including formal measurements using familiar scaled instruments (WA3SSIPL2)
- Organise and represent data using tables, column graphs and models to identify patterns (WA3SSIPR1)
- Compare findings with those of others, and to predictions; consider if investigations were fair; and identify questions for further investigation (WA3SSIE1)
- Communicate ideas using scientific vocabulary (WA3SSICM1)
- Use science knowledge to propose explanations for observed phenomena and solutions to problems (WA3SSICL1)

Timing

These activities should take about four 60-minute lessons to complete. During some of these lessons, students will be handling and examining worms. Before giving students live worms, it is important to remind them that worms are living creatures and should be handled gently.

Learning objectives

Students will:

- ✓ learn about the anatomy of a worm
- ✓ draw a labelled diagram of a worm
- ✓ distinguish between living, non-living, and once-living things and describe their characteristics
- ✓ group animals based on observable characteristics
- ✓ identify producers, consumers, and decomposers in an ecosystem
- ✓ conduct an experiment to investigate how a worm responds to an external environmental stimulus
- ✓ record and analyse the results of an experiment.

Resources required

- Worm science PowerPoint presentation
- Screen to share with class
- Internet access for YouTube video
- Worms
- Light coloured container lids – one per student/pair/group
- Magnifying glass – one per student/pair/group
- Real items/pictures of living, non-living and once-living things for sorting
- Classifying cards
- Producer, consumer, decomposer cards
- Tray - one per pair/group
- Exercise book or piece of paper - one per pair/group
- Light source
- Stopwatch
- Science journal or worksheets

Lesson 1

Looking at worms



To prepare

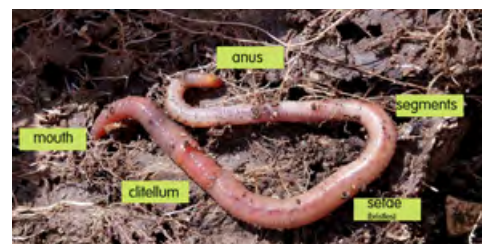
- > Students will need their own worms to examine with a magnifying glass. It is best to place the worms on a light-coloured plastic surface, such as a container lid, and add a small drop of water to stop them from drying out.

Activities

1. Watch the video [Worms Are Wonderful | Amazing Animals | Backyard Science | SciShow Kids - YouTube](#) (4:33 minutes).



2. Complete the *I see, I think, I wonder* worksheet to engage students in thinking about worms. This can be done as a whole class or individual activity.
3. Show students a mix of real living, non-living or once-living objects or use the images on the PowerPoint slide.
4. Discuss with students how we know which are living or non-living things.
5. Discuss with the class some of the characteristics of a worm that show us they are living things.
6. Using the PowerPoint slide, label the parts of a worm.
7. In their science journals, have students create two headings – ‘Diagram of a worm’ and ‘Observations’ (or use the [Looking at worms](#) worksheet).
8. Give each student/pair some worms to examine and a magnifying glass.
9. Instruct students to draw a labelled diagram of their worm using the words discussed earlier in the lesson (display labelled PowerPoint slide if needed).
10. After completing their drawing, students should record their observations about why worms are living using the questions on the PowerPoint to guide them.
11. As a class, discuss what you have learned about worms.



Lesson 2

Classifying living things



To prepare

- > Students will use the *Classifying cards* to sort animals based on characteristics. Prepare enough cards for your class.

Activities

1. Review what was discussed about the characteristics of a worm in the last lesson.
2. Show the class the Powerpoint slide with images of various animals and discuss the similarities and differences between the characteristics of the animals and the characteristics of a worm e.g. number of legs, vertebrate or invertebrate, body covering, habitat, etc.



3. Give each pair/group of students cards with pictures of various animals and ask the students to sort them into groups based on a characteristic of their choice.
4. Ask each group/pair to share their groupings and explain how they have classified them.
5. See if the students can then sort their cards into different classifications.
6. In their science journals, or using the *Classifying animals by their characteristics* worksheet, have students record and label some of their classification groups.

Lesson 3

Producers, consumers, decomposers



To prepare

- > Students will use the *Organism cards* and *Food chain labels* to create food chain diagrams. Prepare enough cards for your class.

Activities

1. Introduce the three roles in a food chain - producers, consumers and decomposers.
2. Discuss what worms eat and what role they play in the ecosystem.
3. Provide each pair/group of students with organism cards and food chain labels. Explain the arrows show the direction of energy (food → eater).
4. Ask students to create simple food chains using the cards.
5. In their science journals, or using the *Food chains* worksheet, have students record and label some of their food chains.

Examples:

Gum tree → fungi

Capsicum → worm

Gum leaf → Christmas beetle → worm

Tomato → caterpillar → bird → bacteria

Lesson 4

How worms respond to light investigation



To prepare

- > Provide students with castings, no more than 10 worms, and the materials they will need to conduct the investigation.

Activities

1. Explain to the students that they will be conducting an investigation to see how worms respond to light.
2. Take the class outside or ensure that there is plenty of light in the space you are using for this investigation.
3. Students set up their trays covering half with a thin layer of worm castings.
4. Place an exercise book (or piece of paper) over half of the tray to cover the castings.
5. Students gently place about 10 worms on the side of the tray that is uncovered and give the worms some time to settle down. Use only 10 worms, because any more will tend to bunch together rather than move around.
6. Have students make predictions about how the worms will respond to the light and record their ideas in their science journals or on the *Science investigation* worksheet.
7. Observe the worms for 15 to 20 minutes and record what happens. Hint: observe whether the worms head directly for the shelter of the castings.
8. Students count and tally how many worms are exposed or undercover every three to five minutes and record this data in a table format.
9. After the experiment has finished, students graph their data showing number of worms versus time.
10. As a class, discuss students' findings using the discussion questions on the PowerPoint as a guide.

Let's discuss

- How did your results compare with your prediction?
- How did the worms respond to light?
- Why do you think the worms responded the way they did?
- Did everyone get the same results?
- Was this experiment fair and accurate?
- How could you improve this experiment?

Name: _____

I see, I think, I wonder



Record your thoughts below:



What did you **see** about worms in the video?

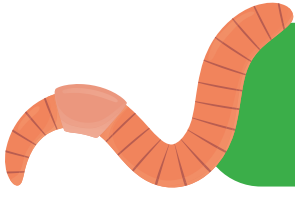


What did the video make you **think** about worms?



What did the video make you **wonder** about worms?

Name: _____



Looking at worms

Diagram

mouth clitellum segments setae anus

Observations

How we know worms are living creatures

Name: _____

Classifying animals by their characteristics



Choose a different characteristic for each box and show which animals could be classified by that characteristic.

<p>Characteristic:</p> <hr/>	<p>Characteristic:</p> <hr/>	<p>Characteristic:</p> <hr/>
<p>Characteristic:</p> <hr/>	<p>Characteristic:</p> <hr/>	<p>Characteristic:</p> <hr/>

Classifying cards



Classifying cards

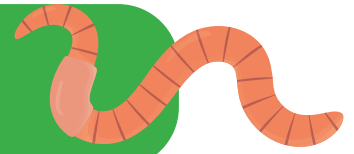


Classifying cards



Name: _____

Food chains



Show some examples of a food chain and label the producer, consumer and decomposer in each.

	→		→			
	→		→			
	→		→		→	
	→		→		→	

Explain how worms and other decomposers help improve soil health.

Organism cards



Organism cards



Organism cards



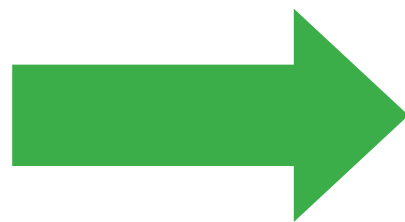
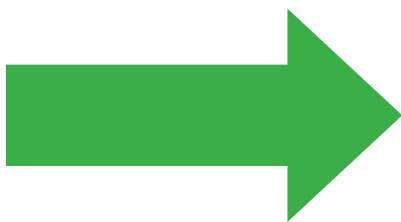
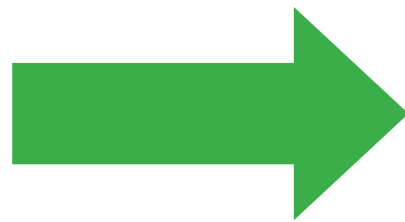
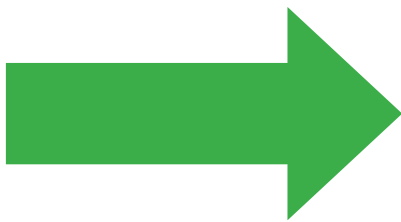
Food chain labels

Producer

Consumer

Consumer

Decomposer



Name: _____



Science investigation

Investigation question:

How will worms react when exposed to sunlight?

Materials

- worms
- worm castings
- tray
- exercise book/piece of paper
- stopwatches/student watches
- magnifying glasses
- recording sheet

Safety conditions

Worms are living creatures and must be treated with care and consideration. Carefully watch the worms during the experiment to make sure they aren't drying out. If this is the case, return them immediately to the worm farm.

Method

1. Cover half a tray with a thin layer of worm castings.
2. Place an exercise book (or piece of paper) over half of the tray to cover the castings.
3. Take the tray outside into sunlight (or place under lamp).
4. Gently place 10 worms on the side of the tray that is uncovered and give the worms some time to settle down.
5. Observe the worms for 15 to 20 minutes and record what happens.
6. Count and tally how many worms there are on each side of the tray every three to five minutes and record in a table.
7. After the experiment is finished, graph the results of your investigation (number of worms exposed or undercover versus time).
8. What conclusion can we draw about worms from this experiment?

Name: _____



Science investigation

Investigation question:

How will worms react when exposed to sunlight?

Prediction:

I predict

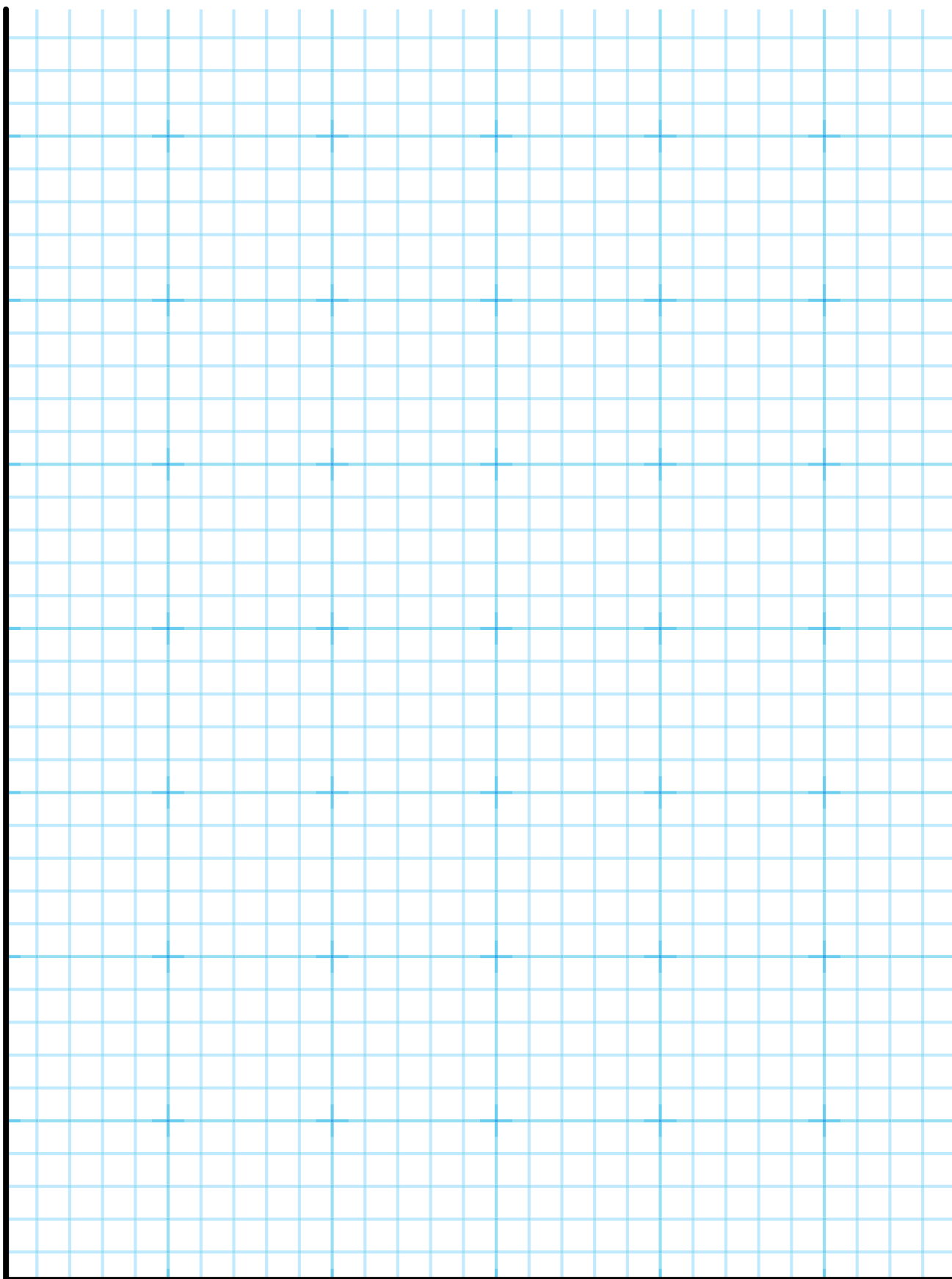
Observations:

Time	No. of worms exposed	No. of worms under cover
Start		
__minutes		
__minutes		
__minutes		
__minutes		

Conclusion:

Name: _____

Title:



Worm food

Years 3 – 4



Background information



Worm farms

Worm farms contain composting worms that eat food scraps and turn those scraps into a natural liquid (worm leachate) and compost (castings) that can be used in the garden. Composting worms thrive in a moist, high-nutrient environment. We can create this environment in a worm farm.

Worm farms:

- decrease the amount of organic waste sent to landfill
- close the recycling loop by changing food waste back into organic fertiliser for growing food
- reduce greenhouse gases. In a well-maintained worm farm, the decomposition process is aerobic (with oxygen), rather than anaerobic (without oxygen).

The earthworms used in worm farms are a different species to those we find in our gardens. The best worms for worm farming are European worms such as the Red Wiggler (*Lumbricus rubellus*) and the Tiger Worm (*Eisenia fetida*). These species are accustomed to soils high in nutrients. They eat and breed much faster than other earthworms and can quickly transform food scraps into worm castings. They do this in a small amount of space, while other earthworms are better equipped for burrowing and searching for food in our drier, nutrient-poor soils.

Living conditions in a worm farm

Worm farms should be situated in a cool, shady spot. Worms need cool, moist conditions and a temperature of 25–26 degrees Celsius. They need a layer of bedding to live in, which can include castings, shredded paper, newspaper, cardboard, brown leaves, and straw. As food scraps decompose, they will make the worm bedding more and more acidic, therefore it is a good idea to occasionally add some garden lime to maintain the pH as worms prefer a neutral environment.

School worm farms

A worm farm is made from a container that has a drainage hole for water and a lid that keeps out vermin but allows air in.

You can buy worm farm containers, make your own, or have one custom made. Some schools use old bathtubs but most use old fridges that have been safely degassed. Look at the [‘How to make a fridge worm farm’](#) fact sheet to find out more. For most schools, at least one large worm farm (such as a fridge or bathtub) is needed.

For more information on setting up a worm farm at school, see the [fact sheets](#) or watch the [instructional videos](#).



Food to put in your worm farm

Materials you can put in your worm farm include:

- shredded, moist cardboard, newspaper and paper scraps (avoid shiny magazines)
- coffee grounds and tea bags (with staples removed)
- fruit and vegetable scraps
- leaves
- straw (but not hay with seeds in it)
- coconut fibre
- egg shells (pulverised) or other sources of grit (good to add when the worm farm gets a bit smelly or acidic).

The smaller the pieces of food, the easier it is for the worms to get through. Some schools blend food scraps or chop them up with a metal spade in a bucket or wheelbarrow.



Food to keep out of your worm farm

Anything organic will eventually be broken down in a worm farm. However, in a small worm farm it is a good idea to omit certain foods such as:

- citrus fruits, pineapple, onions and garlic – can make the worm farm too acidic (pH less than 7) and the worms may even try to move out because of the acidic conditions
- meat and fish – can become smelly as they decompose and attract mice, rats and wasps
- dairy – can become smelly and cause anaerobic conditions
- bread – tends to clump up and worm farms can't cope with the amount of bread that schools produce
- oils – smother worms (as they breathe through their skin)
- weeds – as weed seeds are not destroyed in a worm farm.

A good rule of thumb is: If in doubt, leave it out!

A composting system such as heap, bin or tumbler can also help to manage your organic waste and is perfect for composting citrus, onion and garlic scraps that should be left out of your worm farm.

Worm food

Curriculum links

Learning area: Science

Science understanding

Year 4

- Producers, consumers and decomposers have roles within an ecosystem and interact in ways that can be represented by food chains (WA4SSUB1)

Science inquiry skills

Years 3 – 4

- Pose questions and make predictions based on planned observations of phenomena that include variables to be measured and changed (WA3SSIQ1)
- Plan and conduct investigations, including elements of fair tests, and consider the material and equipment risks (WA3SSIPL1)
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- Communicate ideas using scientific vocabulary (WA3SSICM1)
- Use science knowledge to propose explanations for observed phenomena and solutions to problems (WA3SSICL1)

Timing

This activity will require one 60-minute lesson for planning and one 60-minute lesson to set up the experiment. The students will need a short time to observe their worm farms and record their observations on an ongoing basis over several weeks. It will also require one 60-minute lesson at the end of the experiment for students to compile their data and discuss their results.

This activity can be completed as a paired/group activity.

Learning objectives

Students will:

- ✓ build a mini worm farm
- ✓ investigate factors that affect the rate at which worms consume food
- ✓ observe and record changes
- ✓ discuss their findings.

Resources required

- Worm food PowerPoint presentation and screen to share with class
- Up to four two-litre clear plastic drink bottle (with the top cut off, see [infographic](#)) per group
- Moist worm castings
- Water
- Compost worms
- Newspaper
- Vegetable and fruit scraps
- Fork/knife/grater/mortar and pestle/blender (optional)
- Labels
- Science journals, worksheet or digital device to record observations

Worm farm key words

See [page 40](#).

Lesson 1

Planning an experiment - mini worm farm

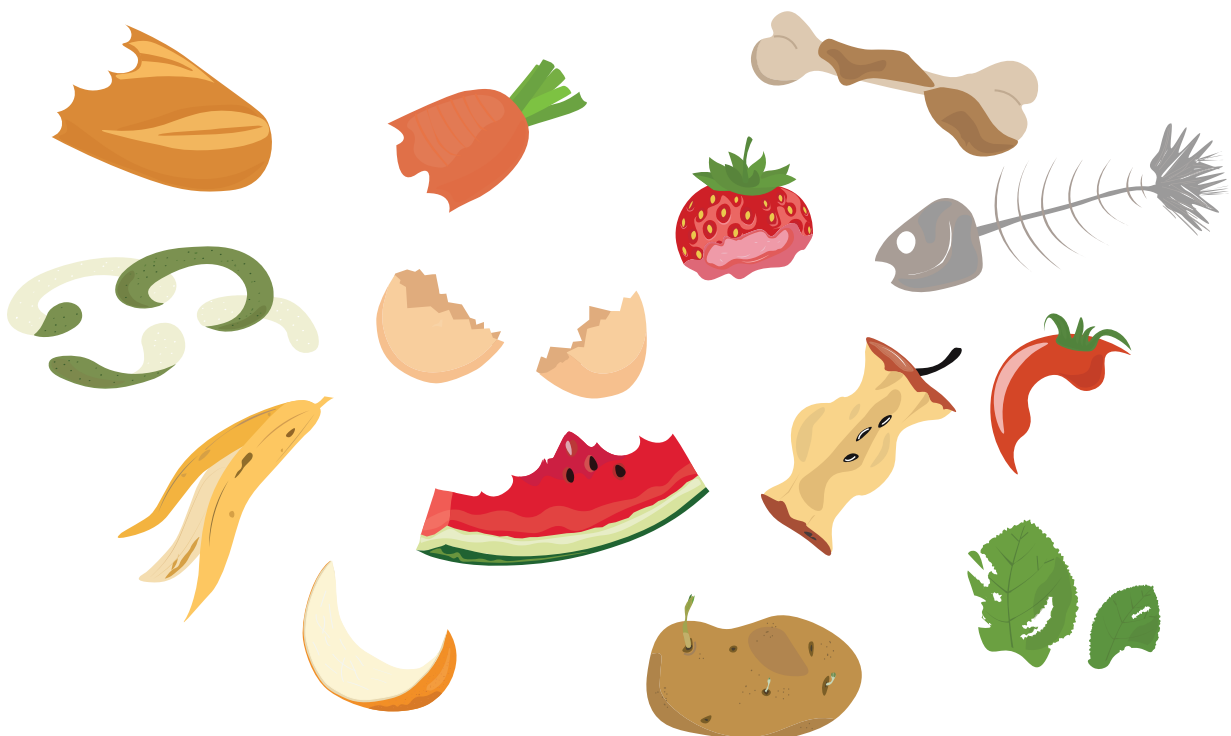


To prepare

- > Have materials ready to set up the mini worm farm experiment. Allow students to choose one type of food and up to four different preparation techniques per pair/group, depending on the number of plastic bottles and worms you have available.

Activities

1. Explain to the class that they will be planning an experiment to investigate how food should be prepared to optimise its consumption in a worm farm.
2. Discuss what foods can and cannot be placed in a worm farm.
3. Show students the mini worm farms they will be using to conduct this experiment so that they can begin to plan their experiment.
4. Discuss the different food scraps that will be available and brainstorm different ways to prepare the food for example, pureeing, chopping, grating, or leaving food items whole.
5. Students plan their experiment in pairs/groups by deciding what they will change (i.e. food preparation method), what they will keep the same (i.e. type of food, amount of food, number of worms in each bottle) and what they will measure.
6. Record the details of their experiment in their science journals or on the *Science investigation* worksheet.



Lesson 2

Conducting an experiment



To prepare

- > In this lesson, students will set up the experiment they designed in the last lesson. Before allowing students to proceed, review the safety considerations to ensure the safety of students and the worms.

Activities

1. Model how to set up a mini worm farm using the steps outlined in the *infographic*.
2. Students make their own mini worm farms in pairs/groups. They will need one worm farm for each type of food preparation they will be investigating.
3. Monitor students for safety reasons as they prepare their food.
4. Dig a small hole along the side of each mini worm farm and place a differently prepared type of food into each one. Make sure that you can see the food through the side of the bottle and that the food is completely covered with castings.
5. Clearly label each container.



Observations

Check the mini worm farms every few days and add a little water if required. Observations should continue until all the food scraps have been converted into castings.

- Record observations in their science journals or using the worksheet provided. Observations may include things like size of the food, number of worms visible near it, movement of the food, etc.
- Measure the size of their different food samples in the worm farm on the first day and then again on a regular basis until the end of the experiment.
- Draw a picture of their worm farm on the first day and then again once each week.
- Take photos to create a digital record of the changes they observe.

Lesson 3

Findings and discussion

Activities

1. At the end of the experiment allow students time to share their observations and findings with each other.
2. Compare the data and see if there are any similarities or differences. Discuss why different groups may have different results.
3. Discuss students' findings using the discussion questions on the PowerPoint as a guide.

Let's discuss

Which food preparation style was eaten the quickest?

Which food preparation style was eaten the slowest?

Did your findings match your predictions? Why/Why not?

Can you think of a reason that your findings did not match your predictions?

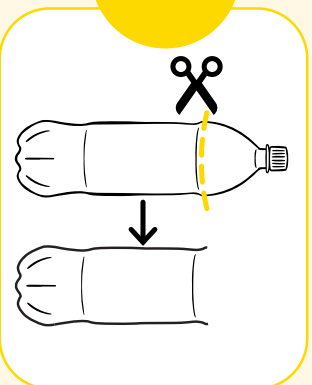
Was your experiment design fair? Why/why not?

Did you notice any patterns when you compared your data with other groups?

Why is a worm farm a suitable place for worms to live?

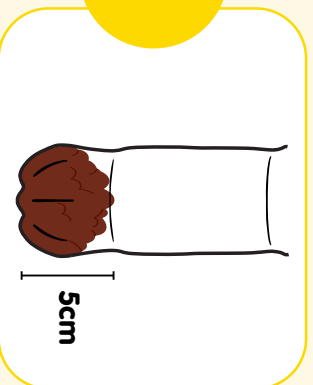
How to make a mini worm farm

1



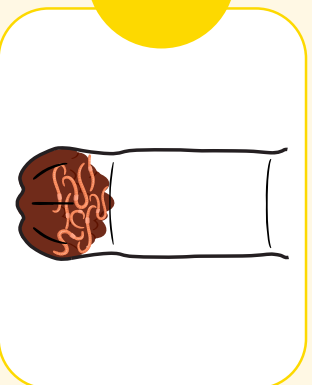
Cut the top off a two litre clear plastic drink bottle.

2



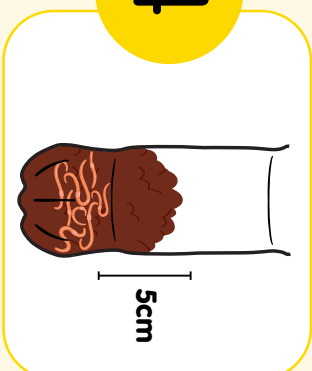
Place roughly 5cm of worm castings at the bottom of the bottle.

3



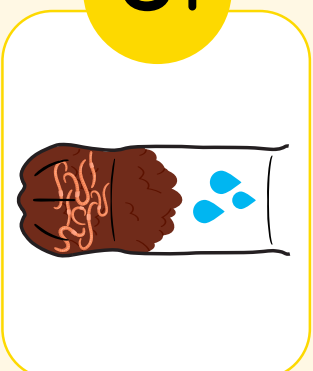
Add a small handful of worms.

4



Add another 5cm of the castings.

5



Add a small amount of water to moisten the farm.

6



Wrap the outside with a piece of newspaper and place a damp newspaper 'plug' on top.

Name: _____



Science investigation

Investigation question:

What is the best way to prepare food scraps for a worm farm?

Materials

- worms
- worm castings
- clear plastic bottle
- water
- newspaper
- food scraps
- chopping equipment
- labels

Safety conditions

Worms are living creatures and must be treated with care and consideration.

Make sure to take suitable care when using cutting implements.

Variables

What I will change

What I will keep the same

What I will measure

Method

1. Make a mini worm farm following the instructions on the [infographic](#).
2. Prepare the food scraps in different ways.
3. Add the food scraps to the mini worm farm, making sure you can see them through the side of the bottle.
4. Cover each bottle with newspaper.
5. Label with the food type and how it was prepared.
6. Check the mini worm farm each week and record observations.
7. Analyse findings and compare with other groups to determine what the results show.
8. Draw a conclusion to answer the investigation question.



Science investigation

Name: _____

Prediction:

I predict

Observations:

Food and method prepared	Day ____	Day ____	Day ____	Day ____	Day ____

Conclusion:

Important worms

Years 3 – 4



Background information

Beneficial products of a worm farm

Worm castings and leachate are highly nutritious organic foods for plants that can be added to your school garden. They contain a wide variety of nutrients and beneficial microbes necessary for plant growth while improving the water retention of soil.

Environmental impact of a worm farm

When organic waste decomposes in landfill, it is usually through anaerobic decomposition which produces methane gas. Methane is a harmful greenhouse gas with a global warming potential of 25 times that of carbon dioxide and is therefore a significant contributor to the warming of the Earth's climate. Currently, the waste sector produces about 13.6 million tonnes of greenhouse gas emissions (or 'carbon pollution') each year, equivalent to almost 3 per cent of Australia's emissions (Australian Government 2023). Aerobic composting (in a worm farm or another compost system) which is done at home, school or on an industrial scale is therefore a more desirable way to process organic waste as it reduces greenhouse gas emissions.



Worm farms contribute to environmental sustainability in several ways, some of which are:

- decreasing the amount of organic waste that is normally put in your school's/home's rubbish bins and sent to landfill
- 'closing the recycling loop' because our organic waste is changed into organic fertiliser for our plants which then produce food for us to eat
- reducing greenhouse gases, because in a well-maintained worm farm the decomposition process is aerobic (with oxygen) rather than anaerobic (without oxygen)
- improving and building the soil with castings and leachate by enriching it with micro-organisms; improving water holding capacity; enhancing germination, improving plant growth, and crop yield, and improving root growth and structure.

Worm farm key words

Aerobic decomposition: Organic matter being broken down in the presence of oxygen.

Anaerobic decomposition: Organic matter being broken down without the presence of oxygen.

Carbon dioxide (CO₂): An odourless, colourless gas produced during respiration. It is a greenhouse gas.

Castings/vermicast: See worm castings.

Decomposition: The process of organic matter being broken down physically and chemically by bacterial or fungal action; the rotting process; decomposition can be aerobic (with oxygen) or anaerobic (without oxygen).

Inorganic: Not organic. That is, matter that has not come from a living thing (e.g. plastic, glass, metal, synthetic fertilisers).

Leachate: See worm leachate.

Microbes: Micro-organisms such as bacteria and actinomycetes. In the case of worm leachate and castings, these are the beneficial micro-organisms that accelerate decomposition (Murphy 2009).

Organic: Matter that has come from a once-living organism and is capable of decay or is the product of decay (e.g. plants, leaves, food scraps, paper, straw etc.).

Worm castings/vermicast: Organic material that has been digested by worms and passed through their digestive system (i.e. faeces). Both worm leachate and castings contain a wide variety of nutrients and beneficial microbes necessary for plant growth. Castings also assist in improving the water retention of soil.

Worm farm: A bought or constructed home for worms put in place to convert organic matter into worm castings and 'worm wiz'.

Worm leachate ('worm wiz'): A highly nutritious organic liquid plant food produced by the worms and collected from a worm farm.

Vermiculture: The raising and production of earthworms and their byproducts.

Important worms

Curriculum links

Learning area: Science

Science understanding

Year 4

- Producers, consumers and decomposers have roles within an ecosystem and interact in ways that can be represented by food chains (WA4SSUB1)

Science inquiry skills

Years 3 – 4

- Pose questions and make predictions based on planned observations of phenomena that include variables to be measured and changed (WA3SSIQ1)
- Plan and conduct investigations, including elements of fair tests, and consider the material and equipment risks (WA3SSIPL1)
- Make and record observations, including formal measurements using familiar scaled instruments (WA3SSIPL2)
- Organise and represent data using tables, column graphs and models to identify patterns (WA3SSIPR1)
- Compare findings with those of others, and to predictions; consider if investigations were fair; and identify questions for further investigation (WA3SSIE1)
- Communicate ideas using scientific vocabulary (WA3SSICM1)
- Use science knowledge to propose explanations for observed phenomena and solutions to problems (WA3SSICL1)

Learning area: Maths

Measurement and geometry

Year 3

- Estimate, measure and order lengths in uniform units, including millimetres, centimetres and metres (WA3MMGTW3)

Year 4

- Estimate, measure and compare the perimeter of two-dimensional shapes, using scaled instruments and appropriate informal or formal units (WA4MMGTW3)

Timing

This activity will require one 60-minute lesson for a class discussion and write up, and one 60-minute lesson to set up the experiment. Students will need a short time to observe and measure their grassy heads and record their observations on an ongoing basis over several weeks. This activity will also require one 60-minute lesson at the end of the experiment for students to compile their data and discuss their results.

This activity can be completed as a paired/group activity.

Learning objectives

Students will:

- ✓ discuss the importance of worms
- ✓ explore the relationship between worms and plant growth
- ✓ conduct an experiment to test the benefits of worm castings and leachate on plant growth
- ✓ record their observations
- ✓ discuss their findings.

Resources required

- Important worms PowerPoint presentation and screen to share with class
- Old stockings/knee highs – up to four per pair/group
 - *Note: Long stockings can be cut into multiple sections and tied in a knot at one end to get more use out of each one.
- Grass seeds or other fast-growing varieties such as wheat grass
- Measuring spoons and cups
- Glass jars – up to four per pair/group
- Water
- Worm castings
- Plain soil from the garden (do not use potting mix as this contains additives which may skew the results)
- Newspaper
- Measuring tools, e.g. ruler, measuring tape
- Labels
- Science journals, worksheet or digital device to record observations

Lesson 1

Planning an experiment - grassy heads



To prepare

- > In this lesson, students will plan their grassy heads investigation. You may like to prepare a sample grassy head in a jar so students can see what they will be making.



Activities

1. Watch the video
[Why are earthworms important? - YouTube \(4:21 minutes\).](#)



2. Discuss some of the benefits we gain from having worms present in our soil.
3. Explain to the students that they will be conducting an experiment that will allow them to investigate the impact of worm castings and leachate on plant growth using grassy heads.
4. Show the students the grassy head you have set up.
5. Share the *Let's discuss* page of the PowerPoint with the class to help them decide which variables they will have and how these will be changed or kept consistent, i.e. plain soil, plain water, a 50/50 mixture of plain soil and worm castings, worm leachate.
6. As a class, decide which variables you will test in your experiment.
7. Write up the experiment in their science journals or using the [Science investigation](#) worksheet provided.
8. Predict what you think will happen.

Lesson 2

Conducting an experiment



To prepare

- > In this lesson, students will be setting up their grassy heads experiment. Depending on the quantity of materials available, you may want to allow each pair/group to have up to four heads each.

Activities

1. Demonstrate how to make a grassy head.



2. Following the instructions in the *infographic*, students make their own grassy heads in pairs/groups.
3. Remind students that the amount of grass seed and the total volume of soil/castings added to each head must be kept consistent to ensure a fair experiment.
4. Label each jar clearly to identify which variables are being used.
5. Place jars in a sunny location and check regularly to ensure they do not dry out.
6. After the grassy heads have been set up, discuss with the class what data can be collected to answer the investigation question.



Observations

Check the grassy heads regularly and record observations.

- Students record their observations for each of their grassy heads on the *Science investigation* worksheet provided or create a similar table in their science journals.
- Record their observations on a regular basis over several weeks.
- Students can also take photos to create a digital record of the changes they observe.

Lesson 3

Findings and discussion



To prepare

- > How often you see the students will impact on when you can complete this final lesson. Allow sufficient time to ensure students have been able to collect adequate data to draw a reasonable conclusion.

Activities

1. At the end of the experiment, students transfer the data collected onto a graph.
2. Students then complete their scientific reports and share their observations and results with each other.
3. As a class, compare the data and see if there are any similarities or differences. Discuss why different groups may have different results.

Let's discuss



-  Which stocking head grew 'hair' the fastest?
-  Why do you think this is?
-  Did your findings match your predictions? Why/Why not?
-  What does this tell us about the effect of worm leachate and castings on plants?
-  Do you think this was a fair experiment to examine the effects of worm leachate and castings on plant growth?
-  Why are worms beneficial to have in a garden?
-  What could we do with worm leachate and castings at school?
-  If you had your own garden, would you use worm leachate or castings on it? Why?

How to make a grassy head

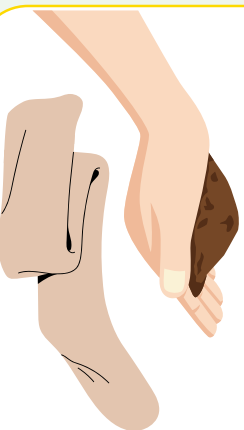
1

Add one tablespoon of grass seeds to the end of a stocking.



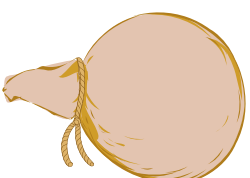
2

Place a handful of soil into the stocking, on top of the grass seeds.



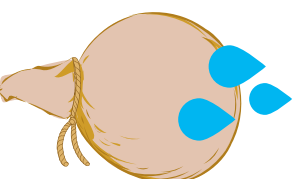
3

Tie a knot in the end of the stocking, leaving a tail piece hanging down.



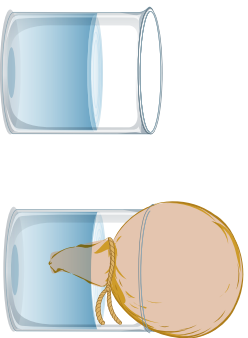
4

Water the grassy head so that it is wet through.



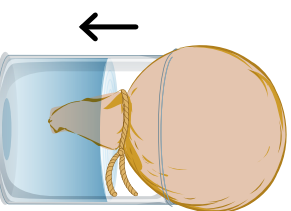
5

Place the grassy head on top of a jar filled with water.



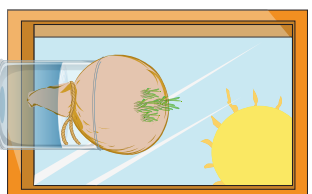
6

Make sure the tail is submerged in the water.



7

Place the jar in a sunny location.



8

Water regularly to make sure the head doesn't dry out.



Name: _____



Science investigation

Investigation question:

Materials

- old stockings
- grass seeds
- measuring spoons and cups
- glass jars
- water
- worm leachate
- worm castings
- plain soil from the garden
- measuring tools
- labels

Method

1. Add one tablespoon of grass seeds to the end of a stocking.
2. Place a cup of soil or soil/casting mix into the stocking, on top of the grass seeds.
3. Tie a knot in the end of the stocking, leaving a tail piece hanging down.
4. Water the grassy head so that it is wet through.
5. Place the grassy head on top of a jar filled with water, ensuring the tail is hanging down into the water.
6. Label each jar.
7. Water the grassy head regularly to make sure it doesn't dry out.
8. Record your observations over a number of weeks.

Variables

What we will change:

What we will keep the same:

What we will measure:

Prediction:



Science investigation

Name: _____

Observations:

Soil and water	Day ____	Day ____	Day ____	Day ____	Day ____
Seeds germinated					
Height					
Colour					

Soil and leachate	Day ____	Day ____	Day ____	Day ____	Day ____
Seeds germinated					
Height					
Colour					

50/50 mix soil and castings and water	Day ____	Day ____	Day ____	Day ____	Day ____
Seeds germinated					
Height					
Colour					

50/50 mix soil and castings and leachate	Day ____	Day ____	Day ____	Day ____	Day ____
Seeds germinated					
Height					
Colour					



Science investigation

Name: _____

Results:

My observations showed

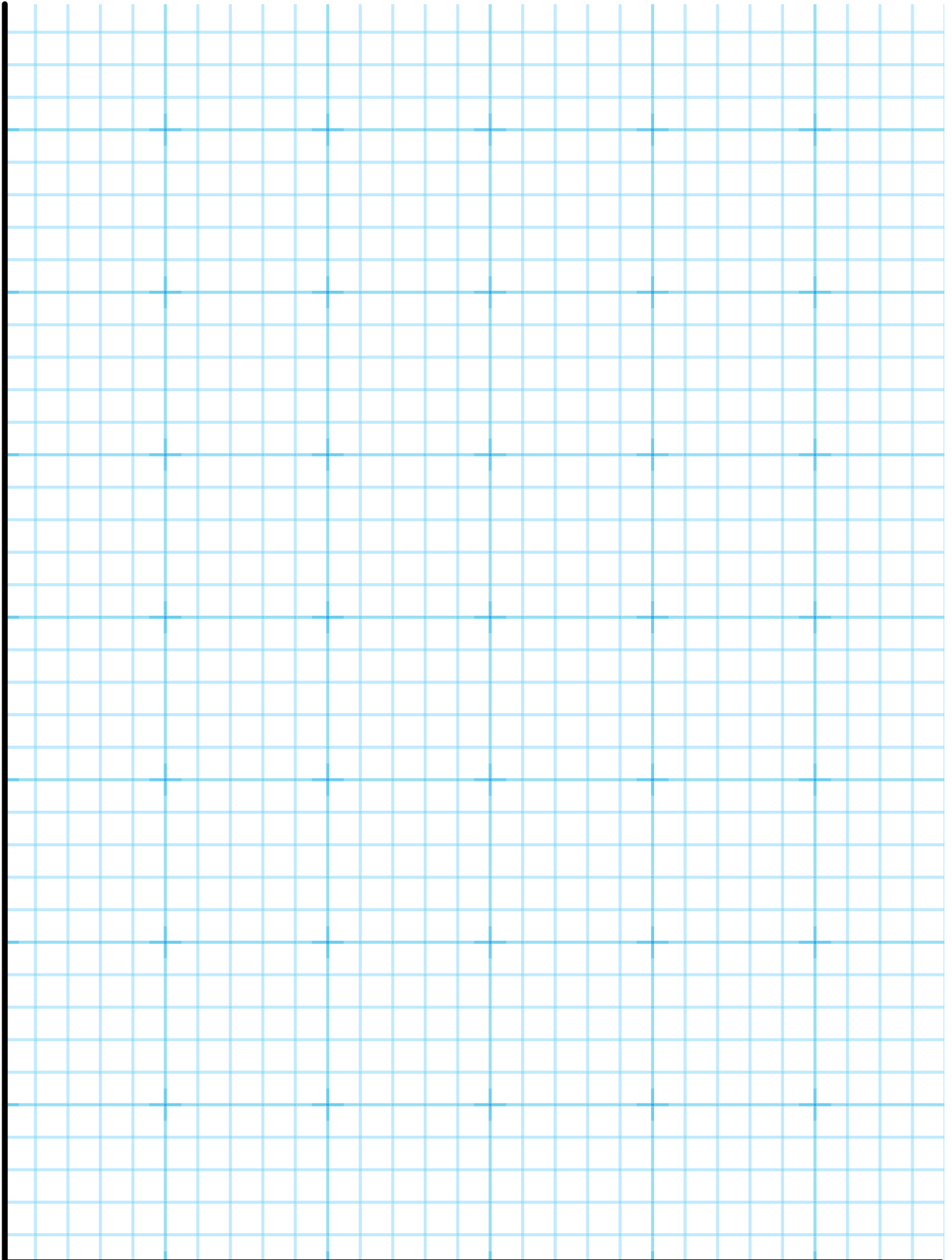
Something that was the same as another group was:

Something that was different from another group was:

Conclusion:

Name: _____

Title:



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