



# ROLY-POLY



Orthodontics Exclusively



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## Contents

Pillbugs	2
Investigate Activity	3
Data Sheet	4
Investigate	6
Results	8
Discover	12
Revisit Your Observations and Data	15
Parent Guide	16
Resources	25
Sources	26
Social Media	28

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## Pillbugs

Have you ever turned over a rock in your yard and found a small armor-covered bug? The common name for this animal is “pillbug.” Some people call them roly-polys because they roll up into a ball when you touch them.

Actually, these shy, harmless creatures are not bugs at all! They are crustaceans from the same group as crabs, lobsters, and shrimp. If you have never seen a pillbug before, here is a video that shows what they look like:

[https://www.youtube.com/watch?v=DWW8Caur8Co.](https://www.youtube.com/watch?v=DWW8Caur8Co)

You can get to know these interesting animals by collecting them yourself. They can be found in your yard, a local park, or an outdoor area containing soil and plant material.





## Investigate

### Collect Pillbugs

**You can collect pillbugs by looking under rocks, leaves, and sticks in the soil. When you find them, just scoop them up and put them in a container or cup. Pillbugs do not bite, and they are not harmful. Pick them up carefully so you don't squish them. Try to collect at least eight pillbugs.**

**If you have trouble finding pillbugs, you can make a trap to attract them. You will need a potato, a knife (parents only please), a spoon, and a container. Here are step-by-step directions.\***

**Step 1:** Pillbugs love potatoes! Get a raw potato. Cut it in half with a knife. (Be sure to have an adult help with this.) Hollow out the center of each potato half with a spoon. You can make two traps with one potato.

**Step 2:** Find an area with soil and lots of plant material (fallen leaves, twigs, mulch, grass, etc.), such as a garden, backyard, or park. Place the hollow potato firmly into the soil with the hollow part down and the skin on the outside.



**Step 3:** Wait for 1–2 days and carefully pick up the potato, looking for pillbugs. Scoop up the pillbugs gently and place them into a cup or container. You will need to act quickly because they might try to run away when you lift the potato. Try to gather at least eight pillbugs if possible. You will use them to do an investigation.

*\*There are also Internet videos available on how to make a pillbug potato trap. Use the search term "pillbug potato trap" to find them. Here is an example video:*  
<https://simplepracticalbeautiful.com/a-pill-bug-trap-made-from-a-potato/>



## Data Sheet

### Observe a Pillbug

**Put one of the pillbugs on a paper towel or piece of paper. Observe it carefully. Look at its parts. Watch it move. Touch it gently with your finger or a pencil tip. If you have a hand lens or magnifying glass, it can be used to help you see details. Record your data below:**

1. How big is the pillbug? If you have a ruler, you can measure it. \_\_\_\_\_

2. How many pairs of legs does the pillbug have? \_\_\_\_\_

3. Find the pillbug's head. Does the pillbug have eyes? \_\_\_\_\_

If so, how many? \_\_\_\_\_

Notice the two structures coming from the head. These are called **antennae** (antenna for one).

What do you think these are used for? \_\_\_\_\_

4. Look at the pillbug's body. It has a hard covering of sections or plates that look like armor. These are called **segments**.

How many segments does the pillbug have? \_\_\_\_\_

What do you think is the purpose of the segments? \_\_\_\_\_

Why do you think the segments are not hooked together? \_\_\_\_\_

\_\_\_\_\_



## Data Sheet

5. Look at the back end of the pillbug. This is not a tail. It is called the **abdomen**. Notice two smaller pointed structures sticking out of the back of the abdomen. These are not legs or antennae. They are called **uropods**. What do you think these structures might be used for?

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### **Observe a Pillbug**

***In the space below, make a drawing of your pillbug that shows the parts you identified above.***

***Put your pillbug back into its container with the others. You will use them in the next investigation.***



## Investigate

### **Conduct a Scientific Investigation**

We know that pillbugs can be found in soil under leaves and other plant materials. These places are usually moist. This brings up the question, “**Do pillbugs prefer to be in moist places?**” You can investigate this question by doing a scientific investigation. You will need to set up an environment where the pillbugs have a choice between a moist area and a dry area to move into. You can then observe which environment they choose. An investigation set-up is described below. You can also design your own investigation if you would like to.

#### *Materials:*

6–10 pillbugs  
rectangular glass or plastic container  
lid for the container  
paper towels  
water  
cardboard  
scissors  
tape  
spoon

#### *Procedure:*

1. Get a rectangular container made of glass or plastic. You can use a plastic shoebox, glass baking dish, or any other container with sides and a flat bottom. Find a lid or something to use as a lid, such as a piece of cardboard or a sheet of aluminum foil, to keep the container covered during the investigation.
2. Cut two pieces of paper towel half the size of the bottom of the container. Place one piece on the bottom of each side of the container. Be sure they do not touch in the middle.
3. Cut out a cardboard barrier that divides the container in half and fits in the middle of the container. Cut a hole at the bottom of the cardboard to create a tunnel big enough for the pillbugs to pass through from one side to the other.



## Investigate

4. Add water, a few drops at a time, to the paper towel on one side of the container until it is very moist but not soggy. Leave the other paper towel dry. A picture of the set-up is shown.



*Glass Baking Dish Set-Up*



*Glass Baking Dish Set-Up with a Foil Lid*

5. Place half of the pillbugs on each side of the container in equal numbers. Cover the container. Count the number of pillbugs on each side of the container every minute for 10 minutes. (You may need to observe for a longer time if the pillbugs are moving slowly.) Record the data in the table below.

Time (Minutes)	1	2	3	4	5	6	7	8	9	10
# of pillbugs on moist side										
# of pillbugs on dry side										



## Results

**Analyze the data you have recorded:**

You observed the pillbugs for 10 minutes. Describe what happened.

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Look at your data. What pattern do you see in the numbers of pillbugs on the moist and dry sides of the container during the 10 minutes? How do these numbers match what you saw?

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The question for this investigation was: ***Do pillbugs prefer to be in moist places?*** Based on your results, how would you answer this question? Circle one sentence choice below as your answer. Then, complete the next sentence using evidence from your investigation.

A. Pillbugs prefer to be in moist places.

B. Pillbugs do not prefer to be in moist places.

I know this because: \_\_\_\_\_

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## Investigate

### ***Design Your Own Investigation***

Let's consider another question: ***Do pillbugs prefer dark or light places?***

Think about how you could do an investigation of this question using the same container and cardboard tunnel set-up from the moisture experiment.

In the moisture experiment, one side of the container had a dry paper towel and the other side had a moist one. What should be different about each side of the container in this experiment? What should be the same about each side of the container? What will you do with the pillbugs? Do you need a data table?

Write down your plan for the experiment in the box below. List materials you will need. The container set-up is included as the first material. You do not need to describe how to build it since it is already done. Describe what you will do. This is called a ***procedure***.

***Question:***

Do pillbugs prefer dark or light places?

***Materials:***

Container with cardboard tunnel

***Procedure:***

After you have written your procedure, make additions to the container set-up as you describe them in your procedure.



## Results

### Do the investigation.

Write observations about what happens in the box below. A blank data table is also provided to use for recording data. You should fill in all of the data boxes yourself with row and column labels, in addition to the new data you have collected.

*Results:*

*What I observed:*

*Data I collected:*

Time (Minutes)	1	2	3	4	5	6	7	8	9	10
# of pillbugs on moist side										
# of pillbugs on dry side										



## Results

### Analyze Your New Data

What pattern do you see in your data? What do your data show?

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The question for this investigation was: **Do pillbugs prefer dark or light places?** Based on your results, how would you answer this question? **Circle** one sentence choice below as your answer. Then complete the next sentence using **evidence** from your investigation.

A. Pillbugs prefer dark places.

B. Pillbugs prefer light places.

I know this because:

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---



## Discover

***Now that you have investigated pillbug preferences for moisture and light, let's find out more about them. As you read the article below, look for answers to these questions to help explain your investigation results.***

Why do pillbugs roll up in a ball?

Why do pillbugs prefer moisture?

Why do pillbugs prefer dark places?

What do pillbugs eat?

Can pillbugs see?

What do pillbugs use their antennae for?

If the uropods are not legs or antennae, what do they do?



## Discover

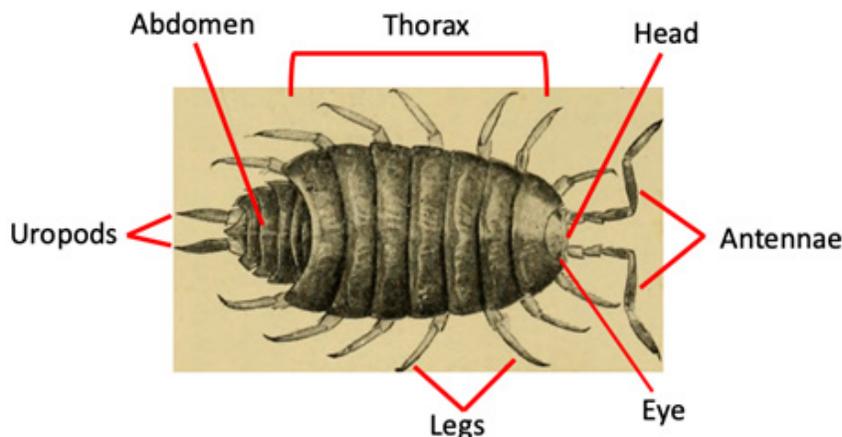
### Meet the Pillbug



Pillbugs are not insects. They belong to a large group of animals called **crustaceans**. Almost all crustaceans are **aquatic**. This means that they live in the water. Pillbugs, however, are **terrestrial**. This means that they live on land. Pillbugs are one of the very few types of crustaceans that are terrestrial. Pillbugs are known by many different names. Some other names you will hear for them are roly-poly, woodlouse, potato bug, and doodlebug.

You can find pillbugs in many areas all over the world where there are **moist** conditions in the soil. They live in dark places in forest areas under leaves, rocks, and logs or in the soil of fields and gardens. Pillbugs need moisture, but they cannot survive in lakes, streams, and ponds because they will drown!

Pillbugs are about  $\frac{1}{2}$  inch long. They have an oval shape with three main body sections: head, thorax, and abdomen. The head has two eyes, which can see light but not shapes. Pillbugs sense the world around them with two **antennae** that are attached to their head. They eat with a mouth. The middle part of their body is called the **thorax**. It is covered with seven plates (**segments**) that are not attached to each other. This allows them to move freely so they can roll up in a ball. Each plate has one leg attached to each side. That gives the pillbug seven pairs of legs (a total of 14) that it uses to crawl. The back part of their body is called the abdomen. You will see two attachments on the back of the **abdomen** that may look like legs. These are called **uropods**. Their job is to help the pillbug get more water by soaking up moisture from its surroundings.





## Discover

### Meet the Pillbug (cont.)

Pillbugs behave in distinct ways. When they sense danger, they roll up into a ball so their outer segments can protect them like armor. They also do this when it gets too dry. This lets them trap moisture and hold it inside. Moisture is very important to pillbugs. This is because they do not have lungs. They breathe using gills like fish. Their **gills** must stay moist all the time so they can get oxygen. This is why they live in dark, moist places. Darkness keeps the temperature lower, so that water does not evaporate as quickly.

Pillbugs eat **decaying** plant material such as leaves and twigs. In their role as **decomposers**, they digest these materials and return nutrients back to the soil. Sometimes they eat living parts of plants such as roots and leaves. This can be a problem for gardeners. You can keep a pillbug as a pet. Put it in a container such as a shoebox, plastic tub, or aquarium. Cover the bottom with soil or peat moss and keep it moist, but not too wet. Sprinkle some leaf litter or bark on top. Feed them chunks of apples, carrots, potatoes, and lettuce. Be sure to remove uneaten food so it doesn't mold. Or you can just observe them and return them to their natural habitat!

***If you would like more information, here are some links to videos about pillbugs:***



**Animal Fact Files**

Roly-Poly Facts:

<https://www.youtube.com/watch?v=WgjxzFu1CpM>



**Jeff the Nature Guy**

A Bug with Many Names:

<https://www.youtube.com/watch?v=ucHwno5mDd4>



## Revisit Your Observations and Data

**Now that you have learned some more things about pillbugs from the reading and videos, see if you can answer these questions:**

Why do pillbugs roll up in a ball?

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Why do pillbugs prefer moisture?

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Why do pillbugs prefer dark places?

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What do pillbugs eat?

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Can pillbugs see?

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What do pillbugs use their antennae for?

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If the uropods are not legs or antennae, what do they do?

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**Go back and look at the questions you answered and the observations you made in the Discover section.**

Based on what you have learned, change or add to any of the questions you answered or the claims you made.

Look at the drawing you made of a pillbug. Add or change labels on your drawing.



## Parent Guide

This set of activities is designed to allow students to gather experiential, authentic data that they can use as evidence to draw conclusions about pillbugs (roly-polys) and make new connections with science content. Hands-on observations and investigations come first, followed by discovery through reading and videos that can be tied to their initial observations. **This guide will give you some tips** to help facilitate your child's learning through their participation in these activities. It can be downloaded and printed so students can utilize the data sheets, question sheets, and data recording tables.

Students in earlier elementary grade levels will need assistance with the activities. The videos also contain some upper elementary concepts. It is recommended that parents read the instructions with or even directly to younger students. The reading level in the instructions is for grades 4–5.

Materials needed for these activities can mostly be found around the house. If there are materials that you do not have, you can substitute or skip them.

### *Materials:*

- cup or container (plastic, glass, or cardboard) for collecting pillbugs
- spoon for gathering pillbugs
- pillbugs (8–10) collected by students per the directions
- potato, knife, and spoon for making a pillbug trap (if you have trouble finding them)
- copies of sheets from this packet for students to write on
- pen, pencil, or marker for writing
- rectangular glass or plastic container with a lid (or something that will cover it)
- paper towels
- water
- cardboard
- scissors
- tape
- ruler
- magnifier or hand lens (optional)
- Internet for viewing videos (if available)



## Investigate

Students are introduced to pillbugs through pictures. A video link is provided that shows a real pillbug.

### **Collect Pillbugs**

Instructions are given for where to find pillbugs. Students gather and scoop them into a container. If they can't find any pillbugs, instructions are given for making a potato trap. A link is also given to a how-to video in the instructions: <https://www.youtube.com/watch?v=y-mDfmDxNQY>

### **Observe a Pillbug**

Students get one pillbug from their cup and examine it closely. If you have access to a magnifier or hand lens, it allows students to see more details. They answer some questions about the pillbug. It is not important that they get these answers correct at this point. They will be asked to come back and revise or add to them at the end. They also need to make a drawing of their pillbug in the data sheet. They can label it if they want, but they will have an opportunity to do this later as well.





## Investigate

### **Conduct a Scientific Investigation**

The investigation starts with a question, “Do pillbugs prefer to be in moist places?” Students build a container in which to conduct the investigation. Instructions and pictures for constructing the container are in the procedure. They place a moist paper towel in the bottom of one side and a dry paper towel in the other side. They put half of their pillbugs on each side. They count the number of pillbugs on each side every minute and record the numbers in the data table. The pillbugs should migrate to the moist side because they need moisture. They can sense the moisture and they move toward it. The numbers will go up on the moist side of the data table. Here is an example of a possible data table with 10 pillbugs.

Time (Minutes)	1	2	3	4	5	6	7	8	9	10
# of pillbugs on moist side	5	5	6	6	6	7	7	8	9	10
# of pillbugs on dry side	5	5	4	4	4	3	3	2	1	0

These are ideal results. They may not always look like this. The experiment works best if the lid is on the container so little direct light is allowed inside. The results may also take longer than 10 minutes depending on conditions. The data collection may need to be extended.



## Investigate

### Analyze the Data

*Here are some possible student responses if the investigation goes as it should.*

You observed the pillbugs for 10 minutes. Describe what happened.

Students should say something about the pillbugs moving toward the wet paper towel.

Look at your data. What pattern do you see in the numbers of pillbugs on the moist and dry sides of the container during the 10 minutes? How do these numbers match what you saw?

Students should say that the number of pillbugs on the moist side went up and the number of pillbugs on the dry side went down over the 10-minute period. They may give numbers (for example, “The moist side went up by five.”)

**Circle** one sentence choice below as your answer.

A. Pillbugs prefer to be in moist places.

Then, complete the next sentence using evidence from your investigation.

Sample answer: I know this because I saw the pillbugs on the dry side move to the moist side, and the numbers on the moist side went up while the numbers on the dry side went down. That means they look for moist places.



## Investigate

### ***Design Your Own Investigation***

Students come up with their own investigation using dark/light as the variable. They should be able to think of an experiment that is very similar to the previous one. They may choose to use materials such as foil, cloth, or dark paper to darken one side of the container. They may want to discuss whether or not to use paper towels on the bottom. The important thing here is not what materials they decide to use; rather, that they use the same materials on both sides. If they decide to use moist paper towels on the bottom, for example, each side should have the same amount of dampness. The only condition that should differ is the amount of light allowed into each side. Given a choice between darkness and moisture, pillbugs will choose moisture. If the light side has more moisture, they may go toward it rather than the dark side. The dark side is where they should go if everything else is equal. Below is an example of one possible way students might fill out the procedure.

***Question:***

Do pillbugs prefer dark or light places?

***Materials:***

Container with cardboard tunnel

10 pillbugs

Black construction paper

***Procedure:***

1. Prepare a container with a cardboard tunnel.
2. Cover one side of the container with black construction paper to make it dark.
3. Put 5 pillbugs on each side of the container.
4. Observe for 10 minutes and record how many are on each side every minute.



## Investigate

### Design Your Own Investigation

*Below is an example of possible results a student might record.*

#### Results:

#### What I observed:

The pillbugs moved from the light side to the dark side. It only took them 7 minutes, and they stayed there the rest of the time.

#### Data I collected:

Time	1m	2m	3m	4m	5m	6m	7m	8m	9m	10m
Light Side	5	5	4	3	3	2	0	0	0	0
Dark Side	5	5	6	7	7	8	10	10	10	10



## Investigate

### Analyze Your New Data

*Here are some possible student responses if the investigation goes as it should.*

What pattern do you see in your data? What does your data show?

Students should say that the number of pillbugs on the dark side went up, and the number of pillbugs on the light side went down over the 10-minute period. They may give numbers, (for example, “The light side went down by five.”)

**Circle** one sentence choice below as your answer.

A. Pillbugs prefer dark places.

Then, complete the next sentence using **evidence** from your investigation.

Sample answer: I know this because the numbers on the dark side went up to 10 in 7 minutes, while the numbers on the light side went down to zero. I saw the pillbugs moving quickly to the dark side. That means they like it better in the dark.



## Discover

The reading level in Meet the Pillbug is grades 3–5. You may want to read it with younger students, depending on their reading level. The videos have a few higher-level concepts mentioned in them.

### **Revisit Your Observations and Data**

#### **Answer the questions after reading and watching videos.**

Students should look at the questions first and keep them in mind as they read and watch the videos. They don't need to answer the questions until after they are done. These questions can also be used for discussion. Sample answers are below.

Why do pillbugs roll up in a ball?

They roll up for protection and to keep moisture inside when it is dry.

Why do pillbugs prefer moisture?

Pillbugs breathe with gills that have to stay moist all the time.

Why do pillbugs prefer dark places?

They need moisture. It is cooler in the dark. This means there is more moisture.

What do pillbugs eat?

They eat rotting leaves, twigs, and roots of living plants.

Can pillbugs see?

Pillbugs can only see light. They cannot see objects.

What do pillbugs use their antennae for?

Pillbugs use their antennae to feel things so they can know what's around.

If the uropods are not legs or antennae, what do they do?

They are used to soak up water from the back.



## Discover

### Revisit Your Observations and Data

**Go back and look at the questions you answered and the observations you made in the Discover section.**

Students should have a chance to go back and add labels to their drawing and correct any answers they gave as part of their observation and investigation. This is important for finalizing their learning. All of the answers to the questions in the data sheet have been covered in investigations, readings, and videos. They should be able to answer all of them now.

How big is the pillbug?

Pillbugs are about  $\frac{1}{2}$  inch long.

How many **pairs** of legs does the pillbug have?

They have 7 pairs, for a total of 14.

Does the pillbug have eyes? If so, how many?

They have 2 eyes that see light but no objects.

What do you think antennae are used for?

The antennae are for sensing things by feel. (This is how they see.)

How many segments does the pillbug have?

There are 7 segments on the thorax.

What do you think is the purpose of the segments?

It is for protection.

Why do you think the segments are not hooked together?

So they can move and let the pill bug roll up.

What do you think these uropods might be used for?

They are for soaking up water. (They drink from both ends).



## Resources

### ***Sample Website Resources Related to Pillbugs:***

Pillbug Observation Video - Two minutes of watching a pillbug move around in a petri dish:

<https://www.youtube.com/watch?v=q9cotFwJHtE>

Animal Diversity Web:

[https://animaldiversity.org/accounts/Armadillidium\\_vulgare/](https://animaldiversity.org/accounts/Armadillidium_vulgare/)

Pacific Northwest National Laboratory:

<https://workbasedlearning.pnnl.gov/pals/resource/cards/pillbugs.stm>

Roly Poly Playground – Just for Fun:

<https://www.youtube.com/watch?v=qPV4mBp7qnQ>

Roly Polies Came from the Sea to Conquer Earth (PBS):

<https://www.youtube.com/watch?v=sj8pFX9SOXE>



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## Social Media

*If you liked this activity, please recommend [LEARN](#)—the K20 Center’s online library of lessons and educational resources—to your local school, your student’s teachers, and other educators you know. You’ll find a searchable database with more resources like this one, along with educational games, instructional strategies, and activities for professional educators.*

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*Learn more: [www.K20Center.ou.edu](http://www.K20Center.ou.edu)*



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