GEEK & CO. SCIENCE!

PROJECT KIT

Ages 8+

# GRaSs HEAD

THAMES & KOSMOS

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# Safety information

**WARNING.**
Not suitable for children under 3 years. Choking hazard — small parts may be swallowed or inhaled.
Keep the packaging and instructions as they contain important information.

Do not put the peat pellet or soil in your mouth! Wash your hands after working with the soil.

## Advice for parents and supervising adults

These amusing grass heads will give you many weeks' worth of fun! Before you start, please read through the instructions and discuss what's involved. When working with soil, it is best to spread out a sheet of newspaper and keep some paper towels handy for wiping up spills. You will start by preparing the head by filling it with soil and seeds and designing the face. Then it's the body's turn — it is assembled from several parts (note: don't forget the water container on the inside!) and decorated with colorful stickers. And then you just have to wait for the first green hairs to grow! How about a game of finger soccer while you're waiting? There's a tiny soccer ball included in the kit!

*NOTE! The additionally required items are highlighted in italic script in the individual experiments. Before starting the experiments, carefully read through everything that will be required and make sure to have all the materials ready.*

# Grass Head Hypotheses

Before we get started making the grass head, let's come up with a few hypotheses (a scientific word for guesses) about what's going to happen. And then, at the end, come back and write in your observed results...

1. How long do you think your grass seeds will take to sprout?

Guess: Observation:

2. What do you think your grass seeds will need in order to grow?

Guess: Observation:

3. For how many days do you think your grass head will keep growing?

Guess: Observation:

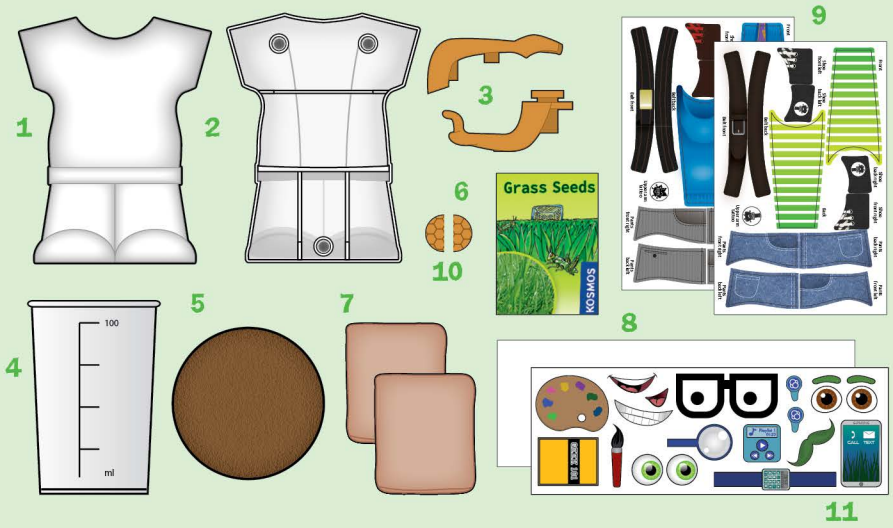
4. How long will the longest blade of grass on your grass head grow?

Guess: Observation:

5. What will happen when you cut the grass on your grass head?

Guess: Observation:

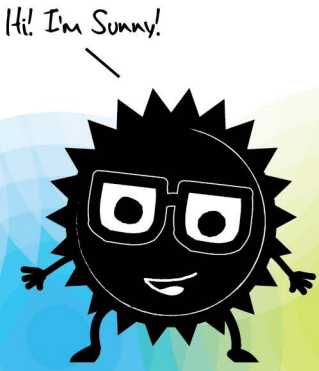
# KIT CONTENTS




| | |
|---|---|
| 1 | Grass head figure front |
| 2 | Grass head figure back |
| 3 | Grass head arms |
| 4 | Water container |
| 5 | Soil |
| 6 | Grass seeds |
| 7 | Stocking sleeves (2) |
| 8 | Foam rubber sheet |
| 9 | Stickers for the body |
| 10 | Soccer ball |
| 11 | Stickers for the face and accessories |

YOU WILL ALSO NEED: *Water, old spoon, container for soaking the soil, string, pins, scissors, glue, tape, crayons, ruler*

## Hey Grassy Gardeners!




Ready to make a funny grass-haired little dude or dudette and learn about botany in the process? The grass head's head is a stocking stuffed with soil and seeds. When it gets wet, the seeds germinate and grow up and out of the soil through the stocking, giving the grass head a lot of crazy green hair. You can then style the hair, give it a hair cut, and decorate your grass head!

PART 1

# LET'S PUT OUR HEADS TOGETHER

Let's start with the head. There's enough soil and seeds for two grass heads! We will begin with just one, so we will be dividing the quantities in half.

## Forming the grass head's head

### You will need:

**Water container, soil, grass seeds, stocking sleeve, foam rubber sheet, stickers for the face and accessories,** *water, old spoon, container for soaking the soil, string, pins, scissors*

### Here's how:

1. Place the turf pellet in a large container (such as a plant container with no drainage holes) and add about 250 ml of water. Careful: As the soil expands, it will require a lot more room! When you are done, all the soil should be evenly moist. If it isn't, add a little more water.

2. While the soil is soaking, you will have time to get the stickers ready for the face and accessories. Stick the sheet of stickers onto the foam rubber section and cut out the individual pieces.

1

2

3 Pour half of the grass seeds into the stocking sleeve. It will be easier if you have a friend hold the stocking open for you. Then add half of the soil. The stocking should be tightly filled at the bottom and look round like a ball. Save the rest of the soil for the other grass head.

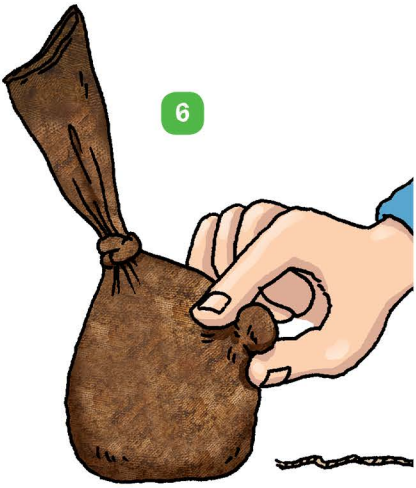
4 Push the soil down to the bottom of the stocking with your hand and tie the stocking closed with a knot — just like a balloon.



5 Now it still needs two ears and a mouth! Knead the soil in the stocking to create a small bump. Tie off the bump with a piece of string.

6 Make another bump on the opposite side and tie it off in the same way. These are the two ears.

7 Find some eyes and a mouth for your grass head — whatever you like best! Secure them in place by inserting small pins through them into the soil.

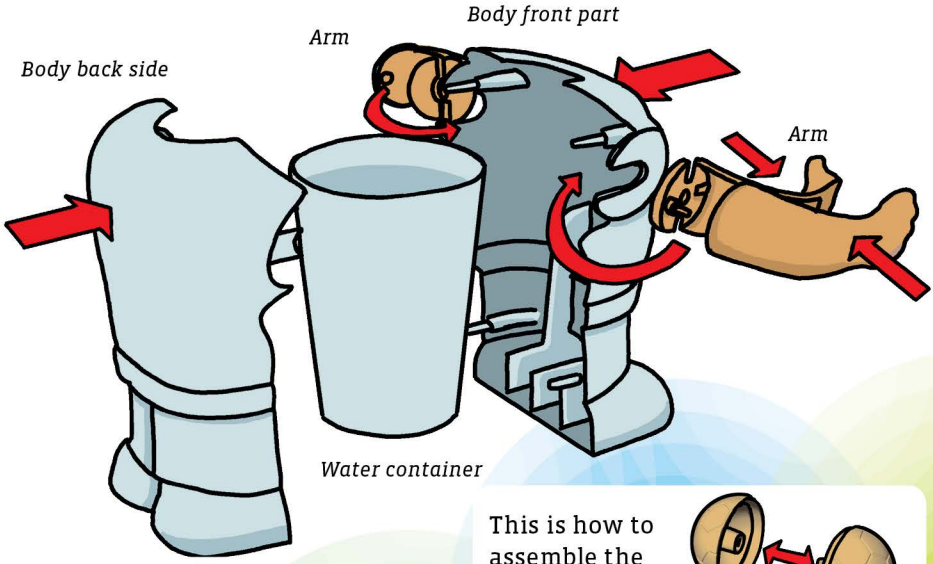

PART 2

# A GRASS ROOTS EFFORT

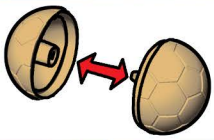
## Assembling the grass head's body

Grass needs water to grow. Grass in a lawn gets that water from the soil below it, which gets that water from rain. But your grass head will get its water from a water reservoir located inside its body.

1. Put the water container in between the front and back parts of the body.
2. Assemble the arms by piecing the inner and outer arm pieces together.
3. Insert the arms into the slots in the front part of the body.
4. Slide the front and back parts of the body together, with the water container between them.
5. There's also a soccer ball, because grass heads love soccer!



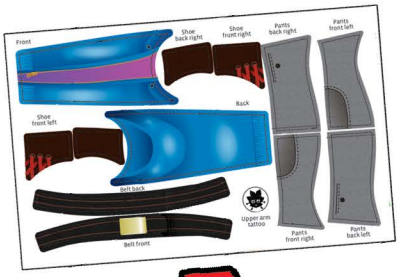

This is how to assemble the soccer ball.



# Decorating the body with stickers

1 Decide which clothes you want to put on your grass head, peel them off the sticker sheet, and carefully affix them to the body.

2 You can use a little tape to secure the accessories in place.





1

2


Use some string to make a cord between the earbuds and the mp3 player!

This guy's hair is a soccer field!

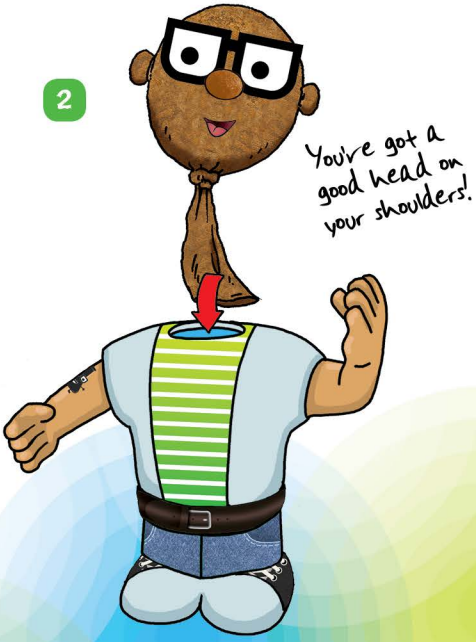
PART 3

# LET'S GET GROWING

## Decorating the body with stickers

1. Fill the water container to the brim with water.

2. Set the head on the body. Make sure the loose end of the stocking sleeve hangs down into the water. The bottom of the stocking always has to be in water. It works like a wick, sucking up water into the soil in this case. The water will travel up the stocking material in much the same way that water travels up the roots and stems of a plant — by a physical science principle called **capillary action**. This occurs because water molecules have strong attractions to both the molecules of other substances (in this case, the material of the stocking) as well as to other molecules of water. This makes the water climb up the stocking material and pull more water along behind it.

3 After a few days, the grass seeds will start to sprout. That's when the first green hairs will emerge! They have no trouble poking their way through the little holes in the stocking.

4 Oops! Are green hairs coming out of your grass head's nose or ears? That can happen if the seeds shifted when you were pouring them in. No problem! If it bothers you, just cut those hairs off.

5 If after a while the hair has grown long enough, you can style it: Tie the blades of grass together, braid them, or cut them — whatever you like! They will grow back, as long as you cut it above the growth point, which for grass is right at the base. This is why you can mow a lawn very short, and it always grows back!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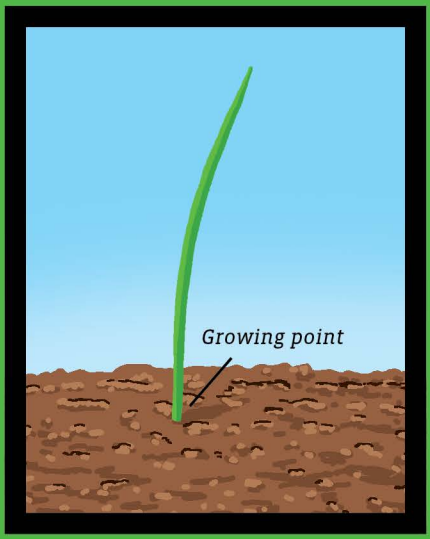
# THE GROWING POINT

How is it that no matter how many times you cut the grass, it always grows back — just like actual hair? It doesn't work that way with all plants! The solution to the riddle lies in the **growing point**. With grass, it lies just above the surface of the ground. If the grass is cut above that stop, which preserves the growing point — such as when you mow the lawn — it soon grows back.




# SPROUT HEAD

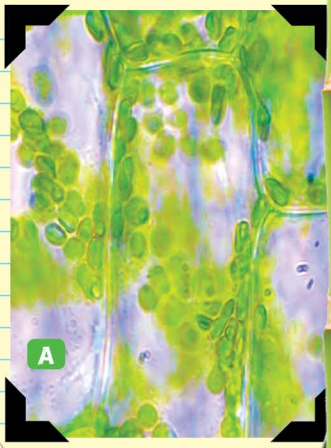
You can also try making a cress head! Cress hair looks pretty funny too. But the growing point of cress lies much farther toward the top than with grass — just under the leaves. So when you cut the cress, nothing grows back! You can use a common garden cress seed or chia seeds. Chia is a member of the mint family, and its seeds develop a jelly-like coating when they get wet which helps them stick to surfaces. This is why chia seeds have been used for decades to cover novelty terracotta figurines.

GEEK OUT!

# THE GRASS IS ALWAYS GREENER...

## Some neat facts about grass

Grass is green in color because it contains chlorophyll. **Chlorophyll** A is a green pigment that is a key ingredient in **photosynthesis**, the process that converts light energy into a plant's food.




The family name for grasses is *Poaceae* (formerly known as *Gramineae*). There are over 10,000 species of grasses across the world, making this family of plants one of the largest on Earth.

There are many different types of grasses. They can include your common lawn grass, turf grass, wheat, sugarcane B, rice, or bamboo.

**Bamboo** C is the tallest grass and can reach heights of over 30 meters (98 feet) tall. It also grows very quickly. There are reports of it growing up to 250 centimeters (98 inches) in just 24 hours.

B

C

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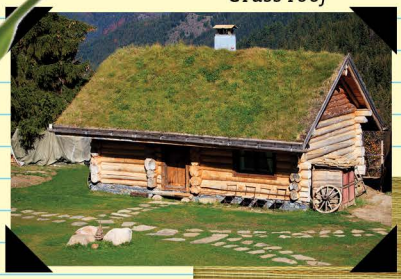
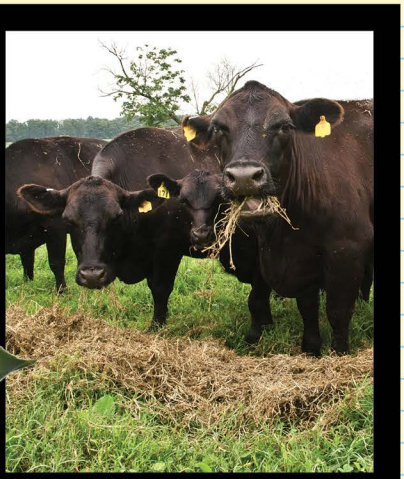
# ...ON THE OTHER SIDE



*Grass roof*

*Grass mat*



*Cow eating grass*

Grasses are used in many different things from clothing and bedding to paper and housing insulation.

Planting grass helps keep our homes cooler. Planting grass can lower the surface temperature of your yard up to 30 degrees as compared to just having exposed soil.

Grass conserves water and is essential in preventing soil erosion.

Grass helps clean our air by absorbing harmful gaseous pollutants like sulfur dioxide.

Through the process of photosynthesis, grass absorbs carbon dioxide and emits oxygen for us to breathe.

Grass is a major food source across the world for both humans and animals. It provides rice and many of the grains for human foodstuffs as well as grazing ranges for much of the world's livestock.

GEEK OUT!

# BLADES OF GRASS & SKYSCRAPERS

Imagine a blade of grass scaled up to be as tall as a skyscraper. Now picture a skyscraper bending in a strong gust of wind the way a blade of grass does. Grass can bend all the way down to the ground without breaking. Do you think a skyscraper could do that?

How does a 50 centimeter-tall blade of grass measuring only one centimeter thick manage not to be blown over by the gentlest of breezes? Skyscraper engineers are inspired by this when they design buildings. They must ensure that their skyscrapers don't simply break in half in a strong wind. Let's look at how grass has solved that problem.

The blade of grass has to be both stable and flexible at the same time. The flexibility starts with the building blocks of the grass, which are plant cells. **Plant cells** can be compressed and stretched a good deal before breaking. Plants have invented specialized types of cells that are tasked with ensuring the plant's stability. Botanists call these cells **ground tissue**. The most striking feature of these cells is that they have particularly thick cell walls.

A special cement called **lignin** is lodged in the cell walls which makes the cell wall even more rigid. Lignin is a wood-like substance which is found in great quantities in tree trunks. Tree trunks and even bark are made up almost exclusively of this cement tissue. Water ducts that travel upward through a plant stem conduct the water through the plant and also provide stability with their thick cell walls.

GEEK OUT!

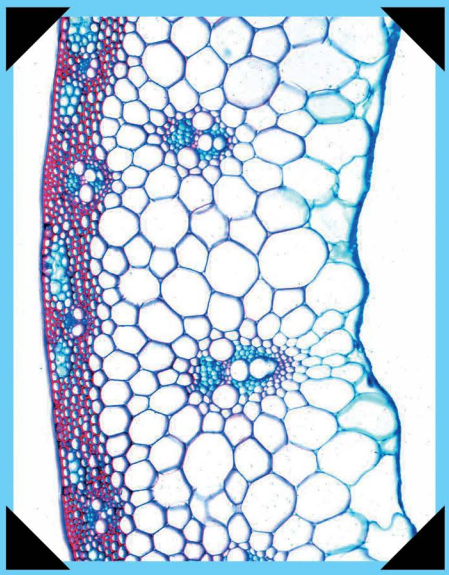
# GRASS UNDER THE MICROSCOPE

A blade of grass has to achieve as much stability as possible with a minimal amount of material. Let's take a look at a blade of grass under a microscope to see how it achieves this.

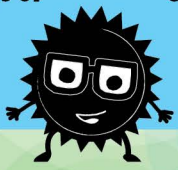
It is typical with most grasses for the stem to be hollow inside. Around this **pith cavity** are large cells with thin cell walls. Such cells are typically water storage cells. By virtue of their thin cell walls, they are quite delicate.

Located in these large cells are usually clusters of smaller cells called **vascular bundles**. In these, there are several cells with large diameters. These are the **water ducts** that transport water from the root to the rest of the plant. Smaller vascular ducts transport nutrients around the plant. The other cells in the vascular bundle have the task of stabilizing the ducts and providing them with substances to transport.

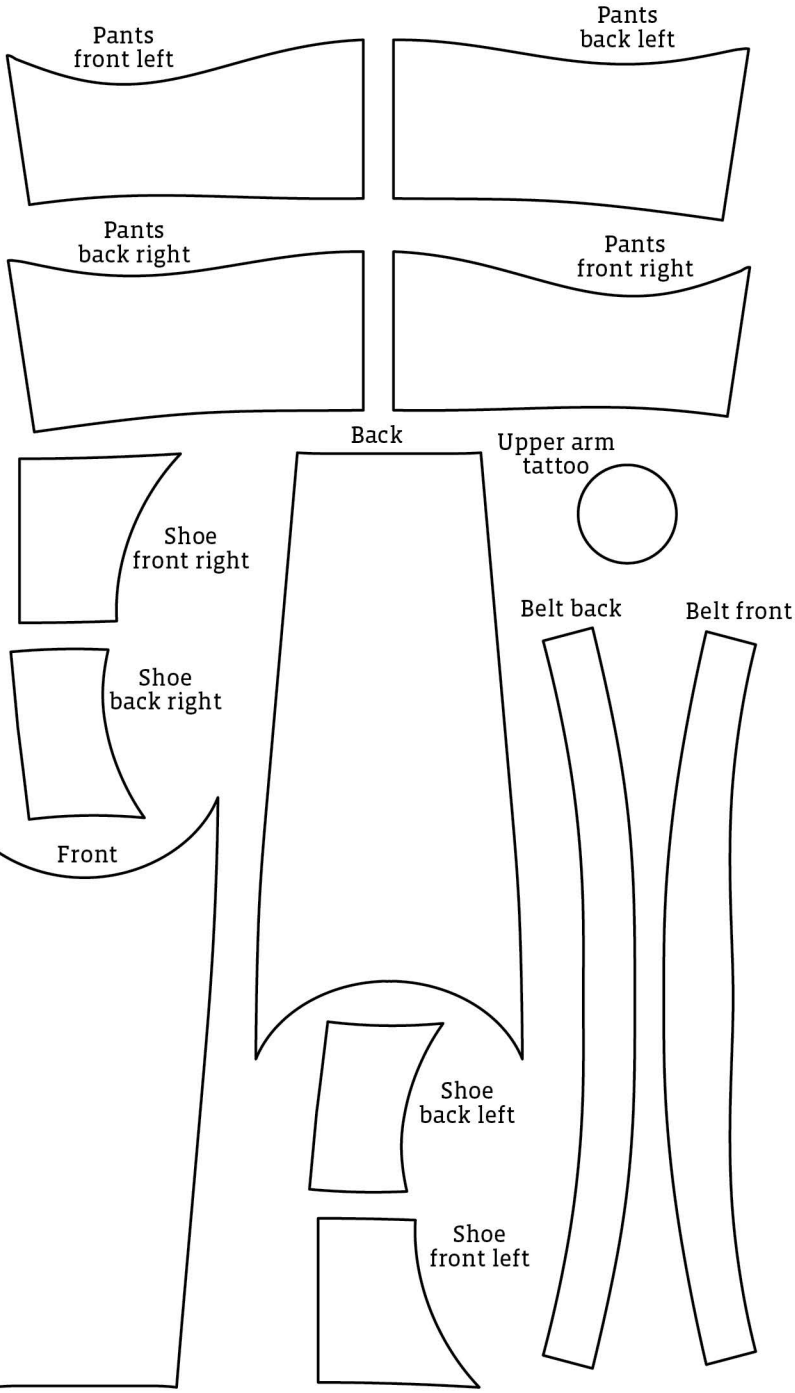
Finally, on the very outside, you will find cells that are responsible for the unbelievable strength of the grass blade. Directly under the outermost layer of cells — the **epidermis** — there are small groups or even a closed ring of small cells with thick cell walls. Just like in the water ducts, these are mostly dead cells whose sole purpose here is to stabilize and protect the long blade. If you take a look at the cross-section as a whole, you will see that the blade achieves maximum stability with minimal effort and while saving as much material as possible. It's an engineer's dream!



*Cross section from the wall of a grass blade. The air-filled pith cavity is visible on the right side.*



If you want to design your own outfit for your grass head, photocopy this page, color it in, and tape it to your grass head.

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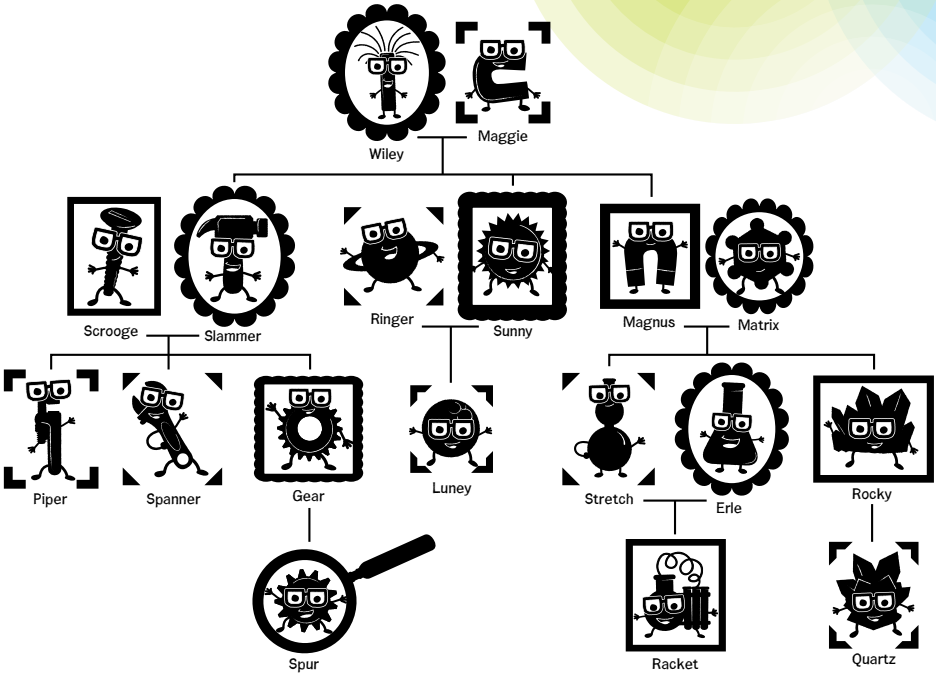
# MEET THE GEEKERS!

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