

UNLOCKING SCIENCE HANDSON!

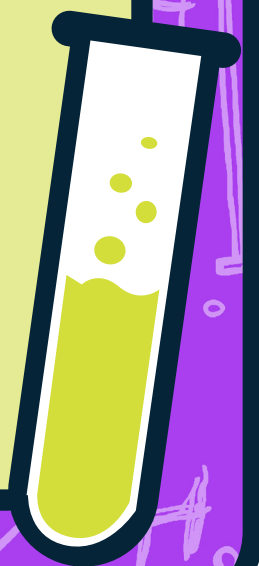
MAGNETIC EXPLORATION

People have been using magnets for thousands of years. While most rocks don't stick to one another, rocks called magnetite or lodestone will. These rocks contain iron ores that have the amazing ability to attract other rocks and materials that contain iron. Any substance that is magnetic or can be turned into a magnet (induced magnetism) is called ferromagnetic. Ferrum is the Latin word for iron and where iron gets its symbol Fe on the periodic table of elements. Today, we use this property of magnetism to do so many different things.

Rather than digging up magnets, we can produce magnets. Heating a combination of iron, nickel, aluminum, cobalt, titanium, and sulfur and then using electricity, we can create a permanent magnetic field. You can watch this video to see [How It's Made](#). Neodymium magnets were first created in 1983 and are much stronger, but they lose their magnetic properties if they get too hot. Their strength has allowed us to make more efficient motors and other devices.

Magnetism is an amazing property of God's creation, and as we unlock the secrets of all he has made, we can find new uses to help improve our lives and the lives of others.

Extra Family Fun: Borrow or build a game using magnets and play a family tournament.



Magnetic Maze

Supplies

- 2 magnets (a strong and a weak magnet)
- A steel ball/marble/ball bearing (or a small weak magnet)
- Markers
- Scissors/utility knife
- Cardboard or heavy card-stock



Figure 1: Supplies

Construction

- 1 Use a piece of cardboard to construct a maze or a path to follow.
- 2 The size and detail can be adjusted based on the age of the explorer.

- 3 Use a marker to draw a path or tape two markers together to make a maze. To make the gaps in the maze wider, place an object between the two markers before you tape them together.

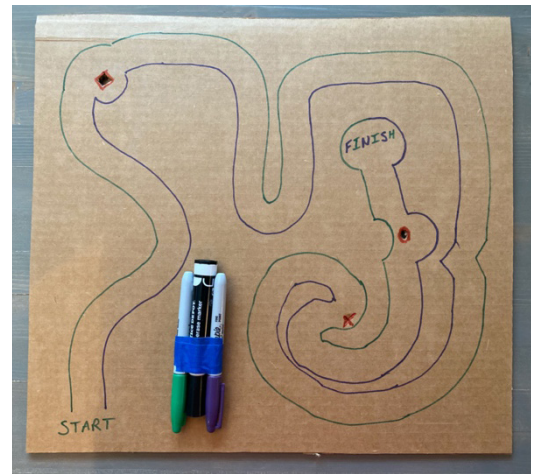


Figure 2: Example maze

- a Alternate: copy a maze from a book or online source and tape it onto the cardboard.
- b Alternate: cut out traps or attach obstacles onto the surface to add a challenge.

Activity: Run the Maze

- 1 Place the magnet under the cardboard and the steel ball (or another weaker magnet) on top at the starting position.
- 2 Move the magnet along the underside to make the steel ball navigate through the maze without going outside the lines.
- 3 Try out these options:
 - a Use your dominant and then your non-dominant hand.
 - b Time how long it takes to navigate your maze. Do multiple trials and find an average time.

ANALYSIS QUESTIONS AND DISCUSSION CONTINUED

- c Have other people try to beat your best time.
- d Use a stronger or weaker magnet and see how that changes your ability to complete the maze.

Analysis Questions and Discussion

- 1 Does the magnet have to be in direct contact with the steel ball or other magnet? How many layers of cardboard can it work through? *The magnet exerts a force that can pass through solid materials. The strength of the magnet will determine how thick of cardboard it can pass through.*
- 2 If you tried using both a magnet and a steel ball on top of the maze, which was easier? Why do you think this was so? *Discuss the answer, noting that the magnet may not move as smoothly and the polarity may cause it to be jerky.*
- 3 If multiple people use the same equipment (keeping the dependent variables the same), why were some people able to do the maze faster (the measured independent variable)? *Discuss possible reasons.*
- 4 Were you able to do the maze faster and smoother with your dominant hand or your non-dominant hand? Why do people have a dominant hand? Could you improve your ability with your non-dominant hand? *Discuss how God has made each of us different, and our handedness is one of those. God has also given us amazing brains that can learn new skills. Through practice and repeated use, we can improve our dexterity.*

Magnetic Fun and Games

- Purchase or borrow a game like Klask that uses magnets and have a family game night. You could also build your own version of Klask using materials from around the house.
- Invent your own game using magnets and sliding or rolling iron objects.
- Have a competition to see who can build the longest paper clip chain attached to a magnet or who can make a chain of a certain length in the shortest time.
- If you have a large, strong magnet (or want to purchase one), attach a long rope and try magnet fishing at a local pond, lake, or stream. Toss the magnet out and drag it back slowly in a pattern. (Follow any local regulations/restrictions.)

Testing for Ferromagnetism

Supplies

- A magnet (optional: use both a weak and a strong magnet)
- Various household items

Place a magnet next to an object. If you can feel any force or if the magnet sticks to the object, the object contains magnetic material (either iron, nickel, or cobalt). Be very careful around electronic items as strong magnets can cause damage. Younger children should have supervision for this activity.

Activity: Magnetic Scavenger Hunt

Place a magnet next to an object. If you can feel any force or if the magnet sticks to the object, the object contains magnetic material (either iron, nickel, or cobalt). If there are different parts of an item (handle, knobs, divided parts, etc.), test each of the parts. Record the results in the data table, noting whether

the magnets stick or not. Try to determine what metal the object is made of and note that in the Observations column.

Be very careful around electronic items as strong magnets can cause damage. Younger children should have supervision for this activity.

Data Table

Item	Weak Magnet	Strong Magnet	Observations

Analysis Questions and Discussion

Considering the data in the table:

- 1 Did any of the results surprise you? *Some surprises might include that cast iron and stainless steel items are not magnetic. Some steel items may have stuck to the strong magnet, but not to the weaker magnet.*
- 2 On an object like a frying pan, why might the handle or rivets holding the handle on be magnetic while the rest of the pan is not? *Steel, which is mainly iron, may be cheaper or more durable than the material for the cooking surface. We use different materials for different purposes based on the different properties they have. A plastic coating over the handle will help keep the handle cooler than a metal handle.*
- 3 Interestingly, there are no mentions of magnetism in the Bible. If the Bible doesn't talk about it, how does the property of magnetism bring glory to God as the Creator? *God has created magnetism as an amazing part of his creation. As we study and learn more about the creation, we learn more about the Creator. We can praise him for his amazing design and then use those properties to design our own creations. As image bearers of God, we reflect his glory when we create beautiful and useful things.*
- 4 What items around your house use magnets? How do these make your life better? *Think of as many as you can and discuss how technology helps us to do different tasks. Consider how the use of magnets has changed in your lifetime, or ask a grandparent or older friend to share their experience. In the medical field, tools like the Magnetic Resonance Imaging systems (MRIs) have helped us provide better healthcare in a world that is corrupted by sin.*
- 5 What item do you wish was magnetic and why? *For example, if plastics were magnetic, then we could retrieve a frisbee from a roof or pond.*

“It is the glory of God to conceal things, but the glory of kings is to search things out.” Proverbs 25:2 (ESV)