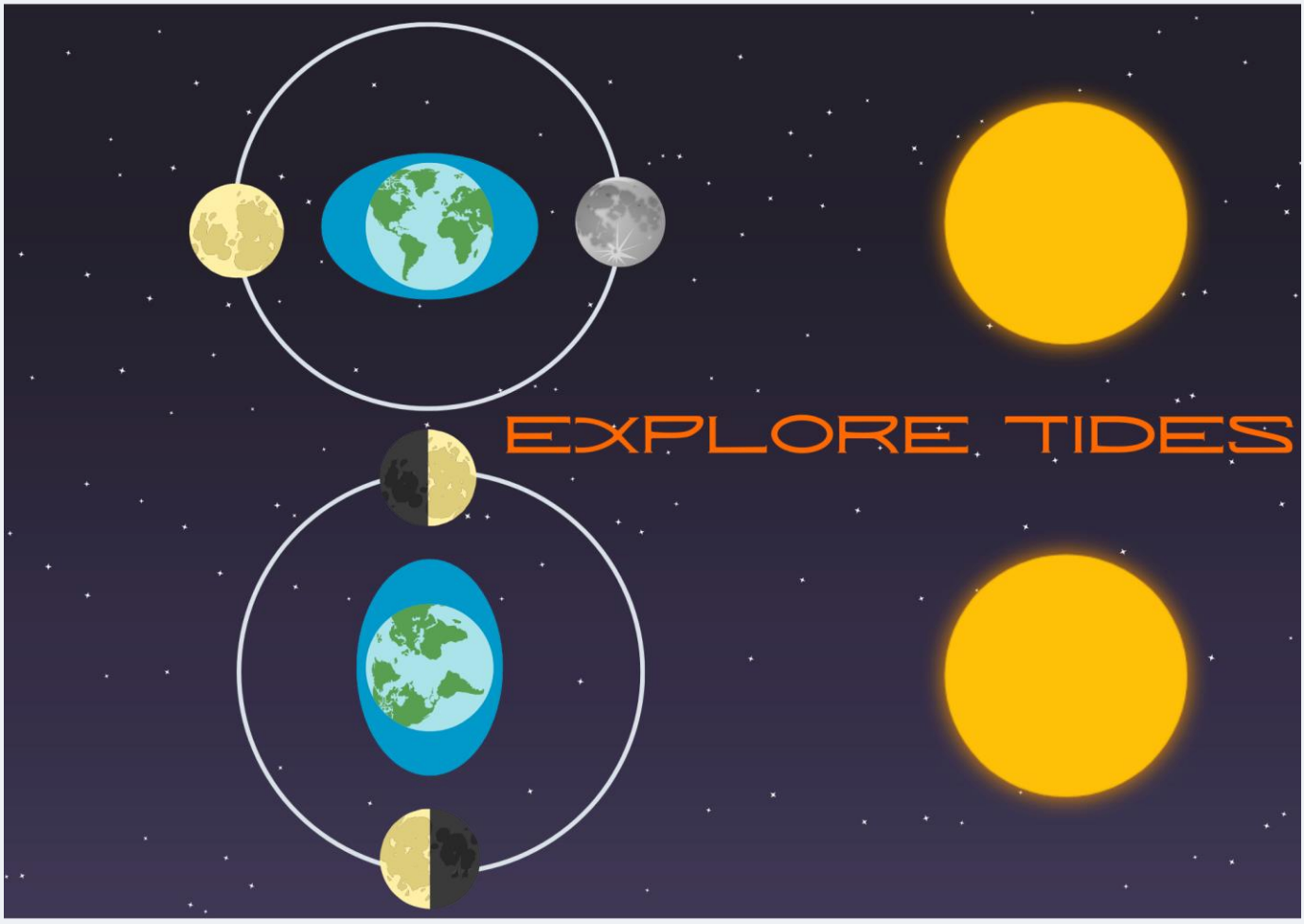
EXPLORE TIDES



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EXPLORE TIDES

Introduction

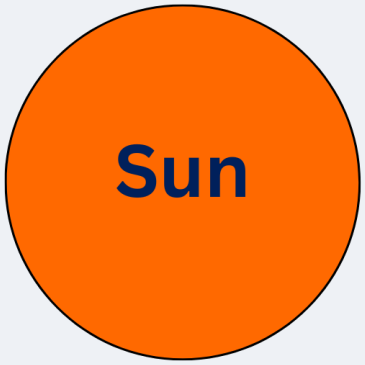
The level of the sea rises and falls every day. We call these changes tides. The movement of ocean water is caused by the gravitational pull of the Moon and the Sun. While both influence the tides, the Moon has the strongest effect because it is much closer to Earth.

In this worksheet, you will build a model of the Earth-Sun-Moon system to explore how tides work. You will investigate the effects of the Sun and the Moon on Earth's oceans.

Activity 1: How Does the Sun Affect Tides on Earth?

Step 1: Prepare Your Model

1. Cut out the Earth-Sun model from the template sheet.
2. Cut out the planet Earth from the template sheet.
3. Place the Earth onto the Earth-Sun model where the plus sign (+) is.
4. Attach the Earth using a pushpin through the + sign in the centre.
5. Fix the pushpin by placing a small piece of cork or foam on the back.



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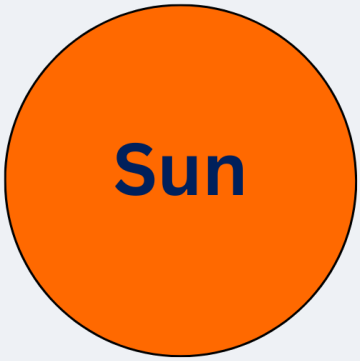
Step 2: Observing the Sun's Effect on Earth's Tides

What do the orange bulges represent?

Draw 3 force arrows (starting from the small squares) on the diagram below to show the size and direction of the Sun's gravitational pull.

Hint: the arrows start at different distances to the Sun. Will this affect the size or direction?



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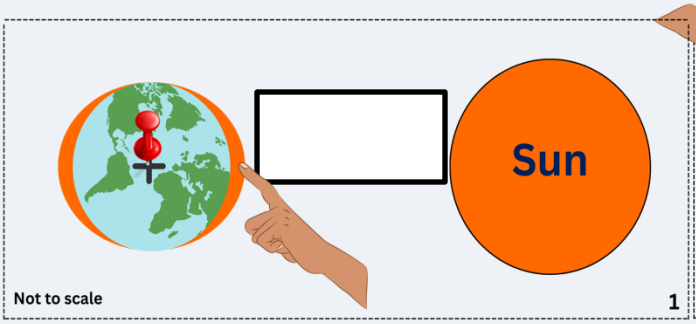
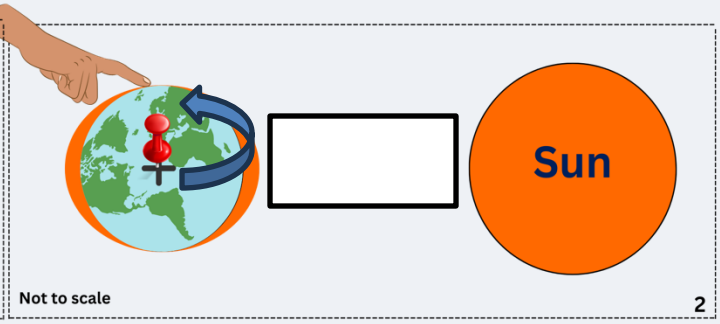
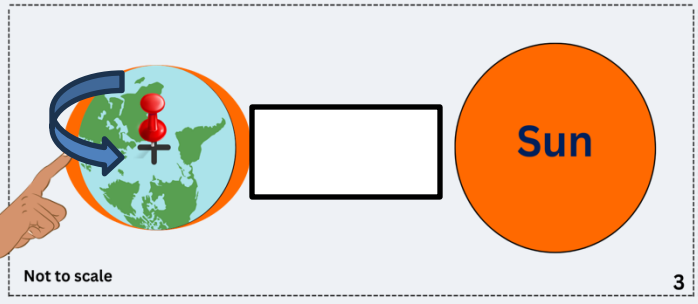
Why there is a bulge on the opposite side of Earth?

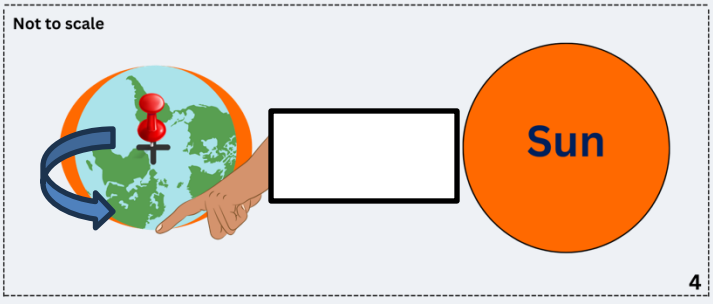
Step 3: Observing the Sun's Effect on Earth's Tides in a Day (24 hours)

1. Choose any location on Earth and point to it with your finger.
2. Line up your location with the tidal bulge facing the Sun.
3. Record whether your location is in a high tide or low tide in the box of diagram 1 below.
4. Rotate the Earth a quarter turn (this is how much it will have moved in about 6 hours)
5. Record whether your location is now in a high tide or low tide in the box of diagram 2 below.
6. Repeat steps 4 and 5 until your location completes a full rotation (24 hours) back to the starting position.
7. Count the number of high and low tides your location experienced in a day.









Your location experienced ☐ high tides and ☐ low tides in one day.

Activity 2: How Does the Moon Affect Tides on Earth?

Step 1: Prepare Your Model

1. Print the Earth-Moon model on a transparency sheet or carefully draw it on a piece of transparent plastic.
2. Remove the pushpin from your Earth-Sun model.
3. Place the Earth-Moon model on top of the Earth-Sun model by lining up the + signs
4. Reinsert the pushpin through the + signs in the centre of both models.
5. Secure the pushpin at the back using a small piece of cork or foam.

Step 2: Observing the Moon's Effect on Earth's Tides

Look at the Earth in your model. What do you notice around it?

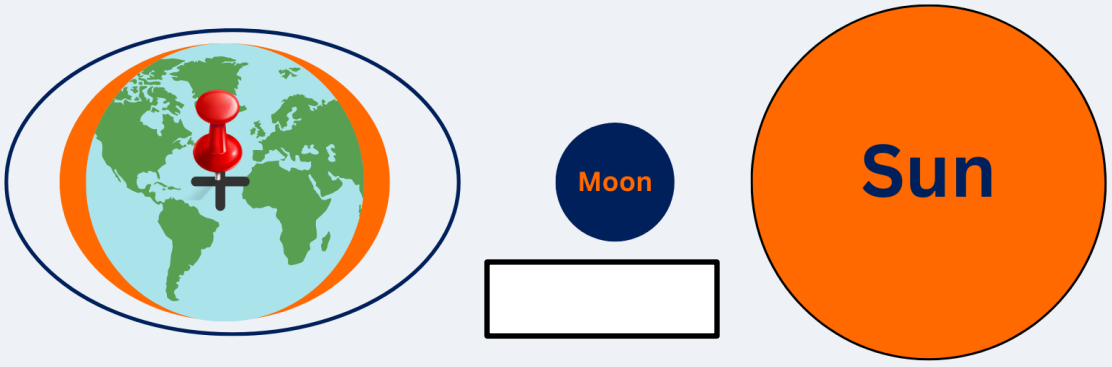
Which has the strongest effect and creates the biggest tidal bulges on Earth?

☐ The Moon ☐ The Sun

Why?

Step 3: Observing the Moon's Effect on Earth's Tides in a Lunar Month

1. Line up the Moon in between the Earth and the Sun as shown in diagram 1 below.
2. Identify the Moon phase that a person on Earth would see from this positions. Write your answer in the box in diagram 1 below.
3. Label the Earth in diagram 1 to show the location of the 'Highest high tides' and the 'Lowest low tides'. These tides happen because the gravitational forces of the Moon and Sun combine.



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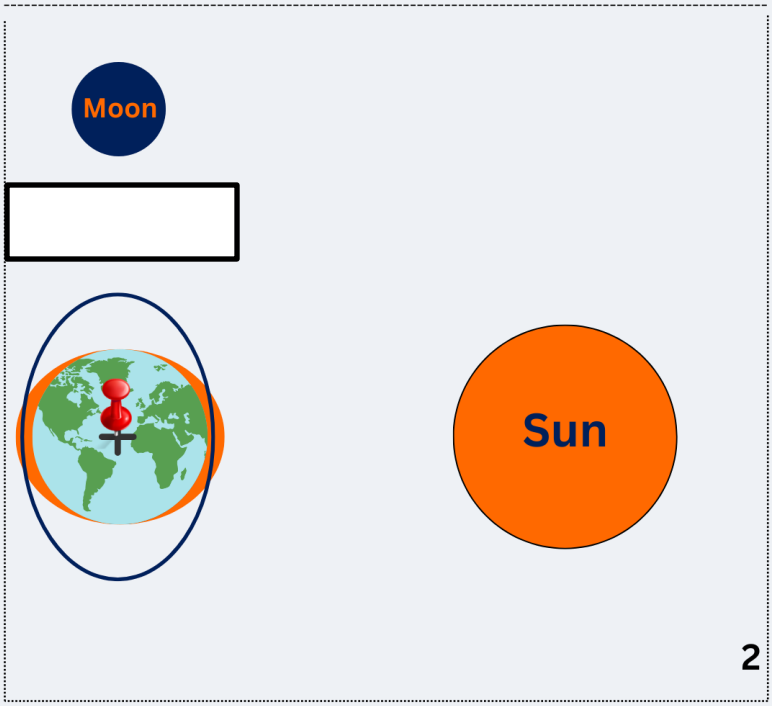
4. Rotate the Moon a quarter turn (7 days) as shown in diagram 2 below.
5. Identify the Moon phase that a person on Earth would see from this positions. Write your answer in the box in diagram 2 below.
6. Because of the Moon's new position, the gravitational forces of the Moon and Sun partially cancel each other out. Label on Earth in diagram 2 where the high tides are 'not as high as usual' and the low tides are 'not as low as usual'.



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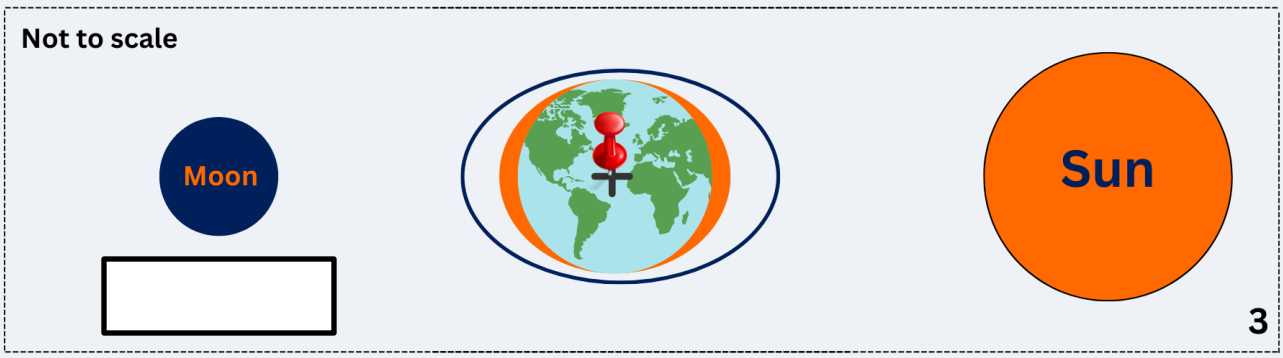
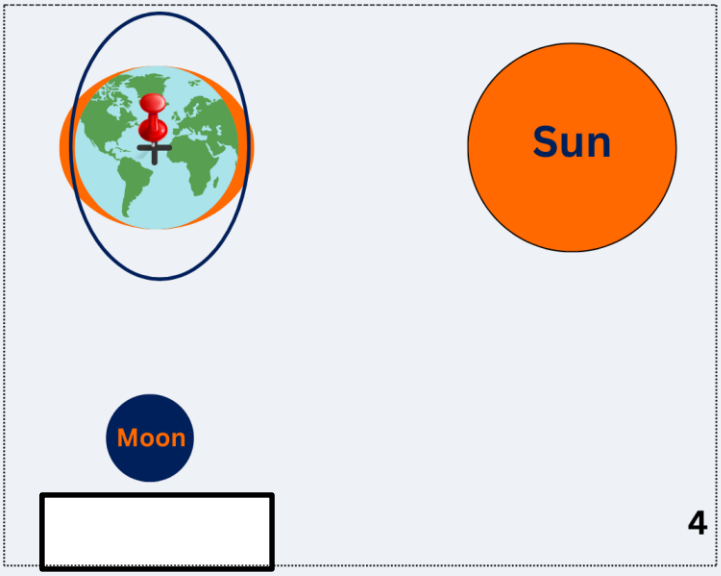
7. Rotate the Moon another quarter turn (7 days) as shown in diagram 3.
8. Identify the Moon phase that a person on Earth would see from this positions. Write your answer in the box in diagram 3 below.
9. Label the Earth in diagram 3 to show location of the 'Highest high tides' and the 'Lowest low tides'. These tides happen because the gravitational forces of the Moon and Sun combine.



10. Rotate the Moon another quarter turn (7 days) as shown in diagram 4.
11. Identify the Moon phase that a person on Earth would see from this positions. Write your answer in the box in diagram 4 below.
12. Because of the Moon's new position, the gravitational forces of the Moon and Sun partially cancel each other out. Label on Earth in diagram 4 where the high tides are 'not as high as usual' and the low tides are 'not as low as usual'.



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Step 4: Identifying the Spring and Neap Tides

Spring tides happen when the Moon and the Sun line up. Their gravity works together to create higher high tides and lower low tides than usual.

Neap tides happen when the Moon and the Sun are at a right angle to Earth. Their gravity pulls in different directions, making high tides lower and low tides higher than usual.

Use the information above to complete the following table.

Diagrams	Moon Phase	Spring or Neap Tides
Diagram 1		
Diagram 2		
Diagram 3		
Diagram 4		