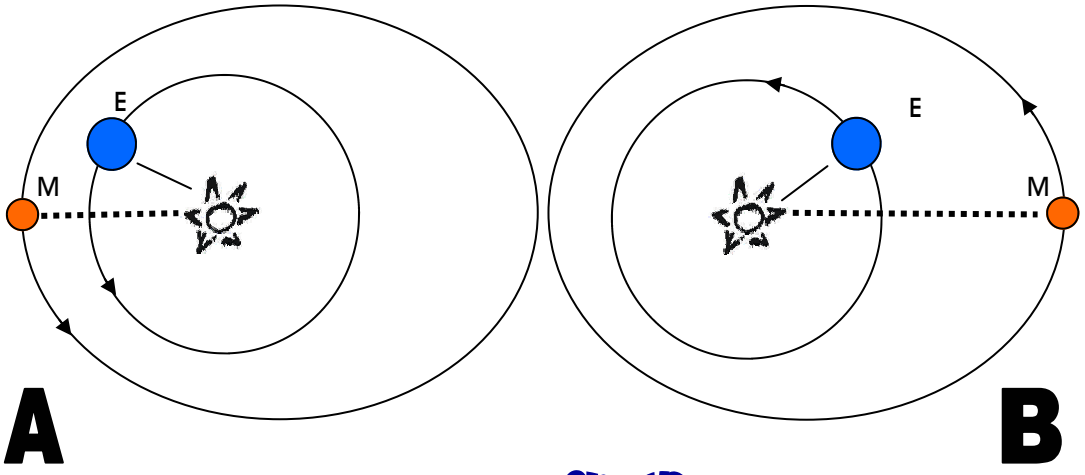
How Old Are You in Martian Years?

Adapted from Kinesthetic Astronomy: The Sky Time Lesson by C. A. Morrow and M. Zawaski

Both Earth and Mars orbit around the Sun. Earth takes 1 year; Mars takes longer.

Each planet also rotates around its own axis. Earth takes 1 day; Mars takes a bit longer.



	Earth	Mars
Average Distance from Sun	1 AU	1.5 AU
Rotation Period	24 hours	24.6 hours
Orbital Period	1 year	About 2 years
Tilt of Axis	23.5°	25°

*1 AU is the average distance between Earth and the Sun.

questions

1. Which planet orbits <u>farther</u> from the Sun? Does this make it generally <u>colder or warmer</u> on Mars compared to Earth?

2. Which of these two planets keeps about the <u>same distance</u> from the Sun as it orbits? Which one does not?

3. How long is the day on Mars? How does this compare to an Earth day?

4. How long is the Martian year*? How does this compare to an Earth year?

HOW OLD WOULD YOU BE IN MARTIAN YEARS?

answers

1. *Mars orbits farther from the Sun. It gets less light energy from the Sun, making it generally colder.*

2. *Earth's orbit around the Sun is an almost perfect circle. So during Earth's orbit, the planet stays almost exactly the same distance from the Sun.*

Mars' orbit around the Sun is a stretched circle (an ellipse). So there ARE times during Mars' orbit when the planet is closer to the Sun, and times when it is farther away (see the figure above.)

3. *A Martian day (called a "sol") is 24.6 hours long. An Earth day is 24 hours long. So a Mars day is 37 minutes longer than an Earth day.*

4. *One Martian year is about two Earth years long.*

You would be only half as old in Mars years.
Can you calculate your Martian age?

Does Mars Have Seasons Like Earth?

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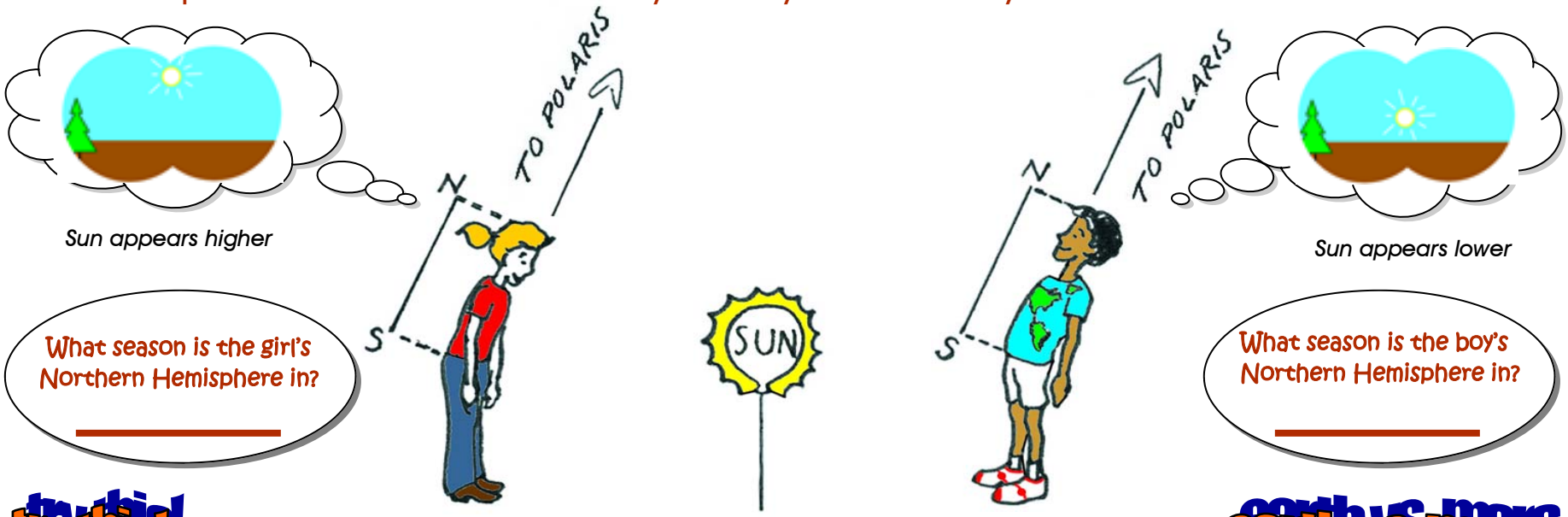


What season is the girl's Northern Hemisphere in?

What season is the boy's Northern Hemisphere in?

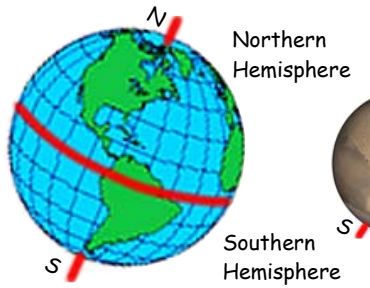
The kids do NOT represent the real size and distance of Earth compared to the Sun!
If the Sun were a large grapefruit, Earth would be the size of a pencil tip, 50 feet (15 m) away!

try this!

1. Pretend your body is Earth in orbit around the Sun. Let a helium balloon be the Sun.
2. The top of your head is Earth's North Pole. Pick a point on the ceiling to be the North Star (Polaris). Tilt your head towards Polaris, like the kids in the drawing.
3. Try to "orbit" the Sun while keeping your head tilted toward Polaris.

hint...

When your Northern Hemisphere* is tilted away from the Sun, will the Sun appear higher or lower in the sky?



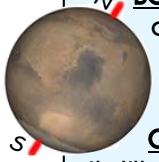
The hemisphere of the planet tilted **away** from the Sun is in winter. The Sun appears lower in the sky, giving fewer daylight hours, less time to heat the planet's surface, thus making colder temperatures.

ANSWERS:

For their northern hemispheres, the girl is in summer; the boy is in winter. For the Southern Hemisphere the girl is in winter and the boy is in*

earth vs. mars

MARS HAS SEASONS TOO !



Seasons on Mars are a result of **BOTH** the effects of its tilt and its changing distance from the Sun.

Earth's seasons result **ONLY** from the effects of its tilt. Earth's orbit is nearly a perfect circle, so Earth's distance from the Sun stays almost exactly the same throughout the year.

Like Earth, Mars is also tilted. But unlike Earth, Mars' distance from the Sun DOES affect its seasons, because Mars' orbit is a stretched circle (an ellipse).

Why is Mars so Bright in the Night Sky Every Two Years?

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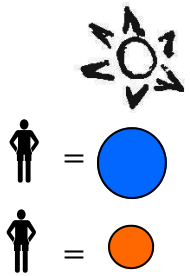
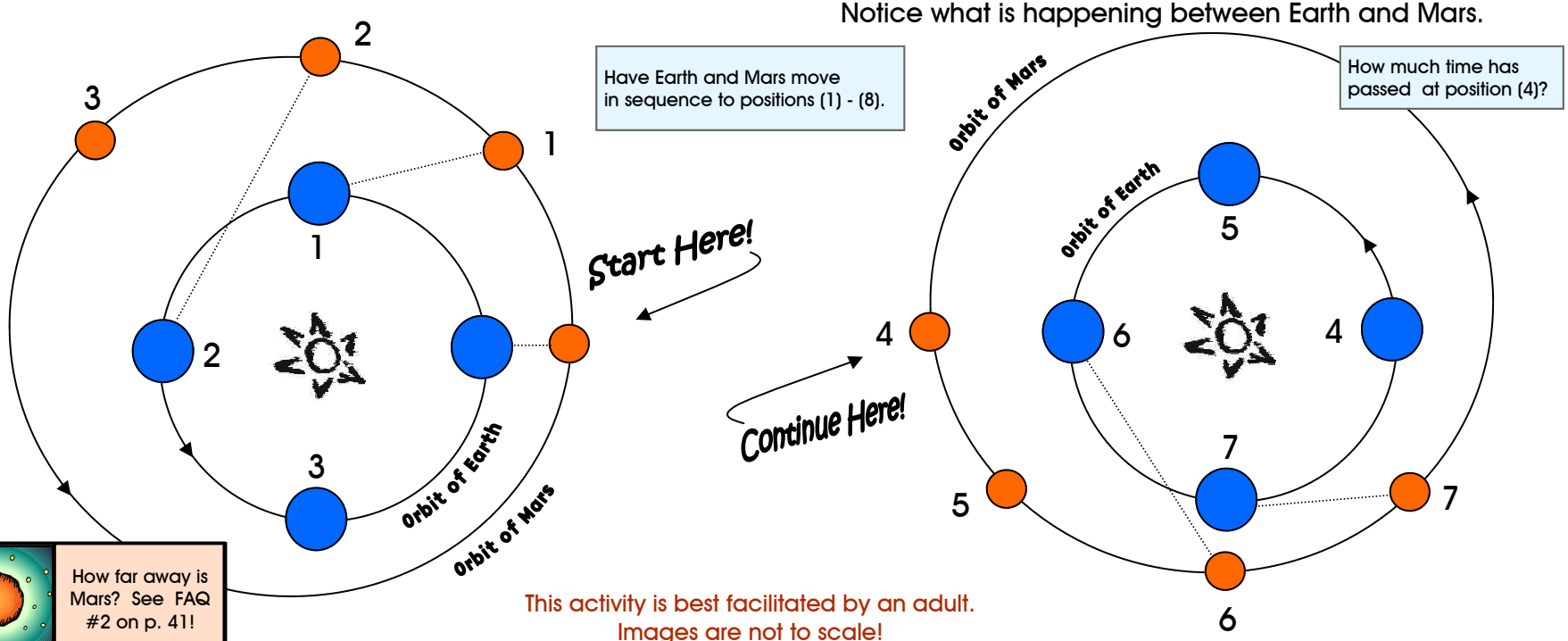
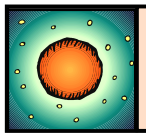
Earth orbits once around the Sun in one year. Mars takes two years to go around the Sun. Let's see what happens if we start Earth and Mars in a line with the Sun and move forward in time.

1. Choose a central object to be the Sun.
2. Let one person be Earth.
3. Let another person be Mars.
4. Have the two people stand in the starting position for Earth and Mars as shown below.



5. Next have Earth move 1/4 of the way around the Sun to position (1). How much time has passed? [3 months.] How far does Mars move? [Only half as much as Earth = 1/8 of the way around the Sun to position (1).]
6. Have Earth and Mars keep moving around the Sun in sequence to positions (2)-(4) — Position (4) is on the diagram below. Each time Earth moves another 1/4, Mars moves another 1/8.
7. How much time has passed at position (4)? [1 year*.] Would people on Earth be able to see Mars in the night sky? [No, the planets are on opposite sides of the Sun.]
8. Keep moving through positions (5)-(7) as shown below. Notice what is happening between Earth and Mars.





How far away is Mars? See FAQ #2 on p. 41!

This activity is best facilitated by an adult.
Images are not to scale!

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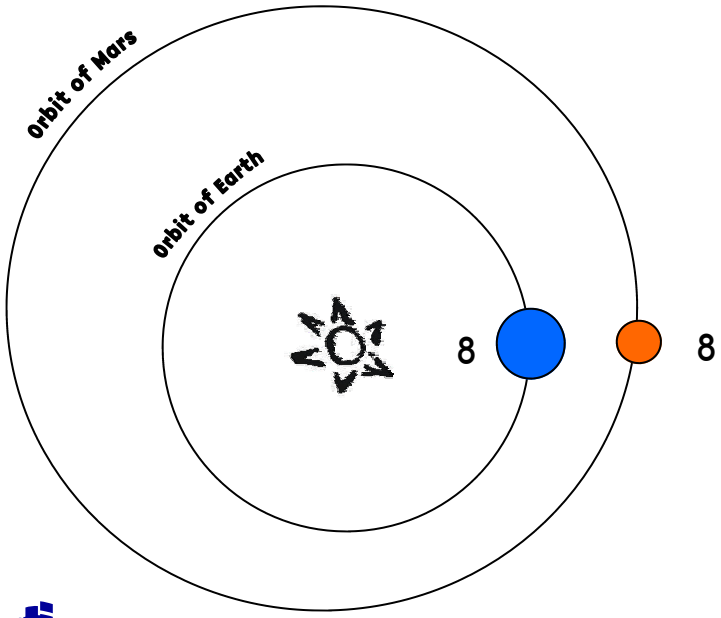
After about 2 years, Earth and Mars make another close encounter as Earth overtakes Mars on the inside track (see position (8) below).



question

In the (8) position, can Earthlings see Mars in their night sky? Would Mars be brighter or dimmer in position (8) compared to other orbital positions?

answer

Yes - Earthlings could see Mars in the night sky at position (8). Mars would be at its brightest because it is closest to Earth.

Why Do We Launch Mars Missions Every Two Years?

Every two years Earth overtakes Mars on an "inside-track" orbit around the Sun. This close approach between Earth and Mars presents the opportunity for launching new Mars missions. Of course, you would want to launch from Earth before position (8) because it takes 7-9 months to get to Mars.

Try your hand at an animated launch activity!

Check out:

www.marsquestonline.org/tour/rovers/flytomars