THE STRIVING

MUSLIM ACADEMY

Islamic and Academic Education

YEARS 7 TO 9 · SCIENCE

Space physics

Orbits as ellipses, the three motions behind day, year and season, and why the sky looks as it does.

WHAT IS INSIDE

- Orbits are ellipses
- Day, year and season
- Fixed stars, and wandering ones
- Orbits, days, years and seasons
- How each one is answered

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1 sets · a hint on every question

Written for a parent teaching at home. No training assumed, and nothing else to buy.

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Orbits are ellipses

Read this, then answer the questions on it.



ORBITS ARE ELLIPSES

Kepler found that a planet's path is not a circle. The shape of the orbit is a somewhat flattened circle, or ellipse, and next to the circle the ellipse is the simplest kind of closed curve.

Kepler began by assuming the orbits were circles, and it was Brahe's unusually precise observations that showed the planets were not where the published tables put them. Mars has an eccentricity of only about 0.1, so its orbit is practically indistinguishable from a circle, and the difference turned out to be critical.

A planet nearer the Sun takes less time to complete an orbit, so an orbital period is not an arbitrary fact about a planet but something fixed by its distance.

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Orbits, days, years and seasons

Every answer is on the pages you have just read.



1. **What shape did Kepler find a planet's orbit to be, and how does the source describe it?**
   Not a circle, but close to one.

2. **Name the motion responsible for the day, for the year, and for the seasons.**
   Three different things: a spin, an orbit and a tilt.

3. **Explain why the northern and southern hemispheres have opposite seasons at the same time.**
   Both are the same distance from the Sun.

4. **Say why it is wrong to explain summer by the Earth being nearer the Sun.**
   Consider what the other hemisphere is doing at that moment.

5. **Over several weeks, most things in the sky keep their places and a few do not. Name what moves and what stays, and say what the solar system contains.**
   The pack's own heading answers the first part.

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How each one is answered

Mark it together. Where a question asks for a list, the order does not matter.



ORBITS, DAYS, YEARS AND SEASONS

1. What shape did Kepler find a planet's orbit to be, and how does the source describe it?

1. The orbit has the shape of a somewhat flattened circle, or ellipse.
2. Next to the circle, the ellipse is the simplest kind of closed curve.

Answer: **an ellipse, described as a somewhat flattened circle**

2. Name the motion responsible for the day, for the year, and for the seasons.

1. The Earth's spin on its axis gives day and night.
2. Its orbit around the Sun gives the year.
3. The tilt of its axis gives the seasons.

Answer: **the spin gives the day, the orbit gives the year, the tilt gives the seasons**

3. Explain why the northern and southern hemispheres have opposite seasons at the same time.

1. The axis is tilted and stays pointing the same way as the Earth orbits.
2. So when one hemisphere is tilted towards the Sun the other is tilted away.
3. The one tilted towards it receives sunlight at a steeper angle and for longer, which is summer there and winter in the other.

Answer: **because the tilt points one hemisphere towards the Sun and the other away at the same time**

4. Say why it is wrong to explain summer by the Earth being nearer the Sun.

1. Both hemispheres are the same distance from the Sun at any moment.
2. If distance caused the seasons, both would have summer together.
3. They do not, so the cause must be the tilt rather than the distance.

Answer: **because both hemispheres are the same distance away, yet their seasons are opposite**

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SAMPLE PAGES

You have read a few pages. The pack is longer.

What you are holding is a short sample, taken from different parts of the pack so that you can see how a week is planned and what a child is actually asked to do, before you decide.

The complete pack, and the rest of the academic materials, are on our website: schemes of work for a parent teaching at home, and practice packs for the skills children get stuck on.

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Islamic and Academic Education

Members of the homeschool community do not buy these. If you have joined the community, the pack for the term you are working on is given to you at no cost.

Our Islamic Education classes are free. These packs are part of what pays the teachers who teach them.