THE STRIVING

MUSLIM ACADEMY

Islamic and Academic Education

YEARS 7 TO 9 · SCIENCE

Forces

Force, mass and acceleration, contact against non-contact, and why weight is not mass.

WHAT IS INSIDE

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- Contact and non-contact, and a complication
- Weight is not mass
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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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Contact and non-contact, and a complication

Read this, then answer the questions on it.



CONTACT AND NON-CONTACT, AND A COMPLICATION

Forces are usually sorted by whether the objects appear to be touching. Contact forces include friction, air resistance, tension in a rope and the normal force a surface pushes back with. Non-contact forces act at a distance: gravity, magnetism and electrostatic attraction. The division decides what you draw on a force diagram.

Now the complication, which is worth meeting early. Physicists say that all forces act at a distance. That is obvious for gravity, since the Earth and the Moon interact without coming into contact, and the source says it is true of the others too: friction is an electromagnetic force between atoms that may not actually touch. Action at a distance is explained by a force field rather than by physical contact, and nearly every force you meet directly turns out to be the one electromagnetic force wearing different clothes.

So contact and non-contact is a way of sorting what you can see, not a statement about what is underneath. Both are useful. Knowing which one you are using is the useful part.

In a force diagram every arrow needs a cause you can name. An arrow with no object responsible for it is usually a mistake, and the commonest invented force is a forward push on something that is simply still moving.

The S

Weight is not mass

Read this, then answer the questions on it.



WEIGHT IS NOT MASS

Mass is how much matter there is, measured in kilograms, and it does not change with where you are. Weight is the force of gravity on that mass, measured in newtons, and it does.

Weight is mass times the gravitational field strength, so the same person has the same mass on the Moon and about a sixth of the weight.

Everyday speech uses weight for both, which is harmless at the shops and fatal in a calculation. If the answer is in kilograms, it is a mass; if it is in newtons, it is a force.

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How each one is answered

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



FORCES, MASS AND WEIGHT

1. What does a net external force on a body produce, and what difference does a larger mass make?

1. A net external force produces an acceleration.
2. For a given force, a larger mass accelerates less.

Answer: **an acceleration, and a larger mass accelerates less for the same force**

2. Explain why a newton is a kilogram metre per second squared.

1. Force is mass times acceleration.
2. Mass is in kilograms and acceleration in metres per second squared.
3. So the unit of force is the product of those, which is what a newton is.

Answer: **because force is mass times acceleration, so its unit is kilograms times metres per second squared**

3. A body has several large forces acting on it and is not accelerating. Explain how.

1. Acceleration depends on the net force, the total of all of them.
2. Forces in opposite directions cancel.
3. If they cancel exactly the net force is zero, so there is no acceleration however large each one is.

Answer: **because the forces cancel, so the net force is zero**

4. Sort these into contact and non-contact: friction, gravity, tension, magnetism, air resistance.

1. Contact: friction, tension, air resistance.
2. Non-contact: gravity, magnetism.

Answer: **contact: friction, tension, air resistance; non-contact: gravity, magnetism**

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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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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.