

ESA Study Guide Year 10 Science

Chapter 6: Forces Then and now

Questions from page 90 of *ESA Study Guide Year 10 Science*

Understanding

1. In what centuries did Isaac Newton live and work? _____
2. What is the name of the force that pulls things to the ground? _____
3. What are the three non-contact forces?

4. What name and abbreviation are given to the unit of force?

Thinking

Why does the Moon stay in orbit around the Earth, rather than moving away?

Contributing

When they travel into space, astronauts have to cope with being weightless. Find out the effects of weightlessness on the human body.



Answers (except for 'Contributing') are provided on page 305 of *ESA Study Guide Year 10 Science*

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Chapter 6: Forces Effects of forces

Questions from pages 93, 94 of *ESA Study Guide Year 10 Science*

Understanding

1. Complete the following paragraph.

Forces acting in the same direction are **a.** _____ to find the total force. Forces acting in **b.** _____ directions are subtracted to find the total force. When the total force is **c.** _____ newtons the forces are said to be balanced. When the **d.** _____ acting on an object are balanced, the object is stationary or travelling at a **e.** _____ speed.

2. A rugby scrum shows forces in action. In the diagram, four players from each team have formed a scrum.



a. Each member of the team on the left exerts the same push. The total push is 6 000 N. What is the (average) push supplied by each person?

b. The scrum is stationary because the forces are balanced. What is the total force from the team on the right? _____

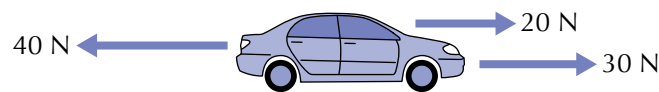
c. If the team on the right can push with a force of 7 000 N, what will happen to the scrum?

3. The following diagram shows three horizontal forces acting on a toy car.

a. What single force would have the same effect? _____

b. State whether this is an example of balanced forces or of unbalanced forces.

c. Describe the overall effect of the forces on the toy car.



Thinking

In the example of the car in **3**, what two forces could be pushing the car to the right?

_____ and _____

Contributing

Design an experiment to find out if different surfaces (painted, bare wood, plastic, paper) will change the distances that a toy car can travel.

Answers (except for 'Contributing') are provided on page 305 of *ESA Study Guide Year 10 Science*

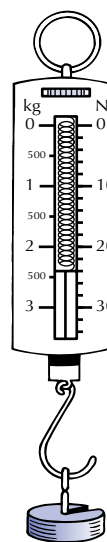
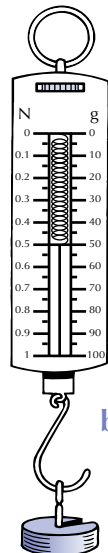
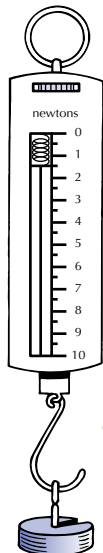
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Chapter 6: Forces Measuring forces

Questions from page 97 of *ESA Study Guide Year 10 Science*

Understanding

- Complete the following sentence by writing a suitable word in each space.
When an apple falls from a tree, because of acceleration due to Earth's **a.** _____, the apple accelerates at approximately 10 **b.** _____ per second, every **c.** _____.
- On the surface of the earth, weight = mass \times 10. Calculate the weight of a:
 - 105 kg rugby player _____
 - 50 kg sack of potatoes _____
 - 500 g block of cheese _____
- State the force in newtons measured on each spring balance below:



Thinking

- Acceleration due to gravity on a planet in a far distant galaxy is 30 m s^{-2} .
 - Calculate the *weight* of a rocket, of mass 900 kg, as it lands on the faraway planet.

 - The planet has the same diameter as the Earth. State whether the planet's mass would be the same, or greater, or less, than that of Earth.

- When the same force is used to accelerate two different masses, what would doubling the mass do to the acceleration?

Contributing

In some sports, the reduction of mass is important to achieve great speed. In other sports, increased force is used to get greater speed. Name two sports that use either or both of these ideas.

Answers (except for 'Contributing') are provided on page 305 of *ESA Study Guide Year 10 Science*

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Chapter 6: Forces Friction

Questions from page 100 of *ESA Study Guide Year 10 Science*

Understanding

1. What is the relationship between friction and movement?

2. Explain the effect of friction force in each of the following examples:
 - a. A car's brakes are applied going down a hill.

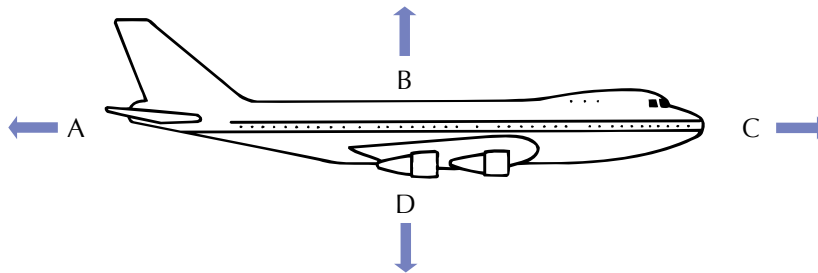
 - b. A runner's sports shoes have spikes on the soles.

 - c. A nail being hammered into wood gets hot.

3. Explain why it is more difficult to walk on ice than on a concrete path.

Thinking

1. The following diagram shows the four main forces acting on a plane as it travels at a steady speed.



- a. Give the letter of the force arrow that represents:
 - i. Driving force of the engine. _____
 - ii. Friction force. _____
 - iii. Weight of the plane. _____
 - iv. Support force of the air on the plane. _____
- b. Force A is measured at 1 million N. What is the size of force C? Give a reason for your answer.

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2. What are three ways friction forces are reduced in everyday life?

Contributing

Four forces act on a person riding a bike: weight, support, friction and push. Design a bike that is both speedy and safe (think about air resistance and friction). Draw a labelled diagram to point out the special features of the bike you design.



Answers (except for 'Contributing') are provided on pages 305 and 306 of *ESA Study Guide Year 10 Science*