Forces and Proportional Relations: Problem Set 3

Please answer as many of the problems in this booklet as you can.

Please use CAPITAL letters

FIRST NAME

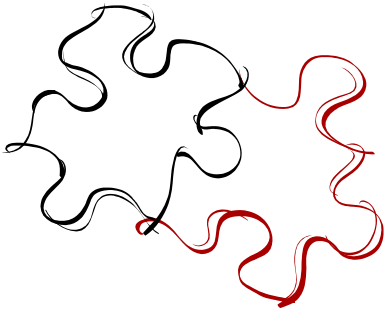
LAST NAME

SCHOOL

CLASS

DATE ____ /____ /____

Quiz



Tick ✓ the box that you think presents the correct information for each of items 1 to 6 below.

1. An example of a balanced force is

- ☐ a car sliding to a halt
- ☐ a tug-of-war game in which no one wins
- ☐ a roller coaster accelerating down the first drop

2. What is the weight of a 20 kg box on the Earth?

- ☐ 2 N
- ☐ 20 N
- ☐ 200 N

3. Bungee ropes are made up of several cords sheathed together.

   The stretch of the bungee rope will be *shortest* if you

- ☐ double the number of sheathed cords and double the person's weight
- ☐ halve the number of sheathed cords and double the person's weight
- ☐ double the number of sheathed cords and halve the person's weight

4. Adding tap water to salt water

   ☐ increases the density of the solution

   ☐ decreases the density of the solution

   ☐ does not affect the density of the solution

5. Which of the following is an example of increasing friction intentionally?

   ☐ waxing skis

   ☐ adding grease to gears on a bike

   ☐ throwing sand on an icy driveway

6. *Stopping distance* when driving depends on:

   - *Thinking distance* - the distance covered between deciding to stop and pushing the brakes
   - *Braking distance* - the distance covered between pushing the brakes and stopping

   The proportion of total stopping distance accounted for by *braking distance*

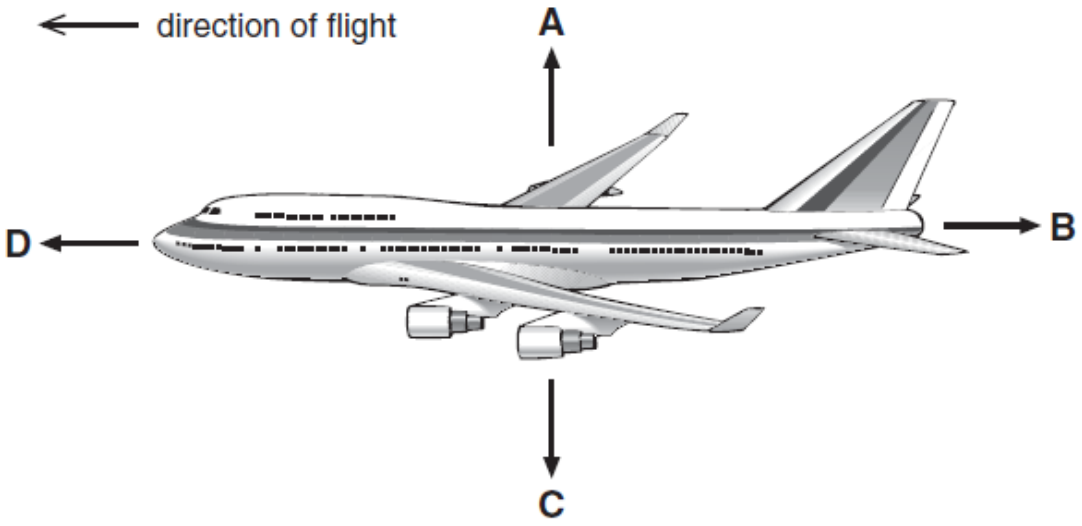
   ☐ is higher at low speeds than high speeds

   ☐ is higher at high speeds than low speeds

   ☐ stays the same at all speeds

Aeroplane

The diagram shows four forces acting on a plane in flight.



(a) Which arrow represents air resistance? Give the letter.

_____

(b) When the plane is flying at a constant height, which <u>two</u> forces must be balanced? Give the letters.

_____ and _____

(c) When the plane is flying at a constant speed in the direction shown, which <u>two</u> forces must be balanced? Give the letters.

_____ and _____

(d) Just before take-off, the plane is speeding up along the ground. Which statement is true? Tick ✓ the correct box.

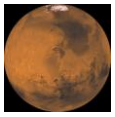
- ☐ Force B is zero
- ☐ Force B is greater than force D
- ☐ Force D is equal to force B
- ☐ Force D is greater than force B

(e) Which statement is true about the plane just as it leaves the ground? Tick ✓ the correct box.

- ☐ Force C is zero
- ☐ Force A is greater than force C
- ☐ Force A is equal to force C
- ☐ Force C is greater than force A

Planets

(a) Think about the weight of the following masses on Earth and Mars. Fill in the missing number in the table.

Mass	 Weight on Earth	 Weight on Mars
5 kg	50 N	20 N
11 kg	110 N	

(b) Why is a 5 kg mass heavier on Earth than Mars?

_____

_____

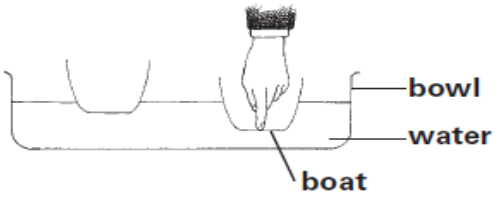
(c) How much does an astronaut of 80 kg weigh in deep space?

_____

Boats

(a) Mike puts two boats in a bowl of water. They float on the water.

Mike pushes down on one of the boats with his finger.



Tick ✓ **ONE** box to show what Mike can feel as he pushes down.

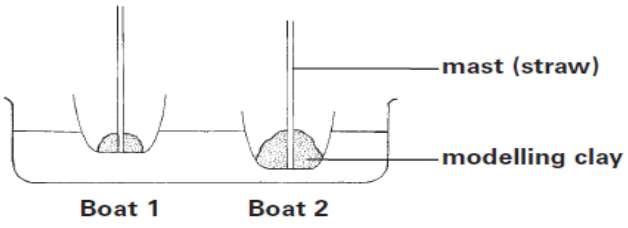
☐ The force from the water pushing the boat up

☐ The force from the air pushing the boat up

☐ The force from the water pushing the boat down

☐ The force from the air pushing the boat down

(b) Mike makes masts for the boats with straws. He attaches the masts to the boats using modelling clay.



Explain why Boat 2 floats lower in the water than Boat 1.

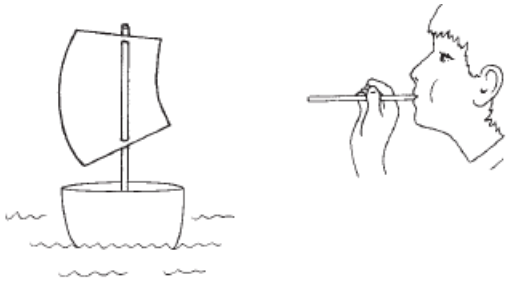
_____

_____

_____

(c) Mike makes sails for the boats out of paper. He blows once into a straw to move one of the boats along.

Draw an arrow on the picture to show the direction of the force pushing the boat along.



(d) What is the name of the force that will slow the boat down?

_____

Stopping distance

Stopping distance when driving depends on:

- *Thinking distance* - the distance covered between deciding to stop and pushing the brakes
- *Braking distance* - the distance covered between pushing the brakes and stopping

The thinking distance is directly related to the speed at which a person is driving.

This table shows some of the stopping distances that appear in the Highway Code for three different speeds.

Fill in the empty boxes in this table.

Speed	30 mph	35 mph	40 mph
Thinking Distance (metres)	9		12
Braking Distance (metres)	14		
Overall Stopping Distance (metres)	23	29	36

Name two factors that influence actual stopping distance and explain how they affect the actual stopping distance.

i) _____

_____

ii) _____

_____

WELL DONE –
NOW YOU'VE FINISHED

