Name		Teacher		TG	

Year 7 Science
Independent Learning Booklet

Homework	Set	Due wb	Booklet	Seneca	Parent	Teacher
1	19/02/24	26/02/24				
2	26/02/24	4/03/24				
3	4/03/24	11/04/24				
4	11/04/24	18/04/24				
5	18/04/24	25/04/24				

Please sign to show you have checked the work

Please note

All Seneca work must be completed by the Monday wb date

All booklet work must be completed by the first lesson in this subject of the week

Seneca Learning

- Seneca Learning should be completed by the Monday of each week
- It will either be revising key content that they have covered, pre-learning new content for their subject or extending their learning beyond what we can cover in lessons
- Students should complete as much as they can
- Students who complete the Seneca work will receive praise postcards
- Students who do not complete any Seneca work will receive homework interventions

How to logon to Seneca Learning

Go to www.senecalearning.com
Click on Login
Enter your school email
(username@student.foresthillschool.co.uk)
Enter the password **seneca2020**

If the password does not work reset your password using the Forgotten Password link

If it still does not work email
passwords@foresthillschool.co.uk

ASPIRING TO EXCELLENCE TOGETHER

HARD WORK AMBITION RESPECT KINDNESS

Year 7 Physics – Forces

By the end of this topic you should be able to:

Describe what is meant by 'non-contact' and 'contact' forces and label them appropriately		
Draw force arrows to show the size and direction that a force acts in		
Describe what happens to stationary and moving objects when forces are balanced or unbalanced		
Use the equation weight = mass x gravitational strength		
Explain why weight can vary, but mass does not change		
Explain how gravitational field strength can vary in different parts of the solar system		
Explain the effects of friction, air resistance and water resistance on the speed of an object		
Use the equation pressure = force ÷ area		
Explain why pressure is high or low in given situations		
Choose an appropriate graph to display results		
Use the speed = distance/time equation		
Describe what is meant by relative motion		
Describe what is shown by a distance-time graph		

Year 7 - Forces Knowledge organiser

Key Terms	Definitions
Newton	The unit of force
Newton meter	A piece of equipment that can be used to measure the size of the force
Contact Force	A force caused by the contact between two objects
Non Contact Force	A force between two bodies that are not in contact for example gravity
Free body force diagram	A diagram which shows all the forces acting on an object

Measuring the size of forces

To measure the size of frictional forces on different surfaces you can drag some masses along the different surfaces and record how much force is required.

For this experiment :

- Independent variable: Surface
- Dependent variable: Force
- Control variable: Mass

Types of force

In the table below different forces are summarised:

Name of Force	What causes it?	Example
Friction	When two objects rub together	Car tyres moving on a road.
Air resistance	When an object rubs against air particles	A sky diver falling through the air
Reaction	A force that acts in the opposite direction	A book on a desk, the force acting up is a reaction force
Weight	The force an object exerts on the ground due to gravity	You will exert a force on the ground, that is your weight
Thrust	The force that drives on objects with an engine	Thrust moves a plane forwards

A force can be a **push or a pull**, for example when you open a door you can either push it or pull it. You can not see forces, you can only see what they do.

When a force is applied to an object it can lead to a change in the objects

- **Speed**
- **Direction of movement**
- **Shape (think about a rubber band)**

Forces can also be divided into 2 types, contact forces and non contact forces.

1. Contact forces for example friction, are caused when two objects are in contact.
2. Other forces for example gravity, are non contact forces. The two objects do not need to be in contact for the force to occur.

Gravitational forces

People often confuse mass and weight. Remember that weight is a force that acts upon a mass, and is measured in newtons, N. Mass is measured in kilograms, kg.

Mass

The mass of an object is the amount of matter or 'stuff' it contains. The more matter an object contains, the greater its mass. An elephant contains more matter than a mouse, so it has a greater mass.

Mass is measured in kilograms, kg. A 100 kg object has a greater mass than a 5 kg object. An object's mass stays the same wherever it is. So a 5 kg mass on Earth has a 5 kg mass on the Moon.

The force of gravity

Gravity is a force that attracts objects towards each other. Gravity only becomes noticeable when there is a really massive object like a moon, planet or star. We are pulled down towards the ground because of gravity. The gravitational force pulls in the direction towards the centre of any object. So we are pulled towards the centre of the Earth.

Unbalanced Forces

If the forces are unbalanced on an object there are two things that could happen:

1. If the object is stationary then it will move in the direction of the resultant force
2. If the object is moving, then the object will speed up or slow down in the direction of the resultant force.

For example, what is the resultant force on the lorry below?

100N-60N= 40N (to the right)

Remember the resultant force does not tell you what direction the lorry is moving in.

- If the resultant force is in the same direction as the movement of the lorry then the lorry will speed up
- If it is in the opposite direction the lorry will slow down

The larger the resultant force the larger the change in movement.

Weight on different Planets

As planets have different masses a person's weight would be different depending which planet they were on. For example, a person's weight on Earth is 1000N. If that same person was on Jupiter their weight would be 2500N.

Speed

The speed of an object tells you how long it takes an object to cover a distance. **The unit for speed is m/s** (metres per second).

Speed is calculated by **dividing distance by the time** (see equation in the box).

If the speed of an object is increasing, then it is **accelerating.** If the speed is decreasing it is **decelerating.**

Acceleration and Deceleration

When an object is accelerating, the distance time graph will **curve upwards.**

When an object is slowing down an object will **curve towards the horizontal.**

Acceleration

Deceleration

Key Terms	Definitions
speed	How fast an object is moving, regardless of direction
velocity	How fast an object is moving, taking direction into account as well
Gradient	How steep the line on a graph is.
Stationary	Not moving
x axis	The horizontal axis on a graph
y axis	The vertical axis graph
Acceleration	Speed of an object is increasing
Deceleration	Speed of an object is decreasing

Equation	Meanings of terms in equation
$* s = \frac{d}{t}$	*s = speed* (m/s) *d = distance* (m) *t = time* (s)

Balanced Forces

When we talk about the total force acting on object we call this the **resultant force.** When the forces acting in opposite directions are the same size we say the forces are **balanced.** This means one of two things:

1. The object is stationary (not moving)
2. The object is moving at a constant speed

This is known as Newton's first law.

For example, the resultant force acting on this object is 5N-5N=0N

4

$$speed = \frac{distance}{time}$$

Interpreting Distance-time graphs

- A straight diagonal line of a distance-time graph shows that the object is travelling at a steady/constant speed.
- A straight horizontal line on a distance-time graph shows that the object is not moving (stationary)
- If a curved line were to appear on a distance-time graph (orange line) this shows the object is accelerating.

Distance-time graphs

A distance-time graph shows how far an object has moved from its starting point over time.

Distance travelled is always plotted on the y-axis (vertical)
Time taken is always plotted on the x-axis (horizontal)

You can find the speed of an object from a distance-time graph by finding the gradient of the graph. This is the 'steepness' of the line.

Gradient = Change in y-axis ÷ Change in x-axis

Using the graph opposite we can find the speed of the object represented by the green line between 6 and 10 seconds by:

Gradient = Change in y-axis ÷ Change in x-axis
= (7-6) ÷ (10-6)
= 1 ÷ 4
= 0.25m/s

We can also find the average speed of the green object by drawing a line from the start of its motion to the end of its motion. This is shown opposite by the blue line and how to find the average speed is shown below.

Gradient = Change in y-axis ÷ Change in x-axis
= (7-0) ÷ (10-0)
= 7 ÷ 10
= 0.7m/s

Homework 1

Force Diagrams

The forces acting on an object can be represented using arrows. Force arrows point in the direction the force acts in. The length of the arrow represents the size of the force.

The arrows must touch the object in the diagram.

If an object is stationary, or moving at a constant speed, the forces on it are balanced. Balanced forces act in opposite directions and are the same size. The forces in the diagram below are balanced.

The upwards arrow represents the **reaction** force.
This is the force of the table supporting the box.

The downwards arrow represents the gravitational force acting on the box, also known as **weight.**
This is the force of the Earth acting on the box.

If forces acting on an object are unbalanced, the object will be accelerating or slowing down.

If an object is speeding up, the forward arrow will be larger.

If an object is slowing down, the backward arrow will be larger.

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~~On a sheet of paper, draw the diagrams below and~~ add force arrows to each diagram. Label the arrows with the force and add descriptions in the fields below that say whether the forces are balanced or unbalanced.

A person sitting on a chair.

An apple hanging on a tree.

A ball accelerating downwards.

A car travelling at a constant speed.

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Homework 2

Mass and Weight

Mass is the amount of matter an object is made up of, measured in kilograms (kg).

Mass is not affected by gravitational field strength so the value of mass will stay the same when the location of the object changes.

Weight is the total amount of force acting on an object due to gravity, measured in newtons (N)

Weight depends on the gravitational field strength acting on the object so if the location of an object changes, then its weight may change.

1. Of the planets in our Solar System, Mercury has the smallest mass and Jupiter has the largest mass.

Explain how the mass and weight of an object would be different on Jupiter compared to on Mercury.

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To calculate weight, we use the equation:

weight = mass × gravitational field strength

An object on Earth has a mass of 5kg. The gravitational field strength on Earth is 10N/kg.

weight = mass × gravitational field strength

weight = 5kg × 10N/kg

weight = 50N

2. An object on the Moon has a mass of 0.6kg. The gravitational field strength on the Moon is 1.6N/kg.

Calculate the weight of the object.

weight =

3. An object on Jupiter has a mass of 3.4kg. The gravitational field strength on Jupiter is 25N/kg.

Calculate the weight of the object.

weight =

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Homework 3 Science Mastery
Quiz 4 Forces and their Effects

1. Name the forces on this picture. [2]

2. Name the force that stops a boat sinking. _____ [1]
3. Name the force found when two objects rub together. _____[1]
4. Label each of the pictures to say if the forces on these objects are balanced or unbalanced. [1.5]

5. Draw an arrow on each of these diagrams to show the direction that they will accelerate in. [1.5]

6. Explain the difference between contact and non-contact forces. [1]

_____

_____

7. Explain the difference between mass and weight. [1]

_____

_____

8. Explain how to calculate weight. [1] _____

SELF ASSESSMENT: **Marks out of 10:**_____

WWW:

EBI:

10

Homework 4

Speed, Distance and Time

1. Work out the speed of a car travelling:
a. 100m in 10s
b. 300m in 20s
c. 700m in 35s
d. 1000m in 200s

2. How far does a lorry move if it's travelling at:
a. 10m/s for 30s
b. 20m/s for 20s
c. 2m/s for 100s
d. 15m/s for 28s

3. How long does it take a car to travel:
a. 10m at 20m/s
b. 50m at 10m/s
c. 200m at 8m/s
d. 50km at 100km/h

4. Car A travels 100m in 5 seconds. If car B travels the same distance in 2 seconds, which one is travelling at the faster speed? Explain your answer.

5. Look at the table below, showing the time taken to travel a distance of 100m by 5 different pupils in a year 11 class:

Name	Time taken (s)
Jenny	15
Ahmed	12
Kevin	13
Julia	12
Louise	16

a. Who travelled at the fastest speed?
b. Who travelled at the slowest speed?

Homework 5 - Year 7 Forces Revision Quiz

What do we say about forces when they have the same size but act in opposite directions?	
If forces are unbalanced, what might happen to an object?	
What is the difference between mass and weight?	
What is the equation for calculating weight?	
Calculate the weight of a 60kg astronaut on the Mars, where the gravitational field strength is 3.7N/kg.	
Why would you weigh more on Jupiter than Earth?	
Which force tries to stop objects moving through air?	
Which force tries to stop objects moving along the surface of water?	
Which force opposes weight to make an object float?	
Which force tries to stop an object moving along a solid surface?	
Which force opposes weight to stop an object moving through a solid surface?	
What is the equation for pressure?	
Calculate the pressure of a shoe with an area of $0.03m^2$ and a force of 1800N.	
Which is higher pressure, $1N/cm^2$ or $1N/m^2$? Explain your answer	
What is the equation for speed?	
A bike travels 200 metres in 10 seconds. Calculate the speed.	
If you were travelling in a car that was travelling at 20 mph along the carriages of a train which was travelling in the same direction at 50 mph, what would be their relative speed?	

What does a flat horizonal line on a distance-time graph tell us about the speed of the object?	
How does a distance-time graph show us whether an object is moving forwards or backwards?	
What information does the gradient of a line on a distance-time graph give us?	

Label the arrows with the names of the forces, describe whether the forces are balanced or unbalanced, state whether the object will accelerate, decelerate or stay at a constant speed and calculate the size of the resultant force.