a

Explain the difference between a vector and a scalar quantity.

Place a tick in the correct column to show whether the following are vector or scalar quantities.

Quantity	Vector	Scalar
Force		
Speed		
Distance		
Velocity		
Displacement		

b

Forces can be contact or non-contact. Provide two examples for each one.

Contact:

Non-contact:

c

Explain the difference between mass and weight.

Mass:

Weight:

Unit of mass: _____

Unit of weight: _____

Name the apparatus used to determine an objects weight.

d

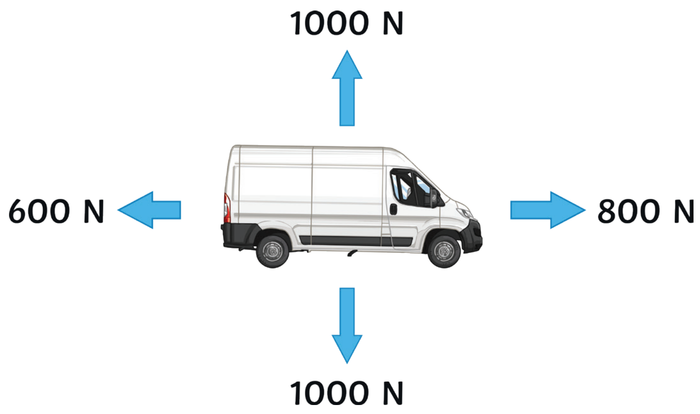
State the equation that can be used to determine the weight of an object.

Calculate the weight of an object on the moon if its mass is 3kg. The gravitational field strength on the moon is 1.6N/kg.

Explain the effect on an object's weight if its mass was doubled.

e

Calculate the resultant forces acting on the van below.



Horizontal force:

Vertical force:

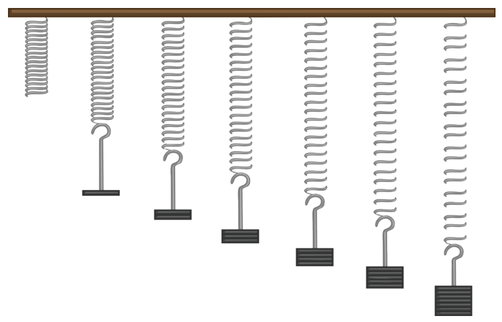
On a force diagram, what two things do the arrows show?

f

Complete the sentences below.

Elastic deformation occurs when a force has been applied to a spring and it ___________ to its original shape. ___________ _____________ occurs when the spring does not return to its original shape.

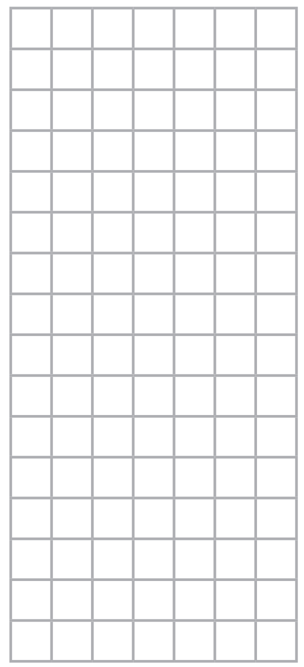
g



Students placed masses, one at a time, on a spring and measured its extension. They collected the following results.

Force (N)	0	1	2	3	4	5
Length of Spring (cm)	3	5	7	9	11	17
Extension (cm)	0	2	4	6	8	14

Plot a force/extension graph for the data shown above. Remember to include a line of best fit.



Mark the limit of proportionality on your graph.

State the equation that links force, spring constant and extension.

a

Define work done.

State the equation that links work done, force and distance.

Write the units for...

work done: __________

force: __________

distance: __________

A lorry travels 200m when the brakes are applied with a force of 600N. Calculate the work done to stop the lorry.

Calculate the force if 3000J of energy is required to move a box of books a distance of 150cm.

b

Draw lines to match the methods of transportation with their average speeds.

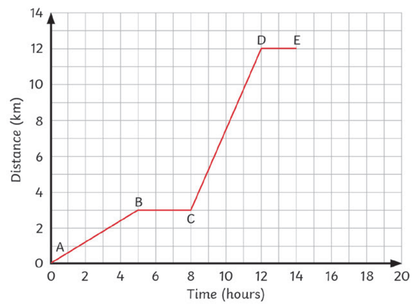
car	1.5m/s
walking	55m/s
train	3m/s
running	25m/s

State three factors that could affect a person's walking speed.

1. ____________________
2. ____________________
3. ____________________

c

The graph below is a distance/time graph of a person travelling from home to the supermarket and home again.



Where on the graph is the person stationary?

Between points A and E, where is the speed the fastest? Explain you answer.

A car increases its velocity from 5m/s to 12m/s in a time of 10 seconds. Calculate its acceleration. Remember to include all units.

d

Explain the term deceleration.

A coach travels at an average speed of 30mph for 20 minutes. How far has it travelled in that time?

e

Stopping distance is calculated by adding thinking distance and braking distance.

Thinking distance is affected by:

s________;

r________ t________.

Braking distance is affected by:

t________;

r________ conditions.

f

Let the mass of a car be 1500kg. One car is travelling at a speed of 20m/s and a second car is travelling at 15m/s. Calculate the forces exerted if they were to hit an object.

g

Describe an experiment to determine whether your reaction time is faster with your right or left hand.

h

Describe the effect of friction on a moving object.

State two ways in which friction on a moving object can be overcome.

i

What is terminal velocity?

j

Explain the term conservation of momentum.

State the equation and the units used to calculate momentum.

A car has a mass of 1500kg and a momentum of 7500kg m/s. Calculate its velocity.

k

State the equation that links force, mass and acceleration.

Rearrange the equation you have given above to calculate acceleration.

Calculate the force acting on an object with a mass of 15kg and acceleration of $4m/s^2$.

Calculate the mass of an object, if it has a force of 2000N and its acceleration is $50m/s^2$.

l

When an object moves in a circular motion, explain what happens to its direction and velocity if its speed remains constant.

a

Explain the difference between a vector and a scalar quantity.
A vector quantity has a magnitude and a direction whereas a scalar quantity only has a magnitude.

Place a tick in the correct column to show whether the following are vector or scalar quantities.

Quantity	Vector	Scalar
Force	✓	
Speed		✓
Distance		✓
Velocity	✓	
Displacement	✓	

b

Forces can be contact or non-contact. Provide two examples for each one.

Contact:
friction, air resistance, tension, normal

Non-contact:
magnetic, gravitational, electrostatic

c

Explain the difference between mass and weight.

Mass: **the amount of matter in an object.**

Weight: **the force acting on an object due to gravity.**

Unit of mass: **kilograms (kg)**

Unit of weight: **newtons (N)**

Name the apparatus used to determine an objects weight.
newton meter

d

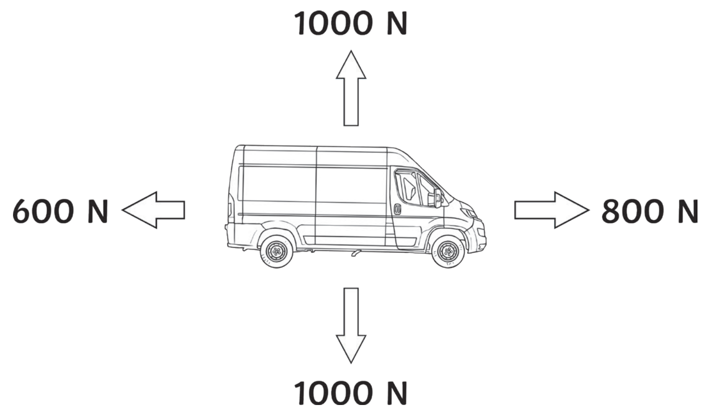
State the equation that can be used to determine the weight of an object.
weight = mass × gravitational field strength

Calculate the weight of an object on the moon if its mass is 3kg. The gravitational field strength on the moon is 1.6N/kg.
weight = 3 × 1.6
= 4.8N

Explain the effect on an object's weight if its mass was doubled.
The weight would also be doubled.

e

Calculate the resultant forces acting on the van below.



Horizontal force: **800 – 600 = 200N**

Vertical force: **1000 – 1000 = 0N**

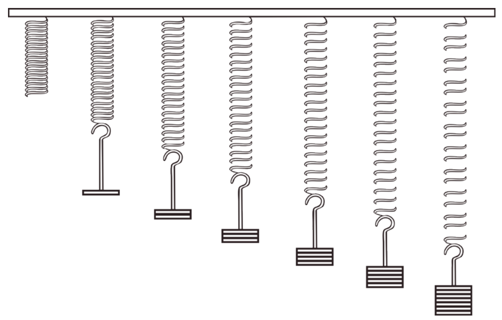
On a force diagram, what two things do the arrows show?
Direction of force and relative size.

f

Complete the sentences below.

Elastic deformation occurs when a force has been applied to a spring and it **returns** to its original shape. **Inelastic deformation** occurs when the spring does not return to its original shape.

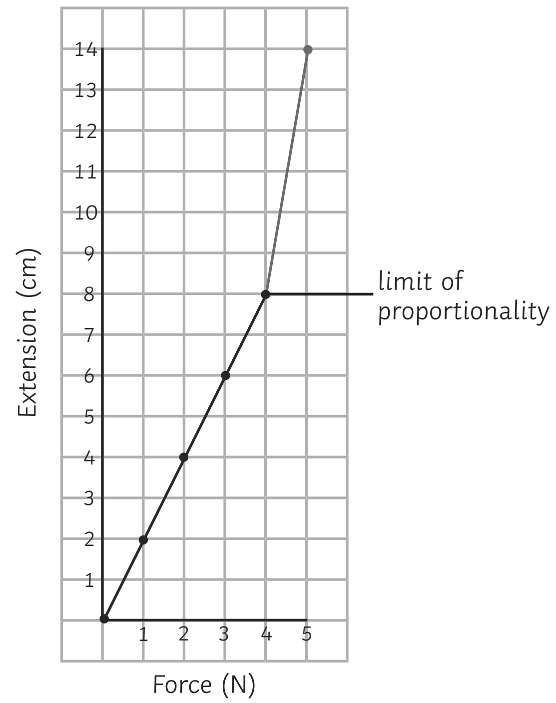
g



Students placed masses, one at a time, on a spring and measured its extension. They collected the following results.

Force (N)	0	1	2	3	4	5
Length of Spring (cm)	3	5	7	9	11	17
Extension (cm)	0	2	4	6	8	14

Plot a force/extension graph for the data shown above. Remember to include a line of best fit.



Mark the limit of proportionality on your graph.

State the equation that links force, spring constant and extension.

force = spring constant × extension

a

Define work done.
This occurs when a force moves an object for a distance.

State the equation that links work done, force and distance.
work done = force × distance

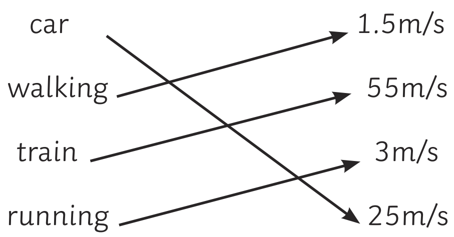
Write the units for...
work done: **joules (J)**
force: **newtons (N)**
distance: **metres (m)**

A lorry travels 200m when the brakes are applied with a force of 600N. Calculate the work done to stop the lorry.
work done = force × distance
= 600 × 200
= 120 000J

Calculate the force if 3000J of energy is required to move a box of books a distance of 150cm.
Convert cm to m: 150cm = 1.5m
Rearrange formula:
force = work done ÷ distance
= 3000 ÷ 1.5
= 2000N

b

Draw lines to match the methods of transportation with their average speeds.

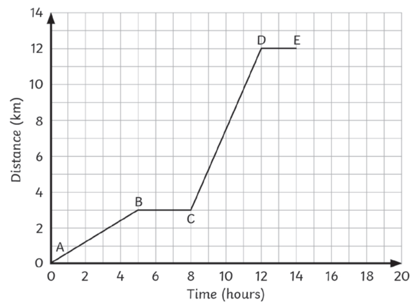


State three factors that could affect a person's walking speed.

1. **age**
2. **fitness**
3. **terrain**

c

The graph below is a distance/time graph of a person travelling from home to the supermarket and home again.



Where on the graph is the person stationary?
B-C and D-E

Between points A and E, where is the speed the fastest? Explain you answer.
C-D because it is the steepest part of the graph.

A car increases its velocity from 5m/s to 12m/s in a time of 10 seconds. Calculate its acceleration. Remember to include all units.
acceleration = change in velocity ÷ time
= (12 – 5) ÷ 10
= 7 ÷ 10
= 0.7m/s

d

Explain the term deceleration.
Negative acceleration, when something is slowing down.

A coach travels at an average speed of 30mph for 20 minutes. How far has it travelled in that time?
10 miles

e

Stopping distance is calculated by adding thinking distance and braking distance.
Thinking distance is affected by:
s**peed**;
r**eaction** t**ime**.

Braking distance is affected by:
t**yres**;
r**oad** conditions.

f

Let the mass of a car be 1500kg. One car is travelling at a speed of 20m/s and a second car is travelling at 15m/s. Calculate the forces exerted if they were to hit an object.
force = mass × acceleration

20 × 1500	**15 × 1500**
30 000N	**22 500N**

g

Describe an experiment to determine whether your reaction time is faster with your right or left hand.
Work with a partner.
Person A places their forearm on the table so that their right hand is hanging over the edge of the table.
Person B places a ruler vertically between Person A's thumb and first finger, with the 0cm end of the ruler pointing downwards. The thumb and first finger should be as far apart as possible.
Person B should place the 0cm mark level with the top of Person A's thumb and drop the ruler without telling them.
Person A catches the ruler as quickly as possible.
Reading from the top of the thumb, record how many cms it took to catch.
Repeat 9 more times with the right hand.
Repeat experiment with the left hand.

h

Describe the effect of friction on a moving object.
It slows it down.

State two ways in which friction on a moving object can be overcome.
Using a lubricant.
Make the object more streamlined.
Smoother surfaces.

i

What is terminal velocity?
When the resultant force on an object is zero, so the object falls at a steady speed.

j

Explain the term conservation of momentum.
In a closed system, the total momentum before an event is equal to the total momentum after the event.

State the equation and the units used to calculate momentum.
momentum (kg m/s) = mass (kg) × velocity (m/s)

A car has a mass of 1500kg and a momentum of 7500kgm/s. Calculate its velocity.
Rearrange formula:
7500 ÷ 1500 = 5m/s

k

State the equation that links force, mass and acceleration.
force = mass × acceleration

Rearrange the equation you have given above to calculate acceleration.
acceleration = force ÷ mass

Calculate the force acting on an object with a mass of 15kg and acceleration of 4m/s^2.
F = ma
15 × 4
60N

Calculate the mass of an object, if it has a force of 2000N and its acceleration is 50m/s^2.
mass = force ÷ acceleration
= 2000 ÷ 50
= 40kg

l

When an object moves in a circular motion, explain what happens to its direction and velocity if its speed remains constant.
Its direction and velocity will be continually changing.