

Paper 2

Chapter 5 — Forces A

Contact or Non-contact

friction, air resistance,
tension, electrostatic force,
normal contact force,
gravitational force,
magnetic force

Write the Definitions

Scalar

Vector

Contact Force

Non-contact force

Centre of Mass

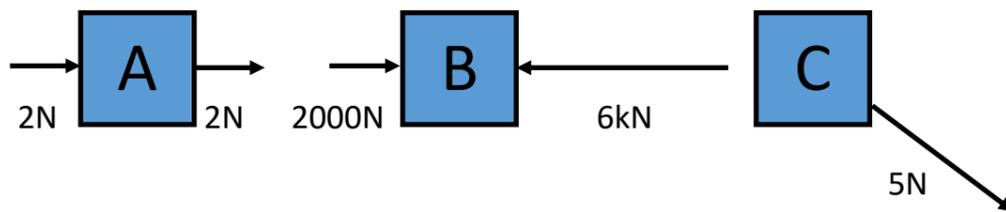
Resultant Force

Limit of proportionality

Vectors

How can you represent a vector on a diagram?

Resultant Force



Calculate the resultant forces on box A and B **HT** Resolve the force into 1 horizontal and 1 vertical force for box C

Calculation Practice

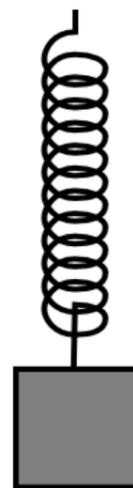
Use the equation to calculate the elastic energy in the spring

elastic potential energy = $0.5 \times \text{spring constant} \times \text{extension}^2$

Spring normal length is 50cm

Spring with mass length 100cm

Spring constant 16N/m



Elastic potential energy in the spring ____ ()

Practice Equation

What does 2kg weigh? (Gravitational field strength = 9.8 N/kg)

Weight = ____ ()

Practice Equation

What is the work done if a 5kN force is used to push a box 200cm?

Work done = ____ ()

Required Practical

How would you investigate the effect of a force on the extension of a spring?
Draw a diagram of equipment. Draw a sketch graph of the results
Words to include, newton, extension, mass, force, limit of proportionality

Forces

A number of forces acting on an object may be replaced by a single force that has the s____e____ as all the original forces acting together.

This single force is called the r____f____.

Practice Equation

What is the extension on a spring if it has a spring constant of 10N/m and is stretched by a 5N force?

Extension = ____ ()

Complete the Equations

(include units)

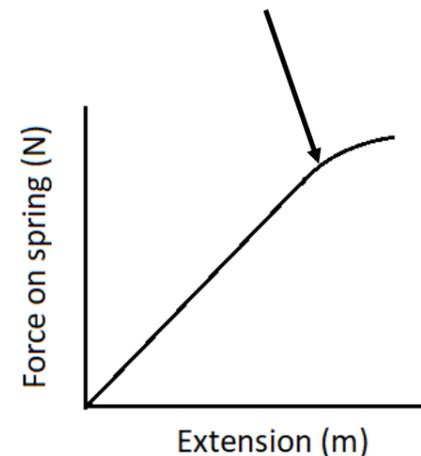
Weight (N) =

Work done (J) =

Force on a spring (N) =

Springs

What is happening here?



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Contact or Non-contact

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Write the Definitions

Scalar **A quantity that has magnitude only**

Vector **A quantity that has direction and magnitude**

Contact Force **A force where objects need to touch**

Non-contact force **A force that does not need contact**

Centre of Mass **A single point where the weight can be assumed to act**

Resultant Force **1 force which has the same effect as many**

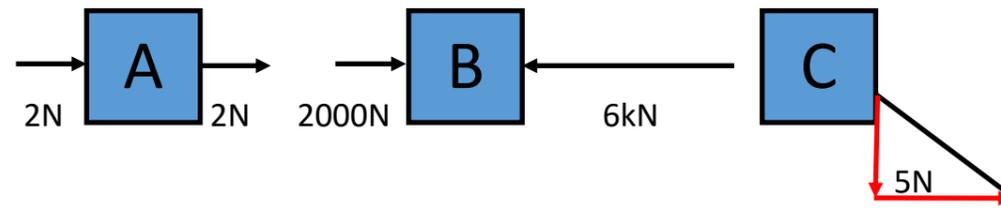
Limit of proportionality **The point where spring extension is no longer proportional to force**

Vectors

How can you represent a vector on a diagram? **Draw an arrow**



Resultant Force



Calculate the resultant forces on boxes A and B **HT** Resolve the force into 1 horizontal and 1 vertical force for box C

4N Right **4000N Left**

3N Down and 4N Right

Calculation Practice

Use the equation to calculate the elastic energy in the spring

$$\text{elastic potential energy} = 0.5 \times \text{spring constant} \times \text{extension}^2$$

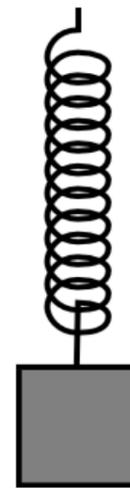
Spring normal length is 50cm

Spring with mass length 100cm

Spring constant 16N/m

$$0.5 \times 16 \times 0.5 \times 0.5 = 2$$

Elastic potential energy in the spring = **2J**



Practice Equation

What does 2kg weigh? (Gravitational field strength = 9.8 N/kg)

$$\text{Weight} = \text{Mass} \times \text{G.F.S}$$

$$= 2 \times 9.8$$

$$= 19.6$$

Weight = **19.6 N**

Practice Equation

What is the work done if a 5kN force is used to push a box 200cm?

$$\text{Work} = \text{Force} \times \text{Distance}$$

$$= 5000\text{N} \times 2\text{m}$$

$$= 10,000$$

Work done = **10,000 J**

Required Practical

How would you investigate the effect of a force on the extension of a spring?

Draw a diagram of equipment. Draw a sketch graph of the results

Words to include, newton, extension, mass, force, limit of proportionality

Extension of a spring is the difference between unstretched spring and stretched spring in metres.

Plot force against extension



Forces

A number of forces acting on an object may be replaced by a single force that has the **same effect** as all the original forces acting together.

This single force is called the **resultant force**.

Practice Equation

What is the extension on a spring if it has a spring constant of 10N/m and is stretched by a 5N force?

$$\text{Force} = \text{Spring Constant} \times \text{Extension}$$

$$5\text{N} = 10\text{N/m} \times \text{Extension}$$

$$5/10 = \text{Extension}$$

$$= 0.5$$

Extension = **0.5m**

Complete the Equations

(include units)

Weight (N) = **mass (kg) x gravitational field strength (N/kg)**

Work done (J) = **Force (N) x Distance (m)**

Force on a spring (N) = **Spring Constant (N/m) x Extension (m)**

Springs

What is happening here? **Spring reaches limit of proportionality**

