

Year 9

Physics booklet

Topic 1 - forces

Name: _____

Forces

Give a definition for each of these key words:

Force	
Balanced	
Unbalanced	
Resultant force	
Scalar	
Vector	
Moment	
Pivot	
Plumb line	
Centre of mass	
Stability	

Draw lines to join the type of force on the left to the definition on the right.

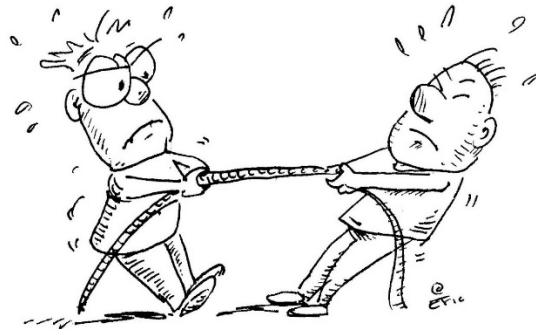
THRUST	This is a force caused by gravity. It is the gravitational force between an object and the Earth. It is not the same as mass and varies depending on where you are in the Universe.
LIFT	This is a force which acts in the air. It can slow objects down when they are moving against it, or can be harnessed and used to move an object along, for example in windsurfing.
AIR RESISTANCE	This is the force required to raise an object through a fluid.
FRICTION	This is an attractive force that pulls objects towards each other. The size of this force varies depending where you are in the Universe.
GRAVITY	This is an upward force that acts in water. It acts against gravity and is why certain objects float.
UPTHRUST	This force acts on objects when they are in contact with a substance, such as the ground. The smoother the two surfaces are, the less friction there will be.
WEIGHT	This can be any driving force. It can be a push or a pull or even an engine that forces an object FORWARDS.

We can show the **forces acting on an object** using a force diagram. In a force diagram, each force is shown as a force arrow. An arrow shows:

- the size of the force (the longer the arrow, the bigger the force)
- the direction in which the force acts.

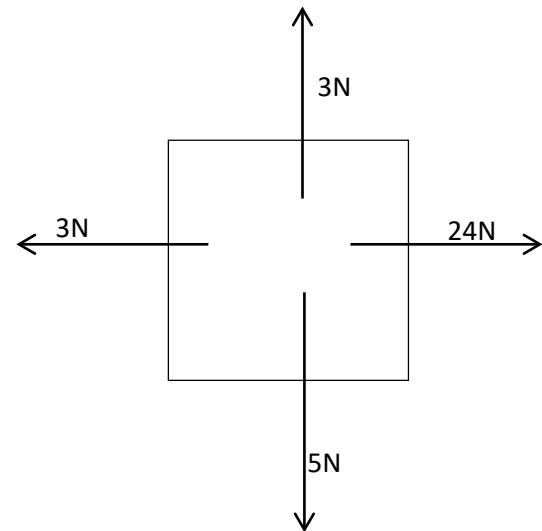
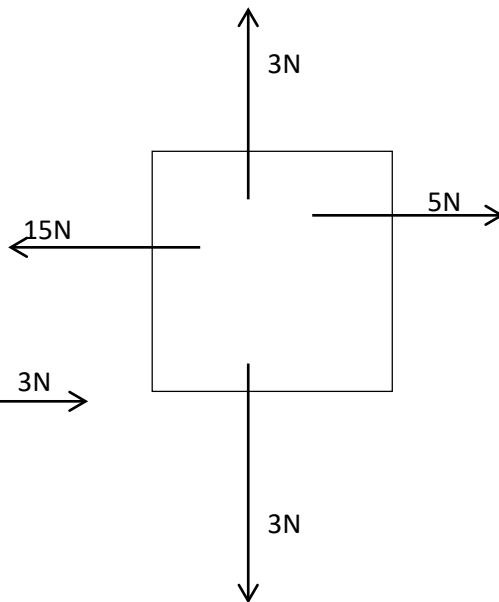
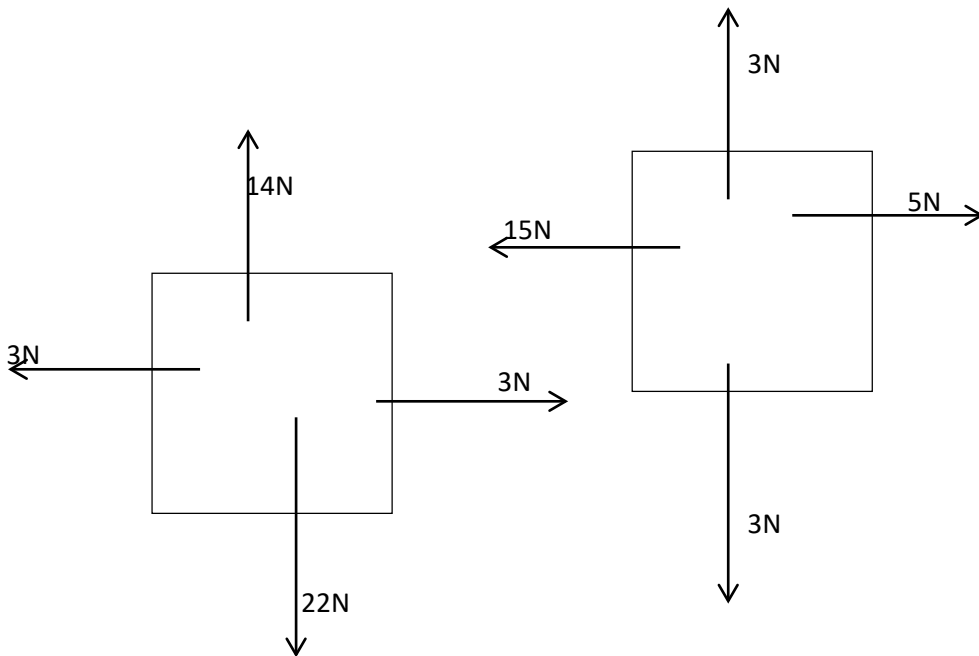
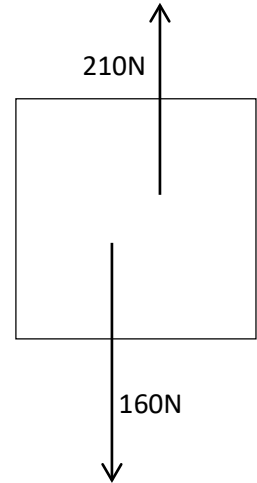
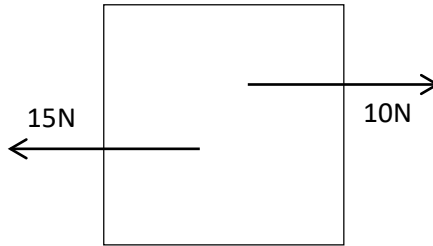
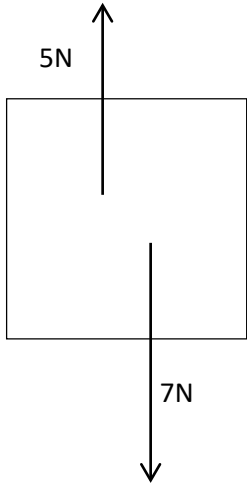
The arrow is usually labelled with the name of the force and its size in Newtons.

Add force arrows to the following diagrams:



RESULTANT FORCES

Draw the resultant forces on the diagrams below.



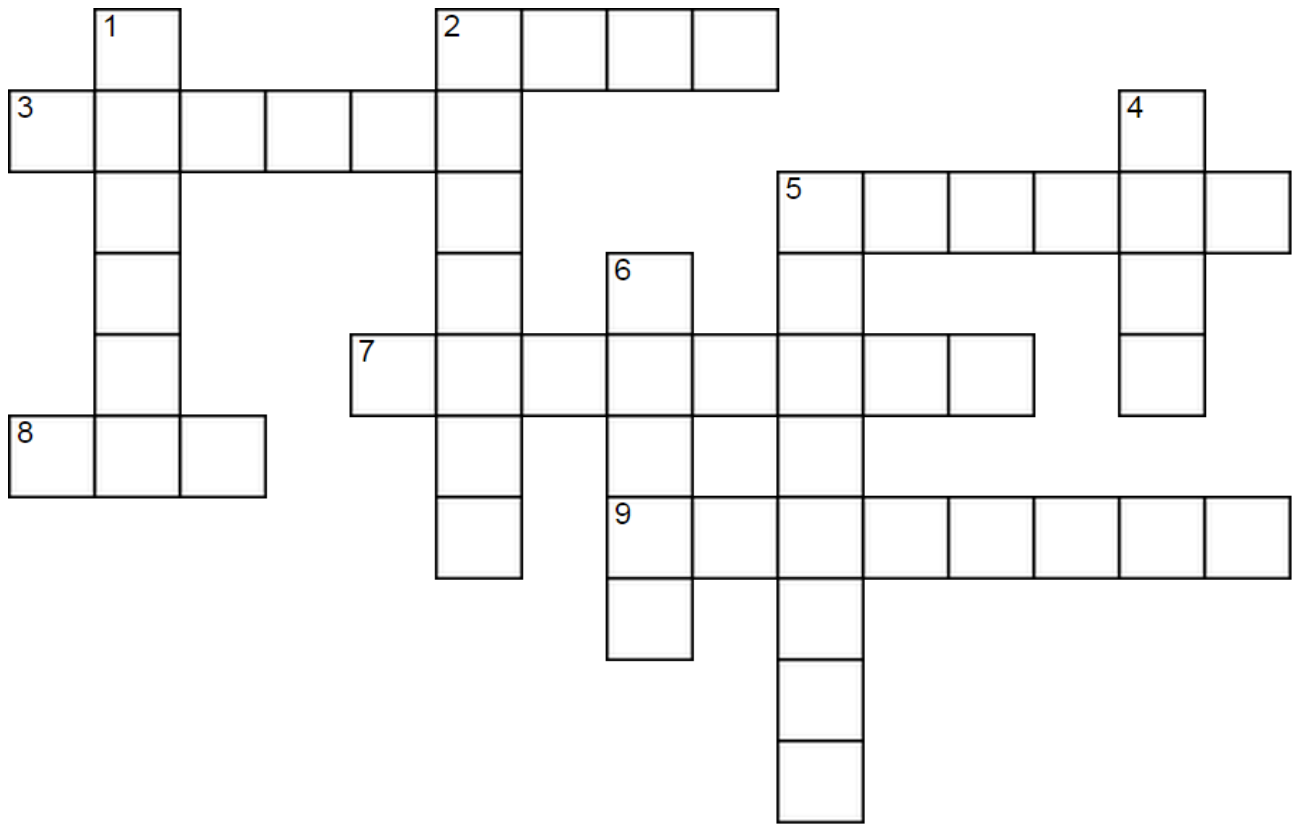
EXTENSION: What real-life situations would have a resultant force:

1) upwards?

2) downwards?

3) either side?

Mass-Weight-Gravity linkword



CLUES

- 1 down Physicists' standard unit of weight (6).
- 7 across The standard unit of mass used in Physics (8).
- 2 across The standard unit of mass used in Chemistry (4).
- 6 down Weight is a _____ that varies, depending on location within the universe (5).
- 9 across Mass measures the amount of matter in a given object, and is _____ in all places in the universe (8).
- 5 across Mass has a magnitude but not a direction, so is a _____ quantity (6).
- 3 across Weight is a _____ quantity: it has a direction that always points towards the centre of the planet (6).
- 2 down Avoid using this ambiguous word, which might mean "9.81 N/kg on Earth", or "the weight force on an object" (7).
- 8 across On the Earth, an apple has a weight of approximately ___ N (3).
- 5 down $W = mg$, where g stands for gravitational field _____ (7).
- 4 down When someone "weighs" an object, the result is actually converted by the scales into the object's _____ (4).

WORD BANK: VECTOR, STRENGTH, SCALAR, ONE, NEWTON, MASS, KILOGRAM, GRAVITY, GRAM, FORCE, CONSTANT

Turning Forces-Moments

(N= Newtons m = metres)

Complete the gaps...

Left		Right		Turning Force		Balanced or left or right
N	m	N	m	Left	Right	
5		3	3	10Nm		
6	4	3	8			
	12	2	9			B
5		2				B
6	3	3	6			
6			5	12Nm	10Nm	
6	7	8	9			
5	4	3			24Nm	
8	8	8	8			
2	7	3.5				B

Task: Design a High-Chair for a leading High Street chain of baby stores...



What you must include...

- Diagram to communicate your ideas.
- A mention of the factors that will affect the stability of the high-chair.

Think, think, think...

How have you included the physics principles of centre of mass, pivots and turning forces to explain your design decisions?

Question yourself about how thorough your work is...

What other factors might you wish to take in to account when making your design?

Marking criteria:

You will get marks for **clear communication** and your **understanding of the concepts** that we have been learning about. This one is not so much about the artwork, more to do with the Physics behind what is an everyday design that we all take for granted!!

Remember: without us Physicists, many children would be left to eat off of the floor!

