# Dynamics and Space Revision

March 2017

**Name:** _____

1

Describe the difference between a scalar and vector.

2

List 4 vector quantities and 5 scalar quantities

| Scalar | Vector |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |

3

In the relationship $v = u + at$, state what each symbol represents and the units of each

4

Sketch a velocity–time graph to show how the velocity of the car varies during the test run.

- During a test run, a car starts from rest on a straight, flat track.
- For the first 2 s of its motion it has a constant acceleration. It then travels at a constant velocity for a further 3 s.
- Numerical values are only required on the time axis.

5

6

- A fork –lift truck us used to load a crate of mass 200kg onto a lorry.
- It has to drive 12m to the lorry and then lift the crate up 1.5 m on to the lorry. The driving force is 500N and the energy available for the operation is 8000J. Will the fork lift truck be able to load the crate onto the lorry?

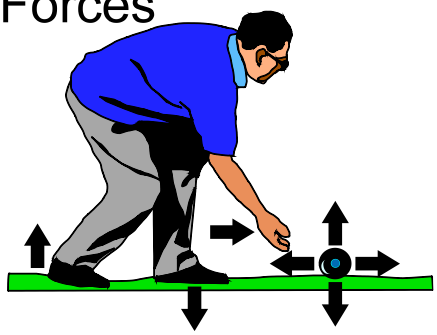
7

8

State Newton's Three Laws of Motion

9

Forces



- Label the forces

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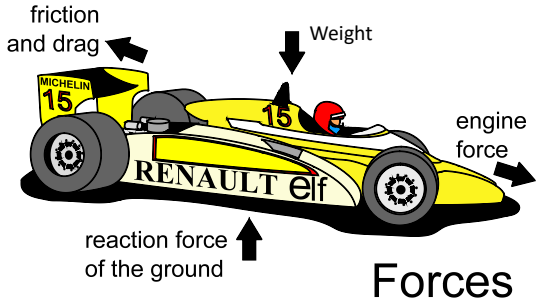


Forces

- Are these examples of balanced forces or Newton Pairs?

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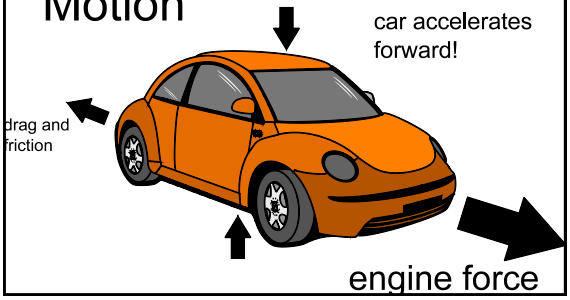
What can you infer about the size of the forces in the example below?

Motion

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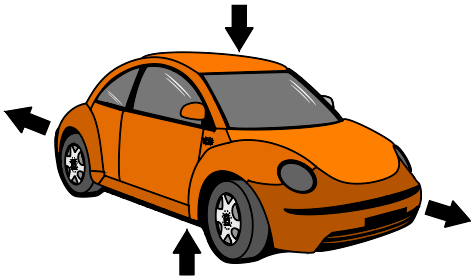
# Forces



State the forces on the car and the corresponding Newton Pair.

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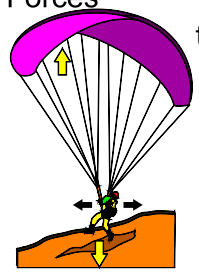
## Forces



What is the name given to this type of diagram?

- Label the forces on the diagram.

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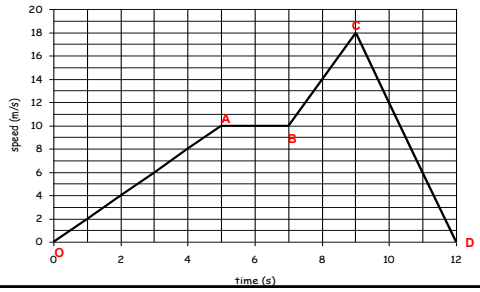
Calculate the accelerations and the distance travelled in the first 5s and the total distance travelled

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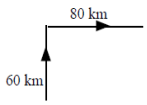
- A car drives 60 km north, then 80 km east, as shown in the diagram. The journey takes 2 hours. Calculate the
- a) distance travelled
- b) displacement
- c) average speed
- d) average velocity.

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The brakes of a car exert a force of 500N to stop the car. If the braking distance is 67m how much work is done by the brakes to stop the car.

- What happens to the kinetic energy of the car?

18

Explain how to measure the acceleration of a trolley as it rolls down a slope

19

Sketch a graph of the velocity against time for a parachutist from the moment they jump out of the plane to when they land

- Describe each part of the journey, making references to the forces involved

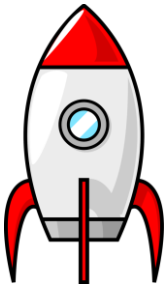
20

21

Explain the term terminal velocity and explain how this arises.

22

A rocket, of mass 300kg, on a launch pad produces a thrust of 2500 N. Describe what happens to the rocket.



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A ball is kicked horizontally off a bench.

a) Sketch the path taken by the ball.

b) describe, in detail, the motion of the ball.

24

25

## Space Exploration

- Give two risks and two benefits of space exploration

26

Explain the difference in motion between an object dropped from 2m on the Earth and one dropped from the same height on the Moon.

27

Describe what is special about the orbit of a geostationary/ geosynchronous satellite

28

State what you can infer about satellite periods from the table below

| Height of orbit (km) | Period (h) |
|---|---|
| 200 | 1.5 |
| 700 | 1.6 |
| 1 000 | 1.8 |
| 1 414 | 1.9 |
| 10 000 | 5.8 |
| 20 000 | 11.9 |
| 35 786 | 24.0 |

29

## A 5kg object is taken to the moon

- State the value of the mass at the three points in its journey.

| Position | Mass (kg) |
|---|---|
| On Earth | |
| In space ship during the journey | |
| On the moon | |

30

Show by calculation that a light year is $9.47 \times 10^{15}$ m

31

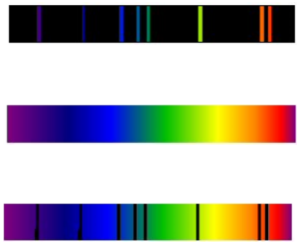
Give **one** example of how space exploration has impacted on everyday life.

32

Why does re-entry to a planet's atmosphere pose a challenge to spacecraft designers and engineers?

33

Name the different spectra



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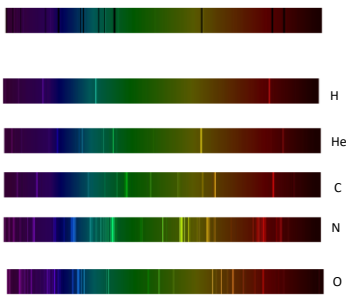
Identify the elements in this star spectrum

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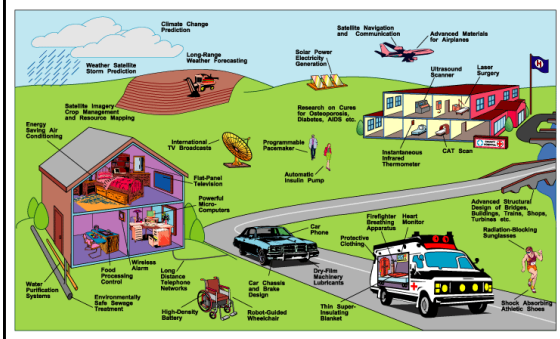
How many of these NASA spinoffs have you used recently?

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## Define the following terms

| Term | Definition |
|---|---|
| Planet | |
| Moon | |
| Star | |
| Sun | |
| Galaxy | |
| Solar System | |
| Universe | |
| Comet | |

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## Put the following in order of size from the largest to the smallest.

**Term**

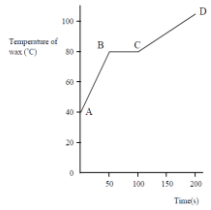
- Planet
- Moon
- Star
- Sun
- Galaxy
- Solar System
- Universe
- Comet

38

Calculate the amount of heat energy required to melt 0.3 kg of ice at 0 °C.
(Specific latent heat of fusion of ice = $3.34 \times 10^5$ J/kg)

39

The graph below shows how the temperature of a 2 kg lump of solid wax varies with time when heated.
A) Explain what is happening to the wax in the regions AB, BC and CD.
B) If a 200 W heater was used to heat the wax, calculate the specific latent heat of fusion of the solid wax.

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