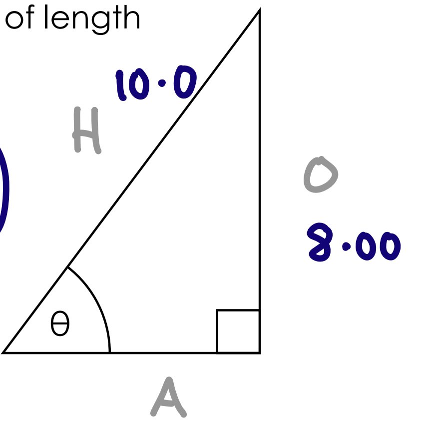
1st July

1 2 3

1. Calculate the **angle**, θ, in the triangle with a hypotenuse of length 10.0 cm and an opposite side length of 8.00 cm.



SOH CAH TOA

$\sin\theta = \frac{O}{H}$

$\theta = \sin^{-1}\left(\frac{O}{H}\right)$

$\theta = \sin^{-1}\left(\frac{8.00}{10.0}\right)$

$\theta = 53.1^\circ$

2. Write down the **proportionality relationship** between kinetic energy and (non-relativistic) mass for a moving object.

$E_K = \frac{1}{2}mv^2$

$E_K \propto m$

3. Calculate the **kinetic energy** and **momentum** of a car with a mass of 1200 kg and a velocity of 30 m s^{-1}.

$m = 1200\ kg$ $v = 30\ m s^{-1}$ $p = mv$ $E_K = \frac{1}{2}mv^2$

$E_K = \frac{1}{2}mv^2 = \frac{1}{2} \times 1200 \times 30^2 = 540\,000\ J$

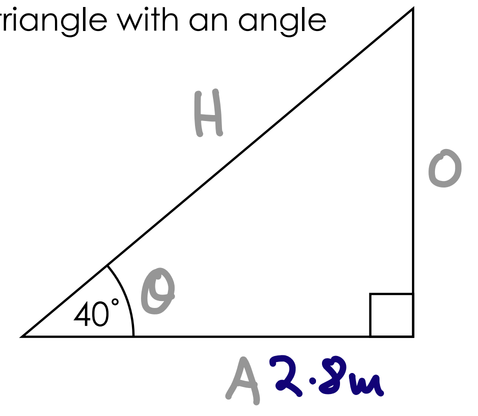
$p = mv = 1200 \times 30 = 36\,000\ kg\ m s^{-1}$

Note: At GCSE we use kg m/s but at A Level you should use kg m s^{-1} etc

2nd July

1 2 3

1. Calculate the length of the **hypotenuse** in this triangle with an angle of 40˚ and an adjacent side length of 2.8 m.



SOH CAH TOA

$\cos\theta = \frac{A}{H}$

$H = \frac{A}{\cos\theta}$

$H = \frac{2.8}{\cos\theta}$

$H = 3.7\,m$

2. Write down the **proportionality relationship** between resultant force and acceleration.

$F = ma$

$\therefore F \propto a$

$\therefore$ means 'therefore'

3. Explain what a **vector** quantity is and identify which of these quantities are vectors:

Speed, velocity, force, mass, energy and weight

A vector quantity has magnitude (size) and direction.

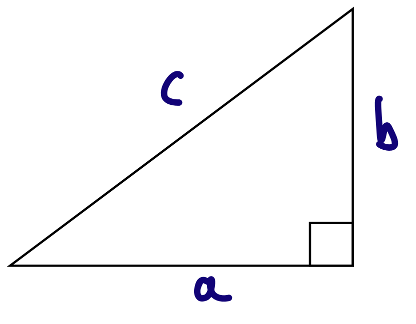
- Velocity
- Force
- Weight

3rd July

1 2 3

1. State **Pythagoras'** Theorem.

$a^2 + b^2 = c^2$



2. Write down the **proportionality relationship** between and frequency and time period for a wave.

$f = \frac{1}{T}$

$\therefore f \propto \frac{1}{T}$

3. Calculate the **frequency** of a sound wave that has a velocity of 330 m s^{-1} and a wavelength of 2.60 m.

3sf 3sf

$v = f\lambda$

$f = \frac{v}{\lambda} = \frac{330}{2.60} = 126.9230769$

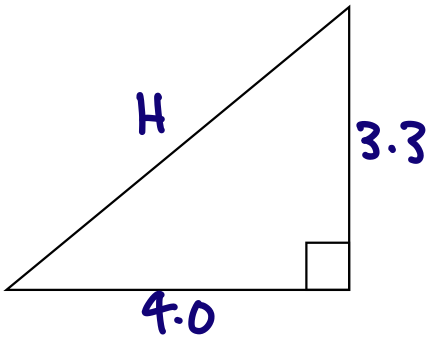
$= 127$ Hz

3sf

4th July

1 2 3

1. Calculate the length of the **hypotenuse** of an orthogonal (right-angled) triangle with sides of length 3.3 cm and 4.0 cm.



$H = \sqrt{3.3^2 + 4.0^2}$

$H = 5.2\text{cm}$

2. Write down the **proportionality relationship** between acceleration and mass, for a constant net force.

$F = ma$ $\quad a = \frac{F}{m}$

$\therefore a \propto \frac{1}{m}$

3. Calculate the **current** in a circuit if 50 C of charge is transferred in 20 s.

$Q = It$

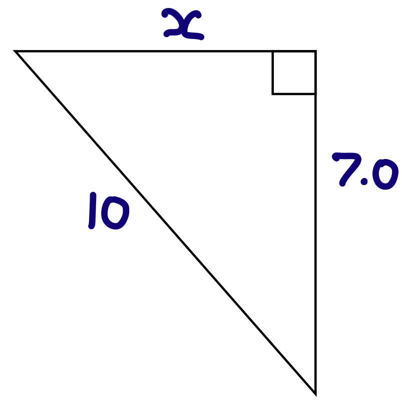
$I = \frac{Q}{t} = \frac{50}{20} = 2.5\text{A}$

↑ 2sf

5th July

1 2 3

1. Calculate the length of the **side** of a right-angled triangle if the hypotenuse is 10 cm and the other side is 7.0 cm.



$10^2 = 7.0^2 + x^2$

$x = \sqrt{100 - 49}$

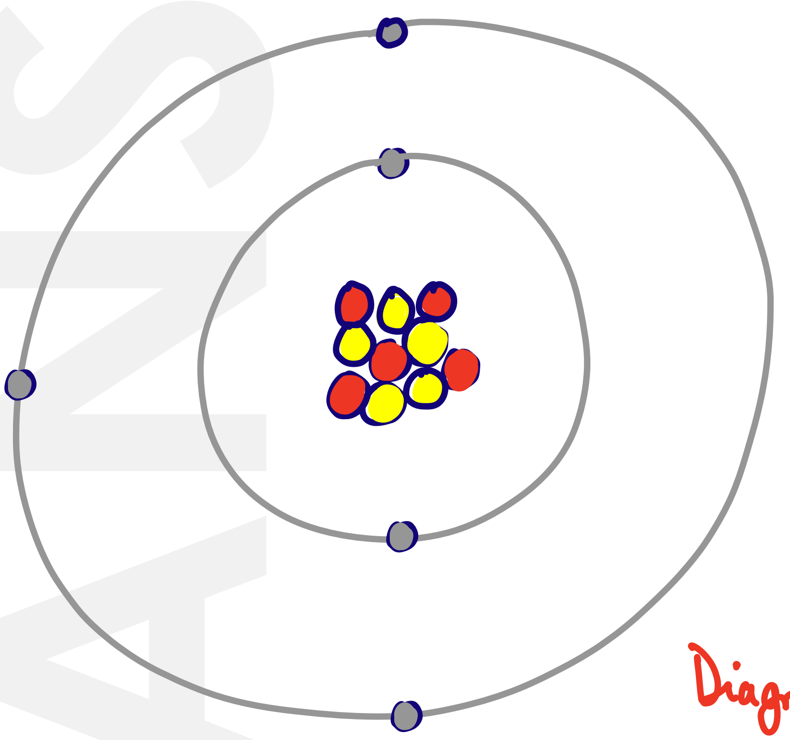
$x = \underline{7.1\,\text{cm}}$

2. Write down the **proportionality relationship** between momentum and velocity.

$p = mv$

$p \propto v$

3. Describe, in as much detail as you can, the structure of an **atom**.



e^- Small electrons orbiting in shells

p Positive protons and neutral neutrons tightly packed in a dense nucleus

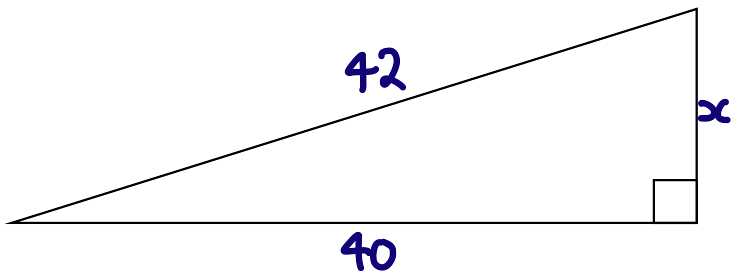
n

Diagrams are really useful in your answers.

6th July

1 2 3

1. Calculate the length of a **side** of a right-angled triangle if the hypotenuse is 42 m and the other side is 40 m.



$x = \sqrt{42^2 - 40^2}$

$x = 12.8$

$x = 13\,m$

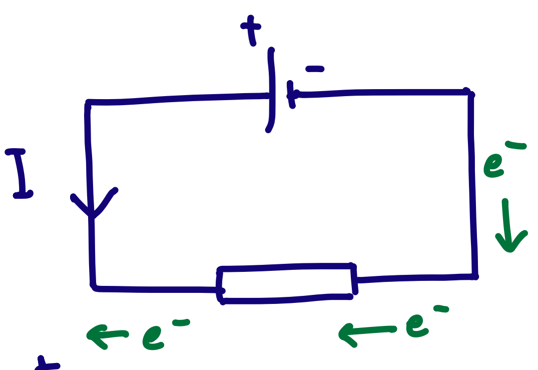
2. Write down the **proportionality relationship** between kinetic energy and velocity.

$E_K = \frac{1}{2}mv^2$

$\therefore E_K \propto v^2$

(E_K or KE can be used)

3. Describe, in a **DC circuit**, what electric current is and how **conventional current** is defined.



Conventional current is from +ve to −ve.

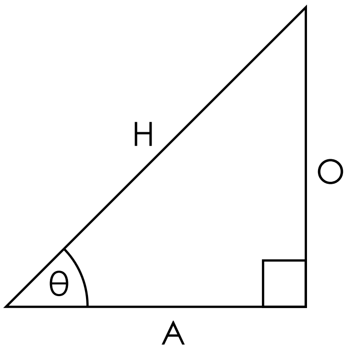
In a DC circuit the negative electrons move towards the positive terminal.

7th July

1 2 3

1. Write the following numbers in **standard form**:
   a. 8 990 000 000 — 8.99×10^9 The size of the Coulomb constant
   b. 299 790 000 — 2.9979×10^8 Speed of light
   c. 96 485 — 9.6485×10^4 The Faraday constant

2. For the following **triangle** where O = 10.00, H = 14.14 and θ = 45.0˚ calculate to 3 sf:
   a. The ratio of side O to H — 0.707
   b. sinθ — 0.707
   c. The ratio of side A to H — 0.707
   d. cosθ — 0.707



Note: $\frac{O}{H} = \sin\theta$ $\frac{A}{H} = \cos\theta$

$\sin 45 = \cos 45$

3. Calculate the **distance** travelled by an object that has a speed of 16 m s^{-1} in exactly one minute.

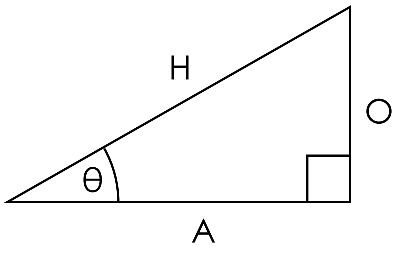
$s = vt = 16 \times 60 = \underline{960\text{m}}$

8th July

1 2 3

1. Write the following numbers in **standard form**:
   a. 0.002 898 — 2.898×10^{-3} Wien's constant
   b. 0.000 000 000 000 000 000 000 000 000 000 910 94 — 9.1094×10^{-31} Mass of an electron
   c. 0.000 000 056 70 — 5.670×10^{-8} Stefan-Boltzmann constant

2. For the following **triangle** where O = 2.20, H = 4.40 and θ = 30.0˚ calculate to 3 sf:
   a. The ratio of side O to H — 0.500
   b. sinθ — 0.500
   c. The ratio of side A to H — 0.866
   d. cosθ — 0.866



$\frac{O}{H} = \sin\theta$ $\frac{A}{H} = \cos\theta$

3. Calculate the **speed of light** if red light has a frequency 4.3×10^{14} Hz and a wavelength of 7.0×10^{-7} m.

$v = f\lambda = 4.3 \times 10^{14} \times 7.0 \times 10^{-7}$

$v = \underline{3.0 \times 10^{8}}\ ms^{-1}$

The speed of light, c, is used all the time.

9th July

1 2 3

1. Write down the charge, in **coulombs**, of:
    a. An electron -1.60×10^{-19} C
    b. A neutron 0
    c. A proton $+1.60 \times 10^{-19}$ C

2. Rearrange $v = u + at$ to make $\boldsymbol{u}$ the subject.

$$v = u + at$$
$$v - at = u$$
$$u = v - at$$

3. Calculate the **average acceleration** of a runner who starts at rest and reaches a velocity of 6.00 m s^{-1} in 9.00 s.

$$a = \frac{v-u}{t} = \frac{6.00 - 0}{9.00} = \underline{0.667} \text{ m s}^{-2}$$

10th July

1 2 3

1. Calculate, **without** using a calculator:
   a. 2.0×10^4 multiplied by 4.0×10^7 — 8.0×10^{11}
   b. 4.0×10^4 multiplied by 2.0×10^7 — 8.0×10^{11}
   c. 3.0×10^4 multiplied by 3.0×10^7 — 9.0×10^{11}
   d. 3.0×10^4 multiplied by 4.0×10^7 — $12 \times 10^{11} = 1.2 \times 10^{12}$

2. Rearrange $v^2 = u^2 + 2as$ to make ***u*** the subject.

$$v^2 = u^2 + 2as$$
$$v^2 - 2as = u^2$$
$$u^2 = v^2 - 2as$$
$$u = \sqrt{v^2 - 2as}$$

3. Calculate the **final** velocity of a rocket if it starts at rest and uniformly accelerates at $0.80\ \text{m s}^{-2}$ over 20 km.

$$v^2 = u^2 + 2as$$
$$v = \sqrt{u^2 + 2as}$$
$$v = \sqrt{0 + 2 \times 0.80 \times 20 \times 10^3}$$
$$v = 178.9 \approx \underline{180\ \text{ms}^{-1}}$$

2sf

11th July

1 2 3

1. Calculate, **without** using a calculator:
   a. 4.0×10^4 divided by 2.0×10^7 — 2.0×10^{-3}
   b. 2.0×10^4 divided by 4.0×10^7 — $0.50 \times 10^{-3} = 5.0 \times 10^{-4}$
   c. 2.0×10^7 divided by 4.0×10^7 — 0.50
   d. 2.0×10^7 divided by 4.0×10^4 — $0.50 \times 10^3 = 5.0 \times 10^2$

2. Rearrange the following to make **d** the subject:
   a. $E = V / d$ — $d = \frac{V}{E}$
   b. $n\lambda = d\sin\theta$ — $d = \frac{n\lambda}{\sin\theta}$
   c. $A = \pi d^2 / 4$ — $d = \sqrt{\frac{4A}{\pi}}$

3. Calculate the **acceleration** of an object that slows down from 70 m s^{-1} to rest in 5.0 minutes.

$$a = \frac{v-u}{t} = \frac{0-70}{5.0 \times 60} = -0.23 \text{ ms}^{-2}$$

12^{th} July

1 2 3

1. Calculate, **without** a calculator:
   a. 2.0×10^4 plus 4.0×10^4 — 6.0×10^4
   b. 2.0×10^5 plus 4.0×10^4 — 2.4×10^5
   c. 2.0×10^4 plus 4.0×10^5 — 4.2×10^5
   d. 8.0×10^4 plus 4.0×10^5 — 4.8×10^5

2. Rearrange *the following* to make **Q** the subject.
   a. *r = p / BQ*

   $$Q = \frac{p}{Br}$$

   b. *V = W / Q*

   $$Q = \frac{W}{V}$$

   c. *F = BQv*

   $$Q = \frac{F}{Bv}$$

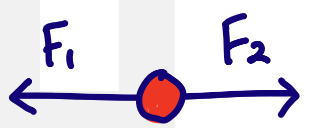
3. A wave travels at 5.00×10^4 m s^{-1}. Calculate its **wavelength** if its frequency is 7.00×10^2 Hz.

$$v = f\lambda \qquad \lambda = \frac{v}{f} = \frac{5.00 \times 10^4}{700} = \underline{71.4\ m}$$

13th July

1. Calculate, **without** a calculator:
   a. 2.0×10^4 minus 4.0×10^4 — -2.0×10^4
   b. 2.0×10^5 minus 4.0×10^4 — 1.6×10^5
   c. 2.0×10^4 minus 4.0×10^5 — -3.8×10^5
   d. 8.0×10^4 minus 4.0×10^5 — -3.2×10^5

2. State **Newton's 1st Law** and provide a real-life example.



$F_1 = F_2$ ∴ No resultant force

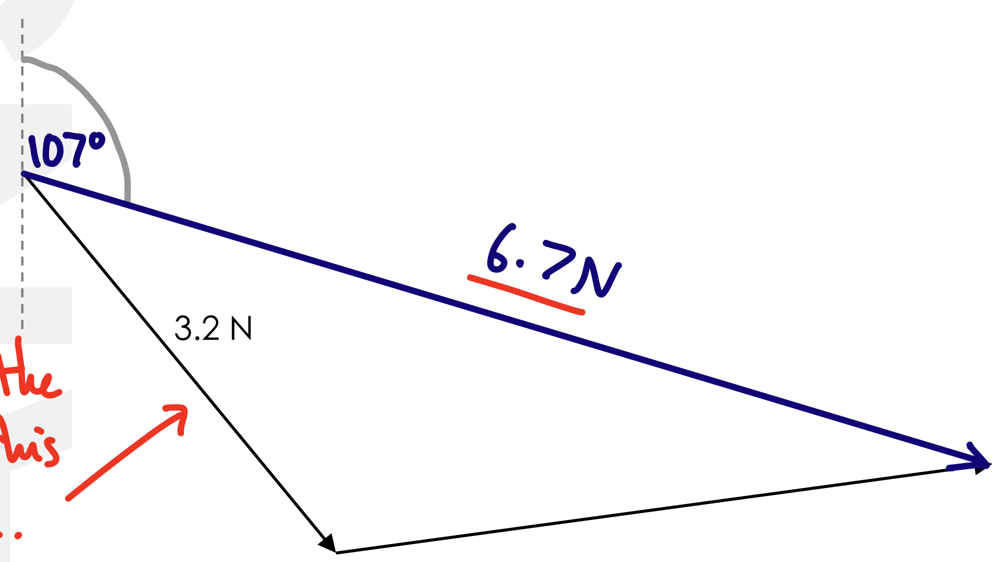
$v = 0$ → Stays at rest

$v \neq 0$ → Continues at v

Plenty of real examples of stationary objects or things moving at a constant velocity.

3. Complete the tip-to-tail vector diagram by drawing in the resultant vector, working out its **magnitude** and measuring the **angle** from the vertical.

Answers close to 107° and 6.7 N



Work out the scale from this length here.

14th July

1 2 3

1. Calculate the **mean**, **mode** and **median** of the following set of numbers:

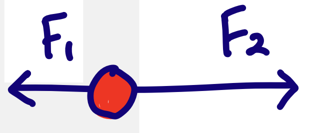
2, 3, 3, 3, 6, 8, 10

Mean $= \frac{(2+3+3+3+6+8+10)}{7} = 5$

Mode = 3

Median = 3

2. State **Newton's 2nd Law** and describe a real-life example to illustrate it in action.

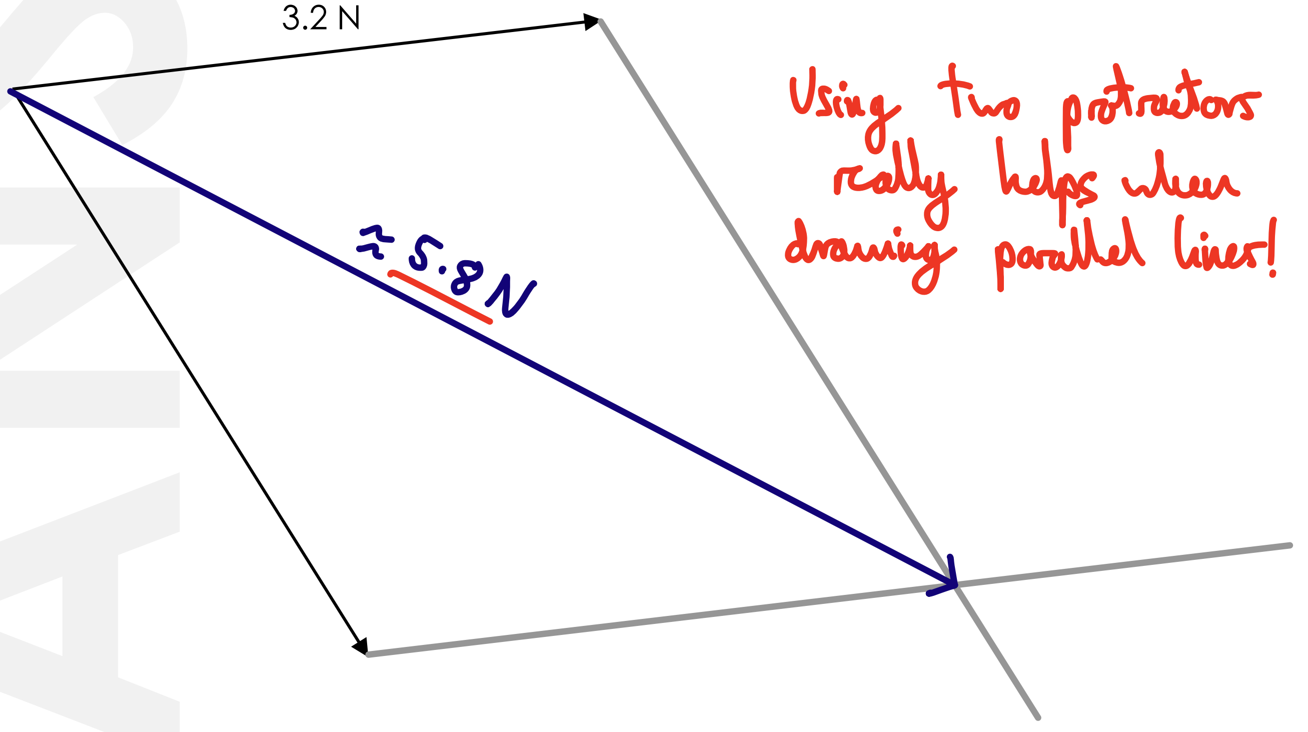


$F_1 \neq F_2$ ∴ Resultant force

$F \propto \frac{\Delta p}{\Delta t}$

F=ma is a special case where 'm' and 'a' are constant.

3. Complete the vector diagram using the **parallelogram** method. Draw in the resultant vector and work out its magnitude.



Using two protractors really helps when drawing parallel lines!

15th July

1 2 3

1. Calculate the **mean**, **mode** and **median** of the following set of numbers:

~~45, 46, 39, 40, 50, 45, 51~~

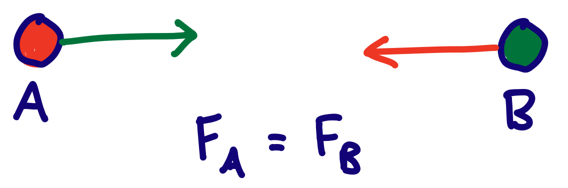
39, 40, 45, 45, 46, 50, 51

Mean = $\frac{(39+40+45+45+46+50+51)}{7} = 45.1$

Mode = 45

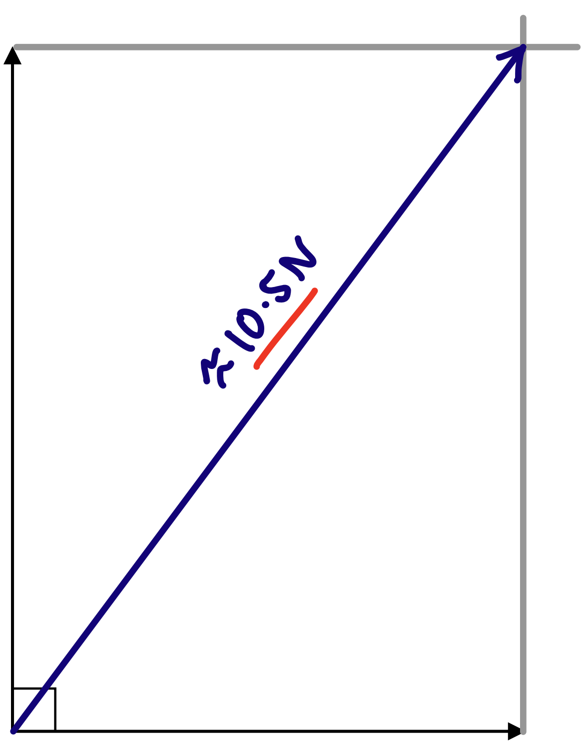
Median = 45

2. State **Newton's 3rd Law** (between two objects A and B) and give a relevant example.



This can be tricky to really deeply understand!

3. Calculate, using a **graphical** method, the size of the resultant force produced by these two perpendicular forces (where 1 cm = 1 N).

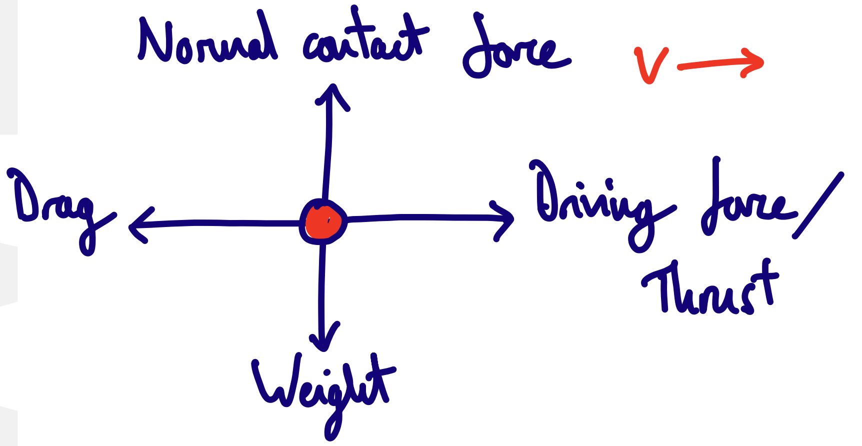


16th July

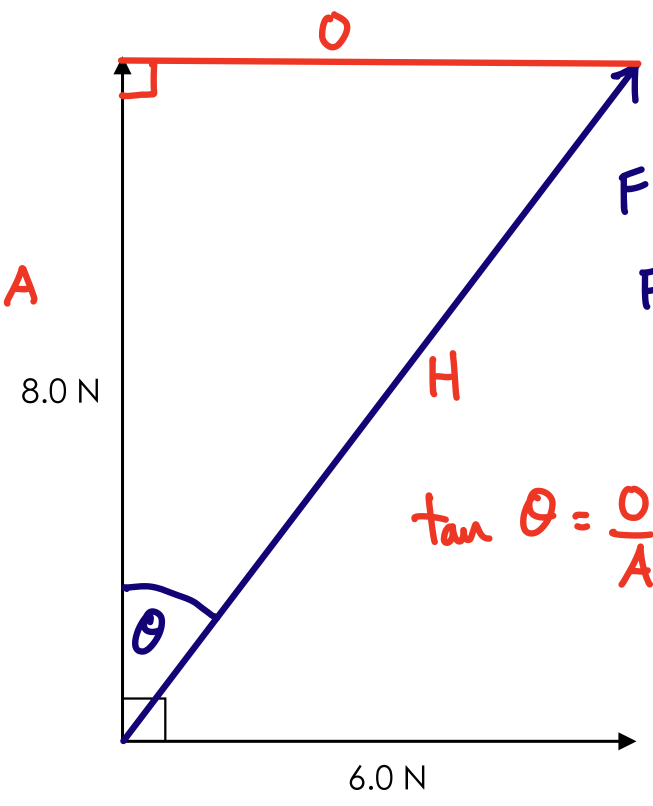
1 2 3

1. Write the following numbers in **standard form** to **3 significant** figures.
   a. 0.000 000 000 000 000 000 000 000 000 000 000 662 607 — 6.63×10^{-34} Planck's const
   b. 0.000 000 000 000 000 000 000 000 001 660 539 — 1.66×10^{-27} Atomic mass unit
   c. 0.000 000 000 008 854 188 — 8.85×10^{-12} Permittivity of free space

2. A car is travelling at a constant velocity of 30 m s^{-1}. Describe the **forces** acting on it and draw a diagram to illustrate your answer.



3. Calculate, using a **mathematical** method, the size of the resultant force produced by these two perpendicular forces and the angle through which it acts.



$\tan\theta = \frac{O}{A}$

$F = \sqrt{6.0^2 + 8.0^2}$

$F = \underline{10\ N}$

$\theta = \tan^{-1}\left(\frac{6.0}{8.0}\right)$

$\theta = \underline{37°}$

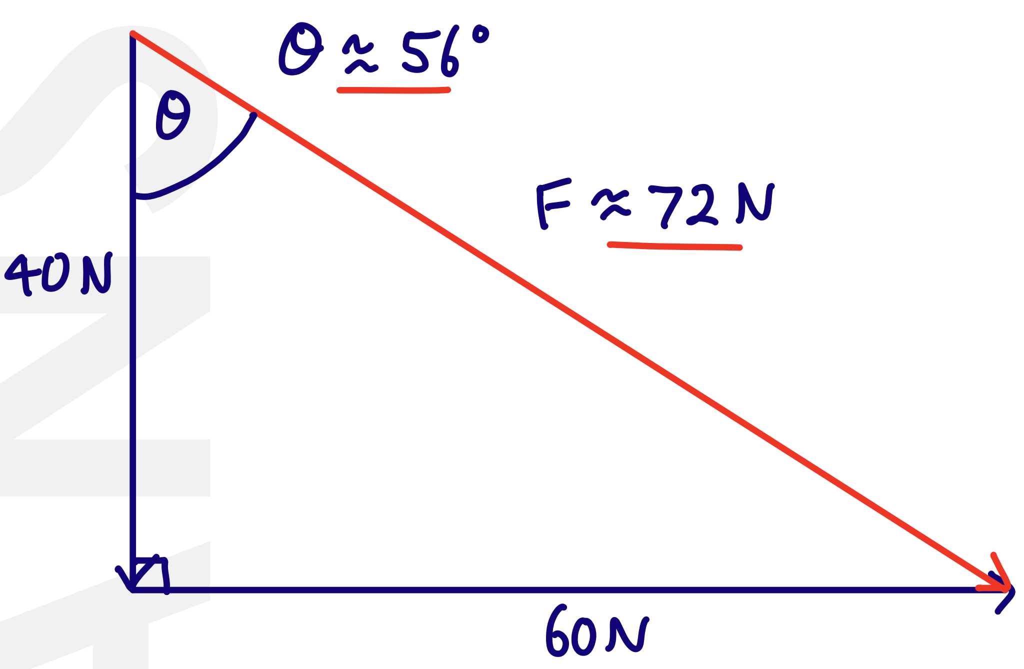
17th July

1. Write the following numbers in **standard form** to **3 significant** figures.
   a. 0.000 000 000 000 000 000 000 000 001 672 622 — 1.67×10^{-27} Mass of a proton
   b. 0.000 000 000 000 000 000 000 000 001 674 927 — 1.67×10^{-27} Mass of a neutron
   c. 0.000 000 000 000 000 000 000 013 806 — 1.38×10^{-23} Boltzmann's const
   d. 0.000 000 000 066 743 — 6.67×10^{-11} Big 'G'

2. State the relative **masses**, relative **charges** and **ionisation** power of alpha, beta minus and gamma radiation.

	m	Q	Ionisation
Alpha	4	+2	High
$Beta^-$	$1/1830$	−1	Medium
Gamma	0	0	Low

3. Calculate the size and angle of the resultant force, using **scale drawing**, produced by a downwards vertical force of 40 N and a horizontal force to the right of 60 N.



Large diagram and a suitable scale.

18th July

1 2 3

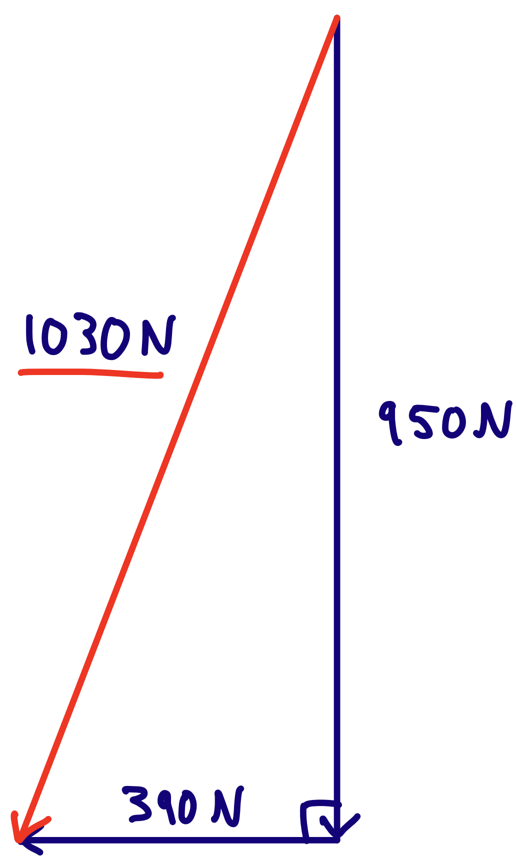
1. Calculate the following to an **appropriate** number of significant figures:
   a. 32.1 x 49 — 1.6×10^3 2sf
   b. 32 x 49 — 1.6×10^3 2sf
   c. 32.1 x 48.9 — 1.57×10^3 3sf
   d. 32 x 48.927 — 1.6×10^3 2sf

2. Calculate the **velocity** of a 600 g basketball ball when it has 67.5 J of kinetic energy.

$$E_K = \frac{1}{2}mv^2 \qquad v = \sqrt{\frac{2E_K}{m}} = \sqrt{\frac{2 \times 67.5}{0.600}}$$

$$v = 15\ ms^{-1}$$

3. Calculate the size of the resultant force, using a **mathematical** method, produced by a vertical force of 950 N down and a horizontal force of 390 N to the left.

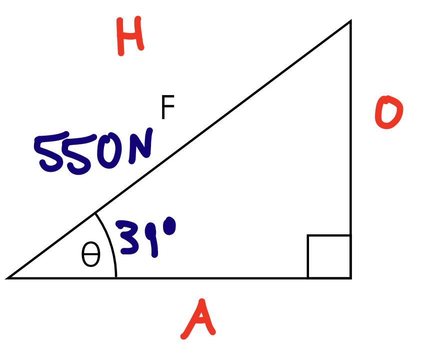


19th July

1 2 3

1. Calculate the following to an **appropriate** number of significant figures:
   a. 30 + 50 — 80 — 2 sf
   b. 30.1 ÷ 49.97 — 0.602 — 3 sf
   c. 30.0 + 50.0 — 80.0 — 3 sf
   d. 30 x 49.97 — 1500 — 2 sf

2. Calculate the **opposite** and **adjacent** sides of the triangle if F = 550 N and θ = 39˚.



$\sin\theta = \frac{O}{H}$ $O = H\sin\theta$

$O = 550\sin 39$

$O = \underline{350\,N}$

$\cos\theta = \frac{A}{H}$ $A = H\cos\theta$

$A = 550\cos 39$

$A = \underline{430\,N}$

3. Describe the changes to a nucleus's **proton** and **mass** numbers if it decays by emitting:
   a. Alpha radiation

      Proton no. −2
      Mass no. −4

   b. Beta minus radiation

      Proton no. +1
      Mass no. 0

   c. Gamma radiation

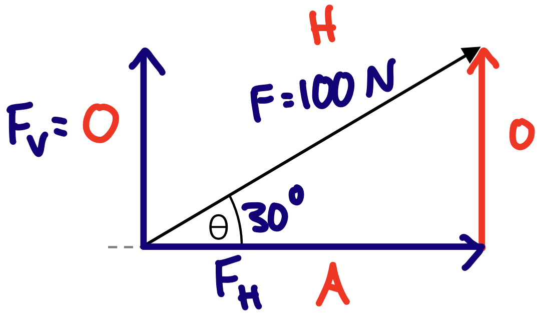
      Proton no. 0
      Mass no. 0

20th July

1 2 3

1. Calculate the following to an **appropriate** number of significant figures:
   a. 9.2 x 10^2 multiplied by 8.3 x 10^{-2} — 76 — 2 sf
   b. 9.21 x 10^2 multiplied by 8.3 x 10^{-2} — 76 — 2 sf
   c. 9.2 x 10^{22} multiplied by 8.317 x 10^{-20} — 7.7×10^3 — 2 sf
   d. 9.210 x 10^{22} multiplied by 8.317 x 10^{-20} — 7.660×10^3 — 4 sf

2. Calculate the **horizontal** and **vertical** components of a resultant force of 100 N acting at 30˚ above the horizontal.



A: $F_H = 100 \cos 30$

$F_H = 87 N$

O: $F_V = 100 \sin 30$

$F_V = 50 N$

3. Calculate the **initial** velocity of a ball if its final velocity is 3.00 m s^{-1} after it accelerates at 24 m s^{-2} over 0.15 m.

$$v^2 = u^2 + 2as$$

$$u = \sqrt{v^2 - 2as} = \sqrt{3.00^2 - (2 \times 24 \times 0.15)}$$

$$u = 1.3 \, m s^{-1}$$

21st July

1 2 3

1. Solve:
   a. $4x + 20 = 0$
   b. $15x – 30 > 0$
   c. $8x – 16 < 0$
   d. $x^2 - 4 = 0$

$4x = -20 \quad x = -5$

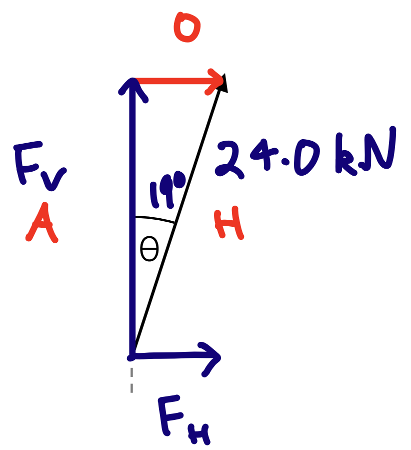
$15x > 30 \quad x > 2$

$8x < 16 \quad x < 2$

$x^2 = 4 \quad x = \pm 2$ *

* In A Level Physics we usually only consider the positive root, +2

2. Calculate the **horizontal** and **vertical** components of a force of 24.0 kN acting at 19° from the vertical plane.



$F_H = 24.0 \sin 19$

$F_H = 7.81\ kN$

$F_V = 24.0 \cos 19$

$F_V = 22.7\ kN$

3. Calculate the **maximum** theoretical height a 300 g ball would reach if fired vertically upwards with an initial kinetic energy of 400 J.

   Assume negligible air resistance and use g = 9.81 N kg^{-1}

$E_K \rightarrow E_P$

$E_K = mg\Delta h$

$$\Delta h = \frac{E_K}{mg} = \frac{400}{0.300 \times 9.81}$$

$\Delta h = 136\ m$

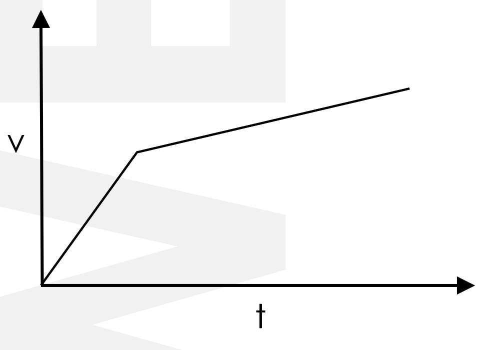
22nd July

1 2 3

1. Define the **joule**.

One joule of work is done when a force of one newton causes a displacement of one metre.

2. Describe what the **area** underneath a velocity-time graph represents.



Total displacement

3. Calculate the **energy transferred per second** in a resistor with 2.0 V across it and 0.30 A through it.

power

$P = VI = 2.0 \times 0.30 = \underline{0.60}\ Js^{-1}$

$1\ Js^{-1} = 1\ W$

23rd July

1 2 3

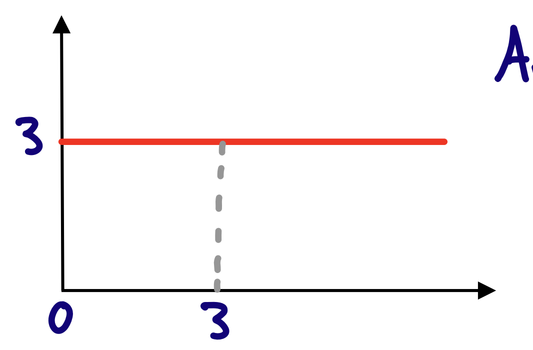
1. Define the **frequency** of a wave.

The frequency of a wave is the number of waves passing a point each second.

Definitions are really important to remember!

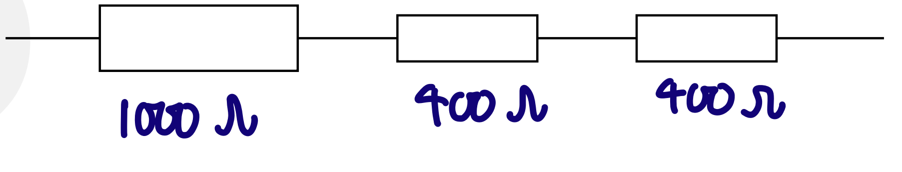
2. Calculate the **area** under the graph of y = 3 between x = 0 and x = 3.

Sketching the graph may help.



Area = 3×3 = 9

3. Calculate the **total resistance** when a 1.0 kΩ resistor is connected in series to two 400 Ω resistors.



$R_T = R_1 + R_2 + R_3$

$R_T = 1000 + 400 + 400$

$R_T = 1800\ \Omega$

24th July

1 2 3

1. Define **fission** and **fusion**.

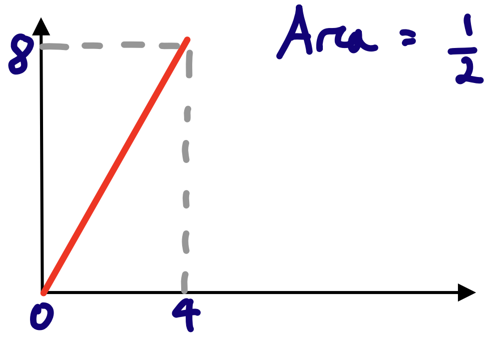
Fission - Splitting of a large and unstable nucleus.

Fusion - Joining of two light nuclei to form a heavier nucleus.

Both convert mass into energy!

2. Calculate the **area** under the graph of y = 2x between x = 0 and x = 4.

Sketching the graph may help.



Area = $\frac{1}{2} \times 4 \times 8 = 16$

3. Calculate the **frequency** of a sound wave with a speed of 330 m s^{-1} and a wavelength of 30 cm.

↑ ≈ Speed of sound in air

$v = f\lambda$

$f = \frac{v}{\lambda} = \frac{330}{0.30} = 1100$ Hz

25th July

1 2 3

1. $y = mx + c$ describes a graph with a straight line of gradient 'm' and y-intercept 'c'.
   Write down the **gradient** and **y-intercept** of the graphs with equation:
   a. $y = 2x + 3$ $m = 2$ $c = 3$
   b. $y = 3x + 2$ $m = 3$ $c = 2$
   c. $y = 6x + 3$ $m = 6$ $c = 3$
   d. $y = 6 + 3x$ $m = 3$ $c = 6$

2. Rearrange $F = BIL\sin\theta$ to make:
   a. **B** the subject $B = F/IL\sin\theta$
   b. **I** the subject $I = F/BL\sin\theta$
   c. **L** the subject $L = F/BI\sin\theta$
   d. **θ** the subject $\theta = \sin^{-1}(F/BIL)$

3. Write down the number of **protons**, **neutrons** and **electrons** in the following atoms:

	$^{56}_{26}Fe$	$^{54}_{26}Fe$	$^{59}_{27}Co$	$^{60}_{28}Ni$
p	26	26	27	28
n	30	28	32	32
e	26	26	27	28

26th July

1 2 3

1. Write down the **gradient** and **y-intercept** of the graphs with equation:
   a. $y = 3x + 5$
   b. $2y = 4x + 2$
   c. $x + 3 = y$
   d. $y - 4 = x / 2$

$m = 3 \quad c = 5$

$y = 2x + 1 \quad m = 2 \quad c = 1$

$y = x + 3 \quad m = 1 \quad c = 3$

$y = \frac{1}{2}x + 4 \quad m = 0.5 \quad c = 4$

2. Rearrange $g = Gm / r^2$ to make **r** the subject.

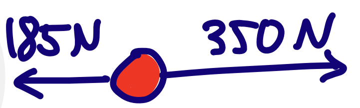
G = Gravitational constant
g = Gravitational field strength

$$g = \frac{Gm}{r^2}$$

$$r^2 = \frac{Gm}{g}$$

$$r = \sqrt{\frac{Gm}{g}}$$

3. Calculate the **acceleration** of a 1825 N boat when there is a thrust of 350 N from the engines and total drag forces of 185 N.



$F = 350 - 185 = 165\ N$

$$m = \frac{W}{g} = \frac{1825}{9.81} = 186.03$$

$$F = ma \qquad a = \frac{F}{m} = \frac{165}{186.03} = 0.887\ ms^{-2}$$

27th July

1 2 3

1. Calculate the **gradient** and **y-intercept** of the line with equation:

   a. *2y = 4x + 8* $\quad y = 2x + 4 \quad m = 2 \quad c = 4$

   b. *4y – 6 = x/2* $\quad y = \frac{1}{8}x + 1.5 \quad m = 0.125 \quad c = 1.5$

   c. *0 = x + y* $\quad y = -x \quad m = -1 \quad c = 0$

   d. *x = 0.5y + 2* $\quad y = 2x - 4 \quad m = 2 \quad c = -4$

2. Rearrange $V_g = Gm / r$ to make **m** the subject.

$$V_g = -\frac{Gm}{r}$$

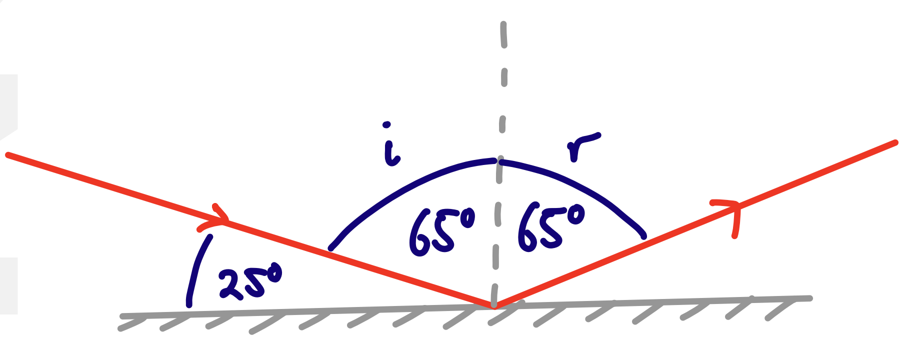
$$V_g r = -Gm$$

$$\frac{V_g r}{G} = -m$$

$$m = -\frac{V_g r}{G}$$

3. A ray of light at 25˚ to the surface of a plane mirror is reflected (with a specular reflection).

   Calculate the angle of **reflection** (a diagram will help).



$i = r$

$r = 65°$

28th July

1 2 3

1. Calculate the gradient and hence the **equation** of the straight-line graph that goes through the points (1, 2) and (5, 10).

$m = \frac{10-2}{5-1} = \frac{8}{4} = 2$

$y - y_1 = m(x - x_1)$

$y - 2 = 2(x - 1)$

$y = 2x$

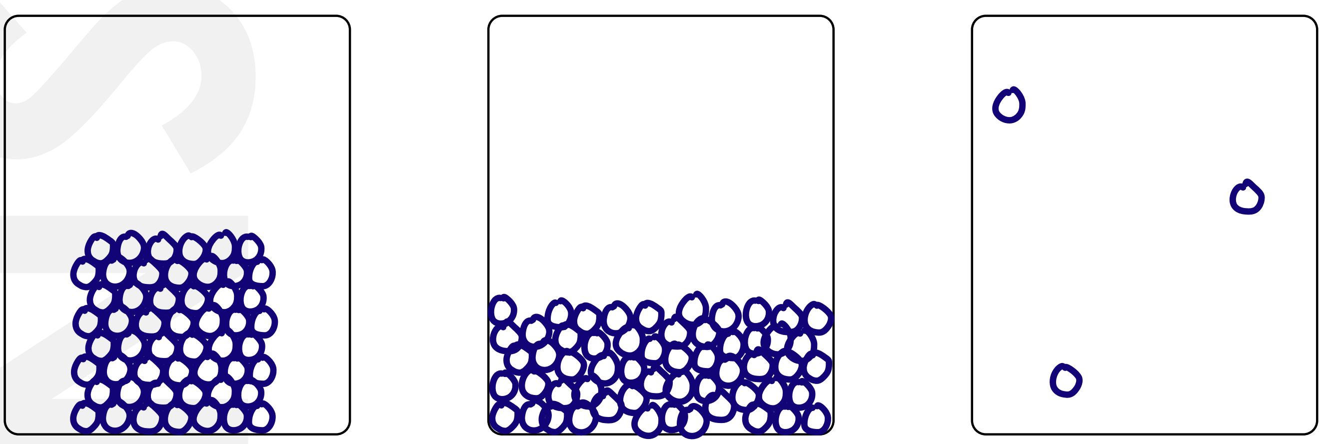
2. Rearrange the following to make **p** the subject:

   a. $m = p / v$ $\quad p = mv$

   b. $pV = NkT$ $\quad p = \frac{NkT}{V}$

   c. $E_k = p^2 / 2m$ $\quad p = \sqrt{2mE_k}$

3. Sketch the arrangement of particles in a **solid**, a **liquid** and a **gas**.



Close packed
Regular arrangement

Close packed
Random order

Far apart!

29th July

1 2 3

1. Calculate the **equation** of the straight-line graph that goes through the point (1, 2) and has a gradient of 3.

$$y - 2 = 3(x - 1)$$
$$y = 3x - 1$$

2. Use the symbol '≈' to describe the **small-angle approximation** involving sin θ, cos θ and tan θ.

$$\sin\theta \approx \theta$$
$$\cos\theta \approx 1$$
$$\tan\theta \approx \theta$$

when θ is very small

3. A 2.1 kg wheel rolls down a slope, losing 0.62 kJ of gravitational potential energy.

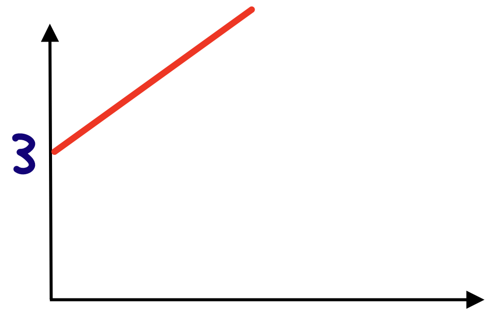
Calculate the **height** it rolls down.

$$\Delta E_p = mg\Delta h$$
$$\Delta h = \frac{\Delta E_p}{mg} = \frac{620}{2.1 \times 9.81}$$
$$\Delta h = 30\ \text{m}$$

30th July

1 2 3

1. **Sketch** the graphs of y = 3x + *1* and *y* = x + 3.



2. Write down **two** ways of defining radioactive **half-life**.

N
- The time it takes for the number of nuclei of the isotope in a sample to halve.

A
- The time it takes for the countrate, or activity, from a sample containing the radioactive isotope to fall to half its initial value.

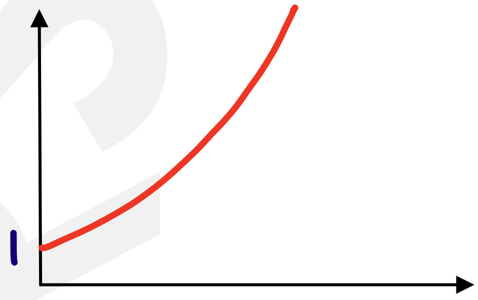
3. Calculate the **acceleration** of a car when it slows down from 10 m s^{-1} to 3.0 m s^{-1} in 2.5 s.

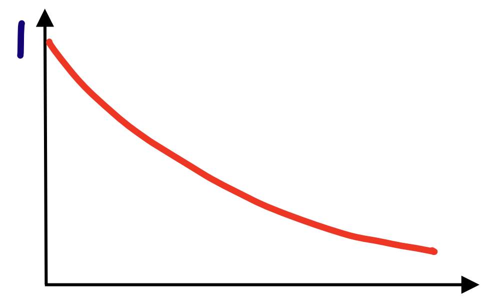
$$a = \frac{v-u}{t} = \frac{3.0 - 1.0}{2.5} = -2.8\ \text{m s}^{-2}$$

31st July

1 2 3

1. **Sketch** the graphs of $y = e^x$ and $y = e^{-x}$.





2. Define electrical **resistance**.

$R = \frac{V}{I}$

Resistance is the ratio of the potential difference across a component to the current through the component.

3. Complete the following **nuclear** equations:

$${}^{238}_{92}U \rightarrow {}^{234}_{90}Th + {}^{4}_{2}He$$

$${}^{234}_{90}Th \rightarrow {}^{234}_{91}Pa + {}^{0}_{-1}\beta$$

$${}^{234}_{91}Pa \rightarrow {}^{234}_{92}U + {}^{0}_{-1}\beta$$