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Section "A"
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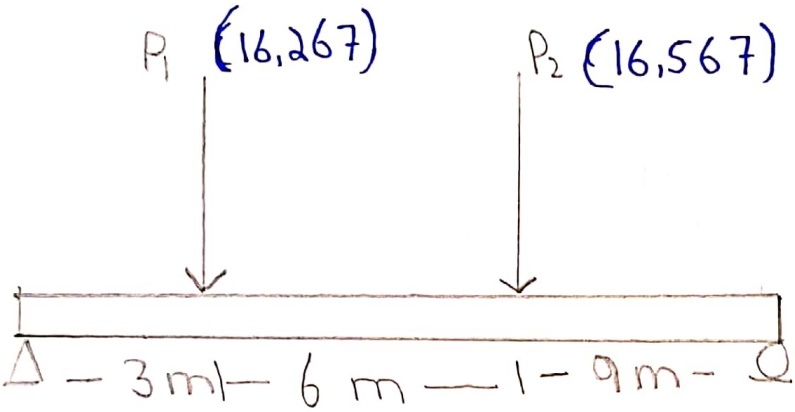
Question No 1
Find the Support reaction. Show all your calculation
(P_1 = 200 + Student ID No) (P_2 = 500 + Student ID No).



Finding all the Support reaction

$R_{1x} = 0$ $\quad \Sigma F_x = 0$

$R_{1y} + R_{2y} - 16267 - 16567 = 0$ — ① $\quad \Sigma F_y = 0$

$(R_{2y} \times 18) - (16267 \times 3) - (16567 \times 6) = 0$

$18R_{2y} - 48801 - 99402 = 0$

$18R_{2y} - 148208 = 0$

$\frac{18R_{2y}}{18} = \frac{148208}{18}$

$\boxed{R_{2y} = 8233.7}$ Put in ①

$R_{1y} + 8233.7 - 16267 - 16567 = 0$

$R_{1y} - 24,600.3 = 0$

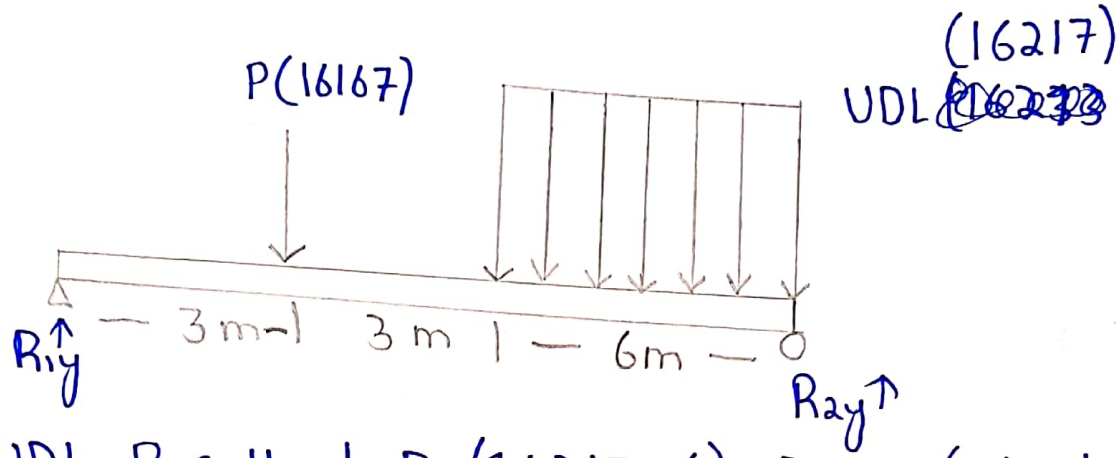
$\boxed{R_{1y} = 24600.3}$

Support Reaction

$R_{1y} = 24600.3$

$R_{2y} = 8233.7$

(UDL = 150 + Student ID No) (P = 100 + Student ID No).



Sol:- UDL Resultant P = (16217 × 6) = 97302 (acts at centre of UDL)

$R_{1y} + R_{2y} - 16167 - 97302 = 0$ — ① $\Sigma F_y = 0$

$(R_{2y} \times 12) - (16167 \times 3) - (97302 \times 9) = 0$

$12R_{2y} - 48501 - 875718 = 0$

$12R_{2y} - 924219 = 0$

$\frac{12R_{2y}}{12} = \frac{924219}{12}$

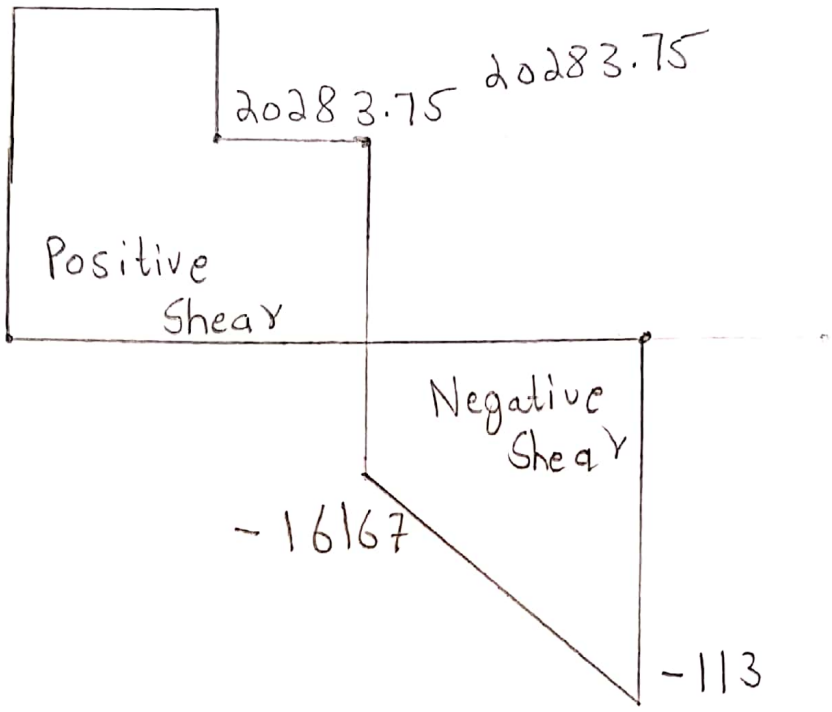
$\boxed{R_{2y} = 77018.25}$ Put in ①

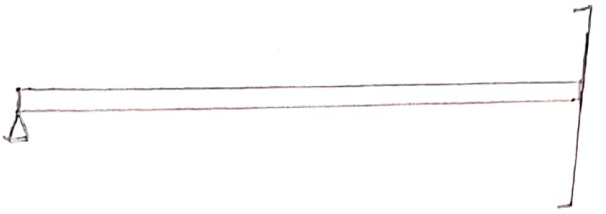
$R_{1y} + 77018.25 - 16167 - 97302 = 0$

$\boxed{R_{1y} = 36450.75}$

Now finding Shear Values

Shear force diagram ③



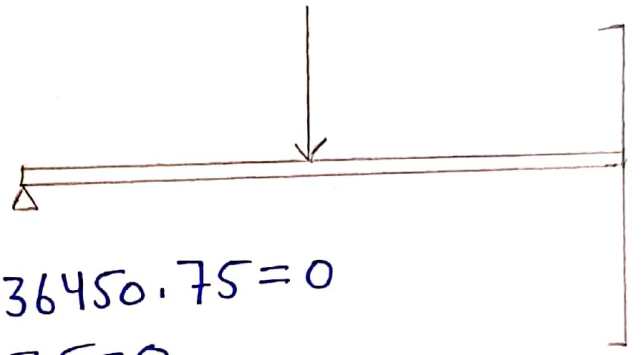


$$-V_{aa} + 36450.75 = 0$$

$$V_{aa} = 36450.75 - (1)$$

at $x = 0$ $\boxed{V_{aa} = 36450.75}$

at $x = 3$ $\boxed{V_{aa} = 36450.75}$



$$-V_{bb} - 16167 + 36450.75 = 0$$

$$-V_{bb} + 20283.75 = 0$$

$$V_{bb} = 20283.75 - (2)$$

at $x = 3$ $\boxed{V_{bb} = 20283.75}$

at $x = 6$ $\boxed{V_{bb} = 20283.75}$

Now Section C

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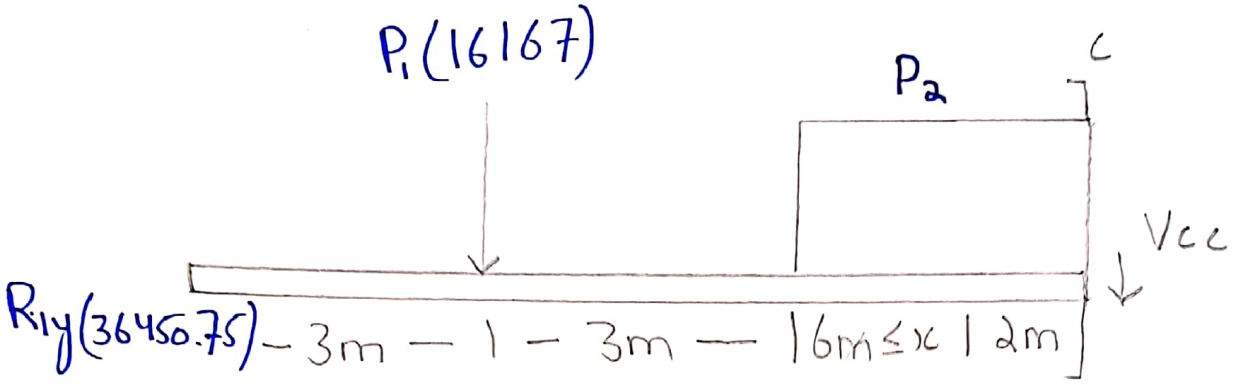


UDL

Resultant

$P_2 = 16217\,(x-6)$

$-Vcc - 16217x + 97302 - 16167 = 0$

$Vcc - 16217x + 81135 = 0$

$Vcc = 81135 - 16217x$ — (3)

at $x = 6$, $Vcc = 81135 - 16167(6)$

$\boxed{Vcc = -97002}$

at $x = 12$, $Vcc = 81135 - 16167(12)$

$\boxed{Vcc = 194004} - 81135$

$\boxed{Vcc = 112,869}$

Now to find shear Point (2) 0 eq (3) = 0

$81135 - 16167x = 0$

$\frac{16167}{16167}x = \frac{81135}{16167}$

$\boxed{x = 5.01}$ at this Value $Vcc = 0$.

Question 3

Draw the neat Shear force and bending Moment diagrams, Show all your calculation. (UVL = Student ID No/1000).

Sol:

Resultant Fo UVL

$$P = \frac{(16.067 \times 12)}{2} = 96.51 \text{ KN/m}$$

distance From low Side $\left(\frac{1}{3} \times 12^{4}\right) = 8\text{m}$

distance From high Side $\frac{1}{3} \times 12^{4}) = 4\text{m}$

$R_{1x} = 0$

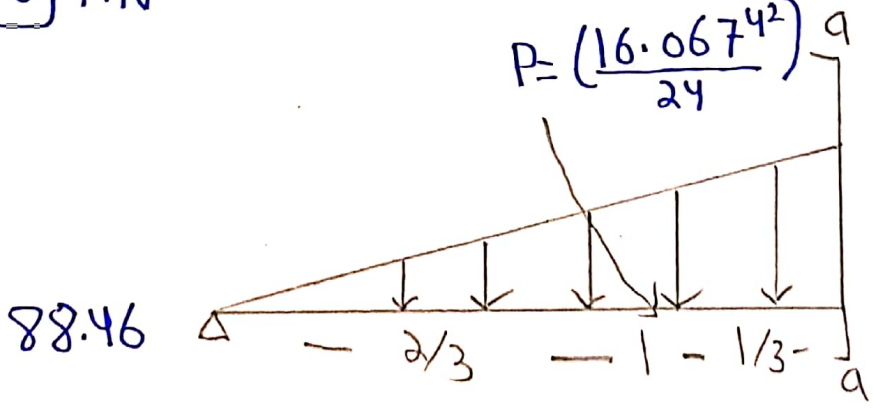
$$R_{1y} + R_{2y} - 96.\overset{4}{0} = 0 \quad \text{—(1)}$$

at U, $V_{aa} = 88.46$

$$(R_{2y} \times 12) - 96.\overset{4}{0} = 0$$

$$\frac{12 R_{2y}}{12} = \frac{96.04}{12}$$

$$\boxed{R_{1y} = 88.46} \text{ KN}$$



From law of Similar triangles

$$\frac{16.067}{12} = \frac{W_o\ kN/m}{x}$$

Resultant $P_2 = [w_o \times x]/2$

$$\Rightarrow P = \frac{16.067x^2}{24}$$

Now

$$-V_{aa} - \left(\frac{16.067x^2}{24}\right) + 88 - 46 = 0$$

$$V_{aa} = 88.46 - \left(\frac{16.067x^2}{24}\right) - (1)$$

at $x = 0$, $\boxed{V_{aa} = 88.46}$ kN

at $x = 12$, $V_{aa} = 88.46 - \left(\frac{16.067 \times (12)^2}{24}\right)$

$$V_{aa} = 88.46 - \left(\frac{16.067 \times 144}{24}\right)$$

$\boxed{V_{aa} = -96.02}$ kN

To find at which Point Shear = 0

eq (1) = 0

$$0 = 88.46 - \left(\frac{16.067x^2}{24}\right)$$

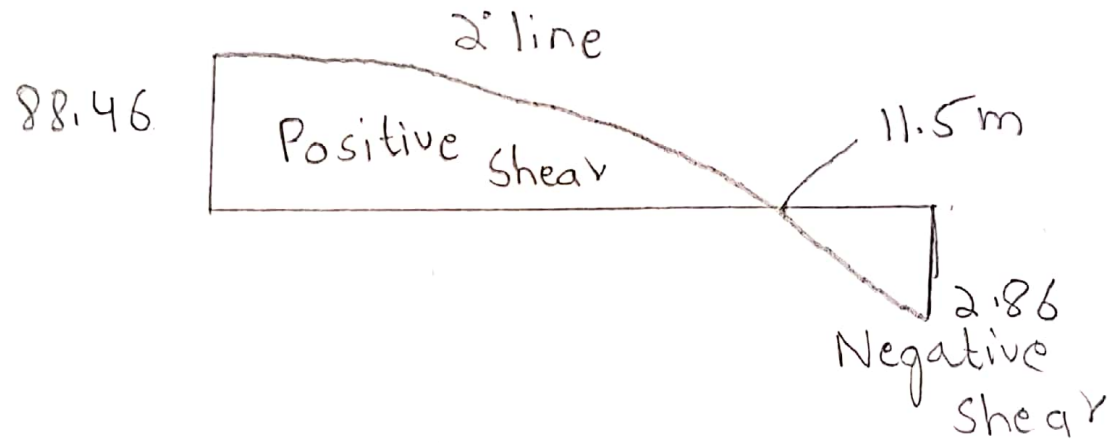
$$\frac{16.067x^2}{24} = 88.46$$

$$x^2 = \frac{132.2}{16.067}$$

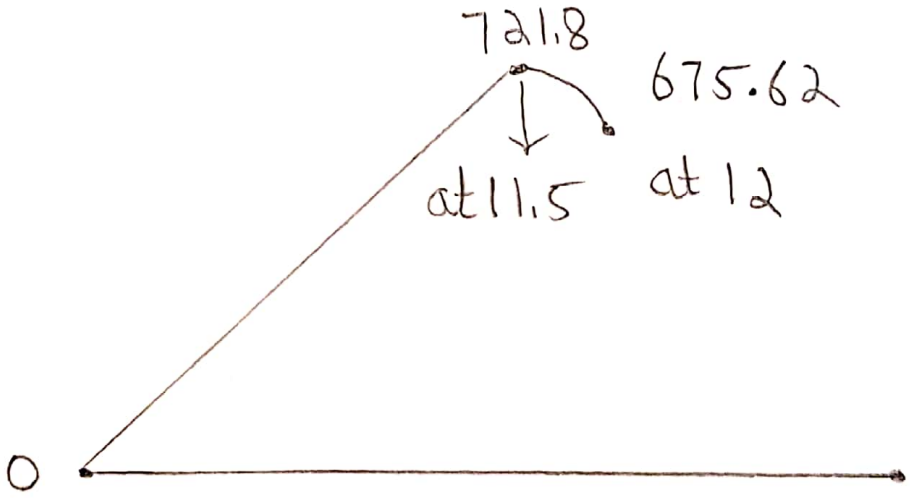
8.22 (8)

$x = 2.86$ at this Point $V_{aa} = 0$

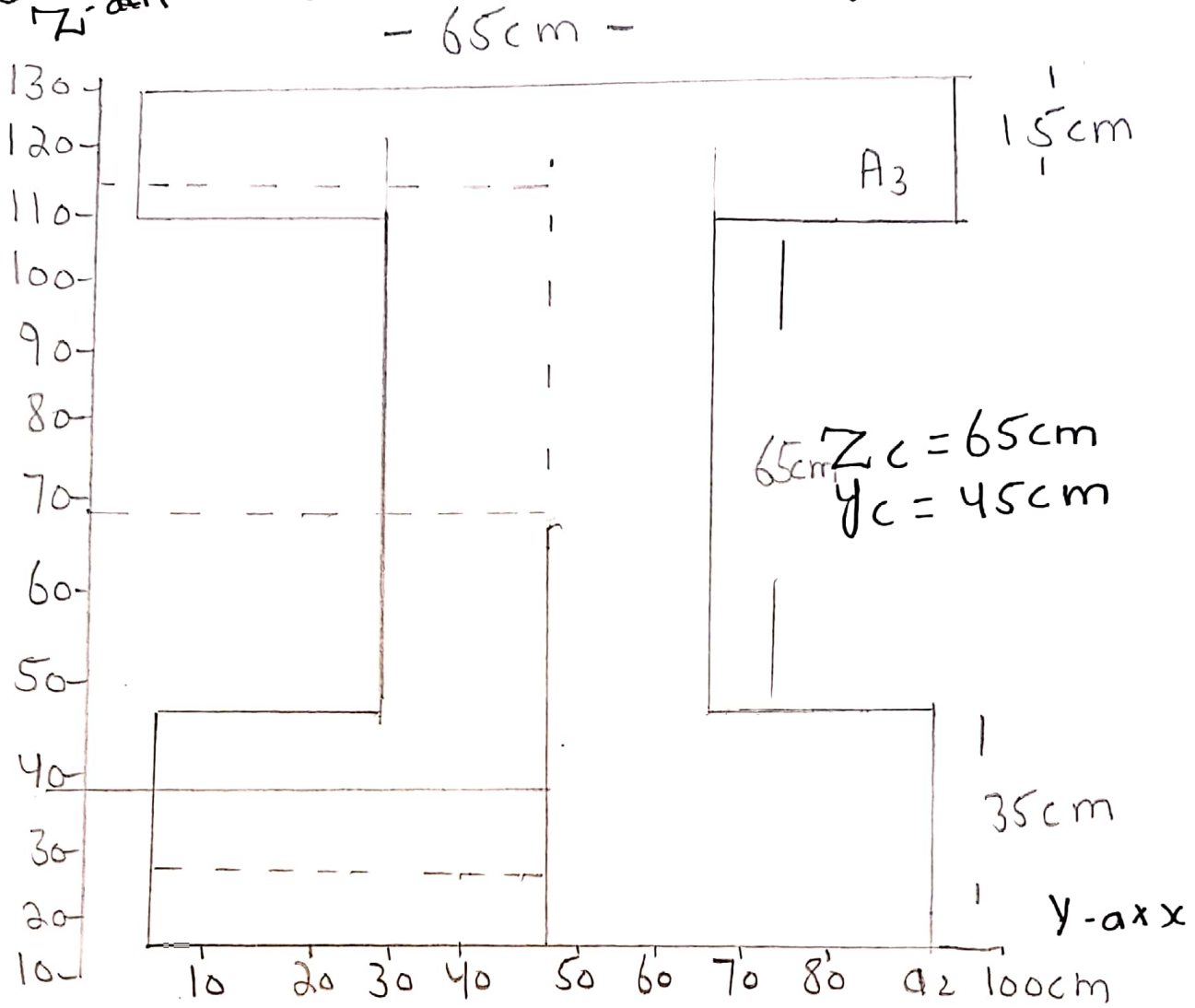
Shear force diagram



Bending moment diagram



Q4 Find the Centroid of the given Shape. Show all cal.



Areas

$A_1 = (0.9 \times 0.35) = 0.315\ m^2$

$A_2 = (0.35 \times 0.65) = 0.2275\ m^2$

$A_3 = (0.15 \times 0.65) = 0.0975\ m^2$

Now centre points from origin

$y_1 = 0.9/2 = 0.45\ m$

$y_2 = 0.9/2 = 0.45\ m$

$y_3 = 0.9/2 = 0.45\ m$

$z_1 = (0.35/2) = 0.175\ m$

$z_2 = 0.35 + (0.65/2) = 0.675m$ (9) (10)

$z_3 = 0.35 + 0.65 + (0.15/2) = 1.075m$

Now centroid

$$y_c = \frac{A_1y + A_2y_2 + A_3y_3}{A_1 + A_2 + A_3} = \frac{(0.315 \times 0.45) + (0.2275 \times 0.45) + (.0975 \times 0.45)}{0.315 + 0.2275 + 0.0975}$$

$y_c = 0.14175 + 0.102375 + 0.043875$

$y_c = 0.288/0.64$

$\boxed{y_c = 0.45m}$

Now

$$z_c = \frac{A_1z_1 + A_2z_2 + A_3z_3}{A_1 + A_2 + A_3} = \frac{(0.315 \times 0.175) + (0.2275 \times 0.675) + (.0975 \times 1.0}{0.64}$$

$$z_c = \frac{0.055125 + 0.153625 + 0.1048125}{0.64}$$

$$Z_c = \frac{0.4183125}{0.64}$$

$\boxed{Z_c = 0.65m}$ 65cm

Question 4 (B) (10) (11)

For mid area (65cm X 35cm) only find the moment of inertia, radius of gyration & section moduli.

Sol:-

For inertia

We know that

$$I_y = \frac{b.h^3}{12}$$

$$= 35 \times (65)^3$$

$$I_y = 800989.6 cm^4 \rightarrow \boxed{8009.9 m^4}$$

Now

$$I_z = \frac{b^3 h}{12}$$

$$= (35)^3 \times (65)$$

$$I_z = 232239.6_{cm} \rightarrow \boxed{2322.4 m^4}$$

Now Radius of gyration.

We know that

$$r_y = \sqrt{\frac{I_y}{A}}$$

$$\sqrt{\frac{8009.9}{22.75}}$$

$$= \sqrt{352.08}$$

$r_y = 18.76$

$r_z = \sqrt{\frac{I_z}{A}}$

$= \sqrt{\frac{2322.4}{22.75}}$

$= \sqrt{102.08}$

$r_z = 10.10$

Now Section moduli

For rectangle

$c = \frac{1}{2}h = .65/2 = 0.325 \quad I = 8009.9$

Now

$S = Ze = \frac{I}{c}$

$= \frac{1}{6}bh^2 = \frac{.35 \times (.65)^2}{6} = 0.0246$

$Zp = \frac{1}{4}bh^2 = \frac{.35 \times (65)^2}{6} = 0.0369$

Now

$f = \frac{Zp}{Ze} = \frac{0.0369}{0.0246} = 1.5$

Q5

Question 5 (12) (13)

Explain work, energy and power in details with Practical examples from daily life.

Answer

Work:-

Measure of energy transfer that occures when an object is moved over a distance by an external force at least Part of which is applied in the direction of displacement.

The Standerd unit of work is the joule (J). equivalent to a newton meters (N.m).

⇒ Formula For work:-

Work = Force X Distance X Cosine

$W = F \times d \times \cos\theta$

Derivation of work Formula:-

W = work done

F = the force which we express in Newton.

d = distance that object covers.

$\cos\theta$ = Refers to the angle amidst the Force and movement distance.

Example:-

The force you applied and the distance you apply must be in the Same direction.

* Pushing a car horizentally from rest.
* Shooting a bullet.
* Walking up Stairs.

Energy:.

Physicsts, who are Scientists who Study Force, motion and energy, Say that energy is the ability to do work and is moving Something against a force, like gravity. therefore alot of different kinds of energy in the universe and that energy can do different things.

types of energy:.

Mechanical energy.
Thermal energy.
chemical energy.
Sonic energy.
Ionization energy.
Gravitation energy.
Potiential energy.
Kinetic energy.
electromagnetic energy.

example:-

Sunlight allows plants to grow and produce food more directly however

Solar Power is a growing part of the renewable energy scene.

unit:-

Energy = Power x Time

The unit of energy is joule.

Power:-

We can define Power as "the rate of doing work, it is the work done in unit time".

S.I unit:-

The S.I unit of Power is "Watt (w) which is joules per second (J/s) Sometimes the Power of motor vehicle and other machines are given in terms of horsepower (hP) which is approximately equat to 745.7