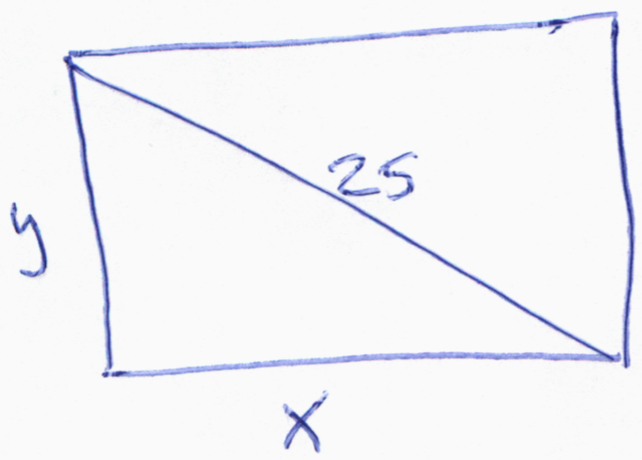
ARITMETICA - ALGEBRA

① 

Perimetro = 70

Area = ?

$$\begin{cases} x^2+y^2=25^2 \\ 2x+2y=70 \end{cases} \Rightarrow \begin{cases} x^2+y^2=625 \\ x+y=35 \end{cases}$$

$$(x+y)^2 = 35^2$$

$$x^2+2xy+y^2 = 1225$$

$$2xy+(x^2+y^2) = 1225$$

$$2xy+625 = 1225$$

$$\text{Area} = xy = 300$$

② $$\begin{cases} x+y=1416 \\ \frac{3}{7}x=\frac{5}{8}y \longrightarrow x=\frac{35}{24}y \end{cases}$$

$\therefore$ $\frac{35}{24}y+y=1416 \Rightarrow y=576$, $x=840$

luego $x-y=264$

③ Operación 1

$$A = 0 - (-x^2 - 3xy + y^2) = x^2 + 3xy - y^2$$

Operación 2

$$B = \frac{x^3 - y^3}{x-y} = \frac{(x-y)(x^2+xy+y^2)}{x-y} = x^2 + xy + y^2$$

Operación 3

$A \times B \Rightarrow$

$$\begin{array}{r} x^2 + 3xy - y^2 \\ x^2 + xy + y^2 \\ \hline x^2y^2 + 3xy^3 - y^4 \\ x^3y + 3x^2y^2 - xy^3 \\ x^4 + 3x^3y - x^2y^2 \\ \hline x^4 + 4x^3y + 3x^2y^2 + 2xy^3 - y^4 \end{array}$$

$P(x,y) = x^4 + 4x^3y + 3x^2y^2 + 2xy^3 - y^4$

Suma de coeficientes $= 1+4+3+2-1 = 9$ //

(4) $(\log_2 16x)^2 + (\log_2 32x)^2 = 13$

$(\log_2 16 + \log_2 x)^2 + (\log_2 32 + \log_2 x)^2 = 13$

$(4 + \log_2 x)^2 + (5 + \log_2 x)^2 = 13$

$16 + 8\log_2 x + (\log_2 x)^2 + 25 + 10\log_2 x + (\log_2 x)^2 = 13$

$(\log_2 x)^2 + 9\log_2 x + 14 = 0$

$(\log_2 x + 7)(\log_2 x + 2) = 0$

i) $\log_2 x + 7 = 0$

$\log_2 x = -7$

$x = 2^{-7}$

$x_1 = \frac{1}{2^7} = \frac{1}{128}$

ii) $\log_2 x + 2 = 0$

$\log_2 x = -2$

$x = 2^{-2}$

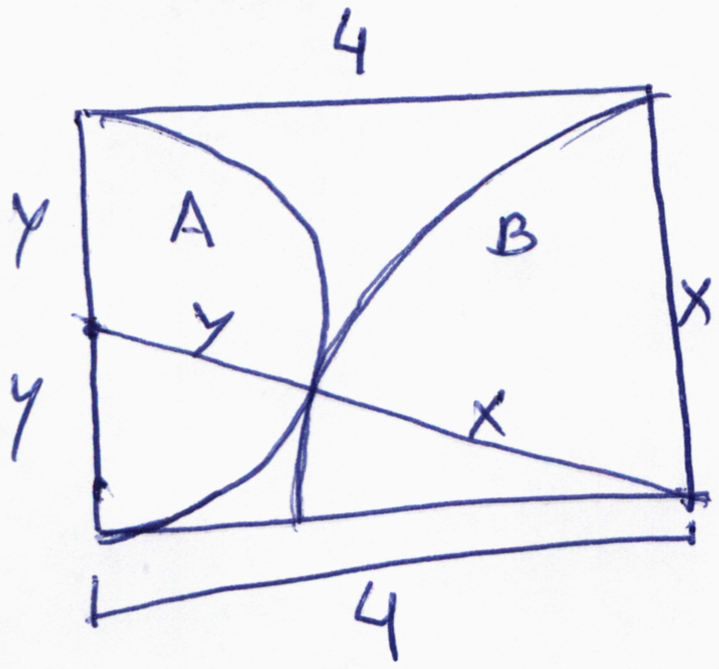
$x_2 = \frac{1}{4}$

Por lo tanto

$x_1 + x_2 = \frac{1}{128} + \frac{1}{4} = \frac{33}{128}$

GEOMETRIA - TRIGONOMETRIA

(5)



$$\begin{cases} x = 2y \\ y^2 + 4^2 = (x+y)^2 \end{cases}$$

$$y^2 + 16 = (3y)^2$$

$$16 = 8y^2$$

$$y = \sqrt{2}$$

$$x = 2\sqrt{2}$$

$$\text{Area} = A + B$$

$$= \frac{1}{2}(\pi y^2) + \frac{1}{4}(\pi x^2) = \frac{1}{2}(\pi \sqrt{2}^2) + \frac{1}{4}(\pi (2\sqrt{2})^2)$$

$$\text{Area} = 3\pi$$

(6)

$$\cot\left(\frac{x}{2}\right) + \operatorname{tg}\left(\frac{x}{2}\right) = 4\operatorname{sen} x$$

$$\frac{\cos\left(\frac{x}{2}\right)}{\operatorname{sen}\left(\frac{x}{2}\right)} + \frac{\operatorname{sen}\left(\frac{x}{2}\right)}{\cos\left(\frac{x}{2}\right)} = 4\operatorname{sen} x$$

$$\frac{\cos^2\left(\frac{x}{2}\right) + \operatorname{sen}^2\left(\frac{x}{2}\right)}{\operatorname{sen}\left(\frac{x}{2}\right)\cos\left(\frac{x}{2}\right)} = 4\operatorname{sen} x$$

$$\frac{1}{\frac{1}{2}\operatorname{sen} x} = 4\operatorname{sen} x$$

$$\operatorname{sen}^2 x = \frac{1}{2}$$

$$\operatorname{sen} x = \pm\frac{\sqrt{3}}{2} \Rightarrow x = 45, 135, 225, 315$$

$$\therefore E = 225 + 315$$

$$E = 540^\circ$$

(7) Nota. $\operatorname{Sen}A + \operatorname{Sen}B = 2\operatorname{Sen}\left(\frac{A+B}{2}\right)\operatorname{Cos}\left(\frac{A-B}{2}\right)$

$$\operatorname{Sen}(70+x) + \operatorname{Sen}(110-x) = 1$$

$$2\operatorname{Sen}\left(\frac{(70+x)+(110-x)}{2}\right)\operatorname{Cos}\left(\frac{(70+x)-(110-x)}{2}\right) = 1$$

$$2\operatorname{Sen}(90)\operatorname{Cos}\left(\frac{2x-40}{2}\right) = 1$$

$$\operatorname{Cos}(x-20) = \frac{1}{2}$$

$\therefore$ $x-20 = 60 \longrightarrow x_1 = 80$

$x-20 = 300 \longrightarrow x_2 = 320$

R. Una solución

(8) $$\begin{cases} x+y = \frac{3\pi}{2} \\ \operatorname{Sen}x + \operatorname{Sen}y = \sqrt{2} \end{cases} \Rightarrow 2\operatorname{Sen}\left(\frac{x+y}{2}\right)\operatorname{Cos}\left(\frac{x-y}{2}\right) = \sqrt{2}$$

$$2\operatorname{Sen}\left(\frac{3\pi/2}{2}\right)\operatorname{Cos}\left(\frac{x-y}{2}\right) = \sqrt{2}$$

$$2\operatorname{Sen}\left(\frac{3\pi}{4}\right)\operatorname{Cos}\left(\frac{x-y}{2}\right) = \sqrt{2}$$

$$2 \cdot \frac{\sqrt{2}}{2}\operatorname{Cos}\left(\frac{x-y}{2}\right) = \sqrt{2}$$

$$\operatorname{Cos}\left(\frac{x-y}{2}\right) = 1$$

$\therefore$ i) $\frac{x-y}{2} = 0$ | ii) $\frac{x-y}{2} = 2\pi$

$x-y = 0$ ✓ | $x-y = 4\pi$ X

$x = y \Rightarrow \boxed{\frac{y}{x} = 1}$

F9

5)

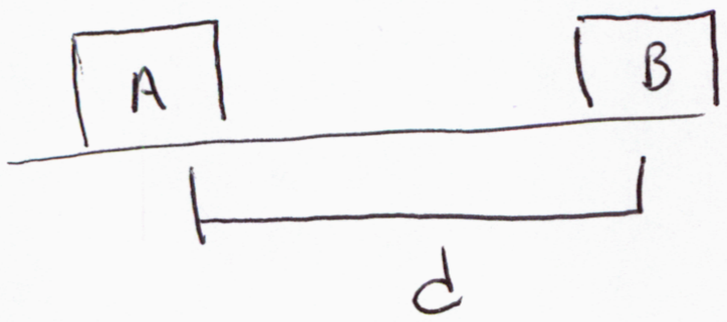
Datos

$d = 50\,m$

$v_A = 40\,m/s$

$v_B = 15\,m/s$

$t = ?$



$$x_A = v_A t$$

$$x_B = d + v_B t$$

$$x_A - x_B = 150$$

$$v_A t - d - v_B t = 150$$

$$t(v_A - v_B) = 150 + d$$

$$t = \frac{150 + 50}{40 - 15} = \frac{200}{25}$$

$$t = 8\,(s)$$

F10

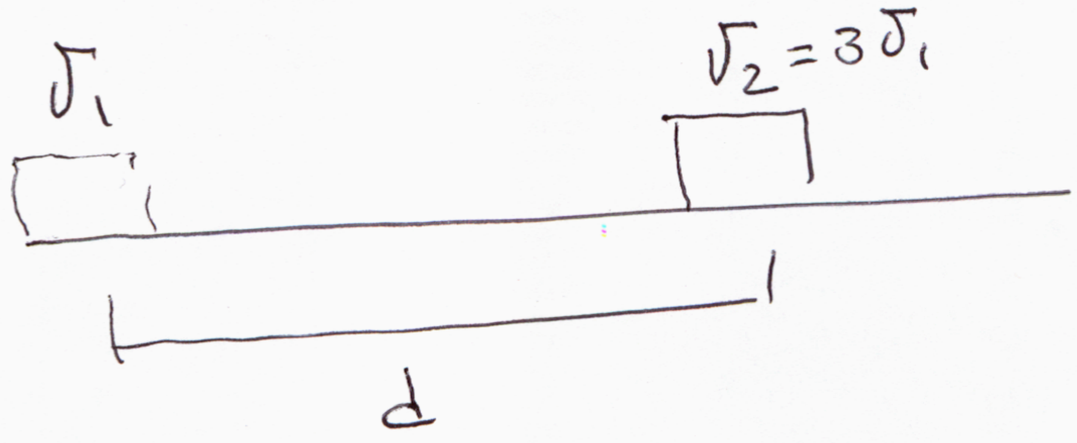
9)

Datos

$d = 200\ m$

$t_d = 10\ s$

$a = ?$



$$y = y_0 + v_0 t + \frac{1}{2} a t^2$$

sea $v_0 = v_1$, $t = t_d$ y $y = d$

$y_0 = 0$

$$d = v_1 t_d + \frac{1}{2} a t_d^2$$

$$v = v_0 + at$$

$$v_2 = v_1 + a t_d \Rightarrow 3v_1 = v_1 + a t_d$$

$$2v_1 = a t_d$$

$$v_1 = \frac{a t_d}{2}$$

o sea $\quad d = \frac{a t_d}{2} t_d + \frac{1}{2} a t_d^2 = \frac{a t_d^2}{2} + \frac{1}{2} a t_d^2$

$$d = a t_d^2 \Rightarrow a = \frac{d}{t_d^2} = \frac{200}{100}$$

$$a = 2\ m/s^2$$

F11

~~15~~)

Datos

$m = 1\ kg$

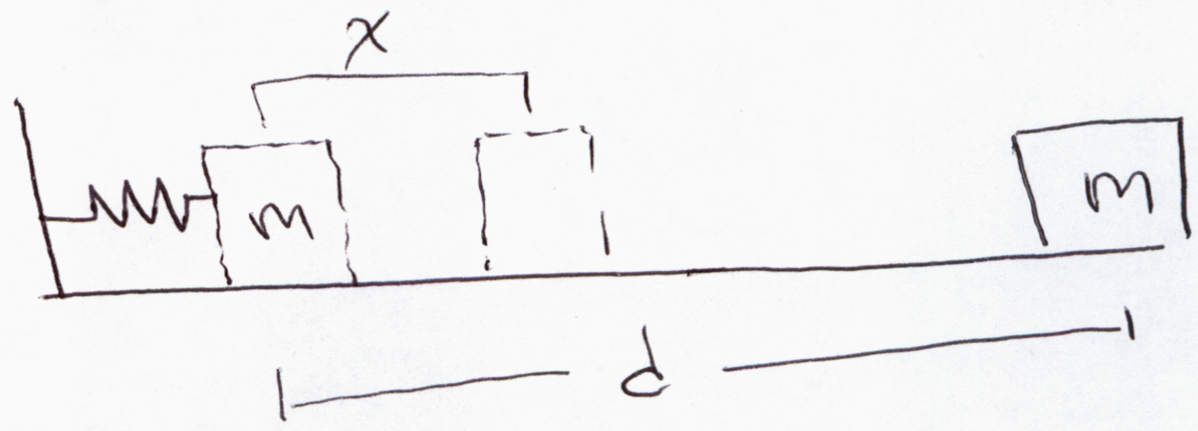
$x = 10\ cm = 0,1\ m$

$k = 500\ N/m$

$\mu = 0,1$

$v_d = ?$

$d = 10x = \cancel{10}\ \frac{1}{\cancel{10}} = 1m.$



$N = mg$

$\Delta E = W_{nc} \qquad \Delta E_{pg} = 0 \ ; \ \Delta E_c = \frac{m}{2}v_f^2 - \frac{v_0^2}{2}m$

$\Delta E_c = \frac{1}{2}mv_d^2 - \frac{1}{2}mv_0^2$ (0)

$\Delta P_{pe} = \frac{1}{2}k\cancel{x_d^2}^{0} - \frac{1}{2}kx^2$

$\Delta E = \Delta E_c + \Delta E_{pe} = \frac{1}{2}mv_d^2 - \frac{1}{2}kx^2$

$W_{nc} = \vec{f_r} \cdot \Delta\vec{r} = -\mu N d = -\mu mg d$

$\therefore \quad \frac{1}{2}mv_d^2 - \frac{1}{2}kx^2 = -\mu mgd$

$\frac{1}{2}mv_d^2 = \frac{1}{2}kx^2 - \mu mgd$

$v_d = \sqrt{\frac{2}{m}\left(\frac{1}{2}kx^2 - \mu mgd\right)} = \sqrt{\frac{kx^2}{m} - 2\mu gd}$

$v_d = \sqrt{500\ \frac{1}{10^2} - 2\ \frac{1}{\cancel{10}}\cancel{10}} = \sqrt{5-2} = \sqrt{3}\ m/s$

F12

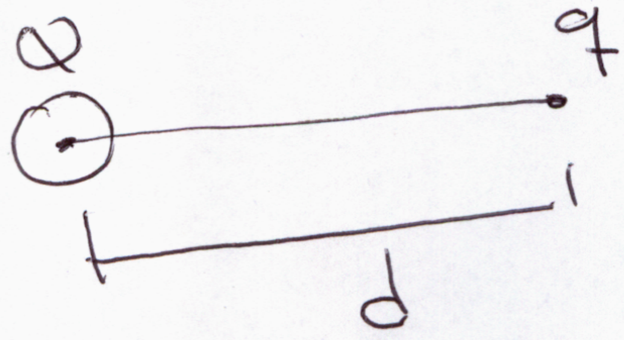
17)

Datos

$Q = 8 \times 10^{-4} C$

$d = 6\ m$

$U = 6 [J]$



$$U = q\Delta V \; ; \quad \Delta V = \frac{k_e Q}{d}$$

$$q = \frac{U}{\Delta V} = \frac{U\,d}{k_e Q} = \frac{6 \cdot 6}{9 \times 10^9 \cdot 8 \times 10^{-4}}$$

$$q = \frac{36}{72 \times 10^5} = \frac{1}{2 \times 10^5} = 0{,}5 \times 10^{-5}$$

$$q = 5 \times 10^{-6} = 5\,\mu C$$

Q13. Una mezcla de 880 g de dióxido de carbono y 280 g de monóxido de carbono está contenida en un recipiente a 27 °C. La relación de presiones parciales del dióxido de carbono con respecto a la del monóxido de carbono es:

$$\frac{P_{CO_2}V}{P_{CO}V} = \frac{n_{CO_2}RT}{n_{CO}RT}$$

$$n_x = \frac{m_x}{M_x} \qquad n_{CO2} = \frac{880\ g}{44\frac{g}{mol}} = 20\ moles \qquad n_{CO} = \frac{280}{28} = 10\ moles$$

$$\frac{P_{CO_2}}{P_{CO}} = \frac{20\ moles}{10\ moles} = 2$$

Q14. En ciertas condiciones de presión y temperatura, la densidad del gas metano (CH_4) es 2,23 g/L. Halle la densidad del gas oxígeno en las mismas condiciones de presión y temperatura.

$$\frac{PM_{O2}}{PM_{CH4}} = \frac{\delta_{O2}RT}{\delta_{CH4}RT}$$

$$\delta_{O2} = \delta_{CH4} * \frac{M_{O2}}{M_{CH4}} = 2{,}23\frac{g}{L} * \frac{32}{16} = 4{,}46\frac{g}{L}$$

Q15. A nivel del mar, una solución acuosa de amoniaco tiene disuelto 5,1 gramos de amoniaco ebulle a 100,52 ºC, Considerando que la constante ebulloscópica para el agua es 0,52 ºC/molal, calcular en volumen en mililitros del solvente presente en la solución, asumiendo que la densidad del agua es igual a 1 g/mL.

$$\Delta T_e = T_{sol} - T_{Disol} = 100{,}52 - 100 = 0.52℃$$

$$\Delta T_e = K_e * m \qquad m = \frac{0{,}52}{0{,}52} = 1\frac{mol}{kg} = \frac{n_{NH3}}{m\ (kg)}$$

$$m(kg) = \frac{\frac{5{,}1\ g}{17\frac{g}{mol}}}{1\frac{mol}{kg}} = 0{,}3\ kg = 300\ g\ H_2O$$

$$V_{H2O} = \frac{m}{\delta} = \frac{300\ g}{1\frac{g}{L}} = 300\ ml$$

Q16. ¿Cuantos moles de átomos de oxigeno están contenidos en 30 de glucosa ($C_6H_{12}O_6$?

PREGUNTA ANULADA PORQUE FALTA UN DATO.