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Kelas : 23 A

Fisika Modern

1). Diket :

$$v = 106 \text{ km/jam} = \frac{106 \times 1000}{3600} = 29,44 \text{ m/s}$$

$$t = 30 \text{ s}$$

$$x = 1 \text{ km} = 1000 \text{ m}$$

Ditanya : a) Koordinat kilatan menurut pengamat di stasiun (x, t)
b) Koordinat kilatan menurut pengamat dalam kereta (x', t')

Jawab :

$$a). x = 0 \rightarrow (x, t) = (1000 \text{ m}, 30 \text{ s})$$

$$b). x' = x - vt$$

$$= 1000 \text{ m} - (29,44 \text{ m/s})(30 \text{ s})$$

$$= 1000 \text{ m} - 883,2 \text{ m}$$

$$= 116,8 \text{ m}$$

$$t' = t = 30 \text{ s}$$

$$(x', t') = (116,8 \text{ m}, 30 \text{ s})$$

2). Diket :

$$v_{\text{kereta}} = 72 \text{ km/jam} = \frac{72 \times 1000}{3600} = 20 \text{ m/s}$$

$$v'_{\text{bola}} = -15 \text{ m/s} \text{ (negatif karena berlawanan arah dengan kereta)}$$

Ditanya : kecepatan bola menurut pengamat diam di stasiun (v_b)

Jawab :

$$v_b = v_k + v'_b$$

$$= 20 + (-15)$$

$$= 5 \text{ m/s}$$

3). Diket :

$$v_A = 60 \text{ km/jam}$$

$$v_B = 40 \text{ km/jam}$$

Ditanya : a). laju mobil A terhadap mobil B (v_{AB})

b). laju mobil B terhadap mobil A (v_{BA})

Jawab :

$$a). v_{AB} = v_A - v_B$$

$$= 60 - 40 \text{ km/jam}$$

$$= 20 \text{ km/jam}$$

$$v_{BA} = v_B - v_A$$

$$= 40 - 60 \text{ km/jam}$$

$$= -20 \text{ km/jam} \text{ (berlawanan arah)}$$

4. Diket :

$$k' = 5 \text{ m}$$

$$v = 36 \text{ km/jam} = 10 \text{ m/s}$$

$$t' = 5 \text{ s}$$

ditanya : a). (x', t')

b). (x, t)

Jawab :

$$\text{a). } (x', t') = (5 \text{ m}, 5 \text{ s})$$

$$\text{b). } x = x' + (v \cdot t')$$

$$= 5 + (10 \cdot 5)$$

$$= 5 + 50$$

$$= 55 \text{ m}$$

$$t = t' = 5 \text{ s}$$

$$(x, t) = (55 \text{ m}, 5 \text{ s})$$

5. Diku :

$$d = 100 \text{ m}$$

$$v_{\text{arus}} = 60 \text{ m/s}$$

$$v_{\text{perenang}} = 80 \text{ m/s}$$

ditanya : a). Perenang berenang tegak lurus (t)?

b). Perenang membentuk sudut 53° terhadap arus (t')?

Jawab :

$$\text{a). } t = \frac{d}{v} = \frac{100}{52,92}$$

$$= 1,89 \text{ s}$$

$$v_{\perp} = \sqrt{v_p^2 - v_A^2}$$

$$= \sqrt{80^2 - 60^2}$$

$$= \sqrt{2800} = 52,92 \text{ m/s}$$

$$\text{b). } v_x = v_p \cos 53^\circ$$

$$= 80 \times 0,6$$

$$= 48 \text{ m/s}$$

$$v_y = v_p \sin 53^\circ$$

$$= 80 \times 0,798$$

$$= 63,84 \text{ m/s}$$

$$t' = \frac{d}{v_y} = \frac{100}{63,84} = 1,576$$

6. Diket :

$$c = c$$

$$u = u$$

$$L = 2L$$

Ditanya : a). t total arus ?

b). t total arus : t total tegak lurus ?

Jawab :

$$\text{a). } v_{\text{kelawanan}} = c - u$$

$$v_{\text{searah}} = c + u$$

$$t_{\text{pergi}} = \frac{L}{c - u}$$

$$t_{\text{kembali}} = \frac{L}{c + u}$$

$$\begin{aligned}
 t_{\text{total}} &= \frac{L}{c-u} + \frac{L}{c+u} \\
 &= \frac{L(c+u) + L(c-u)}{(c-u)(c+u)} \\
 &= \frac{Lc + Lu + Lc - Lu}{c^2 - u^2} \\
 &= \frac{2Lc}{c^2 - u^2}
 \end{aligned}$$

$$\begin{aligned}
 \text{b). } c^2 &= v^2 + u^2 \\
 v^2 &= c^2 - u^2 \\
 v &= \sqrt{c^2 - u^2}
 \end{aligned}$$

$$t_{\text{terang}} = \frac{L}{\sqrt{c^2 - u^2}}$$

$$t_{\text{total tegak lurus}} = 2 \times \frac{L}{\sqrt{c^2 - u^2}}$$

$$t_{\text{total arus}} = \frac{2Lc}{c^2 - u^2}$$

$$t_{\text{total L}} = 2 \times \frac{L}{\sqrt{c^2 - u^2}}$$

$$= \frac{c}{c^2 - u^2} \times \sqrt{c^2 - u^2}$$

$$= \frac{c \sqrt{c^2 - u^2}}{c^2 - u^2}$$

$$= \frac{c}{\sqrt{c^2 - u^2}}$$

$$t_{\text{total arus}} > t_{\text{total L}}$$