

①

$$\omega_5 = \frac{2\pi}{T} = \frac{2\pi}{60} = 0.105 \text{ rad/s}$$

$$= \frac{\pi}{30} \quad \text{B}$$

②

$$\omega_{33} = 2\pi \nu = 2\pi \cdot 33.33 \cdot \frac{1}{60 \cdot 60} = \frac{209}{30} = 3.49 \text{ rad/s}$$

$$\quad \text{B}$$

③

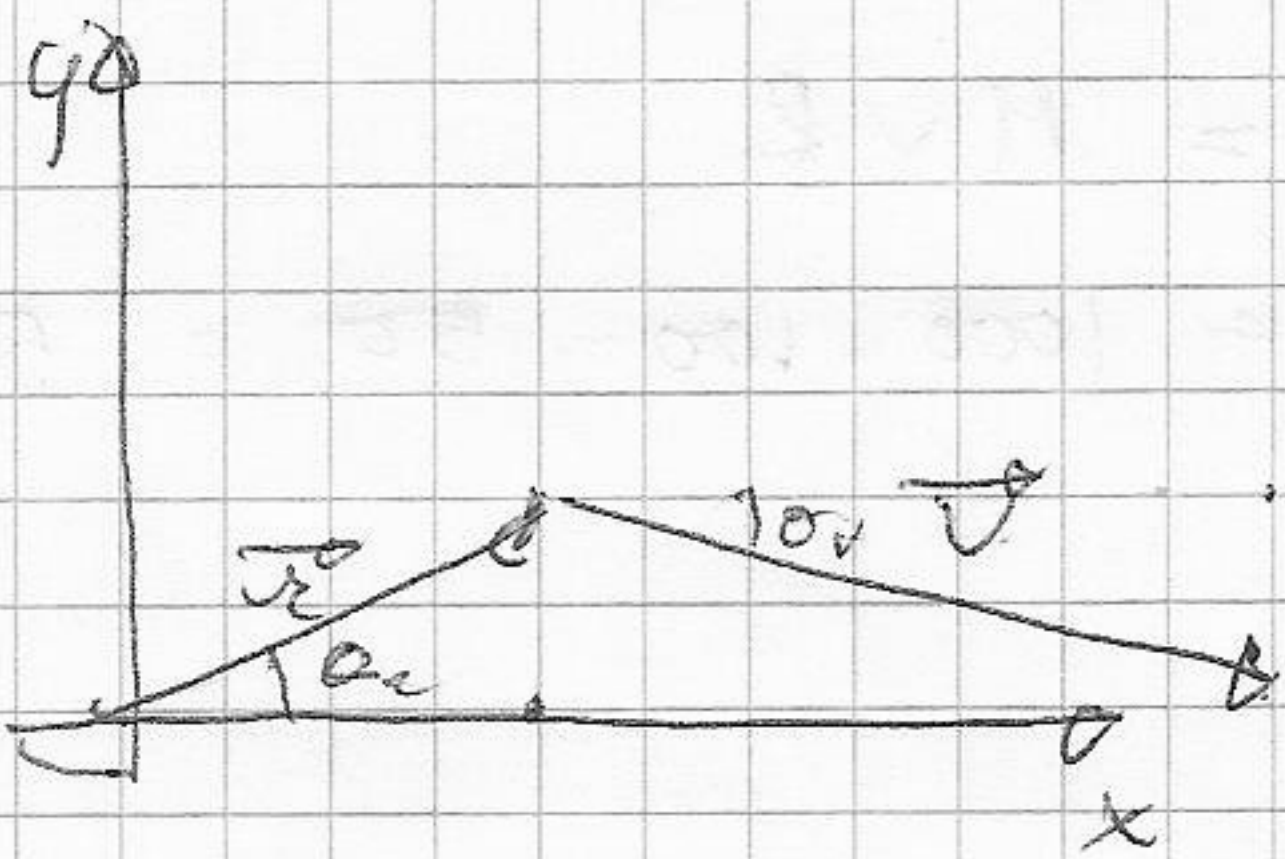
$$\vec{v} = 7.0 \hat{x} + 2.0 \hat{y} \quad \text{m/s}$$

$$m = 2 \text{ kg}$$

$$\vec{r} = 2.0 \hat{x} + 1.0 \hat{y} \quad \text{m}$$

$$\vec{L} = \vec{r} \wedge \vec{p} = \begin{vmatrix} \hat{x} & \hat{y} & \hat{z} \\ 2 & 1 & 0 \\ -14 & -4 & 0 \end{vmatrix} = \hat{z}(-8 - 14) = -22 \hat{z} \text{ kg m}^2/\text{s}$$

④



OPPURE:

$$L = -\hat{z} r p \sin(\theta_r + \theta_v)$$

$$= -2.26 \cdot 14.6 \cdot 0.676 \hat{z}$$

$$= -22.0 \hat{z}$$

$$\|\vec{r}\| = \sqrt{5} = 2.24$$

$$\|\vec{p}\| = \sqrt{212} = 14.6$$

$$\theta_r = \arctan \frac{1}{2} = 26.6^\circ$$

$$\theta_v = \arctan \frac{-2}{7} = -15^\circ$$

$$|\theta_r| + |\theta_v| = 42.5^\circ$$

④

$$\omega = 8.0 \text{ rad/s}$$

$$\Delta t = 2.5 \text{ s}$$

$$\omega = \alpha t + \omega_0$$

$$\alpha = \frac{\omega - \omega_0}{t} = \frac{-8}{2.5}$$

$$= -3.2 \text{ rad/s}^2$$

$$\theta = \frac{1}{2} \alpha t^2 + \omega_0 t + \theta_0$$

$$= -\frac{1}{2} \cdot 3.2 \cdot 2.5^2 + 8 \cdot 2.5 + 0 = -10 + 20 = +10 \text{ rad}$$

④

5) $\vec{r} = 2\hat{x} - \hat{y}$ m
 $\vec{F} = \hat{x} + 3\hat{y}$ N

6) $\vec{\tau} = \vec{r} \wedge \vec{F} = \begin{vmatrix} \hat{x} & \hat{y} & \hat{z} \\ 2 & -1 & 0 \\ 1 & 3 & 0 \end{vmatrix} = \hat{z} (6 + 1) = 7\hat{z}$ Nm

7) $I = 3 \text{ kg m}^2$
 $\omega = 6.0 \text{ rad/s}$

$K = \frac{1}{2} I \omega^2$

8) $= \frac{1}{2} \cdot 3 \cdot 6^2 = 54 \text{ J}$

9) A

10) $M = 1000 \text{ kg}$
 $R = 100 \text{ m}$
 $v = 50 \text{ m/s}$

$L = MvR$

$= 1000 \cdot 100 \cdot 50 = 5 \cdot 10^6 \text{ kg m}^2/\text{s}$

11) $M_L = 7.35 \cdot 10^{22} \text{ kg}$

$R = 3.84 \cdot 10^8 \text{ m}$

$T = 27.3 \text{ d} = 27.3 \cdot 24 \cdot 3600 =$
 $= 2.36 \cdot 10^6 \text{ s}$

$L_{\text{Luna}} = MvR = M\omega R^2 = MR^2 \frac{2\pi}{T}$

$= 7.35 \cdot 10^{22} \cdot (3.84 \cdot 10^8)^2 \frac{2\pi}{2.36 \cdot 10^6} =$ (E)

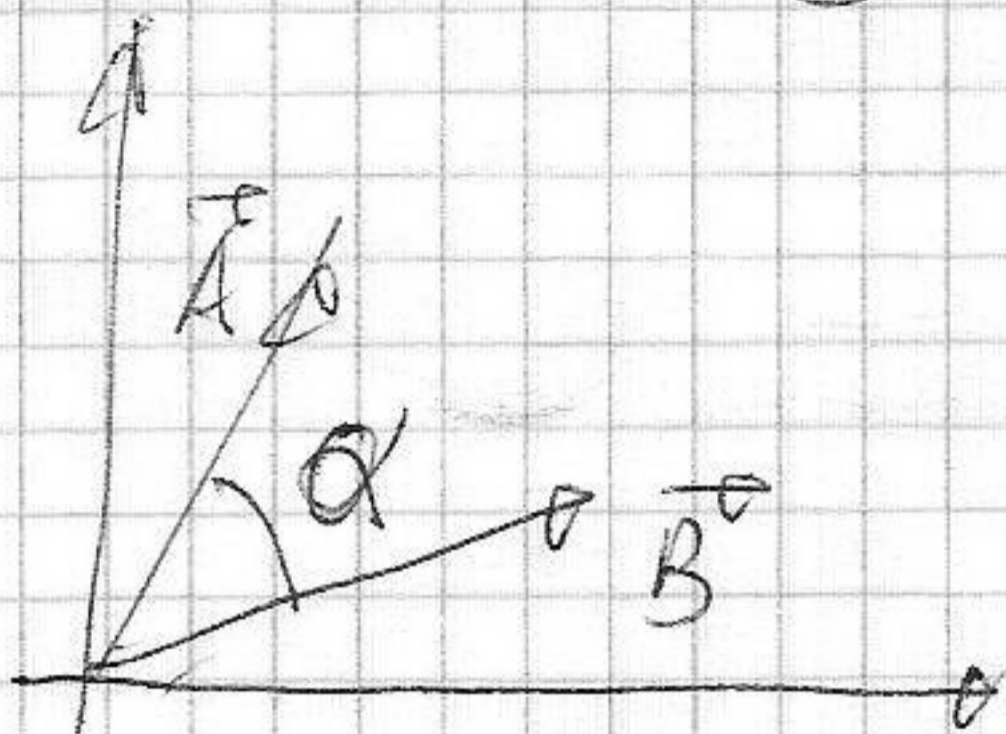
$= 288 \cdot 10^{32} = 2.88 \cdot 10^{34} \text{ kg m}^2/\text{s}$

12) C

Angolo fra 2 vettori:

$$\vec{A} = a\hat{x} + b\hat{y}$$

$$\vec{B} = c\hat{x} + d\hat{y}$$



$$\vec{A} \cdot \vec{B} = \|\vec{A}\| \|\vec{B}\| \cos \alpha$$

$$\cos \alpha = \frac{\vec{A} \cdot \vec{B}}{\|\vec{A}\| \|\vec{B}\|}$$

$$\cos \alpha = \frac{ac + bd}{\sqrt{a^2 + b^2} \sqrt{c^2 + d^2}}$$

$$\vec{A} = 7\hat{x} - 2\hat{y}$$

$$\vec{B} = 2\hat{x} + \hat{y}$$

$$\cos \alpha = \frac{14 - 2}{7.28 \cdot 2.3} = \frac{12}{16.28} = 0.737$$

$$\alpha = 42.5^\circ$$