



Многопрофильная
инженерная олимпиада
«Звезда»

Шифр A-59-08-31

N1

Дано:

$$v_1 = 15 \frac{\text{км}}{\text{сек}}$$

$$v_2 = 12,2 \frac{\text{км}}{\text{сек}}$$

$$l = 54,6 \text{ км}$$

$v_{\text{пр}} = ?$

$$v_{\text{пр}} = \frac{l}{t} = \frac{l_1 + l_2}{t_1 + t_2} = \frac{\frac{l}{3} + \frac{2l}{3}}{\frac{l}{3v_1} + \frac{2l}{3v_2}} = \frac{l}{\frac{l}{3v_1} + \frac{2l}{3v_2}} =$$

$$= \frac{l}{l(\frac{1}{3v_1} + \frac{2}{3v_2})} = \frac{1}{\frac{1}{v_2 + 2v_1}} = \frac{3v_1v_2}{v_2 + 2v_1} = \frac{3 \cdot 15 \frac{\text{км}}{\text{сек}} \cdot 12,2 \frac{\text{км}}{\text{сек}}}{12,2 \frac{\text{км}}{\text{сек}} + 2 \cdot 15 \frac{\text{км}}{\text{сек}}} =$$

$$= 13 \frac{\text{км}}{\text{сек}}$$

Ответ: $13 \frac{\text{км}}{\text{сек}}$

N2 Дано:

$$R = 2,25 \cdot 10^8 \text{ км}$$

$$T = 400 \text{ сут}$$

$$\pi = 3,14$$

$v_{\text{пр}} = ?$

$$l = 2\pi R = 2\pi R = 2 \cdot 3,14 \cdot 2,25 \cdot 10^8 \text{ км} = 14,13 \cdot 10^8 \text{ км}$$

$$t = 400 \cdot 86400 \text{ сек} = 168000 \text{ сек}$$

$$t = 400 \text{ сут} \cdot 24 \text{ ч} = 16800 \text{ ч}$$

$$v_{\text{пр}} = \frac{l}{t} = \frac{14,13 \cdot 10^8 \text{ км}}{16800 \text{ ч}} = 8410 \frac{\text{км}}{\text{ч}} = 23,4 \frac{\text{км}}{\text{ч}}$$

Ответ: $23,4 \frac{\text{км}}{\text{ч}}$

$$T = 1444,5 \text{ мин} \cdot 60 = 86650 \text{ сек}$$

$$\omega = \frac{2\pi}{T} = \frac{2 \cdot 3,14}{86650 \text{ сек}} = 0,0007 \frac{\text{рад}}{\text{сек}}$$

$$v = \omega R = 0,0007 \frac{\text{рад}}{\text{сек}} \cdot 3430 \text{ км} = 0,24 \frac{\text{км} \cdot \text{рад}}{\text{сек}}$$

Ответ: $0,24 \frac{\text{км} \cdot \text{рад}}{\text{сек}}$

N3

Дано:

$$R = 3430 \text{ км}$$

$$T = 1444,5 \text{ мин}$$

$$\pi = 3,14$$

$v_{\text{пр}} = ?$

N 4

Dano:

$$R = 3430 \text{ km}$$

$$m = 6,3 \cdot 10^{23} \text{ kg}$$

$$\bar{J} = 3,14$$

$$\rho_{\text{pr}} = ?$$

$$V = \frac{4}{3} \bar{J} R^3$$

$$\rho = \frac{m}{V} = \frac{m}{\frac{4}{3} \bar{J} R^3} = \frac{6,3 \cdot 10^{23} \text{ kg}}{\frac{4}{3} \cdot 3,14 \cdot (3430 \text{ km})^3} = 3429 \frac{\text{kg}}{\text{m}^3}$$

$$\text{Omdem: } 3429 \frac{\text{kg}}{\text{m}^3}$$

N 5

Dano:

$$T = 88 \text{ min} = 88 \cdot 60 = 5280 \text{ sek}$$

$$h = 220 \text{ km}$$

$$R = 3430 \text{ km}$$

$$\bar{J} = 3,14$$

$$\omega = ? , v = ?$$

r - radij opduvka

$$r = R + h = 3430 \text{ km} + 220 \text{ km} = 3650 \text{ km}$$

$$\omega = \frac{2\pi}{T} = \frac{2 \cdot 3,14}{5280 \text{ sek}} = 0,0012 \frac{\text{rad}}{\text{sek}}$$

$$= 9,38 \frac{\text{km} \cdot \text{rad}}{\text{sek}}$$

$$v = \omega \cdot r = 0,0012 \frac{\text{rad}}{\text{sek}} \cdot 3650 \text{ km} = 0,432 \text{ km}$$

$$\text{Omdem: } 0,0012 \frac{\text{rad}}{\text{sek}} ; 0,432 \text{ km}$$

$$\text{Omdem: } 0,0012 \frac{\text{rad}}{\text{sek}} ; 9,38 \frac{\text{km} \cdot \text{rad}}{\text{sek}}$$