

8-вар

Дано

a
 $C_1 = C_2$

Найти
ёмкость
в паралл.
соед.



1. Если соединить пластины

$$C_2 = C_1 k$$

$$\frac{1}{C_{\text{общ}}} = \frac{1}{C} + \frac{1}{Ck} = \frac{k+1}{Ck}$$

$$C_{\text{общ}} = \frac{Ck}{k+1}$$

при послед. соедин.

k - это

$$d_1 = d$$

$$d_2 = d - a \quad k = \frac{d_1}{d_2} = \frac{d}{d-a}$$

Тогда для параллельных

$$C_{\text{общ}} = C \left(1 + \frac{d}{d-a} \right) = C \left(\frac{d-a+d}{d-a} \right) =$$

$$\text{Для паралл. соедин.} = \left(\frac{2d-a}{d-a} \right) C$$

$$C_{\text{общ}} = C \left(\frac{d}{d-a} \right) \left(\frac{1}{\left(\frac{d}{d-a} + 1 \right)} \right) = \frac{Cd}{2d-a}$$

Вывод

Ёмкость батареи в случае паралл. соедин. увеличивается

т.к. $k > 1$

А в случае послед. соедин. - уменьшается

2) случай, если раздвинуть пластины

$$k = \frac{d}{d+a} \text{ - и всё наоборот}$$

1

$$C_0' = C \left(1 + \frac{d}{d+a} \right) = \frac{C(2d+a)}{d+a} \quad \text{8-вариант}$$

$$C_0'' = C \left(\frac{d}{d+a} \right) \frac{1}{\frac{d}{d+a} + 1} = \frac{cd}{2d+a} \quad \text{при парал.}$$

№

Дано

$$V_1 = 30 \text{ л}$$

$$V_2 = 10 \text{ л}$$

Если $P_1 > P_2$ и 300 мм рт.ст.

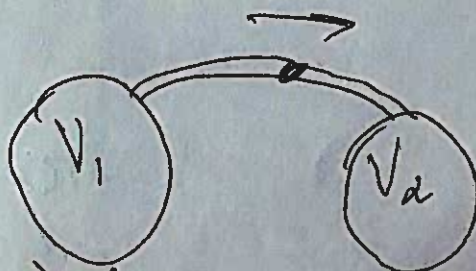
$$P_2 = 760 \text{ мм рт.ст.}$$

$$T_1 = 12^\circ \text{C}$$

$$T_2 = 152^\circ \text{C}$$

Найти P_1' - ?

Решение



1) При $P_2 = 760 \text{ мм. рт.ст.}$

$$\begin{cases} P_2 V_1 = \nu_1 R T_1 \\ P_1 V_1 = \nu_2 R T_2 \end{cases} \quad \text{то было и будет в 1-м сосудах}$$

2) Во втором сосудах

$$P_2' V_2 = \nu_3 R T_2$$

$$\text{где } \nu_3 = \nu_1 - \nu_2$$

$$\nu_1 = \frac{P_0 V_1}{R T_1} \quad \text{— было в 1-м сосудах}$$

$$\nu_2 = \frac{P_1' V_1}{R T_2} \quad \text{— стало в 1-м сосудах}$$

$$P_2' = P_1' - \Delta P$$

$$3) P_2' V_2 = \left(\frac{P_0 V_1}{R T_1} - \frac{P_1' V_1}{R T_2} \right) R T_2$$

$$P_2' V_2 = \frac{P_0 V_1 T_2}{T_1} - \frac{(P_2' + \Delta P) V_1 T_2}{T_2}$$

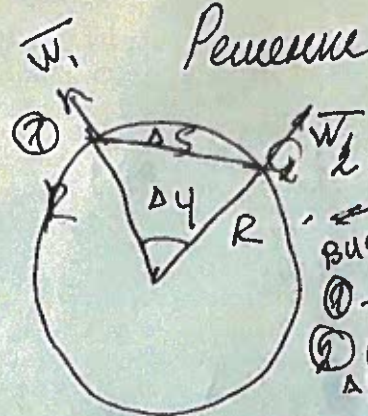
$$P_2' V_2 = P_2 V_2 \frac{T_2}{T_1} - P_2' V_1 - \Delta P V_1$$

2

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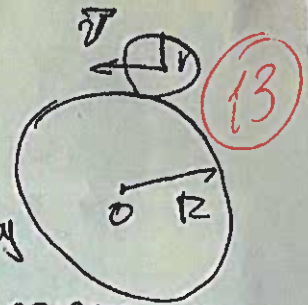
№9
Дано
R - радиус арки
r - радиус колеса
w - угл. скорость
ε - ?

8-вар.



Решение

1 - нар. полост
2 - конвек. полост
ΔS - дуга которую опис. велосипед.
Δφ - угол на сколько угл. скорость



3. При повороте колеса
точка кас. с земл. поверх.
путь $S = R w_1 \Delta t \Rightarrow r w_2 \Delta t = R w_1 \Delta t$

$$1. \Delta \varphi = \frac{(\Delta w)}{w} = \frac{\Delta S}{R}$$

2. Перемещение центра колеса

$$\Delta S = v \Delta t = w R \Delta t$$

знаем

$$\left| \frac{\Delta w}{w} \right| = \frac{w R \Delta t}{R} \Rightarrow$$

$$\Rightarrow \left| \frac{\Delta w}{w} \right| = w_1 \Delta t$$

$$\text{Ответ } \epsilon = \frac{w^2 r}{R}$$

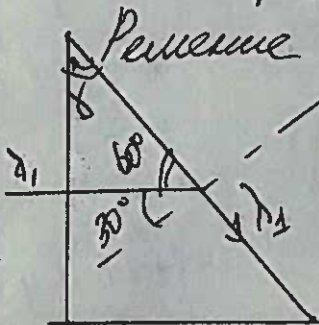
$$\frac{|\Delta w|}{w} = \frac{w \Delta t}{R} \Rightarrow |\Delta w| = \frac{w^2 \Delta t}{R}$$

$$4) \epsilon = \left| \frac{\Delta w}{\Delta t} \right| \Rightarrow \epsilon = \frac{r w^2 \Delta t}{R \Delta t} = \frac{r w^2}{R}$$

№10
Дано

$\lambda_1 = 600 \text{ нм}$
 $\lambda_2 = 450 \text{ нм}$
 $\alpha = 6.0 \cdot 10^{-4} \text{ м}$

Найти
 γ - ?



1. Найдем коэф. преломл.

$$n_1 = 1 + \frac{6.0 \cdot 10^{-4}}{600 \cdot 10^{-9}} = 2$$

$$n_2 = 1 + \frac{6.0 \cdot 10^{-4}}{450 \cdot 10^{-9}} = 2.8$$

На эту грань падает свет под углом $\alpha = 0^\circ \Rightarrow$ преломл. в среду во не менял.

а) Преломление будет макс на пров. грани грани чтобы λ_1 прошла в воздух необходимо чтобы выполнял усл. полного внутр. отражени $\Delta \sin \alpha_{кр} = \frac{1}{n_1} \Rightarrow \Delta \sin \alpha_{кр} = \frac{1}{2}$

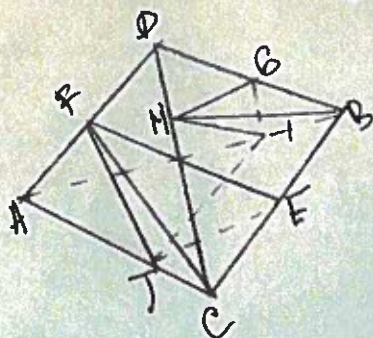
$$\text{Тогда } \gamma = 90 - 60^\circ$$

$$\alpha_{кр} = 30^\circ$$

4) Если $\gamma > 30^\circ$, то луч света, - отраж. от грани. Но при этом надо, чтобы λ_2 вошла в грань. (продолжение на стр 5)

N5

8-вариант



$$a) V_{ABC} = \frac{1}{3} S_{ABC} \cdot DH, DH - \text{выс.}$$

$$V_{CTFE} = \frac{1}{3} S_{CTFE} \cdot FH, DH - \text{выс.}$$

$$S_{CTFE} = \frac{1}{2} \cdot \frac{1}{2} BC \cdot CT \sin C$$

$$S_{ABC} = \frac{1}{2} BC \cdot AD \sin C$$

$$S_{CTFE} = \frac{1}{2m} S_{ABC} \Rightarrow V_{CTFE} = \frac{1}{4m} V_{ABC}$$

$$V_{BIM6} = \frac{1}{3} S_{BVI} \cdot HK \quad HK - \text{высота}$$

$$HK = \frac{1}{2} CK, CK - \text{высота } CABD$$

$$S_{ABVI} = \frac{1}{4} BD \cdot \frac{1}{m} BA \sin B$$

$$S_{ABD} = \frac{1}{2} BD \cdot BA \sin B$$

$$S_{BVI} = \frac{1}{2m} S_{ABD} \Rightarrow V_{BIM6} = \frac{1}{4m} S_{ABD}$$

$$V_{CTFE} = V_{BIM6}$$

$$b) V_{ABCD} = \frac{1}{4m} V_{CTFE}$$

$$2020 = \frac{1}{4m} V_{CTFE}$$

$$V_{CTFE} = \frac{505}{m}$$

Найдем m

$$\frac{AT}{TC} = \frac{5}{1} \Rightarrow S_{TCE} = \frac{1}{4} \cdot \frac{1}{6} S_{ABC}$$

$$TC = \frac{1}{6} AC \Rightarrow m = 6$$

$$V_{CTFE} = V_{BIM6} = \frac{505}{6} = 84 \frac{1}{6}$$

N3
Дано
1) от 12% до 16%
2) от 40% до 77%

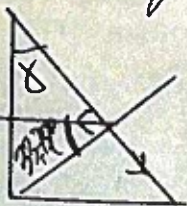
Чтобы число было минимальным, нужно
камень делить на наибольшее
число. В 1 случае будет $1 - 0,16 = 0,84$
наиб во 2 случае будет $1 - 0,4 = 0,3$

$$0,3 : 0,84 = 2,8 \text{ раза} \quad \text{Ответ: } 2,8$$

N4 $n+2020$ $n+2015$ $n+2020 \cdot 2015$
1 Расстояние между квадратами целых чисел -
последовательность из всех нечетных чисел, идущих по возрастанию
($1-0=1$; $4-1=3$; $9-4=5$ и т.д.) 2) У нас есть два квадрата, идущих
по возрастанию, отличающиеся на 5 $\Rightarrow$ это или числа $n+2015=4$
и $n+2020=9$ или таких нет, $1 \neq 2011$ - подходит
 $-2011 + 2015 \cdot 2020 = 4068289 = 2017^2$ и т.д.

6

№10 поговорим т.е. $\Delta \sin \alpha \approx \frac{1}{1.8} \Rightarrow \alpha \approx 33.75^\circ$ Значит если $\alpha \approx 33.75^\circ$
 $\Rightarrow \gamma = 180 - (90 - 33.75) - 90$
 $= 33.75^\circ$



Значит
 при изменении угла
 при вершине угла
 в пределах от 30° до 33.75°

если 33.75°
 перевести в градусы,
 то $33^\circ 44' 56''$

Откуда $\gamma \in (30^\circ; 33^\circ 44' 56'')$

$$\begin{aligned} \text{№1} \quad & 0, (714285) - 1, (571428) \\ & 0, (714285) = \frac{714285}{999999} \neq 1, (571428) = 1 \frac{571428}{999999} \end{aligned}$$

$$\frac{714285 - 1571428}{999999} = -\frac{857142}{999999} = -\frac{31746}{34034} = -\frac{6}{7} \quad \text{Откуда } -\frac{6}{7}$$

№2
 Дано
 $\alpha \in (0; \frac{\pi}{2})$
 $\beta \in (0; \frac{\pi}{2})$

Доказано
 $(\cos \alpha)^{\cos \alpha} + (\sin \beta)^{\sin \beta} \rightarrow \cos \alpha \sin \beta$

$$\begin{aligned} & (\cos \alpha)^{\cos \alpha} \in (0; 1) \Rightarrow (\cos \alpha)^{\cos \alpha} + (\sin \beta)^{\sin \beta} \in (0; 2) \Rightarrow \\ & (\sin \beta)^{\sin \beta} \in (0; 1) \\ & \Rightarrow \text{Таким образом в сумме } (\cos \alpha)^{\cos \alpha} + (\sin \beta)^{\sin \beta} \text{ будет} \\ & \text{больше, чем } \cos \alpha \sin \beta \text{ и т.д.} \end{aligned}$$

