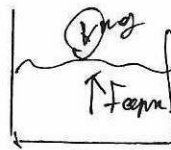
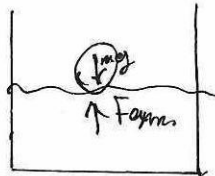


Многопрофильная
инженерная олимпиада
«Звезда»

шифр 34-08-33

Задание	1	2	3	4	5	6	7	8	Всего
Баллы	8	13	0	10	10	4	4	4	

Вариант 2



На шарики действуют 2 силы. Сила тяжести mg и сила архимеда.

$$F_m = mg = F_{m1} = F_{m2}$$

$$F_{a1} = \rho_{m1} g V = 6000 V$$

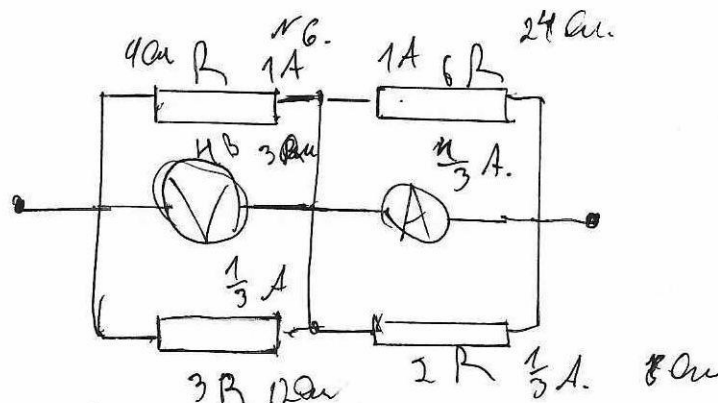
$$F_{a2} = \rho_{m2} g V = 8000 V$$

Чтобы $8000 V$ и $6000 V$ уравновесить, надо на V в I сосуде шарик опустить вниз с $F = 1000 V$, а во II сосуде с $F = 1000 V$ & поднять вверх. $\Rightarrow$

$$\Rightarrow F = 1000 V \Rightarrow \rho = \frac{F}{V \cdot g} = \frac{1000 V}{V \cdot g} = 1000 \frac{кг}{м^3}$$

$$= 7000 V \Rightarrow \rho = \frac{7000 V}{V \cdot g} = 700 \frac{кг}{м^3}$$

Ответ: $700 \frac{кг}{м^3}$

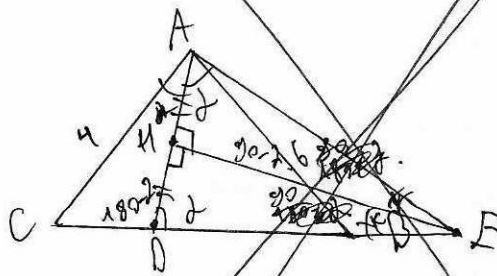
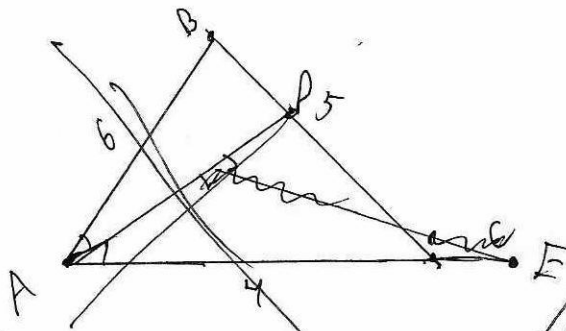


$$I = \frac{U}{R} = 1 A; \frac{1}{3} A. \quad \frac{1}{3} + 1 = \frac{4}{3} A.$$

$$R_{общ} = \frac{1}{\frac{1}{12} + \frac{1}{3} + \frac{1}{4}} \Rightarrow R = \frac{U}{I} = \frac{4}{\frac{4}{3}} = 3.$$

Ответ: $\frac{4}{3} A; 1 A; 2 B.$ $\Rightarrow U = R \cdot I = \frac{4}{3} \cdot 1,5 = 2 B$, но U не измерится

~~2 A; 1 A; 2 B.~~ $2 A; 1 A; 4 B.$

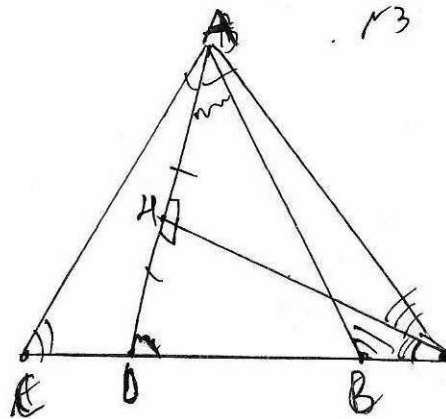


$\triangle AHE = \triangle DHE$ (по 2-м признакам) $\Rightarrow$
 $\Rightarrow \triangle AHE = \triangle DHE \Rightarrow \angle EDH = \angle EAH$.

$$\frac{BE}{CE} = ?$$

$$\frac{4}{6} = \frac{2}{3}$$

$\triangle ACE$ и $\triangle ABE$ подобны $\frac{4}{6} = \frac{2}{3}$
 $\triangle AHE$ и $\triangle DHE$ подобны.



Доказано:

$AB = 6$; $BC = 5$, $AC = 4$, AD - биссектриса.
 Пусть EH - перпендикуляр к AD . $\Rightarrow$
 $\Rightarrow \angle AHE = \angle EHD = 90^\circ$

$$\frac{BE}{CE}$$

$\triangle ACE \sim \triangle ABE$, так как AE - биссектриса $\Rightarrow \angle E$ общий и

$$\angle ABE = \angle ACE. \text{ ЧК} = \frac{4}{6}$$

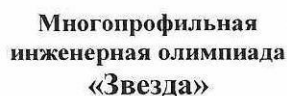
$\triangle AHE \sim \triangle DHE$ по 1-му признаку. $AH = HD$, HE - общая
 и это все признаки (по 2-м признакам) $\Rightarrow \angle AHE = \angle DHE$ и $\angle EDH =$
 $= \angle EAH$.

$\triangle CAD \sim \triangle ABE$

$\triangle ACE$ равнобедренный $\Rightarrow AC = AE = 4$.

$$\frac{BE}{CE} = \frac{4}{6} = \frac{2}{3}$$

Ответ: $\frac{2}{3}$



Задание	1	2	3	4	5	6	7	8	Всего
Баллы									

N2.

14		c		C	C	C
13	C		C		C	
12		C		C		C
11	C		C		C	C
10		C		C		C
9	C		C		C	
8		C		C		C
7	C		C		C	
6		C		C		C
5		C			C	
4	C		C		C	
3		C		C		C
2	C		C		C	
1		C		C		C
	1	2	3	4	5	6

	c		C		c
{	c	b		c	
	v		C		b
	c	L		C	
		C		C	
	C		C		C
c		C		C	
	C		C		c
c		C		C	
	C		C		b
C		C		C	
	C		C		b
c		C		C	
-		V		C	
	v		C		c
D		C		C	

всего II варианта расстановки серых, так как они должны быть между черными и белыми, и в каждом варианте 42 серых может занимать расприделить 42, а это 2^{42} способов, но поскольку вариантов 2, то всего $2^{42} \cdot 2$ способов или 2^{43}

ответ: 2^{43}

N 4.

4a + 5 : pq

3a-10 : 39

3a+10, 34
4a+5 нечетное $\Rightarrow$ рр нечетные ~~7a+10 нечетные~~
можно заметить, что:

$$a + 15 : 3^q$$

$$ka + 5\cancel{40}q \equiv 0 \pmod{pq}$$

$$4a + 5 : 5 = 7p = 5.$$

$$q = \frac{4}{3}a + 5$$

$$a = 11, \Rightarrow a = 40$$

$$3a - 10 \equiv 7 \pmod{pq}$$

Omber: 5 u 19

[illegible]

ОС - средний кернеу.

$$OC^2 + CB^2 - AB^2 = OB^2$$

$$1,2^2 + 6^2 =$$

Горизонтальную погоню займем на дорожке и зафиксируем груз.

$$V_{\text{горизонт}} = \frac{v_{\text{изл}}}{\sqrt{4,6 + 3,4}} = 4,1.$$

$$314 \frac{\text{km}}{\text{h}} = 1,77.$$

$$2a = 2\sqrt{26} \Rightarrow a = \sqrt{26}$$

$$\sqrt{6^2 + 4,6^2} = \sqrt{36 + 20,76} = \sqrt{56,76} = 7,6$$

$$\frac{7.6}{2} = 3.82$$

$$f_{\text{total}} = 1,72 + 3,87 = 5,59$$

~~47~~
 $\sqrt{26}$
Answer: ~~47~~ ~~46~~ ~~45~~ ~~44~~ ~~43~~ ~~42~~ ~~41~~ ~~40~~ ~~39~~ ~~38~~ ~~37~~ ~~36~~ ~~35~~ ~~34~~ ~~33~~ ~~32~~ ~~31~~ ~~30~~ ~~29~~ ~~28~~ ~~27~~ ~~26~~ ~~25~~ ~~24~~ ~~23~~ ~~22~~ ~~21~~ ~~20~~ ~~19~~ ~~18~~ ~~17~~ ~~16~~ ~~15~~ ~~14~~ ~~13~~ ~~12~~ ~~11~~ ~~10~~ ~~9~~ ~~8~~ ~~7~~ ~~6~~ ~~5~~ ~~4~~ ~~3~~ ~~2~~ ~~1~~ ~~0~~ ~~-1~~ ~~-2~~ ~~-3~~ ~~-4~~ ~~-5~~ ~~-6~~ ~~-7~~ ~~-8~~ ~~-9~~ ~~-10~~ ~~-11~~ ~~-12~~ ~~-13~~ ~~-14~~ ~~-15~~ ~~-16~~ ~~-17~~ ~~-18~~ ~~-19~~ ~~-20~~ ~~-21~~ ~~-22~~ ~~-23~~ ~~-24~~ ~~-25~~ ~~-26~~ ~~-27~~ ~~-28~~ ~~-29~~ ~~-30~~ ~~-31~~ ~~-32~~ ~~-33~~ ~~-34~~ ~~-35~~ ~~-36~~ ~~-37~~ ~~-38~~ ~~-39~~ ~~-40~~ ~~-41~~ ~~-42~~ ~~-43~~ ~~-44~~ ~~-45~~ ~~-46~~ ~~-47~~ ~~-48~~ ~~-49~~ ~~-50~~ ~~-51~~ ~~-52~~ ~~-53~~ ~~-54~~ ~~-55~~ ~~-56~~ ~~-57~~ ~~-58~~ ~~-59~~ ~~-60~~ ~~-61~~ ~~-62~~ ~~-63~~ ~~-64~~ ~~-65~~ ~~-66~~ ~~-67~~ ~~-68~~ ~~-69~~ ~~-70~~ ~~-71~~ ~~-72~~ ~~-73~~ ~~-74~~ ~~-75~~ ~~-76~~ ~~-77~~ ~~-78~~ ~~-79~~ ~~-80~~ ~~-81~~ ~~-82~~ ~~-83~~ ~~-84~~ ~~-85~~ ~~-86~~ ~~-87~~ ~~-88~~ ~~-89~~ ~~-90~~ ~~-91~~ ~~-92~~ ~~-93~~ ~~-94~~ ~~-95~~ ~~-96~~ ~~-97~~ ~~-98~~ ~~-99~~ ~~-100~~ ~~-101~~ ~~-102~~ ~~-103~~ ~~-104~~ ~~-105~~ ~~-106~~ ~~-107~~ ~~-108~~ ~~-109~~ ~~-110~~ ~~-111~~ ~~-112~~ ~~-113~~ ~~-114~~ ~~-115~~ ~~-116~~ ~~-117~~ ~~-118~~ ~~-119~~ ~~-120~~ ~~-121~~ ~~-122~~ ~~-123~~ ~~-124~~ ~~-125~~ ~~-126~~ ~~-127~~ ~~-128~~ ~~-129~~ ~~-130~~ ~~-131~~ ~~-132~~ ~~-133~~ ~~-134~~ ~~-135~~ ~~-136~~ ~~-137~~ ~~-138~~ ~~-139~~ ~~-140~~ ~~-141~~ ~~-142~~ ~~-143~~ ~~-144~~ ~~-145~~ ~~-146~~ ~~-147~~ ~~-148~~ ~~-149~~ ~~-150~~ ~~-151~~ ~~-152~~ ~~-153~~ ~~-154~~ ~~-155~~ ~~-156~~ ~~-157~~ ~~-158~~ ~~-159~~ ~~-160~~ ~~-161~~ ~~-162~~ ~~-163~~ ~~-164~~ ~~-165~~ ~~-166~~ ~~-167~~ ~~-168~~ ~~-169~~ ~~-170~~ ~~-171~~ ~~-172~~ ~~-173~~ ~~-174~~ ~~-175~~ ~~-176~~ ~~-177~~ ~~-178~~ ~~-179~~ ~~-180~~ ~~-181~~ ~~-182~~ ~~-183~~ ~~-184~~ ~~-185~~ ~~-186~~ ~~-187~~ ~~-188~~ ~~-189~~ ~~-190~~ ~~-191~~ ~~-192~~ ~~-193~~ ~~-194~~ ~~-195~~ ~~-196~~ ~~-197~~ ~~-198~~ ~~-199~~ ~~-200~~ ~~-201~~ ~~-202~~ ~~-203~~ ~~-204~~ ~~-205~~ ~~-206~~ ~~-207~~ ~~-208~~ ~~-209~~ ~~-210~~ ~~-211~~ ~~-212~~ ~~-213~~ ~~-214~~ ~~-215~~ ~~-216~~ ~~-217~~ ~~-218~~ ~~-219~~ ~~-220~~ ~~-221~~ ~~-222~~ ~~-223~~ ~~-224~~ ~~-225~~ ~~-226~~ ~~-227~~ ~~-228~~ ~~-229~~ ~~-230~~ ~~-231~~ ~~-232~~ ~~-233~~ ~~-234~~ ~~-235~~ ~~-236~~ ~~-237~~ ~~-238~~ ~~-239~~ ~~-240~~ ~~-241~~ ~~-242~~ ~~-243~~ ~~-244~~ ~~-245~~ ~~-246~~ ~~-247~~ ~~-248~~ ~~-249~~ ~~-250~~ ~~-251~~ ~~-252~~ ~~-253~~ ~~-254~~ ~~-255~~ ~~-256~~ ~~-257~~ ~~-258~~ ~~-259~~ ~~-260~~ ~~-261~~ ~~-262~~ ~~-263~~ ~~-264~~ ~~-265~~ ~~-266~~ ~~-267~~ ~~-268~~ ~~-269~~ ~~-270~~ ~~-271~~ ~~-272~~ ~~-273~~ ~~-274~~ ~~-275~~ ~~-276~~ ~~-277~~ ~~-278~~ ~~-279~~ ~~-280~~ ~~-281~~ ~~-282~~ ~~-283~~ ~~-284~~ ~~-285~~ ~~-286~~ ~~-287~~ ~~-288~~ ~~-289~~ ~~-290~~ ~~-291~~ ~~-292~~ ~~-293~~ ~~-294~~ ~~-295~~ ~~-296~~ ~~-297~~ ~~-298~~ ~~-299~~ ~~-300~~ ~~-301~~ ~~-302~~ ~~-303~~ ~~-304~~ ~~-305~~ ~~-306~~ ~~-307~~ ~~-308~~ ~~-309~~ ~~-310~~ ~~-311~~ ~~-312~~ ~~-313~~ ~~-314~~ ~~-315~~ ~~-316~~ ~~-317~~ ~~-318~~ ~~-319~~ ~~-320~~ ~~-321~~ ~~-322~~ ~~-323~~ ~~-324~~ ~~-325~~ ~~-326~~ ~~-327~~ ~~-328~~ ~~-329~~ ~~-330~~ ~~-331~~ ~~-332~~ ~~-333~~ ~~-334~~ ~~-335~~ ~~-336~~ ~~-337~~ ~~-338~~ ~~-339~~ ~~-340~~ ~~-341~~ ~~-342~~ ~~-343~~ ~~-344~~ ~~-345~~ ~~-346~~ ~~-347~~ ~~-348~~ ~~-349~~ ~~-350~~ ~~-351~~ ~~-352~~ ~~-353~~ ~~-354~~ ~~-355~~ ~~-356~~ ~~-357~~ ~~-358~~ ~~-359~~ ~~-360~~ ~~-361~~ ~~-362~~ ~~-363~~ ~~-364~~ ~~-365~~ ~~-366~~ ~~-367~~ ~~-368~~ ~~-369~~ ~~-370~~ ~~-371~~ ~~-372~~ ~~-373~~ ~~-374~~ ~~-375~~ ~~-376~~ ~~-377~~ ~~-378~~ ~~-379~~ ~~-380~~ ~~-381~~ ~~-382~~ ~~-383~~ ~~-384~~ ~~-385~~ ~~-386~~ ~~-387~~ ~~-388~~ ~~-389~~ ~~-390~~ ~~-391~~ ~~-392~~ ~~-393~~ ~~-394~~ ~~-395~~ ~~-396~~ ~~-397~~ ~~-398~~ ~~-399~~ ~~-400~~ ~~-401~~ ~~-402~~ ~~-403~~ ~~-404~~ ~~-405~~ ~~-406~~ ~~-407~~ ~~-408~~ ~~-409~~ ~~-410~~ ~~-411~~ ~~-412~~ ~~-413~~ ~~-414~~ ~~-415~~ ~~-416~~ ~~-417~~ ~~-418~~ ~~-419~~ ~~-420~~ ~~-421~~ ~~-422~~ ~~-423~~

N 1.

Ступень у нас 3 Бегуна, такие, как I, II, III Бегун.

Первая из них началась летом на 2 секунды раньше 3, т.е. пробегом за это время $G-I = 72 \text{ м}$.

Второй предмет за такое время 7 м.

9) $\sqrt{\sigma_{\text{max}}}$ у I и II ~~и III~~ $\sigma - \sigma = 2 \frac{\mu}{C}$

Угол γ II и III $8-7 = 1 \frac{u}{c}$.

† гробки у IV кд II.

$$\frac{7 \mu}{1 \frac{\mu}{l}} = 7 C$$

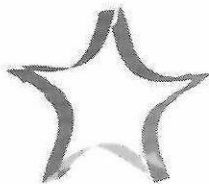
государства у III к I;

$$\frac{12 \text{ d}}{2 \frac{\text{m}}{\text{r}}} = 6 \text{ C}$$

Пусть III перейдет II и F, но первое он достигнет раньше
 $\Rightarrow$ он перейдет I на 2м, а со вторым придет в одно время.

Thorns on Semar kering. $\Rightarrow S = 7 \cdot 8 = 56$ m.

ответ: 56 м



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Баллы									

Вариант 2

№8.

$$1 \text{ литр воды} = 0,001 \text{ м}^3 \Rightarrow m_B = 0,001 \cdot \rho_B = 1 \text{ кг.}$$

$$Q_1 = 45 \cdot 4200 \cdot 1 = 189000 \text{ Дж. } 210000 \text{ Дж}$$

$$A_1 = Q_1 = 189000 \text{ Дж. } 210000 \text{ Дж}$$

$$t_1 = 25 \text{ мм}$$

$$M_1 = \frac{A_1}{11.60} = 16300 \text{ Вт. } 550 \text{ Вт}$$

$$Q_2 = 330000 \cdot 1 = 330000 \text{ Дж}$$

$$A_2 = 330000 \text{ Дж}$$

$$M_2 = 500 \text{ Вт}$$

$$t_2 = 45^\circ \text{C (по графику.)}$$

$$Q_1 = 45 \cdot 4200 \cdot 1 = 189000 \text{ Дж} = A_1$$

$$M_1 = \frac{A_1}{11.60} = 550 \text{ Вт.}$$

$$Q_2 = 330000 \cdot 1 = 330000 \text{ Дж}$$

$$A_3 = M_2 = \frac{330000}{11.60} = 500 \text{ Вт}$$

$$M_3 = \frac{2100 \cdot 5}{60 \cdot 1}$$

Ответ: вода замерзла через 25 мм.

Ответ: 180 Вт; 550 Вт; 17 минут; 45°C; 500 Вт.