



**МОСКОВСКИЙ ГОСУДАРСТВЕННЫЙ УНИВЕРСИТЕТ  
имени М.В. ЛОМОНОСОВА**

**ОЛИМПИАДНАЯ РАБОТА**

Наименование олимпиады школьников: **«Ломоносов»**

Профиль олимпиады: **Биология**

ФИО участника олимпиады: **Моргаев Илья Андреевич**

Класс: **10**

Технический балл: **84**

Дата проведения: **05 марта 2022 года**

1	2	3	4	5	6	7	8	9	10	$\Sigma$
5	9	3	9	7	6	6	14	10	15	84

То же

Одним:  $I^A = 10\%$ ,  $I^B = 30\%$ ,  $I^C = 60\%$ ,  $I^D = 90\%$ ,  $I^E = 100\%$

$q = \frac{p}{0.05} = \frac{0.1}{0.05} = 0.3$ ,  $S = 1 - p - q = 0.6$ ,  $q^2 + 2qs = 0.09 + 2 \times 0.03 \times 0.6 = 0.27$ ,  $S^2 = 0.36$   
 $0.15 - p = \frac{2p}{0.05} + p = 1$ ,  $0.15 - p = 1 + \frac{2p}{0.05} = 1 + 40p$ ,  $0.15 - p - 40p = 1$ ,  $0.15 - 41p = 1$ ,  $-41p = 0.85$ ,  $p = -0.0207$   
 $p^2 + 2ps = 0.13$ ,  $q = \frac{2p}{0.05}$ ,  $p^2 + 2p \cdot \frac{2p}{0.05} = 0.13$ ,  $p^2 + 8p = 0.13$ ,  $p^2 + 8p - 0.13 = 0$ ,  $p = \frac{-8 \pm \sqrt{64 + 0.52}}{2} = \frac{-8 \pm 8.031}{2}$ ,  $p = 0.0155$

10. Система:  $I^A = p$ ,  $I^B = q$ ,  $I^C = s$ ,  $I^D = 1 - p - q - s$   
 $p + q + s = 1$ ,  $p^2 + q^2 + s^2 + 2pq + 2qs + 2ps = 1$ ,  $2pq + 2qs + 2ps = 1 - p^2 - q^2 - s^2$   
 $2p(q + s) + 2s(p + q) = 1 - p^2 - q^2 - s^2$   
 $2p(1 - p) + 2s(1 - p - q) = 1 - p^2 - q^2 - s^2$   
 $2p - 2p^2 + 2s - 2sp - 2sq = 1 - p^2 - q^2 - s^2$   
 $2p + 2s - 2p^2 - 2sp - 2sq = 1 - p^2 - q^2 - s^2$   
 $2p + 2s - 2p^2 - 2sp - 2sq = 1 - p^2 - q^2 - s^2$

9) A-12, B-11, C-10, D-9, E-8, F-7, G-6, H-5, I-4, J-3, K-2, L-1  
 8) 1-B-11, 2-3-11, 3-1-VI, 4-F-VIII, 5-A-V, 6-B-IV, 7-C-III, 8-1-B-11

7)  $\frac{\Delta N}{\Delta t} = N \cdot r = \text{const}$ ,  $r = 6 - m$ ,  $m \cdot r = \text{const}$ ,  $m = \text{const}$ ,  $r = \text{const}$   
 6)  $b_{max} = 2.95 = b + m \cdot t = 2$ ,  $0.95 = m \cdot t$ ,  $t = 0.95 / m$

5) A-F-E-B  
 4) 1-11, 2-85, 3-AT, 4-5B, 5-F  
 3) A  
 2) B, X, 3, 0, 1, C, W, E  
 1) A-1, B-3, 8, 1, 1, 2, E-3

$g = \frac{0.01}{0.1} = 0.1$   
 $s = 0.05$

$\frac{2+1}{2} = 0.1$   
 $p = \frac{2+2y-0.01}{2}$

$\frac{2+2-0.01}{2} = 1$   
 $p = 2+2+0.01$

$\frac{0.1 \cdot 2}{2} + p = 1$

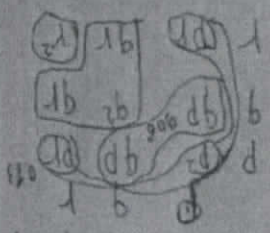
$p+2s = 0.1$   
 $s = \frac{0.1}{2}$   
 $s = 0.05$

$(p+1) = \frac{2}{0.13} = 0.13$   
 $q^2 + q + 1 = 1 + q + q^2 = 0.03 + q + q^2 = 0$   
 $q^2 + q = -0.03$   
 $q^2 = -q - 0.03$   
 $q^2 + 2q = -q - 0.03 + 2q = q - 0.03$   
 $q^2 + 2q = 0.03$   
 $q^2 + 2q + 1 = 1.03$   
 $(q+1)^2 = 1.03$   
 $q+1 = \sqrt{1.03}$   
 $q = \sqrt{1.03} - 1$   
 $q = 0.015$

$I_1 = p + I_0 = 1$   
 $I_2 = 2I_1 + I_0 = 2 + 1 = 3$   
 $I_3 = 2I_2 + I_1 = 6 + 3 = 9$   
 $I_4 = 2I_3 + I_2 = 18 + 9 = 27$   
 $I_5 = 2I_4 + I_3 = 54 + 27 = 81$   
 $I_6 = 2I_5 + I_4 = 162 + 81 = 243$   
 $I_7 = 2I_6 + I_5 = 486 + 243 = 729$   
 $I_8 = 2I_7 + I_6 = 1458 + 729 = 2187$   
 $I_9 = 2I_8 + I_7 = 4374 + 2187 = 6561$   
 $I_{10} = 2I_9 + I_8 = 13122 + 6561 = 19683$

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1)  $A_1 = 2, A_2 = 3, A_3 = 4, \dots, A_n = n+1$   
2)  $A_1 = 1, A_2 = 2, A_3 = 3, \dots, A_n = n$   
3)  $A_1 = 1, A_2 = 2, A_3 = 3, \dots, A_n = n$   
4)  $A_1 = 1, A_2 = 2, A_3 = 3, \dots, A_n = n$   
5)  $A_1 = 1, A_2 = 2, A_3 = 3, \dots, A_n = n$   
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10)  $A_1 = 1, A_2 = 2, A_3 = 3, \dots, A_n = n$