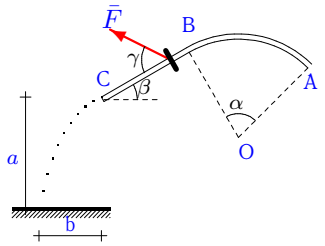
Основные теоремы динамики точки

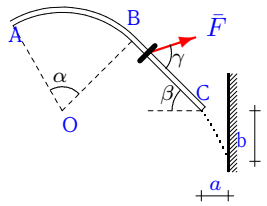
На прямолинейном участке пути шайба разгоняется в течение времени $t = t_1$ переменной силой F, направленной под углом γ к перемещению. На криволинейном участке оси, изогнутой по дуге окружности радиуса r (геометрический центр в точке O), действует постоянная сила сопротивления F_{fr}. Участки оси сопрягаются в точке B без излома. Вся траектория находится в вертикальной плоскости. Сила F дана в Н. В зависимости от варианта найти расстояние b, скорость v_A или силу F_{fr}.

Задача 1.1



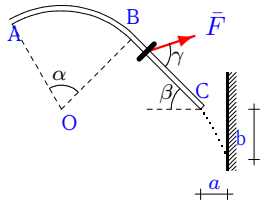
$r = 6$ м, m =0.4кг,
$a = 6$ м, $t_1 = 1$ с,
$F = 10/(1 + 2t)$,
$F_{fr} = 2$ Н, b=3.4 м,
v_A – ?
$\alpha = 75°$, $\beta = 60°$, $\gamma = 30°$.

Задача 1.2



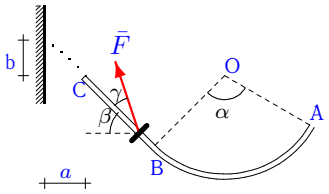
$r = 5$ м, m =0.4кг,
$a = 10$ м, $t_1 = 1$ с,
$F = t \exp(t/4)$,
$F_{fr} = 3$ Н, b=4 м,
v_A – ?
$\alpha = 30°$, $\beta = 15°$, $\gamma = 60°$.

Задача 1.3



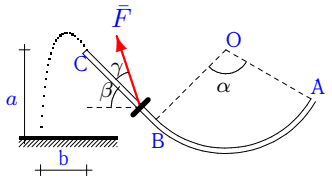
$r = 4$ м, m =0.4кг,
$a = 6$ м, $t_1 = 1$ с,
$F = 10/(1 + 2t)$,
$v_A = 27\frac{\text{м}}{c}$, F_{fr} – ?
$b = 10.9$ м.
$\alpha = 75°$, $\beta = 60°$, $\gamma = 60°$.

Задача 1.4



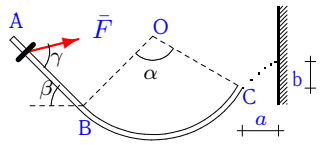
$r = 5$ м, m =0.9кг,
$a = 6$ м, $t_1 = 4$ с,
$F = 3 \sin \frac{\pi t}{4} + t^2$,
$v_A = 25\frac{\text{м}}{c}$, F_{fr} – ?
$b = 6.23$ м.
$\alpha = 90°$, $\beta = 75°$, $\gamma = 30°$.

Задача 1.5



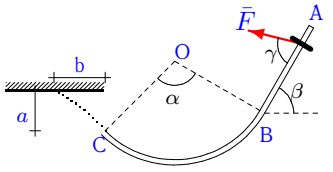
$r = 5$ м, m =0.4кг,
$a = 6$ м, $t_1 = 2$ с,
$F = 10/(1 + 2t)$,
$v_A = 25\frac{\text{м}}{c}$, F_{fr} – ?
$b = 58.9$ м.
$\alpha = 75°$, $\beta = 60°$, $\gamma = 15°$.

Задача 1.6



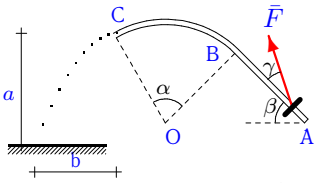
$r = 4$ м, m =3.5кг,
$a = 6$ м, $t_1 = 5$ с,
$F = 2 \cos \frac{\pi t}{4} + 3t^2$,
$F_{fr} = 12$ Н, $v_A = 27\frac{\text{м}}{c}$,
b – ?
$\alpha = 45°$, $\beta = 30°$, $\gamma = 60°$.

Задача 1.7



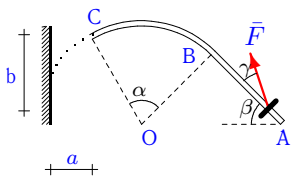
$r = 3$ м, m =0.9кг,
$a = 5$ м, $t_1 = 2$ с,
$F = t\sqrt{t^2 + 1}$,
$v_A = 26\frac{\text{м}}{c}$, F_{fr} – ?
$b = 26$ м.
$\alpha = 60°$, $\beta = 45°$, $\gamma = 45°$.

Задача 1.8



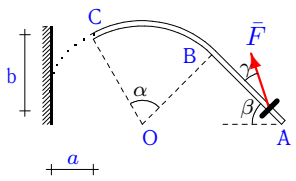
$r = 3$ м, m =0.4кг,
$a = 3$ м, $t_1 = 3$ с,
$F = t \exp(t/4)$,
$F_{fr} = 3$ Н, b=9.8 м,
v_A – ?
$\alpha = 30°$, $\beta = 15°$, $\gamma = 15°$.

Задача 1.9



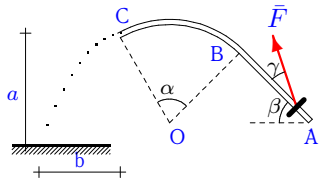
$r = 4$ м, m =0.2кг,
$a = 70$ м, $t_1 = 3$ с,
$F = \sqrt{2t + 1}$,
$F_{fr} = 1$ Н, b=28.1 м,
v_A – ?
$\alpha = 60°$, $\beta = 45°$, $\gamma = 15°$.

Задача 1.10



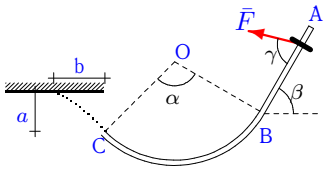
$r = 3$ м, m =0.7кг,
$a = 290$ м, $t_1 = 3$ с,
$F = 2 \cos \frac{\pi t}{4} + 3t^2$,
$F_{fr} = 12$ Н, b=116.6 м,
v_A – ?
$\alpha = 45°$, $\beta = 30°$, $\gamma = 15°$.

Задача 1.11 2



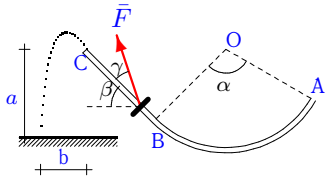
$r = 4$ м, $m = 0.2$кг,
$a = 22$ м, $t_1 = 3$ с,
$F = 7e^{2t}/(1 + e^{2t})$,
$F_{fr} = 2$ Н, b=70.8 м,
v_A – ?
$\alpha = 60°$, $\beta = 45°$, $\gamma = 15°$.

Задача 1.12 2



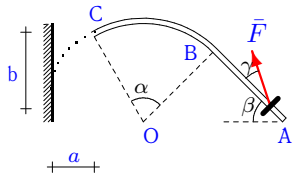
$r = 4$ м, $m = 0.5$кг,
$a = 9$ м, $t_1 = 2$ с,
$F = 3\cos\frac{\pi t}{2} + 4t$,
$v_A = 27\frac{\text{м}}{c}$, F_{fr} – ?
$b = 47.8$ м.
$\alpha = 90°$, $\beta = 75°$, $\gamma = 45°$.

Задача 1.13 2



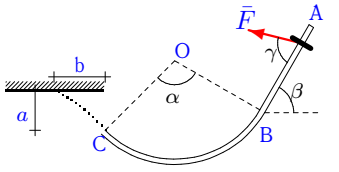
$r = 4$ м, $m = 0.9$кг,
$a = 6$ м, $t_1 = 2$ с,
$F = 3\sin\frac{\pi t}{4} + t^2$,
$F_{fr} = 2$ Н, b=7.8 м,
v_A – ?
$\alpha = 90°$, $\beta = 75°$, $\gamma = 15°$.

Задача 1.14 2



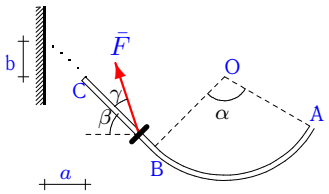
$r = 3$ м, $m = 0.2$кг,
$a = 3$ м, $t_1 = 3$ с,
$F = \sqrt{2t + 1}$,
$F_{fr} = 1$ Н, $v_A = 26\frac{\text{м}}{c}$,
b – ?
$\alpha = 60°$, $\beta = 45°$, $\gamma = 15°$.

Задача 1.15 2



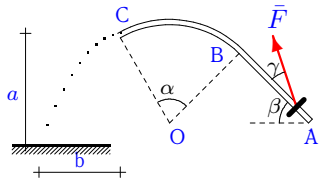
$r = 4$ м, $m = 0.7$кг,
$a = 6$ м, $t_1 = 2$ с,
$F = 2\cos\frac{\pi t}{4} + 3t^2$,
$F_{fr} = 12$ Н, b=31.3 м,
v_A – ?
$\alpha = 45°$, $\beta = 30°$, $\gamma = 45°$.

Задача 1.16 2



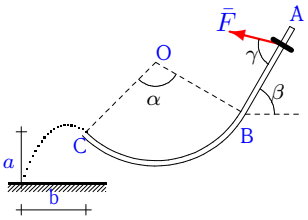
$r = 6$ м, $m = 0.5$кг,
$a = 9$ м, $t_1 = 4$ с,
$F = 3\cos\frac{\pi t}{2} + 4t$,
$v_A = 27\frac{\text{м}}{c}$, F_{fr} – ?
$b = 28.98$ м.
$\alpha = 90°$, $\beta = 75°$, $\gamma = 30°$.

Задача 1.17 2



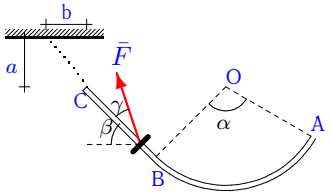
$r = 5$ м, $m = 0.2$кг,
$a = 8$ м, $t_1 = 3$ с,
$F = 8t^2/(1 + 5t)$,
$F_{fr} = 4$ Н, $v_A = 27\frac{\text{м}}{c}$,
b – ?
$\alpha = 90°$, $\beta = 75°$, $\gamma = 15°$.

Задача 1.18 2



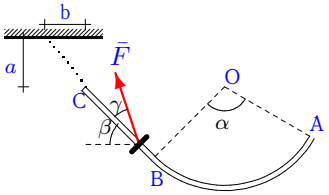
$r = 3$ м, $m = 0.2$кг,
$a = 8$ м, $t_1 = 5$ с,
$F = 8t^2/(1 + 5t)$,
$F_{fr} = 4$ Н, b=504.8 м,
v_A – ?
$\alpha = 90°$, $\beta = 75°$, $\gamma = 75°$.

Задача 1.19 2



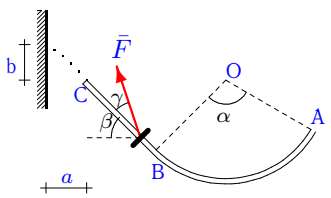
$r = 3$ м, $m = 0.5$кг,
$a = 5$ м, $t_1 = 4$ с,
$F = 2\cos\frac{\pi t}{5} + 4$,
$v_A = 26\frac{\text{м}}{c}$, F_{fr} – ?
$b = 22.8$ м.
$\alpha = 30°$, $\beta = 15°$, $\gamma = 15°$.

Задача 1.20 2



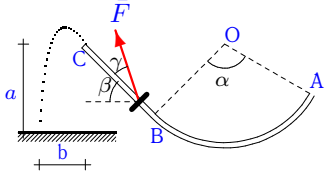
$r = 4$ м, $m = 0.4$кг,
$a = 3$ м, $t_1 = 4$ с,
$F = t\exp(t/4)$,
$v_A = 26\frac{\text{м}}{c}$, F_{fr} – ?
$b = 12.2$ м.
$\alpha = 30°$, $\beta = 15°$, $\gamma = 15°$.

Задача 1.21 2



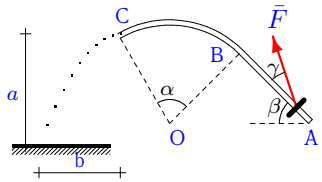
$r = 6$ м, $m = 0.6$кг,
$a = 4$ м, $t_1 = 4$ с,
$F = 4\cos\frac{\pi t}{3} + 3t$,
$v_A = 27\frac{\text{м}}{c}$, F_{fr} – ?
$b = 1.02$ м.
$\alpha = 30°$, $\beta = 15°$, $\gamma = 30°$.

Задача 1.22 2



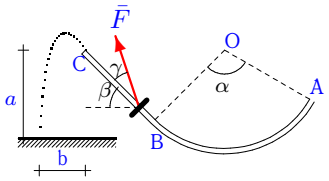
$r = 4$ м, $m = 0.9$кг,
$a = 6$ м, $t_1 = 2$ с,
$F = 3\sin\frac{\pi t}{4} + t^2$,
$v_A = 25\frac{\text{м}}{c}$, F_{fr} – ?
$b = 7.8$ м.
$\alpha = 90°$, $\beta = 75°$, $\gamma = 15°$.

Задача 1.23 2



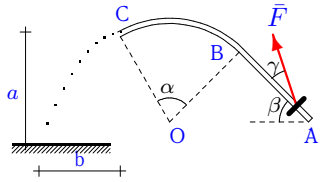
$r = 4$ м, m =0.5кг,
$a = 5$ м, $t_1 = 3$ с,
$F = 2\cos\frac{\pi t}{5}+4$,
$F_{fr} = 5$ Н, b=16.2 м,
v_A – ?
$\alpha = 30°$, $\beta = 15°$, $\gamma = 15°$.

Задача 1.24 2



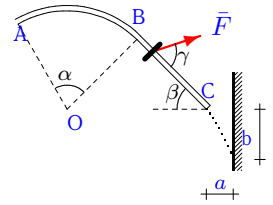
$r = 6$ м, m =0.9кг,
$a = 5$ м, $t_1 = 2$ с,
$F = t\sqrt{t^2+1}$,
$F_{fr} = 2$ Н, b=26 м,
v_A – ?
$\alpha = 60°$, $\beta = 45°$, $\gamma = 15°$.

Задача 1.25 2



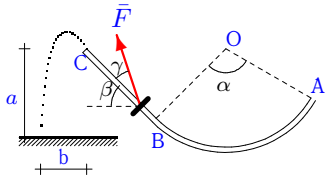
$r = 4$ м, m =0.1кг,
$a = 2$ м, $t_1 = 3$ с,
$F = 2\cos^2\frac{\pi t}{6}$,
$F_{fr} = 5$ Н, $v_A = 26\frac{\text{м}}{c}$,
b – ?
$\alpha = 45°$, $\beta = 30°$, $\gamma = 15°$.

Задача 1.26 2



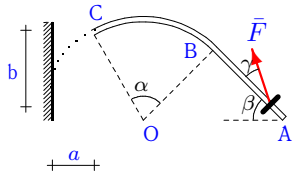
$r = 6$ м, m =0.4кг,
$a = 3$ м, $t_1 = 1$ с,
$F = t\exp(t/4)$,
$v_A = 27\frac{\text{м}}{c}$, F_{fr} – ?
$b = 0.87$ м.
$\alpha = 30°$, $\beta = 15°$, $\gamma = 60°$.

Задача 1.27 2



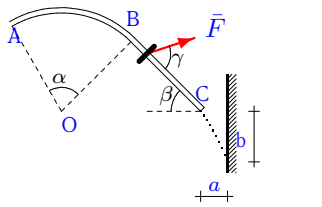
$r = 4$ м, m =0.4кг,
$a = 6$ м, $t_1 = 2$ с,
$F = 10/(1+2t)$,
$v_A = 27\frac{\text{м}}{c}$, F_{fr} – ?
$b = 71.2$ м.
$\alpha = 75°$, $\beta = 60°$, $\gamma = 15°$.

Задача 1.28 2



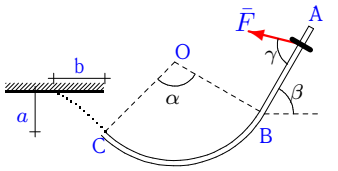
$r = 4$ м, m =0.1кг,
$a = 40$ м, $t_1 = 3$ с,
$F = 2\cos^2\frac{\pi t}{6}$,
$F_{fr} = 5$ Н, b=16.1 м,
v_A – ?
$\alpha = 45°$, $\beta = 30°$, $\gamma = 15°$.

Задача 1.29 2



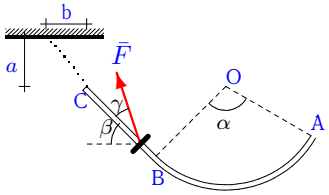
$r = 6$ м, m =0.5кг,
$a = 5$ м, $t_1 = 1$ с,
$F = 2\cos\frac{\pi t}{5}+4$,
$F_{fr} = 5$ Н, $v_A = 25\frac{\text{м}}{c}$,
b – ?
$\alpha = 30°$, $\beta = 15°$, $\gamma = 60°$.

Задача 1.30 2



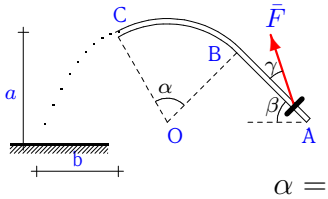
$r = 3$ м, m =0.7кг,
$a = 6$ м, $t_1 = 2$ с,
$F = 2\cos\frac{\pi t}{4}+3t^2$,
$F_{fr} = 12$ Н, $v_A = 27\frac{\text{м}}{c}$,
b – ?
$\alpha = 45°$, $\beta = 30°$, $\gamma = 45°$.

Задача 1.31 2



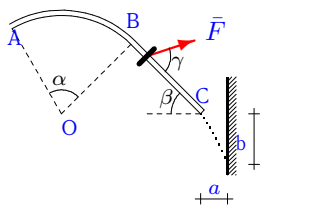
$r = 4$ м, m =0.4кг,
$a = 3$ м, $t_1 = 4$ с,
$F = t\exp(t/4)$,
$F_{fr} = 3$ Н, $v_A = 26\frac{\text{м}}{c}$,
b – ?
$\alpha = 30°$, $\beta = 15°$, $\gamma = 15°$.

Задача 1.32 2



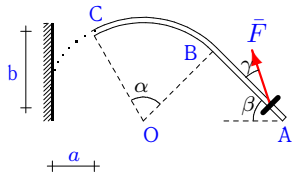
$r = 3$ м, m =0.4кг,
$a = 3$ м, $t_1 = 3$ с,
$F = t\exp(t/4)$,
$v_A = 26\frac{\text{м}}{c}$, F_{fr} – ?
$b = 9.8$ м.
$\alpha = 30°$, $\beta = 15°$, $\gamma = 15°$.

Задача 1.33 2



$r = 5$ м, m =0.3кг,
$a = 20$ м, $t_1 = 1$ с,
$F = 8t/(2+3t)$,
$F_{fr} = 3$ Н, b=17.3 м,
v_A – ?
$\alpha = 45°$, $\beta = 30°$, $\gamma = 60°$.

Задача 1.34 2



$r = 5$ м, m =0.1кг,
$a = 40$ м, $t_1 = 3$ с,
$F = 2\cos^2\frac{\pi t}{6}$,
$F_{fr} = 5$ Н, b=16.1 м,
v_A – ?
$\alpha = 45°$, $\beta = 30°$, $\gamma = 15°$.

Основные теоремы динамики точки

	F_{tr}	$\int F dt$	v_A	v_B	v_C	b
1	2.000	5.493	25.282	24.809	45.197	3.400
2	3.000	0.592	17.813	16.674	19.953	4.000
3	10.861	5.493	27.000	21.937	37.299	10.900
4	2.064	28.973	25.000	22.795	12.771	6.230
5	2.009	8.047	25.000	22.661	25.103	58.900
6	12.000	123.199	27.000	69.125	69.026	1.568
7	2.553	3.393	26.000	42.540	42.509	26.000
8	3.000	7.532	26.485	37.057	36.737	9.800
9	1.000	5.840	45.701	53.096	52.507	28.100
10	12.000	28.801	81.996	107.023	106.617	116.600
11	2.000	18.583	24.890	93.827	93.271	70.800
12	7.179	8.000	27.000	57.265	56.164	47.800
13	2.000	6.486	24.984	23.254	11.264	7.800
14	1.000	5.840	26.000	33.395	32.689	0.848
15	12.000	10.546	27.052	47.516	46.453	31.300
16	8.196	32.000	27.000	18.352	35.875	28.980
17	4.000	6.417	27.000	29.567	22.151	17.546
18	4.000	18.609	25.998	97.458	96.701	504.800
19	5.972	17.871	26.000	25.268	49.636	22.800
20	2.680	16.000	26.000	25.455	53.936	12.200
21	29.139	20.692	27.000	20.588	40.298	1.020
22	2.059	6.486	25.000	23.254	11.264	7.800
23	5.000	15.027	24.790	46.204	45.748	16.200
24	2.000	3.393	26.006	24.857	14.626	26.000
25	5.000	3.000	26.000	40.263	36.043	6.772
26	11.356	0.592	27.000	23.465	26.744	0.870
27	2.015	8.047	27.000	25.292	27.733	71.200
28	5.000	3.000	29.152	43.415	39.533	16.100
29	5.000	5.871	25.000	23.710	32.120	1.467
30	12.000	10.546	27.000	47.464	46.668	31.113
31	3.000	16.000	26.000	25.389	53.870	12.203
32	-1.551	7.532	26.000	36.571	36.737	9.800
33	3.000	1.038	16.868	14.690	21.324	17.300
34	5.000	3.000	30.070	44.333	39.533	16.100