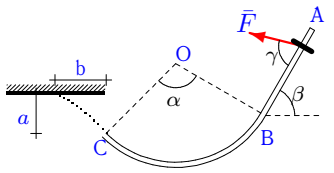
Основные теоремы динамики точки

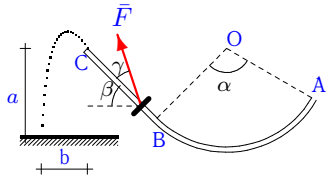
На прямолинейном участке пути шайба разгоняется в течение времени $t = t_1$ переменной силой F, направленной под углом γ к перемещению. На криволинейном участке оси, изогнутой по дуге окружности радиуса r (геометрический центр в точке O), действует постоянная сила сопротивления F_{fr}. Участки оси сопрягаются 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 *3*



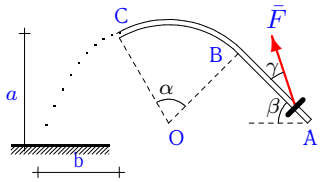
$r = 4$ м, $m = 0.4$кг,
$a = 14$ м, $t_1 = 2$ с,
$F = 4\sin\frac{\pi t}{2} + 5t$,
$v_A = 25\frac{\text{м}}{c}$, F_{fr} – ?
$b = 80.7$ м.
$\alpha = 75°$, $\beta = 60°$, $\gamma = 45°$.

Задача 1.2 *3*



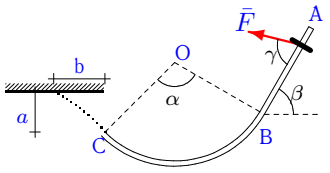
$r = 3$ м, $m = 0.1$кг,
$a = 2$ м, $t_1 = 2$ с,
$F = 2\cos^2\frac{\pi t}{6}$,
$F_{fr} = 5$ Н, $v_A = 26\frac{\text{м}}{c}$,
b – ?
$\alpha = 45°$, $\beta = 30°$, $\gamma = 15°$.

Задача 1.3 *3*



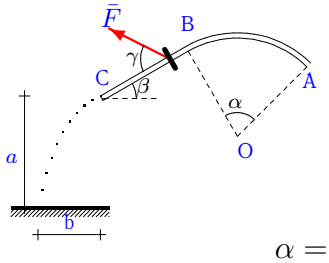
$r = 3$ м, $m = 0.8$кг,
$a = 10$ м, $t_1 = 3$ с,
$F = 2\sin\frac{\pi t}{3} + 9$,
$F_{fr} = 11$ Н, b=28.4 м,
v_A – ?
$\alpha = 60°$, $\beta = 45°$, $\gamma = 15°$.

Задача 1.4 *3*



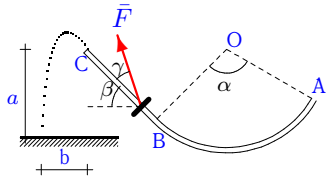
$r = 4$ м, $m = 0.5$кг,
$a = 5$ м, $t_1 = 2$ с,
$F = 2\cos\frac{\pi t}{5} + 4$,
$F_{fr} = 5$ Н, b=23.9 м,
v_A – ?
$\alpha = 30°$, $\beta = 15°$, $\gamma = 45°$.

Задача 1.5 *3*



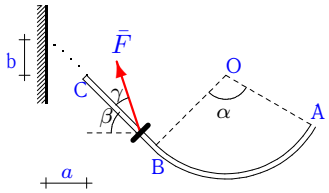
$r = 5$ м, $m = 0.5$кг,
$a = 7$ м, $t_1 = 1$ с,
$F = 10\sin^2(\pi t/6)$,
$v_A = 27\frac{\text{м}}{c}$, F_{fr} – ?
$b = 6.7$ м.
$\alpha = 60°$, $\beta = 45°$, $\gamma = 30°$.

Задача 1.6 *3*



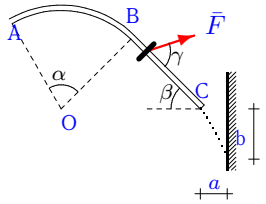
$r = 5$ м, $m = 0.2$кг,
$a = 3$ м, $t_1 = 2$ с,
$F = \sqrt{2t+1}$,
$F_{fr} = 1$ Н, b=83 м,
v_A – ?
$\alpha = 60°$, $\beta = 45°$, $\gamma = 15°$.

Задача 1.7 *3*



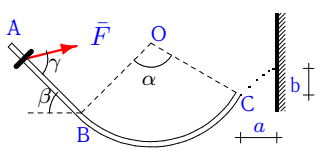
$r = 5$ м, $m = 0.2$кг,
$a = 110$ м, $t_1 = 4$ с,
$F = 8t^2/(1+5t)$,
$F_{fr} = 4$ Н, b=205.3 м,
v_A – ?
$\alpha = 90°$, $\beta = 75°$, $\gamma = 30°$.

Задача 1.8 *3*



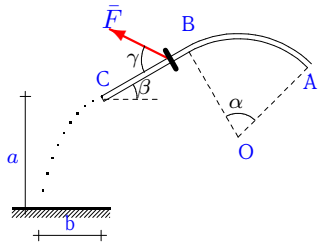
$r = 6$ м, $m = 0.8$кг,
$a = 60$ м, $t_1 = 1$ с,
$F = 2\sin\frac{\pi t}{3} + 9$,
$F_{fr} = 11$ Н, b=90 м,
v_A – ?
$\alpha = 60°$, $\beta = 45°$, $\gamma = 60°$.

Задача 1.9 *3*



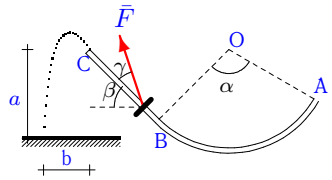
$r = 5$ м, $m = 1$кг,
$a = 11$ м, $t_1 = 5$ с,
$F = 9t^2/(2+t^3)$,
$F_{fr} = 6$ Н, $v_A = 26\frac{\text{м}}{c}$,
b – ?
$\alpha = 75°$, $\beta = 60°$, $\gamma = 60°$.

Задача 1.10 *3*



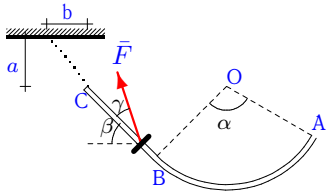
$r = 5$ м, $m = 0.2$кг,
$a = 1$ м, $t_1 = 1$ с,
$F = 0.2\exp(\frac{t}{5}) + 1$,
$F_{fr} = 9$ Н, $v_A = 25\frac{\text{м}}{c}$,
b – ?
$\alpha = 45°$, $\beta = 30°$, $\gamma = 30°$.

Задача 1.11 *3*



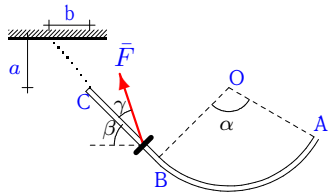
$r = 4$ м, $m = 0.6$кг,
$a = 4$ м, $t_1 = 2$ с,
$F = 4\cos\frac{\pi t}{3} + 3t$,
$F_{fr} = 15$ Н, $v_A = 26\frac{\text{м}}{c}$,
b – ?
$\alpha = 30°$, $\beta = 15°$, $\gamma = 15°$.

Задача 1.12 *3*



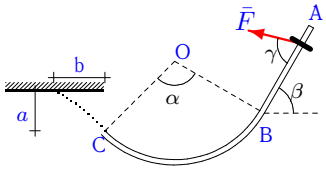
$r = 4$ м, $m = 0.8$кг,
$a = 10$ м, $t_1 = 4$ с,
$F = 2\sin\frac{\pi t}{3} + 9$,
$v_A = 26\frac{\text{м}}{c}$, F_{fr} – ?
$b = 10.6$ м.
$\alpha = 60°$, $\beta = 45°$, $\gamma = 15°$.

Задача 1.13 *3*



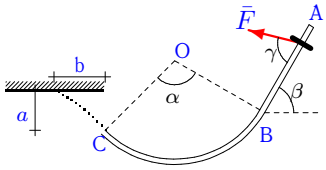
$r = 3$ м, $m = 0.4$кг,
$a = 6$ м, $t_1 = 4$ с,
$F = 10/(1 + 2t)$,
$v_A = 25\frac{\text{м}}{c}$, F_{fr} – ?
$b = 4.2$ м.
$\alpha = 75°$, $\beta = 60°$, $\gamma = 15°$.

Задача 1.14 *3*



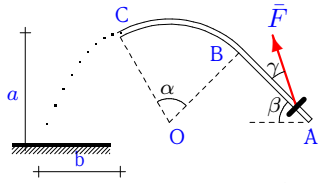
$r = 5$ м, $m = 0.5$кг,
$a = 7$ м, $t_1 = 2$ с,
$F = 10\sin^2(\pi t/6)$,
$F_{fr} = 1$ Н, b=37.5 м,
v_A – ?
$\alpha = 60°$, $\beta = 45°$, $\gamma = 45°$.

Задача 1.15 *3*



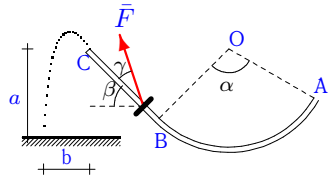
$r = 4$ м, $m = 0.8$кг,
$a = 10$ м, $t_1 = 2$ с,
$F = 2\sin\frac{\pi t}{3} + 9$,
$F_{fr} = 11$ Н, $v_A = 26\frac{\text{м}}{c}$,
b – ?
$\alpha = 60°$, $\beta = 45°$, $\gamma = 45°$.

Задача 1.16 *3*



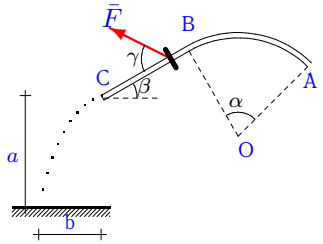
$r = 4$ м, $m = 0.5$кг,
$a = 7$ м, $t_1 = 3$ с,
$F = 10\sin^2(\pi t/6)$,
$F_{fr} = 1$ Н, b=19.7 м,
v_A – ?
$\alpha = 60°$, $\beta = 45°$, $\gamma = 15°$.

Задача 1.17 *3*



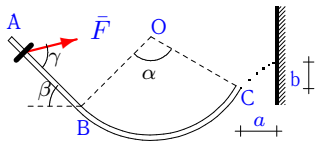
$r = 5$ м, $m = 0.5$кг,
$a = 7$ м, $t_1 = 2$ с,
$F = 10\sin^2(\pi t/6)$,
$F_{fr} = 1$ Н, b=58.1 м,
v_A – ?
$\alpha = 60°$, $\beta = 45°$, $\gamma = 15°$.

Задача 1.18 *3*



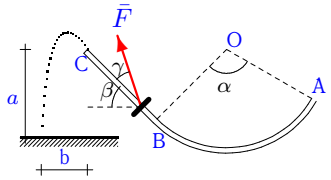
$r = 4$ м, $m = 0.5$кг,
$a = 9$ м, $t_1 = 1$ с,
$F = 3\cos\frac{\pi t}{2} + 4t$,
$F_{fr} = 7$ Н, b=2.3 м,
v_A – ?
$\alpha = 90°$, $\beta = 75°$, $\gamma = 30°$.

Задача 1.19 *3*



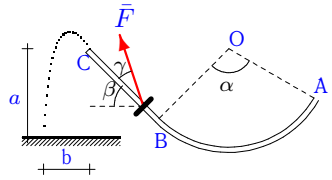
$r = 4$ м, $m = 1$кг,
$a = 8$ м, $t_1 = 5$ с,
$F = 8t^2/(1 + 5t)$,
$v_A = 26\frac{\text{м}}{c}$, F_{fr} – ?
$b = 2.07$ м.
$\alpha = 90°$, $\beta = 75°$, $\gamma = 60°$.

Задача 1.20 *3*



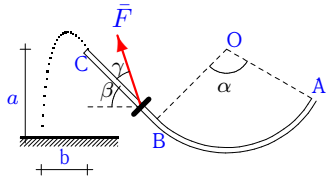
$r = 5$ м, $m = 0.4$кг,
$a = 6$ м, $t_1 = 2$ с,
$F = 10/(1 + 2t)$,
$F_{fr} = 2$ Н, b=63.9 м,
v_A – ?
$\alpha = 75°$, $\beta = 60°$, $\gamma = 15°$.

Задача 1.21 *3*



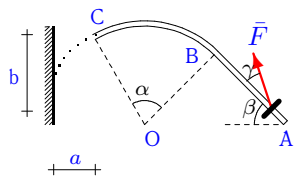
$r = 6$ м, $m = 0.5$кг,
$a = 5$ м, $t_1 = 2$ с,
$F = 2\cos\frac{\pi t}{5} + 4$,
$F_{fr} = 5$ Н, $v_A = 27\frac{\text{м}}{c}$,
b – ?
$\alpha = 30°$, $\beta = 15°$, $\gamma = 15°$.

Задача 1.22 *3*



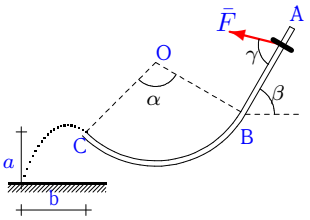
$r = 4$ м, $m = 0.2$кг,
$a = 3$ м, $t_1 = 2$ с,
$F = \sqrt{2t + 1}$,
$v_A = 25\frac{\text{м}}{c}$, F_{fr} – ?
$b = 73.1$ м.
$\alpha = 60°$, $\beta = 45°$, $\gamma = 15°$.

Задача 1.23 *3*



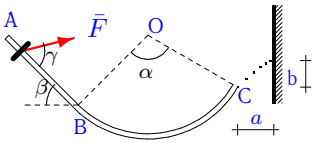
$r = 3$ м, $m = 0.2$кг,
$a = 3$ м, $t_1 = 3$ с,
$F = \sqrt{2t+1}$,
$F_{fr} = 1$ Н, $v_A = 26\frac{\text{м}}{c}$,
b – ?
$\alpha = 60°$, $\beta = 45°$, $\gamma = 15°$.

Задача 1.24 *3*



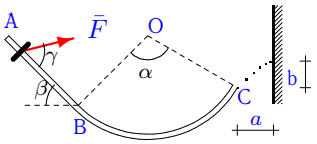
$r = 4$ м, $m = 0.2$кг,
$a = 22$ м, $t_1 = 5$ с,
$F = 7e^{2t}/(1+e^{2t})$,
$F_{fr} = 2$ Н, b=597.5 м,
v_A – ?
$\alpha = 60°$, $\beta = 45°$, $\gamma = 75°$.

Задача 1.25 *3*



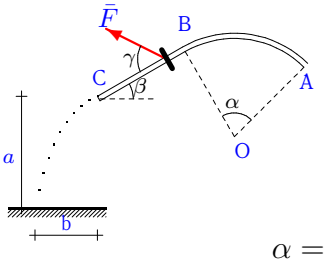
$r = 5$ м, $m = 4.5$кг,
$a = 5$ м, $t_1 = 5$ с,
$F = t\sqrt{t^2+1}$,
$F_{fr} = 2$ Н, $v_A = 26\frac{\text{м}}{c}$,
b – ?
$\alpha = 60°$, $\beta = 45°$, $\gamma = 60°$.

Задача 1.26 *3*



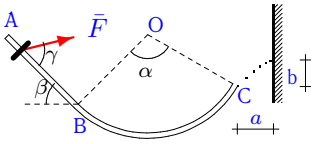
$r = 4$ м, $m = 2$кг,
$a = 3$ м, $t_1 = 5$ с,
$F = t\exp(t/4)$,
$v_A = 27\frac{\text{м}}{c}$, F_{fr} – ?
$b = 0.77$ м.
$\alpha = 30°$, $\beta = 15°$, $\gamma = 60°$.

Задача 1.27 *3*



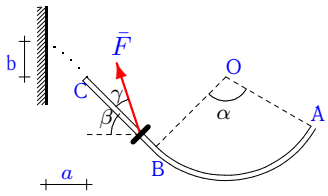
$r = 5$ м, $m = 0.2$кг,
$a = 3$ м, $t_1 = 1$ с,
$F = \sqrt{2t+1}$,
$v_A = 26\frac{\text{м}}{c}$, F_{fr} – ?
$b = 2.9$ м.
$\alpha = 60°$, $\beta = 45°$, $\gamma = 30°$.

Задача 1.28 *3*



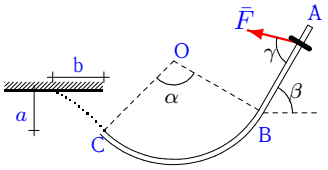
$r = 4$ м, $m = 0.5$кг,
$a = 2$ м, $t_1 = 5$ с,
$F = 2\cos^2\frac{\pi t}{6}$,
$v_A = 25\frac{\text{м}}{c}$, F_{fr} – ?
$b = 0.52$ м.
$\alpha = 45°$, $\beta = 30°$, $\gamma = 60°$.

Задача 1.29 *3*



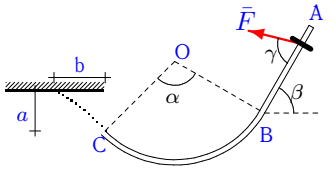
$r = 5$ м, $m = 0.2$кг,
$a = 1$ м, $t_1 = 4$ с,
$F = 0.2\exp(\frac{t}{5})+1$,
$v_A = 27\frac{\text{м}}{c}$, F_{fr} – ?
$b = 0.56$ м.
$\alpha = 45°$, $\beta = 30°$, $\gamma = 30°$.

Задача 1.30 *3*



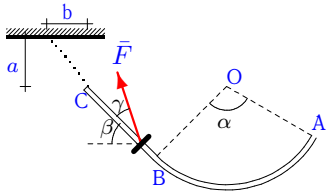
$r = 4$ м, $m = 0.2$кг,
$a = 1$ м, $t_1 = 2$ с,
$F = 0.2\exp(\frac{t}{5})+1$,
$F_{fr} = 9$ Н, b=3.9 м,
v_A – ?
$\alpha = 45°$, $\beta = 30°$, $\gamma = 45°$.

Задача 1.31 *3*



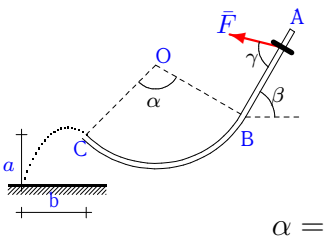
$r = 4$ м, $m = 0.6$кг,
$a = 4$ м, $t_1 = 2$ с,
$F = 4\cos\frac{\pi t}{3}+3t$,
$F_{fr} = 15$ Н, $v_A = 26\frac{\text{м}}{c}$,
b – ?
$\alpha = 30°$, $\beta = 15°$, $\gamma = 45°$.

Задача 1.32 *3*



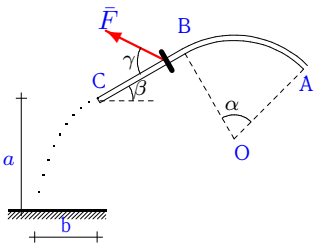
$r = 4$ м, $m = 0.2$кг,
$a = 3$ м, $t_1 = 4$ с,
$F = \sqrt{2t+1}$,
$F_{fr} = 1$ Н, $v_A = 25\frac{\text{м}}{c}$,
b – ?
$\alpha = 60°$, $\beta = 45°$, $\gamma = 15°$.

Задача 1.33 *3*



$r = 4$ м, $m = 0.4$кг,
$a = 6$ м, $t_1 = 5$ с,
$F = 10/(1+2t)$,
$v_A = 26\frac{\text{м}}{c}$, F_{fr} – ?
$b = 316.3$ м.
$\alpha = 75°$, $\beta = 60°$, $\gamma = 75°$.

Задача 1.34 *3*



$r = 6$ м, $m = 0.9$кг,
$a = 6$ м, $t_1 = 1$ с,
$F = 3\sin\frac{\pi t}{4}+t^2$,
$F_{fr} = 2$ Н, $v_A = 27\frac{\text{м}}{c}$,
b – ?
$\alpha = 90°$, $\beta = 75°$, $\gamma = 30°$.

Основные теоремы динамики точки

	F_{tr}	$\int F dt$	v_A	v_B	v_C	b
1	9.986	15.093	25.000	68.672	67.015	80.700
2	5.000	2.827	26.000	20.845	38.341	133.153
3	11.000	30.820	26.906	43.308	42.119	28.400
4	5.000	11.027	26.026	46.699	46.248	23.900
5	-6.604	0.865	27.000	29.878	38.313	6.700
6	1.000	3.393	26.997	25.517	28.033	83.000
7	4.000	11.715	56.391	52.881	65.705	205.300
8	11.000	9.955	24.284	21.152	34.310	90.000
9	6.000	12.453	26.000	74.705	74.485	2.833
10	9.000	1.221	25.000	16.774	26.968	1.688
11	15.000	9.308	26.000	23.901	33.808	70.578
12	9.055	38.865	26.000	23.682	42.861	10.600
13	1.266	10.986	25.000	23.932	16.478	4.200
14	1.000	5.865	27.035	49.203	49.248	37.500
15	11.000	20.865	26.000	58.315	57.496	55.800
16	1.000	15.000	26.794	34.961	34.427	19.700
17	1.000	5.865	26.004	25.097	22.554	58.100
18	7.000	3.910	17.991	14.256	30.504	2.300
19	184.629	18.609	26.000	82.683	67.615	2.070
20	2.000	8.047	25.996	23.762	26.203	63.900
21	5.000	11.027	27.000	25.810	42.035	105.925
22	0.992	3.393	25.000	23.730	26.246	73.100
23	1.000	5.840	26.000	33.395	32.689	0.848
24	2.000	32.574	24.996	101.834	101.522	597.500
25	2.000	43.858	26.000	65.557	65.715	1.309
26	395.625	29.961	27.000	47.185	37.388	0.770
27	8.670	1.399	26.000	15.730	28.723	2.900
28	124.827	4.173	25.000	53.698	36.369	0.520
29	11.459	5.226	27.000	16.408	19.415	0.560
30	9.000	2.492	26.676	45.296	42.153	3.900
31	15.000	9.308	26.000	42.048	40.783	19.341
32	1.000	8.667	25.000	23.723	37.833	3.064
33	2.025	11.989	26.000	76.236	76.128	316.300
34	2.000	1.452	27.000	27.755	38.628	1.575