

Problem 1: A bullet with a mass of $m = 16$ g is shot out of a rifle that has length $L = 1$ m. The bullet spends $t = 0.16$ s in the barrel.

Randomized Variables

$m = 16$ g
 $L = 1$ m
 $t = 0.16$ s

Part (a) Write an expression, in terms of the given quantities, for the magnitude of the bullet's average acceleration, a , as it travels through the rifle's barrel.

Correct Answer	Student Answer	Final Grade
$a = (2 L/t^2)$	$a = 2 L/(t^2)$	91%

Grade Detail	Student	Feedback	Final Answer Credit	100%
Correct				

Submission Detail		Final Answer Credit	100%
Answer	Hints	Feedback	Totals
1 $a = L/(t^2)$	4%	0%	5% 9%
2 $a = 2 L/(t^2)$	0%	0%	0% 0%
Totals	4%	0%	5% 9%

Part (b) Calculate the numerical value for the magnitude of the bullet's acceleration, a in m/s^2 .

Correct Answer	Student Answer	Final Grade
$a = 78.13$	$a = 2/(0.16^2)$ $a = 78.13$	100%

Grade Detail	Student	Feedback	Final Answer Credit	100%
Correct				

Submission Detail		Final Answer Credit	100%
Answer	Hints	Feedback	Totals
1 $a = 2/(0.16^2)$ $a = 78.13$	0%	0%	0% 0%
Totals	0%	0%	0% 0%

Part (c) What is the numerical value of the average net force F in Newtons acting on the bullet?

Correct Answer	Student Answer	Final Grade
$F = 1.25$	$F = 0.016 * 78.13$ $F = 1.25$	100%

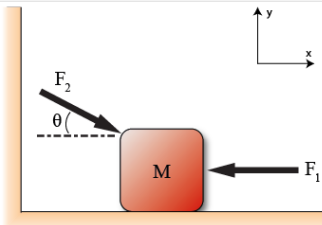
Grade Detail	Student	Feedback	Final Answer Credit	100%
Correct				

Submission Detail		Final Answer Credit	100%
Answer	Hints	Feedback	Totals
1 $F = 0.016 * 78.13$ $F = 1.25$	0%	0%	0% 0%
Totals	0%	0%	0% 0%

Problem 2: A block with a mass of $m = 34$ kg rests on a frictionless surface and is subject to two forces acting on it. The first force is directed in the negative x -direction with a magnitude of $F_1 = 10.5$ N. The second has a magnitude of $F_2 = 21.75$ N and acts on the body at an angle $\theta = 14^\circ$ up from the horizontal as shown.

Randomized Variables

$m = 34$ kg
 $F_1 = 10.5$ N
 $F_2 = 21.75$ N
 $\theta = 14^\circ$



Part (a) Please select the correct FBD from the choices below.

Correct Answer	Student Answer	Final Grade
		72%

Grade Detail	Student	Feedback	Final Answer Credit	100%
Correct				

Submission Detail		Final Answer Credit	100%
Answer	Hints	Feedback	Totals
1 	20%	-Draw the free-body diagram. In the given geometry, what force should be bigger: force of gravity or normal force?	3% 5% 28%
2 	0%		0% 0%
Totals	20%	3%	5% 28%

Part (b) Write an expression for the component of net force $F_{net,x}$ in the x direction.

Correct Answer	Student Answer	Final Grade	
$F_{net,x} = F_2 \cos(\theta) - F_1$	$F_{net,x} = F_2 \cos(\theta) + F_1$	17%	
Grade Detail			
Correct	Student	Feedback	
$F_2 \cos(\theta) + F_1$	see above	Closely check the signs of components. Is the component of F_1 along x positive in the given system of coordinates?	
		Final Answer Credit 30%	
Submission Detail			
Answer	Hints	Feedback	Totals
1 $F_{net,x} = F_2 (\cos(\theta)) - F_1 (-1)$	4%	0%	5% 9%
2 $F_{net,x} = F_2 \sin(\theta)$	4%	0%	0% 4%
3 $F_{net,x} = F_2 \cos(\theta) + F_1$	0%	0%	0% 0%
Totals	8%	0%	5% 13%

Part (c) Write an expression for the magnitude of the normal force, F_N , acting on the block, in terms of F_2 and the other variables of the problem. Assume that the surface it rests on is rigid.

Correct Answer	Student Answer	Final Grade	
$F_N = F_2 \sin(\theta) + m g$	$F_N = F_2 \sin(\theta) + m g$	96%	
Grade Detail			
Correct	Student	Feedback	
		Final Answer Credit 100%	
Submission Detail			
Answer	Hints	Feedback	Totals
1 $F_N = F_2 \sin(\theta) - m g$	4%	0%	0% 4%
2 $F_N = F_2 \sin(\theta) + m g$	0%	0%	0% 0%
Totals	4%	0%	0% 4%

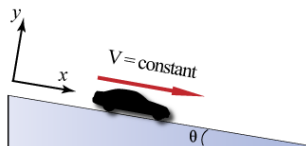
Part (d) Solve numerically for the block's acceleration in the x-direction, a_x , in m/s^2 .

Correct Answer	Student Answer	Final Grade	
$a_x = 0.3119$	$a_x = (21.75 * \cos(14) - 10.5)/34$ $a_x = 0.3119$	85%	
Grade Detail			
Correct	Student	Feedback	
		Final Answer Credit 100%	
Submission Detail			
Answer	Hints	Feedback	Totals
1 $a_x = 10 (21.75 * \cos(14) - 10.5)/34$ $a_x = 3.119$	4%	6%	5% 15%
2 $a_x = (21.75 * \cos(14) - 10.5)/34$ $a_x = 0.3119$	0%	0%	0% 0%
Totals	4%	6%	5% 15%

Problem 3: A toy car rolls down a ramp at a constant velocity. The car's mass is $m = 2$ kg and the ramp makes an angle of $\theta = 20$ degrees with respect to the horizontal. Assume the rolling resistance is negligible.

Randomized Variables

$m = 2$ kg
 $\theta = 20^\circ$



Part (a) What is the magnitude of the car's acceleration, a in m/s^2 ?

Correct Answer	Student Answer	Final Grade	
$a = 0$	$a = 0$	100%	
Grade Detail			
Correct	Student	Feedback	
		Final Answer Credit 100%	
Submission Detail			
Answer	Hints	Feedback	Totals

1	$a = 0$	0%	0%	0%	0%
Totals		0%	0%	0%	0%

Part (b) What is the numeric value for the sum of the forces in the x-direction, ΣF_x , in Newtons?

Correct Answer	Student Answer	Final Grade
$\Sigma F_x = 0$	$\Sigma F_x = 0$	100%
Grade Detail		
Correct	Student	Feedback
		Final Answer Credit 100%

Submission Detail					
	Answer		Hints		Feedback
1	$\Sigma F_x = 0$	0%		0%	0%
Totals		0%		0%	0%

Part (c) Assuming the car experiences only air resistance in opposition to its motion, with magnitude F_r . Write an expression for the sum of the forces in the x-direction using the acceleration due to gravity, g , and the variables provided.

Correct Answer	Student Answer	Final Grade
$\Sigma F_x = m g \sin(\theta) - F_r$	$\Sigma F_x = m g \sin(\theta) - F_r$	87%
Grade Detail		
Correct	Student	Feedback
		Final Answer Credit 100%

Submission Detail					
	Answer		Hints		Feedback
1	$\Sigma F_x = m g \sin(\theta)$	4%		0%	0%
2	$\Sigma F_x = m g \sin(\theta) + F_r$	4%		0%	Closely check signs of all components. Is the force of resistance directed in positive or negative x-direction? (5% 9%)
3	$\Sigma F_x = m g \sin(\theta) - F_r$	0%		0%	0%
Totals		8%		0%	5%

Part (d) What is the magnitude of the force caused by air resistance, F_r , in Newtons? (Maintain the assumption that the car's velocity is constant.)

Correct Answer	Student Answer	Final Grade
$F_r = 6.71$	No Answer Given	0%
Grade Detail		
Correct	Student	Feedback
		Final Answer Credit 0%

Submission Detail					
	Answer		Hints		Feedback
Totals		0%		0%	0%