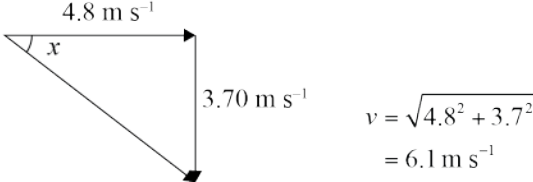


Assessment Schedule – 2022**Physics: Demonstrate understanding of mechanics (91171)****Evidence Statement**

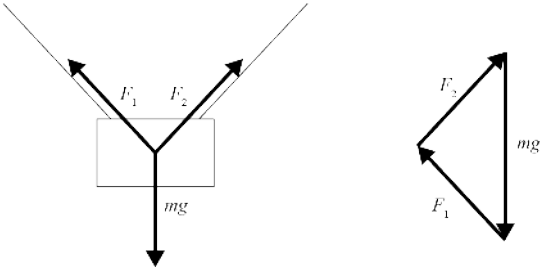
Q	Evidence	Achievement	Merit	Excellence
ONE (a)	$d = v_i t + 0.5at^2 \Rightarrow 0 \times t + 0.5 \times 9.8t^2$ $t = 0.29 \text{ s}$	<ul style="list-style-type: none"> • Correct answer. 		
(b)	<ul style="list-style-type: none"> • The acceleration of both balls is constant (9.8 m s^{-2}). • The time for both balls to fall is the same. 	<ul style="list-style-type: none"> • ONE bullet point. 	<ul style="list-style-type: none"> • BOTH bullet points. 	
(c)(i)	EITHER $v_f^2 = v_i^2 + 2ad$ $v_f^2 = 0 + 2 \times 9.8 \times 0.7 \Rightarrow v_f = 3.7 \text{ m s}^{-1}$ OR $d - v_i t + 0.5at^2 \Rightarrow 0.7 = 0.5 \times 9.8 \times t^2 \Rightarrow t = 0.377$ (0.378 with rounding) then $v_f = v_i + at$ $= 9.8 \times 0.377 = 3.7 \text{ m s}^{-1}$	<ul style="list-style-type: none"> • ONE of: <ul style="list-style-type: none"> - $t = 0.377$ - $v_f = 3.7 \text{ m s}^{-1}$ - Part (ii). 	<ul style="list-style-type: none"> • $v_f = 3.7 \text{ m s}^{-1}$ AND Part (ii). 	
(ii)	Assuming no external forces / air friction or acceleration is solely down to gravity.			

(d)	$d = v_i t + 0.5at^2 \Rightarrow 0.7 = 0 + 0.5 \times 9.8t^2 \Rightarrow t = 0.377$ $v_h = \frac{d}{t} = \frac{1.8}{0.377} = 4.8 \text{ m s}^{-1}$  $v = \sqrt{4.8^2 + 3.7^2} = 6.1 \text{ m s}^{-1}$ $\tan x = \frac{3.7}{4.8} \Rightarrow 37.6^\circ \text{ (or } 0.66 \text{ rad)}$ <p>OR angle from vertical = 52.4° (or 0.91 rad)</p>	<ul style="list-style-type: none"> Shows $v_h = 4.8 \text{ m s}^{-1}$ OR Calculates 6.1 m s^{-1} assuming the 'show' part. 	<ul style="list-style-type: none"> Method correct with ONE major error. 	<ul style="list-style-type: none"> Method correct with ONE minor error.
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Not Achieved			Achievement		Achievement with Merit		Achievement with Excellence	
N0	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence.	Very little Achievement evidence.	Some evidence at Achievement level, but most is at Not Achieved level.	A majority of the evidence is at Achievement level.	Most evidence is at Achievement level.	Some evidence is at Merit level.	A majority of the evidence is at Merit level.	Evidence is provided for most tasks. The evidence at Excellence level may have minor errors, or the evidence is weak.	Evidence is provided for most tasks. The evidence at Excellence level is accurate.
No relevant physics	1a	2a	3a	4a	2m + 1a	3m	1e + 2m	1e + 2m + 1a

Q	Evidence	Achievement	Merit	Excellence
TWO (a)	$E_p = 0.5kx^2$ $E_p = 0.5 \times 250 \times 0.10^2$ $E_p = 1.25 \text{ J}$	<ul style="list-style-type: none"> 1.25 J 		
(b)(i) (ii)	$m_r v_r + m_b v_b \text{ before} = m_r v_r + m_b v_b \text{ after}$ $0 = (2 \times .5) + (0.5 \times v)$ $v = -2 \text{ m s}^{-1}$ Assumption is no external forces. [Alternative approach using conservation of energy accepted with assumption of no energy loss]	<ul style="list-style-type: none"> Correct solution. OR Correct assumption if appropriate calculation attempted. 	<ul style="list-style-type: none"> Correct answer. 	
(c)	<ul style="list-style-type: none"> They both have the same (change) in momentum. $(\Delta)p = F \times t$ The time for the collision for the red car will be longer than the blue car. The red / blue car will experience less / more force, so will have less / more damage 	<ul style="list-style-type: none"> ONE bullet point. 	<ul style="list-style-type: none"> Correct answer. 	
(d)(i) (ii)	There is a force from the cart on the solid board and an equal and opposite force from the solid board to the cart. For cart $\Delta p = 4$ $\Delta p = F \times t$ $4 = F \times 0.02$ $F = 200 \text{ N}$ So final force on the board is 200 N away from the cart.	<ul style="list-style-type: none"> ONE of - (i) - $F = 200 \text{ N}$ - Final force towards the board. 	<ul style="list-style-type: none"> ONE error, e.g. missing direction. 	<ul style="list-style-type: none"> Comprehensive explanation including unambiguous direction.

Not Achieved			Achievement		Achievement with Merit		Achievement with Excellence	
NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence.	Very little Achievement evidence.	Some evidence at Achievement level, but most is at Not Achieved level.	A majority of the evidence is at Achievement level.	Most evidence is at Achievement level.	Some evidence is at Merit level.	A majority of the evidence is at Merit level.	Evidence is provided for most tasks. The evidence at Excellence level may have minor errors, or the evidence is weak.	Evidence is provided for most tasks. The evidence at Excellence level is accurate.
No relevant evidence	1a	2a	3a	4a	1m + 3a	2m + 2a	1e + 1m + 2a	1e + 2m + 1a

Q	Evidence	Achievement	Merit	Excellence
THREE (a)	$F = -kx$ $x = 0.2 \text{ m}$ $k = \frac{2.94}{0.2} = 14.7 \text{ N m}^{-1}$	<ul style="list-style-type: none"> • Correct answer. 		
(b)(i) and (ii)		<ul style="list-style-type: none"> • Correct free body diagram. Any reasonable force-related labels acceptable. OR • Correct vector diagram with labels. (Ignore size of forces.) 	<ul style="list-style-type: none"> • Correct answer. 	
(c)	<p>Taking moments about end A</p> $0 + F_b \times 0.3 = 1 \times 3 \times 9.8 \Rightarrow F_b = 98 \text{ N upwards}$ <p>The down force = the up force</p> $F_a + 3 \times 9.8 = 98 \Rightarrow F_a = 68.6 \text{ N downwards}$	<ul style="list-style-type: none"> • Correct idea of torques, at least one calculated with pivot identified. 	<ul style="list-style-type: none"> • Correct answer. 	
(d)	<ul style="list-style-type: none"> • A centripetal / unbalanced force keeps the jelly on the spinning plate. • There is friction force between the jelly and the plate. • Friction provides the centripetal force. • As the velocity increases, greater force is required to keep the jelly in circular motion. • The jelly slides off at a tangent to the plate. 	<ul style="list-style-type: none"> • ONE bullet point. 	<ul style="list-style-type: none"> • TWO LINKED bullet points. 	<ul style="list-style-type: none"> • Comprehensive answer.

Not Achieved			Achievement		Achievement with Merit		Achievement with Excellence	
NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence.	Very little Achievement evidence.	Some evidence at Achievement level, but most is at Not Achieved level.	A majority of the evidence is at Achievement level.	Most evidence is at Achievement level.	Some evidence is at Merit level.	A majority of the evidence is at Merit level.	Evidence is provided for most tasks. The evidence at Excellence level may have minor errors, or the evidence is weak.	Evidence is provided for most tasks. The evidence at Excellence level is accurate.
No relevant evidence	1a	2a	3a	4a	1m + 3a	2m + 2a	1e + 1m + 2a	1e + 2m + 1a

Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 7	8 – 13	14 – 18	19– 24