

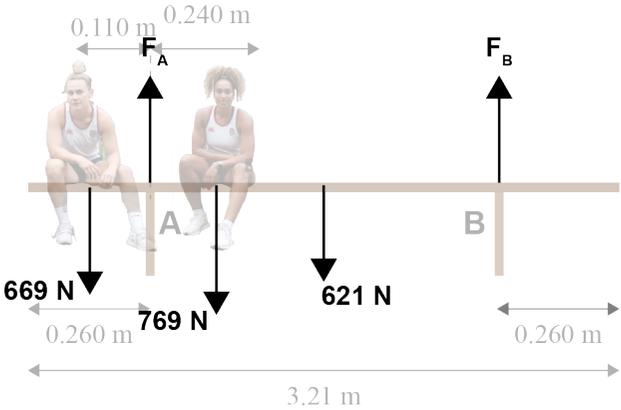
Assessment Schedule – 2025**Physics: Demonstrate understanding of mechanics (91171)****Evidence Statement**

Q	Evidence	Achievement	Achievement with Merit	Achievement with Excellence
ONE (a)	$v_i = 0, a = 0.68, d = 22, t = ?$ $d = v_i t + \frac{1}{2} a t^2$ $22 = 0 + \frac{1}{2} \times 0.68 \times t^2 \Rightarrow t = 8.0 \text{ s}$	<ul style="list-style-type: none"> Correct answer. 		
(b)	$\frac{1}{2} m v^2 = \frac{1}{2} k x^2 \Rightarrow$ doubling v would double x	<ul style="list-style-type: none"> x bigger. OR x double with no evidence. 	<ul style="list-style-type: none"> x double with evidence (e.g. energy is conserved). 	
(c)	Initial velocities: $v_y = 25 \sin(34^\circ) = 13.98 = 14.0 \text{ m s}^{-1}$, $v_x = 25 \cos(34^\circ) = 20.7 \text{ m s}^{-1}$ Time to travel 45.0 m horizontally = $\frac{45}{20.7} = 2.17 \text{ s}$ Height of ball at 2.17 s $d = v_i t + \frac{1}{2} a t^2 = 13.98 \times 2.17 - \frac{1}{2} \times 9.8 \times 2.17^2 = 7.26 \text{ m}$ The ball clears the crossbar before hitting the ground.	<ul style="list-style-type: none"> ONE of: <ul style="list-style-type: none"> $v_y = 25 \sin(34^\circ) = 14.0 \text{ m s}^{-1}$ $v_x = 25 \cos(34^\circ) = 20.7 \text{ m s}^{-1}$ $\frac{45}{\text{any calculated speed}}$ 	<ul style="list-style-type: none"> Made one error in a correct method. 	<ul style="list-style-type: none"> Correct, with a confirmatory sentence.
(d)	The new ball will have the same initial horizontal and vertical speeds because it is kicked with the same speed and angle. Gravity will cause the ball to have the same vertical acceleration as before, so the time in the air will be identical, as will the horizontal distance travelled.	<ul style="list-style-type: none"> One correct statement. 	<ul style="list-style-type: none"> A statement linking cause and effect. 	<ul style="list-style-type: none"> Full explanation.

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

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TWO (a)	$p = mv = 4.3 \times 80 = 344 \text{ kg m s}^{-1}$	• 344 kg m s^{-1}		
(b)	If there are no external forces, then momentum is conserved. Kinetic energy is often lost as heat / light or sound.	• One correct statement.	• Full answer.	
(c)	Argentinian scrum: $850 \times 0.378 = \overrightarrow{321.3} \text{ kg m s}^{-1}$ All Black scrum: $883 \times 0.354 = \overrightarrow{312.58} \text{ kg m s}^{-1}$ Total momentum = $\overrightarrow{321.3} \text{ kg m s}^{-1} + \overrightarrow{312.58} \text{ kg m s}^{-1} = \overrightarrow{8.72} \text{ kg m s}^{-1}$ Speed of combined scrums = $\frac{8.72}{850 + 883} = \overrightarrow{0.00503} \text{ m s}^{-1}$	• One correct momentum.	• Total momentum found.	• Correct speed with direction.
(d)	A player's change in momentum would be the same whether they hit the post with or without pads. The pads crush / compress a bit as the player hits them; this makes the collision take longer. As $F = \frac{\Delta p}{t}$ a longer collision time means the player experiences a smaller force as they stop. This is safer for the player. (Accept an answer correctly argued in terms of deceleration.)	• One of: - Δp the same - collision takes longer - smaller force.	• Two linked statements.	• Full explanation.

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THREE (a)	$w = mgh = 68.3 \times 9.8 \times 14.1 = 9438 = 9440 \text{ J}$	<ul style="list-style-type: none"> • 9440 J 		
(b)	$w = E_k = \frac{1}{2}mv^2 = \frac{1}{2} \times 68.3 \times 7.52^2 = 1931 \text{ J}$ $P = \frac{w}{t} = \frac{1931}{4.35} = 444 \text{ W}$	<ul style="list-style-type: none"> • ONE of: - 1931 J - $\frac{\text{any calculated work}}{4.35}$ 	<ul style="list-style-type: none"> • 444 W 	
(c)(i)		<ul style="list-style-type: none"> • ONE of: - All 5 forces labelled - Any torque calculation. 	<ul style="list-style-type: none"> • Made ONE error, e.g. used one incorrect distance. 	<ul style="list-style-type: none"> • All forces labelled. AND $F_B = 351 \text{ N}$ $F_A = 1708 \text{ N}$
(ii)	$0.11 \times 669 + F_B \times 2.69 = 1.345 \times 621 + 0.24 \times 769$ $F_B = 351 \text{ N}$ and $F_A = 1708 \text{ N}$			
(d)(i)	Arrow towards the centre of the circle.	<ul style="list-style-type: none"> • ONE of: - arrow towards centre - tension force - change in direction - velocity a vector. 	<ul style="list-style-type: none"> • Arrow towards centre and one statement linking cause and effect. 	<ul style="list-style-type: none"> • Full explanation.
(ii)	<p>In order to move in a circle at a constant speed, there must be a force towards the middle of the circle providing a centripetal force.</p> <p>This force changes their direction and not their speed, as it is perpendicular to their direction of motion.</p> <p>Velocity is a vector, and a change in direction is a change in velocity, which is an acceleration.</p>			

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Cut Scores

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