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0 2 Professional rugby players wear a tracking device that measures their velocity and acceleration.

Figure 2 shows a player wearing a tracking device.

The player is tackling another player who is running with the ball.

Figure 2

0 2 . 1 Velocity and acceleration are both vector quantities.

What is a vector quantity?

[1 mark]

Tick (✓) **one** box.

A quantity with both magnitude and direction ☐

A quantity with direction only ☐

A quantity with magnitude only ☐

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0 2 . 2 Which of the following is a vector quantity?

[1 mark]

Tick (✓) **one** box.

Displacement ☐

Distance ☐

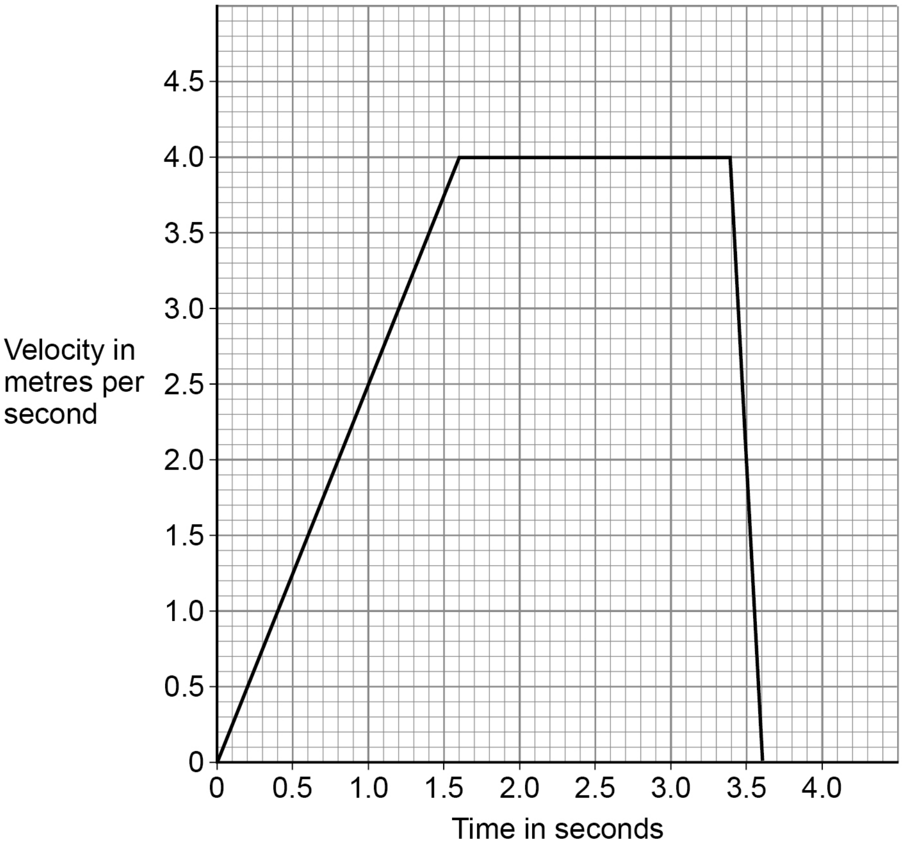
Time ☐

Work done ☐

Question 2 continues on the next page

Figure 3 shows a velocity–time graph for the player running with the ball.

Figure 3



0 2 . 3 Determine the acceleration of the player between 0 and 1.6 s.

[2 marks]

Acceleration = ____________________ m/s^2

0 2 . 4 Describe the motion of the player between 3.4 s and 3.6 s.

[1 mark]

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The force exerted on the player when she is tackled causes her to accelerate.

0 2 . 5 Write down the equation which links acceleration (a), mass (m) and resultant force (F).

[1 mark]

____

0 2 . 6 The player accelerates at 25 m/s^2 when a resultant force of 1800 N acts on her.

Calculate the mass of the player.

[3 marks]

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Mass = ____________________ kg

0 2 . 7 The tracking device sends data to a computer during the game.

Suggest **one** advantage of the data being sent during the game.

[1 mark]

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____

10

Turn over for the next question

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	a quantity with both magnitude and direction		1	AO1 6.5.1.1
02.2	displacement		1	AO1 6.5.4.1.1
02.3	gradient = $\frac{(4 - 0)}{(1.6 - 0)}$ acceleration = 2.5 m/s^2	 allow use of $a = \Delta v / t$	1 1	AO2 6.5.4.1.5
02.4	constant deceleration	allow large deceleration allow decelerates to a stop	1	AO2 6.5.4.1.5
02.5	resultant force = mass × acceleration **or** F = ma	allow force = mass × acceleration	1	AO1 6.5.4.2.2
02.6	1800 = m × 25 m = $\frac{1800}{25}$ m = 72 (kg)		1 1 1	AO2 6.5.4.2.2
02.7	performance can be monitored during the game	allow do not have to wait until the end of the game to download data	1	AO3 6.6.2.4
Total			**10**	