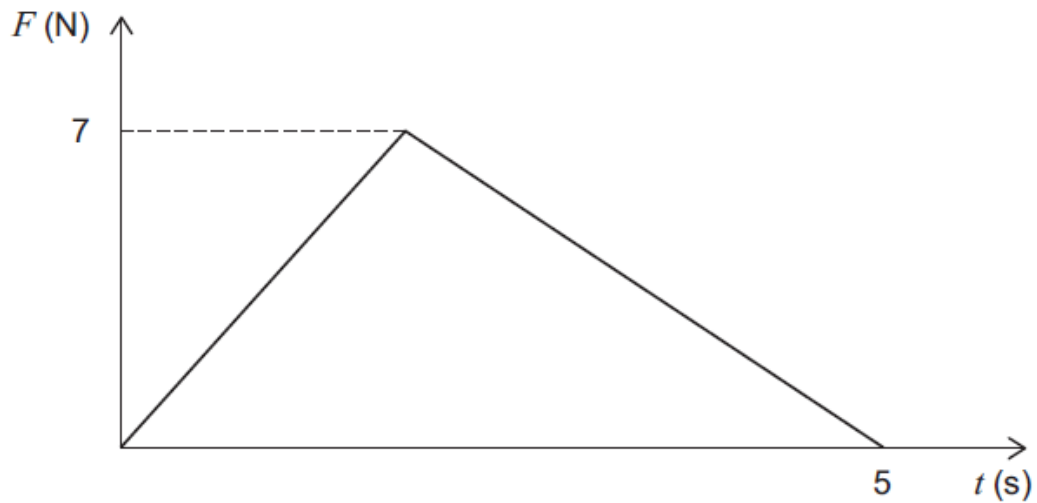## Momentum and collisions – A2 Further Mathematics Mechanics

1. June/2022/Paper_7367/03M/No.1

The graph shows how a force, F newtons, varies during a 5 second period of time.

Calculate the magnitude of the impulse of the force.

Circle your answer.

[1 mark]

| 17.5 N s | 25 N s | 35 N s | 70 N s |

2. June/2022/Paper_7367/03M/No.7

Two snooker balls, one white and one red, have equal mass.

The balls are on a horizontal table *ABCD*

The white ball is struck so that it moves at a speed of $2\,\text{m}\,\text{s}^{-1}$ parallel to *AB*

The white ball hits a stationary red ball.

After the collision, the white ball moves at a speed of $0.8\,\text{m}\,\text{s}^{-1}$ and at an angle of $30°$ to *AB*

After the collision, the red ball moves at a speed $v\,\text{m}\,\text{s}^{-1}$ and at an angle θ to *CD*

When the collision takes place, the white ball is the same distance from *AB* as the distance the red ball is from *CD*

The diagram below shows the table and the velocities of the balls after the collision.

Not to scale
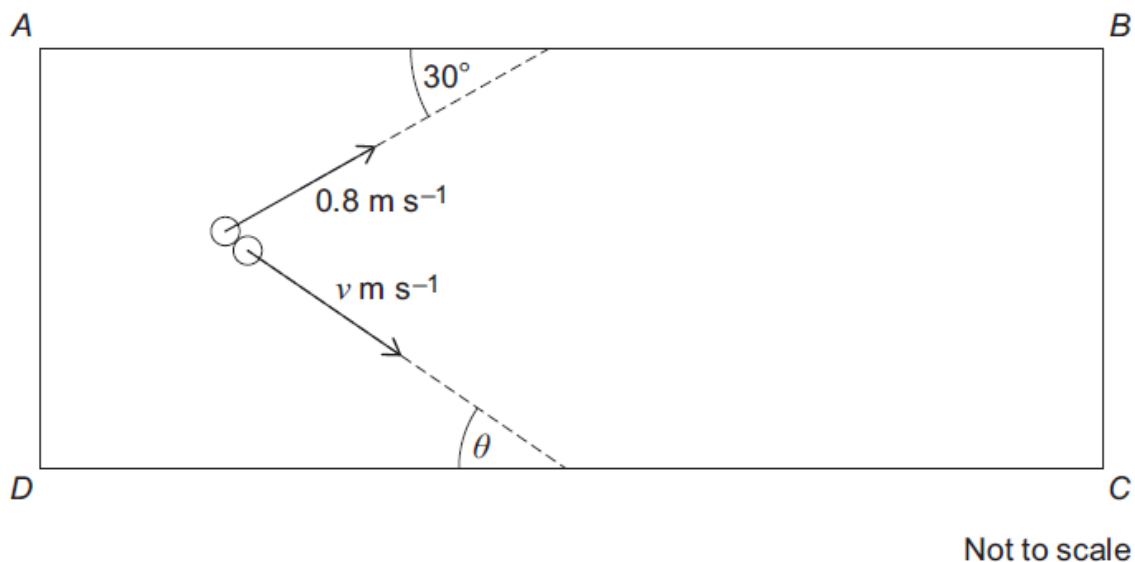
After the collision, the white ball hits *AB* and the red ball hits *CD*

Model the balls as particles that do not experience any air resistance.

(a) Explain why the two balls hit the sides of the table at the same time.

[2 marks]

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2

(b) Show that $\theta = 17.0°$ correct to one decimal place.

[4 marks]

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(c) Find v

[2 marks]

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(d) Determine which ball travels the greater distance after the collision and before hitting the side of the table.

Fully justify your answer.

[2 marks]

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(e) State **one** possible refinement to the model that you have used.

[1 mark]

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