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Other names

Pearson Edexcel
International
Advanced Level

Centre Number

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Candidate Number

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Mechanics M1

Advanced/Advanced Subsidiary

Wednesday 14 June 2017 – Morning

Time: 1 hour 30 minutes

Paper Reference

WME01/01**You must have:**

Mathematical Formulae and Statistical Tables (Blue)

Total Marks

Candidates may use any calculator allowed by the regulations of the Joint Council for Qualifications. Calculators must not have the facility for symbolic algebra manipulation, differentiation and integration, or have retrievable mathematical formulae stored in them.

Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B). Coloured pencils and highlighter pens must not be used.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions and ensure that your answers to parts of questions are clearly labelled.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- You should show sufficient working to make your methods clear. Answers without working may not gain full credit.
- Whenever a numerical value of g is required, take $g = 9.8 \text{ m s}^{-2}$, and give your answer to either two significant figures or three significant figures.
- When a calculator is used, the answer should be given to an appropriate degree of accuracy.

Information

- The total mark for this paper is 75.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

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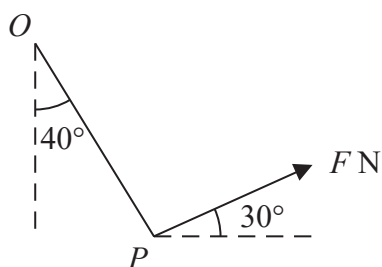
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Pearson

1.

**Figure 1**

A particle P of weight 5 N is attached to one end of a light string. The other end of the string is attached to a fixed point O . A force of magnitude F newtons is applied to P . The line of action of the force is inclined to the horizontal at 30° and lies in the same vertical plane as the string. The particle P is in equilibrium with the string making an angle of 40° with the downward vertical, as shown in Figure 1.

Find

- (i) the tension in the string,
- (ii) the value of F .

(7)

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Question 2 continued

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3. Two particles, P and Q , have masses 0.5 kg and $m\text{ kg}$ respectively. They are moving in opposite directions towards each other along the same straight line on a smooth horizontal plane and collide directly. Immediately before the collision the speed of P is 4 ms^{-1} and the speed of Q is 2 ms^{-1} . The magnitude of the impulse exerted on P by Q in the collision is 4.2 N s . As a result of the collision the direction of motion of P is reversed.

- (3)

(b) Find the two possible values of m .

(4)

Question 3 continued

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4. A small ball of mass 0.2 kg is moving vertically downwards when it hits a horizontal floor. Immediately before hitting the floor the ball has speed 10 m s^{-1} . Immediately after hitting the floor the ball rebounds vertically with speed 7 m s^{-1} .

- By modelling the motion of the ball as that of a particle moving freely under gravity,

- (c) find the time between the instant when the ball first hits the floor and the instant when the ball is first 1 m above the floor and moving upwards. (4)

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Question 4 continued

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Question 4 continued

Q4

(Total 8 marks)



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5. Two trains, P and Q , move on horizontal parallel straight tracks. Initially both are at rest in a station and level with each other. At time $t = 0$, P starts off and moves with constant acceleration for 10 s up to a speed of 25 ms^{-1} and then moves at a constant speed of 25 ms^{-1} . At time $t = 20$, where t is measured in seconds, train Q starts to move in the same direction as P . Train Q accelerates with the same initial constant acceleration as P , up to a speed of 40 ms^{-1} and then moves at a constant speed of 40 ms^{-1} . Train Q overtakes P at time $t = T$, after both trains have reached their constant speeds.

- (a) Sketch, on the same axes, the speed-time graphs of both trains for $0 \leq t \leq T$. (3)
- (b) Find the value of t at the instant when both trains are moving at the same speed. (2)
- (c) Find the value of T . (8)

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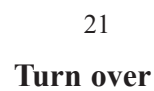
Q5

(Total 13 marks)



Q6

(Total 9 marks)



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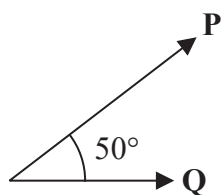


Figure 3

Two forces, **P** and **Q**, act on a particle. The force **P** has magnitude 8 N and the force **Q** has magnitude 5 N. The angle between the directions of **P** and **Q** is 50° , as shown in Figure 3. The resultant of **P** and **Q** is the force **R**.

- (a) Find, to 3 significant figures, the magnitude of $\mathbf{R}$. (4)
- (b) Find, to the nearest degree, the size of the angle between the direction of $\mathbf{P}$ and the direction of $\mathbf{R}$. (4)



Q7

(Total 8 marks)



Question 8 continued

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Question 8 continued

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Q8

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TOTAL FOR PAPER: 75 MARKS

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