CM

AS Level Maths Question Countdown

1 day until the 1st exam

Information

- Each of the ten sheets will contain five pure questions and two applied questions.

Pure questions

- Two of the pure questions will be 'standard'.
- Two of the pure questions will be 'problems'.
- The last pure question will involve modelling.

Applied questions

- One of the questions will focus on statistics.
- One of the questions will focus on mechanics.
- On alternate days, the statistics question will look at the large data set. Note that these questions may be brief as opposed to full length exam questions.

Notes to self

Pure questions – standard

1 The line l_1 passes through the points (4, 3) and (–2, 6).

The line l_2 is perpendicular to l_1 and passes through the point (2, 5).

(a) Find the equation of the line l_2, giving your answer in the form $ax + by + c = 0$, where a, b and c are integers to be found.

The line l_2 meets the coordinate axes at the points A and B.

(b) Determine the area of the triangle OAB, where O is the origin.

2 (a) Find the coordinates of intersection between the curve $y = 3x^2 + 4x + 7$ and the line $y = 9 – x$.

(b) Hence, write down the set of values of x for which the curve $y = 3x^2 + 4x + 7$ lies below the line $y = 9 – x$.

Pure questions – problems

3 The curve C has the equation $y = ax^3 + 5x^2 + bx + 4, \quad a \neq 0$.

The curve has two stationary points at $x = –3$ and $x = -\frac{1}{3}$.

(a) Find the values of a and b.

(b) Use calculus to determine the nature of the stationary points on C.

(c) Sketch the curve C.

On your sketch, show clearly the coordinates of the stationary points and any intersections with the y axis. You do **not** have to show the coordinates of any intersections with the x axis.

4 The circle C has the centre (3, 1) and radius 5.

Two of the tangents to C are parallel to the line $3x + 4y + 20 = 0$.

Use algebra to find the equations of these two tangents.
Show your working clearly.

[NB: this is very demanding algebraically, so brace yourself!]

Pure questions – modelling

5 The price of a car, P pounds, at time T weeks after being purchased is modelled by the equation

$$P = \frac{3000}{2T+1} + 6000, \quad T \geqslant 0$$

(a) Determine the initial cost of the car according to the model.

(b) Find the time at which the price of the car is £6500.

(c) Use the model to sketch how P varies with T.

Applied questions – mechanics

6 Two particles P and Q hang freely under the influence of gravity. The particles are connected by a light inextensible string that passes over a fixed small smooth pulley. The particle P has mass 2 kg and the particle Q has mass 5 kg. The particles P and Q are 3 m above the ground.

The system is released from rest.

(a) Find the acceleration of the masses.

(b) Find the time taken for the particle Q to hit the ground.

(c) Calculate the maximum height reached by the particle P above the ground.

Applied questions – statistics

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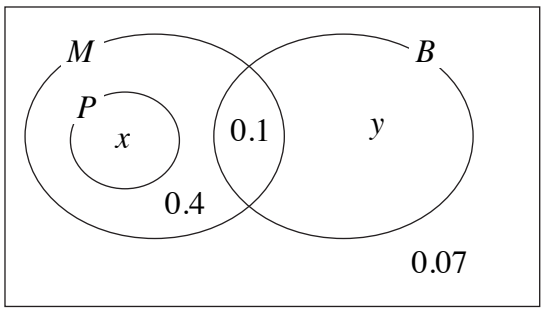

The Venn diagram shows the probabilities that a randomly selected student studies maths (M), physics (P) or biology (B).

The probability that a randomly chosen student studies Maths is 0.63.

(a) Find x and y.

(b) Determine, giving a reason for your answer, whether the events M and B statistically independent. Show your working clearly.