CM

AS Level Maths Question Countdown

9 days 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 (a) Solve $4 - 5x \geqslant 2 - x$.

(b) Solve $\dfrac{5 - 3x}{x} > 2$.

(c) Hence write down the set of values of x that satisfy both

$$\frac{5 - 3x}{x} > 2 \quad \textbf{and} \quad 4 - 5x \geqslant 2 - x$$

2 (a) In ascending powers of x, find the first three terms in the binomial expansion of $(3 - 4x)^6$.

Give each term in its simplest form.

In the binomial expansion of $(1 + py)^8$, $p \neq 0$, the coefficient of y^5 is 13 608.

(b) Find the value of p.

(c) Hence find the coefficient of y^6 in this expansion.

Pure questions – problems

3 The points A, B and C have position vectors $3\mathbf{i} + p\mathbf{j}$, $7\mathbf{i} - \mathbf{j}$ and $\mathbf{i} - 9\mathbf{j}$ respectively, where p is a positive constant.

(a) Find, in terms of p, the vectors $\overrightarrow{AB}$ and $\overrightarrow{BC}$.

The point D is such that $ABCD$ is a parallelogram.

(b) Given that the perimeter of $ABCD$ is 30 units, determine the value of p.

(c) Hence find the position vector of D.

4 The curve C has the equation $y = 4x - \dfrac{1}{\sqrt{x}}$, $x > 0$.

The normal to C at a point P is parallel to the line $16x + 65y - 10 = 0$.

Find the coordinates of the point P.

Pure questions – modelling

5 A tank is initially completely filled with liquid. An outlet is opened at the bottom of the tank and the liquid begins to drain from the tank.

At time t minutes after the outlet is opened, the amount of liquid in the tank is V cm^3.

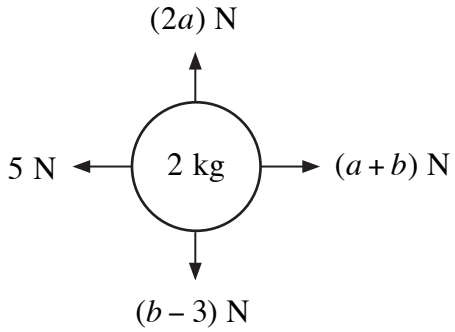
Kyle creates a model for the liquid flow out of the tank. The model includes the following assumptions:

- the initial volume of liquid in the tank is 300 cm^3,
- it takes two minutes for the volume of liquid in the tank to reach 80 cm^3,
- the rate of flow of liquid out of the tank is proportional to the amount of liquid in the tank.

Using Kyle's model, find an expression for V in terms of t.

Applied questions – mechanics

6



The diagram above shows the forces acting on a particle P with mass 2 kg.

Given that P moves to the right at 2 m s^{-2}, find the values of a and b.

Applied questions – statistics

7 Yvonne believes that a coin is biased towards heads. She tosses the coin 24 times and obtains 14 heads. Test Yvonne's claim at the 5% level of significance. State your hypotheses clearly.