CM

AS Level Maths Question Countdown

10 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 The curve C has the equation $y = 4x^2 - 2\sqrt{x} + 1,\ x > 0$.

Find

(a) $\dfrac{\mathrm{d}y}{\mathrm{d}x}$

(b) $\dfrac{\mathrm{d}^2y}{\mathrm{d}x^2}$

(c) $\int y\ \mathrm{d}x$

giving each term in its simplest form.

2 Solve the equations

(a) $5^x = 2$

(b) $\log_4(2x) + \log_4(x-2) = 2$

Give your answers to three significant figures where appropriate.

Pure questions – problems

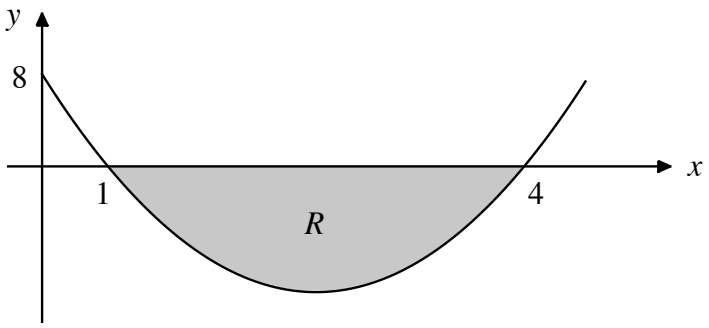
3 The straight line l passes through the points $A(4, 2)$ and $B(-1, 4)$.

(a) Find the equation of l, giving your answer in the form $y = mx + c$.

The curve C has the equation $y = x^2 + 2x + p$, where p is a constant.

(b) Given that l and C do not intersect, find the range of values of p.

4



The diagram above shows a sketch of the curve C with equation $y = ax^2 + bx + c$, where a, b and c are constants. The curve C meets the coordinate axes at the points $(1, 0)$, $(4, 0)$ and $(0, 8)$. The region R, shown shaded in the diagram, is bounded by C and the x axis.

Showing your method clearly, find the area of R.

Pure questions – modelling

5 The temperature of a room, T °C, is modelled using the equation

$$T = 12 - 3\cos(15t)°$$

where t is the time in hours since midnight and $0 \leqslant t < 24$.

(a) Write down the maximum and minimum temperature of the room as given by the model.

(b) Calculate the values of t for which the temperature of the room is 10 °C.

One other unit for temperature is the Kelvin.

To convert a temperature from degrees Celsius (°C) to Kelvin (K), 273 is added to the value. For example, 0 °C = 273 K.

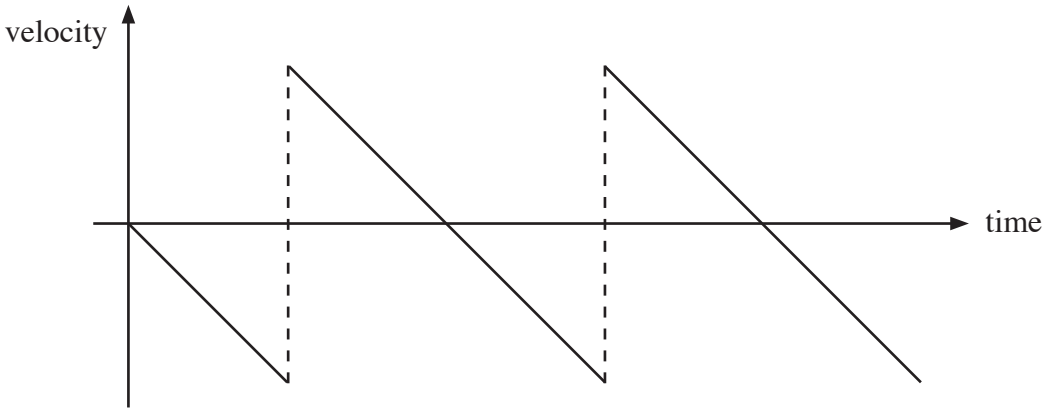
(c) Refine the model for T so that the units for T are in Kelvin.

Applied questions – mechanics

6 Theo releases a ball from rest at a point that is 3 m above the ground. The ball moves freely under the influence of gravity. The ball is modelled as a particle.

(a) Calculate the speed of the ball at the instant when it strikes the ground for the first time.

(b) Find the time taken from when the ball is released to when it strikes the ground for the first time.



After striking the ground for the first time, the ball rebounds vertically and begins bouncing. The diagram above shows Theo's velocity-time graph for the motion of the ball.

(c) State the magnitude of the gradient of Theo's line segments, giving a reason for your answer.

(d) Write down one assumption that Theo has made about the bounces of the ball.

Applied questions – statistics

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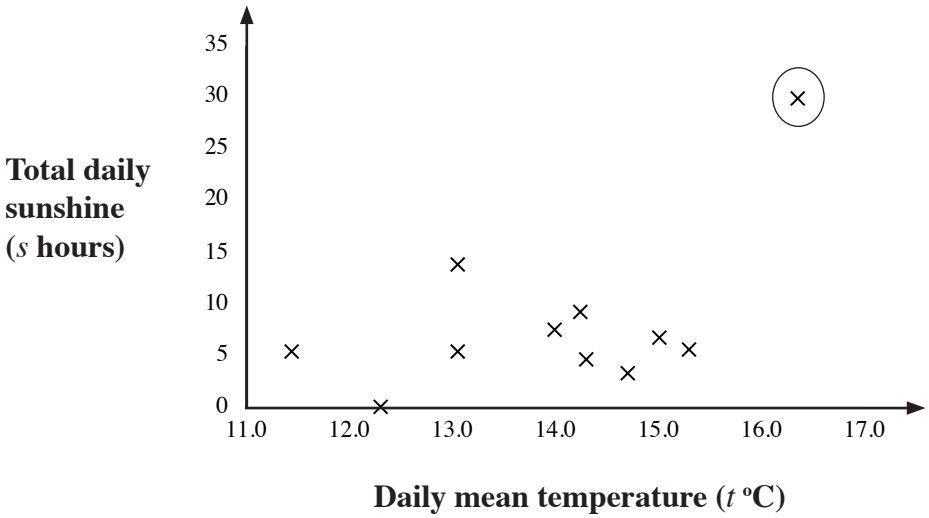

Priya is investigating the relationship between total daily sunshine, s hours, and daily mean temperature, t °C.

Priya's teacher gives her data about s and t for one location in the large data set.

The scatter graphs above show her data.

The point circled on the graph is an outlier.

(a) Using your knowledge of the large data set, explain why this outlier must be an error.

Excluding the outlier, the regression line for s on t is given by $s = 0.297t + 2.160$.

(b) Interpret the figure 0.297 in the regression line.

(c) Explain why the regression line above should **not** be used to estimate the daily mean temperature on a day with 10 hours of sunshine.

Priya suggests the location chosen by her teacher is Perth.

(d) Comment on Priya's suggestion using your knowledge of the large data set.