

AS Level Mathematics B (MEI)
H630/02 Pure Mathematics and Statistics

Question Set 3

1 Solve the equation $4x^{-\frac{1}{2}} = 7$, giving your answer as a fraction in its lowest terms. [3]

2 Fig. 2 shows a triangle with one angle of 117° given. The lengths are given in centimetres.

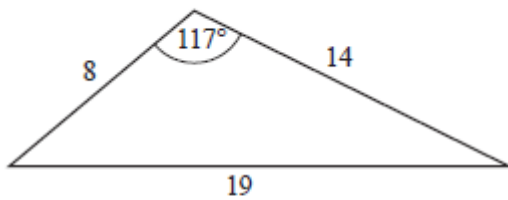


Fig. 2

Calculate the area of the triangle, giving your answer correct to 3 significant figures. [2]

3 Without using a calculator, prove that $3\sqrt{2} > 2\sqrt{3}$. [3]

4 The equation of a circle is $x^2 + y^2 + 8x - 6y - 39 = 0$.

(a) Find the coordinates of the centre of the circle. [2]

(b) Find the radius of the circle. [1]

5 (a) Find $\int x^3 \left(15x + \frac{11}{\sqrt[3]{x}} \right) dx$. [5]

(b) Show that $\int_0^8 x^3 \left(15x + \frac{11}{\sqrt[3]{x}} \right) dx = a \times 2^{11}$, where a is a positive integer to be determined. [3]

6

In 2012 Adam bought a second hand car for £8500. Each year Adam has his car valued. He believes that there is a non-linear relationship between t , the time in years since he bought the car, and V , the value of the car in pounds. Fig. 6.1 shows successive values of V and $\log_{10}V$.

t	0	1	2	3	4
V	8500	6970	5720	4690	3840
$\log_{10}V$	3.93	3.84	3.76	3.67	3.58

Fig. 6.1

Adam uses a spreadsheet to plot the points $(t, \log_{10}V)$ shown in Fig. 6.1, and then generates a line of best fit for these points. The line passes through the points $(0, 3.93)$ and $(4, 3.58)$. A copy of his graph is shown in Fig. 6.2.

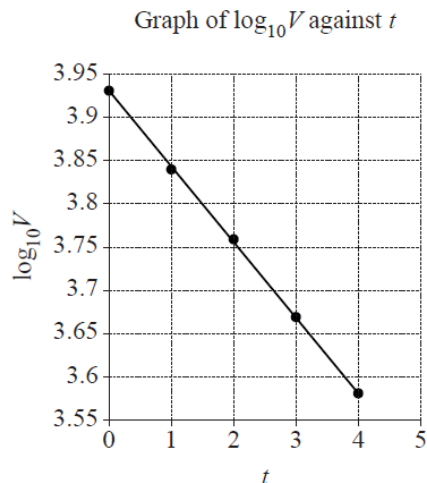


Fig. 6.2

- (a) Find an expression for $\log_{10}V$ in terms of t . [3]
- (b) Find a model for V in the form $V = A \times b^t$, where A and b are constants to be determined. Give the values of A and b correct to 2 significant figures. [3]

In 2017 Adam's car was valued at £3150.

- (c) Determine whether the model is a good fit for this data. [1]

A company called Webuyoldcars pays £500 for any second hand car. Adam decides that he will sell his car to this company when the annual valuation of his car is less than £500.

- (d) According to the model, after how many years will Adam sell his car to Webuyoldcars? [3]

7

In this question you must show detailed reasoning.

The equation of a curve is $y = \frac{x^2}{4} + \frac{2}{x} + 1$. A tangent and a normal to the curve are drawn at the point where $x = 2$.

Calculate the area bounded by the tangent, the normal and the x -axis. [10]

Total Marks for Question Set 3: 39 marks

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