OCR
Oxford Cambridge and RSA

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.

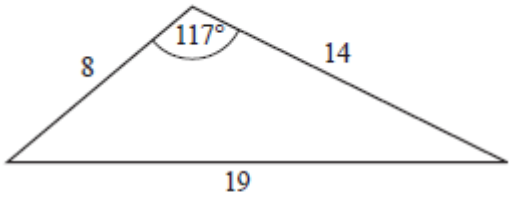

Fig. 2

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.

Graph of $\log_{10} V$ against t

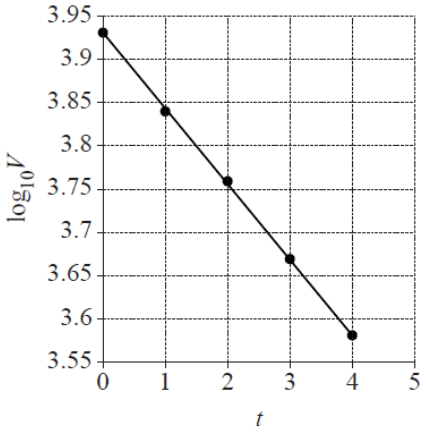

Fig. 6.2

(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