Questions taken from the AQA Specimen Paper 2

Question	3	4	6	8	9	10	19a, biii	Total
Marks								
Max Marks	2	3	4	6	5	8	9	37

SPEND ABOUT 45 MINUTES ON THE QUESTIONS THEN CHECK AND CORRECT YOUR ANSWERS USING THE MARK SCHEME

NOTE: JACK BROWN HAS A FULL SET OF VIDEO SOLUTIONS FOR THIS PAPER (SEARCH YOUTUBE)

3 Find the value of $\log_a\left(a^3\right)+\log_a\left(\frac{1}{a}\right)$

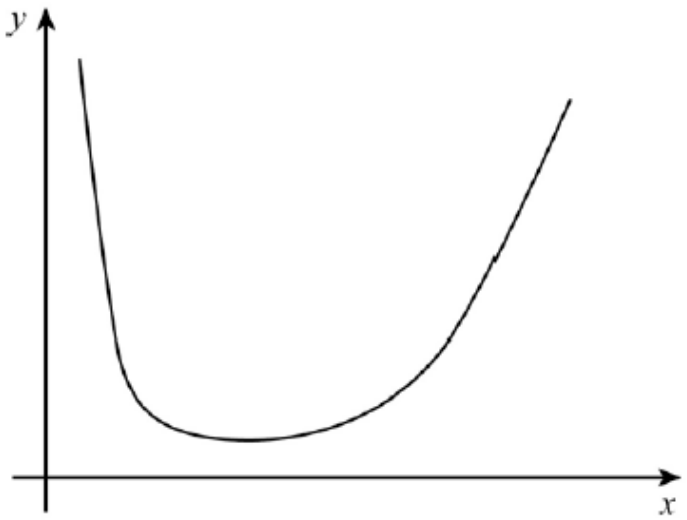
[2 marks]

4 Find the coordinates, in terms of a, of the minimum point on the curve $y=x^2-5x+a$, where a is a constant.

Fully justify your answer.

[3 marks]

6 A curve has equation $y=6x^2+\frac{8}{x^2}$ and is sketched below for $x>0$



Find the area of the region bounded by the curve, the x-axis and the lines $x=a$ and $x=2a$, where $a>0$, giving your answer in terms of a

[4 marks]

8 Prove that the function $f(x) = x^3 - 3x^2 + 15x - 1$ is an increasing function.

[6 marks]

9 A curve has equation $y = e^{2x}$

Find the coordinates of the point on the curve where the gradient of the curve is $\frac{1}{2}$

Give your answer in an exact form.

[5 marks]

10 David has been investigating the population of rabbits on an island during a three-year period.

Based on data that he has collected, David decides to model the population of rabbits, R, by the formula

$$R = 50e^{0.5t}$$

where t is the time in years after 1 January 2016.

10 (a) Using David's model:

10 (a) (i) state the population of rabbits on the island on 1 January 2016;

[1 mark]

10 (a) (ii) predict the population of rabbits on 1 January 2021.

[1 mark]

10 (b) Use David's model to find the value of t when $R = 150$, giving your answer to three significant figures.

[2 marks]

10 (c) Give **one** reason why David's model may **not** be appropriate.

[1 mark]

10 (d) On the same island, the population of crickets, C, can be modelled by the formula

$$C = 1000e^{0.1t}$$

where t is the time in years after 1 January 2016.

Using the two models, find the year during which the population of rabbits first exceeds the population of crickets.

[3 marks]

19 Ellie, a statistics student, read a newspaper article that stated that 20 per cent of students eat at least five portions of fruit and vegetables every day.

Ellie suggests that the number of people who eat at least five portions of fruit and vegetables every day, in a sample of size n, can be modelled by the binomial distribution B(n , 0.20).

19 (a) There are 10 students in Ellie's statistics class.

Using the distributional model suggested by Ellie, find the probability that, of the students in her class:

19 (a) (i) two or fewer eat at least five portions of fruit and vegetables every day;

[1 mark]

19 (a) (ii) at least one but fewer than four eat at least five portions of fruit and vegetables every day;

[2 marks]

19 (b) Ellie's teacher, Declan, believes that more than 20 per cent of students eat at least five portions of fruit and vegetables every day. Declan asks the 25 students in his other statistics classes and 8 of them say that they eat at least five portions of fruit and vegetables every day.

19 (b) (iii) Assuming that these 25 students may be considered to be a random sample, carry out a hypothesis test at the 5% significance level to investigate whether Declan's belief is supported by this evidence.

[6 marks]