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# AS MATHEMATICS

Paper 2

Please note that question 17 uses the original Large Data Set "Family Food". This was replaced by the data set "Transport Stock Vehicle Database" in AS exams from June 2019. If you'd like to see the original data set, please contact [maths@aqa.org.uk](mailto:maths@aqa.org.uk).

Wednesday 23 May 2018

Morning

Time allowed: 1 hour 30 minutes

## Materials

- You must have the AQA Formulae for A-level Mathematics booklet.
- You should have a graphical or scientific calculator that meets the requirements of the specification.

## Instructions

- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer each question in the space provided for that question. If you require extra space, use an AQA supplementary answer book; do **not** use the space provided for a different question.
- Show all necessary working; otherwise marks for method may be lost.
- Do all rough work in this book. Cross through any work that you do not want to be marked.

## Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 80.

## Advice

- Unless stated otherwise, you may quote formulae, without proof, from the booklet.
- You do not necessarily need to use all the space provided.

For Examiner's Use	
Question	Mark
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19	
<b>TOTAL</b>	



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PB/Jun18/E4

**7356/2**

## Section A

Do not write  
outside the  
boxAnswer **all** questions in the spaces provided.

1 Given that  $\frac{dy}{dx} = \frac{1}{6x^2}$  find  $y$ .

Circle your answer.

**[1 mark]**

$$\frac{-1}{3x^3} + c$$

$$\frac{1}{2x^3} + c$$

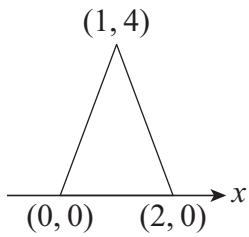
$$\frac{-1}{6x} + c$$

$$\frac{-1}{3x} + c$$



2 **Figure 1** shows  $y = f(x)$ .

**Figure 1**

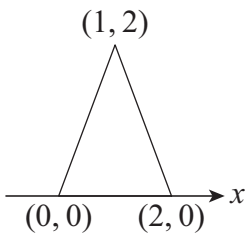


Which figure below shows  $y = f(2x)$ ?

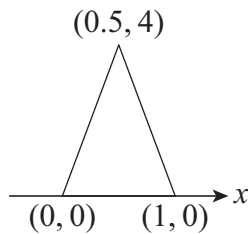
Tick **one** box.

[1 mark]

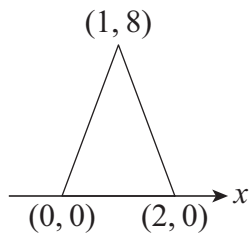
**Figure 2**



**Figure 3**



**Figure 4**



**Figure 5**

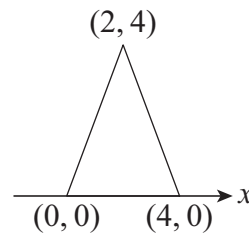


Figure 2

Figure 3

Figure 4

Figure 5

Turn over ►



3 Express as a single logarithm

$$2 \log_a 6 - \log_a 3$$

[2 marks]

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4 Solve the equation  $\tan^2 2\theta - 3 = 0$  giving all the solutions for  $0^\circ \leq \theta \leq 360^\circ$

[4 marks]

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**6** Points  $A(-7, -7)$ ,  $B(8, -1)$ ,  $C(4, 9)$  and  $D(-11, 3)$  are the vertices of a quadrilateral  $ABCD$ .

**6 (a)** Prove that  $ABCD$  is a rectangle.

**[4 marks]**

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**6 (b)** Find the area of  $ABCD$ .

**[2 marks]**

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7 (a) Express  $2x^2 - 5x + k$  in the form  $a(x - b)^2 + c$

[3 marks]

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7 (b) Find the values of  $k$  for which the curve  $y = 2x^2 - 5x + k$  does **not** intersect the line  $y = 3$

[3 marks]

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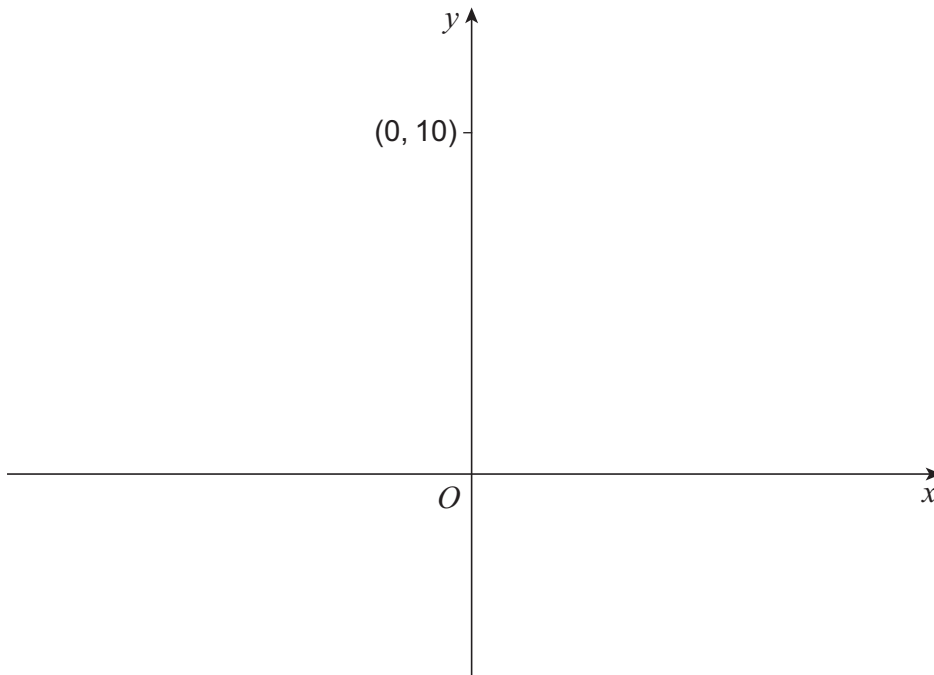
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**8** A circle of radius 6 passes through the points  $(0, 0)$  and  $(0, 10)$ .

**8 (a)** Sketch the two possible positions of the circle.

**[1 mark]**















**12** Trees in a forest may be affected by one of two types of fungal disease, but not by both.

The number of trees affected by disease A,  $n_A$ , can be modelled by the formula

$$n_A = ae^{0.1t}$$

where  $t$  is the time in years after 1 January 2017.

The number of trees affected by disease B,  $n_B$ , can be modelled by the formula

$$n_B = be^{0.2t}$$

On 1 January 2017 a **total** of 290 trees were affected by a fungal disease.

On 1 January 2018 a **total** of 331 trees were affected by a fungal disease.

**12 (a)** Show that  $b = 90$ , to the nearest integer, and find the value of  $a$ .

**[3 marks]**

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## Section B

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boxAnswer **all** questions in the spaces provided.

- 13** The table below shows the probability distribution for a discrete random variable  $X$ .

$x$	0	1	2	3	4 or more
$P(X = x)$	0.35	0.25	$k$	0.14	0.1

Find the value of  $k$ .

Circle your answer.

**[1 mark]**

0.14

0.16

0.18

1

- 14** Given that  $\sum x = 364$ ,  $\sum x^2 = 19412$ ,  $n = 10$ , find  $\sigma$ , the standard deviation of  $X$ .

Circle your answer.

**[1 mark]**

24.8

44.1

616.2

1941.2





**15** Nicola, a darts player, is practising hitting the bullseye. She knows from previous experience that she has a probability of 0.3 of hitting the bullseye with each dart.

Nicola throws eight practice darts.

**15 (a)** Using a binomial distribution, calculate the probability that she will hit the bullseye three or more times.

**[2 marks]**

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**15 (b)** Nicola throws eight practice darts on three different occasions. Calculate the probability that she will hit the bullseye three or more times on all three occasions.

**[2 marks]**

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**15 (c)** State two assumptions that are necessary for the distribution you have used in part (a) to be valid.

**[2 marks]**

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16

Kevin is the Principal of a college.

He wishes to investigate types of transport used by students to travel to college.

There are 3200 students in the college and Kevin decides to survey 60 of them.

Describe how he could obtain a simple random sample of size 60 from the 3200 students.

[4 marks]

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17

The table below is an extract from the Large Data Set, showing the purchased quantities of fats and oils for the South East of England in 2014.

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Description	Purchased quantity
Butter	42
Soft margarine	16
Olive oil	17
Other vegetable and salad oils	28

Kim claims that more olive oil was purchased in the South East than soft margarine.

Explain why Kim may be incorrect.

**[2 marks]**

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18

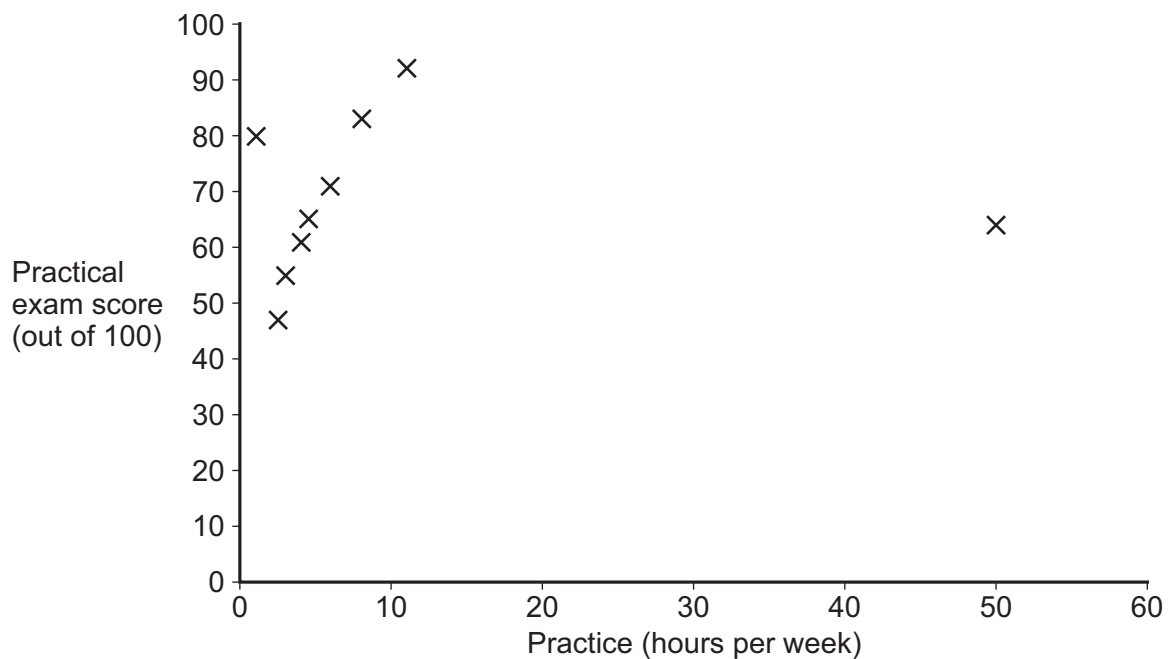
Jennie is a piano teacher who teaches nine pupils.

She records how many hours per week they practice the piano along with their most recent practical exam score.

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Student	Practice (hours per week)	Practical exam score (out of 100)
Donovan	50	64
Vazquez	6	71
Higgins	3	55
Begum	2.5	47
Collins	1	80
Coldbridge	4	61
Nedbalek	4.5	65
Carter	8	83
White	11	92

She plots a scatter diagram of this data, as shown below.



- 18 (a)** Identify two possible outliers by name, giving a possible explanation for the position on the scatter diagram of each outlier.

[4 marks]

First outlier \_\_\_\_\_

Possible reason \_\_\_\_\_

\_\_\_\_\_

Second outlier \_\_\_\_\_

Possible reason \_\_\_\_\_

\_\_\_\_\_

- 18 (b)** Jennie discards the two outliers.

- 18 (b) (i)** Describe the correlation shown by the scatter diagram for the remaining points.

[1 mark]

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- 18 (b) (ii)** Interpret this correlation in the context of the question.

[1 mark]

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**END OF QUESTIONS**



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