AQA Level 3

Mathematical Studies

Mathematics Department

BHFCS

1 **(a)** Simplify $q^7 \times q^5$

[1 mark]

Answer _____

(b) Simplify $\frac{8p^9}{4p^2}$

[2 marks]

_____

_____

Answer _____

(c) Write down the value of a and b if $(2m^a)^3 = bm^{12}$

[2 marks]

_____

_____

Answer $a =$_____ $b =$_____

2 Bobby has £350000. He wants to purchase a house.

When Bobby purchases a house, he will need to pay legal fees of £2000 as well as stamp duty tax at the following rates:

The first £120000 of the property price	No stamp duty
The second £125000 (£125000 − £250000)	2%
Anything above £250000	5%

Bobby decides he wants to buy a house for £330000.

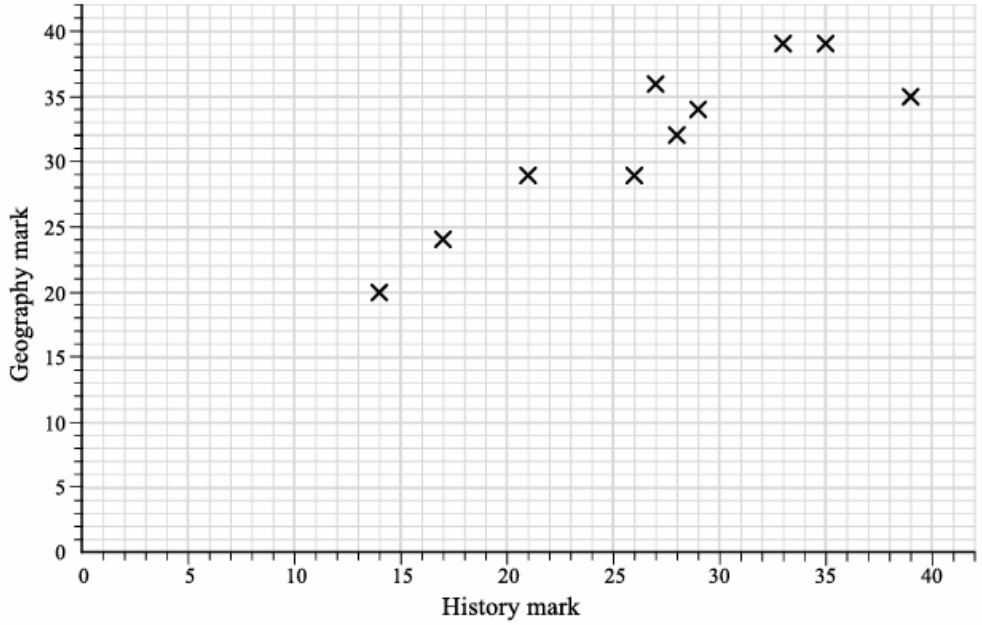
Can Bobby afford to buy the house and pay the fees and stamp duty?

Show how you decide.

[4 marks]

Answer _____

3 The scatter diagram shows the history and geography marks of 10 students in their recent tests.



(a) Describe the correlation shown in the graph.

[1 mark]

Another student scored 25 in the history test.

(b) Use the graph to estimate this student's score in the geography test.

[2 marks]

(c) Both tests were out of 40. Which test do you think was easier? Explain why.

[2 marks]

4 **(a)** Write 0.000034 in standard form.

[1 mark]

Answer _____

(b) Write 2.71×10^4 as an ordinary number.

[1 mark]

Answer _____

(c) Write the fraction $\frac{3 \times 10^8}{4.5 \times 10^9}$ in its simplest form.

[1 mark]

Answer _____

5 Frankie invests £7000 in a bank account.
Frankie gets 6% per annum compound interest.
After n years, Frankie has £9367.58
Work out the value of n.

[2 marks]

Answer _____

6 The mean of three numbers is 120

The three numbers are $3a$, $5a + 2$ and $2a + 8$

Work out the value of the smallest number.

[4 marks]

Answer _____

7 k is a whole number such that $\sqrt{k} = 13.7$ to 1 decimal place. What is the largest possible value of k?

[2 marks]

Answer _____

8 It takes 3 builders 8 hours to build a 20 metre wall.

How long would it take 4 builders to build a 40m wall?

[3 marks]

Answer _____

9 The grouped frequency table gives information about the time taken for 80 swimmers to swim 100 metres.

Time, t seconds	Frequency
$60 \leq t < 90$	7
$80 \leq t < 120$	14
$110 \leq t < 150$	23
$140 \leq t < 180$	27
$170 \leq t < 210$	9

(a) Complete the cumulative frequency table.

[1 mark]

Time, t seconds	Cumulative frequency
$60 \leq t < 90$	
$60 \leq t < 120$	
$60 \leq t < 150$	
$60 \leq t < 180$	
$60 \leq t < 210$	

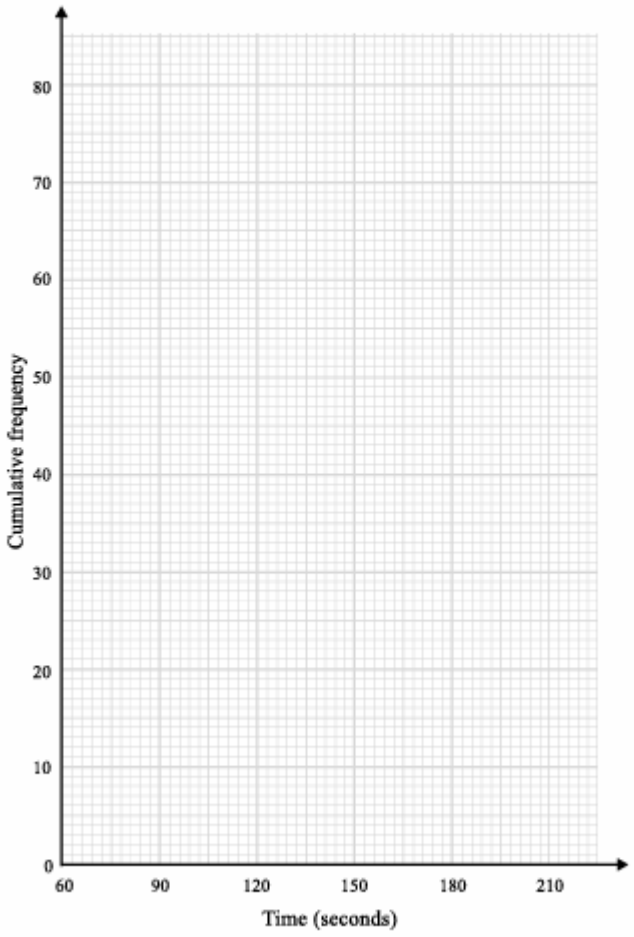
(b) On the grid opposite, draw a cumulative frequency graph for this information.

[2 marks]

(c) Use your graph to find an estimate for the interquartile range.

[2 marks]

Answer _____



10 Amina has a pack of playing cards. However, some of the cards are missing.

Amina is going to pick a card at random.

The probability that she picks a card from each suit is shown in the table.

Suit	Heart	Club	Diamond	Spade
Probability	0.25	0.275		

(a) Describe the correlation shown in the graph.

[2 marks]

Answer _____

(b) Amina has all 13 diamond cards.

Complete the table.

[2 marks]

(c) Amina designs a game. To win the game, the player must draw a club.

A full pack of cards contains 52 cards, 13 of each suit.

Amina says that it is more likely that a player will win if they use her pack of cards than if they use a full pack of cards. Is Amina correct? Explain your answer.

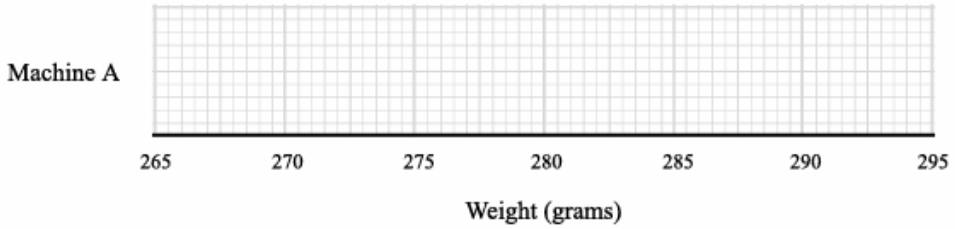
[2 marks]

11 Jessie records the weights of the cakes produced by Machine A in a factory.

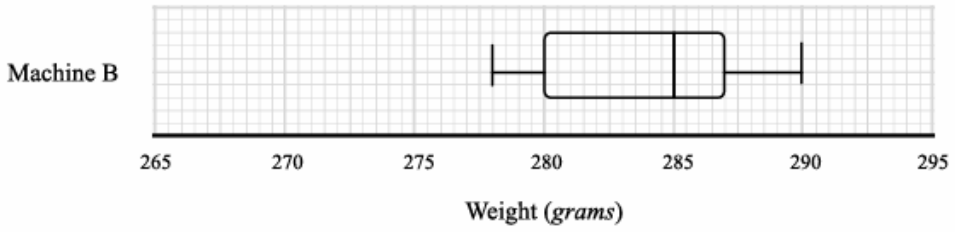
	Weight (grams)
Lowest value	270g
Lower quartile	275g
Median	281g
Interquartile range	10g
Highest value	290g

(a) Draw a box plot to show this information.

[3 marks]



The results of the weights of the cakes produced by machine B in the same factory are shown in the following box plot.



(b) Compare the distribution of the weights of the cakes produced by Machine A and Machine B.

[2 marks]

12 The price of a piece of furniture in London is £345

The price of the furniture in Venice is €360

The price of the furniture in New York is $385

The exchange rates are:

£1 = €1.16

£1 = $1.37

In which city is the furniture the most expensive?

Show how you decide.

[2 marks]

Answer _____

13 Here are the first five terms of a quadratic sequence

7 11 17 25 35

Find an expression in terms of n, for the nth term of the sequence.

[3 marks]

Answer _____

14 Alison rolls 2 dice and adds the values

Find the probability that the sum of the two values is greater than 7

[3 marks]

Answer _____

15 A circle's radius is increased by 12%.

Find the % increase in the circle's area.

[3 marks]

Answer _____%

16 **(a)** Show that the equation $x^3 - 2x^2 - 1 = 0$ has a solution between $x = 2$ and $x = 3$

[2 marks]

(b) Show that the equation $x^3 - 2x^2 - 1 = 0$ can be written in the form $x = \sqrt[3]{2x^2 + 1}$

[1 mark]

(c) Starting with $x_0 = 2.5$, use the iterative formula $x_{n+1} = \sqrt[3]{2x_n^2 + 1}$ four times to find an estimate for the solution of $x^3 - 2x^2 - 1 = 0$

Give each value to 4 decimal places.

[3 marks]

17 At the end of 2024 there were 4200 fish in a lake.

By the end of 2025, the number of fish remaining was 4032

It is assumed that the number of fish in the lake is given by

$$F = ar^n$$

where F is the number of fish in the lake and n is the number of years after the end of 2024.

(a) Describe the correlation shown in the graph.

[1 mark]

Answer a = _____

(b) Show that $r = 0.96$

[2 marks]

(c) Show that by the end of 2034, the number of fish in the lake is expected to have decreased by over 30%.

[3 marks]