



22117305

**MATHEMATICS
STANDARD LEVEL
PAPER 1**

Wednesday 4 May 2011 (afternoon)

1 hour 30 minutes

Candidate session number

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Examination code

2	2	1	1	-	7	3	0	5
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INSTRUCTIONS TO CANDIDATES

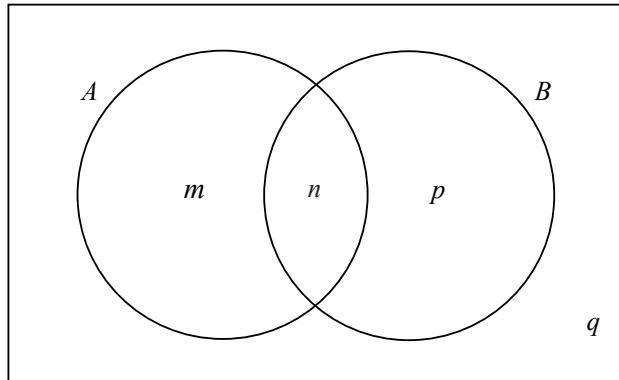
- Write your session number in the boxes above.
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0112

2. [Maximum mark: 6]

The Venn diagram below shows events A and B where $P(A)=0.3$, $P(A \cup B)=0.6$ and $P(A \cap B)=0.1$. The values m , n , p and q are probabilities.



- (a) (i) Write down the value of n .
(ii) Find the value of m , of p , and of q . [4 marks]

(b) Find $P(B')$. [2 marks]



Do NOT write on this page.

9. [Maximum mark: 14]

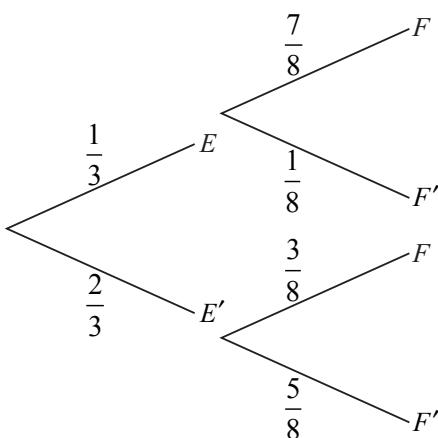
José travels to school on a bus. On any day, the probability that José will miss the bus is $\frac{1}{3}$.

If he misses his bus, the probability that he will be late for school is $\frac{7}{8}$.

If he does not miss his bus, the probability that he will be late is $\frac{3}{8}$.

Let E be the event “he misses his bus” and F the event “he is late for school”.

The information above is shown on the following tree diagram.



(a) Find

(i) $P(E \cap F)$;

(ii) $P(F)$.

[4 marks]

(b) Find the probability that

(i) José misses his bus and is not late for school;

(ii) José missed his bus, given that he is late for school.

[5 marks]

The cost for each day that José catches the bus is 3 euros. José goes to school on Monday and Tuesday.

(c) Copy and complete the probability distribution table.

[3 marks]

X (cost in euros)	0	3	6
$P(X)$	$\frac{1}{9}$		

(d) Find the expected cost for José for both days.

[2 marks]





22117303

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Examination code

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0112

4. [Maximum mark: 7]

The probability distribution of a discrete random variable X is given by

$$P(X=x) = \frac{x^2}{14}, \quad x \in \{1, 2, k\}, \text{ where } k > 0.$$

- (a) Write down $P(X = 2)$. [1 mark]

(b) Show that $k = 3$. [4 marks]

(c) Find $E(X)$. [2 marks]



Turn over



22107303



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**MATHEMATICS
STANDARD LEVEL
PAPER 1**

Wednesday 5 May 2010 (afternoon)

1 hour 30 minutes

Candidate session number

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INSTRUCTIONS TO CANDIDATES

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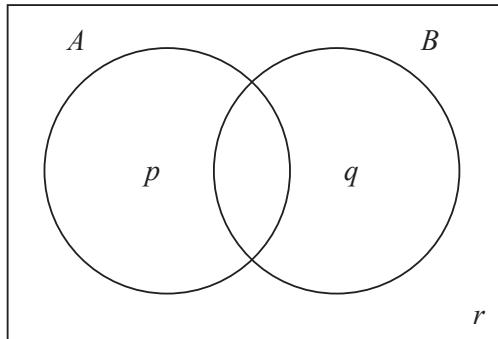


0111

5. [Maximum mark: 6]

Consider the events A and B , where $P(A) = 0.5$, $P(B) = 0.7$ and $P(A \cap B) = 0.3$.

The Venn diagram below shows the events A and B , and the probabilities p , q and r .



- (a) Write down the value of

- (i) p ;
 - (ii) q ;
 - (iii) r .

[3 marks]

- (b) Find the value of $P(A|B')$.

[2 marks]

- (c) Hence, or otherwise, show that the events A and B are **not** independent.

[1 mark]





22117304

**MATHEMATICS
STANDARD LEVEL
PAPER 2**

Thursday 5 May 2011 (morning)

1 hour 30 minutes

Candidate session number

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Examination code

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0112

4. [Maximum mark: 8]

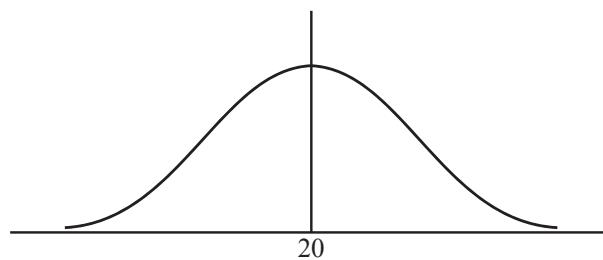
A random variable X is distributed normally with a mean of 20 and variance 9.

(a) Find $P(X \leq 24.5)$.

[3 marks]

(b) Let $P(X \leq k) = 0.85$.

(i) Represent this information on the following diagram.



(ii) Find the value of k .

[5 marks]



Turn over

5. [Maximum mark: 7]

A box holds 240 eggs. The probability that an egg is brown is 0.05.

- (a) Find the expected number of brown eggs in the box. [2 marks]

(b) Find the probability that there are 15 brown eggs in the box. [2 marks]

(c) Find the probability that there are at least 10 brown eggs in the box. [3 marks]



7. [Maximum mark: 7]

A company uses two machines, A and B, to make boxes. Machine A makes 60 % of the boxes.

80 % of the boxes made by machine A pass inspection.
90 % of the boxes made by machine B pass inspection.

A box is selected at random.

- (a) Find the probability that it passes inspection. [3 marks]

(b) The company would like the probability that a box passes inspection to be 0.87. Find the percentage of boxes that should be made by machine B to achieve this. [4 marks]





22117306

**MATHEMATICS
STANDARD LEVEL
PAPER 2**

Thursday 5 May 2011 (morning)

1 hour 30 minutes

Candidate session number

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Examination code

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INSTRUCTIONS TO CANDIDATES

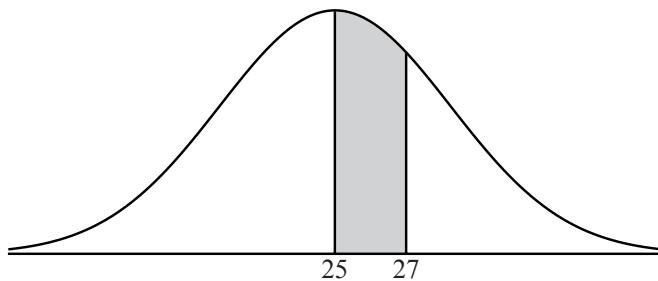
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0112

- 6.** [Maximum mark: 7]

Let the random variable X be normally distributed with mean 25, as shown in the following diagram.



The shaded region between 25 and 27 represents 30 % of the distribution.

- (a) Find $P(X > 27)$. [2 marks]

(b) Find the standard deviation of X . [5 marks]



Turn over



22127303



MATHEMATICS
STANDARD LEVEL
PAPER 1

Thursday 3 May 2012 (afternoon)

1 hour 30 minutes

Candidate session number

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Examination code

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INSTRUCTIONS TO CANDIDATES

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- Unless otherwise stated in the question, all numerical answers should be given exactly or correct to three significant figures.
- A clean copy of the **Mathematics SL information booklet** is required for this paper.
- The maximum mark for this examination paper is [90 marks].



0112

Full marks are not necessarily awarded for a correct answer with no working. Answers must be supported by working and/or explanations. Where an answer is incorrect, some marks may be given for a correct method, provided this is shown by written working. You are therefore advised to show all working.

SECTION A

Answer **all** questions in the boxes provided. Working may be continued below the lines if necessary.

1. [Maximum mark: 7]

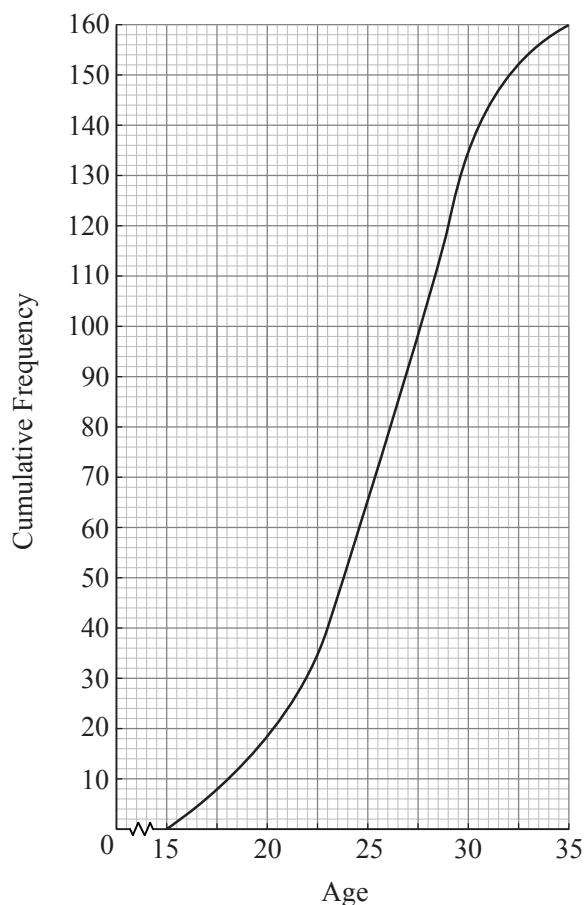
The ages of people attending a music concert are given in the table below.

Age	$15 \leq x < 19$	$19 \leq x < 23$	$23 \leq x < 27$	$27 \leq x < 31$	$31 \leq x < 35$
Frequency	14	26	52	52	16
Cumulative Frequency	14	40	92	p	160

- (a) Find p .

[2 marks]

The cumulative frequency diagram is given below.



(This question continues on the following page)



(Question 1 continued)

- (b) Use the diagram to estimate

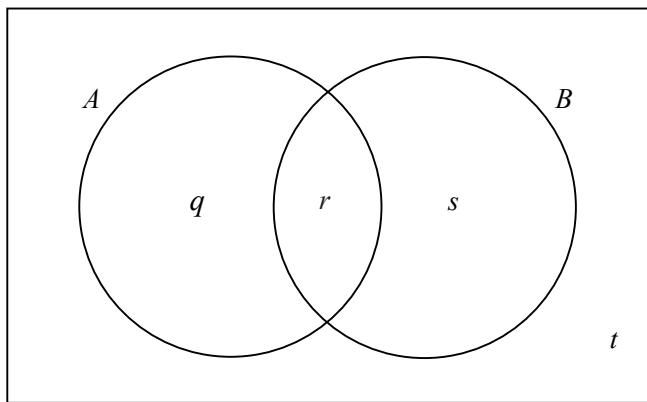
- (i) the 80th percentile;
 - (ii) the interquartile range.

[5 marks]



- 4.** [Maximum mark: 7]

Events A and B are such that $P(A) = 0.3$, $P(B) = 0.6$ and $P(A \cup B) = 0.7$.



The values q , r , s and t represent probabilities.

- (a) Write down the value of t . [1 mark]

(b) (i) Show that $r = 0.2$.

(ii) Write down the value of q and of s . [3 marks]

(c) (i) Write down $P(B')$.

(ii) Find $P(A|B')$. [3 marks]





22127305



**MATHEMATICS
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PAPER 1**

Thursday 3 May 2012 (afternoon)

1 hour 30 minutes

Candidate session number

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0116

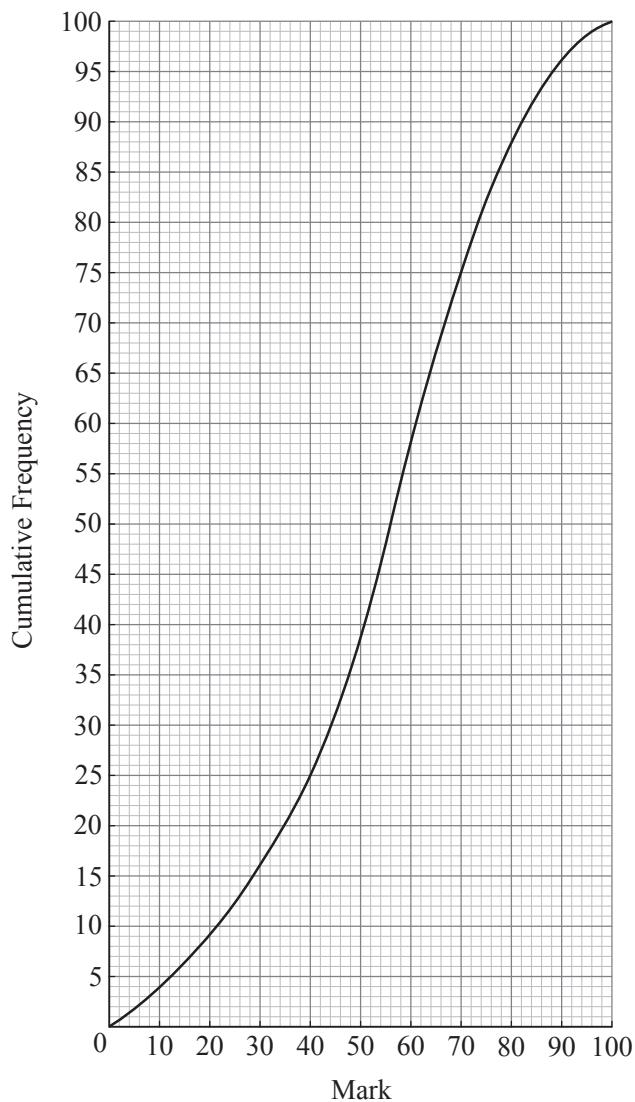
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SECTION A

Answer **all** questions in the boxes provided. Working may be continued below the lines if necessary.

1. [Maximum mark: 5]

The cumulative frequency curve below represents the marks obtained by 100 students.



(This question continues on the following page)



(Question 1 continued)

- (a) Find the median mark. [2 marks]
- (b) Find the interquartile range. [3 marks]



Turn over

4. [Maximum mark: 8]

The random variable X has the following probability distribution, with $P(X > 1) = 0.5$.

x	0	1	2	3
$P(X = x)$	p	q	r	0.2

- (a) Find the value of r . [2 marks]

(b) Given that $E(X)=1.4$, find the value of p and of q . [6 marks]

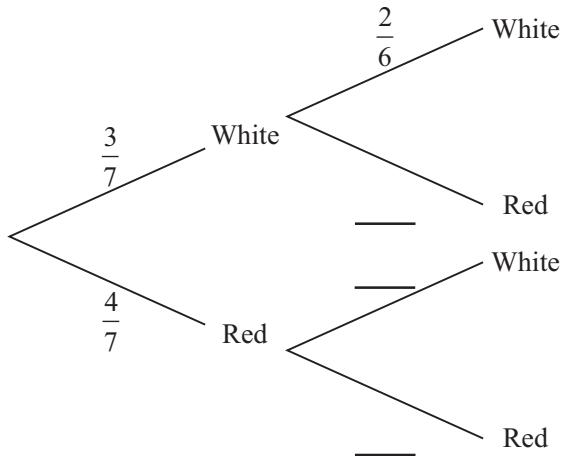


Do **NOT** write solutions on this page.

9. [Maximum mark: 14]

Bag A contains three white balls and four red balls. Two balls are chosen at random without replacement.

(a) (i) Copy and complete the following tree diagram. (Do **not** write on this page.)



(ii) Find the probability that two white balls are chosen.

[5 marks]

Bag B contains four white balls and three red balls. When two balls are chosen at random without replacement from bag B, the probability that they are both white is $\frac{2}{7}$.

A standard die is rolled. If 1 or 2 is obtained, two balls are chosen without replacement from bag A, otherwise they are chosen from bag B.

(b) Find the probability that the two balls are white.

[5 marks]

(c) Given that both balls are white, find the probability that they were chosen from bag A.

[4 marks]



Turn over

**Mathematics
Standard level
Paper 1**

Tuesday 12 May 2015 (morning)

Candidate session number

1 hour 30 minutes

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- A clean copy of the **Mathematics SL formula booklet** is required for this paper.
- The maximum mark for this examination paper is **[90 marks]**.

11 pages

2215–7303

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12EP01



Full marks are not necessarily awarded for a correct answer with no working. Answers must be supported by working and/or explanations. Where an answer is incorrect, some marks may be given for a correct method, provided this is shown by written working. You are therefore advised to show all working.

Section A

Answer **all** questions in the boxes provided. Working may be continued below the lines if necessary.

- 1.** [Maximum mark: 6]

A discrete random variable X has the following probability distribution.

x	0	1	2	3
$P(X=x)$	$\frac{3}{10}$	$\frac{4}{10}$	$\frac{2}{10}$	p

- (a) Find p . [3]

- (b) Find $E(X)$. [3]

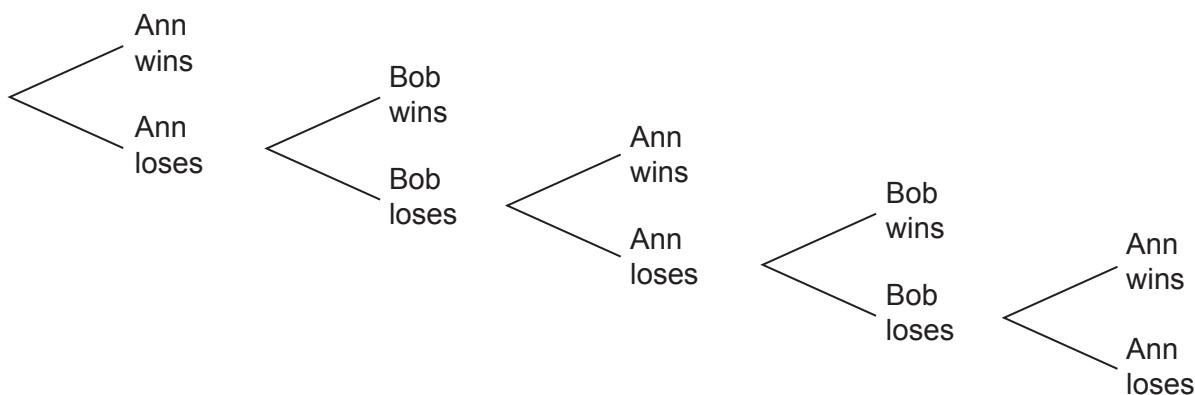


Do **not** write solutions on this page.

10. [Maximum mark: 15]

Ann and Bob play a game where they each have an eight-sided die. Ann's die has three green faces and five red faces; Bob's die has four green faces and four red faces. They take turns rolling their own die and note what colour faces up. The first player to roll green wins. Ann rolls first. Part of a tree diagram of the game is shown below.

Ann's 1st roll Bob's 1st roll Ann's 2nd roll Bob's 2nd roll Ann's 3rd roll



- (a) Find the probability that Ann wins on her first roll.

[2]

- (b) (i) The probability that Ann wins on her third roll is $\frac{5}{8} \times \frac{4}{8} \times p \times q \times \frac{3}{8}$.

Write down the value of p and of q .

- (ii) The probability that Ann wins on her tenth roll is $\frac{3}{8} r^k$ where $r \in \mathbb{Q}, k \in \mathbb{Z}$.

Find the value of r and of k .

[6]

- (c) Find the probability that Ann wins the game.

[7]



12EP11

**Mathematics
Standard level
Paper 1**

Tuesday 12 May 2015 (morning)

Candidate session number

1 hour 30 minutes

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12 pages

2215–7305

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12EP01



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Section A

Answer **all** questions in the boxes provided. Working may be continued below the lines if necessary.

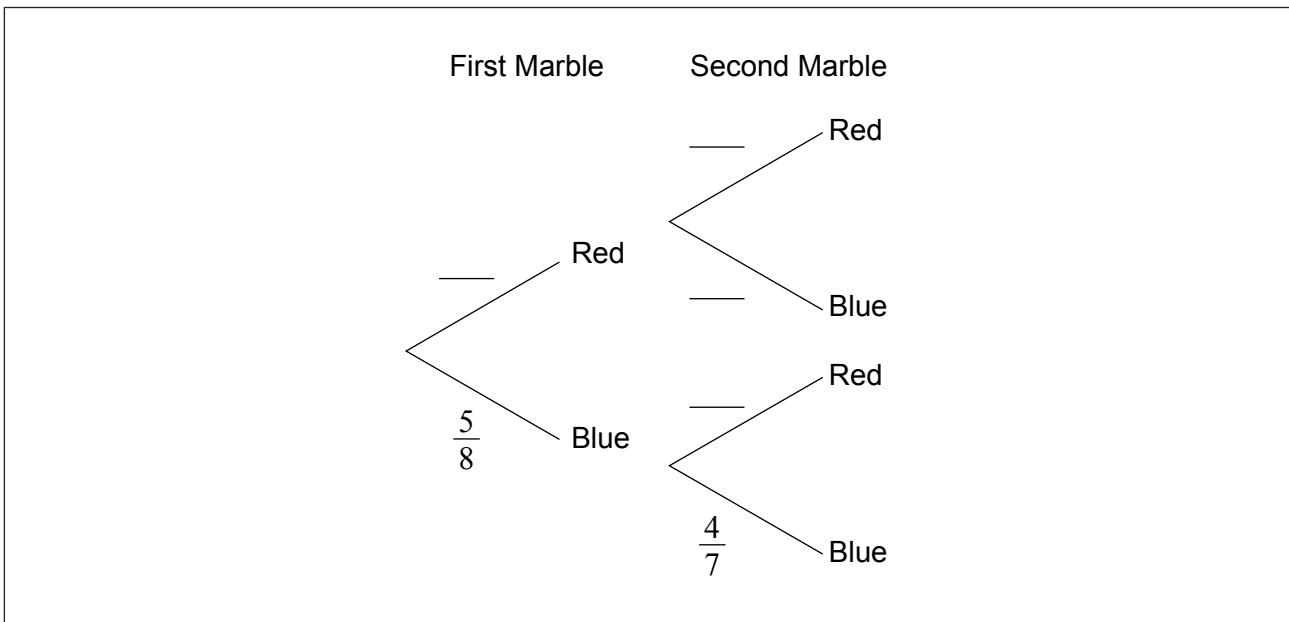
1. [Maximum mark: 6]

A bag contains eight marbles. Three marbles are red and five are blue. Two marbles are drawn from the bag without replacement.

- (a) Write down the probability that the first marble drawn is red. [1]

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- (b) Complete the following tree diagram. [3]



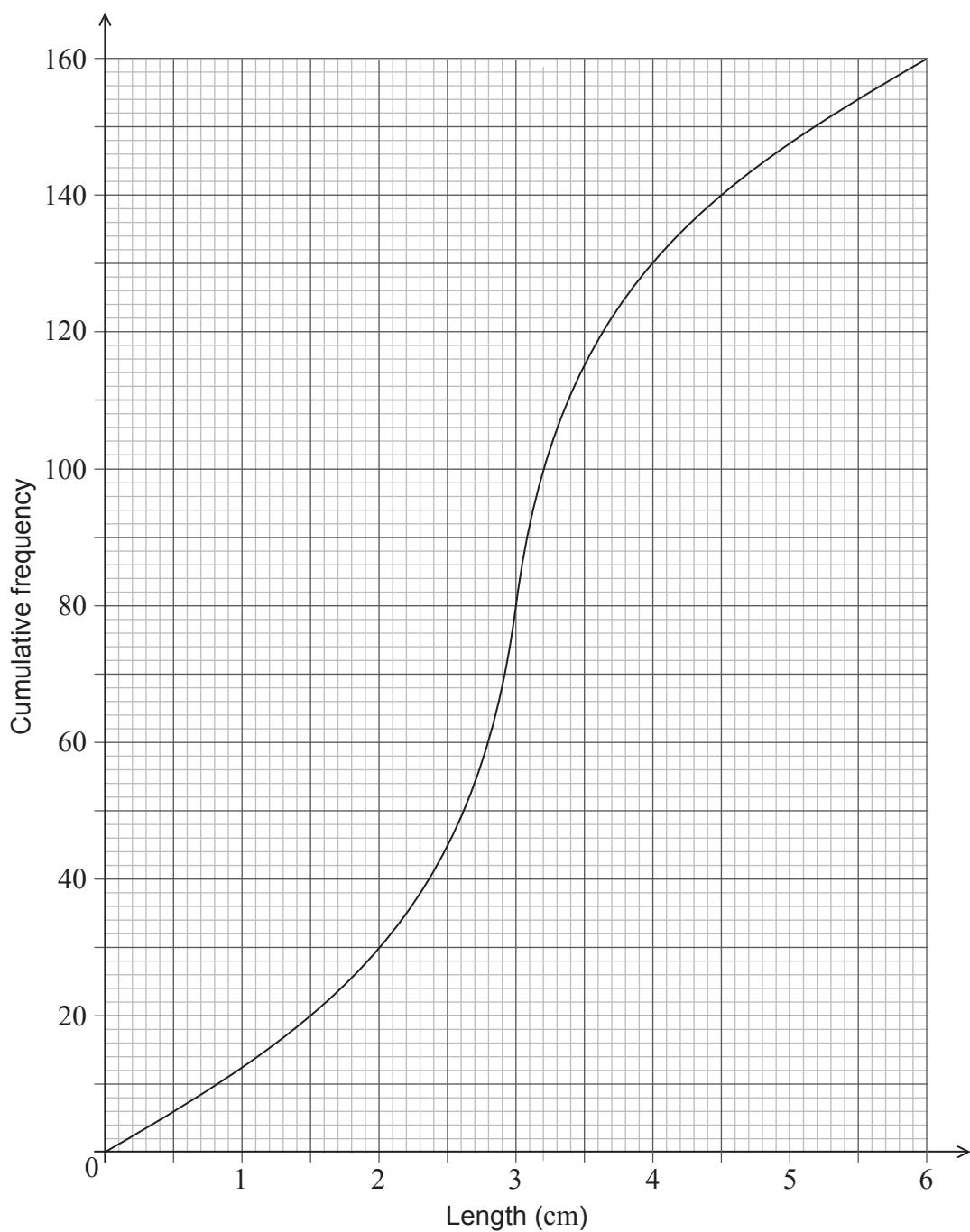
- (c) Find the probability that both marbles are blue. [2]

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3. [Maximum mark: 6]

The following cumulative frequency diagram shows the lengths of 160 fish, in cm.



(This question continues on the following page)



12EP04

(Question 3 continued)

- (a) Find the median length.

[2]

The following frequency table also gives the lengths of the 160 fish.

Length x cm	$0 \leq x \leq 2$	$2 < x \leq 3$	$3 < x \leq 4.5$	$4.5 < x \leq 6$
Frequency	p	50	q	20

- (b) (i) Write down the value of p .

- (ii) Find the value of q .

[4]



12EP05

Turn over

7. [Maximum mark: 7]

A bag contains black and white chips. Rose pays \$10 to play a game where she draws a chip from the bag. The following table gives the probability of choosing each colour chip.

Outcome	black	white
Probability	0.4	0.6

Rose gets no money if she draws a white chip, and gets $\$k$ if she draws a black chip.
The game is fair. Find the value of k .

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12EP09

Turn over



22127304



**MATHEMATICS
STANDARD LEVEL
PAPER 2**

Friday 4 May 2012 (morning)

1 hour 30 minutes

Candidate session number

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0116

7. [Maximum mark: 7]

The probability of obtaining “tails” when a biased coin is tossed is 0.57. The coin is tossed ten times. Find the probability of obtaining

- (a) **at least** four tails; [4 marks]
- (b) the fourth tail on the tenth toss. [3 marks]



Turn over

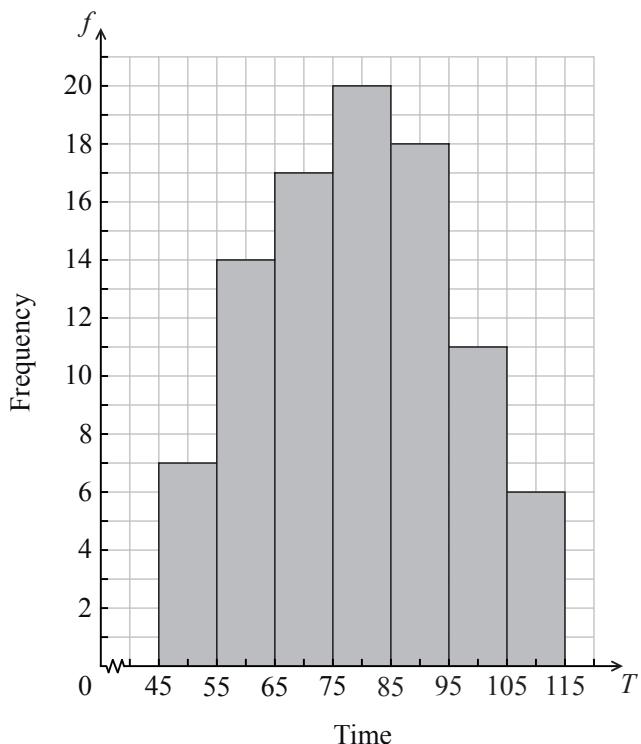
Do NOT write solutions on this page.

SECTION B

Answer all questions on the answer sheets provided. Please start each question on a new page.

8. [Maximum mark: 13]

The histogram below shows the time T seconds taken by 93 children to solve a puzzle.



The following is the frequency distribution for T .

Time	$45 \leq T < 55$	$55 \leq T < 65$	$65 \leq T < 75$	$75 \leq T < 85$	$85 \leq T < 95$	$95 \leq T < 105$	$105 \leq T < 115$
Frequency	7	14	p	20	18	q	6

- (a) (i) Write down the value of p and of q .

- (ii) Write down the median class.

[3 marks]

- (b) A child is selected at random. Find the probability that the child takes less than 95 seconds to solve the puzzle.

[2 marks]

(This question continues on the following page)



Do NOT write solutions on this page.

(Question 8 continued)

Consider the class interval $45 \leq T < 55$.

(c) (i) Write down the interval width.

(ii) Write down the mid-interval value.

[2 marks]

(d) Hence find an estimate for the

(i) mean;

(ii) standard deviation.

[4 marks]

John assumes that T is normally distributed and uses this to estimate the probability that a child takes less than 95 seconds to solve the puzzle.

(e) Find John's estimate.

[2 marks]



Turn over



22127306



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0112

4. [Maximum mark: 6]

The heights of a group of seven-year-old children are normally distributed with mean 117 cm and standard deviation 5 cm. A child is chosen at random from the group.

(a) Find the probability that this child is taller than 122.5 cm. [3 marks]

(b) The probability that this child is shorter than k cm is 0.65. Find the value of k . [3 marks]



0512

Turn over

7. [Maximum mark: 8]

A factory makes lamps. The probability that a lamp is defective is 0.05. A random sample of 30 lamps is tested.

- (a) Find the probability that there is at least one defective lamp in the sample. [4 marks]
- (b) Given that there is at least one defective lamp in the sample, find the probability that there are at most two defective lamps. [4 marks]



0812



88147302



**MATHEMATICS
STANDARD LEVEL
PAPER 2**

Thursday 13 November 2014 (morning)

1 hour 30 minutes

Candidate session number

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Examination code

8	8	1	4	-	7	3	0	2
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- Section B: answer all questions in the answer booklet provided. Fill in your session number on the front of the answer booklet, and attach it to this examination paper and your cover sheet using the tag provided.
- Unless otherwise stated in the question, all numerical answers should be given exactly or correct to three significant figures.
- A clean copy of the **Mathematics SL formula booklet** is required for this paper.
- The maximum mark for this examination paper is [90 marks].



16EP01

2. [Maximum mark: 6]

The following table shows the Diploma score x and university entrance mark y for seven IB Diploma students.

Diploma score (x)	28	30	27	31	32	25	27
University entrance mark (y)	73.9	78.1	70.2	82.2	85.5	62.7	69.4

- (a) Find the correlation coefficient. [2]

The relationship can be modelled by the regression line with equation $y = ax + b$.

- (b) Write down the value of a and of b . [2]

Rita scored a total of 26 in her IB Diploma.

- (c) Use your regression line to estimate Rita's university entrance mark. [2]

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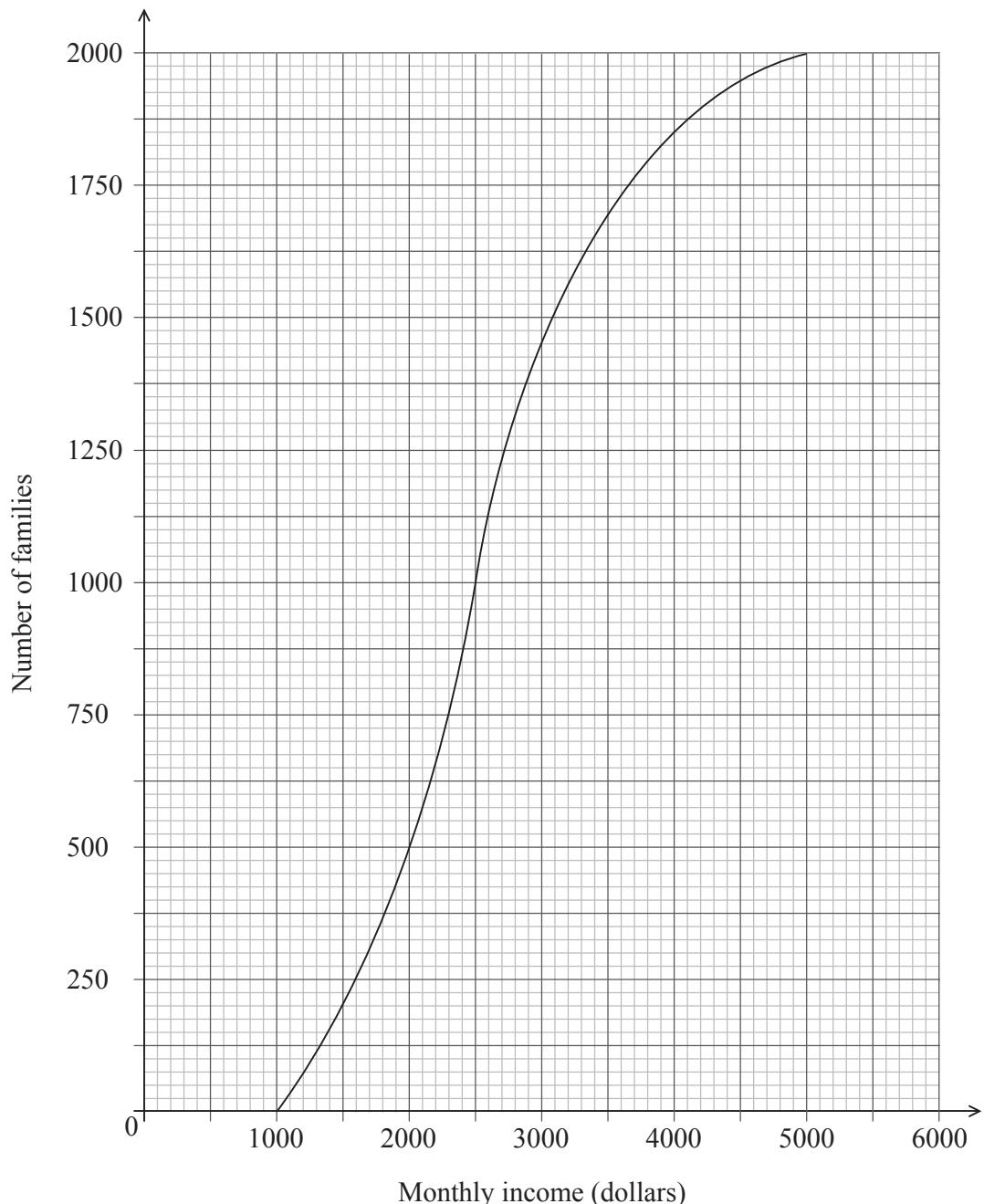
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SECTION B

Answer **all** questions in the answer booklet provided. Please start each question on a new page.

8. [Maximum mark: 15]

The following cumulative frequency graph shows the monthly income, I dollars, of 2000 families.



(This question continues on the following page)



16EP10

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(Question 8 continued)

- (a) Find the median monthly income. [2]
- (b) (i) Write down the number of families who have a monthly income of 2000 dollars or less.
- (ii) Find the number of families who have a monthly income of more than 4000 dollars. [4]

The 2000 families live in two different types of housing. The following table gives information about the number of families living in each type of housing and their monthly income I .

	$1000 < I \leq 2000$	$2000 < I \leq 4000$	$4000 < I \leq 5000$
Apartment	436	765	28
Villa	64	p	122

- (c) Find the value of p . [2]
- (d) A family is chosen at random.
- (i) Find the probability that this family lives in an apartment.
- (ii) Find the probability that this family lives in an apartment, given that its monthly income is greater than 4000 dollars. [4]
- (e) Estimate the mean monthly income for families living in a villa. [3]



Turn over



22147304



**MATHEMATICS
STANDARD LEVEL
PAPER 2**

Wednesday 14 May 2014 (morning)

1 hour 30 minutes

Candidate session number

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Examination code

2	2	1	4	-	7	3	0	4
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INSTRUCTIONS TO CANDIDATES

- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- A graphic display calculator is required for this paper.
- Section A: answer all questions in the boxes provided.
- Section B: answer all questions in the answer booklet provided. Fill in your session number on the front of the answer booklet, and attach it to this examination paper and your cover sheet using the tag provided.
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- A clean copy of the **Mathematics SL formula booklet** is required for this paper.
- The maximum mark for this examination paper is **[90 marks]**.



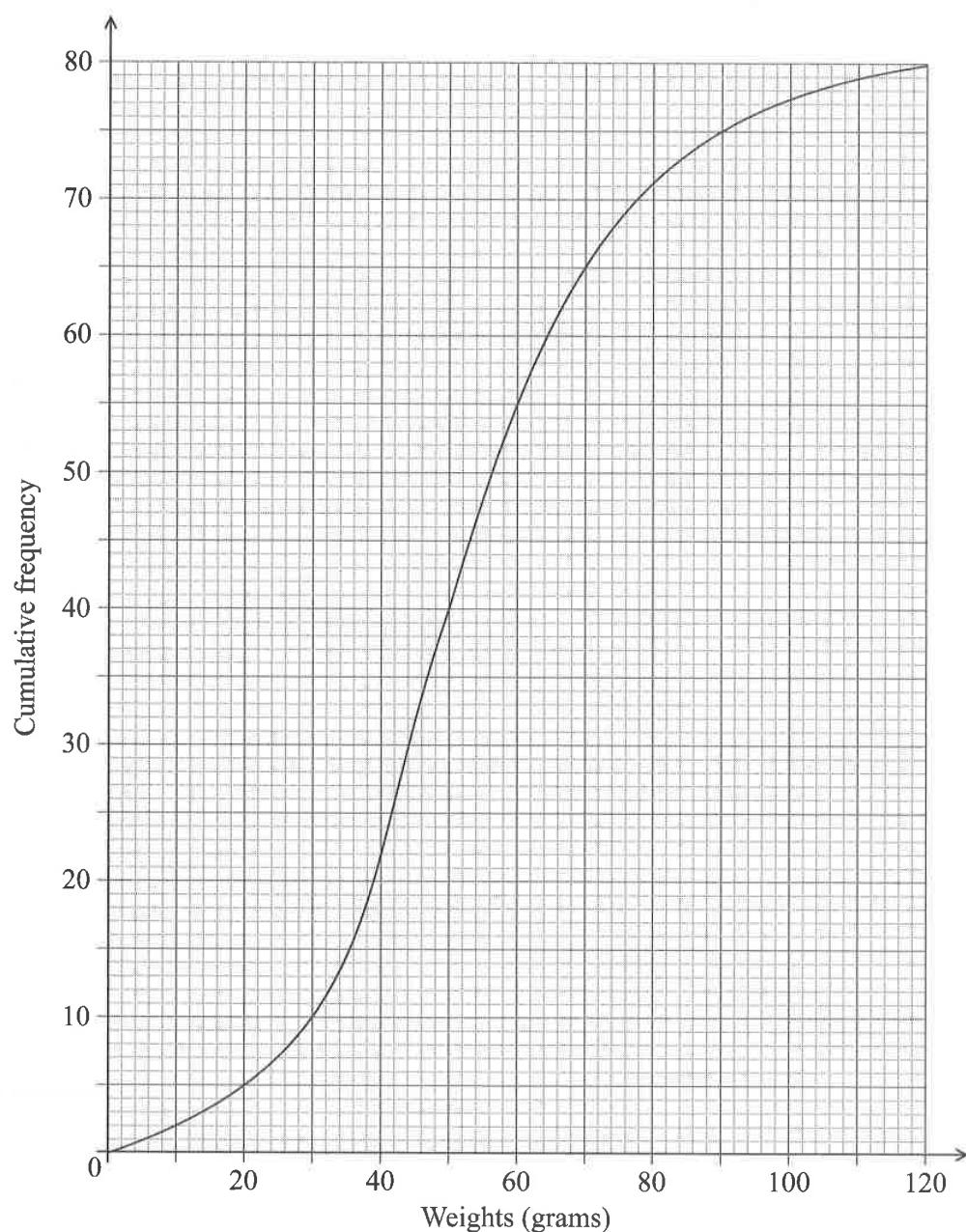
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SECTION B

Answer all questions in the answer booklet provided. Please start each question on a new page.

8. [Maximum mark: 16]

The weights in grams of 80 rats are shown in the following cumulative frequency diagram.



(This question continues on the following page)



Do NOT write solutions on this page.

(Question 8 continued)

- (a) (i) Write down the median weight of the rats.
(ii) Find the percentage of rats that weigh 70 grams or less. [4]

The same data is presented in the following table.

Weights w grams	$0 \leq w \leq 30$	$30 < w \leq 60$	$60 < w \leq 90$	$90 < w \leq 120$
Frequency	p	45	q	5

- (b) (i) Write down the value of p .
(ii) Find the value of q . [4]
(c) Use the values from the table to estimate the mean and standard deviation of the weights. [3]

Assume that the weights of these rats are normally distributed with the mean and standard deviation estimated in part (c).

- (d) Find the percentage of rats that weigh 70 grams or less. [2]
(e) A sample of five rats is chosen at random. Find the probability that at most three rats weigh 70 grams or less. [3]



Turn over

**Mathematics
Standard level
Paper 2**

Wednesday 13 May 2015 (afternoon)

Candidate session number

1 hour 30 minutes

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Instructions to candidates

- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- A graphic display calculator is required for this paper.
- Section A: answer all questions in the boxes provided.
- Section B: answer all questions in the answer booklet provided. Fill in your session number on the front of the answer booklet, and attach it to this examination paper and your cover sheet using the tag provided.
- Unless otherwise stated in the question, all numerical answers should be given exactly or correct to three significant figures.
- A clean copy of the **Mathematics SL formula booklet** is required for this paper.
- The maximum mark for this examination paper is **[90 marks]**.

13 pages

2215–7304

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16EP01



Full marks are not necessarily awarded for a correct answer with no working. Answers must be supported by working and/or explanations. In particular, solutions found from a graphic display calculator should be supported by suitable working, for example, if graphs are used to find a solution, you should sketch these as part of your answer. Where an answer is incorrect, some marks may be given for a correct method, provided this is shown by written working. You are therefore advised to show all working.

Section A

Answer **all** questions in the boxes provided. Working may be continued below the lines if necessary.

- 1.** [Maximum mark: 7]

The following table shows the average number of hours per day spent watching television by seven mothers and each mother's youngest child.

Hours per day that a mother watches television (x)	2.5	3.0	3.2	3.3	4.0	4.5	5.8
Hours per day that her child watches television (y)	1.8	2.2	2.6	2.5	3.0	3.2	3.5

The relationship can be modelled by the regression line with equation $y = ax + b$.

- (a) (i) Find the correlation coefficient.

- (ii) Write down the value of a and of b .

[4]

Elizabeth watches television for an average of 3.7 hours per day.

- (b) Use your regression line to predict the average number of hours of television watched per day by Elizabeth's youngest child. Give your answer correct to one decimal place.

[3]



Do **not** write solutions on this page.

9. [Maximum mark: 16]

A company makes containers of yogurt. The volume of yogurt in the containers is normally distributed with a mean of 260 ml and standard deviation of 6 ml.

A container which contains less than 250 ml of yogurt is **underfilled**.

- (a) A container is chosen at random. Find the probability that it is underfilled. [2]

The company decides that the probability of a container being underfilled should be reduced to 0.02. It decreases the standard deviation to σ and leaves the mean unchanged.

- (b) Find σ . [4]

The company changes to the new standard deviation, σ , and leaves the mean unchanged. A container is chosen at random for inspection. It passes inspection if its volume of yogurt is between 250 and 271 ml.

- (c) (i) Find the probability that it passes inspection.

- (ii) Given that the container is **not** underfilled, find the probability that it passes inspection. [6]

- (d) A sample of 50 containers is chosen at random. Find the probability that 48 or more of the containers pass inspection. [4]



16EP11

Turn over

**Mathematics
Standard level
Paper 2**

Wednesday 13 May 2015 (afternoon)

Candidate session number

1 hour 30 minutes

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Instructions to candidates

- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- A graphic display calculator is required for this paper.
- Section A: answer all questions in the boxes provided.
- Section B: answer all questions in the answer booklet provided. Fill in your session number on the front of the answer booklet, and attach it to this examination paper and your cover sheet using the tag provided.
- Unless otherwise stated in the question, all numerical answers should be given exactly or correct to three significant figures.
- A clean copy of the **Mathematics SL formula booklet** is required for this paper.
- The maximum mark for this examination paper is **[90 marks]**.

12 pages

2215–7306

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12EP01



3. [Maximum mark: 6]

The following table shows the sales, y millions of dollars, of a company, x years after it opened.

Time after opening (x years)	2	4	6	8	10
Sales (y millions of dollars)	12	20	30	36	52

The relationship between the variables is modelled by the regression line with equation $y = ax + b$.

- (a) (i) Find the value of a and of b .
(ii) Write down the value of r . [4]

(b) Hence estimate the sales in millions of dollars after seven years. [2]



6. [Maximum mark: 7]

Ramiro walks to work each morning. During the first minute he walks 80 metres. In each subsequent minute he walks 90 % of the distance walked during the previous minute. The distance between his house and work is 660 metres. Ramiro leaves his house at 08:00 and has to be at work by 08:15.

Explain why he will not be at work on time.



Do **not** write solutions on this page.

9. [Maximum mark: 16]

A machine manufactures a large number of nails. The length, L mm, of a nail is normally distributed, where $L \sim N(50, \sigma^2)$.

(a) Find $P(50 - \sigma < L < 50 + 2\sigma)$. [3]

(b) The probability that the length of a nail is less than 53.92 mm is 0.975.
Show that $\sigma = 2.00$ (correct to three significant figures). [2]

All nails with length at least t mm are classified as large nails.

(c) A nail is chosen at random. The probability that it is a large nail is 0.75.
Find the value of t . [3]

(d) (i) A nail is chosen at random from the large nails. Find the probability that the length of this nail is less than 50.1 mm.

(ii) Ten nails are chosen at random from the large nails. Find the probability that at least two nails have a length that is less than 50.1 mm. [8]



12EP11

Turn over



22137304



**MATHEMATICS
STANDARD LEVEL
PAPER 2**

Candidate session number

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Friday 10 May 2013 (morning)

Examination code

1 hour 30 minutes

2	2	1	3	-	7	3	0	4
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INSTRUCTIONS TO CANDIDATES

- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- A graphic display calculator is required for this paper.
- Section A: answer all questions in the boxes provided.
- Section B: answer all questions in the answer booklet provided. Fill in your session number on the front of the answer booklet, and attach it to this examination paper and your cover sheet using the tag provided.
- Unless otherwise stated in the question, all numerical answers should be given exactly or correct to three significant figures.
- A clean copy of the **Mathematics SL information booklet** is required for this paper.
- The maximum mark for this examination paper is **[90 marks]**.



0112

2. [Maximum mark: 6]

Consider the following cumulative frequency table.

x	Frequency	Cumulative frequency
5	2	2
15	10	12
25	14	26
35	p	35
45	6	41

- (a) Find the value of p . [2 marks]
- (b) Find
- the mean;
 - the variance. [4 marks]

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0312

Turn over

7. [Maximum mark: 7]

A random variable X is normally distributed with $\mu = 150$ and $\sigma = 10$.

Find the interquartile range of X .



0812



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**MATHEMATICS
STANDARD LEVEL
PAPER 2**

Thursday 6 May 2010 (morning)

1 hour 30 minutes

Candidate session number

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INSTRUCTIONS TO CANDIDATES

- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- A graphic display calculator is required for this paper.
- Section A: answer all of Section A in the spaces provided.
- Section B: answer all of Section B on the answer sheets provided. Write your session number on each answer sheet, and attach them to this examination paper and your cover sheet using the tag provided.
- At the end of the examination, indicate the number of sheets used in the appropriate box on your cover sheet.
- Unless otherwise stated in the question, all numerical answers must be given exactly or correct to three significant figures.



Full marks are not necessarily awarded for a correct answer with no working. Answers must be supported by working and/or explanations. In particular, solutions found from a graphic display calculator should be supported by suitable working, e.g. if graphs are used to find a solution, you should sketch these as part of your answer. Where an answer is incorrect, some marks may be given for a correct method, provided this is shown by written working. You are therefore advised to show all working.

SECTION A

Answer all the questions in the spaces provided. Working may be continued below the lines, if necessary.

1. [Maximum mark: 7]

The following table gives the examination grades for 120 students.

Grade	Number of students	Cumulative frequency
1	9	9
2	25	34
3	35	p
4	q	109
5	11	120

- (a) Find the value of

(i) p ;

(ii) q .

[4 marks]

- (b) Find the mean grade.

[2 marks]

- (c) Write down the standard deviation.

[1 mark]

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3. [Maximum mark: 5]

Jan plays a game where she tosses two fair six-sided dice. She wins a prize if the sum of her scores is 5.

- (a) Jan tosses the two dice once. Find the probability that she wins a prize. [3 marks]
- (b) Jan tosses the two dice 8 times. Find the probability that she wins 3 prizes. [2 marks]
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10. [Maximum mark: 15]

The weights of players in a sports league are normally distributed with a mean of 76.6 kg, (correct to three significant figures). It is known that 80 % of the players have weights between 68 kg and 82 kg. The probability that a player weighs less than 68 kg is 0.05.

(a) Find the probability that a player weighs more than 82 kg. [2 marks]

(b) (i) Write down the standardized value, z , for 68 kg.

(ii) Hence, find the standard deviation of weights. [4 marks]

To take part in a tournament, a player's weight must be within 1.5 standard deviations of the mean.

(c) (i) Find the set of all possible weights of players that take part in the tournament.

(ii) A player is selected at random. Find the probability that the player takes part in the tournament. [5 marks]

Of the players in the league, 25 % are women. Of the women, 70 % take part in the tournament.

(d) Given that a player selected at random takes part in the tournament, find the probability that the selected player is a woman. [4 marks]

