Diploma Programme
Programme du diplôme
Programa del Diploma

Mathematics
Standard level
Paper 1

Tuesday 12 May 2015 (morning)

Candidate session number

1 hour 30 minutes

Instructions to candidates

- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- You are not permitted access to any calculator 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]**.

11 pages

12EP01

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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
$P(X=x)$	$\dfrac{3}{10}$	$\dfrac{4}{10}$	$\dfrac{2}{10}$	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
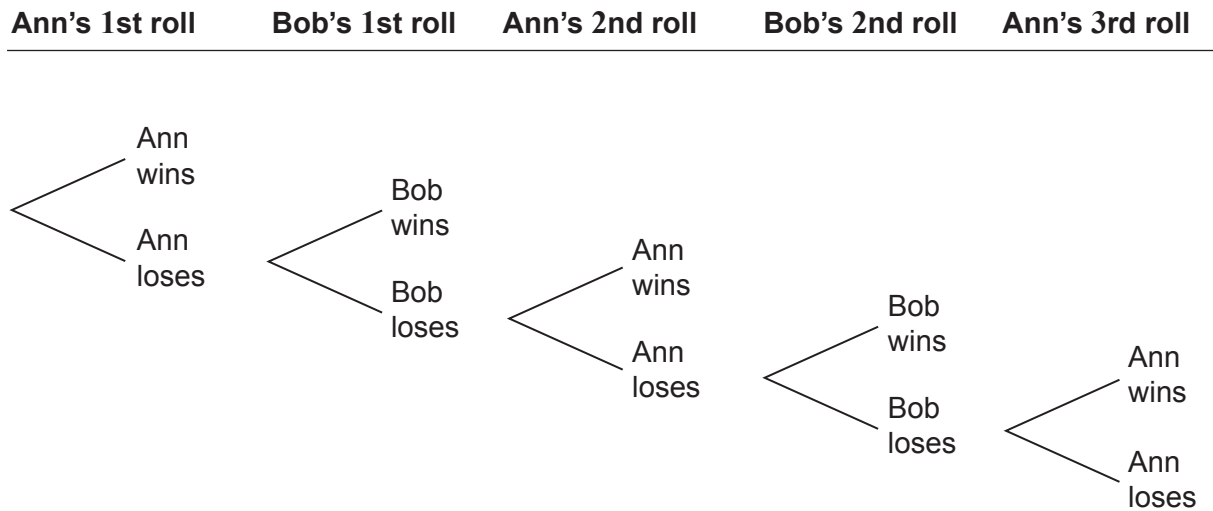
(a) Find the probability that Ann wins on her first roll. [2]

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

Write down the value of p and of q.

(ii) The probability that Ann wins on her tenth roll is $\dfrac{3}{8} r^k$ 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]

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Section A

Answer **all** questions in the boxes provided. Working may be continued below the lines if necessary.
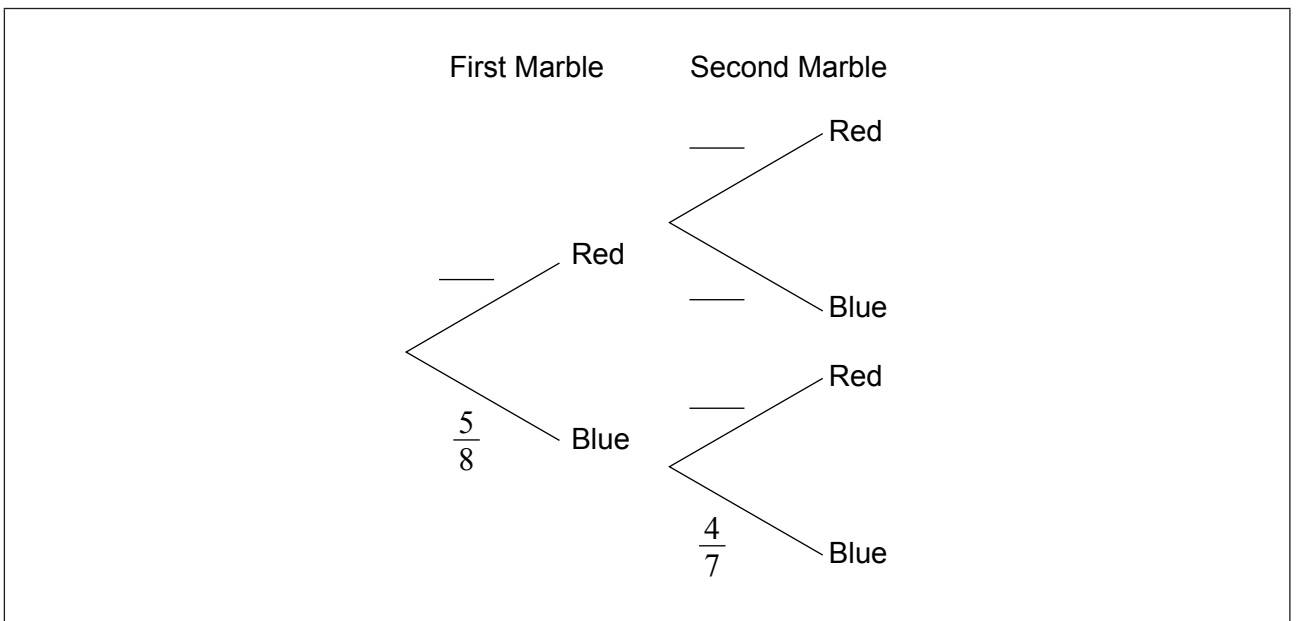
1. [Maximum mark: 6]

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]

....

....

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

First Marble   Second Marble

_____ Red

_____ Red

_____ Blue

_____ Red

$\frac{5}{8}$ Blue

$\frac{4}{7}$ Blue

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

....

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....

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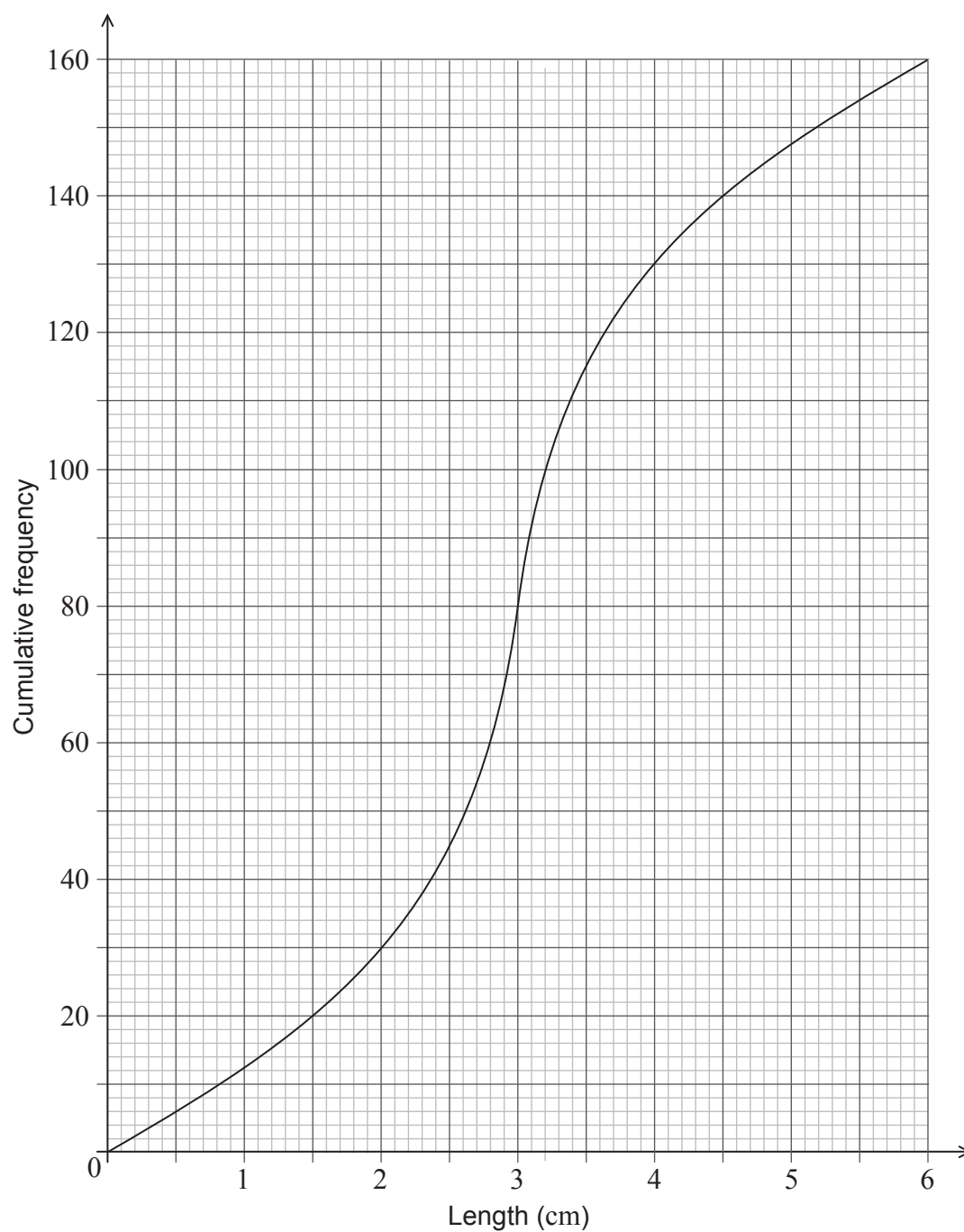...

3. [Maximum mark: 6]

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

(This question continues on the following page)

(Question 3 continued)

(a)   Find the median length.   [2]

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

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

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

(ii)   Find the value of q.   [4]

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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MATHEMATICS
STANDARD LEVEL
PAPER 1

Thursday 9 May 2013 (afternoon)

1 hour 30 minutes

Candidate session number

0	0							

Examination code

2	2	1	3	–	7	3	0	3

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

9. *[Maximum mark: 16]*

Jar A contains three red marbles and five green marbles. Two marbles are drawn from the jar, one after the other, without replacement.

(a) Find the probability that

(i) none of the marbles are green;

(ii) exactly one marble is green. *[5 marks]*

(b) Find the expected number of green marbles drawn from the jar. *[3 marks]*

Jar B contains six red marbles and two green marbles. A fair six-sided die is tossed. If the score is 1 or 2, a marble is drawn from jar A. Otherwise, a marble is drawn from jar B.

(c) (i) Write down the probability that the marble is drawn from jar B.

(ii) Given that the marble was drawn from jar B, write down the probability that it is red. *[2 marks]*

(d) Given that the marble is red, find the probability that it was drawn from jar A. *[6 marks]*

Mathematics
Standard level
Paper 2

Wednesday 13 May 2015 (afternoon)

Candidate session number

1 hour 30 minutes

Instructions to candidates

- Write your session number in the boxes above.
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- A graphic display calculator is required for this paper.
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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 $260\,\mathrm{ml}$ and standard deviation of $6\,\mathrm{ml}$.

A container which contains less than $250\,\mathrm{ml}$ 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 $271\,\mathrm{ml}$.

(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]

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Mathematics
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12EP01

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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 $L \sim N\left(50, \sigma^2\right)$.

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

Turn over

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MATHEMATICS
STANDARD LEVEL
PAPER 2

Candidate session number

0	0							

Friday 10 May 2013 (morning)

1 hour 30 minutes

Examination code

2	2	1	3	–	7	3	0	4

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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

    (i)   the mean;

    (ii) the variance.   *[4 marks]*

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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.