22117306

International Baccalaureate®
Baccalauréat International
Bachillerato Internacional

MATHEMATICS
STANDARD LEVEL
PAPER 2

Thursday 5 May 2011 (morning)

1 hour 30 minutes

Candidate session number									
0	0								

Examination code								
2	2	1	1	–	7	3	0	6

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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- Section B: answer all questions 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.
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Thursday 6 May 2010 (morning)

1 hour 30 minutes

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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. 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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22107304

MATHEMATICS
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0111

4. *[Maximum mark: 6]*

The following frequency distribution of marks has mean 4.5.

Mark	1	2	3	4	5	6	7
Frequency	2	4	6	9	x	9	4

(a) Find the value of x.   *[4 marks]*

(b) Write down the standard deviation.   *[2 marks]*

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7.   *[Maximum mark: 7]*

Evan likes to play two games of chance, A and B.

For game A, the probability that Evan wins is 0.9. He plays game A seven times.

(a)   Find the probability that he wins exactly four games.   *[2 marks]*

For game B, the probability that Evan wins is p. He plays game B seven times.

(b)   Write down an expression, in terms of p, for the probability that he wins exactly four games.   *[2 marks]*

(c)   Hence, find the values of p such that the probability that he wins exactly four games is 0.15.   *[3 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]*

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22117305

MATHEMATICS
STANDARD LEVEL
PAPER 1

Wednesday 4 May 2011 (afternoon)

1 hour 30 minutes

Candidate session number

0	0								

Examination code

2	2	1	1	–	7	3	0	5

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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.
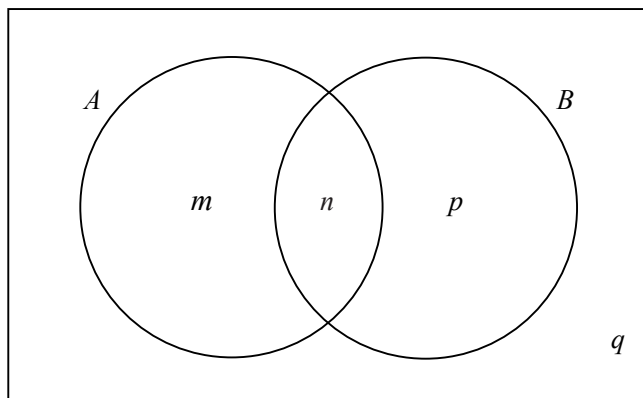
(a) (i) Write down the value of n.

     (ii) Find the value of m, of p, and of q.   *[4 marks]*

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

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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.
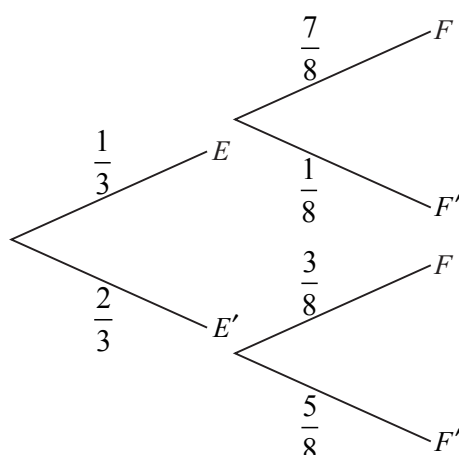
(a)   Find

   (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.

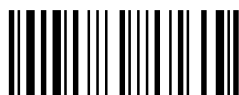(c)   **Copy** and complete the probability distribution table.   *[3 marks]*

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

(d)   Find the expected cost for José for both days.   *[2 marks]*

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MATHEMATICS
STANDARD LEVEL
PAPER 1

Wednesday 4 May 2011 (afternoon)

1 hour 30 minutes

Candidate session number

| 0 | 0 | | | | | | |

Examination code

| 2 | 2 | 1 | 1 | – | 7 | 3 | 0 | 3 |

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4.   *[Maximum mark: 7]*

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

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

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

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

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

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22107303

MATHEMATICS
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PAPER 1

Wednesday 5 May 2010 (afternoon)

1 hour 30 minutes

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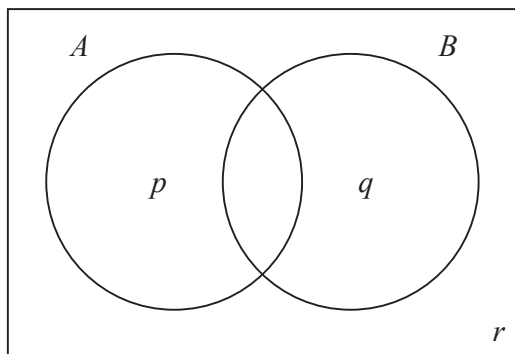
5.   *[Maximum mark: 6]*

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 $P(A \mid B')$.   *[2 marks]*

(c)   Hence, or otherwise, show that the events A and B are **not** independent.   *[1 mark]*
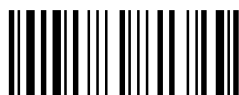
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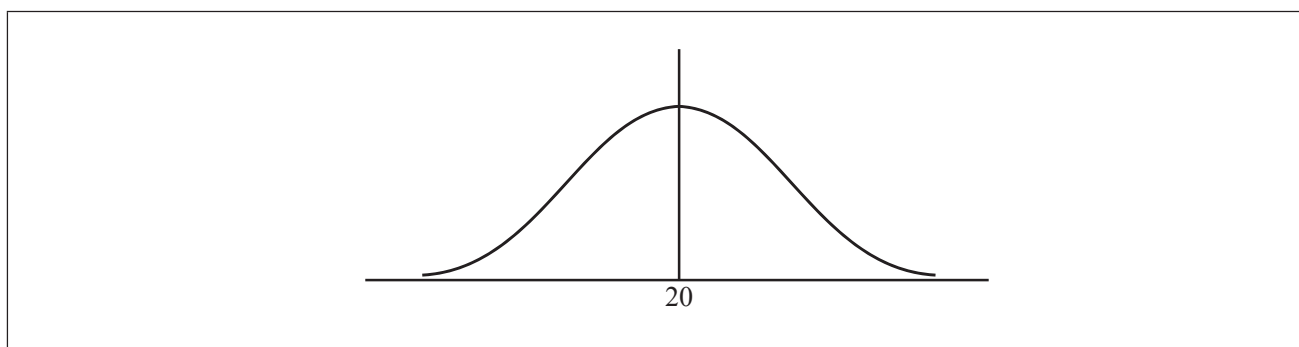
4. *[Maximum mark: 8]*

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]*

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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]*

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6.   *[Maximum mark: 7]*

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

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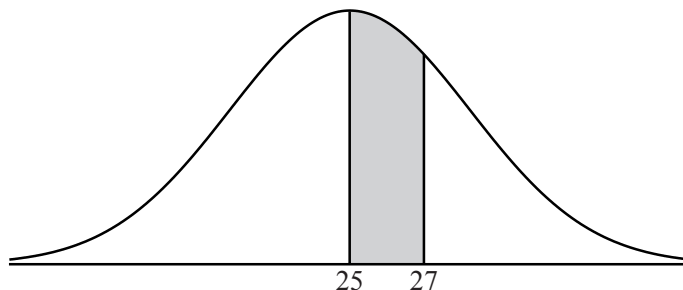
The shaded region between 25 and 27 represents 30 % of the distribution.

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

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

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Turn over