

Mathematics
Standard level
Paper 1

Tuesday 12 May 2015 (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.
- 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]**.



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]

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3. [Maximum mark: 6]

(a) Given that $2^m = 8$ and $2^n = 16$, write down the value of m and of n . [2]

(b) Hence or otherwise solve $8^{2x+1} = 16^{2x-3}$. [4]

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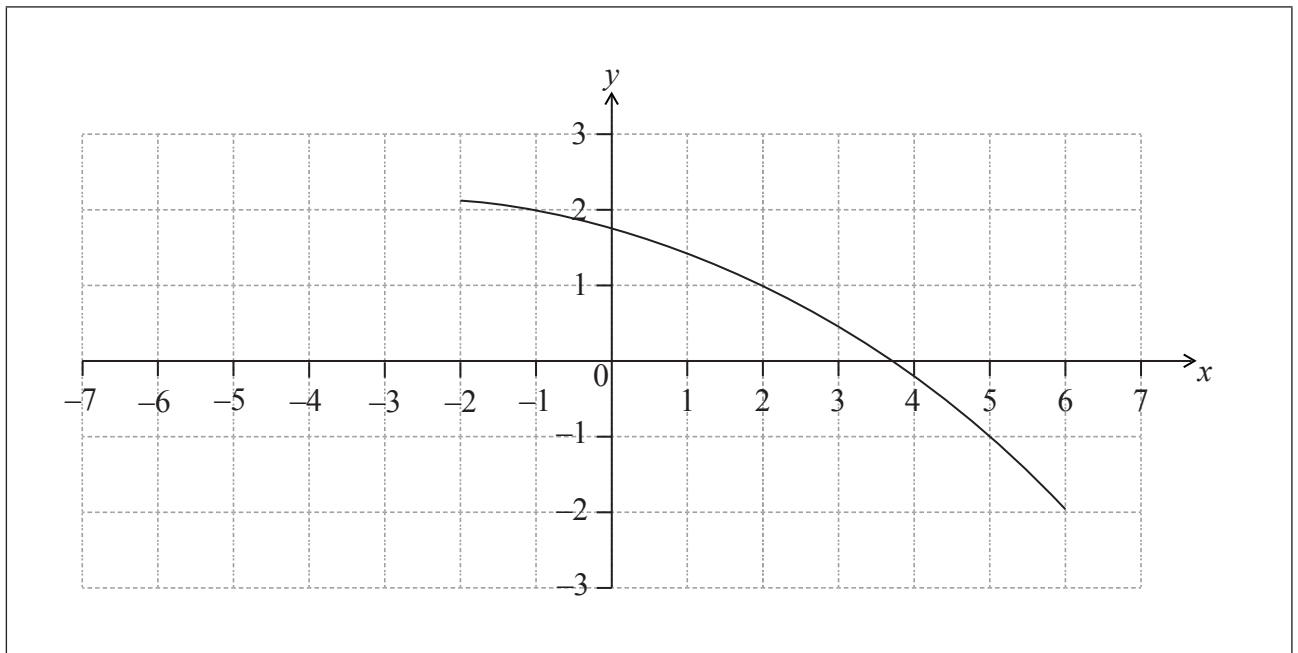
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4. [Maximum mark: 7]

The following diagram shows the graph of a function f .



- (a) Find $f^{-1}(-1)$. [2]
- (b) Find $(f \circ f)(-1)$. [3]
- (c) On the same diagram, sketch the graph of $y = f(-x)$. [2]

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6. [Maximum mark: 6]

Let $f(x) = px^2 + (10 - p)x + \frac{5}{4}p - 5$.

(a) Show that the discriminant of $f(x)$ is $100 - 4p^2$. [3]

(b) Find the values of p so that $f(x) = 0$ has two **equal** roots. [3]

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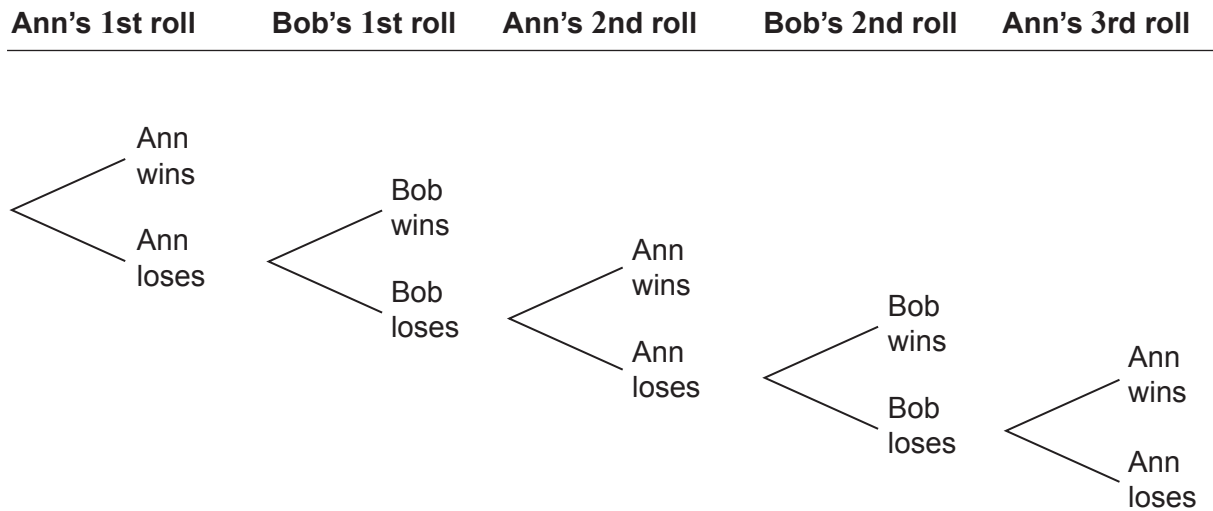
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Do **not** write solutions on this page.

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.



(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]



Section A

1. (a) summing probabilities to 1 (M1)
 eg $\sum = 1, 3 + 4 + 2 + x = 10$
 correct working (A1)
 $\frac{3}{10} + \frac{4}{10} + \frac{2}{10} + p = 1, p = 1 - \frac{9}{10}$
 $p = \frac{1}{10}$ A1 N3
[3 marks]
- (b) correct substitution into formula for $E(X)$ (A1)
 eg $0\left(\frac{3}{10}\right) + \dots + 3(p)$
 correct working (A1)
 eg $\frac{4}{10} + \frac{4}{10} + \frac{3}{10}$
 $E(X) = \frac{11}{10} (1.1)$ A1 N2
[3 marks]
- Total [6 marks]**
2. (a) correct substitution (A1)
 eg $10(1.2)$
 ACB is 12 (cm) A1 N2
[2 marks]
- (b) valid approach to find major arc (M1)
 eg circumference – AB, major angle AOB \times radius
 correct working for arc length (A1)
 eg $2\pi(10) - 12, 10(2 \times 3.142 - 1.2), 2\pi(10) - 12 + 20$
 perimeter is $20\pi + 8$ (= 70.8) (cm) A1 N2
[3 marks]
- Total [5 marks]**