

MOCK EXAM 5
MATHEMATICS Compulsory Part
PAPER 1
Question-Answer Book

Name: _____

(2 $\frac{1}{4}$ hours)

This paper must be answered in English

INSTRUCTIONS

1. Write your name in the space provided on Page 1.
2. This paper consists of **THREE** sections, A(1), A(2), and B.
3. Attempt **ALL** questions in this paper. Write your answers in the spaces provided in this Question-Answer Book. Do not write in the margins. Answers written in the margins will not be marked.
4. Graph paper and supplementary answer sheets will be supplied on request. Write your name on the graph paper and supplementary answer sheets.
5. Unless otherwise specified, all working must be clearly shown.
6. Unless otherwise specified, numerical answers should be either exact or correct to 3 significant figures.
7. The diagrams in this paper are not necessarily drawn to scale.

SECTION A(1) (35 marks)

1. Simplify $\frac{x^{-3}y^5}{(x^2y^{-3})^{-4}}$ and express your answer with positive indices. (3 marks)

2. Make b the subject of the formula $\frac{2}{a} - \frac{3}{b} = 4$. (3 marks)

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3. Factorize

(a) $9x^2 + 24xy + 16y^2$,

(b) $9x^2 + 24xy + 16y^2 - 25x^2y^2$.

(3 marks)

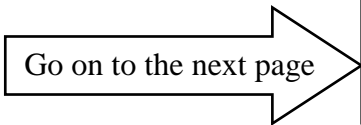
4. The number of comic books Amy has is 5 times that of Bob has. If Amy gives Bob 8 comic books, then they have the same number of comic books. Find the total number of comic books they have.

(4 marks)

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5. The selling price of a bag is 30% higher than a jacket while the selling price of the jacket is 30% lower than a pair of shoes. It is given that the selling price of the jacket is \$280.
- (a) Find the selling price of the bag.
- (b) Which one has the highest selling price? Explain your answer. (4 marks)

6. In a polar coordinate system, O is the pole. The polar coordinates of the points of A and B are $(18, 30^\circ)$ and $(18, 150^\circ)$ respectively. Let L be the axis of reflectional symmetry of $\triangle AOB$.
- (a) Describe the geometric relationship between L and AB.
- (b) Find the polar coordinates of the point of intersection of L and AB. (4 marks)

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7. In Figure 1, O is the centre of the circle ABC. If $AB = AC$ and $\angle ABO = 36^\circ$, find $\angle BOC$.

(4 marks)

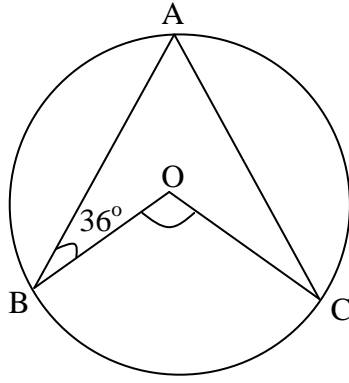


Figure 1

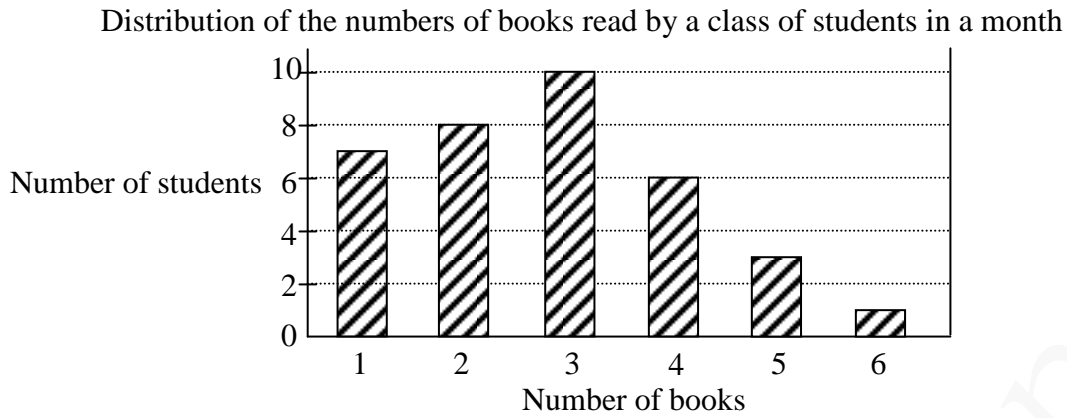
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9. The bar chart below shows the distribution of the numbers of books read by a class of students in a month.



- (a) Find the mean, the inter-quartile range and the standard deviation of the above distribution.
- (b) A student was found to have reported the number of books she read in the month wrongly. She actually read 2 books instead of 5 books. Find the change in the standard deviation of the numbers of books read by the class of students in the month due to the correction of the datum.

(5 marks)

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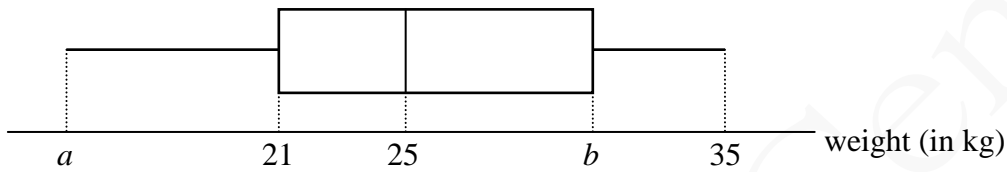
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11. The stem-and-leaf diagram below shows the distribution of weights (in kg) of a group of children.

Stem (tens)	Leaf (units)						
1	4	4	4	5	7	8	9
2	0	0	2	3	5		
3	0	1	1	2			

- (a) Write down the median and the mode of the weights of the group of children. (2 marks)
- (b) The box-and-whisker diagram below shows the distribution of the weights of another group of students. It is given that the range and the inter-quartile range of this distribution are 19 kg and 11 kg respectively.



- (i) Find a and b .
- (ii) For each group, a child is randomly selected. Someone claims that the probability that the sum of their weights is 45 kg or above is more than 0.5. Do you agree? Explain your answer. (4 marks)

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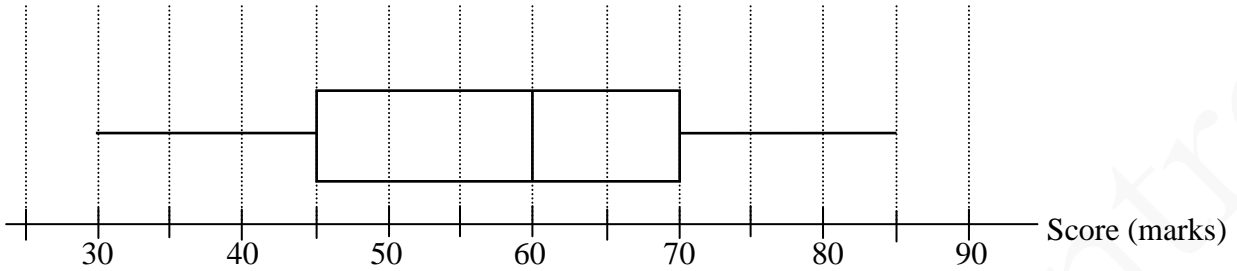
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SECTION B (35 marks)

15. The box-and-whisker diagram below shows the distribution of the scores (in marks) of the students of a class in an exam. Amy gets the lowest score while John gets 51 marks in the exam. The standard scores of Amy and John in the exam are -5 and -2 respectively.



- (a) Find the mean of the distribution. (2 marks)
- (b) John claims that the standard scores of more than half of the students in the exam are negative. Do you agree? Explain your answer. (2 marks)

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17. (a) Let $f(x) = 108x - x^2$. Using the method of completing the square, find the coordinates of the vertex of the graph of $y = f(x)$. (2 marks)
- (b) The length of a fence is 216 m. A farmer cuts the fence into 3 parts. One part is used to enclose an outdoor rectangular region of area $A \text{ m}^2$ by using the wall of a greenhouse as one side. The other two parts are used to divide the region into three rectangular areas as shown in Figure 4.

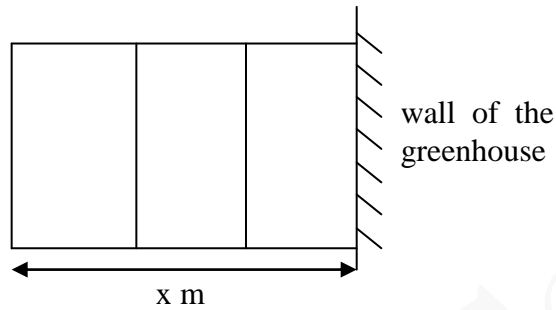


Figure 4

- (i) Express A in terms of x .
- (ii) The farmer claims that the area of the outdoor rectangular region can be greater than 2000 m^2 . Do you agree? Explain your answer. (4 marks)

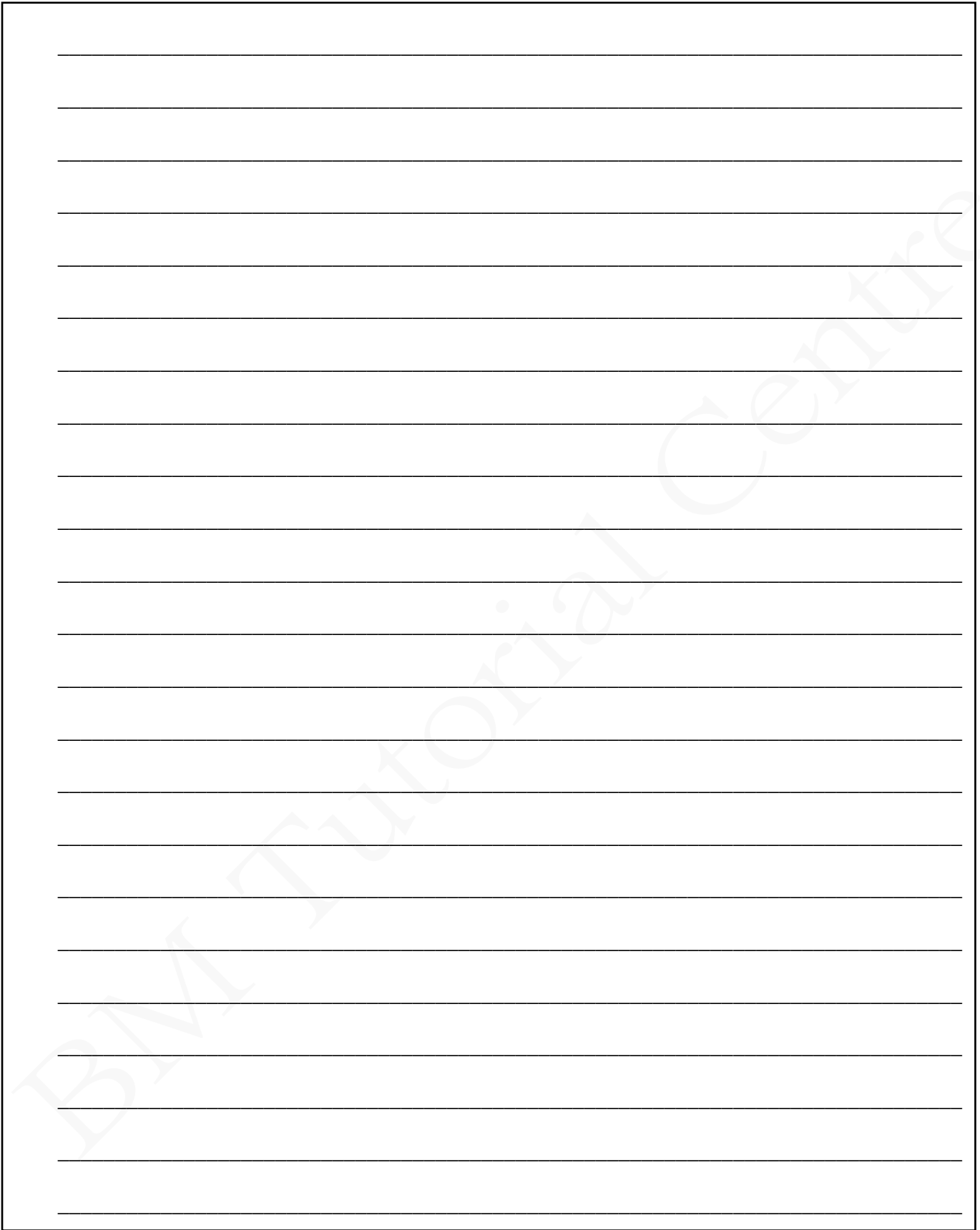
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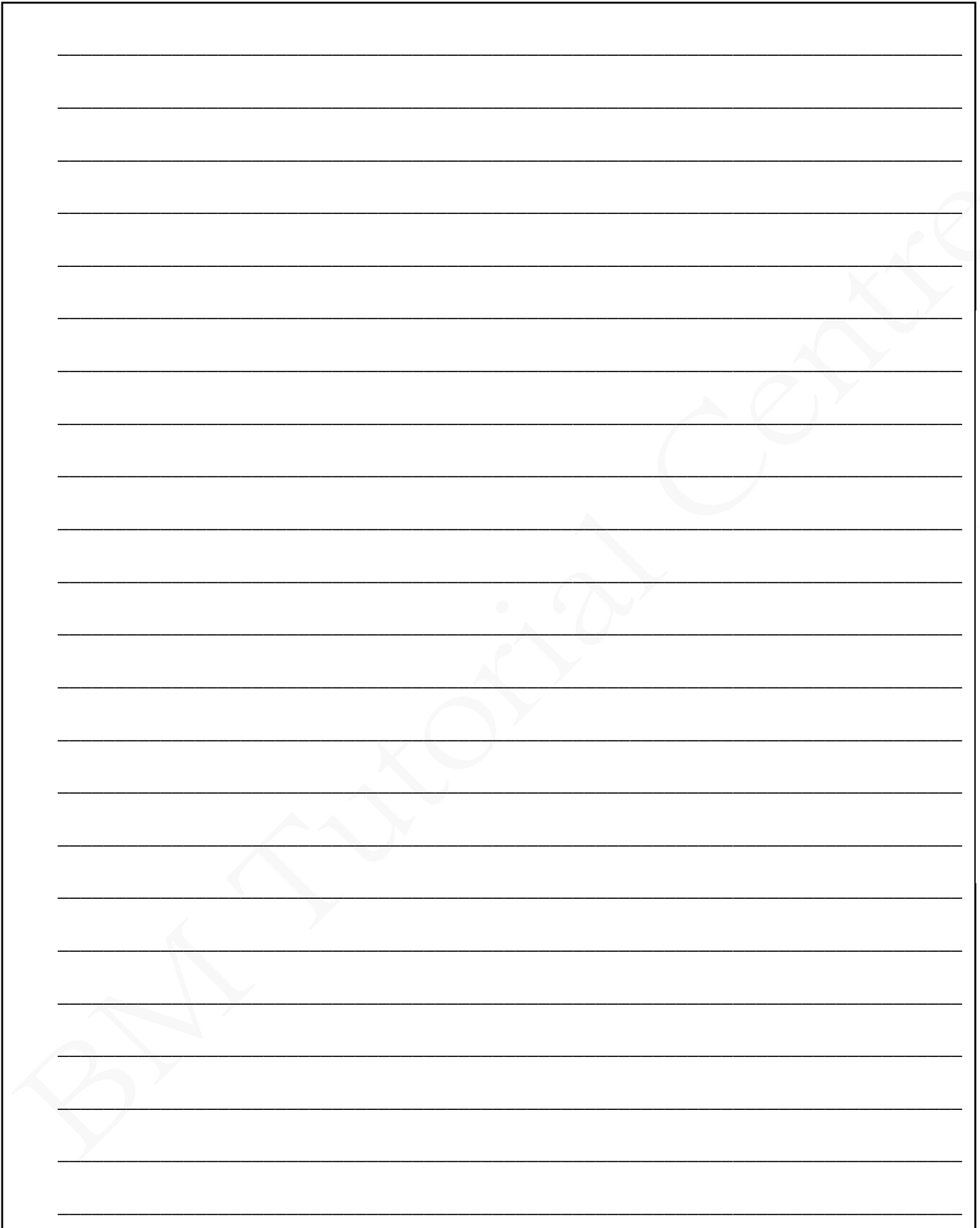
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19. Amy and Bob play a game consisting of two rounds. In the first round, they take turns to draw a card from ten cards numbered 1-10 with **replacement**. The player who first gets a multiple of 3 wins the first round. They play the first round until one of them wins. Amy draws first.

- (a) Find the probability that Amy wins the first round of the game. (3 marks)
- (b) In the second round of the game, balls are dropped one by one onto a slope. At the bottom of the slope, seven tubes are arranged side by side. A score is attached to each tube as shown in Figure 6. When a ball is dropped onto the slope, it falls randomly into one of the tubes. Each tube can hold at most three balls.

10	10	50	100	50	10	10
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Figure 6

The player of this round adopts one of the following two options.

Option 1: Two balls are dropped one by one onto the slope. If the two balls fall into the same tube, then the player gets a score equal to 20 times the score attached to the tube. If the two balls fall into two adjacent tubes, then the player gets a score equal to the sum of the scores attached to the tubes. Otherwise, the player gets no score.

Option 2: Three balls are dropped one by one onto the slope. If the three balls fall into the same tube, then the player gets a score equal to the square of the score attached to the tube. If the three balls fall into three adjacent tubes, then the player gets a score equal to 10 times the sum of the scores attached to the tubes. Otherwise, the player gets no score.

- (i) If the player of the second round adopts Option 1, find the expected score got.
- (ii) Which option should the player of the second round adopt in order to maximize the score got? Explain your answer.
- (iii) Only the winner of the first round plays the second round. It is given that the player of the second round adopts the option which can maximize the score got.

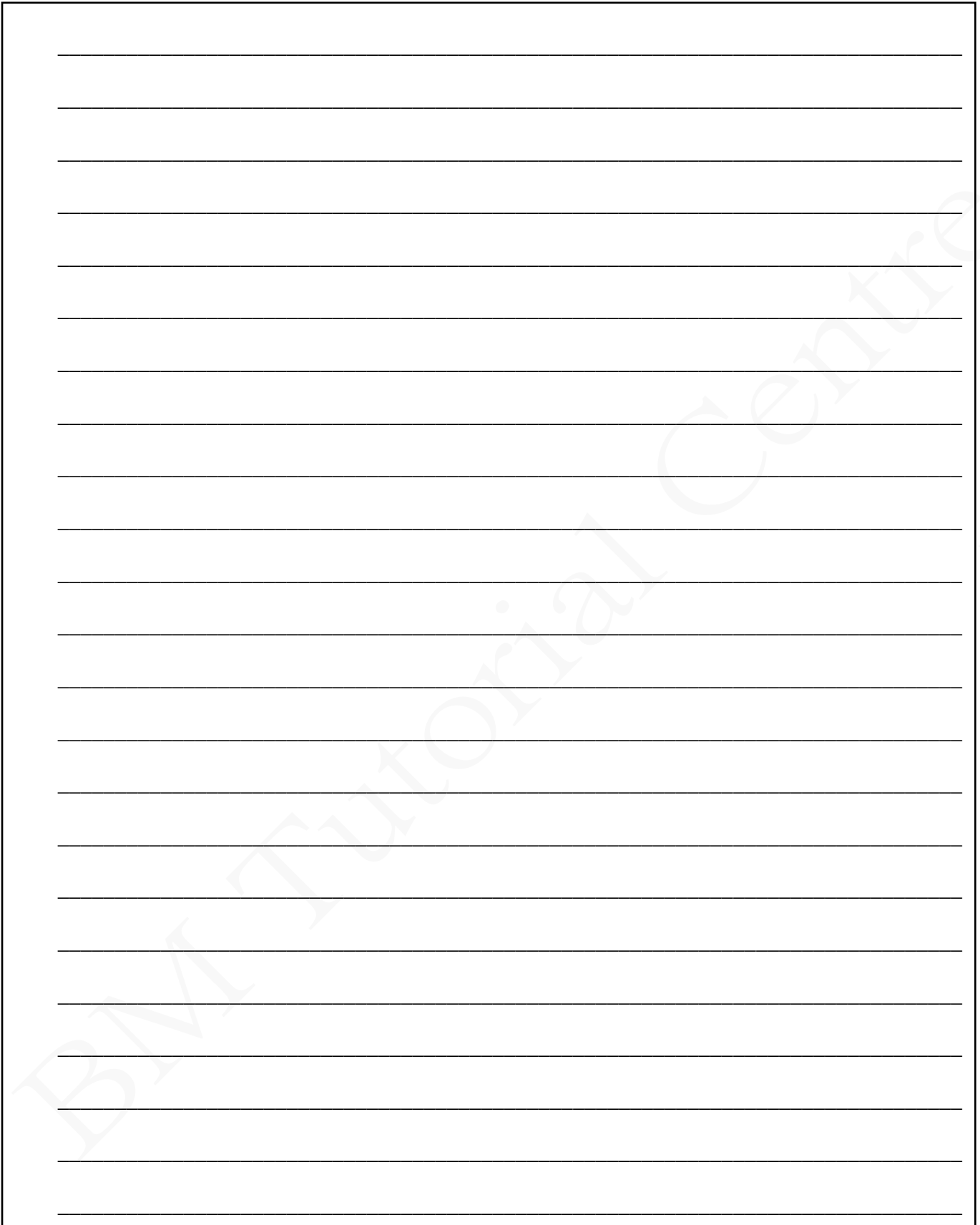
Bob claims that the probability of Amy getting no score in the game exceeds 0.9. Is the claim correct? Explain your answer.

(10 marks)

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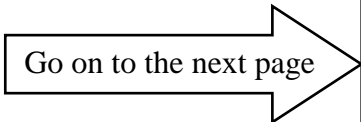
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