



H07-10min The Binomial Distribution: 10-minute Pack

EDEXCEL 1ST0 · Calculator allowed · about 10 minutes

Total Marks

Name: _____ Date: ____ / ____ / ____

Answer ALL questions. Show all your working.

- 1** For each situation described below, state whether the random variable X can be modelled by a binomial distribution. If it cannot, give a brief reason why not.
- (i) A fair coin is tossed 20 times. X is the number of heads obtained. (1)
- (ii) Cards are drawn one at a time, without replacement, from a well-shuffled standard deck of 52 playing cards, and drawing continues until the first ace appears. X is the number of cards drawn. (1)
- (iii) A biased six-sided dice, for which $P(\text{rolling a six}) = 0.2$ on each roll, is rolled 15 times. X is the number of sixes obtained. (1)
- (iv) A bag contains 10 red counters and 10 blue counters. Six counters are drawn from the bag, one at a time, without replacement. X is the number of red counters drawn. (1)
- (v) A multiple-choice test has 10 questions, each with exactly 4 options and only one correct answer. A student guesses the answer to every question at random, independently of their other guesses. X is the number of questions the student answers correctly. (1)

(Total for Question 1 is 5 marks)

2 A fair, ordinary six-sided dice is rolled 5 times. Let X be the number of times a 6 is obtained.

(a) Write down the value of n and the value of p for this binomial distribution. (2)

(b) Using the formula $P(X = r) = {}^nC_r p^r (1 - p)^{n-r}$, find $P(X = 1)$, the probability that exactly one 6 is obtained. (3)

(Total for Question 2 is 5 marks)

Mark scheme · H07-10min The Binomial Distribution: 10-minute Pack

Question 1

- (i) **B1** Yes cao (fixed $n = 20$, two outcomes, constant $p = 0.5$, independent tosses)
- (i) **Answer: Yes**
- (ii) **B1** No, because there is no fixed number of trials (drawing stops as soon as an ace appears)
- (ii) **Answer: No**
- (iii) **B1** Yes cao (fixed $n = 15$, two outcomes, constant $p = 0.2$, independent rolls)
- (iii) **Answer: Yes**
- (iv) **B1** No, because sampling without replacement changes the probability of drawing a red counter after each draw, so p is not constant and the draws are not independent
- (iv) **Answer: No**
- (v) **B1** Yes cao (fixed $n = 10$, two outcomes, constant $p = 0.25$, independent guesses)
- (v) **Answer: Yes**

Question 2

- (a) **B1** $n = 5$ cao
- (a) **B1** $p = 1/6$ oe (awrt 0.167)
- (a) **Answer: $n = 5$, $p = 1/6$**
- (b) **M1** $5C1 = 5$ identified
- (b) **M1** $5 \times (1/6) \times (5/6)^4$, oe substitution
- (b) **A1** awrt 0.402
- (b) **Answer: 0.402 (awrt)**