

1 The random variable X takes the value x with probability kx^2 , where k is a constant and x takes the values $-2, 1, 2, 3$ only.

(a) Draw up the probability distribution table for X , giving the probabilities as numerical fractions. [3]

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(b) Find $E(X)$. [1]

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(c) Find $P(X \neq 2 | X > 0)$. [2]

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5 On any given day, Cooper either wears a blue jumper or he wears a green jumper or he does not wear a jumper. The probability that he wears a blue jumper is 0.6 and the probability that he wears a green jumper is 0.3. Whether Cooper wears a jumper of either colour, or does not wear a jumper, on any day is independent of his choice on any other day.

(a) Find the probability, that in a week (7 days), Cooper wears a blue jumper on at least 5 days. [3]

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(b) Use a suitable approximation to find the probability that, in any 150-day period, Cooper does not wear a jumper on fewer than 22 days. [5]

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- 1 A coin is biased so that the probability of obtaining a head when it is thrown is 0.4. The coin is thrown repeatedly until the first head is obtained.

(a) Find the probability that the first head is obtained on the 5th throw. [1]

This image shows a full page of white paper with ten horizontal dashed lines, typical of primary school handwriting practice paper. The lines are evenly spaced and extend across the entire width of the page. There is no text or other markings on the paper.

(b) Find the probability that the first head is obtained after the 6th throw. [2]

This image shows a full page of white paper with horizontal dotted lines. The lines are evenly spaced and run across the width of the page, providing a guide for handwriting practice. There are no margins, text, or other markings on the page.

- 2 Kayla has a bag containing 3 red marbles, 1 blue marble and 2 green marbles. She selects one marble from the bag at random and does not replace it in the bag. She repeats this process until she obtains a green marble. The random variable X is the number of marbles that she needs to select until she obtains a green marble.

(a) Draw up the probability distribution table for X . [4]

[illegible]

(b) Find $\text{Var}(X)$. [3]

[illegible]

6 For a randomly chosen person, their next birthday is equally likely to occur on any day of the week, independently of any other person’s birthday.

- (a) Find the probability that, out of 10 randomly chosen people, none of them will have their next birthday on a Saturday or Sunday. [1]

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- (b) Find the probability that, out of 10 randomly chosen people, fewer than 3 will have their next birthday on a Wednesday. [3]

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(c) Use a suitable approximation to find the probability that, out of 392 randomly chosen people, more than 65 will have their next birthday on a Friday. [5]

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4 Every Saturday, a particular community holds a ‘Puzzle’ event to raise money for a new Leisure Centre. Competitors attempt to solve a puzzle as quickly as possible.

Last Saturday, 600 competitors took part. The times taken to complete the puzzle were normally distributed with mean 32.4 minutes and standard deviation 2.5 minutes.

(a) How many competitors would you expect to have times within 1.2 minutes of the mean time? [4]

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In this Saturday’s event, 60% of the competitors had times less than 36.0 minutes.

(b) 9 competitors who took part in this Saturday’s event are selected at random.

Find the probability that at least 2 and fewer than 8 of these competitors had times less than 36.0 minutes. [3]

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(c) 80 competitors who took part in this Saturday’s event are selected at random.

Use a suitable approximation to find the probability that more than 50 of these competitors had times less than 36.0 minutes. [5]

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- (a) Show that $P(X=2) = \frac{3}{7}$. [2]

[2]

- (b) Draw up the probability distribution table for X . [4]

[4]

- (c) Find the probability that at least 2 of the marbles chosen are blue, given that at least 1 red marble and at least 1 blue marble are chosen. [3]

[3]

Additional page

If you use the following page to complete the answer to any question, the question number must be clearly shown.

This image shows a full page of white paper with horizontal dotted lines. The lines are evenly spaced and run across the width of the page, providing a guide for handwriting practice. There are no margins, text, or other markings on the page.