

1. The discrete random variable X has the probability distribution specified below.

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|------------|-----|-----|-----|-----|-----|
| x | -2 | -1 | 0 | 1 | 2 |
| $P(X = x)$ | 0.1 | 0.2 | 0.3 | d | 0.1 |

Find

- (a) the value of d (1)
- (b) $P(-1 \leq X < 2)$ (2)
- (c) $E(X)$ (2)
- (d) $E(3X + 2)$ (2)
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2. A police radar gun records the speed of passing cars through a 30 mph speed limit

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|----------------|-------|-------|-------|-------|-------|-------|
| Speed mph, s | 24–28 | 28–32 | 32–36 | 36–40 | 40–44 | 44–48 |
| Number of cars | 2 | 8 | 42 | 30 | 18 | 6 |

By using the coding $t = \frac{s - 34}{4}$ calculate

- (a) the mean of t (2)
- (b) standard deviation of t (3)
- (c) hence find the mean and standard deviation of these speeds. (4)
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3. (a) Explain what you understand by the terms exclusive and exhaustive when referring to events. (2)

Events A and B are exclusive and A , B and C are exhaustive. The $P(A) = 0.3$, $P(C) = 0.5$, $P(A \cap C) = 0.1$ and $P(B \cap C) = 0.15$.

- (b) Draw a Venn diagram to illustrate this information. (4)

Hence find

- (c) $P(B)$. (2)
- (d) $P(B \cup C)$ (2)
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4. Over a period of time Jack has calculated that his journey to school is distributed approximately normally with a mean of 30 min and a standard deviation of 3.5 min. Find the probability that on a given morning his journey takes:
- (a) less than 28 mins (4)
- (b) more than 33 mins (3)
- (c) If he is due in school by 8.45am find the latest time he can leave home and be 95% sure of not being late. (3)
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5. Thirty married couples at a wedding reception were asked how many years they had been married with the following results

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|----|----|----|----|----|----|----|----|----|---|
| 12 | 5 | 21 | 10 | 18 | 13 | 22 | 16 | 30 | 9 |
| 15 | 52 | 16 | 10 | 2 | 5 | 14 | 11 | 32 | 4 |
| 1 | 7 | 5 | 6 | 11 | 3 | 15 | 12 | 8 | 5 |

- (a) Draw a stem and leaf diagram to represent this information (3)
- (b) What is the modal value? (1)
- (c) Find the median and upper and lower quartiles. (6)
- (d) Describe the skewness of this distribution (1)
- (e) Given that the mean of these figures is 13 years show how the mean, mode and median can reinforce your answer to part (d). (1)
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6. In a clothing factory three women are all producing the same type of shirts. Ann produces 30% of the output Barbara 45% and Carol 25%. Of the shirts produced it is found that the number that are faulty are 6% for Ann, 5% for Barbara and 4% for Carol.

- (a) Draw a tree diagram to represent this information. (4)
- Find the probability that
- (b) A randomly selected shirt is found to be faulty (3)
- (c) Given that the shirt is faulty find the probability that it was produced by Barbara. (2)
- (d) Given that the shirt is NOT faulty find the probability it was produced by either Ann or Carol. (3)
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7. The yield from a tomato crop was compared to the amount of fertiliser that was used.

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|----------------------|-----|-----|-----|-----|-----|-----|-----|-----|
| Fertilizer, f (ml) | 20 | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| Yield of crop, y | 128 | 136 | 148 | 159 | 170 | 175 | 172 | 160 |

- (a) Plot the data on a scattergraph (3)
- (b) Find the least squares regression line in the form $y = a + bf$. (7)
- (c) Draw the regression line on your graph (2)
- (d) Give an interpretation to the values of a and b (2)
- (e) Do you think it is sensible to use the regression line to predict the yield if 200 ml of fertilizer is used? (1)

TOTAL 75 MARKS