



1. The events A and B are such that $P(A) = \frac{2}{5}$, $P(B) = \frac{1}{2}$ and $P(A \cap B') = \frac{4}{5}$
 - a. Find $P(A \cap B')$ (2)
 - b. Find $P(A \cap B)$ (2)
 - c. Find $P(A \cup B)$ (2)
 - d. $P(A \cap B)$ (2)
 - e. State, with a reason, whether or not A and B are mutually exclusive. (1)
 - f. State, with a reason, whether or not A and B are independent. (4)

Solutions

1a.

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|---|-----------|
| $P(B') = 1 - \frac{1}{2} = \frac{1}{2}$ | M1 |
| $P(A \cap B') = \frac{4}{5} \times \frac{1}{2} = \frac{2}{5}$ | M1 |

1b.

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|---|-----------|
| $P(A \cap B) = \frac{2}{5} - \frac{2}{5}$ | M1 |
| $P(A \cap B) = 0$ | M1 |

1c.

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|---|-----------|
| $P(A) = \frac{2}{5}$ $P(B) = \frac{1}{2}$ $P(A \cup B) = \frac{2}{5} + \frac{1}{2} - 0$ | M1 |
| $P(A \cup B) = \frac{9}{10}$ | M1 |

1d.

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|---|-----------|
| $P(A B) = \frac{P(A \cap B)}{P(B)}$ As $P(A \cap B) = 0$ | M1 |
| $P(A B) = 0$ | M1 |

1e.

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| From b, we know that $P(A \cap B) = 0$, therefore the two events are mutually exclusive. | M1 |
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1f.

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| $P(A) = \frac{2}{5}$ $P(B) = \frac{1}{2}$ $P(A \cap B) = \frac{2}{5} \times \frac{1}{2} = \frac{1}{5}$ | M1 |
| From b, $P(A \cap B) = 0$ | M1 |
| If independent, $P(A) \times P(B) = P(A \cap B)$ $\frac{1}{5} \neq 0$ | M1 |
| Therefore, A and B are no independent events | M1 |

