LC 2016 (Set A): Paper 2

Question 6 (25 marks)

Question 6 (a)

$$P(\text{Letter \textbf{and then} first number \textbf{and then} second number}) = \frac{1}{26} \times \frac{1}{10} \times \frac{1}{10} = \frac{1}{2600}$$

> **Marking Scheme Notes**
> **Question 6 (a) [Scale 10C (0, 3, 7, 10)]**
> **3**: • any correct relevant probability
> **7**: • correct probabilities but not expressed as single fraction or equivalent
> **Note**: Accept correct answer without supporting work

Question 6 (b)

$$P(\text{Letter \textbf{and then} first number \textbf{and then} not second number}) = \frac{1}{26} \times \frac{1}{10} \times \frac{9}{10} = \frac{9}{2600}$$

$$P(\text{Letter \textbf{and then} not first number \textbf{and then} second number}) = \frac{1}{26} \times \frac{9}{10} \times \frac{1}{10} = \frac{9}{2600}$$

$$P(\text{Letter \textbf{and then} not first number \textbf{and then} not second number}) = \frac{1}{26} \times \frac{9}{10} \times \frac{9}{10} = \frac{81}{2600}$$

$$P(\text{Fail to win}) = 1 - \frac{1}{2600} - \frac{9}{2600} - \frac{9}{2600} - \frac{81}{2600} = \frac{25}{26}$$

Fill in the table from the club's point of view. If someone wins the jackpot, the club ends up paying the winner €998 (€1000 − €2).

Event	Payout (x) in euro	Probability $P(x)$	$xP(x)$
Win Jackpot	−998	$\dfrac{1}{2600}$	$-\dfrac{998}{2600}$
Match letter and first number only	−48	$\dfrac{9}{2600}$	$-\dfrac{432}{2600}$
Match letter and second number only	−48	$\dfrac{9}{2600}$	$-\dfrac{432}{2600}$
Match letter and neither number	−48	$\dfrac{81}{2600}$	$-\dfrac{3888}{2600}$
Fail to win	2	$\dfrac{25}{26}$	$\dfrac{25}{13}$

$$E(x) = \sum xP(x) = -\frac{998}{2600} - 2 \times \frac{432}{2600} - \frac{3888}{2600} + \frac{25}{13} = -\frac{15}{52} = -€0\cdot29 = -29\,\text{c}$$

The club expects to lose 29 c per €2 play.

> **Marking Scheme Notes**
> **Question 6 (b) [Scale 10C (0, 3, 7, 10)]**
> **3**: • 1 correct entry to table
> **7**: • all entries correct but fails to finish or finishes incorrectly
> • no conclusion

Question 6 (c)

If you increase or decrease each value of the discrete random variable by the same number, the expected value also increases or decreases by the same number.

Profit needed per game $= \dfrac{€600}{845} = €0·71$

Change in ticket price $= €0·71 - (-€0·29) = €1·00$

New ticket price $= €3$

> **Marking Scheme Notes**
> **Question 6 (c) [Scale 5C (0, 2, 4, 5)]**
> **2**:   • links profit, revenue and payout
> **4**:   • formula fully substituted