Oct 16

Question 6 **(25 marks)**

A local sports club is planning to run a weekly lotto. To win the Jackpot of €1000, contestants must match one letter chosen from the 26 letters in the alphabet and two numbers chosen, in the correct order, from the numbers 0 to 9. In this lotto, repetition of numbers is allowed (e.g. M, 3, 3 is an outcome).

(a) Calculate the probability that M, 3, 3 would be the winning outcome in a particular week.

$\frac{1}{26} \times \frac{1}{10} \times \frac{1}{10} = \boxed{\frac{1}{2600}}$

(b) If a contestant matches the letter only, or the letter and one number (but not both numbers), they will win €50. Using the table below, or otherwise, find how much the club should expect to make or lose on each play, correct to the nearest cent, if they charge €2 per play.

Event	Payout (x) €	Probability ($P(x)$)	$x.P(x)$
Win Jackpot	1000	$\frac{1}{2600}$	$\frac{1000}{2600}$
Match letter and first number only	50	$\frac{9}{2600}$	$\frac{450}{2600}$
Match letter and second number only	50	$\frac{9}{2600}$	$\frac{450}{2600}$
Match letter and neither number	50	$\frac{81}{2600}$	$\frac{4050}{2600}$
Fail to win	0		0

$E(x) = \frac{5950}{2600} = €2.29$

$- €2$

0.29

∴ Club loses 29 cent per play

(c) The club estimates that the average number of plays per week will be 845. If the club wants to make an average profit of €600 per week from the lotto, how much should the club charge per play, correct to the nearest cent?

$600 = 845(x - 2.29)$

∴ $\boxed{x = €3}$