Question 6 (6 marks)

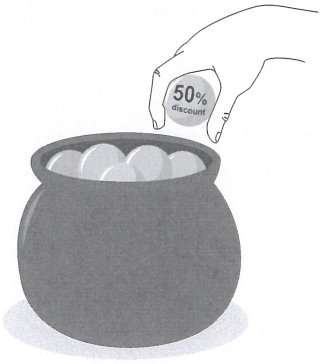
The owner of a local pet food shop is offering an incentive program to attract customers.

The shop owner has placed 50 balls in a bucket. Each ball is labelled with a percentage discount that the customer will be given after their purchase total is tallied. The customer draws a ball randomly from the bucket, and the percentage discount on the ball is applied to the purchase total. The ball is then placed back in the bucket before the next customer draws a ball.

Of the 50 balls in the bucket:

- one ball is labelled '100% discount'
- two balls are labelled '50% discount'
- four balls are labelled '25% discount'
- eight balls are labelled '20% discount'.

The remaining 35 balls are labelled '10% discount'.



(a) What is the probability that a customer will draw the ball labelled '100% discount'?

$\frac{1}{50}$ ie. 0.02

(1 mark)

(b) If 500 customers each draw one ball from the bucket, what is the probability that more than 10 of these customers will draw the ball labelled '100% discount'?

Let X = the number of customers that draw the ball labelled '100% discount'

$X \sim B(500, 0.02)$

$P(X > 10) = 0.417$ (3s.f.)

(2 marks)

(c) The shop owner could offer an alternative incentive program, in which a 15% discount is given to all customers.

In the long run, which of these two incentive schemes will cost the shop owner more? Explain your answer.

Discount %	100	50	25	20	10
Probability	0.02	0.04	0.08	0.16	0.70

$E(\text{Discount \%}) = 100 \times 0.02 + 50 \times 0.04 + 25 \times 0.08 + 20 \times 0.16 + 10 \times 0.70$

$= 16.2\ \%$

$> 15\%$ for the alternative incentive program

In the long run, the original incentive scheme will cost the shop owner more.

(3 marks)