12Ma Statistics Mini Test 01
Sampling and Probability

Question 1

A dance studio has 800 dancers of which

- 452 are beginners
- 251 are intermediates
- 97 are professionals

(a) Explain in detail how a stratified sample of size 50 could be taken. **[3]**

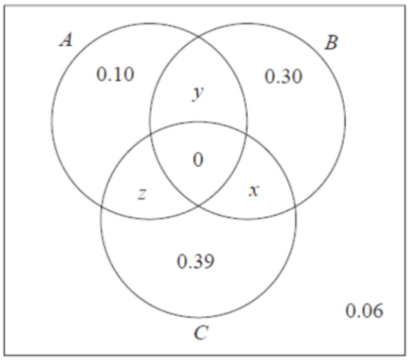
(b) State an advantage of stratified sampling rather than simple random sampling in this situation. [1]

Question Number	Scheme	Marks
(a)	Label beginners 1 – 452, intermediates 1 – 251, professionals 1 – 97 Use random numbers to select a ... Simple random sample of 28 beginners, 16 intermediates and 6 professionals.	M1 M1 A1 [3]
(b)	**Any one of** • Enables estimation of statistics/sampling errors for each strata. • Reduces variability. • More representative of the population/reflects population structure	B1 [1]

		Notes
(a)	1st M1	for a suitable numbered/labelled list for each ability level
	2nd M1	for use of random numbers/sample to select beginners, intermediates and professionals.
	A1	**(dependent on either the 1st or the 2nd M1 mark)** For 28 beginners, 16 intermediates and 6 professionals.

Question 2

The Venn diagram shows three events, A, B and C, and their associated probabilities.



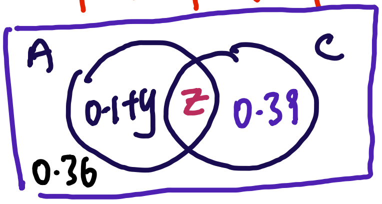
- Events B and C are mutually exclusive.
- Events A and C are independent.

Showing your working, find the value of x, the value of y and the value of z.

[5]

$x = 0$

$P(A) \times P(C) = P(A \cap C)$



$(0.1 + y + z)(0.39 + z) = z$ ①

$\Sigma p = 1$

$0.1 + 0.3 + 0.39 + 0.06 + y + z = 1$

$y + z = 0.15$

Sub into ①,

$(0.1 + 0.15)(0.39 + z) = z$

$0.0975 + 0.25z = z$

$z = 0.13$

$y = 0.02$ //

Question 3

A manufacturer carried out a survey of the defects in their soft toys. It is found that:

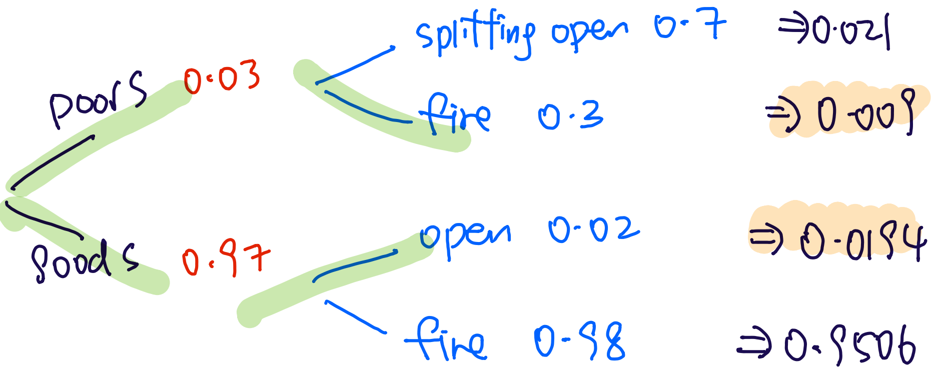
- The probability of a toy having poor stitching is 0.03
- A toy with poor stitching has a probability of 0.7 of splitting open
- A toy without poor stitching has a probability of 0.02 of splitting open.

(a) Draw a tree diagram to represent this information. **[3]**

(b) Find the probability that a randomly chosen soft toy has exactly one of the two defects, poor stitching or splitting open. **[3]**

The manufacturer also finds that soft toys can become faded with probability of 0.05 and that this defect is independent of poor stitching or splitting open. A soft toy is chosen at random.

(c) Find the probability that the soft toy has exactly one of these 3 defects. **[4]**



b) $p(PS, O') + p(PS', O) = 0.0284$ //

c) $p(PS, O', F') + p(PS', O', F) + p(PS', O, F)$

$0.009 \times 0.95 + 0.97 \times 0.98 \times 0.05 + 0.0194 \times 0.95$

$= 0.07451$ //