Y1S5 XMQs and MS

(Total: 16 marks)

1. P31(AS)_2018 Q2 . 4 marks - Y1S5 Probability

2. P31(AS)_2019 Q2 . 5 marks - Y1S5 Probability

3. P31(AS)_2021 Q1 . 2 marks - Y1S5 Probability

4. P31(AS)_2021 Q5 . 5 marks - Y1S5 Probability

2. A factory buys 10% of its components from supplier A, 30% from supplier B and the rest from supplier C. It is known that 6% of the components it buys are faulty.

Of the components bought from supplier A, 9% are faulty and of the components bought from supplier B, 3% are faulty.

(a) Find the percentage of components bought from supplier C that are faulty.

(3)

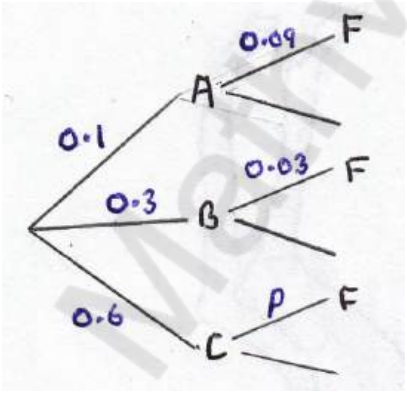
A component is selected at random.

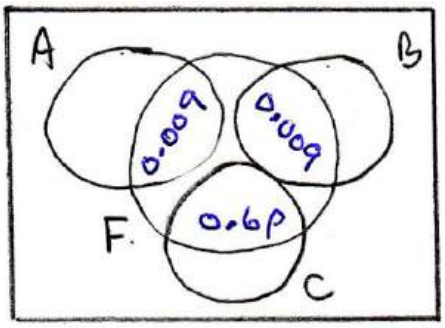
(b) Explain why the event "the component was bought from supplier B" is not statistically independent from the event "the component is faulty".

(1)

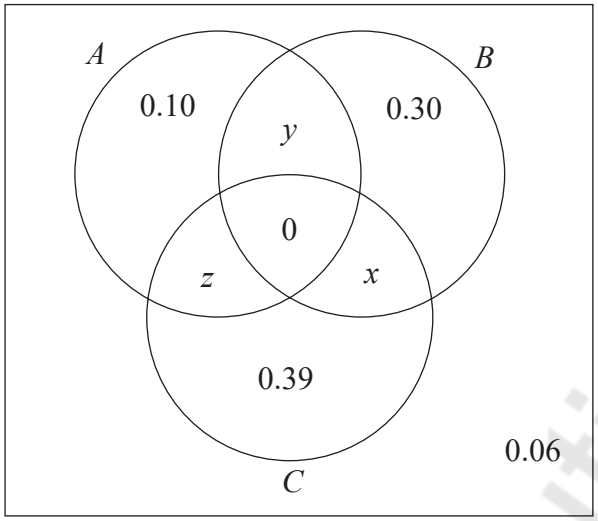
Qu	Scheme	Marks	AO
2 (a)	[Let $p = \text{P}(F \mid C)$]		
	Tree diagram or some other method to find an equation for p	M1	2.1
	$0.1\times0.09+0.3\times0.03+0.6\times p=0.06$	A1	1.1b
	$p = 0.07$ i.e. **7%**	A1	1.1b
		(3)	
(b)	e.g. $\text{P}(B \text{ and } F) = 0.3\times0.03 = 0.009$ but		
	$\text{P}(B)\times\text{P}(F) = 0.3\times0.06 = 0.018$	B1	2.4
	These are not equal so not independent		
		(1)	
		(4 marks)	

	Notes
(a)	M1 for selecting a suitable method to find the missing probability e.g. sight of tree diagram with 0.1, 0.3, 0.6 and 0.09, 0.03, p suitably placed e.g. sight of VD with 0.009 for $A\cap F$ and $B\cap F$ and 0.6p suitably placed or attempt an equation with at least one correct numerical and one "p" product (not necessarily correct) on LHS or for sight of 0.06 – (0.009 + 0.009) (o.e. e.g. 6 – 1.8 = 4.2%) 1st A1 for a correct equation for p (May be implied by a correct answer) or for the expression $\dfrac{0.06-(0.009+0.009)}{0.6}$ (o.e.) 2nd A1 for 7% (accept 0.07) **Correct Ans:** Provided there is no incorrect working seen award 3/3 e.g. may just see tree diagram with 0.07 for p (probably from trial and improv')
(b)	B1 for a suitable explanation…may talk about 2nd branches on tree diagram and point out that $0.03 \neq 0.06$ but need some supporting calculation/words Can condone incorrect use of set notation (it is not on AS spec) provided the rest of the calculations and words are correct.





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)

Question	Scheme	Marks	AOs
2	$x = 0$	B1	2.2a
	$\text{P}(A) = 0.1 + z + y \quad \text{P}(C) = 0.39 + z[+x] \quad \text{P}(A \text{ and } C) = z$	M1	2.1
	$\text{P}(A \text{ and } C) = \text{P}(A) \times \text{P}(C) \rightarrow z = (0.1 + z + y) \times (0.39 + z[+x])$	M1	1.1b
	$\left[\sum p = 1\right]$ $0.06 + 0.3 + 0.39 + 0.1 + z + y[+x] = 1 \rightarrow \quad [z + y[+x] = 0.15]$	M1	1.1b
	Solving (simultaneously) leading to $\underline{z = 0.13} \quad \underline{y = 0.02}$	A1	1.1b
			(5 marks)

Notes

B1: for $x = 0$, may be seen on Venn diagram

M1: Identifying the probabilities required for independence and at least 2 correct
These must be labelled
If there are no labels, then this may be implied by $z = (0.1 + z + y)(0.39 + z\ [+x])$, allow one numerical slip

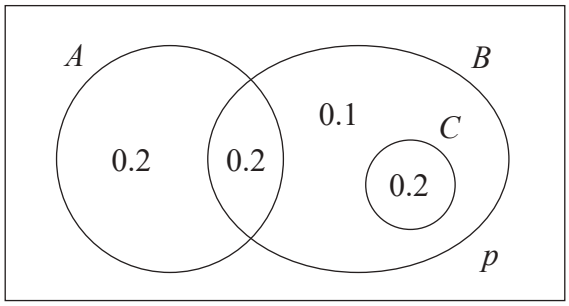
Allow e.g.
$\text{P}(A') = 0.39 + 0.30 + 0.06[+x] \quad \text{P}(C) = 0.39 + z[+x] \quad \text{P}(A' \text{ and } C) = 0.39$
[Not on spec. but you may see use of conditional probabilities]

M1: Use of independence equation with their labelled probabilities in terms y, z [and x]
All their probabilities must be substituted into a correct formula
Sight of a correct equation e.g. $z = (0.1 + z + y)(0.39 + z\ [+x])$ scores M1M1

M1: Using $\Sigma p = 1$
Implied by $[x +] \ y + z = 0.15$
or their $x + y + z = 0.15$ where x, y, and z are all probabilities
or e.g. $\text{P}(A) = 0.25$

A1: both $y = 0.02$ and $z = 0.13$

1.



The Venn diagram, where p is a probability, shows the 3 events A, B and C with their associated probabilities.

(a) Find the value of p.

(1)

(b) Write down a pair of mutually exclusive events from A, B and C.

(1)

Qu	Scheme	Marks	AO
1 (a)	[$p = 1 - (0.2 + 0.2 + 0.1 + 0.2)] =$ **<u>0.3</u>**	B1 **(1)**	1.1b
(b)	A and C are mutually exclusive. [NOT P(A) and P(C)]	B1 **(1)**	1.2
		(2 marks)	

	Notes
(a)	B1 for
(b)	B1 for A and C [NB $A \cap C$ or $A \cap C = \varnothing$ is B0] If more than one case given they must <u>all</u> be correct e.g. $A \cap B$ and C

5. Two bags, **A** and **B**, each contain balls which are either red or yellow or green.

Bag **A** contains 4 red, 3 yellow and n green balls.
Bag **B** contains 5 red, 3 yellow and 1 green ball.

A ball is selected at random from bag **A** and placed into bag **B**.
A ball is then selected at random from bag **B** and placed into bag **A**.

The probability that bag **A** now contains an equal number of red, yellow and green balls is p.

Given that $p > 0$, find the possible values of n and p.

(5)

Qu	Scheme	Marks	AO
5	Must end up with 3 of each colour or 4 of each colour	M1	3.1b
	***n* = 2** requires 1st red and 2nd green or red from **A** and green from **B**	M1	2.2a
	P(1st red and 2nd green) = $\frac{4}{9}\times\frac{1}{10}=\frac{4}{90}$ or $\frac{2}{45}$ $\quad p = \underline{\underline{\frac{2}{45}}}$	A1	1.1b
	***n* = 5** requires 1st green and 2nd yellow or green from **A** and yellow from **B**	M1	2.2a
	P(1st green and 2nd yellow) = $\frac{5}{12}\times\frac{3}{10}=\frac{15}{120}$ or $\frac{1}{8}$ $\quad p = \underline{\underline{\frac{1}{8}}}$	A1	1.1b
		(5)	
		(5 marks)	

	Notes
	1st M1 for an overall strategy realising there are 2 options. Award when evidence of both cases (3 of each colour or 4 of each colour) seen.
	2nd M1 for $n = 2$ and attempt at 1st red and 2nd green May be implied by e.g. $\frac{4}{9}\times\frac{1}{9}$
	1st A1 for $p = \underline{\underline{\frac{2}{45}}}$ or exact equivalent
	3rd M1 for $n = 5$ and attempt at 1st green and 2nd yellow May be implied by e.g. $\frac{5}{12}\times\frac{3}{9}$
	2nd A1 for $p = \underline{\underline{\frac{1}{8}}}$ or exact equivalent
NB	If both correct values of p are found and then added (get $\frac{61}{360}$) , deduct final A1 only (i.e. 4/5)

Greg Attwood 23rd Oct 2021