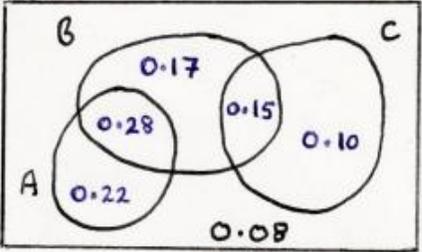


Probability – Mark Scheme

June 2017 Mathematics Advanced Paper 1: Statistics and Mechanics 1

1.

Question Number	Scheme	Marks
3. (a)	$p = P(B \cap C) = P(B) \times P(C) = 0.6 \times 0.25 = \underline{0.15}$ $q = [P(C) - p] = \underline{0.10}$	M1 A1 (2)
(b)	$r = 1 - 0.08 - [P(B) + q] = 1 - 0.08 - 0.6 - 0.1$ (o.e.) <u>or</u> $1 - 0.08 - (0.6 + 0.25 - p)$ $= \underline{0.22}$	M1 A1cao (2)
(c)	$s = [P(A) - r] = \underline{0.28}$ $t = [P(B) - p - s]$ <u>or</u> use $P(B \cap C') - s = 0.6 \times 0.75 - "0.28"$] = <u>0.17</u>	B1ft B1ft (2)
(d)	$P(A) \times P(B) = 0.5 \times 0.6 = 0.3$ which is <u>not</u> equal to $s (= 0.28)$ So A and B are <u>not</u> independent	M1 A1 (2)
(e)	$\frac{(s + p) \text{ or } (0.6 - t)}{P(A \cup C) \text{ or } [P(A) + P(C)] \text{ or } (r + s + p + q)}, = \frac{("0.28" + "0.15") \text{ or } (0.6 - "0.17")}{0.5 + 0.25}$ $= \underline{\frac{43}{75}}$	M1, A1ft A1 (3) [11]

		Notes
(a)	M1 for a correct expression (using independence) for p or 0.15 A1 for $q = 0.10$ (both correct 2/2)	 <p>Fully correct Venn diagram will score the first 6 marks If text and VD disagree use <u>text</u> values</p>
Mark (b) & (c) together		
(b)	M1 for a correct expression for r using $P(B \cup C)$. Can fit their $q \in [0, 0.32]$ A1cao for $r = 0.22$ (correct ans only 2/2)	
(c)	1 st B1ft for $s = 0.28$ or 0.5 – their “0.22” 2 nd B1ft for $t = 0.17$ or 0.6 – their “0.15” – their “0.28”	
ALT	Find t then s then r	
(c)	2 nd B1 for $t = 0.17$ [from $1 - 0.08 - P(A) - P(C)$] 1 st B1ft for $s = 0.28$ or $P(B) - “0.17” - “0.15”$	
(b)	M1 for $r = P(A) - s$ and the A1 for 0.22	
$s = 0.3$	They assume A and B are independent and get $s = 0.3$ [from $P(A) \times P(B)$]	
(c)	1 st B0 for $s = 0.3$ BUT can get 2 nd B1ft for either case in the scheme	
(b)	M1 for $r = P(A) - s$ BUT then A0cao for $r = 0.2$	
(d)	M1 for a correct $P(A) \times P(B) = 0.5 \times 0.6$ or 0.3 and a clear comparison with their $s (\neq 0.3)$ <u>Or</u> calculation of $P(A B) = \frac{7}{15}$ or 0.467 or $\frac{\text{their } s}{0.6}$ and comparison with $P(A) = 0.5$ (o.e.) A1 dep. on M1 being earned and clear statement that A and B are <u>not</u> independent	
SC $s = 0.3$	dep on 1 st B1ft for $s = 0.5 - 0.2$ in (c); for correct calc. <u>and</u> conclusion seen (B1). On open M0A1	
(e)	M1 for a correct ratio expression of probs: num. < den. Allow $1 - (0.08 + \text{their “}t\text{”})$ on den. Any sight of multiplication on the numerator e.g. 0.6×0.75 is M0 1 st A1ft for correct ratio or ft using their values in numerator but correct denominator. 2 nd A1 for $\frac{43}{75}$ or accept awrt 0.573	