Subject – Math AA(Standard Level)
Topic - Statistics and Probability
Year - May 2021 – Nov 2024
Paper -1
Answers

Question 1

(a)	evidence of median position	*(M1)*	
	80th employee		
	40 minutes	*A1*	
			[2 marks]
(b)	valid attempt to find interval (25−55)	*(M1)*	
	18 (employees), 142 (employees)	*A1*	
	124	*A1*	
			[3 marks]
(c)	recognising that there are 16 employees in the top 10%	*(M1)*	
	144 employees travelled more than k minutes	*(A1)*	
	$k = 56$	*A1*	
			[3 marks]
(d)	$b = 70$	*A1*	
			[1 mark]
(e)	(i) recognizing a is first quartile value	*(M1)*	
	40 employees		
	$a = 33$	*A1*	
	(ii) $47 - 33$	*(M1)*	
	$\text{IQR} = 14$	*A1*	
			[4 marks]
(f)	attempt to find $1.5 \times$ their IQR	*(M1)*	
	$33 - 21$		
	12	*(A1)*	
			[2 marks]

[Total 15 marks]

Question 2

attempt to substitute into $\mathrm{P}(A \cup B) = \mathrm{P}(A) + \mathrm{P}(B) - \mathrm{P}(A \cap B)$ ***(M1)***

e: Accept use of Venn diagram or other valid method.

$0.6 = 0.5 + 0.4 - \mathrm{P}(A \cap B)$ ***(A1)***

$\mathrm{P}(A \cap B) = 0.3$ (seen anywhere) ***A1***

attempt to substitute into $\mathrm{P}(A \mid B) = \dfrac{\mathrm{P}(A \cap B)}{\mathrm{P}(B)}$ ***(M1)***

$= \dfrac{0.3}{0.4}$

$\mathrm{P}(A \mid B) = 0.75 \left(= \dfrac{3}{4} \right)$ ***A1***

Total [5 marks]

Question 3

(a) recognising probabilities sum to 1 *(M1)*

$p+p+p+\frac{1}{2}p=1$

$p=\frac{2}{7}$ ***A1***

[2 marks]

(b) valid attempt to find $\mathrm{E}(X)$ *(M1)*

$1\times p+2\times p+3\times p+4\times\frac{1}{2}p\left(=8p\right)$

$\mathrm{E}(X)=\frac{16}{7}$ ***A1***

[2 marks]

(c) (i) $0\le r\le 1$ ***A1***

(ii) attempt to find a value of q *(M1)*

$0\le 1-3q\le 1$ OR $r=0\Rightarrow q=\frac{1}{3}$ OR $r=1\Rightarrow q=0$

$0\le q\le\frac{1}{3}$ ***A1***

[3 marks]

(d) $\mathrm{E}(Y)=1\times q+2\times q+3\times q+4\times r\left(=2+2r \text{ OR } 4-6q\right)$ *(A1)*

one correct boundary value ***A1***

$1\times\frac{1}{3}+2\times\frac{1}{3}+3\times\frac{1}{3}+4\times 0\left(=2\right)$ OR

$1\times 0+2\times 0+3\times 0+4\times 1\left(=4\right)$ OR

$2+2(0)\left(=2\right)$ OR

$2+2(1)\left(=4\right)$ OR

$4-6(0)\left(=4\right)$ OR $4-6\left(\frac{1}{3}\right)\left(=2\right)$

$2\le\mathrm{E}(Y)\le 4$ ***A1***

[3 marks]

(e) **METHOD 1**

evidence of choosing at least four correct outcomes from
1&2, 1&3, 1&4, 2&3, 2&4, 3&4 ***(M1)***

$\frac{6}{7}q+\frac{6}{7}r$ OR $3pq+3pr$ OR $pq+pq+p(1-3q)+pq+p(1-3q)+p(1-3q)$ ***(A1)***

solving for either q or r ***M1***

$\frac{6}{7}(q+1-3q)=\frac{1}{2}$ OR $\frac{6}{7}\left(\frac{1-r}{3}+r\right)=\frac{1}{2}$ OR $3pq+3p(1-3q)=\frac{1}{2}$

OR $3p\left(\frac{1-r}{3}\right)+3pr=\frac{1}{2}$

EITHER two correct values

$q=\frac{5}{24}$ and $r=\frac{3}{8}$ ***A1A1***

OR one correct value

$q=\frac{5}{24}$ OR $r=\frac{3}{8}$ ***A1***

substituting their value for q or r ***A1***

$4-6\left(\frac{5}{24}\right)$ OR $2+2\left(\frac{3}{8}\right)$

THEN

$\mathrm{E}(Y)=\frac{11}{4}$ ***A1***

[6 marks]

METHOD 2 (solving for $\mathrm{E}(Y)$)
evidence of choosing at least four correct outcomes from
1&2, 1&3, 1&4, 2&3, 2&4, 3&4 ***(M1)***

$\frac{6}{7}q+\frac{6}{7}r$ OR $3pq+3pr$ OR $pq+pq+p(1-3q)+pq+p(1-3q)+p(1-3q)$ ***(A1)***

rearranging to make q the subject ***M1***

$q=\frac{4-\mathrm{E}(Y)}{6}$

$3pq+3p(1-3q)=\frac{1}{2}$ ***M1***

$\frac{6}{7}\times\left(\frac{4-\mathrm{E}(Y)}{6}\right)+\frac{6}{7}\left(1-3\left(\frac{4-\mathrm{E}(Y)}{6}\right)\right)=\frac{1}{2}$ ***A1***

$\frac{2(\mathrm{E}(Y)-1)}{7}=\frac{1}{2}$

$\mathrm{E}(Y)=\frac{11}{4}$ ***A1***

[6 marks]
Total [16 marks]

Question 4

(a) attempt to use definition of outlier
$1.5\times 20+Q_3$ ***(M1)***
$1.5\times 20+U\geq 75$ $(\Rightarrow U\geq 45$, accept $U>45)$ OR $1.5\times 20+Q_3=75$ ***A1***
minimum value of $U=45$ ***A1***

[3 marks]

(b) attempt to use interquartile range ***(M1)***
$U-L=20$ (may be seen in part (a)) OR $L\geq 25$ (accept $L>25$)
minimum value of $L=25$ ***A1***

[2 marks]
Total [5 marks]

Question 5

(a) evidence of median position **(M1)**

40 students

median $=14$ (hours) **A1**

[2 marks]

(b) recognizing there are 8 students in the top 10% **(M1)**

72 students spent less than k hours **(A1)**

$k=18$ (hours) **A1**

[3 marks]

(c) 15 hours is 60 students OR $p=60-4$ **(M1)**

$p=56$ **A1**

21 hours is 76 students OR $q=80-76$ OR $q=80-4-56-16$ **(A1)**

$q=4$ **A1**

[4 marks]

(d) 20 of the 80 students OR $\frac{1}{4}$ spend more than 15 hours doing homework **(A1)**

$\frac{20}{80}=\frac{x}{320}$ OR $\frac{1}{4}\times 320$ OR 4×20 **(A1)**

80 (students) **A1**

[3 marks]

(e) (i) only year 12 students surveyed OR amount of homework might be different for different year levels **R1**

(ii) stratified sampling OR survey students in all years **R1**

[2 marks]

Total [14 marks]

Question 6

(a) valid approach to find $\mathrm{P}(R)$ **(M1)**

tree diagram (must include probabilty of picking box) with correct required probabilities

OR $\mathrm{P}(R \cap B_1) + \mathrm{P}(R \cap B_2)$ OR $\mathrm{P}(R \mid B_1)\mathrm{P}(B_1) + \mathrm{P}(R \mid B_2)\mathrm{P}(B_2)$

$\frac{5}{7} \cdot \frac{1}{2} + \frac{4}{7} \cdot \frac{1}{2}$ **(A1)**

$\mathrm{P}(R) = \frac{9}{14}$ **A1**

[3 marks]

(b) events A and R are not independent, since $\frac{9}{14} \cdot \frac{1}{2} \neq \frac{5}{14}$ OR $\frac{5}{7} \neq \frac{9}{14}$ OR $\frac{5}{9} \neq \frac{1}{2}$

OR an explanation e.g. different number of red balls in each box **A2**

Note: Both conclusion and reasoning are required. Do not split the ***A2***.

[2 marks]

Total [5 marks]

Question 7

(a) $\text{IQR} = 10 - 6 \; (= 4)$ **(A1)**

attempt to find $Q_3 + 1.5 \times \text{IQR}$ **(M1)**

$10 + 6$

16 **A1**

[3 marks]

(b) (i) choosing $c = \frac{1}{2}a - 9$ **(M1)**

$\frac{1}{2} \times 42 - 9$

= 12 (years old) **A1**

(ii) attempt to solve system by substitution or elimination **(M1)**

34 (years old) **A1**

[4 marks]

Total [7 marks]

Question 8

(a) uses $\sum \mathrm{P}(X = x) = 1$ to form a linear equation in p and q ***(M1)***

correct equation in terms of p and q from summing to 1 ***A1***

$p + 0.3 + q + 0.1 = 1$ OR $p + q = 0.6$ (or equivalent)

uses $\mathrm{E}(X) = 2$ to form a linear equation in p and q ***(M1)***

correct equation in terms of p and q from $\mathrm{E}(X) = 2$ ***A1***

$p + 0.6 + 3q + 0.4 = 2$ OR $p + 3q = 1$ (or equivalent)

Note: The marks for using $\sum \mathrm{P}(X = x) = 1$ and the marks for using $\mathrm{E}(X) = 2$ may be awarded independently of each other.

evidence of correctly solving these equations simultaneously ***A1***

for example, $2q = 0.4 \Rightarrow q = 0.2$ or $p + 3 \times (0.6 - p) = 1 \Rightarrow p = 0.4$

so $p = 0.4$ and $q = 0.2$ ***AG***

[5 marks]

(b) valid approach ***(M1)***

$\mathrm{P}(X > 2) = \mathrm{P}(X = 3) + \mathrm{P}(X = 4)$ OR $\mathrm{P}(X > 2) = 1 - \mathrm{P}(X = 1) - \mathrm{P}(X = 2)$

$= 0.3$ ***A1***

[2 marks]

continued…

(c) recognises at least one of the valid scores (6, 7, or 8) required to win the game **(M1)**

Note: Award ***M0*** if candidate also considers scores other than 6, 7, or 8 (such as 5).

let T represent the score on the last two rolls

a score of 6 is obtained by rolling $(2,4),(4,2)$ or $(3,3)$

$\mathrm{P}(T=6)=2(0.3)(0.1)+(0.2)^2 \ (=0.1)$ ***A1***

a score of 7 is obtained by rolling $(3,4)$ or $(4,3)$

$\mathrm{P}(T=7)=2(0.2)(0.1) \ (=0.04)$ ***A1***

a score of 8 is obtained by rolling $(4,4)$

$\mathrm{P}(T=8)=(0.1)^2 \ (=0.01)$ ***A1***

Note: The above 3 ***A1*** marks are independent of each other.

$\mathrm{P}(\text{Nicky wins})=0.1+0.04+0.01$

$=0.15$ ***A1***

[5 marks]

(d) $3+b=8$ ***(M1)***

$b=5$ ***A1***

[2 marks]

(e) **METHOD 1**

EITHER

$\mathrm{P}(S=5)=\frac{4}{16}$

$\mathrm{P}(S=a+2)=\frac{4}{16}$ ***A1***

$\Rightarrow a+2=5$

OR

$\mathrm{P}(S=6)=\frac{3}{16}$

$\mathrm{P}(S=a+3)=\frac{2}{16}$ and $\mathrm{P}(S=5+1)=\frac{1}{16}$ ***A1***

$\Rightarrow a+3=6$

OR

$\mathrm{P}(S=4)=\frac{3}{16}$

$\mathrm{P}(S=a+1)=\frac{2}{16}$ and $\mathrm{P}(S=1+3)=\frac{1}{16}$ ***A1***

$\Rightarrow a+1=4$

THEN

$\Rightarrow a=3$ ***A1***

Note: Award ***A0A0*** for $a=3$ obtained without working/reasoning/justification.

[2 marks]

METHOD 2

EITHER

correctly lists a relevant part of the sample space *A1*

for example, $\{S=4\}=\{(3,1),(1,a),(1,a)\}$ or $\{S=5\}=\{(2,a),(2,a),(2,a),(2,a)\}$

or $\{S=6\}=\{(3,a),(3,a),(1,5)\}$

$a+3=6$

OR

eliminates possibilities (exhaustion) for $a<5$

convincingly shows that $a \neq 2,4$ *A1*

$a \neq 4$, for example, $\mathrm{P}(S=7)=\frac{2}{16}$ from $(2,5),(2,5)$ and so

$(3,a),(3,a) \Rightarrow a+3 \neq 7$

THEN

$\Rightarrow a=3$ *A1*

[2 marks]

Total [16 marks]

Question 9

(a) $P(A \cap B) = 0.24$ **A1**

[1 mark]

(b) $P(A \cup B) = 1.1 - P(A \cap B)$ ***(A1)***

$(0 \leq) P(A \cup B) \leq 1$ ***(M1)***

Note: This may be conveyed in a clearly labelled diagram or written explanation where $P(A \cup B) = 1$

the minimum value of $P(A \cap B)$ is 0.1 ***A1***

[3 marks]

(c) A is a subset of B (so $P(A \cap B) = P(A)$). ***R1***

Note: This may be conveyed in a clearly labelled diagram where A is completely inside B, or in a written explanation indicating that $P(A \cap B) = P(A)$

so the maximum value of $P(A \cap B)$ is 0.3 ***A1***

Note: Do not award ***R0A1***.

[2 marks]

Total [6 marks]

Question 11

(a) $u_1 + 3d = u_4$ **(M1)**

$0.6 + 3d = 0.15$

$d = -0.15$ **A1**

[2 marks]

(b) **METHOD 1**

$u_2 = 0.45$ or $u_3 = 0.3$ (may be seen in their equation) ***(A1)***

summing their probabilities to 1 (seen anywhere) ***(M1)***

$$\frac{0.6}{k} + \frac{u_2}{k} + \frac{u_3}{k} + \frac{0.15}{k} = 1$$

$\frac{0.6}{k} + \frac{0.45}{k} + \frac{0.3}{k} + \frac{0.15}{k} = 1$ (or equivalent) ***(A1)***

$$\frac{1.5}{k} = 1$$

$k = 1.5$ **A1**

[4 marks]

METHOD 2 (using S_n formula)

$S_4 = \frac{4}{2}\left(2(0.6) + (4-1)(-0.15)\right)$ OR $S_4 = \frac{4}{2}\left(2\left(\frac{0.6}{k}\right) + (4-1)\left(\frac{-0.15}{k}\right)\right)$

OR $S_4 = \frac{4}{2}(0.6 + 0.15)$ OR $S_4 = \frac{4}{2}\left(\frac{0.6}{k} + \frac{0.15}{k}\right)$ (or equivalent) ***(A1)***

summing their probabilities to 1 (seen anywhere) ***(M1)***

$\frac{u_1}{k} + \frac{u_2}{k} + \frac{u_3}{k} + \frac{u_4}{k} = 1$ OR $u_1 + u_2 + u_3 + u_4 = k$ OR $S_4 = 1$ OR $S_4 = k$

$\frac{4}{2}\left(2(0.6) + (4-1)(-0.15)\right) = k$ (or equivalent) ***(A1)***

$k = 1.5$ **A1**

[4 marks]

Total [6 marks]

Question 12

(a) (i) summing frequencies of riders or finding complement *(M1)*

probability $= \frac{34}{40}$ ***A1***

(ii) attempt to find expected value *(M1)*

$$\frac{16}{40} + \left(2 \times \frac{13}{40}\right) + \left(3 \times \frac{2}{40}\right) + \left(4 \times \frac{3}{40}\right)$$

$$\frac{60}{40} (= 1.5)$$ ***A1***

[4 marks]

(b) evidence of **their** rides/visitor $\times 1000$ or $\div 10$ *(M1)*

1500 OR 0.15

150 (times) ***A1***

[2 marks]

Total [6 marks]

Question 13

(a) (i) $p = 9$ **A1**

(ii) $600 < n \leq 800$ **A1**

Note: Award ***A0*** if candidate answers 700.

[2 marks]

(b) (i) median = 600 **A1**

(ii) $80\%\text{ of }800 = 640$ ***(A1)***

40 (performances less than 80% of tickets sold) ***(A1)***

20 (performances) ***A1***

[4 marks]

(c) (i) any reasonable answer which suggests a biased sample (must include reason, do not accept reasons such as "sample size is too small", or answers that simply say "not representative of entire audience" without a valid reason) ***A1***

eg likely to come from the same part of the theatre OR be part of same group OR be from priority seating OR it is convenience sampling

(ii) every 20^{th} person ***A1A1***

Note: Award ***A1*** for recognizing that sampling occurs at regular intervals eg "every". Award ***A1*** for interval length is 20.

(iii) quota (sampling method) ***A1***

[4 marks]

(d) (i) 75% (of 36000 spent between \$$3$ and \$$25$) *(M1)*

$= 27000$ ***A1***

(ii) $a = 7$ ***A1***

[3 marks]

(e) (i) **METHOD 1**

old mean is 600 (tickets) ***(A1)***

recognising new mean is old mean + 18 ***(M1)***

$600 + 18$

$= 618$ (tickets) ***A1***

METHOD 2

new total number of tickets = $36000 + 60 \times 18 (= 37080)$ ***(A1)***

$$\text{new mean} = \frac{36000 + 60 \times 18}{60} \left(= \frac{37080}{60} \right)$$ ***(M1)***

$= 618$ (tickets) ***A1***

(ii) no effect on the variance ***A1***

[4 marks]

Total [17 marks]

Question 14

(a) $\left(\mathrm{P}(A \cup B)=\right) 0.7+0.75-0.55$ ***(A1)***

$=0.9$ ***A1***

[2 marks]

(b) recognition that $A' \cap B' = (A \cup B)'$ OR $A' \cap B' = 1 - A \cup B$

(region/value may be seen in a correctly shaded/labeled Venn diagram) ***(M1)***

$(=1-0.9)$

$=0.1$ ***A1***

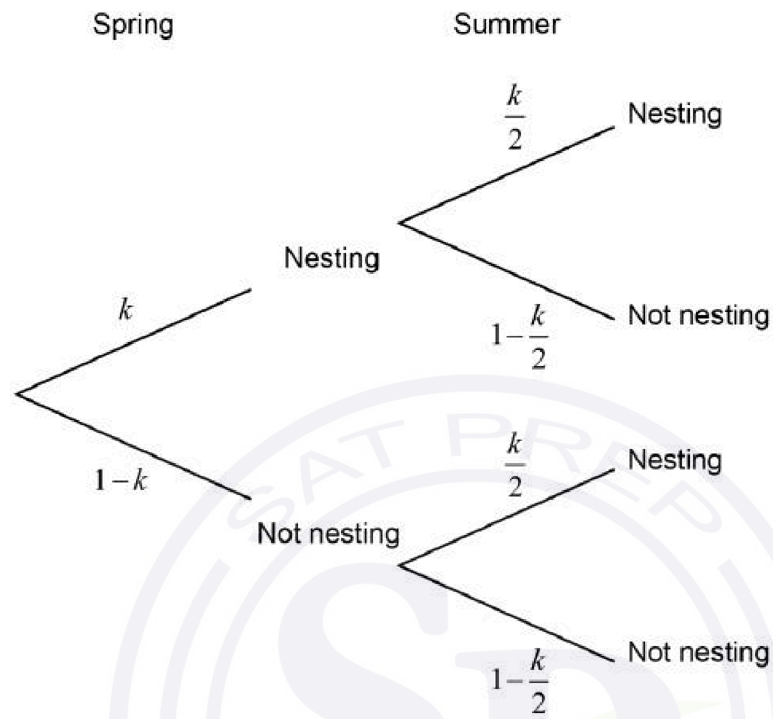
Note: For the final mark, 0.1 must be stated as the candidate's answer, or labeled as $\mathrm{P}(A' \cap B')$ in their Venn diagram. Just seeing an unlabeled 0.1 in the correct region of their diagram earns ***M1A0***.

[2 marks]

Total [4 marks]

Question 15

(a)



$1-k$ for Spring **_A1_**

$1-\frac{k}{2}$ for both Summers **_A1_**

[2 marks]

(b) (i) multiplying the two correct branches *(A1)*

$(1-k)\left(1-\frac{k}{2}\right)$

attempt to expand and equate to $\frac{5}{9}$ *(M1)*

$1-k-\frac{k}{2}+\frac{k^2}{2}=\frac{5}{9}$

$18-18k-9k+9k^2=10$ OR $\frac{k^2}{2}-\frac{3k}{2}+\frac{4}{9}=0$ OR $\frac{9k^2}{2}-\frac{27k}{2}+4=0$ ***A1***

$9k^2-27k+8=0$ ***AG***

(ii) ($k=\frac{1}{3}$ is the only valid solution as) $\frac{8}{3}>1$ ***R1***

[4 marks]

Total [6 marks]

Question 16

(a) evidence of understanding that there are now 3R and 2B **(M1)**

$p = \frac{3}{5},\ q = \frac{2}{5}$ **A1**

[2 marks]

(b) attempt to add two products **(M1)**

P(same) = P(RR or BB) = $\frac{3}{4} \times \frac{4}{5} + \frac{1}{4} \times \frac{2}{5}$ **A1**

$= \frac{14}{20}$

$= \frac{7}{10}$ **AG**

[2 marks]

(c) attempt to use conditional probability formula in context **(M1)**

$\text{P(RR|same)} = \frac{\text{P(RR)}}{\text{P(same)}}$

Note: Award ***M0*** if candidate only writes $\text{P}(A|B)$ formula and nothing else.

$= \frac{\left(\frac{12}{20}\right)}{\left(\frac{14}{20}\right)}$ **(A1)**

$= \frac{12}{14}\left(= \frac{6}{7}\right)$ **A1**

[3 marks]

(d) $a=\frac{6}{20}\left(=\frac{3}{10}\right),\ b=\frac{12}{20}\left(=\frac{6}{10}\right)$ ***A1A1***

[2 marks]

(e) attempt to use the formula for $\mathrm{E}(X)$ ***(M1)***

$\mathrm{E}(X)=0\times\frac{1}{10}+1\times\frac{6}{20}+2\times\frac{12}{20}$

$=\frac{30}{20}\left(=\frac{3}{2}\right)$ ***A1***

[2 marks]

(f) $\frac{1}{6}$ ***A1***

[1 mark]

(g) **METHOD 1**

$\mathrm{P}(n-1\text{ reds })=\frac{3}{4}\times\frac{4}{5}\times\ldots\times\frac{n+1}{n+2}\ \left(=\frac{3}{n+2}\right)$ ***(A1)***

$\mathrm{P}(\text{next one blue})=\frac{1}{n+3}$ ***(A1)***

$\mathrm{P}(n-1\text{ reds then 1 blue})=\mathrm{P}(n-1\text{ reds})\times\mathrm{P}(\text{next one blue})$ ***(M1)***

$\frac{3}{n+2}\times\frac{1}{n+3}=\frac{3}{56}$ ***(A1)***

$(n+2)(n+3)=56$

$n=5$ ***A1***

e: If no working shown, award ***M1A0A0A0A1*** for $n=5$.

METHOD 2

Let X be the number of selections in total made when first blue picked

attempt to establish pattern for $X = 1, 2, 3, \ldots$ with at least 3 cases **(M1)**

$\mathrm{P}(X=1)=\frac{1}{4}$ and $\mathrm{P}(\text{second pick})=\frac{3}{4}\times\frac{1}{5}$ **(A1)**

$\mathrm{P}(X=3)\left(=\frac{3}{4}\times\frac{4}{5}\times\frac{1}{6}\right)=\frac{3}{5}\times\frac{1}{6}$ **(A1)**

$\mathrm{P}(X=5)=\frac{3}{7}\times\frac{1}{8}\left(=\frac{3}{56}\right)$ **(A1)**

so $n=5$ **A1**

METHOD 3

$\mathrm{P}(\text{next one blue})=\frac{1}{n+3}$ **(A1)**

recognising $\mathrm{P}(n-1\text{ R then 1B})=\mathrm{P}(n-1\text{ R})\times\mathrm{P}(\text{next one B})$ OR $\frac{3}{4}\times\frac{4}{5}\times\ldots\times\frac{1}{n+3}$ **(M1)**

$\frac{3}{4}\times\frac{4}{5}\times\frac{5}{6}\times\frac{6}{7}\times\frac{1}{8}\left(=\frac{3}{56}\right)$ **(A1)(A1)**

Note: Award ***A1*** for $\frac{3}{4}\times\frac{4}{5}\times\frac{5}{6}\times\frac{6}{7}$ (seen anywhere) and ***A1*** for $\times\frac{1}{8}$.

so $n=5$ **A1**

[5 marks]

Total [17 marks]

Question 17

(a) attempt to form equation for the sum of frequencies=16 or mean=3 ***(M1)***

$p+q+4+2+3=16(\Rightarrow p+q=7)$ ***A1***

$\frac{p+2q+12+8+18}{16}=3(\Rightarrow p+2q=10)$ OR $\frac{p+2q+12+8+18}{9+p+q}=3(\Rightarrow 2p+q=11)$ ***A1***

attempt to eliminate one variable from their equations ***(M1)***

$p+2(7-p)+38=48$ OR $2(7-q)+q=11$

$p=4$ and $q=3$ ***A1***

Note: Award ***M1A0A0M0A1*** for $p=4, q=3$ with no working.

[5 marks]

(b) mean final score $=30$ ***A1***

[1 mark]

Total [6 marks]

Question 18

(a) use of $\mathrm{P}(A\cup B)=\mathrm{P}(A)+\mathrm{P}(B)-\mathrm{P}(A\cap B)$ ***(M1)***

$\mathrm{P}(A\cap B)=0.65+0.45-0.85$ (or equivalent) ***(A1)***

$=0.25$ ***A1***

[3 marks]

(b) $\mathrm{P}(A'\cap B')=0.15$ (may be seen in Venn diagram) ***(A1)***

attempt to substitute their values into $\mathrm{P}(A'|B')=\frac{\mathrm{P}(A'\cap B')}{\mathrm{P}(B')}$ ***(M1)***

$=\frac{15}{55}\left(=\frac{3}{11}\right)$ ***A1***

[3 marks]

Total [6 marks]

Question 19

(a) (i) 22 ***A1***

(ii) 20 ***A1***

(iii) 30 ***A1***

[3 marks]

(b) $Q_1 = 26$ and $Q_3 = 38$ ***(A1)***

attempt to subtract their upper and lower quartiles ***(M1)***

Note: Award ***M1*** only for correct values, or for values clearly indicated as candidate's Q1 and Q3.

$38 - 26$

$\text{IQR} = 12$ ***A1***

[3 marks]

[Total: 6 marks]

Question 20

(a) use of $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ ***(M1)***

$P(A \cap B) = 0.45 + 0.65 - 0.8$ (or equivalent) ***(A1)***

$= 0.3$ ***A1***

[3 marks]

(b) $P(A' \cap B') = 0.2$ (may be seen in Venn diagram) ***(A1)***

attempt to substitute their values into $P(A' | B') = \dfrac{P(A' \cap B')}{P(B')}$ ***(M1)***

$P(A' | B') = \dfrac{0.2}{0.35}$

$= \dfrac{20}{35} \left(= \dfrac{4}{7} \right)$ ***A1***

[3 marks]

Total [6 marks]

Question 21

(a) (i) 27 ***A1***

(ii) 30 ***A1***

(iii) 35 ***A1***

[3 marks]

(b) $Q_1 = 31$ and $Q_3 = 46$ ***(A1)***

attempt to subtract their upper and lower quartiles ***(M1)***

Note: Award ***M1*** only for correct values, or for values clearly indicated as candidate's Q_1 and Q_3.

$46 - 31$

$\text{IQR} = 15$ ***A1***

[3 marks]

[Total: 6 marks]