Probability 3 Answers

1) (a) (i) correct calculation *(A1)*

e.g. $\frac{9}{20}+\frac{5}{20}-\frac{2}{20}$, $\frac{4+2+3+3}{20}$

$\text{P}(\text{male or tennis})=\frac{12}{20}\ \left(=\frac{3}{5}\right)$ ***A1*** ***N2***

(ii) correct calculation *(A1)*

e.g. $\frac{6}{20}\div\frac{11}{20}$, $\frac{3+3}{11}$

$\text{P}(\text{not football}\mid\text{female})=\frac{6}{11}$ ***A1*** ***N2***

(b) $\text{P}(\text{first not football})=\frac{11}{20}$, $\text{P}(\text{second not football})=\frac{10}{19}$ ***A1***

$\text{P}(\text{neither football})=\frac{11}{20}\times\frac{10}{19}$ ***A1***

$\text{P}(\text{neither football})=\frac{110}{380}\ \left(=\frac{11}{38}\right)$ ***A1*** ***N1***

[7 marks]

2) (a) $\text{P}(A)=\frac{1}{11}$ ***A1*** ***N1***

(b) $\text{P}(B|A)=\frac{2}{10}$ ***A2*** ***N2***

(c) recognising that $\text{P}(A\cap B)=\text{P}(A)\times\text{P}(B|A)$ *(M1)*

correct values *(A1)*

e.g. $\text{P}(A\cap B)=\frac{1}{11}\times\frac{2}{10}$

$\text{P}(A\cap B)=\frac{2}{110}$ ***A1*** ***N3***

[6 marks]

Probability 3 Answers

3) (a) (i) evidence of substituting into $n(A \cup B) = n(A) + n(B) - n(A \cap B)$ ***(M1)***
$e.g.$ $75 + 55 - 100$, Venn diagram

30 ***A1*** ***N2***

(ii) 45 ***A1*** ***N1***
[3 marks]

(b) (i) **METHOD 1**

evidence of using complement, Venn diagram ***(M1)***
$e.g.$ $1 - p$, $100 - 30$

$\frac{70}{100} \left(= \frac{7}{10}\right)$ ***A1*** ***N2***

METHOD 2

attempt to find P(only one sport), Venn diagram ***(M1)***
$e.g.$ $\frac{25}{100} + \frac{45}{100}$

$\frac{70}{100} \left(= \frac{7}{10}\right)$ ***A1*** ***N2***

(ii) $\frac{45}{70} \left(= \frac{9}{14}\right)$ ***A2*** ***N2***

[4 marks]

(c) valid reason in words or symbols ***(R1)***
$e.g.$ $\mathrm{P}(A \cap B) = 0$ if mutually exclusive, $\mathrm{P}(A \cap B) \neq 0$ if not mutually exclusive

correct statement in words or symbols ***A1*** ***N2***
$e.g.$ $\mathrm{P}(A \cap B) = 0.3$, $\mathrm{P}(A \cup B) \neq \mathrm{P}(A) + \mathrm{P}(B)$, $\mathrm{P}(A) + \mathrm{P}(B) > 1$, some students play both sports, sets intersect

[2 marks]

(d) valid reason for independence ***(R1)***
$e.g.$ $\mathrm{P}(A \cap B) = \mathrm{P}(A) \times \mathrm{P}(B)$, $\mathrm{P}(B \mid A) = \mathrm{P}(B)$

correct substitution ***A1A1*** ***N3***
$e.g.$ $\frac{30}{100} \neq \frac{75}{100} \times \frac{55}{100}$, $\frac{30}{55} \neq \frac{75}{100}$

[3 marks]

Total [12 marks]

4) (a) (i) $p = 0.2$ *A1* *N1*

(ii) $q = 0.4$ *A1* *N1*

(iii) $r = 0.1$ *A1* *N1*

(b) $\mathrm{P}(A \mid B') = \frac{2}{3}$ *A2* *N2*

Note: Award ***A1*** for an unfinished answer such as $\frac{0.2}{0.3}$.

(c) valid reason *R1*

$e.g.\ \frac{2}{3} \neq 0.5,\ 0.35 \neq 0.3$

thus, A and B are not independent *AG* *N0*

[6 marks]

5) (a) (i) $\frac{7}{24}$ *A1* *N1*

(ii) evidence of **multiplying** along the branches *(M1)*

$e.g.\ \frac{2}{3} \times \frac{5}{8},\ \frac{1}{3} \times \frac{7}{8}$

adding probabilities of two mutually exclusive paths *(M1)*

$e.g.\ \left(\frac{1}{3} \times \frac{7}{8}\right) + \left(\frac{2}{3} \times \frac{3}{8}\right),\ \left(\frac{1}{3} \times \frac{1}{8}\right) + \left(\frac{2}{3} \times \frac{5}{8}\right)$

$\mathrm{P}(F) = \frac{13}{24}$ *A1* *N2*

[4 marks]

(b) (i) $\frac{1}{3} \times \frac{1}{8}$ *(A1)*

$\frac{1}{24}$ *A1*

(ii) recognizing this is $\mathrm{P}(E/F)$ *(M1)*

$e.g.\ \frac{7}{24} \div \frac{13}{24}$

$\frac{168}{312}\ \left(= \frac{7}{13}\right)$ *A2* *N3*

[5 marks]

6)

(a) $p = \frac{4}{5}$ *A1* *N1*

(b) multiplying along the branches *(M1)*

e.g. $\frac{1}{5} \times \frac{1}{4}$, $\frac{12}{40}$

adding products of probabilities of two mutually exclusive paths *(M1)*

e.g. $\frac{1}{5} \times \frac{1}{4} + \frac{4}{5} \times \frac{3}{8}$, $\frac{1}{20} + \frac{12}{40}$

$\mathrm{P}(B) = \frac{14}{40} \left(= \frac{7}{20} \right)$ *A1* *N2*

(c) appropriate approach which must include A' (may be seen on diagram) *(M1)*

e.g. $\frac{\mathrm{P}(A' \cap B)}{\mathrm{P}(B)}$ $\left(\text{do not accept } \frac{\mathrm{P}(A \cap B)}{\mathrm{P}(B)} \right)$

$\mathrm{P}(A' | B) = \frac{\frac{4}{5} \times \frac{3}{8}}{\frac{7}{20}}$ *(A1)*

$\mathrm{P}(A' | B) = \frac{12}{14} \left(= \frac{6}{7} \right)$ *A1* *N2*

[7 marks]