Probability Worksheet

0 min
0 marks

1. (a) Independent (I) (C2)

(b) Mutually exclusive (M) (C2)

(c) Neither (N) (C2)

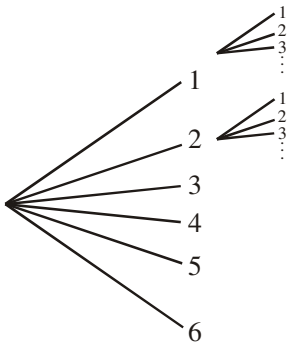
Note: *Award part marks if the candidate shows understanding of I and/or M*

eg I $P(A \cap B) = P(A)P(B)$ *(M1)*

M $P(A \cup B) = P(A) + P(B)$ *(M1)*

[6]

2. Sample space ={(1, 1), (1, 2) ... (6, 5), (6, 6)}
(This may be indicated in other ways, for example, a grid or a tree diagram, partly or fully completed)



(a) $P(S < 8) = \frac{6+5+4+3+2+1}{36}$ (M1)

$= \frac{7}{12}$ (A1)

OR

$P(S < 8) = \frac{7}{12}$ (A2)

(b) $P(\text{at least one 3}) = \frac{1+1+6+1+1+1}{36}$ (M1)

$= \frac{11}{36}$ (A1)

OR

$P(\text{at least one 3}) = \frac{11}{36}$ (A2)

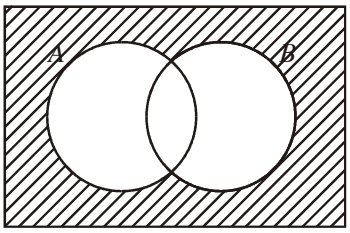
(c) $P(\text{at least one 3} \mid S < 8) = \frac{P(\text{at least one 3} \cap S < 8)}{P(S < 8)}$ (M1)

$= \frac{7/36}{7/12}$ (A1)

$= \frac{1}{3}$ (A1)

[7]

3. (a)



(A1) (C1)

(b) (i) $n(A \cap B) = 2$ (A1) (C1)

(ii) $P(A \cap B) = \frac{2}{36}\left(\text{or}\frac{1}{18}\right)$ (allow **ft** from (b)(i)) (A1) (C1)

(c) $n(A \cap B) \neq 0$ (or equivalent) (R1) (C1)

[4]

4. P(different colours) = 1 – [P(GG) + P(RR) + P(WW)] (M1)

$= 1 - \left(\frac{10}{6}\times\frac{9}{25}+\frac{10}{26}\times\frac{9}{25}+\frac{6}{26}\times\frac{5}{25}\right)$ (A1)

$= 1 - \left(\frac{210}{650}\right)$ (A1)

$= \frac{44}{65}$ (= 0.677, to 3 sf) (A1) (C4)

OR

P(different colours) = P(GR) + P(RG) + P(GW) + P(WG) + P(RW) + P(WR) (A1)

$= 4\left(\frac{10}{26}\times\frac{6}{25}\right)+2\left(\frac{10}{26}\times\frac{10}{25}\right)$ (A1)(A1)

$= \frac{44}{65}$ (= 0.677, to 3 sf) (A1) (C4)

[4]

5. (a)

	Males	Females	Totals
Unemployed	**20**	**40**	**60**
Employed	**90**	**50**	**140**
Totals	**110**	**90**	200

Note: *Award (A1) if at least 4 entries are correct.*
Award (A2) if all 8 entries are correct.

(b) (i) $P(\text{unemployed female}) = \frac{40}{200} = \frac{1}{5}$ (A1)

(ii) $P(\text{male I employed person}) = \frac{90}{140} = \frac{9}{14}$ (A1)

[4]

6. $P(RR) = \frac{7}{12} \times \frac{6}{11} \left(= \frac{7}{22} \right)$ (M1)(A1)

$P(YY) = \frac{5}{12} \times \frac{4}{11} \left(= \frac{5}{33} \right)$ (M1)(A1)

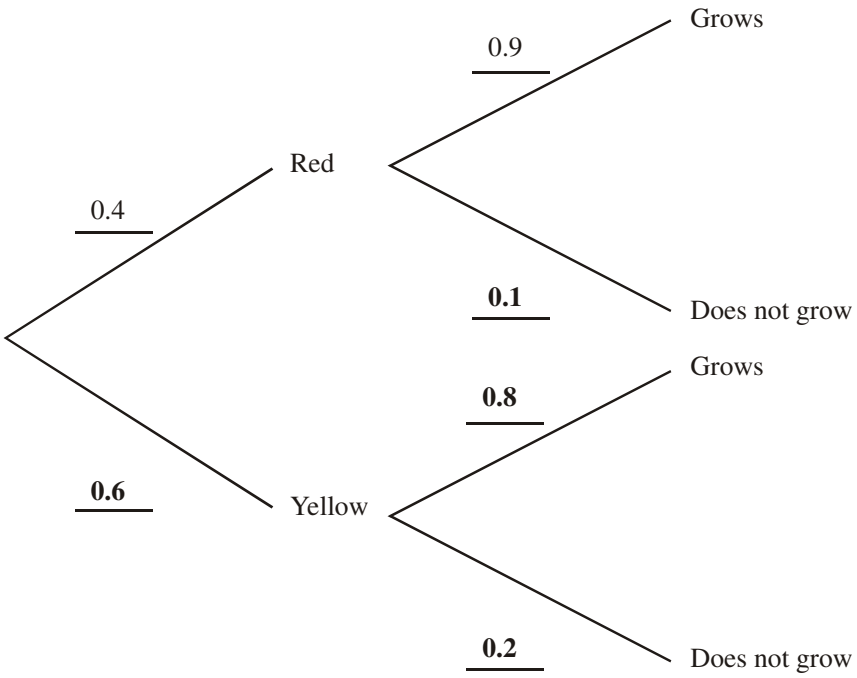
P (same colour) = P(RR) + P(YY) (M1)

$= \frac{31}{66}$ (= 0.470, 3 sf) (A1) (C6)

Note: *Award C2 for* $\left(\frac{7}{12}\right)^2 + \left(\frac{5}{12}\right)^2 = \frac{74}{144}$.

[6]

7. (a)



(A3) (N3) 3

(b) (i) 0.4×0.9 (A1)

$= 0.36$(A1) (N2)

(ii) $0.36 + 0.6 \times 0.8 \quad (= 0.36 + 0.48)$ (A1)

$= 0.84$(A1) (N1)

(iii) $\dfrac{P(\text{red} \cap \text{grows})}{P(\text{grows})}$ (may be implied) (M1)

$= \dfrac{0.36}{0.84}$ (A1)

$= 0.429 \left(\dfrac{3}{7}\right)$

(A1) (N2) 7

[10]

8. (a) $\dfrac{3}{4}$ A1 N1

(b) $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ (M1)

$P(A \cap B) = P(A) + P(B) - P(A \cup B)$

$= \frac{2}{5} + \frac{3}{4} - \frac{7}{8}$ A1

$= \frac{11}{40}$ (0.275) A1 N2

(c) $P(A \mid B) = \frac{P(A \cap B)}{P(B)} \left(= \frac{\frac{11}{40}}{\frac{3}{4}} \right)$ A1

$= \frac{11}{30}$ (0.367) A1 N1

[6]

9. (a) $\frac{19}{120}$ $(=0.158)$ A1 N1

(b) $35 - (8 + 5 + 7)(= 15)$ (M1)

Probability = $\frac{15}{120} \left(= \frac{3}{24} = \frac{1}{8} = 0.125 \right)$ A1 N2

(c) Number studying = 76 (A1)

Number not studying = 120 − number studying = 44 (M1)

Probability = $\frac{44}{120} \left(= \frac{11}{30} = 0.367 \right)$ A1 N3

[6]

10. (a) $P(F \cup S) = 1 - 0.14 \ (= 0.86)$ (A1)

Choosing an appropriate formula (M1)

eg $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

Correct substitution

eg $P(F \cap S) = 0.93 - 0.86$ A1

$P(F \cap S) = 0.07$ AG N0

Notes: *There are several valid approaches. Award (A1)(M1)A1 for relevant working using any appropriate strategy eg formula, Venn Diagram, or table.*

Award no marks for the incorrect solution

$P(F \cap S) = 1 - P(F) + P(S) = 1 - 0.93 = 0.07$

(b) Using conditional probability (M1)

eg $P(F \mid S) \left(= \frac{P(F \cap S)}{P(S)} \right)$

$P(F \mid S) = \frac{0.07}{0.62}$ (A1)

$= 0.113$ A1 N3

(c) F and S are **not** independent A1 N1

EITHER

If independent $P(F \mid S) = P(F)$, $0.113 \neq 0.31$ R1R1 N2

OR

If independent $P(F \cap S) = P(F)\,P(S)$, $0.07 \neq 0.31 \times 0.62 \ (= 0.1922)$ R1R1 N2

(d) Let $P(F) = x$

$P(S) = 2P(F) \ (= 2x)$ (A1)

For independence $P(F \cap S) = P(F)P(S) \ (= 2x^2)$ (R1)

Attempt to set up a quadratic equation (M1)

eg $P(F \cup S) = P(F)P(S) - P(F)P(S)$, $0.86 = x + 2x - 2x^2$

$2x^2 - 3x + 0.86 = 0$ A2

$x = 0.386$, $x = 1.11$ (A1)

$P(F) = 0.386$ (A1) N5

[16]