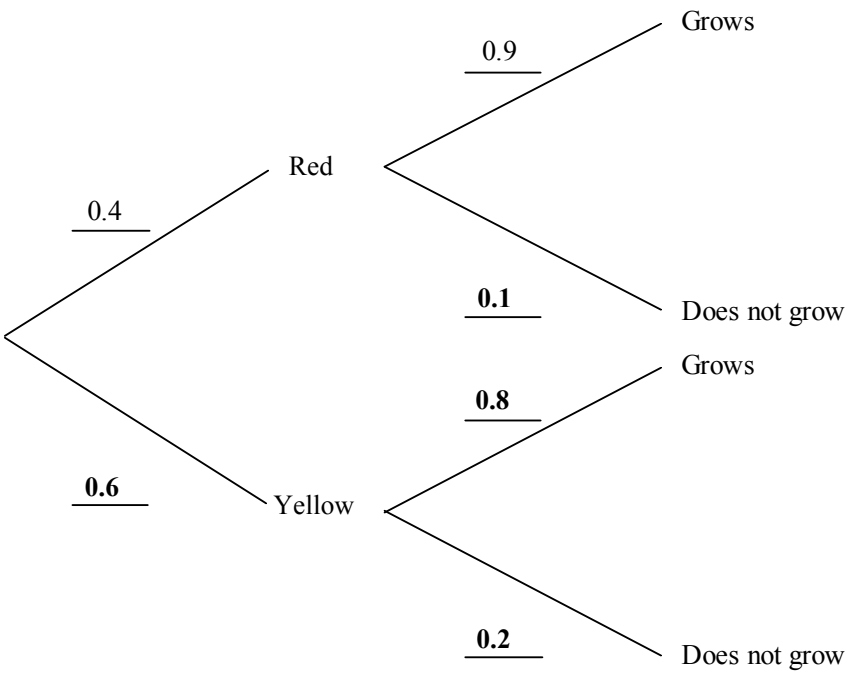
Probability 2 Answers

1) (a)



(A3) ***(N3)***

[3 marks]

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

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

$= 0.429 \left(\dfrac{3}{7}\right)$ ***(A1)*** ***(N2)***

[7 marks]

Total [10 marks]

2) Total number of possible outcomes = 36 (may be seen anywhere) ***(A1)***

(a) $\mathrm{P}(E) = \mathrm{P}(1,1) + \mathrm{P}(2,2) + \mathrm{P}(3,3) + \mathrm{P}(4,4) + \mathrm{P}(5,5) + \mathrm{P}(6,6)$

$= \dfrac{6}{36}$ ***(A1)*** ***(C2)***

(b) $\mathrm{P}(F) = \mathrm{P}(6,4) + \mathrm{P}(5,5) + \mathrm{P}(4,6)$

$= \dfrac{3}{36}$ ***(A1)*** ***(C1)***

(c) $\mathrm{P}(E \cup F) = \mathrm{P}(E) + \mathrm{P}(F) - \mathrm{P}(E \cap F)$

$\mathrm{P}(E \cap F) = \dfrac{1}{36}$ ***(A1)***

$\mathrm{P}(E \cup F) = \dfrac{6}{36} + \dfrac{3}{36} - \dfrac{1}{36} \quad \left(= \dfrac{8}{36} = \dfrac{2}{9}, 0.222\right)$ ***(M1)(A1)*** ***(C3)***

3)

Correct probabilities $\left(\frac{13}{24}\right), \left(\frac{12}{23}\right), \left(\frac{11}{22}\right), \left(\frac{10}{21}\right)$ ***(A1)(A1)(A1)(A1)***

Multiplying $\left(\frac{13}{24} \times \frac{12}{23} \times \frac{11}{22} \times \frac{10}{21}\right)$ ***(M1)***

$\mathrm{P}(4 \text{ girls}) = \frac{17\,160}{255\,024} \left(= \frac{65}{966} = 0.0673\right)$ ***(A1)*** ***(C6)***

4)

(a) Independent $\Rightarrow \mathrm{P}(A \cap B) = \mathrm{P}(A) \times \mathrm{P}(B) \quad (= 0.3 \times 0.8)$ ***(M1)***

$= 0.24$ ***A1*** ***N2***

(b) $\mathrm{P}(A \cup B) = \mathrm{P}(A) + \mathrm{P}(B) - \mathrm{P}(A \cap B) \quad (= 0.3 + 0.8 - 0.24)$ ***M1***

$= 0.86$ ***A1*** ***N1***

(c) No, **with** valid reason ***A2*** ***N2***

e.g. $\mathrm{P}(A \cap B) \neq 0$ or $\mathrm{P}(A \cup B) \neq \mathrm{P}(A) + \mathrm{P}(B)$ or correct numerical equivalent

5)

(a) $\mathrm{P}(P|C) = \frac{20}{20+40}$ ***A1***

$= \frac{1}{3}$ ***A1*** ***N1***

(b) $\mathrm{P}(P|C') = \frac{30}{30+60}$ ***A1***

$= \frac{1}{3}$ ***A1*** ***N1***

(c) Investigating conditions, or some relevant calculations ***(M1)***

P is independent of C, **with** valid reason ***A1*** ***N2***

e.g. $\mathrm{P}(P|C) = \mathrm{P}(P|C')$, $\mathrm{P}(P|C) = \mathrm{P}(P)$,

$\frac{20}{150} = \frac{50}{150} \times \frac{60}{150}$ $\left(i.e.\ \mathrm{P}(P \cap C) = \mathrm{P}(P) \times \mathrm{P}(C)\right)$

6)

(a) For attempting to use the formula $(\mathrm{P}(E \cap F) = \mathrm{P}(E)\,\mathrm{P}(F))$ ***(M1)***

Correct substitution or rearranging the formula ***A1***

e.g. $\frac{1}{3} = \frac{2}{3}\,\mathrm{P}(F)$, $\mathrm{P}(F) = \frac{\mathrm{P}(E \cap F)}{\mathrm{P}(E)}$, $\mathrm{P}(F) = \frac{\frac{1}{3}}{\frac{2}{3}}$

$\mathrm{P}(F) = \frac{1}{2}$ ***A1*** ***N2***

(b) For attempting to use the formula $\left(\mathrm{P}(E \cup F) = \mathrm{P}(E) + \mathrm{P}(F) - \mathrm{P}(E \cap F)\right)$ ***(M1)***

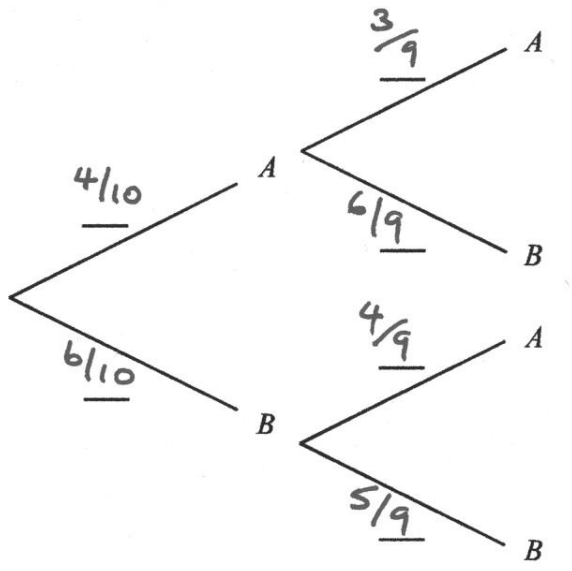
$\mathrm{P}(E \cup F) = \frac{2}{3} + \frac{1}{2} - \frac{1}{3}$ ***A1***

$= \frac{5}{6}$ $(= 0.833)$ ***A1*** ***N2***

Probability 2 Answers

7)	(a)	$\frac{3}{4}$	***A1***	***N1***
	(b)	$\mathrm{P}(A \cup B) = \mathrm{P}(A) + \mathrm{P}(B) - \mathrm{P}(A \cap B)$	***(M1)***	
		$\mathrm{P}(A \cap B) = \mathrm{P}(A) + \mathrm{P}(B) - \mathrm{P}(A \cup B)$		
		$= \frac{2}{5} + \frac{3}{4} - \frac{7}{8}$	***A1***	
		$= \frac{11}{40} \quad (0.275)$	***A1***	***N2***
	(c)	$\mathrm{P}(A \mid B) = \frac{\mathrm{P}(A \cap B)}{\mathrm{P}(B)} \quad \left(= \frac{\frac{11}{40}}{\frac{3}{4}} \right)$	***A1***	
		$= \frac{11}{30} \quad (0.367)$	***A1***	***N1***
8)	(a)	$\frac{46}{97} \quad (= 0.474)$	***A1A1***	***N2***
	(b)	$\frac{13}{51} \quad (= 0.255)$	***A1A1***	***N2***
	(c)	$\frac{59}{97} \quad (= 0.608)$	***A2***	***N2***
9)	(a)	$\frac{19}{120} \quad (= 0.158)$	***A1***	***N1***
	(b)	$35 - (8 + 5 + 7) \quad (= 15)$	***(M1)***	
		Probability $= \frac{15}{120} \quad \left(= \frac{3}{24} = \frac{1}{8} = 0.125 \right)$	***A1***	***N2***
	(c)	Number studying $= 76$	***(A1)***	
		Number not studying $= 120 -$ number studying $= 44$	***(M1)***	
		Probability $= \frac{44}{120} \quad \left(= \frac{11}{30} = 0.367 \right)$	***A1***	***N3***

10) (a)



A1A1A1 ***N3***

(b) $\left(\frac{4}{10}\times\frac{6}{9}\right)+\left(\frac{6}{10}\times\frac{4}{9}\right)$ ***M1M1***

$=\frac{48}{90}$ $\left(\frac{8}{15}, 0.533\right)$ ***A1*** ***N1***