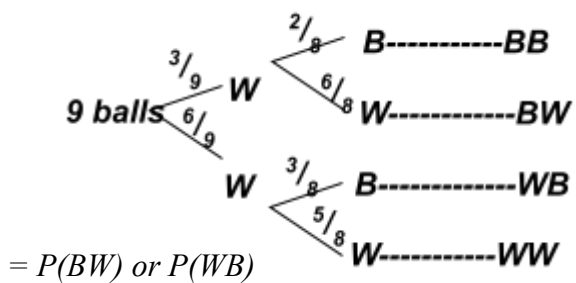


2. Probability

|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                     |  |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|--|
| 1  | <div> <div> <math>P(R)=\frac{1}{8}</math> and <math>P(H)=\frac{3}{7}</math> </div> <div>a)</div> </div> <div> <math>\therefore \frac{1}{8} \times \frac{3}{7} = \frac{3}{56}</math> </div> <div> <div> <div>b)</div> <div> <math>P(RH')</math> or <math>P(R'H)</math> or <math>P(RH)</math> </div> </div> <div> <math>\left(\frac{1}{8} \times \frac{4}{7}\right) + \left(\frac{7}{8} \times \frac{3}{7}\right) + \frac{3}{56}</math> </div> <div> <math>\frac{4}{56} + \frac{21}{56} + \frac{3}{56}</math> </div> <div> <math>= \frac{28}{56} or \frac{1}{2} or 0.5</math> </div> </div> | <div>B<sub>1</sub></div> <div>M<sub>1</sub></div> <div>M<sub>1</sub></div> <div>A<sub>1</sub></div> |  |
|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 4                                                                                                   |  |
| 2. | <div> </div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | B2                                                                                                  |  |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                 |  |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|--|
|  | <p>(b) (i) <math>(\frac{1}{2} \times \frac{7}{10} \times \frac{2}{3}) + (\frac{1}{2} \times \frac{3}{10} \times \frac{2}{9}) + (\frac{1}{2} \times \frac{4}{9} \times \frac{1}{2}) + \frac{1}{2} \times \frac{1}{2} \times \frac{4}{9}) = \frac{22}{45}</math></p> <p>(ii) <math>1 - \frac{22}{45} = \frac{23}{45}</math></p> <p>(iii) <math>(\frac{1}{2} \times \frac{7}{10} \times \frac{1}{3}) + (\frac{1}{2} \times \frac{3}{10} \times \frac{7}{10}) + (\frac{1}{2} \times \frac{1}{2} \times \frac{5}{9}) + (\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}) = \frac{7}{60} + \frac{7}{60} + \frac{5}{36} + \frac{5}{36} = \frac{23}{45}</math></p> <p>(iv) <math>1 - \frac{23}{45} = \frac{22}{45}</math></p> | <p>U1</p> <p>A1</p> <p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p> <p>B1</p> <p>A1</p> |  |
|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 10                                                                              |  |

1. (a) (i) Total balls = 3 + 6 = 9



$$\begin{aligned}
 &= \left[ \begin{array}{c} 4 \\ 3 \end{array} \right] + \left[ \begin{array}{c} 4 \\ 3 \end{array} \right] \\
 &= \frac{18}{72} + \frac{18}{72} = \frac{36}{72} \\
 &= \frac{1}{2}
 \end{aligned}$$

$$(ii) = P(BW) \text{ or } P(WB)$$

$$\begin{aligned}
 &= \left[ \begin{array}{c} 4 \\ 3 \end{array} \right] + \left[ \begin{array}{c} 4 \\ 3 \end{array} \right] \\
 &= \frac{18}{81} + \frac{18}{81} \\
 &= \frac{36}{81} = \frac{4}{9}
 \end{aligned}$$

$$\begin{aligned}
 (b) (i) P(WW) &= \frac{6}{9} \times \frac{5}{8} \\
 &= \frac{30}{72} = \frac{5}{12}
 \end{aligned}$$

$$\begin{aligned}
 (ii) P(WW) &= \frac{6}{9} \times \frac{6}{9} \\
 &= \frac{4}{9}
 \end{aligned}$$

$$\begin{aligned}
 2. \quad P(W) &= \frac{7}{12} \quad P(B) = \frac{5}{12} \\
 &\text{(2 white and one brown)} \\
 &= (WWB \text{ or } WBW \text{ or } BWW) \\
 &= \left( \frac{7}{12} \times \frac{6}{11} \times \frac{5}{10} \right) + \left( \frac{7}{12} \times \frac{5}{11} \times \frac{6}{10} \right) + \left( \frac{7}{12} \times \frac{7}{11} \times \frac{6}{10} \right) \\
 &= \frac{22}{44}
 \end{aligned}$$

$$\begin{aligned}
 (ii) P(BBW \text{ or } BWB \text{ or } WBB) \\
 &= \left( \frac{5}{12} \times \frac{4}{11} \times \frac{7}{10} \right) + \left( \frac{5}{12} \times \frac{7}{11} \times \frac{4}{10} \right) + \left( \frac{7}{12} \times \frac{5}{11} \times \frac{4}{10} \right) \\
 &= \frac{7}{22}
 \end{aligned}$$

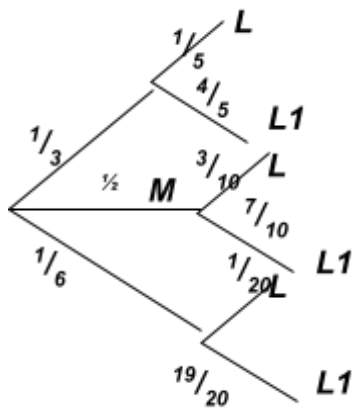
$$\begin{aligned}
 (iii) P(\text{at least one white cup}) \\
 &= (1 - P(BBB)) = 1 - \left( \frac{5}{12} \times \frac{4}{11} \times \frac{3}{10} \right) \\
 &= \frac{21}{22}
 \end{aligned}$$

$$\begin{aligned}
 (iv) P(\text{same colour}) &= P(BBB \text{ or } WWW) \\
 &= \left( \frac{7}{12} \times \frac{6}{11} \times \frac{5}{10} \right) + \left( \frac{5}{12} \times \frac{4}{11} \times \frac{3}{10} \right) \\
 &= \frac{9}{44}
 \end{aligned}$$

$$\begin{array}{r}
 3. a) \quad \begin{array}{cccc}
 2 & 3 & 5 & 7 \\
 \hline
 2 & 32 & 52 & 72 \\
 \hline
 3 & 23 & 53 & 73 \\
 \hline
 5 & 25 & 35 & 75 \\
 \hline
 7 & 27 & 37 & 57
 \end{array}
 \end{array}$$

$$\begin{aligned}
 b) P(E) &= \frac{4}{16} \\
 &= \frac{1}{4}
 \end{aligned}$$

4.

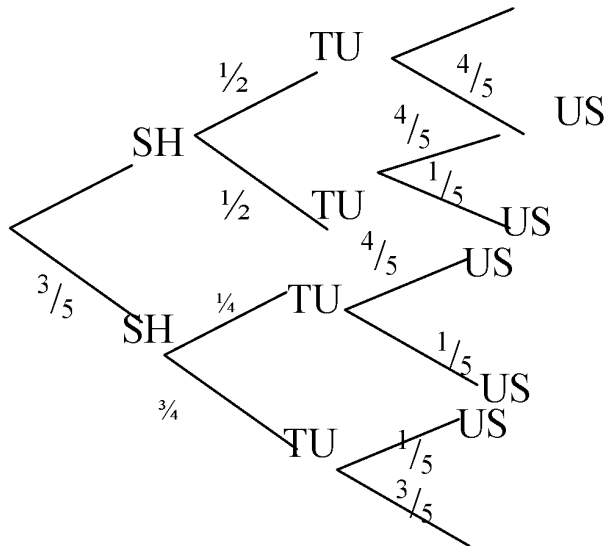


$$\begin{aligned}
 (a) P(\text{late}) &= \left(\frac{1}{3} \times \frac{1}{5}\right) + \left(\frac{1}{2} \times \frac{3}{10}\right) + \left(\frac{1}{6} \times \frac{1}{20}\right) \\
 &= \frac{1}{15} + \frac{3}{20} + \frac{1}{120} \\
 &= \frac{9}{40}
 \end{aligned}$$

$$\begin{aligned}
 (b) P &= \frac{1}{3} \times \frac{1}{5} + \left(\frac{1}{6} \times \frac{1}{20}\right) \\
 &= \frac{1}{15} + \frac{1}{120} \\
 &= \frac{3}{40}
 \end{aligned}$$

$$(c) P = (\text{not late}) = (1 - \frac{9}{40})$$

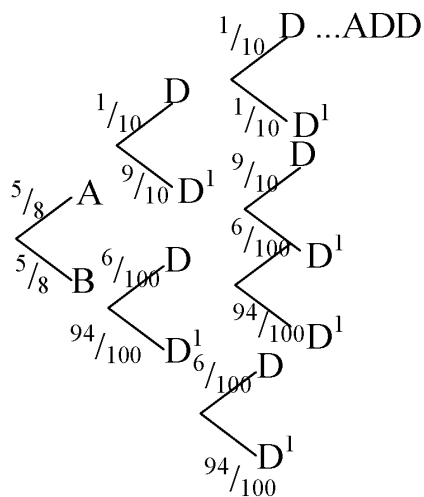
5. a)



$$\begin{aligned}
 b) \quad i) P(\text{all faults}) &= P(\text{SH and TU and US}) \\
 &= \frac{2}{5} \times \frac{1}{2} \times \frac{4}{5} = \frac{4}{25}
 \end{aligned}$$

$$ii) P(\text{exactly two}) = \frac{2}{5} \times \frac{1}{2} \times \frac{1}{5} + \frac{2}{5} \times \frac{1}{2} \times \frac{1}{5} + \frac{3}{5} \times \frac{3}{4} \times \frac{1}{5}$$

6.



Both defective

$$= \underline{3} \times \underline{1} \times \underline{1} + \underline{5} \times \underline{6} \times \underline{6}$$

$$8 \quad 10 \quad 10 \quad 8 \quad 100 \quad 100$$

$$= \underline{3} + \frac{180}{80000}$$

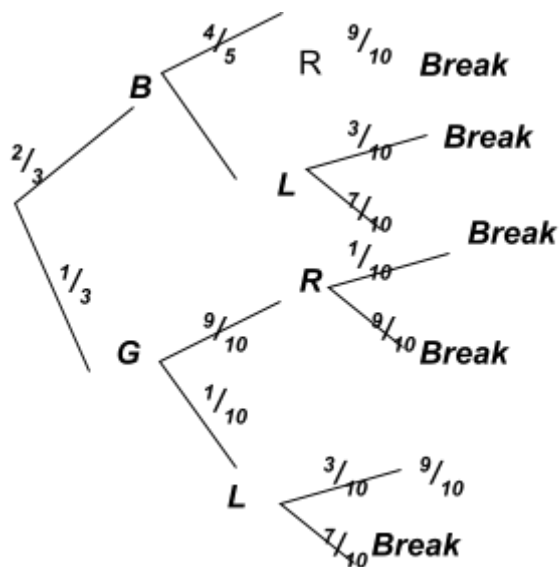
$$= \underline{24}$$

$$4000$$

$$= \underline{3}$$

$$500$$

7. a)



$$b) i) P(BL \text{ or } GL) = \frac{2}{3} X \frac{1}{10} + \frac{1}{3} X \frac{1}{10}$$

$$= \frac{2}{15} + \frac{1}{30} = \frac{5}{30}$$

$$ii) P(BL \text{ break or } GR \text{ break})$$

$$= \frac{2}{3} X \frac{1}{5} X \frac{3}{10} + \frac{1}{3} X \frac{1}{10} X \frac{3}{10}$$

$$= \frac{2}{50} + \frac{1}{100} = \frac{4+1}{100} = \frac{5}{100}$$

$$iii) P(BR \text{ break or } GR \text{ break})$$

$$= \frac{2}{3} X \frac{4}{5} X \frac{1}{10} + \frac{1}{3} X \frac{9}{10} X \frac{1}{10}$$

$$= \frac{8}{150} + \frac{9}{300} = \frac{16+9}{300} = \frac{25}{300}$$

$$\text{iv) } 1 - \left( \frac{5}{100} + \frac{25}{300} \right) = 1 - \frac{15+25}{300} \\ = \frac{260}{300}$$

8.

|   |   |   |   |    |    |    |
|---|---|---|---|----|----|----|
|   | 1 | 2 | 3 | 4  | 5  | 6  |
| 1 | 2 | 3 | 4 | 5  | 6  | 7  |
| 2 | 3 | 4 | 5 | 6  | 7  | 8  |
| 3 | 4 | 5 | 6 | 7  | 8  | 9  |
| 4 | 5 | 6 | 7 | 8  | 9  | 10 |
| 5 | 6 | 7 | 8 | 9  | 10 | 11 |
| 6 | 7 | 8 | 9 | 10 | 11 | 12 |

$$P(\text{a two days outing}) = \frac{10}{36} = \frac{5}{18}$$

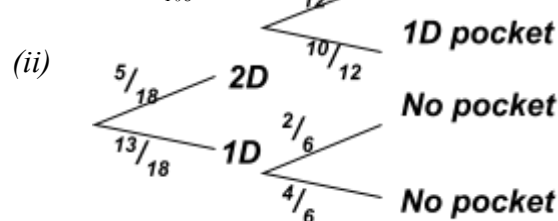
(b)      1      2      3      4      5      6  
           H    H1   H2   H3   H4   H5   H6  
           T    T1   T2   T3   T4   T5   T6

$P(\text{2 days and one day pocket money})$

$$= \frac{5}{18} \times \frac{10}{12}$$

$$= \frac{25}{108}$$

(c)      (i)  $\frac{5}{18} \times \frac{2}{12}$   
                        $= \frac{5}{108}$



$P(\text{get pocket money})$

$$= \frac{5}{18} \times \frac{2}{12} + \frac{5}{18} \times \frac{10}{12} + \frac{13}{18} \times \frac{2}{6}$$

9. (a) (i)  $P(WW) = \frac{4}{10} \times \frac{3}{9}$   
 $= \frac{2}{15}$

(ii)  $P(WW) \text{ or } (RR) = \frac{4}{10} \times \frac{3}{9} + \frac{6}{10} \times \frac{5}{9}$   
 $= \frac{2}{15} + \frac{1}{3} = \frac{7}{15}$

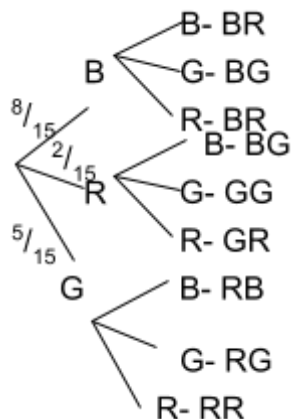
(iii)  $P(\text{at least Red}) = 1 - P(WW)$   
 $= 1 - \frac{2}{15}$   
 $= \frac{13}{15}$

(iv)  $P(WR) \text{ or } P(RW) = \frac{3}{5} \times \frac{4}{9} + \frac{2}{5} \times \frac{2}{3}$   
 $= \frac{8}{15}$

10. a) i)  $\frac{8}{15}$

ii)  $\frac{2}{15} + \frac{5}{15} = \frac{7}{15}$

b) i)



$$Gh = \frac{2}{15} \times \frac{1}{14} = \frac{2}{210} = \frac{1}{105}$$

ii) RG or RB

$$\frac{3}{21} + \frac{7}{45} = \frac{45 + 147}{945}$$

$$= \frac{192}{945}$$

(c)(i)

|   | $H$ | $T$ |
|---|-----|-----|
| 1 | 1H  | 1T  |
| 2 | 2H  | 2T  |
| 3 | 3H  | 3T  |
| 4 | 4H  | 4T  |
| 5 | 5H  | 5T  |
| 6 | 6H  | 6T  |

11. (a)

(b) (i) same colour  $= \frac{5}{9} \times \frac{4}{2} \times \frac{3}{7} + \frac{4}{9} \times \frac{3}{8} \times \frac{2}{7}$   
 $= \frac{5}{42} + \frac{1}{7}$   
 $= \frac{11}{42}$

(ii) more red balls  $= \frac{5}{89} \times \frac{1}{2} \times \frac{3}{7} + \frac{5}{9} \times \frac{1}{2} \times \frac{4}{7} + \frac{5}{9} \times \frac{1}{2} \times \frac{4}{7}$   
 $= \frac{5}{42} + \frac{10}{63} = \frac{10}{63}$   
 $= \frac{5}{42} + \frac{20}{63} = \frac{15 + 40}{126} = \frac{55}{126}$

(iii) at least black ball was picked

$$= 1 - \frac{5}{9} \times \frac{1}{2} \times \frac{3}{7}$$

$$= 1 - \frac{5}{21}$$

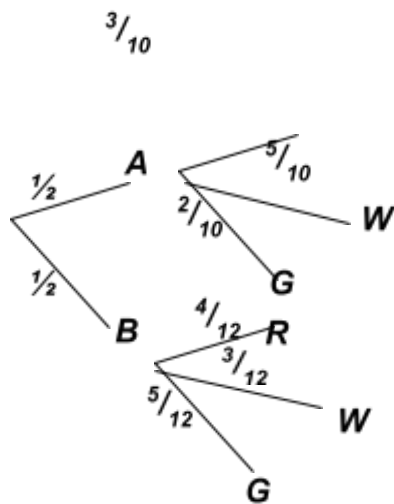
$$= \frac{16}{21}$$

(iv) Atmost 1 red ball picked

$$= \frac{5}{9} \times \frac{4}{2} \times \frac{3}{7} + \frac{4}{9} \times \frac{5}{8} \times \frac{3}{7} + \frac{4}{9} \times \frac{3}{8} \times \frac{2}{7}$$

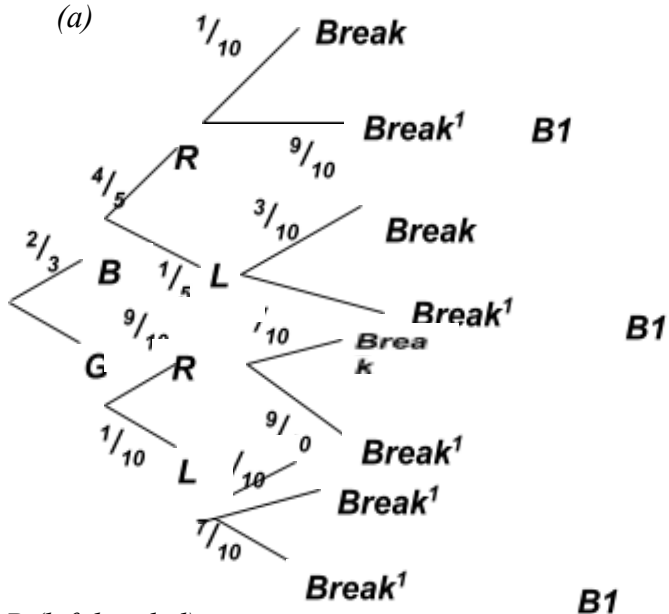
$$\begin{aligned}
 &= \frac{5}{42} + \frac{5}{92} + \frac{1}{21} \\
 &= \frac{5+5+2}{42} \\
 &= \frac{12}{42} \\
 &= \frac{2}{7}
 \end{aligned}$$

12.



$$P(\text{Red}) = \left( \frac{1}{2} \times \frac{3}{10} \right) + \left( \frac{1}{2} \times \frac{4}{12} \right) = \frac{19}{60}$$

13. (a)



bi)  $P(\text{left handed})$

$$\begin{aligned}
 &= \frac{2}{3} \times \frac{1}{5} + \frac{1}{3} \times \frac{1}{10} \\
 &= \frac{2}{15} + \frac{1}{30} \\
 &= \frac{5}{30} = \frac{1}{6}
 \end{aligned}$$

ii)  $P(\text{Right handed and will break})$

$$\begin{aligned}
 &= \frac{2}{3} \times \frac{4}{5} \times \frac{1}{10} + \frac{1}{3} \times \frac{1}{9} \times \frac{1}{10} \\
 &= \frac{8}{150} + \frac{1}{300} \\
 &= \frac{25}{300} = \frac{1}{12}
 \end{aligned}$$

$$c) P = \frac{2}{3} \times \frac{4}{5} \times \frac{1}{10} + \frac{2}{3} \times \frac{1}{5} \times \frac{3}{10} + \frac{1}{3} \times \frac{9}{10} \times \frac{1}{10} + \frac{1}{3} \times \frac{1}{10} \times \frac{3}{10}$$

$$14. \quad (i) P(RRR) = \frac{5}{15} \times \frac{5}{15} \times \frac{5}{15}$$

$$= \frac{125}{3375}$$

$$= \frac{1}{27}$$

$$(ii) \frac{125}{3375} + \frac{64}{3375} + \frac{216}{3375}$$

$$= \frac{405}{3375}$$

$$= \frac{3}{25}$$

$$(iii) P(RBG) + P(GRB) + P(BGR)$$

$$\frac{5}{15} \times \frac{4}{15} \times \frac{6}{15} + \frac{6}{15} \times \frac{5}{15} \times \frac{4}{15} + \frac{4}{15} \times \frac{6}{15} \times \frac{5}{15}$$

$$= \frac{120}{3375} + \frac{120}{3375} + \frac{120}{3375}$$

$$= \frac{24}{25}$$

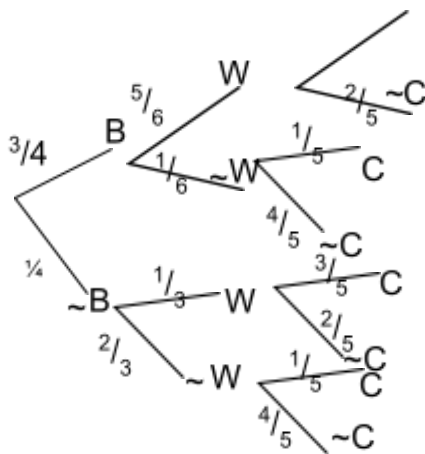
$$(iv) P(BBB) + P(GGG) + P(BBG) + P(GGB)$$

$$= \frac{4}{15} \times \frac{4}{15} \times \frac{4}{15} + \frac{6}{15} \times \frac{6}{15} \times \frac{6}{15} + \frac{4}{15} \times \frac{4}{15} \times \frac{6}{15} + \frac{6}{15} \times \frac{6}{15} \times \frac{4}{15}$$

$$= \frac{64}{3375} + \frac{216}{3375} + \frac{96}{3375} + \frac{144}{3375}$$

$$= \frac{520}{3375} + \frac{104}{3375}$$

15.



**B- To bed on time**  
**~B- To bed late**  
**W- Waking upon time**  
**~W- waking up late**  
**C- Getting to class on time**  
**~C- Getting to class late**

**B- To bed on time**  
**B- To bed late**  
**W- Waking upon time**  
**W- waking up late**  
**C- Getting to class on time**  
**C- Getting to class late**

✓ tree diagram.  
 ✓ Addition of probability  
 ✓ Addition of prob.  
 ✓ Addition of prob.

$$(a) (i) P(Bnw) = \frac{3}{4} \times \frac{5}{6}$$

$$= \frac{5}{8}$$

ii) P( Waking up late)

$$\left[ \frac{1}{8} \right] + \left[ \frac{1}{6} \right]$$

$$= \frac{1}{8} + \frac{1}{6} = \frac{3+4}{24}$$

$$= \frac{7}{24}$$

b) (i)  $P(BW \sim C)$  or  $P(B \sim W \sim C)$

$$^1 \left[ \begin{array}{ccc} \diagup & & \diagup \\ \diagdown & \diagup & \\ - & & \end{array} \right] + \left[ \begin{array}{ccc} \diagup & & \diagup \\ & \diagdown & \diagup \\ & 2 & 1 \end{array} \right]$$

$$\frac{1}{10} + \frac{1}{4} = \frac{4+10}{40}$$

$$= \frac{7}{20}$$

$$\begin{aligned} \text{ii) } P(\sim B \sim C) &= \frac{1}{4} \times \frac{1}{3} \times \frac{3}{5} + \frac{1}{4} \times \frac{2}{3} \times \frac{1}{5} \\ &= \frac{1}{20} + \frac{1}{30} = \frac{3+2}{60} = \frac{5}{60} \\ &= \frac{1}{12} \end{aligned}$$