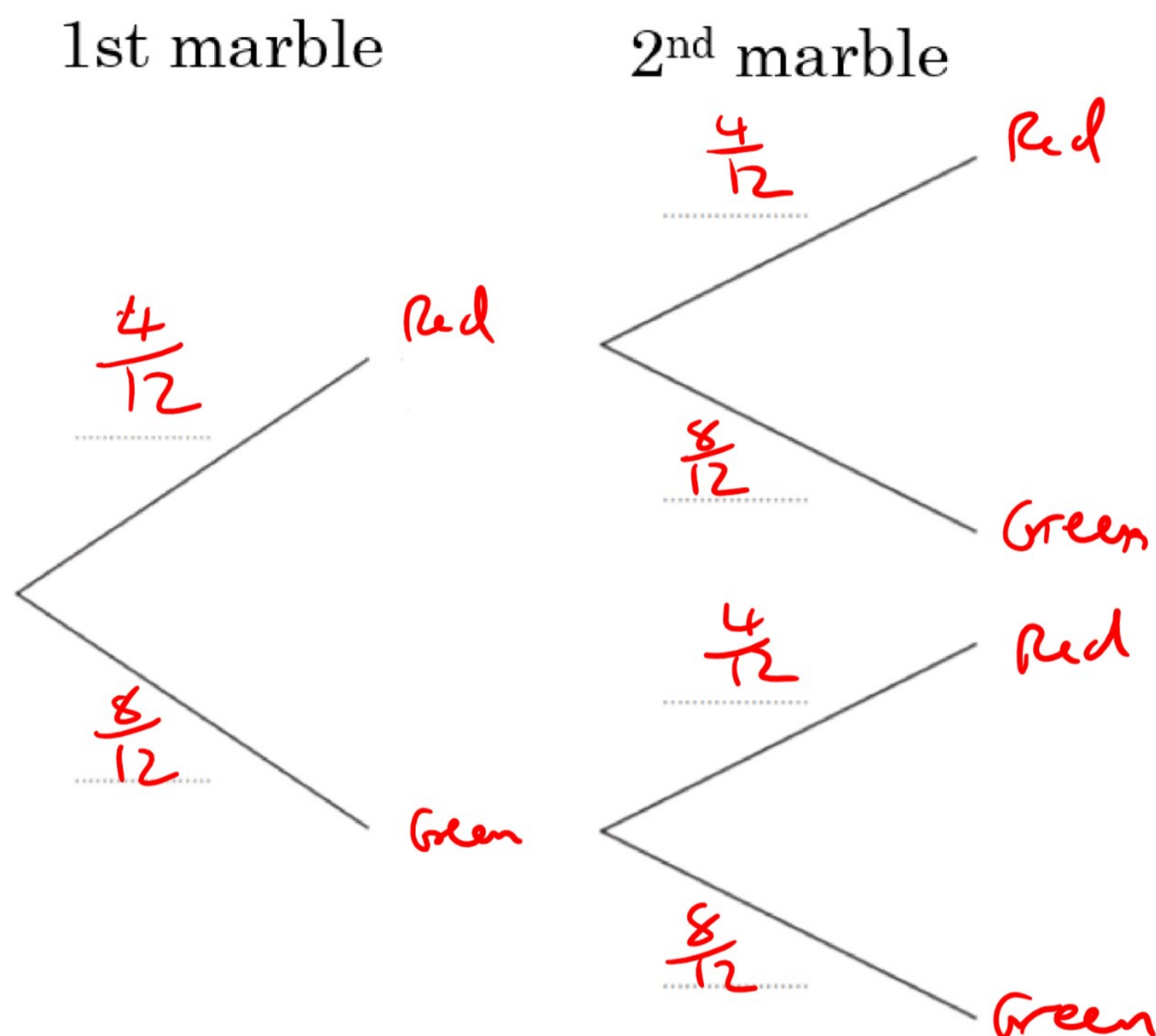




Probability Trees Exam Practice

Q1. A bag contains 4 red marbles and 8 green marbles. Mike chooses one marble at random from the bag, and then chooses a second marble after he replaces the first.

a) Complete the tree diagram below:



Answer: _____
(2 marks)

b) Find the probability that the two marbles are of different colours

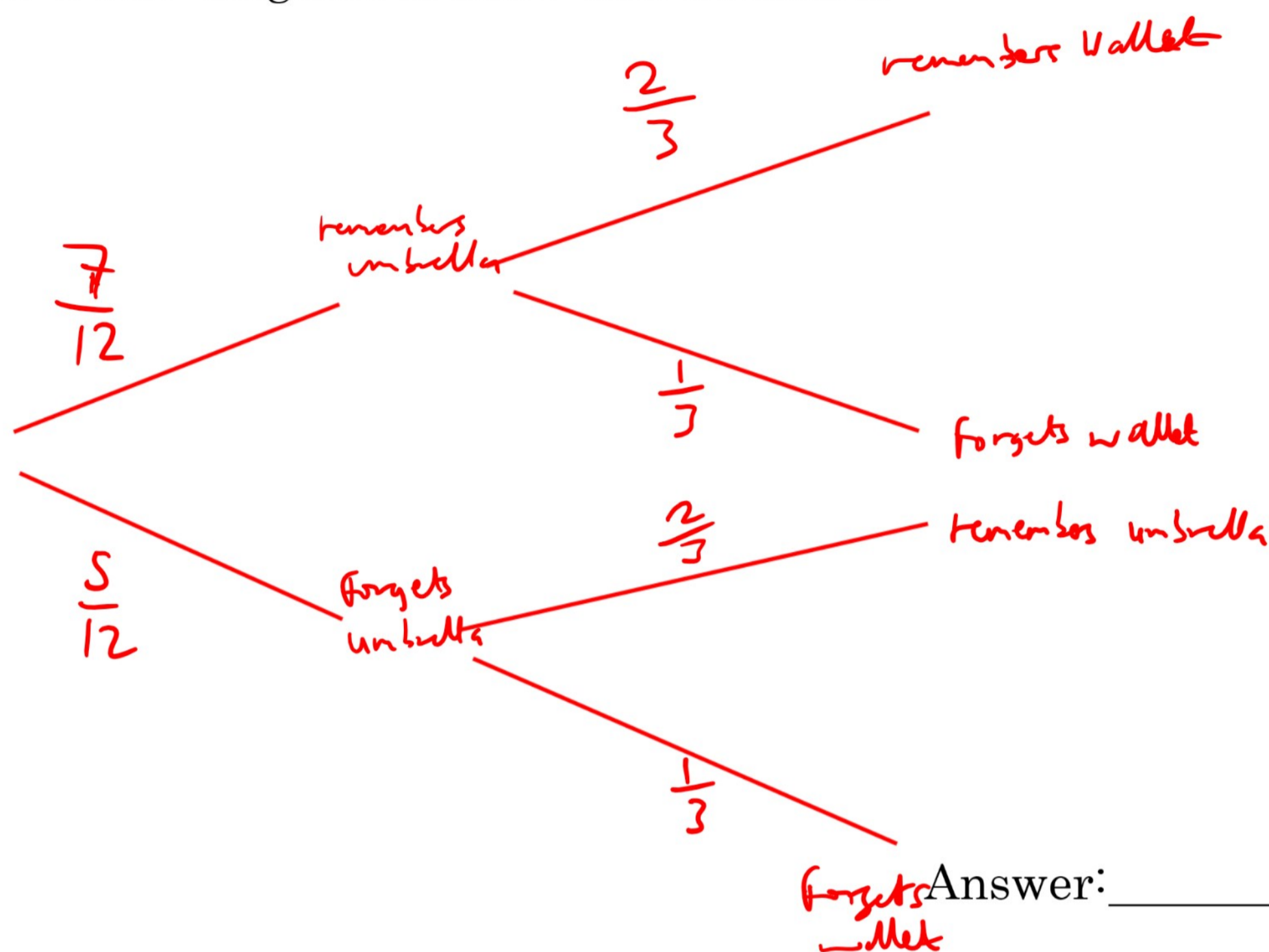
$$\begin{aligned} P(\text{different colours}) &= P(\text{Red and Green OR Green and Red}) \\ &= \frac{4}{12} \times \frac{8}{12} + \frac{8}{12} \times \frac{4}{12} \\ &= \frac{32+32}{144} \\ &= \frac{64}{144} \end{aligned}$$

Answer: $\frac{4}{9}$ _____
(2 marks)



Q2. Bob always takes an umbrella and his wallet to work each day when he remembers them. The probability that Bob forgets his umbrella is $\frac{5}{12}$ whilst the probability he remembers his wallet is $\frac{2}{3}$

a) Draw a tree diagram to show this situation.



b) Find the probability that he forgets both his umbrella and his wallet.

$$\begin{aligned} P(\text{forgets both}) &= P(\text{forgets umbrella}) \times P(\text{forgets wallet}) \\ &= \frac{5}{12} \times \frac{1}{3} \end{aligned}$$

Answer: $\frac{5}{36}$ _____ (2 marks)

c) During a 30 day period, estimate the number of days he forgets both his items

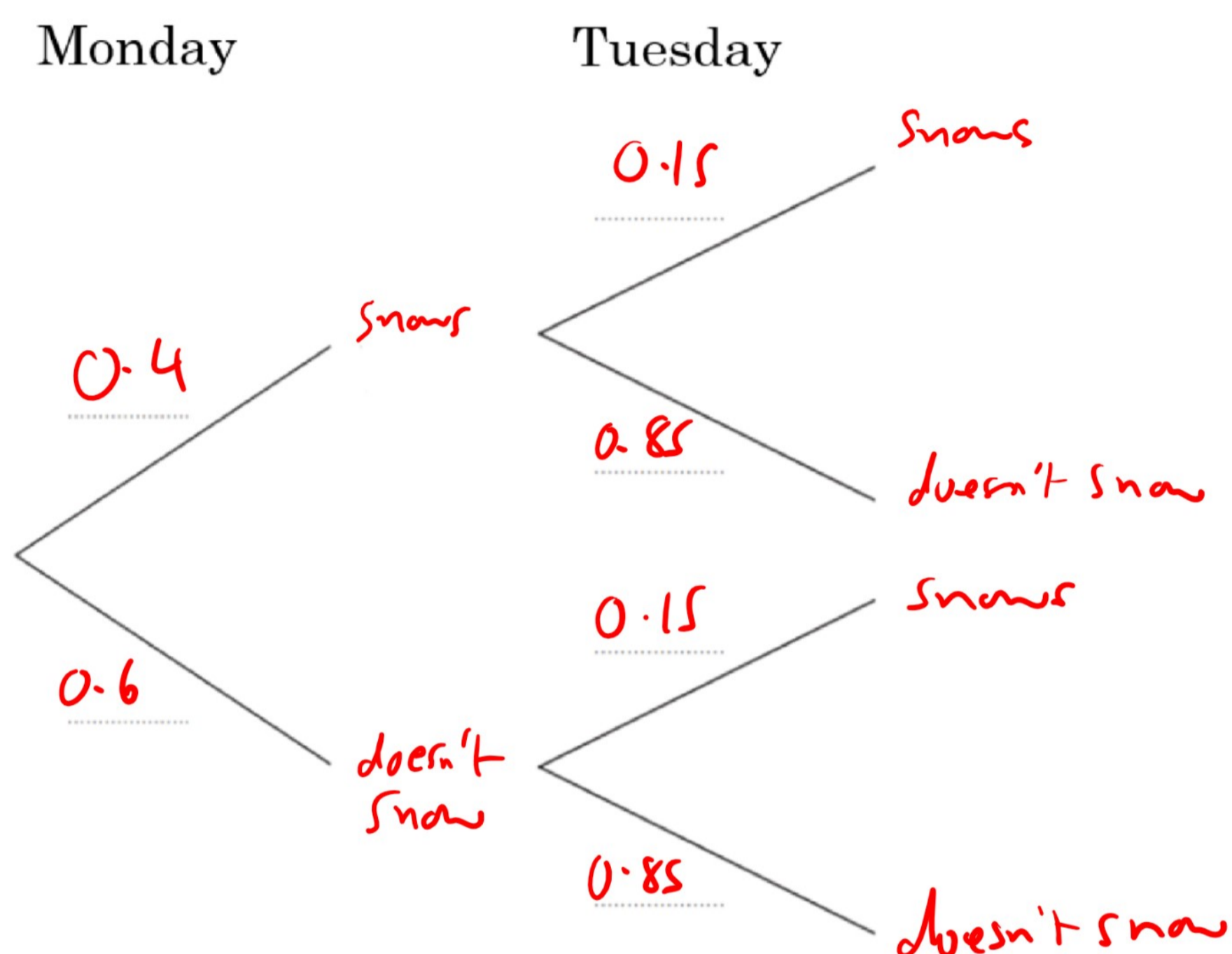
$$\begin{aligned} \frac{5}{36} \times 30 &= 4.1\bar{6} \\ &\approx 4 \text{ days} \end{aligned}$$

Answer: 4 days _____ (2 marks)



Q3. The probability it snows on Monday is 0.4, and 0.15 on Tuesday.

a) Complete the tree diagram below showing this situation:



Answer: _____
(2 marks)

b) Find the probability that it does not snow on either day.

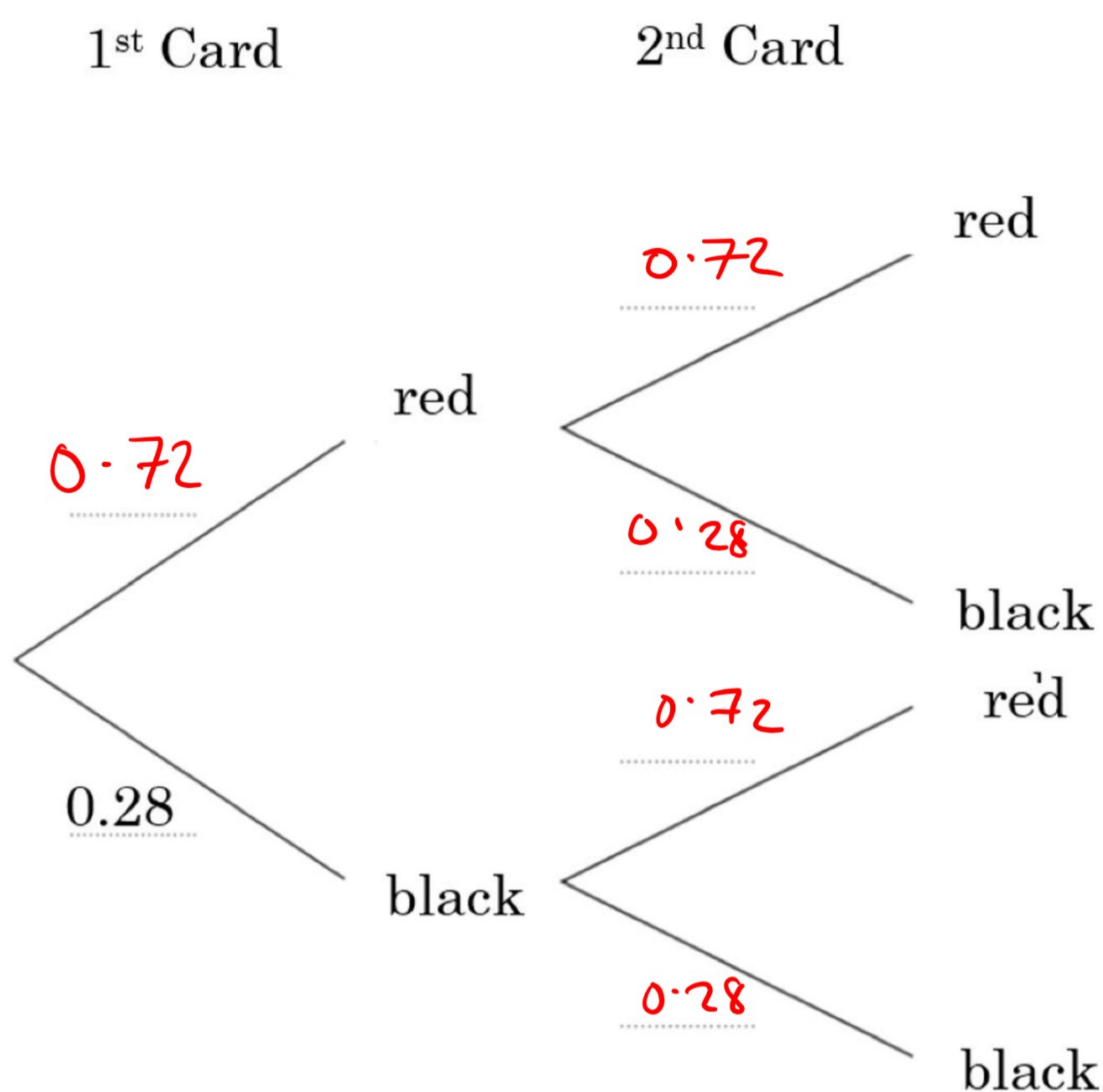
$$\begin{aligned} & P(\text{doesn't snow on Monday and doesn't snow on Tuesday}) \\ &= P(\text{doesn't snow on Monday}) \times P(\text{doesn't snow on Tuesday}) \\ &= 0.6 \times 0.85 \\ &= 0.51 \end{aligned}$$

Answer: 0.51
(2 marks)



Q4. Tara plays a card game which has either red or black cards being drawn from a pack of 20 cards.

Using the diagram, find the probability that she gets a red and a black card if she chooses 2 cards with replacement.



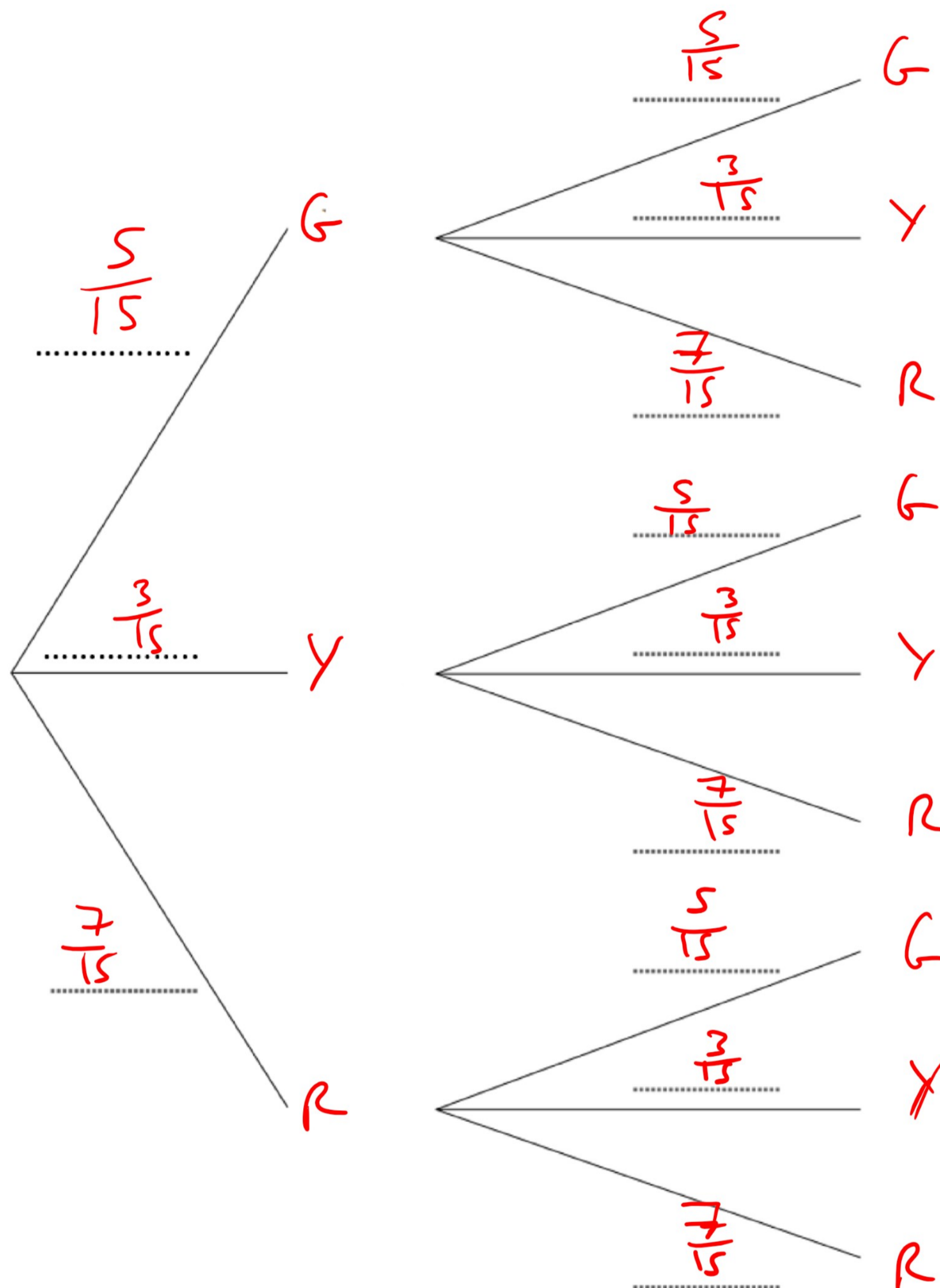
$$\begin{aligned} P(\text{Red and a black}) &= P(\text{red and black OR black and red}) \\ &= P(\text{red and black}) + P(\text{black and red}) \\ &= 0.72 \times 0.28 + 0.28 \times 0.72 \\ &= 0.4032 \end{aligned}$$

Answer: 0.403 (3 s.f.)
(2 marks)



Q5. A bag contains 5 green balls, 3 yellow balls and 7 red balls. Tim selects two balls from the bag where he replaces the first marble before drawing out the second.

a) Complete the tree diagram representing this situation:



Answer: _____

(3 marks)

b) Find the probability that Tim selects 1 yellow ball only

$$\begin{aligned} &= P(G, Y) + P(Y, G) + P(Y, R) + P(R, Y) \\ &= \frac{5}{15} \times \frac{3}{15} + \frac{3}{15} \times \frac{5}{15} + \frac{3}{15} \times \frac{7}{15} + \frac{7}{15} \times \frac{3}{15} \end{aligned}$$

$$\frac{72}{225} = \frac{8}{25}$$

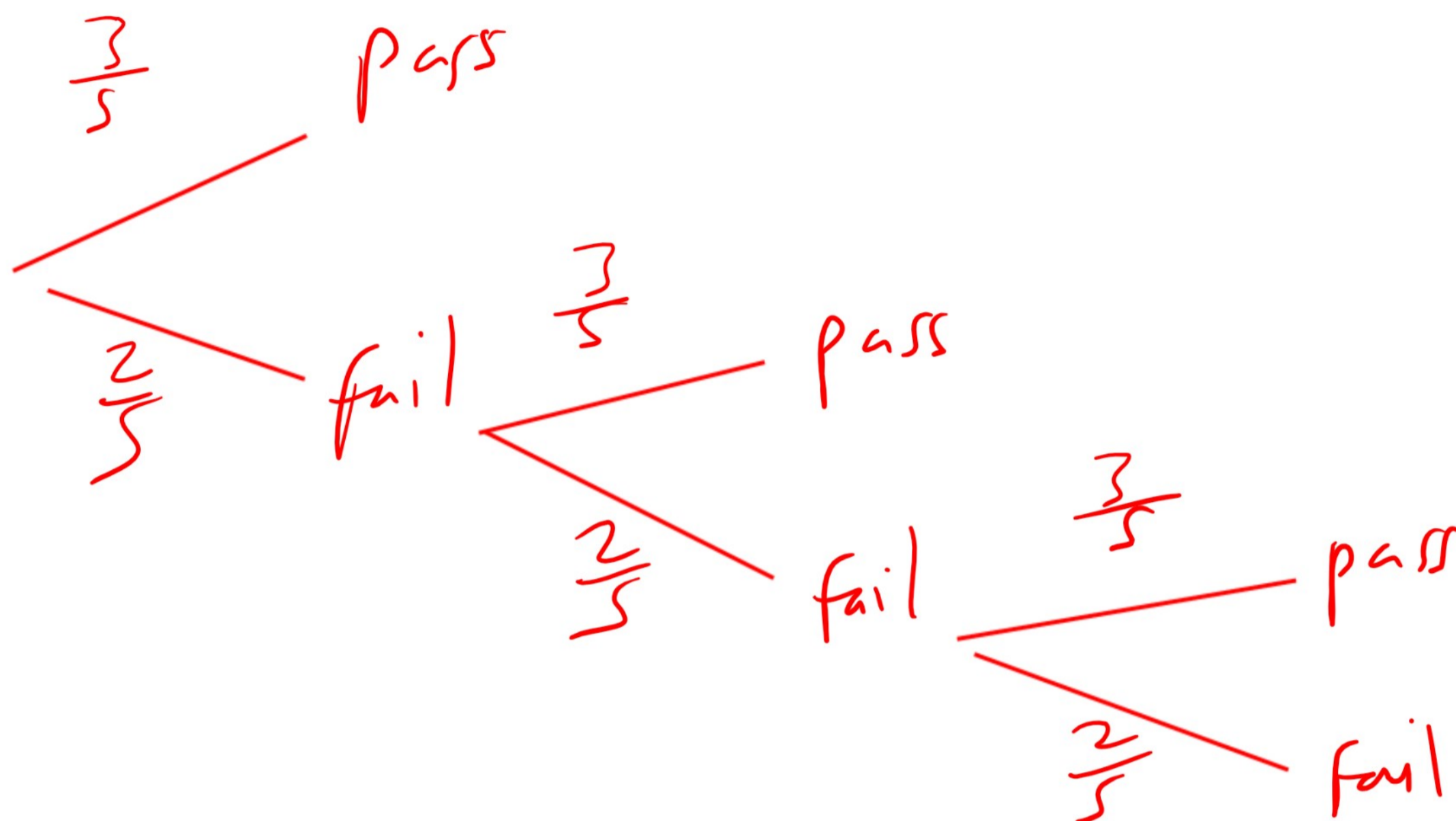
Answer: _____

(3 marks)



Q6. In a driving test, a student has unlimited attempts to pass. The probability of passing each time is $\frac{3}{5}$.

a) Draw a tree diagram showing all the possible outcomes up to and including the third attempt.



Answer: _____

(3 marks)

b) Sam eventually passes his test, with the probability of this event being $\frac{384}{390625}$.

Work out the number of times he failed his driving test.

let $n = \text{no. of fails}$

$$\left(\frac{2}{5}\right)^n \times \frac{3}{5} = \frac{384}{390625}$$

$$\left(\frac{2}{5}\right)^n = \frac{128}{78125}$$

By trial and error,
 $n = 7$

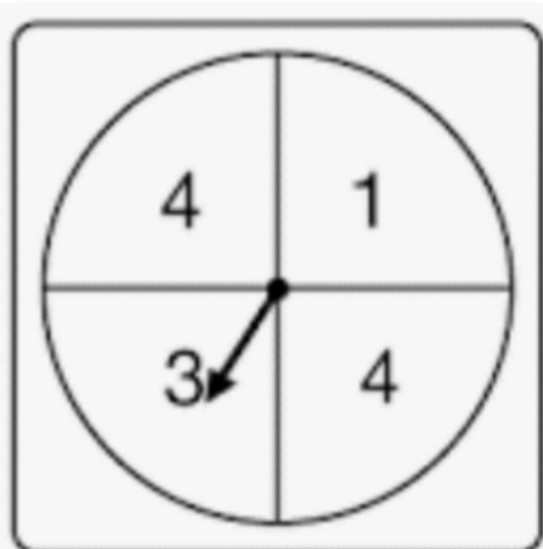
7 fails

Answer: _____

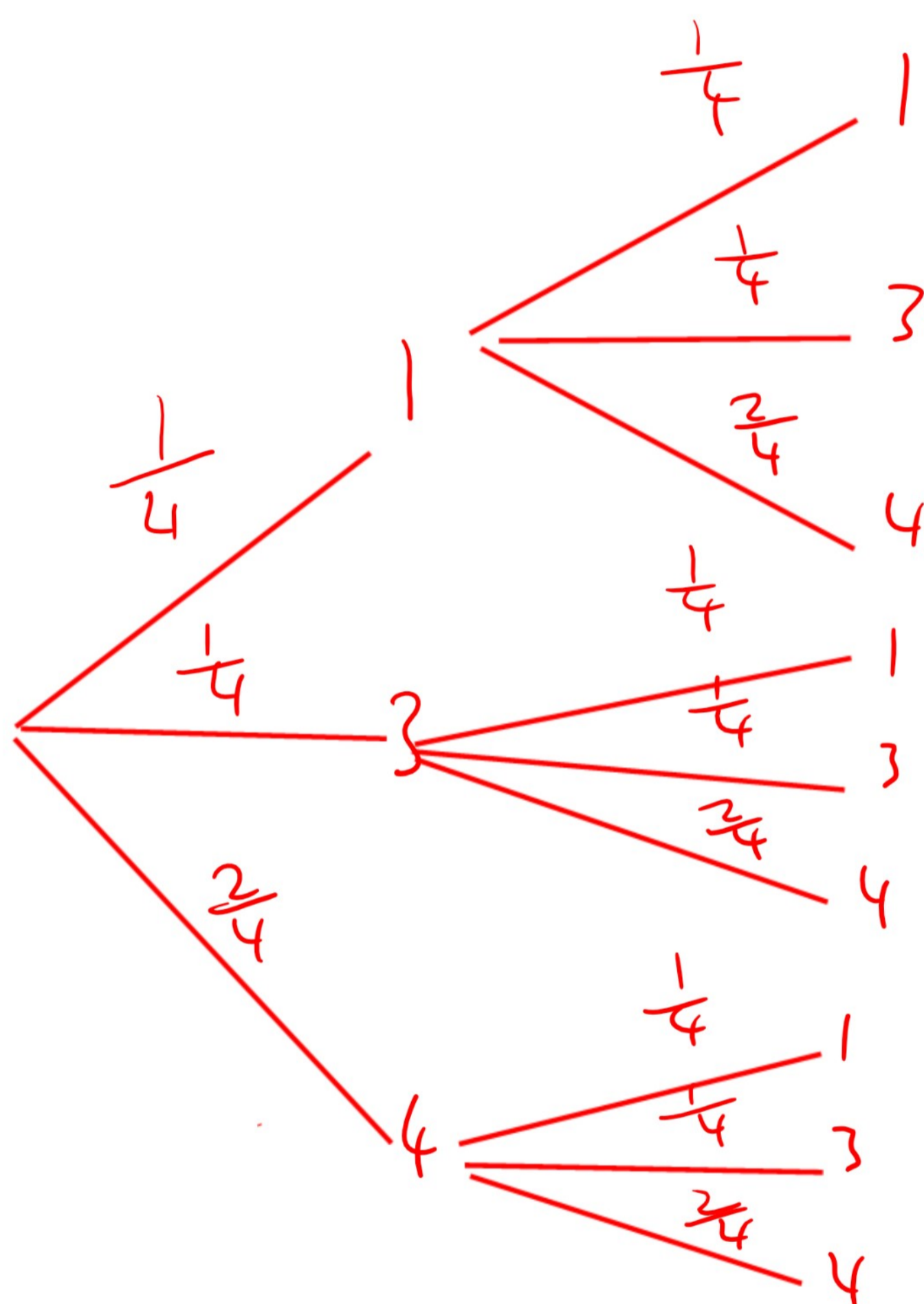
(2 marks)



Q7. Ben spins the spinner below twice, and records each score, before adding them together.



a) Draw a tree diagram to show this situation.



Answer: _____
(2 marks)

b) Hence find the probability that Ben obtains a score more than 3.

$$\begin{aligned} P(\text{score} > 3) &= 1 - P(\text{score} \leq 3) \\ &= 1 - P(1, 1) \\ &= 1 - \left(\frac{1}{4} \times \frac{1}{4}\right) \\ &= 1 - \frac{1}{16} \end{aligned}$$

Answer: $\frac{15}{16}$ _____
(3 marks)



Q8. Amy is playing a game involving throwing balls at a target. The probability that she wins on her first attempt is 0.3. The chance of her winning on her second attempt is $\frac{1}{2}$ the chance of her first attempt, and the chance of her winning on her third attempt is $\frac{1}{2}$ of the chance of her winning on her second attempt.

a) Find the probability that she hits the target every time on three goes.

$$\begin{aligned} & 0.3 \times (0.3 \times \frac{1}{2}) \times (0.3 \times \frac{1}{2} \times \frac{1}{2}) \\ &= 0.3 \times (0.3 \times 0.5) \times (0.3 \times 0.5 \times 0.5) \\ &= 0.3 \times 0.15 \times 0.075 \\ &= 0.003375 \\ & \left(= \frac{27}{8000} \right) \end{aligned}$$

Answer: 0.00338 (3sf)
(2 marks)

b) Find the probability that she wins on her third go, and just once in her first two attempts.

The cases are: W, L, W and L, W, W

$$\begin{aligned} P(W, L, W) &= 0.3 \times (1 - 0.3 \times \frac{1}{2}) \times (0.3 \times \frac{1}{2} \times \frac{1}{2}) \\ &= 0.3 \times (0.85) \times 0.075 \\ &= 0.019125 \end{aligned}$$

$$\begin{aligned} P(L, W, W) &= 0.7 \times (0.3 \times \frac{1}{2}) \times (0.3 \times \frac{1}{2} \times \frac{1}{2}) \\ &= 0.7 \times (0.15) \times (0.075) \\ &= 0.007875 \end{aligned}$$

$$\therefore P(W, L, W \text{ or } L, W, W) = 0.019125 + 0.007875$$

Answer: 0.027 $\left(\frac{27}{1000}\right)$

(3 marks)