23 It is known that 7 out of 10 students from a certain school will go on to university. If a group of 3 students is chosen at random from this school, find the probability that:

(a) all will go on to university

$\left(\frac{7}{10}\right)^3 = 0.343$

(b) some will go on to university.

P(at least one will go to uni) = 1 − P(none going to uni)

$= 1 - \left(\frac{3}{10}\right)^3 = 0.973$

24 An archer finds that her ratio of success to failure in hitting a bullseye is 9 to 1. If 3 arrows are shot, what is the probability of:

(a) 3 successes

$\left(\frac{9}{10}\right)^3 = 0.729$

(b) at least 2 successes

2 or 3 successes

$P(\text{2 successes}) = \left(\frac{9}{10}\right)^2 \times 0.1 + \frac{9}{10} \times 0.1 \times \frac{9}{10} + 0.1 \times \frac{9}{10} \times \frac{9}{10}$

$= 0.243$

So P(at least 2) = 0.243 + 0.729

= 0.972

(c) not more than 1 success? (no more or 1)

P(none or 1) = 1 − P(at least 2)

= 1 − 0.972

= 0.028

26 A container holds a number of cubes: 60% are white and the remainder are black. Two cubes are randomly selected without replacement. What is the probability that:

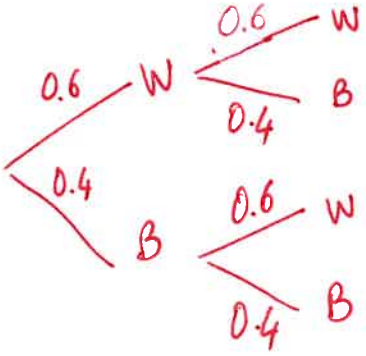
(a) they are the same colour

$0.6^2 + 0.4^2 = \frac{13}{25}$

(b) they are different colours?

$P(\neq \text{colours}) = 1 - \frac{13}{25}$

$= \frac{12}{25}$



28 Container *X* holds 1 white cube and 2 black cubes. Container *Y* holds 2 white cubes and 1 black cube. A container is selected at random and from it two cubes are selected without replacement. Draw a tree diagram to represent this three-stage process and find the probability that both cubes drawn are:

(a) the same colour

$0.5 \times P(WW) = 0.5 \times \frac{2}{3} \times \frac{1}{2} = \frac{1}{6}$

$0.5 \times P(BB) = 0.5 \times \frac{2}{3} \times \frac{1}{2} = \frac{1}{6}$

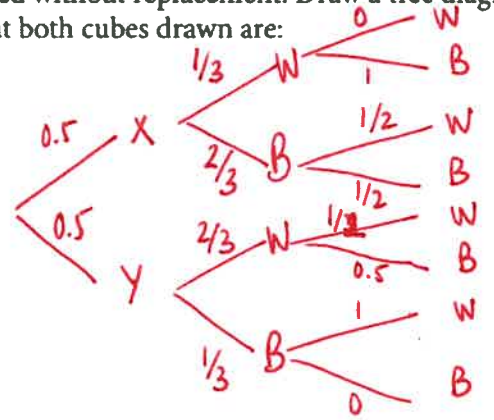
So $P = \frac{1}{6} + \frac{1}{6} = \frac{1}{3}$

(b) different colours.

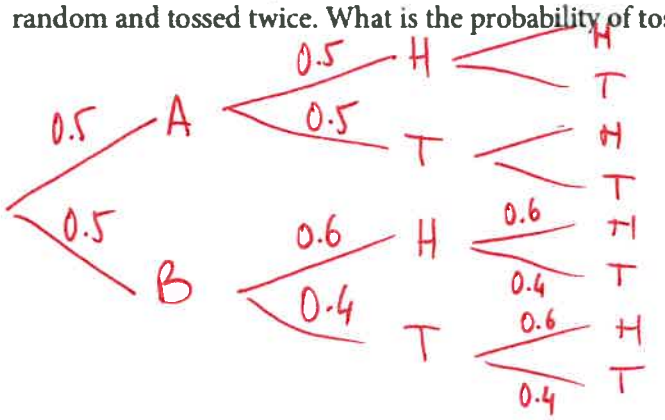
P(different colours)

= 1 − P(same colour)

$= 1 - \frac{1}{3} = \frac{2}{3}$



30 Of two coins *A* and *B*, *A* is a fair coin while *B* is loaded with a probability of 0.6 for heads. A coin is chosen at random and tossed twice. What is the probability of tossing two heads?



$P(\text{2 heads}) = 0.5 \times (0.5)^2 + 0.5 \times (0.6)^2$

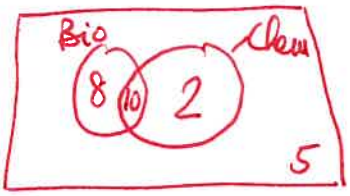
$P(\text{2 heads}) = 0.305$

18 + 12 = 30

6 In a group of 25 students, 18 study Biology, 12 study Chemistry and 5 study neither Biology nor Chemistry. If a student is chosen at random, what is the probability that the student studies:

(a) Biology only **(b)** Chemistry only

(c) Biology or Chemistry or both **(d)** both Biology and Chemistry?



a) P(Bio only) = 8/25 b) P(Chem only) = 2/25

c) P(Bio, Chem, or both) = 20/25 d) P(both) = 10/25

10 Trinh and Oscar play three tennis matches. Trinh's chance of winning any one match is $\frac{2}{3}$. What is the probability that Trinh:

(a) wins all three matches **(b)** loses all three matches

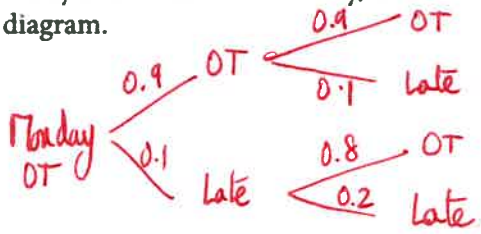
(c) wins the first and third but loses the second **(d)** loses the first and wins the other two?

a) $\left(\frac{2}{3}\right)^3 = \frac{8}{27}$ b) $\left(\frac{1}{3}\right)^3 = \frac{1}{27}$ c) $\frac{2}{3} \times \frac{1}{3} \times \frac{2}{3} = \frac{4}{27}$ d) $\frac{1}{3} \times \left(\frac{2}{3}\right)^2 = \frac{4}{27}$

11 A man finds that he is late for work on 10% of occasions if he was on time the previous day, but late on 20% of occasions if he was late the previous day. Given that he was on time on Monday and worked on Tuesday, what is the probability that he is on time on Wednesday? Illustrate using a tree diagram.

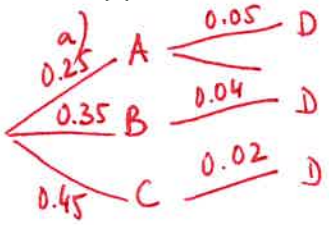
P(on time) = 0.9 × 0.9 + 0.1 × 0.8

= 0.89



12 A certain factory has three machines *A*, *B* and *C*, which manufacture 25%, 35% and 40% respectively of the factory's products. Of the machines' products, 5%, 4% and 2% respectively are defective. A product from the machines is selected at random. What is the probability that:

(a) it was manufactured by *A* and is defective **(b)** it was manufactured by *B* and is not defective?



P(A ∩ D) = 0.25 × 0.05

= 0.0125

P(B and not Defective) = 0.35 × 0.96

= 0.336

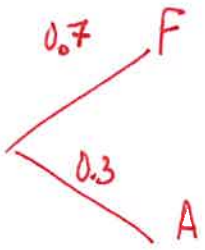
20 In an opinion poll, the ratio of those in favour to those against a particular proposal was 7 to 3. If three randomly chosen people are interviewed about the proposal, what is the probability that:

(a) all will be in favour **(b)** the majority will be in favour

(c) not more than two will be against the proposal?

a) $(0.7)^3 = 0.343$

b) 0.7 × 0.7 × 0.3 + 0.7 × 0.3 × 0.7 + 0.3 × 0.7 × 0.7 + 0.343 = 0.784



c) either 0, 1, or 2 will be against.

P(either 0, 1, or 2 are against) + P(3 against) = 1

So P(not more than 2 are against) = 1 − (0.3)³ = 0.973