4 Use the tables provided to calculate the required probabilities.

a A pair of regular dice are rolled and the two numbers recorded.

	1	**2**	**3**	**4**	**5**	**6**
1	(1, 1)	(1, 2)	(1, 3)	(1, 4)	(1, 5)	(1, 6)
2	(2, 1)	(2, 2)	(2, 3)	(2, 4)	(2, 5)	(2, 6)
3	(3, 1)	(3, 2)	(3, 3)	(3, 4)	(3, 5)	(3, 6)
4	(4, 1)	(4, 2)	(4, 3)	(4, 4)	(4, 5)	(4, 6)
5	(5, 1)	(5, 2)	(5, 3)	(5, 4)	(5, 5)	(5, 6)
6	(6, 1)	(6, 2)	(6, 3)	(6, 4)	(6, 5)	(6, 6)

What is the probability that:

i the numbers rolled are 6 and 3?

$P(6 \text{ and } 3) = \frac{2}{36}$

ii the numbers are both 2s?

$P(\text{both } 2) = \frac{1}{36}$

iii the product of the numbers is 12?

can be either 2×6, 3×4, 4×3 or 6×2 So $4/36$

iv the sum of the numbers is 13?

impossible 0.

v the numbers differ by more than two?

$(4,1),(5,1),(6,1),(5,2)(6,2)(6,3)$ = total 6

plus 6 others So $12/36 = 1/3$

vi the sum of the numbers is less than 9?

$P(\text{sum less than } 9) = \frac{36-10}{36} = \frac{26}{36} = \frac{13}{18}$

A man leaves Ashfield to drive to Newcastle. He can travel to Hornsby via the Gladesville Bridge (no toll), the Sydney Harbour Bridge (toll) or the Sydney Harbour Tunnell (toll). From Hornsby he can travel by Freeway (no toll) or by the Pacific Highway (no toll). If both his choices are random find the probability that:

i he crosses the Gladesville Bridge.

ii he uses the Sydney Harbour Tunnel and the Freeway.

iii he doesn't pay any tolls.

i) $1/3$

ii) $\frac{1}{3} \times \frac{1}{2} = \frac{1}{6}$

iii) $\frac{1}{3}$ (Gladesville bridge) $\times$ $= \frac{1}{3}$

Seven cards are labeled 1, 2, 3 …, 7. Another eight cards are labeled *A*, *B*, *C*, …, *H*. One card is selected at random from each set.

8

	1	2	3	4	5	6	7
A	(A, 1)	(A, 2)	(A, 3)	(A, 4)	(A, 5)	(A, 6)	(A, 7)
B	(B, 1)	(B, 2)	(B, 3)	(B, 4)	(B, 5)	(B, 6)	(B, 7)
C	(C, 1)	(C, 2)	(C, 3)	(C, 4)	(C, 5)	(C, 6)	(C, 7)
D	(D, 1)	(D, 2)	(D, 3)	(D, 4)	(D, 5)	(D, 6)	(D, 7)
E	(E, 1)	(E, 2)	(E, 3)	(E, 4)	(E, 5)	(E, 6)	(E, 7)
F	(F, 1)	(F, 2)	(F, 3)	(F, 4)	(F, 5)	(F, 6)	(F, 7)
G	(G, 1)	(G, 2)	(G, 3)	(G, 4)	(G, 5)	(G, 6)	(G, 7)
H	(H, 1)	(H, 2)	(H, 3)	(H, 4)	(H, 5)	(H, 6)	(H, 7)

Find the probability of:

i one card being a D. $1/8$

ii the cards being G and 4. $\frac{1}{8 \times 7} = 1/56$

iii the cards being an A and an even number. $3/56$

iv the cards being a prime number and a letter other than G or H. prime are 2, 3, 5, 7 $\frac{4 \times 6}{56} = \frac{24}{56}$

v the letter being composed entirely of straight lines and the number being greater than 3. A, E, F, H So $P = \frac{4 \times 4}{56} = \frac{16}{56} = \frac{2}{7}$

Bronwyn has four different skirts (black, white, cream and pink) and six tops (white, red, gold, blue, green and orange). If she chooses at random how many different outfits does she have? $4 \times 6 = 24$ What is the probability of her wearing:

i a cream skirt and a blue top? $1/24$

ii either her white skirt or her pink skirt?

iii her black skirt with either her orange or white top?

iv her cream skirt with her red top or her pink skirt with any of her tops?

v neither her pink skirt nor her gold top?

ii) $\frac{2}{4} = \frac{1}{2}$ iii) $\frac{2}{24} = \frac{1}{12}$ iv) $\frac{1+6}{24} = \frac{7}{24}$

v) $3 \times 5 = 15$ $P = \frac{15}{24} = \frac{3 \times 5}{4 \times 6} = \frac{5}{8}$

Exercise 9.2

1 Use the tree diagrams provided to calculate the required probabilities.

a Three cards are labeled 1, 2 and 3. A card is selected at random and the number recorded. The card is replaced and a second selection is made. The two umbers are added. Find the probability that the sum is:

First	Second	Result
1	1	1, 1
	2	1, 2
	3	1, 3
2	1	2, 1
	2	2, 2
	3	2, 3
3	1	3, 1
	2	3, 2
	3	3, 3

(i) 5 (2,3) or (3,2) so $\frac{2}{9}$

(ii) 4 (1,3), (2,2) or (3,1) so $\frac{3}{9} = \frac{1}{3}$

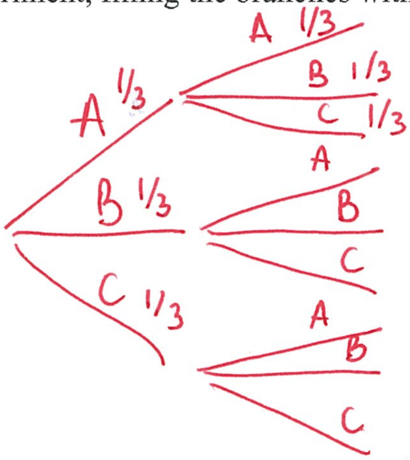
(iii) greater than 5

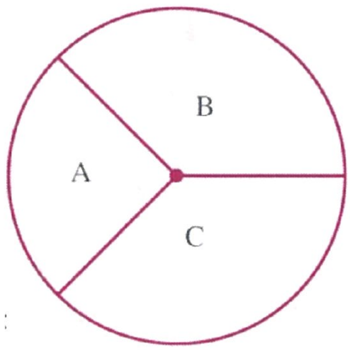
only (3,3) so $\frac{1}{9}$

(iv) less than 4

$\frac{3}{9}$

A circular spinner has 3 sectors called A, B and C.
The spinner is spun twice. Draw a tree diagram to describe this experiment, filling the branches with corresponding probabilities.





What is the probability of: (i) two A 1/9

(ii) one B and one C

Could be B then C or C then B 2/9

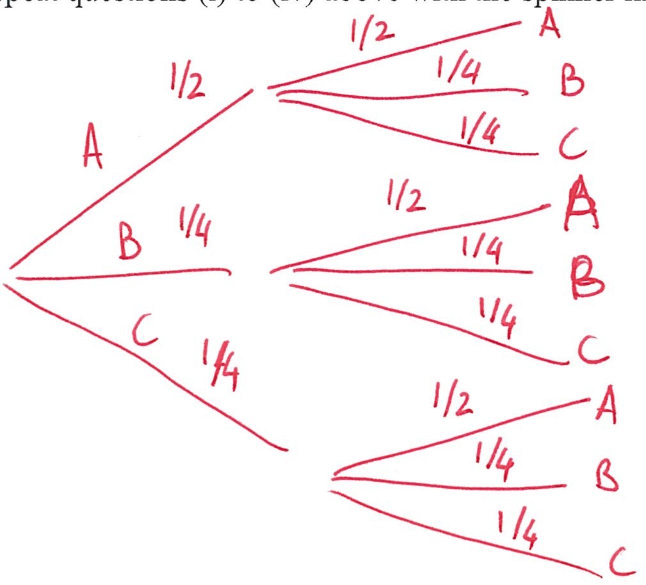
(iii) no C

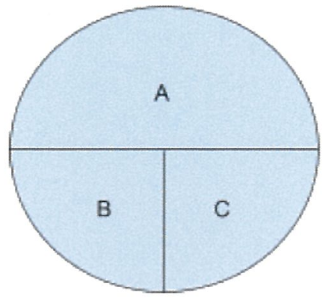
$\frac{4}{9}$

(iv) at least one B

$\frac{1+3+1}{9} = \frac{5}{9}$

Repeat questions (i) to (iv) above with the spinner modified as follows





2 A: $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$

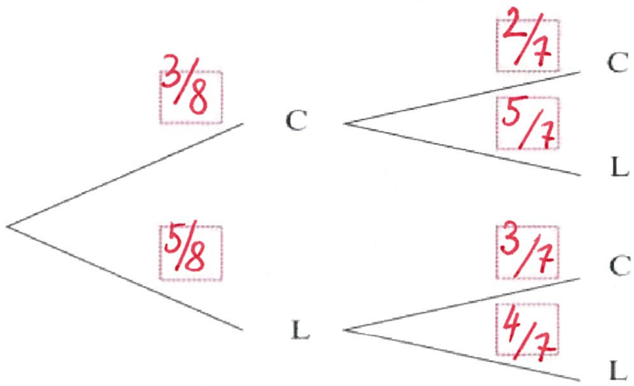
one B and one C = $\frac{1}{4} \times \frac{1}{4} + \frac{1}{4} \times \frac{1}{4} = \frac{1}{8}$

no C: $\frac{1}{4} + \frac{1}{8} + \frac{1}{8} + \frac{1}{16} = \frac{4+2+2+1}{16} = \frac{9}{16}$

at least one B: $\frac{1}{8} + \frac{1}{4} + \frac{1}{16} = \frac{2+4+1}{16} = \frac{7}{16}$

27. A jar contains 3 caramels and 5 licorices. Kate picks one lolly and eats one, then selects another.

a) Fill the red boxes on the tree diagram below with the probabilities for each event. **2**



b) Use the tree above to calculate the probability that she picks:

i) two caramels **1**

$\frac{3}{8} \times \frac{2}{7} = \frac{6}{56} = \frac{3}{28}$

ii) one caramel and one licorice **1**

$\frac{3}{8} \times \frac{5}{7} + \frac{5}{8} \times \frac{3}{7} = \frac{30}{56} = \frac{15}{28}$

QUESTION 1 A box contains 4 yellow and 5 black balls. A ball is drawn from the box and is not replaced, then a second ball is drawn. Find the probability of:

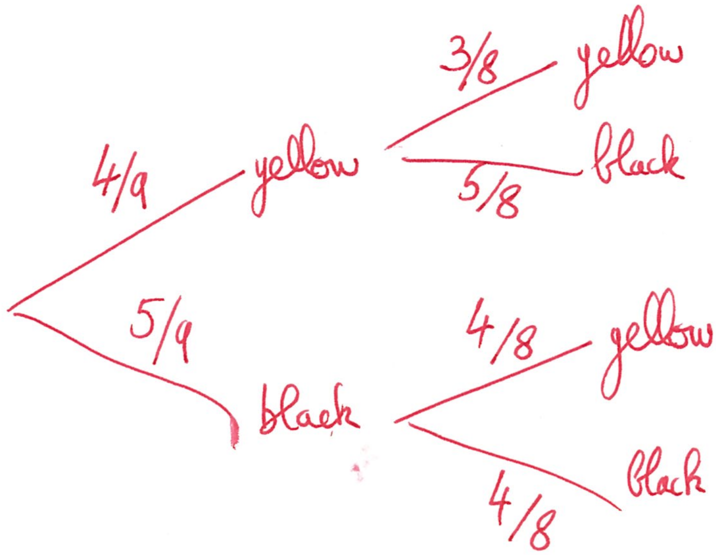
a yellow then black being drawn ____________

b black then yellow being drawn ____________

c both balls being yellow ____________

d both balls being black ____________

e drawing yellow and black in any order



a) $\frac{4}{9} \times \frac{5}{8} = \frac{20}{72} = \frac{5}{18}$ c) $\frac{4}{9} \times \frac{3}{8} = \frac{12}{72} = \frac{1}{6}$

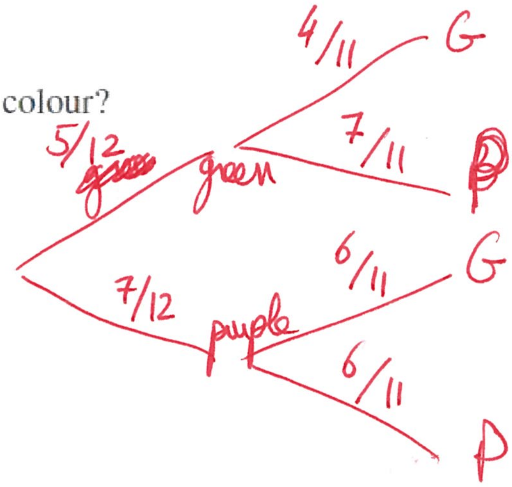
b) $\frac{5}{9} \times \frac{4}{8} = \frac{20}{72} = \frac{5}{18}$ d) $\frac{5}{9} \times \frac{4}{8} = \frac{20}{72} = \frac{5}{18}$

e) $\frac{20}{72} + \frac{20}{72} = \frac{40}{72} = \frac{5}{9}$

HSC 2019

(f) A bag contains 5 green beads and 7 purple beads. Two beads are selected at random, without replacement. **2**

What is the probability that the two beads are the same colour?



green/green or puple/puple

$$\frac{5}{12} \times \frac{4}{11} + \frac{7}{12} \times \frac{6}{11} = \frac{20 + 42}{132} = \frac{62}{132}$$

$$= \frac{31}{66}$$

HSC 2018

6 A runner has four different pairs of shoes.

If two shoes are selected at random, what is the probability that they will be a matching pair?

A. $\frac{1}{56}$

B. $\frac{1}{16}$

C. $\boxed{\frac{1}{7}}$

D. $\frac{1}{4}$

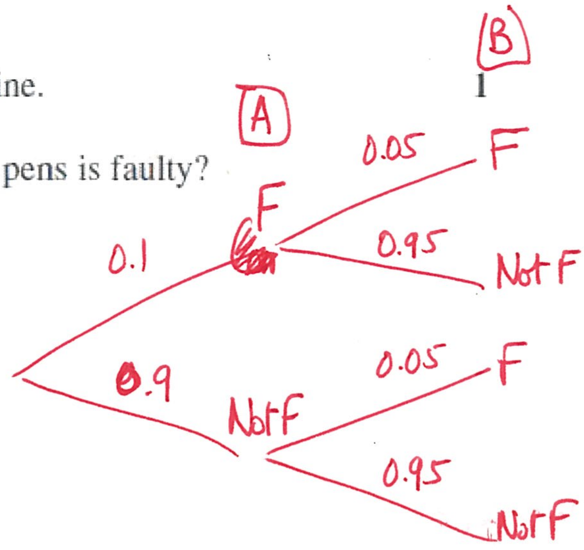
she picks one shoe at random.

For the second, there is only one out of 7

(e) Two machines, A and B, produce pens. It is known that 10% of the pens produced by machine A are faulty and that 5% of the pens produced by machine B are faulty.

(i) One pen is chosen at random from each machine. 1

What is the probability that at least one of the pens is faulty?



Prob (at least one faulty)

$= 1 - \text{Prob (none faulty)}$

$= 1 - 0.9 \times 0.95$

$= 0.145 \quad 14.5\%$

(b) A game involves rolling two six-sided dice, followed by rolling a third six-sided die. To win the game, the number rolled on the third die must lie between the two numbers rolled previously. For example, if the first two dice show 1 and 4, the game can only be won by rolling a 2 or 3 with the third die.

(i) What is the probability that a player has no chance of winning before rolling the third die? 2

	1	2	3	4	5	6
1	No	No				
2	No	No	No			
3		No	No	No		
4			No	No	No	
5				No	No	No
6					No	No

~~P(winning) 16~~ P(no chance of winning before 3rd dice rolled)

$= \dfrac{16}{36} = \dfrac{4}{9}$