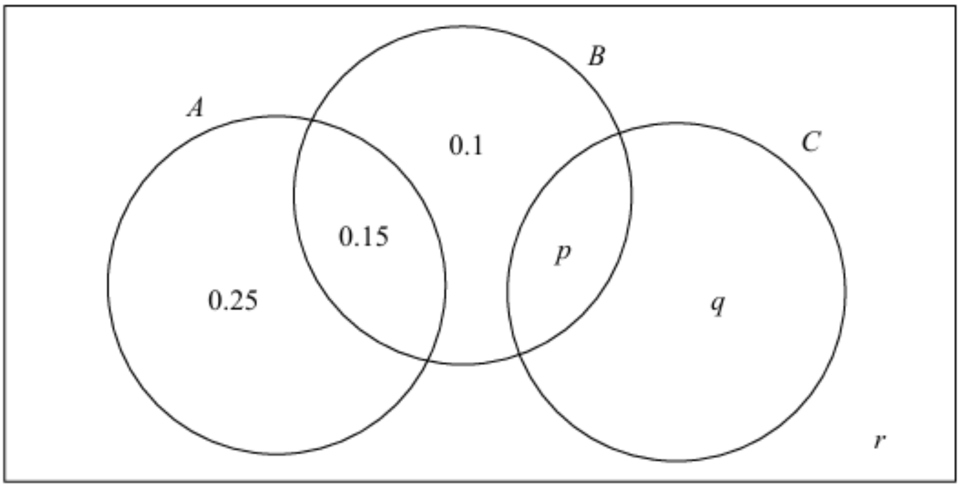
1 The Venn diagram below shows three events A, B and C.



(a) Write down two of the events that are mutually exclusive.

Events A and B are independent.
The probability of C is 0.3

(b) Find the values of p, q and r.

a/ A and C

b/ $P(A) \times P(B) = P(A \cap B)$

$0.4 \times P(B) = 0.15$

$P(B) = 0.375$

$p = 0.375 - 0.25$

$= \underline{\underline{0.125}}$

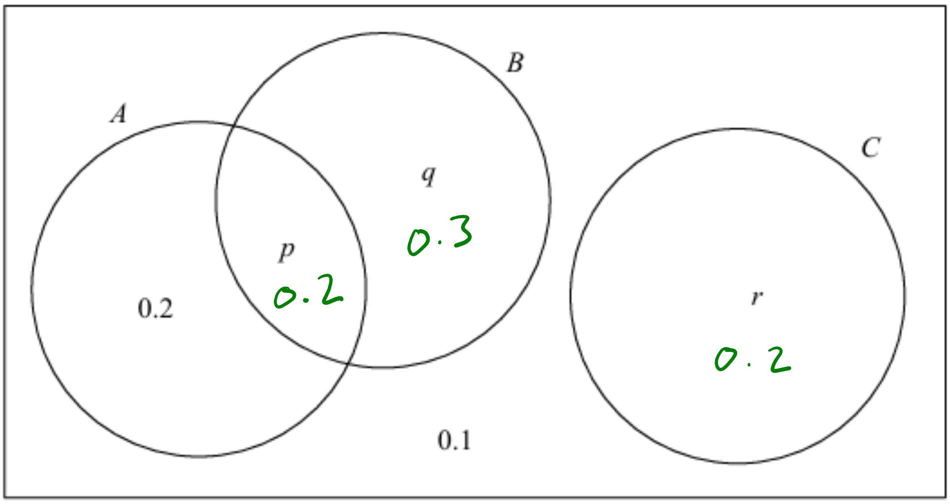
$q = 0.3 - 0.125$

$= \underline{\underline{0.175}}$

$r = 1 - 0.25 - 0.15 - 0.1 - 0.3$

$= \underline{\underline{0.2}}$

2 The Venn diagram below shows three events A, B and C.



(a) Write down two of the events that are mutually exclusive.

The probability of A is 0.4
The probability of A or B is 0.7

(b) Find the values of p, q and r.

(c) State, giving a reason, whether of not the events A and B are statistically independent.

a) A and C [or B and C]

b) $p = 0.2$
$q = 0.3$
$r = 0.2$

c) If independent $P(A) \times P(B) = P(A \cap B)$
$0.4 \times 0.5 = 0.2$

$P(A \cap B) = 0.2$ $\therefore$ A and B are independent.

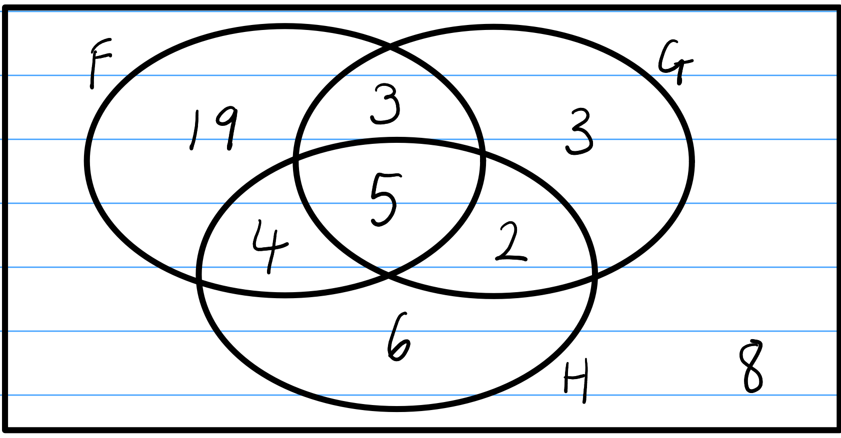
3 Raheem asks 50 people which sports they watch. The can chose from football, golf and hockey.

5 people watch all three sports.
8 people watch football and golf
7 people watch golf and hockey
9 people watch football and hockey
31 people watch football
13 people watch golf
17 people watch hockey.

(a) Draw a Venn diagram for this information.

(b) Two people are selected at random find the probability they both watch football.

a/



b/ $\frac{31}{50} \times \frac{30}{49} = \frac{93}{245}$

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4 For the events A and B.

The probability of A is 0.6
The probability of B is 0.5
The probability of neither A or B is 0.1.

(a) Find P(A and B)

(b) Draw a Venn diagram for this information.

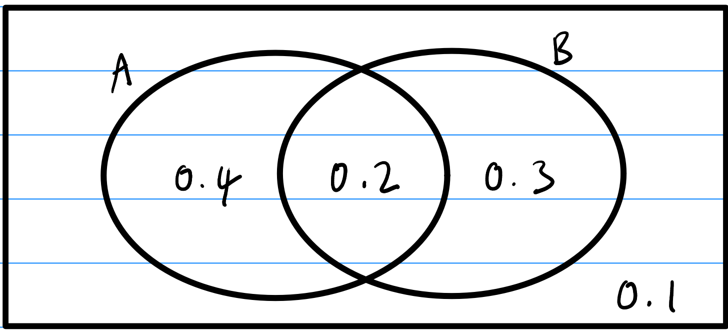
(c) Determine whether A and B are independent.

a/ $P(A \cup B) = 0.9$

$0.6 + 0.5 - 0.9 = 0.2$

$P(A \cap B) = P(A) + P(B) - P(A \cup B)$

b/



c/ $0.6 \times 0.5 = 0.3$ $\therefore$ not independent

$0.2 \neq 0.3$

5 Two events A and B are independent and P(A) = 0.4 and P(B) = 0.3

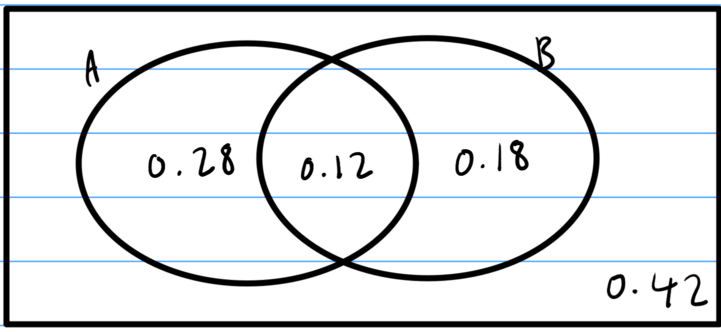
(a) Find P(A and B)

(b) Draw a Venn diagram for this information.

a/ if independent $P(A) \times P(B) = P(A \cap B)$

$0.4 \times 0.3 = 0.12$

b/



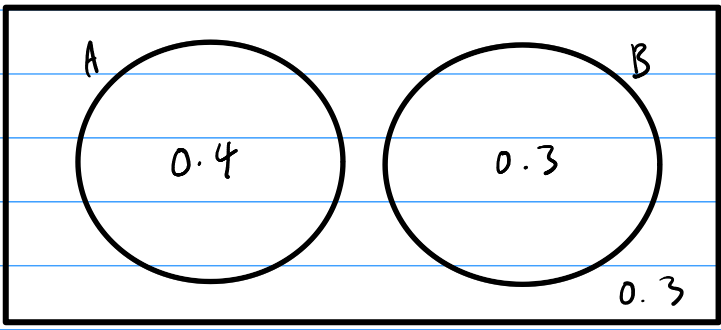
6 Two events A and B are mutually exclusive and P(A) = 0.4 and P(B) = 0.3

(a) Write down P(A and B)

(b) Draw a Venn diagram for this information.

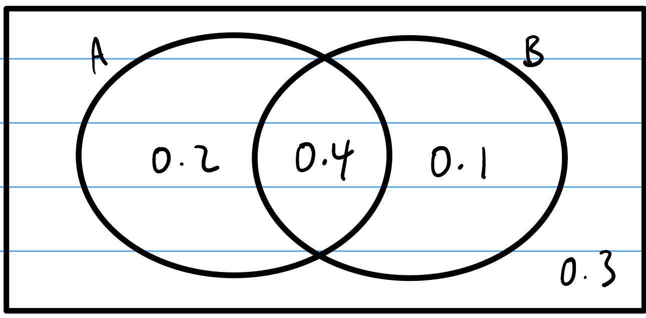
a/ $P(A \text{ and } B) = 0$

b/



7 Two events A and B are such that P(A) = 0.6 and P(B) = 0.5 and P(A and B) = 0.4

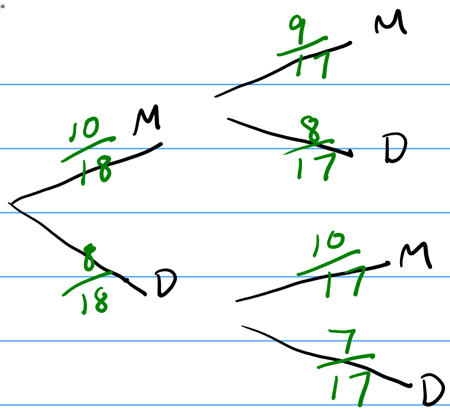
Draw a Venn diagram for this information.



8 A box contains 10 milk chocolates and 8 dark chocolates. Connor takes two chocolates at random.
Find the probability Connor takes

(a) Two dark chocolates

(b) One milk chocolate and one dark chocolate.



a) $\frac{8}{18} \times \frac{7}{17} = \frac{28}{153}$

b) $\frac{10}{18} \times \frac{8}{17} = \frac{40}{153}$

$\frac{8}{18} \times \frac{10}{17} = \frac{40}{153}$

$\frac{40}{153} + \frac{40}{153} = \underline{\underline{\frac{80}{153}}}$

9 A bag contains 10 blue counters, 8 red counters and 6 green counters.
Two counters are removed from the bag at random.
Find the probability that the two counters removed are:

(a) both red

(b) different colours

a) $P(R,R) = \frac{8}{24} \times \frac{7}{23} = \underline{\underline{\frac{7}{69}}}$

b) $P(B,R) = \frac{10}{24} \times \frac{8}{23} = \frac{10}{69}$

$P(R,B) = \qquad = 10/69$

$P(B,G) = \frac{10}{24} \times \frac{6}{23} = 5/46$

$P(G,B) = \qquad = 5/46$

$P(R,G) = \frac{8}{24} \times \frac{6}{23} = 2/23$

$P(G,R) = \qquad = 2/23$

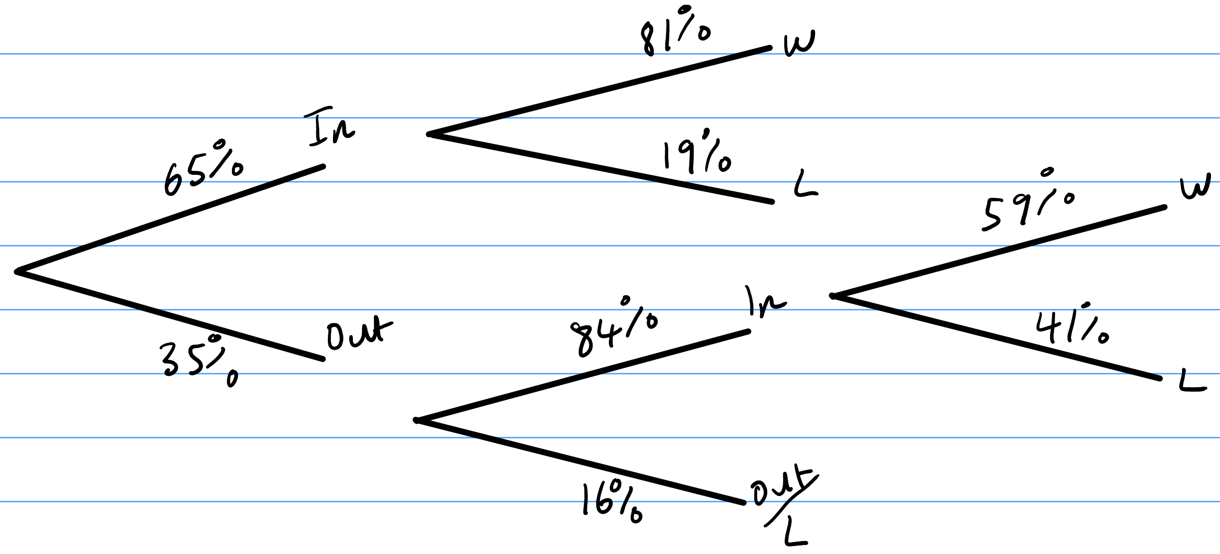
$2 \times \frac{10}{69} + 2 \times \frac{5}{46} + 2 \times \frac{2}{23} = \underline{\underline{\frac{47}{69}}}$

10 The probability a tennis player gets her first serve in court is 65%.
If she gets her first serve in court the probability of winning the point is 81%.
The chance of getting her second serve in court is 84% and if she gets he second serve in court the chance of winning the point is 59%.
If the tennis player fails to get her second serve in court she loses the point.

(a) Draw a tree diagram to show this information.

(b) Find the probability of the tennis player winning the point.

a/



b/ $0.65 \times 0.81 + 0.35 \times 0.84 \times 0.59 = \underline{\underline{0.69996}}$

11 A company has three machines that produce a component. Machine A produces 40% of the components. Machine B produces 35% of the components and machine C produces 25% of the components.

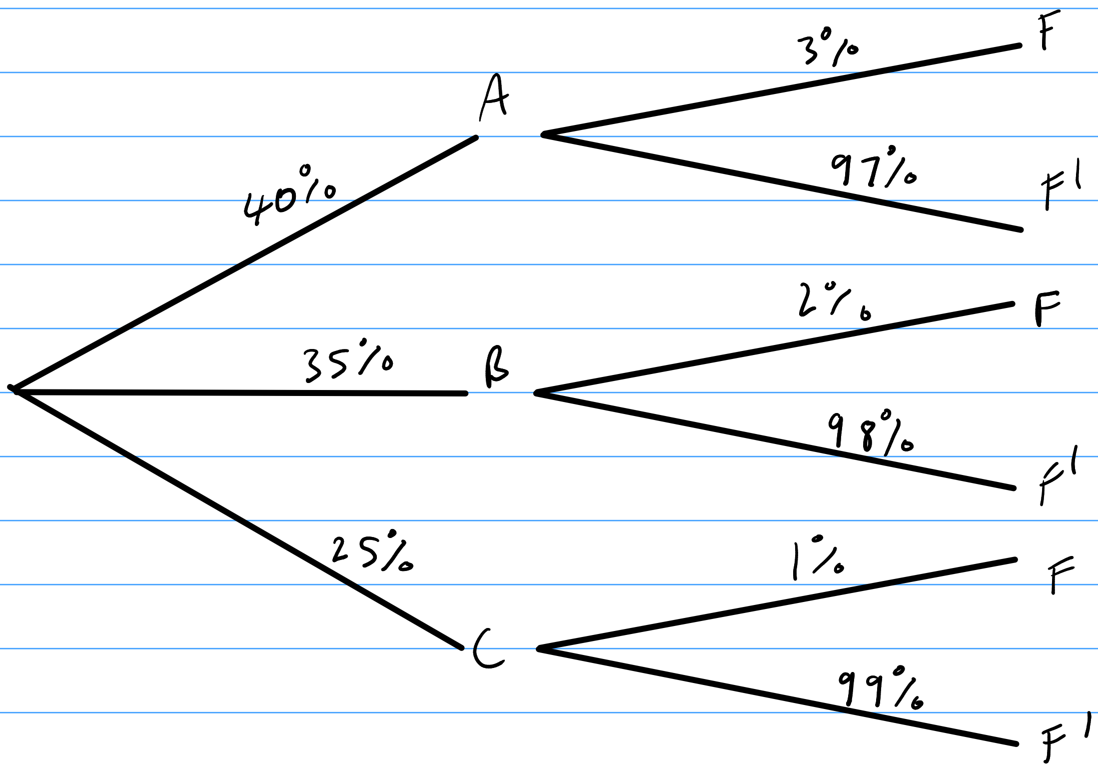
If a component is produced by machine A the chance that it will be faulty is 3%.
If a component is produced by machine B the chance that it will be faulty is 2%.
If a component is produced by machine C the chance that it will be faulty is 1%.

(a) Draw a tree diagram to show this information. **(3)**

A component is selected at random. Find the probability:

(b) it is from machine A and faulty. **(2)**

(c) it is faulty. **(2)**



b) $0.4 \times 0.03 = \underline{\underline{0.012}}$

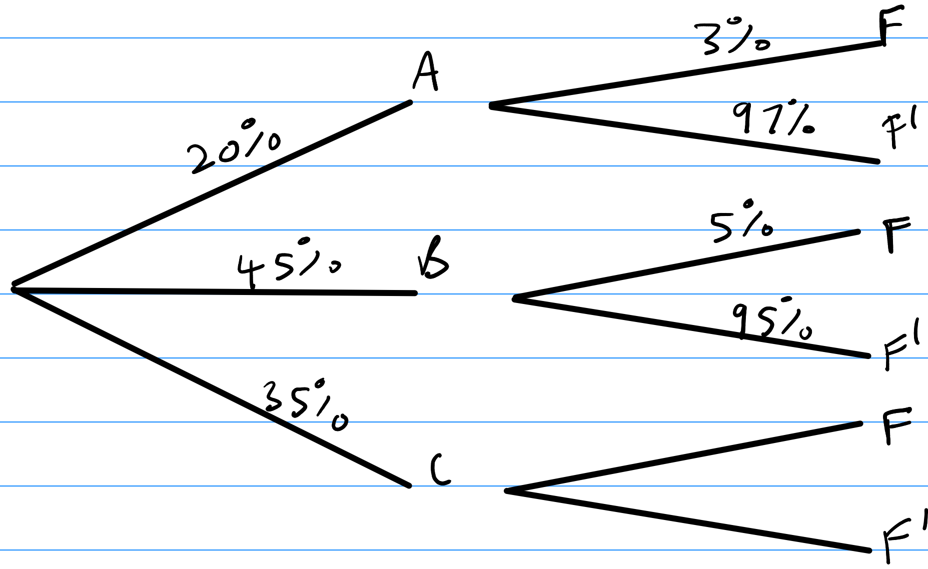
c) $0.012 + 0.35 \times 0.02 + 0.25 \times 0.01 = 0.0215$

12 A company has three machines that produce a component. Machine A produces 20% of the components, machine B produces 45% of the components and machine C produces the rest of the components.

4% of the components produced are faulty.

Of the components produced by machine A, 3% are faulty and of the components produced by machine B, 5% are faulty.

Find the percentage of components produced by machine C that are faulty.



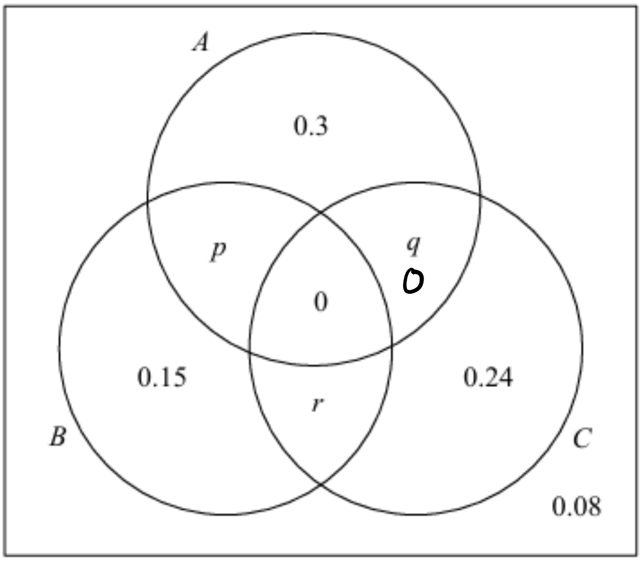
$$0.2 \times 0.03 + 0.45 \times 0.05 + 0.35 \times F_c = 0.04$$

$$0.0285 + 0.35 F_c = 0.04$$

$$0.35 F_c = 0.0115$$

$$F_c = \frac{23}{245}$$

13 The Venn diagram below shows three events A, B and C.



Events A and C are mutually exclusive. $\therefore q = 0$
Events A and B are independent.

Find the values of p, q and r.

$q = 0$

all add up to 1.

$0.3 + 0.15 + 0.24 + 0.08 = 0.77$

$\therefore p + r = 0.23$

$P(B) = 0.15 + 0.23$
$= 0.38$

$P(A) \times P(B) = P(A \cap B)$
$(0.3 + p) \times 0.38 = p$

$0.114 + 0.38p = p$
$0.114 = 0.62p$
$p = \frac{57}{310}$

$r = 0.23 - \frac{57}{310}$
$= \frac{143}{3100}$