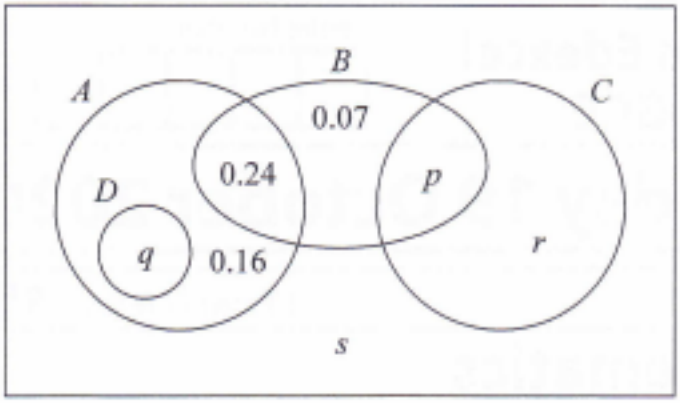
YORKSHIRE MATHS TUTOR

1. The Venn diagram shows the probabilities associated with four events, A, B, C and D



(a) Write down any pair of mutually exclusive events from A, B, C and D

(1)

Given that $P(B) = 0.4$

(b) find the value of p

(1)

Given also that A and B are independent

(c) find the value of q

(2)

Given further that $P(B' | C) = 0.64$

(d) find

(i) the value of r

(ii) the value of s

(4)

a) Mutually exclusive A and C
or D and B
or D and C

b) $P(B) = 0.4$ $\quad p = 0.4 - 0.24 - 0.07 = 0.09$

c) If A and B independent
$P(A) \times P(B) = P(A \cap B)$
$P(A) \times 0.4 = 0.24$
$P(A) = 0.6$
$q = 0.6 - 0.24 - 0.16 = 0.2$

d) $P(B'|C) = \frac{r}{P(C)} = \frac{r}{p+r}$

$0.64 = \frac{r}{p+r}$ $\quad p = 0.09$

$0.64(0.09 + r) = r$

$0.0576 + 0.64r = r$

$0.0576 = r - 0.64r$

$0.0576 = 0.36r$

$r = 0.16$

$s = 1 - (0.6 + 0.07 + 0.09 + 0.16)$

$s = 1 - 0.92 = 0.08$

2.

Three bags, A, B and C, each contain 1 red marble and some green marbles.

Bag A contains 1 red marble and 9 green marbles only
Bag B contains 1 red marble and 4 green marbles only
Bag C contains 1 red marble and 2 green marbles only

Sasha selects at random one marble from bag A.
If he selects a red marble, he stops selecting.
If the marble is green, he continues by selecting at random one marble from bag B.
If he selects a red marble, he stops selecting.
If the marble is green, he continues by selecting at random one marble from bag C.

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

(2)

(b) Find the probability that Sasha selects 3 green marbles.

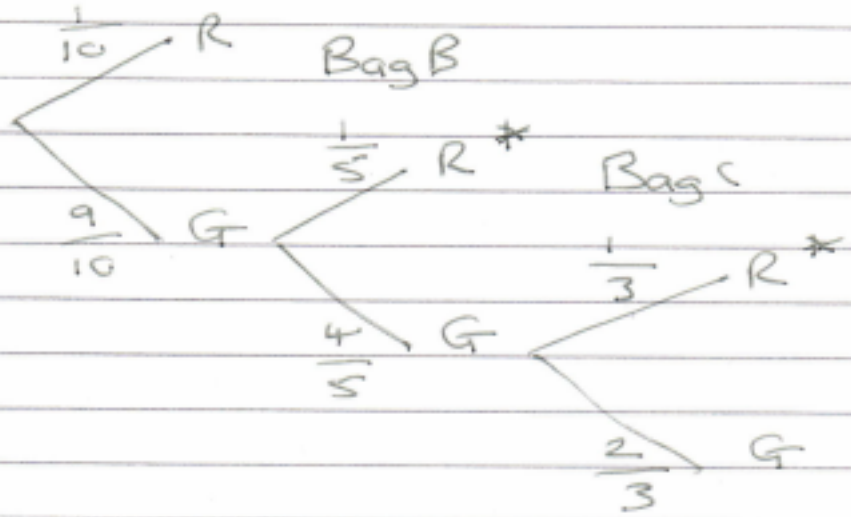
(2)

(c) Find the probability that Sasha selects at least 1 marble of each colour.

(2)

Bag A

a)



b) $P(GGG) = \frac{9}{10} \times \frac{4}{5} \times \frac{2}{3} = \frac{12}{25}$

c) $P(\text{one of each}) = \frac{9}{10} \times \frac{1}{5} + \frac{9}{10} \times \frac{4}{5} \times \frac{1}{3} = \frac{21}{50}$ * outcomes

d) $P(\text{Given red selected}) = \frac{1}{10} + \frac{9}{10} \times \frac{1}{5} + \frac{9}{10} \times \frac{4}{5} \times \frac{1}{3} = \frac{13}{25}$

↑ ↑ Bag B ↑ Bag C

Bag A

$$P(\text{R from bag B}) = \frac{9}{10} \times \frac{1}{5} = \frac{9}{50}$$

$$P(\text{From B} \mid \text{selects red}) = \frac{P(\text{R from B})}{P(\text{Given R selected})}$$

$$= \frac{\frac{9}{50}}{\frac{13}{25}} = \frac{9}{26}$$