C.E.M.TUITION

Student Name : ______________________________

Review Topic : Probability

(HSC - PAPER 3)

Year 12 - 2 Unit

15. A biscuit barrel contains 15 choc chip and 5 walnut cookies. Nita chooses two cookies randomly and notes their flavour before consuming them. Find the probability that the two cookies were:

(a) both walnut; **(b)** one was walnut;

(c) neither were walnut; **(d)** at least one was walnut.

16. Leigh collects football cards. In her top drawer she has 5 Newcastle Knights, 5 St George and 2 Brisbane Bronco cards to swap. Lee pulled from her drawer 2 cards in succession while the lights were out. Find the probability that:

(a) the first card chosen was a Knight;

(b) both cards were Knights;

(c) both cards were from the same club;

(d) at least one card was a Bronco.

(Answer all questions as fractions in simplest form.)

17. Quality control experts assessed the probability of a dog whistle being defective was 0·01. Big Al complained to the manufacturers that of two dog whistles that he had purchased, neither functioned correctly as he could hear nothing and he was constantly being followed by dogs. Calculate the probability that:

(a) both whistles are defective;

(b) one is defective;

(c) at least one is defective.

18. From a packet of mixed seed it was estimated that the probability of any seed planted yielding a white carnation was 0·02.

(a) Calculate the probability that from any two seeds planted there will be:

(i) two white carnations; **(ii)** no white carnations;
(iii) at least one white carnation.

(b) If n seeds are planted find an expression (leave unsimplified) to represent the probability of obtaining:

(i) no white carnations; **(ii)** at least one carnation.

(c) *How many* seeds must be planted for you to be at least 98% certain of obtaining a white carnation?

19. The numbers one to five are written on metal discs and the discs placed in a green cloth bag. Mario draws out one disc at random and places it on the table. His brother draws a second disc out and places it to the right of the first forming a two-digit number.

(a) Find the probability that the number formed is:

(i) 42; **(ii)** even;

(iii) a number containing consecutive integers (i.e. 12);

(iv) greater than 40; **(v)** is divisible by 3.

(b) Find the probability that the sum of the two numbers is:

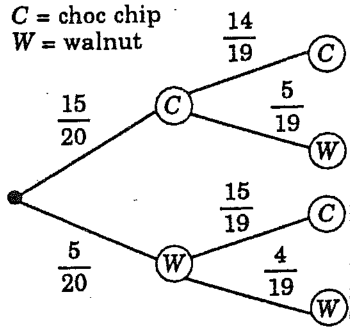
(i) five; **(ii)** at least five.

(c) If Mario replaces the first disc after noting its number before his brother selects the second disc find the probability that:

(i) both numbers are the same;

(ii) the sum of the numbers is six.

15. C = choc chip
W = walnut



$$P(CC)=\frac{15}{20}\times\frac{14}{19}=\frac{21}{38}$$
$$P(CW)=\frac{15}{20}\times\frac{5}{19}=\frac{15}{76}$$
$$P(WC)=\frac{5}{20}\times\frac{15}{19}=\frac{15}{76}$$
$$P(WW)=\frac{5}{20}\times\frac{4}{19}=\frac{1}{19}$$

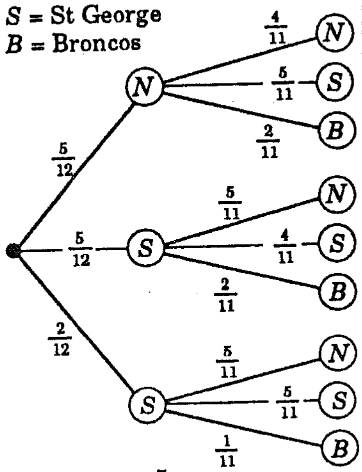
(a) $P(WW)=\frac{1}{19}$

(b) $P(\text{one } W)$
$=P(CW)+P(WC)$
$=\frac{15}{76}+\frac{15}{76}=\frac{15}{38}$

(c) $P(CC)=\frac{21}{38}$

(d) $P(\text{at least one walnut})$
$=1-P(CC)$
$=1-\frac{21}{38}=\frac{17}{38}$

16. N = Newcastle
S = St George
B = Broncos



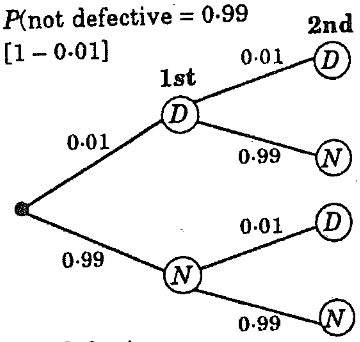
(a) $P(N)=\frac{5}{12}$

(b) $P(NN)=\frac{5}{12}\times\frac{4}{11}=\frac{5}{33}$

(c) $P(\text{both same})$
$=P(NN)+P(SS)+P(BB)$
$=\frac{5}{33}+\frac{5}{12}\times\frac{4}{11}+\frac{2}{12}\times\frac{1}{11}$
$=\frac{7}{22}$

(d) $P(\text{at least one Bronco})$
$=1-P(NN)-P(NS)$
$\quad -P(SN)-P(SS)$
$=1-\left(\frac{5}{33}+\frac{5}{12}\times\frac{5}{11}+\frac{5}{12}\times\frac{5}{11}+\frac{5}{12}\times\frac{4}{11}\right)$
$=1-\frac{15}{22}\qquad=\frac{7}{22}$

17. $P(\text{defective})=0{\cdot}01$
$P(\text{not defective}=0{\cdot}99$
$[1-0{\cdot}01]$



D = defective
N = not defective

(a) $P(DD)$
$=0{\cdot}01\times0{\cdot}01$
$=0{\cdot}0001$

(b) $P(\text{one defective})$
$=P(DN)+P(ND)$
$=0{\cdot}01\times0{\cdot}99+0{\cdot}99\times0{\cdot}01$
$=0{\cdot}0099+0{\cdot}0099$
$=0{\cdot}0198$

(c) $P(\text{at least 1 defective})$
$=1-P(\text{both not defective})$
$=1-0{\cdot}99\times0{\cdot}99$
$=0{\cdot}0199$

18. (a) $P(W)=0{\cdot}02$
$P(\text{not } W)=0{\cdot}98$

(i) $P(\text{2 white})=(0{\cdot}02)^2$

(ii) $P(\text{2 not white})$
$=(0{\cdot}98)^2$

(iii) $P(\text{at least 1 white})$
$=1-P(\text{none white})$
$=1-(0{\cdot}98)^2$

(b) (i) $P(\text{none white})=(0{\cdot}98)^n$

(ii) $P(\text{at least 1 white})$
$=1-P(\text{none white})$
$=1-(0{\cdot}98)^n$

(c) For 98% certainty,
Put $1-(0{\cdot}98)^n=0{\cdot}98$ (%)
$\therefore\quad (0{\cdot}98)^n=0{\cdot}02$
$\therefore\quad \log(0{\cdot}98)^n=\log 0{\cdot}02$

Take logs of both sides.

$n\log(0{\cdot}98)=\log 0{\cdot}02$
$\therefore\quad n=\frac{\log(0{\cdot}02)}{\log(0{\cdot}98)}$
$=193{\cdot}638\,55$

$\therefore$ 194 seeds must be planted.

19. Possible combinations are:

12	13	14	15
21	23	24	25
31	32	34	35
41	42	43	45
51	52	53	54

Number of different possibilities = 20

(a) (i) $P(42)=\frac{1}{20}$

(ii) $P(\text{even})=\frac{8}{20}=\frac{2}{5}$

(iii) $P(\text{consecutive integers})$
$=\frac{4}{20}=\frac{1}{5}$ (12, 23, 34, 45)

(iv) $P(>40)=\frac{8}{20}=\frac{2}{5}$

(v) $P(\text{divisible by 3})$
$=\frac{8}{20}=\frac{2}{5}$

(b) (i) $P(\text{sum of 5})=\frac{4}{20}=\frac{1}{5}$

(ii) $P(\text{at least 5})$
$=P(\geq 5)=\frac{16}{20}=\frac{4}{5}$

(c) Combinations now become:

11	12	13	14	15
21	22	23	24	25
31	32	33	34	35
41	42	43	44	45
51	52	53	54	55

Number of different possibilities = 25

(i) $P(\text{both same})=\frac{5}{25}=\frac{1}{5}$

(ii) $P(\text{sum 6})=\frac{5}{25}=\frac{1}{5}$

24. We need to know the relative areas of each section.

A of inner circle
$= \pi r^2 = \pi 8^2 = 64\pi \text{ cm}^2$

A of middle section
$= \pi(16)^2 - 64\pi = 192\pi \text{ cm}^2$

A of outer ring
$= \pi(24)^2 - 192\pi = 384\pi \text{ cm}^2$

Also area of board
$= 80 \times 80 = 6400 \text{ cm}^2$

The probability of hitting any section will be the ratio of the area of each section relative to the area of the board.

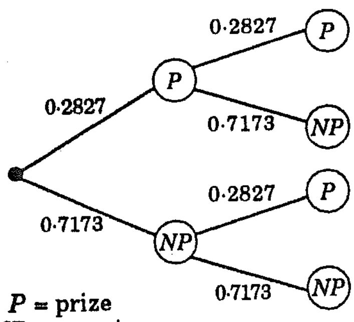
(a) (i) P(Super Supreme)
$= P$(hitting centre)
$= \dfrac{64\pi}{6400} = 0{\cdot}0314$ $(4dp)$

(ii) P(thickshake)
$= P$(outer ring)
$= \dfrac{384\pi}{6400} = 0{\cdot}1885$ $(4dp)$

(iii) P(prize) $= P$(hitting anywhere inside large circle)
$= \dfrac{\pi(24)^2}{6400} = 0{\cdot}2827$
$(4dp)$

(iv) P(no prize)
$= 1 - P$(prize) $= 0{\cdot}7173$
$(4dp)$

(b) P(prize) $= 0{\cdot}2827$
P(no prize) $= 0{\cdot}7173$



P = prize
NP = no prize

(i) $P(P, P)$
$= (0{\cdot}2827)^2$
$= 0{\cdot}0799$ $(4dp)$

(ii) P(one prize)
$= P(P, NP) + P(NP, P)$
$= 0{\cdot}2827 \times 0{\cdot}7173$
$+ 0{\cdot}7173 \times 0{\cdot}2827$
$= 0{\cdot}4056$ $(4dp)$

(iii) P(no prizes)
$= P(NP, NP)$
$= (0{\cdot}7173)^2$
$= 0{\cdot}5145$ $(4dp)$

(iv) P(at least one prize)
$= 1 - P$(no prizes)
$= 1 - 0{\cdot}5145$
$= 0{\cdot}4855$ $(4dp)$