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EE 381 HW 2

2.1.1) a) $P[H_2] = P[H_1 H_2] + P[T_1 H_2] = 1/4$

we get, $P[H_1 H_2] = \frac{P[H_1 H_2]}{P[H_2]} = \frac{1/16}{1/4} = 1/4$

b) Prob that first flip is heads and second flip becomes tails is $P[H_1 T_2] = 3/16$

2.2.1) $P[R_2 Y_2 G_2 B_2] = \frac{8!}{2!\,2!\,2!\,2!}\left(\frac{1}{4}\right)^2\left(\frac{1}{4}\right)^2\left(\frac{1}{4}\right)^2\left(\frac{1}{4}\right)^2$

$= \frac{8!}{4^{10}} \approx 0.0385$

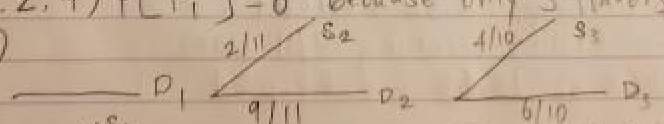
2.2.2) a) If each piece is berry or cherry then prob. is $p = 1/2$. Prob of only berry or cherry is $p^{12} = 1/4096$

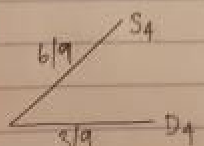
b) Probability will be 3/4. Prob. all 12 pieces are not pink is $(3/4)^{12} = 0.0317$

c) $P[F_1] = P[C_1 \cup C_2 \cup \ldots \cup C_4] = \sum_{i=1}^{4} P[C_i] = 4P[C_1] = (1/4)^{11}$

2.2.4) a) $P[F_1] = 0$ because only 3 flavors

b)





$P[D_1 D_2 D_3 D_4] = 1\left(\frac{9}{11}\right)\left(\frac{6}{10}\right)\frac{3}{9} = \frac{9}{55}$

c) Let outcome be $\binom{12}{4} = 495$ combinations or pieces. Then count number of combinations in which we have two pieces of each flavors.

$n_1 = \binom{4}{2} = 6$, $n_2 = \binom{3}{2} = 3$, $n_3 = \binom{3}{2} = 3$

$n_1 n_2 n_3 = 54$ possible ways

$$P[F_2] = \frac{n_1 n_2 n_3}{\binom{12}{4}} = \frac{54}{495} = \frac{6}{55}$$

All combinations are equally likely

2.2.8) Number of 3 letter words formed is $4^3 = 64$. Letting each letter once and using 3 choices for second letter, two choices for third letter. Total is $4 \cdot 3 \cdot 2 = 24$ possible codes

2.3.1) a) $P[00111] = (0.8)^2 (0.2)^3 = 0.00512$

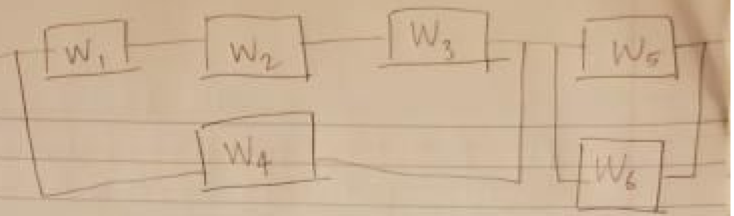
b) $P[\text{three 1's}] = \binom{5}{3} (0.8)^2 (0.2)^3 = 0.0512$

2.3.2) $P(\text{celtics win}) = 0.32$, $P(\text{celtics losing}) = 1 - 0.32 = 0.68$

Prob of celtics winning 8 championships: $0.32^8 = 0.0001$

Prob of Celtics winning 10/11 games $= 11(0.32^{10})0.68 = 0.00084$

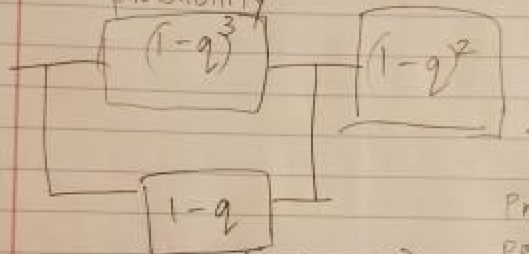
2.4.1)



$P[W_1 W_2 W_3] = (1-q)^3$

$P[W_5 \cup W_6] = 1 - P[W_5 W_6] = 1 - q^2$

Replace each series with a single device with probability



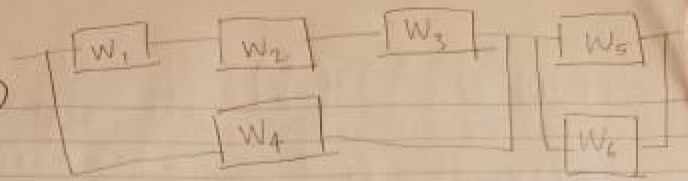
Prob of two devices in parallel work is 1 minus probability neither works

$P[W] = 1 - q(1-(1-q)^3)$

$P[W] = (1-q(1-(1-q)^3)[1-q^2]$

1.65)

2.4.1)



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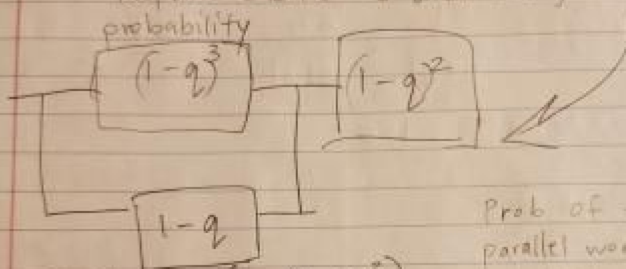

Prob of two devices in parallel work is 1 minus probability neither works

$P[W] = 1 - q(1-(1-q)^3)$

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1.65) a) 7! ways, $6! = 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1$
$= 5040$ ways

b) $(5!) \times (3!)$
$(5 \times 4 \times 3 \times 2 \times 1)(3 \times 2 \times 1) = (120)(6) = 720$ ways

c) $(5!)(2!) = (5 \times 4 \times 3 \times 2 \times 1)(2 \times 1) = (120)(2) = 240$ ways

1.76) a) $\binom{5}{3} \times \binom{6}{2} = \frac{5!}{3!2!} \times \frac{6!}{2!4!} = \frac{5\times4}{2} \times \frac{6\times5}{2}$

$= 5\times2\times3\times5 = 150$

b) $\binom{3}{1} \times \binom{6}{2} = \frac{3!}{1!2!} \times \frac{6!}{2!4!} = 3 \times \frac{6\times5}{2} = 3\times3\times5$

$= 45$

c) $\binom{5}{2} \times \binom{5}{3} = \frac{5!}{2!3!} \times \frac{5!}{3!2!} = \frac{5\times4}{2} \times \frac{5\times4}{2}$

$= 5\times2\times2\times5 = 100$