P12 - 2.8 - Misc Probability

Five out of 1000 light bulbs are Defective (D).

If 20 are selected w/out rep. Find $P(all\ good)$

$$\frac{995}{1000} \times \frac{994}{999} \cdots = \left(\frac{995}{1000}\right)^{20} = \boxed{0.905}$$

$5\%\ of\ 1000 = 50$ | **5% Rule w/out Replacement**

If two are selected w/out rep. Find $P(\bar{D}, \bar{D})$

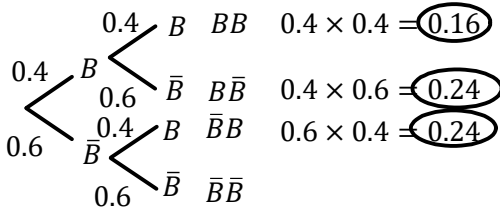$$\frac{995}{1000} \times \frac{994}{999} = \boxed{0.990}$$

60 # Combo Lock.

$$_{60}P_3 = \frac{60!}{(60-3)!} = \boxed{205320}$$

$$p(\text{1st guess}) = \boxed{\frac{1}{205320}}$$

Eye Colour
0.4 Brown, 0.35 Blue, 0.12 Green, 0.07 Gray, 0.06 Hazel
$p(Brown: B \geq 1, of\ 2) = 0.16 + 0.24 + 0.24 = \boxed{0.64}$

$$
\begin{array}{llll}
0.4 & B & BB & 0.4 \times 0.4 = \boxed{0.16} \\
0.6 & \bar{B} & B\bar{B} & 0.4 \times 0.6 = \boxed{0.24} \\
0.4 & B & \bar{B}B & 0.6 \times 0.4 = \boxed{0.24} \\
0.6 & \bar{B} & \bar{B}\bar{B} & \\
\end{array}
$$

M,Tu,W,Th,F,Sa,Su

Choose 3

$$p(\neq Sa, Sun) = \frac{10}{35} = \boxed{\frac{2}{7}}$$

$$_5C_3 = \boxed{10} \qquad _7C_3 = \boxed{35}$$

Find the probability two people are born on :

The same day of the week.   A Monday.

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

$$\frac{1}{7} \times \frac{1}{7} = \boxed{\frac{1}{49}}$$

6/49 Lottery.

$$_{49}C_6 = \frac{n!}{r!\,(n-r)!} = \frac{49!}{6!\,(49-6)!} = \boxed{13983816}$$

$$p(win) = \boxed{\frac{1}{13983816}}$$

5 boys, 5 girls

$$_{10}C_5 = \boxed{252}$$

$$p(choose\ 5\ same\ sex) = \boxed{\frac{2}{252}} \qquad \text{All boys/All girls}$$

Children

$$P(b,b,b) = \left(\frac{1}{2}\right)^3 = \boxed{\frac{1}{8} = 0.375}$$

Two Six Sided Die $p(sum \geq 10) = \dfrac{6}{36}$

	1	2	3	4	5	6
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

3 attempts to pass a test $p(p) = 0.8$ $p(f) = 0.2$

p
f, p
f, f, p
f, f, f

$$p(p) = \boxed{0.8}$$

$$p(f, p) = 0.2 \times 0.8$$
$$p(f, p) = \boxed{0.16}$$

$$p(f, f, p) = 0.2 \times 0.2 \times 0.8$$
$$p(f, f, p) = \boxed{0.032}$$

$$p(f, f, f) = 0.2 \times 0.2 \times 0.2$$
$$p(f, f, f) = \boxed{0.008}$$

$$p(pass) = 0.8 + 0.16 + 0.032$$
$$p(pass) = \boxed{0.992}$$

$$p(pass) = 1 - 0.008$$
$$p(pass) = \boxed{0.992}$$

let $x =$ Trifecta - Choose 1st, 2nd and 3rd Place (In Order). 8 Horse (Equally likely) Race.

$$_nP_r = \frac{n!}{(n-r)!} \qquad p(x) = \boxed{\frac{1}{336}}$$

$$_8P_3 = \frac{8!}{(8-3)!}$$

$$_8P_3 = \frac{8!}{5!}$$

$$_8P_3 = 8 \times 7 \times 6 \qquad \boxed{\frac{5!}{8!} = \frac{1}{336}}$$

$$_8P_3 = \boxed{336}$$

$$\boxed{\underline{8} \times \underline{7} \times \underline{6} = 336}$$

123, 872
132, 931
213, ...
231
312
321

let $x =$ Trifecta box - Choose 1st, 2nd and 3rd Place (Any Order). 8 Horse (Equally likely) Race.

$$_nC_r = \frac{n!}{r!\,(n-r)!} \qquad p(x) = \boxed{\frac{1}{56}}$$

$$_8C_3 = \frac{8!}{3!\,(8-3)!}$$

$$_8C_3 = \frac{8!}{3!\,5!}$$

$$_8C_3 = \frac{8 \times 7 \times 6}{3 \times 2 \times 1}$$

$$_8C_3 = \boxed{56}$$

$$\frac{3!\,5!}{8!} = \boxed{\frac{1}{56}}$$

123=312
364
571
...