1-) Suppose we have 4 shirts of 4 different Colours and 3 pants of different colors. How many different outfits are there?

Solution:

Shirts = 4
Pants = 3
Total outfits = ?

Total Outfits = Shirts x Pants
Total Outfits = 4 x 3
Total Outfits = 12 outfits. Answer

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2-) How many different license plate no.s with 3 letters followed by 3 no.s are possible?

Solution:

letters on plate = 3
Digits on plate = 3

Combination for 3 letters = $26 \times 26 \times 26$
$= 17576$

∴ Letters = 26
∴ Digits = 10 [0-9]

Combination for 3 digits = $10 \times 10 \times 10$
$= 1000$

Therefore,
Combination/Possibilities = 17576×1000
$= 17576000$

Answer: 17576000 license plates can be made.

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3-) How many ways can one arrange 4 Math books, 3 Chem. books, 2 Physics books and 1 biology book on a bookshelf so that all the math books are together, all the chemistry books are together and all the Physics books are together?

Solution: Given that,

Math books = 4
Chemistry books = 3
Physics books = 2
Biology books = 1
N.o. of subjects = 4

Therefore, within each subject, the possible combination for each subject is;

$$Math = 4! = 4 \times 3 \times 2 \times 1 = 24 \text{ placements}$$
$$Chemistry = 3! = 3 \times 2 \times 1 = 6 \text{ placements}$$
$$Physics = 2! = 2 \times 1 = 2 \text{ placements}$$
$$Biology = 1! = 1 = 1 \text{ placement}$$

As total subjects are 4, possible ways to place the books are

$$= (\text{Total subjects})! \times (\text{Math})! \times (\text{Chemistry})! \times (\text{Physics})! \times (\text{Biology})!$$

$$= 4! \times 4! \times 3! \times 2! \times 1!$$
$$= 24 \times 24 \times 6 \times 2 \times 1$$
$$= \boxed{6912 \text{ possibilities}}$$ ∴ Answer

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4-) Suppose there are 8 men and 8 women. How many ways can we choose a committee that has 2 men and 2 women?

Solution:) Given,

No. of men = 8
No. of women = 8

For 2 men committee,

$$^8C_2 = \frac{8!}{(8-2)! \times 2!} \qquad \because {}^nC_k = \frac{n!}{(n-k)! \times k!}$$

$$= \frac{8!}{6! \times 2!} = \frac{8!}{6! \times 2!} = \frac{8 \times 7 \times 6!}{6! \times 2!}$$

$$= \frac{8 \times 7}{2} = 4 \times 7$$

$^8C_2 = 28$ possible groups for men

For 2 women possibilities,

$$^8C_2 = \frac{8!}{(8-2)! \times 2!}$$

$$= \frac{8!}{6! \times 2!} = \frac{8 \times 7 \times 6!}{6! \times 2!} = 4 \times 7$$

$^8C_2 = 28$ possible groups for women

For overall committee group

$= {}^8C_2 \times {}^8C_2$

$= 28 \times 28 = \boxed{784 \text{ groups}}$

Answer

5-) Let $S = \{1,2,3,4\}$ and $A = \{1,2\}$, $B = \{1,3\}$, $C = \{1,4\}$. Assumen the outcomes are equiproprable. Are A and C independent events?

Solution: Given,

$S = \{1,2,3,4\}$
$A = \{1,2\}$
$B = \{1,3\}$
$C = \{1,4\}$

Independent events,

$$\boxed{P(A \cap C) = P(A) \cdot P(C)} \quad \text{i}$$

$\because$ $A \cap C = \{1,2\} \cap \{1,4\}$
$A \cap C = \{1\}$

$$\boxed{P(A \cap C) = 1/4} \quad (A)$$

$\because$ $P(A) = 2/4$

$$\boxed{P(A) = 1/2} \quad (B)$$

$\because$ $P(C) = 2/4$

$$\boxed{P(C) = 1/2} \quad (C)$$

Putting (A), (B) and (C) in i

$1/4 = (1/2) \cdot (1/2)$
$1/4 = 1/4$
$\boxed{0.25 = 0.25}$

Answer: A and C are independent events.

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6-)

Solution: Given that,

Players = A and B

Sample space = {Score, miss}

Required: (i) $P[A] = ?$

(ii) Either A or B scores.

(iii) Both scores.

(iv) Both miss.

(i) $\boxed{P[A] = 1/2}$ Player A scoring . Answer

(ii) Either A or B scores:

$$P[AB' \cup A'B]$$
$$= P[AB'] + P[A'B]$$
$$= P[A].P[B'] + P[A'].P[B]$$
$$= P[A].(1 - P[B]) + (1 - P[A]).P[B]$$
$$= (1/2)(1 - 1/2) + (1 - 1/2)(1/2)$$
$$= (1/2)(1/2) + (1/2)(1/2)$$
$$= (1/4) + (1/4) = 2/4$$
$$= 1/2 = 0.5$$
$$\boxed{P[AB' \cup A'B] = 0.5}$$. Answer

(iii) Both scores;

$$P[AB] = P[A]\,P[B]$$
$$= (1/2)(1/2) = (1/4)$$
$$\boxed{P[AB] = 0.25}$$. Answer

(iv) Both miss:

$$P[A'B'] = P[A']\,P[B']$$
$$= (1 - P[A])(1 - P[B])$$
$$= (1 - 1/2)(1 - 1/2)$$
$$= (1/2)(1/2) = 1/4$$
$$\boxed{P[A'B'] = 0.25}$$. Ans

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7-)

Solution:

$$S = [3, 6]$$

$$P[A] = \frac{5-3}{6-3}$$

$$\because P[A] = \frac{\text{final Point} - \text{Initial Point}}{\text{Final point of sample Space} - \text{Initial Point of Sample space}}$$

$$P[A] = 2/3$$

$$\boxed{P[A] = 0.66}$$ Answer

$$P[B] = \frac{6-4}{6-3}$$

$$P[B] = 2/3$$

$$\boxed{P[B] = 0.66}$$ Answer

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8-)

Solution:

$n = 4, \quad P = \frac{1}{6}, \quad k = 0, 1, 2, 3, 4$

$$\boxed{\because P_n(k) = {}^{n}_{k}C\,(P)^k\,(1-P)^{n-k}}$$

For $k = 0$;

$$P_4(0) = {}^{4}_{0}C \left(\frac{1}{6}\right)^0 \left(1 - \frac{1}{6}\right)^{4-0}$$

$$= (1)(1)\left(\frac{5}{6}\right)^4$$

$$\boxed{P_4(0) = 0.482} \text{ . Answer}$$

$k = 1$; $P_4(1) = {}^{4}_{1}C \left(\frac{1}{6}\right)^1 \left(1 - \frac{1}{6}\right)^{4-1}$

$$= (4)\left(\frac{1}{6}\right)(5/3)^3$$

$$\boxed{P_4(1) = 0.385} \text{ . Answer}$$

$k = 2$; $P_4(2) = {}^{4}_{2}C \left(\frac{1}{6}\right)^2 (5/6)^{4-2}$

$$= (6)(1/36)(5/6)^2$$

$$\boxed{P_4(2) = 0.115} \text{ . Ans}$$

$k = 3$; $P_4(3) = {}^{4}_{3}C \left(\frac{1}{6}\right)^3 \left(\frac{5}{6}\right)^{4-3}$

$$= (4)(1/6)^3(5/6)^1$$

$$\boxed{P_4(3) = 0.015} \text{ . Answer}$$

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$\underline{\underline{k=4}};$ $P_4(4) = {}^4_4C \left(\frac{1}{6}\right)^4 \left(5/6\right)^{4-4}$

$= (1)\left(1/6\right)^4 \left(5/6\right)^0$

$\boxed{P_4(4) = 0.00077}$. Ans

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9-)

Solution: Defective chips = 5%

Working chips = 95% ($\because$ 100-5)

P[Working] = 0.95

$$\therefore \boxed{P_n(k) = {}^{n}_{k}C\,(p)^k (1-p)^{n-k}}$$

For $n=8, k=8$; $P_8(8) = {}^{8}_{8}C\,(0.95)^8 (0.05)^0$

$P_8(8) = 0.66$

For $n=9, k=8$; $P_9(8) = {}^{9}_{8}C\,(0.95)^8 (0.05)^0$

$P_9(8) = 0.297$

For $n=9, n=9$; $P_9(9) = {}^{9}_{9}C\,(0.98)^9 (0.05)^0$

$P_9(9) = 0.63$

$\therefore$ $P_9(8) + P_9(9) = 0.29 + 0.63$

$= 0.92$

Answer: The student must buy 2 chips.

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10-) What is the prob. of getting a six on the third attempt if you roll a fair dice?

Solution:

By Geometric Probability law,

$$P(m) = (q^{m-1})(P)$$

$\because$ $m = 3$

$P = 1/6$

$q = 1 - \frac{1}{6} = 5/6$

$$\therefore \quad P(3) = \left(\frac{5}{6}\right)^{3-1} \left(\frac{1}{6}\right)$$

$$= \left(\frac{5}{6}\right)^{2} \left(\frac{1}{6}\right)$$

$$= 25/216$$

$\boxed{P(3) = 0.1157}$ Answer

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11-)

Solution:

C = Cook Available
W = Waiter Available

$P[C] = 0.85$ ∵ $1 - P[C']$
$P[W] = 0.75$ ∵ $1 - P[W']$

(i) Suppose restaurant is open;
For 2 waiters;
let $F = (W_1 \cap W_2') \cup (W_1' \cap W_2) \cup (W_1 \cap W_2)$
$P[F] = P[W_1 \cap W_2'] + P[W_1' \cap W_2] + P[W_1 \cap W_2]$
∵ $P[A \cap B] = P[A] . P[B]$
$= (0.75)(0.25) + (0.25)(0.75) + (0.75)^2$

$P[F] = 0.9375$
$P[\text{open Restaurant}] = P[C] . P[F]$
$= (0.85)(0.93)$
$\boxed{P[OR] = 0.7968}$. Answer

(ii) Another cook is employed;
let $C = (C_1 \cap C_2') \cup (C_1' \cap C_2) \cup (C_1 \cap C_2)$
$P[C] = P[C_1 \cap C_2'] + P[C_1' \cap C_2] + P[C_1 \cap C_2]$
∵ $P[A \cap B] = P[A] . P[B]$
$= (0.85)(0.15) + (0.85)(0.15) + (0.85)^2$

$\boxed{P[C] = 0.902}$. Answer

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12.)

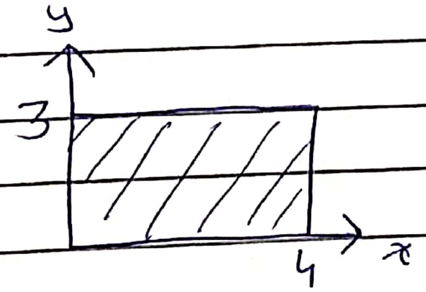
Solution:

Bed time = x
Wake-up time = y

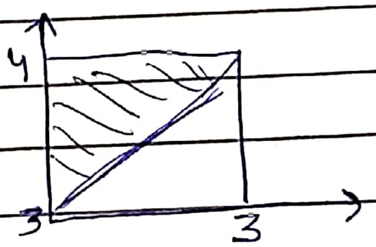
$\because$ in statement
bed-time = 2 min
Wake-up time = 4 max

Event (A):
wake-up time = 3 o'clock

Event (B):
wake-up time = 4 o'clock



Event (A)



Event (B)

$\because$ $P[A] \neq 0$
$\because$ $P[B] \neq 0$
Also, $P[A \cap B] = 0$

So, $P[A] \cdot P[B] \neq P[A \cap B]$

A and B are not independent. **Answer**

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