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A president and vice-president are to be elected in a club which has 14 members including 6 men and 8 women. Assuming that all members are equally likely to be elected, what is the probability that both officers will be women?

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Solution:

C(14,2) = 91 = number of possibilities for which 2 of the 14 will be elected officers.

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Solution:

C(14,2) = 91 = number of possibilities for which 2 of the 14 will be elected officers.

C(8,2) = 28 = number of these cases where both are women

Answer = 28/91

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A president and vice-president are to be elected in a club which has 14 members including 6 men and 8 women. Assuming that all members are equally likely to be elected, what is the probability that both officers will be women?

Alternate Solution:

P(14,2) = 182 = number of possibilities for electing a President and a Vice-President

P(8,2) = 56 = number of possibilities for electing a woman President and a woman Vice-President

Answer = 56/182 = 28/91

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In a uniform sample space S,

$$P(E) = \frac{n(E)}{n(S)}$$

Example: If you deal a card from a 52-card deck, the probability that it's a heart is 13/52.

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Charlie has 4 pairs of white socks, 2 pairs of black socks, and 3 pairs of blue socks. They are all mixed up in a drawer in his dresser. One morning he gets out of bed in the dark and reaches into the drawer and pulls out two socks. What is the probability that the socks will be of the same color?

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Solution:

He has 18 socks and picks 2: $C(18,2) = 153$

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Solution:

He has 18 socks and picks 2: $C(18,2) = 153$

$C(8,2) = 28$ ways to pick 2 white
$C(4,2) = 6$ ways to pick 2 black
$C(6,2) = 15$ ways to pick 2 blue

$$28 + 6 + 15 = 49$$

Answer = $\frac{49}{153}$

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Eric and Edith have applied for jobs at Sadlacks. There are 6 job openings available and 25 people have applied.

(a) What is the probability that Edith gets a job?

(b) What is the probability that both of them get jobs? (Assume that the 6 people to get jobs are to be randomly chosen from among the 25 applicants.)

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(a) What is the probability that Edith gets a job?

(b) What is the probability that both of them get jobs? (Assume that the 6 people to get jobs are to be randomly chosen from among the 25 applicants.)

Solution:

(a) C(25, 6) = 177,100 ways to pick 6 who get jobs
C(24,5) = 42,504 ways to pick 5 besides Edith

$$\frac{C(24,5)}{C(25,6)} = \frac{42,504}{177,100} = \frac{6}{25} = .24$$

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(b) What is the probability that both of them get jobs? (Assume that the 6 people to get jobs are to be randomly chosen from among the 25 applicants.)

Solution:

(b) C(23,4) = 8,855 ways to pick 4 others besides Edith and Eric

$$\frac{C(23,4)}{C(25,6)} = \frac{8,855}{177,100} = \frac{6 \times 5}{25 \times 24} = .05$$

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Pud is playing 5-card draw (a poker game). When he picks up the hand that is dealt to him, what is the probability that it will be a "full house"?

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Pud is playing 5-card draw (a poker game). When he picks up the hand that is dealt to him, what is the probability that it will be a "full house"?

Solution:

The number of poker hands is $C(52,5) = 2{,}598{,}960$

The number of hands that constitute a full house is

$13 \times 12 \times C(4,3) \times C(4,2) = 3{,}744$

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$13 \times 12 \times C(4,3) \times C(4,2) = 3{,}744$

$$\text{Answer} = \frac{3{,}744}{2{,}598{,}960} \approx .00144$$

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Mary wrote postcards to 4 friends in California and 6 friends in South Carolina. 4 of the 10 cards fell out of her purse and were lost. What is the probability that all of the cards that were lost were cards to South Carolina? What is the probability that exactly 3 of the lost cards were addressed to California?

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Solution:

C(10,4) = 210 possibilities for which cards were lost
C(6,4) = 15 ways that the lost cards could all be to SC

$$\frac{C(6,4)}{C(10,4)} = \frac{15}{210} = \frac{1}{14}$$

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Mary wrote postcards to 4 friends in California and 6 friends in South Carolina. 4 of the 10 cards fell out of her purse and were lost. What is the probability that all of the cards that were lost were cards to South Carolina? What is the probability that exactly 3 of the lost cards were addressed to California?

Solution:

C(10,4) = 210 possibilities for which cards were lost
C(4,3) × C(6,1) = 24 ways that three of the lost cards could be to CA and one to SC

$$\frac{C(4,3)\times C(6,1)}{C(10,4)} = \frac{24}{210} \approx .1143$$

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A school teacher is going to assign four children to safety patrol duty on four different streets. The children are Eddie, Bob, Mike, and Alice. The streets are Elm, Park, Van Dyke, and Oakwood.

What is the probability that Mike will be assigned duty at Elm Street?

Solution:

$$\frac{3!}{4!} = \frac{6}{24} = \frac{1}{4}$$

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A school teacher is going to assign four children to safety patrol duty on four different streets. The children are Eddie, Bob, Mike, and Alice. The streets are Elm, Park, Van Dyke, and Oakwood.

What is the probability that Mike gets Elm Street and Alice gets Oakwood?

Solution:

$$\frac{2!}{4!} = \frac{2}{24} = \frac{1}{12}$$

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A school teacher is going to assign four children to safety patrol duty on four different streets. The children are Eddie, Bob, Mike, and Alice. The streets are Elm, Park, Van Dyke, and Oakwood.

What is the probability that Mike gets Elm Street and Alice gets Oakwood and Bob gets Van Dyke?

Solution: $\frac{1}{4!} = \frac{1}{24}$

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Six married couples are attending a party where two door prizes are awarded to two different people.

(a) What is the probability that a married couple wins both prizes?

(b) What is the probability that one prize goes to a man and the other to a woman?

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(a) What is the probability that a married couple wins both prizes?

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Solution:

(a) C(12,2) = 66 possibilities for the two who win prizes

$$\frac{6}{66} = \frac{1}{11}$$

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(a) What is the probability that a married couple wins both prizes?

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Solution:

(a) C(12,2) = 66 possibilities for the two who win prizes

$$\frac{6}{66} = \frac{1}{11}$$

(b) C(6,1) × C(6,1) = 36 ways to pick a man and woman

$$\frac{36}{66} = \frac{6}{11}$$

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Ten people are dividing up to play basketball. Two of the ten are brothers.

(a) What is the probability the brothers will be on the same team if the players divide up arbitrarily?

(b) What is the probability the brothers and their friend Max will all be on the same team?

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(a) What is the probability the brothers will be on the same team if the players divide up arbitrarily?

(b) What is the probability the brothers and their friend Max will all be on the same team?

Solution:

(a)

$$\frac{C(8,3)}{C(10,5)} \times 2 = \frac{4}{9} \left[\text{or } \frac{C(2,2) \times C(8,3)}{C(10,5)} \times 2 \right]$$

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(b) $$\frac{C(7,2)}{C(10,5)} \times 2 = \frac{21}{252} \times 2 = \frac{1}{6} \left[\text{or } \frac{C(3,3) \times C(7,2)}{C(10,5)} \times 2 \right]$$

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The letters of the word MAMMAL are scrambled and written in a row.

(a) What is the probability that the 3 M's come first?

(b) What is the probability that none of the M's appear side by side?

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(a) What is the probability that the 3 M's come first?

(b) What is the probability that none of the M's appear side by side?

Solution:

(a) — — — — — — $C(6,3) \times C(3,2) \times C(1,1) =$ 60 ways to arrange the letters. With the 3 M's first there are only $C(3,2) \times C(1,1) = 3$ ways.
Answer = 3/60 = 1/20

? ? ? ? ? ?

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(a) What is the probability that the 3 M's come first?

(b) What is the probability that none of the M's appear side by side?

Solution:

(b) — — — — — — 60 ways to arrange the letters. How many possibilities are there for where the M's go?

M ? M ? ? M

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The letters of the word MAMMAL are scrambled and written in a row.

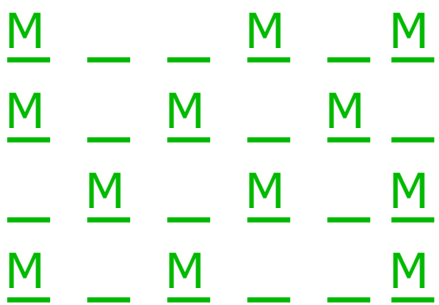
(a) What is the probability that the 3 M's come first?

(b) What is the probability that none of the M's appear side by side?

Solution:

(b) $4 \times C(3,2) \times C(1,1) = 12$

Answer = 12/60 = 1/5



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A shelf has 15 books.

4 of them are travel guides

5 of them are biographies, and

6 are fiction

If you randomly pick 3 books off the shelf, what is the probability they will all be fiction?

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A shelf has 15 books.

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If you randomly pick 3 books off the shelf, what is the probability they will all be fiction?

$$\frac{C(6,3)}{C(15,3)} = \frac{20}{455} = .04396$$

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$$\frac{C(4,2)\times C(5,1)}{C(15,3)} = \frac{6\times 5}{455} = \frac{30}{455} = .06593$$

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$$\frac{C(4,1)\times C(5,1)\times C(6,1)}{C(15,3)} = \frac{4\times 5\times 6}{455} = \frac{120}{455} = .26374$$

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If you randomly pick 3 books off the shelf, what is the probability that all 3 will be the same genre?

$$\frac{C(4,3)}{C(15,3)} = \frac{4}{455}, \quad \frac{C(5,3)}{C(15,3)} = \frac{10}{455}, \quad \frac{C(6,3)}{C(15,3)} = \frac{20}{455}$$

$$\frac{4+10+20}{455} = \frac{34}{455} = .07473$$

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If you randomly pick 3 books off the shelf, what is the probability that 2 will be one category and the remaining one a different category?

Possibilities

- 2 travel & 1 biography
- 2 biography & 1 travel
- 2 travel & 1 fiction
- 2 fiction and 1 travel
- 2 biographies & 1 fiction
- 2 fiction & 1 biography

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This one we already calculated 

2 travel & 1 biography
2 biography & 1 travel
2 travel & 1 fiction
2 fiction and 1 travel
2 biographies & 1 fiction
2 fiction & 1 biography

Find the other 5 probabilities and add the 6 probabilities to get the answer

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Alternate (and easier) solution:

Answer = 1 - P(all 3 from same category)

- P(books from 3 different categories)

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