PROBABILITY LEVEL=3

1. An airplane is built to be able to fly on one engine. If the plane’s two engines operate independently, and each has a 1% chance of failing in any given four-hour flight, what is the chance the plane will fail to complete a four-hour flight to Seoul due to engine failure?

**Ans: 0.0001**

**Explanation:**

The plane will fail to make the flight due to engine failure only

If BOTH engines fail (because the plane can fly on one engine.)

P (flight fails) =P (BOTH engines f ail) = P (1st f ails)\*P (2nd fails) =0 .0001

1. A pair of fair, standard dice are rolled. What is the probability the sum of the dice is 5?

**Ans: 1/9**

**Explanation:**

P (sum = 5) = P(rolling 14 or 23 or 32 or 41) = 4/36 = 1/9

1. A probability experiment has four possible outcomes: e1, e2, e3, e4. The outcome e1 is four times as likely as each of the three remaining outcomes. Find the probability of e1.

**Ans: 4/7**

**Explanation:**

4p + p + p + p = 1

=> 7p = 1 =>p = 1/7

=> P(e1) = 4p = 4(1/7) = 4/7

1. In a roomful of 30 people, what is the probability that at least two people have the same birthday? Assume birthdays are uniformly distributed and there is no leap year complication?

**Ans: over 70%**

**Explanation:**

It is difficult to calculate directly the chance of at least t w o matching birthdays, because you have to allow for so many possibilities: just two matching, three matching, two pairs matching, etc. The COMPLEMENT of this event is, ho w ever, quite simple. If there are NOT at least two matching birthdays, then there are NONE!

P(all different) =(365/365)\*(364/365)\*(363/365)….(336/365)

This turns out to be under 30 %

Therefore, the probability that at least t w o birthdays match is over 70%

1. Hundred passengers are boarding an airplane with hundred seats. Everyone has a ticket with his seat number. These Hundred passengers boards the airplane in order. However, the first passenger lost his ticket so he just take a random seat. For any subsequent passenger, he either sits on his own seat or, if the seat is taken, he takes a random empty seat. What's the probability that the last passenger would sit on his own seat?

Ans: ½

Explanation:

Favorable events: =1 ( passengers sits on his own seat)

Events: 2 ( may be his own seat or may be not)

P= ½.

1. Isabella prepared four different letters to 4 different addresses. For each letter she prepared an envelope with its correct address. If 4 letters are to be put into 4 envelopes at random, what is the probability that only one letter will be put into envelop with correct address?

Ans: 1/3

Explanation:

For example, "ABCD" means letter A is in the right envelop (1st place), B 2nd place is right, C 3rd place is right, D 4th place is right. So ABCD is the case when 4 letters are in the 4 good envelops.   
And after I write all possibilities for A at the first place.   
ABCD   
ABDC   
ACBD   
ACDB (\*)   
ADCB   
ADBC (\*)   
the number of combinations which only have 1 letter at the right place: 2   
We have 4 letters so 4x2=8 total good possibilities   
And total of 24 possibilities   
8/24=1/3

1. In a chessboard two squares are chosen at random. What is the probability that they have a side in common?

**Ans: 1/18**

**Explanation:**

The number of ways of choosing the first square is 64. The number of ways of choosing the second square is 63. There are a total of 64 \* 63 = 4032 ways of choosing two squares.

If the first square happens to be any of the four corner ones, the second square can be chosen in 2 ways.

If the first square happens to be any of the 24 squares on the side of the chess board, the second square can be chosen in 3 ways.

If the first square happens to be any of the 36 remaining squares, the second square can be chosen in 4 ways.

Hence the desired number of combinations = (4 \* 2) + (24 \* 3) + (36 \* 4) = 224. Therefore, the required probability =224/4032 =1/18

1. An experiment succeeds twice as often as it fails. What is the probability that in the next 5 trials there will be four successes?

**Ans: 5\*((2/3)^4)\*(1/3)**

**Explanation**

An experiment succeeds twice as often as it fails.

i.e. the probability of its success is 2/3 and the probability of its failure is 1/3.

In the next 5 trials the experiment needs to succeed in 4 out of the 5 trials.

4 out of the 5 trials in which it succeeds could be selected in 5C4 ways = 5 ways.

And as 4 of them are successes, they have a probability of 2/3 and the one that is a failure will have a probability of 1/3.

Hence, the required probability = 5\*((2/3)^4)\*(1/3)

1. An anti-aircraft gun can fire four shots at a time. If the probabilities of the first, second, third and the last shot hitting the enemy aircraft are 0.7, 0.6, 0.5 and 0.4, what is the probability that four shots aimed at an enemy aircraft will bring the aircraft down?

**Ans: 0.964**

**Explanation:**

The enemy aircraft will be brought down even if one of the four shots hits the aircraft.

The opposite of this situation is that none of the four shots hit the aircraft. The probability that none of the four shots hit the aircraft is given by

(1-0.7)(1-0.6)(1-0.5)(1-0.4) = 0.3\*0.4\*0.5\*0.6 = 0.036

So, the probability that at least one of the four hits the aircraft = 1 – 0.036 = 0.964.

1. A jar contains four marbles: three red, one whit e. Two marbles are drawn with replacement.

What is the probability the colors of the two marbles match?

**Ans: 5/8**

**Explanation:**

P(colors match) = P(RR) + P(WW) = 9/16 + 1/16 = 10/16 or 5/8