

Howard University Math Department

1. (10 points) Two dice are thrown, each could be 1 to 6. What is the probability that at least one of the numbers is smaller than 6? You must use this formula : $P(A) = 1 - P(\text{NOT } A)$. In other words, probability of an event is 1 minus the probability of its opposite.

Solution:

It is easier to find the probability of the opposite, namely that both are equal to 6. This can happen in only one out of a total of $6 \times 6 = 36$ So if A is the event that at least one is a 6, then

$$P(A) = 1 - P(\text{NOT } A) = 1 - \frac{1}{36} = \frac{35}{36}.$$

You can also find $P(\text{NOT } A)$ (probability of both being six) by multiplying the probabilities of each being 6:

$$P(6) \times P(6) = \frac{1}{6} \times \frac{1}{6} = \frac{1}{36}.$$

2. (Extra credit 5 points) If $P(A) = 1/2$ and $P(B) = 1/3$ and $P(A \text{ and } B) = 1/6$ What is $P(A \text{ or } B)$?

Solution:

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B) = \frac{1}{2} + \frac{1}{3} - \frac{1}{6} = \frac{2}{3}.$$

3. (10 points) There are 10 questions in an exam. Each has only two answers : true or false. What is the probability that a student guesses the right answer for all the questions?

Solution:

Each has 2 outcomes. Total number of outcomes is $2 \times 2 \times \dots \times 2$ (10 times) $= 2^{10}$.

There is only one correct solution set. So probability of getting all of them right is $1/2^{10}$.

4. (10 points) 5 players are chosen from a group of 10. What is the number of ways to do this, if order does matter? What is the number of ways to do this if order doesn't matter?

Solution:

Order does matter: $10P5 = 10 \times 9 \times 8 \times 7 \times 6 = 30240$.

Order doesn't matter: $10C5 = 10P5/5! = (10 \times 9 \times 8 \times 7 \times 6)/(5 \times 4 \times 3 \times 2 \times 1) = 252$.