Probabilities for “at least”

When you are asked to find a probability involving “at least” remember that P(not E) = 1 - P(E)

What is the probability of getting at least one ace when drawing four cards from a standard deck, with replacement.

What is the probability of getting at least one ace when drawing four cards from a standard deck, without replacement.

$P(\bar{E})$ = P(not ace) * P(not ace) * P(not ace) * P(not ace)

$$= \frac{48}{52} * \frac{48}{52} * \frac{48}{52} * \frac{48}{52}$$

$$= \frac{20{,}736}{28{,}561}$$

Since P(winning) + P(not winning) = 1 we can do the following

$P(E) = 1 - P(\bar{E})$

$$= 1 - \frac{20{,}736}{28{,}561}$$

$$\approx 0.27$$

The probability of drawing at least one ace in four cards, with replacement is 0.27

Find the probability of getting at least one head in five tosses of a coin.

Possible Outcomes

0H 5T
1H 4T
2H 3T
3H 2T
4H 1T
5H 0T

Find the probability of getting at least one head in five tosses of a coin.

Which is going to easier, to find at least one head or zero heads?

Possible Outcomes

0H 5T
1H 4T
2H 3T
3H 2T
4H 1T
5H 0T

P(at least 1 head) = 1 – P(no heads)

$= 1 - (\frac{1}{2})^5$

$= 1 - 1/32$

$= 31/32$

The probability of getting at least one head in five tosses of a coin is 31/32.

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