Probability With A Deck Of Cards:

A. Sometimes a number sense test will ask for the probability of drawing a particular card from a deck of 52 cards, or they might say from a standard deck (which is the same thing). There are many patterns that develop.

B. If the question is talking about more than one card, they might use the phrase "with replacement" or "without replacement". If no phrase is used, it is assumed "without replacement". If additional cards are drawn "with replacement", then the card is put back before drawing the next card, otherwise it is not.

C. If drawing only one card:

1. The probability of drawing a specific card is $^{1}/_{52}$.
2. The probability of drawing a specific number (or specific face card) is $^{4}/_{52}$ or $^{1}/_{13}$.
3. The probability of drawing a specific suit (club, spade, diamond, or heart) is $^{13}/_{52}$ or $^{1}/_{4}$.

D. If drawing more than one card with replacement:

1. The probability of drawing a specific card each time is $^{1}/_{52^{n}}$ where n is the number of draws.
2. The probability of drawing a specific number (or specific face card) each time is $^{1}/_{13^{n}}$.
3. The probability of drawing a specific suit each time is $^{1}/_{4^{n}}$.

E. If drawing more than one card without replacement (hardest):

1. The probability of drawing a specific number (or specific face card) each time is $^{4}/_{52} \times {}^{3}/_{51} \times {}^{2}/_{50}$ or $^{1}/_{13} \times {}^{1}/_{17} \times {}^{1}/_{25}$. Note: This is if you wanted to draw 3 specific numbers. If you wanted 2, it would only be the first 2 terms multiplied by each other. Also, number sense will never ask you for 4 specific numbers.
2. The probability of drawing a specific suit each time is $^{13}/_{52} \times {}^{12}/_{51} \times {}^{11}/_{50} \times \ldots$ or $^{1}/_{4} \times {}^{4}/_{17} \times {}^{11}/_{50} \times \ldots$

F. Examples

Ex [1] A card is drawn at random from a standard deck of cards. The probability it is a spade is _____.

a. The answer is $^{13}/_{52}$ or $^{1}/_{4}$.

Ex [2] 2 cards are drawn from a deck of 52 cards, with replacement. What is the probability they were both the King of hearts?

a. The first draw, the probability is $^1/_{52}$.

b. The second draw, the probability is still $^1/_{52}$.

c. The answer is $^1/_{522}$ or $^1/_{2704}$. See *Squaring Numbers In The Range: 50-59*.

Ex [3] Find the probability of drawing 3 Aces from a standard deck of cards.

a. Since the question does not specify "with replacement" we can assume it is "without replacement".

b. The first draw the probability is $^4/_{52}$ or $^1/_{13}$.

c. The second draw the probability is $^3/_{51}$ or $^1/_{17}$.

d. The third draw the probability is $^2/_{50}$ or $^1/_{25}$.

e. The answer is the product of all of these.

f. Since the numerator is 1, we only have to focus on the denominator or 13 x 17 x 25.

g. 13 x 17 = 221. See *Multiplying Numbers Whose One's Add To 10*.

h. 221 x 25 = 5525. See *Multiplying By 25*.

i. The answer is $^1/_{5525}$.