COLLEGE ALGEBRA QUIZ

(1) When two, six sided dice, are rolled what is the probability of getting a 7?
Solution: $\frac{1}{6}$

We want to find the $\frac{\text{number ways of rolling 7 on two dice}}{\text{number of possible outcomes from rolling two dice}}$

The table below shows that there are 6 possible ways that a 7 can be rolled on two dice.

2^{nd} Die	1^{st} Die					
	1	2	3	4	5	6
6	6,1					
5		5,2				
4			4,3			
3				3,4		
2					2,5	
1						1,6

The total number of possible outcomes from rolling two dice is found from $6 \cdot 6 = 36$, since there are 6 possible outcomes from each dice.

Therefore we have for the probability of rolling a 7 on two dice, $\frac{6}{36} = \frac{1}{6}$.

Notice:
Now if only one die is rolled, then there is no possible way of rolling a 7, since the largest number on a die is 6. Therefore the probability of rolling a 7 on one die is 0.

(2) What is the probability of drawing one king from a deck of 52 cards.
Solution: $\frac{1}{13}$

We want to find the $\frac{\text{number ways of drawing one king}}{\text{number ways of drawing 1 card from a deck of 52}}$

Since there are 4 suits in a deck of 52 cards, and each suit has 1 king – then there are a total of 4 kings in the deck. There are 52 ways of drawing one card from the deck.

So we have for the probability of drawing one king from a deck of 52 cards: $\frac{4}{52} = \frac{1}{13}$

(3) If four cards are randomly taken from a deck of 52 cards, what is the probability that it will be 2 spades, and 1 ace?
Solution: $\frac{24}{20825}$

We want to find the $\frac{\text{number ways of drawing 2 spades and 1 ace}}{\text{number ways of drawing 4 cards from a deck of 52}}$
Since there are 13 spades in the deck, there are $\binom{13}{2}$ "13 choose 2" ways of drawing 2 spades.
Since there are 4 aces in a deck, then there are $\binom{4}{1}$ "4 choose 1" ways of drawing 1 ace.
Multiply $\binom{13}{2}$ by $\binom{4}{1}$ for the ways of drawing both 2 spades AND 1 ace.

Since there are 52 total cards, there are $\binom{52}{4}$ "52 choose 4" ways of drawing 4 cards.

The probability of drawing an 2 spades and 1 ace, using combinatorics is found by,

$$\frac{\binom{13}{2}\cdot\binom{4}{1}}{\binom{52}{4}} = \frac{\frac{13!}{2!(13-2)!}\cdot\frac{4!}{1!(4-1)!}}{\frac{52!}{4!(52-4)!}} = \frac{\frac{13\cdot12\cdot\cancel{11!}}{2\cdot\cancel{11!}}\cdot\frac{4\cdot\cancel{3!}}{\cancel{3!}}}{\frac{52\cdot51\cdot50\cdot49\cdot\cancel{48!}}{4\cdot3\cdot2\cdot1\cdot\cancel{48!}}} = \frac{13\cdot12\cdot4}{\frac{52}{4}\cdot\frac{51}{3}\cdot50\cdot49} = \frac{\cancel{13}\cdot\cancel{12}^{6}\cdot4}{\cancel{13}\cdot17\cdot\cancel{50}^{25}\cdot49} = \frac{24}{20825}$$

$\approx 0.12\%$

(4) A bag of mixed vegetable seeds contain 68 tomato seeds, 79 cucumber seeds, and 32 corn seeds. The bag is closed and thoroughly shaken, then one seed is drawn at random. What is the probability that it is a tomato seed?
Solution: $\frac{68}{179} \approx 38\%$
$\frac{\text{number of ways of choosing 1 tomato seed}}{\text{number of ways of choosing 1 seed from bag}} = \frac{68}{68+79+32} = \frac{68}{179} \approx 38\%$

(5) A pair of dice are thrown onto the table, what is the probability of rolling a 5?
(a) $\frac{1}{9}$
(b) $\frac{1}{12}$
(c) $\frac{1}{6}$
(d) $\frac{5}{36}$
Solution: (a)
There are 4 ways of rolling a 5 on two dice, and $6 \cdot 6$ total ways of rolling 2 dice.
Therefore the probability of rolling a 5 on two dice is $\frac{4}{36} = \frac{1}{9}$

2^{nd} Die	1^{st} Die					
	1	2	3	4	5	6
6						
5						
4	(4,1)					
3		(3,2)				
2			(2,3)			
1				(1,4)		