MDM 4U

PROBABILITIES using COUNTING TECHNIQUES

RECALL FORMULAS for PERMUTATIONS & COMBINATIONS:

$\boldsymbol{P(n,r) = \frac{n!}{(n-r)!}}$ *and* $\boldsymbol{C(n,r) = \frac{n!}{r!(n-r)!}}$ *and other related formulas.*

1. A 12-sided die is tossed 3 times. Let F = a factor of 12 is tossed. Draw a probability tree diagram showing the different outcomes. What is the probability that...

   A) a factor of 12 shows twice?

   B) a factor of 12 never shows?

   C) a factor of 12 shows at least once?

2. Two cards are selected from a standard deck of cards. What is the probability that...

   A) the cards are a king and a queen?

   $Let\ A = king;\ \ B = queen$

   $n(A) = \binom{4}{1} = 4;\ \ n(B) = \binom{4}{1} = 4$

   $n(S) = \binom{52}{2} = 1326$

   $P(A) = \frac{n(A)}{n(S)} =$

   B) the 2 cards are face cards?

   $Let\ A = face\ card$

   $n(A) =$

   $n(S) =$

   $P(A) = \frac{n(A)}{n(S)} =$

   C) if the 2 cards are face cards, they are a king and a queen?

   D) the 2 cards are a pair?

   E) if the cards are selected one at a time without replacement, the first card is a king and the second card is a queen?

3. Two marbles are selected, one at a time, from a bag containing 8 green marbles and 2 red marbles. Draw a probability tree diagram showing all possible outcomes. What are the odds in favour of...

A) both marbles are red?

$Let\ A = first\ marble\ is\ red;\ \ B = second\ marble\ is\ red$
$n(A) = 2;\ \ n(B) = 1$
$n(S) = {}_{10}P_2 = 90$

$P(A) = \frac{n(A)}{n(S)} =$

$odds\ in\ favour\ of\ A\ and\ B =$

B) the first marble is green and the second marble is red?

C) at least 1 red marble is chosen?

4. Most Ontario licence plates begin with 4 letters and end with 3 digits. What is the probability that ...

A) the licence plate begins with ASMP?

B) the licence plate contains only vowels [A, E, I, O, U] and odd numbers?

C) the licence plate contains no repeating letters and no repeating numbers?

D) if the licence begins with ASMP, it contains a 3 (with no repetition)?

5. Two friends, Brett and Katie, are equal in strength when it comes to playing squash. However, after 1 game, if Brett wins, his confidence builds and the chances he will win the next game increases to 70%. On the other hand, if Katie wins the first game, the chances she will win the next game improves to 60%. What is the probability that...

A) Brett wins the second game?

B) if Brett won the second game, he lost the first game?