① a) 10 letters
each appears exactly once

So there is 10 choices for the 1st letter, 9 for the second, 8 for the 3rd, all the way until the last.

Therefore there is 10! ~~choices~~ variations =)

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b) There is two ways to order 'E' and 'F', and 8 letters remain. Therefore we have 9 choices for 'E' and 'F', 8 for the next letter, 7 for the next etc.

=) $2 \cdot 9! = 725,760$ variations.

c) There is 6 letters, but we must note that there are 3 'A''s, and 2 'N's and only 1 'B'.

$$\frac{6!}{1! \cdot 2! \cdot 3!} = 60 \text{ variations}$$

d) There are five distinct options but we chose 3. Therefore

$$\binom{5}{3} = 10$$

(2) a) Each roll of the dice has 6 possible Outcomes. Therefore

$$6^4 = 1296$$

b) There are $\binom{4}{2}$ different placements of the '3's and 5 options for each of the remaining rolls.

$$\binom{4}{2} \cdot 5 \cdot 5 = 150$$

c) So we know that there are 150 ways to get exactly 2 '3's.

There is $\binom{4}{3}$ placements of the three 3s and 5 options for the remaing roll.

There is only one scenario where we get all 3s.

$$150 + \left(\binom{4}{3} \cdot 2\right) + 1 = 171$$

③a) There are 8 possible positions for the first card, 7 for the second, 6 for the 3rd etc, but we must note that there are 2 of each suit.

$$\frac{8!}{2!\cdot 2!\cdot 2!\cdot 2!} = 2520$$

b) There are four different cards and we choose two, so

$$\binom{4}{2} = 6$$

(the question says distinct, so I did not account for two of the same suit)

c) In the deck is 2 of each diamonds and hearts. Therefore there is $\binom{4}{2}$ ways to get "good" cards.
But order doesn't matter so only half of these ways are distinct.

$$\left(\frac{\binom{4}{2}}{2}\right) = \cancel{6}\ 3.$$