Binomial and Multinomial Theorem

1. Show that $\binom{8}{3} + \binom{8}{4} = \binom{9}{4}$. Get a common denominator and add fractions, but do not evaluate any of the factorials or binomial coefficients.
2. Use the binomial theorem to write out the first five terms of the binomial expansion of $(x + 2y^2)^{20}$ and simplify.
3. In the expansion of$(2x^2 - (1/x))^{10}$, find the middle term.
4. In the expansion of$(2x^2 - (1/x))^{10}$, find the term whose simplified form involves (1/x) .
5. Compute the coefficient of x^2y^{15} in the expansion of $(3x - 12y^5)^5$
6. Compute the coefficient of x^2y^{15} in the expansion of $(3x - 12y^5)^k$. What if $0 \leq k < 5$?
7. What is the coefficient of x^4y^3 in the expansion of $(2x^2 + 3x + y + 7)^{20}$?
8. Find the coefficient of x^7y^2 in the expansion of $(2y - x)^9$.
9. Determine the coefficient of a^2b^4d in the expansion of the polynomial $(3a+5b-2c+d)^7$

Probability

1. A bag contains 2 yellow, 3 green and 2 blue balls. Two balls are drawn at random. What is the probability that none of the balls drawn is blue?
2. Three coins are tossed. What is the probability of getting at most two tails?
3. What is the probability of getting a number less than 4 when a die is rolled?
4. A bag contains 4 black, 5 yellow and 6 green balls. Three balls are drawn at random from the bag. What is the probability that all of them are yellow?
5. One card is randomly drawn from a pack of 52 cards. What is the probability that the card drawn is a face card(Jack, Queen or King)?
6. John draws a card from a pack of cards. What is the probability that the card drawn is a card of black suit?
7. There are 15 boys and 10 girls in a class. If three students are selected at random, what is the probability that 1 girl and 2 boys are selected?
8. 3 balls are drawn randomly from a bag containing 3 black, 5 red and 4 blue balls. What is the probability that the balls drawn contain balls of different colors?
9. 5 coins are tossed together. What is the probability of getting exactly 2 heads?
10. When two dice are rolled, what is the probability that the sum is either 7 or 11?
11. John and Dani go for an interview for two vacancies. The probability for the selection of John is 1/3 whereas the probability for the selection of Dani is 1/5 . What is the probability that only one of them is selected?
12. A letter is chosen at random from the word 'ASSASSINATION'. What is the probability that it is a vowel?

13. Two dice are rolled together. What is the probability of getting two numbers whose product is an even number or a prime number?
14. Mary knows the answers to 20 of the 25 multiple-choice questions on the Psychology 101 exam, but she has skipped several of the lectures; she must take random guesses for the other five. Assuming each question has four answers, what is the probability that she will get exactly 3 of the last 5 questions right?
15. In 1997, 10.8% of female smokers smoked cigars. In a sample of size 10 female smokers, what is the probability that (a) exactly 2 of the women smoke cigars? (b) At most 1 smokes cigars?
16. A man has five packets and each contains three brown sugar cubes and one white sugar cube. He randomly selects one cube from each packet. Find the probability that he selects exactly one brown sugar cube.
17. A driving test is passed by 70% of people at their first attempt. Find the probability that exactly five out of eight randomly selected people pass at their first attempt.
18. There is a 15% chance of rain on any particular day during the next 14 days. Find the probability that, during the next 14 days, it rains on:
    a. exactly 2 days
    b. at most 2 days.
19. On average, Diya concedes one penalty in every six hockey matches that she plays. Find the probability that Diya next concedes a penalty:
    a. in the eighth match that she plays
    b. after the fourth match that she plays.

20. The probability that a woman can connect to her home Wi-Fi at each attempt is 0.44. Find the probability that she fails to connect until her fifth attempt.