Combinatorics and pigeonhole principle:

Question 01: How many 6 letter passwords (assume all are small letters and letter repetition is allowed if not mentioned specifically)-

a) End with y ?
b) Start with r and end with b? (Letter repetition is not allowed)
c) Contain only vowel?
d) Do not contain z,e,r,o?
e) Contain "est"?

Question 02: How many positive integer < 1000 are

a) Divisible by 5?
b) Divisible by 5 but not 7?
c) Divisible by both 5 and 7?
d) Divisible by either 5 or 7?
e) Divisible by only 5 or only 7?
f) Have distinct digits?

Question 03: A box has 10 blue toys and 10 red toys inside it. A kid selects toys at random without looking at them.

a) How many toys must she choose to have at least three toys of the same color?
b) How many toys must she choose to have at least three toys of red?
c) In how many ways can she arrange all the toys?

Question 04: Assume, Dhaka's population is 22M.

a) Prove that, there exists at least 4 people who has same three initials (ex: AIA) who were born in the same day of a year (year can be different)?

Question 05: Suppose there are 30 students in your section. Each student's student ID's last digit is in between 0-8.

a) Show that your class must has at least 25 female or 25 male students.
b) Show that your class must has 17 male or 13 female students.
c) If 5 different digits is selected from 0 to 8, there must be a pair made out of these integers with a sum equal to 9.
d) Is the conclusion in part (c) is true if 4 digits are selected instead of 5?

Question 06: In how many ways can 21 Women and 10 men to stand in a line so that, no man stand next to each other?

Question 07: Sixteen people want to participate in a game.

a) In how many ways, a team of 10 players can be formed?
b) In how many ways, a team of 10 players can be formed, if they're given jersey based on their position?

c) Assume, six of sixteen participants are women. In how many ways team can be formed if the team has at least one woman player?
d) In how many ways, can we choose the 1st, 2nd and 3rd prize owners from 10 players?

Question 08: 6 women and 8 men are waiting to get on micro bus and a bus arrives which has 8 seats . How many ways are there to select who can get on to the bus if,

a) At least 3 passenger has to be woman?
b) Exactly 1 passenger has to be women and at least 4 passenger has to be men?

Question 09: A string of 14 binary digits exists

a) How many ways that string can be formed with exactly three 0's and eleven 1's if every 0 is followed by two 1's?
b) How many ways that string can be formed with at least five 0's and five 1's?

Question 10: A multinational organization will be formed with 18 countries. How many ways are there to select 8 countries from Asia, 6 countries from America and 4 countries from Europe? (There are 48, 35 and 44 countries in Asia, America and Europe respectively)

Question 11: Given two strings:

(i)"EVERGREEN"

(ii) "00001101110"

a) How many 7 or more character can be formed from (i)?
b) In how many different ways the letter can be arranged from (i) if all the consonants are glued together?
c) In how many different ways the letter can be arranged from (ii) excluding (ii)?

Question 12: A password can be of 6,7 or 8 length. The password can contain any small letter or decimal digit. However, the password must contain one decimal digit. In how many ways the password can be formed?

Question 13: A shop has T-shirt of 4 different color (pink, purple, white, black) and 5 different sizes (S,M,L). However, S size comes in all colors, M size comes in pink and white and L size comes in pink, purple and white. How many T-shirt the shop owner should keep in stock so that there is at least one of each available size and color is found?

Question 14: In how many ways can 10 friends sit around Bonfire in circular order?

Question 15: In how many ways can 7 pearls be arranged to form a necklace?

Question 16: 7 cards are drawn from standard deck of 52 cards. In how many ways we can choose if

a) Exactly 3 of the cards are king?
b) All 5 cards are hearts?
c) Exactly 4 cards are face cards?