1) There are a total of 12!/(4!4!4!) = 27,720 ways to assign the 12 students to the three tests such that each test has four students.

2) The tree diagram for the number of permutations of (a, b, c} would have three levels, with three branches emanating from each level, representing the three choices for the first, second, and third positions in the permutation. The total number of possible permutations is 3 x 2 x 1 = 6.

3) i) P(A) = (4/12) x (3/11) = 3/55; P(B) = (8/12) x (7/11) = 14/33.

ii) P(at least one item is defective) = 1 - P(both items are non-defective) = 1 - [(8/12) x (7/11)] = 19/33.

4) i) P(none of the three selected items is defective) = (10/15) x (9/14) x (8/13) = 24/91.

ii) P(exactly one item of the three items is defective) = (5/15) x (10/14) x (9/13) + (10/15) x (5/14) x (9/13) + (10/15) x (9/14) x (5/13) = 27/52.

iii) P(at least one item of the three items is defective) = 1 - P(none of the three selected items is defective) = 67/91.

5) Since half of the boys and half of the girls are from Mansoura, there are 5 boys and 10 girls from Mansoura. Thus, the total number of students who are either boys or from Mansoura is 10 + 5 = 15. The probability that a person chosen randomly is a boy or from Mansoura university is 15/30 = 1/2.

6) (i) P(Ac) = 1 - P(A) = 5/8.

(ii) P(Bc) = 1 - P(B) = 1/2.

(iii) P(Ac intersection Bc) = P((A union B)c) = 1 - P(A union B) = 1 - [P(A) + P(B) - P(A intersection B)] = 3/8.

(iv) P(Ac union Bc) = P((Ac intersection Bc)c) = 1 - P(Ac intersection Bc) = 5/8.

(v) P(A intersection Bc) = P(Bc) - P(A intersection B) = 1/4.

(vi) P(B intersection Ac) = P(Ac) - P(A intersection B) = 1/8.

7) The probability of not rolling a 7 on any one try is 30/36, since there are 30 outcomes that do not result in a 7 out of the 36 possible outcomes. Thus, the probability of not rolling a 7 on any of the three tries is (30/36)^3 = 125/216, and the probability of rolling at least one 7 is 1 - 125/216 = 91/216.

8) Σ P(x) = k^2 - 8 is the sum of all probabilities for all possible values of x, which must equal 1. Thus, we have:

k^2 - 8 = 1

k^2 = 9

k = ±3

Since probabilities must be positive, we have k = 3.

9) Since A and B are mutually exclusive events, P(A′ ∩ B′) is the probability that neither event A nor event B occurs. Thus, we have:

P(A′ ∩ B′) = 1 - P(A union B) = 1 - (P(A) + P(B)) = 1 - (0.35 + 0.45) = 0.20.