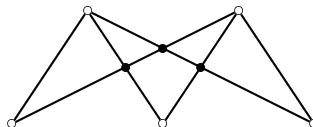




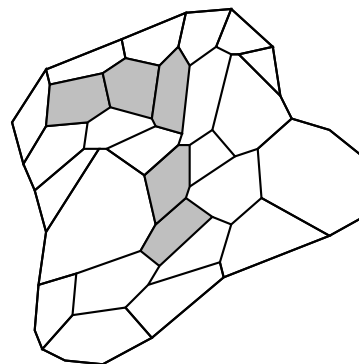
7. Given  $p$  dots on the top row and  $q$  dots on the bottom row, draw line segments connecting each top dot to each bottom dot. (In the diagram below, the dots referred to are the small open circles.) The dots must be arranged such that no three line segments intersect at a common point (except at the ends). The line segments connecting the dots intersect at several points. (In the diagram below, the points of intersection of the line segments are the small filled circles.) For example, when  $p = 2$  and  $q = 3$  there are three intersection points, as shown below.



When  $p = 3$  and  $q = 4$  the number of intersections is:

- (a) 7                      (b) 12                      (c) 18                      (d) 21                      (e) 27
8. At one time, the population of Petticoat Junction was a perfect square. Later, with an increase of 100, the population was 1 greater than a perfect square. Now, with an additional increase of 100, the population is again a perfect square. The original population was a multiple of:
- (a) 3                      (b) 7                      (c) 9                      (d) 11                      (e) 17
9. The cashier at a local movie house took in a total of \$100 from 100 people. If the rates were \$3 per adult, \$2 per teenager and 25 cents per child, then the smallest number of adults possible was:
- (a) 0                      (b) 2                      (c) 5                      (d) 13                      (e) 20

10. The island of Aresia has 27 states each of which belongs to one of two factions, the white faction and the grey faction, who are sworn enemies. The United Nations wishes to bring peace to Aresia by converting one state at a time to the opposite faction, i.e., converting one state from white to grey or from grey to white, so that eventually all states belong to the same faction. In doing this they must guarantee that no single state is completely surrounded by states of the opposite faction. Note that a coastal state can never be completely surrounded, and that it may be necessary to convert a state from one faction to the other at one stage and then convert it back to its original faction later. A map of the state of Aresia is shown. The five shaded states belong to the grey faction, and all of the unshaded states belong to the white faction. The minimum number of conversions necessary to completely pacify Aresia is:



- (a) 5                      (b) 7                      (c) 9
- (d) 10                      (e) 15