1. **No Restrictions:** 5.5.5.5 = 54  

2. **Distinct Digits:** 5432  

3. **Even:** 5552  

4. **Distinct Digits and Even:** 4321 (2 choices for last digit, then 4 choices for first digit, 3 for the 2nd digit, and 2 for the 3rd digit)  

5. **Order the Suits:** 4! Ways  

   a) Order the cards in each suit: 13! Ways  

   Answer: 4! * 13! * 13! = 4! * (13!)^4  

6. Since the digits are distinct and there are only 8 digits available, the integers can have at most 8 digits:  

   a) 8 digits: 77654321 = 35,280  
   b) 7 digits: 7765432 = 35,280  
   c) 6 digits: 776543 = 17,640  
   d) 5 digits: 77654 = 5,880  
   e) 4 digits: \(\frac{1 * 4 * 6 * 3}{4} + 3 * 7 * 6 * 5 = 750\)  

   Using the Addition Principle, there are 94,280 such numbers.  

7. **First seat A:** 1) Choices for B: 12  

   a) Ways to seat other 13 people: 13!  

   Answer: 12 * 13!  

   b) By the Subtraction Principle, 14! - 2 * 13!  

   (Total) (A and B together)  

   8. **First seat A:** 1) Choices for B: 13  

   a) Ways to seat other 13 people: 13!  

   Answer: 13! * 13!  

   b) By the Subtraction Principle, 14! - 13!  

   (Total) (B on A's right)  

   9. **Answer:** \(\frac{24}{5} - \frac{10}{5} - \frac{10}{4} \cdot \frac{1}{1}\)  

   \(\frac{10}{3} \cdot \frac{12}{2} + \frac{10}{2} \cdot \frac{12}{3} + \frac{10}{1} \cdot \frac{12}{4} + \frac{12}{5}\)  

   (Total) (0 women) (1 woman)  

   10. **Seat S who sit in front:** 87654 choices  

   a) Seat 4 who sit in back: 8765 choices  

   b) Seat S remaining students in 7 remaining seats: 76543 choices  

   Answer: (87654), (8765), (76543)  

   11. **There are:** \(\frac{20!}{5!}\) ways for the men to choose their partners.  

   b) 1) Choose the men: \(\binom{15}{10}\) ways  

   2) Choose the women: \(\binom{20}{10}\) ways  

   1) Choose the men: \(\binom{15}{10}\) ways  

   2) Pair them up: 10! ways  

   Answer: \(\binom{15}{10} \cdot \binom{20}{10} \cdot 10!\)
7) Seat the men in a circle: 3! ways
   a) Seat the women in the 8 positions between the men: 8! ways
      Answer: 3! 8!
   b) Seat the women in a circle: 7! ways
      a) Choose the 4 gaps for the men: 2 ways
      b) Seat the men in their positions: 4! ways
      Answer: 7! 2 4!

10) We must subtract the number of committees which have Tom and Betty and at least 2 women!
    There are \( \binom{20}{3} \) committees with Tom and Betty, and \( \binom{3}{8} \) of them have 4 men and Betty;
    so the answer is
    \[
    \binom{22}{5} - \binom{10}{5} \binom{10}{4} \binom{12}{1} - \left[ \binom{20}{5} \binom{3}{2} \right]
    = \binom{22}{5} - \binom{10}{5} \binom{10}{4} \binom{12}{1} - \binom{20}{5} \binom{3}{2} + \binom{3}{2}
    \]

9) a) Answer: 6!
      Since the row in row 1 was 6 choices for its column, and
      Then the row in row 2 was 5 choices for its column, etc.
      b) Arrange the rows: 6! choices
      c) Select 2 rows to color red: \( \binom{6}{2} \) choices
      Answer: 6! \( \binom{6}{2} \)

11) Addresses
    Let \( T = \{ A, R, O, E, J, S \} \).
    Number of permutations of \( T \):
    \[
    \binom{9}{3} \binom{6}{2} \binom{4}{2} \binom{3}{1} = \frac{9!}{3! 2! 2! 1!}
    \]
    d) The number of 8-permutations is the same,
    since every 8-permutation of \( T \) can be matched with a permutation of \( T \)
    by placing the missing letter at the end.
    (For example, DAREJESO \( \leftrightarrow \) DAREJESO S)

18) A route corresponds to a permutation of \( \{ 9, E, 8, N \} \),
    so there are \( \binom{17}{9} = \binom{17}{8} \) possible routes.
    
    b) We can find the number of routes which use the block which is under water
    by multiplying the number of routes from \( (0, 0) \) to \( (4, 3) \)
    by the number of routes from \( (4, 4) \) to \( (9, 8) \);
    using the Subtraction Principle,
    there are \( \binom{17}{9} - \binom{7}{4} \binom{9}{5} \) routes still available.