1. Twenty-five percent of all cars are manufactured on Mondays or Fridays ("Beg-End-week") and seventy-five percent of all cars are manufactured on Tuesdays or Wednesdays or Thursdays ("Mid-week"). Suppose that 20 percent of all cars manufactured Beg-End-week are defective, and that 10 percent of all cars that are manufactured Mid-week are defective.

(a) (8) What is the overall proportion of defective cars. Explain/Justify.
(b) (7) You have just purchased a car that is defective. What is the probability that it was manufactured in Mid-week?

2. Suppose that the Maytag company employs 5 people who are sent to fix broken machines. On a particular day, there are 10 calls to repair Maytag washing machines. The dispatcher, who handles the phone calls, is confused this day, and randomly assigns each job to one of the 5 repair-people.

(a) (5) Briefly describe the sample space for this experiment where you will notice which repair-people went to each of the 10 jobs eg. give a couple of elementary outcomes in the sample space.
(b) (5) How many ways are there to assign jobs to repair-people where you will notice which repair-person went to each of the 10 jobs? Explain/Justify.
(c) (5) What is the probability that a single repair-person will be sent to all of the jobs? Explain/Justify.
(d) (8) What is the probability that two of the repair-people won't be assigned a job on this day eg. exactly 3 repair-people are sent out and two are not? Explain/Justify.
(e) (*10) What is the probability that each repair-person is assigned to exactly two jobs. Explain/Justify.

3. (6) Suppose that \( Pr(A) = 0.1 \), that \( Pr(B) = 0.5 \), and that if the event \( A \) occurs, then the event \( B \) must also occur. What is \( Pr(B \cap A^c) \)? Explain/Justify.
4. A large extended family is going on a trip together. There are 4 men, 6 women and 10 teenagers. All 20 are to be regarded as distinct individuals. Everyone has a drivers licence.

(a) (7) How many ways are there to select 2 men to be cooks on the vacation, 3 women to be in charge of the teenagers and 5 teenagers to do various chores?
Suppose there are 4 cars available and each holds 5 people. The brands of the cars are Ford, Chevrolet, Mercury and Saturn. So the cars are distinguishable.

(b) (7) How many different collections of 4 drivers are there if it is noticed who is driving what brand of car? (only think about allocating drivers to cars here)

(c) (6) How many different driver collections are there if we care about the group of drivers without regard to who is driving what brand? (only think about allocating drivers to cars here)
Now, ignoring the previous two parts, suppose that the 4 cars are to be loaded with the 20 people in a random fashion.

(d) (6) How many distinct ways can the cars be loaded (remembering that all the cars are different brands so that, for example, having the same 5 people in the Ford is different from having them in the Saturn)? Explain/Justify.

(e) (7) What is the probability that all of the teenagers will be in the Mercury and the Chevrolet? Explain/Justify.

(f) (6) What is the probability that all of the teenagers will be loaded in two cars? Explain/Justify.
Now suppose that a driver is first selected for each car and that then, each car is allocated 4 additional passengers at random.

(g) (*10) How many ways can the allocations be made now? Explain/Justify

(h) (7) What is the probability of all women drivers? Explain/Justify.
This one can be done without doing the previous part, or using it.
1(a) \( P(BE) = 0.25 \) \( P(M) = 0.75 \)

\[ P(D | BE) = 0.2 \]

\[ P(D | M) = 0.1 \]

Law of Total Prob.

\[ P(D) = P(D \cap BE) + P(D \cap M) \]

\[ = P(BE) P(D | BE) + P(M) P(D | M) \]

\[ = (0.25)(0.2) + (0.75)(0.1) \]

(b) \( P(M | D) = \frac{P(M) P(D | M)}{P(D)} \)

\[ = \frac{(0.75)(0.1)}{P(D)} \]

2(a) \[ S = \{ \frac{R_1 R_1 \ldots R_1}{10}, \frac{R_1 R_1 R_2}{10}, \ldots, \frac{R_1 R_S}{10} \} \]

\[ \Rightarrow \text{all 10 jobs} \]

\[ \text{go to Repairs - 1} \]

(b) 10 experiments w/ 5 options per experiment

\[ \frac{5}{10} \text{ ways} \]

(c) \[ \binom{5}{1} \]

\[ \frac{5}{10} \]

Pick a repairperson
Pick 3 repair-people to get the 10 jobs.

Pick 2 jobs for R_1, 2 for R_2, and 2 for R_5.

Allocate 10 jobs to these repair-people so that exactly 2 go into each.

\[
\binom{10}{2} \binom{8}{2} \binom{6}{2} \binom{4}{2} \binom{2}{2} = 22222
\]

Put 2 in 1st row, put 2 in 2nd row.
\[ 3 \quad A \cap B \implies \\
B = A \cup (B \cap A^c) \\
\text{so} \quad P_r(B) = .5 = P_r(A) + P_r(B \cap A^c) \\
\implies P_r(B \cap A^c) = .5 - .1 = .4 \]
(a) \[ \frac{4}{2} \cdot \frac{6}{3} \cdot \frac{10}{5} \]

(b) \[ \frac{20}{5} \cdot \frac{15}{5} \cdot \frac{10}{5} \cdot \frac{5}{5} = \frac{20}{5} \cdot \frac{15}{5} \cdot \frac{10}{5} \cdot \frac{1}{1} \]

(c) \[ \frac{20}{4} \quad \text{order doesn't matter} \]

(d) \[ \left( \frac{20}{5} \right) \left( \frac{15}{5} \right) \left( \frac{10}{5} \right) \left( \frac{5}{5} \right) = \frac{20}{5} \cdot \frac{15}{5} \cdot \frac{10}{5} \cdot 1 \]

(e) \[ \left( \frac{10}{5} \right) \left( \frac{5}{5} \right) \left( \frac{10}{5} \right) \left( \frac{5}{5} \right) \]

(f) \[ \left( \frac{4}{2} \right) \left( \frac{5}{5} \right) \]

Pick 5 adults for Mercury

Allocate 4 drivers to 4 cars

Pick 4 women to drive teens

Put 5 teens in Ford and remaining teens in Chevrolet

Pick 2 cars for teens