1. A sample space consists of 6 events with the following probabilities.

$$P(E_1) = .05, \quad P(E_2) = .1, \quad P(E_3) = .1, \quad P(E_4) = .15,$$

$$P(E_5) = 4P(E_6)$$

(a) Find the probabilities of simple events E_5 and E_6.

$P(E_1) + P(E_2) + P(E_3) + P(E_4) + P(E_5) + P(E_6) = 1$

$.05 + .1 + .1 + .15 + 4P(E_6) + P(E_6) = 1$

$.4 + 5P(E_6) = 1$

$5P(E_6) = .6$

$P(E_6) = .12 \longrightarrow P(E_5) = 4(.12) = .48$

$P(E_5) = .48$

$P(E_6) = .12$

(b) Find the probabilities of the following events.
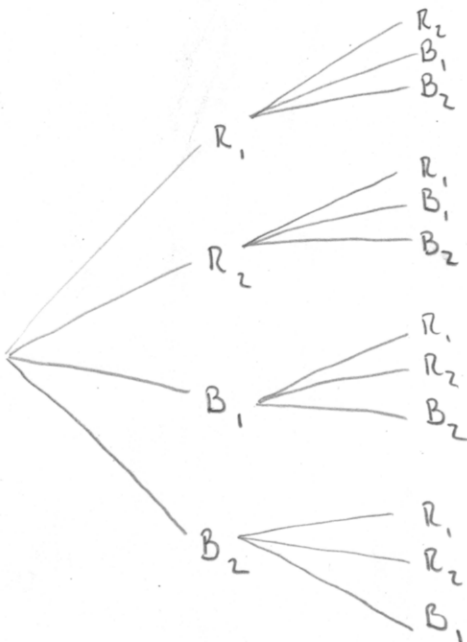
$$A = \{E_1, E_2, E_4\}, \quad B = \{E_4, E_5, E_6\}$$

$P(A) = P(E_1) + P(E_2) + P(E_4)$

$= .05 + .1 + .15 = \boxed{.3}$

$P(B) = P(E_4) + P(E_5) + P(E_6)$

$= .15 + .48 + .12 = \boxed{.75}$

2. A bowl contains two red and two blue balls. Two balls are randomly selected and their colors recorded. Use a tree diagram to list the 12 simple events in the experiment, keeping in mind the order in which the balls are drawn.

12 SIMPLE EVENTS:

$\left\{ \begin{array}{l} R_1 R_2 , R_1 B_1 , R_1 B_2 , \\ R_2 R_1 , R_2 B_1 , R_2 B_2 , \\ B_1 R_1 , B_1 R_2 , B_1 B_2 , \\ B_2 R_1 , B_2 R_2 , B_2 B_1 \end{array} \right\}$

3. In how many ways can a committee of 9 people select a president, vice president, and treasurer?

$$P^9_3 = \frac{9!}{(9-3)!} = \frac{9!}{6!} = 9 \cdot 8 \cdot 7 = \boxed{504}$$

4. In how many ways can a committee of 9 people select a sub-committee of three people? (All positions on the sub-committee are the same.)

$$C^9_3 = \frac{9!}{3!(9-3)!} = \frac{9!}{3! \, 6!} = \frac{9 \cdot 8 \cdot 7}{3 \cdot 2} = \boxed{84}$$

5. An experiment consist of randomly choosing 3 marbles from an urn that contains 4 red and 5 blue marbles.

   (a) How many simple events are there in the sample space?

   $$C^9_3 = \boxed{84} \quad (\text{SEE QUESTION 4})$$

   (b) How many simple events result in choosing 3 blue marbles?

   $$C^5_3 = \frac{5!}{3! \, 2!} = \boxed{10}$$

   (c) What is the probability of randomly choosing 3 blue marbles?

   $$\frac{10}{84} \quad \text{OR} \quad \boxed{\frac{5}{42}}$$