**Question 7**

There are 6 vowels, each worth 3 points, and 20 consonants, each worth 1 point. The probability of picking each is 1/26.

1. Distribution of X is the set of all pairs (r, p(X=r)) for all r ∈ X(S). The possible pair (3, 1/26) appears 6 times, while (1, 1/26) appears 20 times. Thus, the distribution is {(3, 6/26), (1, 20/26)}. ({p(X = 3) = 6/26, p(X = 1) = 20/26})
2. Expected value of X is ∑ p\*r = ((1/26)\*3)\*6 + ((1/26)\*1)\*20 ~= 1.46.
3. Variance of X is ∑ p(s)\*(X(s) – E(X))^2 = ((1/26)\*(3-1.46)^2)\*6 + ((1/26)\*(1-1.46)^2)\*20 ~= 0.71

**Question 8**

Total number of possible values of X is 26^2, from the set {2, 4, 6}. Possible scenarios are as follows:

1. 1 vowel + 1 consonant, X = 4
2. 2 vowels, X = 6
3. 2 consonants, X = 2
4. Probability of first scenario: 2\*(6/26)\*(20/26) = 240/26^2 ~= 0.355
5. Probability of second scenario: (6/26)^2 = 36/26^2 ~= 0.053
6. Probability of third scenario: (20/26)^2 = 400/26^2 ~= 0.592
7. Distribution of X = set of (value of scenario 1 \* probability of scenario 1) + (value of scenario 2 + probability of scenario 2) + (value of scenario 3 \* probability of scenario 3) = {(4, 0.355), (6, 0.053), (2, 0.592)}
   1. Expected value is ∑ p\*r = 0.355\*4 + 0.053\*6 + 0.592\*2 ~= 2.92
   2. Expected value of the sum is 2\*expected value of 1 deck. The latter is found in Part b) in the previous question, 1.46. So the expected value of the sum of ~= 2.92

**Question 9**

1. Suppose probability for 1, 2, 4, 5, 6 to come on each die is x, then probability for 3 to appear is 2x. 5x+2x = 7x = 1, so x = 1/7. The probability for 1 through 6 to come up on each die is therefore 1/7, 1/7, 2/7, 1/7, 1/7, and 1/7.

Expected value of the random variable is ∑ p\*r = 1\*1/7+2\*1/7+3\*2/7+4\*1/7+5\*1/7+6\*1/7 = (1+2+6+4+5+6)/7 = 24/7 ~= 3.43

Expected value of the sum of two such dice is twice the expected value for either, or ~= 6.86.

1. Probability for each number to come up on a single fair die is 1/6. The expected value is thus 1/6\*(1+2+3+4+5+6) = 3.5.

The expected sum for 3 such dice is 3\*3.5 = 10.5.