Basic Probability and Statistics Questions.

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1 Data Analysis

1. Expand out the following:

   - $\sum_{i=1}^{4}(i+4)$
   - $\sum_{i=1}^{n} 2$
   - $\sum_{i=1}^{3} 3^i$

2. Write the following in summation notation:

   - $1 + 2 + 3 + ... + 10$
   - $1 + 4 + 9 + 16 + 25$
   - $1 + 1/2 + 1/3 + 1/4 + ... + 1/n$
   - $1 \times 1/2 + 2 \times 1/2 + 3 \times 1/2$

3. For the two earthquake data sets, calculate the variances of each.

2 Probability

1. For each of the following experiments/random variables, write down the sample space, a possible outcome and event, and the probability of that event: (a) The sum of the outcomes of two fair dice; (b) An experiment to see whether a certain drug allows people to see in the dark; (c) Drawing a card at random from an ordinary deck of playing cards, with suits not being taken into account.

2. Draw a Venn diagram to describe the sample space of: (a) Picking a person at random from the population and discriminating based on whether they are male or female; (b) Flipping a coin; (c) Rolling a die.

3. A card is drawn at random from a deck of 52 playing cards. Let A be the event that a king is drawn, and B the event that a club is drawn. Describe the events (and calculate the probability of each): (a) $A \cup B$, (b) $A \cap B$.

4. An urn contains 4 red balls, 3 black balls and 2 green balls. We draw two balls at random (without replacement). (a) If the first ball is red, calculate the probability that the last ball is black. (b) Calculate the probability that both balls are green.

5. Find the probability of a 4 turning up at least once in two tosses of a fair coin.

6. Write down the probability distribution for the sum of scores on a pair of dice. Then calculate the probability that the score is less than or equal to 4.

7. Calculate the expected value of a random variable which takes the value 3 with probability 0.4 and 7 otherwise.

8. The probability of death given that someone was stabbed is 0.9. The probability that someone has been stabbed is 0.001. The probability that someone is dead is 0.4. Write down all of the above in the language of probability (giving events suitable names etc.), and hence calculate the probability that someone was stabbed, given that they are dead.

3   Random Variables

For each of these random variables, write down the probability distribution

- The number of heads after a fair coin is flipped twice

- The total score when rolling two fair 4-sided dice