**KEY FACTS AND CONCEPTS**

**Discrete random variables**

* A **random variable** is a number whose value is determined by a process, the outcome of which is open to chance. Usually, capital letters such as are used to represent random variables.
* **Discrete random variables** may take only specific values. They are usually characterised by *counting*.
* **Continuous random variables** may take any value (often within set limits). They are usually characterised by *measuring*.
* A **probability distribution** associates a probability with each possible value of a discrete random variable. It can be represented using a table, column graph, or a probability distribution function.
* If is a random variable with possible values and corresponding probabilities then:
  + Each probability must be between 0 and 1.  
     for all
  + The sum of all the probabilities must be 1.
* For a **uniform discrete random variable,** each possible value has the same probability of occurring  
   for all .
* The **mode** of a discrete probability distribution is the most frequently occurring value of the variable. This is the data value whose probability is the highest.
* The **median** of the distribution corresponds to the 50th percentile. If the possible values are listed in ascending order, the median is the value when the cumulative sum reaches 0.5.
* If there are trials of an experiment, and an event has probability of occurring in each of the trials, then the number of times we **expect** the event to occur is .
* If is a random variable with possible values and corresponding probabilities then the **expected value** or **mean** is:
* The expected value can be interpreted as a long-run sample mean.
* The principle purpose of the expected value is to be a measurement of the *centre* of the distribution.
* If is a random variable with possible values and corresponding probabilities then the **standard deviation** is:
* The principle purpose of the standard deviation is to be a measurement of the *spread* of the distribution.
* For a random variable, , and any constants and :
* A **Bernoulli trial** is an experiment which only has two possible outcomes: “success” if some event occurs or “failure” if the event does not occur.
* A **Bernoulli random variable** is the number of successes in a single Bernoulli trial.

We define as the probability of success, so , and , where .

* A **binomial random variable** is the number of successes in identical independent Bernoulli trials with probability of success .

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The distribution of is called the binomial distribution and we write .

* + The probability distribution of is  
     where