



Year 8 Mathematics: Statistics and Probability Exercise

A. Statistical Investigation

1. A local council wants to know the average age of residents in their town. They survey the first 50 people who attend the local seniors' bingo night. State the **population** and the **sample** in this investigation.
2. Is the sample described in Question 1 likely to be **biased**? Explain why or why not.
3. A research group wants to determine the most popular sport among teenagers. They decide to survey students at the state's largest performing arts high school. Identify a potential **limitation** or **bias** in this sampling method.
4. A factory produces 1, 000 light bulbs a day. To check the quality, a supervisor randomly selects 50 bulbs for testing. Name the **sampling method** used (e.g., census, random sample, convenience sample).
5. State the difference between **primary data** and **secondary data**, and give one example of each.

B. Data Analysis

1. Calculate the **mean**, **median**, and **mode** of the following set of test scores:
15, 18, 12, 19, 15, 21, 14.
2. The following numbers represent the daily maximum temperature in a city over a week:
25°C, 28°C, 24°C, 30°C, 27°C, 26°C, 31°C. Calculate the **range** of the temperatures.
3. A **stem-and-leaf plot** shows the ages of people at a party:

1	5 8 8 9
2	0 1 4 6
3	2 5
4	0 1

What is the **median age**? (Key: 1|5 means 15 years old).

4. The mean height of 5 basketball players is 180 cm. If a sixth player of height 198 cm joins the team, what is the **new mean height** of the team?
5. The scores on a science test had a median of 75. If the teacher decides to give every student **5 bonus points**, what will the **new median** be?

C. Probability

1. A standard six-sided die is rolled. What is the probability of rolling an **even number**? Express your answer as a simplified fraction.
2. A bag contains 4 red marbles, 5 blue marbles, and 3 green marbles. If one marble is chosen at random, what is the probability that it will be a **blue marble**?
3. A spinner is divided into four equal sectors coloured Red, Blue, Green, and Yellow. You spin the spinner twice. How many total **possible outcomes** are there for the two spins?
4. Using the spinner from Question 3, what is the probability of spinning a **Red** on the first spin AND a **Blue** on the second spin?
5. A family has two children. Assuming that having a boy (B) or a girl (G) is equally likely, list all the possible compound outcomes (the sample space). What is the probability that the family has **at least one girl**?

✓ Answers

A. Statistical Investigation

1. **Population:** All residents of the town. **Sample:** The 50 people who attend the local seniors' bingo night.
2. **Yes, it is biased.** The sample only includes people who attend a seniors' event, meaning the ages will likely be skewed towards the older population, and will not be representative of all age groups in the town.
3. **Bias/Limitation:** The sample is likely to be biased towards participants of performing arts, who may have less interest in (or time for) physical sports compared to the general teenage population.
4. **Random Sample** (or **Simple Random Sample**).
5. **Primary Data** is data collected directly by the person or group using it (e.g., recording the heights of your classmates). **Secondary Data** is data collected by someone else that you use (e.g., using census data or data published in a scientific journal).

B. Data Analysis

1. **Order the data first:** 12, 14, 15, 15, 18, 19, 21

- **Mean:** $\frac{12+14+15+15+18+19+21}{7} = \frac{114}{7} \approx 16.29$ (or $16\frac{2}{7}$)
- **Median:** 15 (The middle value of the ordered set)
- **Mode:** 15 (The most frequent score)

2. **Range:** $31^{\circ}\text{C} - 24^{\circ}\text{C} = 7^{\circ}\text{C}$

3. **Median Age:** 20 years old. (There are 12 data points. The median is the average of the 6th and 7th values: $\frac{21+24}{2} = 22.5$. *Note: If the class is taught that for an even set of data the median is the average of the two middle scores, the answer is 22.5. If they are taught that the median is just the middle observation, this might be 21 or 24 depending on interpretation. However, 22.5 is the precise mathematical median.*)

4. **New Mean Height:** 183 cm

- Total height of 5 players: $5 \times 180 \text{ cm} = 900 \text{ cm}$
- Total height of 6 players: $900 \text{ cm} + 198 \text{ cm} = 1098 \text{ cm}$
- New Mean: $\frac{1098}{6} = 183 \text{ cm}$

5. **New Median:** 80. (Adding a constant value to every score shifts the mean, median, and mode by that same constant value. $75 + 5 = 80$.)

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C. Probability

1. $\frac{1}{2}$

- Favourable outcomes (Even numbers): 2, 4, 6 (3 outcomes)
- Total outcomes: 1, 2, 3, 4, 5, 6 (6 outcomes)
- Probability: $\frac{3}{6} = \frac{1}{2}$

2. $\frac{5}{12}$

- Total marbles: $4 + 5 + 3 = 12$
- Blue marbles: 5
- Probability: $\frac{5}{12}$

3. **16 total possible outcomes**

- Number of outcomes for one spin: 4
- Total possible outcomes for two spins: $4 \times 4 = 16$

4. $\frac{1}{16}$

- Probability of Red (R) on first spin: $\frac{1}{4}$
- Probability of Blue (B) on second spin: $\frac{1}{4}$
- Probability of R and B: $\frac{1}{4} \times \frac{1}{4} = \frac{1}{16}$

5. $\frac{3}{4}$

- **Sample Space (Possible Outcomes):** BB, BG, GB, GG (4 outcomes)
- Favourable outcomes (at least one girl): BG, GB, GG (3 outcomes)
- Probability: $\frac{3}{4}$