MATHS

Lessons 12–13

Year 7

Topic: Data representation and interpretation

Problem solving and reasoning by applying statistics to an inquiry involving dice

Today you will:

- ► solve a problem using digital technology and an understanding of statistics.

Resources

Find and prepare

Sheet 9 — Mean, median, mode using a spreadsheet (optional; from previous lesson)

Sheet 10 — Zarkan

Key terms

data (data set), mean, median, mode

For definitions and explanations of terms, please see the Glossary.

Lesson

Explore context such as decision-making in games (Discover)



In the previous lesson, you calculated measures of centre and spread using a spreadsheet. In these next two lessons, you will consolidate these skills to complete an inquiry task. The inquiry task focuses on a game.

1. What type of computer or board games have you played and enjoyed (for example: car racing, role-playing game, adventure games)?

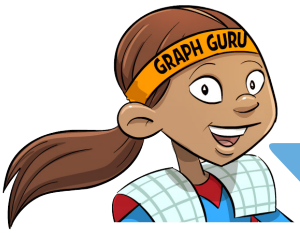


2. Consider the decisions you have made to succeed or win the game by answering the following:

   a. Was there a particular character or object that you chose because it was better than others? Provide a brief description identifying the game, character or object.

   b. Did it have a better feature or skill or power (for example: faster car, best move, most powerful attack)? Discuss your reasons for your choice of character or object.

   c. Discuss particular strategies you use to help win the game.



Did you realise that mathematics underpins most computer games, board games and role-playing games? You can often find yourself using mathematical understanding (for example: probability, ratios, statistics) without even realising. Many people who write computer games have to do well at mathematics.

Plan how to answer the question (Devise)

Have you played role-playing games in which you take the role of a character? In these types of games, you often have to make decisions about the character's strengths and weaknesses and the equipment used. This is usually done before the game starts and then continues throughout the game. For the inquiry task, you need to decide on the features of a character in the game *Zarkan*.



3. Read the inquiry task on **Sheet 10 —** Zarkan.



To complete this task you need to determine 'What is the best character for the game *Zarkan*?' You will use your maths skills to build the most powerful character in the game. Remember, you have two lessons to complete this activity.



4. To check your understanding of the task, answer the following questions:

   a. What does a roll of the dice represent?

   b. Is rolling a total of 8 better than rolling a total of 4?

   c. Why are different dice used for different scramblers?

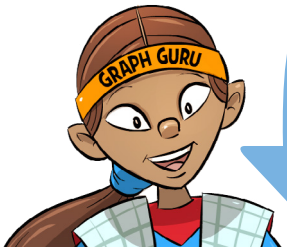
   d. How long will the pesky robots be frozen for if you roll a 7 using a Binary Blaster with a Plus 1 skill boost?

   e. How long will the pesky robots be frozen for if you roll 5 and 3 using a Zappy Zapper with a Max power?

   f. How long will the pesky robots be frozen for if you roll 7 and 4 using a Nullifier with a Max power?

   g. What effect do the skill boosts have on the effectiveness of the scramblers?

   h. Identify the mathematical methods that could be used to help solve this problem.



Let's work out a plan to approach this problem. Make sure you record all information when creating your plan, as it will form the basis of your conclusion and justification.

5. To formulate a plan consider the following questions:

   a. What evidence do you need to gather to answer the question?

   b. What are the possible scrambler/skill-boost combinations?

   c. How will you compare which scrambler/skill-boost combination is the most powerful?

   d. What do you think you might find out — any predictions?

Summary of plan

- Construct an organised list of the outcomes for each scrambler/skill-boost combination.
- Calculate the measures of centre (mean, median and mode) for each combination.
- Record the data in a spreadsheet.
- Present the data in a table or graph.

Collect data (Develop)



Now it is time to start collecting data. You will need to use the spreadsheet skills learned in the previous lesson to sort data into increasing numerical order, enter functions such as **mean**, **median** and **mode** and select the data to apply the functions to.

6. Collect data on all the possible scrambler/skill-boost combinations. To get you started, work through the following steps to find the measures of centre for the Binary Blaster + Max power combination and the Binary Blaster + Plus 1 combination.

   Steps:

   1. Open the spreadsheet.
   2. Type in relevant headings.
   3. In the second column, list all possible outcomes for the Binary Blaster.
   4. In the third column, identify the outcomes for when the Binary Blaster is combined with the Max power skill booster.
   5. In the fourth column, identify the outcomes for when the Binary Blaster is combined with the Plus 1 skill booster. **Note:** As a short cut, use a formula (for example =B4+1).
   6. Find the mean, median and mode of each column (For help, refer back to **Sheet 9 —** Mean, median, mode using a spreadsheet).

      Example layout (**Note:** This is incomplete, as outcomes from 3–11 are not included and measures of centre are not given.)

Binary Blaster — One 12-sided dice			
		Max power	**Plus 1**
	Outcomes of rolling the dice	Add 10 to rolls of 11 and 12	Add 1 to each dice roll.
	1	1	2
	2	2	3

Need to include all outcomes (1–12)

	12	22	13
mean	?	?	?
median	?	?	?
mode	?	?	?

Repeat a similar process to collect data on the other four combinations. It may help to include an extra column to display outcomes of dice rolls in ascending order.

7. Review evidence and summarise and interpret data by considering the following questions:
    - Do you have evidence to support your conclusion? Were you able to use your mathematical analysis to identify differences between the scrambler/skill-boost combinations?
    - Which measure of centre(s) is the most appropriate to justify your decision?
    - Have you considered the effect of unusual values?
    - Do you think you have provided a reasonable solution? Are you sure?
    - Have you considered all the evidence, for example the mean, median and mode, rather than just one of them? Also could probability help you reach a conclusion?
    - Will further analysing the data or presenting it in a graph help interpret the data or help support the conclusion?

Conclusion (Defend)

8. Discuss your results and write a conclusion. Select from the following questions to include in your written response (You do not need to answer all the questions).
    - What is your answer to the question?
    - What maths did you use?
    - Do you think this is the only possible answer? How does your answer compare with that of other students?
    - What assumptions did you make in determining your sample?
    - What challenges did you experience during this inquiry?
    - How could your plan be improved to make your answer more accurate?
    - How could this type of analysis help you make choices in games?

