Grade 5 Probability

5.SP.3	
Describe the likelihood of a single outcome occurring using words, such as • impossible • possible • certain	1. Provide examples of events that are impossible, possible, or certain from personal contexts. 2. Classify the likelihood of a single outcome occurring in a probability experiment as impossible, possible, or certain. 3. Design and conduct a probability experiment in which the likelihood of a single outcome occurring is impossible, possible, or certain. 4. Conduct a probability experiment a number of times, record the outcomes and explain the results.

5.SP.4	
Compare the likelihood of two possible outcomes occurring using words, such as • less likely • equally likely • more likely	5. Identify outcomes from a probability experiment which are less likely, equally likely, or more likely to occur than other outcomes. 6. Design and conduct a probability experiment in which one outcome is less likely to occur than the other outcome. 7. Design and conduct a probability experiment in which one outcome is equally as likely to occur as the other outcome. 8. Design and conduct a probability experiment in which one outcome is more likely to occur than the other outcome.

Clarification of the outcome:

✦ The two outcomes are strongly linked. It makes good pedagogical sense to develop them concurrently.

✦ The outcomes concern language of probability (e.g.: possible, unlikely). Probability is not quantified (no number between 0 and 1 attached to the language). Quantification is a grade 6 outcome.

✦ The outcomes arise from single events (e.g.: throwing ONE die; spinning ONE spinner)

Required close-to-at-hand prior knowledge:

✤ A general, informal sense of what luck/chance means in real world contexts.

✤ Understand how to collect data and what frequency means in relation to collected data.

SET SCENE stage

The problem task to present to students:

Ask students to list on a probability line outcomes (e.g. winning a lottery prize) that range from cannot to must. One end of the line is labeled 'cannot happen'. The other end is labeled 'must happen'. [See below for an example.]

winning the lottery   moving to Alberta   snowing in winter

CANNOT   MUST
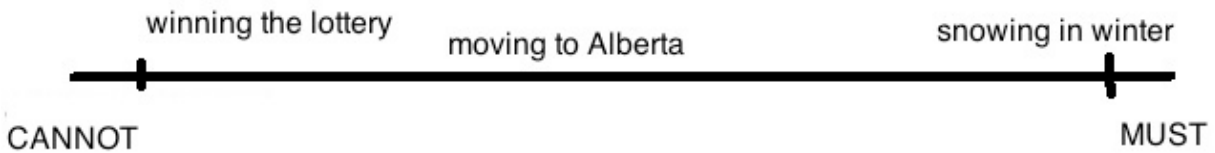
Comments

The task encourages students to think about luck/chance although some of the events they place on the line may have nothing to do with luck (for example, paying taxes, graduating from high school).

DEVELOP stage

Activity 1: Revisits SET SCENE and addresses indicator 1.

✦ Revisit the SET SCENE task by asking selected students to present their probability lines. Discuss any events that do not concern luck/chance (e.g: paying taxes). ENSURE students realize that probability must be about luck/chance.

✦ Introduce students to new terminology (see list below) and relabel the probability line using the new terminology.

- cannot happen - impossible to happen
- must happen - certain to happen

✦ Ask students to describe outcomes that are impossible to happen, certain to happen, and possible to happen, based on their daily lives. Discuss the appropriateness of the probability language for the outcomes they describe.

Activity 2: Addresses achievement indicators 2, 4, and 5.

✦ Show students a spinner that has four equal regions, containing 1, 2, 3, and 4 respectively (see example).

✦ Ask them whether it is impossible or certain that, when the spinner is spun, it will stop at one of the numbers from 1 through 4. Discuss their answers.

✦ Ask them whether it is impossible or certain that, when the spinner is spun, it will stop at the number 5. Discuss their answers.

✦ Ask them whether it is possible that, when the spinner is spun, it will stop at either 1, 2, 3, or 4. Discuss their answers.

✦ Organize students into groups. Provide spinners of the type shown here. Ask each group to spin its spinner ten times and to record how many times the 1, 2, 3, 4 occur. Mention that this is the frequency of occurrence of each number.

✦ Have at least three groups present their results. Assuming the results are different, discuss why they are different. ENSURE student realize that luck is just that, luck. The results can be different.

✦ Combine the results from the groups. Hopefully, the frequency of occurrence of each number will be close to the same. Discuss what is likely to happen if the spinner is sun 10 000 times (the frequencies should be almost identical).
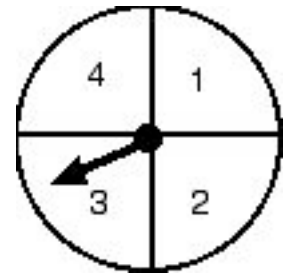
Activity 3: Addresses achievement indicators 2, 3, and 4.

✦ Organize students into groups. Ask the groups to design a probability experiment (e.g. throwing dice, spinning a spinner, picking things out of a bag) where an outcome is certain to happen, impossible to happen, and possible to happen. Have the groups run the experiment ten times and record the outcomes (what happens). Ask the groups to present their experiment. Discuss results.

Activity 4: Addresses achievement indicators 4 through 8.

✦ Organize students into groups of 2. Provide each group with a styrofoam cup. Ask each group to list the ways the cup could land (on its side, on its bottom, on its top).

✦ Ask each group to toss the cup 10 times, recording the results. Discuss the results of the experiment and the students' list of ways the cup could land in relation to the terminology of more likely/equally likely/less likely. [For example: *Do you think it is more likely that the cup will land on its side. Did that happen when you ran the experiment?*].

✦ Discuss whether the results of throwing the cup might be influenced by the age of the students or their skill/experience in throwing a cup.

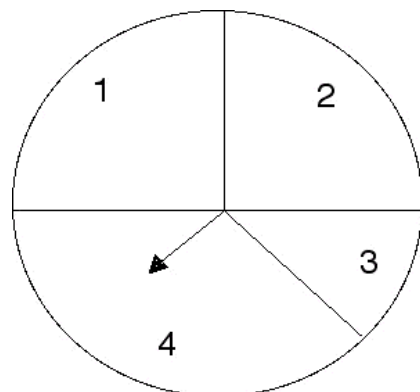**Activity 5:** Addresses achievement indicators 4 through 8, and practice.

✦ Organize students into groups of 2. Provide each group with an 8-sided die. Ask each group to list all possible events that can occur if the single 8-sided die is thrown.

✦ Ask each group to throw the 8-sided die 20 times, recording the results.

✦ Discuss the results of throwing the die and the students' list of ways the die could land in relation to the terminology of more likely/equally likely/less likely/impossible/certain/ possible.

✦ Discuss whether the results of throwing the die might be influenced by such matters as the age of the throwers or their skill/experience in throwing a die.

Activity 6: Addresses achievement indicators 2 through 8, and practice.

✦ Organize students into groups of 3. Provide each group with a bag containing 6 red, 1 blue, 5 yellow, and 2 white marbles. Let them know the kinds of colours of marbles in the bag but not the number of each kind of colour.

✦ Ask each group to list all possible events that can occur if a single marble is drawn out of the bag.

✦ Ask each group to pick a marble out of the bag and return it (do this 15 times), recording the results. Discuss the results of picking a marble out of the bag.

✦ Ask students to examine open the bag and count the number of each kind of colour of marble. Discuss the students' list of all possible events and the results of picking a marble in relation to the terminology of more likely/equally likely/less likely/ impossible/certain/possible.

Activity 7: Addresses achievement indicators 4 through 8, and practice.

✦ Organize students into groups of 3 and provide each group with a 1-2-3-4 unequal area spinner (see example). Ask each group to list all the numbers the spinner can stop on. Ask them to predict which number the spinner should stop on the most and the least.

✦ Ask each group to spin the spinner 20 times to confirm their predictions. Discuss the students' predictions and results of their experiment in relation to the terminology of more likely/equally likely/less likely/impossible/certain/possible.

Activity 8: Revisits SET SCENE & addresses all achievement indicators & practice.

✦ Revisit the SET SCENE probability line task. Organize students into groups of 2. Have each group design (design, not actually do) a hypothetical experiment for which the probability language of more likely/equally likely/less likely/impossible/certain/possible would occur for one or more of the outcomes.

✦ Have selected groups present their hypothetical experiments. Discuss them to ensure luck/chance is involved.

Comments

This activity provides an opportunity for students' minds to go "wild". It is a good idea to get away from conventional probability situations such as throwing dice and spinning spinners and let students' imaginations soar.

Activity 9: Assessment of teaching.

💡 Ask students to design (not run) a probability experiment that involves a 3-D object (not a coin or spinner) that can land in exactly 2 ways. Ask students to write a brief report that explains whether the two outcomes are equally likely to occur or whether one of them is more/less likely to occur than the other one.

If all is well with the assessment of teaching, engage students in PRACTICE (the conclusion to the lesson plan).

An example of a partial well-designed worksheet follows.

The worksheet contains a sampling of question types. More questions of each type are needed.

The MAINTAIN stage follows the sample worksheet.

Question 1.

Describe a probability situation for which:

  a)   An outcome is more likely to occur than another outcome.

  b)   An outcome is less likely to occur than another outcome.

  c)   An outcome is equally likely to occur as another outcome.

  d)   An outcome is impossible to occur.

  e)   An outcome must occur.

Question 2.

A 4-sided die is thrown. It has the numbers 2, 4, 6, 8, on it.

  a)   Is landing on a '8' more likely to happen than landing on a '4'?

  b)   Is landing on a '2' less likely to happen than landing on a '6'?

  c)   Is landing on a '7 impossible?

  d)   Is landing on one of the numbers 2, 4, 6, 8 certain?

Question 3.

For the spinner shown,

  a)   Which region (A, B, C, D, or E) will the spinner most likely stop at?

  b)   Which region (A, B, C, D, or E) will the spinner least likely stop at?

  a)   Which two regions (A, B, C, D, E) have an equal chance of stopping at?
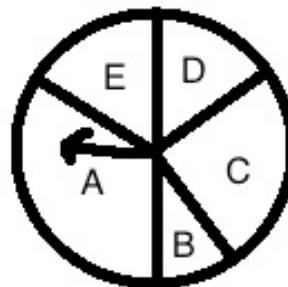
Question 4.

Design a probability experiment in which one outcome is more likely to occur than all other outcomes. You cannot use a spinner or a die in the experiment.

Question 5.

Design a probability experiment in which all outcomes are equally likely to occur. You cannot use a spinner or a die in the experiment.

MAINTAIN stage

Mini-task example

Every so often:

- Present a probability situation. Ask students to identify outcomes that are more likely/equally likely/less likely/impossible/certain/possible to occur.

Rich-task example

Ask students to create simple English sentences of at most 10 words. Ask them to make a frequency count of the letters appearing in the sentences. Using the frequency information, students order the probability of occurrence of the letters in a table, from most likely to least likely.

Have students visit the website, Free Translation, (http://www.freetranslation.com/) and use it to translate the English sentence into French and Spanish sentences. Have students make a frequency count of the letters appearing in each of these sentences. Making two tables, have students order the probability of occurrence of the letters in French and Spanish sentences, from most likely to least likely. Have students compare the English, French, and Spanish tables.

Comments

This is a rich-task because of the complexity involved.