

Data Management and Probability

General Curriculum Outcome G:

Students will represent and solve problems involving uncertainty.

GCO G: Students will represent and solve problems involving uncertainty.

KSCO: By the end of grade 6, students will have achieved the outcomes for entry-grade 3 and will also be expected to

- i) *explore, interpret and make conjectures about everyday probability situations by estimating probabilities, conducting experiments, beginning to construct and conduct simulations, and analysing claims which they see and hear*

SCO: By the end of grade 6, students will be expected to

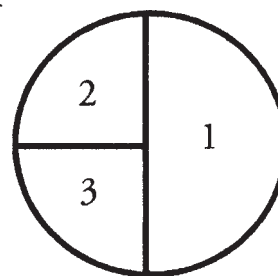
- G1 conduct simple simulations to determine probabilities**
- G2 evaluate the reliability of sampling results**
- G3 analyse simple probabilistic claims**

A simulation is a technique used for answering questions or making decisions in complex situations where an element of chance is involved. A simulation is very much like solving a probability problem by an experimental approach. The only difference is that one must design a model that has the same probabilities as the real situation. (Elementary School Mathematics, p. 390)

Elaboration - Instructional Strategies/Suggestions

G1 Having had experience directly determining experimental probabilities, students should be introduced to simulations, experiments which indirectly model a situation. For example, a well-known simulation is designed to determine approximately how many boxes of cereal will need to be purchased before a consumer collects each of six possible prizes contained therein. This simulation can be performed by

- rolling a die
- recording the prize number won (based on the roll of the die)
- continuing until at least one of each number is rolled
- repeating the experiment several times and
- determining, on average, the number of rolls (purchases) required.



G2 It is important that students recognize that more data from larger samples generally produces more reliable probabilities. For example, if a student spins this spinner 10 times, it is less likely that the empirical probability of getting a 1 will be close to $\frac{1}{2}$ than if the student spins 100 times.

G3 Students should be able to interpret some of the probabilistic claims they hear. For example, if students hear that the probability of rain is 100%, yet see the sun is shining, they might wonder about the basis of the claim. Or, if students hear that the chance of rain on Saturday is 50% and on Sunday is 50%, they will realize that an interpretation of the probability for rain on the weekend of 100% does not make sense.

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Worthwhile Tasks for Instruction and/or Assessment

Performance

G1.1 Tell students that a particular baseball player has an average of .250, i.e., he gets 1 hit in 4 times at bat, on average. Ask them to conduct a simulation to determine the probability that the player will get a hit each time at bat in a particular game. [This can be simulated by creating a spinner with four equal sections, one of which is labelled 'hit' and the other three labelled 'miss'. Spin the spinner 4 times recording each outcome (batting average) and repeat several times.]

G2.1 Ask students to roll a die 12 times and record the probability of getting a 1. Then ask the student to group his/her data with other students and recalculate the probability of getting a 1. Ask: What do you notice?

Paper and Pencil

G1.2 Ask students to develop a simulation to determine the probability that, in a family planning three children, all the children will be boys.

Interview/Journal

G1.3 Ask: Why would you use a die to conduct a simulation to determine the number of cereal boxes you would need to purchase to collect each of six possible prizes, but a different device if there were 10 possible prizes?

G2.2 Ask: How much data about people's hair color might it be necessary to collect before you predict the probability that a randomly chosen individual will be blonde? Explain.

Presentation

G3.1 Ask students to collect probability claims from news media and comment on how believable they are and why.

Suggested Resources

GCO G: Students will represent and solve problems involving uncertainty.

KSCO: By the end of grade 6, students will have achieved the outcomes for entry-grade 3 and will also be expected to

- ii) *determine theoretical probabilities using simple counting techniques and*
- iii) *demonstrate an understanding of the relationship between the numerical expression describing a probability and the events which give rise to the numbers*

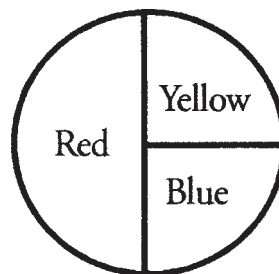
SCO: By the end of grade 6, students will be expected to

- G4 determine theoretical probabilities**
- G5 identify events that might be associated with a particular theoretical probability**

Elaboration - Instructional Strategies/Suggestions

G4 Students will often be presented with situations for which outcomes are equally likely. In these cases, they should list the outcomes and count the number of items on the list to determine probabilities. Students must also recognize, however, when outcomes are not equally likely and take this into account.

For example, using the spinner shown,



the student might list the outcomes as “red,” “yellow” and “blue” and assume that since there are 3 outcomes, each has a probability of $\frac{1}{3}$. This, however, is not the case. Students might benefit from reconfiguring the situation to show equally likely outcomes by dividing the red section into two equal pieces. Now the outcomes might be “red 1,” “red 2,” “yellow” and “blue” and each outcome does have a probability of $\frac{1}{4}$. Because there are two red sections, the probability of red is, therefore, $\frac{2}{4}$.

Students should be encouraged to use decimals as well as fractions to describe probabilities. Therefore, a probability might be reported as 0.3 rather than as $\frac{3}{10}$.

G5 Conversely, by listing outcomes, students should consider what events might be associated with a certain probability. For example, when rolling a die, a probability of $\frac{1}{2}$ might be associated with rolling

- an even number
- a number greater than 3
- a number that is not a factor of 4

- Tell students that the probability of an event that involves choosing a number between 1 and 100, inclusive, is $\frac{3}{4}$. Ask them to describe what the event might be. (Note: Possible answers include choosing a number greater than 25, choosing a number less than 75, and choosing a number that is not prime.)

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Worthwhile Tasks for Instruction and/or Assessment
Performance

G4.1 Ask students to create a spinner for which there are 6 equally likely outcomes and another spinner for which the 6 outcomes are not equally likely.

Paper and Pencil

G5.1 Provide a hundreds chart. Ask students to choose a set of numbers with some characteristics in common such that the probability of choosing that type of number is $\frac{1}{5}$?

G4.2 Ask students to list the possible outcomes that result when two dice are rolled and the numbers are subtracted.

G4.3 Ask students to list the possible outcomes that result when two cubes are pulled from a bag with 10 red cubes and 5 blue ones. [Could be 2 blue, 2 red, or 1 of each.]

G4.4 What is the probability of rolling each of the following:

- an even number when one die is rolled
- a number greater than 4 when one die is rolled
- a sum of seven when two dice are rolled
- a sum greater than four when two dice are rolled
- a sum of one when two dice are rolled [answer: 0]

Interview

G5.2 Ask students to think about rolling a die. Ask: What might you expect to happen about $\frac{1}{3}$ of the time?

Presentation

G5.3 Ask students to work in groups to develop 5 different scenarios, one each to model a situation in which the probability is one of

$$\frac{1}{2} \quad \frac{1}{3} \quad \frac{1}{4} \quad \frac{1}{5} \quad \frac{1}{6}$$

Different equipment should be used in each different situation.

Suggested Resources

Spinners

