Rock Concert

Purpose:
Participants will determine the expected value of promoting concert events.

Overview:
In small groups, participants will determine the expected value of promoting rock concerts given that the promoter will lose $4000 in expenses if the event is cancelled, will make $3000 in profit if the event is held, and the chance of cancellation is estimated to be 18%.

TExES Mathematics 4-8 Competencies. The beginning teacher:

IV.013.A	Explores concepts of probability through data collection, experiments, and simulations.
IV.013.B	Uses the concepts and principles of probability to describe the outcome of simple and compound events.
IV.013.D	Determines probabilities by constructing sample spaces to model situations.

TEKS Mathematics Objectives. The student is expected to:

4.13.A	List all possible outcomes of a probability experiment such as tossing a coin.
4.13.B	Use a pair of numbers to compare favorable outcomes to all possible outcomes.
5.12.A	Use fractions to describe the results of an experiment.
6.9.A	Construct sample spaces using lists, tree diagrams, and combinations.
6.9.B	Find the probabilities of a simple event and its complement and describe the relationship between the two.
7.10.A	Construct sample spaces for compound events (dependent and independent). ???
8.11.A	Find the probabilities of compound events (dependent and independent). ???
8.11.B	Use theoretical probabilities and experimental results to make predictions and decisions.??

Terms.
Probability, odds, random variable, sample space, complement of an event, expected value, weighted arithmetic mean

Materials.
For each small group of participants:
- 3 dice for each small group
- Transparency
- Activity Sheet for each participant
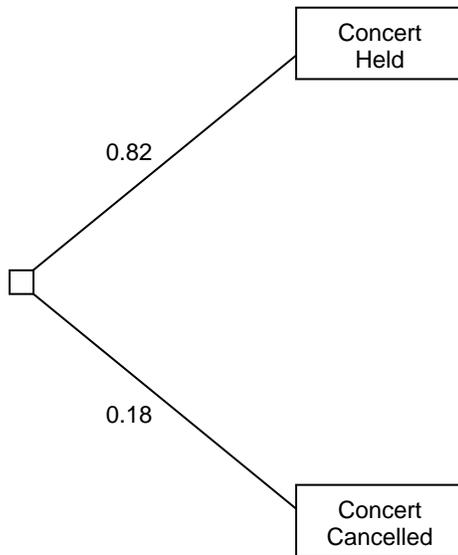
Transparencies.
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Activity Sheet(s).
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Procedure:

Steps	Questions/Math Notes
1. Read aloud the Rock Concert Problem (Transparency #??) two times. Ask participants to work in small groups to determine the expected value of planning a rock concert.	To stimulate their thinking, ask participants questions about what they are doing: *What is the sample space for this problem? Is this a finite or infinite sample space? Explain.*
2. Circulate among the groups as they work the problem. Ask participants to draw a tree diagram to represent the Rock Concert Problem.	*What is the probability of a concert cancellation?* *What is the probability of a concert event being held? How do you know?* *How many branches do you need for the tree diagram for this problem?* *Should the rock concert promoter get out of the business since he loses more money when concerts cancel than he makes in profit when concerts are held? Why?*
3. Select several small groups to present their solution. Ask them to include a tree diagram that shows the possible outcomes, and the probability of each outcome occurring. Also ask them to determine the expected profit/loss from planning one rock concert. Try to select groups that have different solution approaches.	*What is the promoter's expected value for planning one rock concert? How do you know?* *What does that number mean in this problem?* *What is the promoter's expected value for planning 20 rock concerts? What does that number mean in this problem?*

Sample Space: Let random variable X = {(concert held) or (concert cancelled)}

Tree Diagram:

If the probability of concert cancellation is estimated to be 18%, then the probability of a concert being held is the complement (100% - 18%) of that event, or 82%.

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                                        ┌──────────┐
                                        │ Concert  │
                                        │  Held    │
                                        └──────────┘
                            0.82
                       ┌──┐
                       └──┘
                            0.18
                                        ┌──────────┐
                                        │ Concert  │
                                        │ Cancelled│
                                        └──────────┘
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Solution:
1. E(X) = -$4000 (0.18) + $3000 (0.82) = -$(720) + $2460 = $1740

    On average, the promoter should expect to earn $1740 for each concert he promotes. This number doesn't make much sense in terms of a single event because the promoter will either lose $4000 or make $3000. The number does make sense, however, when we consider the expected value over several events.

2. The promoter's expected value on 20 rock concerts is $34,800. This amount makes the cancellations worth the risk!

Reference:
Check *Probability without Tears.*