

## Activity 9

# Radiation Hazards in Space

### Relevant Reading

Chapter 4, section 2

### Purpose

To become familiar with the relative hazards associated with space travel, and the attendant personal and governmental problems that impact that travel.

### Materials

Cardboard to mount game board sheets

Markers or crayons to color game board

Small colored paper squares or paper clips, distinctive for each player

Tally Cards, cut to size, and pencils

Chance cards, cut to size

one die

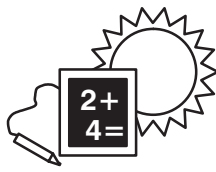
### Procedures

1. Groups of two to four can play this game. Duplicate materials as needed for other groups.

Mount the game board on a piece of cardboard. Color the board. (Mars is the “red planet.” What color would Earth be? the Sun be?)

Cut out Tally Cards and *Chance* cards. Each player needs a Tally Card and a pencil. Cut out *Chance* cards and place face down in a pile. You may want to double the number of *Chance* cards by copying before cutting. There are several blank cards that can be used to make your own *Chance* cards.

2. Have group read over directions for the game. A game will take 10–15 minutes to play.
3. Review the scoring and plotting when a game is over.
4. Have Fun!



## Rules of the Game

### Object

The idea is to get from Earth to Mars and back along one of two pathways. Along the way you will acquire Radiation Points (RPs) and these are detrimental to your health. You will also acquire Mission Points (MPs) for significant events that measure your success.

When you have finished the game, plot your total Radiation Points and Mission Points on the back of the Tally Card to see how you did and who “won.”

### Procedure

From two to four players may play at one time.

Use any small object for each person’s marker that moves on the board.

Use one die and begin play. Move the marker the number of spaces on the board.

Each player must select which path he/she will take to Mars at his/her first turn. If a player is sent back to Earth, that player may choose either path to proceed.

You *must* stop on each shaded space, regardless of your roll, and record your points. In your next turn, roll the die and proceed as usual.

If a player lands on *Chance*, draw a card off the top of the Chance pile, do as it says, and return the card to the bottom of the pack.

When one player finishes the game (you do not need an exact roll to move to the last space), all other players continue to play in turn until each has finished and received all points.

### Scoring

Each player must record all Radiation Points and Mission Points on his/her card. At the end of the game, each totals his/her own points and plots the two values in a single point on the graph on the back of the Card. The player with the point that is most in the upper left-hand corner of the graph is the winner.

Record Mission Points for launching, landing, etc. next to the appropriate space on your tally card.

If you are sent back to Earth with a *Chance* card, your score card continues to accrue Mission Points and Radiation Points. You do *not* clear your card to 0’s.

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### Here are some real numbers for radiation exposure (from NASA)

| TYPES OF EXPOSURES   | REM    |
|--|--------|
| Transcontinental Round Trip by Jet   | 0.004  |
| Chest X-Ray (Lung Dose)  | 0.010  |
| Living One Year in Houston, TX   | 0.100  |
| Living One Year in Denver, CO  | 0.200  |
| Living One Year in Kerala, India   | 1.300  |
| Highest Skin Dose, Apollo 14 (Mission to the Moon; 9 day mission)                    | 1.140  |
| Highest Skin Dose, Skylab 4 (Orbiting Earth at 272 miles, 87 day mission)            | 17.800 |
| Highest Skin Dose, Shuttle Mission 41-C (Orbiting Earth at 286 miles, 8 day mission) | 0.559  |
| Maximum Allowable in 1 Year to a Terrestrial Worker                                  | 5.000  |
| Background radiation in 1 Year on surface of Earth                                   | 0.100  |