

Game Name:

GRID GAME- SAVE THE HIKERS (FULL VERSION)
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Players: 3 player or 1 player (Whole class activity)

Time: 15-20 minutes

Materials: 3 hiker tokens, 1 medical center token per game (paper tokens provided). One Cartesian Coordinate Graph, $D = [1,6]$ $R = [1,6]$ (provided), Two 6-sided dies of *different* colors (*not provided*), Pencil and paper for students.

Special Requirements: None

Major Math Topics:

Algebra/Geometry: Distance Formula,
Pythagorean Theorem
Triangle Side Theorem ($S < M < L$)

Minor Math Topics:

Squaring, Square Rooting, Decimal Computations,
Ordering (least to greatest) , Read a Cartesian
Graph and Points.

Student Knowledge Requirement:

Ability to use the above formulas and theorems.

Pre-Class Set Up:

- Make a copy of the game board for each team or player. My recommendation is to play the game once with the class as a whole class activity, then break up into teams of 3.

The Story:

Read this story. "You are part of a doctor's medical team at the main health clinic on (mountain in your area). Recently, there have been some unfortunate infections and accidents affecting local hikers. Generally you get one distress call every month, but this particular day, is not like any other. 3 hikers have contacted your emergency hotline all within the last 5 minutes. One says he has a snake bite, the other just tripped and cracked her ankle, and the last ran out of water and is getting dehydrated and dizzy and can barely walk . Lucky for you, they have GPS tracking devices so you can find them. Lucky for you, there are 2 other emergency techs (classmates) that can go out and sustain the patients for one day. Lucky for you, you have all the resources to save each patient. Unlucky for you, there is only one medical doctor that has the know how to apply the correct treatment. *So the doctor can only help one patient at a time.*

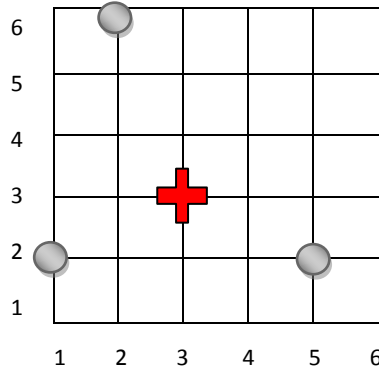
Getting to the patients is easy. The question is, whom should the doctor hike to 1st, 2nd, then 3rd to give the best chance of saving the patients in one trip? It is very likely that a patient may suffer permanent injuries or even death if the doctor has to take multiple trips from the health clinic. *Getting this right the first time matters.* You and your team can only spare 5 (10?) minutes planning time to discover and quickly explain to the doctor why your path is the right one. The doctor is ready and waiting for your instructions."

Set Up:

- Roll your 2 different color dies 3 times to determine the 3 hiker's location.
- The 1st roll is the x value, the 2nd roll is the y value.
- If you roll the same numbers, re-roll till you have 3 different coordinates.
- If you roll (3,3), re-roll. (3,3) is always the medical center's location.

Example:

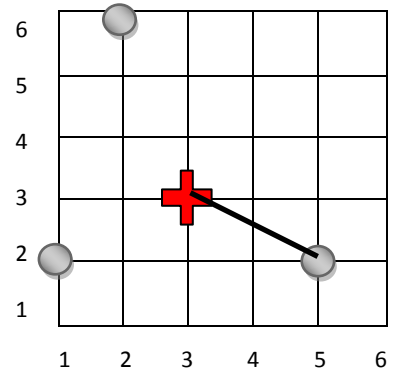
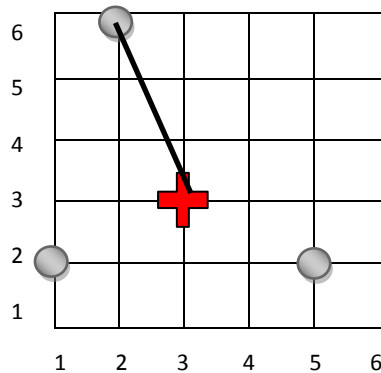
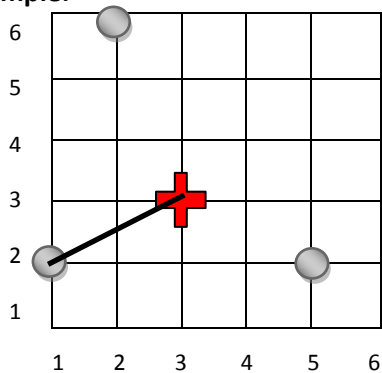
After placing the medical token on (3,3), a student rolls (1,2) (2,6), and (3,3). She re-rolls for (3,3) and gets (5,1). She places 3 hiker tokens on (1,2) (2,6) and (5,1)).



Rules:

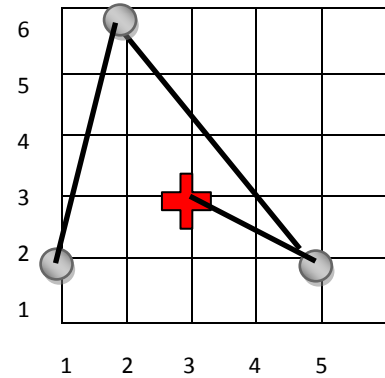
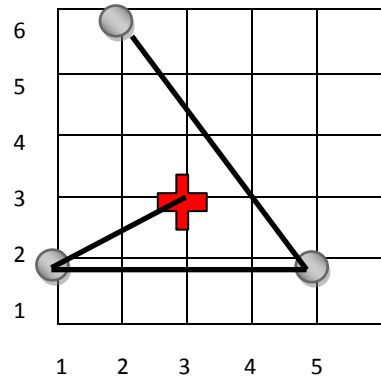
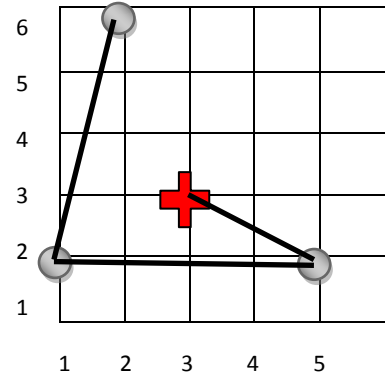
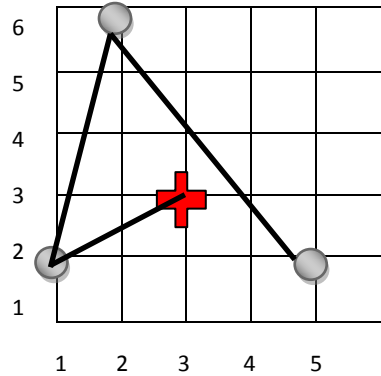
- It is a mathematical fact that the shortest distance from a point inside a triangle to the nearest vertex will lead to a shortest path connecting the interior point and all 3 vertices of the triangle. The object is for the team to pick the shortest distance from the medical center to the nearest hiker *first*.
- Then each player will calculate one of two possible paths from the first distance.

Example:



Since graph 1 and graph 3 have the shortest interior path, $\sqrt{(2)^2 + (1)^2} = \sqrt{5} \approx 2.23$ miles, there are 4 possibilities that must be picked from.

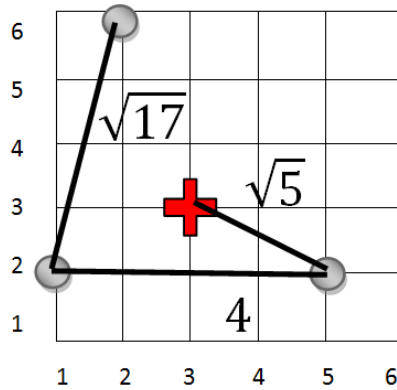
Generally, the medical center will *not* be equal distance from 1 hiker and there will be only 2 possibilities to choose from. Also, in this game, it is impossible to have all hikers equal distance from the health clinic, so students will never have an equilateral triangle, claiming any path is sufficient. They will have to make calculations to verify a best possible path. At worst, they will have two isosceles triangles, claiming 2 possible best paths.



- Students must show an exact answer or a decimal answer good to 2 decimal spaces.
- Each player should end up calculating a minimum of 2 of 6 possible paths.

Example:

Based on the examples above, the shortest distance is $\sqrt{5} + 4 + \sqrt{1^2 + 4^2} = 4 + \sqrt{5} + \sqrt{17} \approx 10.36$ miles



End of Game:

- After 5-15 minutes (5-10 recommended), the teacher calls the games.
- Teams must immediately write down whom the doctor saves 1st, 2nd, and 3rd and the total distance.

Scoring/Assessment (10 point scale)

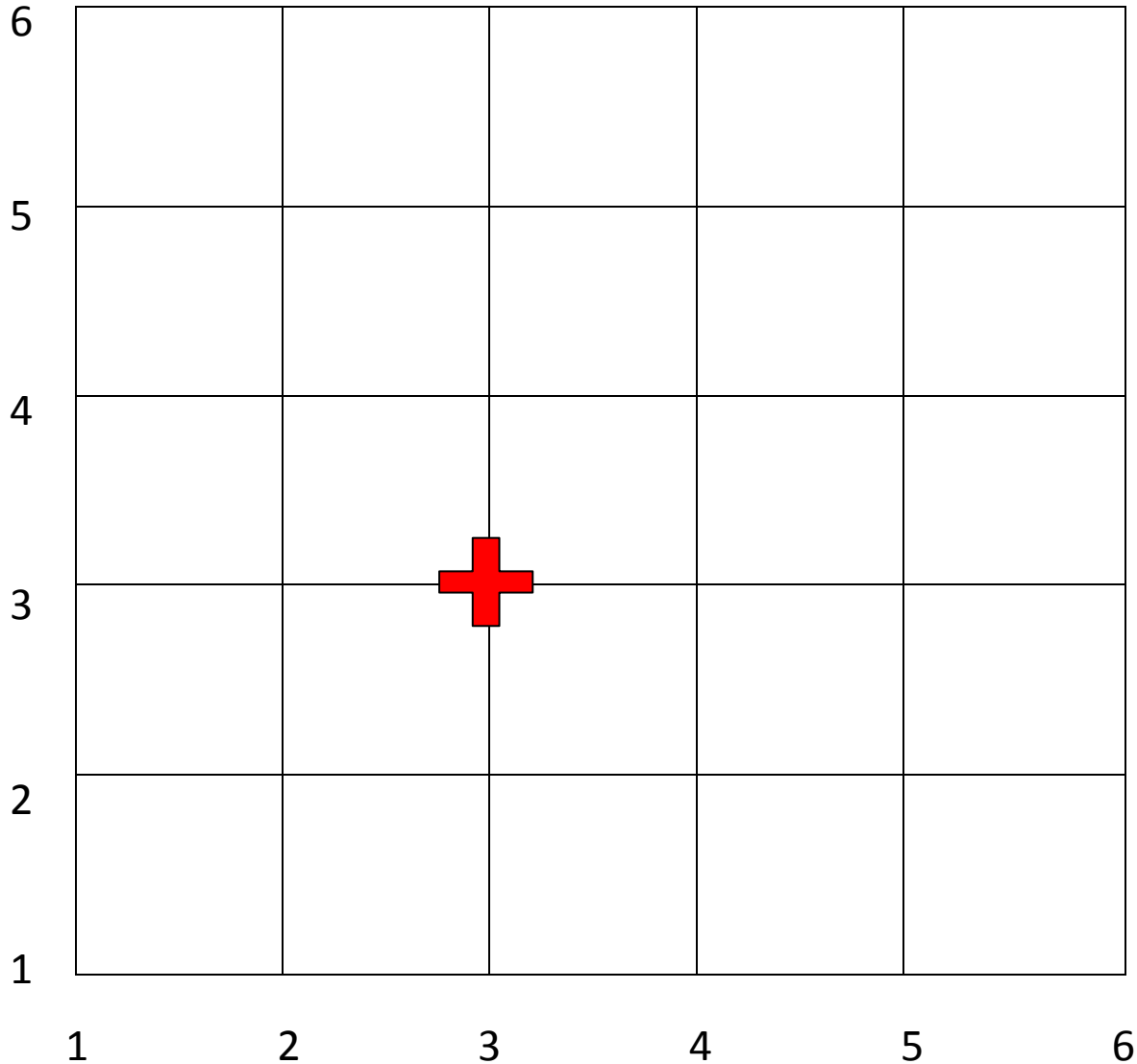
- Give the highest of:

If the team writes down the distance from the medical center to the nearest hiker	7 points
If the team finds the distances from medical center to hikers	8 points
If the team finds the distances from the hikers to hikers	8 points
If the team finds all distances from hiker to hiker and hiker to medical center	9 points
If the team states a path that they believe is the shortest distance and has evidence based on what they found	9.5 points
If the team finds a shortest path <i>and</i> backs it up with evidence	10 points
If the team guesses the shortest path <i>without</i> evidence	5 points
If the team guesses a path, <i>without</i> evidence	4 points
If the team quits or does not participate	0 points

HIKER TOKENS



SAVE THE HIKERS – Board Sheet



RULES:

- ROLL TWO d6 DIES , 3 UNTIL YOU GET 3 DIFFERENT POINTS. 1st DIE IS X. 2nd DIE IS Y.
- RE-ROLL IF YOU GET (3,3).
- PLACE HIKER TOKENS ON THE POINTS ROLLED.
- FIND AND WRITE DOWN THE SHORTEST DISTANCE FROM THE MEDICAL CENTER TO ALL 3 POINTS ALONG ONE PATH ON A SEPARATE SHEET OF PAPER.
- KEEP WORKING/CHECKING UNTIL THE TEACHER SAYS “TIMES UP”. © Walter Poelzing 2013

Game Name: GRID GAME-
SAVE THE HIKERS (Beginner Version)

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Players: 3 player or 1 player (Whole class activity)

Major Math Topics:

Algebra/Geometry: Distance Formula,
 Pythagorean Theorem

Minor Math Topics:

Squaring, Square Rooting, Decimal Computations,
 Ordering (least to greatest), Read a Cartesian Graph
 and Points.

Student Knowledge Requirement:

Ability to Use the Above Formulas and Theorems.

Time: 15-20 minutes

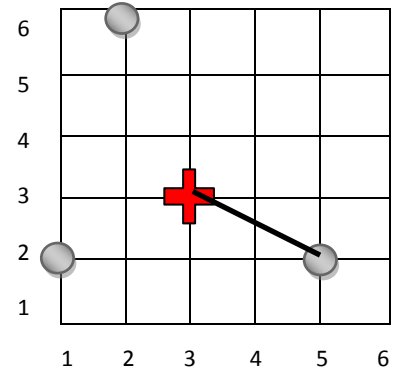
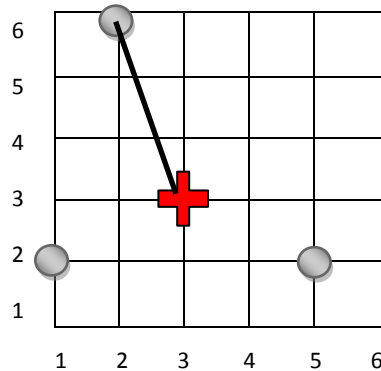
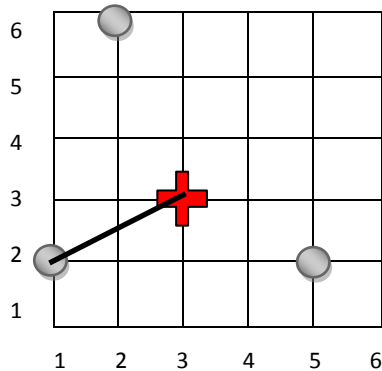
Materials: Same as Version 1

Special Requirements: None

Changes: All aspects of this game are the same as Version 1, except for a rule change and scoring. This game is designed for students being introduced to the distance formula, or Pythagorean Theorem.

Rules:

Same as Version 1, except this time you only choose to save the *nearest* hiker.



End Game

Same as Version 1

Scoring/Assessment (on 10 pt scale):

Found the shortest pass, with evidence	10 – points
Found all 3 distances	10 – points
Found 2 distances	7 – points
Found 1 distance	6 – points
Pick the shortest path without evidence	5 – points
Did not participate	0 – points