



Activity D.5: On Belay

Special Note: This game is a more advanced version of Activity C.6: Mountain Goat Scramble II. This game adds one additional rule, which increases the number of computations and requires more strategy to take probability into account. This game may take a little more time to allow for additional calculations and more “no move possible” turns.

Learning Objectives:

- 1) Understand equivalency.
- 2) Develop factoring skills.
- 3) Incorporate probability into play.
- 4) Practice cooperative play.

Examples of Skills Accomplished:

- 1) $6 \times 4 = 8 \times 3 = 12 \times 2 = 4 \times 6 = 3 \times 8 = 2 \times 12$.
- 2) Factors of 24 are 2,3,4,6,8, and 12.

Setup:

- 1) Put staircases in counterclockwise sequence $1x \rightarrow 12x$.
- 2) You will need three dice.
- 3) During setup, if desired teams may place multiples on Zillio to help them calculate the difference in elevation between the highest and lowest climber on their team before they finalize their turn.
- 4) Allow each team to pick a uniquely colored foam card.

Maximum Number of Players for Small Group Activities: 4 - Two teams with two players each

Players Positions: Standing



Game Objective: The first team to get all of their mountain climbers to the top wins.

- 1) Each team should place one of their climbers (uniquely colored tokens) blank side up on the tabletop in front of each staircase, $2x \rightarrow 12x$.
- 2) Explain that the term “on belay” means “to secure a person by attaching to one end of a rope”. The topmost climber on a team can be no more than 20

Hint: More than one team may have a climber on the same step at a time. Rather than putting climbers in the notches, have them land on the top of the step.

feet above the lowest climber on the team, because the climbers are tied together. If a team violates this rule the rope will break and all of the climbers on the team must return to the bottom to start again.

- 3) The first team rolls three dice. After the dice have been rolled, all teams make a move (discussed below) on that based on the roll.
- 4) Each team's climbers can ascend (move up) one or more whole step(s) on their own trail. They cannot move up partial steps; the move must be exactly equal to the elevation gain as calculated.
- 5) To calculate possible elevation gains (moves) a player may decide to use any **one** dice or any operation (+, -, x, /) using any **two** dice. Each team then moves one climber for their play.
- 6) After all teams have made a move, teams should evaluate their opponent's move to see if they violate the on belay rule (the difference in elevation between the topmost climber and the bottom most climber can not be greater than 20). If so, the opponent's climbers must return to base camp and start over.
- 7) The dice are handed to the next team to roll. Play continues with each team getting to roll the dice in turn but **all** teams move a climber on each roll.
- 8) The team that gets all of its climbers to the top first wins.

For example, if a 2, 5, and a 6 were rolled, the possible elevation gains and moves are:	
Dice Used and Operations	Possible moves (only one per turn)
Single dice 2	1 step on 2x
Single dice 5	1 step on 5x
Single dice 6	3 steps on 2x 2 steps on 3x 1 step on 6x
Sum of 2 + 5 = 7	1 step on 7x
Sum of 2 + 6 = 8	4 steps on 2x 2 steps on 4x 1 step on 8x
Sum of 5 + 6 = 11	1 step on 11x
Subtract 5 - 2 = 3	1 step on 3x
Subtract 6- 2 = 4	2 steps on 2x 1 step on 4x
Multiply 2 x 5 = 10	5 steps on 2x 2 steps on 5x 1 step on 10x
Multiply 2 x 6 = 12	6 steps on 2x 4 steps on 3x 3 step on 4x 2 steps on 6x 1 step on 12x
Multiply 5 x 6 = 30	15 steps on 2x 10 steps on 3x 6 step on 5x 5 steps on 6x 3 step on 10x
Divide 6 / 2 = 3	1 step on 3x

Observe and Assess:

- 1) Whether teams recognize an opponent's violation of the 20 elevation points limit between opponents' highest and lowest climbers.
- 2) Observe how teams develop strategies for selecting among possible moves. For example, 7 and 11 require the sum of two dice so it is not possible to move multiple steps at a time on these staircases. To minimize "no possible moves" players should use addition to move on the 7x and 11x staircase whenever they can, because there are fewer rolls that allow those moves.

Group Discussion & Review of Findings:

- 1) N/A

Transition to Paper:

- 1) Using your other curriculum, introduce basic probability concepts.