

### Materials Needed

- Game dice
- Dice images on page 2, if dice are unavailable
- Cardboard or stiff paper, if dice are unavailable
- Scissors (optional)
- Glue or tape (optional)

### Grade Range

3-5  
6-8

### Topics/Skills

Science: Observation, Defining Problems, Investigation, Data Analysis, Computational Thinking

### Learning Standards

NGSS: [Science & Engineering Practices](#)

### Duration

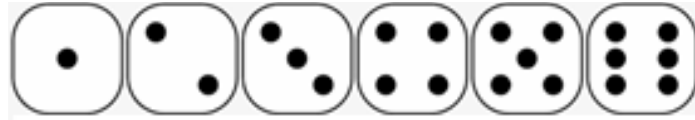
15-20 minutes

### Prep Time

5 minutes

## Petals Around the Rose

### A Science & Engineering Puzzle for Social Emotional Learning



Develop social emotional skills in this unique problem-solving activity where players apply science and engineering practices without knowing it!

### Activity Challenge

Lead friends, classmates, or family members towards figuring out the rules of this interesting puzzle.

### Preparation

1. Review materials list and gather needed items.
2. Choose a leader/facilitator. This person must learn the rules of the puzzle in secret (see solution in science behind the activity below).
3. Optional: If no game dice are available, cut out the dice face images on the next page (make additional copies if desired). Glue or tape each dice face image onto a small piece of stiff paper or cardboard.

### To Do

1. The leader/facilitator does the following with the other person(s).
  - a. Say: "The name of the puzzle is *Petals Around the Rose* and the name is significant."
  - b. Roll the dice or drop the dice images on the ground. If using the images, make sure they are all visible.
  - c. Call out the puzzle solution.
  - d. Roll or drop the dice/images again. Allow people to guess the answers. Tell the guesser(s) whether they are correct.
2. Repeat this process as many times as necessary for people to successfully solve the puzzle.

### Observations

- What pattern(s) do you notice in the images in relation to the solution shared by the facilitator?
- How might the pattern(s) reflect the name of the puzzle and provide clues about the solution?

### Extensions

- Facilitate the puzzle with more dice and/or more people!
- Play a digital version of the puzzle - <https://bit.ly/3cuInBC>

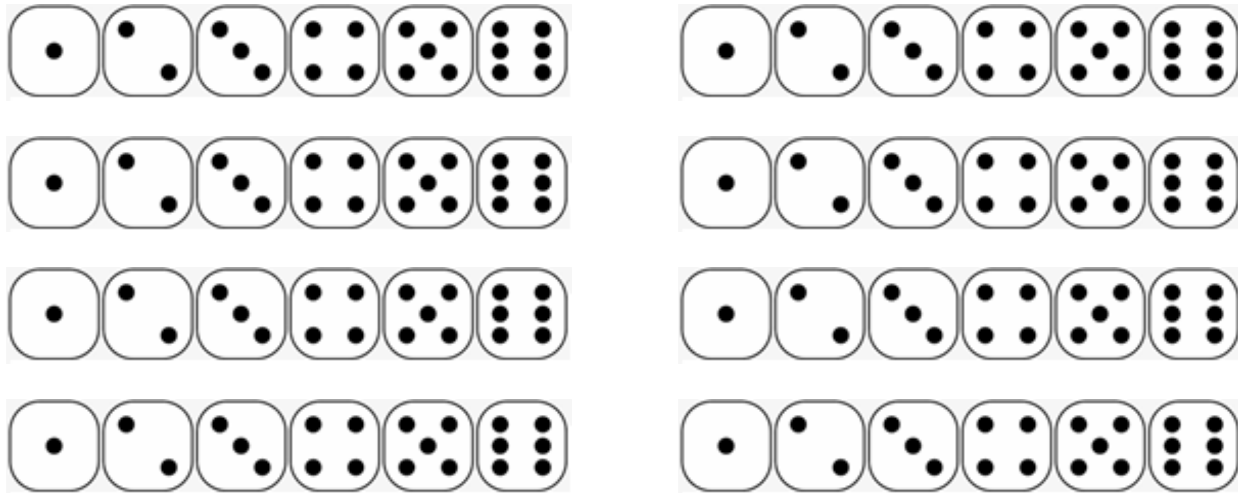
### The Science behind the Activity

To solve the puzzle Petals Around the Rose, players unknowingly use the **science & engineering practices (SEPs)** below:

- Asking questions / Define problems (figure out the rules of the puzzle)
- Developing and using models (dice/dice images serve as the model)
- Planning and carrying out investigations (“I will try to add the dice and see if my answer is correct.”)
- Analyzing and interpreting data (“Adding the dice did not get the answer.”)
- Using mathematical and computational thinking (“What other patterns do I see in the dice?”)
- Construct explanations / Design solutions (“The name of the puzzle factors into the answer by ...”)
- Engage in argument from evidence (“Based on my previous attempts, the solution involves ...”)
- Obtaining, evaluating, and communicating information (“I will call out the answer in the next 3 throws to show I have figured it out.”)

**Social emotional learning**, or SEL, is integral to an effective learning experience. Skill such as relationship building, and personal responsibility are much needed but often difficult to teach. The Petals Around the Rose puzzle focuses on the SEL skill called **goal-directed learning** which includes developing **persistence** in tasks with various degrees of difficulty. While this puzzle might cause some frustration, figuring out the solution is extremely empowering and encourages persevere, especially while students attempt to solve the puzzle on their own. A discussion following the activity enables students to reflect on their thought processes and connect the **scientific & engineering practices** with a real-life experience.

### Dice Images:



**Solution:** When the dice are rolled, focus on the ones with a center dot (“rose”). Ignore the dice without roses. Any dots around the roses are “petals.” Find the sum of petals around all the roses. That’s the answer to the puzzle! As an example, the solution for the dice below is 6.

