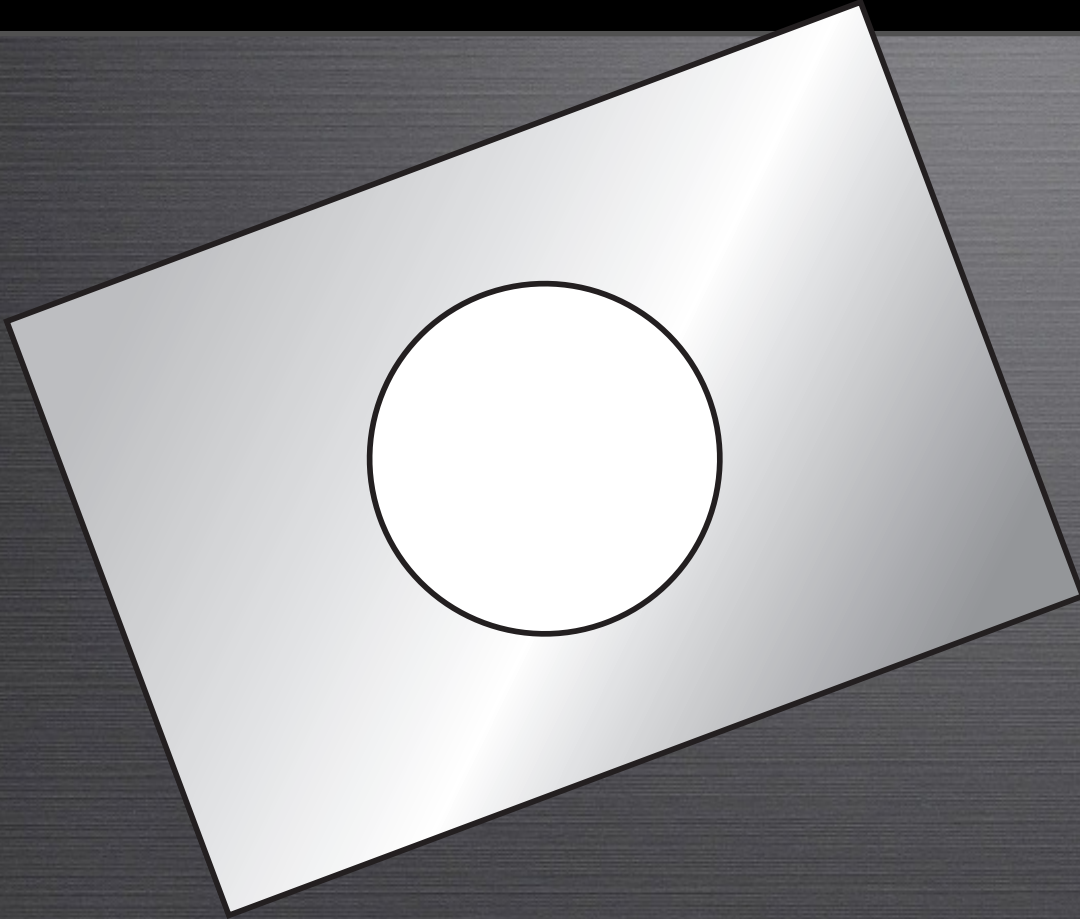


# Question design workshop



Julie Schell  
Sr. Educational Research Associate  
Mazur Group, Harvard University

NCAT  
Greensboro, NC  
May 14, 2013

Please go to [lcatalytics.com](https://lcatalytics.com)

Sign in with your username and password

Click Student View

Join session 832384

Select “I can’t find my seat”

Wait for questions

# Workshop goals

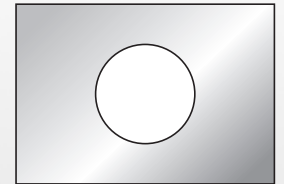
- Consider the anatomy of a question
- Practice answering different question types
- Conduct contrasting case analyses to identify the key elements of effective questions and practices for developing them

# Part 1: What makes a question?

# Question Anatomy

## Item

Imagine a metal plate with a hole in it.



If you heat it uniformly what happens to diameter of hole?

- A. increases
- B. stays the same
- C. decreases

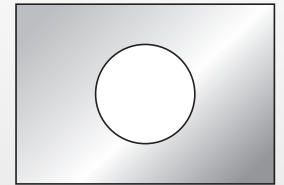
# Question Anatomy

## Item

question stem



Imagine a metal plate with a hole in it.



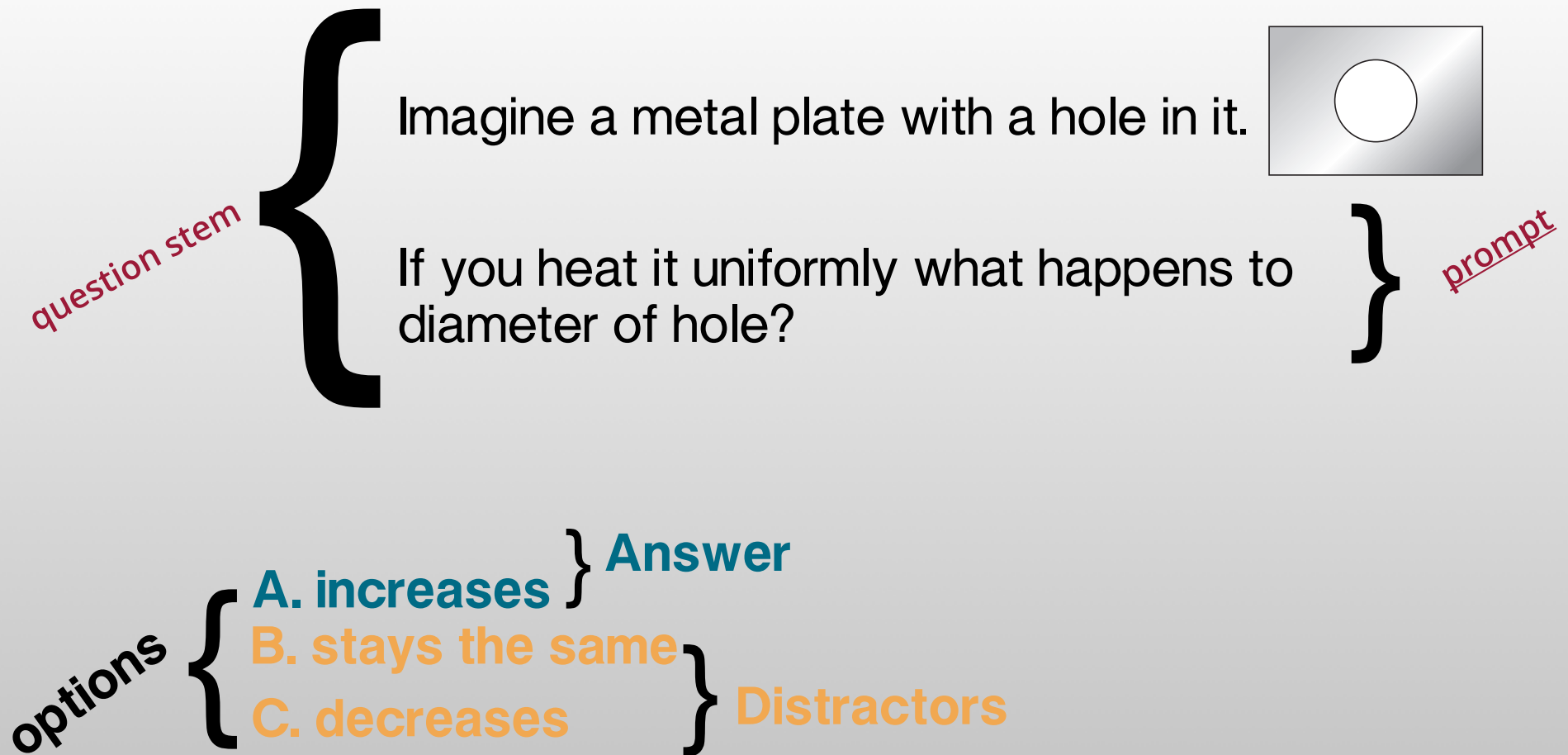
If you heat it uniformly what happens to diameter of hole?



prompt

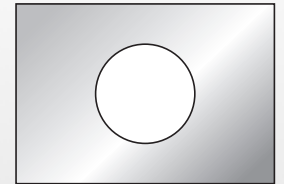
- A. increases
- B. stays the same
- C. decreases

# Question Anatomy



# Constructed response

Imagine a metal plate with a hole in it.

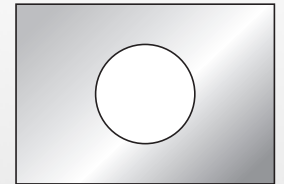


If you heat it uniformly what happens to diameter of hole?



# Modified multiple choice

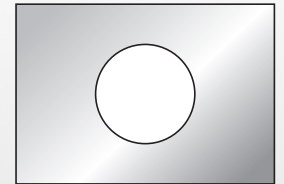
Imagine a metal plate with a hole in it.



If you heat it uniformly what happens to diameter of hole?

# Modified multiple choice

Imagine a metal plate with a hole in it.



If you heat it uniformly what happens to diameter of hole?

- A. increases**
- B. stays the same**
- C. decreases**

# Response formats

- **Multiple choice response:** Best when the universe of responses is known
- **Constructed response:** Best when it is hard to anticipate student responses, and when a more authentic task is desired
- **Modified multiple choice:** Formative versus summative assessment

## Part 2: Practicing different question types

## Part 3: Effective question cases

## Case A

What is the shortest distance  
between first and third base?

Case A

$$a^2 + b^2 = c^2$$

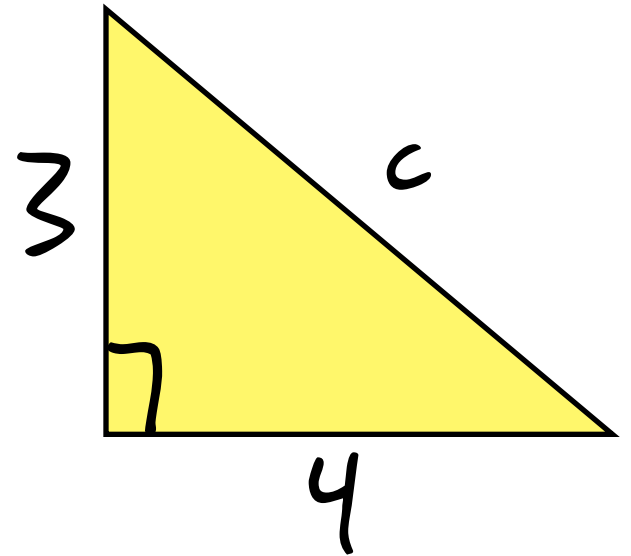
$$3^2 + 4^2 = c^2$$

$$9 + 16 = c^2$$

$$25 = c^2$$

$$\sqrt{25} = c$$

$$5 = c$$

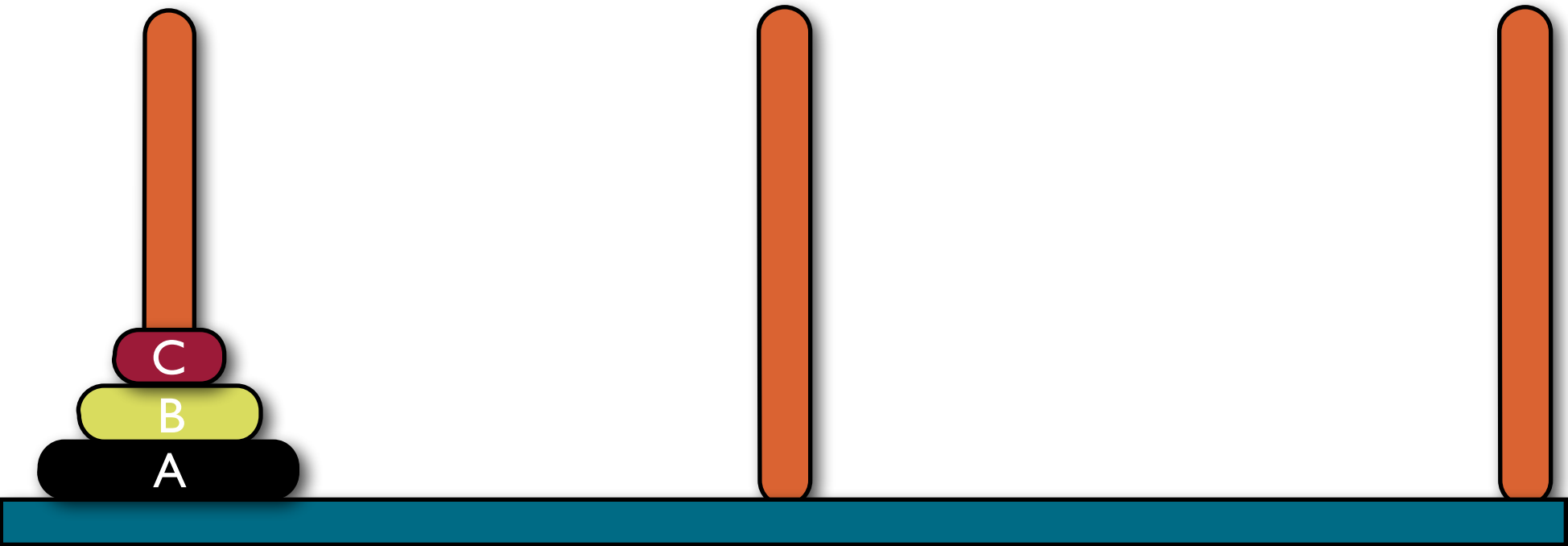


# Case A: Effective practice

Pose questions that put students in situations where there are unknowns.

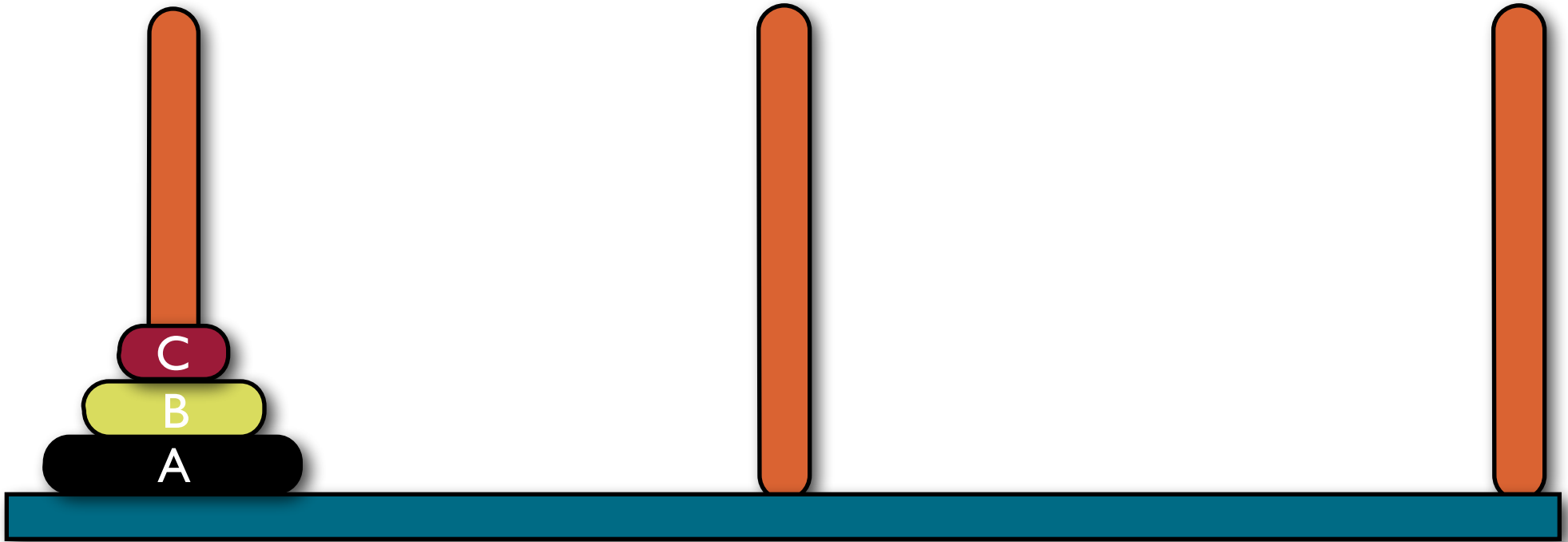


# Case B



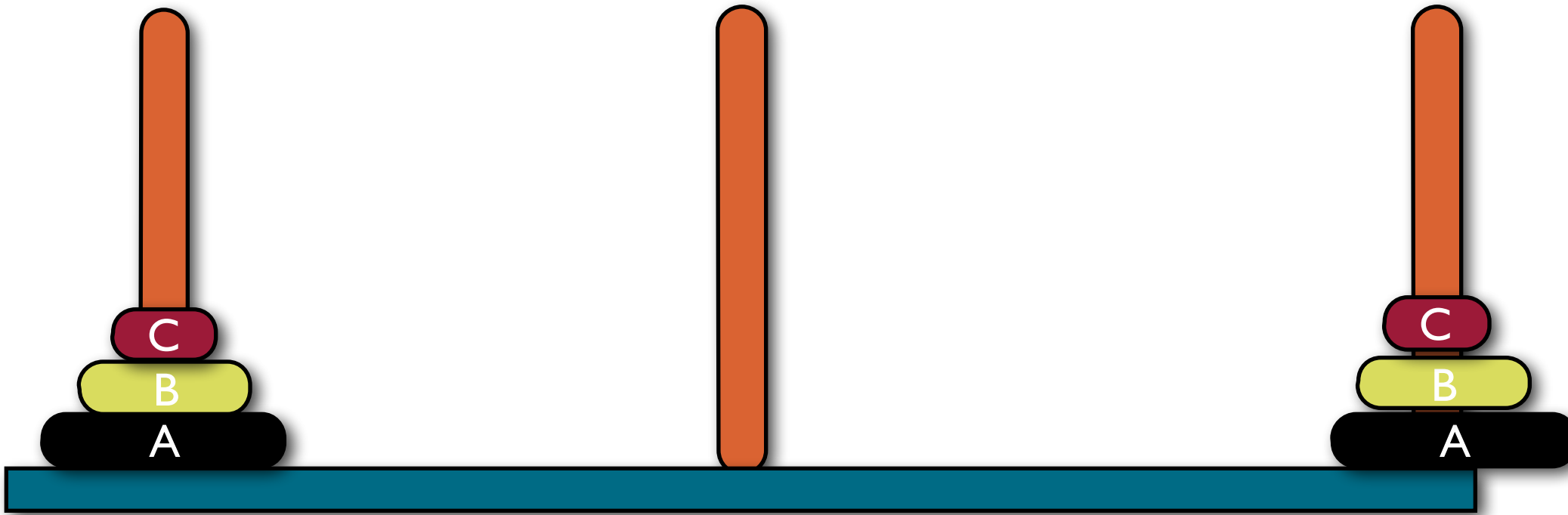
**Pole 1**

**Pole 2**

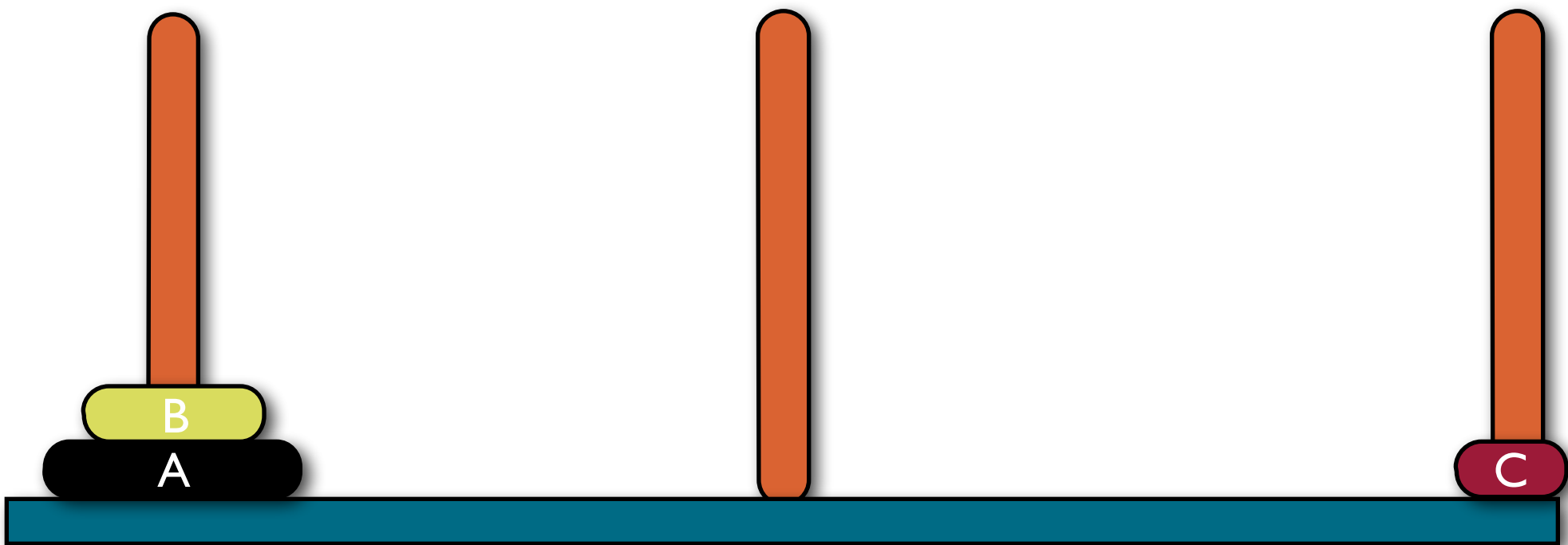


**What is the shortest number of steps required to replicate the order of disks on pole 1 on pole 2, following these rules:**

- 1. You can only move one disk at a time**
- 2. You can never put a bigger disk on top of a smaller disks**



- a. 3
- b. 5
- c. 7
- d. 9





A

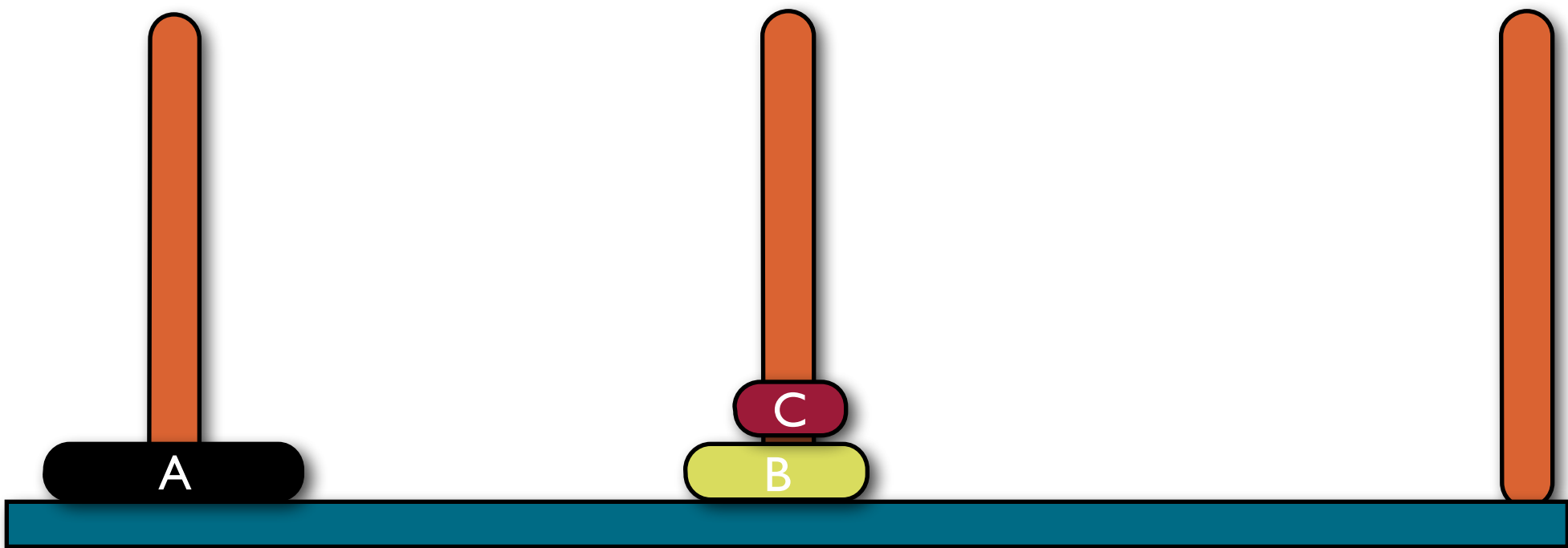


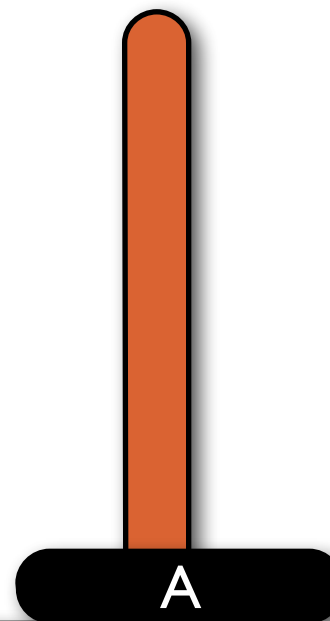
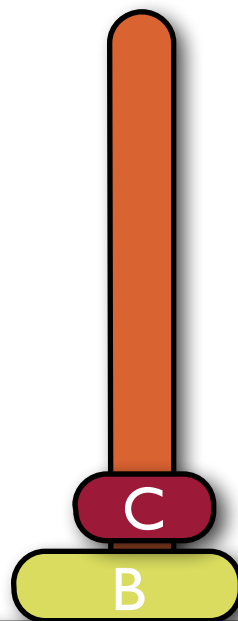
B

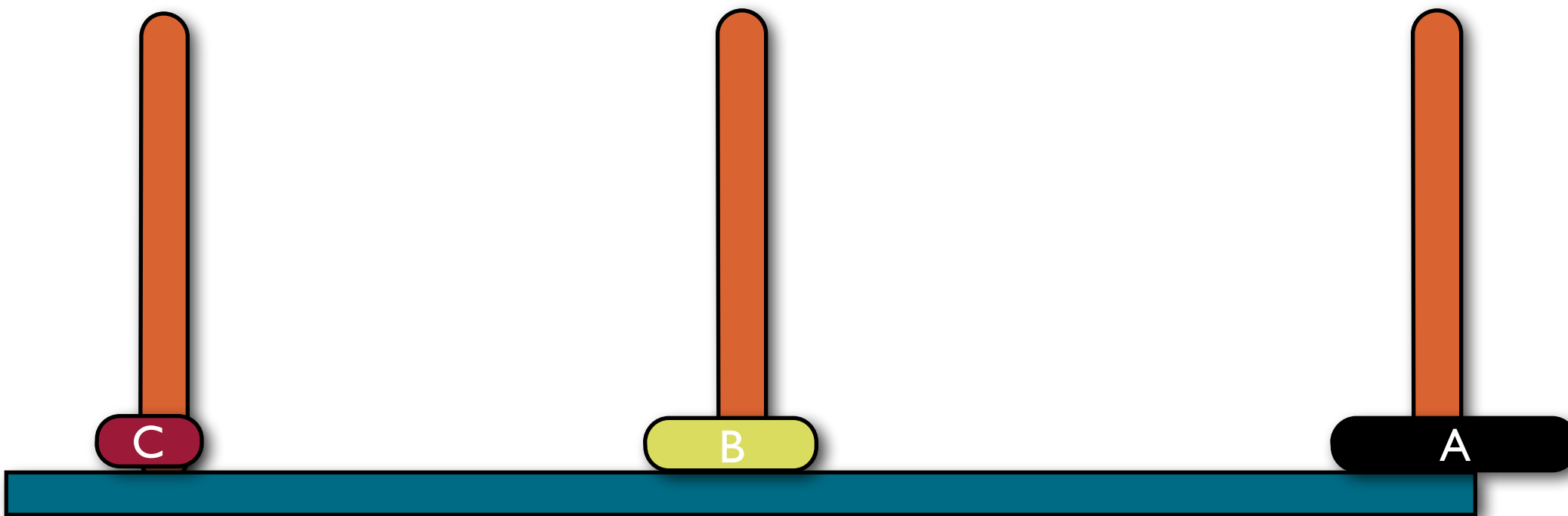


C

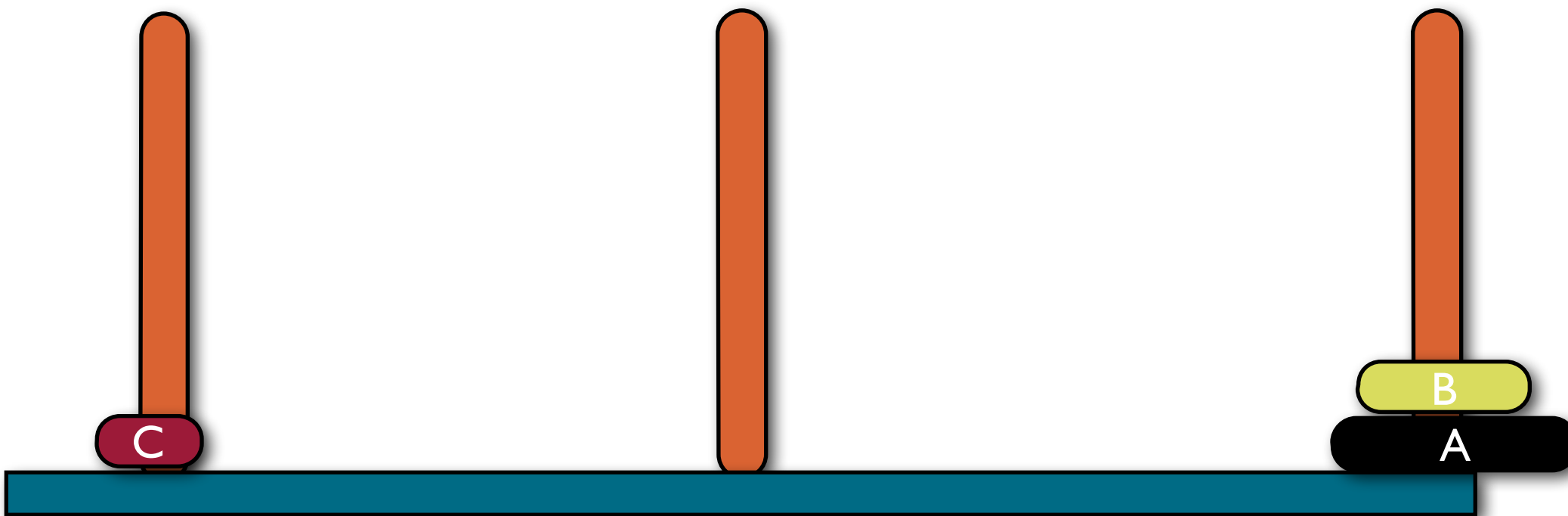


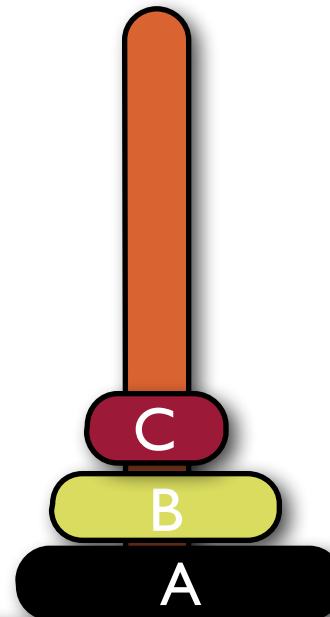


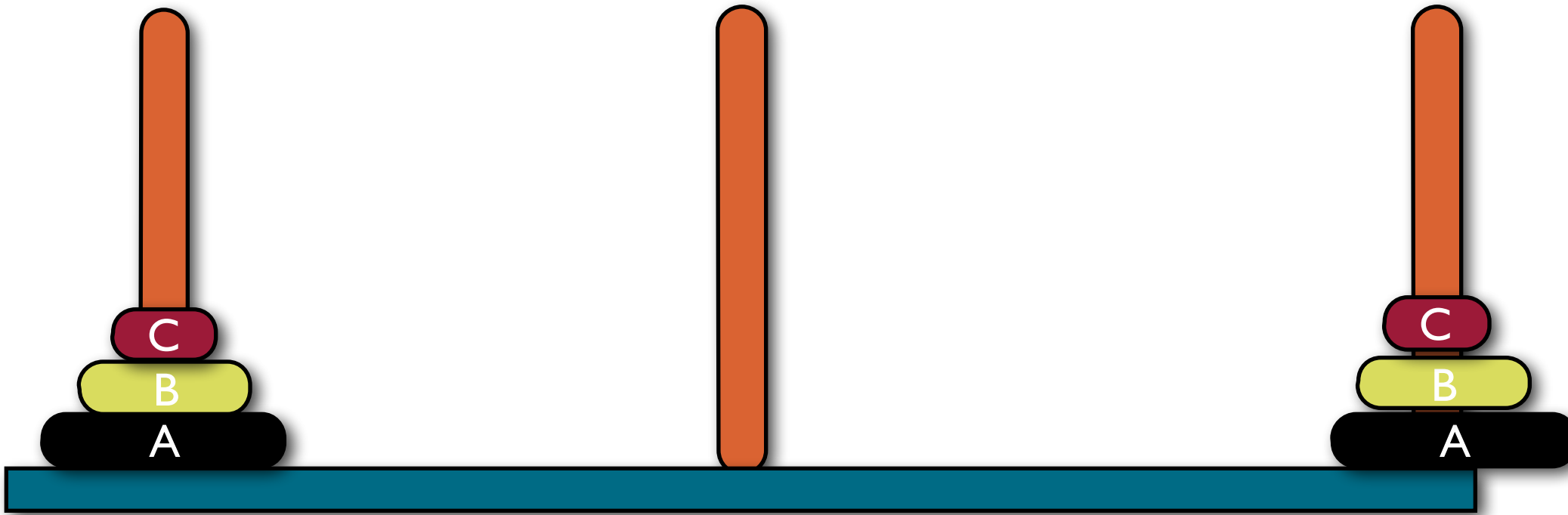












- a. 3
- b. 5
- c. 7
- d. 9

# Case B: Effective practice

Pose questions that are at a level of desirable difficulty

## Case C

What happens when you heat metals up?

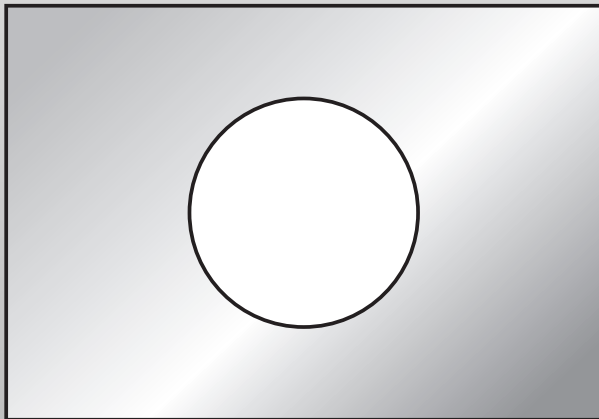
**A. increases**

**B. stays the same**

**C. decreases**

*Versus*

What happens when you heat a metal plate with a hole in it?



**A. increases**

**B. stays the same**

**C. decreases**

# Case C: Effective Practice

Pose questions that

1. elicit student misconceptions (use real distractors)
2. require students to apply versus retrieve knowledge
3. direct students' thinking to the underlying, key concepts

# Tips for developing effective questions

- give students practice with authentic situations (not knowing all the variables)
- pose questions at a range of desirable difficulty
- elicit student misconceptions or difficulties about subject matter
- give them practice applying knowledge in various contexts
- direct student thinking to the precise point you want them to remember or learn