

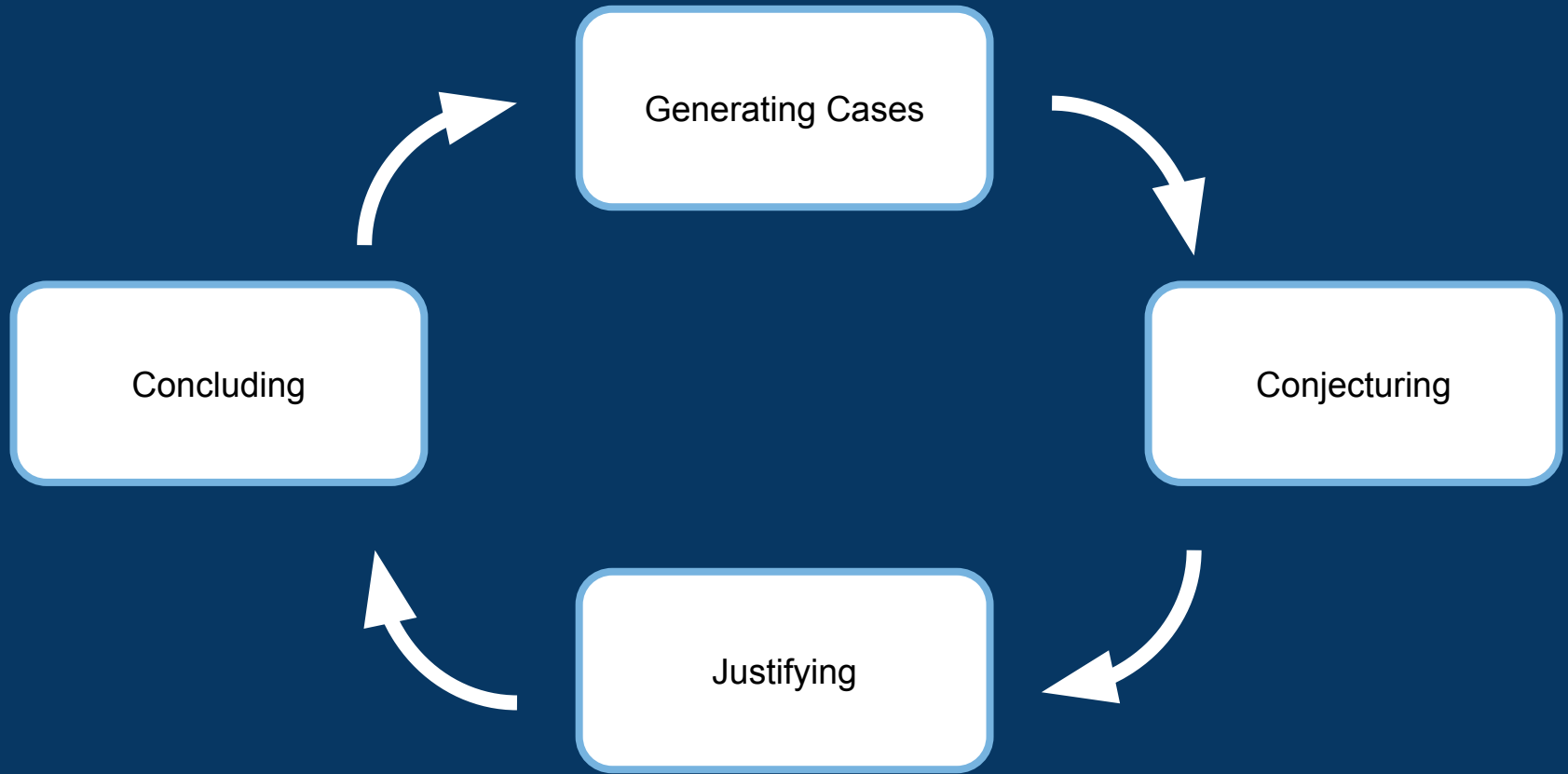
Sharing Skepticism and Arguing Constructively in Math Class

David Wees
davidwees@gmail.com

@davidwees
davidwees.com

Goals:

1. Participants experience an instructional routine.
2. Participants can explain how the routine supports students getting better at constructing arguments.



$$6 \div 2(1+2) = 9$$

$$6 \div 2(1+2) = 1$$



Sharing Skepticism

Sharing Skepticism

WHAT: To see the structure of expressions.

WHY: To “*argue like a mathematician*”, to construct and critique arguments.



THINK like a student



SPEAK like a student

Sharing Skepticism

Sharing Skepticism

WHAT: To see the structure of expressions.

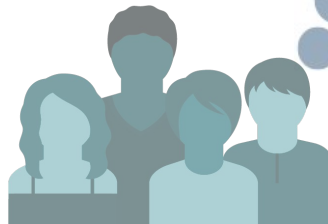
WHY: To "argue like a mathematician", to construct and critique arguments.



THINK like a student



SPEAK like a student



Consider the routine

Sharing Skepticism

Sharing Skepticism

WHAT: To see the structure of expressions.

WHY: To "argue like a mathematician", to construct and critique arguments.



THINK like a student



SPEAK like a student



Consider the routine



Sharing Skepticism

WHAT: To see the structure of expressions.

WHY: To “*argue like a mathematician*”, to construct and critique arguments.



Sharing Skepticism



Solve a problem



Discuss Arguments



Share and Critique Arguments



Choose an Argument



Reflect on Learning

Solve a Problem

Ask yourself...

- How can I make my process and reasoning as clear and convincing to others?



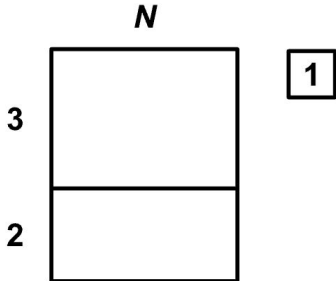
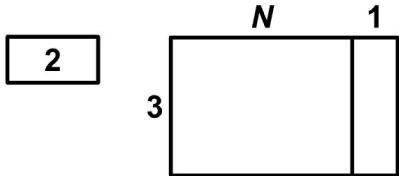
Match an expression to one of the visuals.

Solve a Problem

Ask yourself...

- How can I make my process and reasoning as clear and convincing to others?



<div>1</div> <div></div>	<div>2</div> <div></div>	
<div>A</div> <div>$2 + (3 \times N) + 1$</div>	<div>B</div> <div>$(2 + 3) \times N + 1$</div>	<div>C</div> <div>$2 + 3 \times (N + 1)$</div>

Match an expression to one of the visuals.

Discuss Arguments



“I think... because...”

“This works because...”

“How do you know...?”

“Can you help me understand...?”



Share Arguments



“We think... because...”

“This works because...”

“They think... because...”

“Their argument works because...”

“We wonder about ... because ...”



Choose an Argument

THINK

Ask yourself...

*Which of these arguments
convinces me and why?*



Choose an Argument

PAIR

Decide together on argument you both agree with and be prepared to explain your reasoning.



Ask yourselves: Can we improve the argument?

Choose an Argument

SHARE

“We found ... convincing because ...”

“We understood ... better because ...”

“We can improve ... by ...”



Reflect on Learning



When *constructing* arguments it is important to ...
because ...

When *critiquing* arguments it is important to ...
because ...



END of Activity



Discuss with your partner:

- What do you think stays the same each time this routine is used?
- What do you think changes?

Sharing Skepticism

Sharing Skepticism

WHAT: To understand the structure of radicals.

WHY: To “*argue like a mathematician*”, to construct and critique arguments.



THINK like a student



SPEAK like a student

Sharing Skepticism

Sharing Skepticism

WHAT: To understand the structure of radicals.

WHY: To “*argue like a mathematician*”, to construct and critique arguments.



TIME
OUT!



Sharing Skepticism

WHAT: To understand sequences.

WHY: To “*argue like a mathematician*”, to construct and critique arguments.



Sharing Skepticism



Solve a problem



Discuss Arguments



Share and Critique Arguments



Choose an Argument



Reflect on Learning

Sharing Skepticism



Solve a problem



Discuss Arguments



Share and Evaluate Arguments



Choose an Argument



Reflect on Learning



Solve a Problem

Ask yourself...

- How can I make my process and reasoning as clear and convincing to others?

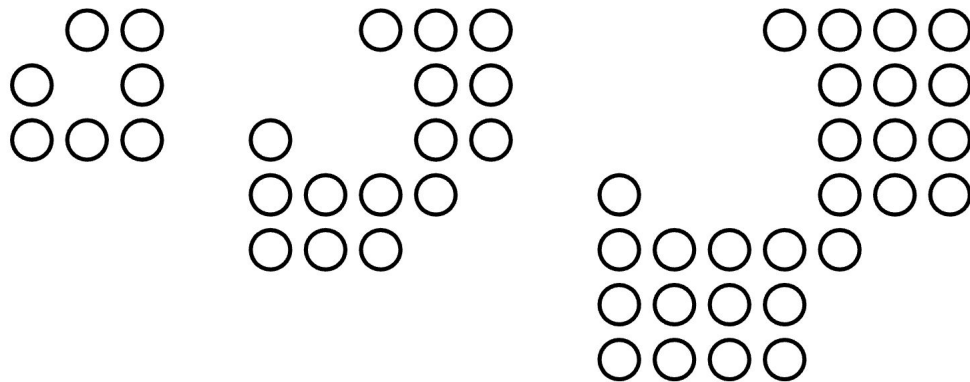


Find the number of circles in the 100th term of this visual sequence.

Solve a Problem

Ask yourself...

- How can I make my process and reasoning as clear and convincing to others?



Find the number of circles in the 100th term of this visual sequence.



Discuss Arguments



“I think... because...”

“This works because...”

“How do you know...?”

“Can you help me understand...?”



Discuss Arguments



“I think... because...”

“This works because...”



“How do you know...?”

“Can you help me understand...?”



Share Arguments



“We think... because...”

“This works because...”

“They think... because...”

“Their argument works because...”

“We wonder about ... because ...”



Share Arguments



“We think... because...”

“This works because...”



“They think... because...”

“Their argument works because...”

“We wonder about ... because ...”



Choose an Argument

THINK

Ask yourself...

*Which of these arguments
convinces me and why?*



Choose an Argument

PAIR

Decide together on argument you both agree with and be prepared to explain your reasoning.

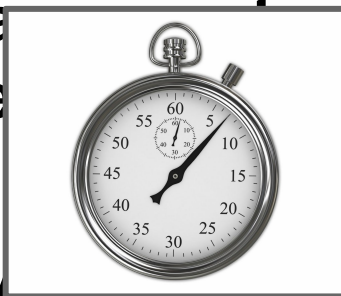


Ask yourselves: Can we improve the argument?

Choose an Argument

PAIR

Decide together on a topic you both agree with and be prepared to explain your reasoning.



Ask yourselves: Can we improve the argument?



Choose an Argument

SHARE

“We found ... convincing because ...”

“We understood ... better because ...”

“We can improve ... by ...”



Choose an Argument

SHARE

“We found ... convincing because ...”

“We understood ... because ...”

“We can improve ... by ...”



Reflect on Learning



When *constructing* arguments it is important to ...
because ...

When *critiquing* arguments it is important to ...
because ...



Reflect on Learning



When *constructing* arguments it is important to ...
because ...



When *critiquing* arguments it is important to ...
because ...



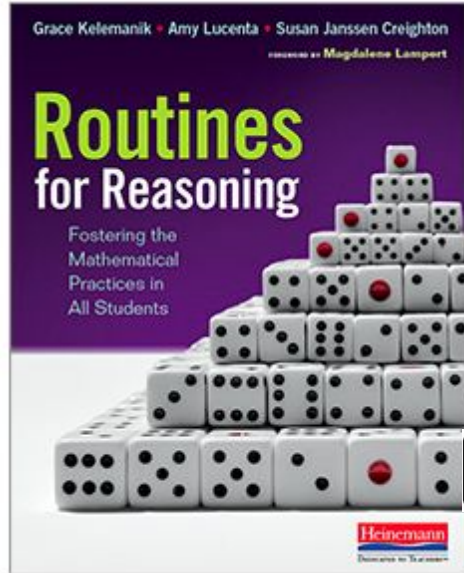
END of Activity



Questions:

1. Identify three questions your group has about the routine.
2. Decide as a group which of these questions has to be answered before you can use the routine yourselves.
3. Be prepared to share your questions with the room.

More Resources and Acknowledgements



Available at
amazon
Heinemann
DEDICATED TO TEACHERS

tedd.org



Ambitious Math Instruction

The Common Core State Standards, based on a growing body of research, call for students to engage in discussion around mathematics and to develop both conceptual and procedural understandings of...

5 0



Contemplate then Calculate (BPE)

In Contemplate then Calculate attention is shifted away from calculating an answer to interpreting an equation, expression, or shape. This activity was contributed by BPE's Boston Teacher Residency.

4 0



Three-Act Tasks

This activity is made up of three parts or "acts": 1) The Question, 2) Gathering information, and 3) The Reveal. The entire activity typically takes a full math period or...

2 0



Mental Math

In Mental Math students solve a computational problem mentally and discuss their solution strategies. The problems selected for Mental Math encourage students to use number relationships, place value, and properties...



Quick Images

In Quick Images, children are shown pictures displaying groups of objects or symbols, viewing each for only a few seconds. The short period of time encourages children to find efficient...



Counting Collections

Counting Collections is a structured...



ALL_ED
ALL LEARNERS LEARNING EVERY DAY

 **New Visions
for Public Schools**

**Choral Counting
& Counting Collections**

Contact Information & Slides

Blog: <https://davidwees.com>

Twitter: [@davidwees](https://twitter.com/davidwees)

Email: davidwees@gmail.com