

INTEGER OPERATIONS

NCTM Annual Meeting 2017

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CPA

Concrete Stage

- Use manipulatives to explore concepts in a purposeful activity

Representational Stage

- Use pictures to stand for the manipulative
- Demonstrate visualization and communication of concept

Abstract Stage

- Use symbols (numbers and operation signs)
- Demonstrate understanding through the use of mathematical language

“(The) use of manipulatives compared with traditional instruction typically had a positive effect on student achievement... especially for high-risk, learning disabled and limited English proficient students.”

~National Center for Accessing
the General Curriculum

NCTM MATHEMATICAL TEACHING PRACTICES

- Establish mathematical goals to focus learning
- Implement tasks that promote reasoning and problem solving
- Use and connect mathematical representations
- Facilitate meaningful discourse
- Pose purposeful questions
- Build procedural fluency through conceptual understanding
- Support productive struggle in learning mathematics
- Elicit and use evidence of student thinking

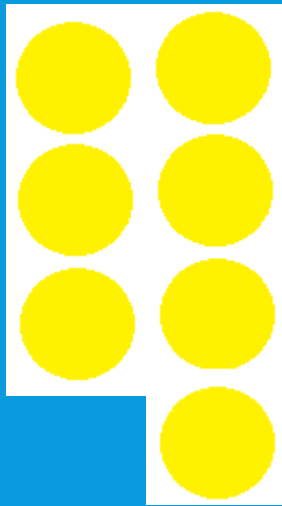
A REVIEW OF MANIPULATIVES

- Two-Color Tiles
- Linking Cubes
- Number Lines

TWO COLOR TILES

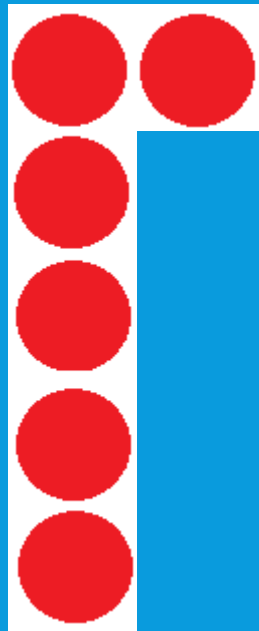
Two Positives

$$3 + 4 = \underline{7}$$



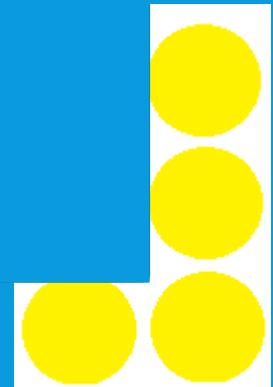
Two Negatives

$$-5 + (-1) = \underline{-6}$$



Positive + Negative

$$-2 + 6 = \underline{4}$$



LINKING CUBES

Two Positives

$$3 + 4 = \underline{7}$$

Two Negatives

$$-5 + (-1) = \underline{-6}$$

Positive + Negative

$$-2 + 6 = \underline{4}$$

NUMBER LINE

Two Positives

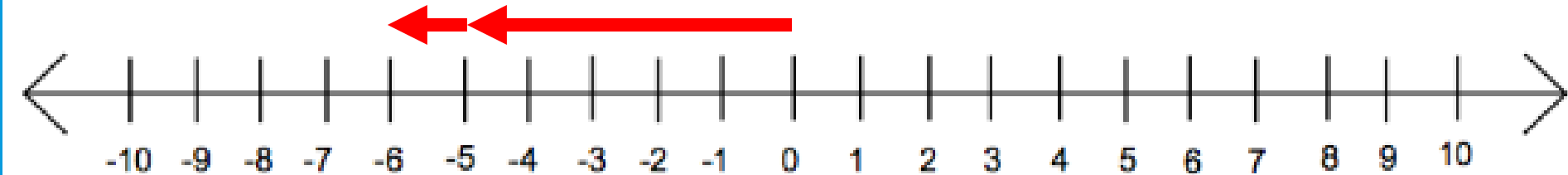
$$3 + 4 = \underline{7}$$



NUMBER LINE

Two Negatives

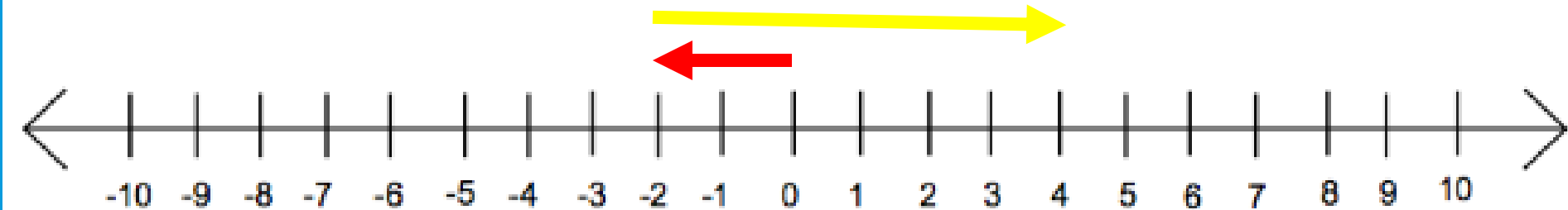
$$-5 + (-1) = \underline{-6}$$



NUMBER LINE

Positive + Negative

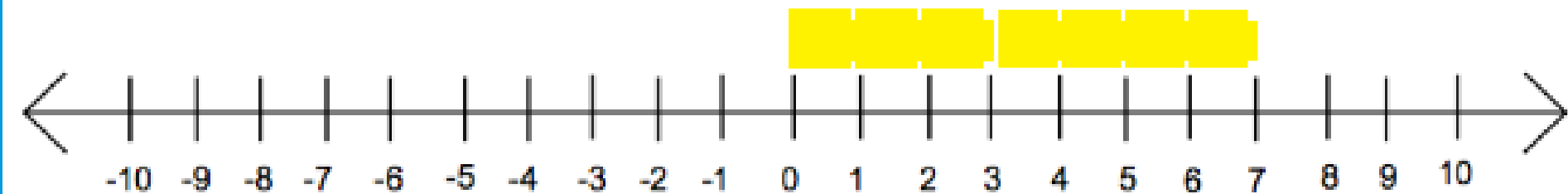
$$-2 + 6 = \underline{4}$$



NUMBER LINE WITH TILES

Two Positives

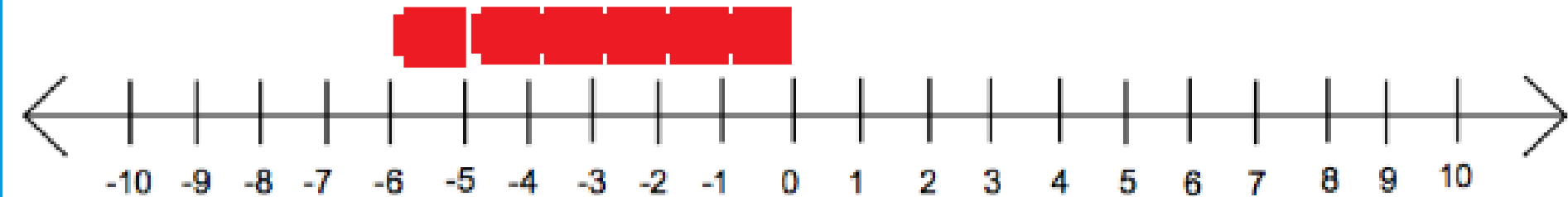
$$3 + 4 = \underline{7}$$



NUMBER LINE WITH TILES

Two Negatives

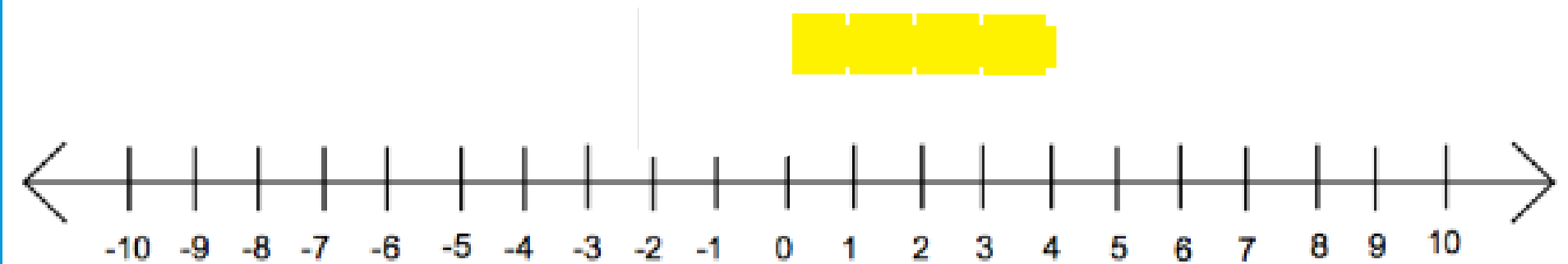
$$-5 + (-1) = \underline{-6}$$



NUMBER LINE WITH TILES

Positive + Negative

$$-2 + 6 = \underline{4}$$



MAKE IT MATTER

“Contextualized situations, whether real or imaginary, help students make visual like and sometimes physical links between their informal knowledge and formal mathematical ideas.”

~Laura Brinker Kent

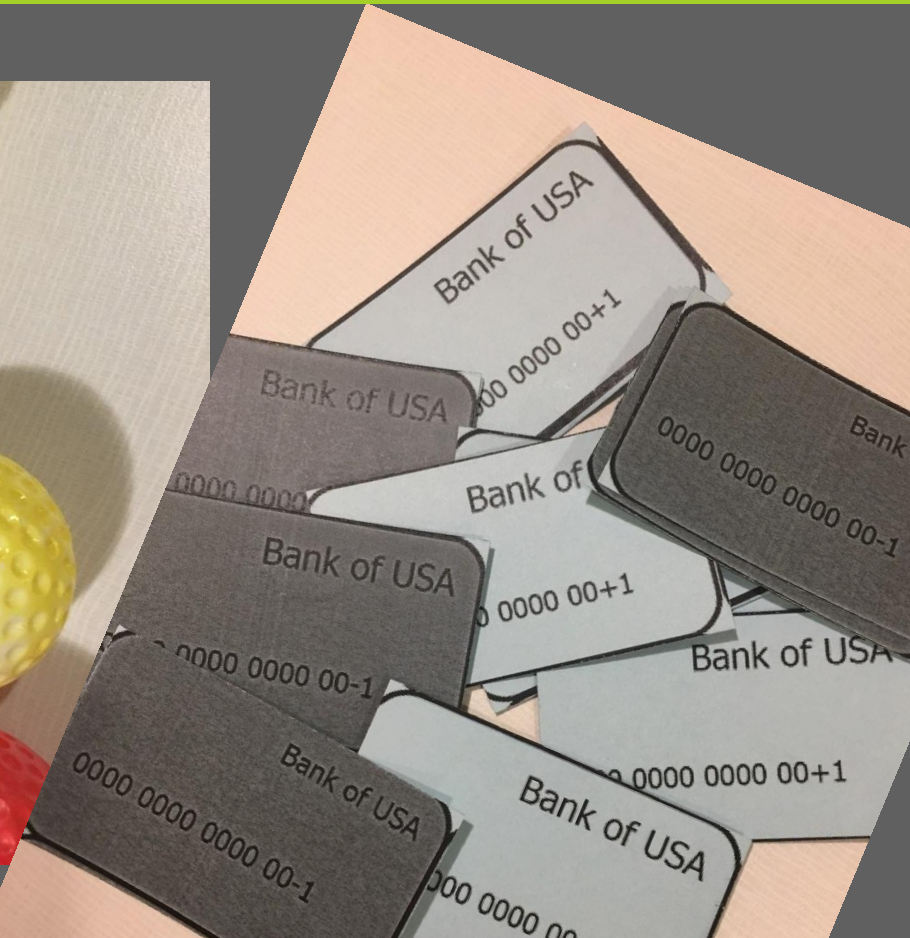
TILES



Money



Golf



Credit

NUMBER LINE



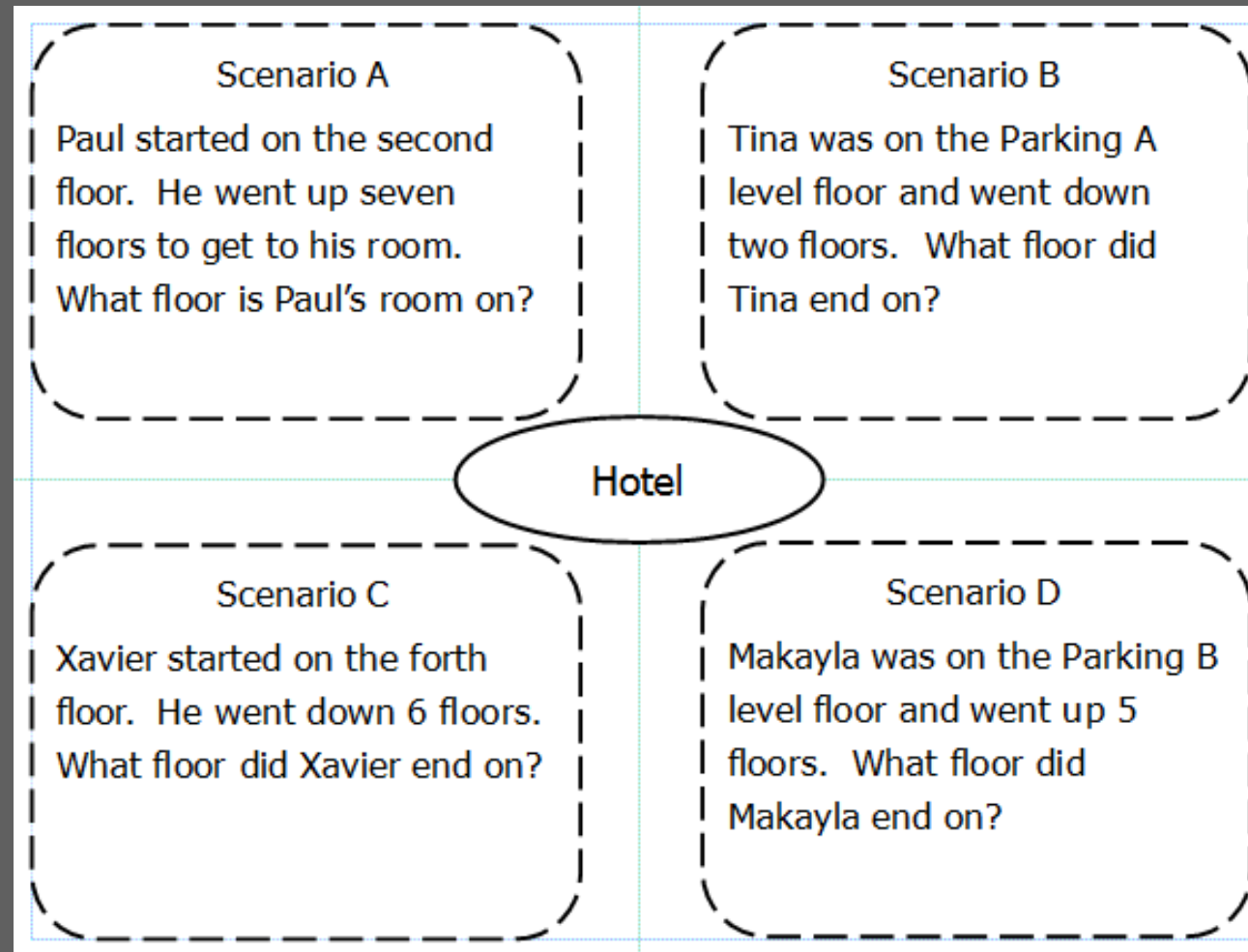
Temperature

Hotel

Football

Cliff Diving

SCENARIOS



GRAPHIC ORGANIZER

Real World Integers

Directions: At each station, write the equation for each scenario. Use the manipulatives provided to find the solution to the equation and record your answer. Then use the table to answer the questions below.

Station	Scenario A	Scenario B	Scenario C	Scenario D
Hotel	___ + ___ = ___	___ + ___ = ___	___ + ___ = ___	___ + ___ = ___
Thermometer	___ + ___ = ___	___ + ___ = ___	___ + ___ = ___	___ + ___ = ___
Golf	___ + ___ = ___	___ + ___ = ___	___ + ___ = ___	___ + ___ = ___
Credit Card	___ + ___ = ___	___ + ___ = ___	___ + ___ = ___	___ + ___ = ___
Cash	___ + ___ = ___	___ + ___ = ___	___ + ___ = ___	___ + ___ = ___
Seal Level	___ + ___ = ___	___ + ___ = ___	___ + ___ = ___	___ + ___ = ___
Football	___ + ___ = ___	___ + ___ = ___	___ + ___ = ___	___ + ___ = ___

PLACE OF ALGORITHMS IN THE MATH CLASSROOM

“Thoughtful use of standard algorithms advances fluency. However, rote learning of these traditional paper-and-pencil algorithms can interfere with the development of number sense. Alternative or student-invented algorithms are often more successful, especially when they build on student thinking about the operations.”

John Sutton and Alice Krueger

INTEGER RULES UNCOVERED

Scenario A

Positive + Positive = Positive

Scenario B

Negative + Negative = Negative

Scenario C

Positive + Negative = Negative when Negative
Addend has the larger absolute value
(magnitude)

Addend order does not matter.

Scenario D

Positive + Negative = Positive when Positive
Addend has the larger absolute value
(magnitude)

Addend order does not matter.

Standards for Student Mathematical Practice

1

Make sense of problems and persevere in solving them.

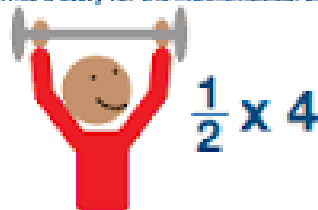


Keep on going!

2

Reason abstractly and quantitatively.

Write a story for the mathematical equation

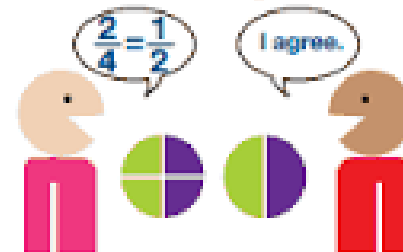


DeJuan exercises 1/2 hour a day for 4 days. How many total hours does he exercise?

Think what makes sense.

3

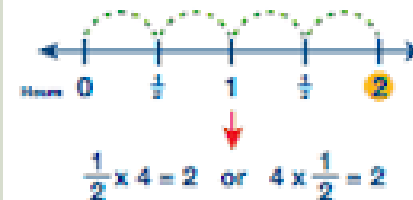
Construct viable arguments and critique the reasoning of others.



Talk and explain.

4

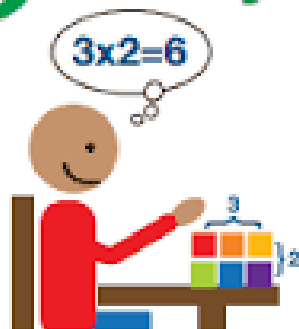
Model with mathematics.



Show your thinking.

5

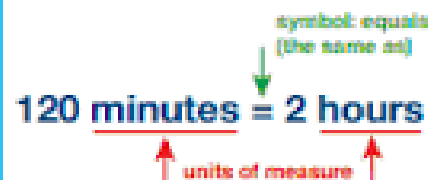
Use appropriate tools strategically.



Use the right tools.

6

Attend to precision.



Check your work.

7

Look for and make use of structure.



See the pattern or connection.

8

Look for and express regularity in repeated reasoning.



See the pattern or connection.

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THANK YOU!

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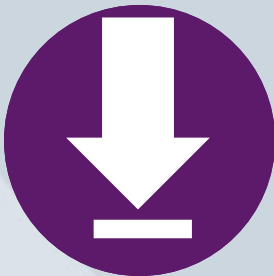


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