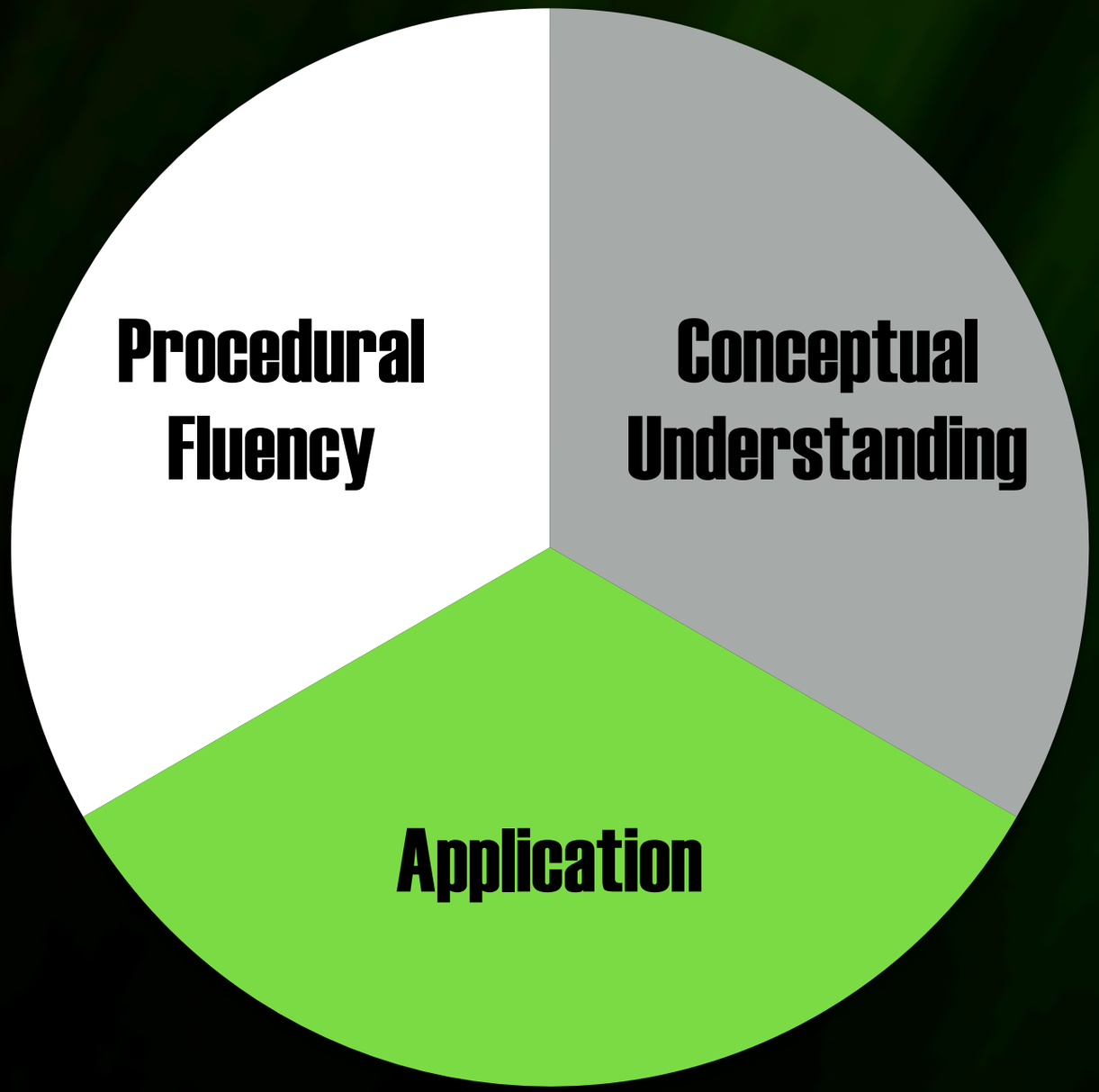
Harnessing the Power of Modeling Tasks through the Lens of a Math Progression

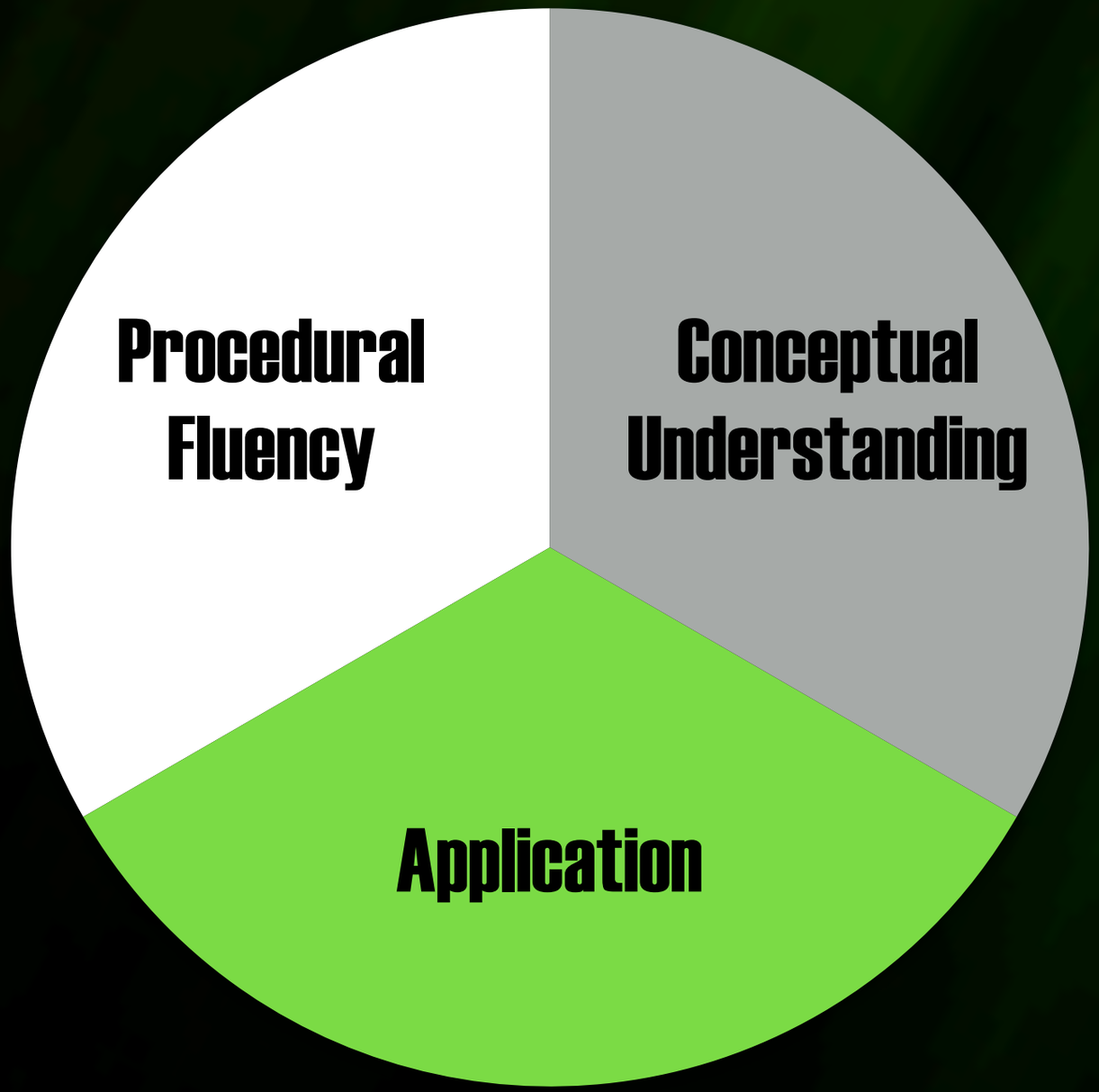
Graham Fletcher

gfletchy@gmail.com @gfletchy www.gfletchy.com/



http://www.corestandards.org/other-resources/key-shifts-in-mathematics/

Procedural Fluency



http://www.corestandards.org/other-resources/key-shifts-in-mathematics/

NEXT TIME YOU RE AFRAID
TO SHARE IDEAS
REMEMBER SOMEONE
ONCE SAID IN A MEETING
LETS MAKE A FILM WITH A
TORNADO FULL OF SHARKS

students doing the solving and the sense making

teacher showing a very conceptual approach

top-down, rule oriented approach

3 questions

1 Billion Circles

?

!

Fletchy

100 circles : minute

144,000 circles : day

1,000,000,000 would take 6944 days

19+ years with no sleep

Fletchy

2nd Question

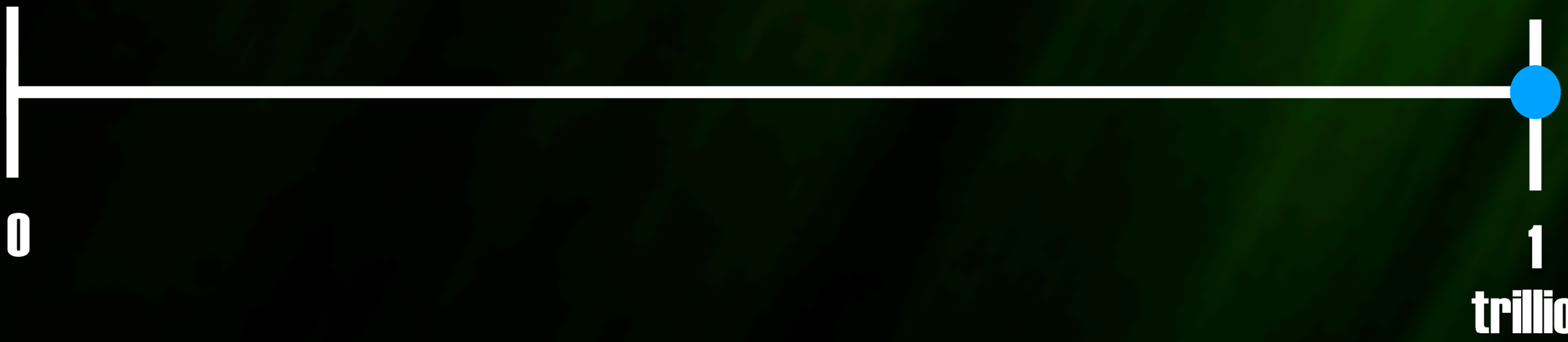
Mark Chubb @MarkChubb3 · 16m

@gfletchy

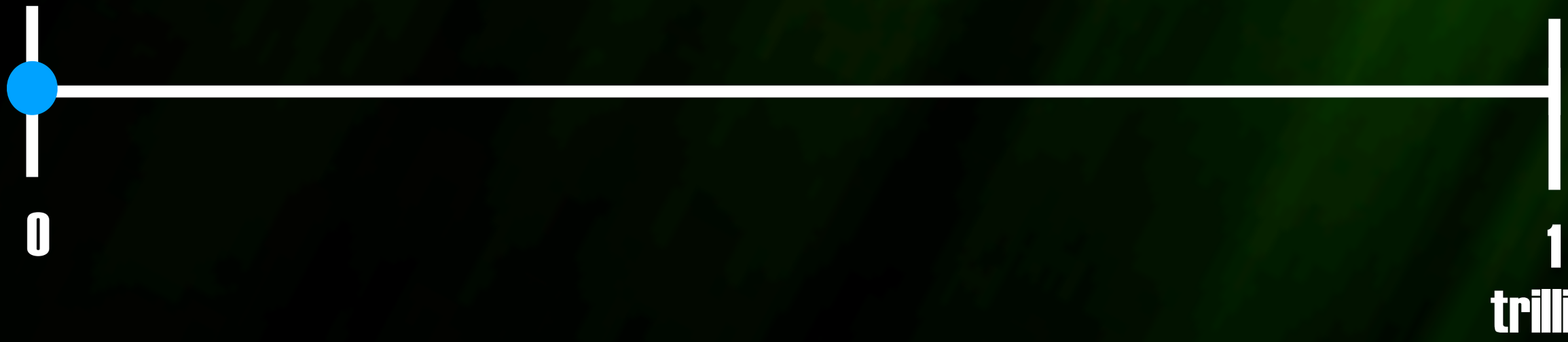
Where does 1 billion go?

Fletchy

Where does 1 billion go on the number line?



Where does 1 billion go on the number line?



Fletchy

$$6 \times \frac{5}{8}$$

Fletchy

$$6 \times \frac{5}{8}$$

$$10 + 3 + 5/8$$

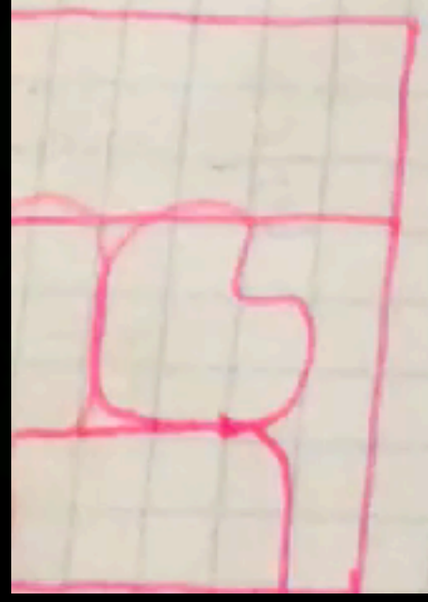
$$60 \mid 600 \mid 180 \mid$$

$$6 * 5/8 = 3\ 6/8$$

10 + 3 + 5/8

6 | 600 | 180 |

6 * 5/8 = 3 6/8



$6 \times \frac{5}{8}$

8

Today's Goals

- Understand the structure of 3-act task and see how they fit into the scope and sequence of a unit.

- Explore the importance of progressional understanding and how a good task can be used as formative assessment.
    - Numbers and Operations in Fractions

- Understand the importance of an effective closing and the role it plays in deciding our next move.

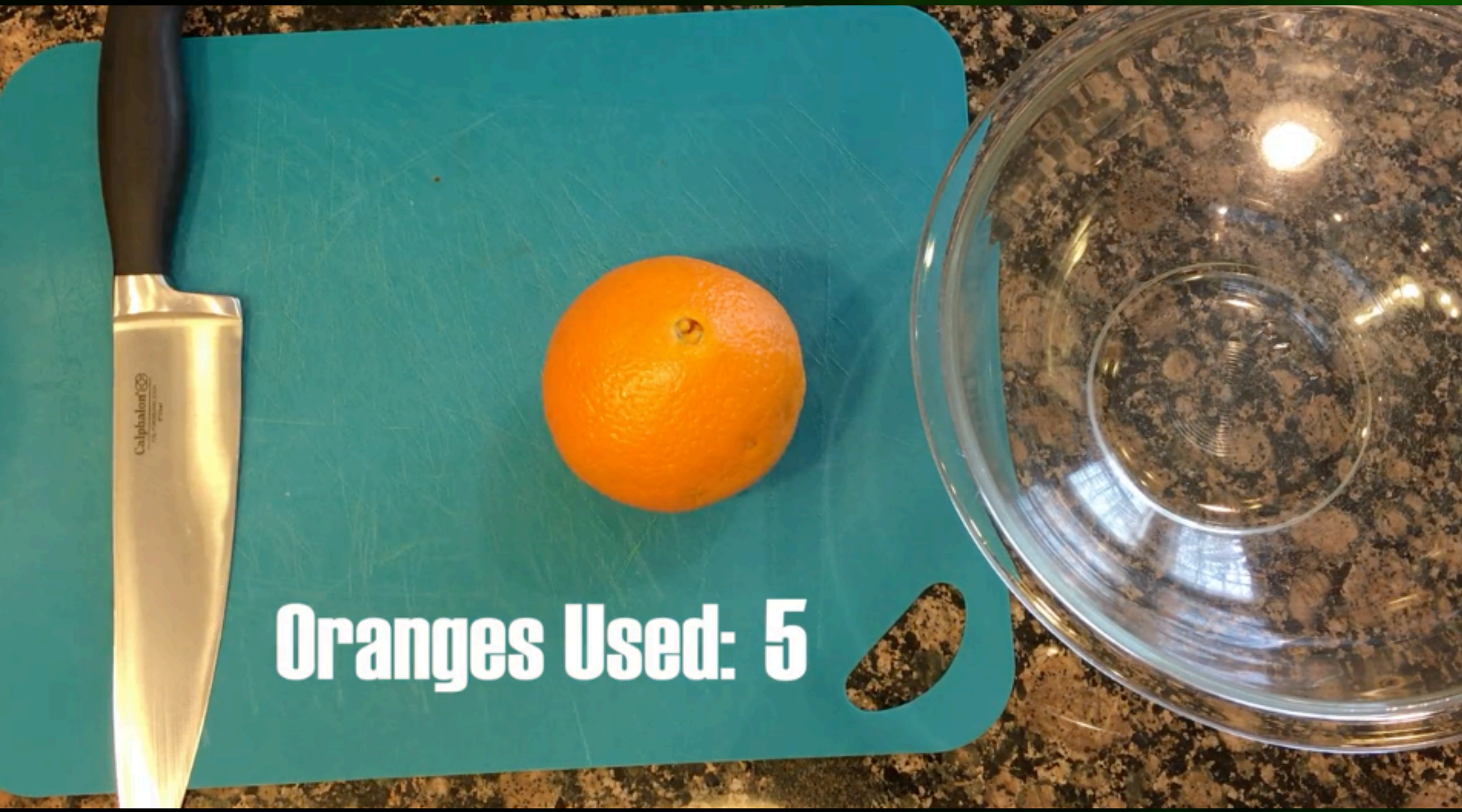
How many orange wedges are in the bowl?

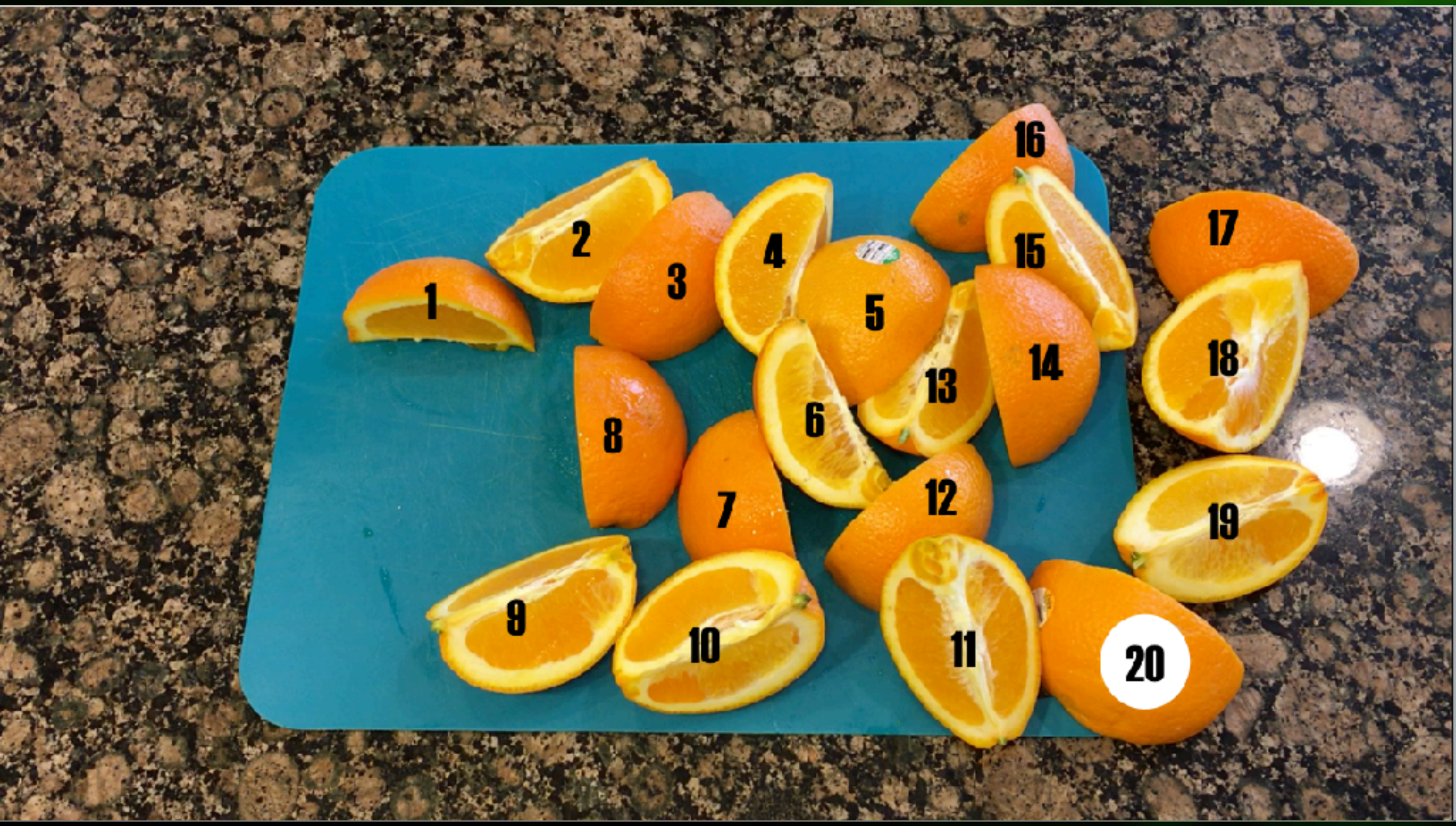
Estimate

How many orange wedges are in the bowl?

What information do you need to know?

Each orange wedges is a quarter.


Oranges Used: 5


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Graham had 5 oranges and cut them into quarters.

How many orange wedges did Graham have?

3-Act Tasks

Act 1:

- Real world problem or scenario presented
- What do you notice? What do you wonder?
- Make estimates

Act 2:

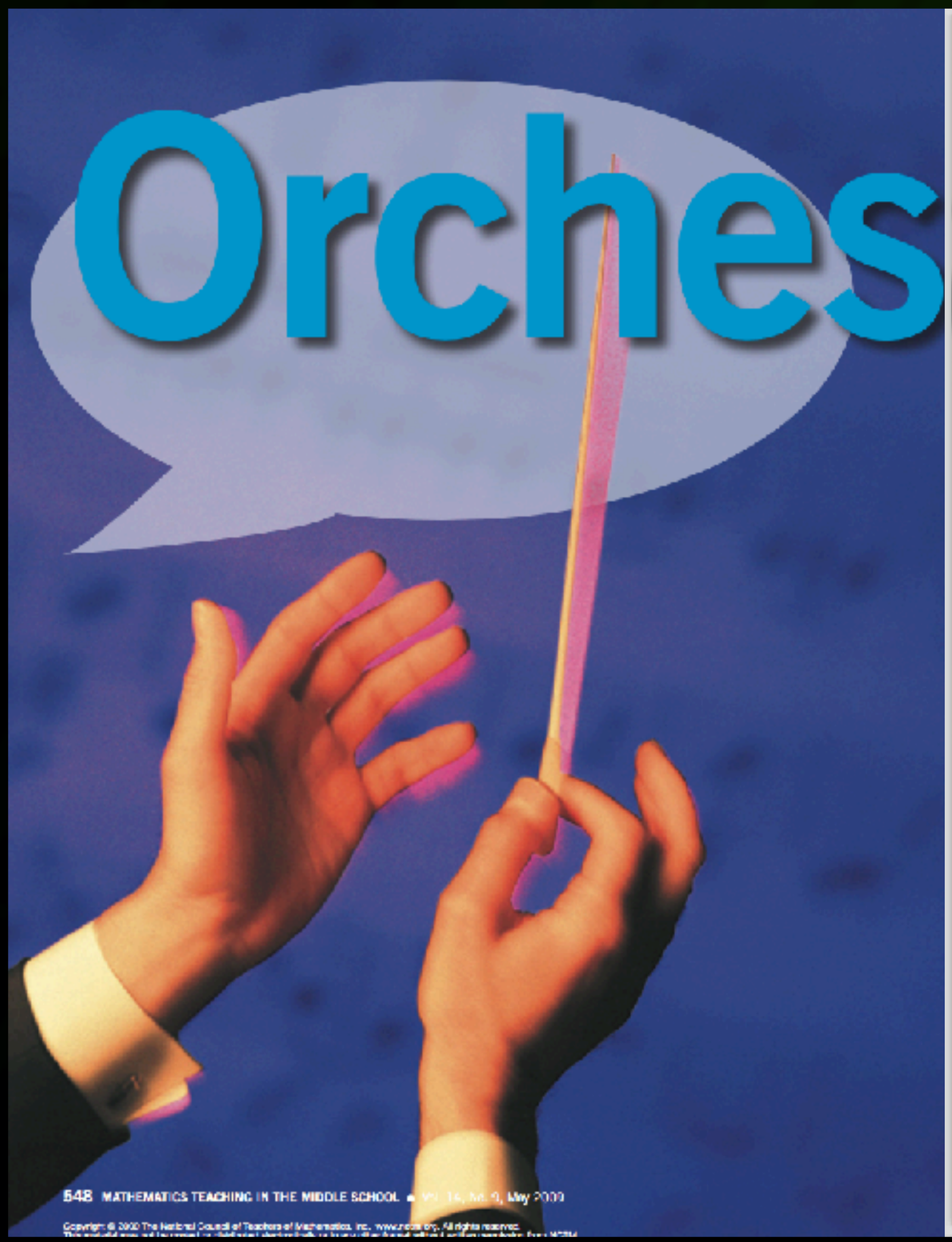
- Identify missing variables and missing variables to solve
- Define solution path using variables

Act 3:

- Solve and interpret results of the solution
- Validate answer

<u>Most asked questions:</u>

- How often should we use 3-Act Tasks? How do they fit into the scope of a unit?
- How long does one task usually take?
- What if we don’t have the time?



Orchestrating Discussions

Five practices constitute a model for effectively using student responses in whole-class discussions that can potentially make teaching with high-level tasks more manageable for teachers.

Margaret S. Smith, Elizabeth K. Hughes, Randi A. Engle, and Mary Kay Stein

Margaret S. Smith, peggy@pitt.edu, is an associate professor of mathematics education at the University of Pittsburgh. Over the past decade, she has been developing research-based materials for use in the professional development of mathematics teachers and studying what teachers learn from the professional development in which they engage. **Elizabeth K. Hughes**, elizabeth.hughes@uni.edu, recently finished her doctorate in mathematics education at the University of Pittsburgh. Her areas of interest include preservice secondary mathematics teacher education and the use of practice-based materials in developing teachers' understanding of what it means to teach and learn mathematics. **Randi A. Engle**, rengle@berkeley.edu, is an assistant professor of mathematics education and the social context of learning at the University of California, Berkeley. She is interested in developing practical theories for how mathematics teachers can create discussion-based learning environments that promote strong student engagement, learning, and transfer. **Mary Kay Stein**, mkstein@pitt.edu, is a professor of learning sciences and policy and the director of the Learning Policy Center at the University of Pittsburgh. Her research focuses on instructional practice and the organizational and policy conditions that shape it.

Discussions that focus on cognitively challenging mathematical tasks, namely, those that promote thinking, reasoning, and problem solving, are a primary mechanism for promoting conceptual understanding of mathematics (Hiebert and Wearne 1993; Michaels, O'Connor, and Resnick forthcoming). Such discussions give students opportunities to share ideas and clarify understandings, develop convincing arguments regarding why and how things work, develop a language for expressing mathematical ideas, and learn to see things from other perspectives (NCTM 2000).

Although discussions about high-level tasks provide important

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MTMS: Vol. 14, No. 9, May 2009-5 Practices for Orchestrating Productive Mathematics Discussions

The **5** practices are:

1. **Anticipating** student responses to challenging mathematical tasks;

2. **Monitoring** students' work on and engagement with the tasks;

3. **Selecting** particular students to present their mathematical work;

4. **Sequencing** the student responses that will be displayed in a specific order and;

5. C**onnecting** different students' responses and connecting the responses to key mathematical ideas.

MTMS: Vol. 14, No. 9, May 2009-5 Practices for Orchestrating Productive Mathematics Discussions

Task Planning Page

Learning Target:		
Questions and Look-Fors:		
Strategy	Who and What	Order
Notes:		

Anticipating → Monitoring → Selecting → Sequencing → Connecting

5 oranges

Each wedge is a quarter

Task Planning Page

Learning Target:		
Questions and Look-Fors:		
Strategy	**Who and What**	**Order**
Notes:		

Anticipating → Monitoring → Selecting → Sequencing → Connecting

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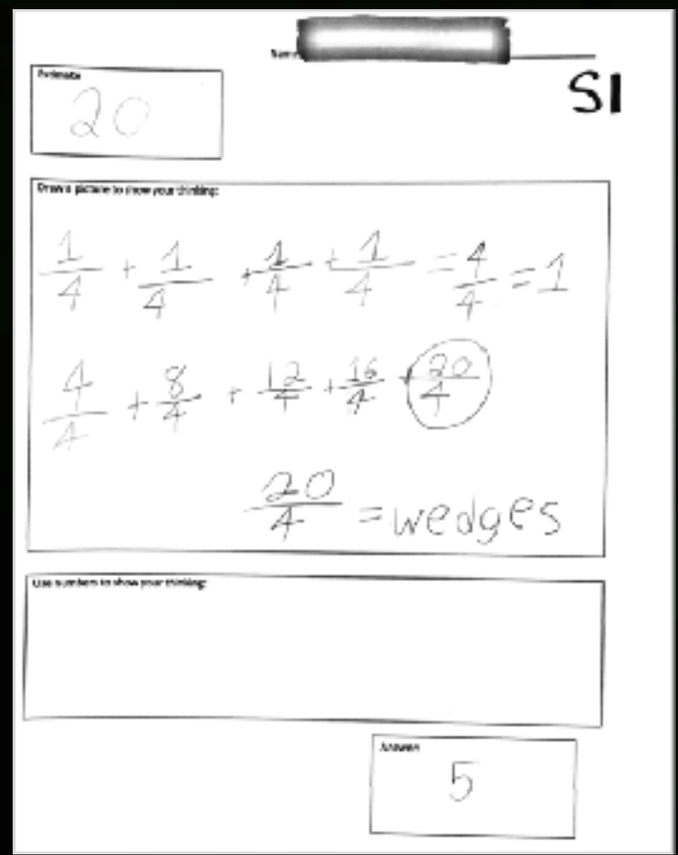
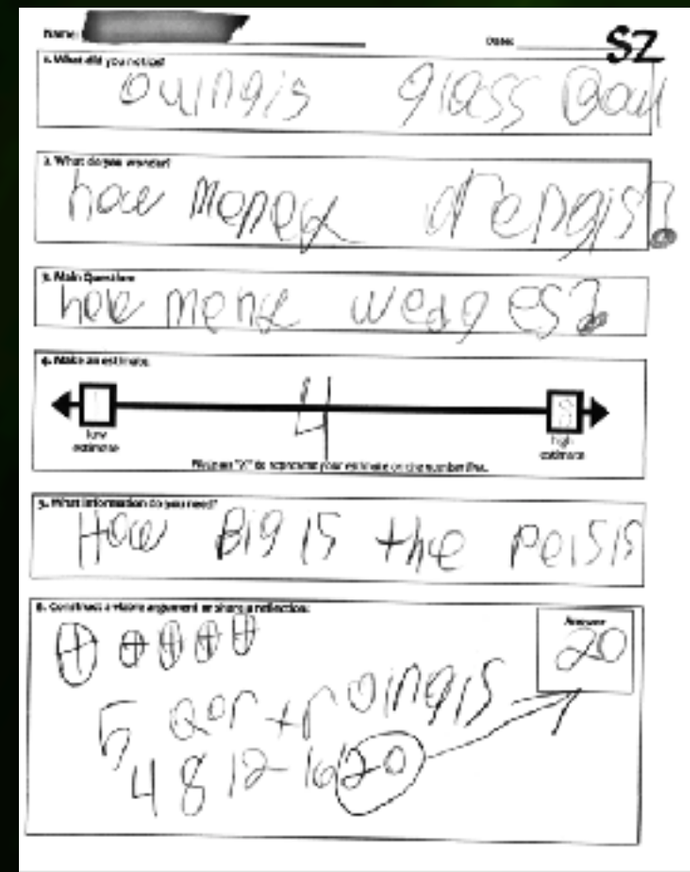
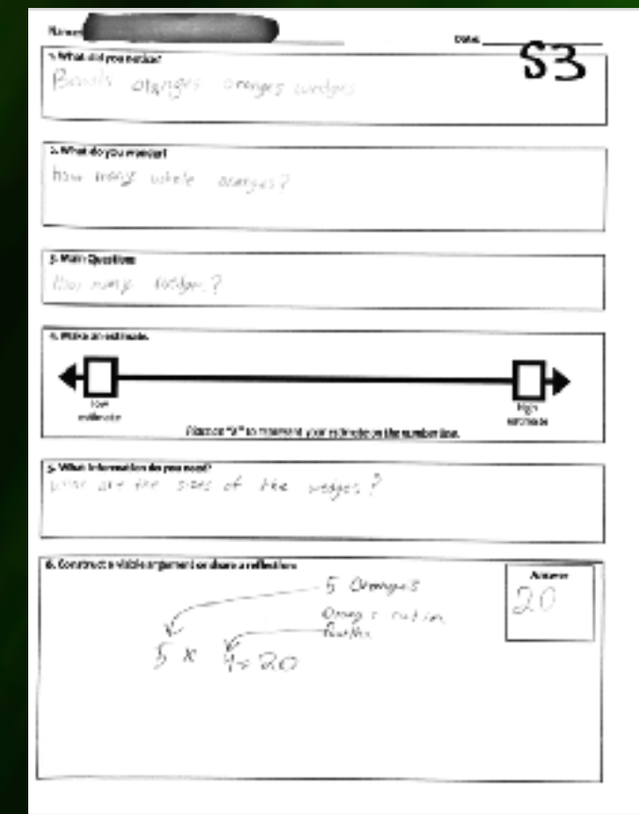
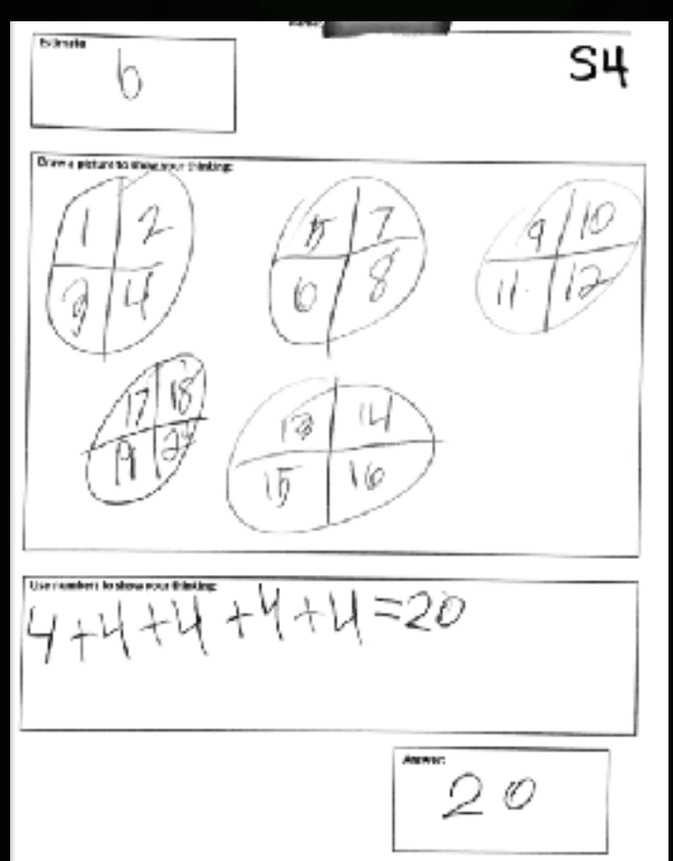
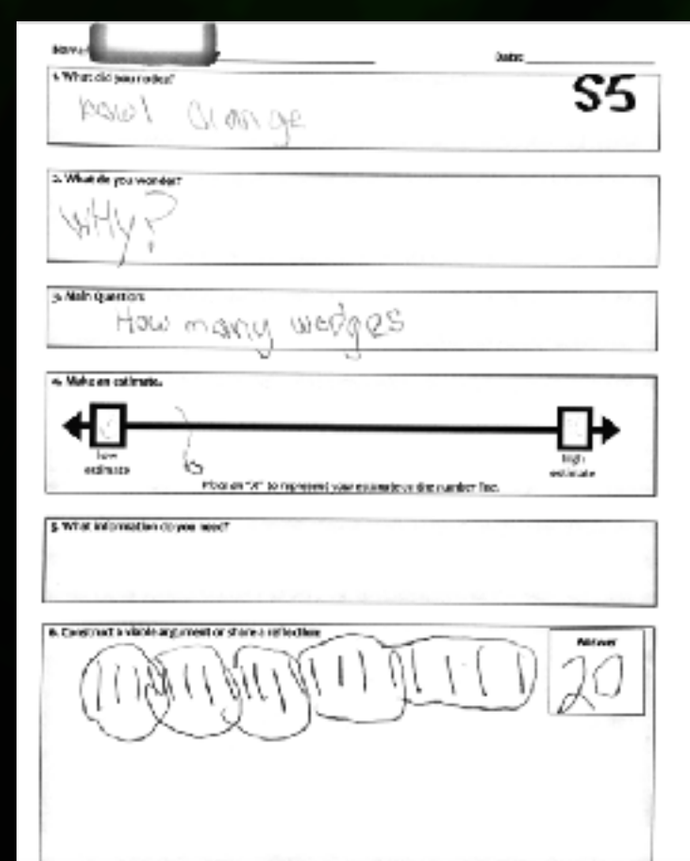
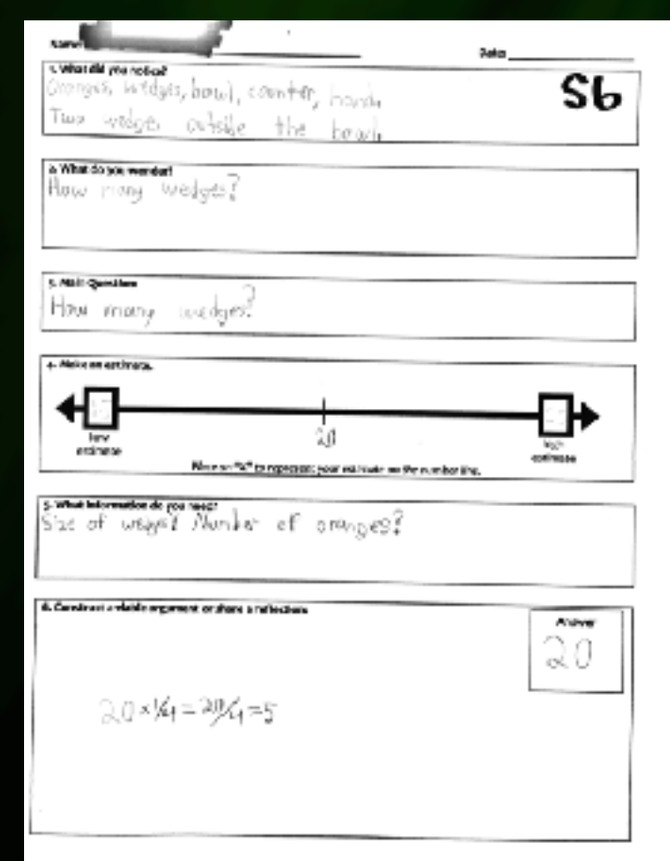

S1
Estimate
20
Draw a picture to show your thinking:
1/4 + 1/4 + 1/4 + 1/4 = 4/4 = 1
4/4 + 8/4 + 12/4 + 16/4 + 20/4
20/4 = wedges
Use numbers to show your thinking:
Answer
5


S2
1. What did you notice?
Quingis glass Bowl
2. What do you wonder?
how menex orengis?
3. Main Question
how menx wedges?
4. Make an estimate.
low estimate
high estimate
5. What information do you need?
How Big is the Peisis
6. Construct a viable argument or share a reflection:
5 Qor + Quingis
4 8 12 16 20
Answer
20


S3
1. What did you notice?
Bowls oranges oranges wedges
2. What do you wonder?
how many whole oranges?
3. Main Question
How many wedges?
4. Make an estimate.
low estimate
high estimate
5. What information do you need?
What are the sizes of the wedges?
6. Construct a viable argument or share a reflection
5 Oranges
5 x 4 = 20
Answer
20


S4
Estimate
6
Draw a picture to show your thinking:
1 2 3 4
5 7 6 8
9 10 11 12
17 18 19 20
13 14 15 16
Use numbers to show your thinking:
4+4+4+4+4=20
Answer
20


S5
1. What did you notice?
bowl orange
2. What do you wonder?
Why?
3. Main Question
How many wedges
4. Make an estimate.
low estimate
high estimate
5. What information do you need?
6. Construct a viable argument or share a reflection
Answer
20


S6
1. What did you notice?
Oranges, wedges, bowl, counter, hands
Two wedges outside the bowl
2. What do you wonder?
How many wedges?
3. Main Question
How many wedges?
4. Make an estimate.
low estimate
20
high estimate
5. What information do you need?
Size of wedges? Number of oranges?
6. Construct a viable argument or share a reflection
Answer
20
20 × 1/4 = 20/4 = 5

Name [redacted]

S1

Estimate

20

Draw a picture to show your thinking:

$\frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{4}{4} = 1$

$\frac{4}{4} + \frac{8}{4} + \frac{12}{4} + \frac{16}{4} + \frac{20}{4}$

$\frac{20}{4}$ = wedges

Use numbers to show your thinking:

Answer:

5

Name: [redacted] Date: S2

1. What did you notice?

ouingis glass Bowl

2. What do you wonder?

how money drengis?

3. Main Question:

how money wedges?

4. Make an estimate.

Place an "X" to represent your estimate on the number line.

5. What information do you need?

How Big is the peisis

6. Construct a viable argument or share a reflection:

Answer 20

5 Qor + roingis

4 8 12 16 20

estimate

Place an "X" to represent your estimate on the number line.

5. What information do you need?

What are the sizes of the wedges?

6. Construct a viable argument or share a reflection:

5 Oranges

Orange cut in fourths.

5 x 4 = 20

Answer

20

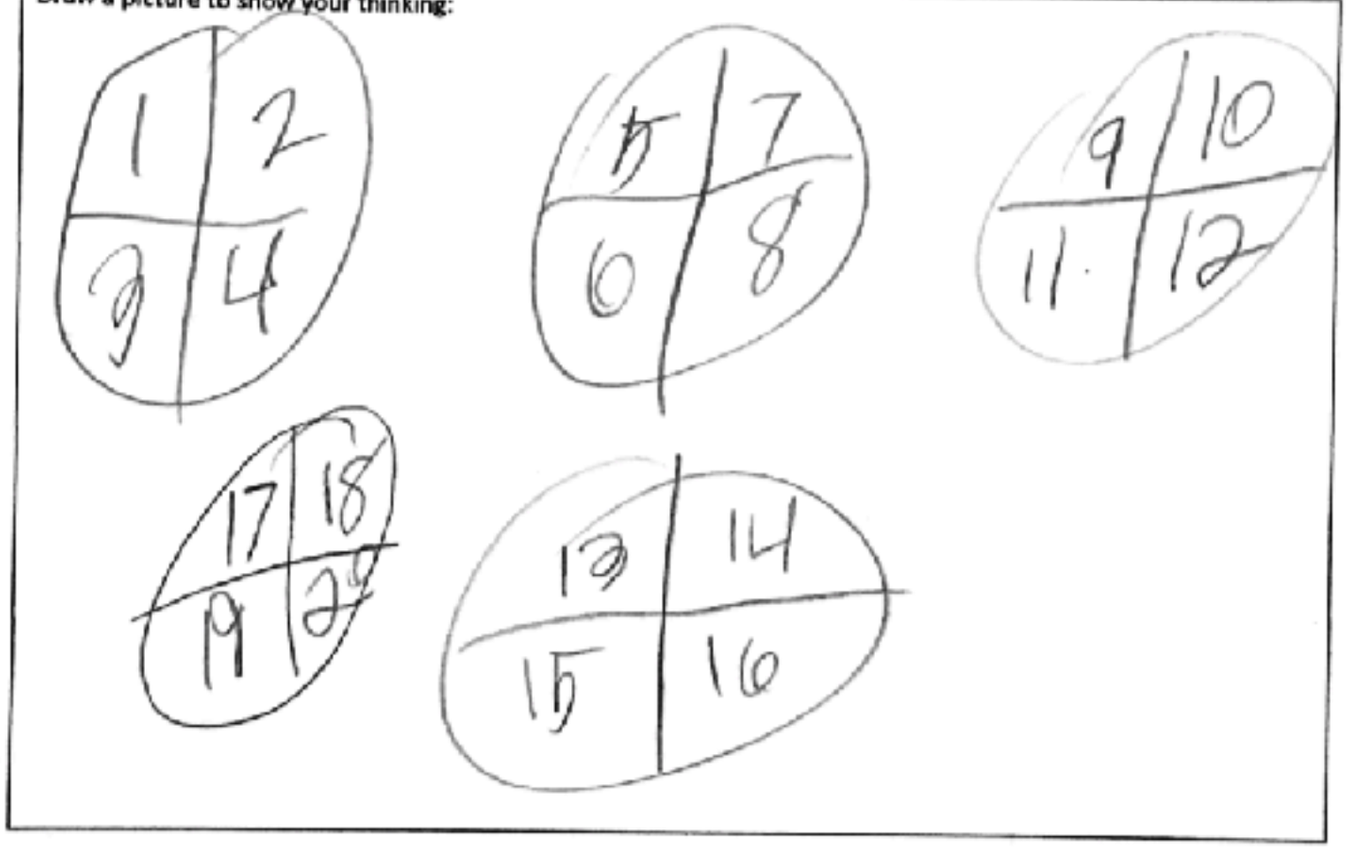
Name: [redacted]

S4

Estimate

6

Draw a picture to show your thinking:



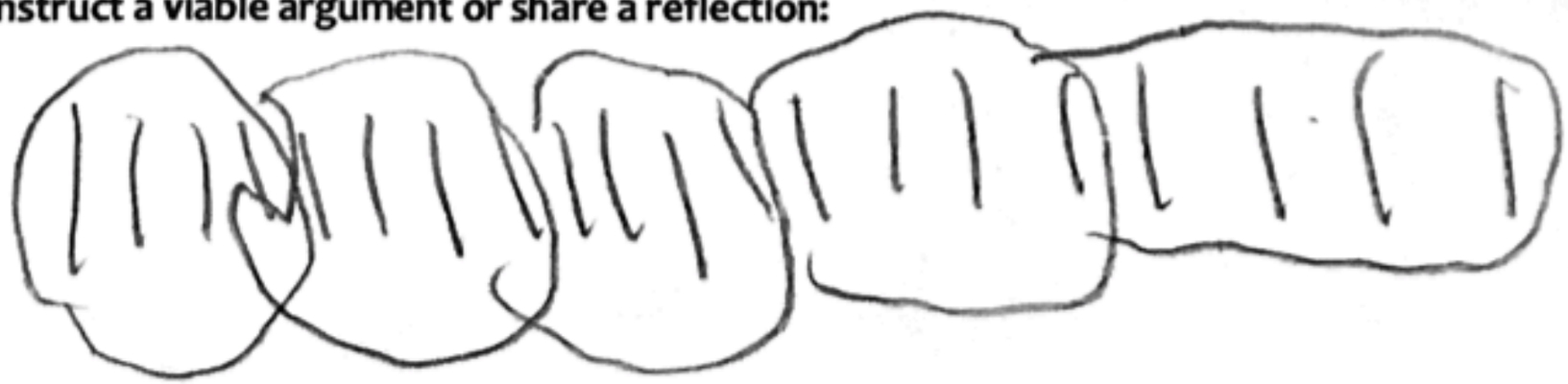
Use numbers to show your thinking:

4 + 4 + 4 + 4 + 4 = 20

Answer:

20

6. Construct a viable argument or share a reflection:



Answer

20

5. What information do you need?

Size of wedges? Number of oranges?

6. Construct a viable argument or share a reflection:

Answer

20

$20 \times 1/4 = 20/4 = 5$

Name: [redacted]

S1

Estimate

20

Draw a picture to show your thinking:

$\frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{4}{4} = 1$

$\frac{4}{4} + \frac{8}{4} + \frac{12}{4} + \frac{16}{4} + \frac{20}{4}$

$\frac{20}{4}$ = wedges

Use numbers to show your thinking:

Answer:

5

Name: [redacted] Date:

S2

1. What did you notice?

oranges glass bowl

2. What do you wonder?

how many oranges?

3. Main Question:

how many wedges?

4. Make an estimate.

low estimate — high estimate

Place an "X" to represent your estimate on the number line.

5. What information do you need?

How big is the peice

6. Construct a viable argument or share a reflection:

5 oranges

4 8 12 16 20

Answer

20

Name: [redacted] Date:

S3

1. What did you notice?

Bowls oranges oranges wedges

2. What do you wonder?

How many whole oranges?

3. Main Question:

How many wedges?

4. Make an estimate.

low estimate — high estimate

Place an "X" to represent your estimate on the number line.

5. What information do you need?

What are the sizes of the wedges?

6. Construct a viable argument or share a reflection:

5 Oranges

Orange cutin fourths

5 x 4 = 20

Answer

20

Name: [redacted]

S4

Estimate

6

Draw a picture to show your thinking:

1 2 3 4

5 6 7 8

9 10 11 12

17 18 19 20

13 14 15 16

Use numbers to show your thinking:

4+4+4+4+4=20

Answer:

20

Name: [redacted] Date:

S5

1. What did you notice?

bowl Orange

2. What do you wonder?

Why?

3. Main Question:

How many wedges

4. Make an estimate.

low estimate — high estimate

Place an "X" to represent your estimate on the number line.

5. What information do you need?

6. Construct a viable argument or share a reflection:

Answer

20

Name: [redacted] Date:

S6

1. What did you notice?

Oranges, wedges, bowl, counter, hand. Two wedges outside the bowl.

2. What do you wonder?

How many wedges?

3. Main Question:

How many wedges?

4. Make an estimate.

low estimate — 20 — high estimate

Place an "X" to represent your estimate on the number line.

5. What information do you need?

Size of wedges? Number of oranges?

6. Construct a viable argument or share a reflection:

$20 \times \frac{1}{4} = \frac{20}{4} = 5$

Answer

20

Name: [redacted]

S1

Estimate: 20

Draw a picture to show your thinking:

$\frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{4}{4} = 1$

$\frac{4}{4} + \frac{8}{4} + \frac{12}{4} + \frac{16}{4} + \frac{20}{4}$

$\frac{20}{4}$ = wedges

Use numbers to show your thinking:

Answer: 5

Name: [redacted] Date:

S2

1. What did you notice?
oranges glass bowl

2. What do you wonder?
how many oranges?

3. Main Question:
how many wedges?

4. Make an estimate.

low estimate — high estimate

Place an "X" to represent your estimate on the number line.

5. What information do you need?
How big is the peice

6. Construct a viable argument or share a reflection:

1 4 8 12 16 20

5 oranges

Answer: 20

Name: [redacted] Date:

S3

1. What did you notice?
Bowls oranges oranges wedges

2. What do you wonder?
How many whole oranges?

3. Main Question:
How many wedges?

4. Make an estimate.

low estimate — high estimate

Place an "X" to represent your estimate on the number line.

5. What information do you need?
What are the sizes of the wedges?

6. Construct a viable argument or share a reflection:

5 Oranges
Orange cutin fourths

5 x 4 = 20

Answer: 20

Name: [redacted]

S4

Estimate: 6

Draw a picture to show your thinking:

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Use numbers to show your thinking:

4+4+4+4+4=20

Answer: 20

1b-Counting Up

Name: [redacted] Date:

S5

1. What did you notice?
bowl Orange

2. What do you wonder?
Why?

3. Main Question:
How many wedges

4. Make an estimate.

low estimate — high estimate

Place an "X" to represent your estimate on the number line.

5. What information do you need?

6. Construct a viable argument or share a reflection:

Answer: 20

1a-Counting Up

Name: [redacted] Date:

S6

1. What did you notice?
Oranges, wedges, bowl, counter, hand.
Two wedges outside the bowl.

2. What do you wonder?
How many wedges?

3. Main Question:
How many wedges?

4. Make an estimate.

low estimate — 20 — high estimate

Place an "X" to represent your estimate on the number line.

5. What information do you need?
Size of wedges? Number of oranges?

6. Construct a viable argument or share a reflection:

$20 \times \frac{1}{4} = \frac{20}{4} = 5$

Answer: 20

Name: [redacted]

S1

Estimate: 20

Draw a picture to show your thinking:

$\frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{4}{4} = 1$

$\frac{4}{4} + \frac{8}{4} + \frac{12}{4} + \frac{16}{4} + \frac{20}{4}$

$\frac{20}{4}$ = wedges

Use numbers to show your thinking:

2b-Skip Counting

Answer: 5

Name: [redacted] Date:

S2

1. What did you notice? ouings glass bad

2. What do you wonder? how money oranges?

3. Main Question: how many wedges?

4. Make an estimate.

low estimate — high estimate

Place an "X" to represent your estimate on the number line.

5. What information do you need? How Big is the peisis

6. Construct a viable argument or share a reflection:

Answer: 20

5 oranges 4 8 12 16 20

2a-Skip Counting

Name: [redacted] Date:

S3

1. What did you notice? Bowls oranges oranges wedges

2. What do you wonder? How many whole oranges?

3. Main Question: How many wedges?

4. Make an estimate.

low estimate — high estimate

Place an "X" to represent your estimate on the number line.

5. What information do you need? What are the sizes of the wedges?

6. Construct a viable argument or share a reflection:

5 Oranges
Orange cutin fourths
5 x 4 = 20

Answer: 20

Name: [redacted]

S4

Estimate: 6

Draw a picture to show your thinking:

1 2 3 4 | 5 6 7 8 | 9 10 11 12 | 13 14 15 16 | 17 18 19 20

Use numbers to show your thinking:

4+4+4+4+4=20

Answer: 20

1b-Counting Up

Name: [redacted] Date:

S5

1. What did you notice? bowl Orange

2. What do you wonder? Why?

3. Main Question: How many wedges

4. Make an estimate.

low estimate — high estimate

Place an "X" to represent your estimate on the number line.

5. What information do you need?

6. Construct a viable argument or share a reflection:

Answer: 20

1-Counting Up

Name: [redacted] Date:

S6

1. What did you notice? Oranges, wedges, bowl, counter, hand. Two wedges outside the bowl.

2. What do you wonder? How many wedges?

3. Main Question: How many wedges?

4. Make an estimate.

low estimate — 20 — high estimate

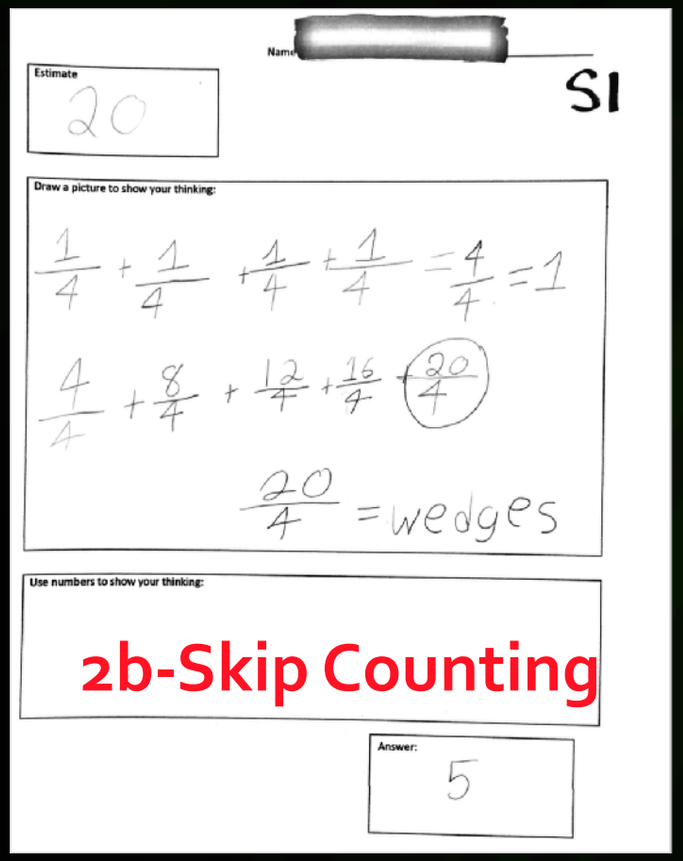
Place an "X" to represent your estimate on the number line.

5. What information do you need? Size of wedges? Number of oranges?

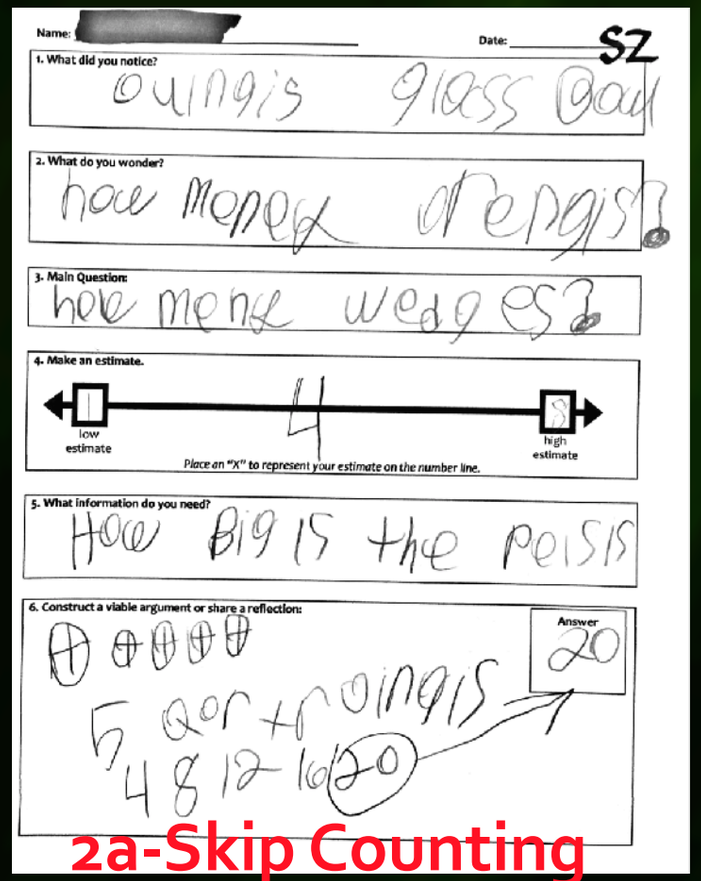
6. Construct a viable argument or share a reflection:

$20 \times 1/4 = 20/4 = 5$

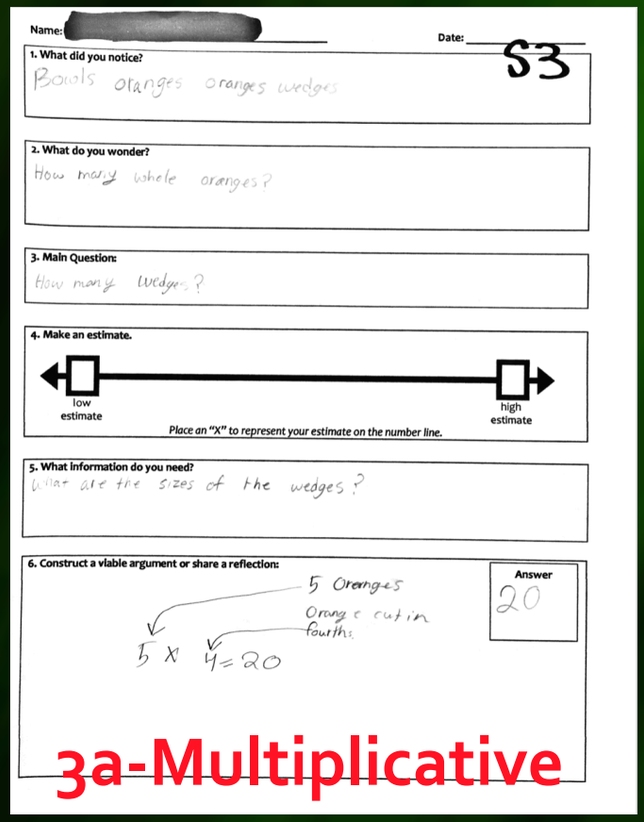
Answer: 20



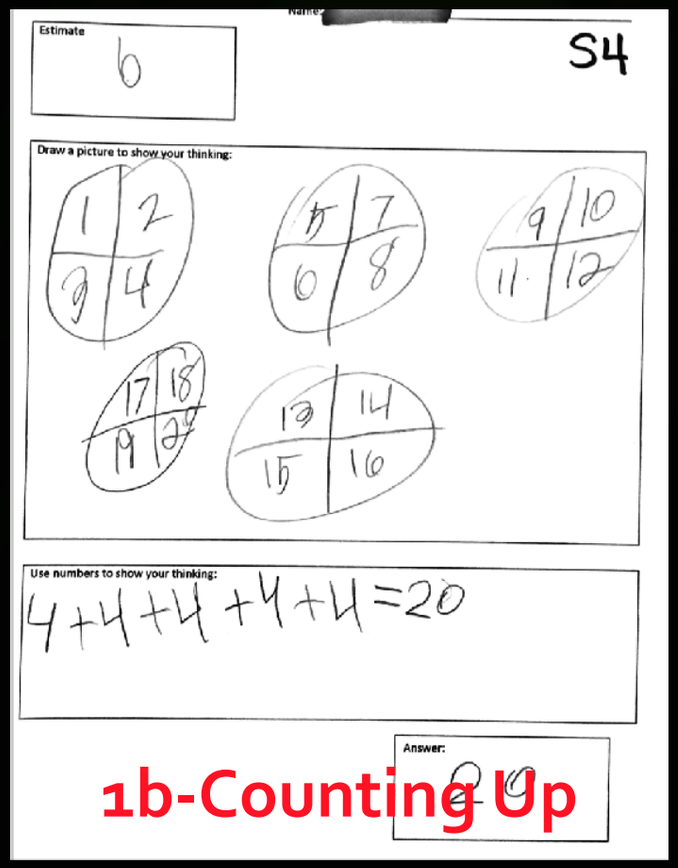
2b-Skip Counting



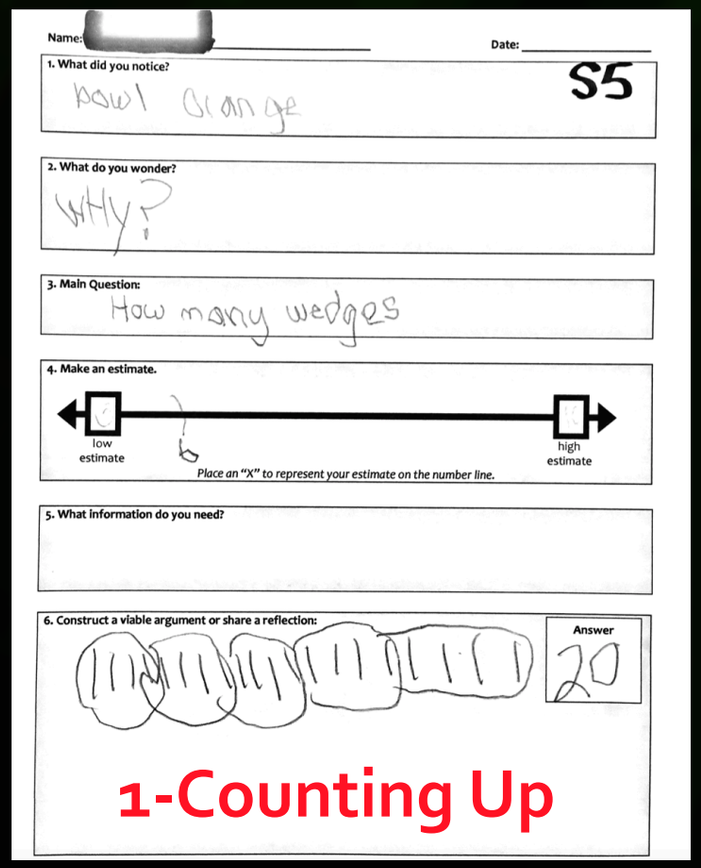
2a-Skip Counting



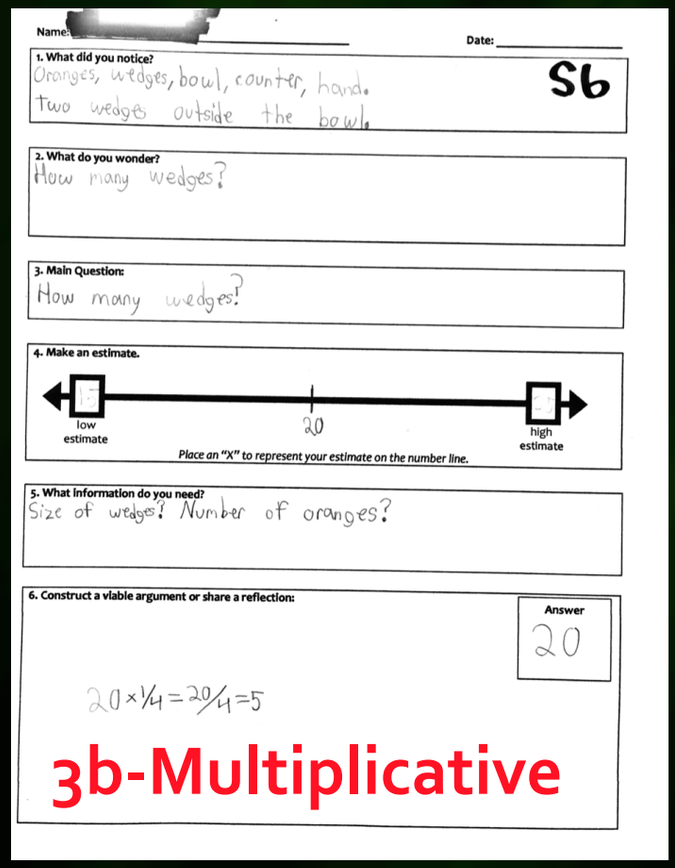
3a-Multiplicative



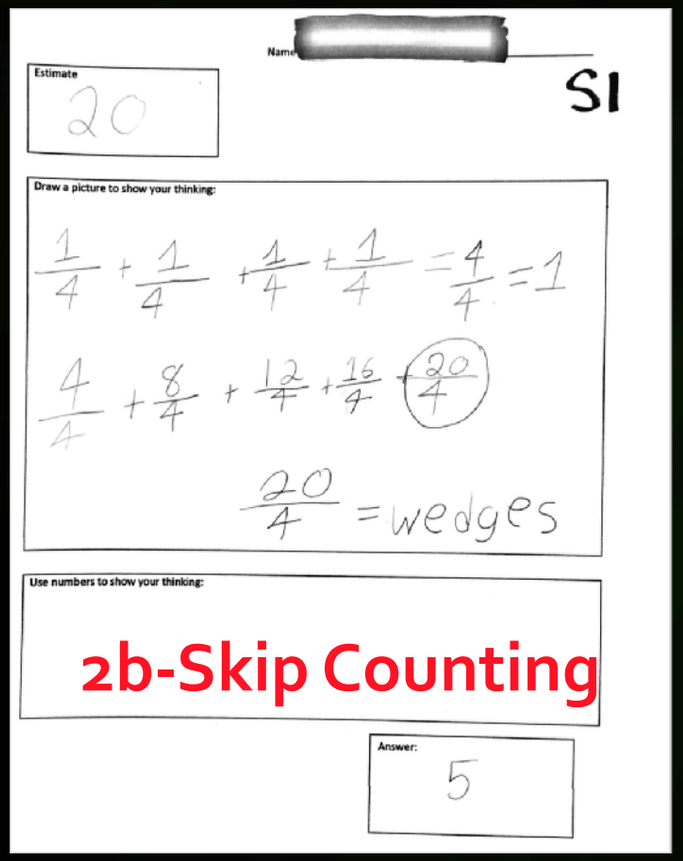
1b-Counting Up



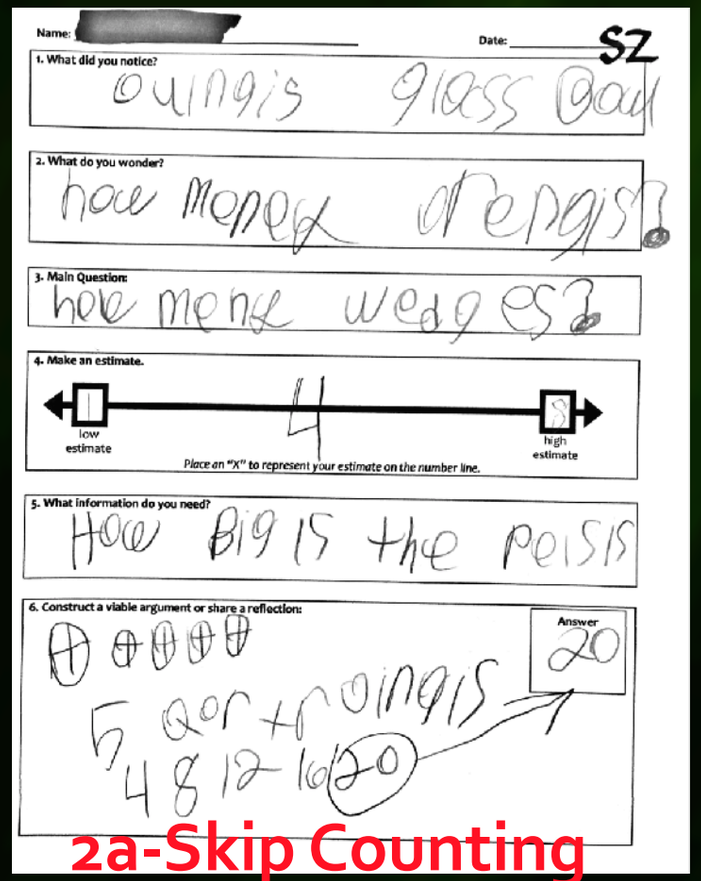
1-Counting Up



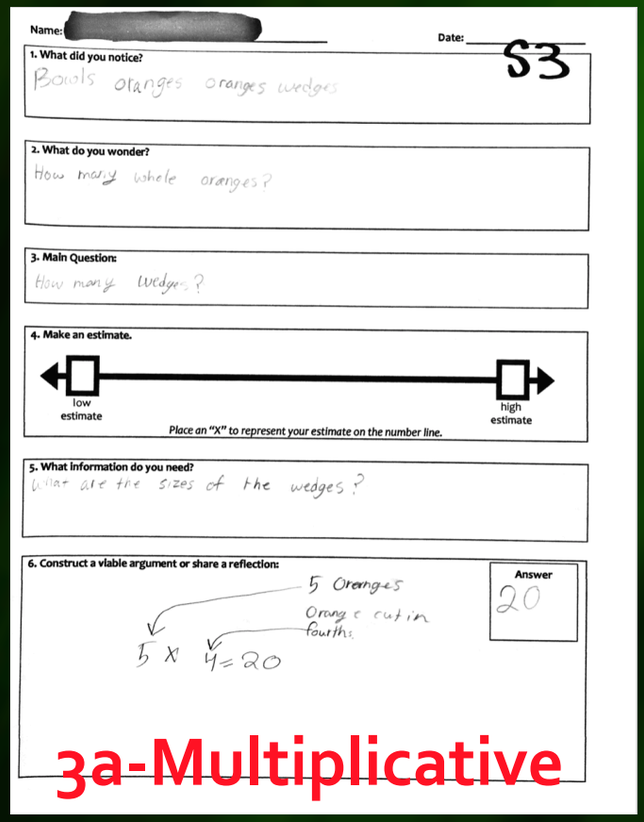
3b-Multiplicative



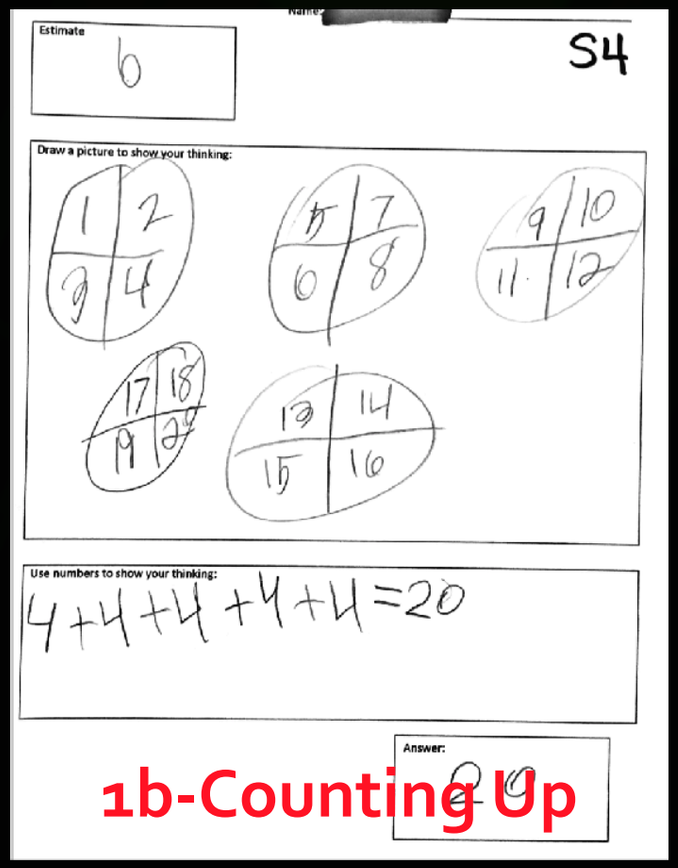
2b-Skip Counting



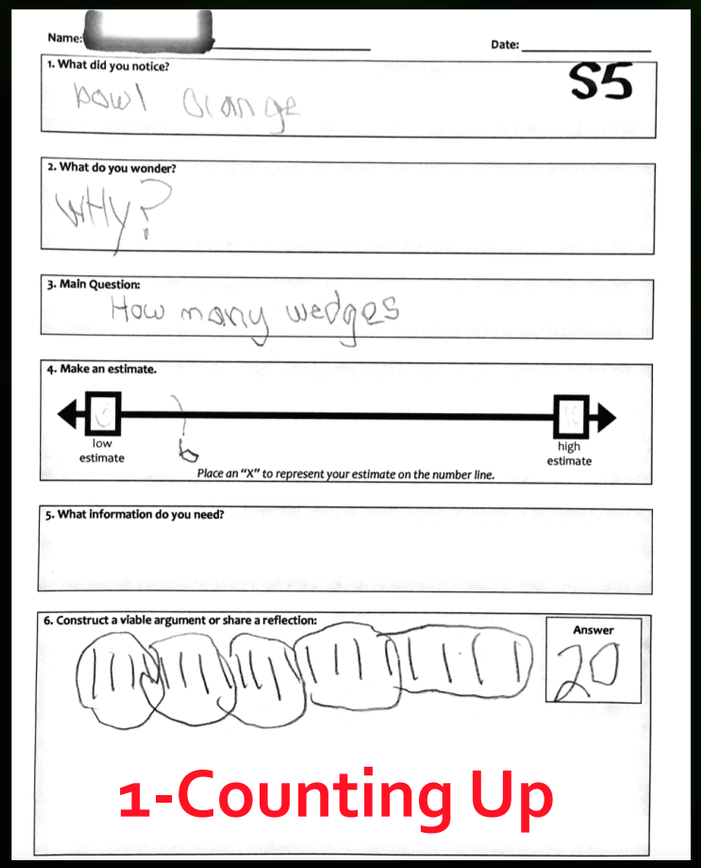
2a-Skip Counting



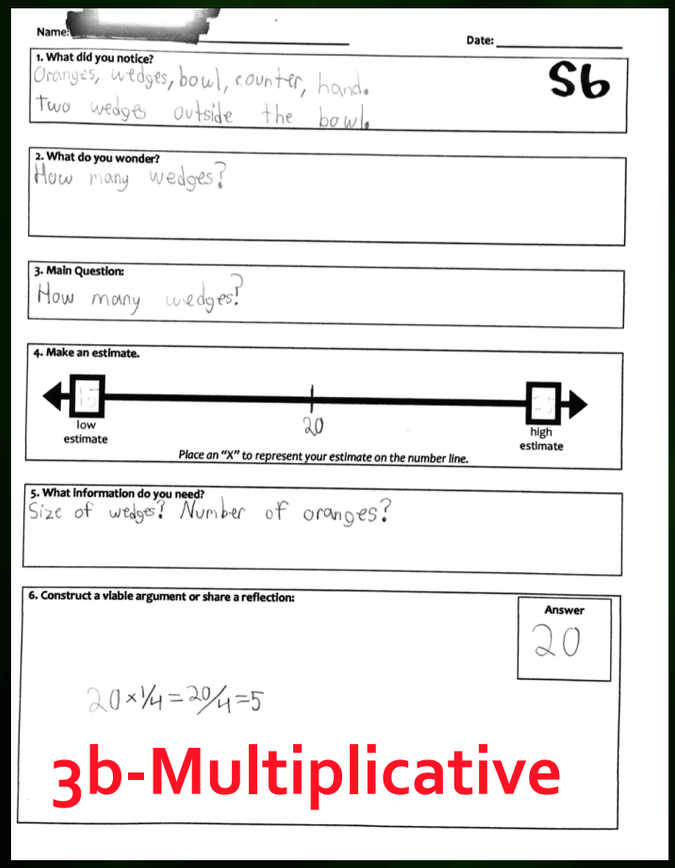
3a-Multiplicative



1b-Counting Up



1-Counting Up



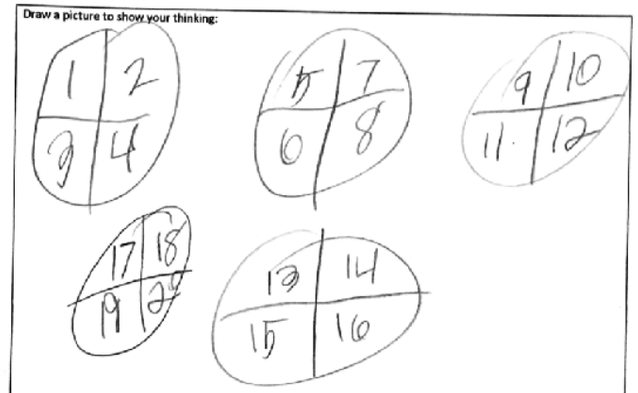
3b-Multiplicative

Name: [redacted]

S4

Estimate: 6

Draw a picture to show your thinking:



Use numbers to show your thinking:

4+4+4+4+4=20

Answer: 20

Name: [redacted]

S1

Estimate: 20

Draw a picture to show your thinking:

$\frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{4}{4} = 1$

$\frac{4}{4} + \frac{8}{4} + \frac{12}{4} + \frac{16}{4} + \frac{20}{4}$

$\frac{20}{4}$ = wedges

Use numbers to show your thinking:

Answer: 5

Name: [redacted] Date:

S3

1. What did you notice?
Bowls oranges oranges wedges

2. What do you wonder?
How many whole oranges?

3. Main Question:
How many wedges?

4. Make an estimate.

low estimate — high estimate

Place an "X" to represent your estimate on the number line.

5. What information do you need?
What are the sizes of the wedges?

6. Construct a viable argument or share a reflection:

5 Oranges
Orange cut in fourths

5 x 4 = 20

Answer: 20

Name: [redacted]

S1

Estimate

20

Draw a picture to show your thinking:

$\frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{4}{4} = 1$

$\frac{4}{4} + \frac{8}{4} + \frac{12}{4} + \frac{16}{4} + \frac{20}{4}$

$\frac{20}{4}$ = wedges

Use numbers to show your thinking:

Answer:

5

Name: [redacted] Date:

S2

1. What did you notice?

oranges glass bowl

2. What do you wonder?

how many oranges?

3. Main Question:

how many wedges?

4. Make an estimate.

low estimate — high estimate

Place an "X" to represent your estimate on the number line.

5. What information do you need?

How big is the peice

6. Construct a viable argument or share a reflection:

5 oranges

4 8 12 16 20

Answer

20

Name: [redacted] Date:

S3

1. What did you notice?

Bowls oranges oranges wedges

2. What do you wonder?

How many whole oranges?

3. Main Question:

How many wedges?

4. Make an estimate.

low estimate — high estimate

Place an "X" to represent your estimate on the number line.

5. What information do you need?

What are the sizes of the wedges?

6. Construct a viable argument or share a reflection:

5 Oranges

Orange cutin fourths

5 x 4 = 20

Answer

20

Name: [redacted]

S4

Estimate

6

Draw a picture to show your thinking:

1 2 3 4

5 6 7 8

9 10 11 12

17 18 19 20

13 14 15 16

Use numbers to show your thinking:

4+4+4+4+4=20

Answer:

20

Name: [redacted] Date:

S5

1. What did you notice?

bowl Orange

2. What do you wonder?

Why?

3. Main Question:

How many wedges

4. Make an estimate.

low estimate — high estimate

Place an "X" to represent your estimate on the number line.

5. What information do you need?

6. Construct a viable argument or share a reflection:

Answer

20

Name: [redacted] Date:

S6

1. What did you notice?

Oranges, wedges, bowl, counter, hand. Two wedges outside the bowl.

2. What do you wonder?

How many wedges?

3. Main Question:

How many wedges?

4. Make an estimate.

low estimate — 20 — high estimate

Place an "X" to represent your estimate on the number line.

5. What information do you need?

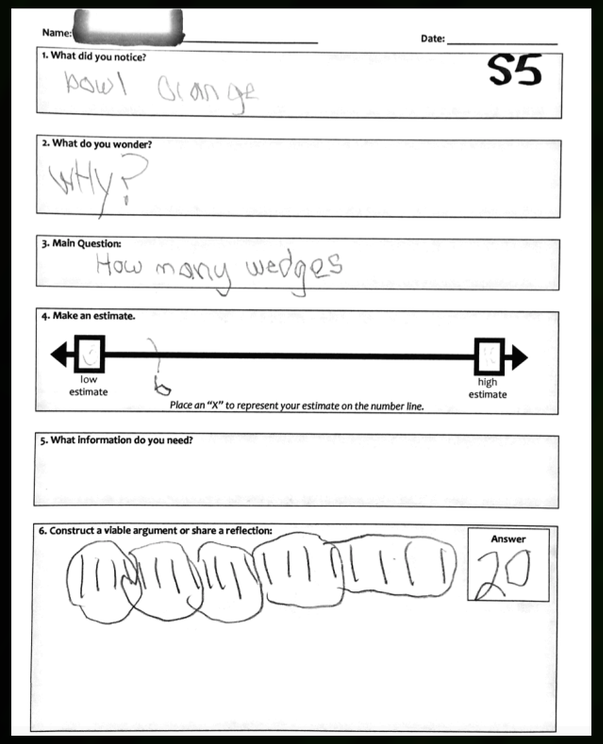
Size of wedges? Number of oranges?

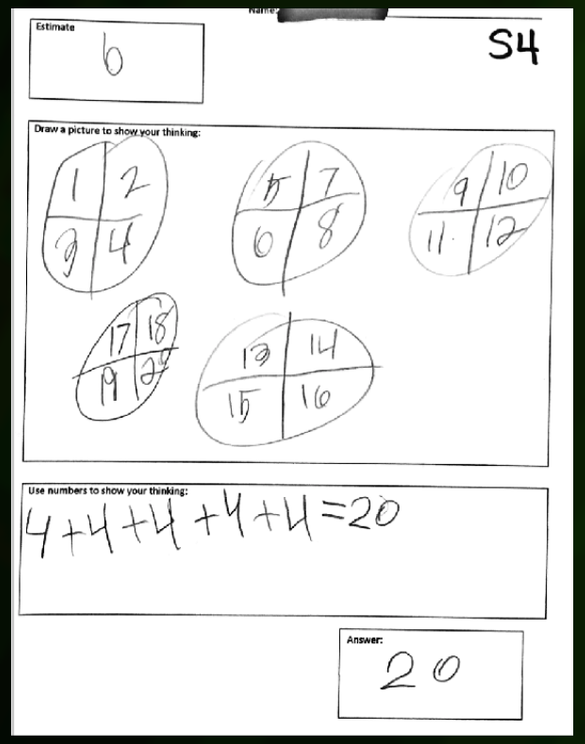
6. Construct a viable argument or share a reflection:

$20 \times \frac{1}{4} = \frac{20}{4} = 5$

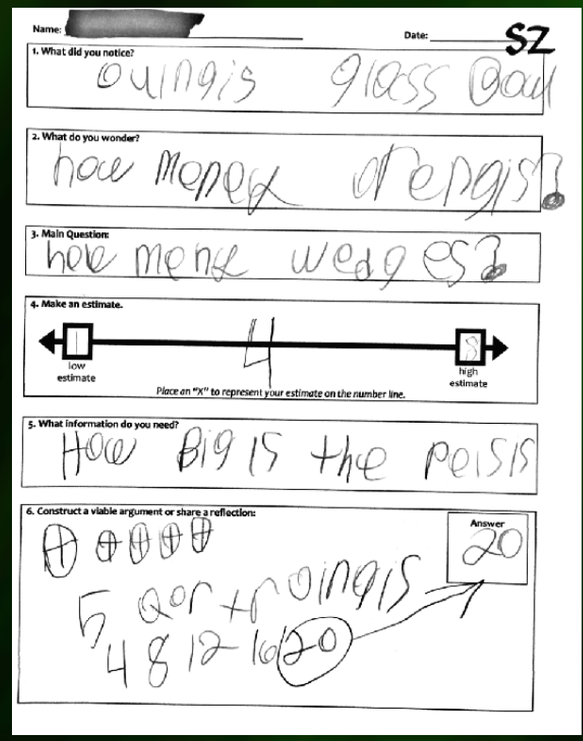
Answer

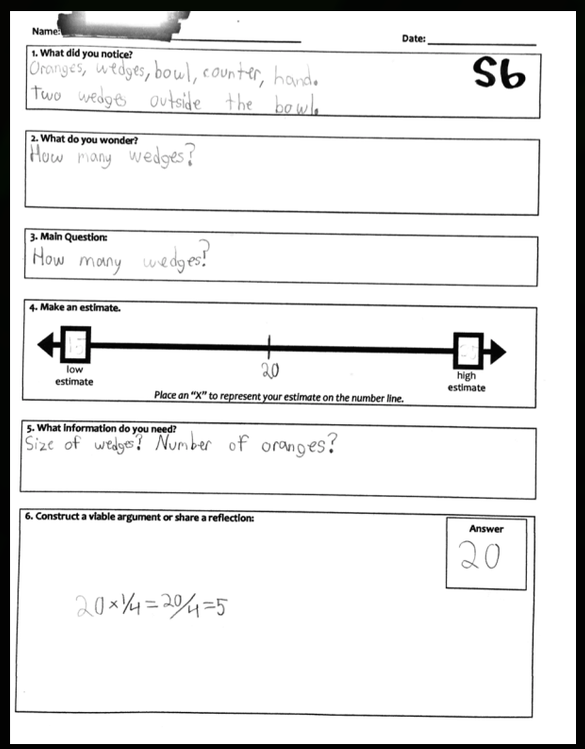
20

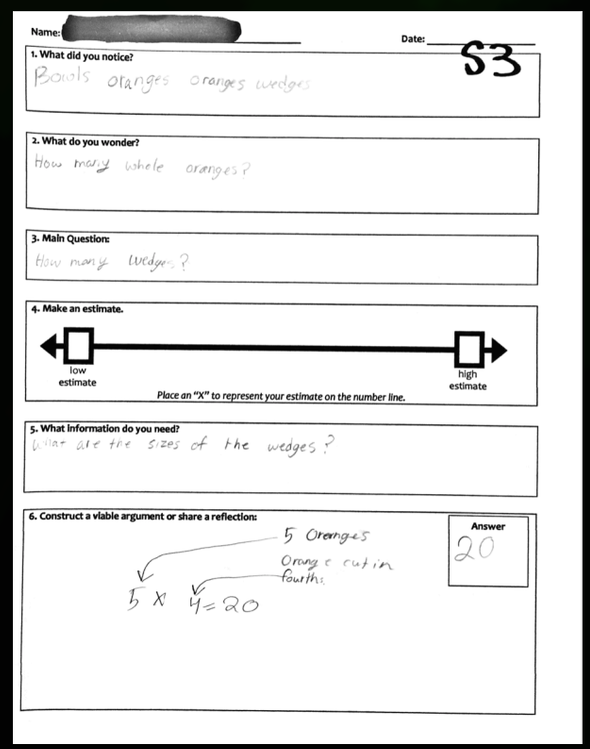




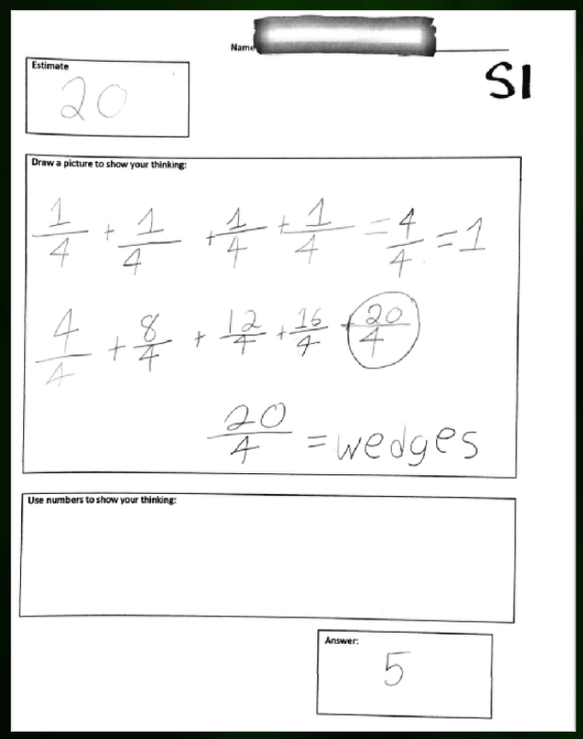
Group 1







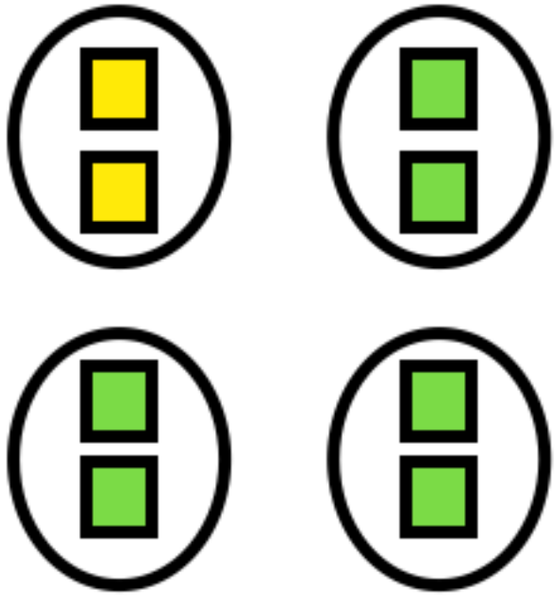
Group 2



Group 3

Unit Fractions

Representation of a Fraction

Area	Length	Set
		

unit fraction $\frac{1}{a}$

Say this fraction

$$\frac{3}{4}$$

Say this fraction

$$\frac{3}{4}$$

three one-fourths

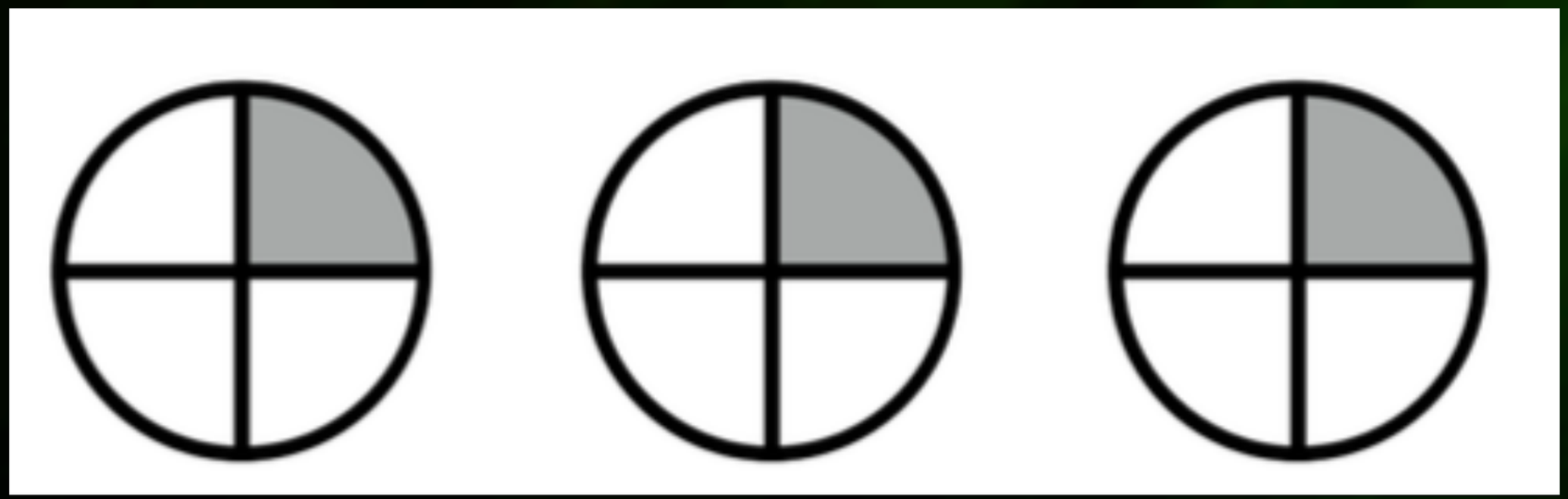
Fletchy

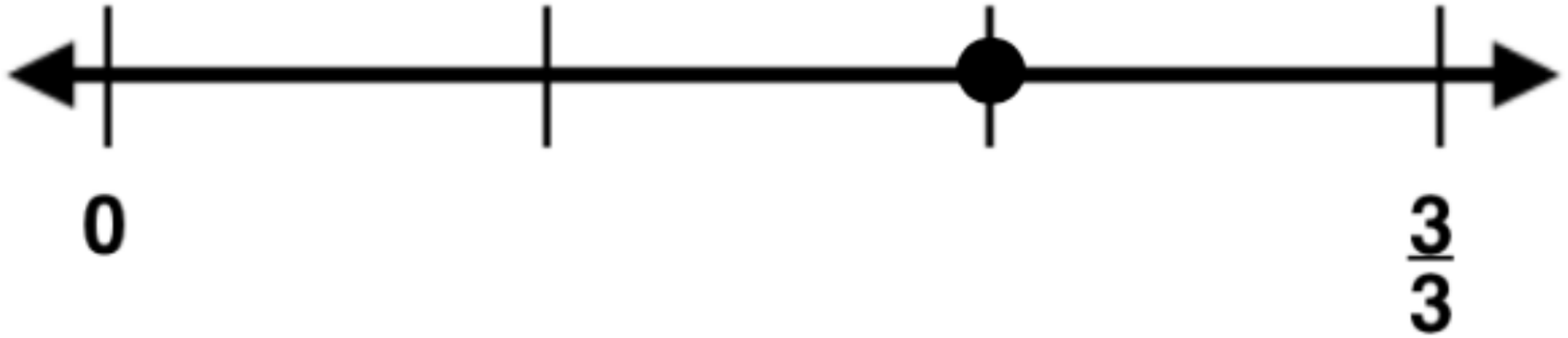
$$3 = 1 + 1 + 1$$

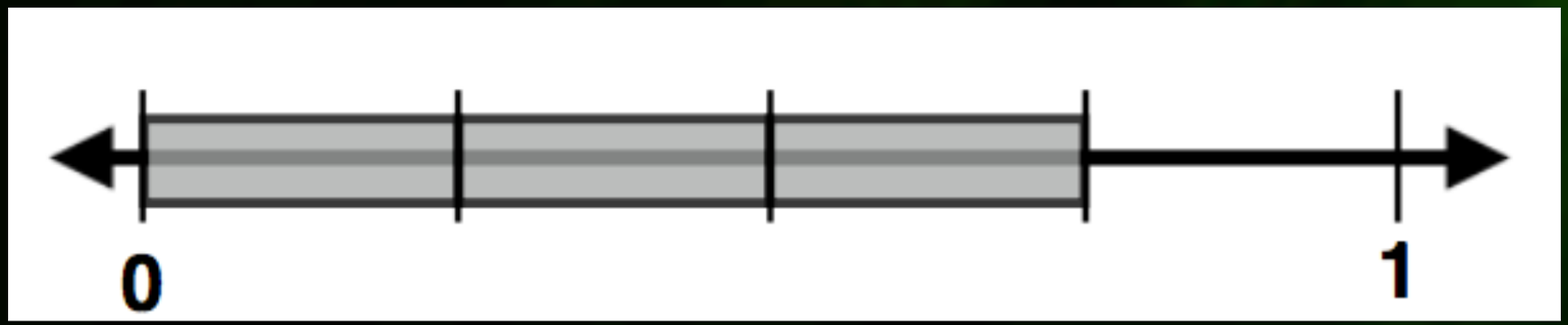
$$3 = 1 + 1 + 1$$

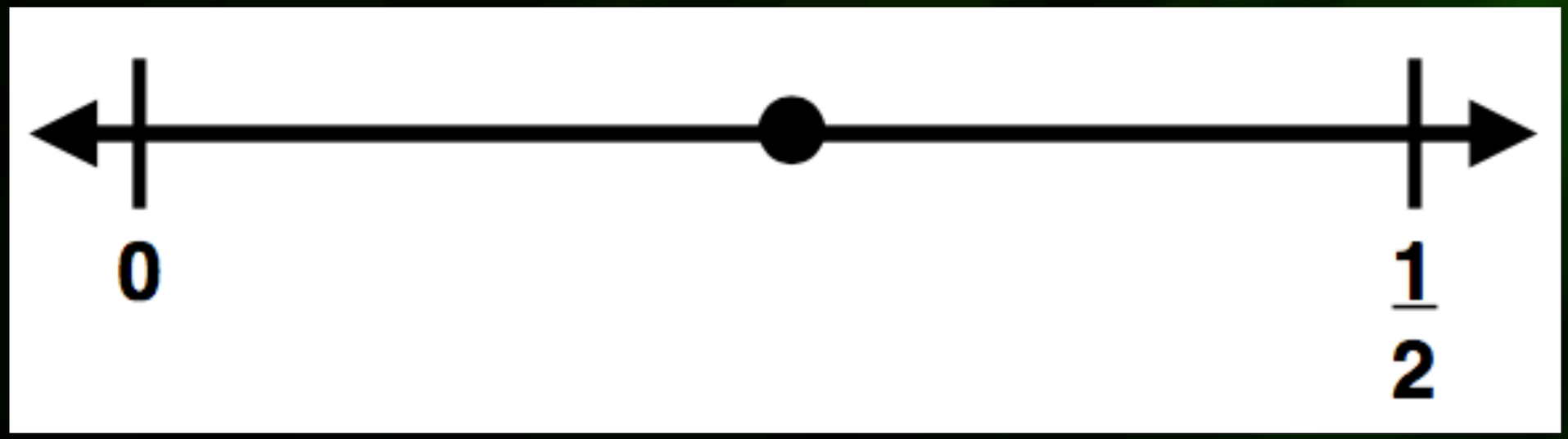
$$\frac{3}{4} = \frac{1}{4} + \frac{1}{4} + \frac{1}{4}$$

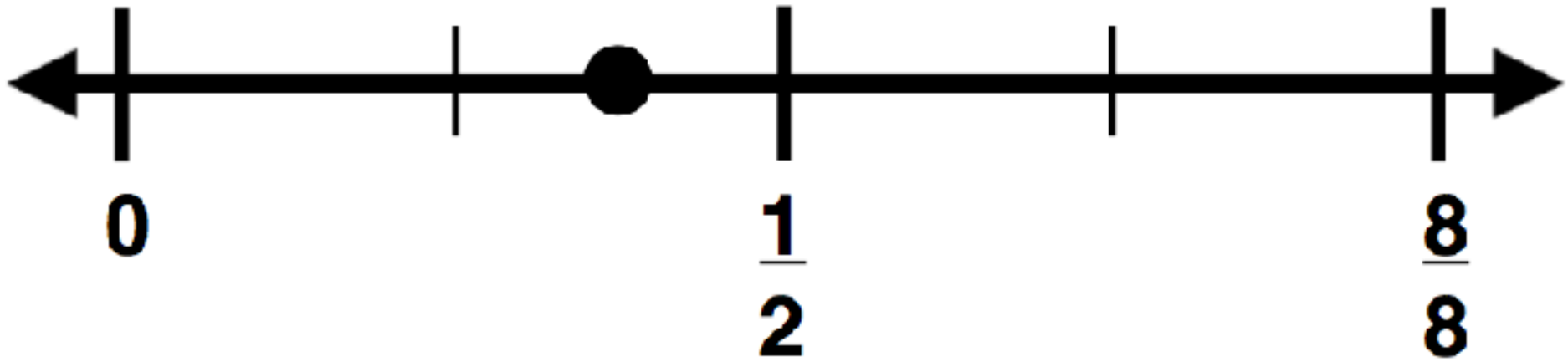
Fletchy

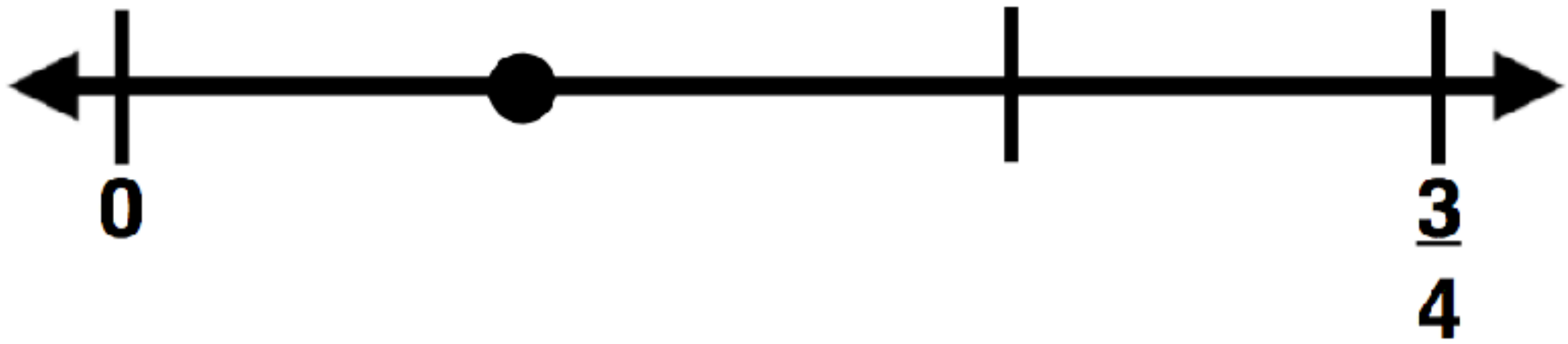



0
3/3


0
1


0
1
2


0
1/2
8/8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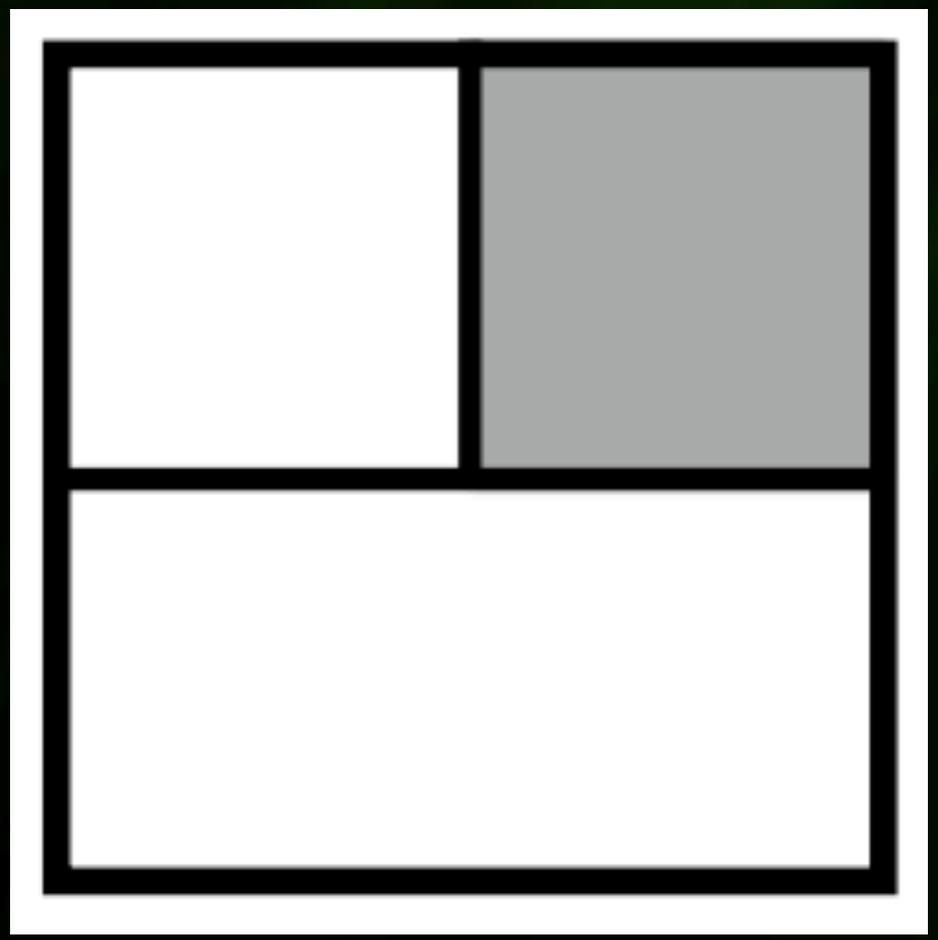
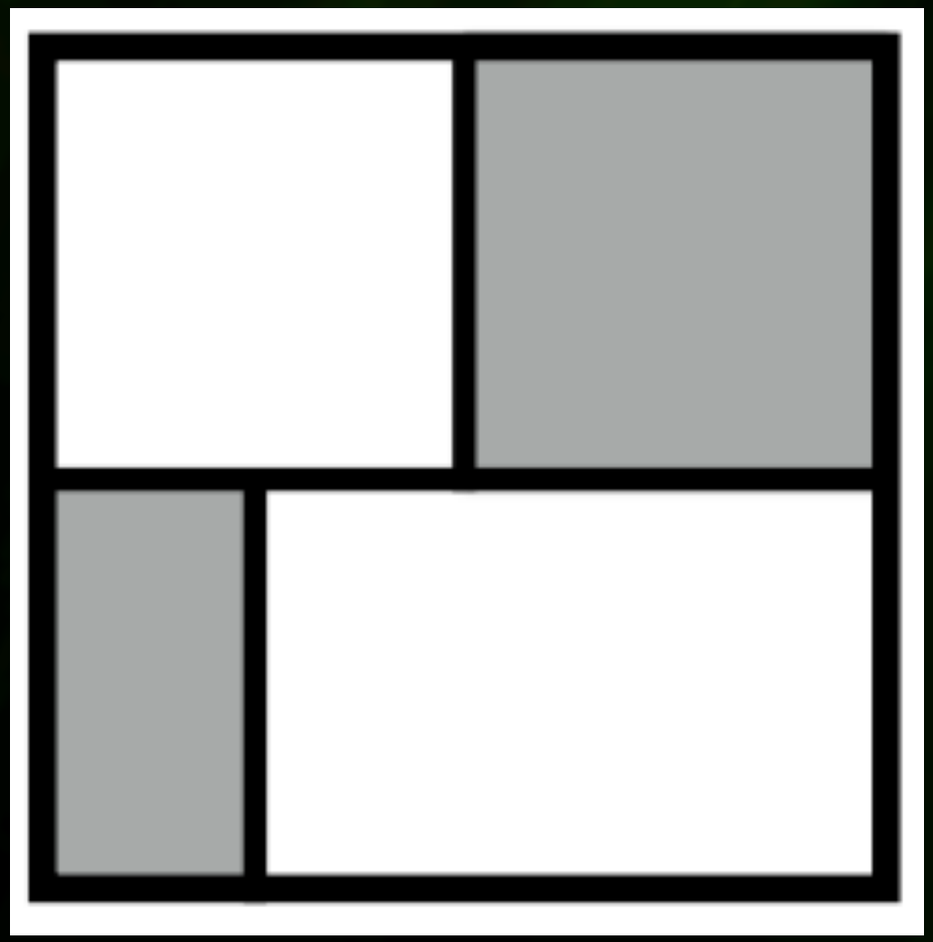
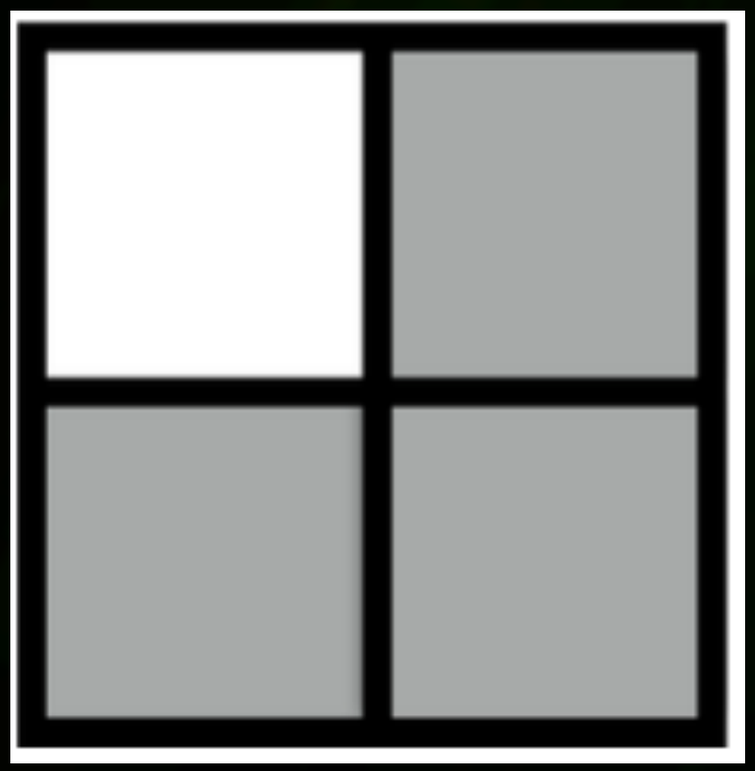
3
4



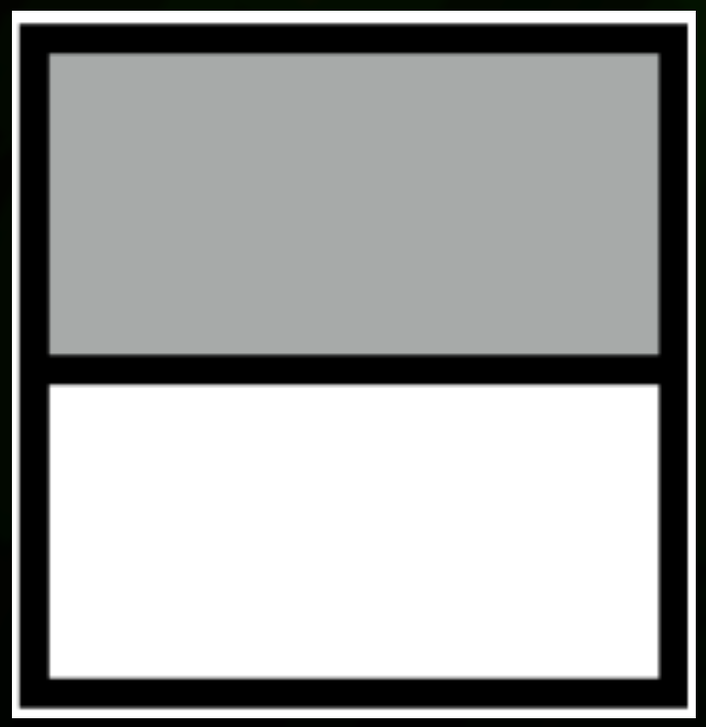


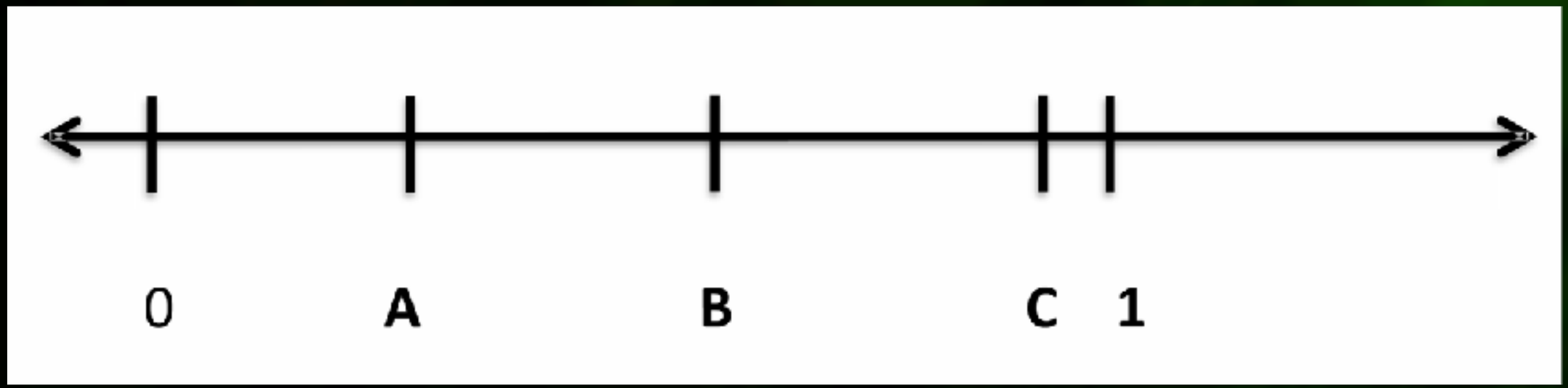
What's the Sum?

What's the Sum?



What's the Sum?




0
A
B
C
1

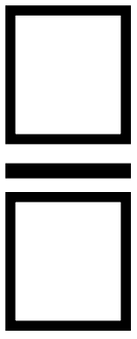
½
A
2
B

Open Middle

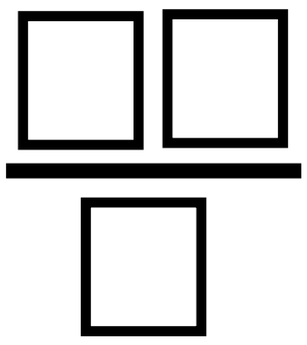
CCSS.MATH.CONTENT.4.NF.A.2

Directions: Using the whole numbers 1-9 once each, create and place 4 fractions *greater than 1* on the number line in the correct order. *(fractions B & C are equal)*

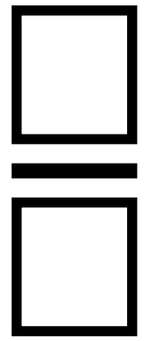
A



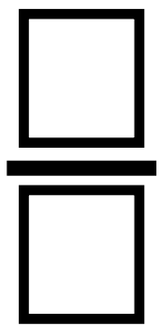
B



D



C



@gfletchy

Equivalent Fractions

Equal Fraction

$$\frac{2}{3} = \frac{\blacksquare}{\blacksquare} \qquad \frac{3}{4} = \frac{\blacksquare}{\blacksquare}$$

$$\frac{2}{6} = \frac{\blacksquare}{\blacksquare}$$

Equal fraction

$\frac{2}{3} = \frac{5}{6}$ $\frac{3}{4} = \frac{7}{8}$

$\frac{2}{6} = \frac{5}{9}$

Equal fraction

WTF?

$$\frac{2}{6} = \frac{5}{9}$$

Equal fraction

WTF?

What's This Fraction?

$$\frac{2}{6} = \frac{5}{9}$$

Equal fraction

$\frac{2}{3} = \frac{5}{6}$ $\frac{3}{4} = \frac{7}{8}$

$\frac{2}{6} = \frac{5}{9}$

Name _____ Date _____

1. Draw a rectangular fraction model to find the sum. Simplify your answer, if possible.

a. $\frac{1}{4}+\frac{1}{3}=$

b. $\frac{1}{4}+\frac{1}{5}=$

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G5-M3-SE-1.3.0-05.2015

Name _____ Date _____

1. Draw a rectangular fraction model to find the sum. Simplify your answer, if possible.

a. $\frac{1}{4}+\frac{1}{3}=$

b. $\frac{1}{4}+\frac{1}{5}=$

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It is possible to over-emphasize the importance of simplifying fractions in this way. There is no mathematical reason why fractions must be written in simplified form, although it may be convenient to do so in some cases.

://commoncoretools.me/wp-content/uploads/2011/08/ccss_progression_nf_35_2013_09_19.pdf

What about “the test”

$\frac{3}{6} + \frac{1}{6}$ is equal to which of the following?

a. $\frac{4}{12}$

b. $\frac{8}{12}$

c. $\frac{3}{6}$

d. None of the above

Simplifying

Equivalence

Fletchy

Comparing Fractions

Which girl ate more apple?

Which girl ate more apple?

What information do you need to know?

Pause
II

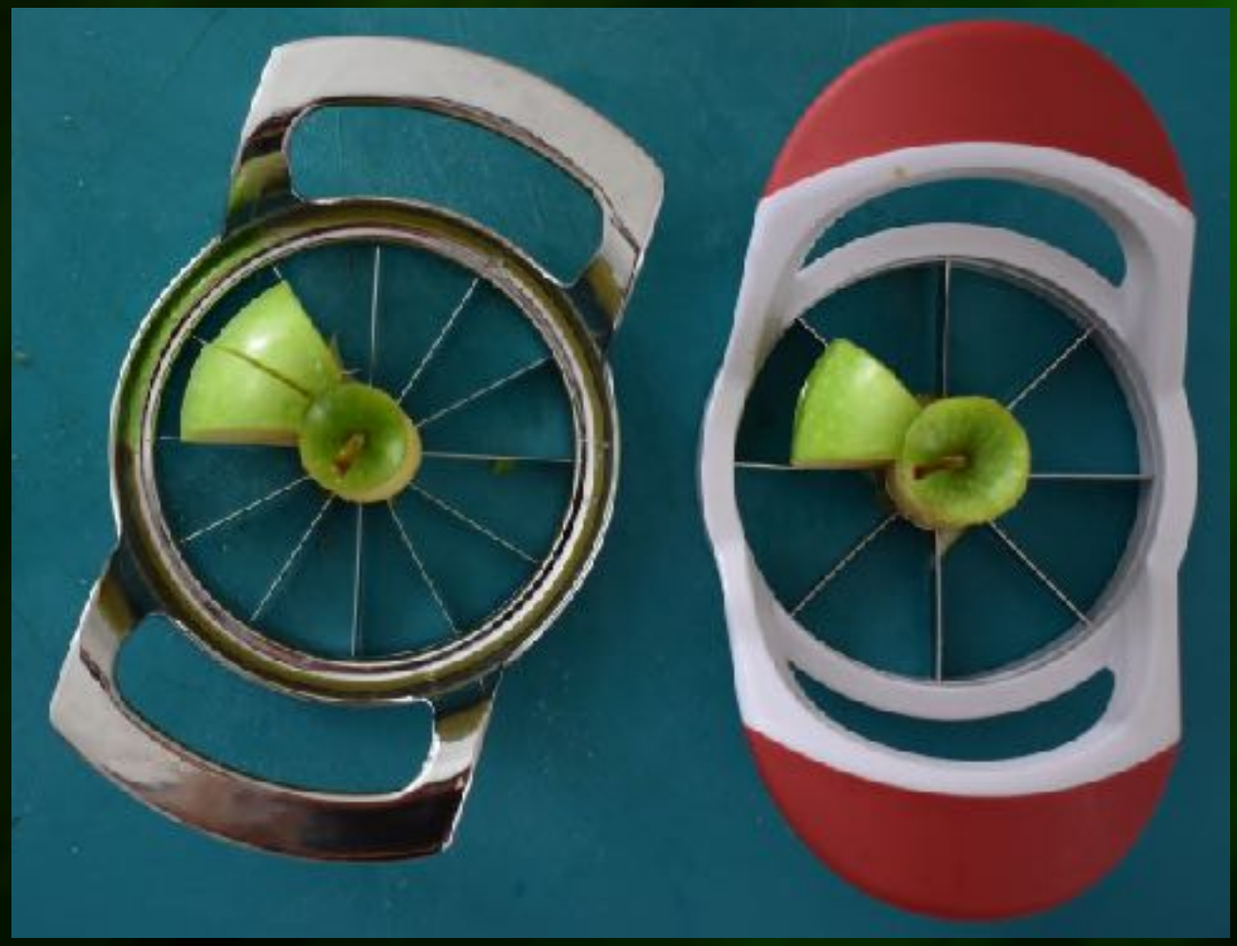
twelfths

Pause

||

eighths

Apple Eat Off Act-3



Big sister ate $\frac{10}{12}$ of an apple and little sister ate $\frac{7}{8}$ of an apple. Which sister ate more apple?

The **5** practices are:

1. **Anticipating** student responses to challenging mathematical tasks;
2. **Monitoring** students' work on and engagement with the tasks;
3. **Selecting** particular students to present their mathematical work;
4. **Sequencing** the student responses that will be displayed in a specific order and;
5. C**onnecting** different students' responses and connecting the responses to key mathematical ideas.

MTMS: Vol. 14, No. 9, May 2009-5 Practices for Orchestrating Productive Mathematics Discussions

6. Construct a viable argument or share a reflection:

Answer

$\frac{10}{12} > \frac{7}{10}$

ten is more than seven

6. Construct a viable argument or share a reflection:

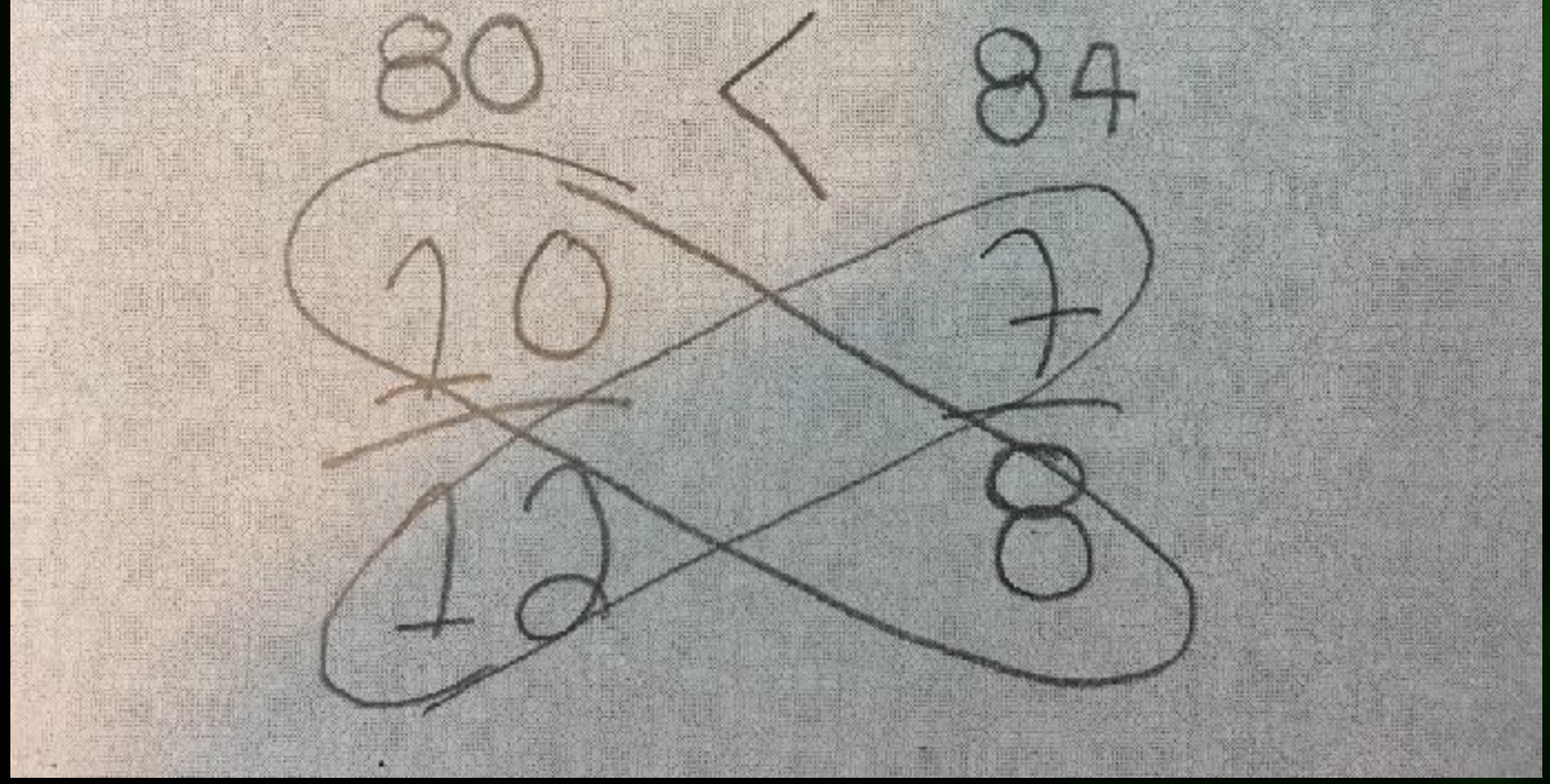
Answer

$\frac{10}{12}$ 2 pieces left over

$\frac{1}{8}$ 1 piece leftover more

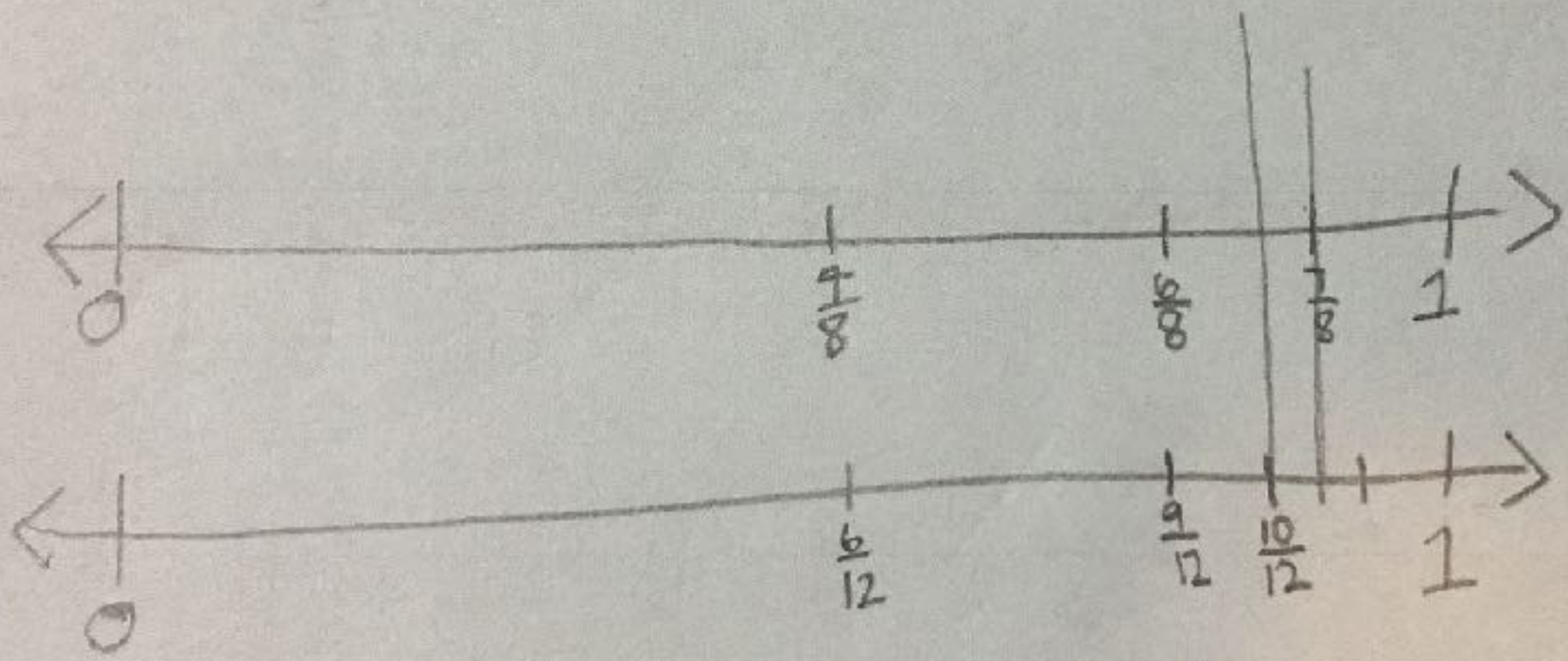
$\frac{10}{12} > \frac{1}{8}$

6. Construct a viable argument or share a reflection:



6. Construct a viable argument or share a reflection:

$\frac{7}{8} > \frac{10}{12}$



6. Construct a viable argument or share a reflection:

$\frac{7}{8}$ $\frac{10}{12}$ → $\frac{1}{8}$ is a smaller pice left over

$\frac{1}{8}$ $\frac{2}{12} = \frac{1}{6}$ $\frac{7}{8} > \frac{10}{12}$

6. Construct a viable argument or share a reflection:

$\frac{10}{12} \times 2 \quad \frac{20}{24}$

$\frac{7}{8} \times 3 \quad \frac{21}{24}$

$\frac{20}{24} < \frac{21}{24}$

$\frac{10}{12} < \frac{7}{8}$

6. Construct a viable argument or share a reflection:

S1

$\frac{7}{8}$ $\frac{10}{12}$ → $\frac{1}{8}$ is a smaller pice left over

$\frac{1}{8}$ $\frac{2}{12} = \frac{1}{6}$ $\frac{7}{8} > \frac{10}{12}$

6. Construct a viable argument or share a reflection:

Answer

S2

$\frac{10}{12}$ 2 pices left over

$\frac{1}{8}$ 1 piece leftover more

$\frac{10}{12} > \frac{1}{8}$

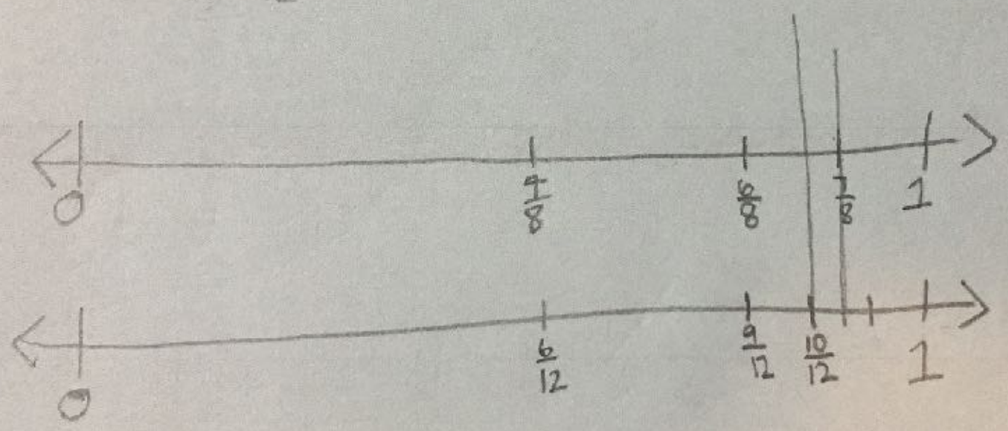
Pause

II

6. Construct a viable argument or share a reflection:

S3

$\frac{7}{8} > \frac{10}{12}$



6. Construct a viable argument or share a reflection:

S4

$\frac{10}{12} \times 2 \frac{20}{24}$

$\frac{7}{8} \times 3 \frac{21}{24}$

$\frac{20}{24} < \frac{21}{24}$

$\frac{10}{12} < \frac{7}{8}$

6. Construct a viable argument or share a reflection:

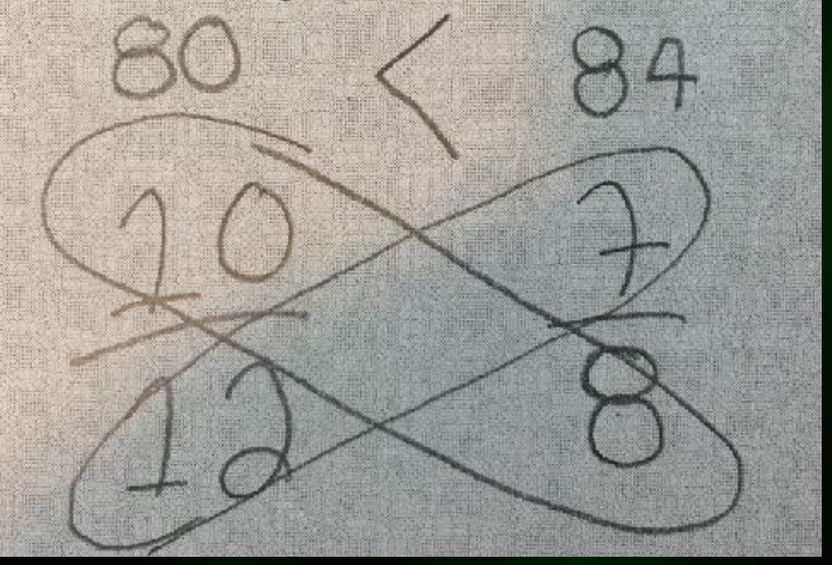
Answer

S5

$\frac{10}{12} > \frac{7}{10}$ ten is more than seven

6. Construct a viable argument or share a reflection:

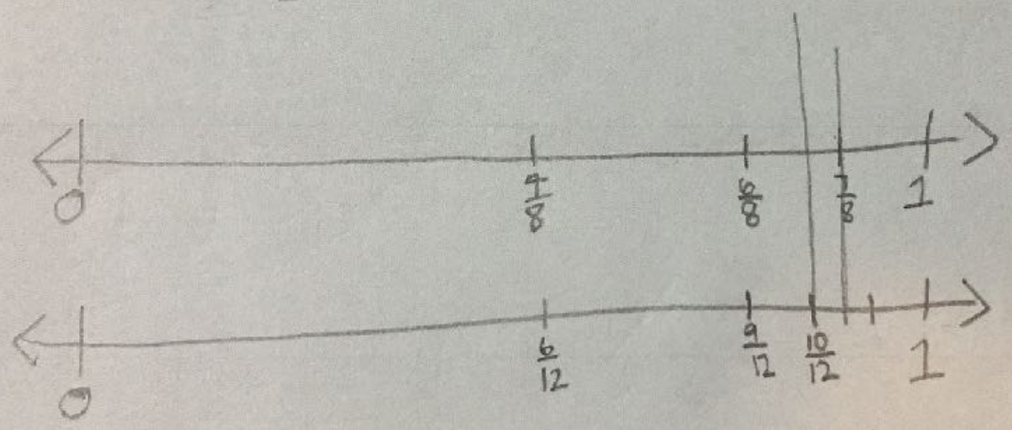
S6



6. Construct a viable argument or share a reflection:

S3

$\frac{7}{8} > \frac{10}{12}$



6. Construct a viable argument or share a reflection:

S4

$\frac{10}{12} \times 2 \frac{20}{24}$

$\frac{7}{8} \times 3 \frac{21}{24}$

$\frac{20}{24} < \frac{21}{24}$

$\frac{10}{12} < \frac{7}{8}$

6. Construct a viable argument or share a reflection:

S1

$\frac{7}{8}$ $\frac{10}{12}$

$\frac{1}{8}$ is a smaller pice left over

$\frac{1}{8}$

$\frac{2}{12} = \frac{1}{6}$

$\frac{7}{8} > \frac{10}{12}$

It Takes 3 to Prove it to Me

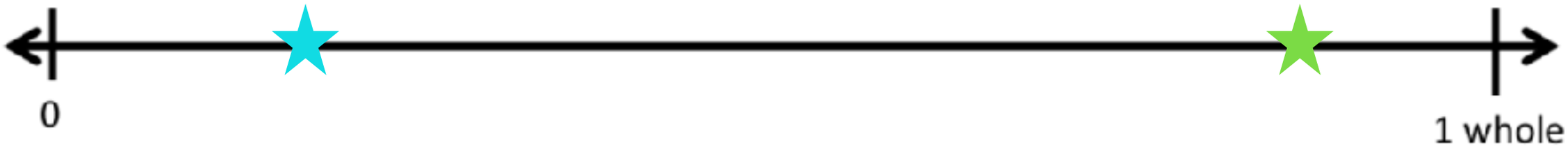
$\frac{2}{3}$	$\frac{6}{12}$	$\frac{4}{5}$	$\frac{3}{4}$	$\frac{2}{8}$
$\frac{9}{12}$	$\frac{3}{9}$	$\frac{6}{8}$	$\frac{3}{12}$	$\frac{4}{8}$
$\frac{7}{8}$	$\frac{5}{6}$	$\frac{3}{6}$	$\frac{8}{12}$	$\frac{4}{6}$
$\frac{3}{5}$	$\frac{1}{3}$	$\frac{1}{4}$	$\frac{6}{8}$	$\frac{2}{6}$

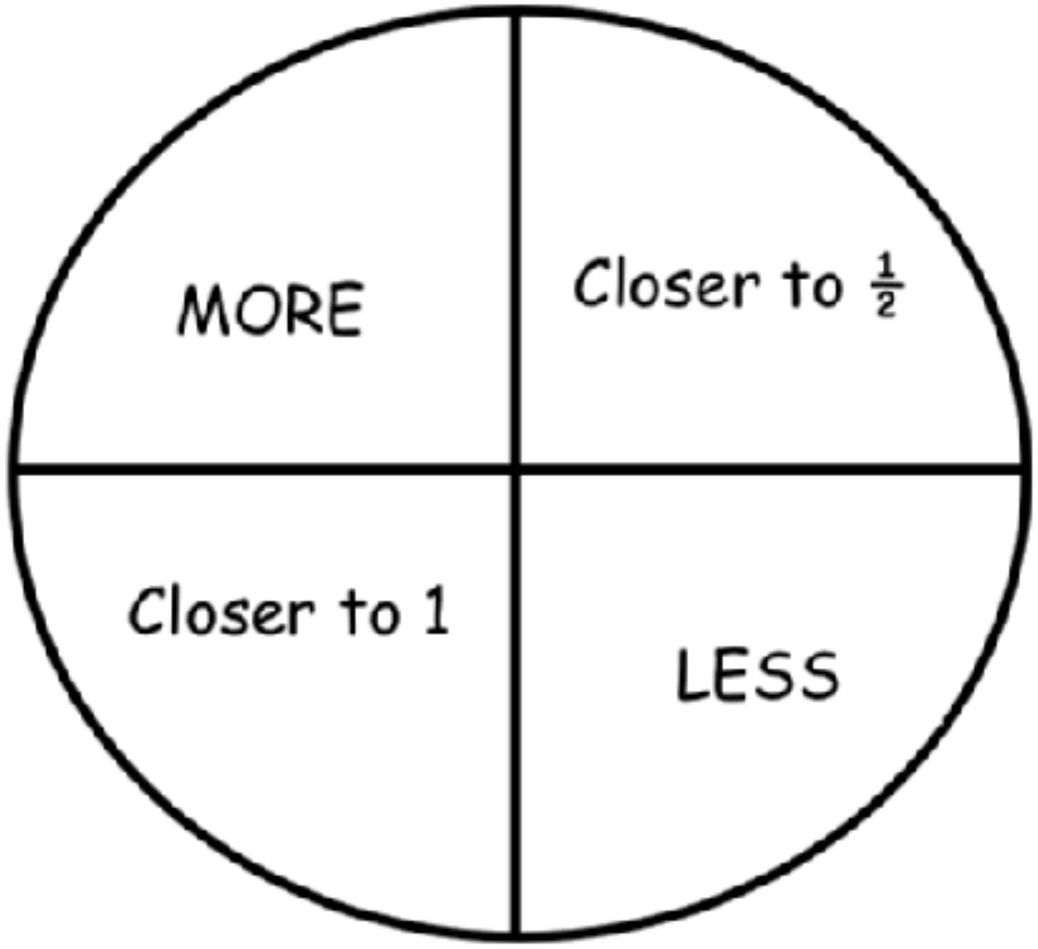
$\frac{2}{3}$	$\frac{6}{12}$	$\frac{4}{5}$	$\frac{3}{4}$	$\frac{2}{8}$
$\frac{9}{12}$	$\frac{3}{9}$	$\frac{6}{8}$	$\frac{3}{12}$	$\frac{4}{8}$
$\frac{7}{8}$	$\frac{5}{6}$	$\frac{3}{6}$	$\frac{8}{12}$	$\frac{4}{6}$
$\frac{3}{5}$	$\frac{1}{3}$	$\frac{1}{4}$	$\frac{6}{8}$	$\frac{2}{6}$

It Takes 3 …to Prove it to Me!

Cards are evenly distributed between two players. Each player turns over their top card and the spinner is spun. Whichever player's card matches the spinner gets to keep the 2 fraction cards. The player with the most cards after every card has been played wins. In order to prove which card is *more* or *less*, players must go through the following steps:

1. Players must first discuss which fraction they think matches the spinner (why and how they know) (abstract)
2. Players must identify where each card would be on the number line by placing a chip. (representation)
3. Players verify their answer by modeling through fraction bars, circles, etc… (concrete)





$\frac{5}{6}$

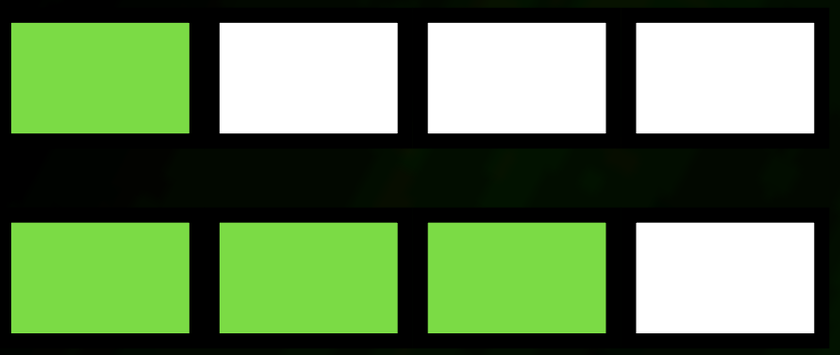
$\frac{2}{8}$

$\frac{2}{3}$	$\frac{6}{12}$	$\frac{4}{5}$	$\frac{3}{4}$	$\frac{2}{8}$
$\frac{9}{12}$	$\frac{3}{9}$	$\frac{6}{8}$	$\frac{3}{12}$	$\frac{4}{8}$
$\frac{7}{8}$	$\frac{5}{6}$	$\frac{3}{6}$	$\frac{8}{12}$	$\frac{4}{6}$
$\frac{3}{5}$	$\frac{1}{3}$	$\frac{1}{4}$	$\frac{6}{8}$	$\frac{2}{6}$

$\frac{1}{4}$ $\frac{3}{4}$

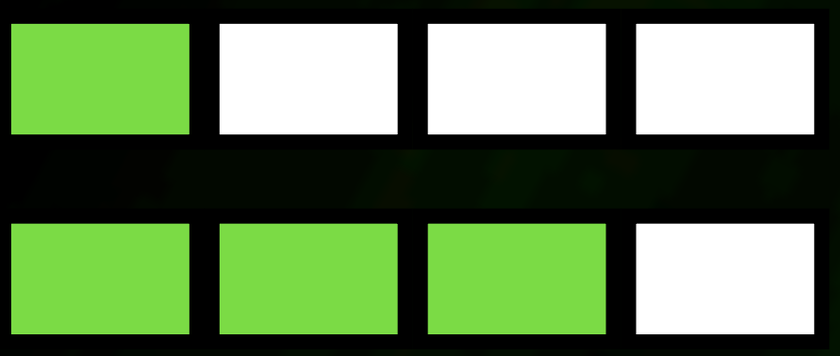
$\frac{1}{4}$ $\frac{3}{4}$

Common Denominator



$\frac{1}{4}$ $\frac{3}{4}$

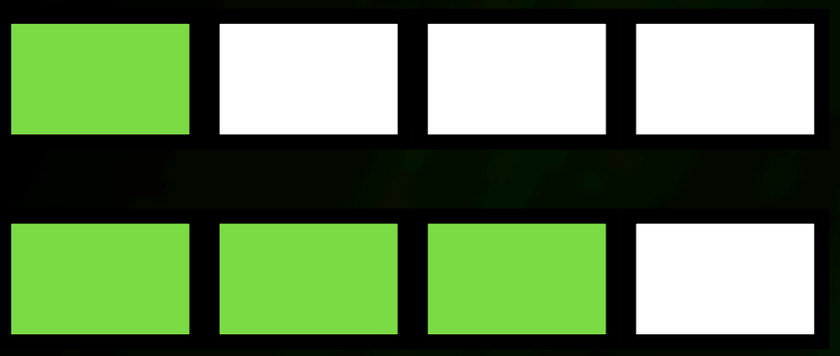
Common Denominator



$\frac{5}{6}$ $\frac{3}{4}$

$\frac{1}{4}$ $\frac{3}{4}$

Common Denominator

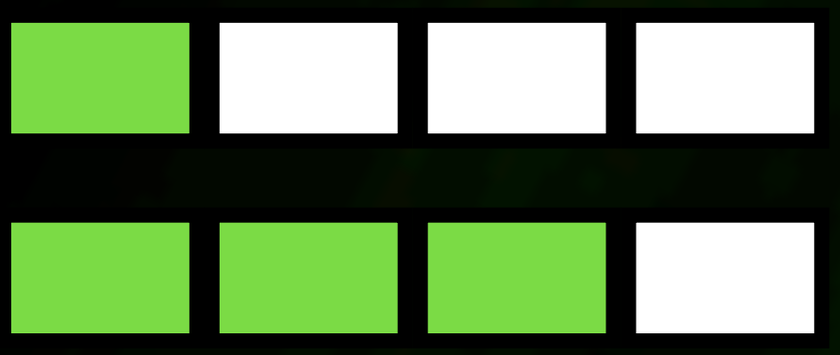


$\frac{5}{6}$ $\frac{3}{4}$

Missing Parts

$\frac{1}{4}$ $\frac{3}{4}$

Common Denominator

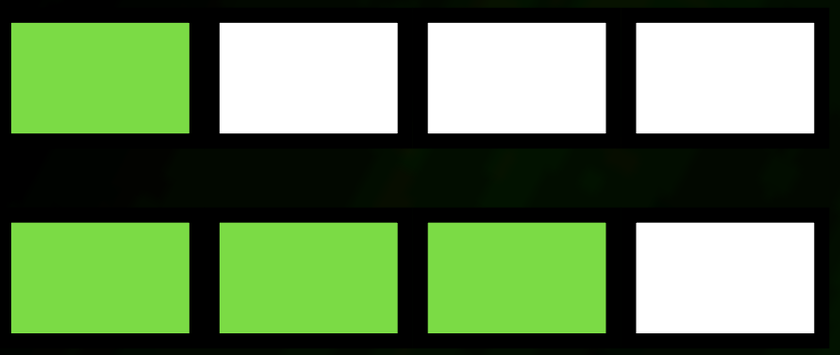


$\frac{5}{6}$ $\frac{3}{4}$

Missing Parts

$\frac{1}{4}$ $\frac{3}{4}$

Common Denominator



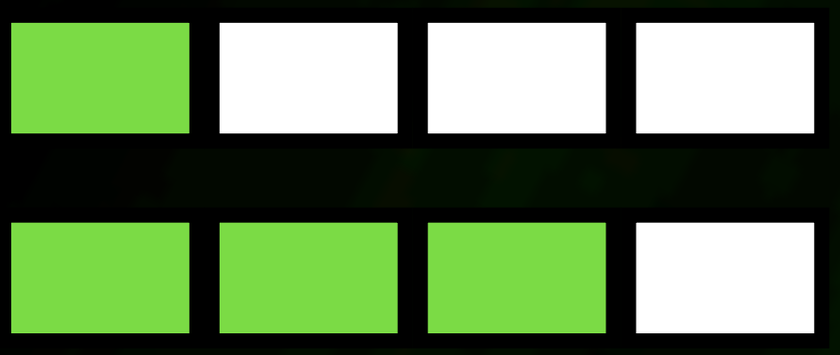
$\frac{5}{6}$ $\frac{3}{4}$

Missing Parts

$\frac{2}{4}$ $\frac{4}{6}$

$\frac{1}{4}$ $\frac{3}{4}$

Common Denominator



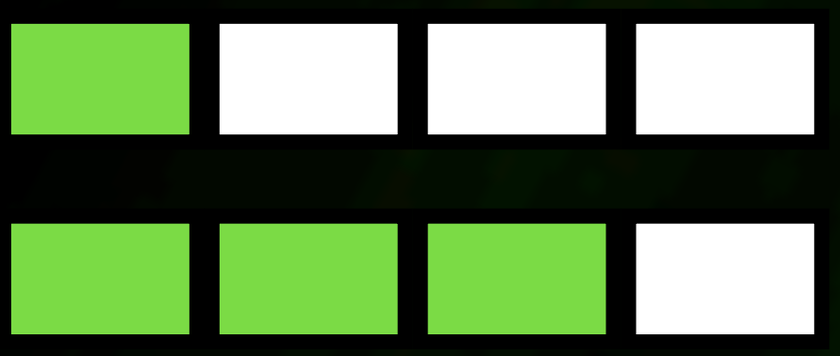
$\frac{5}{6}$ $\frac{3}{4}$

Missing Parts

$\frac{2}{4}$ $\frac{4}{6}$

$\frac{1}{4}$ $\frac{3}{4}$

Common Denominator

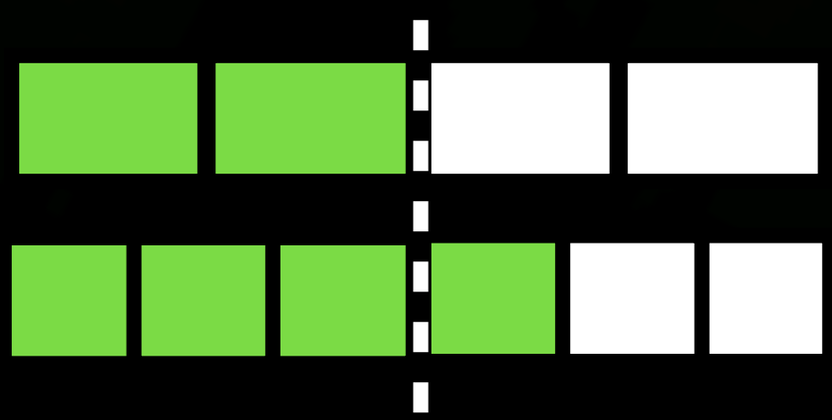


$\frac{5}{6}$ $\frac{3}{4}$

Missing Parts

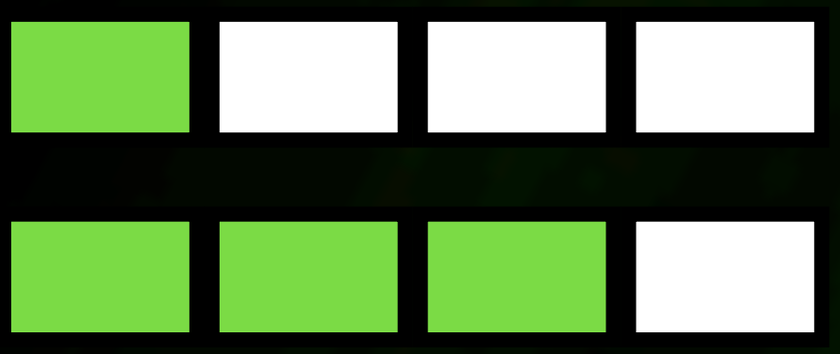
$\frac{2}{4}$ $\frac{4}{6}$

Benchmark



$\frac{1}{4}$ $\frac{3}{4}$

Common Denominator

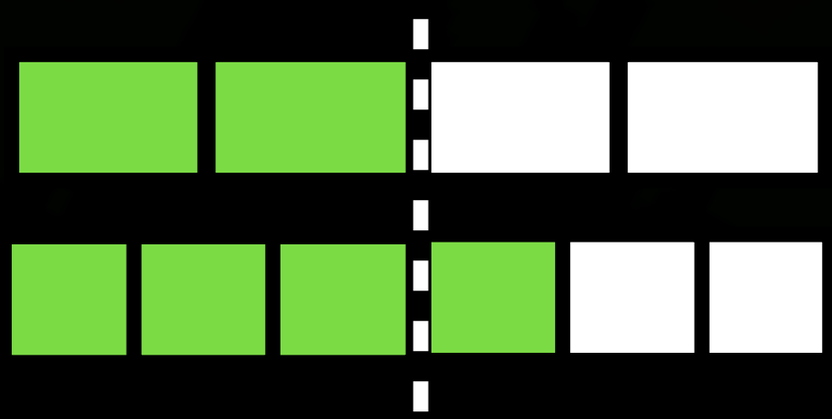


$\frac{5}{6}$ $\frac{3}{4}$

Missing Parts

$\frac{2}{4}$ $\frac{4}{6}$

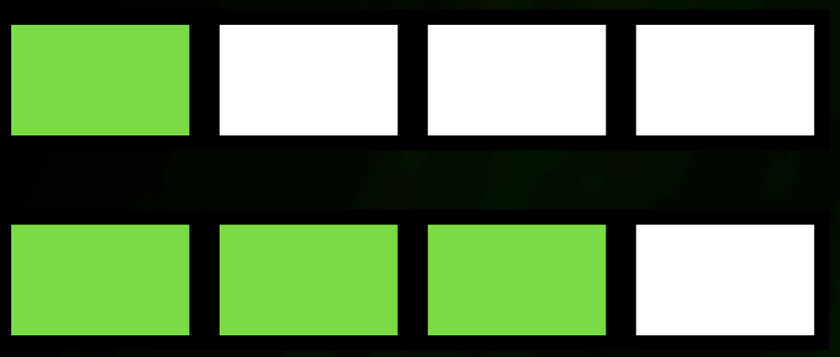
Benchmark



$\frac{2}{3}$ $\frac{2}{5}$

$\frac{1}{4}$ $\frac{3}{4}$

Common Denominator

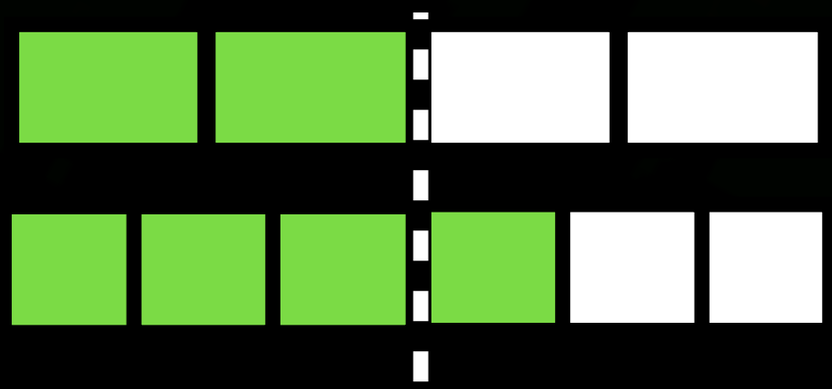


$\frac{5}{6}$ $\frac{3}{4}$

Missing Parts

$\frac{2}{4}$ $\frac{4}{6}$

Benchmark

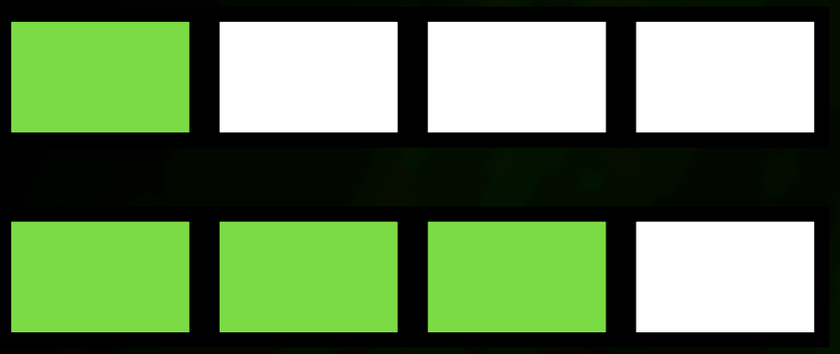


$\frac{2}{3}$ $\frac{2}{5}$

Common Numerator

$\frac{1}{4}$ $\frac{3}{4}$

Common Denominator



Unit Fraction Understanding

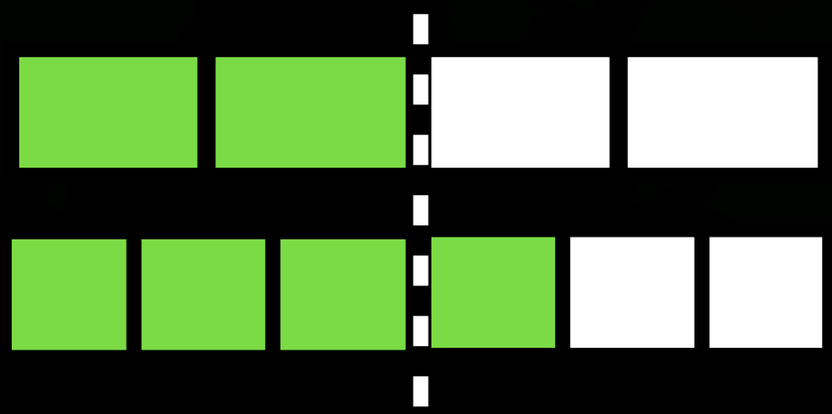
$\frac{5}{6}$ $\frac{3}{4}$

Missing Parts

Unit Fraction Understanding

$\frac{2}{4}$ $\frac{4}{6}$

Benchmark



$\frac{2}{3}$ $\frac{2}{5}$

Common Numerator

Unit Fraction Understanding

$$\frac{8}{11} \qquad \frac{4}{7}$$

$$\frac{8}{11} \qquad \frac{8}{14}$$

Making Sense Series

The Progression of Fractions
Meaning, Equivalence, & Comparison

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