#### **Examining Student Work for**

#### **Mathematical Thinking**

(grades 3-8)

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Presented to: Sacred Heart, Hampton
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#### Agenda

- SacredHeartMath2016
- 1. Introduction
- 2. A 5<sup>th</sup>/6<sup>th</sup> grade fractions writing prompt
- 3. Student-generated calculation methods
- 4. MARS formative assessment tasks (you choose your grade level and task)
- 5. Wrap-up

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### **Examining Student Work**

Why, when adding and subtracting decimals, must you line up the decimal points? You may use pictures to help you explain, but you must also explain in words.

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#### Steven

- Procedural only
- Focused on the answer
- Example shows procedure

You may use pictures to help you explain, but you must also explain in words.

93.46V

93.46V

104 have to like up the

15 cay for the point because

15 cay for the problem. And

1040 accidental think

14 cay accidental think

15 cay accidental think

16 cay accidental think

17 cay accidental think

18 cay accidental t

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#### <u>Anna</u>

- Conceptual
- Focused on place value
- Uses base ten blocks in picture but doesn't explain them

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#### **Caitlin**

- Conceptual
- Focused on place value
- Money example in the text matches her calculation example

why, when adding and subtracting decimals, must you line up the decimal points? for may use pictures to help you explain, but you must also explain in words.

O.090
Right 1.000

Right 1.000

No 90

1.000

Right 1.0000

Right 1.0000

Right 1.0000

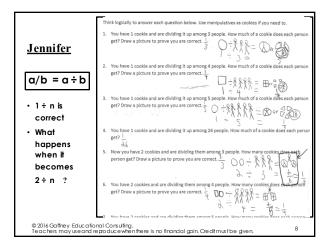
Right

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## **Student Thinking**

- All 3 students could add decimals correctly.
- The differences were in their level of thinking about the problem conceptually.
- Student thinking tells us about student understandings and student misconceptions.

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#### **Student Thinking**

- Jennifer has a misconception. What is it?
- Jennifer is confused about the whole.
   Is one cookie the whole or is the group of cookies the whole?
- Student thinking tells us about student understandings and student misconceptions.

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## **A Fractions Writing Prompt**

Explain why 5 x 5/6 equals 4 1/6.

You may not use the algorithm to explain. You must explain why the answer actually makes sense.

In groups of 2-3, examine the index cards and discuss the questions on the back.

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#### **Student-Generated Calculation Methods**

(Mostly student-generated anyway....)

- Posted around the room are studentgenerated calculation methods. All of these methods DO work.
- **Begin anywhere.** Look at each method and try to figure out what the student was thinking.
- Can you figure out why each method works?

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Why do these methods work?

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A

2 7 6

+ 8 9

1 5

1 5

2 3 6 5

B

2 7 6

+ 1 1 8 9

3 6 5

C

2 7 6 → 2 6 5

+ 8 9 → 1 0 0

3 6 5

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D

2 9

3 0 10 7

- 2 8 4
2 7 2 3

E 3 0 0 7
- 2 8 4
- 1 6
+ 7 0 0
+ 2 0 0 0
+ 7
2 7 2 3

F

3 0 0 7 → 3 0 2 3

- 2 8 4 → 3 0 0

2 7 2 3

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G

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H  $126 \times 48$   $= 252 \times 24$   $= 504 \times 12$   $= 1008 \times 6$  = 6,048© 2016 Coffrey Educational Consultration

ī

$$13 \times 14$$

$$= (12 \times 12) + (12 \times 2) + 14$$

$$= 144 + 24 + 14$$

$$= 182$$

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5 7
x 2 6
4 2
3 0 0
1 4 0
+ 1 0 0 0
1 4 8 2

K

$$57 \times 26 =$$
 $(50 + 7)(20 + 6) =$ 
 $1000 + 300 + 140 + 42 =$ 

1482

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2/3 ÷ 4/5=

10/15 ÷ 12/15 =

10/12=

5/6

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Other methods you have seen....

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M

0 4 8

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Why do we care?

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Why do we care?

- Diverse populations mean diverse algorithms.
- Student-generated calculation methods allow us to see their thinking.
- As teachers we must evaluate students' computation methods for their validity.
- Other algorithms may be equally as efficient as the traditional ones.

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# Honor differences, develop shared understandings...

- Alternative and student-generated calculation methods are not necessarily wrong, and should be judged according to:
  - Applicability
  - Efficiency
  - Student understanding and facility with algorithm
- >Always teach the traditional algorithms to mastery while honoring alternative methods!

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## **Examine a MARS Task**

(MARS – Mathematics Assessment Resource Service)

These analyses of student work and resources for teachers available on the Inside Mathematics website:

www.insidemathematics.org

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## **Examine a MARS Task**

- 1. Find a group of 3-4 from the same grade level.
- 2. Send a representative to choose a task.
- 3. Peruse the packet to see what is inside.
- 4. Discuss the student work.

  What do you notice about student understandings and misunderstandings?

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## The Take-Home Message

- We can "see" students' thinking in their written work and calculation methods
- Examining student work for student thinking allows us to see:
  - > student understandings
  - ➤ hidden misconceptions

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#### Resources

- The MARS Assessment Tasks used in this workshop are free to download from the Inside Mathematics website: www.insidemathematics.org
- Today's presentation handout: tinyurl.com/SacredHeartMath2016
- Email me: Ann Gaffney at gaffneyedcons@gmail.com

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