Number Talks – Middle School

Developing accuracy, efficiency and flexibility

In a Number Talk, the teacher gives the class an equation to sole mentally. Students may use paper and pencil to keep track of the steps as they do the mental calculations. Students strategies are shared and discussed to help all students think more flexibly as they work with numbers and operations.

Number Talks focus students' attention so they will move from:

- **figuring out answer any they can to…**
- **becoming more efficient at figuring out answers to…**
- **just knowing or using efficient strategies**

Number Talks are an opportunity for students to make sense of our number system.

Materials:

- Prepared problems to be explored
- Chalkboard, white board, document camera, or overhead transparency
- Individual white boards or pencil and paper
- Option: Interlocking cubes; base ten materials; decimal squares

Time: 8-10 minutes

Directions

Example: 9.8 + 8.7

1.

Write an expression **horizontally** on the board (e.g., 9.8 + 8.7)

2.

Ask students to think first and estimate their answer before attempting to solve the problem. Post estimates on the board. This will allow you to see how the students are developing their number and operational sense.

3.

Ask students to mentally find the solution using a strategy that makes sense to them. Encourage students to "think first" and then check with models, if needed. Have tools available to help students visualize the problem if they need them (e.g. base ten blocks; 100 grids; decimal squares).

Ask students to explain to a partner how they solved the problem.

4.

While students are discussing their strategies, walk among the groups listening to the explanations. Find those strategies you want to call attention to for the whole class. Choose strategies for discussion that you might want other students to think about and possible experiment with. For example, in the problem 9.8 + 8.7 you might see the following strategy and want other students to think about and possibly experiment with:

9.8 + 8.7 =
8.7 - 0.2 = 8.5
9.8 + 0.2 = 10
10 + 8.5 = 18.5

Call on a student to fully explain the steps he/she followed to solve the problem.

5.

Record the steps precisely as the student explains them to you. Ask clarifying questions as needed to ensure that you understand the flow of the student's thinking. Be explicit about the mathematics.

- "Why did you subtract 0.2 from 8.7?"
- "Will this strategy always work? How do you know?"
- "What did you know about addition that allowed you to use this strategy?"

6.

As time allows, ask other students to share different methods they used for solving the equation. Follow up on each strategy shared by asking similar questions to those included in step 5. Publicly record these methods as well.

It is important to facilitate a discussion about how the different representations/strategies relate to each other and result in the same answer.

Example - Guiding the Share-Out:

Scenario 1: 6.3 – 2.7

Public Recording	Student Explanation
2.7 + 0.3 = 3.0 6.3 + 0.3 = 6.6 6.6 – 3.0 = 3.6	"I added the same amount to both numbers to keep the difference the same. I chose 0.3 because it makes the 2.7 into a 'friendly' number to subtract."

Possible teacher response:

"You said you added 0.3 to both numbers. How does adding 0.3 to both numbers keep the difference the same? Use a model to convince me."

Scenario 2: 6.3 – 2.7

Public Recording	Student Explanation
2.7 + **0.3** = 3.0 3.0 + **3.0** = 6.0 6.0 + **0.3** = 6.3 **0.3 + 3.0 + 0.3** = 3.6	"I added 0.3 to 2.7 which makes 3.0. Then, I added 3 more to make 6. Then I added 0.3 more to make 6.3. I added together all the numbers I used. The answer is 3.6."

Possible teacher response:

"You used an 'adding up' strategy. How does adding numbers help to find the difference? Why did you to choose to add the numbers that you did? How did you keep track of the numbers you added? Each strategy is different, yet each arrives at the same answer for 6.3 – 2.7. Why do you think this is so?"

Scaffold:

- When beginning **Number Talks**, make sure that the problems and quantities are accessible and within each student's zone of proximal development. The numbers must be accessible so that the students are solving the equations mentally.

- If you have students in your classroom who are performing at diverse instructional levels, select three different problems for students to solve at three different levels. Allow students to choose the problem which they will solve. Select problems with varying levels of difficulty so that all students

have access to a problem and all students are working at a level that pushes them to their optimal level. For example:

4.63 – 0.27 6.3 – 2.7 6.3 – 0.7

- As students' flexibility, accuracy and efficiency improve, increase the rigor of the problems by adjusting the numbers or operations.

- Allow the students to document on paper their intermediate steps **as** they are solving the problem.

Notes about Number Talks:

A. Keep them short.

B. Encourage sharing and clarify students' thinking.

C. Teach intentionally

- Start where your students are.
- Choose related sequences of problems.
- Chart the students' thinking g so that it can be saved and referred to later.

D. Create a safe and supportive environment

- Accept answers without praise or criticism.
- Allow students to ask questions of each other.
- Encourage students to listen to each other.
- Encourage students to self-correct

E. Vary the Number Talks to meet the range of needs.

- Vary the sharing strategies used.

  Pair share
  Share whole group
  Explain someone else's strategy

- Vary the level of difficulty with a Number Talk

  Use written problems
  Use word problems

- Record the students' thinking using correct notation on the board, on the overhead, or on chart paper.

F. Give students lots of practice with the same kinds of problems.

G. When planning or implementing a Number Talk, consider the following?

- How do students get their answers?
- Can students use what they know for related problems?
- How well can students verbalize their thinking?
- Are errors way off or are they reasonable?

H. The role of the teacher during a Number Talk is to facilitate and guide the conversation.

- The teacher purposefully chooses children to share strategies that will move the class toward computational fluency.
- The teacher asks questions that draw attention to the relationships among strategies.
- **It is important to focus on the mathematics, not just the variety of strategies**. Mathematically, why does the strategy work?

Examples:

65% of 80	85% of 60	51% of 40	92% of 90
1 – 3/5	¼ + ½	4/6 – 1/3	¾ + ½
1 ¾ + ½	¼ + 2/4	4/6 – 1/3	3/12 + ¼
1 ½ ÷ ¼	6/8 ÷ ¼	0.45 ÷ 0.3	48 ÷ 1.2
2.4 ÷ 1/5	16,000 ÷ 2,000	245 ÷ 7	829 ÷ 9
>, <, or =?	>, <, or =?	>, <, or =?	>, <, or =?
89 + 15 ☐ 85 + 19	89 x 15 ☐ 85 x 19	16 x 38 ☐ 18 x 36	38 x 18 ☐ 38 x 12
-98 + (-97)	-27 – (-63)	100 + (-49)	-98 – (-97)

Expressions for students who need more support

100 – 49	372 + 98	59 + 36	864 - 499
370 + 99	104 – 39	16 x 25	15 x 30
25 x 6	450 ÷ 45	187 ÷ 17	½ ÷ ¼