Washington Office of Superintendent of
PUBLIC INSTRUCTION

You can help your student think like a mathematician!

1. Make sense of problems and persevere in solving them.

What it means:

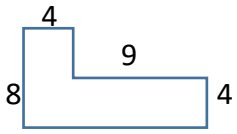
- Think about what I know about this problem
- Identify what the question is asking
- Try a similar but simpler problem
- Try different strategies
- Don't give up!
- Think about whether answers make sense

How parents can help:

- What do you know about this problem?
- Have you seen something like this before?
- Can you draw a picture or diagram about it?
- What are you trying to figure out?
- Does this answer the question and make sense to you?
- What information do you need to solve this problem?
- Is there another way you can answer this question?

How a student might use this mathematical practice:

Find the perimeter:



What do I know? How can I find the missing information? How can that help me solve the problem?

Our reading goal each week is 1 ½ hours. I read 20 min. a day for 6 days. Did I meet my goal?

I know how many minutes per day and how many days.
I can multiply 20 x 6 and get 120 minutes.
120 minutes is 2 hours, 1 ½ hours is 90 minutes.
2 hours is more than 1 ½ hours. I also see that 120 minutes is more than 90 minutes. I can see that, either way, I met my goal.

A shirt is marked 25% off. The original price was $30. My calculations tell me that it now sells for $7.50.

Does my answer make sense? What else should I think about?

2. Reason abstractly and quantitatively.

What it means:

- Use tools to make sense of problems
- Understand that numbers and units together represent quantities
- Represent problems using numbers and symbols
- Create models to figure out a problem or explain thinking processes
- Connect operations to the context of a problem

How parents can help:

- Can you develop a model to show what you see?
- What does your model tell you about this problem?
- What do the numbers in the problem mean?
- How did you decide on the operation you are using?

How a student might use this mathematical practice:

Four chickens each laid five eggs per week for three weeks.

I can see that the same thing happens each week so I can use multiplication and write the equation $4 \times 5 \times 3 = 60$
That means that 60 eggs were laid.

The cost, C, to rent a truck to help your friends move costs $30 per day plus $.75 per mile, m.

C represents the cost and I'll have to pay $30 no matter how far I drive so that is a fixed cost. Each mile will cost $.75 so .75m is the cost per mile and I can write the equation:
$C = 30 + .75m$

3 weeks, 2 days and 12 hours is the same as
21 days + 2 days + .5 day or 23.5 days and the same as
504 hours + 48 hours + 12 hours or 564 hours

Tools: rulers, blocks, tiles, ruler, protractor, etc.
Model: drawing or building to represent the problem
Operations: add, subtract, square root, etc.

3. Construct viable arguments and critique the reasoning of others.

What it means:

- Explain your reasoning for the solution for a problem
- Understand the thinking of others
- Evaluate different problem solving strategies and thinking
- Revise thinking to improve models or strategies

How parents can help:

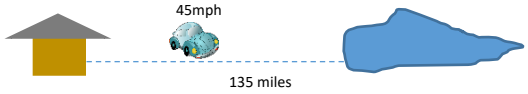
- How did you decide on your strategy?
- What steps did you take, and why?
- How do you know your answer is correct?
- How is this like a solution you have found before?

How a student might use this mathematical practice:

A classmate claims that there are 17 chips.

I agree with the total of 17 because I saw 2 groups of 8 and 1 more. That's double 8 which is 16, then 16 plus 1 is 17.

I saw that each box could hold 4 bottles, but one box had an empty space. Since there were 3 boxes, that is $3 \cdot 4 = 12$ *but I had to take one away for the empty space.* $12 - 1 = 11$ *so there are 11 bottles.*



I do not understand how you decided it would take 3 hours to get to the lake. How did you get that?

4. Model with mathematics.

What it means:

- Use objects, models or tools to make a model for a real life situation
- Identify key information to build models
- Understand how different quantities affect each other
- Adjust a model to improve the answer

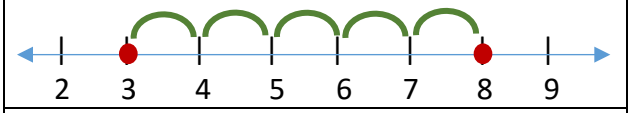
How parents can help:

- What might you use to model this problem?
- What could the problem look like as a model or picture?
- How are the numbers in the problem connected?
- How can you design your scale for this problem?

How a student might use this mathematical practice:

$2 \cdot 5 =$ **10**

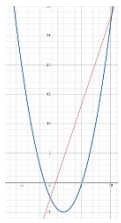
$3 + 5 = 8$



What is the break even point for these functions?

$y = 3x - 2$

$y = \frac{1}{2}x^2 - 2x - 3$



The graph shows the break even points are the intersections at $(-.2, -2.6)$ *and* $(10.2, 28.6)$

5. Use appropriate tools strategically.

What it means:

- Consider all tools available and choose the best one
- Understand the benefits and limitations of using a tool
- Know that tools include paper and pencil, tables, diagrams, graphs, physical objects, drawing tools, calculators and technology
- Use tools to increase understanding and to improve problem solving

How parents can help:

- What tools do you have available to help with this problem?
- What information do you have to help you pick a tool?
- What challenges could this tool create?
- What is the best tool to use here?
- Did the tool you chose help you to find an answer that makes sense?

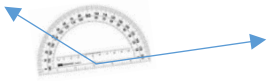
How a student might use this mathematical practice:

Using a table

Favorite Fruits

	Apple	Banana	Orange	Kiwi
Boys	7 ||		7 |||	||
Girls	5	5 |||	5	|||

Using a protractor

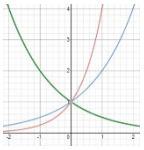


Using a graph: Compare the functions:

$f(x) = 4^x$

$g(x) = 2^x$

$h(x) = \frac{1}{2}^x$



computer generated graph

Tools to use at home: every day objects to use as counters, items with characteristics that are the same or different, white boards, calculators, graph paper, online tools (such as desmos.com) etc.

6. Attend to precision.

What it means:

- Use appropriate vocabulary to explain thinking
- Understand the meaning of symbols and use them correctly
- Use units of measure and graph labels to make meaning clear
- Understand quantities in terms of the context
- Use the level of accuracy needed for the problem they are solving

How parents can help:

- What units are you using? What do these units mean?
- How do you know your solution is reasonable?
- Can you test your answer?
- Is your answer as accurate as it needs to be?

How a student might use this mathematical practice:

If a value c represents the number of cars needed to take our soccer team to watch an MLS game and we calculate $c = 3.4$, *I know that we will need 4 cars.*

If a water tower is measured in feet, *its volume can be described in cubic feet. Cubic feet can also be expressed in gallons.*

For the graph the title, axes and scale are clear so that people can understand what data shows

7. Look for and make use of structure.

What it means:

- Look for and find patterns
- Use patterns to solve new problems
- Use grouping to chunk problems into manageable pieces
- Use a pattern I see to build a new expression

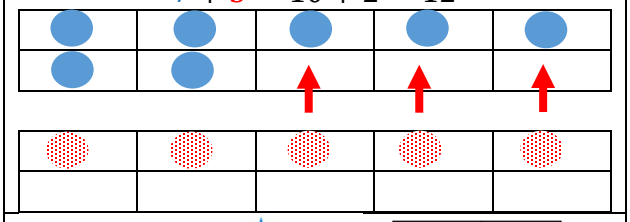
How parents can help:

- What do the different parts of the expression or equation mean to you?
- What patterns do you see?
- What other problems are similar to this one?
- How can a problem you have done before help you with this one?

How a student might use this mathematical practice:

I can add by making 10

$7 + 5 = 10 + 2 = 12$



Step (x)	# of stars
1	3
2	5
3	7

How many stars in the x^{th} step? $2x + 1$

Use area to find the product: $12 \cdot 14$

	10	+ 4
10	100	40
+ 2	20	8

12 • 14

(10 + 2) • (10 + 4)
100 + 20 + 40 + 8
= 168

8. Look for and express regularity in repeated reasoning.

What it means:

- See repetition in calculations
- Recognize when repetition can create routines or short cuts
- Use repetition to build rules or formulas
- Use formulas to develop understanding and solve problems efficiently

How parents can help:

- What is happening in this situation?
- Do you see something happening over and over?
- Is this always true?
- What do you notice about something in this problem?

How a student might use this mathematical practice:

How many squares?

I see:
3 in each branch
4 branches
So I can multiply:
4 x 3=12
I see 12 squares

Using Doubles facts

$6 + 7 =$
$6 + 6 + 1 =$
$12 + 1 = 13$

$5 + 7 =$
$5 + 5 + 2 =$
$10 + 2 = 12$

Day 1: 600 website views
Day 2: 900 website views
Day 3: 1300 website views
Day 4: 1800 website views

The number of views increases by 100 more each day. After 1 week there will be 4800 views per day.