Student Handbook

Mathematical Practices

There are eight math habits that will help make your math thinking grow stronger. We use our math thinking to figure out all kinds of problems, even hard problems from real life.

HABIT 1
Solve Problems

HABIT 2
Think and Reason

HABIT 3
Show and Explain

HABIT 4
Use Math in the Real World

HABIT 5
Choose a Tool

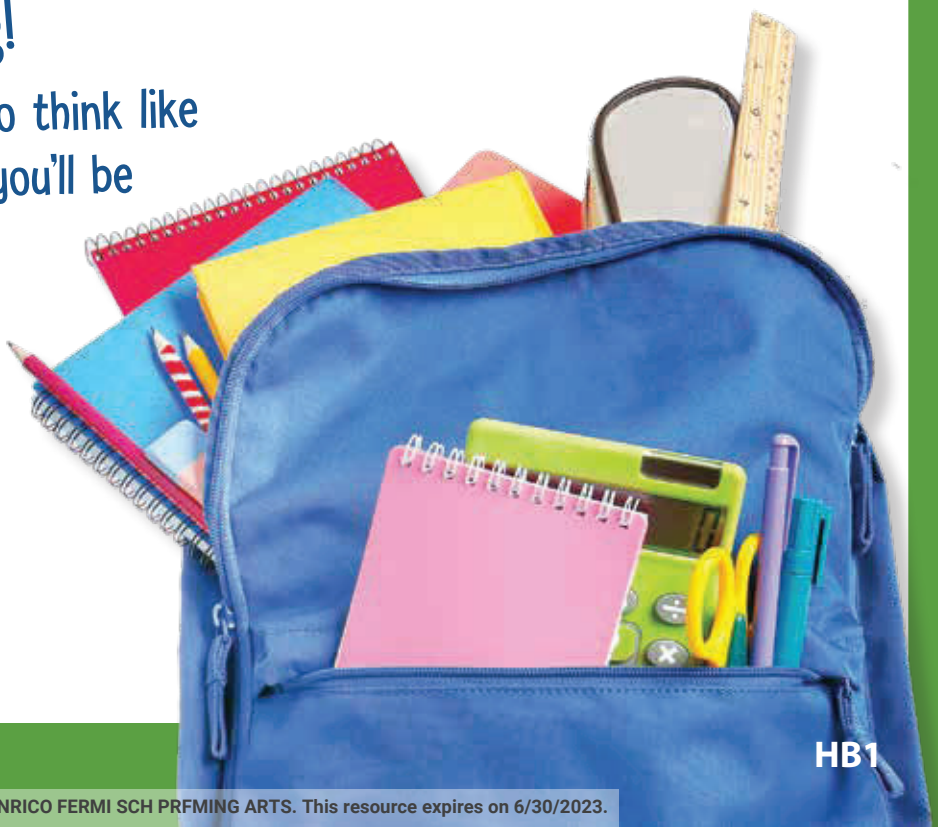
HABIT 6
Be Clear and Precise

HABIT 7
Zoom in and Zoom out

HABIT 8
Use Patterns

Keep practicing!

You'll be learning to think like a math pro. Then you'll be ready to take on any problem!



HABIT 1

Solve problems.

Keep looking for clues until you solve the problem.

For some math problems, you may not know where to start. Try different ways to find a solution and look for clues about which way works best. Then check that your answer makes sense.

MATHEMATICAL PRACTICES

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

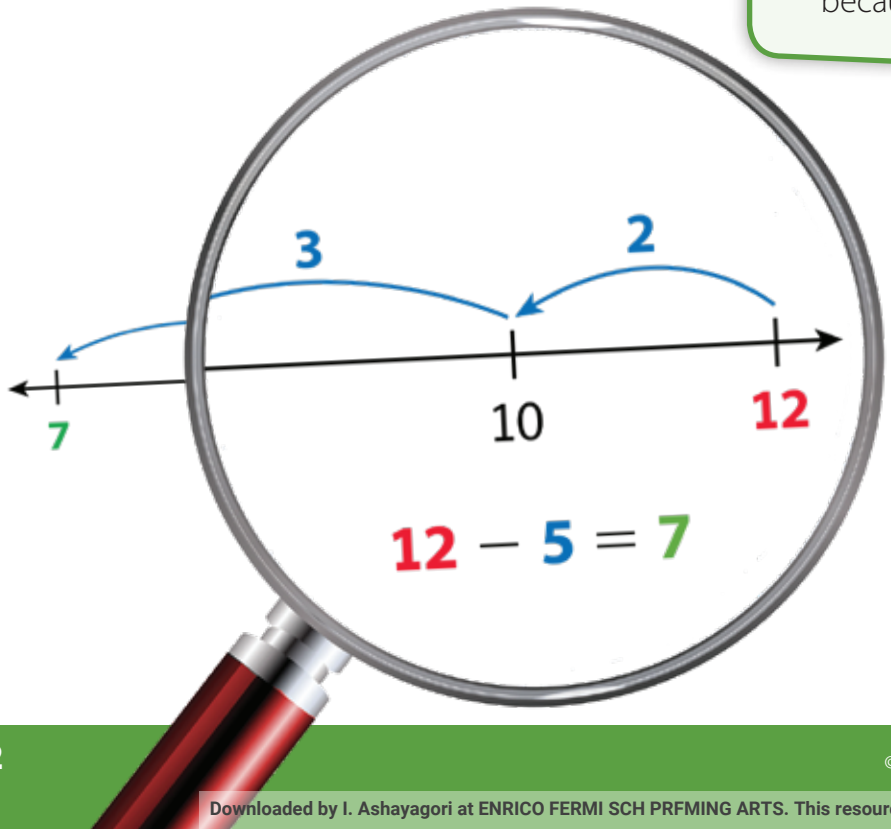
To solve problems . . .

Ask yourself

- Can I say what the problem is asking for?
- Can I ask questions to understand it better?
- Can I think about what does or doesn't make sense?
- Can I try a different way if I need to?

Then, discuss with a partner

- I thought the problem didn't make sense until I asked . . .
- I know my answer makes sense because . . .



HABIT 2

Think and reason.

MATHEMATICAL PRACTICES

SMP 2 Reason abstractly and quantitatively.

Make sense of the words and the numbers in a problem.

Reasoning is a way of thinking that puts ideas together.
If you know one thing, then you know another thing.
Reasoning is using math rules and common sense together..

To use reasoning to solve a problem . . .

Ask yourself

- Can I show how whole numbers and decimals are related?
- When I see an equation, can I think of a situation that would go with it?
- When I read a problem, can I write an equation to find the answer?
- Can I try out my answer to see if it makes sense in the problem?

Then, discuss with a partner

- I turned the problem into numbers when I wrote . . .
- I think my answer makes sense because . . .

HABIT 3

Show and explain.

Share your math ideas to help others understand you.

When you explain your math ideas to others, it helps you understand them even better. And that helps you solve other problems later. When you listen to other people, you get new ideas too.

MATHEMATICAL PRACTICES

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

To help explain your ideas or listen to others . . .

Ask yourself

- Can I use words to show how to solve the problem?
- Can I use pictures or act out the problem with objects?
- Can I ask questions to understand another person's ideas better?

Then, discuss with a partner

- I showed my ideas when I wrote . . .
- I explained my ideas when I said . . .

Read and try to solve the problem below.

Jenna spent $1\frac{2}{3}$ hours mowing the back yard. After taking a break, she spent $\frac{3}{4}$ hour mowing the front yard. How many hours did she spend mowing the whole yard?

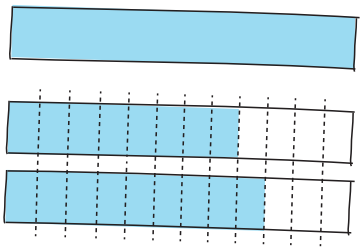
TRY IT

$1\frac{2}{3} = 1\frac{8}{12}$

$\frac{3}{4} = \frac{9}{12}$

$1\frac{8}{12} + \frac{9}{12} = 1\frac{17}{12}$ or $2\frac{5}{12}$

She mowed for $2\frac{5}{12}$ hours.



DISCUSS IT

Ask your partner: Can you explain that again?

Tell your partner: I do not understand how . . .

HABIT 4
Use math in the real world.

MATHEMATICAL PRACTICES
SMP 4 Model with mathematics.

Solve problems in real life.

One of the best ways to use your math thinking is to solve real problems. Words tell the story for the problem. Math can turn the words into a model, such as a picture or an equation.

You can use models to solve problems about shopping, art projects, sports, cooking, or . . . almost anything!

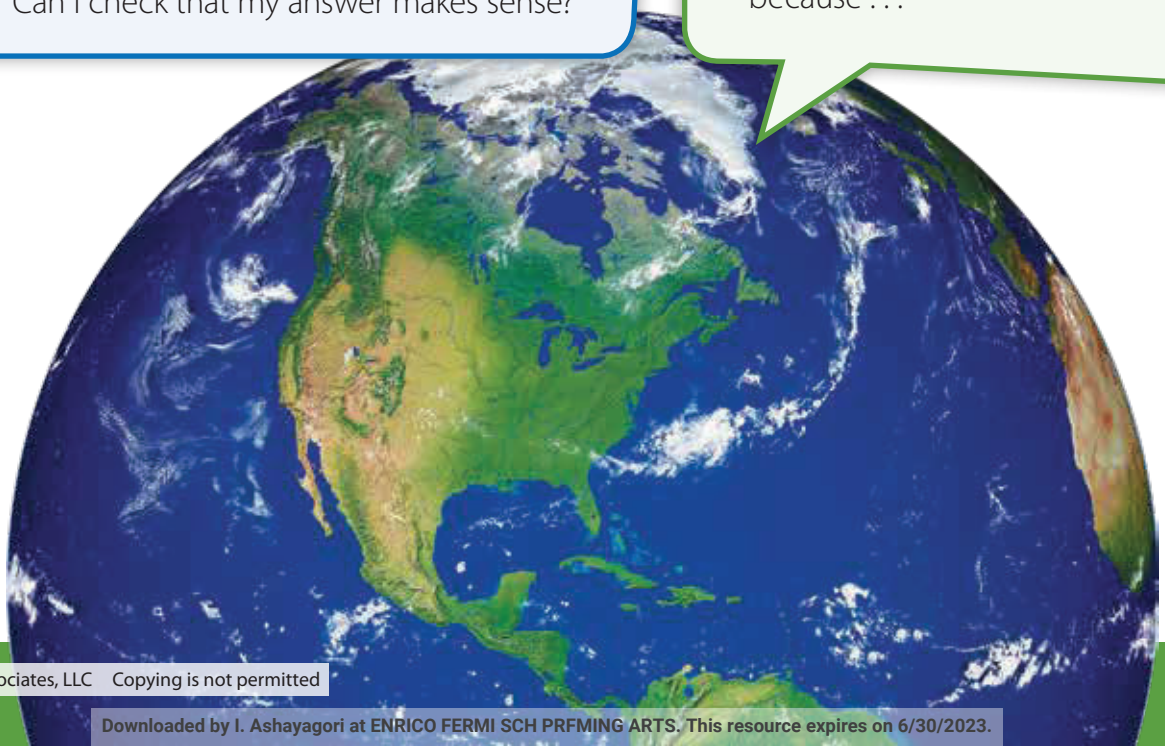
To solve a real-life problem . . .

Ask yourself

- Can I draw a picture, write an equation, or use a different model to show the math?
- Can I use my math model to solve the problem?
- Can I check that my answer makes sense?

Then, discuss with a partner

- I used a math model to show the problem when I . . .
- I know my answer makes sense because . . .



HABIT 5

Choose a tool.

Decide when to use tools like a diagram, a ruler, or mental math.

MATHEMATICAL PRACTICES

SMP 5 Use appropriate tools strategically.

Math Toolkit There are many tools to use in math. You can use a pencil to do a lot of math. Sometimes you need a ruler, or maybe a diagram. Often you can just do the math in your head.

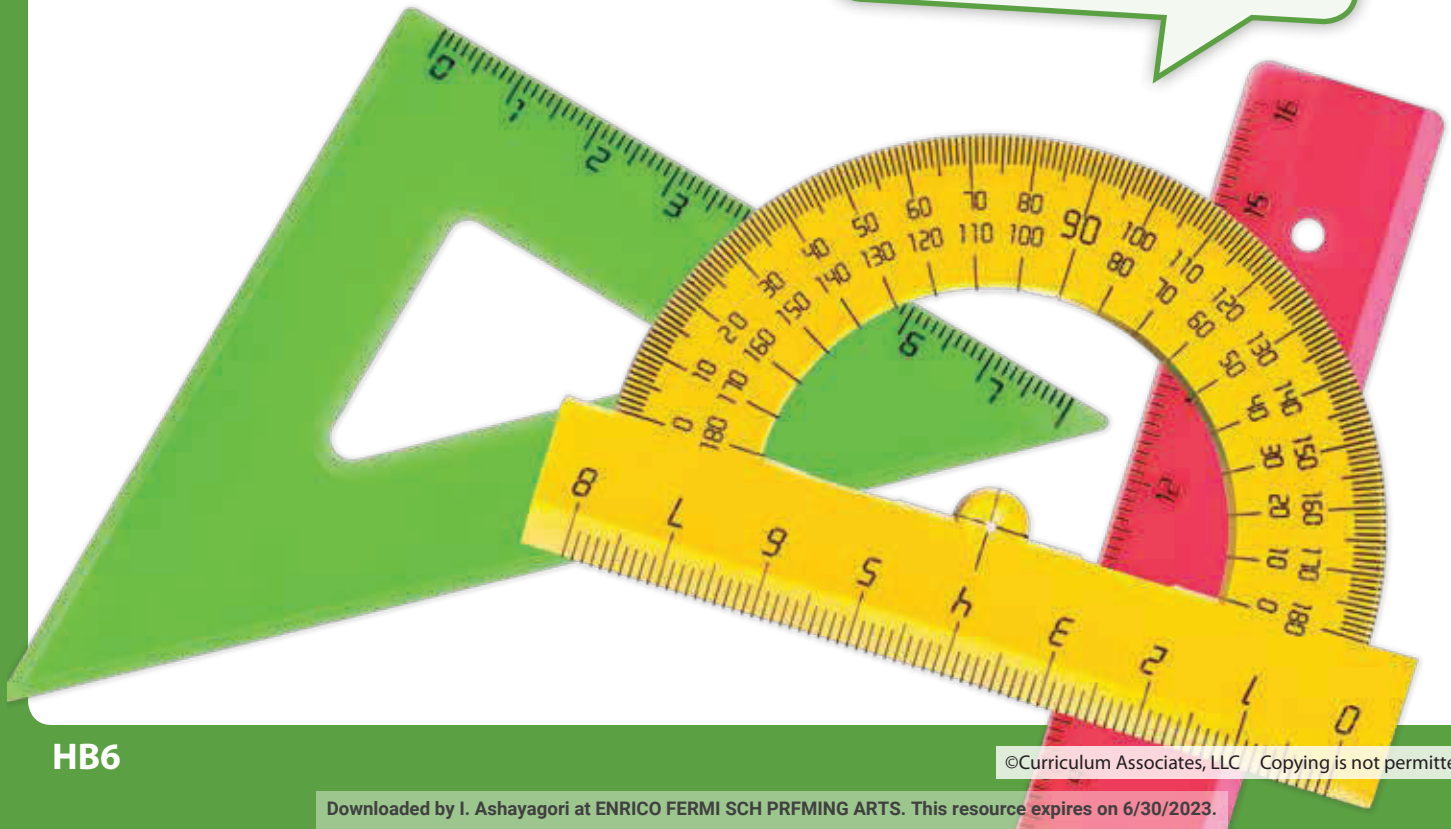
To choose the best tools . . .

Ask yourself

- Can I do some problems in my head?
- Can I write the problem on paper?
- Can I make a table or a diagram?
- Can I use a ruler to solve the problem?

Then, discuss with a partner

- The tools I chose for this problem are . . .
- I chose these tools because . . .



HABIT 6

Be clear and precise.

MATHEMATICAL PRACTICES
SMP 6 Attend to precision.

Try to be exactly right in what you say and do.

Everybody likes to be right when they do math. But sometimes people make mistakes. So it's good to check your work. And it's good to say exactly what you mean when you talk about your math ideas.

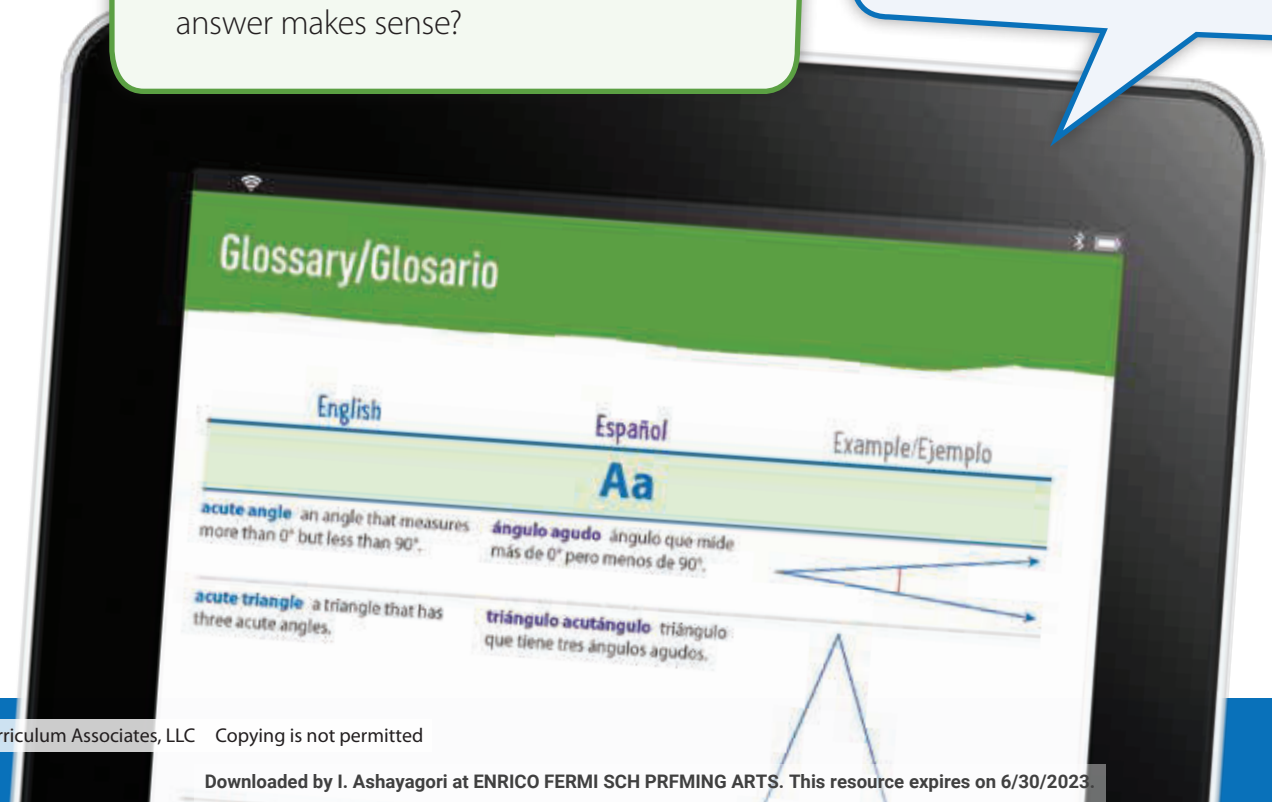
To be exactly right . . .

Ask yourself

- Can I use words that will help everyone understand my math ideas?
- Can I ask questions to understand the meaning of math words I don't know?
- Can I find different ways to check my work when I multiply or add?
- Can I always think about whether my answer makes sense?

Then, discuss with a partner

- I was careful to use the right words when I . . .
- I checked my answer by . . .



HABIT 7

Zoom in and zoom out.

MATHEMATICAL PRACTICES

SMP 7 Look for and make use of structure.

Look for what's the same and what's different.

Math follows rules. Think about these equations:

$3 \times 1 = 3$
$4 \times 1 = 4$

You can *zoom out* to look at what's the *same* about problems. They show that any number times 1 is that number.

You can also *zoom in* to see what's *different* about problems. The number multiplied by 1 is different in each problem.

To zoom in and zoom out . . .

Ask yourself

- Can I see how decimals and fractions are both similar and different?
- Can I see how decimals and whole numbers are both similar and different?
- Can I see how shapes are different but are made from other shapes that are the same?

Then, discuss with a partner

- I zoomed out and used a math rule when I . . .
- I zoomed in and found a difference when I looked at . . .

HABIT 8
Use patterns.

MATHEMATICAL PRACTICES
SMP 8 Look for and express regularity in repeated reasoning.

Look for patterns in math to find shortcuts.

It's important in math to pay close attention. You might find a pattern or see a math idea.

Think about the pattern you see when you count by elevens:

11, 22, 33, 44, 55 . . .

You can use the pattern to make a good guess about what comes next.

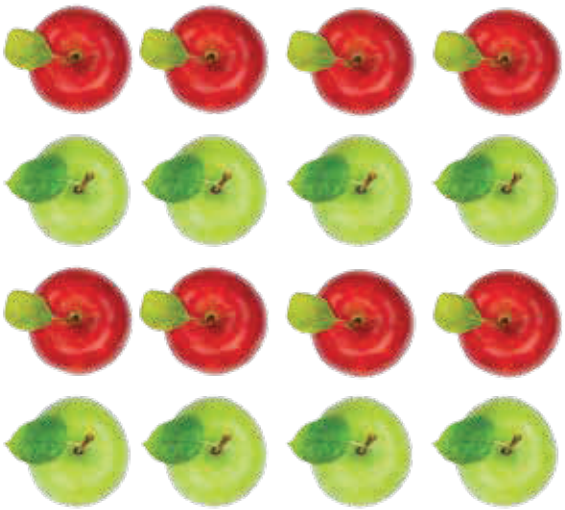
To use patterns . . .

Ask yourself

- Can I find a pattern in a math problem?
- Can I use clear math words to describe my pattern?
- Can I make a good guess about what is next?

Then, discuss with a partner

- I saw a pattern in this problem when I looked at . . .
- I made a good guess about the pattern when I . . .



Mathematical Language Reference Tool

Use the following sentence frames throughout the units when speaking and writing about the math concepts you are learning.

Unit 1

1. From what I know about _____, I can use reason to determine _____.
2. A quotient is the result of dividing _____ by _____.
3. When I justify my answer, I _____.
4. Having a remainder in a division problem means _____.
5. Create your own sentence frame.

Unit 2

1. I should analyze _____ before starting to _____.
2. The format of a place value chart helps me sequentially order _____.
3. I can use _____ to find the relationship between _____.
4. When I defend my argument, I am _____.
5. Create your own sentence frame.

Unit 3

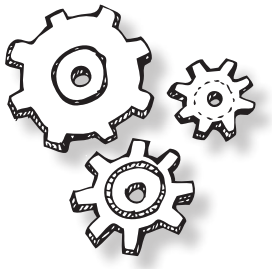
1. It is evident from the problem that _____.
2. Before I can _____, I have to interpret _____.
3. I should ask my partner to restate his or her _____ so that _____.
4. Sometimes I have to round _____ because _____.
5. Create your own sentence frame.

Unit 4

1. I have to _____ in order to support _____.
2. One difference between the customary system and the metric system is _____.
3. I can use a model to organize _____.
4. When I classify units of measurement into _____, I have to think about _____.
5. Create your own sentence frame.

Unit 5

1. The similarities between the concepts of patterns and rules are _____. The differences are _____.
2. When I think about the rest of the year, I anticipate that _____.
3. I can categorize an operation into _____, _____, _____, or _____.
4. A _____ is characterized by _____.
5. Create your own sentence frame.



100 Mathematical Discourse Questions

Make sense of the problem.

1. What is this problem about? What can you **tell me about it**?
2. Do you need to **define or set limits** for the problem?
3. How would you **interpret** that?
4. Could you **reword that in simpler terms**?
5. Is there something that can be **eliminated** or that is **missing**?
6. Could you **explain** what the problem is asking?
7. What **assumptions** do you have to make?
8. What do you **know** about this part?
9. Which words were **most important**? Why?

Persevere in problem solving.

10. Have you tried making a **guess**? What would a **good guess** be?
11. **What other ideas** have you tried?
12. Would **another method** work as well or better?
13. Is there **another way** to draw, explain, or say that?
14. What is another **related problem**?
15. Is there an **easier way** to do the problem?
16. How would you **explain** what you know right now?

Reason mathematically.

17. **How did you begin** to think about this problem?
18. What is **another way** you could solve this problem?
19. How could you **prove** _____?
20. Can you **explain how your answer is different from or the same as** another student's answer?
21. **Break the problem into parts.** What would the parts be?
22. Can you **explain this part more specifically**?
23. Does that strategy **always work**?
24. Can you think of a case where that strategy **wouldn't work**?
25. What was the **first thing** you did? Then what did you do? Why?

Explain and critique.

26 **What would happen if _____?**

27 Did you see any **patterns**? If so, describe them.

28 What are some **possibilities** here?

29 Where could you get more **information**?

30 How would you **check your steps** or your answer?

31 What **did not work**?

32 How is your solution method the **same as or different from** another student's method?

33 Other than retracing your steps, **how can you determine** if your answers are appropriate?

34 How did you **organize** the information?

35 How could you solve this using **tables, lists, pictures, or diagrams**?

36 What have you tried? What **steps** did you take?

37 How would your solution look if you used another **model**?

38 How would you draw a **diagram or make a sketch** to solve the problem?

39 Is there **another possible answer**? If so, explain.

40 Is there **another way to solve** the problem?

41 Is there **another model** you could use to solve the problem?

42 Is there anything you have **forgotten**?

43 **How did you think** about the problem?

44 What was your **estimate or prediction**?

45 How **confident** are you in your answer?

46 **What else** would you like to know?

47 What do you think comes **next**?

48 Is the solution **reasonable**, considering the context?

49 Did you have a **system**? Explain it.

50 Did you have a **strategy**? Explain it.

51 Did you have a **design**? Explain it.

Decide if something is mathematically correct.

52 Is this a **reasonable answer**?

53 Does your partner's strategy make **sense**?

54 **Why** do you think that? Why is that true?

55 Can you **draw a picture or make a model** to show that?

56 **How** did you reach that conclusion?

57 Does anyone want to **revise** his or her answer?

58 **How were you sure** your answer was right?

Share your thinking.

59 What **strategy** did you use?

60 Do you **agree**?

61 Do you **disagree**?

62 Would you **ask the rest of the class** that question? Why or why not?

63 Could you **share your method** with the class?

64 What part of what he or she said **do you understand**?

65 Would someone like to **share** _____?

66 Can you **convince your partner or others** that your answer makes sense?

67 **What do others think** about what another student said?

68 Can someone **retell or restate** another student's explanation?

69 Did you **work together**? In what way?

70 Would you like to **add to what was said**?

71 Have you **discussed this** with your group? With others?

72 Did anyone get a **different answer**?

73 **Where** would you go for **help**?

74 **Did everybody get a fair chance** to talk or use the manipulatives?

75 How could you help another student **without telling them the answer**?

76 **How would you explain** how to solve this problem to someone who missed class today?

Make connections.

77 What is the **relationship** between _____ and _____?

78 How is this problem like one you **solved before**? How is it **different**?

79 What is the **same** about your strategy and your partner's?

80 What is **different** about your strategy and your partner's?

81 Which **skills or concepts** did you use?

82 What **ideas** have we explored before that were useful in solving this problem?

83 How is this like _____? How is it different from _____?

84 **Where else** would this strategy be useful?

85 How does this **relate** to _____?

86 Is there a **general rule**?

87 Is there a **real-life situation** where this could be used?

88 How would your method work with **other problems**?

89 What other **questions** do you have about this topic?

Evaluate.

90 What do you need to do **next**?

91 What have you **accomplished**?

92 What are your **strengths and weaknesses**?

93 Was your **group participation appropriate and helpful**?

Reflect.

94 Did you **use any tools**? If so, explain.

95 What are some **things you learned**?

96 Would you solve the problem the **same way next time**? Why or why not?

97 What **mathematics topics** did you use?

98 What were the **mathematical ideas** in this problem?

99 What is mathematically **different about this problem** from others you have done?

100 Are there **any advantages** to using one strategy over another? If so, explain.