Sample Pages from

SHELL EDUCATION

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SHELL EDUCATION

Mathematics
Problem Solving

Leveled Text-Dependent Question Stems

How did ____ lead you to the correct solution?

Explain how to solve your partner's word problem.

What strategy will you use to solve this problem?

What does the graph tell you?

Which problem-solving strategy would work best to solve the problem?

How can you use estimation to represent the numbers in the problem and solve it?

Use drawings to represent the problem.

Explain your thinking.

Use evidence from the problem to support your explanation.

Explain how this representation helps you solve the problem.

What tools can you use to make a model or representation of the problem?

Explain why the tools you chose are the best choices for solving this type of

Explain why the information in the diagram/picture/graph/chart help you

How does the information in the diagram/picture/graph/chart help you solve the problem?

How does this problem relate to a similar problem that you have so

Compare and contrast this problem to a similar problem that you have solved.

Explain why your solution is correct.

What strategy will you use to solve this problem?

Table of Contents

How to Use This Book

Skill Overview—Each skill is defined on the first page of its section. This explains what the skill is and how to introduce it to students.

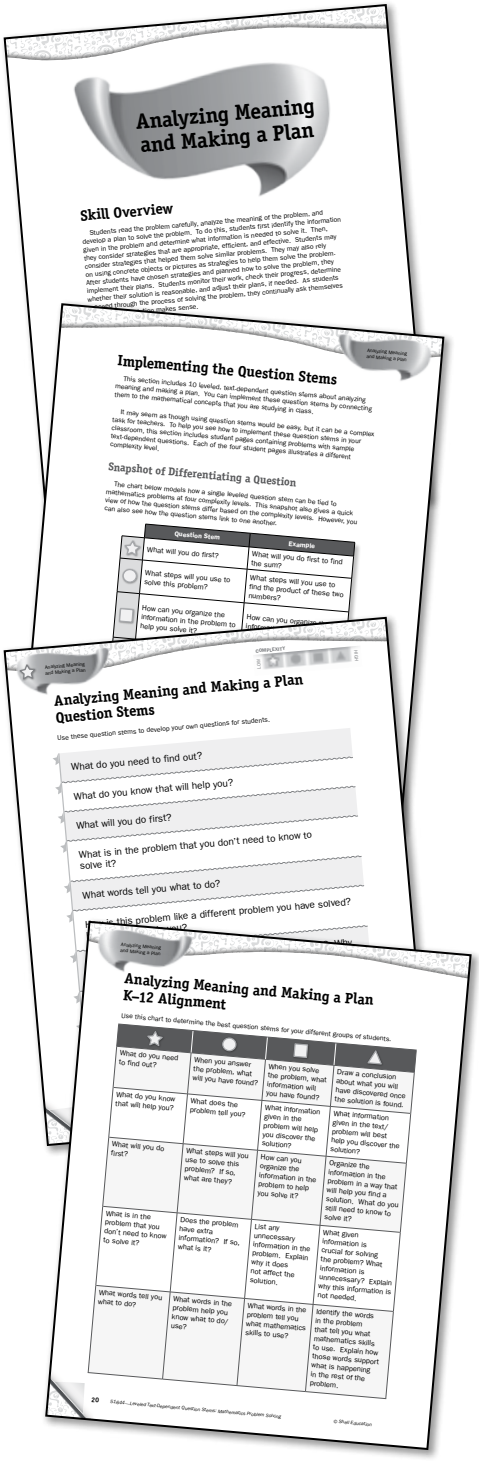
Complexity—The text-dependent question stems in this book are differentiated to four complexity levels. The levels roughly correlate to four grade ranges as follows:

- ☆ grades K–1
- ○ grades 2–4
- □ grades 5–8
- △ grades 9–12

Implementing the Question Stems—The second page of each section contains an example question stem differentiated to all four complexity levels. This is a great way for teachers to see a model of how the leveled text-dependent questions can be used with their students.

Question Stems—Each of the 12 sections includes 10 question stems differentiated to four complexity levels for a total of 480 questions in the book. Along with a chart showing the 10 question stems, each complexity level also includes leveled word problems with sample text-dependent questions.

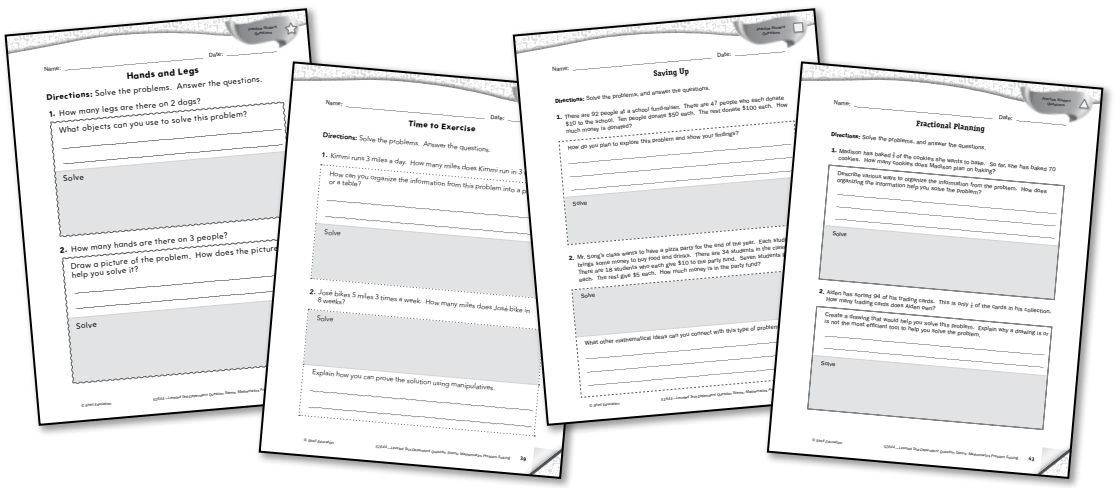
K–12 Alignment—The final two pages in each section include the leveled text-dependent question stems in one chart. This allows teachers to use these two pages to differentiate the text-dependent questions for their students.



Moving from Concrete to Abstract Thinking

Skill Overview

Students progress from using various types of concrete models to increasingly abstract models to represent and solve problems. Initially, students use concrete models such as blocks, counters, objects, or tiles. Then, as they gain understanding, they represent problems through figures, drawings, diagrams, tables, or graphs. Finally, students develop and use abstract thinking and reasoning. They represent problems symbolically through numeric or algebraic expressions and equations. Types of abstract models range from addition, subtraction, multiplication, or division number sentences, to algebraic expressions and equations, proportional relationships, and mathematical functions. Throughout the process, students monitor their work to ensure their models are appropriate for the problems and their solutions are reasonable. Students may modify or adjust their strategies and models as needed.



Implementing the Question Stems

This section includes 10 leveled, text-dependent question stems about moving to more abstract thinking. You can implement these question stems by connecting them to the mathematical concepts that you are studying in class.

It may seem as though using question stems would be easy, but it can be a complex task for teachers. To help you see how to implement these question stems in your classroom, this section includes student pages containing problems with sample text-dependent questions. Each of the four student pages illustrates a different complexity level.

Snapshot of Differentiating a Question

The chart below models how a single leveled question stem can be tied to mathematics problems at four complexity levels. This snapshot also gives a quick view of how the question stems differ based on the complexity levels. However, you can also see how the question stems link to one another.

	Question Stem	Example
☆	How does your model/ picture/table show the numbers in the problem?	How does your picture show the numbers in the problem?
○	How does your model/ picture/table represent the numbers in the problem?	How does your model represent the numbers in the problem?
□	Explain how your model/ picture/table represents the numbers in the problem.	Explain how your table represents the numbers in the problem.
△	Defend how your model/ picture/table accurately represents the numbers in the problem.	Defend how your model accurately represents the numbers in the problem.

Moving from Concrete to Abstract Thinking Question Stems

Use these question stems to develop your own questions for students.

- What objects can you use to solve this problem?
- How do the _____ (*manipulative*) show the answer?
- How does your model/picture/table show the numbers in the problem?
- What kind of drawing would help you solve this problem?
- Draw a picture of the problem. How does the picture help you solve it?
- What is your plan for this problem? How can you show your answer?
- What other mathematics topics does this make you think of?
- Do the number sentence and the model match? How?
- Can you put what you know in a picture or a table? How?
- Use the picture/table to write a number sentence.

Name: _____ Date: _____

Hands and Legs

Directions: Solve the problems. Answer the questions.

1. How many legs are there on 2 dogs?

What objects can you use to solve this problem?

_____

_____

Solve

2. How many hands are there on 3 people?

Draw a picture of the problem. How does the picture help you solve it?

_____

_____

Solve

Moving from Concrete to Abstract Thinking Question Stems

Use these question stems to develop your own questions for students.

What manipulatives could you use to model this problem? Why would that be a good choice for the problem?

Explain how you can prove the answer using manipulatives.

How does your model/picture/table represent the numbers in the problem?

Draw a picture that would help you solve this problem.

Draw a model of the problem. How does the model help you solve it?

What is your plan for solving this problem? How can you show your findings?

Can you connect this problem with any other mathematical ideas? How?

How do the number sentence and the model match?

How can you organize the information from this problem into a picture or a table?

What number sentence can be written from this picture/table? Explain how the number sentence represents the picture/table.

Name: _____ Date: _____

Time to Exercise

Directions: Solve the problems. Answer the questions.

1. Kimmi runs 3 miles a day. How many miles does Kimmi run in 3 weeks?

How can you organize the information from this problem into a picture or a table?

_____

_____

Solve

2. José bikes 5 miles 3 times a week. How many miles does José bike in 8 weeks?

Solve

Explain how you can prove the answer using manipulatives.

_____

_____

Moving from Concrete to Abstract Thinking Question Stems

Use these question stems to develop your own questions for students.

How could you use manipulatives to represent this problem? Explain why you used the manipulative you chose.

How can you justify your solution using manipulatives?

Explain how your model/picture/table represents the numbers in the problem.

Draw examples of pictures that would help you solve this problem.

Use drawings to represent the problem. Explain how this representation helps you solve the problem.

How do you plan to explore this problem and show your findings?

What other mathematical ideas can you connect with this type of problem?

Describe how the number sentence is related to the model.

Describe how you can organize the information from the problem.

What number sentence can be written from this picture/table? Explain how your number sentence accurately represents the picture/table.

Name: _____ Date: _____

Saving Up

Directions: Solve the problems, and answer the questions.

1. There are 92 people at a school fund-raiser. There are 47 people who each donate $10 to the school. Ten people donate $50 each. The rest donate $100 each. How much money is donated?

How do you plan to explore this problem and show your findings?

_____

_____

_____

Solve

2. Mr. Song's class wants to have a pizza party for the end of the year. Each student brings some money to buy food and drinks. There are 34 students in the class. There are 18 students who each give $10 to the party fund. Seven students give $6 each. The rest give $5 each. How much money is in the party fund?

Solve

What other mathematical ideas can you connect with this type of problem?

_____

_____

_____

Moving from Concrete to Abstract Thinking Question Stems

Use these question stems to develop your own questions for students.

- How could you represent this problem using manipulatives? Explain why the manipulative you chose is the best tool to model this problem.
- Use manipulatives to justify your solution. Explain how the manipulatives you chose are effective tools for modeling the problem.
- Defend how your model/picture/table accurately represents the numbers in the problem.
- Create a drawing that would help you solve this problem. Explain why a drawing is or is not the most efficient tool to help you solve the problem.
- Draw a representation of the problem. Explain how this accurately represents the problem and how it can help you solve it.
- Develop a plan for how you will explore this problem and show your findings.
- Describe any other mathematical ideas you can connect with this problem.
- Explain the relationship between the number sentence and the model.
- Describe various ways to organize the information from the problem. How does organizing the information help you solve it?
- How can you create a number sentence from this picture/table? Justify how your number sentence is an accurate representation of the picture/table.

Name: _____ Date: _____

Fractional Planning

Directions: Solve the problems, and answer the questions.

1. Madison has baked $\frac{2}{3}$ of the cookies she wants to bake. So far, she has baked 70 cookies. How many cookies does Madison plan on baking?

Describe various ways to organize the information from the problem. How does organizing the information help you solve it?

_____

_____

_____

Solve

2. Aiden has sorted 94 of his trading cards. This is only $\frac{1}{5}$ of the cards in his collection. How many trading cards does Aiden own?

Create a drawing that would help you solve this problem. Explain why a drawing is or is not the most efficient tool to help you solve the problem.

_____

_____

_____

Solve