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DAILY ROUTINES to JUMP-START PROBLEM SOLVING

GRADES K–8

CORWIN Mathematics

Thank you

SAME AND DIFFERENT

About the Routine

Comparing and contrasting is an effective way for learning about concepts. It is also a powerful thinking and reasoning strategy. When students are challenged with a problem, teachers often ask students to think of a similar problem, a familiar problem, or something that is the exact opposite of the current challenge. But you know that this can be quite hard for elementary students. This routine, Same and Different, is an opportunity for students to analyze two similar but different problems. It helps them see that the same operation can be applied to two problems with similar contexts and actions as shown in the dog treat example. In this second-grade example, you want students to talk about how both problems are about dog treats, how the dog ate treats in both problems, how the toy had 32 treats in it each time, and that both are asking about the number of treats remaining. You would also want them to focus on the key difference—the number of treats the dog ate. Bringing this to students' attention can then help them think about how the equation and solution will be similar (subtraction, fewer treats remaining) and different (different subtrahend, different difference).

With clever variations, your students can compare important aspects of problems. You can help them see how the same equation can be used for problems that have a similar action but completely different numbers and contexts. You can prompt students to notice that changing numbers changes the result even when everything else about a problem is identical. Using this routine consistently builds an essential

Sam added 32 treats to her dog's toy. The puppy ate 24 of the treats. How many treats were left in the toy?

Sam added 32 treats to her dog's toy. The puppy ate 18 of the treats. How many treats were left in the toy?

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"problem-attack" skill. But as you use it, be sure to close each time asking students why looking at how problems are the same and different can help them with a new, challenging, or confusing problem.

How This Routine Helps With Problem Solving

This routine builds problem-solving skill by providing opportunities for students to

- develop critical-thinking skills about the architecture of word problems;
- shift focus from unreliable strategies to proven methods of thinking and reasoning;
- grow their confidence with word problems by developing an approach to analyzing problems (identity);
- help them generate an entry point with challenging, confusing, or complex problems (agency);
- build skill with decontextualizing problems by focusing on the actions within them;
- foster perseverance by teaching a strategy for helping one get unstuck (agency); and
- reinforce an essential reasoning skill that can be transferred to other learning situations.

What to Do

1. Pose a problem to students.
2. Give students time to individually think about the problem. Ask them to ask themselves questions like:
   » What do I know about the problem? What is it about?
   » What's happening in the problem? What is it about?
   » What could I do to solve the problem? What equation could I use?
3. Have partners share their ideas about the problem.
4. Bring the class together to discuss the problem. During discussion, be sure to highlight context, action, numbers, and other important features about the problems.
5. Then, unveil a similar, but different problem.
6. Have students independently identify how the second problem is similar to and different from the first.
7. Have partners discuss their ideas and encourage them to think about the context and actions of the problem.
8. Bring the class together again to talk about their ideas.
9. After the class discussion, ask students how comparing and contrasting two problems can help them solve new problems.

Something to Think About: Scaffolding the Routine

Scaffolding routines increases access to these important experiences. Remember that scaffolds should be temporary. However, there isn't a set number of experiences before you should take them away. The decision is based solely on your students' needs. It is likely a good idea to remove them when you notice that students are using them mindlessly, when the scaffold is becoming another procedure to complete, or when students go back to the scaffold after they have already made sense of the problem or even solved it.

Charting student thinking is a good way to scaffold these routines because it documents ideas without causing students to keep too many thoughts in their working memory. With this routine, a traditional Venn diagram is an excellent tool to record and organize ideas. Other ways to scaffold this routine might be to first have students compare very familiar things like a basketball and a soccer ball, a dog and a cat, or snow and rain. This helps students understand the process for examining two different word problems. Recording ideas on sticky notes or lapboards is a good move too. Having students do this first will help them remember it and focus their thoughts when they share.
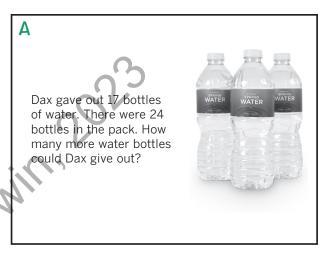
SAME AND DIFFERENT (VARIATIONS): DIFFERENT POSSIBILITIES FOR MODIFYING

This routine is possibly the most important for you to modify. Simply, there are many different things you want students to consider when comparing two different problems. The dog treat example shows how two problems can be identical except for the numbers used. But you can change the contexts, actions, numbers, number types, and much more to provide rich, diverse experiences. As you modify, think about what you've noticed as students solve problems. If you see that they are grabbing numbers and adding, provide two problems with different questions or actions. If you see that they struggle when numbers become larger, pose two problems that are identical except for the numbers used. The following are just some of the ways that you can modify to harness the power of this routine.

Variation A: Changing the Operation

Variation A is one of the best ways to modify this routine. The first problem is a subtraction problem with a known start and change. The second is a multiplication problem with an unknown product. Mentioning the pack, the number of bottles, and including the same name are intentional similarities. In this example, you want fourth-grade students to articulate how and why the operations are different. In a primary example, you might change the second problem to read "Dax put 17 bottles on a table. There were 24 bottles in a pack already on the table. How many bottles were on the table now?" While the two problems aren't quite as similar, they do provoke students to think about how 17 is subtracted in one problem and multiplied in another.

A

Dax gave out 17 bottles of water. There were 24 bottles in the pack. How many more water bottles could Dax give out?

A

Dax purchased 17 packs of water bottles. There were 24 bottles in the pack. How many water bottles could Dax give out?

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Variation B: Same Problem, Different Contexts

Sometimes the context of a problem is a barrier to student solutions. Contexts can be challenging due to each students' unique culture and experience. You can modify this routine to offer problems with different contexts. In this example, the two problems are essentially identical comparison problems. The context in one compares cola and diet cola and the other compares two different candy bars. The "store" context is shared here for simplistic vocabulary and familiarity. You could change the context to a school fundraiser, sales at a soccer game, or something else for greater relevance. Listen for students who note that they are the same problems because they give the same numbers in the same order. This is accurate but you also want to be sure that students recognize that the two quantities are being compared. When using this version of the routine, work to establish the equation that would be used for solving both problems and help students see how the numbers and operation connect explicitly to both.

B

A store sold 98 cases of cola and 53 cases of diet cola. What is the difference in the number of cases sold?

B

A store sold 98 cases of candy bars with nuts and 53 cases candy bars without nuts. What is the difference in the number of candy bars?

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Variation C: Compare Language

The way a problem is phrased can distract or confuse any of us. Perception and inference mingle with prior knowledge and experience to generate comprehension. A subtle turn of phrase, change in number, or change in the order of action can be enough to completely stall the problem-solving process. This example shows how you can use two problems to help students broaden their word problem experience. In both examples, bottles are being put on a table, creating an addition problem. But how each problem is phrased creates a slightly different order of addends. Also note that the way the question is phrased is different.

C

Kai put 37 bottles of water on a table that already had 39 bottles of water on it. How many bottles were on the table when Kai was finished?

C

There were 28 bottles of water on the table. Kai put 57 bottles on the table. How many were on the table when Kai was done?

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Variation D: Changing Number Types

That first example seems ridiculous unless you are thinking about batches made at a factory! The real point of this variation and example is to show how the routine can be used to help students make sense of context and operation when different number types, namely fractions, are introduced in fourth and fifth grade. In this example, you want students to talk about group size (6 pounds) and the number of groups (4 batches). Help them think about what the problem looks like and the equation that they would attach to it. Then, introduce the second problem that is almost the exact same. The only difference now is that the group size has changed from 6 to $\frac{1}{5}$. And as you suspect, this same approach can be used with different operations, decimals, or problems where both numbers are fractions.

D

A batch of yogurt calls for 6 pounds of berries. How many pounds are in 4 batches of yogurt?

D

A batch of yogurt calls for $\frac{1}{5}$ pounds of berries. How many pounds are in 4 batches of yogurt?

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Variation E: Three Problems

It makes sense to modify this routine to have students compare more than two problems. When doing so, you can choose to have students focus on two of the three to compare. Or, you can have them think about all three at the same time. In this example, the contexts are similar, and all three begin with the same number of students. Discussion about these three problems can become quite rich as students talk about what is happening, the resulting operations, the related equations, and, ultimately, the different solutions. Keep in mind that this is just one example of different problems. You could swap out the last problem with, "64 students are on the bus. 37 get on the bus at the next stop. How many are on the bus?" This problem is very similar to the first with a different number of students getting on the bus. With this change, you could focus on the difference in situation when students get off the bus.

E

64 students are on the bus. 27 get on the bus at the next stop. How many are on the bus?

E

64 students are on the bus. 27 get off the bus at the first stop. How many are left on the bus?

E

64 students are on the bus. There are 4 buses with the same number of students. How many students are there altogether?

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Variation F: One-Step and Two-Step Problems

Same and Different is excellent for introducing two-step problems to primary students or strengthening older students' skill with them. Simply pose a one-step problem and have students discuss it. Then, present a second problem that triggers another action or step. In the example, you notice that the number of treats and the number eaten remain the same. You want your students to speak to that during discussion. You also want them to note that the question is the exact same and that the idea of the problem is to find how many treats remain. Your students should be able to home in on the notion that the second will have fewer because another puppy ate more. Discussion about the equations used to solve each problem could be very interesting. It's likely that most students will argue that you subtract the number eaten each time. But it's possible that a student might speak to combining the number eaten before subtracting, offering yet another way that differences might bubble up in the routine.

F

Sam added 50 treats to her dog's toy. One puppy ate 13 of the treats. How many treats were left in the toy?

F

Sam added 50 treats to her dog's toy. One puppy ate 13 of the treats. Another puppy ate 22 of the treats. How many treats were left in the toy?

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Variation G: Students Create Their Own Comparisons

It can be challenging for students to create a problem when only given numbers or an equation. There is a lot for them to think about that can muddy the process. In this variation of Same and Different, you pose a problem for students to work with and discuss. Then, you have them craft a new question, creating a new problem to compare to the original. In other words, you take away the question and have them write a new one. Have students share their different problems and choose one student-generated example to compare with your original problem. Instead of having them create a new question to compare, you could give the exact same problem without the numbers. In this example, the second problem wouldn't include the number of pages for each book and students would be charged with creating them instead.

G

Kirby's favorite book is 395 pages. Nick's favorite book is 413 pages. Gina's favorite book is 525 pages. How much shorter is Kirby's book than Gina's?

G

Kirby's favorite book is 395 pages. Nick's favorite book is 413 pages. Gina's favorite book is 525 pages.

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Variation H: Comparing Inequalities and Equations
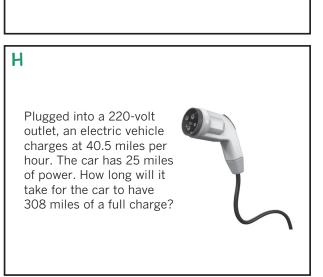
Same and Different is the perfect routine for comparing inequalities and equations. To do this, you can use a problem like the one on the top or in the center and compare them with the problem on the bottom. The routine is also a good tool for seeing how inequalities can change as well. Take a look at the inequalities on the top and in the center. They will have a common feature of adding 25 and a comparison of greater than or equal to 300. Of course, there is a clear difference as well. Seeing these situations side by side helps students make better sense of problems and the symbolic representations of them. And remember, you're surrounded with good examples. You can use any equation or inequality word problem from your mathematics series. Simply write a new one to compare by changing some feature of the original.

H

Plugged into a 110-volt outlet, an electric vehicle charges at 4 miles per hour. The car has 25 miles of power. How long will it take for the car to have at least 300 miles of charge?

H

Plugged into a 220-volt outlet, an electric vehicle charges at 45.5 miles per hour. The car has 25 miles of power. How long will it take for the car to have at least 300 miles of charge?

H

Plugged into a 220-volt outlet, an electric vehicle charges at 40.5 miles per hour. The car has 25 miles of power. How long will it take for the car to have 308 miles of a full charge?

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