

General Information

Lesson Parts & Duration

Total Duration: 1 hour

- Using Drawings and Tape Diagrams to Solve Addition Word Problems- Unknown Total

Subject(s)

- Operations & Algebraic Thinking: Addition within 100, Drawing Pictures to Solve Word Problems, Tape Diagrams, Explaining Strategies Used (2.OA.1)

Objective

- Students will use drawings to help solve an addition word problem.
- Students will draw tape diagrams to solve an addition word problem.
- Students will explain how they solved the addition word problem.

Materials

- blank paper
- pencil & crayons/colored pencils
- document camera or whiteboard
- **Optional Printable Student Resources:** “Exit Slips” (page 10) (1 copy per student), “Solving Word Problems (Class Practice)” (page 11) (1 copy per student), “Solving Word Problems (Partner Practice)” (page 12) (1 copy per student)
- **Optional Printable Teacher Resources:** “Steps to Solve a Word Problem” (page 13) (1 copy for display), “Break Up Your Day” brain/movement break ideas (page 14)

Instructional Setting

- Students should be seated so that they can easily work with a partner.

Throughout this lesson, you will find:

- ☀ **Scripted Text** indicates things that need to be said directly. Bullets starting with a “T” followed by *italicized* type indicate scripted text
- ☀ **Clarifiers** within scripted text are in orange
- ☀ **Teacher Directions** indicate things you should be doing
- ☀ **Side notes** provide helpful hints, ELL strategies, differentiation and information
- ☀ **Break Up Your Day** (Brain/Movement Breaks) are in green boxes (at the end)

Remember!

Quality over quantity. All components do not have to be accomplished; lessons may be ended at any time and resumed later.

Introduction

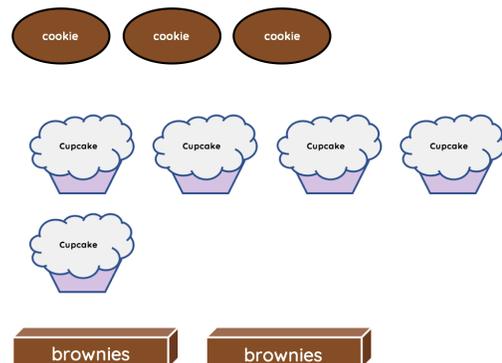
- T* I love baked treats.
- T* I like to bake cakes, cupcakes, pies, and cookies.
- T* Have any of you ever baked before?
- T* Raise your hand if you have ever helped someone to bake a cake, cupcakes, pies, cookies, or other treats.
- T* Many times, if you are having a party you may bake several different kinds of treats.
- T* Let's pretend we are having a party.
- T* For our party let's bake some cookies, cupcakes, and brownies.

Pass out 1 half sheet of blank paper per student.

Whole Group **Setting up the Paper**

- T* Here is our problem: "Today we are having a party. For our party, we will bake 3 large chocolate chip cookies, 5 cupcakes with sprinkles, and 2 brownies. How many treats did we bake in all?" **Write problem on the board so that students can see the important information.**
- T* On your paper, I would like you to draw pictures to help us to solve a baking problem.

Today we are having a party. For our party, we will bake 3 large chocolate chip cookies, 5 cupcakes, and 2 pans of brownies. How many treats did we bake in all?



Give students a few minutes to complete their drawings. Monitor and provide assistance as needed.

- T* Now that you have created drawings to match our problem, please share what you drew with a partner either next to or near you.
- T* Did you draw the same thing as your partner?
- T* With your partner explain what you need to do to find the answer to our problem.
- T* Remember it is asking us how many treats we baked in all.

Give students a few minutes to share their drawings. Monitor and provide assistance as needed.

- T* Who would like to come up and share their drawing with the class and explain how you would solve the problem? I need 3 volunteers. **Call on 3 students to come up and share.**
- T* The rest of you need to listen carefully to see if my 3 volunteers have the same ideas and drawings or if they are different.

Allow students to share their drawings and ideas. If students have different ideas or if they are incorrect, nicely clear up any misconceptions.

- T* Those were some great drawings and ideas.
- T* So, the answer to our question: "How many treats did we bake in all?" was 10, because 3 cookies + 5 cupcakes + 2 pans of brownies = 10 treats.
- T* Now, since you are all 2nd graders I am sure that you have started adding larger numbers than 3, 5, and 2.
- T* And it would be silly to just bake 3 cookies, 5 cupcakes, and 2 brownies.
- T* Whenever I have baked, I bake much larger quantities.
- T* So, a more realistic word problem about baking for a party would be something like: "Today we are having a party. For our party, we will bake 32 large chocolate chip cookies, 12 cupcakes, and 24 brownies. How many treats did we bake in all?"
- T* I don't know about you, but that sounds like a lot to draw!

- T* Drawing pictures to solve problems was a useful strategy for us to use as Kindergarteners and 1st graders, but as 2nd graders we have some much more challenging math problems.
- T* This means we will need to find a new method of illustrating the problem so that we can see it visually.
- T* This new strategy is using something called, “tape diagrams” or “bar models.”
- T* Tape diagrams help us to see a visual model that uses rectangles.
- T* Let me show you how using a tape diagram can help us to visually see our problem.
- T* The first step is to draw one long bar. **See example & model so students can follow.**
- T* Next, you break you bar up into the correct number of spaces.
- T* In our problem we had 3 parts: cookies, cupcakes, and brownies.
- T* So, I will break the bar into 3 pieces. **See example & model so students can follow.**
- T* Now here is the important part, the pieces I break the bar into should make sense with the numbers in my problem.
- T* Let me show you what I mean.
- T* Our problem had 32 cookies, 24 cupcakes, and 12 brownies.
- T* 32, 24, and 12 are not equal in value so that means the spaces should not all be the same size.
- T* 32 is the largest number and should have the largest piece, next is 24, should be smaller than 32, but larger than 12, and last is 12 which should be the smallest piece.
- T* Then I need to label each part. **See example & model so students can follow.**
- T* This is a “part + part + part = total” model. **See example & model so students can follow.**
- T* The unknown in our problem is the total, so below my bar I will draw a bracket and put a question mark.
- T* Not all word problems will follow this model of the total being the unknown.
- T* Sometimes the total might be known and one of the parts is the unknown. **See example & model so students can follow.**
- T* Either way we always label the parts of our diagram with the correct words and numbers and then identify the unknown by using a question mark.
- T* During this lesson we will focus on the total being the unknown.

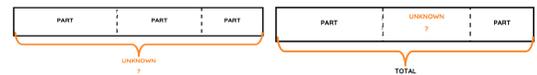
Pass out a copy of “Solving Word Problems (Class Practice)” to each student –or– project it so that students can copy on blank paper.

Name: _____

Steps to Solve a Word Problem

RDW: Read, Draw, and Write

- Read** the problem carefully.
- Read** it a second time underlining important details and circling the question.
- Draw** the information using a tape diagram/bar model.
- Label** all of the “Parts”, the “Total” and the “Unknown” using a question mark “?”.



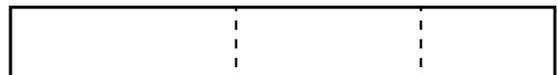
- Write** the **equation** to match the word problem and **solve**.
- Write** your **answer** in a **complete sentence**.

Creating a Tape Diagram/Bar Model

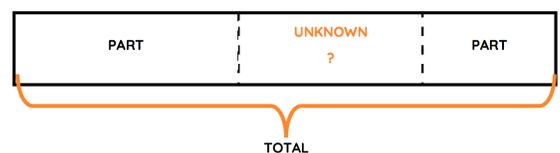
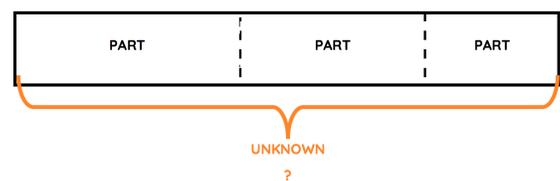
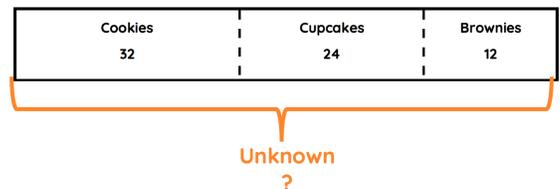
Step 1: Draw a Bar



Step 2: Separate spaces to match the number of items in your problem. Spaces should make sense based on the numbers.



Step 3: Label each part of your bar model/tape diagram.



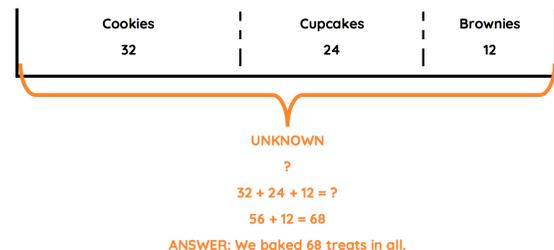
Whole Group Practice

- T** Now that you have seen the strategy that we will be using, let's practice a few problems.
- T** Once everyone has gotten the hang of solving word problems by identifying key information, drawing a tape diagram/bar model to represent the numbers, and finally writing an equation that matches to solve the problem, you will have a chance to solve some problems the same way.
- T** Let's start by going through the whole process on a new problem.
- T** We are going to follow the RDW process.
- T** RDW stands for "Read, Draw, Write."
- T** We will always start by reading our problem carefully.
- T** Then we will read it a second time and underline important details and circle our question.
- T** Next, we will "Draw," in this case we aren't drawing pictures, we are drawing a tape diagram/bar model.
- T** Finally, we will "Write," this means we will write the equation and solve for the unknown.
- T** Then we will write our final answer in a complete sentence.

Problem # 1

- T** We will start by completing problem number 1.
- T** First, we will read the problem carefully: "For our party, we will bake 32 large chocolate chip cookies, 12 cupcakes, and 24 brownies. How many treats did we bake in all?"
- T** Then we will read it a second time looking for important details.
- T** I will stop reading each time I find an important detail and I will underline it.
- T** "For our party, we will bake 32 large chocolate chip cookies," I need to underline "32 large chocolate chip cookies." See example & model so students can follow.
- T** "12 cupcakes," stop, I need to underline "12 cupcakes." See example & model so students can follow.
- T** "and 24 brownies." Stop we need to underline "24 brownies." See example & model so students can follow.
- T** "How many treats did we bake in all?" This is our question so we will circle it. See example & model so students can follow.
- T** Step 2 is to draw.
- T** Using this tape diagram bar, let's decide how many parts there are in our word problem.
- T** Show me with your fingers how many parts there are in this problem. **Answer: 3 parts.**
- T** Correct, there are 3 parts.
- T** Thumbs up if you think all of the parts should be the same size and thumbs down if you think they should be different sizes. **Answer: Thumbs down, they should be different sizes.**
- T** 32, 12, and 24 have different values, therefore I will make the portions of my bar different sizes.
- T** Next, I have to label each of the 3 parts and the total.
- T** In this case, the total is unknown, so we will indicate that using a "?".
- T** The last thing that we will do is write our equation, " $32 + 24 + 12 = ?$ ".
- T** When adding 3 numbers I like to combine 2 numbers, add those, and then add the final number to that.
- T** I will add: " $32 + 24 = 56$ " and then " $56 + 12 = 68$."
- T** Now I have my final answer which is 68.
- T** The final step is to write our answer as a complete sentence.
- T** To do this, I will use words from my question to write a complete sentence containing my answer.

1. For our party, we will bake 32 large chocolate chip cookies, 12 cupcakes, and 24 brownies. How many treats did we bake in all?



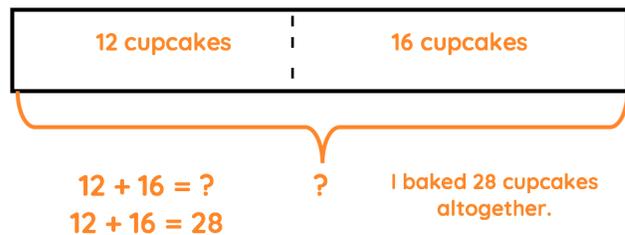
- T* Let me show you what I mean, the question is: “How many treats did we bake in all?”
T So, I will say, “We baked 68 treats in all.” I am using the words from the end of the question in my answer.

Problem # 2

- T* Problem number 2.
T First, we will read the problem carefully: “I have 12 cupcakes. I need to bake 16 more. How many cupcakes did I bake altogether?”
T Then we will read it a second time looking for important details.
T I will stop reading each time I find an important detail and I will underline it.
T “I have 12 cupcakes,” stop and underline “12 cupcakes.” *See example & model so students can follow.*
T “I need to bake 16 more.” Stop and underline “16 more.” *See example & model so students can follow.*
T “How many cupcakes did I bake altogether?” This is our question so we will circle it. *See example & model so students can follow.*
T Step 2 is to draw.
T Using this tape diagram bar, let’s decide how many parts there are in our word problem.
T Show me with your fingers how many parts there are in this problem. **Answer: 2 parts.**
T Correct, there are 2 parts.
T Thumbs up if you think all of the parts should be the same size and thumbs down if you think they should be different sizes. **Answer: Thumbs down, they should be different sizes.**
T 12 and 16 have different values, therefore I will make the portions of my bar different sizes.
T Next, I have to label each of the 2 parts and the total.
T In this case, the total is unknown, so we will indicate that using a “?”.
T The last thing that we will do is write our equation, “12 + 16 = ?”.
T I will add: “12 + 16 = 28.”
T Now I have my final answer which is 28.
T The final step is to write our answer as a complete sentence.
T To do this, I will use words from my question to write a complete sentence containing my answer.
T Let me show you what I mean, the question is: “How many cupcakes did I bake altogether?”
T So, I will say, “I baked 28 cupcakes altogether.” I am using the words from the end of the question in my answer.

2. I have 12 cupcakes. I need to bake 16 more. How many cupcakes did I bake

altogether?



Problem # 3

- T* Now I will let you try each step and then we will check to see if you are correct as we go.
T First, you need to read the problem carefully.
T Then read a second time and underline the important details and circle the question.

Give students about a minute to complete this step. Monitor and provide assistance as needed.

- T* You should have underlined: “24 crayons” and “36 more.”
T Then circled the question which is: “How many crayons will I have altogether?”

T Give me a thumbs up if you got that step right! Scan the room to get an idea of who is understanding and who may need more support later.

T Step 2 is to draw.

T Using this tape diagram bar, decide how many parts there are in our word problem.

T Divide the tape diagram up and label all of the parts.

Give students about a minute to complete this step. Monitor and provide assistance as needed.

T Show me with your fingers how many parts there are in this problem. Answer: 2 parts.

T Correct, there are 2 parts.

T Thumbs up if you think all of the parts should be the same size and thumbs down if you think they should be different sizes. Answer: Thumbs down, they should be different sizes.

T You should have labeled the first part “24 crayons,” the second part is “36 crayons.”

T In this case, the total is unknown, so we will indicate that using a “?”.

T The last thing that we will do is write our equation.

T Please write out the equation and solve.

Give students about a minute to complete this step. Monitor and provide assistance as needed.

T Our equation is: “ $24 + 36 = ?$ ”.

T I will add: “ $24 + 36 = 60$.”

T Now I have my final answer which is “60”.

T Final step, write your answer in a complete sentence.

Give students about a minute to complete this step. Monitor and provide assistance as needed.

T To do this, you should have used words from the question to write a complete sentence containing your answer.

T The question is: “How many crayons will I have altogether?”

T So, I will say, “I will have 60 crayons altogether.” I am using the words from the end of the question in my answer.

Problem # 4

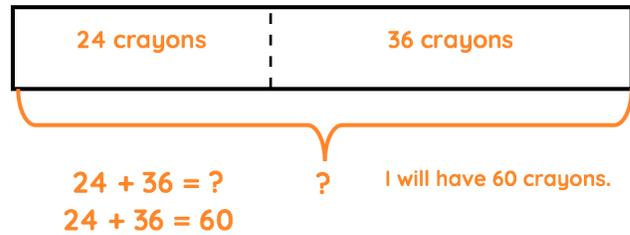
T Last problem, again, I will let you try each step and then we will check to see if you were correct as we go.

T First, you need to read the problem carefully.

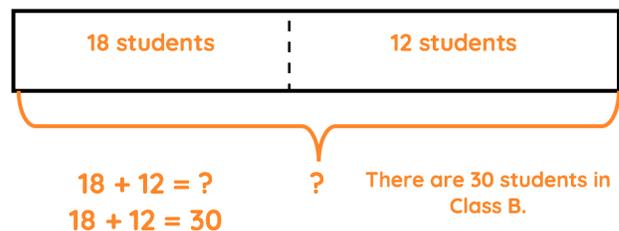
T Then read a second time and underline the important details and circle the question.

Give students about a minute to complete this step. Monitor and provide assistance as needed.

3. I have 24 crayons. I need to buy 36 more. How many crayons will I have altogether?

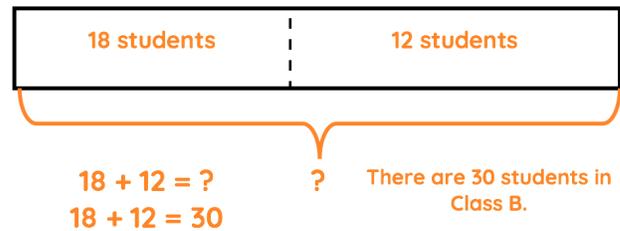


4. There are 18 students in Class A. There are 12 more students in Class B. How many kids are in Class B?



- T* You should have underlined: “18 students in Class A” and “12 more students in Class B.”
- T* Then circled the question which is: “How many kids are in class B?”
- T* Give me a thumbs up if you got that step right! Scan the room to get an idea of who is understanding and who may need more support later.
- T* Step 2 is to draw.
- T* Using this tape diagram bar, decide how many parts there are in our word problem.
- T* Divide the tape diagram up and label all of the parts.

4. There are 18 students in Class A. There are 12 more students in Class B. How many kids are in Class B?



Give students about a minute to complete this step. Monitor and provide assistance as needed.

- T* Show me with your fingers how many parts there are in this problem. Answer: 2 parts.
- T* Correct, there are 2 parts.
- T* Thumbs up if you think all of the parts should be the same size and thumbs down if you think they should be different sizes. Answer: Thumbs down, they should be different sizes.
- T* You should have label the first part “18 students” and the second part “12 students.”
- T* The total is unknown so you should have shown this with a “?”.
- T* The last thing that we will do is write our equation.
- T* Please write out the equation and solve.

Give students about a minute to complete this step. Monitor and provide assistance as needed.

- T* Our equation is: “ $18 + 12 = ?$ ”.
- T* Let’s add: “ $18 + 12 = 30$.”
- T* Now I have my final answer which is 30.
- T* Final step, write you answer in a complete sentence.

Give students about a minute to complete this step. Monitor and provide assistance as needed.

- T* To do this, you should have used words from the question to write a complete sentence containing your answer.
- T* The question is: “How many kids are in Class B?”.
- T* So, I will say, “There are 30 students or kids in Class B.” I am using the words from the end of the question in my answer.



Now is a great time to take a break and get students re-energized.
See our list of engaging movement and brain break ideas to get your students moving and ready to refocus! (see page 10)

Partner Practice

Pass out the “Solving Word Problems (Partner Practice)” to each student –or– project it for students to copy on blank paper.

- T** Now that we have practiced 4 problems together as a class, I think you are all ready to try some similar problems with a partner.
- T** Please use the paper we did together as a guide to help you follow all of the steps: RDW: Read, Draw, and Write.
- T** When I say go, you will get up and find a partner who was born in the same month as you.
- T** If you can't find a partner I will pair you up with another student.
- T** Ready, Go! Don't forget to take your paper and pencil with you. **Pair up any student who doesn't have a partner.**

Allow students about 15-20 minutes to complete this sheet with a partner. Either pull a small group of students who are struggling, or monitor and provide assistance as needed.

Differentiation:

Support: Pull small group aside to work through problems together. Make the numbers in the problems smaller, or have them only complete half of the problems.

Enrichment: Give students who need an additional challenge more problems containing larger numbers.

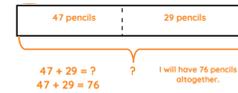
ELL:

Pair student(s) with a partner. Word problems will be difficult to understand. You may need to provide more pictures to go with the word problem for the student to understand vocabulary, especially nouns.

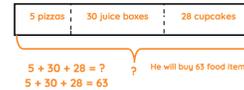
Name: **ANSWER KEY**

Solving Word Problems (Partner Practice)

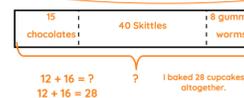
1. I have **47 pencils**. I need to buy **29 more**. How many pencils will I have altogether?



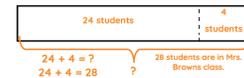
2. Frank is having a birthday party. He will buy **5 large pizzas**, **30 juice boxes**, and **28 cupcakes**. How many food items will he buy in all?



3. Ana has **15 pieces of chocolate**. Steve has **40 skittles** and Landon has **8 gummy worms**. How many pieces of candy do they have altogether?



4. There are **24 students** in Mr. Smith's class. There **4 more students** in Mrs. Brown's class. How many students are in Mrs. Brown's class?



Optional Assessment Component "Exit Slips"

*You may use the exit slip at the end of this lesson as a quick assessment of student understanding. Either print them out (page 10), or simply have students copy the problems on a half sheet of paper.

- T** Now it is time to show your teacher what you have learned.
- T** But first let's turn and tell the person next to us how to make a tape diagram to solve an addition problem.

Give a few minutes for students to review. If you hear many incorrect response please review quickly before having students complete their exit slips.

- T** You will solve 1 word problem independently the same way that you solved the problems with the whole class, and with your partner.
- T** Remember to RDW: Read, Draw, and Write.
- T** You need to underline important details, circle the question, create a tape diagram, write an equation, solve, and finally write your answer as a complete sentence.
- T** Once you have finished please bring me your paper.

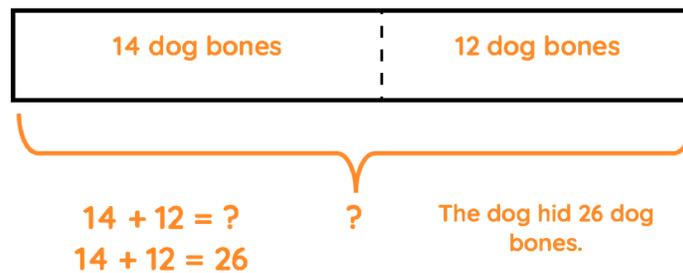
Collect "Exit Slips" and leave for the teacher. Answer found on next page.

Name: **ANSWER KEY** Date: _____

Exit Slip:

Addition Word Problems Using Tape Diagrams

1. The dog hid 14 bones under the porch. Then the dog hid 12 more bones in the garden. How many bones did he hide altogether?



 **Make sure to “Break Up Your Day!”** 

Now is a great time to take a break and get students re-energized. See our list of engaging movement and brain break ideas to get your students moving and ready to refocus! (see page 14)

Name: _____ Date: _____

Exit Slip:

Addition Word Problems Using Tape Diagrams

2. The dog hid 14 bones under the porch. Then the fog hid 12 more bones in the garden.
How many bones did he hide altogether?

Name: _____ Date: _____

Exit Slip:

Addition Word Problems Using Tape Diagrams

1. The dog hid 14 bones under the porch. Then the fog hid 12 more bones in the garden.
How many bones did he hide altogether?

Name: _____

Solving Word Problems (Class Practice)

1. For our party, we will bake 32 large chocolate chip cookies, 12 cupcakes, and 24 brownies. How many treats did we bake in all?

2. I have 12 cupcakes. I need to bake 16 more. How many cupcakes did I bake altogether?

3. I have 24 crayons. I need to buy 36 more. How many crayons will I have altogether?

4. There are 18 students in Class A. There are 12 more students in Class B. How many kids are in Class B?

Name: _____

Solving Word Problems (Partner Practice)

1. I have 47 pencils. I need to buy 29 more. How many pencils will I have altogether?

2. Frank is having a birthday party. He will buy 5 large pizzas, 30 juice boxes, and 28 cupcakes. How many food items will he buy in all?

3. Ana has 15 pieces of chocolate. Steve has 40 Skittles and Landon has 8 gummy worms. How many pieces of candy to they have altogether?

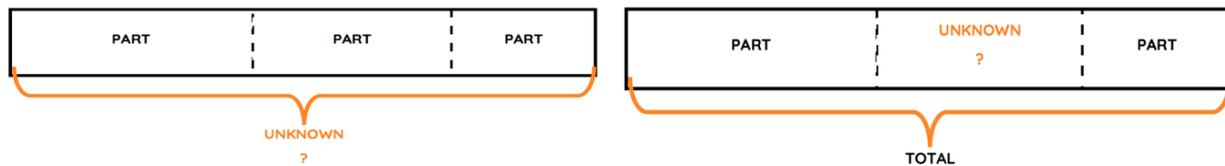
4. There are 24 students in Mr. Smith's class. There 4 more students in Mrs. Brown's class. How many students are in Mrs. Brown's class?

Name: _____

Steps to Solve a Word Problem

RDW: Read, Draw, and Write

1. **Read** the problem carefully.
2. **Read** it a second time underlining important details and circling the question.
3. **Draw** the information using a tape diagram/bar model.
4. **Label** all of the “**Parts**”, the “**Total**” and the “**Unknown**” using a question mark “?”.



5. **Write** the **equation** to match the word problem and **solve**.
6. **Write** your **answer** in a **complete sentence**.

Make sure to “Break Up Your Day!”

These can be used in the middle of a lesson or at the end of your lesson.

Here are a few engaging movement and brain break ideas to get your students moving and ready to refocus!



Break Up Your Day: Guess My Number!



- Begin by showing an example:
- “I am thinking of a number between 1 and 10. Who would like to guess my number” Call on a student.
- When they take a guess, let them know if your number is bigger or smaller than what they guessed (ex: Student guesses 5, your number is 7, so you would say “My number is bigger than 5.” Then call on another student to guess).
- Keep giving clues until students guess the number.
- You could play again with the teacher picking the number if students need reinforcement, or you could have a student come up and pick the number (have them tell you what the number is so you can help them).



Break Up Your Day: The Wiggles!



- Let’s get our wiggles out before we continue!
- Stand up and shake out your arms (4-5 seconds to shake) Remember! No one should get hurt! ...now FREEZE!
- Now shake the wiggles out of your right leg...FREEZE!
- Now shake the wiggles out of your left leg...FREEZE!
- Now shake all the wiggles out of your whole body...FREEZE!



Break Up Your Day: Body Stretches!



10 minutes

FORMATION: Standing at desks

- Have students begin the day with a series of simple activities lasting 30 seconds or more: jumping jacks, knee lifts, flap arms like a bird, hopping, scissors (feet apart then cross in front, feet apart then cross in back)...
- Follow each activity with a basic stretching movement:
- Reach for the sky runner’s stretch
- Butterfly stretch (sit with bottom of feet together)
- Knee to chest, rotate ankles, scratch your back

Hold stretches for 10 - 30 seconds. Repeat a different simple activity followed by a new basic stretch as many times as desired.