

Pre-K Mathematics: **TRUCKS**  
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# Trucks



## Math - Operations and Algebraic Thinking

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### SUMMARY

The following pages include guidelines to a culminating common core aligned task for mathematics, based on the unit *Trucks*. These guidelines include how to prepare students for mathematical activities, steps to play a game using addition and subtraction, ways to challenge and support students' mathematical learning, formative assessment questions, and samples of scored and annotated student work.

This common core aligned task for mathematics is to be used in correlation with the curriculum-embedded common core aligned task for literacy, *Trucks*.

### STANDARDS ASSESSED

**Operations and Algebraic Thinking PK.OA.1:** Demonstrates an understanding of addition and subtraction by using objects, fingers, and responding to practical situations (e.g. if we have 3 apples and add two more, how many do we have all together?).

**Counting and Cardinality PK.CC.4:** Count to answer "how many?" questions about as many as 10 things arranged in a line, a rectangular array, or a circle, or as many as 5 things in a scattered configuration; given a number from 1-10, count out that many objects.

### DEPTH OF KNOWLEDGE (DOK) LEVELS:

TASK—DOK Level 3

UNIT—DOK Level 4

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## *How Many Trucks?*

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#### **GUIDELINES FOR ADMINISTERING THE TASK**

Young children begin to acquire informal knowledge of mathematics in the context of their everyday experiences early in life. In pre-k students use mathematical reasoning in typical activities such as setting the table for snack time, rotating blocks to build a structure, and exploring ways to equally share an apple with two friends. Pre-k teachers can help build on their students' implicit explorations and curiosities of the world around them by explicitly making them aware of their thinking about mathematics. To nurture pre-k students' individual mathematical growth and development, structure classroom environments with mathematical activities, tools, and language, and always model positive attitudes about math and multiple approaches to solving problems (Clements & Sarama, 2000).

The following task consists of an interactive word problem using addition and subtraction skills, ideas for preparing students, a tiered list of vocabulary words, formative assessment questions, and guidelines for collecting student work. Teachers are encouraged to adapt this activity to a different theme or unit of study.

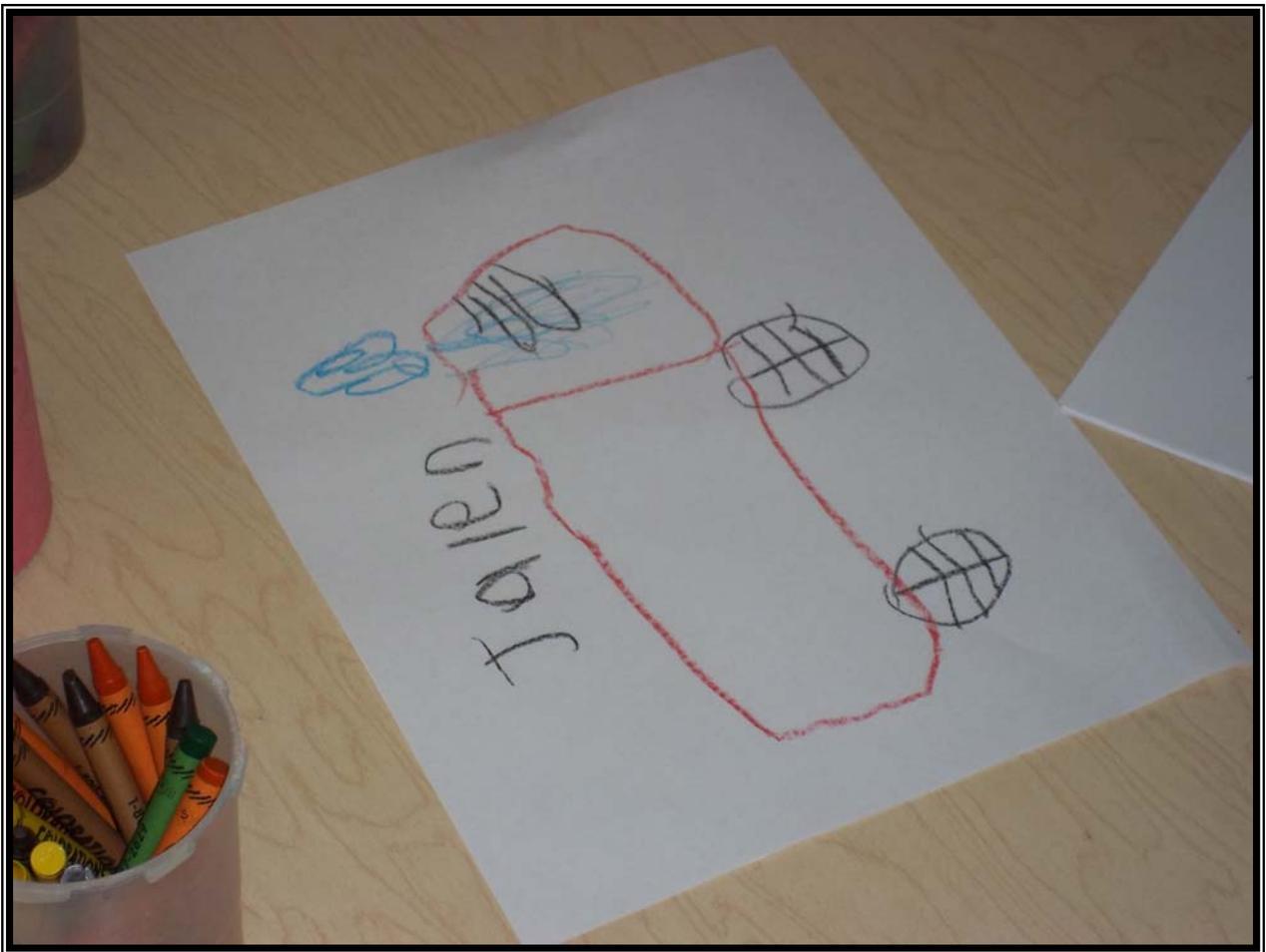
#### **IDEAS FOR PREPARING STUDENTS**

- Read books and encourage students to have conversations about different types of trucks. Trucks by Byron Barton and Truck by Donald Crews (see Literacy task) to bridge literacy and mathematics.
- Invite students to bring toy trucks from home to school on “sharing day.” Create a chart with a graph to record how many students brought delivery trucks, fire trucks, tanker trucks, etc. to school.
- As you clean-up the vehicles in your classroom prompt students to categorize your classroom trucks on the shelves by size and/or type. Count how many trucks you have all together when you sort them in a bin.

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- Take a neighborhood walk and play an “I Spy Trucks” game. Take pictures to document the “neighborhood trucks” in a book.
- Take a class trip to the local fire station to learn more about fire trucks. Work with students to prepare questions to ask that are specific to fire trucks.
- Explore the different types of street signs in your neighborhood. Categorize them by type, such as: Caution Signs, Speed Signs, Pedestrian Signs, and Stop Signs.
- Build roads and highways with blocks, painter’s tape, and other classroom materials. Introduce new mathematical language as you explore the shapes of blocks and buildings, such as rectangular, and the types of lines for roads, such as zigzagged or curved.
- Encourage students to create traffic signs, draw pictures of trucks, and maps of roadways.



After looking at images of trucks, a student draws a picture of a fire truck.

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### DAY ONE: Activity for Preparing Students

#### Preparing for the Road Trip with Students!

**Objective:** In this activity students will explore various linguistic concepts, such as moving trucks “into tunnels” and “onto bridges,” mathematical concepts by exploring the attributes of blocks and by practicing addition and subtraction skills.

**Estimated Time:** 15-20 minutes as a center time activity

#### Set-up & Materials:

- Read Truck by Donald Crews.
- Facilitate a discussion around the illustrations in the text (see Literacy Task).
- Provide students with paper, crayons, tape, cardboard, scissors, and boxes to create props from the text.
- Explain to students that they need to build a roadway for trucks that includes bridges, tunnels, a large gas station, and a main road.
- Encourage students to create signs for the roads and gas station.
- With a small group of students, introduce what it means to add trucks to the road, and subtract trucks from the road. Improvise mathematical prompts for students to follow while playing.
- Introduce what it means to go into something, like a tunnel, and onto something, like a bridge.
- Provide students with opportunities to independently explore the trucks and roadways prior



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to the task (Day Two).

### DAY TWO: *How Many Trucks? A Mathematical Game*

**Objective:** Students will explore the concept of addition and subtraction by combining and separating up to 5 trucks while playing in centers.

**Estimated Time:** 5-10 minutes

#### Math Game Set-up

- Build a roadway on the floor as a center time activity with students (see Day 1). *Be sure that this area is closed to others play while you play this game.*
- Have a designated “main road.”
- Have a variety of trucks available for students to explore with in open-ended play before engaging in the structured task.
- Have pictures of trucks ready to stick to a wall, chart paper, or magnetic board to model verbal directions to students (see “truck photographs”).

#### Math Game Materials

- A variety of five trucks, safe for small children.
- Story cards with mathematical prompts for students (see “teacher story cards”)
- A child-created bridge, tunnel, gas station, roads, and street signs
- Images of trucks (see “truck photographs”).
- A wall, chart paper, or magnetic board to model adding and subtracting trucks to the road using real images of trucks.

#### Math Words/Vocabulary

Linguistic Access: In this performance-based assessment help students connect the vocabulary words to the mathematical language functions (i.e. what it means to combine, take away, explain), and provide entry points to the mathematical content for all students. Introduce the most essential vocabulary and language functions first, with concrete models for students to grasp the meaning.

The following vocabulary words are not meant to be memorized, but rather conceptualized through hands-on experiences.

Tier 1: line, more, less, enough, fewer

Tier 2: all together, number



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Tier 3: add, addition, subtract, subtraction, total, sum

Language Functions: combine, take away, and explain

### Directions to Facilitators:

- During center time invite a small group of 3-5 students to play a game using the trucks and roadway they created on the floor.
- Explain that you will be playing a mathematical game using addition and subtraction. Reinforce that addition means to “combine trucks” and subtraction means to “separate trucks.” Show them what you mean when you say, “Add 2 trucks to the road” and “Subtract 1 truck from the road.”
- Explain to the students that they will be listening to a story and adding and subtracting trucks to the road. They need to listen and watch the teacher to know when it’s their turn
- Take a moment to practice a few suggested teacher prompts:
  - *Two trucks drive through the tunnel and onto the road. How many are on the road?*
  - *One truck needs gas and stops at the station. Subtract one truck from the road. How many are on the road? How many are at the gas station?*
- Now start playing the game! Create your own story about trucks while prompting students to add and/or subtract within five trucks.



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#### Formative Assessment:

##### Questions for Students

These questions have various Depth of Knowledge (DOK) levels in order to provide multiple entry points for students. Work alongside students to scaffold mathematical concepts and document what they can do and know about mathematics:

- Please explain your answer.
- Did anyone find a different answer?
- How many more trucks?
- How many fewer trucks?
- How many trucks are on the road / at the gas station / on the bridge?
- Subtract \_\_\_ number of trucks.
- Add \_\_\_ number of trucks?
- When we separate trucks, do we end up with more or fewer trucks all together?
- When we combine trucks, do we end up with more or fewer trucks all together?

##### Questions for Teacher Reflection

Consider the following questions to help guide your documentation notes and evaluations.

- Did the student combine trucks when prompted to add?
- Did the student separate or remove trucks when prompted to subtract?
- Did the student observe the teacher and his/her peers before manipulating the materials?
- Did the student count each truck to answer “how many”?
- Did the student call out the correct number without counting each one?
- Did the student count on from a number (i.e. ...3, 4, 5) or start counting from number one (i.e. 1, 2, 3, 4, 5) to answer how many questions?
- Did the student count the same truck more than once, needing guidance to accurately count the trucks?

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#### Additional Supports for Students:

The following are additional ideas and resources to help you motivate all of your students to participate in this task. The mathematical supports will help you consider adaptations for your students to engage in this task, while the extensions will help you challenge some students to explore addition and subtraction in other ways beyond the expectations of the standard being assessed.

#### Mathematical Supports

- Offer a wide range of mathematical manipulatives such as counting chips, Unifix cubes, and interlocking links to use in place of trucks.
- Incorporate technology and computer games for students to practice and experience other functions for addition and subtraction. Visit the National Council for the Teachers of Mathematics' [Illuminations](#) website.
- Partner students to work together, take turns, and explore different approaches to addition and subtraction. This works well for students who want to observe the process before fully engaging in the task on their own.
- Create number jars with written 0-5 numerals outside and the corresponding quantity of an item inside. Explore why the jar with the numeral "0" has nothing inside. What does zero mean? Use these jars with students who will benefit from visual representations of numbers to practice one-to-one correspondence.
- Motivate all students by playing a similar mathematical game with different classroom materials such as: animals in a zoo, people in a dollhouse, counting bears, etc. Encourage the students to help you make up the story!
- Provide pictures, manipulative, and writing materials to encourage students to show you how they got the answer in ways other than verbal communication. Verbally expressing thoughts about mathematics may be challenging for many pre-k students as their expressive and receptive language skills are still developing.

#### Mathematical Extensions

- Challenge students to guess how many more or how many fewer trucks they need: "We have 3 trucks and we want 5. How can we get 5 trucks?"
- Challenge students to demonstrate different ways to find a sum. "We combined 2 trucks with 3 trucks and now have 5 trucks. What are some other ways to combine trucks to make a sum of 5? Let's try to combine  $1+1+3$  trucks."

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- Introduces students to other functions of addition and subtraction, for example, by showing them addition and subtraction along the number line, through drawings, or on the computer.

### Guidelines for Collecting Student Work in Mathematics:

To document student performance in mathematics notate: 1) exactly what the student says in response to teacher prompts, 2) how the student physically manipulates the materials and, 3) how the student demonstrates the mathematical concept. Some methods for documenting and collecting student work are as follows:

- Draw and/or write how students combine and separate trucks while playing the game. Take photos of the student's process and how they demonstrate steps with addition and subtraction.
- With media consent, video record students in the process. Encourage students to draw, write, and describe the game.
- Ask students to articulate their thinking about math and dictate what they say. Prompt students with reminders and ask questions.



### References:

Campbell, P.F., & Langrall, C. (1993). Making equity a reality in classrooms. *The Arithmetic*

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*Teacher*; 41, 2; ProQuest Education Journals.

Sarama, J., & Clements, D.H. (2000). Standards for preschoolers. *Teaching Children Mathematics*, 7 (1), 38-41.

### **APPENDIX**

***A: Story Cards***

***B: Photographs of Trucks***

***C: Scoring Rubric***

***D: Teacher Notes Template***

***E: Student Work Samples***

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**A: Story Cards**

**How Many Trucks? A Mathematical Game**

<p><b>Five trucks drive through a tunnel and into NYC.</b></p> <p><u>Student Prompt:</u></p> <ul style="list-style-type: none"><li>• Can you add <i>five</i> trucks to the road and drive them through the tunnel?</li></ul>	<p><b>After the <i>five</i> trucks drive through the tunnel into NYC, <i>three</i> trucks stop at a gas station.</b></p> <p><u>Student Prompts:</u></p> <ul style="list-style-type: none"><li>• Subtract <i>three</i> trucks from the road to stop at the gas station.</li><li>• How many trucks are left on the road? [2]</li></ul>	<p><b>Now <i>two</i> of the trucks at the gas station are ready to drive! Add <i>two</i> trucks to the road b with the other <i>two</i> trucks.</b></p> <p><u>Student Prompt:</u></p> <ul style="list-style-type: none"><li>• How many trucks are on the road? [4]</li></ul>
<p><b>Suddenly it starts raining so <i>one</i> truck pulls off the road and goes back into the gas station. Subtract <i>one</i> truck from the road?</b></p> <p><u>Student Prompts:</u></p> <ul style="list-style-type: none"><li>• How many trucks are in the gas station? [2]</li><li>• How many trucks are on the road? [3]</li></ul>	<p><b>The rain finally stops and all <i>five</i> trucks are ready to drive!</b></p> <p><u>Student Prompts:</u></p> <ul style="list-style-type: none"><li>• Let's think...we have <i>three</i> trucks on the road but want five trucks on the road. How many more trucks do we need? [2]</li><li>• Now all <i>five</i> trucks are back on the road!</li></ul>	<p><b>All <i>five</i> trucks are driving on the road together, but then <i>two</i> trucks turn to go through the tunnel.</b></p> <p><u>Student Prompts:</u></p> <ul style="list-style-type: none"><li>• Teacher prompts two students to drive their trucks through the tunnel.</li><li>• We had <i>five trucks</i> and subtracted <i>two</i>. How many trucks are left on the on the road? [3]</li></ul>

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**Oh no! The *two* trucks in the tunnel realize that they made a wrong turn! They need to go back to the road.**

Student Prompts:

- Do we need to add or subtract trucks?
- Add the *two* trucks to the road.
- How many trucks do we have all together? [5]

***Three* trucks turn off the road and drive onto the bridge.**

Student Prompts:

- How many fewer trucks are on the road? [2]
- How many trucks are on the bridge? [3]

**Oh no! We need *five* trucks back on the road.**

Student Prompts:

- How many more trucks do we need to make *five*? [3]
- Can you add *three* trucks to the road?

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### B: Photographs of Delivery Trucks

Please note that we encourage teachers to go on a neighborhood walk and take their own photographs of trucks with students. Exposing students to a wide variety of trucks is the best way for them to develop content knowledge of trucks. These photographs of delivery trucks are provided as a resource for teachers to use in addition to their own neighborhood photographs of different trucks.



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**C: Scoring Rubric**

<b>1</b>	<b>2</b>		<b>3</b>
<b>Not Yet</b>	<b>In Process</b>		<b>Proficient</b>
<p>Student inconsistently explores concrete objects to demonstrate ways to combine and/or separate number sets, and does not answer how many questions.</p>	<p>Student inconsistently explores concrete objects to demonstrate ways to combine and/or separate number sets, but begins to count to answer how many questions.</p>	<p>Student consistently uses concrete objects to demonstrate ways to combine and/or separate number sets, but inaccurately counts to answer how many questions.</p>	<p>Student consistently uses concrete objects to demonstrate ways to combine <b>and</b> separate number sets, and accurately answers how many questions by counting or calling out the answer.</p>

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**D: Teacher Notes Template**

Student Name & Date	Observation, Dictation & Evidence of Understanding	Rubric Rating & Rationale