

Pre K–K Sample Math Task

Counting Cars

Max counts cars going past his house. First, Max counts 3 cars. Next, Max counts 1 car. Last, Max counts 2 cars. How many cars did Max count going past his house? Show and tell how you know.

Counting Cars

Suggested Grade Span

Grades Pre K–K

Common Core Task Alignments

Mathematical Practices: 1, 3, 4, 5, 6

Grade K Content Standards:

K.CC.2, K.CC.4c, K.OA.1, K.OA.2

Task

Max counts cars going past his house. First, Max counts 3 cars. Next, Max counts 1 car. Last, Max counts 2 cars. How many cars did Max count going past his house? Show and tell how you know.

Alternative Versions of the Task

More Accessible Version:

Max counts cars going past his house. First, Max counts 2 cars. Next, Max counts 1 car. How many cars did Max count going past his house? Show and tell how you know.

More Challenging Version:

Max counts cars going past his house. First, Max counts four cars. Next, Max counts three cars. Last, Max counts one car. How many cars did Max count going past his house? Show and tell how you know.

NCTM Content Standards and Evidence

Instructional programs from pre-kindergarten through grade 12 should enable all students to:

- Solve problems using informal counting strategies up to totals of 10.
- Solve problems which require the joining of two or more sets of objects in order to find the whole.
- In this task, learners must be able to combine three, one and two objects and determine the total of six.

Links

This task would link well to a unit on transportation. Instruction allowing children to combine sets of objects should have taken place prior to teaching this lesson.

Support

A child can be given manipulatives or toy cars to represent/model the six cars and can be encouraged to transfer the model to paper if s/he is comfortable doing so, or the teacher can take a picture of the child's model. (Many children will select paper, pencil, crayon, etc. to show their solution.) A teacher, older student, paraprofessional, volunteer, etc. should scribe the child's solution so there is a complete record of the child's reasoning.

Possible Solutions

Original Version:

Max counts 6 cars.

More Accessible Version:

Max counts 3 cars.

More Challenging Version:

Max counts 8 cars.

Task-Specific Assessment Notes

General Notes: Many children will solve this task by diagramming the cars and either count on or use addition to find a total of six cars.

Novice: The Novice will be unable to solve the task and could simply draw a “picture” of a car(s). No understanding of the underlying mathematics of the task will be evident.

Apprentice: The Apprentice will be able to partially solve the task. S/he will understand that the task involves three cars, one car and two cars. The child may not be able to find the total number of cars. The child could also model/diagram six cars but not have the correct sets. The Apprentice will attempt to communicate her/his reasoning by using a mathematical language term and/ or number. The Apprentice will also attempt to make an appropriate representation. A connection may be attempted, but it will not be mathematically relevant to the task.

Practitioner: The Practitioner will be able to correctly solve the task by demonstrating a total of six cars. The Practitioner will use mathematical language and/or numbers. Terms could include, but are not limited to, *total, more than, less than, 1, 2, 3 ..., first, next and last*. The Practitioner will be able to construct an appropriate and accurate representation (usually a diagram, but could also use a model or table). The Practitioner will be able to make a mathematically relevant observation (connection) about her/his solution, such as three is the most cars that Max counted at one time.

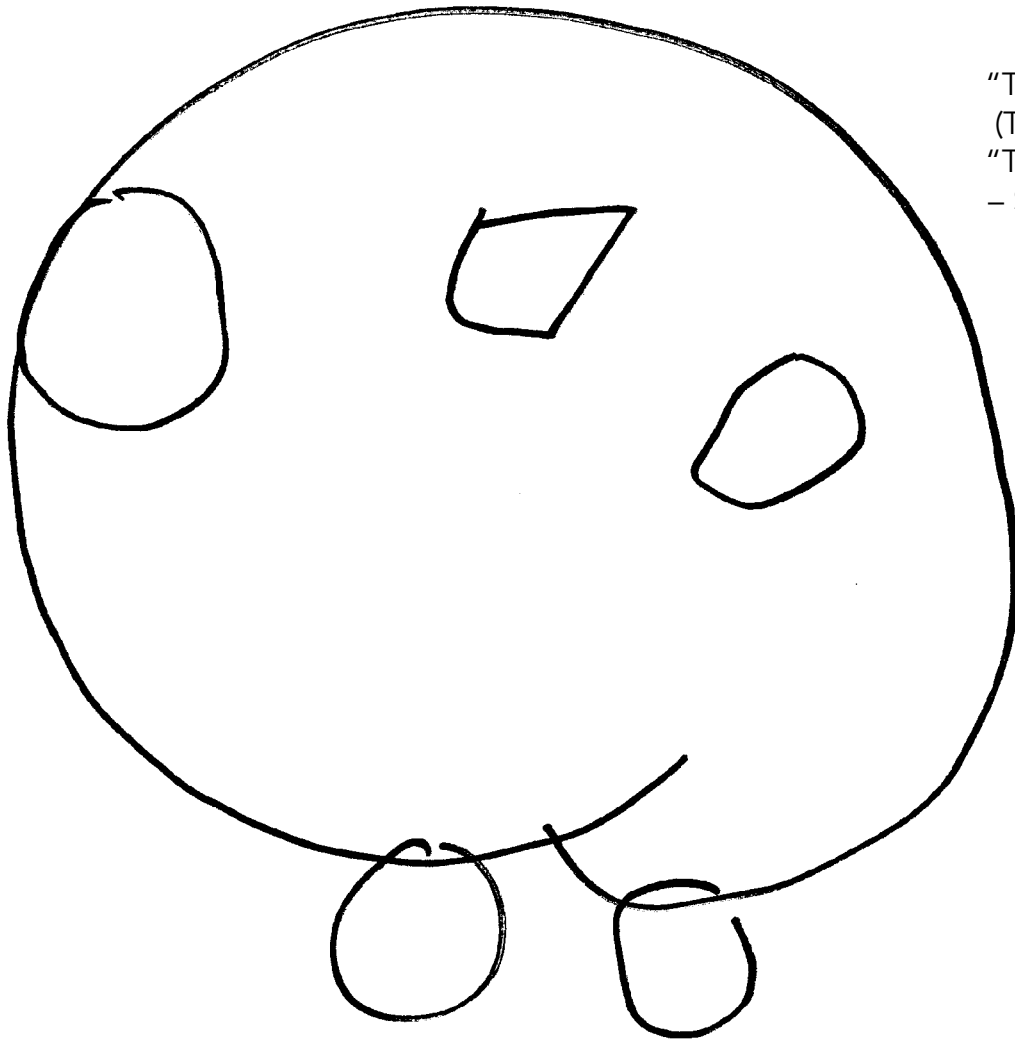
Expert: All the Practitioner criteria are evident and the Expert will be able to demonstrate a deeper understanding of the mathematical concept of sets or addition in the task. The Expert will also bring more mathematical language and/or numbers to the task than the Practitioner. Terms could include, but are not limited to, *diagram, key, model, table, first, next, last, second ..., even, odd, pair, total, sum, equal, fair share, pattern and equation*. The Expert will often use her/his representation to explore the underlying mathematical concepts in the task. The Expert could, but is not limited to, conclude that you need to add two cars to the second count and one car to the third count for Max to have seen the same number of cars each time; recreate the task with different numbers of cars at each counting; conclude that Max saw an even number of cars two times and an odd number of cars one time. The Expert could construct a new representation or make an equation to verify her/his answer or relate the “Counting Cars” task to a similar task and state the mathematical similarities.

Rationales for Novice Work

	Assessment Rationales
Problem Solving/ Reasoning/Proof	The child's drawing of, "This is my car," would not work to solve the task. No understanding of the underlying mathematics of sets and counting to a total of six cars is evident. (Novice)
Communication	The child indicates no awareness of audience or mathematical purpose and uses no mathematical language or numbers. (Novice)
Representation	The child's drawing of "my car" is not appropriate or accurate to the task. (Novice)
Connections	The child is unable to make a mathematically relevant observation because s/he demonstrates no understanding of the underlying mathematical concept of three sets of cars totaling six. (Novice)

Novice

P/S R/P	Com	Rep	Con	Ach. Level
N	N	N	N	Novice



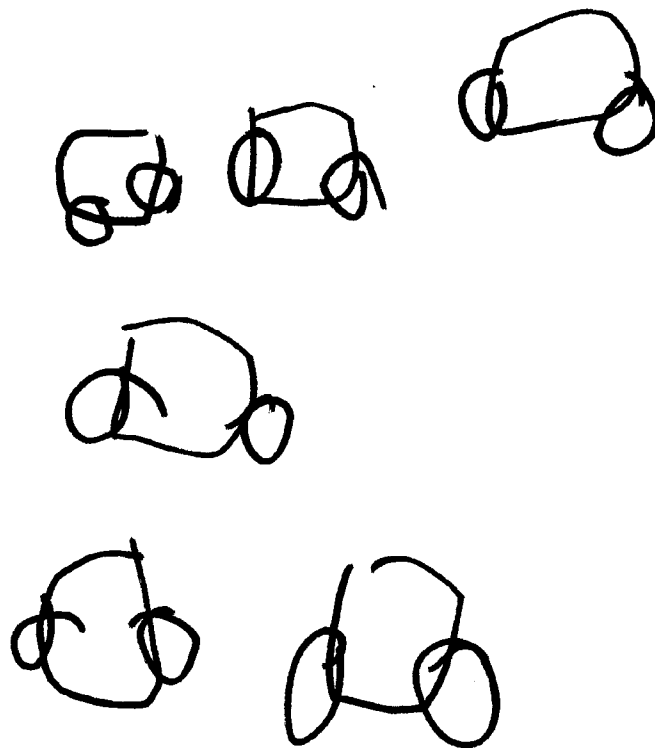
"This is my car."
(Task is reread.)
"This is my car."
– Scribed by Teacher

Rationales for Apprentice Work

	Assessment Rationales
Problem Solving/ Reasoning/Proof	The child's strategy of using toy cars in groups of three, one and two and then diagramming the cars would work to solve the task. The child is unable to total the cars to six so a correct answer cannot be reached. <i>(Apprentice)</i>
Communication	The child orally counts to three correctly. <i>(Practitioner)</i>
Representation	The child's diagram of three cars, one car and two cars is appropriate and accurate. The child labels the diagram in the scribing. <i>(Practitioner)</i>
Connections	The child demonstrates understanding of the number of cars that Max counts first, next and last but does not make a relevant observation about her/his solution. <i>(Apprentice)</i>

Apprentice

P/S R/P	Com	Rep	Con	Ach. Level
A	P	P	A	Apprentice



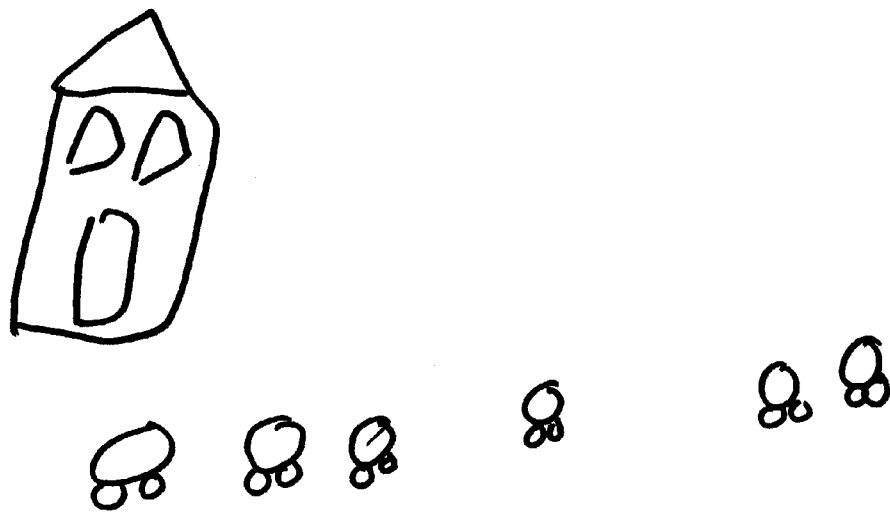
(Child first used toy cars to line up three, one and two.)
"I got one, two, three cars. One car. One, two cars (pointed correctly)."
(Can you tell me how many cars Max counted in all?)
"No. I just do 1, 2, 3. 1, 1, 2."
– Scribed by Teacher

Rationales for Practitioner Work

	Assessment Rationales
Problem Solving/ Reasoning/Proof	The child's strategy of making a diagram to represent three cars, one car, two cars works to solve the task. The child's answer, "Six cars," is correct and the child's solution supports this answer. <i>(Practitioner)</i>
Communication	The child orally counts each set of cars correctly and then combines the set and orally counts to six. The child also counts backwards from six to one correctly. <i>(Practitioner)</i>
Representation	The child's diagram of six cars is appropriate and accurate and is labeled in the scribing. <i>(Practitioner)</i>
Connections	The child makes the mathematically relevant observation, "I can also count backwards, 6, 5, 4, 3, 2, 1." The child also states, "The next car is seven." The child's comment, "I want to be seven. My brother is," is not mathematically relevant. <i>(Practitioner)</i>

Practitioner

P/S R/P	Com	Rep	Con	Ach. Level
P	P	P	P	Practitioner



"I made Max's house. And I made the cars. First, I did three cars (counted 1, 2, 3). Next, I did one car (counted 1). At the end I did two cars (counted 1, 2)."

[How many cars did Max count?]

"3, 4, 5, 6 (child stated three for the first three and counted on). Six cars. I can also count backwards 6, 5, 4, 3, 2, 1. The next car is seven. I want to be seven. My brother is."

- Scribed by Teacher

Rationales for Expert Work

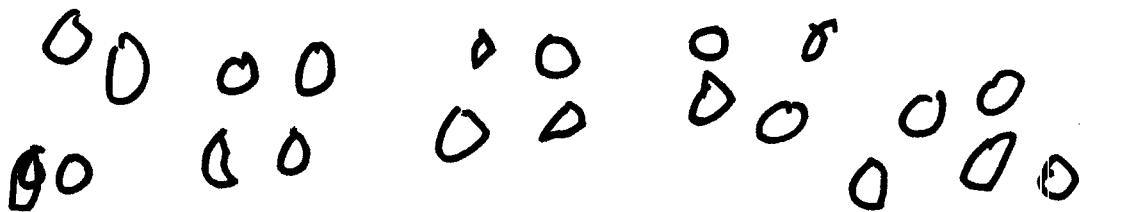
	Assessment Rationales
Problem Solving/ Reasoning/Proof	The child's strategy of using the letter "C," to show a total of six cars works to solve the task and is considered efficient at this age level. The child's answer of six cars is correct. The child counts the cars by twos as well as finding the total number of wheels on six cars. (Expert)
Communication	The child uses the mathematical terms <i>key</i> , <i>pair</i> , <i>pattern</i> , and the directional terms <i>front</i> and <i>back</i> correctly. The child also counts to 24 orally and notates six and 24 correctly. The child also uses the notation "=". (Expert)
Representation	The child's diagram C C C C C C = 6C with C defined by the child when s/he states, "Make my key. C is car," and the diagram of 24 wheels is appropriate and accurate to the task. The scribing provides the necessary labels. The child used her/his diagram to also demonstrate how s/he can count to six by twos. (Expert)
Connections	The child demonstrates an understanding of patterning by pointing to groups of two cars and stating "2, 4, 6. The pattern." The child is also able to determine how many wheels are on the six cars and correctly counts to 24. The use of a variable (C) and the ability to diagram and count 24 wheels in six sets is a very strong Expert connection. (Expert)

Expert

P/S R/P	Com	Rep	Con	Ach. Level
E	E	E	E	Expert

C C C C C C = 6 C

(Child counted 1, 2, 3, 4, 5, 6.)
 "Make my key. C is car."
 [Is there anything else about your thinking?]
 (Child pointed by twos on the Cs.)
 "You can just go 2, 4, 6. The pattern."
 "I can do the wheels."
 – Scribed by Teacher



"You have to do four wheels. (Pointed to circles.) Two on the front. Two on the back. Two is a pair. There are 1, 2, 3, 4... 24 wheels. You need more fingers for 24 but I do it in my head."
 (Child pointed to wheels and counted silently to 12 and out loud to 24 with no errors.)
 – Scribed by Teacher

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