

Bobsled Blunder

The women Olympic bob sledders were very excited when the not-well-known American pair won the gold medal. They rushed to celebrate leaving all of their helmets and sleds in a big pile. Egor and Jasmine were left to match the helmets with the bobsleds. Some of the bobsleds were for 2 people, and some were for 3 people. There were 29 helmets in all. Egor and Jasmine were able to match all of the helmets to their sleds. How many 2 and 3 person bobsleds could there be? Show your math thinking.

Bobsled Blunder

Suggested Grade Span

Grades 3–5

Grade(s) in Which Task Was Piloted

Grades 3 and 4

Task

The women Olympic bob sledders were very excited when the not-well-known American pair won the gold medal. They rushed to celebrate leaving all of their helmets and sleds in a big pile. Egor and Jasmine were left to match the helmets with the bobsleds. Some of the bobsleds were for 2 people, and some were for 3 people. There were 29 helmets in all. Egor and Jasmine were able to match all of the helmets to their sleds. How many 2 and 3 person bobsleds could there be? Show your math thinking.

Alternative Versions of Task

More Accessible Version:

The women Olympic bob sledders were very excited when the not-well-known American pair won the gold medal. They rushed to celebrate leaving all of their helmets and sleds in a big pile. Egor and Jasmine were left to match the helmets with the bobsleds. Some of the bobsleds were for 2 people, and some were for 3 people. There were 12 helmets in all. Egor and Jasmine were able to match all of the helmets to their sleds. How many 2 and 3 person bobsleds could there be?

More Challenging Version:

The women Olympic bob sledders were very excited when the not-well-known American pair won the gold medal. They rushed to celebrate leaving all of their helmets and sleds in a big pile. Egor and Jasmine were left to match the helmets with the bobsleds. Some of the bobsleds were for 2 people, some were for 3 people, and some were for 4 people. There were 29 helmets in all. Egor and Jasmine were able to match all of the helmets to their sleds. How many 2, 3 and 4 person bobsleds could there be? List all of the possibilities, and show your math thinking.

NCTM Content Standards and Evidence

Number and Operation Standard for Grades 3-5

Instructional programs from Pre-Kindergarten through grade 12 should enable students to...

- Understand numbers, ways of representing numbers, relationships among numbers, and number systems.
 - *NCTM Evidence:* Recognize equivalent representations for the same number and generate them by decomposing and composing numbers.
 - *Exemplars Task Specific Evidence:* This task requires students find different ways of generating the number 29 using multiples of 2 and 3.

Time/Context/Qualifiers/Tip(s) From Piloting Teacher

This is a medium length task. It was given to my students during the past winter Olympic games.

Links

This task could accompany a study of the Olympics. For more information about the Olympics, go to <http://www.olympic.org>.

Common Strategies Used to Solve This Task

Most students will use a guess and check approach, but the task can be solved algebraically as well.

Possible Solutions

Original Version:

<u>Three-Person Sleds</u>	<u>Two-Person Sleds</u>
1	13
3	10
5	7
7	4
9	1

An algebraic rule that can be used is $2x + 3y = 29$, substituting values for x to determine y , with x equal to the number of 2 person sleds, and y equal to the number of 3 person sleds.

More Accessible Version:

There could be two 3-person sleds and three 2-person sleds.

More Challenging Version:

# of 2 person sleds	x 2 helmets	# of 3 person sleds	x 3 helmets	# of 4 person sleds	x 4 helmets	Total Helmets	Total Sleds
1	2	1	3	6	24	29	8
2	4	3	9	4	16	29	9
3	6	1	3	5	20	29	9
4	8	3	9	3	12	29	10
5	10	1	3	4	16	29	10
6	12	3	9	2	8	29	11
7	14	1	3	3	12	29	11
8	16	3	9	1	4	29	12
9	18	1	3	2	8	29	12
11	22	1	3	1	4	29	13

Task Specific Assessment Notes

General Notes: This task assesses students’ ability to apply problem solving strategies for composing and decomposing numbers to find all combinations of 29 using multiples of 2 and 3.

Novice: The novice will demonstrate little or no understanding of the task. No combinations will be attempted, or none will be correct, and no correct reasoning will be evident.

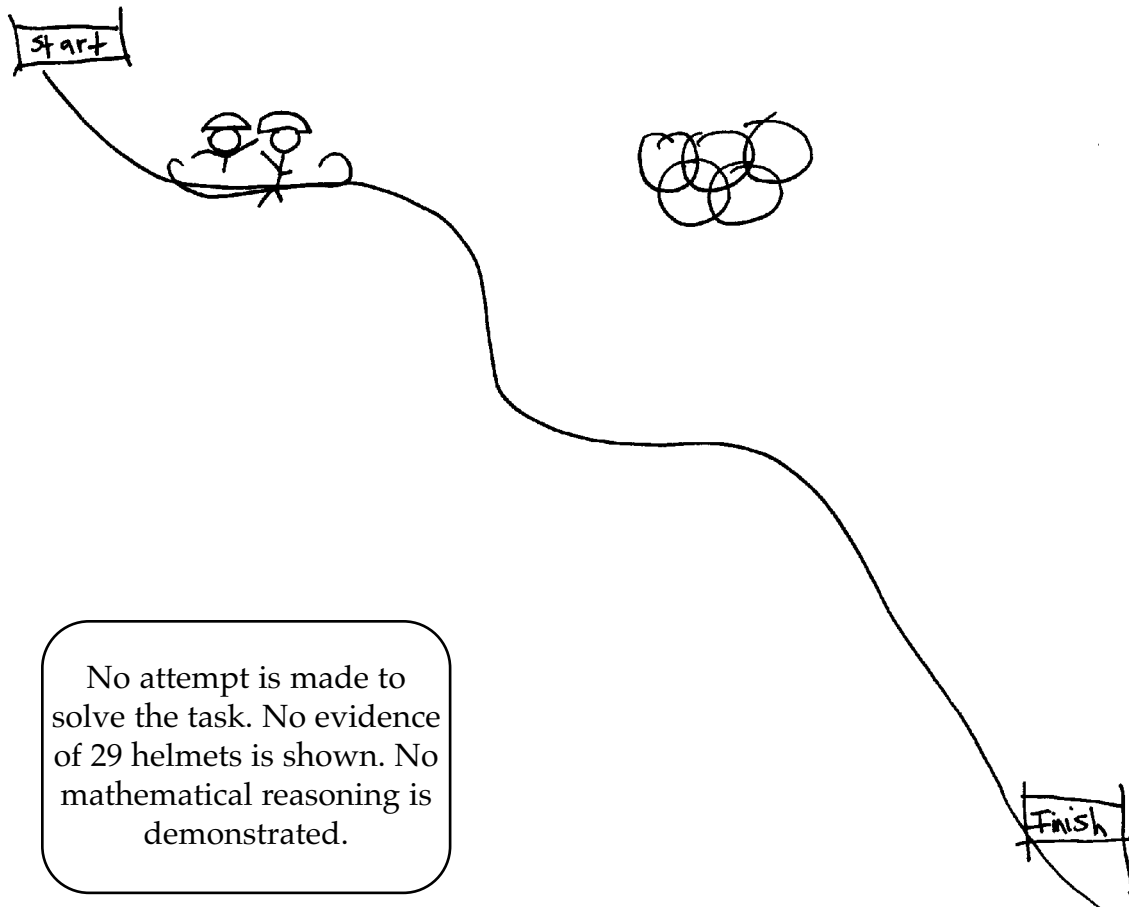
Apprentice: The apprentice will have a partially correct solution with a strategy that will work for solving part of the task. The apprentice may be able to find some but not all of the combinations, or some of the combinations will be incorrect.

Practitioner: The practitioner will achieve a correct solution to the task. All combinations will be listed, and supporting computation will accompany them. The student may make relevant observations about the solution, but will not use that information to extend the solution.

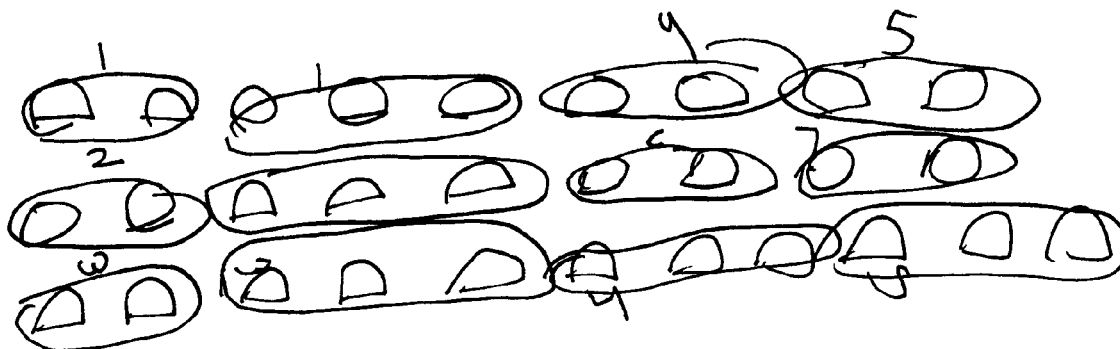
Expert: The expert will not only achieve a correct solution, but will also utilize other good problem solving strategies such as verifying the solution, or going above and beyond the task requirements. Students may also create a rule to solve the task ($2x + 3y = 29$) and will then substitute values for x to find for y . Students may also identify impossible combinations and use that information to verify the solution. For example, there always has to be an odd number of 3-person sleds because $29 - \text{odd } \# = \text{even } \#$, and only even numbers can be divided by two.

Author

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Apprentice



first I drew 29 helmets, Then I circled group of 2 and 3. There are 7 two person sleds and 3 three person sleds,

One correct combination is achieved. The approach is explained and work is shown. There is no attempt to find additional correct combinations.

Practitioner

FIRST I MADE A CHART

2 PEOPLE # SLEDS	3 PEOPLE # SLEDS	Total		
1	2	3	5	no
2	4	6	10	no
3	6	9	15	no
4	8	12	26	no
5	10	15	25	no
6	12	18	30	no
5	10	18	28	no
4	8	21	29	yes
7	14	15	29	yes
6	20	9	29	yes
13	26	6	32	no
13	26	3	29	yes
1	2	9	27	yes

THERE ARE 5 WAYS

All correct combinations are found.
Work is shown, organized and labeled.

Communication with the audience is evident but could be a bit stronger. A math representation is used to analyze relationships and to interpret phenomenon.

Exemplars

Expert

To find a solution, I will make an organized List.

# of 2-person sleds	total # of people on 2-person sleds	Total # of people on 3 person sleds	Total # of 3 person sleds	Total People or helmets (must equal 29)
1	2	$27 \div 3 = 9$	27	29
2	4	$25 \div 3$ can't do		
3	6	$23 \div 3 =$ can't do		
4	8	$21 \div 3 = 7$	21	29
5	10	$19 \div 3 =$ can't do		
6	12	$17 \div 3 =$ can't do		
7	14	$15 \div 3 = 5$	15	29
8	16	$13 \div 3 =$ can't do		
9	18	$11 \div 3 =$ can't do		
10	20	$9 \div 3 = 3$	9	29
11	22	$7 \div 3 =$ can't do		
12	24	$5 \div 3 =$ can't do		
13	26	$3 \div 3 = 1$	3	29

you can't go lower than 3 so I know I have all combinations

The student has all correct combinations. the approach was systematic, exhibiting analysis and noting patterns and regularities. Evidence is used to justify conclusions.