

Exemplars

Title: Puzzle Pieces

Achievement Level: Novice 1

Criteria and Performance Level	Rationales
Problem Solving <i>Novice</i>	It appears that the student is adding all the numbers located in the task for a total of 285. This strategy does not solve the task. The student's answer, "285 pieces," is not correct.
Reasoning & Proof <i>Novice</i>	The student does not demonstrate correct reasoning. The student does not understand that the placed puzzle pieces need to be totaled and subtracted from 150 pieces to determine how many pieces are needed to finish the puzzle.
Communication <i>Novice</i>	The student does not use any mathematical language to communicate their reasoning and proof. Verbs, such as "add," are not included in considering communication as they are considered an action the student takes in their solution.
Connections <i>Novice</i>	The student does not make a mathematically relevant observation about their solution.
Representation <i>Novice</i>	The student does not attempt a mathematical representation to solve or portray their solution.

Exemplars

Achievement Level: Novice 1

P/S	R/P	Com	Con	Rep	A/Level
N	N	N	N	N	N

I want to find how many pieces
Andy needs to find. I will add.

$$\begin{array}{r} 1 \\ 150 \\ 36 \\ 41 \\ + 68 \\ \hline 285 \end{array}$$

A ☆
285 pieces

Andy has to find a lot of pieces.

Exemplars

Title: Puzzle Pieces

Achievement Level: Apprentice 1

Criteria and Performance Level	Rationales
Problem Solving <i>Apprentice</i>	The student has a partially correct strategy. The student totals the puzzle pieces used in the three days. The student does not find the difference between the puzzle pieces used and the original 150 puzzle pieces. The student's answer, "145 pieces of puzzle," is not correct.
Reasoning & Proof <i>Apprentice</i>	The student uses some correct reasoning of the underlying concepts of the task. The student organizes and determines the 145 puzzle pieces used in three days. The student does not determine how many puzzle pieces are needed to finish the puzzle.
Communication <i>Practitioner</i>	The student correctly uses the mathematical term <i>day</i> , from the task. The student also correctly uses the mathematical terms <i>table</i> , <i>odd</i> , <i>total</i> .
Connections <i>Practitioner</i>	The student makes the mathematically relevant observation, "41 is only odd pieces total in a day."
Representation <i>Practitioner</i>	The student's table is appropriate to the task and accurate. All labels are included and the data is correct.

Exemplars

Achievement Level: Apprentice 1

P/S	R/P	Com	Con	Rep	A/Level
A	A	P	P	P	A

I need to find how many pieces are lost.

I will make a table.

day	Pieces	
1	36	36.
2	41	41.
3	68	108.
		145

A
145 pieces of puzzle

41 is only odd pieces total in a day

Exemplars

Title: Puzzle Pieces

Achievement Level: Practitioner 1

Criteria and Performance Level	Rationales
Problem Solving <i>Practitioner</i>	The student's strategy of making a diagram of the puzzle pieces used each of three days works to solve part of the task. The student's answer, "5," is correct.
Reasoning & Proof <i>Practitioner</i>	The student uses correct reasoning of the underlying concepts of the task. The student organizes and determines a total of 145 puzzle pieces are used in three days. The student finds the number of remaining puzzle pieces needed to finish the puzzle by applying subtraction.
Communication <i>Practitioner</i>	The student correctly uses the mathematical term <i>day</i> from the task. The student also correctly uses the mathematical terms <i>diagram</i> , <i>key</i> , <i>number</i> .
Connections <i>Practitioner</i>	The student makes the mathematically relevant observations, "I see 36 is 3 dozen pieces" and "I see 68 is the most pieces." The student's statement, "The 5 pieces are on the floor," is not considered a mathematically relevant statement. This comment could lead to an engaging classroom writing activity determining where those five missing pieces are.
Representation <i>Practitioner</i>	The student's diagram is appropriate to the task and accurate. A key defines the days and puzzle pieces. The entered "numbers" are correct.

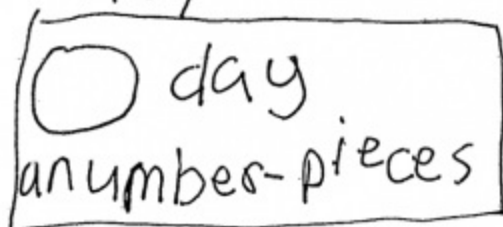
Exemplars

Achievement Level: Practitioner 1

P/S	R/P	Com	Con	Rep	A/Level
P	P	P	P	P	P

I have to find out how many puzzle pieces Andy needs. I will make a diagram and a key.

key



$$36 + 41 + 68$$

$$30 + 40 + 60 = 130$$

$$6 + 1 + 8 = 15$$

$$\begin{array}{r} 150 \\ -145 \\ \hline \end{array}$$

5 answer $130 + 15 =$

$$100 + 40 + 5 = 145$$

Exemplars

I see 36 is 3 dozen pieces.
I see 68 is the most pieces.
The 5 pieces are on the floor.

Exemplars

Title: Puzzle Pieces

Achievement Level: Practitioner 2

Criteria and Performance Level	Rationales
Problem Solving <i>Expert</i>	The student's strategy of making a table of the day, puzzle pieces and total puzzle pieces works to solve part of the task and arrives at an answer by applying subtraction. The student's answer, "the answer is 5 puzzle pieces," is correct. The student shows evidence of analyzing the situation in mathematical terms. The student explores the numbers in the ones place and determines that a total of 150 pieces is not possible.
Reasoning & Proof <i>Expert</i>	The student demonstrates correct reasoning of the underlying concepts of the problem. The student organizes and determines a total of 145 puzzle pieces are used in three days. The student finds the number of remaining puzzle pieces needed to finish the puzzle by applying subtraction. The student explains the phenomenon of how some sets of numbers can not have a total with a zero in the ones place. The student uses that thinking to explain how they realized that five puzzle pieces must be missing.
Communication <i>Practitioner</i>	The student correctly uses the mathematical term <i>day</i> , from the problem. The student also correctly uses the mathematical terms <i>ones place</i> , <i>dozen</i> .
Connections <i>Expert</i>	The student makes the Practitioner connection, "I know 36 is $12 + 12 + 12$, 3 dozen." The student makes an Expert connection by extending their understanding of this task to place value. "Look at the ones place $36 + 41 + 68$, $6 + 1 + 8 = 15$. It can't be 150. So + 5 pieces gives the zero. $36 + 41 + 68 = 145$, $145 + 5 = 150$."

Exemplars

Representation

Practitioner

The student's table is appropriate to the task and accurate. All labels are included and the data is correct.

Exemplars

Achievement Level: Practitioner 2

P/S	R/P	Com	Con	Rep	A/Level
E	E	P	E	P	P

Find how many pieces are missing. I can do a plan.

The puzzle

the day	the puzzle pieces	used pieces
1	36	36
2	41	77
3	68	145

$$\begin{array}{r} 36 \\ +41 \\ \hline 77 \end{array}$$

$$\begin{array}{r} 145 \\ -145 \\ \hline 5 \end{array}$$

the answer is 5 puzzle pieces

Exemplars

look at the ones place
 $3(6) + 4(1) + 6(8)$

$$6 + 1 + 8 = 15$$

It can't be 15(0)

So + (5) pieces gives the

$$\text{Zero } 3(6) + 4(1) + 6(8) = 145$$

$$+ 5$$

$$\hline 150$$

I know 36 is $12 + 12 + 12$
3 dozen

Exemplars

Title: Puzzle Pieces

Achievement Level: Expert 1

Criteria and Performance Level	Rationales
Problem Solving <i>Expert</i>	The student's strategy of making a table of the days, puzzle pieces and total puzzle pieces works to solve part of the task. The student applies subtraction and states a correct answer, "5 pieces." The student shows evidence of analyzing the situation in mathematical terms. The student explores the numbers in the ones place and determines that a total of 150 pieces is not possible. The student also applies the Even + Odd + Even = Odd rule to support their analysis. The student also verifies that their solution is correct by using number lines as a new strategy.
Reasoning & Proof <i>Expert</i>	The student uses correct reasoning of the underlying concepts of the task. The student organizes and determines a total of 145 puzzle pieces are used in three days. The student finds the number of remaining puzzle pieces needed to finish the puzzle by applying subtraction. The student explains the phenomenon that when adding, some sets of numbers can not have a total with a zero in the ones place. The student uses this thinking to explain how they realized that some puzzle pieces must be missing. The student uses number lines to verify that the data in their table is correct.
Communication <i>Expert</i>	The student correctly uses the mathematical term <i>day</i> from the task. The student also correctly uses the mathematical terms <i>table, 1st, 2nd, 3rd, total, dozen, most, sum, number line, odd, even, sets, rule</i> . The student correctly uses the symbolic notation $E + O + E = O$ and defines E and O under the numbers.

Exemplars

<p>Connections <i>Expert</i></p>	<p>The student makes the mathematically relevant Practitioner observation, "36 is 3 dozen pieces" and "He puts the most pieces in on the 3rd day." The student makes the Expert connection, "36 41 68, $6 + 1 + 8 = 15$. The sum does not end in 0 so they can not add up to 150." The student also states $E + O + E = O$, $36 + 41 + 68 = 145$, even + odd + even = odd." The student applies this rule by using the equations, $6 + 1 + 8 = 15$, $8 + 5 + 2 = 15$, $4 + 9 + 10 + 23$, and states, "it is a true rule." The student also verifies their answer by using two number lines to arrive at 150 pieces. The first number line considers addition and the second number line considers subtraction. The student states, "I am correct. I found 5 pieces 3 ways. I thought of all I know."</p>
<p>Representation <i>Expert</i></p>	<p>The student's table is appropriate to the task and accurate. All labels are included and the data is correct. The student attempts a number line and discards it as they realized the paper is too short to have a number line using increments of five. The student makes two correct number lines with increments of ten. The student indicates that the numbers represent pieces. The student compares these two number lines with their table to verify that their answer is correct.</p>

Exemplars

Achievement Level: Expert 1

P/S	R/P	Com	Con	Rep	A/Level
E	E	E	E	E	E

I need to find out how many Andy has missing in the puzzle.
I will make a table.

days	puzzle pieces used	total pieces
1st	36	36
2nd	41	77
3rd	68	145

$$\begin{array}{r} 36 \\ +41 \\ \hline 77 \end{array}$$

$$\begin{array}{r} 77 \\ +68 \\ \hline 130 \end{array}$$

$$150 - 145 = 5$$

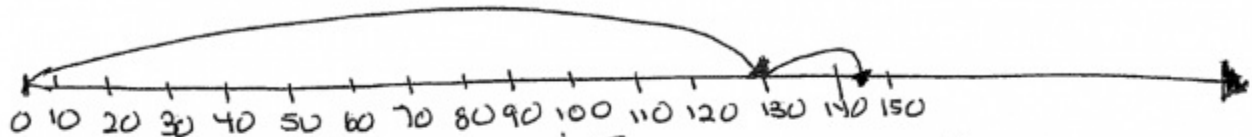
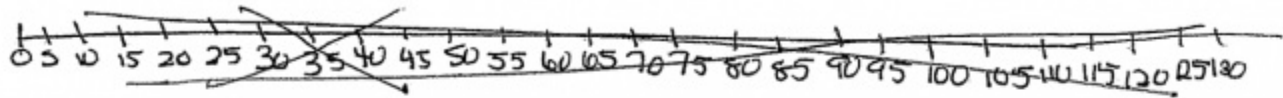
Answer
5 pieces

$$\begin{array}{r} 36 \\ +41 \\ +68 \\ \hline 145 \end{array}$$
 The sum does not end in 0
 So they cannot add up to 150

36 is 3 dozen pieces.
He puts the most pieces in on the 3rd day.

Exemplars

I can't do a number line.

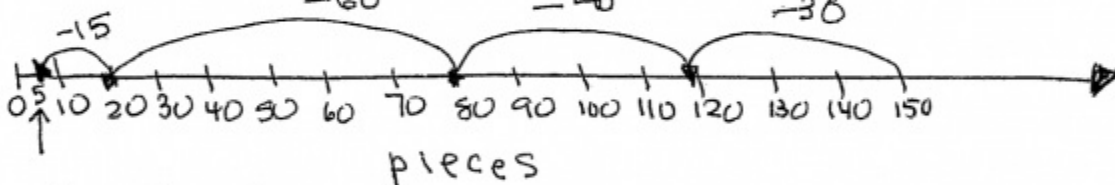


odd - 36 do 1st do 2nd
 30 + 6
 odd - 41 40 + 1
 even - 68 + 60 + 8
 130 15
 145 -60
 -46

$E + O + E = O$
 $36 + 41 + 68 = 145$
 even + odd + even = odd
 $6 + 1 + 8 = 15$
 $8 + 5 + 2 = 15$ it is true rule
 $4 + 9 + 10 = 23$

$145 + 5 = 150$

this is add sets of pieces



36 30 + 6
 41 40 + 1
 68 + 60 + 8
 130 15
 ✓
 145

5 left

this is subtract sets of pieces

I am correct.
 I found 5 pieces
 3 ways, I thinked of
 all I know.