

Transcript: 21 Cents Problem

Elementary Mathematics Laboratory
University of Michigan School of Education
Wednesday, July 11, 2007

Seating Arrangement

Marquis									Ariel
Nathan									Leyla
Tosana									Pharoah
TaQuieshia									Shawn
Mamadou									Alexis
Eric									Alliyah
Kalvin									Michael
David									Nicholas
Azira									Autumn
									Jael
	Honoré	Naia	Irene	Karina	Scott	Noah	Robie	Dovan	

pennies	nickels	dimes
6	1	1
	4	1

Focus questions:

- How are students reasoning about the problem?
- How are students supporting/explaining their approaches using words, drawings, or tools?
- What is the teacher doing to establish and maintain an environment that nurtures student reasoning practices? What else could the teacher be doing?

July 11, 2007:

The class is discussing methods for recording coin combinations that equal twenty-one cents. A table was made to show the various solutions to the number of pennies, nickels, and dimes whose total equal twenty-one cents.

1 Teacher: We have three different solutions so far: a dime,
2 two nickels, and a penny; six pennies, one nickel,
3 and a dime; four nickels and one dime. So we
4 have three different solutions. Who has a different
5 method of recording? And then you can share a
6 solution. Who has another method that's different?
7 Jael, what did you do?

8 Jael: For ten cents, I put a square around it, for one
9 cent, I put a triangle around it and for five cents, I
10 put a circle around it.

11 Teacher: Okay, so you used a different symbol for each coin.
12 Is that what you did? Like tell me again the
13 symbols. It was a square for-

14 Jael: Ten cents.

15 Teacher: For which?

16 Jael: Ten cents.
17 Teacher: Okay, and then what?
18 Jael: A triangle for one cent. And a circle for five cents.
19 Teacher: And what?
20 Jael: A circle for five cents.
21 Teacher: Okay. (*Draws the representations and monetary values*).
22



23 Like this? Is that what you did? So can you tell us
24 a solution with using your method that's different-
25 different than anything we have on the board so
26 far?
27 Jael: Two nickels, one dime, and one penny.
28 Teacher: Two nickels, one dime, and one penny. How would
29 I use her system to record for two nickels, one
30 dime, and one penny?
31 Student: That one's already on the board.
32 Teacher: Is that one that's already on the board, Jael? Can
33 you give us a different one?
34 Jael: Yeah. Three nickels-
35 Teacher: How would I record that? Can someone tell me
36 how to use her system to record three nickels?
37 Robie?
38 Robie: You put three circles.
39 Teacher: Is that right? Three circles, Jael? (*Draws three*
40 *circles*). Okay, and then what after the three
41 nickels?
42 Jael: And six pennies.

43 Teacher: Okay, how would I record six cents using Jael's
44 method? Naia?
45 Naia: A triangle.
46 Teacher: Is that right? (*Draws six triangles*).



47 Jael: Triangles.
48 Teacher: Okay, how can you explain that that's twenty-one
49 cents, Jael?
50 Jael: Three nickels equals fifteen cents, so then I just
51 added five pennies to make twenty cents and then
52 I added one more penny to make twenty-one.
53 Teacher: Okay. I think we have at least one more method
54 that people used in their notebooks that's different
55 from anything on the board. Jael used symbols,
56 pictures to go with the different coins. Shawn and
57 Alexis used a table and- Was it Honoré? No. Who
58 told us the first one?
59 Students: Ariel.
60 Teacher: Who?
61 Student: Ariel.
62 Teacher: Ariel. Sorry. Ariel used representations of coins,
63 but with the letters in them. Who has a different
64 method of recording?
65 Students: That was Azira.
66 Teacher: That was Azira? Okay. David, what did you do?
67 David: Well, I actually did a mixture of two things. What I
68 did was one is- I put the amount of how much the

69 one cent is worth and then I switched to having
70 how many of the cent and then their name.

71 Teacher: Okay, so how would I- Give us a different solution
72 than the four that are already on the board. Can
73 you pick a different one?

74 David: Well, like it just shows the amount, like I put five
75 cents for a nickel and just put a "five cent" up.

76 Teacher: Okay.

77 David: And like-

78 Teacher: So you just wrote the amounts like this? (*Draws*
79 *five cents, one cent, and ten cents*).

5¢ 1¢ 10¢

80 David: Yeah.

81 Teacher: And then how did you record? Did you write them
82 multiple times or what did you do?

83 David: Well, I just- What I did is, after each one, I put a
84 comma.

85 Teacher: Oh, okay. So give us a solution that's different.
86 Not one of these. Getting harder to tell since we're
87 using all these different methods. It's harder to
88 find one that's different.

89 David: Two dimes and one penny.

90 Teacher: So how do I record two dimes in your method?

91 David: I put two ten cents and then one cent.

92 Teacher: Like this? (*Draws two ten cents*). And then you
93 put a comma?

94 David: A comma in between.

95 Teacher: Here? (*Draws a comma in between the two ten*
96 *cents*).

97 David: Yeah, and then there.

98 Teacher: Like that? (*Draws a comma and one cent after the*
99 *two ten cents*).

5¢ 1¢ 10¢

10¢, 10¢, 1¢

100 David: Uh-huh.

101 Teacher: Okay, and how is that twenty-one cents?

102 David: Because if you add them all up, then you would get
103 twenty-one cents.

104 Teacher: Okay, so now we have one, two, three, four
105 different methods.

106 Student: One more.

107 Teacher: What?

108 Student: I've got one more, I think.

109 Teacher: One more solution? Any more methods? Or should
110 we just finish the solutions? More methods?
111 Karina, what did you do?

112 Karina: Well, I used dimes, nickels, and pennies all in
113 circles too, but I made a little chart, like one, two,
114 three, four, five, and so on.

115 Teacher: So is it similar to what Alexis did except instead of
116 writing the words you wrote pictures of the coins?

117 Karina: Well, I actually put numbers down the side

118 Teacher: Uh-huh.

119 Karina: and then put the combinations beside the numbers.

120 Teacher: Okay. So at the top do you have the coins?

121 Karina: No, beside the numbers I have the coins.

122 Teacher: Okay. Why don't you come up and draw it.

123 Karina: Okay. (*Draws four representations of nickels and*
124 *one representation of a penny next to a one*).

1. (N)(N)(N)(N) (P)

125 Teacher: Do you have a different solution you can report
126 too? Wait one second.

127 Shawn: Ms. Ball? You put the penny mark in the dime on
128 the table. (*Refers to the second row of the table*
129 *on the board*).

130 Teacher: (*To Shawn*). Where?

131 Shawn: 'Cause I had said for one penny

132 Teacher: I put the- Yeah.

133 Shawn: and you put the penny in the dime spot.

134 Pharoah: Oh, yeah. You put the penny in the dime spot.

135 Teacher: Where?

136 Shawn: On the table.

137 Teacher: You put four nickels and one dime? Oh, that's
138 supposed to be a penny?

139 Shawn: Uh-huh.

140 Teacher: You should have- Why didn't you- You better
141 point that out 'cause I made a mistake. When she
142 finishes, you should point it out. (*To Karina*).

143 Okay. Alright can you explain? So what did you
144 do?

145 Karina: So I put the number up because I have to know
146 how many combinations I have.

147 Teacher: Oh, so you added another piece of information.
148 Your system keeps track of how many solutions
149 you have too.

150 Karina: Yeah.

151 Teacher: How many people put numbers to keep track of
152 how many solutions they were- kept getting? Like
153 one solution, two solutions, like that?