



Math Olympiad and Problem Solving Programs
E120 - Honors Algebra Problem Solving
Problem Set 4.1 - Linear Equations

Name:

Date:

1. D

2. C

3. If you have x quarters, and you want to know how many dimes x is, you would multiply by 25 cents and then divide by 10 cents. In other words, multiply x by the fraction $\frac{25}{10} = \frac{5}{2}$. If Charles has $5q + 1$ quarters and Richard has $q + 5$ quarters, the difference in quarters is $(5q + 1) - (q + 5) = 5q + 1 - q - 5 = 4q - 4 = 4(q - 1)$. Now multiply by our fraction: $4(q - 1) \times \frac{5}{2} = 2(q - 1) \times 5 = 10(q - 1)$. A

4. D

5. E

6. A

7. Take note: DO NOT USE REGULAR AVERAGING FOR SPEED PROBLEMS. Memorize this fact! Instead, use harmonic mean. The harmonic mean formula for two numbers a and b is $\frac{2}{1/a + 1/b}$. Our two speeds are 10 and 20, so the harmonic mean is $\frac{2}{1/10 + 1/20} = \frac{2}{3/20} = \frac{20 \times 2}{3} = \frac{40}{3} = 13\frac{1}{3}$. B

8. B

9. Make a table and fill it in with information we are given. Let Walter's age in 1994 be x .

Year	Walter	Grandma
1994	x	$2x$
$1994 - x$	Born	x
$1994 - 2x$		Born
1999	$x + 5$	$2x + 5$

Make sure you understand the information in this chart. For instance, Walter is x years old in 1994, so in the year $1994 - x$, he was born. We are given that the sum of the years they were born was 3838. Make an equation: (year of Grandma's birth) + (year of Walter's birth) = 3838 $\Rightarrow (1994 - 2x) + (1994 - x) = 3988 - 3x = 3838 \Rightarrow 3x = 150 \Rightarrow x = 50$. To answer the question, Walter is $x + 5$ in 1999, so he is $50 + 5 = 55$. D

10. D