

Appendix A: 20 Items and Their Associated 80 Solution Strategies, Proportion Correct Scores, Proportion of Students Selecting the Solution Strategies

Table A1.

Math Test Items with Associated Strategies and Summaries of Student Responses (Correct Solution Strategies in Bold).

Question	Proportion correct score: high school	Proportion correct score: college	Proportion correct community	Solution strategies	Strategy proportion selected: high school	Strategy proportion selected: community college
1. Simplify: $9/15$	0.895	0.848		A. I divide 3 into 9 and divide 3 into 15 to get 3/5.	0.836	0.813
				B. 9 into 15 goes 1 time with 6 as the remainder. So I go $1\frac{6}{9}$ or $1\frac{2}{3}$.	0.067	0.077
				C. I divide 9 by 15 and I get 0.6.	0.008	0.034
				D. The answer become $5/3$.	0.017	0.014
2. Multiply and simplify: $2/5 \cdot 35$	0.336	0.394		A. I'm supposed to put a 1 under 35 and then cross multiply.	0.508	0.665
				B. I'm supposed to multiply 5 by $35 = 175 \times 2 = 350$.	0.113	0.096
				C. I go 2 times 35 = 70 and my answer is 70/5.	0.286	0.177
				D. I didn't know that the dot meant multiply.	0.017	0.100
3. Multiply and simplify: $3/10 \cdot 43/100$	0.345	0.376		A. I'm going to cross-multiply and get 430 over 300.	0.437	0.287
				B. After I got 430 and 300, I should have added to get 730.	0.038	0.029
				C. I should have gotten $(4300/300)$, which becomes $43/3$ or 14 remainder 1.	0.126	0.124
				D. I should have multiplied across: 3 times 43 and 10 times 100.	0.273	0.412

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Question	Proportion correct score: high school	Proportion correct score: college	Solution strategies	Strategy proportion selected: high school	Strategy proportion selected: community college
4. Divide and simplify: $7/2 \div 49/4$	0.345	0.376	A. I'm going to cross-multiply and get 430 over 300.	0.437	0.287
			B. After I got 430 and 300, I should have added to get 730.	0.038	0.029
			C. I should have gotten (4300/300), which becomes 43/3 or 14 remainder 1.	0.126	0.124
			D. I should have multiplied across: 3 times 43 and 10 times 100.	0.273	0.412
5. Divide and simplify: $7/4 \div 7$	0.340	0.374	A. You would have to multiply by $1/4$. So you get $7/4$. $7/4$ divided by $7/4$ equals 1.	0.130	0.086
			B. You start out by changing $7/4$ divided to $1 \frac{3}{4}$ and then dividing by 7.	0.071	0.086
			C. You should start out by changing to a multiplication problem: $7/4 \times 1/7$.	0.462	0.522
			D. After you have $7/4 \times 1/7$ you cross-multiply to get $49/4$ or $12 \frac{1}{4}$.	0.160	0.163
6. Add and simplify: $7/8 + 7/8$	0.273	0.248	A. I didn't know that the bottom numbers should not get added.	0.160	0.168
			B. I didn't know what it meant by simplify.	0.046	0.034
			C. I thought I had to divide the top part of each fraction by the bottom part of each fraction to get decimals.	0.130	0.067
			D. After I got $14/16$, I didn't know how to simplify.	0.193	0.306

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Question	Proportion correct score: high school	Proportion correct score: college	Solution strategies	Strategy proportion selected: high school	Strategy proportion selected: community college
7. Add and simplify: $7/9 + 5/6$	0.277	0.282	A. I add the numerators and add the denominators to get $12/15$. Then I simplify to get $4/5$.	0.294	0.301
			B. First, I find the lowest common denominator by multiplying 9 by 6 = 54.	0.143	0.148
			C. The lowest common denominator is 18. I then multiply 2 by 7 and 3 by 5 = $14 + 15 = 29/18 = 1\ 11/18$.	0.298	0.325
			D. The lowest common denominator is 36. $28/36 + 30/36 = 58/36 = 1\ 22/36 = 1\ 11/18$.	0.105	0.081
8. Subtract and simplify: $7/10 - 13/25$	0.391	0.380	A. I need to get the denominator to be 100. Then I get $70/100$ and $52/100$, which is $18/100$ and simplified to $9/50$.	0.420	0.311
			B. I have to find the lowest common denominator, which is 250.	0.097	0.081
			C. First, I cross-multiply and get $(10)(13)$ and $(7)(25)$. It gives me $130/175$. Then I subtract to get $1/45$.	0.109	0.134
			D. Cannot be done. $13/25$ is greater than $7/10$. The answer could be negative.	0.122	0.105

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Question	Proportion correct score: high school	Proportion correct score: college	Proportion correct community	Solution strategies	Strategy proportion selected: high school	Strategy proportion selected: community college
9. Add. Write the answer as a mixed numeral: $6\frac{5}{6} + 2\frac{5}{6}$	0.307	0.257		A. I add the numbers 6 and 2 = 8. Then I add the fractions $\frac{5}{6} + \frac{5}{6} = \frac{10}{6}$. The answer is $8\frac{10}{6}$.	0.235	0.234
				B. Once I get $8\frac{10}{6}$, I change it to $9\frac{4}{6}$ or $9\frac{2}{3}$.	0.198	0.234
				C. I add the number 6 and 2 = 8 and then add $\frac{10}{12}$. The answer is $8\frac{10}{12}$ or $8\frac{5}{6}$.	0.189	0.196
				D. I change $6\frac{5}{6}$ to $\frac{41}{6}$ and change $2\frac{5}{6}$ to $\frac{17}{6}$ and get $\frac{58}{6}$.	0.219	0.153
10. Add: $8\frac{1}{9} + 7\frac{2}{5}$	0.139	0.201		A. I added $8 + 7 = 15$ and $\frac{1}{9} + \frac{2}{5} = \frac{3}{14}$. The answer is $15\frac{3}{14}$.	0.277	0.225
				B. I first changed $8\frac{1}{9}$ to $\frac{73}{9}$ and $7\frac{2}{5}$ to $\frac{37}{5}$.	0.189	0.124
				C. First, I have to find the lowest common denominator, which is 45. Answer is $15\frac{3}{45}$.	0.164	0.254
				D. The answer I got is $\frac{73}{9} + \frac{37}{5} = \frac{(657 + 185)}{45} = \frac{842}{45} = 18\frac{32}{45}$.	0.109	0.115

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Question	Proportion correct score: high school	Proportion correct score: college	Solution strategies	Strategy proportion selected: high school	Strategy proportion selected: community college
11. Subtract: $9 \frac{2}{5} - 5 \frac{1}{3}$	0.185	0.222	A. I change $9 \frac{2}{5}$ to $\frac{16}{5}$ and $5 \frac{1}{3}$ to $\frac{9}{3}$. Then I find the common denominator.	0.185	0.057
			B. I didn't know the lowest common denominator was 15.	0.067	0.043
			C. I subtract $9 - 5$ and get 4 and then subtract the numerators $2 - 1 = 1$ and the denominators $5 - 3 = 2$. The answer is $4 \frac{1}{2}$.	0.261	0.249
			D. I change $9 \frac{2}{5}$ to $\frac{47}{5}$ and change $5 \frac{1}{3}$ to $\frac{16}{3}$ then find the common denominator which is 15.	0.206	0.335
12. Subtract. Write a mixed numeral for the answer: $27 - 22 \frac{1}{2}$	0.227	0.242	A. I didn't know what a mixed numeral is.	0.105	0.077
			B. I subtracted 22 from 27 and got 5 and then I subtracted $\frac{1}{2}$ to get $4 \frac{1}{2}$.	0.261	0.321
			C. I changed $22 \frac{1}{2}$ to 22.5. Then I subtracted to get 4.5.	0.189	0.053
			D. The answer should be $5 \frac{1}{2}$.	0.168	0.258
13. Multiply: $17 \frac{4}{7} \cdot \frac{1}{4}$	0.017	0.134	A. I changed $17 \frac{4}{7}$ to a regular fraction by adding $7 + 17 + 4 = 28$ over 7. $\frac{28}{7}$ times $\frac{1}{4} = 1$.	0.126	0.124
			B. I changed $17 \frac{4}{7}$ to $\frac{113}{4}$ and multiplied by $\frac{1}{4}$. The answer is 113.	0.143	0.120
			C. I changed $17 \frac{4}{7}$ to $\frac{113}{4}$ and multiplied by $\frac{1}{4}$ and got $\frac{113}{16} = 7 \frac{1}{16}$.	0.252	0.182
			D. The lowest common denominator is 28.	0.185	0.196

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Question	Proportion correct score: high school	Proportion correct score: college	Solution strategies	Strategy proportion selected: high school	Strategy proportion selected: community college
14. Divide. Write as a mixed numeral: $12 \div 1 \frac{1}{13}$	0.042	0.060	A. I change 12 to $12/1$ and $1 \frac{1}{13}$ to $13/14$ and then cross-multiply.	0.227	0.230
			B. I'm not sure what a mixed numeral is.	0.109	0.077
			C. I change 1 1/13 to 14/13 then I multiply 12 by 13/14.	0.198	0.230
			D. The answer is $11 \frac{1}{7}$.	0.147	0.115
15. Divide: $7 \frac{1}{6} \div 1 \frac{6}{7}$	0.000	0.020	A. I change $7 \frac{1}{6}$ to $42/6$ and add to get $49/6$. I use the same method to get $13/7$ and divide.	0.151	0.091
			B. It becomes $7 \frac{1}{12}$ and $1 \frac{7}{12}$ and then get $8 \frac{8}{12}$ or $8 \frac{2}{3}$.	0.113	0.077
			C. First I change 7 1/6 to a fraction 43/6 and change 1 6/7 to a fraction 13/7.	0.219	0.278
			D. I change $7 \frac{1}{6}$ to $14/6$ and $1 \frac{6}{7}$ to $13/7$ and "keep change flip."	0.181	0.163
16. Round to the nearest tenth: 7.8493	0.357	0.340	A. 8 is the larger number therefore round it up to 8.0.	0.172	0.153
			B. 9 is greater than 5 so round up and the answer is 7.85.	0.231	0.177
			C. The answer is 7.80.	0.290	0.325
			D. 7.8493 is already rounded to the nearest tenth.	0.029	0.048

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17. Find decimal notation: $4/15$	0.050	0.069		A. I'm not sure what the word decimal notation means.	0.113	0.115
				B. 4 into 15 goes 3 times with a remainder of 3.	0.252	0.191
				C. 4 into 15 goes 3 times so the answer is .33.	0.252	0.158
				D. 15 into 4 does not go.	0.076	0.153
18. Calculate $1/4 \cdot 1224$	0.076	0.112		A. I thought I should change the $1/4$ to .25 and then multiply by 1224.	0.282	0.12
				B. By multiplying 1224 by .25, I got 30,600.	0.156	0.067
				C. I didn't know I should divide 1224 by 4.	0.063	0.139
				D. I should have cross multiplied 1224 by 4.	0.160	0.239
19. Find percent notation for 0.372	0.214	0.213		A. I didn't know what percent notation meant.	0.139	0.120
				B. I moved the decimal place over two places to the right. That's 37 or 37%.	0.361	0.330
				C. I moved the decimal over one place to the right, which gave me 3.72%.	0.143	0.166
				D. I dropped the 2 to make it 0.37%.	0.080	0.038

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20. Find percent notation: $5/8$	0.034	0.069		A. First, make it a decimal = .5 times 100 and then divide 5.00 by 8.	0.219	0.110
				B. 5 goes into 8 one time with a remainder of 3.	0.071	0.148
				C. I'm not sure if I divide 5 by 8 or 8 by 5.	0.126	0.139
				D. The answer is 6.25%.	0.206	0.172