

Error Patterns and Algorithms.

Below is the work of 12 fictional students. All of them are consistent in their work. Some of them are making consistent errors. That means, if there is the opportunity in the problem for them to make their ideosyncratic error, they will make it, though in some problems they make errors and in other problems of a slightly different type they get correct answers. Some of them have alternate algorithms that they are using (that yield the correct result in a reasonable way that is different from the standard algorithm). Try to get inside the head of each student and see if you can figure out what they are doing and why.

- Your task is to figure out what each student is doing and to do the same thing they would on the last two problems in each set. If they are doing something right, you should do the same right thing they are doing. If they are making an error, you should make the same error they would make.
- You then need to explain what they did in words: *what are they doing* and why: *is it an error or an alternate algorithm?* Try to use place value language to *describe why* their work is consistently in error or consistently works.

Addition examples:

1.

$$\begin{array}{r} 346 \\ + 572 \\ \hline 819 \end{array}$$

$$\begin{array}{r} 764 \\ + 135 \\ \hline 899 \end{array}$$

$$\begin{array}{r} 782 \\ + 819 \\ \hline 1115 \end{array}$$

$$\begin{array}{r} 625 \\ + 837 \\ \hline 1912 \end{array}$$

You do:

$$\begin{array}{r} 749 \\ + 825 \\ \hline \end{array}$$

$$\begin{array}{r} 362 \\ + 854 \\ \hline \end{array}$$

Explain the pattern, and why it works or doesn't work.

$$\begin{array}{r} 467 \\ + 395 \\ \hline \end{array}$$

$$767 \rightarrow 857 \rightarrow 862$$

$$\begin{array}{r} 743 \\ + 191 \\ \hline \end{array}$$

$$843 \rightarrow 933 \rightarrow 934$$

$$\begin{array}{r} 621 \\ + 145 \\ \hline \end{array}$$

$$721 \rightarrow 761 \rightarrow 766$$

$$\begin{array}{r} 943 \\ + 172 \\ \hline \end{array}$$

$$1043 \rightarrow 1113 \rightarrow 1115$$

$$\begin{array}{r} 781 \\ + 465 \\ \hline \end{array}$$

$$\begin{array}{r} 932 \\ + 189 \\ \hline \end{array}$$

Explain the pattern, and why it works or doesn't work.

$$\begin{array}{r} 74 \\ + 13 \\ \hline 87 \end{array}$$

$$\begin{array}{r} 65 \\ + 49 \\ \hline 1014 \end{array}$$

$$\begin{array}{r} 38 \\ + 16 \\ \hline 414 \end{array}$$

$$\begin{array}{r} 276 \\ + 193 \\ \hline 3169 \end{array}$$

$$\begin{array}{r} 29 \\ + 35 \\ \hline \end{array}$$

$$\begin{array}{r} 74 \\ + 68 \\ \hline \end{array}$$

Explain the pattern, and why it works or doesn't work.

4.

$\begin{array}{r} 24 \\ + 30 \\ \hline 54 \end{array}$	$\begin{array}{r} 28 \\ + 9 \\ \hline 19 \end{array}$	$\begin{array}{r} 4 \\ + 18 \\ \hline 13 \end{array}$	$\begin{array}{r} 37 \\ + 4 \\ \hline 14 \end{array}$	$\begin{array}{r} 15 \\ + 23 \\ \hline 38 \end{array}$
$\begin{array}{r} 46 \\ + 12 \\ \hline \end{array}$	$\begin{array}{r} 38 \\ + 5 \\ \hline \end{array}$			

Explain the pattern, and why it works or doesn't work.

5.

$\begin{array}{r} 523 \\ + 678 \\ \hline 1201 \end{array}$	$\begin{array}{r} 658 \\ + 391 \\ \hline 1049 \end{array}$	$\begin{array}{r} 792 \\ + 186 \\ \hline 978 \end{array}$	$\begin{array}{r} 459 \\ + 183 \\ \hline 642 \end{array}$
$\begin{array}{r} 648 \\ + 237 \\ \hline \end{array}$	$\begin{array}{r} 486 \\ + 297 \\ \hline \end{array}$		

Explain the pattern, and why it works or doesn't work.

6.
$$\begin{array}{r} 1 \\ 65 \\ + 8 \\ \hline 153 \end{array}$$

$$\begin{array}{r} 1 \\ 28 \\ + 7 \\ \hline 105 \end{array}$$

$$\begin{array}{r} 1 \\ 36 \\ + 5 \\ \hline 91 \end{array}$$

$$\begin{array}{r} 1 \\ 75 \\ + 9 \\ \hline 174 \end{array}$$

$$\begin{array}{r} 34 \\ + 8 \\ \hline \end{array}$$

$$\begin{array}{r} 49 \\ + 7 \\ \hline \end{array}$$

Explain the pattern, and why it works or doesn't work.

7. Choose one of the addition *errors* in the examples above, and write about how you would help the student correct that error.

a. Which example are you focusing on? _____

b. If you were to go back to using manipulatives (such as base 10 blocks) to help the child fix his or her error, describe what that might look and sound like.

c. What else might you try to do to help the child fix his or her error? (Describe another teaching idea)

Subtraction Examples.

8.

$\begin{array}{r} 356 \\ - 179 \\ \hline 200 \\ - 23 \\ \hline 177 \end{array}$	$\begin{array}{r} 412 \\ - 172 \\ \hline 300 \\ - 60 \\ \hline 240 \end{array}$	$\begin{array}{r} 32 \\ - 18 \\ \hline 20 \\ - 6 \\ \hline 14 \end{array}$	$\begin{array}{r} 439 \\ - 145 \\ \hline 304 \\ - 10 \\ \hline 294 \end{array}$	$\begin{array}{r} 54 \\ - 17 \\ \hline \end{array}$	$\begin{array}{r} 323 \\ - 164 \\ \hline \end{array}$
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Explain the pattern, and why it works or doesn't work.

9.

$\begin{array}{r} 51 \\ 28 \\ - 54 \\ \hline 2014 \end{array}$	$\begin{array}{r} 61 \\ 173 \\ - 29 \\ \hline 144 \end{array}$	$\begin{array}{r} 519 \\ 18 \\ - 36 \\ \hline 1213 \end{array}$	$\begin{array}{r} 71 \\ 387 \\ - 54 \\ \hline 3213 \end{array}$	$\begin{array}{r} 294 \\ - 62 \\ \hline \end{array}$	$\begin{array}{r} 254 \\ - 39 \\ \hline \end{array}$
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Explain the pattern, and why it works or doesn't work.

10.

$\begin{array}{r} 4 \\ 548 \\ -173 \\ \hline 375 \end{array}$	$\begin{array}{r} 6 \\ 611 \\ -135 \\ \hline 536 \end{array}$	$\begin{array}{r} 3 \\ 431 \\ -157 \\ \hline 284 \end{array}$	$\begin{array}{r} 4 \\ 536 \\ -287 \\ \hline 259 \end{array}$	$\begin{array}{r} 416 \\ -179 \\ \hline \end{array}$	$\begin{array}{r} 416 \\ -174 \\ \hline \end{array}$
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Explain the pattern, and why it works or doesn't work.

11.

$\begin{array}{r} 70 \\ -48 \\ \hline 32 \end{array}$	$\begin{array}{r} 300 \\ -193 \\ \hline 217 \end{array}$	$\begin{array}{r} 60 \\ -24 \\ \hline 46 \end{array}$	$\begin{array}{r} 100 \\ -74 \\ \hline 36 \end{array}$	$\begin{array}{r} 80 \\ -17 \\ \hline \end{array}$	$\begin{array}{r} 500 \\ -324 \\ \hline \end{array}$
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Explain the pattern, and why it works or doesn't work.

$\begin{array}{r} 12. \ 743 \\ - 152 \\ \hline 643 \\ 593 \\ \hline (591) \end{array}$	$\begin{array}{r} 74 \\ - 18 \\ \hline 64 \\ (56) \end{array}$	$\begin{array}{r} 439 \\ - 125 \\ \hline 339 \\ 319 \\ \hline (314) \end{array}$	$\begin{array}{r} 231 \\ - 86 \\ \hline 151 \\ (145) \end{array}$	$\begin{array}{r} 82 \\ - 46 \\ \hline \end{array}$	$\begin{array}{r} 325 \\ - 167 \\ \hline \end{array}$
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Explain the pattern, and why it works or doesn't work.

$\begin{array}{r} 13. \ 143 \\ - 30 \\ \hline 110 \end{array}$	$\begin{array}{r} 647 \\ - 143 \\ \hline 504 \end{array}$	$\begin{array}{r} 372 \\ - 130 \\ \hline 240 \end{array}$	$\begin{array}{r} 306 \\ - 102 \\ \hline 204 \end{array}$	$\begin{array}{r} 454 \\ - 134 \\ \hline \end{array}$	$\begin{array}{r} 326 \\ - 204 \\ \hline \end{array}$
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Explain the pattern, and why it works or doesn't work.

14. Choose one of the *subtraction errors* in the examples above, and write about how you would help the student correct that error.

a. Which example are you focusing on? _____

b. If you were to go back to using manipulatives (such as base 10 blocks) to help the child fix his or her error, describe what that might look and sound like.

c. What else might you try to do to help the child fix his or her error? (Describe another teaching idea)