

On the job – Student work samples

Link to the assessment resource, *On the job* (NM1346)

These examples are generally listed from the most sophisticated to the least sophisticated. The mean ability of students using each strategy largely follows the stages of the number framework.

Rounding and compensation

- (a) 16×7 Subtracts 3×7 instead of 3×16

$$\begin{array}{l}
 16 \times 7 \\
 16 \times 10 \\
 160 - 21 = 139
 \end{array}
 \quad
 \underline{139} \text{ hours}$$

- (d) 195×38

$$\begin{array}{l}
 38 \times 195 = \\
 +5 \\
 38 \times 200 = 7600 - 5 \times 38 = 190 = 7410
 \end{array}
 \quad
 \underline{7410} \text{ hours}$$

Partitioning just one number

- (b) 14×23 Partitions 14 to $10 + 4$

$$\begin{array}{l}
 23 \times 10 = 230 \\
 23 \times 4 = 92 \\
 230 + 92 = 322
 \end{array}
 \quad
 \underline{322} \text{ hours}$$

- (b) 14×23 Partitions 23 into $20 + 3$

$$\begin{array}{l}
 14 \times 20 = 280 \\
 14 \times 3 = 42 \\
 280 + 42 = 322
 \end{array}
 \quad
 \underline{322} \text{ hours}$$

- (b) 14×23 Partitions 23 into $10 + 10 + 3$

$$\begin{array}{l}
 14 \times 10 = 140 \\
 14 \times 10 = 140 \\
 14 \times 3 = 42 \\
 100 + 100 = 200 \\
 40 + 40 + 40 = 120 \\
 120 \div 2 = 122 \\
 200 + 122 = 322
 \end{array}
 \quad
 \underline{322} \text{ hours}$$

- (d) 195×38 Partitions the 195 as $100 + 90 + 5$

$$\begin{array}{l}
 38 \times 195 = 7,410 \\
 (38 \times 100 = 3,800) \\
 (38 \times 90 = 3,420) \\
 (38 \times 5 = 190) \\
 3,800 + 3,420 + 190 = 7,410
 \end{array}$$

7410 days

Full place value partitioning

In part a), this is indistinguishable from partitioning just one number.

- (b) 14×23 The student partitions and then lays out their components in the vertical form.

$$\begin{array}{l}
 10 \times 20 = 200 \\
 4 \times 20 = 80 \\
 10 \times 3 = 30 \\
 4 \times 3 = 12 \\
 \begin{array}{r}
 200 \\
 80 \\
 30 \\
 + 12 \\
 \hline
 322
 \end{array}
 \end{array}$$

322 hours

- (b) 14×23 The student partitions and then lays out their components in a horizontal form.

$$\begin{array}{l}
 14 \times 23 = \\
 10 \times 20 = 200 \\
 10 \times 3 = 30 \\
 4 \times 20 = 80 \\
 4 \times 3 = 12 \\
 200 + 30 + 80 + 12 =
 \end{array}$$

322 hours

- (b) 14×23 The student partitions into an array, but suppresses the zeros from the 20 and the 30 in the top margin of the table.

$$\begin{array}{l}
 14 \times 23 \\
 \begin{array}{c|c|c}
 \times & 2 & 3 \\
 \hline
 1 & 200 & 30 \\
 4 & 80 & 12 \\
 \hline
 \end{array}
 \end{array}$$

322 hours

- (c) 32×27 This same student partitions but does not lay out their sum but performs it mentally.

$$\begin{array}{l}
 32 \times 27 = \\
 30 \times 20 = 600 \\
 30 \times 7 = 210 \\
 2 \times 20 = 40 \\
 2 \times 7 = 14 \\
 \text{total} =
 \end{array}$$

864 post holes

Other partitioning methods

(a) 16×7 Splits 7 additively into $4 + 3$

$$\begin{array}{l} 16 \times 4 = 64 \\ 16 \times 3 = 48 \end{array} \left. \vphantom{\begin{array}{l} 16 \times 4 = 64 \\ 16 \times 3 = 48 \end{array}} \right\} 112 \quad \text{or} \quad \begin{array}{r} 16 \\ \times 7 \\ \hline 112 \end{array}$$

112 hours

(a) 16×7 Splits 6 multiplicatively into 2×3 then adds 16

$$\begin{array}{l} 16 \times 2 = 32 \\ 32 \times 3 = 96 \\ 96 + 16 = 112 \end{array}$$

112 hours

(a) 16×7 Splits 16 multiplicatively into 4×4

$$\begin{array}{l} 7 \times 4 = 28 \\ 28 \times 4 = 112 \end{array}$$

112 hours

(c) 32×27 Splits 27 additively into $4 + 10 + 10 + 3$

$$\begin{array}{l} 32 \text{ holes} \quad 32 \times 4 = 128 \\ 32 \text{ holes} \quad 32 \times 10 = 320 \\ 32 \text{ holes} \quad 32 \times 10 = 320 \\ 32 \text{ holes} \quad 32 \times 3 = 96 \end{array} \left. \vphantom{\begin{array}{l} 32 \times 4 = 128 \\ 32 \times 10 = 320 \\ 32 \times 10 = 320 \\ 32 \times 3 = 96 \end{array}} \right\} 864$$

864 post holes

Doubling and halving

(c) 32×27

$$\begin{array}{l} 2 \times 27 = 54 \\ 4 \times 27 = 108 \\ 8 \times 27 = 216 \\ 16 \times 27 = 432 \\ 32 \times 27 = 864 \end{array}$$

864 post holes

$$\begin{array}{l} 32 \times 27 = \\ 16 \times 54 = \\ 8 \times 108 = \\ 4 \times 216 = \\ 2 \times 432 = \end{array}$$

864 post holes

Vertical algorithm

(b) 14×23 Performs 14 lots of 23

$$\begin{array}{r}
 23 \\
 \times 14 \\
 \hline
 92 \\
 230 \\
 \hline
 322
 \end{array}$$

322 hours

(b) 14×23 Performs 23 lots of 14

14 hours
23 days

$$\begin{array}{r}
 14 \\
 \times 23 \\
 \hline
 42 \\
 280 \\
 \hline
 322
 \end{array}$$

322 hours

Russian algorithm

(d) 195×38 The student should be encouraged to describe why this method works (just as they need to with the vertical algorithm)

~~38×195~~

$38 \times 100 = 3800$

$38 \times 90 =$

38×195

	1	9	5	
0	3	2	1	5
0	7	1	4	3
1	8	2	0	8

7410

7410

7410 hours

Repeated addition

(a) 16×7

$16 + 16 + 16 + 16 + 16 + 16 + 16$

16×7

112 hours

$16 + 16 = 32$ hours

$32 + 32 = 64$ hours

$64 + 16 = 80$ hours

$80 + 16 = 96$ hours

$96 + 16 = 112 = 7$ weeks

112 hours

16×7

~~$6 \times 7 = 42$~~

$\begin{array}{r} 16 \\ 16 \\ 16 \\ 16 \\ 16 \\ 16 \\ 16 \\ 16 \\ \hline 112 \end{array}$

112 hours

(b) 14×23

Repeats the 14 twenty-three times rather than 23 fourteen times.

$14 + 14 + 14 + 14 + 14 + 14 + 14 + 14 + 14 + 14 + 14 + 14 + 14 + 14 + 14 = 182$

182 hours