

Math and Chess Workbook

Whole Numbers Operations

Frank Ho © 2004, all rights reserved. ISBN 0-9683967-4-7

Note to teacher: _____ Date: _____
 Note to parent: _____ Date: _____
 Test Date: _____ Start: ___ / ___ / ___ / Finish: ___ / ___ / ___ Assignment date: _____

dd ÷ d with 1-digit quotient and no remainder

$\square \times 6 = 42$	$42 = \square \times 7$	<p>Step1: Do $\square \times 6 \leq 42$ (4 is too small, use 42) Place the quotient in the rightmost position</p> $\begin{array}{r} \times \square \leftarrow \text{step 2: } 7 \times 6 = 42 \\ 6 \overline{) 42} \\ - \underline{\square\square} \leftarrow \text{step 3: } 42 - 42 = 0 \\ \quad 0 \leftarrow \text{Remainder} = 0 \end{array}$
$\square \times 2 = 18$	$18 = \square \times 9$	<p>Step1: Do $\square \times 2 \leq 18$ (1 is too small, use 18) Place the quotient in the rightmost position</p> $\begin{array}{r} \times \square \leftarrow \text{step 2: } 9 \times 2 = 18 \\ 2 \overline{) 18} \\ - \underline{\square\square} \leftarrow \text{step 3: } 18 - 18 = 0 \\ \quad 0 \leftarrow \text{Remainder} = 0 \end{array}$
$\square \times 9 = 81$	$81 = \square \times 9$	<p>Step1: Do $\square \times 9 \leq 81$ (8 is too small, use 81) Place the quotient in the rightmost position</p> $\begin{array}{r} \times \square \leftarrow \text{step 2: } 9 \times 9 = 81 \\ 9 \overline{) 81} \\ - \underline{\square\square} \leftarrow \text{step 3: } 81 - 81 = 0 \\ \quad 0 \leftarrow \text{Remainder} = 0 \end{array}$

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<p>Step1: Do $\square \times 3 \leq 15$ (1 is too small, use 5)</p> $\begin{array}{r} \times \quad \square \\ 3 \overline{)15} \\ - \square \square \\ \hline 0 \end{array}$ <p style="text-align: center;">← step 2: Do multiplication, $5 \times 3 = 15$ ← step 3: Do subtraction, $15 - 15 = 0$ ← Remainder = 0</p>	<p>Step1 Do $\square \times 3 \leq 18$ (3 is too small, use 6)</p> $\begin{array}{r} \times \quad \square \\ 3 \overline{)18} \\ - \square \square \\ \hline 0 \end{array}$ <p style="text-align: center;">← step 2: Do multiplication, $6 \times 3 = 18$ ← step 3: Do subtraction, $18 - 18 = 0$ ← Remainder = 0</p>
<p>Step1: Do $\square \times 5 \leq 25$ (2 is too small, use 5)</p> $\begin{array}{r} \times \quad \square \\ 5 \overline{)25} \\ - \square \square \\ \hline 0 \end{array}$ <p style="text-align: center;">← step 2: Do multiplication ← step 3: Do subtraction ← Remainder = 0</p>	<p>Step1: Do $\square \times 4 \leq 28$ (2 is too small, use 7)</p> $\begin{array}{r} \times \quad \square \\ 4 \overline{)28} \\ - \square \square \\ \hline 0 \end{array}$ <p style="text-align: center;">← step 2: Do multiplication ← step 3: Do subtraction ← Remainder = 0</p>
<p>Step1: Do $\square \times 4 \leq 32$ (3 is too small, use 8)</p> $\begin{array}{r} \times \quad \square \\ 4 \overline{)32} \\ - \square \square \\ \hline 0 \end{array}$ <p style="text-align: center;">← step 2: Do multiplication ← step 3: Do subtraction ← Remainder = 0</p>	<p>Step1: Do $\square \times 2 \leq 16$ (1 is too small, use 8)</p> $\begin{array}{r} \times \quad \square \\ 2 \overline{)16} \\ - \square \square \\ \hline 0 \end{array}$ <p style="text-align: center;">← step 2: Do multiplication ← step 3: Do subtraction ← Remainder = 0</p>

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dd ÷ d with 1-digit quotient and no remainder

$12 \div 2 = \square$	$\begin{array}{r} \square \\ 2 \overline{)12} \end{array}$
$20 \div 4 = \square$	$\begin{array}{r} \square \\ 4 \overline{)20} \end{array}$
$56 \div 8 = \square$	$\begin{array}{r} \square \\ 8 \overline{)56} \end{array}$
$0 \div 56 = \square$	$\begin{array}{r} \square \\ 56 \overline{)0} \end{array}$

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dd ÷ d with 1-digit quotient and no remainder

$18 \div 3 = \square$	$\overline{) }$
$35 \div 7 = \square$	$\overline{) }$
$54 \div 6 = \square$	$\overline{) }$
$49 \div 7 = \square$	$\overline{) }$

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Strategies for 1d – d subtraction

For many students, one of the most difficult elementary math subject is the 36 subtraction facts such as 11–2, 11–3, 11–4, 11–5, 11–6, 11–7, 11–8, 12–3, 12–4, 12–5, 12–6, 12–7, 12–8, 12–9, 13–4, 13–5, 13–6, 13–7, 13–8, 13–9, 14–5, 14–6, 14–7, 14–8, 14–9, 15–6, 15–7, 15–8, 15–9, 16–7, 16–8, 16–9, 17–8, 17–9, 18–9. The following strategies could be used to master the subtraction skills.

Strategies	Procedure	Comments
Intuitive	Many students have done enough computations to the extent they just know the answers.	Requires the student's willingness to learn and memorization.
Borrowing 10	$\begin{array}{r} 11 \\ - 7 \\ \hline \end{array}$ 1 ten is borrowed to minus 7 (to get 3) and then add 1 to get the answer 4.	A universal method can be used to subtract all facts.
Making ten (adding the bottom to 10)	$\begin{array}{r} 11 \\ - 7 \\ \hline \end{array}$ 3 added to 7 is 10, so 3 plus 1 is 4. This method is similar to the above borrowing 10	A universal method can be used to subtract all facts.
Subtracting to 10 (subtracting top to 10)	$11 \rightarrow 10 \rightarrow 9$ $\begin{array}{r} 11 \\ - 2 \\ \hline \end{array}$ Subtract 1 from 11 to make 10 and then subtract 1 again to make 9.	Used when the subtracted number is less than 7. Not an universal approach for all subtraction facts.
Adding the bottom to 10	$\begin{array}{r} 11 \rightarrow 13 \\ - 8 \rightarrow - 10 \\ \hline \end{array}$	Not an universal approach for all subtraction facts.
Subtracting top to 10	$\begin{array}{r} 12 \rightarrow 10 \\ - 3 \rightarrow - 1 \\ \hline \end{array}$	Not an universal approach for all subtraction facts.

Even though I use Borrowing Ten method with very high successful rate, worksheets in this book are designed to be used for any kinds of strategies.

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36 difficult subtractions from addition

$2 + 9 = \underline{\quad}$	$7 + 7 = \underline{\quad}$
$3 + 8 = \underline{\quad}$	$7 + 8 = \underline{\quad}$
$3 + 9 = \underline{\quad}$	$7 + 9 = \underline{\quad}$
$4 + 7 = \underline{\quad}$	$8 + 3 = \underline{\quad}$
$4 + 8 = \underline{\quad}$	$8 + 4 = \underline{\quad}$
$4 + 9 = \underline{\quad}$	$8 + 5 = \underline{\quad}$
$5 + 6 = \underline{\quad}$	$8 + 6 = \underline{\quad}$
$5 + 7 = \underline{\quad}$	$8 + 7 = \underline{\quad}$
$5 + 8 = \underline{\quad}$	$8 + 8 = \underline{\quad}$
$5 + 9 = \underline{\quad}$	$8 + 9 = \underline{\quad}$
$6 + 5 = \underline{\quad}$	$9 + 2 = \underline{\quad}$
$6 + 6 = \underline{\quad}$	$9 + 3 = \underline{\quad}$
$6 + 7 = \underline{\quad}$	$9 + 4 = \underline{\quad}$
$6 + 8 = \underline{\quad}$	$9 + 5 = \underline{\quad}$
$6 + 9 = \underline{\quad}$	$9 + 6 = \underline{\quad}$
$7 + 4 = \underline{\quad}$	$9 + 7 = \underline{\quad}$
$7 + 5 = \underline{\quad}$	$9 + 8 = \underline{\quad}$
$7 + 6 = \underline{\quad}$	$9 + 9 = \underline{\quad}$

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From addition to subtraction

Fill in the following \square with a number.

$\begin{array}{r} 9 \\ + 2 \\ \hline \square \end{array} - 2 = \square$	$\begin{array}{r} 2 \\ + 9 \\ \hline \square \end{array} - 9 = \square$
$\begin{array}{r} 9 \\ + 1 \\ \hline \square \end{array} - 1 = \square$	$\begin{array}{r} 1 \\ + 9 \\ \hline \square \end{array} - 9 = \square$
$\begin{array}{r} 9 \\ + 3 \\ \hline \square \end{array} - 3 = \square$	$\begin{array}{r} 3 \\ + 9 \\ \hline \square \end{array} - 9 = \square$
$\begin{array}{r} 9 \\ + 4 \\ \hline \square \end{array} - 4 = \square$	$\begin{array}{r} 4 \\ + 9 \\ \hline \square \end{array} - 9 = \square$
$\begin{array}{r} 9 \\ + 5 \\ \hline \square \end{array} - 5 = \square$	$\begin{array}{r} 5 \\ + 9 \\ \hline \square \end{array} - 9 = \square$
$\begin{array}{r} 9 \\ + 6 \\ \hline \square \end{array} - 6 = \square$	$\begin{array}{r} 6 \\ + 9 \\ \hline \square \end{array} - 9 = \square$

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From addition to subtraction

Fill in the following with a number.

$9 + 2 = 9 + 1 + \square = \overset{9}{\underset{\text{L}_{10}\text{J}}{\square}} = \overset{9}{\underset{\text{L}_{10}\text{J}}{\square}} + 1$ $\begin{array}{r} 9 \\ + 2 \quad (1 + 1) \\ \hline \square \end{array}$	$\begin{array}{r} 11 \leftarrow \leftarrow \leftarrow \leftarrow \\ - 2 \\ \hline \square + 2 = \square \end{array}$ <p style="text-align: center;">Check</p>	$\begin{array}{r} 11 \leftarrow \leftarrow \leftarrow \leftarrow \\ - 9 \\ \hline \square + 9 = \square \end{array}$ <p style="text-align: center;">Check</p>
<p>Nine plus two is <input type="checkbox"/></p> <p>4444444444</p> <p>44</p>	<p>Eleven minus 2 is <input type="checkbox"/></p>	<p>Eleven minus 9 is <input type="checkbox"/></p>
<p>Two plus nine is <input type="checkbox"/></p> <p>44</p> <p>4444444444</p>	<p>Eleven minus 9 is <input type="checkbox"/></p>	<p>Eleven minus 2 is <input type="checkbox"/></p>

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Preparing for division

<input type="checkbox"/> X 2 = 16	$\begin{array}{r} \text{X } \square \\ 2 \overline{)16} \end{array}$	$\begin{array}{r} \square \overline{)16} \\ \text{X } 2 \end{array}$
<input type="checkbox"/> X 2 = 18	$\begin{array}{r} \text{X } \square \\ 2 \overline{)18} \end{array}$	$\begin{array}{r} \square \overline{)18} \\ \text{X } 2 \end{array}$
<input type="checkbox"/> X 2 = 2	$\begin{array}{r} \text{X } \square \\ 2 \overline{)2} \end{array}$	$\begin{array}{r} \square \overline{)2} \\ \text{X } 2 \end{array}$
<input type="checkbox"/> X 2 = 4	$\begin{array}{r} \text{X } \square \\ 2 \overline{)4} \end{array}$	$\begin{array}{r} \square \overline{)4} \\ \text{X } 2 \end{array}$
<input type="checkbox"/> X 2 = 6	$\begin{array}{r} \text{X } \square \\ 2 \overline{)6} \end{array}$	$\begin{array}{r} \square \overline{)6} \\ \text{X } 2 \end{array}$
<input type="checkbox"/> X 2 = 8	$\begin{array}{r} \text{X } \square \\ 2 \overline{)8} \end{array}$	$\begin{array}{r} \square \overline{)8} \\ \text{X } 2 \end{array}$
<input type="checkbox"/> X 2 = 10	$\begin{array}{r} \text{X } \square \\ 2 \overline{)10} \end{array}$	$\begin{array}{r} \square \overline{)10} \\ \text{X } 2 \end{array}$

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Cross multiplication

$\begin{array}{ccc} 12 & & 12 \\ \square & & \square \\ \frac{6}{2} = \frac{6}{2} \end{array}$	$\begin{array}{ccc} \square & & \square \\ \square & & \square \\ \frac{2}{2} = \frac{2}{2} \end{array}$	$\begin{array}{ccc} \square & & \square \\ \square & & \square \\ \frac{2}{2} = \frac{3}{3} \end{array}$	$\begin{array}{ccc} \square & & \square \\ \square & & \square \\ \frac{2}{2} = \frac{4}{4} \end{array}$
$\begin{array}{ccc} \square & & \square \\ \square & & \square \\ \frac{2}{2} = \frac{5}{5} \end{array}$	$\begin{array}{ccc} \square & & \square \\ \square & & \square \\ \frac{2}{2} = \frac{6}{6} \end{array}$	$\begin{array}{ccc} \square & & \square \\ \square & & \square \\ \frac{2}{2} = \frac{7}{7} \end{array}$	$\begin{array}{ccc} \square & & \square \\ \square & & \square \\ \frac{2}{2} = \frac{9}{9} \end{array}$
$\begin{array}{ccc} \square & & \square \\ \square & & \square \\ \frac{2}{2} = \frac{5}{5} \end{array}$	$\begin{array}{ccc} \square & & \square \\ \square & & \square \\ \frac{2}{2} = \frac{4}{4} \end{array}$	$\begin{array}{ccc} \square & & \square \\ \square & & \square \\ \frac{2}{2} = \frac{7}{7} \end{array}$	$\begin{array}{ccc} \square & & \square \\ \square & & \square \\ \frac{2}{2} = \frac{8}{8} \end{array}$
$\begin{array}{ccc} \square & & \square \\ \square & & \square \\ \frac{2}{2} = \frac{6}{6} \end{array}$	$\begin{array}{ccc} \square & & \square \\ \square & & \square \\ \frac{2}{2} = \frac{8}{8} \end{array}$	$\begin{array}{ccc} \square & & \square \\ \square & & \square \\ \frac{2}{2} = \frac{9}{9} \end{array}$	$\begin{array}{ccc} \square & & \square \\ \square & & \square \\ \frac{2}{2} = \frac{3}{3} \end{array}$

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Different ways of writing multiplication (Learning division while doing multiplications)

$\frac{4}{\square \times} = 2$	$\begin{array}{r} 2 \\ \times \\ 2 \end{array}$	$\frac{4}{\square \times} = 2$
	↙ ↘	
$2 \times \square$	$= \square =$	$2 \times \square$
	↙ ↘	
$\begin{array}{r} \times \square \\ 2 \overline{)4} \end{array}$	$\begin{array}{r} 2 \\ \times \\ \square \end{array}$	$\begin{array}{r} \times \square \\ 2 \overline{)4} \end{array}$
$\begin{array}{r} 2 \overline{)4} \\ \times \square \end{array}$		$\begin{array}{r} 2 \overline{)4} \\ \times \square \end{array}$

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Using line segment – Age problems

Many word problems could be easily solved using algebra but for elementary students, using algebra is out of question until grade 7 or 8. So the line segment is a very good strategy used to substitute the operation of algebra.

Equation	Line segment	Problems	Solutions
Age + 4 = 20		In four years, I will be twenty years old. How old am I?	$20 - 4 = 16$
		Six years ago. I was five. How old am I?	
		I am three years old than Ling, who is 7. How old am I?	
		My sister, 16 years old, is nine years older than I am. How old am I?	
$6 = \frac{1}{2}$ of my age		My brother who is six is one half of my age. How old am I?	
		I am as old as Andrew. Andrew and Amanda have the same age. Together we are 30 years old. How old am I?	

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Fun with math

1. Make one mathematical operator change of the following expression such that it will be equal to 11111.

$$10 \times 1000 + 10 \times 100 + 10 \times 10 + 1 \times 1$$

2. Which one of the following size of house numbers is the biggest?

9999 9998 9997

Answer: _____

3. Stanley's ladder has 15 rungs but Stanley would only stand on 14th rung on the way up, why?

Answer: _____

4. Meghan put \$10 her father gave to her in her pocket and went to the Richmond night market. She bought a key chain for \$2 and \$5 for a T-shirt, and she noticed that she still had \$8 in her pocket when no one else had given her more money, why?

Answer: _____