VANCOUVER COMMUNITY COLLEGE

The Long and Short of
Division by Hand

Division is probably the trickiest operation to do by hand. The following examples will help you keep track of the exceptions and short cuts of division.

Example 1: Divide 843 by 13. Express your answer to two decimal places.

In North America, the first number goes under the division symbol, and the second number goes to the left of it:

$$13\overline{)843}$$

Since the divisor (13) has two digits, look at the first two digits of the dividend (84). How many times does 13 go into 84? We don't know, so we try multiplying. Guess and zoom in on the answer. (Don't erase the ones that don't work! You may need them later in the problem!)

$$\begin{array}{ccc} 13 & 13 & 13 \\ \times 5 & \times 6 & \times 7 \\ \hline 65 & 78 & 91 \end{array}$$

We start by guessing 5, and 5 × 13 = 65, which is smaller than 84, but it's quite a bit smaller. We try 6, and it's still smaller, then 7, which is bigger. That means 6 × 13 = 78 is the largest multiple of 13 that's less than 84.

$$\begin{array}{r} 6 \\ 13\overline{)843} \\ -78\downarrow \\ \hline 63 \end{array}$$

Write the 6 above the last digit in the 84, and subtract 78 from 84. The answer, 6, is less than 13. The answer to the subtraction problem must be less than the divisor or we've made a mistake. Bring down the next digit, the 3 in 843, and now we're looking at 13 into 63. From our earlier multiplication we see 13 × 5 = 65 is *slightly* too big, so the next number in our answer should be 4.

$$\begin{array}{r} 64 \\ 13\overline{)843} \\ -78 \\ \hline 63 \\ -52 \\ \hline 11 \end{array}$$

Keep multiplying and subtracting until we've used all the digits in the dividend. If the question had asked us for a remainder, the answer to our last subtraction, 11, would be the remainder. In this question, however, we have been asked for decimal places. Continue dividing: add a decimal point at the end of the dividend and add zeroes beyond that, as many as we need. The decimal point in the dividend lines up with the decimal point in the quotient (the answer). We want two decimal places, so write one extra zero so we can round. Continue multiplying and subtracting as we did before. Our answer is 64.846, so we round to two decimal places: 64.85.

$$\begin{array}{r} 64.846 \\ 13\overline{)843.000} \\ -78 \\ \hline 63 \\ -52 \\ \hline 110 \\ -104 \\ \hline 60 \\ -52 \\ \hline 80 \\ -78 \\ \hline 2 \end{array}$$

DECIMALS IN DIVISORS

We cannot have decimals in divisors, so we decimal point in the divisor to the right until the a whole number, but we also have to move the the dividend the same number of positions.

$$4.32\overline{)6.1957}$$

$$432\overline{)619.57}$$

move the number is decimal in

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ZEROES

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      2 0
45) 9 2 8 3
  − 9 0
      2 8
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If, after we bring down a new digit, the number we're looking at is still too small we write a zero.

In the problem on the left, we subtracted to get 2, then brought down the 8. How many times does 45 go into 28? It doesn't; 28 is still too small, so we write a zero above the line, and *then* we can bring down the 3 to continue the problem.

LONG DIVISION IS VERY LONG

Why do they call it long division? Because there's such a thing as short division! Short division works well with single-digit divisors.

Example 2: Divide 9823 ÷ 7.

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      1
7) 9²8 2 3
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The 7 goes into 9 once, so we write a 1 above the line, and 9 − 7 = 2. Write the 2 as a small number above the next number — this means 28. Cross out the 9 because we're finished with it.

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1 4 0 3  R2
7) 9²8 2²3
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The 7 goes into 28 three times with 0 left over, so we just move on to the next number. Seven doesn't go into 2, so we write a zero as in long division and bring in the next number. Seven goes into 23 three times with 2 left over, so 2 is the remainder. If we needed a decimal answer, we'd add a decimal point and zeroes to the 9823 and keep going as before.

Short division relies more on mental math (so it's great if you know the multiplication table well), it goes faster and it takes less paper.

EXERCISES

A. Divide.

1) 663 ÷ 17

2) 1944 ÷ 24

3) 4104 ÷ 38

4) 60,288 ÷ 64

5) 3126 ÷ 6

6) 186,762 ÷ 3

B. Divide. Give your answer to two decimal places.

1) 742 ÷ 13

2) 1159 ÷ 35

3) 648 ÷ 2.9

4) 65 ÷ 3.16

5) 8532 ÷ 7

6) 63185 ÷ 9

SOLUTIONS

A: (1) 39 (2) 81 (3) 108 (4) 942 (5) 521 (6) 62,254
B: (1) 57.08 (2) 33.11 (3) 223.45 (4) 20.57 (5) 1218.86 (6) 7020.56