



## Grade 7 & 8 Math Circles

### October 5, 2011

### Mental Division

Dividing two or three (or even four!) digit numbers by a one digit number in your head (with decimal accuracy) is much easier than you would think!

**To begin:** We start with a little memorization of single digit division, you may be surprised with how many of these quotients you already know!

$$1 \div 2 =$$

$$1 \div 3 =$$

$$2 \div 3 =$$

$$1 \div 4 =$$

$$2 \div 4 =$$

$$3 \div 4 =$$

$$1 \div 5 =$$

$$2 \div 5 =$$

$$3 \div 5 =$$

$$4 \div 5 =$$

Most of the 6ths are familiar as well:

$$2 \div 6 =$$

$$3 \div 6 =$$

$$4 \div 6 =$$

Now we only have two new quotients to remember:

$$1 \div 6 =$$

$$5 \div 6 =$$

When working with 7ths, simply remember the sequence 142857. Every 7th will repeat this sequence, only the starting point varies!

To help remember the sequence, think of it as doubling 7 three times.

i.e. 7, 14(7 × 2), 28(14 × 2), 56(28 × 2).

The 6 of 56 is replaced with a 7 which starts the sequence again.

To find your starting point, take your dividend and multiply by 14, the number in the sequence closest to this number will be your starting point:

$$1 \div 7(1 \times 14 = \quad) =$$

$$2 \div 7(2 \times 14 = \quad) =$$

$$3 \div 7(3 \times 14 = \quad) =$$

$$4 \div 7(4 \times 14 = \quad) =$$

$$5 \div 7(5 \times 14 = \quad) =$$

$$6 \div 7(6 \times 14 = \quad) =$$

8ths are simple, they are the half way in-between the 4ths. You can also multiply your dividend by 125 and put the decimal place in front:

$$1 \div 8 =$$

$$2 \div 8 =$$

$$3 \div 8 =$$

$$4 \div 8 =$$

$$5 \div 8 =$$

$$6 \div 8 =$$

$$7 \div 8 =$$

9ths are simply the dividend repeated:

$$1 \div 9 =$$

$$2 \div 9 =$$

$$3 \div 9 =$$

$$4 \div 9 =$$

$$5 \div 9 =$$

$$6 \div 9 =$$

$$7 \div 9 =$$

$$8 \div 9 =$$

### Two Digit Numbers:

Example 1

a)  $65 \div 7 =$

b)  $33 \div 4 =$

c)  $88 \div 9 =$

### Three Digit Numbers:

Example 2

a)  $435 \div 6 =$

b)  $787 \div 5 =$

c)  $342 \div 7 =$

## Bonus Material: Divisibility Rules

We can see if large numbers are divisible by certain small numbers using these simple rules:

<i><b>A number is divisible by:</b></i>	<i><b>Only if:</b></i>
2	The last digit is even
3	The sum of the digits is divisible by 3
4	The last two digits are divisible by 4
5	The number ends in 5 or 0
6	The number is divisible by 2 and 3
7	Twice the last digit subtracted from the remaining digits is divisible by 7 (Repeat for large numbers)
8	The last three digits are divisible by 8
9	The sum of the digits is divisible by 9
10	The number ends in 0
11	The sum of the even numbered digits subtracted from the sum of the odd numbered digits is divisible by 11 (remember 0 is divisible by 11)
12	The number is divisible by 3 and 4
13	Nine times the last digit subtracted from the remaining digits is divisible by 13

### Examples:

1. Is 3983 divisible by 7?
2. Is 93024 divisible by 11?
3. Is 1157 divisible by 13?

**Exercises:**

1.

a)  $31 \div 9 =$

k)  $41 \div 8 =$

b)  $82 \div 5 =$

l)  $79 \div 5 =$

c)  $121 \div 4 =$

m)  $53 \div 8 =$

d)  $18 \div 7 =$

n)  $356 \div 6 =$

e)  $586 \div 3 =$

o)  $771 \div 4 =$

f)  $11 \div 9 =$

p)  $58 \div 3 =$

g)  $543 \div 6 =$

q)  $460 \div 9 =$

h)  $884 \div 3 =$

r)  $77 \div 2 =$

i)  $41 \div 2 =$

s)  $94 \div 7 =$

j)  $4545 \div 8 =$

t)  $5075 \div 6 =$

2.

a) Is 261 divisible by 3?

b) Is 4562 divisible by 9?

c) By what numbers is 225612 divisible?

d) If a number is divisible by 9, by what other number is it also divisible?

e) Is 84651 divisible by 7?

f) Is 56232 divisible by 11?

g) Determine how much to add to 33475 to make it divisible by:

i) 2      ii) 3      iii) 4      iv) 6      v) 9