Secrets of Mental Math – Division

1. **When does one number divide evenly into another?**

   A number is divisible by

   2 if and only if it ends in 0, 2, 4, 6, or 8.

   5 if and only if it ends in 0 or 5

   10 if and only if it ends in 0

   4 if and only if its last two digits create a number divisible by 4

      Is 276485328 divisible by 4?

   8 if and only if its last three digits create a number divisible by 8

      Is 123456 divisible by 8?
      Is 3145926 divisible by 8? (hint: check divisibility by 4)

   3 if and only if its digits add up to a number divisible by 3

      Is 12345 divisible by 3?

   9 if and only if its digits add up to a number divisible by 9

      Is 12345 divisible by 9?

   Exercise: show that the rules of divisibility by 3 and 9 are correct (hint: start with 9).

   11 if and only if you alternately subtract and add the digits and you end up with zero or a multiple of 11.

      Is 843689 divisible by 11?

   6 if and only if it is divisible by 2 and 3

   12 if and only if it is divisible by 3 and 4

7: take off the last digit of the number, double it, subtract from the rest of the number, if what you get is divisible by 7 then the number is divisible by 7.

Is 112 divisible by 7?

Is 2345 divisible by 7?

Can your birthday ever be on the same day two years in a row?

7 again: “Create a zero, kill a zero rule”

1234 create a zero by adding or subtracting a multiple of 7.
1234 – 14 = 1220 kill a zero
122 + 28 = 150
15 not divisible by 7, so 1234 is not divisible by 7.

This rule can be used for any odd number except for 5.

Is 2001 divisible by 23?

2. Let’s look at one digit division now.

79 : 3, think of 3 goes 2 times into 7 so subtract 3 x 20 from 79 to get an easier problem of 20 + 19 : 3 = 20 + 6 + 1/3 = 26 and 1/3.

Covert from Fahrenheit to Celsius: 79F

76 – 32 = 44
44 x 5 = 220
220/9 = ?
9 goes 2 times into 22 so it goes 20 times into 220, 220 – 180 = 40, now 40/9 = 4 and 4/9, so the answer is 20 and 4 and 4/9 or 24 and 4/9.

Try 100F.

Try 777/4 =?

1234/5 =? Here is trick: double both numbers, then divide.

Practice:

353/14 =?

500/73 =?
This problem can be solved easier using “Overeshooting”.

Now try: 770/79 =?

Practice division by 2 digit numbers:

2001/23 = ?

2012/24 =? (hint: reduce by first dividing both numbers by 4)

314/16 =?

695/25 =? (hint: when numbers end in 5 doubling may simplify the problem)

3. Decimals.

1/2 = 0.5

1/3 = 0.333…	2/3 = 0.666…		
1/4 = 0.25	3/4 = 0.75		
1/5 = 0.2	2/5 = 0.4	3/5 = 0.6	4/5 = 0.8
1/6 = 0.1666…	5/6 = 0.8333…		
1/8 = 0.125	3/8 = 0.375	5/8 = 0.675	7/8 = 0.875
1/9 = 0.111…	2/9 = 0.222…	4/9 = 0.444…	etc.
1/11 = 0.0909…	2/11 = 0.1818…	3/11 = 0.2727…	etc.

1/7 = 0.142857142857142857…

Look at 1, 4, 2, 8, 5, 7, you can create all other fractions. Note 1/7 is about 0.14 so
2/7 is about 0.28, so 2/7 = 0.285714 repeated
3/7 is about 0.42 so 3/7 = 0.428571 repeated

Try:
4/7 =
5/7 =
6/7 =

Now try

3.0/16 as a decimal

5.0/14 as a decimal

4. **Exercises:**

Determine which numbers between 2 and 12 divide into each number below:

4410

7062

2744

33,957

Use the “create a zero, kill a zero” method to test to test the following:

Is 4913 divisible by 17?

Is 3141 divisible by 59?

Is 355,113 divisible by 7?

Mentally do the following divisions

97/8

63/4

159/7

4668/6

8763/5