Divisibility Rules

Name: _____   Date: _____

Divisible By

"Divisible By" means "when you divide one number by another the result is a whole number"

Examples:

14 **is** divisible by 7, because 14 ÷ 7 = 2 **exactly**

15 is **not** divisible by 7, because 15 ÷ 7 = $2 \frac{1}{7}$ (the result is **not** a whole number)

0 **is** divisible by 7, because 0 ÷ 7 = 0 **exactly** (0 is a whole number)

"Divisible by" and "can be exactly divided by" mean the same thing

The Divisibility Rules

These rules let you test if one number is divisible by another, without having to do too much calculation!

Example: is 723 divisible by 3?

We could try dividing 723 by 3

Or use the "3" rule: 7+2+3=12, and 12 ÷ 3 = 4 exactly **Yes**

*Note: Zero is divisible by **any number** (except by itself), so gets a "yes" to all these tests.*

Type "yes" or "no" if the number 3 546 divisible by 9? _____

1 Any integer (not a fraction) is divisible by 1

2 The last digit is even (0,2,4,6,8)

➤ 128 **Yes**

➤ 129 **No**

3 The sum of the digits is divisible by 3

➤ 381 (3+8+1=12, and 12÷3 = 4) **Yes**

➤ 217 (2+1+7=10, and 10÷3 = 3 $\frac{1}{3}$) **No**

This rule can be repeated when needed:

➤ 99996 (9+9+9+9+6 = 42, then 4+2=6) **Yes**

4 The last 2 digits are divisible by 4

➜ 13**12** is (12÷4=3) **Yes**

➜ 70**19** is not (19÷4=4 $^3/_4$) **No**

A quick check (useful for small numbers) is to [half] the number twice and the result is still a whole number.

➜ 12/2 = 6, 6/2 = 3, 3 is a whole number. **Yes**

➜ 30/2 = 15, 15/2 = 7.5 which is not a whole number. **No**

5 The last digit is 0 or 5

➜ 17**5** **Yes**

➜ 80**9** **No**

- Which number is divisible by 4?

  78 715;   916;   32 449

- Which number is NOT divisible by 5?

  51 763;   374 950;   300 005

6 Is even and is divisible by 3 (it passes both the 2 rule and 3 rule above)

➡ 114 (it is even, and 1+1+4=6 and 6÷3 = 2) **Yes**

➡ 308 (it is even, but 3+0+8=11 and 11÷3 = 3 $^2/_3$) **No**

7 Double the last digit and subtract it from a number made by the other digits. The result must be divisible by 7. (We can apply this rule to that answer again)

➡ 672 (Double 2 is 4, 67−4=63, and 63÷7=9) **Yes**

➡ 105 (Double 5 is 10, 10−10=0, and 0 is divisible by 7) **Yes**

➡ 905 (Double 5 is 10, 90−10=80, and 80÷7=11 $^3/_7$) **No**

- Is the number **214** divisible by 6, 7 or neither? _____

- Is the number **3101** divisible by 6, 7 or neither? _____

8 The last three digits are divisible by 8

➡ 109**816** (816÷8=102) **Yes**

➡ 216**302** (302÷8=37 $^3/_4$) **No**

A quick check is to half three times and the result is still a whole number:

➡ 816/2 = 408, 408/2 = 204, 204/2 = 102 **Yes**

➡ 302/2 = 151, 151/2 = 75.5 **No**

- Half the following number three times to determine if it is divisible by 8:

3986/2 = _____
_____/2 = _____
_____/2 = _____

Is 3986 divisible by 8? Yes   No

9 The sum of the digits is divisible by 9

(Note: This rule can be repeated when needed)

➡ 1629 (1+6+2+9=18, and again, 1+8=9) **Yes**

➡ 2013 (2+0+1+3=6) **No**

- Is the number 457 983 divisible by 9?

4+5+7+9+8+3 = _____
_____ + _____ = _____

Is 457 983 divisible by 9? Yes No

10

The number ends in 0

➔ 2**20** **Yes**

➔ 2**21** **No**

- Which number is not divisible by 10?

305   600   710   309

11

Add and subtract digits in an alternating pattern (add digit, subtract next digit, add next digit, etc). Then check if that answer is divisible by 11.

➔ 1364 (+1−3+6−4 = **0**) **Yes**

➔ 913 (+9−1+3 = **11**) **Yes**

➔ 3729 (+3−7+2−9 = **−11**) **Yes**

➔ 987 (+9−8+7 = **8**) **No**

- Add and subtract the digits in the alternating pattern to determine if the number 346 987 522 is divisible by 11:

+____ - ____+____ - ____+____ - ____+____ - ____+____ = _____

Is the number 346 987 522 divisible by 11?   Yes   No

12 The number is divisible by both 3 **and** 4 (it passes both the 3 rule and 4 rule above)

648
(*By 3?* 6+4+8=18 and 18÷3=6 Yes)
(*By 4?* 48÷4=12 Yes)
Both pass, so **Yes**

524
(*By 3?* 5+2+4=11, 11÷3= 3 $^2/_3$ No)
(Don't need to check by 4) **No**

- Does the number 984 pass both the 3 rule and 4 rule of divisibility?   Yes   No
(Show Your working below)

984: by 3 →

984: by 4 →