Section 4-1 Divisibility

Defn If a and b are integers, $a \neq 0$ then a <u>divides</u> b, denoted $a|b$ if and only if there exists an integer c such that $ac = b$.

<u>Note:</u> $a|b$ is not $a \div b$ or $\frac{a}{b}$

<u>Note:</u> a does not divide b is denoted $a \nmid b$.

Defn If $a|b$ then a is a <u>factor (divisor)</u> of b and b is a <u>multiple</u> of a.

Defn If $a \div b$ has an integer quotient and no remainder, then a is <u>divisible</u> by b.

Factors of 10: 1, 2, 5, 10 finite
Multiples of 10: 10, 20, 30, 40, ... infinite

Factors of a number are that # and smaller.
Multiples of a number are that # and bigger.

multiple = multiply = get bigger

ex 1 Label the following as True or False.

a) 6 is a multiple of 2 → 2, 4, 6, 8, 10, ... True

b) 2 is a multiple of 6 → 6, 12, 18, 24, ... False

c) 5 | 20 True
×4

d) 18 is divisible by 3 → 3 ⟌ 18 with 0 remainder True

e) 35 | 7 1/5 is not an integer False
×1/5

f) 0 | 4 False

g) 6 | 0 True
×0

h) 30 is a factor of 3 → 1, 3 False

i) 3 is a factor of 30 → 1, 30, 2, 15, 3, 10, 5, 6 True

j) 14,922 is divisible by 2 → 2 ⟌ 14,922 no rem True

k) 14,922 is divisible by 3 True

add digits 1+4+9+2+2 = 18 is divisible by 3
so 14,922 is also divisible by 3

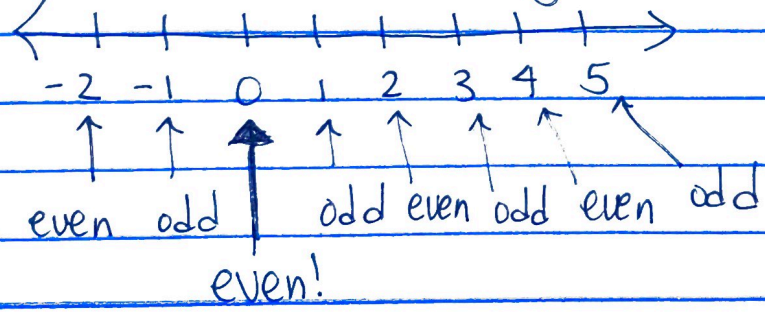
Divisibility Rules : separate page

A whole number that is divisible by 2 is even. A whole number that is not even is odd.

Is 0 even or odd?

Well, is 0 divisible by 2?
Does $0 \div 2$ have an integer quotient and no remainder? Yes because $0 \div 2 = 0$

So, 0 is divisible by 2, therefore it is even.



A number is divisible by...

2... if the last digit is even.
(*even digits: 0, 2, 4, 6, 8*)

3... if (the sum (add) of the digits) ÷ 3.

4... if (the last two digits) ÷ 4.

5... if the last digit is 0 or 5.

6... if the number is divisible by *BOTH* 2 and 3.

7... ***Long Division.*** OR learn the trick!

8... if (the last three digits) ÷ 8.

9... if (the sum of the digits) ÷ 9.

10... if the last digit is 0.

ex 2 Is the number 97,128 divisible by

a) 2? Yes bc 8 is even
b) 3? 9+7+1+2+8 = 27 Yes
c) 4? Is 28 div by 4? Yes
d) 5? No bc 8 is not 0 or 5
e) 6? Yes bc 2 and 3 are both yes
f) 8? Is 128 div by 8? Yes
g) 9? sum = 27 Yes
h) 10? No bc 8 is not 0

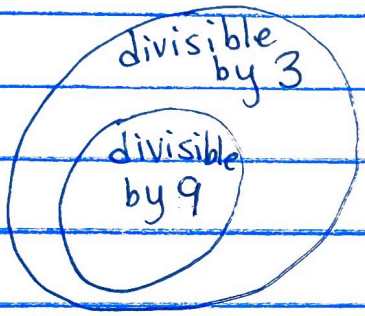
* We won't cover divisibility by 7 or 11. *

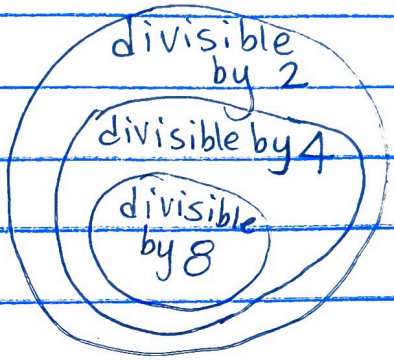
ex 3 Is the number 638,741,233,200

a) 2? Yes bc 0 is even
b) 3? 6+3+8+7+4+1+2+3+3+2 = 39 Yes
c) 4? Is 00 divisible by 4? Yes
d) 5? Yes bc 0
e) 6? Yes bc 2 and 3 are both Yes
f) 8? Is 200 div by 8? Yes
g) 9? sum = 39 No 39 is not divisible by 9
h) 10? Yes bc 0

Note: Every number that is divisible by 9, is automatically divisible by 3. (not vice versa)

Note: If a number is divisible by 8, then it is automatically divisible by 4 and 2 too.





Use base ten blocks to explain the divisibility rules for 2, 3, 4, 5, 9, and 10. (see video)

end 4-1