

## SIGNED NUMBERS

There are many ways to approach signed numbers. The one to be presented here is like MONEY. Think of positives as money earned or income; think of negatives as debts or money spent. Now,  $8 + (-4)$  means that you have earned \$8 and spent \$4, leaving a balance of \$4. The problem  $4 + (-8)$  means that you have earned \$4 and you spent \$8, which leaves you in debt \$(-4). As a third example,  $(-4) + (-8)$  means that you have spent \$4 and then you spend an extra \$8 for a total debt of \$(-12). The following rule is helpful for some:

<u>RULE FOR ADDITION</u>	<u>WHAT TO DO</u>	<u>SIGN OF ANSWER</u>	<u>EXAMPLES</u>
$(+) + (+) = +$	Add the numbers	+	$(+8) + (+4) = 12$
$(-) + (-) = -$	Add the numbers	-	$(-8) + (-4) = -12$
$(+) + (-) =$	Subtract numbers	sign of larger	$(+12) + (-8) = 4$
$(-) + (+) =$	Subtract numbers	sign of larger	$(-12) + (+8) = -4$

<u>IN SUBTRACTION</u>	<u>EXAMPLES</u>
$-(-) = +$	$-(-6) = 6$
$-(+) = -$	$-(+6) = -6$

<u>MULTIPLICATION</u>	<u>EXAMPLES</u>	<u>DIVISION</u>	<u>EXAMPLES</u>
$(+) \cdot (+) = +$	$3(4) = 12$	$(+) \div (+) = +$	$\frac{12}{4} = 3$
$(+) \cdot (-) = -$	$3(-4) = -12$	$(+) \div (-) = -$	$\frac{12}{-3} = -4$
$(-) \cdot (+) = -$	$-3(4) = -12$	$(-) \div (+) = -$	$\frac{-12}{3} = -4$
$(-) \cdot (-) = +$	$-3(-4) = 12$	$(-) \div (-) = +$	$\frac{-12}{-3} = 4$

"Like" signs = positive

"Opposite signs = negative

ZERO

For any number  $x$ ,  $0 \cdot x = 0$  Examples:  $5(0) = 0$  and  $0(5) = 0$

Division by zero is undefined. Examples:  $\frac{5}{0} = \text{undefined}$  and  $\frac{0}{0} = \text{undefined}$

However, zero divided by any non-zero number is zero. Example:  $\frac{0}{8} = 0$

NOTATION

$4 + (-8)$  means the same as  $4 - 8$  (Answer is -4)

$4 - (-8)$  means the same as  $4 + 8$  (Answer is 12)

$4 - (+8)$  means the same as  $4 - 8$  (Answer is -4)

**EXAMPLES:**

$$(-2)^2 = (-2)(-2) = 4$$

$$(-2)^3 = (-2)(-2)(-2) = -8$$

$$(-2)^4 = (-2)(-2)(-2)(-2) = 16$$

Negative number raised to even power equals positive.

Negative number raised to odd power equals negative.

**CAREFUL!!**  $-2^2 = -(2)(2)$   
 $= -4$

WHY?

PROBLEMS

1.  $6 + (-8) =$

2.  $-8 - 4 =$

3.  $(-9) + 3 + (-6) + 2 =$

4.  $17 - 12 + (-36) =$

5.  $7 - (-13) =$

6.  $(-2) - (11 - 15) =$

7.  $(9 - 3) + (-15) =$

8.  $(-12) - (+14) =$

9.  $(-12) - (-26) - 14 =$

10.  $5 + (-7) =$

11.  $(-6) \cdot (-9) =$

12.  $-9 - 4 \cdot (-5) =$

13.  $5 \cdot (-3) - 9 =$

14.  $(-8) \cdot (-25) - 45 =$

15.  $1^5 =$

16.  $1^{50} =$

17.  $(-1)^5 =$

18.  $(-1)^{50} =$

19.  $(-6)^4 =$

20.  $(-2)^4 =$

21.  $(-3)^4 =$

22.  $(-2)^3 =$

23.  $(-3)^3 =$

24.  $-3^2 =$

25.  $-2^3 =$

26.  $(-2)^2 \cdot (-5)^2 =$

27.  $(-2)^3 \cdot (-5)^2 =$

28.  $20 \div (0 + 4) =$

29.  $20 \div 0 + 4 =$

30.  $0 \div 20 + 4 =$

31.  $\frac{30 - 63}{12 + (-1)} =$

32.  $\frac{6 \cdot (-4) + 4}{(7 + 3) + (-5)} =$

33.  $\frac{6^2 - 7^2}{5 \cdot (-2) + (-3)} =$

34.  $-3^3 + (-3)^2 =$

35.  $-3 [(-2)^4 + (-5)] =$

36.  $(-2)[-2^2 \cdot (-3)^2 - 8(5) + 4] =$

37. In your own words, as if you were explaining it to a friend, explain the difference between  $(-2)^2$  and  $-2^2$ : \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

$$1. 6 + (-8) =$$

$$6 - 8 = -2$$

$$2. -8 - 4 =$$

$$-12$$

$$3. (-9) + 3 + (-6) + 2 =$$

$$-9 + 3 - 6 + 2 = -10$$

$$4. 17 - 12 + (-36) =$$

$$17 - 12 - 36 = -31$$

$$5. 7 - (-13) =$$

$$7 + 13 = 20$$

$$6. (-2) - (11 - 15) =$$

$$-2 - (-4) =$$

$$-2 + 4 = 2$$

$$7. (9 - 3) + (-15) =$$

$$6 - 15 = -9$$

$$8. (-12) - (+14) =$$

$$-12 - 14 = -26$$

$$9. (-12) - (-26) - 14 =$$

$$-12 + 26 - 14 = 0$$

$$10. 5 \cdot (-7) =$$

$$-35$$

$$11. (-6) \cdot (-9) =$$

$$54$$

$$12. -9 - 4 \cdot (-5) =$$

$$-9 + 20 = 11$$

$$13. 5 \cdot (-3) - 9 =$$

$$-15 - 9 = -24$$

$$14. (-8) \cdot (-25) - 45 =$$

$$200 - 45 = 155$$

$$15. 1^5 = 1$$

$$16. 1^{50} = 1$$

$$17. (-1)^5 = -1$$

$$18. (-1)^{50} = 1$$

$$19. (-6)^2 = 36$$

$$20. (-7)^2 = 49$$

$$21. (-8)^2 = 64$$

$$22. (-2)^3 = -8$$

$$23. (-3)^3 = -27$$

$$24. -3^2 = -9$$

$$25. -2^3 = -8$$

$$26. (-2)^2 \cdot (-5)^2 =$$

$$4(25) = 100$$

$$27. (-2)^3 \cdot (-5)^2 =$$

$$-8(25) = -200$$

$$28. 20 \div (0 + 4) =$$

$$20 \div 4 = 5$$

$$29. 20 \div 0 + 4 =$$

undefined

$$30. 0 \div 20 + 4 =$$

$$0 + 4 = 4$$

$$31. \frac{30 - 63}{12 + (-1)} =$$

$$\frac{-33}{11} = -3$$

$$32. \frac{6 \cdot (-4) + 4}{(7 + 3) + (-5)} =$$

$$\frac{-24 + 4}{10 - 5} = -4$$

$$33. \frac{6^2 - 7^2}{5 \cdot (-2) + (-3)} =$$

$$\frac{36 - 49}{-10 - 3} = 1$$

$$34. -3^3 + (-3)^2 =$$

$$-27 + 9 = -18$$

$$35. -3 [(-2)^4 + (-5)] =$$

$$-3 [16 - 5] =$$

$$-3(11) = -33$$

$$36. (-2)[-2^2 \cdot (-3)^2 - 8(5) + 4] =$$

$$(-2)[-4(9) - 40 + 4] =$$

$$(-2)(-72) = 144$$