Unit 1: Review of sign rules for arithmetic operations **Lesson 03** Unit multipliers

Rules for addition and subtraction:

If signs are alike: Add the two numbers and apply their sign. Example group 1: 3 + (+4) = +7 (-5) - 4 = -9 5 + 8 = +13 -4 + (-6) = -10 -9 - 2 = -11If signs are different: Subtract and give the answer the sign of the largest number. Examples group 2:

3 + (-7) = -4	14 – 8 = 6
9 – 11 = -2	22 + (-1) = 21

Rules for multiplication:

If signs are alike: Multiply and give the answer a positive sign. Example group 3: 3(4) = 12 -3(-12) = 36 (-5)(-3) = 15If signs are different: Multiply and give the answer a negative sign. Example group 4: (-3)4 = -125(-2) = -10

Rules for division (same as for multiplication):

If signs are alike: Divide and give the answer a positive sign. Example group 5: 12 / (4) = 3 -12 / (-3) = 4 6 / 2 = 3 (-15) / (-3) = 5If signs are different: Divide and give the answer a negative sign. Example group 6: (-30) / 5 = -6 -8 / 2 = -416 / (-2) = -8

Unit multipliers:

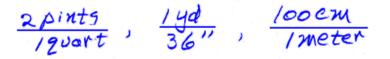
Now consider the various ways in which we could express 1 as any number over itself. For example:

 $\frac{189}{189} = 1$, $\frac{77}{77} = 1$, etc.

Consider an unusual way in which we could multiply by 1. Since 12 inches = 1 foot, when we "stack" them as follows, the quotient is exactly 1:

$$\frac{12in}{1gt} = 1 \text{ or } \frac{1gt}{1gin} = 1$$

Some other ways to "build 1" are:



These quantities that are equivalent to 1 are known as **unit multipliers**. They are useful in converting a number expressed in one type of units to an **equivalent number of different types of units**. . .for example, from inches to yards.

Example 7: Convert 108.19 inches to yards.

$$\frac{109.19 \tan 14d}{1} = \frac{108.19}{36} \text{ yd} = \frac{36}{36}$$
$$= 3.00527 \text{ yd}$$

Example 8: Convert 22.8 feet into inches.

$$\frac{22.87 + 12in}{17} = 22.8(12)in = 273.6in$$

Example 9: Convert 450 cm into meters.

$$\frac{450 \text{ m}}{100 \text{ m}} = \frac{450 \text{ m}}{100} = \frac{450 \text{ m}}{100} = 4.5 \text{ m}$$

Example 10: Use the fact that 1 inch = 2.54 cm to convert 19 cm into inches.

$$\frac{19}{1} \frac{1}{2.540} = \frac{19}{2.54} in$$

$$= 7.4803 in$$

Multiple applications of unit multipliers:

It is possible to apply **more than one unit multiplier in succession** in order to achieve the desired conversion.

*Example 11: Convert 150 meters into inches.

150 m 100 cm = 150000m 1-in 1 1m = 150000m 1-in 2,54 cm $= \frac{15,000}{2.54} - \frac{10}{10}$ = 5,905.5118 in

Assignment:

1. 5(-3) = -15	2. 8(5) = 4 0	3. -9/(-3) = <u>3</u>
4. -2(-6) = 12	5. 22(-1) = -22	6. -12(-2) = 24
7. 3 + (-8) = -5	8. (-50)/10 = -5	9. 2 + (19) = 21
10. 16(2) = <u>32</u>	11. 23 + (-2) = 21	12. -8/4 = -2
13. 15 – 6 = <i>9</i>	14. 16/(-2) = -8	15. 36/4 = <i>9</i>
16. (-3)(-8) = 24	17. 5(-4) = -20	18. -3(-22) = <u>66</u>
19. 9 – 12 = -3	20. 5 + (8) = 1 3	21. -6 + (-7) = - <i>1</i> 3
22. 8 + (-11) = -3	23. (-2) – 4 = - 6	24. -19(-2) = <u>38</u>
*25. (400 - 20)/(-10) = - <u>38</u>	* 26. -4 + (-2)(-6) = 8	* 27. (-5)(-4)(-3) = - 60

28. Use a unit multiplier to convert 24.1 quarts to pints (1 quart = 2 pints).

$$\frac{24.12}{12} = (24.1) 2 \text{ pints}$$

= (48.2 \text{ pints})

29. Use a unit multiplier to convert 80.9 millimeters to meters (1000 mm = 1 m).

$$\frac{80.9}{1000} = \frac{100}{1000} = \frac{100}{100} = \frac{10$$

30. Use a unit multiplier to convert 11.28 inches to centimeters (2.54 cm = 1 in).

$$\frac{11.28 \text{ int } 2.54 \text{ cm}}{1 \text{ int }} = 11.28(2.54) \text{ cm}$$
$$= 28.6512 \text{ cm}$$

31. Use a unit multiplier to convert 102 centimeters to inches.

$$\frac{102 \text{ sol}}{1} \frac{1 \text{ in}}{2.54 \text{ sol}} = \frac{102}{2.54} \text{ in}$$
$$= 40.15748 \text{ in}$$

32. Use a unit multiplier to convert 82,000 feet to miles (5280 ft = 1 mi).

$$\frac{82,000 \text{ ft}}{1000 \text{ ft}} = \frac{1000}{5280} \text{ mi}$$
$$= 15.5303 \text{ mi}$$

***33.** Use multiple unit multipliers to convert 82,000 inches to meters.

$$\frac{82,000 \text{ Km}}{1} = \frac{82,000(2.54) \text{ ord}}{1} \frac{1 \text{ m}}{100 \text{ m}}$$

$$= \frac{82,000(2.54)}{100} \text{ m} = 2082.8 \text{ m}$$