Literal Equations Worksheet

1. \( P = 1RT \) (T)
   \[ P/1R = T \]

2. \( A = 2(L+W)(W) \)
   \[ A = 2L + 2W \]

3. \( y = 5x - 6 \)
   \[ y + 6 = 5x \]
   \[ \frac{x}{5} = \frac{y + 6}{5} \]

4. \( 2x - 3y = 8 \)
   \[ -2x - 2x \]
   \[ -3y = 8 - 2x \]
   \[ \frac{-y}{3} = \frac{8 - 2x}{-3} \]
   \[ x = 15 \]

5. \( ax + by = c \)

6. \( A = \frac{1}{2}h(b+c) \)

7. \( V = LH + WH + HW \)

8. \( A = \pi r^2 \)

9. \( P = \frac{F}{E} \)

10. \( A = \frac{x+y}{2} \)

11. \( 7x - y = 14 \)

12. \( y + y = \frac{5}{5} \)

13. \( x = 2 \)
\[ \begin{align*}
(2^a) & \Rightarrow x = \frac{y}{2} \\
0^a & \Rightarrow y = \frac{y}{2} \\
0^b & \Rightarrow x = 2L \\
2AL & = L \\
L & = \frac{2A}{2A} \\
-4A & - a \\
3A & - a + b + c
\end{align*} \]

\[\begin{align*}
(3^a) & \Rightarrow 12x - 4y = 20 (y) \\
-12x & - 12x \\
-4y & = 20 - 12x \\
\frac{-4}{4} & -4 \\
y & = -5 + 3x
\end{align*} \]

\[\begin{align*}
(4^a) & \Rightarrow y = 2x - z \\
\frac{1}{4} & (2z) \\
4x & = 2y - 2 \\
-2y & - 2y \\
4x - 2y & = -2
\end{align*} \]

\[\begin{align*}
-4x + 2y & = 3
\end{align*} \]

\[\begin{align*}
2D \Rightarrow (P = \frac{E - C}{N})(E) \\
NP = EC \\
\frac{C}{C} & = P
\end{align*} \]
Ratios, Rates, Conversions

1. oil \[ \frac{7}{x} = \frac{8}{4} \]
   \[ 7x = 32 \]
   \[ x = \frac{32}{7} \approx 4.571 \text{ lbs} \]

2. height \[ \frac{9}{x} = \frac{16}{30} \]
   \[ 16x = 270 \]
   \[ x = \frac{270}{16} \approx 16.875 \text{ ft} \]

3. gals \[ \frac{1.5}{x} = \frac{120}{240} \]
   \[ 120x = 360 \]
   \[ x = \frac{360}{120} = 3 \text{ gals} \]

4. Earth \[ \frac{10}{x} = \frac{95}{4} \]
   \[ 10x = 380 \]
   \[ x = \frac{380}{10} = 38 \text{ lb} \]

5. cookies \[ \frac{160}{x} = \frac{90}{4} \]
   \[ 160x = 360 \]
   \[ x = \frac{360}{160} = 2.25 \text{ cups} \]

6. calories \[ \frac{1200}{x} = \frac{8}{3} \]
   \[ 8x = 3600 \]
   \[ x = \frac{3600}{8} = 450 \text{ calories per ounce} \]

7. height \[ \frac{x}{1000} = \frac{425}{1025} \]
   \[ 425x = 10250 \]
   \[ x = \frac{10250}{425} = 24 \text{ ft} \]

8. shares \[ \frac{100}{x} = \frac{425}{125} \]
   \[ 425x = 10000 \]
   \[ x = \frac{10000}{425} = 23.33 \text{ shares} \]

9. in. \[ \frac{1}{x} = \frac{1.44}{12} \]
   \[ 1.44x = 12 \]
   \[ x = \frac{12}{1.44} = 8.33 \text{ in} \]

10. height \[ \frac{x}{20} = \frac{27.9}{4.3} \]
    \[ 4.3x = 120 \]
    \[ x = \frac{120}{4.3} = 27.9 \text{ ft} \]

11. spins \[ \frac{1044}{x} = \frac{3}{1} \]
    \[ 3x = 1044 \]
    \[ x = \frac{1044}{3} = 348 \text{ per min} \]

12. in. \[ \frac{x}{29} = \frac{1}{8} \]
    \[ 8x = 29 \]
    \[ x = \frac{29}{8} = 3.625 \text{ in/hr} \]
13. \( \frac{1 \text{ gallon}}{4.5 \text{ ft}^3} = \frac{x}{4.50 \text{ ft}^3} \Rightarrow x = 1.5 \text{ gallons} \)

14. \( \frac{0.3 \text{ in.}}{x} = \frac{50}{1000} \Rightarrow x = 15 \text{ kg/m} \)

15. \( \frac{3.00 \text{ lb}}{1000 \text{ gal}} = \frac{x}{1 \text{ gal}} \Rightarrow x = 3 \text{ lb/gal} \)

16. \( \frac{12 \text{ in}}{2} = \frac{14}{x} \Rightarrow x = 7 \text{ in} \)

17. \( \frac{2 \text{ in}}{10 \text{ ft}} = \frac{x}{14 \text{ ft}} \Rightarrow x = 2 \text{ in} \)

18. \( \frac{28 \text{ hr}}{2} = \frac{x}{28 \text{ hr}} \Rightarrow x = 56 \text{ hr} \)

19. \( \frac{240 \text{ cups}}{80 \text{ gal}} = \frac{x}{1 \text{ gal}} \Rightarrow x = 3 \text{ cups/gal} \)

20. \( \frac{140 \text{ oz}}{2.70 \text{ oz}} = \frac{x}{0.14} \Rightarrow x = 10 \text{ oz} \)

21. \( \frac{140 \text{ oz}}{20} = \frac{x}{12 \text{ oz}} \Rightarrow x = 84 \text{ oz} \)

22. \( \frac{11.2 \text{ in}}{0.7} = \frac{x}{9.1} \Rightarrow x = 11.7 \text{ in} \)

23. \( \frac{5.7 \text{ ft}}{10} = \frac{x}{9.1} \Rightarrow x = 5.2 \text{ ft} \)

24. \( \frac{5.7 \text{ ft}}{10} = \frac{x}{5.7} \Rightarrow x = 5.7 \text{ ft} \)

25. \( \frac{5.7 \text{ ft}}{10} = \frac{x}{5.7} \Rightarrow x = 5.7 \text{ ft} \)

26. \( \frac{5.7 \text{ ft}}{10} = \frac{x}{5.7} \Rightarrow x = 5.7 \text{ ft} \)

27. \( \frac{5.7 \text{ ft}}{10} = \frac{x}{5.7} \Rightarrow x = 5.7 \text{ ft} \)

28. \( \frac{5.7 \text{ ft}}{10} = \frac{x}{5.7} \Rightarrow x = 5.7 \text{ ft} \)
Ratios, Proportions, Conversions

Solve the proportion:
\[
\frac{3}{x - 5} = \frac{10}{x + 2}
\]
\[
3(x + 2) = 10(x - 5)
\]
\[
3x + 6 = 10x - 50
\]
\[
-7x = -56
\]
\[
x = 8
\]

Find the unit price for each item and tell which is the better buy:
- A long distance phone charge of $1.40 for 10 minutes
- A long distance phone charge of $4.50 for 45 minutes

1. \( \frac{\$1.40}{10 \text{ min}} = \$0.14/\text{min} \)
2. \( \frac{\$4.50}{45 \text{ min}} = \$0.10/\text{min} \)

The 2nd plan is the better buy, by $0.04.

Change 5 feet per minute to inches per second

\[
\frac{5 \text{ ft}}{1 \text{ min}} \times \frac{12 \text{ in}}{1 \text{ ft}} \times \frac{1 \text{ min}}{60 \text{ sec}} = \frac{120}{60} = \frac{1}{5} \text{ in/sec}
\]

Driving at a constant rate, Noah covered 140 miles in 3.5 hours. Express his driving rate in feet per minute.

\[
\frac{140 \text{ mi}}{3.5 \text{ hr}} \times \frac{5280 \text{ ft}}{1 \text{ mi}} \times \frac{1 \text{ hr}}{60 \text{ min}} = \frac{739200}{210} = 35200\text{ ft/min}
\]

Change 40 miles per hour to feet per second

\[
\frac{40 \text{ mi/hr}}{1 \text{ hr}} \times \frac{5280 \text{ ft}}{1 \text{ mi}} \times \frac{1 \text{ hr}}{3600 \text{ sec}} = \frac{211200}{3600} = 60.3\text{ ft/sec}
\]

There are 675 students and 30 teachers in the middle school. What is the ratio of teachers to students?

\[
\frac{30}{675} = \frac{2}{455}
\]

The average price of a 30 second commercial for the 2002 Super Bowl was $1,900,000. Express this as a unit rate.

\[
\frac{\$1,900,000}{30 \text{ sec}} = \frac{\$63,333}{\text{sec}}
\]
Worker bees can travel at 24 km/h. How fast can the worker bee travel in miles per hour?

\[
\frac{24 \text{ km}}{1 \text{ hr.}} = \frac{24}{1.609} = 14.9 \text{ mi/hr.}
\]

Five milliliters of children’s medicine contains 400 mg of the drug amoxicillin. How many mg of amoxicillin does 25 mL contain?

\[
\frac{5 \text{ mL}}{400 \text{ mg}} = \frac{25 \text{ mL}}{X \text{ mg}}
\]

\[X = 2000 \text{ mg}
\]

Vladimir Radmanovic of the Seattle Supersonics makes, on average, about 2 three-pointers for every 5 he shoots. If he attempts 10 three-pointers in a game, how many would you expect him to make?

\[
\frac{2 \text{ makes}}{5 \text{ attempts}} = \frac{X}{10}
\]

\[20 = 5X
\]

\[4 = X \text{ shots}
\]

In 2002, a 30-second commercial during the Super Bowl cost an average of $1,900,000. At this rate, how much would a 45-second commercial cost?

\[
\frac{1,900,000}{30 \text{ sec}} = \frac{X}{45 \text{ sec}}
\]

\[X = 2,850,000
\]

A medicine for dogs indicates that the medicine should be administered in the ratio 2 teaspoons per 5 lb, based on the weight of the dog. How much should be given to a 70 lb dog?

\[
\frac{2 \text{ tsp}}{5 \text{ lb}} = \frac{X + 5 \text{ tsp}}{70 \text{ lb}}
\]

\[5X = 140
\]

\[X = 28 \text{ tsp}
\]

The Kelp Forest exhibit at the Monterey Bay Aquarium holds 335,000 gallons. How many days would it take to fill it at a rate of 1 gallon per second?

\[
\frac{1 \text{ sec}}{1 \text{ gal}} = \frac{x \text{ sec}}{335000}
\]

\[x = 335000\text{ sec}
\]

\[335000 \div 86400 = 4 \text{ days}
\]

An automobile engine is turning at 3000 revolutions per minute. During each revolution, each of the four spark plugs fires. How many times do the spark plugs fire in one second?

\[
\frac{3000 \text{ rev.}}{1 \text{ min}} = \frac{12000 \text{ fires}}{1 \text{ min}}
\]

\[1 \text{ min} = 60 \text{ sec}
\]

\[200 \text{ fires/second}
\]

Solve the proportion:

\[
\frac{11b}{6} = b - 5
\]

\[11b = 6(b - 5)
\]

\[11b = 6b - 30
\]

\[-5b = -30
\]

\[b = 6
\]

Conversions you may need:

- 1 mile = 1.609 km
- 1 kg = 2.2046 lb
Conversion Practice Problems

1. \(\frac{1 \text{ gal}}{1 \text{ person}} = \frac{x \text{ gal}}{20 \text{ ppl}}\)  \(x = 20 \text{ qts} / 4 \) (4 qts = 1 gal)

Need 5 gallons of lemonade.

2. \(2 \text{ cups} \times \frac{x \text{ cups}}{1 \text{ pt}} \times \frac{3 \text{ pts}}{x \text{ cups}}\)  \(x = 16 \text{ cups} \times 8\) (8 fl oz = 1 c)

Need 48 ounces sauce.

3. \(36 \text{ min} \times \frac{x \text{ min}}{1 \text{ part}} \times \frac{45 \text{ parts}}{x \text{ min}}\)  \(x = 1675 \text{ min} / \text{hr} \) (60 min = 1 hr)

20.25 or 20 hr. 15 min.

4. \(\frac{50 \text{ mi}}{1 \text{ hr}} \times \frac{40 \text{ mi}}{x \text{ hr}}\)  \(x = .8 \text{ hr} (\text{hr})\) (60 min = 1 hr)

48 minutes to travel 40 mi.

5. \(\frac{83 \text{ mph}}{1 \text{ mi}} \times \frac{5280 \text{ ft}}{1 \text{ mi}}\)  \(1 \text{ hr} = 121440 \)

33.7 ft/second

6. \(\frac{59 \text{ sec}}{852 \text{ ft}} \times \frac{5280 \text{ ft}}{1 \text{ min}}\)  \(5280 \text{ ft} \times \frac{x \text{ min}}{1 \text{ mi}}\)  \(x = 31520 = 5.1120\)

16.09 min/1 mile

7. \(\frac{25 \text{ mi}}{1 \text{ gal}} = \frac{x \text{ mi}}{x \text{ gal}}\)  \(x = \frac{60}{112} = 5 \text{ gal}\)

For 200 mi.
1. 149 m = 7 mm
   149,000 mm
2. 28 km → m
   28,000 m
3. 3400 mg → g
   3.4 g
4. 2.10 L → mL
   2100 mL
Similar Figures (Chicken Napoleon)

1. \[ \frac{4}{11} = \frac{h}{15} \]
   \[ h = 9.1 \text{ in} \]
   \[ a = 6.7 \text{ ft} \]

2. \[ \frac{12}{9} = \frac{a}{5} \]
   \[ a = 8.7 \text{ ft} \]

3. \[ \frac{3.7}{4} = \frac{e}{6} \]
   \[ e = 14.8 \text{ cm} \]
   \[ S = 13 \text{ cm} \]

4. \[ \frac{10}{8} = \frac{5}{y} \]
   \[ y = 9.8 \text{ cm} \]

5. \[ \frac{50}{88} = \frac{n}{370} \]
   \[ n = 42.2 \text{ ft} \]

6. \[ \frac{90}{88} = \frac{0}{8} \]
   \[ t = 57.1 \text{ ft} \]

7. \[ \frac{43}{44} = \frac{y}{74} \]
   \[ y = 41.5 \text{ m} \]

8. \[ \frac{48}{74} = \frac{u}{43} \]
   \[ u = 87.9 \text{ m} \]
\( 0 \rightarrow 0 = 10.1 \quad t \rightarrow t = 12.1 \)
\[
\begin{align*}
10.1 & \quad 11.8 \\
11.80 & = 14.76 \\
0 & = 13.7 \text{ cm} \\
11.8t & = 62.168 \\
t & = 5.3 \text{ cm}
\end{align*}
\]

\[
\frac{\text{p}}{8} = \frac{30}{13} \\
\text{p} & = 18.58 \text{ ft} \\
\text{p} & = 26.8 \text{ m}
\]

\[
\frac{\text{p}}{8} = \frac{15.5}{12} \\
\text{p} & = 240 \text{ ft} \\
\text{p} & = 75 \text{ m}
\]

\[
\frac{\text{l}}{75} = \frac{\text{b}}{100} \\
\text{l} & = 125 \text{ ft} \\
\text{l} & = 75 \text{ m}
\]

\[
\frac{\text{r}}{9.8} = \frac{\text{n}}{9.8} \\
\text{r} & = 9.8 \text{ cm} \\
\text{n} & = 0.2 \text{ cm}
\]

\[
\text{b} = 40 \quad \frac{\text{b}}{40} = \frac{\text{b}}{40} \\
\text{l} = 125 \quad \frac{\text{l}}{75} = \frac{\text{l}}{75} \\
\text{b} = 121.3 \text{ m} \\
\text{l} = 76.7 \text{ m}
\]

\[
\frac{\text{r}}{4.3} = \frac{\text{a}}{2.7} \\
\text{r} & = 9.8 \text{ cm} \\
\text{n} & = 0.2 \text{ cm}
\]

\[
\frac{\text{r}}{5.1} = \frac{\text{4.3}}{\text{4.3}} \\
\text{r} & = 9.8 \text{ cm} \\
\text{n} & = 0.2 \text{ cm}
\]
Basic %0s / Ratios (Bad Forwards...)

1. Total = 380
   \[ \frac{9}{100} = \frac{x}{380} \]  
   \[ 100x = 3420 \]  
   \[ x = 34.2 \]

2. 34 songs are Jazz
   \[ \frac{21}{100} = \frac{x}{380} \]  
   \[ 100x = 7980 \]  
   \[ x = 79.8 \]

3. 24 + 21 + 14 + 9 = 68
4. \[ 90\% - 18\% = 32\% \]
5. 32\% are Hip-Hop/Rap

6. \[ \frac{1.77}{1.60} = \frac{x}{100} \]  
   \[ 1.0x = 177 \]  
   \[ x = 177 \]

7. The actual height is 110.6 meters.

8. \[ 20 \times (1.4) = 36 \]  
   \[ The \ new \ perimeter \ is \ 36.4 \ in. \]

9. \[ 4000 \times 0.045 = 405 \]  
   He earned $405

10. \[ 4.5 = \frac{9000}{100} \]  
    \[ 4.5x = 900000 \]  
    \[ x = 200000 \]

11. She must sell $200,000

12. \[ 129.00 \]  
    \[ - 25.80 \]  
    \[ 103.20 \times 1.00 = 109.29 \]
    \[ She \ spent \$109.29 \]

13. \[ \frac{120}{364} = \frac{x}{1.20} \]  
    \[ x = 3.4 \]  
    \[ The \ area \ of \ the \ windows \ is \ 3.4 \]  

14. \[ 13 + 12 + 10 = 37 \] questions
    \[ 37 - 8 = 29 \]
    \[ 29 \times 37 = 2900 \]
    \[ 37 - 100 \times 78 \]  
    \[ 2900 = 120x \]
    \[ 80 = x \]
    \[ 78\% \ of \ his \ questions \ were \ correct. \]

15. The 3 windows take up 30% of the wall.
10)  
(a) \$800 \times 0.032 \times 5 = \$128 \quad \text{She earned \$128 in interest.}

(b) \$800 + 128 = \$928 \quad \text{She had \$928 at the end of 5 years.}

11) Ben: \( \frac{15}{30} = \frac{1}{2} \cdot 100 = 41.7 \% \quad \text{(42\% of Ben's shots were baskets)}

Jerry: \( \frac{14}{27} = \frac{14}{27} \cdot 100 = 44.4 \% \quad \text{(44\% of Jerry's shots were baskets)}

\rightarrow \text{Jerry has the higher shooting percentage. (44\%)}
Books Never Written

1. $45 \rightarrow 120$
   \[
   \frac{120-45}{45} = \frac{75}{45} = \frac{5}{3} = 166\%\]
   \[
   \frac{200-88}{88} = \frac{112}{88} = 127\%\]

2. $59 \rightarrow 181$
   \[
   \frac{181-59}{59} = \frac{122}{59} = 2\%\]
   \[
   \frac{100-45}{45} = \frac{55}{45} = \frac{11}{9} = 122\%\]

3. $24.9 \rightarrow 7.5$
   \[
   \frac{7.5-24.9}{24.9} = \frac{-17.4}{24.9} = -68.9\%\]

4. $450 \rightarrow 420$
   \[
   \frac{420}{450} = \frac{14}{15} = 93.3\%\]
   \[
   \frac{4.123-1.89}{1.89} = \frac{2.234}{1.89} = 118\%\]

5. $15(30) = 300$
   \[
   \frac{570-300}{300} = \frac{270}{300} = 90\%\]
   \[
   \frac{46.75-49.50}{49.50} = \frac{-2.75}{49.50} = -5\%\]

6. $9.40 (1.01e) =$
   \[
   \frac{9.92}{9.40} = 1.052\%\]

7. $0.95-576 = 13.95$
   \[
   \frac{0.95}{69.95} = 1.4%\]

8. $3(6x10) = 240$
   \[
   \frac{384-240}{240} = \frac{144}{240} = 60\%\]
   \[
   \frac{4(8x12)}{240} = \frac{384}{240} = 100\%\]
100 (1,1) = $110 (0.1) = 11

\[ \frac{110 - 11}{1} = 99 \]

\[ \frac{20 - 9}{20} = \frac{11}{20} = 55\% \]