Literal Equations Worksheet #1

① $P = IRT$ (T)

$\frac{P}{IR} = \frac{IRT}{IR}$

$\frac{P}{IR} = T$

② $A = 2(L+W)$ (W)

$A = 2L + 2W$

$-2L \quad -2L$

$A - 2L = 2W$

$\frac{A-2L}{2} = \frac{2W}{2}$

$\frac{A}{2} - L = W$

③ $y = 5x - 6$ (x)

$+6 \quad +6$

$y + 6 = 5x$

$\frac{y+6}{5} = \frac{5x}{5}$

$\frac{y+6}{5} = x$

④ $2x - 3y = 8$ (y)

$-2x \quad -2x$

$-3y = 8 - 2x$

$\frac{-3y}{-3} = \frac{8-2x}{-3}$

$y = \frac{-8+2x}{3}$

⑤ $\frac{x+y}{3} = 5$ (x)

$x + y = 15$

$-y \quad -y$

$x = 15 - y$

⑥ $y = mx + b$ (b)

$-mx \quad -mx$

$y - mx = b$

⑦ $ax + by = c$ (y)

$-ax \quad -ax$

$by = c - ax$

$\frac{by}{b} = \frac{c-ax}{b}$

$y = \frac{c-ax}{b}$

⑧ $A = \frac{1}{2}h(b+c)$ (b)

$2A = h(b+c)$

$\frac{2A}{h} = \frac{h(b+c)}{h}$

$\frac{2A}{h} = b + c$

$-c \quad -c$

$\frac{2A}{h} - c = b$

⑨ $V = LWH$ (L)

$\frac{V}{WH} = \frac{LWH}{WH}$

$\frac{V}{WH} = L$

⑩ $A = 4\pi r^2$ (r^2)

$\frac{A}{4\pi} = \frac{4\pi r^2}{4\pi}$

$\frac{A}{4\pi} = r^2$

⑪ $V = \pi r^2 h$ (h)

$\frac{V}{\pi r^2} = \frac{\pi r^2 h}{\pi r^2}$

$\frac{V}{\pi r^2} = h$

⑫ $7x - y = 14$ (x)

$+y \quad +y$

$7x = 14 + y$

$\frac{7x}{7} = \frac{14+y}{7}$

$x = 2 + \frac{y}{7}$

⑬ $A = \frac{x+y}{2} 2$ (y)

$2A = x + y$

$-x \quad -x$

$2A - x = y$

⑭ $P = \frac{E}{I}$ (I)

$IP = E$

$\frac{IP}{P} = \frac{E}{P}$

$I = \frac{E}{P}$

(15) $\left(x = \frac{yz}{6}\right)(z)$

$zx = \frac{yz}{y}$

$\frac{zx}{y} = z$

(16) $\left(A = \frac{r}{2L}\right)2L$

$2AL = r$

$\frac{2AL}{2A} = \frac{r}{2A}$

$L = \frac{r}{2A}$

(17) $\left(A = \frac{a+b+c}{3}\right)3$

$3A = a+b+c$

$-a \quad -a$

$3A - a = b+c$

$-c \quad -c$

$3A - a - c = b$

(18) $12x - 4y = 20(y)$

$-12x \quad -12x$

$\frac{-4y}{-4} = \frac{20-12x}{-4}$

$y = -5 + 3x$

(19) $4\left(x = \frac{2y-2}{4}\right)(2)$

$4x = 2y - 2$

$-2y \quad -2y$

$4x - 2y = -2$

$-4x \quad -4x$

$-4x + 2y = 2$

(20) $N\left(P = \frac{R \cdot C}{N}\right)(P)$

$NP = RC$

$\frac{C}{NP} = \frac{C}{C}$

$\frac{NP}{C} = R$

Ratios, Rates, Conversions #3

① oil / vinegar $\frac{7}{4} = \frac{8}{x}$

$7x = 32$

$\frac{7x}{7} = \frac{32}{7}$

$x = 4\frac{4}{7}$ oz.

② height / width $\frac{9}{16} = \frac{x}{30}$

$16x = 270$

$\frac{16x}{16} = \frac{270}{16}$

$x = 16\frac{7}{8}$ in.

③ qt. / drew $\frac{1.5}{120} = \frac{x}{240}$

$120x = 360$

$x = 3$ qt.

④ EARTH / MARS $\frac{10}{4} = \frac{95}{x}$

$10x = 380$

$\frac{10x}{10} = \frac{380}{10}$

$x = 38$ lb.

⑤ cookies / cups $\frac{60}{4} = \frac{90}{x}$

$60x = 360$

$\frac{60x}{60} = \frac{360}{60}$

$x = 6$ cups.

⑥ calories / oz $\frac{1202}{8} = \frac{x}{3}$

$8x = 3606$

$x = 450.8$ calories

⑦ ft / pedal turns $\frac{50}{3} = \frac{5280}{x}$

$50x = 15840$

$\frac{50x}{50} = \frac{15840}{50}$

$x \approx 317$ turns

⑧ shares / $ $\frac{100}{425} = \frac{x}{1000}$

$425x = 100000$

$\frac{425x}{425} = \frac{100000}{425}$

$x \approx 235$ shares

⑨ in. / mi. $\frac{1}{1.44} = \frac{12.8}{x}$

$x = 18.43$ mi

⑩ height / shadow $\frac{x}{20} = \frac{6}{4.3}$

$4.3x = 120$

$x = 27.9$ ft

⑪ spins / min $\frac{1044}{3} = \frac{x}{1}$

$3x = 1044$

$x = \frac{348}{60}$ per min

5.8 spins / second

⑫ in. / hr. $\frac{29}{8} = \frac{x}{1}$

$8x = 29$

$x = 3\frac{5}{8}$ in/hr

(13) $\frac{\text{gallons}}{\text{sq. ft}}$ $\frac{1}{450} = \frac{X}{675}$

$\frac{450X}{450} = \frac{675}{450}$

$X = 1.5$ gallons

(14) $\frac{\text{tin}}{\text{copper}}$ $\frac{.3}{1} = \frac{X}{50}$

$X = 15$ kg tin

(15) $\frac{\text{salt}}{\text{water}}$ $\frac{3.6}{10} = \frac{X}{1000}$

$\frac{10X}{10} = \frac{3600}{10}$

$X = 360$ g

(16) $\frac{\text{in}}{\text{ft}}$ $\frac{2 \text{ in}}{10 \text{ ft}} = \frac{14}{X}$

$\frac{2X}{2} = \frac{140}{2}$

$X = 70$ ft

(17) $\frac{\text{in}}{\text{mi}}$ $\frac{1}{15} = \frac{X}{30}$

$\frac{15X}{15} = \frac{30}{15}$

$X = 2$ in

(18) $\frac{\text{\#}}{\text{hr}}$ $\frac{28}{2} = \frac{49}{X}$

$\frac{28X}{28} = \frac{98}{28}$

$X = 3.5$ hrs.

(19) $\frac{\text{\$}}{\text{copies}}$ $\frac{6.40}{80} = \frac{X}{1}$

$\frac{80X}{80} = \frac{6.40}{80}$

$X = \$0.08$/copy

(20) $\frac{\text{\#}}{\text{oz}}$ $\frac{140}{12} = \$.12$ $\frac{2.70}{20} = \$.14$

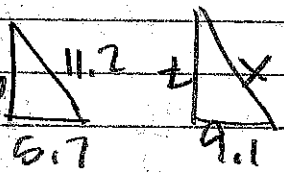
$\$1.40/12$ oz is better.

(21) $\frac{\text{in}}{\text{ft}}$ $\frac{1}{2} = \frac{X}{14}$ $2X = 14$ $X = 7$

$\sqrt{196} = 14$

The dimensions are 7 in x 7 in

(22)



$t \rightarrow \frac{9.6}{t} = \frac{5.7}{9.1}$ $5.7t = 87.36$

$\frac{5.7}{5.7} \quad \frac{5.7}{5.7}$

$t = 15.3$

$X \rightarrow \frac{11.2}{X} = \frac{5.7}{9.1}$ $5.7X = 101.92$

$\frac{5.7}{5.7} \quad \frac{5.7}{5.7}$

$X = 17.9$

#22 - Bonus

SKIP

Name Key date ____ block ____ score ____ #6

Ratios, Proportions, Conversions

Solve the proportion:

$$\frac{3}{x-5}=\frac{10}{x+2}$$

$3(x+2)=10(x-5)$

$3x+6=10x-50$

$-3x \quad -3x$

$6=7x-50$

$+50 \quad +50$

$\frac{56}{7}=\frac{7x}{7}$

$8=x$

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.

Solve the proportion:

$$\frac{7-2n}{7+2n}=\frac{1}{18}$$

$18(7-2n)=7+2n$

$126-36n=7+2n$

$+36n \quad +36n$

$\frac{119}{38}=\frac{38n}{38}$

$3.1=n$

Change 5 feet per minute to inches per second

$\frac{5\text{ft}}{1\text{min}}\cdot\frac{12\text{in}}{1\text{ft}}\cdot\frac{1\text{min}}{60\text{sec}}=$

$\frac{60}{60}=1\text{in/sec}$

Change 40 miles per hour to feet per second

$\frac{40\text{mi}}{1\text{hr}}\cdot\frac{5280\text{ft}}{1\text{mi}}\cdot\frac{1\text{hr}}{3600\text{sec}}=$

$\frac{211200}{3600}=58.7\text{ft/sec}$

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

$\frac{140\text{mi}}{3.5\text{hr}}\cdot\frac{5280\text{ft}}{1\text{mi}}\cdot\frac{1\text{hr}}{60\text{min}}=$

$\frac{739200}{210}=3520\text{ft/min}$

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

$\frac{t}{s}\quad\frac{30}{675}=\frac{2t}{45s}$

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

$\frac{\$}{\text{second}}\quad\frac{\$1,900,000}{30}=$

$\approx\$63,333/\text{second}$

Worker bees can travel at 24 km/h. How fast can the worker bee travel is miles per hour?

$\frac{24\text{ km}}{1\text{ hr.}}$ $\frac{24}{1.609} = 14.9\frac{\text{mi}}{\text{hr.}}$

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

$\frac{5\text{mL}}{400\text{mg}} = \frac{25\text{mL}}{X\text{ mg}}$ $\frac{5X}{5} = \frac{10000}{5}$ $X = 2000\text{ mg}$

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?

$\frac{2\text{ makes}}{5\text{ attempts}} = \frac{X}{10}$ $20 = 5X$ $4 = X$ 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?

$\frac{\$1,900,000}{30\text{ sec}} = \$63333/\text{sec}$ $\times 45$

$\$2,850,000$

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?

$\frac{2\text{ tsp}}{5\text{ lb}} = \frac{X\text{ tsp}}{70\text{ lb}}$ $\frac{5X}{5} = \frac{140}{5}$ $X = 28$ 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?

$\frac{1\text{ sec}}{1\text{ gal}} = \frac{X\text{ sec}}{335000}$ $X = 335000$ seconds

(24 hr = 1440 min = 86400 sec/day)

$\frac{335000}{86400} \approx 4$ 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?

$3000(4) = 12000$ fires/min

$\frac{3000\text{ rev}}{1\text{ min}}$ $\frac{12000\text{ fires}}{1\text{ min}} \cdot \frac{1\text{ min}}{60\text{ sec}}$

200 fires/second

Solve the proportion:

$$\frac{11b}{6} = \frac{b-5}{1}$$

$11b = 6(b-5)$

$11b = 6b - 30$

$-6b \quad -6b$

$\frac{5b}{5} = \frac{-30}{5}$ $b = -6$

Conversions you may need:

- 1 mile = 1.609 km
- 1 kg = 2.2046 lb

Conversion Practice Problems

#7

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

Need 5 gallons of lemonade.

② $\frac{2\text{ cups}}{1\text{ pot}} \quad \frac{x\text{ cups}}{3\text{ pots}}$ $x = 6\text{ cups} \times 8$ (8 fl oz. = 1c)

Need 48 ounces sauce.

③ $\frac{35\text{ min}}{1\text{ part}} \quad \frac{x\text{ min}}{45\text{ parts}}$ $x = 1575\text{ min}/60$ (60 min = 1 hr)

26.25 or 26 hr. 15 min

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

48 minutes to travel 40 mi

⑤ $\frac{23\text{ mi}}{1\text{ hr.}} \cdot \frac{5280\text{ ft}}{1\text{ mi.}} \cdot \frac{1\text{ hr.}}{3600\text{ sec}} = \frac{121440}{3600} =$

33.7 ft/second

⑥ $\frac{59\text{ sec}}{852\text{ ft}} \cdot \frac{1\text{ min}}{60\text{ sec}} \cdot \frac{5280\text{ ft}}{1\text{ mi}} = \frac{311520}{51120} =$

6.09 min/1 mile

⑦ $\frac{25\text{ mi}}{1\text{ gal}} = \frac{2000\text{ mi}}{x\text{ gal.}}$ $25x = 2000$ $x = 80/16 = 5$ gallons for 2000 mi

① 149 m → mm

149.000

3 hops

149,000 mm

② 28 Km → m

28.000

3 hops

28,000 meters

③ 3400 mg → g

3400.

3 hops

3.4 grams

④ 2.440 L → mL

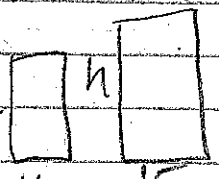
2440.

3 hops

2440 mL

#9

Similar Figures (Chicken Napoleon)

① 

$\frac{14}{11} = \frac{h}{15}$

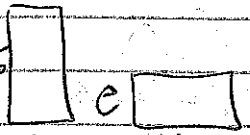
$11h = 210$

$\boxed{h = 19.1\text{ in}}$

② 

$\frac{12}{a} = \frac{9}{5}$ $\quad 9a = 60$

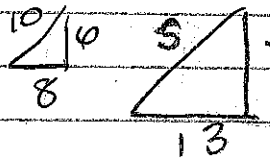
$\boxed{a = 6.7\text{ ft}}$

③ 

$\frac{6.5}{4} = \frac{3.7}{e}$

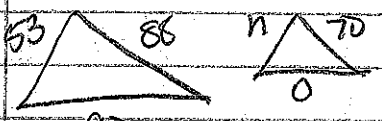
$6.5e = 14.8$

$\boxed{e = 2.3\text{ m}}$

④ 

$s \rightarrow \frac{10}{s} = \frac{8}{13}$ $\quad 8s = 130$

$\boxed{s = 16.3\text{cm}}$

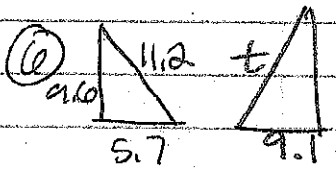
⑤ 

$y \rightarrow \frac{6}{y} = \frac{8}{13}$ $\quad 8y = 78$

$\boxed{y = 9.8\text{cm}}$

$n \rightarrow \frac{n}{53} = \frac{70}{88}$ $\quad 88n = 3710$

$\boxed{n = 42.2\text{ ft}}$

⑥ 

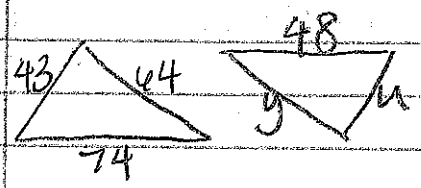
$0 \rightarrow \frac{0}{90} = \frac{70}{88}$ $\quad 880 = 6300$

$\boxed{0 = 71.6\text{ ft}}$

$t \rightarrow \frac{t}{11.2} = \frac{9.1}{5.7}$

$5.7t = 101.92$

$\boxed{t = 17.9\text{ in}}$

⑦ 

$y \rightarrow \frac{y}{64} = \frac{48}{74}$

$74y = 3072$

$\boxed{y = 41.5\text{ m}}$

$e \rightarrow \frac{e}{9.6} = \frac{9.1}{5.7}$

$5.7e = 87.36$

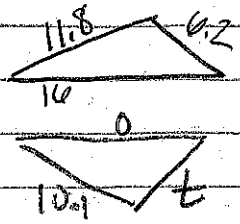
$\boxed{e = 15.3\text{ in}}$

$u \rightarrow \frac{u}{43} = \frac{48}{74}$

$74u = 2064$

$\boxed{u = 27.9\text{ m}}$

(8)



$o \rightarrow \frac{o}{16} = \frac{10.1}{11.8}$

$11.8o = 161.6$

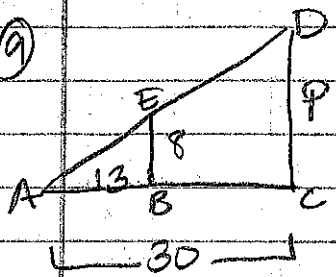
$o = 13.7\text{cm}$

$t \rightarrow \frac{t}{6.2} = \frac{10.1}{11.8}$

$11.8t = 62.62$

$t = 5.3\text{cm}$

(9)

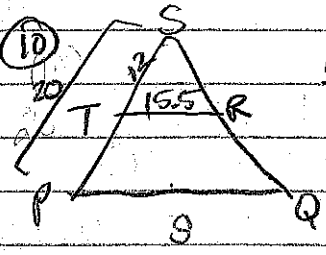


$\frac{p}{8} = \frac{30}{13}$

$13p = 240$

$p = 18.5\text{ft}$

(10)

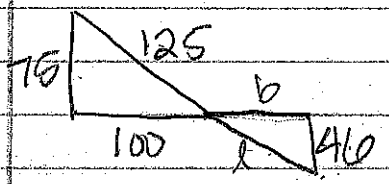


$\frac{15.5}{s} = \frac{12}{20}$

$12s = 310$

$s = 25.8\text{in}$

(11)



$b \rightarrow \frac{46}{75} = \frac{b}{100}$

$75b = 4600$

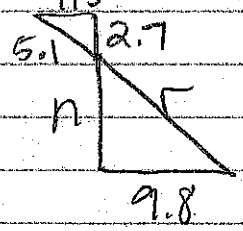
$b = 61.3\text{m}$

$l \rightarrow \frac{125}{l} = \frac{75}{46}$

$75l = 5750$

$l = 76.7\text{m}$

(12)



$r \rightarrow \frac{r}{5.1} = \frac{9.8}{4.3}$

$4.3r = 49.98$

$r = 11.6\text{cm}$

$n \rightarrow \frac{n}{2.7} = \frac{9.8}{4.3}$

$4.3n = 26.46$

$n = 6.2\text{cm}$

Basic %s / Ratios (Bad Forwards...) #10

① total = 380

a) $\frac{9}{100} = \frac{x}{380}$ $100x = 3420$ $x = 34.2$

34 songs are Jazz.

b) $\frac{21}{100} = \frac{x}{380}$ $100x = 7980$ $x = 79.8$

80 songs are country.

c) $24+21+14+9 = 68$

$100\% - 68\% = 32\%$

32% are Hip-Hop/Rap.

② $9000(.045) = \$405$

He earned $405.

③ $\frac{4.5}{100} = \frac{9000}{x}$ $4.5x = 900{,}000$ $x = \$200{,}000$

She must sell $200,000.

④ $129(.2) = 25.80$

$129.00 - 25.80$

$103.20(1.06) = 109.39$

She spent $109.39.

⑤ $15+12+10 = 37$ questions

$37-8 = 29$

$\frac{29}{37} = \frac{x}{100}$ $37x = 2900$ $x = 78$

78% of his questions were correct.

⑥ $\frac{1.77}{x} = \frac{1.6}{100}$

$1.6x = 177$

$x = 110.6$

The actual height is 110.6 meters.

⑦ Original perimeter = $9+9+4+4 = 26$ in

$26(1.4) = 36.4$

The new perimeter is 36.4 in.

⑧ $\frac{740}{x} = \frac{45}{100}$

$45x = 74000$

$x = 1644.4$

1644 students should be admitted.

⑨ $15(8) = 120$ (total area)

$3(4) = 12$

$\times 3$

36 (window area)

$\frac{36}{120} = \frac{x}{100}$

$3600 = 120x$

$30 = x$

The 3 windows take up 30% of the wall.

(10) a) $800(.032) = 25.6(5) = 128$ She earned $128 in interest.

b) $800 + 128 = \$928$ She had $928 at the end of 5 years.

(11) Ben: $\frac{15}{36} = .416\ldots(100) = 41.7$

42% of Ben's shots were baskets.

Jerry: $\frac{12}{27} = .4(100) = 44\%$

44% of Jerry's shots were baskets

→ Jerry has the higher shooting percentage. (44%)

#11

Books Never Written

(K) 45 → 60

$\frac{60-45}{45} = \frac{15}{45} = \frac{1}{3} = 33.3\%$

(O) 88 → 200

$\frac{200-88}{88} = \frac{112}{88} = 127.3\%$

(Y) 59 in → 68 in

$\frac{68-59}{59} = \frac{9}{59} = 15.3\%$

(T) 60 → 45

$\frac{60-45}{60} = \frac{15}{60} = \frac{1}{4} = 25\%$

(A) 24.9 → 7.5

$\frac{24.9-7.5}{24.9} = \frac{17.4}{24.9} = 69.9\%$

(I) 5.75 → 4.22

$\frac{5.75-4.22}{5.75} = \frac{1.53}{5.75} =$ 26.6% ↓

(E) $\frac{510-420}{420} = \frac{90}{420} = 21.4\%$ ↑

(H) $\frac{4.123-1.89}{4.123} = \frac{2.233}{4.123} =$ 54.2% ↓

(S) $15(20) = 300$, $18(32) = 576$

$\frac{576-300}{300} = \frac{276}{300} = 92\%$ ↑

(U) $\frac{66.75-49.50}{66.75} = \frac{17.25}{66.75} =$ 25.8% ↓

(W) $9.40(1.06) =$ $9.96/hr

(D) $\frac{6.1-2.3}{2.3} = \frac{3.8}{2.3} =$ 165.2% ↑

(P) $\frac{69.95-56}{69.95} = \frac{13.95}{69.95} = 19.9\%$ ↓

(G) $3(8)(10) = 240$, $4(8)(12) = 384$

$\frac{384-240}{240} = \frac{144}{240} = 60\%$ ↑

(N) $100(1.1) = \$110$ $(.1) = 11$

$110 - 11 = 99$

$\boxed{\$99}$

(L) $\frac{20-9}{20} = \frac{11}{20} = \boxed{55\% \downarrow}$