

Chapter 5

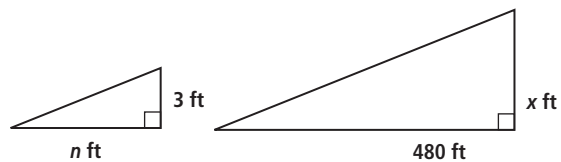
Division and Proportions in Algebra

Chapter Review (pp. 320–323)

- $\frac{7a}{2} \cdot \frac{4}{5} = \frac{2}{2} \cdot \frac{7a \cdot 2}{5} = \frac{14a}{5}$
- $\frac{12}{5x} \cdot \frac{2x}{3} = \frac{3x \cdot 8}{3x \cdot 5} = \frac{8}{5}$
- $\frac{6}{5p} \cdot \frac{10}{1} = \frac{5}{5} \cdot \frac{6 \cdot 2}{p} = \frac{12}{p}$
- $\frac{2ax}{3} \cdot \frac{9x}{a} = \frac{18ax^2}{3a} = \frac{3a}{3a} \cdot \frac{6x^2}{1} = 6x^2$
- $\frac{121bcd}{11cd} = \frac{11cd}{11cd} \cdot \frac{11b}{1} = 11b$
- $\frac{-24x^3y}{32x^2y^2} = \frac{8x^2y}{8x^2y} \cdot \frac{-3x}{4y} = -\frac{3x}{4y}$
- $\frac{c}{6} \div \frac{9}{2} = \frac{c}{6} \cdot \frac{2}{9} = \frac{2c}{54} = \frac{c}{27}$
- $\frac{x}{y} \div \frac{x}{z} = \frac{x}{y} \cdot \frac{z}{x} = \frac{z}{y}$
- $\frac{\frac{4a}{15}}{\frac{-20a}{9}} = \frac{4a}{15} \div \frac{-20a}{9} = \frac{4a}{15} \cdot \frac{9}{-20a} = \frac{36a}{300a} = \frac{12a}{12a} \cdot \frac{3}{-25} = -\frac{3}{25}$
- $\frac{-625x}{\frac{50x}{8}} = \frac{-625x}{1} \div \frac{50x}{8} = \frac{-625x}{1} \cdot \frac{8}{50x} = \frac{-5,000x}{50x} = \frac{50x}{50x} \cdot \frac{-100}{1} = -100$
- The expression $\frac{10+x}{8+x}$ is undefined if $8+x=0$ or $x=-8$.
- The expression $\frac{28v}{4v-2.4}$ is undefined if $4v-2.4=0$, $4v=2.4$; $v=0.6$
- $\frac{-28k}{5} = \frac{14}{3}$; $-84k=70$; $k=-\frac{70}{84} = \frac{14}{14} \cdot \frac{-5}{6} = \frac{-5}{6}$
- $\frac{6}{y-4} = \frac{2}{5}$; $2y-8=30$; $2y=38$; $y=19$
- $\frac{3(t-5)}{4} = \frac{9t}{2}$; $36t=6t-30$; $30t=-30$; $t=-1$
- $\frac{a+12}{a-3} = \frac{4}{1}$; $4a-12=a+12$; $3a-12=12$; $3a=24$; $a=8$
- $\frac{6}{54} = \frac{54}{x}$; $6x=2,916$; $x=\frac{2,916}{6}=486$
- a. 8, 28
b. 7, 32
- If $\frac{6}{15} = \frac{x}{8}$, then $\frac{15}{6} = \frac{8}{x}$ so $\frac{8}{x}$ equals $\frac{15}{6}$.
- The means are b and x and the extremes are a and y , so the Means-Extremes Property states that $ay = bx$ (or $bx = ay$).
- $\frac{m}{n} = \frac{u}{v}$; $mv = un$; $\frac{mv}{mn} = \frac{un}{mn}$; $\frac{v}{n} = \frac{u}{m}$
- a. $\frac{\text{miles}}{\text{hour}} = \frac{225}{3} = 75 \frac{\text{mi}}{\text{hr}}$
b. The reciprocal of 75 mi/hr is $\frac{1}{75}$ hr/mi
- a. $\frac{\text{cost}}{\text{ounce}} = \frac{\$1.20}{16} = \$0.075$ per oz
b. $\frac{\text{cost}}{\text{ounce}} = \frac{\$1.80}{32} = \$0.05625$ per oz
c. the 32-oz box
- $\frac{45 \text{ min}}{32 \text{ questions}} = \frac{x \text{ min}}{1 \text{ question}}$; $32x = 45$; $x = \frac{45}{32} = 1.40625$; about 1.4 min per question
- w words in $2m$ minutes is the same as $3w$ words in $6m$ minutes, and that is not as fast as $4w$ words in $6m$ minutes.
- Sample: $\frac{160 \text{ cal}}{22 \text{ almonds}} \approx 7.3$ cal/almond or $\frac{22 \text{ almonds}}{160 \text{ cal}} \approx 0.1375$ almonds/cal.
- Sample: $\frac{12 \text{ ft}}{8 \text{ yr}} = 1.5$ ft/yr or $\frac{8 \text{ yr}}{12 \text{ ft}} = \frac{2}{3}$ yr/ft
- $\frac{95 \text{ km}}{1 \text{ sec}} \cdot \frac{1 \text{ mi}}{1.6 \text{ km}} \cdot \frac{3,600 \text{ sec}}{\text{hr}} = 213,750$ mi/hr
- a. In one week there are $7 \cdot 24 \cdot 60 = 10,080$ min; $(10,080)(16) = 161,280$ breaths
b. 16 breaths/min = $(16)(600) = 960$ breaths/hr; a cat breathes at a faster rate than a person.
- $\frac{\text{cost}}{\text{slices}} = \frac{\$6.50}{20} = \frac{\$2.60}{x}$; $6.5x = 52$; $x = 8$; 8 slices
- a. Melanie can stuff half of $4n$ envelopes per min; that is $2n$ envelopes per min
b. The reciprocal of $2n$ envelopes per min is $\frac{1}{2n}$ min per envelope.
- $(6 \text{ hr per day})(365 \text{ days per yr}) = 2,190$ hr
- Choice A: $\frac{12x}{7x} = \frac{x}{x} \cdot \frac{12}{7} = \frac{12}{7}$;
Choice B: $\frac{60}{35} = \frac{5}{5} \cdot \frac{12}{7} = \frac{12}{7}$;
Choice C: $\frac{24 \text{ ft}}{14 \text{ ft}} = \frac{2 \text{ ft}}{2 \text{ ft}} \cdot \frac{12}{7} = \frac{12}{7}$;
Choice D: $\frac{700}{1,200} = \frac{100}{100} \cdot \frac{7}{12} = \frac{7}{12}$ the ratio that is not equal to $12 : 7$ is choice D.

34. The total number of TVs is $12 + 36 + 8 + 64 = 120$, so $\frac{\text{HD}}{\text{total}} = \frac{12}{120} = \frac{1}{10}$.
35. $\frac{\text{CRT}}{\text{Proj}} = \frac{64}{8} = 8$
36. a. The discount is $\$53 - \$42.40 = \$10.60$;
 $\frac{10.60}{53} = 0.2$ or 20%
- b. The original cost would be $(53)(1.0625) = \$56.32$ and the sale cost is $(\$42.40)(1.0625) = \45.05 , so the savings is $\$11.27$. Alternate method: the savings is the discount plus the tax on the discount, or $(\$10.60)(1.0625) = \11.27 .
37. $5x + 3x = 20$; $8x = 20$; $x = 2.5$; $5x = 12.5$ gal of blue paint, $3x = 7.5$ gal of yellow paint.
38. $\frac{\text{hits}}{\text{at-bats}} = \frac{20 + 2}{57 + 10} = \frac{22}{67} \approx .328$
39. $\frac{\text{hits}}{\text{at-bats}} = \frac{20 + x}{57 + x} = \frac{0.400}{1}$; $20 + x = 22.8 + 0.4x$;
 $0.6x = 2.8$; $x = \frac{2.8}{0.6} = 4.\bar{6}$; at least 5 hits
40. There are 10 numbers in the set $\{-1, 0, \dots, 8\}$ and 7 of them $\{2, 3, \dots, 8\}$ are greater than 1;
 $P(> 1) = \frac{7}{10}$.
41. There are 2 even numbers greater than 2 (4 and 6), so the probability is $\frac{2}{6} = \frac{1}{3}$.
42. The events are complements, so the probability is $1 - \frac{1}{25,000} = \frac{24,999}{25,000}$.
43. The events are complements, so the relative frequency is $100\% - 31\% = 69\%$.
44. The three probabilities are $42\% = 0.42$;
 $\frac{5}{12} = 0.41\bar{6}$; and 0.45.
- a. Event C has the greatest probability, so it is most likely to happen.
- b. Event B has the least probability, so it is least likely to happen.
45. $\frac{\text{area of shaded region}}{\text{area of large square}} = \frac{36 - 25}{36} = \frac{11}{36}$
46. $\frac{\text{length of highway}}{\text{total length}} = \frac{18}{4 + 18 + 3} = \frac{18}{25} = 72\%$
47. a. $\frac{\text{area of bull's eye}}{\text{area of square}} = \frac{\pi \cdot 4^2}{32 \cdot 32} = \frac{16\pi}{16 \cdot 2 \cdot 32} = \frac{\pi}{64}$
- b. $\frac{\text{area of 2 rings}}{\text{area of square}} = \frac{\pi(12)^2 - \pi(4)^2}{32 \cdot 32} = \frac{128\pi}{32 \cdot 32} = \frac{128}{128} \cdot \frac{\pi}{8} = \frac{\pi}{8}$
48. $\frac{\text{cups}}{\text{teaspoons}} = \frac{\frac{1}{2}}{\frac{2}{24}} = \frac{2}{x}$; $\frac{1}{2}x = 56$; $x = 112$; 112 tsp
49. $5x = 12 \cdot 490$; $5x = 5,880$; $x = 1,176$; \$1,176
50. $\frac{\text{pesos}}{\text{US\$}} = \frac{10.89}{1} = \frac{290}{x}$; $10.98x = 290$;
 $x = \frac{290}{10.98} \approx 26.63$; \$26.63
51. $\frac{\text{tagged}}{\text{total}} = \frac{14}{20} = \frac{28}{x}$; $14x = 560$; $x = 40$; 40 moose
52. Here is a list of the scores, ordered from least to greatest: 1550, 1680, 1680, 1780, 1790, 1790, 1870, 1880, 1900, 1910, 1950, 1970, 2000, 2020, 2050, 2050, 2110, 2200, 2230, 2330.
- The 10th and 11th scores are 1910 and 1950, so the median is $\frac{1910 + 1950}{2} = \frac{3860}{2} = 1930$.
53. There were 4 lower scores out of the 20, so his percentile was $\frac{4}{20} = 0.2 = 20\text{th}$.
54. The 90th percentile is the 18th highest score of the 20 scores; that is 2,200.
55. a. There are $(20)(0.10) = 2$ scores below the 10th percentile, so there are 3 scores in the 10th percentile.
- b. There are $(20)(0.25) = 5$ scores below the 25th percentile, so there are 6 scores in the 25th percentile.
- c. There are $(20)(0.75) = 15$ scores below the 75th percentile, so there are 16 scores in the 75th percentile.
56. The ratio of the longer dimensions is $\frac{1,200}{1,100} = \frac{12}{11}$ and the ratio of the smaller dimensions is $\frac{900}{800} = \frac{9}{8}$. Since $\frac{12}{11} \neq \frac{9}{8}$, the fields are not similar.
57. a. $\frac{32}{9}$ or $\frac{9}{32}$
- b. $\frac{y}{4} = \frac{32}{9}$; $9y = 128$; $y = \frac{128}{9}$
- c. $\frac{x}{6} = \frac{9}{32}$; $32x = 54$; $x = \frac{54}{32} = \frac{27}{16}$

58. a.



b. $\frac{x}{3} = \frac{480}{n}$; $nx = 1,440$; $x = \frac{1,440}{n}$

59. If the ratio of the sides is $\frac{4}{5}$, then the ratio of the

areas is $\left(\frac{4}{5}\right)^2 = \frac{16}{25}$; $\frac{\text{area of } PQRST}{\text{area of } VWXYZ} = \frac{16}{25}$; $\frac{60}{x} = \frac{16}{25}$;

$16x = 1,500$; $x = \frac{1,500}{16} = 93.75$; 93.75 units^2