THE SOLUTIONS TO THE PRACTICE PROBLEMS FROM CHAPTERS 1 AND 2

1) *rational numbers, real numbers*■

2) $|-4.2+2.8| = |-1.4| = 1.4$■

3) $\frac{(26+16)\div 7}{9-7-2} = \frac{42\div 7}{2-2} = \frac{6}{0} = undefined$■

4) $\frac{4}{5} - \frac{7}{10} - \frac{11}{12}$

$= \frac{4}{5} + \left(\frac{-7}{10}\right) + \left(\frac{-11}{12}\right)$

$= \frac{48}{60} + \left(\frac{-42}{60}\right) + \left(\frac{-55}{60}\right)$

$= \frac{48+(-42)+(-55)}{60}$

$= \frac{-49}{60}$ ■

5) $-4[23 + 7(3-11)]$
$= -4[23 + 7(3+(-11)]$
$= -4[23 + 7(-8)]$
$= -4[23 + (-56)]$
$= -4[-33]$
$= 132$■

6) $\frac{8(4-12) - 3(19-22)}{5-2\cdot 8}$

$= \frac{8\cdot(-8) - 3\cdot(-3)}{5-16}$

$= \frac{-64 + (-3)\cdot(-3)}{5+(-16)}$

$= \frac{-64+9}{-11}$

$= \frac{-55}{-11}$

$= 5$ ■

7) $\frac{-36}{85} \div \left(\frac{-48}{51}\right)$
$= \frac{-36}{85} \cdot \left(\frac{-51}{48}\right)$
$= \frac{2\cdot 2\cdot 3\cdot 3\cdot 3\cdot 17}{5\cdot 17\cdot 2\cdot 2\cdot 2\cdot 2\cdot 3}$
$= \frac{9}{20}$■

8) $-8^2 = -(8\cdot 8) = -64$■

9) $26,500 - (-650)$
$= 26,500 + (+650)$
$= 27,150\ feet$■

10) $T = 3(A-20)^2 \div 50 + 10$
$T = 3(25-20)^2 \div 50 + 10$
$T = 3(5)^2 \div 50 + 10$
$T = 3\cdot 25 \div 50 + 10$
$T = 75 \div 50 + 10$
$T = 1.5 + 10$
$T = 11.5\ seconds$ ■

11) $x^3 - 4y^2 + 10z$
$= (-2)^3 - 4\cdot 3^2 + 10\cdot(-6)$
$= -8 - 4\cdot 9 + 10\cdot(-6)$
$= -8 - 36 + (-60)$
$= -8 + (-36) + (-60)$
$= -104$■

12) $7 + 13y = 13y + 7$■

13) $7(10x) = (7\cdot 10)x = 70x$■

14) $15r + 15t + 15s = 15(r+s+t)$■

15) $8(a-b-c)-8(a+b-c)$
$=8a-8b-8c-8a-8b+8c=$
$8a+(-8b)+(-8c)+(-8a)+(-8b)+8c$
$=-16b$ ■

16) $-5[3x-2(4x-1)]$
$=-5[3x-8x+2]$
$=-5[-5x+2]$
$=25x-10$ ■

17) Solve: $\frac{2}{3}x-5=13$
$\frac{2}{3}x-5+5=13+5$
$\frac{2}{3}x=18$
$\frac{3}{2}\cdot\frac{2}{3}x=\frac{3}{2}\cdot 18$
$x=27$
$\{27\}$■

18) Solve: $-1x=-102$
$\frac{-1x}{-1}=\frac{-102}{-1}$
$x=102$
$\{102\}$■

19) $-\frac{3}{4}x=12$

$\left(\frac{-4}{3}\right)\cdot\left(\frac{-3}{4}\right)x=\left(\frac{-4}{3}\right)\cdot 12$
$x=-16$
$\{-16\}$■

20) $6r+20=-22$
$6r+20-20=-22-20$
$6r=-22+(-20)$
$6r=-42$
$r=-7$
$\{-7\}$ ■

21) $0.4x-0.9x=25$
$0.4x+(-0.9x)=25$
$-0.5x=25$
$\frac{-0.5x}{-0.5}=\frac{25}{-0.5}$
$x=-50$
$\{-50\}$■

22) $12k+40=-8k-60$
$12k+8k+40=-8k+8k-60$
$20k+40=-60$
$20k+40-40=-60-40$
$20k=-60+(-40)$
$20k=-100$
$k=-5$
$\{-5\}$■

23) $5r-4(2r-6)=7(r+2)$
$5r-8r+24=7r+14$
$-3r+24=7r+14$
$-3r-7r+24=7r-7r+14$
$-10r+24=14$
$-10r+24-24=14-24$
$-10r=-10$
$r=1$
$\{1\}$■

24) $\frac{r}{2}+\frac{r}{5}=-21$

$10\cdot\frac{r}{2}+10\cdot\frac{r}{5}=10\cdot(-21)$

$5r+2r=-210$
$7r=-210$
$r=-30$
$\{-30\}$■

25) $\frac{p}{4}+\frac{p}{2}+\frac{3p}{10}=\frac{p}{20}+12$

$20\cdot\frac{p}{4}+20\cdot\frac{p}{2}+20\cdot\frac{3p}{10}=20\cdot\frac{p}{20}+20\cdot 12$

$5p+10p+6p=p+240$

$21p=p+240$

$21p-p=p-p+240$
$20p=240$
$p=12$
$\{12\}$■

26) $2x + 6y = -12$

$2x - 2x + 6y = -2x - 12$

$6y = -2x - 12$

$\frac{6y}{6} = \frac{-2x}{6} - \frac{12}{6}$

$y = -\frac{1}{3}x - 2$ ■

27) $A = P + Prt$

$P + Prt = A$

$Prt + P = A$

$Prt + P - P = A - P$

$Prt = A - P$

$\frac{Prt}{Pr} = \frac{A - P}{Pr}$

$t = \frac{A - P}{Pr}$ ■

28) *Case 1) When 0 is the numerator or dividend, the quotient is 0. As an example,* $\frac{0}{4} = 0$ *because* $0 = 4 \cdot 0$. *The general rule is* $\frac{0}{k} = 0$ *provided that* $k \neq 0$.

Case 2) When 0 is in the denominator or is the divisor, the quotient is undefined.

$\frac{4}{0}$ *is undefined because* $\frac{4}{0} = 0$ *or any real number leads to the false mathematical statement that* $4 = 0$. *Not true! The general rule is* $\frac{k}{0}$ *is undefined for any real number* k.

Case 3) When 0 is both the numerator and denominator, the quotient we say is indeterminate. Because $\frac{0}{0}$ *could be* 0 *because* $0 = 0 \cdot 0$ *or* $\frac{0}{0}$ *could be* 10 *because* $0 = 0 \cdot 10$ *we do not get a unique solution for* $\frac{0}{0}$. *Thus, we say* $\frac{0}{0}$ *is indeterminate or undefined.* ■

29) $N = 2.4x + 180$

$324 = 2.4x + 180$

$2.4x + 180 = 324$

$2.4x + 180 - 180 = 324 - 180$

$2.4x = 144$

$\frac{2.4x}{2.4} = \frac{144}{2.4}$

$x = 60$

The U.S. population is expected to be 324 million 60 years after 1960 or in the year 2020. ■

30) *Hint : The amount is near the word "is" and the base is always after the word "of".*

Amount = Percent · Base

$A = P \cdot B$

$A = 0.06 \cdot 140$

$A = 8.4$ ■

31) Amount = Percent · Base

$A = P \cdot B$

$120 = 0.80 \cdot B$

$0.80B = 120$

$(100)0.80B = (100)120$

$80B = 12,000$

$\frac{80B}{80} = \frac{12,000}{80}$

$B = 150$ ■

32) Amount = Percent · Base

$A = P \cdot B$

$12 = P \cdot 240$

$240P = 12$

$\frac{240P}{240} = \frac{12}{240}$

$P = 0.05 = 5\%$ ■

33) *let* $x =$ *the number*

$5x - 9 = 310$

$+9 \quad +9$

$5x = 319$

$\frac{5x}{5} = \frac{319}{5}$

$x = 63.8$

The number is 63.8 ■

34) *let* $x =$ *the number*

$6x - 8 = 184$

$+8 \quad +8$

$6x = 192$

$\frac{6x}{6} = \frac{192}{6}$

$x = 32$

The number is 32. ■

35)

1) *Let* $x =$ *the # of home runs hit by Sosa*

2) *Then* $x + 4 =$ *the # of home runs hit by McGwire*

3) $x + (x + 4) = 136$

4) $2x + 4 = 136$

$-4 \quad -4$

$2x = 132$

$x = 66$

5) *Sammy Sosa hit* 66 *home runs and Mark McGwire hit* 70 *home runs in* 1998. ■

36)

1) *Let* $x =$ *the width of a basketball court*

2) *Then* $x + 13 =$ *the length*

3) $2 \cdot width + 2 \cdot length = Perimeter$

$2x + 2(x + 13) = 86$

4) $2x + 2x + 26 = 86$

$4x + 26 = 86$

$4x = 60$

$x = 15$

5) *The width of a basketball court is* 15 *meters and the length is* 28 *meters.* ■

37)

1) *Let* $x =$ *the book's original price before the reduction*

3) *Original Price-Reduction = Sale Price*

$x - 0.25x = 6.00$

$1x - 0.25x = 6.00$

$0.75x = 6.00$

$100 \cdot 0.75x = 100 \cdot 6.00$

$75x = 600$

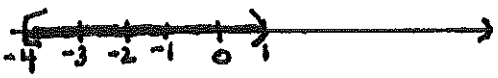
$\frac{75x}{75} = \frac{600}{75}$

$x = 8$

The original price of the Richard Laymon paperback book was $8. ■ *Note: Richard Laymon was a friend of Mr. Green's who wrote more than* 35 *scary horror novels which sold very well in Europe and Australia and are starting to catch on here in the U.S. after Richard's untimely death. If you like books by Koontz and King, try Laymon for some seriously strange stories!*

38)

39)

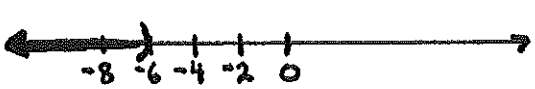


40) $\frac{x}{2} < -3$

$2 \cdot \frac{x}{2} < 2 \cdot (-3)$

$x < -6$

$\{x | x < -6\}$



41) $6 - 9x \geq 33$

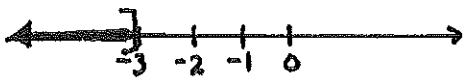
$-6 \qquad -6$

$-9x \geq 27$

$\frac{-9x}{-9} \leq \frac{27}{-9}$

$x \leq -3$

$\{x|x \leq -3\}$



42) $5x + 4 < 7(x + 2)$

$5x + 4 < 7x + 14$

$-7x \qquad -7x$

$-2x + 4 < 14$

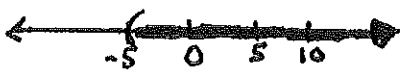
$-4 \quad -4$

$-2x < 10$

$\frac{-2x}{-2} > \frac{10}{-2}$

$x > -5$

$\{x|x > -5\}$



43) $2(2x + 4) > 4(x + 2) - 6$

$4x + 8 > 4x + 8 - 6$

$4x + 8 > 4x + 2$

$-4x \qquad -4x$

$8 > 2$

The original inequality is equivalent to the statement $8 > 2$ *which is true for every value of* x*. Thus, the solution is all real numbers! The answer can be expressed in set-builder notation as* $\{x|x$ *is a real number*$\}$ *or in interval notation as* $(-\infty, \infty)$*.* ■

44) $-2(x - 4) \leq 3x + 1 - 5x$

$-2x + 8 \leq -2x + 1$

$+2x \qquad +2x$

$8 \leq \quad 1$

The original inequality is equivalent to the statement $8 \leq 1$ *which is false for every value of* x*. Thus, the inequality has* ***no solution****. The solution set is* $\emptyset$*, the empty set.* ■

45) A student has grades on three exams of 76, 80 and 72. What grade must the student earn on the 4th exam in order to have an average of *at least* 80?

1) *let* $x =$ *the 4th exam score*

2) *then the average* $= \frac{76+80+72+x}{4}$

3) *the student's average* ≥ 80

4)
$$\frac{76+80+72+x}{4} \geq 80$$
$$\frac{228+x}{4} \geq 80$$
$$4 \cdot \frac{228+x}{4} \geq 4 \cdot 80$$
$$228 + x \geq 320$$
$$-228 \qquad -228$$
$$x \geq 92$$

5) *The student must earn* 92 *or higher or the fourth exam to have an average of at least* 80. ■