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Chapter 2

2.1 Exercises

2. If the same number is added to both sides of an equation, the results on each side are equal in value.

4. The additive inverse of -20 is 20.

6. The additive inverse of a is $-a$.

8.
$$x+15=21$$
$$x+15+(-15)=21+(-15)$$
$$x=6$$
Check: $6+15 \stackrel{?}{=} 21$
$$21=21 \checkmark$$

10.
$$23=8+x$$
$$23+(-8)=8+x+(-8)$$
$$15=x$$
Check: $23 \stackrel{?}{=} 8+15$
$$23=23 \checkmark$$

12.
$$x-13=4$$
$$x-13+13=4+13$$
$$x=17$$
Check: $17-13 \stackrel{?}{=} 4$
$$4=4 \checkmark$$

14.
$$0=x+9$$
$$0+(-9)=x+9+(-9)$$
$$-9=x$$
Check: $0 \stackrel{?}{=} -9+9$
$$0=0 \checkmark$$

16.
$$x-11=-13$$
$$x-11+11=-13+11$$
$$x=-2$$
Check: $-2-11 \stackrel{?}{=} -13$
$$-13=-13 \checkmark$$

18.
$$-16+x=47$$
$$-16+16+x=47+16$$
$$x=63$$
Check: $-16+63 \stackrel{?}{=} 47$
$$47=47 \checkmark$$

20.
$$8-2=x+5$$
$$6=x+5$$
$$6+(-5)=x+5+(-5)$$
$$1=x$$
Check: $8-2 \stackrel{?}{=} 1+5$
$$6=6 \checkmark$$

22.
$$32-11=x-4$$
$$21=x-4$$
$$21+4=x-4+4$$
$$25=x$$
Check: $32-11 \stackrel{?}{=} 25-4$
$$21=21 \checkmark$$

24.
$$19-3+x=10+6$$
$$16+x=16$$
$$16+x+(-16)=16+(-16)$$
$$x=0$$
Check: $19-3+0 \stackrel{?}{=} 10+6$
$$16=16 \checkmark$$

26.
$$3-17+8=8+x-3$$
$$-6=5+x$$
$$-6+(-5)=5+(-5)+x$$
$$-11=x$$
Check: $3-17+8 \stackrel{?}{=} 8+(-11)-3$
$$-6=-6 \checkmark$$

28.
$$-19+x-7=20-42+10$$
$$-26+x=-12$$
$$-26+26+x=-12+26$$
$$x=14$$
Check: $-19+14-7 \stackrel{?}{=} 20-42+10$
$$-12=-12 \checkmark$$

30. $-13+x=4,\ x \stackrel{?}{=} 7$
$$-13+7 \stackrel{?}{=} 4$$
$$-6 \neq 4$$
$x=7$ is not the solution.
$$-13+x=4$$
$$-13+13+x=4+13$$
$$x=17$$

32. $-13-4=x-8,\ x \stackrel{?}{=} -9$
$$-13-4 \stackrel{?}{=} -9-8$$
$$-17=-17$$
$x=-9$ is the solution.

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34. $-39 = x - 47,\ x \stackrel{?}{=} -8$

$-39 \stackrel{?}{=} -8 - 47$

$-39 \neq -55$

$x = -8$ is not the solution.

$$-39 = x - 47$$
$$-39 + 47 = x - 47 + 47$$
$$8 = x$$

36. $x + 8 = 12 - 19 + 3,\ x \stackrel{?}{=} -12$

$-12 + 8 \stackrel{?}{=} 12 - 19 + 3$

$-4 = -4$

$x = -12$ is the solution.

38.
$$8.2 + x = 3.2$$
$$8.2 + x + (-8.2) = 3.2 + (-8.2)$$
$$x = -5$$

40.
$$4.3 + x - 2.6 = 3.4$$
$$1.7 + x = 3.4$$
$$1.7 + (-1.7) + x = 3.4 + (-1.7)$$
$$x = 1.7$$

42.
$$x + \frac{1}{3} = \frac{2}{3}$$
$$x + \frac{1}{3} + \left(-\frac{1}{3}\right) = \frac{2}{3} + \left(-\frac{1}{3}\right)$$
$$x = \frac{1}{3}$$

44.
$$\frac{2}{5} + x = \frac{1}{2} - \frac{3}{10}$$
$$\frac{4}{10} + x = \frac{5}{10} - \frac{3}{10}$$
$$\frac{4}{10} + x = \frac{2}{10}$$
$$\frac{4}{10} + \left(-\frac{4}{10}\right) + x = \frac{2}{10} + \left(-\frac{4}{10}\right)$$
$$x = -\frac{2}{10}$$
$$x = -\frac{1}{5}$$

46.
$$12 + x = -7 + 20$$
$$12 + x = 13$$
$$12 + (-12) + x = 13 + (-12)$$
$$x = 1$$

48.
$$3\frac{3}{4} + x = 9$$
$$3\frac{3}{4} + \left(-3\frac{3}{4}\right) + x = 9 + \left(-3\frac{3}{4}\right)$$
$$x = \frac{36}{4} + \left(-\frac{15}{4}\right)$$
$$x = \frac{21}{4} \text{ or } 5\frac{1}{4}$$

50.
$$\frac{3}{16} - \frac{1}{4} = x - \frac{3}{8}$$
$$\frac{3}{16} - \frac{4}{16} = x - \frac{3}{8}$$
$$-\frac{1}{16} = x - \frac{3}{8}$$
$$-\frac{1}{16} + \frac{3}{8} = x - \frac{3}{8} + \frac{3}{8}$$
$$-\frac{1}{16} + \frac{6}{16} = x$$
$$\frac{5}{16} = x$$

52.
$$1.8 + x - 4.6 = -3 + 4.2$$
$$x - 2.8 = 1.2$$
$$x - 2.8 + 2.8 = 1.2 + 2.8$$
$$x = 4$$

54.
$$x - 10.012 = -16.835$$
$$x - 10.012 + 10.012 = -16.835 + 10.012$$
$$x = -6.823$$

Cumulative Review

55.
$$x + 3y - 5x - 7y + 2x = (1 - 5 + 2)x + (3 - 7)y$$
$$= -2x - 4y$$

56.
$$y^2 + y - 12 - 3y^2 - 5y + 16$$
$$= (1 - 3)y^2 + (1 - 5)y - 12 + 16$$
$$= -2y^2 - 4y + 4$$

Classroom Quiz 2.1

1.
$$x - 8.3 = 12.8$$
$$x - 8.3 + 8.3 = 12.8 + 8.3$$
$$x = 21.1$$

2.
$$-7.8 + x = -14.2$$
$$-7.8 + x + 7.8 = -14.2 + 7.8$$
$$x = -6.4$$

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3. $5-16+3=-9+x+3$
$-8=x-6$
$-8+6=x-6+6$
$-2=x$

2.2 Exercises

2. To solve the equation $-7x=56$, divide each side of the equation by -7.

4. To solve the equation $\frac{1}{9}x=5$, multiply each side of the equation by 9.

6. $\frac{1}{5}x=12$
$5\left(\frac{1}{5}x\right)=5(12)$
$x=60$
Check: $\frac{1}{5}(60) \stackrel{?}{=} 12$
$12=12$ ✓

8. $\frac{1}{9}x=-8$
$9\left(\frac{1}{9}x\right)=9(-8)$
$x=-72$
Check: $\frac{1}{9}(-72) \stackrel{?}{=} -8$
$-8=-8$ ✓

10. $\frac{x}{12}=-7$
$12\left(\frac{x}{12}\right)=12(-7)$
$x=-84$
Check: $\frac{-84}{12} \stackrel{?}{=} -7$
$-7=-7$ ✓

12. $\frac{x}{6}=-2$
$6\left(\frac{x}{6}\right)=6(-2)$
$x=-12$
Check: $\frac{-12}{6} \stackrel{?}{=} -2$
$-2=-2$ ✓

14. $15x=60$
$\frac{15x}{15}=\frac{60}{15}$
$x=4$
Check: $15(4) \stackrel{?}{=} 60$
$60=60$ ✓

16. $46=2x$
$\frac{46}{2}=\frac{2x}{2}$
$23=x$
Check: $46 \stackrel{?}{=} 2(23)$
$46=46$ ✓

18. $-35=21x$
$\frac{-35}{21}=\frac{21x}{21}$
$-\frac{5}{3}=x$
Check: $-35 \stackrel{?}{=} 21\left(-\frac{5}{3}\right)$
$-35=-35$ ✓

20. $2x=0.36$
$\frac{2x}{2}=\frac{0.36}{2}$
$x=0.18$
Check: $2(0.18) \stackrel{?}{=} 0.36$
$0.36=0.36$ ✓

22. $32=-x$
$\frac{32}{-1}=\frac{-x}{-1}$
$-32=x$
Check: $32 \stackrel{?}{=} (-1)(-32)$
$32=32$ ✓

24. $-108=-18x$
$\frac{-108}{-18}=\frac{-18x}{-18}$
$6=x$
Check: $-108 \stackrel{?}{=} -18(6)$
$-108=-108$ ✓

26. $2.5x=0.5$
$\frac{2.5x}{2.5}=\frac{0.5}{2.5}$
$x=0.2$
Check: $2.5(0.2) \stackrel{?}{=} 0.5$
$0.5=0.5$ ✓

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28. $-4.7x = -14.1$

$$\frac{-4.7x}{-4.7} = \frac{-14.1}{-4.7}$$

$$x = 3$$

Check: $(-4.7)(3) \stackrel{?}{=} -14.1$

$-14.1 = -14.1$ ✓

30. $5x = -40,\ x \stackrel{?}{=} 8$

$5(8) \stackrel{?}{=} -40$

$40 \neq -40$

$x = 8$ is not the solution.

$5x = -40$

$$\frac{5x}{5} = \frac{-40}{5}$$

$x = -8$

32. $-11x = 88,\ x \stackrel{?}{=} -8$

$-11(-8) \stackrel{?}{=} 88$

$88 = 88$ ✓

$x = -8$ is the solution.

34. $-6y = 2.16$

$$\frac{-6y}{-6} = \frac{2.16}{-6}$$

$y = -0.36$

36. $26 = -39t$

$$\frac{26}{-39} = \frac{-39t}{-39}$$

$$-\frac{2}{3} = t$$

38. $-2.8y = -3.08$

$$\frac{-2.8y}{-2.8} = \frac{-3.08}{-2.8}$$

$y = 1.1$

40. $5x + 4x = 36$

$9x = 36$

$$\frac{9x}{9} = \frac{36}{9}$$

$x = 4$

42. $3x - 9x = 18$

$-6x = 18$

$$\frac{-6x}{-6} = \frac{18}{-6}$$

$x = -3$

44. $\frac{1}{5}x = -4$

$$5\left(\frac{1}{5}x\right) = 5(-4)$$

$x = -20$

46. $24 - 27 = -9x$

$-3 = -9x$

$$\frac{-3}{-9} = \frac{-9x}{-9}$$

$$\frac{1}{3} = x$$

48. $8x = 26 - 50$

$8x = -24$

$$\frac{8x}{8} = \frac{-24}{8}$$

$x = -3$

50. $\frac{5}{6}x = 40$

$$\frac{6}{5}\left(\frac{5}{6}x\right) = \frac{6}{5}(40)$$

$x = 48$

52. $-5.42102x = -45.536568$

$$\frac{-5.42102x}{-5.42102} = \frac{-45.536568}{-5.42102}$$

$x = 8.4$

Cumulative Review

53. $-3y(2x + y) + 5(3xy - y^2)$

$= -6xy - 3y^2 + 15xy - 5y^2$

$= (-6 + 15)xy + (-3 - 5)y^2$

$= 9xy - 8y^2$

54. $-\{2(x - 3) + 3[x - (2x - 5)]\}$

$= -\{2(x - 3) + 3[x - 2x + 5]\}$

$= -\{2(x - 3) + 3[-x + 5]\}$

$= -\{2x - 6 - 3x + 15\}$

$= -\{-x + 9\}$

$= x - 9$

55. Find 25% of 30.

25% of $30 = 0.25 \times 30 = 7.5$

The whale will lose 7.5 tons.

$30 - 7.5 = 22.5$

The whale will weigh 22.5 tons.

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56. Find 35% of 20.
35% of $20 = 0.35 \times 20 = 7$
The number of earthquakes is expected to increase by 7.
$20 + 7 = 27$
A total of 27 earthquakes can be expected.

Classroom Quiz 2.2

1. $2.2x = -88$
$\frac{2.2x}{2.2} = \frac{-88}{2.2}$
$x = -40$

2. $-5.2x = -62.4$
$\frac{-5.2x}{-5.2} = \frac{-62.4}{-5.2}$
$x = 12$

3. $15x - 18x = 21$
$-3x = 21$
$\frac{-3x}{-3} = \frac{21}{-3}$
$x = -7$

2.3 Exercises

2. $4x + 7 = 35$
$4x + 7 + (-7) = 35 + (-7)$
$4x = 28$
$\frac{4x}{4} = \frac{28}{4}$
$x = 7$
Check: $4(7) + 7 \stackrel{?}{=} 35$
$28 + 7 \stackrel{?}{=} 35$
$35 = 35$ ✓

4. $5x - 9 = 36$
$5x - 9 + 9 = 36 + 9$
$5x = 45$
$\frac{5x}{5} = \frac{45}{5}$
$x = 9$
Check: $5(9) - 9 \stackrel{?}{=} 36$
$45 - 9 \stackrel{?}{=} 36$
$36 = 36$ ✓

6. $8x - 15 = -47$
$8x - 15 + 15 = -47 + 15$
$8x = -32$
$\frac{8x}{8} = \frac{-32}{8}$
$x = -4$
Check: $8(-4) - 15 \stackrel{?}{=} -47$
$-32 - 15 \stackrel{?}{=} -47$
$-47 = -47$ ✓

8. $-6x + 25 = -83$
$-6x + 25 + (-25) = -83 + (-25)$
$-6x = -108$
$\frac{-6x}{-6} = \frac{-108}{-6}$
$x = 18$
Check: $-6(18) + 25 \stackrel{?}{=} -83$
$-108 + 25 \stackrel{?}{=} -83$
$-83 = -83$ ✓

10. $4x + 4.6 = 9.2$
$4x + 4.6 + (-4.6) = 9.2 + (-4.6)$
$4x = 4.6$
$\frac{4x}{4} = \frac{4.6}{4}$
$x = 1.15$
Check: $4(1.15) + 4.6 \stackrel{?}{=} 9.2$
$4.6 + 4.6 \stackrel{?}{=} 9.2$
$9.2 = 9.2$ ✓

12. $\frac{1}{2}x + 1 = 7$
$\frac{1}{2}x + 1 - 1 = 7 - 1$
$\frac{1}{2}x = 6$
$2\left(\frac{1}{2}x\right) = 2(6)$
$x = 12$
Check: $\frac{1}{2}(12) + 1 \stackrel{?}{=} 7$
$6 + 1 \stackrel{?}{=} 7$
$7 = 7$ ✓

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14. $\frac{1}{8}x-3=-9$

$\frac{1}{8}x-3+3=-9+3$

$\frac{1}{8}x=-6$

$8\left(\frac{1}{8}x\right)=8(-6)$

$x=-48$

Check: $\frac{1}{8}(-48)-3 \stackrel{?}{=} -9$

$-6-3 \stackrel{?}{=} -9$

$-9=-9$ ✓

16. $5x=22+3x$

$5x+(-3x)=22+3x+(-3x)$

$2x=22$

$\frac{2x}{2}=\frac{22}{2}$

$x=11$

Check: $5(11) \stackrel{?}{=} 22+3(11)$

$55 \stackrel{?}{=} 22+33$

$55=55$ ✓

18. $-7x=-26+6x$

$-7x+(-6x)=-26+6x+(-6x)$

$-13x=-26$

$\frac{-13x}{-13}=\frac{-26}{-13}$

$x=2$

Check: $-7(2) \stackrel{?}{=} -26+6(2)$

$-14 \stackrel{?}{=} -26+12$

$-14=-14$ ✓

20. $21-5x=7x$

$21-5x+5x=7x+5x$

$21=12x$

$\frac{21}{12}=\frac{12x}{12}$

$\frac{7}{4}=x$ or $x=1.75$

Check: $21-5\left(\frac{7}{4}\right) \stackrel{?}{=} 7\left(\frac{7}{4}\right)$

$\frac{84}{4}-\frac{35}{4} \stackrel{?}{=} \frac{49}{4}$

$\frac{49}{4}=\frac{49}{4}$ ✓

22. $72-4x=-12x$

$72-4x+4x=-12x+4x$

$72=-8x$

$\frac{72}{-8}=\frac{-8x}{-8}$

$-9=x$

Check: $72+36 \stackrel{?}{=} -12(-9)$

$72-4(-9) \stackrel{?}{=} 108$

$108=108$ ✓

24. $5y+2=6y-6+y,\ y \stackrel{?}{=} 4$

$5(4)+2 \stackrel{?}{=} 6(4)-6+4$

$20+2 \stackrel{?}{=} 24-2$

$22=22$

$y=4$ is the solution.

26. $9x+2-5x=-8+5x-2,\ x \stackrel{?}{=} -12$

$9(-12)+2-5(-12) \stackrel{?}{=} -8+5(-12)-2$

$-108+2+60 \stackrel{?}{=} -8-60-2$

$-46 \neq -70$

$x=-12$ is not the solution.

$9x+2-5x=-8+5x-2$

$4x+2=5x-10$

$4x+(-4x)+2=5x+(-4x)-10$

$2=x-10$

$2+10=x-10+10$

$12=x$

28. $8-3x=7x+8$

$8-3x+3x=7x+3x+8$

$8=10x+8$

$8-8=10x+8-8$

$0=10x$

$\frac{0}{10}=\frac{10x}{10}$

$0=x$

30. $-x+12=-4+x$

$-x+x+12=-4+x+x$

$12=-4+2x$

$12+4=-4+4+2x$

$16=2x$

$\frac{16}{2}=\frac{2x}{2}$

$8=x$

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32.
$$1.1y+0.3=-1.3+0.3y$$
$$1.1y+0.3-0.3y=-1.3+0.3y-0.3y$$
$$0.8y+0.3=-1.3$$
$$0.8y+0.3-0.3=-1.3-0.3$$
$$0.8y=-1.6$$
$$\frac{0.8y}{0.8}=\frac{-1.6}{0.8}$$
$$y=-2$$

34.
$$9x-5=7x+43$$
$$9x+(-7x)-5=7x+(-7x)+43$$
$$2x-5=43$$
$$2x-5+5=43+5$$
$$2x=48$$
$$\frac{2x}{2}=\frac{48}{2}$$
$$x=24$$

36. $7y+21-5y=5y-7+y$

Left
$$2y+21=6y-7$$
$$2y+(-6y)+21=6y+(-6y)-7$$
$$-4y+21=-7$$
$$-4y+21+(-21)=-7+(-21)$$
$$-4y=-28$$
$$\frac{-4y}{-4}=\frac{-28}{-4}$$
$$y=7$$

Right
$$2y+21=6y-7$$
$$2y+(-2y)+21=6y+(-2y)-7$$
$$21=4y-7$$
$$21+7=4y-7+7$$
$$28=4y$$
$$\frac{28}{4}=\frac{4y}{4}$$
$$7=y$$

Neither approach is better.

38.
$$7(x+3)=28$$
$$7x+21=28$$
$$7x+21-21=28-21$$
$$7x=7$$
$$\frac{7x}{7}=\frac{7}{7}$$
$$x=1$$

Check: $7(1+3)\stackrel{?}{=}28$
$$7(4)\stackrel{?}{=}28$$
$$28=28\ \checkmark$$

40.
$$4(2x+1)-7=6-5$$
$$8x+4-7=6-5$$
$$8x-3=1$$
$$8x-3+3=1+3$$
$$8x=4$$
$$\frac{8x}{8}=\frac{4}{8}$$
$$x=\frac{1}{2}$$

Check: $4\left[2\left(\frac{1}{2}\right)+1\right]-7\stackrel{?}{=}6-5$
$$4(1+1)-7\stackrel{?}{=}1$$
$$4(2)-7\stackrel{?}{=}1$$
$$8-7\stackrel{?}{=}1$$
$$1=1\ \checkmark$$

42.
$$8x-2(4-x)=14$$
$$8x-8+2x=14$$
$$10x-8=14$$
$$10x-8+8=14+8$$
$$10x=22$$
$$\frac{10x}{10}=\frac{22}{10}$$
$$x=\frac{11}{5}$$

Check: $8\left(\frac{11}{5}\right)-2\left(4-\frac{11}{5}\right)\stackrel{?}{=}14$
$$\frac{88}{5}-2\left(\frac{9}{5}\right)\stackrel{?}{=}14$$
$$\frac{88}{5}-\frac{18}{5}\stackrel{?}{=}14$$
$$14=14\ \checkmark$$

44.
$$0.4x-0.2(3-x)=1.8$$
$$0.4x-0.6+0.2x=1.8$$
$$0.6x-0.6=1.8$$
$$0.6x-0.6+0.6=1.8+0.6$$
$$0.6x=2.4$$
$$\frac{0.6x}{0.6}=\frac{2.4}{0.6}$$
$$x=4$$

Check: $0.4(4)-0.2(3-4)\stackrel{?}{=}1.8$
$$1.6-0.2(-1)\stackrel{?}{=}1.8$$
$$1.6+0.2\stackrel{?}{=}1.8$$
$$1.8=1.8\ \checkmark$$

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46. $6(a+3)-2=-4(a-4)$
$6a+18-2=-4a+16$
$6a+16=-4a+16$
$6a+16+4a=-4a+16+4a$
$10a+16=16$
$10a+16-16=16-16$
$10a=0$
$\frac{10a}{10}=\frac{0}{10}$
$a=0$
Check: $6(0+3)-2 \stackrel{?}{=} -4(0-4)$
$6(3)-2 \stackrel{?}{=} -4(-4)$
$18-2 \stackrel{?}{=} 16$
$16=16$ ✓

48. $-3(x+5)+2=4(x+6)-9$
$-3x-15+2=4x+24-9$
$-3x-13=4x+15$
$-3x+3x-13=4x+3x+15$
$-13=7x+15$
$-13+(-15)=7x+15+(-15)$
$-28=7x$
$\frac{-28}{7}=\frac{7x}{7}$
$-4=x$
Check: $-3(-4+5)+2 \stackrel{?}{=} 4(-4+6)-9$
$-3(1)+2 \stackrel{?}{=} 4(2)-9$
$-3+2 \stackrel{?}{=} 8-9$
$-1=-1$ ✓

50. $2(4x-x)+6=2(2x+x)+8-x$
$2(3x)+6=2(3x)+8-x$
$6x+6=6x+8-x$
$6x+6=5x+8$
$6x+6-6=5x+8-6$
$6x=5x+2$
$-5x+6x=-5x+5x+2$
$x=2$
Check: $2[4(2)-2]+6 \stackrel{?}{=} 2[2(2)+2]+8-2$
$2(8-2)+6 \stackrel{?}{=} 2(4+2)+6$
$2(6)+6 \stackrel{?}{=} 2(6)+6$
$12+6 \stackrel{?}{=} 12+6$
$18=18$ ✓

52. $4x-3.1=5.3-3x$
$4x+3x-3.1=5.3-3x+3x$
$7x-3.1=5.3$
$7x-3.1+3.1=5.3+3.1$
$7x=8.4$
$\frac{7x}{7}=\frac{8.4}{7}$
$x=1.2$

54. $8-7z+2z=20+5z$
$8-5z=20+5z$
$8-5z+5z=20+5z+5z$
$8=20+10z$
$-20+8=-20+20+10z$
$-12=10z$
$\frac{-12}{10}=\frac{10z}{10}$
$-\frac{6}{5}=z$

56. $-0.7b+1.6=-1.7-1.5b$
$-0.7b+1.5b+1.6=-1.7-1.5b+1.5b$
$0.8b+1.6=-1.7$
$0.8b+1.6+(-1.6)=-1.7+(-1.6)$
$0.8b=-3.3$
$\frac{0.8b}{0.8}=\frac{-3.3}{0.8}$
$b=-4.125$

58. $4-7x-13=8x-3-5x$
$-7x-9=3x-3$
$-7x-3x-9=3x-3x-3$
$-10x-9=-3$
$-10x-9+9=-3+9$
$-10x=6$
$\frac{-10x}{-10}=\frac{6}{-10}$
$x=-\frac{6}{10}$
$x=-\frac{3}{5}$

60. $1.4x-0.8=1.2x-0.2$
$1.4x-0.8+0.8=1.2x-0.2+0.8$
$1.4x=1.2x+0.6$
$1.4x-1.2x=1.2x-1.2x+0.6$
$0.2x=0.6$
$\frac{0.2x}{0.2}=\frac{0.6}{0.2}$
$x=3$

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62.
$$\begin{aligned} 5(2x-3) &= 3(3x+2)-17 \\ 10x-15 &= 9x+6-17 \\ 10x-15 &= 9x-11 \\ 10x-9x-15 &= 9x-9x-11 \\ x-15 &= -11 \\ x-15+15 &= -11+15 \\ x &= 4 \end{aligned}$$

64.
$$\begin{aligned} 6x-3.7-1.2x &= 0.8x+1.1 \\ 4.8x-3.7 &= 0.8x+1.1 \\ 4.8x-3.7+3.7 &= 0.8x+1.1+3.7 \\ 4.8x &= 0.8x+4.8 \\ 4.8x-0.8x &= 0.8x-0.8x+4.8 \\ 4x &= 4.8 \\ \frac{4x}{4} &= \frac{4.8}{4} \\ x &= 1.2 \end{aligned}$$

Cumulative Review

65. $(-6)(-8) + (-3)(2) = 48 - 6 = 42$

66.
$$\begin{aligned} (-3)^3 + (-20) \div 2 &= -27 + (-20) \div 2 \\ &= -27 + (-10) \\ &= -37 \end{aligned}$$

67. $5 + (2-6)^2 = 5 + (-4)^2 = 5 + 16 = 21$

68. We multiply and then add.
$35 \times \$9.11 = \$318.85$
$16 \times \$22.70 = \$363.20$
$5 \times \$100.46 = \$502.30$
$\$318.85 + \$363.20 + \$502.30 = \$1184.35$
The market value was \$1184.35 on May 1, 2015.

69. a. 30% of $\$899 = 0.30 \times \$899 = \$269.70$
$\$899 - \$269.70 = \$629.30$
With a total discount of 30%, the sale price is \$629.30.

b. 20% of $\$899 = 0.20 \times \$899 = \$179.80$
$\$899 - \$179.80 = \$719.20$
The price after the 20% discount is \$719.20.
10% of $\$719.20 = 0.10 \times \$719.20 = \$71.92$
$\$719.20 - \$71.92 = \$647.28$
The sale price after both discounts is \$647.28.

Classroom Quiz 2.3

1.
$$\begin{aligned} 8x+3 &= -12x-7 \\ 8x+3+12x &= -12x-7+12x \\ 20x+3 &= -7 \\ 20x+3-3 &= -7-3 \\ 20x &= -10 \\ \frac{20x}{20} &= \frac{-10}{20} \\ x &= -\frac{1}{2} \end{aligned}$$

2.
$$\begin{aligned} -7x+3.5 &= 16.8 \\ -7x+3.5-3.5 &= 16.8-3.5 \\ -7x &= 13.3 \\ \frac{-7x}{-7} &= \frac{13.3}{-7} \\ x &= -1.9 \end{aligned}$$

3.
$$\begin{aligned} -3(4x-2) &= 2(6x+1) \\ -12x+6 &= 12x+2 \\ -12x+6+12x &= 12x+2+12x \\ 6 &= 24x+2 \\ 6-2 &= 24x+2-2 \\ 4 &= 24x \\ \frac{4}{24} &= \frac{24x}{24} \\ \frac{1}{6} &= x \end{aligned}$$

2.4 Exercises

2.
$$\begin{aligned} \frac{1}{3}x+\frac{5}{6} &= \frac{1}{2} \\ 6\left(\frac{1}{3}x\right)+6\left(\frac{5}{6}\right) &= 6\left(\frac{1}{2}\right) \\ 2x+5 &= 3 \\ 2x+5-5 &= 3-5 \\ 2x &= -2 \\ \frac{2x}{2} &= \frac{-2}{2} \\ x &= -1 \end{aligned}$$

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Check: $\frac{1}{3}(-1)+\frac{5}{6} \stackrel{?}{=} \frac{1}{2}$

$-\frac{1}{3}+\frac{5}{6} \stackrel{?}{=} \frac{1}{2}$

$-\frac{2}{6}+\frac{5}{6} \stackrel{?}{=} \frac{1}{2}$

$\frac{3}{6} \stackrel{?}{=} \frac{1}{2}$

$\frac{1}{2}=\frac{1}{2}$ ✓

4. $\frac{4}{15}x+\frac{1}{5}=\frac{2}{3}x$

$15\left(\frac{4}{15}x\right)+15\left(\frac{1}{5}\right)=15\left(\frac{2}{3}x\right)$

$4x+3=10x$

$4x-4x+3=10x-4x$

$3=6x$

$\frac{3}{6}=\frac{6x}{6}$

$\frac{1}{2}=x$

Check: $\frac{4}{15}\left(\frac{1}{2}\right)+\frac{1}{5} \stackrel{?}{=} \frac{2}{3}\left(\frac{1}{2}\right)$

$\frac{2}{15}+\frac{1}{5} \stackrel{?}{=} \frac{1}{3}$

$\frac{2}{15}+\frac{3}{15} \stackrel{?}{=} \frac{1}{3}$

$\frac{5}{15} \stackrel{?}{=} \frac{1}{3}$

$\frac{1}{3}=\frac{1}{3}$ ✓

6. $\frac{x}{8}+\frac{x}{4}=-\frac{3}{4}$

$8\left(\frac{x}{8}\right)+8\left(\frac{x}{4}\right)=8\left(-\frac{3}{4}\right)$

$x+2x=-6$

$3x=-6$

$\frac{3x}{3}=\frac{-6}{3}$

$x=-2$

Check: $\frac{-2}{8}+\frac{-2}{4} \stackrel{?}{=} -\frac{3}{4}$

$\frac{-1}{4}+\frac{-2}{4} \stackrel{?}{=} -\frac{3}{4}$

$-\frac{3}{4}=-\frac{3}{4}$ ✓

8. $15-\frac{1}{2}x=\frac{1}{4}x$

$4(15)-4\left(\frac{1}{2}x\right)=4\left(\frac{1}{4}x\right)$

$60-2x=x$

$60-2x+2x=x+2x$

$60=3x$

$\frac{60}{3}=\frac{3x}{3}$

$20=x$

Check: $15-\frac{1}{2}(20) \stackrel{?}{=} \frac{1}{4}(20)$

$15-10 \stackrel{?}{=} 5$

$5=5$ ✓

10. $\frac{x}{3}+3=\frac{5x}{6}+2$

$6\left(\frac{x}{3}\right)+6(3)=6\left(\frac{5x}{6}\right)=6(2)$

$2x+18=5x+12$

$2x+18-2x=5x+12-2x$

$18=3x+12$

$18-12=3x+12-12$

$6=3x$

$\frac{6}{3}=\frac{3x}{3}$

$2=x$

Check: $\frac{2}{3}+3 \stackrel{?}{=} \frac{5(2)}{6}+2$

$\frac{2}{3}+\frac{9}{3} \stackrel{?}{=} \frac{10}{6}+\frac{12}{6}$

$\frac{11}{3} \stackrel{?}{=} \frac{22}{6}$

$\frac{11}{3}=\frac{11}{3}$ ✓

12. $\frac{y-5}{4}=1-\frac{y}{5}$

$20\left(\frac{y-5}{4}\right)=20(1)-20\left(\frac{y}{5}\right)$

$5(y-5)=20-4y$

$5y-25=20-4y$

$5y-25+4y=20-4y+4y$

$9y-25=20$

$9y-25+25=20+25$

$9y=45$

$\frac{9y}{9}=\frac{45}{9}$

$y=5$

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Check: $\frac{5-5}{4} \stackrel{?}{=} 1-\frac{5}{5}$

$\frac{0}{4} \stackrel{?}{=} 1-1$

$0=0$ ✓

14. $\frac{x-2}{3}=\frac{x}{12}+\frac{5}{4}$

$12\left(\frac{x-2}{3}\right)=12\left(\frac{x}{12}\right)+12\left(\frac{5}{4}\right)$

$4(x-2)=x+15$

$4x-8=x+15$

$4x-8-x=x+15-x$

$3x-8=15$

$3x-8+8=15+8$

$3x=23$

$\frac{3x}{3}=\frac{23}{3}$

$x=\frac{23}{3}$

Check: $\frac{\frac{23}{3}-2}{3} \stackrel{?}{=} \frac{\frac{23}{3}}{12}+\frac{5}{4}$

$\frac{\frac{17}{3}}{3} \stackrel{?}{=} \frac{23}{36}+\frac{45}{36}$

$\frac{17}{9} \stackrel{?}{=} \frac{68}{36}$

$\frac{17}{9}=\frac{17}{9}$ ✓

16. $-3.2x-5.1=2.9$

$10(-3.2x)-10(5.1)=10(2.9)$

$-32x-51=29$

$-32x-51+51=29+51$

$-32x=80$

$\frac{-32x}{-32}=\frac{80}{-32}$

$x=-\frac{5}{2}$ or -2.5

Check: $-3.2(-2.5)-5.1 \stackrel{?}{=} 2.9$

$8-5.1 \stackrel{?}{=} 2.9$

$2.9=2.9$ ✓

18. $\frac{1}{5}(y+2)=\frac{1}{10}y+\frac{3}{5},\ y \stackrel{?}{=} 2$

$\frac{1}{5}(2+2) \stackrel{?}{=} \frac{1}{10}(2)+\frac{3}{5}$

$\frac{4}{5} \stackrel{?}{=} \frac{1}{5}+\frac{3}{5}$

$\frac{4}{5}=\frac{4}{5}$

Yes, $y = 2$ is a solution.

20. $\frac{1}{3}\left(x-\frac{1}{4}\right)=\frac{1}{8}+\frac{1}{3}x,\ x \stackrel{?}{=} \frac{1}{2}$

$\frac{1}{3}\left(\frac{1}{2}-\frac{1}{4}\right) \stackrel{?}{=} \frac{1}{8}+\frac{1}{3}\left(\frac{1}{2}\right)$

$\frac{1}{3}\left(\frac{2}{4}-\frac{1}{4}\right) \stackrel{?}{=} \frac{1}{8}+\frac{1}{6}$

$\frac{1}{3}\left(\frac{1}{4}\right) \stackrel{?}{=} \frac{3}{24}+\frac{4}{24}$

$\frac{1}{12} \neq \frac{7}{24}$

No, $x=\frac{1}{2}$ is not a solution.

22. $\frac{1}{4}(3x+1)=2(2x-4)-8$

$\frac{3}{4}x+\frac{1}{4}=4x-8-8$

$\frac{3}{4}x+\frac{1}{4}=4x-16$

$4\left(\frac{3}{4}x\right)+4\left(\frac{1}{4}\right)=4(4x)-4(16)$

$3x+1=16x-64$

$3x+1-3x=16x-64-3x$

$1=13x-64$

$1+64=13x-64+64$

$65=13x$

$\frac{65}{13}=\frac{13x}{13}$

$5=x$

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24.
$$2(x-4)=\frac{5}{6}(x+6)-6$$
$$2x-8=\frac{5}{6}x+5-6$$
$$2x-8=\frac{5}{6}x-1$$
$$6(2x)-6(8)=6\left(\frac{5}{6}x\right)-6(1)$$
$$12x-48=5x-6$$
$$12x-48-5x=5x-6-5x$$
$$7x-48=-6$$
$$7x-48+48=-6+48$$
$$7x=42$$
$$\frac{7x}{7}=\frac{42}{7}$$
$$x=6$$

26.
$$0.2(x+1)+0.5x=-0.3(x-4)$$
$$0.2x+0.2+0.5x=-0.3x+1.2$$
$$0.7x+0.2=-0.3x+1.2$$
$$0.7x+0.2+0.3x=-0.3x+1.2+0.3x$$
$$x+0.2=1.2$$
$$x+0.2-0.2=1.2-0.2$$
$$x=1$$

28.
$$0.6x+1.5=0.3x-0.6(2x+5)$$
$$0.6x+1.5=0.3x-1.2x-3$$
$$0.6x+1.5=-0.9x-3$$
$$10(0.6x)+10(1.5)=10(-0.9x)-10(3)$$
$$6x+15=-9x-30$$
$$6x+15+9x=-9x-30+9x$$
$$15x+15=-30$$
$$15x+15-15=-30-15$$
$$15x=-45$$
$$\frac{15x}{15}=\frac{-45}{15}$$
$$x=-3$$

30.
$$\frac{1}{4}(y+6)=2y-3(y-3)$$
$$\frac{1}{4}y+\frac{3}{2}=2y-3y+9$$
$$\frac{1}{4}y+\frac{3}{2}=-y+9$$
$$4\left(\frac{1}{4}y\right)+4\left(\frac{3}{2}\right)=4(-y)+4(9)$$
$$y+6=-4y+36$$
$$y+6+4y=-4y+36+4y$$
$$5y+6=36$$
$$5y+6-6=36-6$$
$$5y=30$$
$$\frac{5y}{5}=\frac{30}{5}$$
$$y=6$$

32.
$$\frac{1+3x}{2}+\frac{2-x}{3}=\frac{5}{6}$$
$$6\left(\frac{1+3x}{2}\right)+6\left(\frac{2-x}{3}\right)=6\left(\frac{5}{6}\right)$$
$$3(1+3x)+2(2-x)=5$$
$$3+9x+4-2x=5$$
$$7x+7=5$$
$$7x+7-7=5-7$$
$$7x=-2$$
$$\frac{7x}{7}=\frac{-2}{7}$$
$$x=-\frac{2}{7}$$

34.
$$\frac{2}{3}(x+4)=6-\frac{1}{4}(3x-2)-1$$
$$\frac{2}{3}x+\frac{8}{3}=6-\frac{3}{4}x+\frac{1}{2}-1$$
$$\frac{2}{3}x+\frac{8}{3}=\frac{11}{2}-\frac{3}{4}x$$
$$12\left(\frac{2}{3}x\right)+12\left(\frac{8}{3}\right)=12\left(\frac{11}{2}\right)-12\left(\frac{3}{4}x\right)$$
$$8x+32=66-9x$$
$$8x+32+9x=66-9x+9x$$
$$17x+32=66$$
$$17x+32-32=66-32$$
$$17x=34$$
$$\frac{17x}{17}=\frac{34}{17}$$
$$x=2$$

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36.
$$\frac{1}{4}(x+5)=3x-2(3-x)-7$$
$$\frac{1}{4}x+\frac{5}{4}=3x-6+2x-7$$
$$\frac{1}{4}x+\frac{5}{4}=5x-13$$
$$4\left(\frac{1}{4}x\right)+4\left(\frac{5}{4}\right)=4(5x)-4(13)$$
$$x+5=20x-52$$
$$x-x+5=20x-x-52$$
$$5=19x-52$$
$$5+52=19x-52+52$$
$$57=19x$$
$$\frac{57}{19}=\frac{19x}{19}$$
$$3=x$$

38.
$$\frac{5}{12}x+\frac{1}{3}=\frac{2x-3}{4}$$
$$12\left(\frac{5}{12}x\right)+12\left(\frac{1}{3}\right)=12\left(\frac{2x-3}{4}\right)$$
$$5x+4=3(2x-3)$$
$$5x+4=6x-9$$
$$5x-5x+4=6x-5x-9$$
$$4=x-9$$
$$4+9=x-9+9$$
$$13=x$$

40.
$$0.7(x+3)=0.2(x-5)+0.1$$
$$0.7x+2.1=0.2x-1.0+0.1$$
$$10(0.7x)+10(2.1)=10(0.2x)-10(1.0)+10(0.1)$$
$$7x+21=2x-10+1$$
$$7x+21=2x-9$$
$$7x-2x+21=2x-2x-9$$
$$5x+21=-9$$
$$5x+21-21=-9-21$$
$$5x=-30$$
$$\frac{5x}{5}=\frac{-30}{5}$$
$$x=-6$$

42.
$$x+3x-2+3x=-11+7(x+2)$$
$$7x-2=-11+7x+14$$
$$7x-2=7x+3$$
$$7x-2-7x=7x+3-7x$$
$$-2=3, \text{ no solution}$$

44.
$$7(x+4)-10=3x+20+4x-2$$
$$7x+28-10=7x+18$$
$$7x+18=7x+18$$
$$7x-7x+18=7x-7x+18$$
$$18=18$$
Infinite number of solutions

46.
$$11x-8=-4(x+3)+4$$
$$11x-8=-4x-12+4$$
$$11x-8=-4x-8$$
$$11x-8+4x=-4x-8+4x$$
$$15x-8=-8$$
$$15x-8+8=-8+8$$
$$15x=0$$
$$\frac{15x}{15}=\frac{0}{15}$$
$$x=0$$

48.
$$5(-3+4x)=4(2x+4)+12x$$
$$-15+20x=8x+16+12x$$
$$-15+20x=20x+16$$
$$-15+20x-20x=20x+16-20x$$
$$-15=16, \text{ no solution}$$

Cumulative Review

49.
$$\left(-3\frac{1}{4}\right)\left(5\frac{1}{3}\right)=\left(-\frac{13}{4}\right)\left(\frac{16}{3}\right)$$
$$=-\frac{13\cdot\cancel{4}\cdot 4}{\cancel{4}\cdot 3}$$
$$=-\frac{52}{3} \text{ or } -17\frac{1}{3}$$

50.
$$5\frac{1}{2}\div 1\frac{1}{4}=\frac{11}{2}\div\frac{5}{4}$$
$$=\frac{11}{2}\cdot\frac{4}{5}$$
$$=\frac{11\cdot\cancel{2}\cdot 2}{\cancel{2}\cdot 5}$$
$$=\frac{22}{5} \text{ or } 4\frac{2}{5}$$

51. 30% of 440 = 0.30 × 440 = 132
440 + 132 = 572
30% of 750 = 0.3 × 750 = 225
750 + 225 = 975
The weight range for females is 572 – 975 grams.

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52. Find the area of the seating area.

$$\text{Area} = \frac{1}{2}a(b_1 + b_2)$$
$$= \frac{1}{2}(200)(150 + 88)$$
$$= 100(238)$$
$$= 23{,}800 \text{ ft}^2$$

Find the area required for each seat.

$\text{Area} = L \cdot W = 2.5 \cdot 3 = 7.5 \text{ ft}^2$

Now divide.

$23{,}800 \div 7.5 \approx 3173$

The auditorium will hold approximately 3173 seats.

Classroom Quiz 2.4

1.
$$\frac{3}{7}x + \frac{5}{14} = \frac{1}{2}x - \frac{2}{7}$$
$$14\left(\frac{3}{7}x\right) + 14\left(\frac{5}{14}\right) = 14\left(\frac{1}{2}x\right) - 14\left(\frac{2}{7}\right)$$
$$6x + 5 = 7x - 4$$
$$6x + 5 - 6x = 7x - 4 - 6x$$
$$5 = x - 4$$
$$5 + 4 = x - 4 + 4$$
$$9 = x$$

2.
$$\frac{2}{5}x - \frac{3}{2} + \frac{4}{5} - \frac{7}{2}x = 2$$
$$10\left(\frac{2}{5}x\right) - 10\left(\frac{3}{2}\right) + 10\left(\frac{4}{5}\right) - 10\left(\frac{7}{2}x\right) = 10(2)$$
$$4x - 15 + 8 - 35x = 20$$
$$-31x - 7 = 20$$
$$-31x - 7 + 7 = 20 + 7$$
$$-31x = 27$$
$$\frac{-31x}{-31} = \frac{27}{-31}$$
$$x = -\frac{27}{31}$$

3.
$$\frac{3}{4}(x+3) - \frac{1}{2} = \frac{1}{8}(6 - 2x)$$
$$\frac{3}{4}x + \frac{9}{4} - \frac{1}{2} = \frac{3}{4} - \frac{1}{4}x$$
$$\frac{3}{4}x + \frac{7}{4} = \frac{3}{4} - \frac{1}{4}x$$
$$4\left(\frac{3}{4}x\right) + 4\left(\frac{7}{4}\right) = 4\left(\frac{3}{4}\right) - 4\left(\frac{1}{4}x\right)$$
$$3x + 7 = 3 - x$$
$$3x + 7 + x = 3 - x + x$$
$$4x + 7 = 3$$
$$4x + 7 - 7 = 3 - 7$$
$$4x = -4$$
$$\frac{4x}{4} = \frac{-4}{4}$$
$$x = -1$$

Use Math to Save Money

1. Shell: \$4.55
ARCO: \$4.43 + \$0.45 = \$4.88

2. Shell: 3(\$4.55) = \$13.65
ARCO: $3(\$4.43) + \$0.45 = \$13.29 + \$0.45$
$= \$13.74$

3. Shell: 4(\$4.55) = \$18.20
ARCO: $4(\$4.43) + \$0.45 = \$17.72 + \$0.45$
$= \$18.17$

4. Shell: 10(\$4.55) = \$45.50
ARCO: $10(\$4.43) + \$0.45 = \$44.30 + \$0.45$
$= \$44.75$

5. $4.55x = 4.43x + 0.45$
$0.12x = 0.45$
$x = 3.75$
The price is the same for 3.75 gallons of gas.

6. For less than four gallons, the SHELL station is less expensive.

7. For more than four gallons, the ARCO station is less expensive.

8. Answers will vary.

9. Answers will vary.

10. Answers will vary.

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How Am I Doing? Sections 2.1–2.4
(Available online through MyMathLab or from the Instructor's Resource Center.)

1.
$$\begin{aligned} 5-8+x &= -12 \\ -3+x &= -12 \\ -3+3+x &= -12+3 \\ x &= -9 \end{aligned}$$

2.
$$\begin{aligned} -2.8+x &= 4.7 \\ -2.8+2.8+x &= 4.7+2.8 \\ x &= 7.5 \text{ or } 7\frac{1}{2} \end{aligned}$$

3.
$$\begin{aligned} -45 &= -5x \\ \frac{-45}{-5} &= \frac{-5x}{-5} \\ 9 &= x \end{aligned}$$

4.
$$\begin{aligned} 12x-6x &= -48 \\ 6x &= -48 \\ \frac{6x}{6} &= \frac{-48}{6} \\ x &= -8 \end{aligned}$$

5.
$$\begin{aligned} -1.2x+3.5 &= 2.7 \\ -1.2x+3.5-3.5 &= 2.7-3.5 \\ -1.2x &= -0.8 \\ \frac{-1.2x}{-1.2} &= \frac{-0.8}{-1.2} \\ x &= \frac{2}{3} \end{aligned}$$

6.
$$\begin{aligned} -14x+9 &= 2x+7 \\ -14x-2x+9 &= 2x-2x+7 \\ -16x+9 &= 7 \\ -16x+9-9 &= 7-9 \\ -16x &= -2 \\ \frac{-16x}{-16} &= \frac{-2}{-16} \\ x &= \frac{1}{8} \end{aligned}$$

7.
$$\begin{aligned} 14x+2(7-2x) &= 20 \\ 14x+14-4x &= 20 \\ 10x+14 &= 20 \\ 10x+14-14 &= 20-14 \\ 10x &= 6 \\ \frac{10x}{10} &= \frac{6}{10} \\ x &= \frac{3}{5} \end{aligned}$$

8.
$$\begin{aligned} 0.5(1.2x-3.4) &= -1.4x+5.8 \\ 0.6x-1.7 &= -1.4x+5.8 \\ 0.6x+1.4x-1.7 &= -1.4x+1.4x+5.8 \\ 2x-1.7 &= 5.8 \\ 2x-1.7+1.7 &= 5.8+1.7 \\ 2x &= 7.5 \\ \frac{2x}{2} &= \frac{7.5}{2} \\ x &= 3.75 \text{ or } 3\frac{3}{4} \end{aligned}$$

9.
$$\begin{aligned} 3(x+6) &= -2(4x-1)+x \\ 3x+18 &= -8x+2+x \\ 3x+18 &= -7x+2 \\ 3x+7x+18 &= -7x+7x+2 \\ 10x+18 &= 2 \\ 10x+18-18 &= 2-18 \\ 10x &= -16 \\ \frac{10x}{10} &= -\frac{16}{10} \\ x &= -\frac{8}{5} \end{aligned}$$

10.
$$\begin{aligned} \frac{x}{3}+\frac{x}{4} &= \frac{5}{6} \\ 12\left(\frac{x}{3}\right)+12\left(\frac{x}{4}\right) &= 12\left(\frac{5}{6}\right) \\ 4x+3x &= 10 \\ 7x &= 10 \\ \frac{7x}{7} &= \frac{10}{7} \\ x &= \frac{10}{7} \end{aligned}$$

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11. $\frac{1}{4}(x+3)=4x-2(x-3)$

$\frac{1}{4}x+\frac{3}{4}=4x-2x+6$

$\frac{1}{4}x+\frac{3}{4}=2x+6$

$4\left(\frac{1}{4}x\right)+4\left(\frac{3}{4}\right)=4(2x)+4(6)$

$x+3=8x+24$

$x-x+3=8x-x+24$

$3=7x+24$

$3-24=7x+24-24$

$-21=7x$

$\frac{-21}{7}=\frac{7x}{7}$

$-3=x$

12. $\frac{1}{2}(x-1)+2=3(2x-1)$

$\frac{1}{2}x-\frac{1}{2}+2=6x-3$

$\frac{1}{2}x+\frac{3}{2}=6x-3$

$2\left(\frac{1}{2}x\right)+2\left(\frac{3}{2}\right)=2(6x)-2(3)$

$x+3=12x-6$

$x-x+3=12x-x-6$

$3=11x-6$

$3+6=-11x-6+6$

$9=11x$

$\frac{9}{11}=\frac{11x}{11}$

$\frac{9}{11}=x$

13. $\frac{1}{7}(7x-14)-2=\frac{1}{3}(x-2)$

$x-2-2=\frac{1}{3}x-\frac{2}{3}$

$x-4=\frac{1}{3}x-\frac{2}{3}$

$3(x)-3(4)=3\left(\frac{1}{3}x\right)-3\left(\frac{2}{3}\right)$

$3x-12=x-2$

$3x-x-12=x-x-2$

$2x-12=-2$

$2x-12+12=-2+12$

$2x=10$

$\frac{2x}{2}=\frac{10}{2}$

$x=5$

14. $0.2(x-3)=4(0.2x-0.1)$

$0.2x-0.6=0.8x-0.4$

$10(0.2x)-10(0.6)=10(0.8x)-10(0.4)$

$2x-6=8x-4$

$2x-2x-6=8x-2x-4$

$-6=6x-4$

$-6+4=6x-4+4$

$-2=6x$

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

$-\frac{1}{3}=x$

2.5 Exercises

2. Use the distributive property to obtain $A=\frac{9}{2}b+\frac{9}{2}c$. Multiply each term by 2. Subtract $9c$ from each side. Then divide each side by 9. We would obtain $\frac{2A-9c}{9}=b$ or $\frac{2A}{9}-c=b$.

4. a. $I=Prt$

$720=(3000)(0.06)t$

$720=180t$

$\frac{720}{180}=\frac{180t}{180}$

$4=t$

It would take 4 years.

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b. $I = Prt$
$400 = (5000)r(2)$
$400 = 10,000r$
$\frac{400}{10,000} = \frac{10,000r}{10,000}$
$0.04 = r$
The rate of interest is 4%.

c. $I = Prt$
$120 = P(0.05)(3)$
$120 = 0.15P$
$\frac{120}{0.15} = \frac{0.15P}{0.15}$
$800 = P$
The investment is \$800.

6. a. $-3x + 8y = 24$
$-3x = 24 - 8y$
$\frac{-3x}{-3} = \frac{24 - 8y}{-3}$
$x = \frac{24 - 8y}{-3} = \frac{8y - 24}{3}$
$x = \frac{8y}{3} - \frac{24}{3}$
$x = \frac{8}{3}y - 8$

b. $y = 6$
$x = \frac{8}{3}(6) - 8 = 16 - 8 = 8$

8. $A = \frac{1}{2}bh$
$2(A) = 2\left(\frac{1}{2}bh\right)$
$2A = bh$
$\frac{2A}{b} = \frac{bh}{b}$
$\frac{2A}{b} = h$

10. $I = Prt$
$\frac{I}{Pr} = \frac{Prt}{Pr}$
$\frac{I}{Pr} = t$

12. $y = mx + b$
$y + (-mx) = mx + (-mx) + b$
$y - mx = b$

14. $2x - 7y = 14$
$-7y = 14 - 2x$
$\frac{-7y}{-7} = \frac{14 - 2x}{-7}$
$y = \frac{14}{-7} - \frac{2x}{-7}$
$y = -2 + \frac{2x}{7}$
$y = \frac{2}{7}x - 2$

16. $y = -\frac{5}{6}x + 10$
$6(y) = 6\left(-\frac{5}{6}x\right) + 6(10)$
$6y = -5x + 60$
$6y - 60 = -5x$
$\frac{6y - 60}{-5} = \frac{-5x}{-5}$
$\frac{6y}{-5} - \frac{60}{-5} = x$
$-\frac{6}{5}y + 12 = x$
$x = -\frac{6}{5}y + 12$

18. $ax + by = c$
$ax = -by + c$
$\frac{ax}{a} = \frac{-by + c}{a}$
$x = \frac{c - by}{a}$

20. $s = 4\pi r^2$
$\frac{s}{4\pi} = \frac{4\pi r^2}{4\pi}$
$\frac{s}{4\pi} = r^2$

22. $V = \frac{4}{3}\pi r^3$
$3(V) = 3\left(\frac{4}{3}\pi r^3\right)$
$3V = 4\pi r^3$
$\frac{3V}{4\pi} = \frac{4\pi r^3}{4\pi}$
$\frac{3V}{4\pi} = r^3$

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24.
$$A = \frac{1}{2}a(b_1 + b_2)$$
$$A = \frac{1}{2}ab_1 + \frac{1}{2}ab_2$$
$$2(A) = 2\left(\frac{1}{2}ab_1\right) + 2\left(\frac{1}{2}ab_2\right)$$
$$2A = ab_1 + ab_2$$
$$2A - ab_2 = ab_1 + ab_2 - ab_2$$
$$2A - ab_2 = ab_1$$
$$\frac{2A - ab_2}{a} = \frac{ab_1}{a}$$
$$\frac{2A - ab_2}{a} = b_1$$
$$b_1 = \frac{2A - ab_2}{a}$$

26.
$$H = 5as + 10a^2$$
$$H - 10a^2 = 5as$$
$$\frac{H - 10a^2}{5a} = \frac{5as}{5a}$$
$$\frac{H - 10a^2}{5a} = s$$
$$s = \frac{H - 10a^2}{5a}$$

28.
$$K = \frac{1}{2}mv^2$$
$$2(K) = 2\left(\frac{1}{2}mv^2\right)$$
$$2K = mv^2$$
$$\frac{2K}{m} = \frac{mv^2}{m}$$
$$\frac{2K}{m} = v^2$$

30.
$$V = LWH$$
$$\frac{V}{LW} = \frac{LWH}{LW}$$
$$\frac{V}{LW} = H$$

32.
$$V = \frac{1}{3}\pi r^2 h$$
$$3(V) = 3\left(\frac{1}{3}\pi r^2 h\right)$$
$$3V = \pi r^2 h$$
$$\frac{3V}{\pi r^2} = \frac{\pi r^2 h}{\pi r^2}$$
$$\frac{3V}{\pi r^2} = h$$

34.
$$N = F + d(n-1)$$
$$N - F = d(n-1)$$
$$\frac{N - F}{(n-1)} = \frac{d(n-1)}{(n-1)}$$
$$\frac{N - F}{n-1} = d$$

36.
$$c^2 = a^2 + b^2$$
$$c^2 - a^2 = a^2 + b^2 - a^2$$
$$c^2 - a^2 = b^2$$

38.
$$C = \frac{5}{9}(F - 32)$$
$$C = \frac{5}{9}F - \frac{160}{9}$$
$$9(C) = 9\left(\frac{5}{9}F\right) - 9\left(\frac{160}{9}\right)$$
$$9C = 5F - 160$$
$$9C + 160 = 5F$$
$$\frac{9C + 160}{5} = \frac{5F}{5}$$
$$\frac{9C}{5} + \frac{160}{5} = F$$
$$\frac{9}{5}C + 32 = F \text{ or } F = 1.8C + 32$$

40.
$$d = \frac{m}{v}$$
$$vd = v \cdot \frac{m}{v}$$
$$vd = m$$
$$\frac{vd}{d} = \frac{m}{d}$$
$$v = \frac{m}{d}$$

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42. $A = \dfrac{\pi r^2 S}{360}$

$360A = 360 \cdot \dfrac{\pi r^2 S}{360}$

$360A = \pi r^2 S$

$\dfrac{360A}{\pi S} = \dfrac{\pi r^2 S}{\pi S}$

$\dfrac{360A}{\pi S} = r^2$

44. $d = \dfrac{N-F}{n-1}$, $F = 6$, $n = 3$, $N = 24$

$d = \dfrac{24-6}{3-1} = \dfrac{18}{2} = 9$

The difference is 9.

46. $H = \dfrac{V}{LW}$, $V = 3024$, $W = 14$, $L = 18$

$H = \dfrac{3024}{(18)(14)} = 12$

The height of the tank is 12 inches.

48. a. $V = 1709x + 31{,}560$

$V - 31{,}560 = 1709x$

$\dfrac{V - 31{,}560}{1709} = x$

b. $V = 50{,}359$

$x = \dfrac{50{,}359 - 31{,}560}{1709}$

$x = \dfrac{18{,}799}{1709}$

$x = 11$

2009 + 11 = 2020

The year is 2020.

50. $A = \dfrac{1}{2}ab$, $a \to 2a$ and $b \to 2b$

$A \to \dfrac{1}{2}(2a)(2b) = 4A$

A quadruples.

52. $A = \pi r^2$

If $r \to \dfrac{r}{2}$, $A \to \pi\left(\dfrac{r}{2}\right)^2 = \dfrac{\pi r^2}{4} = \dfrac{A}{4}$

A is one-fourth of its original value.

Cumulative Review

53. 20% of \$80 = $0.20 \times \$80 = \$16$

54. 0.5% of 200 = $0.005 \times 200 = 1$

55. $\left(3\dfrac{1}{4}\right)(12{,}000) = \dfrac{13}{4}(12{,}000)$

$= 39{,}000$

The company needs 39,000 square feet of plastic.

56. $\text{Total} = 4\dfrac{1}{3} + 2\dfrac{3}{4} + 3\dfrac{1}{2}$

$= \dfrac{13}{3} + \dfrac{11}{4} + \dfrac{7}{2}$

$= \dfrac{52}{12} + \dfrac{33}{12} + \dfrac{42}{12}$

$= \dfrac{127}{12}$

$= 10\dfrac{7}{12}$

The spotlight was used $10\dfrac{7}{12}$ hours.

Classroom Quiz 2.5

1. $A = 4x + 5y$

$A - 4x = 5y$

$\dfrac{A - 4x}{5} = \dfrac{5y}{5}$

$\dfrac{A - 4x}{5} = y$

2. $A = \dfrac{1}{4}h(a+b)$

$A = \dfrac{1}{4}ha + \dfrac{1}{4}hb$

$4(A) = 4\left(\dfrac{1}{4}ha\right) + 4\left(\dfrac{1}{4}hb\right)$

$4A = ha + hb$

$4A - ha = hb$

$\dfrac{4A - ha}{h} = \dfrac{hb}{h}$

$\dfrac{4A - ha}{h} = b$

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3. $4ax = 2axy - 3$
$4ax + 3 = 2axy$
$\frac{4ax+3}{2ax} = \frac{2axy}{2ax}$
$\frac{4ax+3}{2ax} = y$

2.6 Exercises

2. $-8 < -3$ is equivalent to $-3 > -8$. Both statements imply that -3 is to the right of -8 on a number line.

4. $-10 \; ? \; 6$
Use <, since -10 is to the left of 6 on a number line.
$-10 < 6$

6. $-8 \; ? \; 0$
Use <, since -8 is to the left of 0 on a number line.
$-8 < 0$

8. $-5 \; ? \; -8$
Use >, since -5 is to the right of -8 on a number line.
$-5 > -8$

10. a. $-5 \; ? \; 11$
Use <, since -5 is to the left of 11 on a number line.
$-5 < 11$

b. $11 \; ? \; -5$
From part a, $11 > -5$ since $-5 < 11$ is equivalent to $11 > -5$.

12. a. $-17 \; ? \; 17$
Use <, since -17 is to the left of 17 on a number line.
$-17 < 17$

b. $17 \; ? \; -17$
From part a, $17 > -17$ since $-17 < 17$ is equivalent to $17 > -17$.

14. $\frac{4}{6} \; ? \; \frac{7}{9}$
$\frac{12}{18} \; ? \; \frac{14}{18}$
Use <, since $12 < 14$.
$\frac{4}{6} < \frac{7}{9}$

16. $\frac{9}{11} \; ? \; \frac{41}{53}$
$\frac{477}{583} \; ? \; \frac{451}{583}$
Use >, since 477 is to the right of 451 on a number line.
$\frac{9}{11} > \frac{41}{53}$

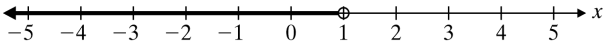
18. $-4.2 \; ? \; -7.3$
Use >, since -4.2 is to the right of -7.3 on a number line.
$-4.2 > -7.3$

20. $-3.7 \; ? \; 3.7$
Use <, since -3.7 is to the left of 3.7 on a number line.
$-3.7 < 3.7$

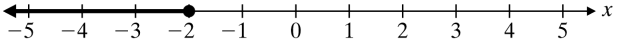
22. $-5 \; ? \; -\frac{29}{4}$
$-\frac{20}{4} \; ? \; -\frac{29}{4}$
Use >, since $-20 > -29$.
$-5 > -\frac{29}{4}$

24. $-\frac{2}{3} \; ? \; -\frac{1}{2}$
$-\frac{4}{6} \; ? \; -\frac{3}{6}$
Use <, since $-4 < -3$.
$-\frac{2}{3} < -\frac{1}{2}$

26. $x < 1$
x is less than 1. All of the points to the left of 1 are shaded.



28. $x \le -2$
x is less than or equal to -2. All of the points to the left of -2 are shaded. The closed circle indicates that we do include the point for -2.

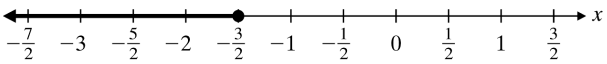


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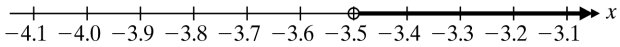
30. $x \le -\frac{3}{2}$

x is less than or equal to $-\frac{3}{2}$. All of the points to the left of $-\frac{3}{2}$ are shaded. The closed circle indicates that we do include the point for $-\frac{3}{2}$.



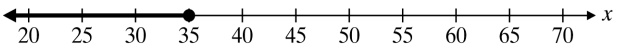
32. $x > -3.5$

x is greater than −3.5. All of the points to the right of −3.5 are shaded.



34. $35 \ge x$

35 is greater than or equal to x is equivalent to x is less than or equal to 35. All of the points to the left of 35 are shaded. The closed circle indicates that we do include the point for 35.



36. x is greater than −4.5.

$x > -4.5$

38. x is less than or equal to $\frac{5}{2}$.

$x \le \frac{5}{2}$

40. x is greater than −10.

$x > -10$

42. Since the BMI measurement is smaller than 18.5, we have $B < 18.5$.

44. Since the weight must not exceed 126 pounds, the weight must be less than or equal to 126 pounds, so we have $w \le 126$.

46. $x < 4, x > -4, x \le \frac{7}{2}, x \ge -\frac{9}{2}$

x is less than 4.

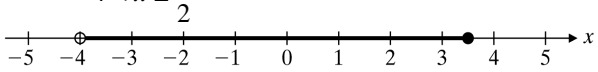
x is greater than −4.

x is less than or equal to $\frac{7}{2}$.

x is greater than or equal to $-\frac{9}{2}$.

Since $\frac{7}{2} = 3.5$ is less than 4, x must be less than or equal to $\frac{7}{2}$. Since −4 is greater than $-\frac{9}{2} = -4.5$, x must be greater than −4.

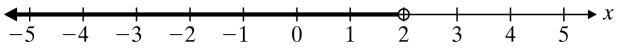
$-4 < x \le \frac{7}{2}$



48. $x - 5 < -3$

$x - 5 + 5 < -3 + 5$

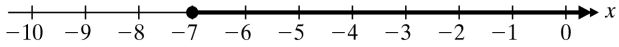
$x < 2$



50. $6x \ge -42$

$\frac{6x}{6} \ge \frac{-42}{6}$

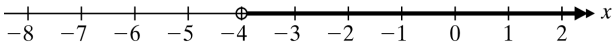
$x \ge -7$



52. $-7x < 28$

$\frac{-7x}{-7} > \frac{28}{-7}$

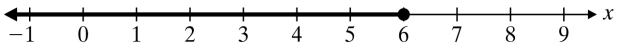
$x > -4$



54. $\frac{1}{3}x \le 2$

$3\left(\frac{1}{3}x\right) \le 3(2)$

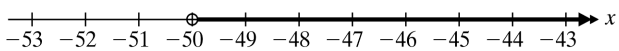
$x \le 6$



56. $-\frac{1}{5}x < 10$

$-5\left(-\frac{1}{5}x\right) > -5(10)$

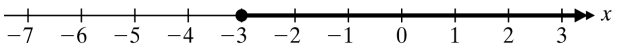
$x > -50$



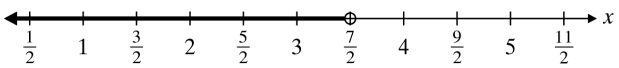
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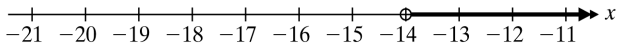
58.
$$\begin{aligned} 9-4x &\le 21 \\ 9-4x-9 &\le 21-9 \\ -4x &\le 12 \\ \frac{-4x}{-4} &\ge \frac{12}{-4} \\ x &\ge -3 \end{aligned}$$



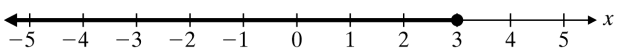
60.
$$\begin{aligned} -6-4x &< 1-6x \\ -6-4x+6x &< 1-6x+6x \\ -6+2x &< 1 \\ -6+2x+6 &< 1+6 \\ 2x &< 7 \\ \frac{2x}{2} &< \frac{7}{2} \\ x &< \frac{7}{2} \end{aligned}$$



62.
$$\begin{aligned} \frac{x}{4}-2 &< \frac{3x}{4}+5 \\ 4\left(\frac{x}{4}\right)-4(2) &< 4\left(\frac{3x}{4}\right)+4(5) \\ x-8 &< 3x+20 \\ x-8-3x &< 3x+20-3x \\ -2x-8 &< 20 \\ -2x-8+8 &< 20+8 \\ -2x &< 28 \\ \frac{-2x}{-2} &> \frac{28}{-2} \\ x &> -14 \end{aligned}$$



64.
$$\begin{aligned} 5(x-3) &\le 2(x-3) \\ 5x-15 &\le 2x-6 \\ 5x-15-2x &\le 2x-6-2x \\ 3x-15 &\le -6 \\ 3x-15+15 &\le -6+15 \\ 3x &\le 9 \\ \frac{3x}{3} &\le \frac{9}{3} \\ x &\le 3 \end{aligned}$$



66.
$$\begin{aligned} -21 &> -29 \\ \frac{-21}{-3} &< \frac{-29}{-3} \\ 7 &< \frac{29}{3} \end{aligned}$$

Dividing both sides of an inequality by a negative number reverses the direction of the inequality.

68.
$$\begin{aligned} 7x+8 &< 12x-2 \\ 7x+8-12x &< 12x-2-12x \\ -5x+8 &< -2 \\ -5x+8-8 &< -2-8 \\ -5x &< -10 \\ \frac{-5x}{-5} &> \frac{-10}{-5} \\ x &> 2 \end{aligned}$$

70.
$$\begin{aligned} 9x-8 &\le 7x+4 \\ 9x-8-7x &\le 7x+4-7x \\ 2x-8 &\le 4 \\ 2x-8+8 &\le 4+8 \\ 2x &\le 12 \\ \frac{2x}{2} &\le \frac{12}{2} \\ x &\le 6 \end{aligned}$$

72.
$$\begin{aligned} 0.4(2-x)+0.6 &> 0.2(x-2) \\ 0.8-0.4x+0.6 &> 0.2x-0.4 \\ 1.4-0.4x &> 0.2x-0.4 \\ 10(1.4)-10(0.4x) &> 10(0.2x)-10(0.4) \\ 14-4x &> 2x-4 \\ 14-4x-2x &> 2x-4-2x \\ 14-6x &> -4 \\ 14-6x-14 &> -4-14 \\ -6x &> -18 \\ \frac{-6x}{-6} &< \frac{-18}{-6} \\ x &< 3 \end{aligned}$$

74.
$$\begin{aligned} 9-3(2x-1) &\le 4(x+2) \\ 9-6x+3 &\le 4x+8 \\ 12-6x &\le 4x+8 \\ 12-6x-4x &\le 4x+8-4x \\ 12-10x &\le 8 \\ 12-10x-12 &\le 8-12 \\ -10x &\le -4 \\ \frac{-10x}{-10} &\ge \frac{-4}{-10} \\ x &\ge \frac{2}{5} \end{aligned}$$

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76.
$$\frac{3x+5}{4}-\frac{7}{12}>-\frac{x}{6}$$
$$12\left(\frac{3x+5}{4}\right)-12\left(\frac{7}{12}\right)>12\left(-\frac{x}{6}\right)$$
$$3(3x+5)-7>-2x$$
$$9x+15-7>-2x$$
$$9x+8>-2x$$
$$9x+8-9x>-2x-9x$$
$$8>-11x$$
$$\frac{8}{-11}<\frac{-11x}{-11}$$
$$-\frac{8}{11}<x$$
$$x>-\frac{8}{11}$$

78. x = amount of sales
$$0.08x>10{,}000$$
$$\frac{0.08x}{0.08}>\frac{10{,}000}{0.08}$$
$$x>125{,}000$$
She must have more than \$125,000 in sales.

80.
$$600+260x\geq 4500$$
$$260x\geq 3900$$
$$x\geq\frac{3900}{260}$$
$$x\geq 15$$
It will take 15 months.

Cumulative Review

81. 16% of 38 = $0.16\times 38 = 6.08$

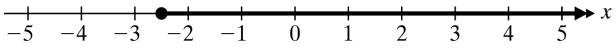
82. 18 is what percent of 120?
$$\frac{18}{120}=\frac{3}{20}=0.15=15\%$$

83. 16 is what percent of 800?
$$\frac{16}{800}=0.02=2\%$$
2% are accepted.

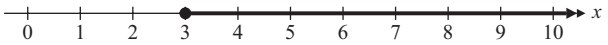
84. $\frac{3}{8}=0.375=37.5\%$

Classroom Quiz 2.6

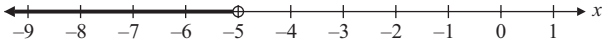
1. $x\geq -2.5$
x is greater than or equal to −2.5. All of the points to the right of −2.5 are shaded. The closed circle indicates that we do include the point for −2.5.



2.
$$-9+6x\geq 3x$$
$$-9+6x-6x\geq 3x-6x$$
$$-9\geq -3x$$
$$\frac{-9}{-3}\leq\frac{-3x}{-3}$$
$$3\leq x$$
$$x\geq 3$$



3.
$$\frac{x}{5}-2>\frac{4}{5}x+1$$
$$5\left(\frac{x}{5}\right)-5(2)>5\left(\frac{4}{5}x\right)+5(1)$$
$$x-10>4x+5$$
$$x-10-4x>4x+5-4x$$
$$-3x-10>5$$
$$-3x-10+10>5+10$$
$$-3x>15$$
$$\frac{-3x}{-3}<\frac{15}{-3}$$
$$x<-5$$



Career Exploration Problems

1. Solve for W
$$\text{BMR}=10W+6.25H-5A+5$$
$$\text{BMR}-6.25H+5A-5=10W$$
$$\frac{\text{BMR}-6.25H+5A-5}{10}=W$$
Solve for H.
$$\text{BMR}=10W+6.25H-5A+5$$
$$\text{BMR}-10W+5A-5=6.25H$$
$$\frac{\text{BMR}-10W+5A-5}{6.25}=H$$

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2. IBW = 106 lb + 6 (the number of inches over 5 feet tall)

$$\begin{aligned} 190 &= 106 + 6(x - 60) \\ 190 &= 106 + 6x - 360 \\ 190 &= 6x - 254 \\ 444 &= 6x \\ 74 &= x \end{aligned}$$

The male's height is 74 inches or 6 feet 2 inches.

3. IBW = 100 lb + 5 (the number of inches over 5 feet tall)

$$\begin{aligned} &= 100 + 5(5) \\ &= 100 + 25 \\ &= 125 \end{aligned}$$

Her ideal weight is 125 pounds.

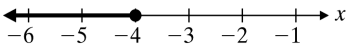
You Try It

1.
$$\begin{aligned} -8x - 1 + x &= 13 - 6x - 2 \\ -7x - 1 &= -6x + 11 \\ -7x - 1 + 6x &= -6x + 11 + 6x \\ -x - 1 &= 11 \\ -x - 1 + 1 &= 11 + 1 \\ -x &= 12 \\ \frac{-x}{-1} &= \frac{12}{-1} \\ x &= -12 \end{aligned}$$

2.
$$\begin{aligned} \frac{1}{3}(y + 5) &= \frac{1}{4}(5y - 8) \\ \frac{1}{3}y + \frac{5}{3} &= \frac{5}{4}y - 2 \\ 12\left(\frac{1}{3}y\right) + 12\left(\frac{5}{3}\right) &= 12\left(\frac{5}{4}y\right) - 12(2) \\ 4y + 20 &= 15y - 24 \\ 4y + 20 - 15y &= 15y - 24 - 15y \\ -11y + 20 &= -24 \\ -11y + 20 - 20 &= -24 - 20 \\ -11y &= -44 \\ \frac{-11y}{-11} &= \frac{-44}{-11} \\ y &= 4 \end{aligned}$$

3.
$$\begin{aligned} H &= \frac{1}{4}(ca + b) \\ H &= \frac{1}{4}ca + \frac{1}{4}b \\ 4(H) &= 4\left(\frac{1}{4}ca\right) + 4\left(\frac{1}{4}b\right) \\ 4H &= ca + b \\ 4H - b &= ca \\ \frac{4H - b}{c} &= a \\ a &= \frac{4H - b}{c} \end{aligned}$$

4.
$$\begin{aligned} 4 + 3x - 5 &\geq \frac{1}{3}(10x + 1) \\ 3x - 1 &\geq \frac{10}{3}x + \frac{1}{3} \\ 3(3x) - 3(1) &\geq 3\left(\frac{10}{3}x\right) + 3\left(\frac{1}{3}\right) \\ 9x - 3 &\geq 10x + 1 \\ 9x - 3 - 10x &\geq 10x + 1 - 10x \\ -x - 3 &\geq 1 \\ -x - 3 + 3 &\geq 1 + 3 \\ -x &\geq 4 \\ \frac{-x}{-1} &\leq \frac{4}{-1} \\ x &\leq -4 \end{aligned}$$



Chapter 2 Review Problems

1.
$$\begin{aligned} 3x + 2x &= -35 \\ 5x &= -35 \\ \frac{5x}{5} &= \frac{-35}{5} \\ x &= -7 \end{aligned}$$

2.
$$\begin{aligned} x - 19 &= -29 + 7 \\ x - 19 &= -22 \\ x - 19 + 19 &= -22 + 19 \\ x &= -3 \end{aligned}$$

3.
$$\begin{aligned} 18 - 10x &= 63 + 5x \\ 18 - 10x + 10x &= 63 + 5x + 10x \\ 18 &= 63 + 15x \\ 18 - 63 &= 63 - 63 + 15x \\ -45 &= 15x \\ \frac{-45}{15} &= \frac{15x}{15} \\ -3 &= x \end{aligned}$$

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4.
$$\begin{aligned} x-(0.5x+2.6)&=17.6\\ x-0.5x-2.6&=17.6\\ 0.5x-2.6&=17.6\\ 10(0.5x)-10(2.6)&=10(17.6)\\ 5x-26&=176\\ 5x-26+26&=176+26\\ 5x&=202\\ \frac{5x}{5}&=\frac{202}{5}\\ x&=40.4 \text{ or } 40\frac{2}{5}\end{aligned}$$

5.
$$\begin{aligned} 3(x-2)&=-4(5+x)\\ 3x-6&=-20-4x\\ 3x+4x-6&=-20-4x+4x\\ 7x-6&=-20\\ 7x-6+6&=-20+6\\ 7x&=-14\\ \frac{7x}{7}&=\frac{-14}{7}\\ x&=-2\end{aligned}$$

6.
$$\begin{aligned} 12-5x&=-7x-2\\ 12-5x+7x&=-7x+7x-2\\ 12+2x&=-2\\ 12-12+2x&=-2-12\\ 2x&=-14\\ \frac{2x}{2}&=\frac{-14}{2}\\ x&=-7\end{aligned}$$

7.
$$\begin{aligned} 2(3-x)&=1-(x-2)\\ 6-2x&=1-x+2\\ 6-2x+x&=3-x+x\\ 6-x&=3\\ 6+(-6)-x&=3+(-6)\\ -x&=-3\\ \frac{-x}{-1}&=\frac{-3}{-1}\\ x&=3\end{aligned}$$

8.
$$\begin{aligned} 4(x+5)-7&=2(x+3)\\ 4x+20-7&=2x+6\\ 4x+13&=2x+6\\ 4x+13-13&=2x+6-13\\ 4x&=2x-7\\ -2x+4x&=-2x+2x-7\\ 2x&=-7\\ \frac{2x}{2}&=\frac{-7}{2}\\ x&=-\frac{7}{2} \text{ or } -3\frac{1}{2} \text{ or } -3.5\end{aligned}$$

9.
$$\begin{aligned} 3&=2x+5-3(x-1)\\ 3&=2x+5-3x+3\\ 3&=-x+8\\ 3+(-8)&=-x+8+(-8)\\ -5&=-x\\ \frac{-5}{-1}&=\frac{-x}{-1}\\ 5&=x\end{aligned}$$

10.
$$\begin{aligned} 2(5x-1)-7&=3(x-1)+5-4x\\ 10x-2-7&=3x-3+5-4x\\ 10x-9&=-x+2\\ 10x+x-9&=-x+x+2\\ 11x-9&=2\\ 11x-9+9&=2+9\\ 11x&=11\\ \frac{11x}{11}&=\frac{11}{11}\\ x&=1\end{aligned}$$

11.
$$\begin{aligned} \frac{3}{4}x-3&=\frac{1}{2}x+2\\ 4\left(\frac{3}{4}x\right)-4(3)&=4\left(\frac{1}{2}x\right)+4(2)\\ 3x-12&=2x+8\\ 3x-12+12&=2x+8+12\\ 3x&=2x+20\\ -2x+3x&=-2x+2x+20\\ x&=20\end{aligned}$$

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12.
$$1=\frac{5x}{6}+\frac{2x}{3}$$
$$6(1)=6\left(\frac{5x}{6}\right)+6\left(\frac{2x}{3}\right)$$
$$6=5x+4x$$
$$6=9x$$
$$\frac{6}{9}=\frac{9x}{9}$$
$$\frac{2}{3}=x$$

13.
$$\frac{7x}{5}=5+\frac{2x}{5}$$
$$5\left(\frac{7x}{5}\right)=5(5)+5\left(+\frac{2x}{5}\right)$$
$$7x=25+2x$$
$$7x-2x=25+2x-2x$$
$$5x=25$$
$$\frac{5x}{5}=\frac{25}{5}$$
$$x=5$$

14.
$$\frac{7x-3}{2}-4=\frac{5x+1}{3}$$
$$6\left(\frac{7x-3}{2}\right)-6(4)=6\left(\frac{5x+1}{3}\right)$$
$$3(7x-3)-24=2(5x+1)$$
$$21x-9-24=10x+2$$
$$21x-33=10x+2$$
$$21x+(-10x)-33=10x+(-10x)+2$$
$$11x-33=2$$
$$11x-33+33=2+33$$
$$11x=35$$
$$\frac{11x}{11}=\frac{35}{11}$$
$$x=\frac{35}{11}\text{ or }3\frac{2}{11}$$

15.
$$\frac{3x-2}{2}+\frac{x}{4}=2+x$$
$$4\left(\frac{3x-2}{2}\right)+4\left(\frac{x}{4}\right)=4(2)+4(x)$$
$$2(3x-2)+x=8+4x$$
$$6x-4+x=8+4x$$
$$7x-4=4x+8$$
$$7x-4+4=4x+8+4$$
$$7x=4x+12$$
$$-4x+7x=-4x+4x+12$$
$$3x=12$$
$$\frac{3x}{3}=\frac{12}{3}$$
$$x=4$$

16.
$$\frac{-3}{2}(x+5)=1-x$$
$$-\frac{3}{2}x-\frac{15}{2}=1-x$$
$$2\left(-\frac{3}{2}x\right)-2\left(\frac{15}{2}\right)=2(1)-2(x)$$
$$-3x-15=2-2x$$
$$-3x+3x-15=2-2x+3x$$
$$-15=2+x$$
$$-15+(-2)=2+(-2)+x$$
$$-17=x$$

17.
$$-0.2(x+1)=0.3(x+11)$$
$$10[-0.2(x+1)]=10[0.3(x+11)]$$
$$-2(x+1)=3(x+11)$$
$$-2x-2=3x+33$$
$$-2x-2-33=3x+33-33$$
$$-2x-35=3x$$
$$2x-2x-35=2x+3x$$
$$-35=5x$$
$$\frac{-35}{5}=\frac{5x}{5}$$
$$-7=x$$

18.
$$1.2x-0.8=0.8x+0.4$$
$$1.2x-0.8-0.8x=0.8x+0.4-0.8x$$
$$0.4x-0.8=0.4$$
$$0.4x-0.8+0.8=0.4+0.8$$
$$0.4x=1.2$$
$$\frac{0.4x}{0.4}=\frac{1.2}{0.4}$$
$$x=3$$

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19.
$$3.2-0.6x=0.4(x-2)$$
$$3.2-0.6x=0.4x-0.8$$
$$3.2-0.6x+0.6x=0.4x-0.8+0.6x$$
$$3.2=x-0.8$$
$$3.2+0.8=x-0.8+0.8$$
$$4=x$$

20.
$$\frac{1}{3}(x-2)=\frac{x}{4}+2$$
$$\frac{1}{3}x-\frac{2}{3}=\frac{x}{4}+2$$
$$12\left(\frac{1}{3}x\right)-12\left(\frac{2}{3}\right)=12\left(\frac{x}{4}\right)+12(2)$$
$$4x-8=3x+24$$
$$4x+(-3x)-8=3x+(-3x)+24$$
$$x-8=24$$
$$x-8+8=24+8$$
$$x=32$$

21.
$$\frac{3}{4}-\frac{2}{3}x=\frac{1}{3}x+\frac{3}{4}$$
$$12\left(\frac{3}{4}\right)-12\left(\frac{2}{3}x\right)=12\left(\frac{1}{3}x\right)+12\left(\frac{3}{4}\right)$$
$$9-8x=4x+9$$
$$9-8x+8x=4x+9+8x$$
$$9=12x+9$$
$$9-9=12x+9-9$$
$$0=12x$$
$$\frac{0}{12}=\frac{12x}{12}$$
$$0=x$$

22.
$$-\frac{8}{3}x-8+2x-5=-\frac{5}{3}$$
$$-\frac{8}{3}x-13+2x=-\frac{5}{3}$$
$$3\left(-\frac{8}{3}x\right)-3(13)+3(2x)=3\left(-\frac{5}{3}\right)$$
$$-8x-39+6x=-5$$
$$-2x-39=-5$$
$$-2x-39+39=-5+39$$
$$-2x=34$$
$$\frac{-2x}{-2}=\frac{34}{-2}$$
$$x=-17$$

23.
$$\frac{1}{6}+\frac{1}{3}(x-3)=\frac{1}{2}(x+9)$$
$$\frac{1}{6}+\frac{1}{3}x-1=\frac{1}{2}x+\frac{9}{2}$$
$$\frac{1}{3}x-\frac{5}{6}=\frac{1}{2}x+\frac{9}{2}$$
$$6\left(\frac{1}{3}x\right)-6\left(\frac{5}{6}\right)=6\left(\frac{1}{2}x\right)+6\left(\frac{9}{2}\right)$$
$$2x-5=3x+27$$
$$2x-2x-5=3x-2x+27$$
$$-5=x+27$$
$$-5-27=x+27-27$$
$$-32=x$$

24.
$$\frac{1}{7}(x+5)-\frac{3}{7}=\frac{1}{2}(x+3)$$
$$\frac{1}{7}x+\frac{5}{7}-\frac{3}{7}=\frac{1}{2}x+\frac{3}{2}$$
$$\frac{1}{7}x+\frac{2}{7}=\frac{1}{2}x+\frac{3}{2}$$
$$14\left(\frac{1}{7}x\right)+14\left(\frac{2}{7}\right)=14\left(\frac{1}{2}x\right)+14\left(\frac{3}{2}\right)$$
$$2x+4=7x+21$$
$$2x-2x+4=7x-2x+21$$
$$4=5x+21$$
$$4-21=5x+21-21$$
$$-17=5x$$
$$\frac{-17}{5}=\frac{5x}{5}$$
$$-\frac{17}{5}=x \text{ or } x=-3.4$$

25.
$$3x-y=10$$
$$3x+(-3x)-y=-3x+10$$
$$-y=-3x+10$$
$$\frac{-y}{-1}=\frac{-3x+10}{-1}$$
$$y=3x-10$$

26.
$$5x+2y+7=0$$
$$5x+2y=-7$$
$$2y=-5x-7$$
$$y=\frac{-5x-7}{2}$$

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27.
$$A = P(1+rt)$$
$$A = P + Prt$$
$$A + (-P) = P + (-P) + Prt$$
$$A - P = Prt$$
$$\frac{A-P}{Pt} = \frac{Prt}{Pt}$$
$$\frac{A-P}{Pt} = r$$

28.
$$A = 4\pi r^2 + 2\pi rh$$
$$A - 4\pi r^2 = 2\pi rh$$
$$\frac{A-4\pi r^2}{2\pi r} = \frac{2\pi rh}{2\pi r}$$
$$\frac{A-4\pi r^2}{2\pi r} = h$$
$$h = \frac{A-4\pi r^2}{2\pi r}$$

29.
$$H = \frac{1}{3}(a+2p+3)$$
$$H = \frac{1}{3}a + \frac{2}{3}p + 1$$
$$3(H) = 3\left(\frac{1}{3}a\right) + 3\left(\frac{2}{3}p\right) + 3(1)$$
$$3H = a + 2p + 3$$
$$3H + (-a) + (-3) = a + (-a) + 2p + 3 + (-3)$$
$$3H - a - 3 = 2p$$
$$\frac{3H-a-3}{2} = \frac{2p}{2}$$
$$\frac{3H-a-3}{2} = p$$
$$p = \frac{3H-a-3}{2}$$

30.
$$ax + by = c$$
$$ax - ax + by = c - ax$$
$$by = c - ax$$
$$\frac{by}{b} = \frac{c-ax}{b}$$
$$y = \frac{c-ax}{b}$$

31. a.
$$x = \frac{ABC}{10}$$
$$10(x) = 10\left(\frac{ABC}{10}\right)$$
$$10x = ABC$$
$$\frac{10x}{BC} = \frac{ABC}{BC}$$
$$\frac{10x}{BC} = A$$

b.
$$A = \frac{10x}{BC} = \frac{10(6)}{(-1)(1.5)} = \frac{60}{-1.5} = -40$$

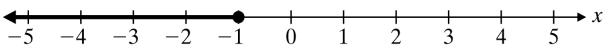
32. a.
$$2l + 2w = P$$
$$2w = P - 2l$$
$$\frac{2w}{2} = \frac{P-2l}{2}$$
$$w = \frac{P-2l}{2}$$

b.
$$w = \frac{P-2l}{2}$$
$$= \frac{34-2(10.5)}{2}$$
$$= \frac{34-21}{2}$$
$$= \frac{13}{2}$$
$$= 6.5$$

33. a.
$$V = lwh$$
$$\frac{V}{lw} = \frac{lwh}{lw}$$
$$\frac{V}{lw} = h$$

b. $V = 48$, $l = 2$, $w = 4$
$$h = \frac{48}{2(4)} = 6$$

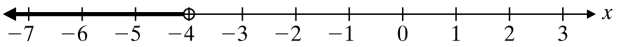
34.
$$9 + 2x \le 6 - x$$
$$9 + 2x + x \le 6 - x + x$$
$$9 + 3x \le 6$$
$$9 + 3x - 9 \le 6 - 9$$
$$3x \le -3$$
$$\frac{3x}{3} \le \frac{-3}{3}$$
$$x \le -1$$



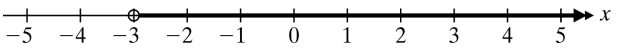
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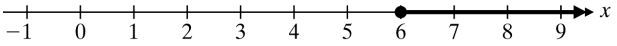
35. $2x-3+x>5(x+1)$
$3x-3>5x+5$
$3x-3-5x>5x+5-5x$
$-2x-3>5$
$-2x-3+3>5+3$
$-2x>8$
$\frac{-2x}{-2}<\frac{8}{-2}$
$x<-4$



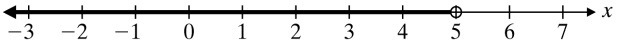
36. $-x+4<3x+16$
$-x+4-4<3x+16-4$
$-x<3x+12$
$-3x-x<-3x+3x+12$
$-4x<12$
$\frac{-4x}{-4}>\frac{12}{-4}$
$x>-3$



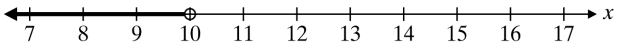
37. $8-\frac{1}{3}x\le x$
$3(8)-3\left(\frac{1}{3}x\right)\le 3x$
$24-x\le 3x$
$24-x+(-3x)\le 3x+(-3x)$
$24-4x\le 0$
$24+(-24)-4x\le 0+(-24)$
$-4x\le -24$
$\frac{-4x}{-4}\ge\frac{-24}{-4}$
$x\ge 6$



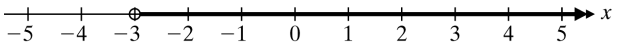
38. $7-\frac{3}{5}x>4$
$5(7)-5\left(\frac{3}{5}x\right)>5(4)$
$35-3x>20$
$35+(-35)-3x>20+(-35)$
$-3x>-15$
$\frac{-3x}{-3}<\frac{-15}{-3}$
$x<5$



39. $-4x-14<4-2(3x-1)$
$-4x-14<4-6x+2$
$-4x-14<6-6x$
$-4x-14+6x<6-6x+6x$
$2x-14<6$
$2x-14+14<6+14$
$2x<20$
$\frac{2x}{2}<\frac{20}{2}$
$x<10$



40. $3(x-2)+8<7x+14$
$3x-6+8<7x+14$
$3x+2<7x+14$
$3x-2+2<7x+14-2$
$3x<7x+12$
$-7x+3x<-7x+7x+12$
$-4x<12$
$\frac{-4x}{-4}>\frac{12}{-4}$
$x>-3$



41. $15h\le 480$
$\frac{15h}{15}\le\frac{480}{15}$
$h\le 32$
Julian can work a maximum of 32 hours.

42. $110n\le 2420$
$\frac{110n}{110}\le\frac{2420}{110}$
$n\le 22$
A substitute teacher can be hired a maximum of 22 times.

43. $10(2x+4)-13=8(x+7)-3$
$20x+40-13=8x+56-3$
$20x+27=8x+53$
$20x+27-8x=8x+53-8x$
$12x+27=53$
$12x+27-27=53-27$
$12x=26$
$\frac{12x}{12}=\frac{26}{12}$
$x=\frac{13}{6}$

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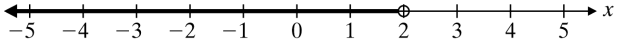
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44.
$$\begin{aligned} -9x+15-2x &= 4-3x \\ -11x+15 &= 4-3x \\ -11x+15+3x &= 4-3x+3x \\ -8x+15 &= 4 \\ -8x+15-15 &= 4-15 \\ -8x &= -11 \\ \frac{-8x}{-8} &= \frac{-11}{-8} \\ x &= \frac{11}{8} \end{aligned}$$

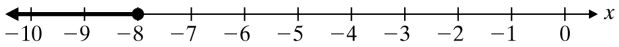
45.
$$\begin{aligned} -2(x-3) &= -4x+3(3x+2) \\ -2x+6 &= -4x+9x+6 \\ -2x+6 &= 5x+6 \\ -2x+6-6 &= 5x+6-6 \\ -2x &= 5x \\ 2x-2x &= 2x+5x \\ 0 &= 7x \\ \frac{0}{7} &= \frac{7x}{7} \\ 0 &= x \end{aligned}$$

46.
$$\begin{aligned} \frac{1}{2}+\frac{5}{4}x &= \frac{2}{5}x-\frac{1}{10}+4 \\ 20\left(\frac{1}{2}\right)+20\left(\frac{5}{4}x\right) &= 20\left(\frac{2}{5}x\right)-20\left(\frac{1}{10}\right)+20(4) \\ 10+25x &= 8x-2+80 \\ 10+25x &= 8x+78 \\ 10+25x+(-8x) &= 8x+(-8x)+78 \\ 10+17x &= 78 \\ 10+(-10)+17x &= 78+(-10) \\ 17x &= 68 \\ \frac{17x}{17} &= \frac{68}{17} \\ x &= 4 \end{aligned}$$

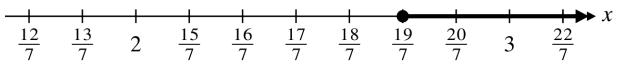
47.
$$\begin{aligned} 5-\frac{1}{2}x &> 4 \\ 2(5)-2\left(\frac{1}{2}x\right) &> 2(4) \\ 10-x &> 8 \\ -10+10-x &> -10+8 \\ -x &> -2 \\ \frac{-x}{-1} &< \frac{-2}{-1} \\ x &< 2 \end{aligned}$$



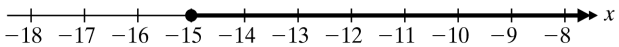
48.
$$\begin{aligned} 2(x-1) &\geq 3(2+x) \\ 2x-2 &\geq 6+3x \\ 2x-2-3x &> 6+3x-3x \\ -x-2 &\geq 6 \\ -x-2+2 &\geq 6+2 \\ -x &\geq 8 \\ x &\leq -8 \end{aligned}$$



49.
$$\begin{aligned} \frac{1}{3}(x+2) &\leq \frac{1}{2}(3x-5) \\ \frac{1}{3}x+\frac{2}{3} &\leq \frac{3}{2}x-\frac{5}{2} \\ 6\left(\frac{1}{3}x\right)+6\left(\frac{2}{3}\right) &\leq 6\left(\frac{3}{2}x\right)-6\left(\frac{5}{2}\right) \\ 2x+4 &\leq 9x-15 \\ 2x+4+15 &\leq 9x-15+15 \\ 2x+19 &\leq 9x \\ -2x+2x+19 &\leq -2x+9x \\ 19 &\leq 7x \\ \frac{19}{7} &\leq \frac{7x}{7} \\ \frac{19}{7} &\leq x \text{ or } x \geq \frac{19}{7} \end{aligned}$$



50.
$$\begin{aligned} 4(2-x)-(-5x+1) &\geq -8 \\ 8-4x+5x-1 &\geq -8 \\ x+7 &\geq -8 \\ x+7-7 &\geq -8-7 \\ x &\geq -15 \end{aligned}$$



How Am I Doing? Chapter 2 Test

1.
$$\begin{aligned} 3x+5.6 &= 11.6 \\ 3x+5.6-5.6 &= 11.6-5.6 \\ 3x &= 6 \\ \frac{3x}{3} &= \frac{6}{3} \\ x &= 2 \end{aligned}$$

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2.
$$\begin{aligned} 9x-8&=-6x-3\\ 9x+6x-8&=-6x+6x-3\\ 15x-8&=-3\\ 15x-8+8&=-3+8\\ 15x&=5\\ \frac{15x}{15}&=\frac{5}{15}\\ x&=\frac{1}{3}\end{aligned}$$

3.
$$\begin{aligned} 2(2y-3)&=4(2y+2)\\ 4y-6&=8y+8\\ 4y-6+6&=8y+8+6\\ 4y&=8y+14\\ -8y+4y&=-8y+8y+14\\ -4y&=14\\ \frac{-4y}{-4}&=\frac{14}{-4}\\ y&=-\frac{7}{2} \text{ or } -3\frac{1}{2} \text{ or } -3.5\end{aligned}$$

4.
$$\begin{aligned} \frac{1}{7}y+3&=\frac{1}{2}y\\ 14\left(\frac{1}{7}y\right)+14(3)&=14\left(\frac{1}{2}y\right)\\ 2y+42&=7y\\ 2y-2y+42&=7y-2y\\ 42&=5y\\ \frac{42}{5}&=\frac{5y}{5}\\ y&=\frac{42}{5} \text{ or } y=8\frac{2}{5} \text{ or } y=8.4\end{aligned}$$

5.
$$\begin{aligned} 4(7-4x)&=3(6-2x)\\ 28-16x&=18-6x\\ 28-16x+6x&=18-6x+6x\\ 28-10x&=18\\ 28+(-28)-10x&=18+(-28)\\ -10x&=-10\\ \frac{-10x}{-10}&=\frac{-10}{-10}\\ x&=1\end{aligned}$$

6.
$$\begin{aligned} 0.8x+0.18-0.4x&=0.3(x+0.2)\\ 0.4x+0.18&=0.3x+0.06\\ 100(0.4x)+100(0.18)&=100(0.3x)+100(0.06)\\ 40x+18&=30x+6\\ 40x+18-18&=30x+6-18\\ 40x&=30x-12\\ -30x+40x&=-30x+30x-12\\ 10x&=-12\\ \frac{10x}{10}&=\frac{-12}{10}\\ x&=-\frac{6}{5} \text{ or } -1.2\end{aligned}$$

7.
$$\begin{aligned} \frac{2y}{3}+\frac{1}{5}-\frac{3y}{5}+\frac{1}{3}&=1\\ 15\left(\frac{2y}{3}\right)+15\left(\frac{1}{5}\right)-15\left(\frac{3y}{5}\right)+15\left(\frac{1}{3}\right)&=15(1)\\ 10y+3-9y+5&=15\\ y+8&=15\\ y+8-8&=15-8\\ y&=7\end{aligned}$$

8.
$$\begin{aligned} 3-2y&=2(3y-2)-5y\\ 3-2y&=6y-4-5y\\ 3-2y&=y-4\\ 3-2y+2y&=y+2y-4\\ 3&=3y-4\\ 3+4&=3y-4+4\\ 7&=3y\\ \frac{7}{3}&=\frac{3y}{3}\\ \frac{7}{3}&=y \text{ or } y=2\frac{1}{3}\end{aligned}$$

9.
$$\begin{aligned} 5(20-x)+10x&=165\\ 100-5x+10x&=165\\ 100+5x&=165\\ -100+100+5x&=-100+165\\ 5x&=65\\ \frac{5x}{5}&=\frac{65}{5}\\ x&=13\end{aligned}$$

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10. $5(x+40)-6x=9x$
$5x+200-6x=9x$
$200-x=9x$
$200-x+x=9x+x$
$200=10x$
$\frac{200}{10}=\frac{10x}{10}$
$20=x$

11. $-2(2-3x)=76-2x$
$-4+6x=76-2x$
$-76-4+6x=-76+76-2x$
$-80+6x=-2x$
$-80+6x-6x=-2x-6x$
$-80=-8x$
$\frac{-80}{-8}=\frac{-8x}{-8}$
$10=x$

12. $20-(2x+6)=5(2-x)+2x$
$20-2x-6=10-5x+2x$
$-2x+14=-3x+10$
$3x-2x+14=3x-3x+10$
$x+14=10$
$x+14-14=10-14$
$x=-4$

13. $2x-3=12-6x+3(2x+3)$
$2x-3=12-6x+6x+9$
$2x-3=21$
$2x-3+3=21+3$
$2x=24$
$\frac{2x}{2}=\frac{24}{2}$
$x=12$

14. $\frac{1}{3}x-\frac{3}{4}x=\frac{1}{12}$
$12\left(\frac{1}{3}x\right)-12\left(\frac{3}{4}x\right)=12\left(\frac{1}{12}\right)$
$4x-9x=1$
$-5x=1$
$\frac{-5x}{-5}=\frac{1}{-5}$
$x=-\frac{1}{5}$ or -0.2

15. $\frac{3}{5}x+\frac{7}{10}=\frac{1}{3}x+\frac{3}{2}$
$30\left(\frac{3}{5}x\right)+30\left(\frac{7}{10}\right)=30\left(\frac{1}{3}x\right)+30\left(\frac{3}{2}\right)$
$18x+21=10x+45$
$18x+21-21=10x+45-21$
$18x=10x+24$
$-10x+18x=-10x+10x+24$
$8x=24$
$\frac{8x}{8}=\frac{24}{8}$
$x=3$

16. $\frac{15x-2}{28}=\frac{5x-3}{7}$
$28\left(\frac{15x-2}{28}\right)=28\left(\frac{5x-3}{7}\right)$
$15x-2=4(5x-3)$
$15x-2=20x-12$
$15x-2+12=20x-12+12$
$15x+10=20x$
$-15x+15x+10=-15x+20x$
$10=5x$
$\frac{10}{5}=\frac{5x}{5}$
$2=x$

17. $\frac{2}{3}(x+8)+\frac{3}{5}=\frac{1}{5}(11-6x)$
$\frac{2}{3}x+\frac{16}{3}+\frac{3}{5}=\frac{11}{5}-\frac{6}{5}x$
$\frac{2}{3}x+\frac{89}{15}=\frac{11}{5}-\frac{6}{5}x$
$15\left(\frac{2}{3}x\right)+15\left(\frac{89}{15}\right)=15\left(\frac{11}{5}\right)-15\left(\frac{6}{5}x\right)$
$10x+89=33-18x$
$10x+18x+89=33-18x+18x$
$28x+89=33$
$28x+89+(-89)=33+(-89)$
$28x=-56$
$\frac{28x}{28}=\frac{-56}{28}$
$x=-2$

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18.
$$A = 3w + 2P$$
$$A - 2P = 3w + 2P - 2P$$
$$A - 2P = 3w$$
$$\frac{A-2P}{3} = \frac{3w}{3}$$
$$\frac{A-2P}{3} = w$$
$$w = \frac{A-2P}{3}$$

19.
$$\frac{2w}{3} = 4 - \frac{1}{2}(x+6)$$
$$\frac{2w}{3} = 4 - \frac{1}{2}x - 3$$
$$\frac{2w}{3} = 1 - \frac{1}{2}x$$
$$6\left(\frac{2w}{3}\right) = 6(1) - 6\left(\frac{1}{2}x\right)$$
$$4w = 6 - 3x$$
$$\frac{4w}{4} = \frac{6-3x}{4}$$
$$w = \frac{6-3x}{4}$$

20.
$$A = \frac{1}{2}h(a+b)$$
$$A = \frac{1}{2}ha + \frac{1}{2}hb$$
$$2(A) = 2\left(\frac{1}{2}ha\right) + 2\left(\frac{1}{2}hb\right)$$
$$2A = ha + hb$$
$$2A - hb = ha$$
$$\frac{2A-hb}{h} = \frac{ha}{h}$$
$$\frac{2A-hb}{h} = a$$
$$a = \frac{2A-hb}{h}$$

21.
$$5ax(2-y) = 3axy + 5$$
$$10ax - 5axy = 3axy + 5$$
$$10ax - 5axy + 5axy = 3axy + 5 + 5axy$$
$$10ax - 5 = 8axy$$
$$\frac{10ax-5}{8ax} = \frac{8axy}{8ax}$$
$$\frac{10ax-5}{8ax} = y$$
$$y = \frac{10ax-5}{8ax}$$

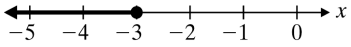
22.
$$V = \frac{1}{3}Bh$$
$$3V = 3\left(\frac{1}{3}Bh\right)$$
$$3V = Bh$$
$$\frac{3V}{h} = \frac{Bh}{h}$$
$$\frac{3V}{h} = B$$
$$B = \frac{3V}{h}$$

23. $B = \frac{3V}{h}$, $V = 140$, $h = 14$

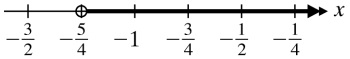
$$B = \frac{3(140)}{14} = 30$$

The base is 30 square inches.

24.
$$3(x-2) \geq 5x$$
$$3x - 6 \geq 5x$$
$$3x + (-5x) - 6 \geq 5x + (-5x)$$
$$-2x - 6 \geq 0$$
$$-2x - 6 + 6 \geq 0 + 6$$
$$-2x \geq 6$$
$$\frac{-2x}{-2} \leq \frac{6}{-2}$$
$$x \leq -3$$



25.
$$2 - 7(x+1) - 5(x+2) < 0$$
$$2 - 7x - 7 - 5x - 10 < 0$$
$$-12x - 15 < 0$$
$$-12x - 15 + 15 < 0 + 15$$
$$-12x < 15$$
$$\frac{-12x}{-12} > \frac{15}{-12}$$
$$x > -\frac{5}{4}$$



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26. $5+8x-4<2x+13$

$8x+1<2x+13$

$8x+1-1<2x+13-1$

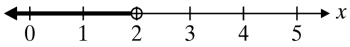
$8x<2x+12$

$-2x+8x<-2x+2x+12$

$6x<12$

$\frac{6x}{6}=\frac{12}{6}$

$x<2$



27. $\frac{1}{4}x+\frac{1}{16}\le\frac{1}{8}(7x-2)$

$\frac{1}{4}x+\frac{1}{16}\le\frac{7}{8}x-\frac{1}{4}$

$16\left(\frac{1}{4}x\right)+16\left(\frac{1}{16}\right)\le16\left(\frac{7}{8}x\right)-16\left(\frac{1}{4}\right)$

$4x+1\le14x-4$

$4x+1+4\le14x-4+4$

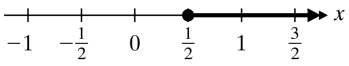
$4x+5\le14x$

$-4x+4x+5\le-4x+14x$

$5\le10x$

$\frac{5}{10}\le\frac{10x}{10}$

$\frac{1}{2}\le x$



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Name:_____

Chapter 2 Pretest Form A

Date:_____

Solve the equation.

1. $x-9=-25$ **1.** _____

2. $\frac{1}{6}x=12$ **2.** _____

3. $-5x=20$ **3.** _____

4. $7x-5=30$ **4.** _____

5. $9x-2=7x+8$ **5.** _____

6. $3x-7x+8=12-20$ **6.** _____

7. $2.1-1.5x=2.2x-9$ **7.** _____

8. $2(3x-5)-8=4(x-7)+2$ **8.** _____

9. $\frac{2}{3}x-\frac{4}{5}=\frac{7}{5}x+\frac{1}{3}$ **9.** _____

10. $\frac{1}{2}(2x-2)+3=\frac{3}{4}x+1$ **10.** _____

11. $\frac{1}{5}x-\frac{1}{6}=\frac{2}{3}-\frac{4}{5}x$ **11.** _____

12. $\frac{2}{3}(x-6)=\frac{1}{2}x+\frac{5}{3}$ **12.** _____

13. **(i)** Solve for y: $ax+by=c$ **13.** **(i)** _____

(ii) Find y for $c=10$, $a=2$, $b=4$, and $x=3$. **(ii)** _____

14. **(i)** Solve for b: $A=\frac{1}{2}bh$ **14.** **(i)** _____

(ii) Find b for $A=60$ and $h=10$. **(ii)** _____

Replace ? with < or >.

15. -2 ? -6 **15.** _____

16. 2 ? -2 **16.** _____

17. -10 ? 5 **17.** _____

18. 8 ? 12 **18.** _____

Solve the inequality.

19. $2x-5<3$ **19.** _____

20. $8-3x\geq 11$ **20.** _____

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Name:_____

Date:_____

Chapter 2 Pretest Form B

Solve the equation.

1. $x+6=-9$

a. 3 **b.** -3 **c.** -15 **d.** 15

2. $\frac{1}{5}x=-15$

a. -3 **b.** -10 **c.** -75 **d.** -20

3. $6x=-12$

a. -2 **b.** -18 **c.** -6 **d.** 2

4. $3x-2=9$

a. $\frac{11}{3}$ **b.** $\frac{7}{3}$ **c.** $-\frac{7}{3}$ **d.** $-\frac{11}{3}$

5. $2x-5=3x-6$

a. -1 **b.** 1 **c.** $-\frac{11}{5}$ **d.** $\frac{11}{5}$

6. $3x-4x+6=8-2+4x$

a. 0 **b.** $-\frac{12}{5}$ **c.** 4 **d.** -2

7. $5.7-3.1x=2.5+0.1x$

a. -2 **b.** 0 **c.** 1 **d.** 2

8. $3(x-5)+4=6x-2(x-4)$

a. -3 **b.** -19 **c.** 3 **d.** $\frac{19}{7}$

9. $\frac{1}{2}x-\frac{3}{4}=\frac{1}{4}x+\frac{1}{2}$

a. 4 **b.** $\frac{1}{3}$ **c.** $-\frac{1}{3}$ **d.** 5

10. $\frac{1}{2}x-\frac{3}{4}=\frac{1}{4}x+\frac{1}{2}$

a. $-\frac{7}{3}$ **b.** $\frac{7}{3}$ **c.** 5 **d.** $-\frac{7}{6}$

11. $2x+\frac{1}{5}=\frac{3}{2}-\frac{1}{5}$

a. $\frac{11}{2}$ **b.** $\frac{3}{4}$ **c.** $\frac{11}{20}$ **d.** $-\frac{11}{2}$

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Chapter 2 Pretest Form B *(cont.)*

Name:_____

12. $x+5=\frac{3}{4}(x-8)$

a. $\frac{101}{11}$ **b.** -44 **c.** 28 **d.** $\frac{29}{2}$

13. (i) Solve for W: $V = LWH$

a. $W = V - LH$ **b.** $W = \frac{V}{LH}$ **c.** $W = VLH$ **d.** $W = \frac{VL}{H}$

13. (ii) Find W for $V = 600,\ L = 20,$ and $H = 3$.

e. 90 **f.** 4000 **g.** 10 **h.** 577

14. (i) Solve for P: $I = Prt$

a. $P = \frac{I}{rt}$ **b.** $P = I - rt$ **c.** $P = Irt$ **d.** $P = \frac{I}{r} - t$

14. (ii) Find P for $I = 40,\ t = 2,$ and $r = 10\%$.

e. 2 **f.** 8 **g.** 800 **h.** 200

Replace ? with < or >.

15. 5 ? 6 **a.** > **b.** <

16. -2 ? 2 **a.** > **b.** <

17. 0 ? -4 **a.** > **b.** <

18. -10 ? -2 **a.** > **b.** <

Solve the inequality.

19. $3x - 2 \le 4x + 6$

a. $x \ge -8$ **b.** $x \le -8$ **c.** $x \ge 4$ **d.** $x \le 4$

20. $6 - 3x \le 15$

a. $x \ge 7$ **b.** $x \le -3$ **c.** $x \ge -3$ **d.** $x \le 7$

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Name:_____

Date:_____

Chapter 2 Test Form A

Solve the equation.

1. $x-10=-12$ **1.** _____

2. $-5x=-35$ **2.** _____

3. $\frac{1}{4}x=12$ **3.** _____

4. $6x-7=53$ **4.** _____

5. $6x-8=4x+10$ **5.** _____

6. $6x+2-3x+4=12$ **6.** _____

7. $1.7x-2.5=2.9x-7.3$ **7.** _____

8. $3(2x-5)-6=4-2(x-8)$ **8.** _____

9. $\frac{1}{3}x+6=9$ **9.** _____

10. $\frac{1}{5}x-\frac{2}{5}=\frac{1}{3}x-\frac{2}{3}$ **10.** _____

11. $\frac{1}{2}x-2=\frac{1}{4}x+6$ **11.** _____

12. $\frac{1}{2}(x-4)=3$ **12.** _____

13. **(i)** Solve for x: $2x-h=5$ **13.** **(i)** _____

(ii) Find x for $h=-1$. **(ii)** _____

14. **(i)** Solve for d: $C=\pi d$ **14.** **(i)** _____

(ii) Find d for $C=9.42$ and $\pi=3.14$. **(ii)** _____

Replace ? with < or >.

15. -2 ? -3 **15.** _____

16. 10 ? -10 **16.** _____

17. 0 ? 7 **17.** _____

18. 5 ? -7 **18.** _____

Solve the inequality.

19. $2x-3x+5>8$ **19.** _____

20. $5-6x\le 41$ **20.** _____

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Name:_____

Chapter 2 Test Form B

Date:_____

Solve the equation.

1. $-9+x=-2$ **1.** _____

2. $7x=-56$ **2.** _____

3. $\frac{1}{3}x=15$ **3.** _____

4. $4x-7=29$ **4.** _____

5. $7x-8=4x-5$ **5.** _____

6. $2x-3x+5=8$ **6.** _____

7. $2-1.3x=2x-1.3$ **7.** _____

8. $6(x-5)-5x=4-2(x-1)$ **8.** _____

9. $\frac{1}{2}x-5=12$ **9.** _____

10. $8-7x=5-6x$ **10.** _____

11. $\frac{1}{2}(x-4)=\frac{2}{3}x+\frac{1}{5}$ **11.** _____

12. $\frac{3}{4}x-\frac{1}{2}=\frac{1}{4}x+\frac{3}{2}$ **12.** _____

13. **(i)** Solve for x: $y=\frac{1}{3}x-2$ **13.** **(i)** _____

(ii) Find x for $y=0$. **(ii)** _____

14. **(i)** Solve for g: $S=\frac{1}{2}gt^2$ **14.** **(i)** _____

(ii) Find g for $S=140$ and $t=2$. **(ii)** _____

Replace ? with < or >.

15. -5 ? -10 **15.** _____

16. 120 ? -250 **16.** _____

17. 0 ? 8 **17.** _____

18. -53 ? -52 **18.** _____

Solve the inequality.

19. $3x-4(x-2)\le 8$ **19.** _____

20. $6x+8\ge 8x-10$ **20.** _____

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Name:_____

Date:_____

Chapter 2 Test Form C

Solve the equation.

1. $x-17=-24$ **1.** _____

2. $-6x=-18$ **2.** _____

3. $\frac{1}{5}x=10$ **3.** _____

4. $8x+5=-1$ **4.** _____

5. $8x+7=5x-11$ **5.** _____

6. $18-3x=-4(x+3)$ **6.** _____

7. $32=8x-(5x-16)$ **7.** _____

8. $2(6x-3)-15=8(x-4)$ **8.** _____

9. $3(2x-2)-8=4(x-1)+6-2x$ **9.** _____

10. $5y-3.8=3.7$ **10.** _____

11. $\frac{10}{3}-\frac{2}{3}x+x=3+\frac{1}{6}x$ **11.** _____

12. $\frac{1}{6}(x+8)=\frac{1}{3}x-3$ **12.** _____

13. **(i)** Solve for t: $A=P(1+rt)$ **13.** **(i)** _____

(ii) Find t for $A=16,800$, $P=15,000$, and $t=2\%$. **(ii)** _____

14. **(i)** Solve for r: $d=rt$ **14.** **(i)** _____

(ii) Find r for $d=600$ and $t=10$. **(ii)** _____

Replace ? with < or >.

15. -3 ? -5 **15.** _____

16. 10 ? 18 **16.** _____

17. 0 ? -5 **17.** _____

18. -10 ? 2 **18.** _____

Solve the inequality.

19. $\frac{1}{2}(2x-6)\le 3x-5$ **19.** _____

20. $6(2-x)<4-2(x+4)$ **20.** _____

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Chapter 2 Test Form D

Solve the equation.

1. $8 - x = 11$ **1.** _____

2. $4x = -24$ **2.** _____

3. $\frac{1}{3}x = 12$ **3.** _____

4. $6x - 7 = -5$ **4.** _____

5. $7x + 9 = 4x - 12$ **5.** _____

6. $2 - (x - 2) = 14x - 12$ **6.** _____

7. $12 - 2x = 6x - 4(x + 5)$ **7.** _____

8. $3(2x - 6) - 8 = 4(7 - x) - 3x$ **8.** _____

9. $6x - 8 - 3x + 5 = 7x - 12 + 9$ **9.** _____

10. $2.1x - 3.7 = 3.3x - 10.9$ **10.** _____

11. $\frac{2}{3}(2x - 5) = \frac{1}{2}x - 4$ **11.** _____

12. $\frac{1}{5}x - \frac{5}{3} - \frac{2}{3}x = 1$ **12.** _____

13. **(i)** Solve for h: $A = \frac{1}{2}h(b_1 + b_2)$ **13.** **(i)** _____

(ii) Find h for $A = 72$, $b_1 = 5$, and $b_2 = 7$. **(ii)** _____

14. **(i)** Solve for y: $3x - 4y = 9$ **14.** **(i)** _____

(ii) Find y for $x = \frac{1}{3}$. **(ii)** _____

Replace ? with < or >.

15. -5 ? -6 **15.** _____

16. 10 ? -3 **16.** _____

17. -2 ? 25 **17.** _____

18. -12 ? 0 **18.** _____

Solve the inequality.

19. $4x - 2(4x - 6) \geq 12$ **19.** _____

20. $8x - 12 > 10x + 24$ **20.** _____

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Name:_____

Date:_____

Chapter 2 Test Form E

Solve the equation.

1. $x+9=-8$

a. 1 **b.** -1 **c.** -17 **d.** 17

2. $\frac{1}{10}x=-20$

a. -30 **b.** -10 **c.** -200 **d.** -2

3. $4x=-48$

a. -12 **b.** -44 **c.** -52 **d.** $-\frac{1}{12}$

4. $7x-3=25$

a. $\frac{22}{7}$ **b.** 21 **c.** $-\frac{22}{7}$ **d.** 4

5. $5x-9=2x+12$

a. 7 **b.** $\frac{3}{7}$ **c.** 3 **d.** -7

6. $6x-3+3x-6=5x-12+3x+5$

a. 5 **b.** 2 **c.** $\frac{5}{2}$ **d.** -20

7. $3.5x-7.2=2.1x-4.4$

a. 2 **b.** 5 **c.** 2 **d.** -5

8. $3(2x-5)+8=6x-(2x+3)$

a. -1 **b.** 5 **c.** 0 **d.** 2

9. $\frac{1}{7}x+\frac{1}{5}=\frac{2}{7}x-\frac{2}{5}$

a. $\frac{7}{3}$ **b.** $\frac{3}{7}$ **c.** $\frac{5}{21}$ **d.** $\frac{21}{5}$

10. $\frac{1}{3}(x+1)=\frac{1}{2}x-\frac{1}{3}$

a. 4 **b.** 0 **c.** -2 **d.** 3

11. $\frac{1}{2}x-\frac{1}{3}+\frac{4}{5}=x$

a. $\frac{3}{2}$ **b.** $\frac{14}{15}$ **c.** $\frac{15}{14}$ **d.** $\frac{2}{3}$

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Chapter 2 Test Form E *(cont.)*

Name:_____

12. $\frac{1}{2}(x-3)=5$

a. $\frac{13}{2}$ **b.** 8 **c.** 13 **d.** $\frac{7}{2}$

13. (i) Solve for y: $3x+2y=6$

a. $y=-3x+2$ **b.** $y=\frac{-3x+6}{2}$ **c.** $y=-3x+4$ **d.** $y=3x+2$

13. (ii) Find y for $x=2$.

e. -4 **f.** 0 **g.** -2 **h.** 8

14. (i) Solve for t: $I=Prt$

a. $t=I-Pr$ **b.** $t=\frac{I-P}{r}$ **c.** $t=\frac{I}{Pr}$ **d.** $t=IrP$

14. (ii) Find t for $I=1600,\ P=20,000,$ and $r=2\%$.

e. 0.04 **f.** 4 **g.** 400 **h.** 8000

Replace ? with < or >.

15. 4 ? -3 **a.** > **b.** <

16. -8 ? -5 **a.** > **b.** <

17. 0 ? -15 **a.** > **b.** <

18. -80 ? 54 **a.** > **b.** <

Solve the inequality.

19. $2x-(3x-6)>-18$

a. $x>24$ **b.** $x<-24$ **c.** $x>-24$ **d.** $x<24$

20. $4x-(2x+8)<6x+5$

a. $x<-\frac{13}{4}$ **b.** $x>-\frac{13}{4}$ **c.** $x<\frac{13}{4}$ **d.** $x>\frac{13}{4}$

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Name:_____

Date:_____

Chapter 2 Test Form F

Solve the equation.

1. $x-8=-2$

a. -6 **b.** -10 **c.** 6 **d.** 10

2. $2x=-20$

a. 22 **b.** 10 **c.** -22 **d.** -10

3. $\frac{1}{6}x=18$

a. 3 **b.** 12 **c.** 108 **d.** 24

4. $4x+13=-7$

a. -5 **b.** $\frac{3}{2}$ **c.** $\frac{1}{5}$ **d.** 2

5. $5x-2=8x-5$

a. -1 **b.** 1 **c.** $-\frac{7}{3}$ **d.** $-\frac{11}{7}$

6. $3x-2+5x=6x-4$

a. -3 **b.** 3 **c.** 1 **d.** -1

7. $2.4x+1.7=3.1x+1.14$

a. 1.5 **b.** 0.8 **c.** -0.8 **d.** 2

8. $3(2x-5)-4x=3(x-2)+x$

a. $-\frac{9}{2}$ **b.** $-\frac{21}{2}$ **c.** $\frac{9}{2}$ **d.** $\frac{21}{2}$

9. $\frac{1}{3}x-\frac{2}{3}=\frac{1}{2}-\frac{1}{3}x$

a. $-\frac{7}{4}$ **b.** $\frac{7}{4}$ **c.** $\frac{1}{4}$ **d.** $-\frac{1}{4}$

10. $\frac{1}{5}(x-2)+\frac{1}{2}=\frac{3}{4}-\frac{1}{8}x$

a. 0 **b.** 2 **c.** $\frac{34}{3}$ **d.** -22

11. $2x-\frac{3}{4}=4-\frac{1}{2}x$

a. $\frac{1}{4}$ **b.** $-\frac{7}{4}$ **c.** $\frac{7}{4}$ **d.** $\frac{19}{10}$

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12. $x+5=\frac{1}{2}(x-4)$

a. 12 **b.** 0 **c.** 6 **d.** -14

13. (i) Solve for b_2: $A=\frac{1}{2}h(b_1+b_2)$

a. $b_2=\frac{2A-hb_1}{h}$ **b.** $b_2=A-b_1$ **c.** $b_2=2A-hb_1-h$ **d.** $b_2=\frac{A-hb_1}{h}$

13. (ii) Find b_2 for $A=120,\ h=24,$ and $b_1=6.$

e. 16 **f.** 20 **g.** 4 **h.** 10

14. (i) Solve for y: $y-3=2(x-3)$

a. $y=2x-6$ **b.** $y=2x-3$ **c.** $y=2x+3$ **d.** $y=2x$

14. (ii) Find y for $x=6.$

e. 6 **f.** 9 **g.** 15 **h.** 12

Replace ? with < or >.

15. -18 ? -23 **a.** > **b.** <

16. 0 ? 25 **a.** > **b.** <

17. -16 ? -48 **a.** > **b.** <

18. -110 ? 3 **a.** > **b.** <

Solve the inequality.

19. $5-6x\le 8x+4$

a. $x\le\frac{1}{14}$ **b.** $x\ge\frac{1}{14}$ **c.** $x\le-\frac{9}{2}$ **d.** $x\ge-\frac{9}{2}$

20. $8-2x\le 0$

a. $x\ge -4$ **b.** $x\le 4$ **c.** $x\le -4$ **d.** $x\ge 4$

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Chapters 0–2 Cumulative Test Form A

Name:_____

Date:_____

1. Add: $3\frac{2}{3}+4\frac{3}{5}$ **1.** _____

2. Subtract: $\frac{7}{8}-\frac{5}{6}$ **2.** _____

3. Divide: $2\frac{2}{5}\div 1\frac{11}{25}$ **3.** _____

4. Multiply: $(1.8)(3.06)$ **4.** _____

5. Divide: $0.065\div 1.3$ **5.** _____

6. What is 18% of 360? **6.** _____

7. Multiply: $(-2)(-1)(5)(-3)$ **7.** _____

8. Simplify: $-8-(-2)$ **8.** _____

9. Simplify: $(-3)^2$ **9.** _____

10. Simplify: $3x-2(4x-6)$ **10.** _____

11. Solve: $3(2x+5)=5x+15$ **11.** _____

12. Solve: $\frac{1}{2}(x-6)=x+2$ **12.** _____

13. Solve: $3x-2(4-x)=6x+3$ **13.** _____

14. Solve: $4-3(2x+5)=4x-6$ **14.** _____

15. Solve: $2.5-3.6x=1.01x+20.94$ **15.** _____

16. Solve: $3x-2x+4(x-6)=-24$ **16.** _____

17. Solve: $3x-7+2(x-3)=-(x-5)$ **17.** _____

18. Solve for y: $4x-2y=6$ **18.** _____

19. Solve: $\frac{1}{2}(x-2)\geq x+5$ **19.** _____

20. Solve: $5-2x\leq 21$ **20.** _____

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Chapters 0–2 Cumulative Test
Form B

Name:_____

Date:_____

1. Subtract: $\frac{5}{8}-\frac{3}{5}$

a. $\frac{1}{40}$ **b.** $-\frac{3}{8}$ **c.** $\frac{2}{3}$ **d.** $-\frac{2}{7}$

2. Add: $3\frac{4}{5}+2\frac{1}{3}$

a. $5\frac{1}{3}$ **b.** $1\frac{7}{15}$ **c.** $6\frac{2}{15}$ **d.** $5\frac{5}{8}$

3. Divide: $3\frac{1}{5}\div 5\frac{1}{3}$

a. 15 **b.** $\frac{5}{3}$ **c.** $1\frac{1}{15}$ **d.** $\frac{3}{5}$

4. Multiply: $(6.8)(3.4)$

a. 23.12 **b.** 0.2312 **c.** 231.2 **d.** 2.312

5. Divide: $7.5\div 1.5$

a. 0.2 **b.** 20 **c.** 0.5 **d.** 5

6. What is 24% of 720?

a. 30 **b.** 172.8 **c.** 3000 **d.** 17,280

7. Multiply: $(-2)(-7)(-5)(-3)$

a. -210 **b.** 17 **c.** 210 **d.** -17

8. Simplify: -8^2

a. 64 **b.** -64 **c.** 16 **d.** -16

9. Simplify: $-12-(-4)$

a. -8 **b.** -16 **c.** 16 **d.** 3

10. Simplify: $3x-2(x-5)$

a. $x-10$ **b.** $x+10$ **c.** $5x-10$ **d.** $5x+10$

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Chapters 0–2 Cumulative Test
Form B *(cont.)*

Name:_____

11. Solve: $6(2x+5)+20=2x+10$

a. 5 **b.** $\frac{3}{2}$ **c.** $\frac{30}{7}$ **d.** -4

12. Solve: $3x+7=-20$

a. $-\frac{13}{3}$ **b.** 9 **c.** -9 **d.** $\frac{13}{3}$

13. Solve: $4x-3(x-6)=2x+12$

a. -30 **b.** -18 **c.** 18 **d.** 6

14. Solve: $6+2(3x-6)=-6$

a. 3 **b.** 0 **c.** -2 **d.** -1

15. Solve: $7.5-2.5x=5$

a. -10 **b.** 10 **c.** -1 **d.** 1

16. Solve: $\frac{1}{3}x-\frac{2}{3}+\frac{1}{5}x=1$

a. $\frac{8}{25}$ **b.** $\frac{25}{8}$ **c.** $\frac{11}{8}$ **d.** $-\frac{11}{8}$

17. Solve: $\frac{1}{2}(x-2)=12$

a. 8 **b.** 28 **c.** 14 **d.** 26

18. Solve for b: $A=\frac{1}{2}bh$

a. $b=\frac{2A}{h}$ **b.** $b=A-\frac{1}{2}h$ **c.** $b=2A-h$ **d.** $b=\frac{A}{2h}$

19. Solve: $3x-5\le 4x+8$

a. $x\ge -13$ **b.** $x\le -13$ **c.** $x\ge 13$ **d.** $x\le 13$

20. Solve: $5-2(x-6)\ge 13$

a. $x\le -10$ **b.** $x\ge -10$ **c.** $x\le 2$ **d.** $x\ge 2$

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Activity 0-A

A Brief Review of Arithmetic Skills

How Many Cookies Do You Need?

You have decided to make cookies for three different holiday parties you will be attending. The table below shows how many cookies you will need for each party. The recipe you found shows the ingredients for 14 cookies.

In this activity you will calculate the ingredient measurements for the other two parties and fill in the table.

Ingredient	**Party #1** 14 Cookies	**Party #2** 7 Cookies	**Party #3** 42 Cookies
Sliced Almonds	1 cup		
Butter, at room temp.	$\frac{3}{4}$ cup		
Sugar	$\frac{1}{4}$ cup		
Egg	1		
Almond Extract	2 tsp		
Flour	$1\frac{1}{4}$ cup		
Ground Nutmeg	$\frac{1}{2}$ tsp		

Try It At Home!

Preheat oven to 350°F. Chop almonds into small pieces. Beat the butter and sugar in a mixing bowl until the mixture is light and fluffy. Mix in the egg until completely blended. Add the almond extract and mix again until blended.

Add half the flour and mix until smooth. Add the rest of the flour and the nutmeg and mix again. Add the almonds and mix until they're evenly distributed through the dough.

Break off a piece of dough about the size of a golf ball and roll it into a smooth ball. Press the ball into a flat, 2-inch round cookie and place on cookie sheet. Make the remaining cookies and place them about $1\frac{1}{2}$ inches apart on the cookie sheet.

Bake at 350°F for 10 to 12 minutes, or until the edges are golden brown.

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Activity 0-B

A Brief Review of Arithmetic Skills

What is The Better Bargain?

In each row, write A if the first item is the better bargain or B if the second item is the better bargain. Be sure to explain your reasoning. Round to the nearest cent, if necessary.

	FIRST ITEM A	SECOND ITEM B	RESPONSE
1	50 CD's for $8.29	10 CD's for $2 (You have a coupon for $0.50 off!)	
2	12 pack of highlighters for $2.99	$5.75 for 25 highlighters	
3	$1.47/pound of hot dogs	3 pounds of hot dogs for $4.47	
4	10.2 ounce package of frozen carrots for $2.50	1.5 lb package of frozen carrots for $6.25	
5	2 pack of light bulbs (no special) for $0.44	4 pack of light bulbs for $1.99 Special: Buy 1 pack get 1 pack free!	
6	Two 15 fl. oz. bottles of shampoo for $4.99	One 25 fl. oz. bottle of shampoo for $3.50	
7	38 ounce bottle of mouthwash for $1.89	Two 12 ounce bottles of mouthwash for $1.29	
8	Package of 20 tablets of Cold Medication for $6.40	2 packages of 15 tablets each for $4.80/package	

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Activity 1-A

Real Numbers and Variables

Match the Partners

Simplify each expression in Column A and draw a line to the correct answer in Column B.

Column A	Column B
$3x+5x$	$2x+8$
$x^2+2y+3x^2+y$	$2x^2-17y$
$x(x+5)$	$-12xy+7y^2$
$2(x+4)$	$-x-1$
$-3(x^2+4y)-5(y-x^2)$	$4x^2+3y$
$-5(x-2)$	$8x$
$x^2+3y+4+5y-x^2-1$	x^2+5x
$-2(3xy+y^2)+3y(-2x+3y)$	$-5x+10$
$-(x+1)$	$8y+3$

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Activity 1-B

Real Numbers and Variables

In each row, evaluate the expressions. In the last column, use < or > to indicate the relationship between Expression A and Expression B.

	Expression A	Expression B	< or >
1	$-6 \cdot 3 \div 9 \cdot (-2)$	$-55 \div (-11)$	
2	$5 \div \left(-\frac{5}{7}\right)$	$\left(-\frac{1}{2}\right)\left(\frac{8}{2}\right)$	
3	3^4	4^3	
4	-2^4	$(-2)^4$	
5	$-11.9-(-4.3)+8.6$	$-\frac{2}{3}-\left(-\frac{5}{12}\right)+\frac{1}{4}$	
6	$\left(-\frac{1}{3}\right)(15)$	$(-3)\left(\frac{1}{15}\right)$	
7	Let $x = 7, y = -2$ $2x^2 - y$	Let $x = -7, y = 2$ $2x^2 - y$	
8	Area of a parallelogram with altitude of 6.2 feet and a base of 15.1 feet.	Area of an isosceles right triangle with a leg of 13.2 feet.	

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Activity 2-A

Equations and Inequalities

Linear Equation Exploration – How Many Solutions Are There?

Consider the equation: $3(x+2)=3x+6$

1. Is $x=4$ a solution to the equation? Check by substituting 4 for x and seeing whether the two sides of the equation come out equal. Show your work.

2. Is $x=-2$ a solution to the equation? Show your work.

3. Is $x=\frac{1}{3}$ a solution to the equation? Show your work.

4. Choose another value for x and check if it is solution to the equation. Show your work.

5. Solve the equation by clearing parentheses and isolating the x. Show your work.

   $3(x+2)=3x+6$

6. How many solutions do you think this equation has? Write a sentence or two explaining your answer.

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Activity 2-B

Equations and Inequalities

Circle the item in each row that has the greater value.

	A	B
1	$3x+5=2x+13$	$\frac{4}{3}x-7=\frac{7}{3}$
2	$\frac{3x-2}{2}=2+\frac{3x}{4}$	$\frac{3}{5}(x-3)=3\left(2-\frac{x}{2}\right)$
3	$0.8x-0.4(40+x)=0.2(40)$	$0.5x-0.2(50+x)=0.22(50)$
4	$9(k+2)-(8k+6)=7$	$5(5x-8)-3(-1-8x)=35+50x$
5	$7.8x-4.9-7.1x=0.7x-4.9$	$9x-2.7-6.6x=2.4x-2.7$

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Activity 3-A

Solving Applied Problems

Using Geometric Formulas

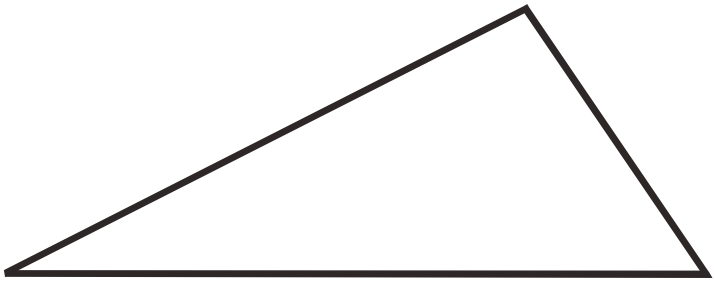
Materials needed: 1 ruler per group (preferably with cm markings)

1. Calculate the area of the shape shown below by following steps (a) to (c):

   a) Write the formula you will use.

   b) What values need to be measured so that you have numbers to plug into the formula? Use a ruler to make the measurements. Record the measurements here, and write the measurements where they belong on the shape.

   c) Calculate the area (show work).

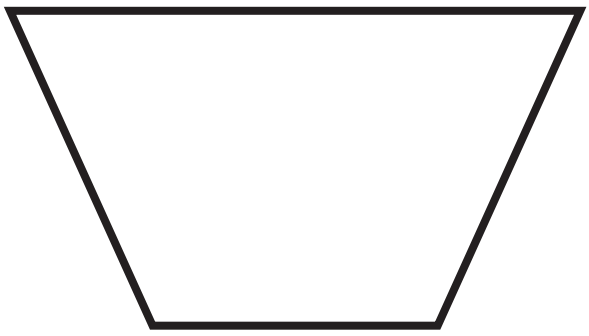


2. Calculate the area of the shape shown below by following steps (a) to (c):

   a) Write the formula you will use.

   b) What values need to be measured so that you have numbers to plug into the formula? Record the measurements here, and write the measurements where they belong on the shape.

   c) Calculate the area (show work).



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Activity 3-B

Solving Applied Problems

No Math Skills Needed!

Use your problem solving skills and basic logical thinking to solve the following word problems.

1) Two high-speed trains, each moving at 75 miles per hour, were approaching each other on the same track. When they were 150 miles apart, a bird on the front of one train started flying toward the other train at a steady ground speed of 45 miles per hour. When it reached the other train it turned quickly and flew toward the first train. It continued to fly back and forth until the trains crashed. How far did it fly? Don't worry, the bird flew away safely!

2) Suppose you have a five-gallon bottle and a three-gallon bottle and plenty of milk. How can you get four gallons of milk into the five-gallon bottle?

3) In Jazzy Alli's sock drawer she has 10 pairs of pink socks and 7 pairs of yellow-polka dot socks. Jazzy Alli is very lazy and never puts her socks away as pairs. How many socks does Jazzy Alli have to pick at random to get a matched pair?

4) Your friend asks you for change for an American dollar bill. You reach into your pocket and pull out a hand full of change. What is the largest amount of change in U.S. coins that you can have and still not make change for the dollar bill?

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Name:_____

Additional Exercises 0.1

Date:_____

Simplify.

1. $\frac{28}{63}$ **1.** _____

2. $\frac{17}{31}$ **2.** _____

3. $\frac{18}{30}$ **3.** _____

4. $\frac{20}{25}$ **4.** _____

Write as a mixed number.

5. $\frac{56}{7}$ **5.** _____

6. $\frac{17}{11}$ **6.** _____

7. $\frac{55}{4}$ **7.** _____

8. $\frac{31}{5}$ **8.** _____

Change to an improper fraction.

9. $3\frac{7}{12}$ **9.** _____

10. $5\frac{6}{7}$ **10.** _____

11. $6\frac{5}{9}$ **11.** _____

12. $5\frac{4}{9}$ **12.** _____

Find the missing numerator.

13. $\frac{5}{7} = \frac{?}{14}$ **13.** _____

14. $\frac{7}{11} = \frac{?}{55}$ **14.** _____

15. $\frac{14}{3} = \frac{?}{9}$ **15.** _____

16. $\frac{6}{7} = \frac{?}{21}$ **16.** _____

17. There are 5280 feet in a mile. What fraction of a mile is represented by 660 feet? **17.** _____

18. There are 100 centimeters in 1 meter. What fraction of a meter is 35 centimeters? **18.** _____

19. There are 1950 students in a school district and 30 are in Mrs. Johnson's class. What fraction of all the students is represented by Mrs. Johnson's class? **19.** _____

20. Bobby owes $275 in bills. He has $425 in the bank. What fraction of his bank account is owed in bills? **20.** _____

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Name:_____

Additional Exercises 0.2

Date:_____

Perform the indicated operations. Simplify your answers.

1. $\frac{2}{9}+\frac{4}{9}+\frac{1}{9}$ **1.** _____

2. $\frac{1}{3}+\frac{1}{9}$ **2.** _____

3. $\frac{1}{5}+\frac{3}{14}$ **3.** _____

4. $\frac{7}{9}-\frac{1}{2}$ **4.** _____

5. $\frac{1}{7}-\frac{1}{11}$ **5.** _____

6. $8\frac{3}{5}+11\frac{3}{10}$ **6.** _____

7. $4\frac{1}{3}+6\frac{3}{8}$ **7.** _____

8. $15\frac{1}{5}-7\frac{3}{5}$ **8.** _____

9. $38\frac{2}{3}-25\frac{13}{16}$ **9.** _____

10. $\frac{24}{26}+\frac{48}{26}+\frac{6}{26}$ **10.** _____

11. $\frac{5}{8}+\frac{2}{3}$ **11.** _____

12. $\frac{3}{5}-\frac{1}{4}+\frac{2}{7}$ **12.** _____

13. $\frac{4}{5}-\frac{3}{20}$ **13.** _____

14. $\frac{9}{20}+\frac{8}{15}-\frac{3}{10}$ **14.** _____

15. $8\frac{3}{4}+1\frac{1}{4}$ **15.** _____

16. $17\frac{1}{4}+7\frac{3}{8}$ **16.** _____

17. $18\frac{2}{7}-4\frac{5}{14}$ **17.** _____

18. The total length of a motorcycle race is $\frac{7}{8}$ of a mile. Rilee has completed $\frac{3}{8}$ of a mile. How much does she have left to complete? **18.** _____

19. Austin walked $\frac{3}{26}$ mile to his biology class, $\frac{3}{26}$ mile to his art class, $\frac{6}{26}$ of a mile to his calculus class, and back to his dormitory. If he walked 1 mile altogether, how far did he walk from his calculus class to his dormitory? **19.** _____

20. Payton read $\frac{7}{20}$ of her book on Monday, $\frac{3}{20}$ of her book on Tuesday, and $\frac{1}{5}$ of her book on Wednesday. What part of her book has she read? **20.** _____

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Additional Exercises 0.3

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Perform the indicated operations. Simplify your answers.

1. $\frac{1}{7}\times\frac{1}{3}$ **1.** _____

2. $\frac{10}{4}\times\frac{3}{25}$ **2.** _____

3. $4\frac{6}{7}\times 7$ **3.** _____

4. $2\frac{3}{4}\times 1\frac{3}{5}$ **4.** _____

5. $\frac{6}{8}\div\frac{7}{16}$ **5.** _____

6. $\frac{5}{9}\div 5$ **6.** _____

7. $4\frac{4}{7}\div 1\frac{4}{5}$ **7.** _____

8. $4\frac{7}{8}\div 1\frac{4}{5}$ **8.** _____

9. $9\frac{3}{5}\div 12$ **9.** _____

10. $\frac{9}{6}\times\frac{8}{19}$ **10.** _____

11. $7\times\frac{4}{3}$ **11.** _____

12. $8\times 9\frac{11}{20}$ **12.** _____

13. $1\frac{1}{4}\times\frac{1}{7}\times\frac{4}{5}$ **13.** _____

14. $\frac{20}{8}\div 10$ **14.** _____

15. $15\div\frac{60}{5}$ **15.** _____

16. $5\frac{2}{9}\div 4\frac{2}{3}$ **16.** _____

17. $5\frac{3}{7}\div\frac{1}{7}$ **17.** _____

18. $6\div 2\frac{2}{5}$ **18.** _____

19. Mary is saving $\frac{3}{22}$ of her monthly income of \$9570 for retirement. How much money is she setting aside each month for retirement? **19.** _____

20. How many $\frac{4}{15}$ pound boxes of cereal can be made from 9960 pounds of cereal? **20.** _____

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Additional Exercises 0.4

Date:_____

Write as a decimal.

1. Write as a decimal: $\frac{7}{8}$ **1.** _____

2. Write as a decimal: $\frac{7}{10}$ **2.** _____

Write as a fraction in lowest terms.

3. Write as a fraction in lowest terms: 0.38 **3.** _____

4. Write as a fraction in lowest terms: 2.03 **4.** _____

Perform the indicated operations. Simplify your answers.

5. $93.98 + 67.22 + 11.948$ **5.** _____

6. $3.4 + 62.19 + 18.3$ **6.** _____

7. $24.2 - 8.91$ **7.** _____

8. $9.25 - 3.5$ **8.** _____

9. $8.8 + 9 + 4.9$ **9.** _____

10. $4.0121 - 0.0645$ **10.** _____

11. $0.00472 - 0.0011$ **11.** _____

12. 6.08×0.3 **12.** _____

13. 14.54×0.0075 **13.** _____

14. $0.0025 \div 0.005$ **14.** _____

15. $1.926 \times 10,000$ **15.** _____

16. $1.8 \div 100$ **16.** _____

17. 0.0010×0.011 **17.** _____

18. $5.3152 \div 3.02$ **18.** _____

19. $0.00214 \times 10,000$ **19.** _____

20. $49.90 \div 1000$ **20.** _____

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Date:_____

1. Write as a percent: 0.83 **1.** _____

2. Write as a decimal: 68% **2.** _____

3. What is 15% of 420? **3.** _____

4. 89.1 is what percent of 66? **4.** _____

5. What percent of 10 is 180? **5.** _____

6. What is 8.5% of 4800? **6.** _____

7. Write as a percent: 0.881 **7.** _____

8. Write as a decimal: 624% **8.** _____

9. An inspector found 30 defective calculators during an inspection. If this is 0.006% of the total number of calculators, how many calculators were inspected? **9.** _____

10. The enrollment at a local college increased 3% over the previous year's enrollment of 5800 students. Find the increase in enrollment. **10.** _____

11. A sales representative is paid a commission rate of 5.6%. Find his commission if he sold $101,650 worth of goods last month. **11.** _____

12. Find the amount of discount when the original price is $93.00 and the discount rate is 15%. **12.** _____

13. Estimate by rounding to the nearest thousand: $122,278 \times 2481$ **13.** _____

14. Estimate by rounding to the nearest hundred: $621 + 387 + 719 + 224 + 753$ **14.** _____

15. Estimate by rounding to the nearest ten for the divisor and the nearest million for the dividend: $6,508,575 \div 45$ **15.** _____

16. Estimate by rounding to the nearest thousandth for the numerator and the nearest hundredth for the denominator: $\dfrac{0.00549}{0.25375}$ **16.** _____

17. Estimate by rounding the percent to the nearest ten and dollars to the nearest ten thousand: 75% of $36,229.87 **17.** _____

18. Karl wants to buy a refrigerator for $1059, a stove for $739, and a dishwasher for $489. Round each cost to the nearest hundred to estimate the total cost. **18.** _____

19. Linda scored 82, 85, 80, 78, 84, and 100 on her calculus tests. Round each score to the nearest ten to estimate her total score. **19.** _____

20. Estimate the floor area of a classroom that measures 27.5 feet long and 39.8 feet wide by rounding each measurement to the nearest ten. **20.** _____

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Name:_____

Additional Exercises 0.6

Date:_____

1. Kathy wants to put a new carpet in her living room. The living room measures 10 feet by 12 feet. The carpet costs $18.00 per square yard. How much will it cost? **1.** _____

For problems 2 and 3, a garden measures 12 feet by 8 feet.

2. How much fencing must be purchased to go around the garden? **2.** _____

3. If the fence costs $1.90 per foot, how much will it cost? **3.** _____

For problems 4–6, a fish pond is to be built that measures 10 feet by 7 feet, and is 3 feet deep.

4. How many cubic feet of water will the pond hold? **4.** _____

5. Each cubic foot of water is 7.5 gallons. How many gallons of water will the pond hold? **5.** _____

6. Large gold fish require 150 gallons of water per fish. How many can be kept in the pond? **6.** _____

7. In 2003, the average selling price of a 3 bedroom house was $225,000. Between 2003 and 2005 the average price increased 18% Between 2005 and 2008, the price decreased by 16%. What was the average selling price in 2008? Round to the nearest thousand. **7.** _____

Use the following family budget for problems 8–10.

Housing	Food	Utilities	Clothing	Medicine	Entertainment	Transportation
8.5%	32%	8%	10%	5%	5%	10%

8. The family's income is $60,000 before taxes. If 28% is taken out for taxes, how much is left (i.e. take-home income)? **8.** _____

9. How much of their take-home income is set aside for housing? **9.** _____

10. How much of their take-home income is set aside for savings? **10.** _____

11. A recipe calls for $2\frac{3}{4}$ cups of flour. If you decide to double the recipe, how much flour will you need? **11.** _____

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Additional Exercises 0.6 *(cont.)*

Name:_____

For problems 12–15, a garden measures $6\frac{1}{2}$ feet by $8\frac{1}{2}$ feet.

12. How many feet of fencing will it take to enclose the garden? **12.** _____

13. Fencing costs $2.25 per foot. What will the fencing cost? **13.** _____

14. A pathway $2\frac{1}{2}$ feet wide is to be put around the garden. How many square feet will the path cover? **14.** _____

15. Tiles to cover the pathway cost $1.50 per square foot. How much will the tiles cost for the pathway? **15.** _____

16. Anne works part time and gets paid $200 a week. If her first paycheck was for $152, what percentage was deducted for taxes? **16.** _____

17. Angie wants to paint the outside of her house. The front and back are approximately 50 feet by 10 feet. The sides measure 40 feet by 10 feet. A gallon of paint will cover 1200 square feet. How many gallons of paint will she need? **17.** _____

For problems 18 and 19, Rick wants to carpet his entertainment room that measures 22 feet by 18 feet.

18. How many square feet are in his entertainment room? **18.** _____

19. If the carpet he wants to use costs $3.99 per square foot, how much will it cost? **19.** _____

20. Logan jogs $1\frac{1}{4}$ mile. She wants to increase this by $\frac{1}{5}$. How much should she jog now to meet her goal? **20.** _____

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Name:_____

Additional Exercises 1.1

Date:_____

1. Select each description of the number that applies: 43
Integer Rational Irrational Real

1. _____

2. Select each description of the number that applies: $\sqrt{18}$
Integer Rational Irrational Real

2. _____

3. Use a real number to represent the situation.
The thermometer read 24° below zero

3. _____

4. Use a real number to represent the situation.
The stock experienced a $152 profit.

4. _____

5. Find the additive inverse: -25

5. _____

6. Find the additive inverse: 62.1

6. _____

7. Find the absolute value: $|-11|$

7. _____

8. Find the absolute value: $|12.4|$

8. _____

Add.

9. $5+(-2)$

9. _____

10. $-23+12$

10. _____

11. $-43+(-17)$

11. _____

12. $-6.7+(-17.9)$

12. _____

13. $31+38$

13. _____

14. $4.119+(-2.971)$

14. _____

15. $-7.3+(-8.9)$

15. _____

16. $\frac{1}{7}+\left(-\frac{1}{7}\right)$

16. _____

17. $\frac{5}{8}+\left(-\frac{1}{8}\right)$

17. _____

18. $19+(-9)+23+(-16)$

18. _____

19. A deep-sea diver dives from the surface to 131 feet below the surface. She then dives down 12 more feet. Find the diver's depth.

19. _____

20. On part of a scenic tour of underground caves, Dave and Anne started at an elevation of 51 feet below sea level. They rose 12 feet. Represent their distance below sea level as a signed integer.

20. _____

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Name:_____

Additional Exercises 1.2

Date:_____

Subtract.

1. $2-9$ **1.** _____

2. $-3-11$ **2.** _____

3. $-9-(-8)$ **3.** _____

4. $35-(-17)$ **4.** _____

5. $-13.9-(-6.7)$ **5.** _____

6. $3-(-2)$ **6.** _____

7. $-5-(-7)$ **7.** _____

8. $0.85-(-0.54)$ **8.** _____

9. $-\frac{5}{7}-\left(-\frac{9}{14}\right)$ **9.** _____

10. $-\frac{3}{4}-\frac{5}{8}$ **10.** _____

Calculate.

11. $9-14+9$ **11.** _____

12. $6+(-5)-(-7)$ **12.** _____

13. $-7-(-11)+(-14)$ **13.** _____

14. $2+(-12)-15-(-16)$ **14.** _____

15. $3+(-8)-15-(-14)+7$ **15.** _____

16. $9-0-(-10)-20+(-7)$ **16.** _____

17. $13-(-42)+53+(-37)$ **17.** _____

18. $-4+2-17+(-5)$ **18.** _____

19. Sean has \$389 in his savings account. After he withdraws \$78, what will his balance be? **19.** _____

20. Trader Tower stands at 2962 feet high. Exchange Emporium is 883 feet tall. How much taller is Trader Tower than Exchange Emporium? **20.** _____

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Name:_____

Additional Exercises 1.3

Date:_____

Calculate.

1. $3(-12)$ **1.** _____

2. $-9(16)$ **2.** _____

3. $8(-8)$ **3.** _____

4. $-\frac{35}{16}\left(\frac{2}{7}\right)$ **4.** _____

5. $\frac{15}{2}\left(-\frac{23}{6}\right)$ **5.** _____

6. $3.0(-2.12)$ **6.** _____

7. $-4.0(-15)$ **7.** _____

8. $-19(0)$ **8.** _____

9. $0 \div 44$ **9.** _____

10. $-144 \div (-6)$ **10.** _____

11. $-292 \div 4$ **11.** _____

12. $117 \div (-9)$ **12.** _____

13. $-\frac{1}{2} \div \frac{6}{7}$ **13.** _____

14. $-60 \div (-3)$ **14.** _____

15. $(-2)(3)(-6)(-5)$ **15.** _____

16. $(7)(4)(-3)(5)(12)$ **16.** _____

17. $\dfrac{-8}{-\frac{4}{5}}$ **17.** _____

18. $\dfrac{\frac{6}{11}}{3}$ **18.** _____

19. Chris lost $39.15 playing poker in one week. If this continued, what would be his net winnings or losses after five weeks? **19.** _____

20. At the end of the year last year, Widgets Unlimited, Inc. posted a net income of $209.7 billion. If this continues, what would be its total income for three years? **20.** _____

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Additional Exercises 1.4

Date:_____

Evaluate the expression.

1. 5^4 **1.** _____

2. -5^2 **2.** _____

3. $\left(\frac{4}{7}\right)^2$ **3.** _____

4. $(-4)^3$ **4.** _____

5. 1^5 **5.** _____

6. $(0.03)^3$ **6.** _____

7. $(-3)^4$ **7.** _____

8. -3^4 **8.** _____

9. $\left(\frac{1}{3}\right)^3$ **9.** _____

10. $\left(\frac{1}{4}\right)^2$ **10.** _____

Write the expression in exponent form.

11. $(7)(7)(7)(7)(7)$ **11.** _____

12. $(x)(x)(x)(x)(x)(x)(x)$ **12.** _____

13. $(8y)(8y)(8y)(8y)$ **13.** _____

14. $(x^2y)(x^2y)(x^2y)(x^2y)(x^2y)$ **14.** _____

Evaluate the expression.

15. $4^2(-6)^3$ **15.** _____

16. $7^3-(-12)^2$ **16.** _____

17. $(-2)^2-3^2$ **17.** _____

18. 4^3+7^2 **18.** _____

19. $(-4)^2-(-5)^3$ **19.** _____

20. $(-2)^4(-5)^3$ **20.** _____

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Additional Exercises 1.5

Date:_____

Evaluate the expression.

1. $240 \div 8 - 4$ **1.** _____

2. $3^2 - 2 \cdot 11$ **2.** _____

3. $6 \cdot 17 + 14 \cdot 16$ **3.** _____

4. $3 - (3 + 2)$ **4.** _____

5. $8 - 6(7 - 3)$ **5.** _____

6. $(8 - 5)^2 - 9$ **6.** _____

7. $36 - 4 \div 2 + 6$ **7.** _____

8. $63 - 4 \cdot 11 + 140 \div (-14)$ **8.** _____

9. $2^2 - 4^2$ **9.** _____

10. $\left(\frac{2}{3}\right)^2 \cdot \frac{1}{2}$ **10.** _____

11. $\frac{3}{4} \div \left(\frac{9}{8} + \frac{3}{8}\right)$ **11.** _____

12. $\frac{2}{3} \cdot \left(\frac{5}{6} - \frac{1}{3}\right)$ **12.** _____

13. $(1.5)^2 - 2(1.5)$ **13.** _____

14. $-2^2 + (-2)^2$ **14.** _____

15. $-1.2(6.4 - 7.5)$ **15.** _____

16. $(-2)^2 + (-9)^2 - 7$ **16.** _____

17. $-0.54 \cdot (2.7 - 1.9)^2$ **17.** _____

18. $\left(\frac{1}{2}\right)^2 \cdot \left(\frac{7}{9} - \frac{5}{18}\right)$ **18.** _____

19. $3 \cdot 5 - 2(6 - 4)$ **19.** _____

20. $\left(\frac{1}{4}\right)^2 \left(\frac{1}{10} + \frac{2}{5}\right)$ **20.** _____

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Additional Exercises 1.6

Date:_____

Multiply using the distributive property.

1. $9(6n+7)$ **1.** _____

2. $\frac{1}{5}(25x-40)$ **2.** _____

3. $8(x+4y+9)$ **3.** _____

4. $3x(6x-11)$ **4.** _____

5. $6x^5(-10x-9)$ **5.** _____

6. $3x(3x-8)$ **6.** _____

7. $-6(2x-5)$ **7.** _____

8. $\frac{1}{3}(6x^2+9x-12)$ **8.** _____

9. $5x^3y^5(x^2+4xy-5y^2)$ **9.** _____

10. $4x(2x^2-3xy)$ **10.** _____

11. $-2x^2(-4x-6)$ **11.** _____

12. $-12x^2(-9x^4-7)$ **12.** _____

13. $-4ax^2(-4ax^7+10x^4+2)$ **13.** _____

14. $-4x^3y^5(3x^2y-4xy^4+9y^6)$ **14.** _____

15. $-9x(-2x^2+4x-6)$ **15.** _____

16. $-5x(-5x^2-7x+7)$ **16.** _____

17. $\frac{5}{4}\left(\frac{8}{5}y+\frac{16}{25}x-\frac{12}{25}\right)$ **17.** _____

18. $\frac{2}{3}(6x^2-9x+5)$ **18.** _____

19. $3x^3(12x^5y^3-8x^8y^{12})$ **19.** _____

20. $5y(7x-0.2y+3)$ **20.** _____

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Additional Exercises 1.7

Date:_____

Simplify.

1. $9a-2a+7$ **1.** _____

2. $-9y-2x-7x$ **2.** _____

3. $-3b+8b$ **3.** _____

4. $-8y+6-5+2+y-3$ **4.** _____

5. $5.6k-1.4-3.4k+2+2.5k$ **5.** _____

6. $6-8x+4y+8x-4y-6$ **6.** _____

7. $\left(9x^6-6x^4-4\right)+\left(9x^5-2x^4-3\right)$ **7.** _____

8. $-12x+6y+6-4x+3y-4$ **8.** _____

9. $\frac{3}{8}y^2-\frac{1}{2}y^2-\frac{1}{4}$ **9.** _____

10. $-8(10x+4)+4(4x+10)$ **10.** _____

11. $10ab+3+18ab^2+14+6ab^2+16ab+7ab^2$ **11.** _____

12. $-(3wz-5)+4(2wz+7)$ **12.** _____

13. $5(3n+4)+2n-7$ **13.** _____

14. $8n(m+5n)+12\left(6mn+7n^2\right)$ **14.** _____

15. $-8(6x+3)+6(9x+7)$ **15.** _____

16. $\frac{4}{11}\left(x^2y\right)-\frac{9}{22}\left(x^2y\right)-\frac{5}{22}\left(x^2y\right)$ **16.** _____

17. $3\left(2n^7-5n^6-3n\right)+2n\left(5n^7-5n^5+4\right)$ **17.** _____

18. Find the perimeter of a square with sides of length $x-7$. **18.** _____

19. Find the perimeter of a triangle whose sides are of lengths $3x-1$, $7x-4$, and $2x$. **19.** _____

20. The value of 6 dimes is $10\cdot 6=60$ cents. Likewise, the value of x dimes is $10x$. If Rick finds $8x$ dimes, $3x+2$ nickels, and x quarters in his change cup, express the total value of the change in cents as an algebraic expression. **20.** _____

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Additional Exercises 1.8

Date:_____

Evaluate the expression for the specified values.

1. $4x+9$ for $x=8$ **1.** _____

2. $-3x^2-2x+7$ for $x=-2$ **2.** _____

3. $14x-9$ for $x=6$ **3.** _____

4. $8x^2$ for $x=-11$ **4.** _____

5. $2-x^2$ for $x=-10$ **5.** _____

6. $-4x-3$ for $x=8$ **6.** _____

7. $3x^2-5x+2$ for $x=5$ **7.** _____

8. $\frac{7}{3}x^2+8$ for $x=3$ **8.** _____

9. $-9-10x^2+3x$ for $x=7$ **9.** _____

10. $(6x)^2+2(5x+1)$ for $x=2$ **10.** _____

11. $a^2+5ac-c^2$ for $a=-8$ and $c=5$ **11.** _____

12. $4x^2-5xyz+6y^2$ for $x=4$, $y=-3$, and $z=-2$ **12.** _____

Solve.

13. A rectangular poster has a width of 2.5 feet and a length of 3.8 feet. What is the area of the poster? **13.** _____

14. A window in the shape of a trapezoid has an altitude of 39 inches. One base measures 33 inches, and the other base measures 25 inches. What is the area of the window? **14.** _____

15. A circular pizza has a radius of 12 in. What is the area of the pizza? Use 3.14 to approximate π, and round the final answer to one decimal place, if needed. **15.** _____

16. The temperature on a thermometer was $34°C$. Convert this temperature to Fahrenheit. Use the formula $F=\frac{9}{5}C+32$. **16.** _____

17. A square compartment opening in a television set measures 18 cm per side. Next year's design will contain the same square compartment, but each side of the opening will measure only 15 cm. By how much will the area of the opening be decreased? **17.** _____

18. In a home economics class, students cut triangular pieces of fabric for a quilt. Each triangle has a base of 27 cm and an altitude of 15 cm. What is the area of each triangular piece of fabric? **18.** _____

19. A weather forecaster has predicted a high temperature of $24°C$ for tomorrow. Find the temperature in degrees Fahrenheit. Use the formula $F=\frac{9}{5}C+32$. **19.** _____

20. Aaron's map shows that he needs to drive 82 more km to reach his destination. Approximately how many more miles must he drive? Use the formula Miles = $0.62k$, where k is the number of kilometers. Round the answer to the nearest tenth of a mile. **20.** _____

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Additional Exercises 1.9

Date:_____

Simplify.

1. $7+7(11-4m)$ **1.** _____

2. $-4(2x-6)-4x+7$ **2.** _____

3. $12-3(16-x)$ **3.** _____

4. $-3(x-2)+2x$ **4.** _____

5. $-4(5x+3)+7(6x-5)$ **5.** _____

6. $-4(5r^2+10)+7(8r+10)$ **6.** _____

7. $-3(x+2)+3(2x-5)$ **7.** _____

8. $4x(5x-2)+4(x^2-3x)$ **8.** _____

9. $3c+3(5c-3)-5(5c+4)+4c-6$ **9.** _____

10. $3x-4(3x-7)+8(2x+1)$ **10.** _____

11. $3x-3+5(x-6)+2(x-3)$ **11.** _____

12. $8-5(3x-7)+2x(4x+5)$ **12.** _____

13. $3p+4(p+1)-2(5p-2)-7(3p+4)$ **13.** _____

14. $[-8p-(2p-3)]+[(4p-(-7-5p))-9p]$ **14.** _____

15. $-4m[8m^2-7(2-3m)]$ **15.** _____

16. $-4x[3x-x(2x-3)]$ **16.** _____

17. $9x^2(3x-1)-5x(x^2+5)$ **17.** _____

18. $3x^3(7x-4)+x^2(2x^2-4x)$ **18.** _____

19. $9y^2(y+9)-7[y+3(y-4y^3)]$ **19.** _____

20. $4\{12y^2+3[7y^2-2y^2(y+z)]\}$ **20.** _____

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Mini-Lecture 0.1

Simplifying Fractions

Learning Objectives:

1. Understand basic mathematical definitions.
2. Simplify fractions to lowest terms using prime numbers.
3. Convert between improper fractions and mixed numbers.
4. Change a fraction to an equivalent fraction with a given denominator.
5. Key vocabulary: *whole numbers, fractions, numerator, denominator, numerals, simplest (reduced) form, natural numbers, counting numbers, factors, prime numbers, lowest terms, multiplicative identity, proper/improper fraction, mixed number*

Examples:

1. Identify the numerator, denominator, and whole number part, if any.

   a) $\frac{7}{13}$ b) $\frac{1}{4}$ c) $4\frac{2}{5}$ d) $5\frac{2}{3}$

2. Simplify each fraction.

   a) $\frac{5}{10}$ b) $\frac{16}{64}$ c) $\frac{42}{77}$ d) $\frac{88}{90}$

3. Change each improper fraction to a mixed number or a whole number.

   a) $\frac{8}{5}$ b) $\frac{81}{9}$ c) $\frac{34}{4}$ d) $\frac{196}{9}$

4. Change each mixed number to an improper fraction.

   a) $2\frac{3}{4}$ b) $6\frac{2}{9}$ c) $1\frac{43}{58}$ d) $103\frac{4}{5}$

5. Build each fraction to an equivalent fraction with the specified denominator.

   a) $\frac{1}{4}=\frac{?}{12}$ b) $\frac{5}{7}=\frac{?}{49}$ c) $\frac{3}{8}=\frac{?}{32}$

Teaching Notes:

- Most students prefer to simplify fractions by dividing the numerator and denominator by the same number. Encourage them to also try factoring into prime numbers and canceling common factors – it will be a useful skill later.
- Most students find it easy to convert between mixed numbers and improper fractions.
- Remind students that either improper fractions or mixed numbers are OK; but often one is preferred, depending on how the result will be used.
- Refer students to the charts ***To Change an Improper Fraction to a Mixed Number*** and ***To Change a Mixed Number to an Improper Fraction*** in the textbook.

Answers: 1a) num: 7; den: 13, b) num: 1; den: 4, c) num: 2; den: 5; whole: 4, d) num: 2; den: 3; whole: 5; 2a) $\frac{1}{2}$, *b)* $\frac{1}{4}$, *c)* $\frac{6}{11}$, *d)* $\frac{44}{45}$; *3a)* $1\frac{3}{5}$, *b) 9, c)* $8\frac{1}{2}$, *d)* $21\frac{7}{9}$; *4a)* $\frac{11}{4}$, *b)* $\frac{56}{9}$, *c)* $\frac{101}{58}$, *d)* $\frac{519}{5}$; *5a) 3, b) 35, c) 12*

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Mini-Lecture 0.2

Adding and Subtracting Fractions

Learning Objectives:

1. Add or subtract fractions with a common denominator.
2. Use prime factors to find the least common denominator of two or more fractions.
3. Add or subtract fractions with different denominators.
4. Add or subtract mixed numbers.
5. Key vocabulary: *least common denominator (LCD)*

Examples:

1. Add or subtract. Simplify all answers.

   a) $\frac{3}{8}+\frac{2}{8}$ b) $\frac{5}{14}+\frac{3}{14}$ c) $\frac{2}{3}-\frac{1}{3}$ d) $\frac{9}{15}-\frac{3}{15}$

2. Find the LCD for each group of fractions.

   a) $\frac{4}{9}, \frac{5}{6}$ b) $\frac{3}{15}, \frac{17}{20}$ c) $\frac{7}{8}, \frac{9}{14}, \frac{11}{16}$

3. Add or subtract. Simplify all answers.

   a) $\frac{2}{4}+\frac{1}{8}$ b) $\frac{5}{6}+\frac{7}{8}$ c) $\frac{5}{12}+\frac{11}{30}$ d) $\frac{2}{3}+\frac{2}{24}+\frac{1}{6}$

   e) $\frac{3}{4}-\frac{5}{8}$ f) $\frac{2}{3}-\frac{3}{16}$ g) $\frac{5}{6}-\frac{8}{12}$ h) $\frac{4}{5}-\frac{8}{10}$

4. Add or subtract. Express the answer as a mixed or whole number. Simplify all answers.

   a) $8\frac{3}{10}+1\frac{1}{10}$ b) $10\frac{5}{7}+15\frac{1}{2}$ c) $12\frac{3}{8}-10\frac{1}{4}$ d) $16\frac{3}{8}-10\frac{1}{2}$

Teaching Notes:

- Tell students that the LCD and LCM are the same.
- Some students try to "cross-cancel" instead of finding the LCD in example 3.
- Some students add (or subtract) the denominators instead of finding the LCD.
- Some students forget to multiply the numerator when building equivalent fractions.
- Encourage students to change mixed numbers to improper fractions so that they can avoid borrowing for subtraction, and also because it leads more logically to adding rational expressions in algebra.
- Refer the students to the charts ***Add/Subtract Two Fractions with Common/Uncommon Denominators*** and ***Procedure to Find the LCD Using Prime Factors*** in the textbook.

Answers: 1a) $\frac{5}{8}$, b) $\frac{4}{7}$, c) $\frac{1}{3}$, d) $\frac{2}{5}$; 2a) 18, b) 60, c) 112; 3a) $\frac{5}{8}$, b) $\frac{41}{24}$ or $1\frac{17}{24}$, c) $\frac{47}{60}$, d) $\frac{11}{12}$, e) $\frac{1}{8}$, f) $\frac{23}{48}$, g) $\frac{1}{6}$, h) 0; 4a) $9\frac{2}{5}$, b) $26\frac{3}{14}$, c) $2\frac{1}{8}$, d) $5\frac{7}{8}$

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Mini-Lecture 0.3

Multiplying and Dividing Fractions

Learning Objectives:

1. Multiply fractions, whole numbers, and mixed numbers.
2. Divide fractions, whole numbers, and mixed numbers.
3. Key vocabulary: *reciprocal of a fraction, complex fraction*

Examples:

1. Multiply the fractions. Simplify all answers.

   a) $\frac{1}{2}\times\frac{3}{4}$ b) $\frac{10}{9}\times\frac{6}{15}$ c) $\frac{5}{6}\times\frac{9}{2}$ d) $\frac{5}{24}\times\frac{36}{25}$

2. Multiply the fractions, whole numbers, and mixed numbers. Simplify all answers.

   a) $7\times\frac{4}{9}$ b) $\frac{4}{9}\times 18$ c) $3\frac{1}{2}\times 1\frac{1}{4}$ d) $2\frac{3}{4}\times\frac{8}{9}$

3. Divide the fractions. Simplify all answers.

   a) $\frac{1}{2}\div\frac{3}{4}$ b) $\frac{5}{9}\div\frac{3}{15}$ c) $\frac{5}{6}\div\frac{9}{2}$ d) $\frac{5}{24}\div\frac{36}{24}$

4. Divide the fractions, whole numbers, and mixed numbers. Simplify all answers.

   a) $5\div\frac{3}{7}$ b) $\frac{2}{\frac{18}{36}}$ c) $\frac{5}{3}\div 8\frac{3}{4}$ d) $\frac{7\frac{1}{2}}{1\frac{3}{4}}$

Teaching Notes:

- Some students need to be shown how to turn a whole number into a fraction.
- Most students do better if they cancel before multiplying.
- Some students cancel before taking the reciprocal of the second fraction in division.
- Some students forget that mixed numbers must be changed to improper fractions before multiplying or dividing. Some try to multiply/divide the whole number parts together, and then multiply/divide the fraction parts together.
- Refer students to the charts ***To Multiply Any Two Fractions*** and ***To Divide Two Fractions*** in the textbook.
- Show some examples of applied problems.

Answers: 1a) $\frac{3}{8}$, b) $\frac{4}{9}$, c) $\frac{15}{4}$ or $3\frac{3}{4}$, d) $\frac{3}{10}$; 2a) $\frac{28}{9}$ or $3\frac{1}{9}$, b) 8, c) $\frac{35}{8}$ or $4\frac{3}{8}$, d) $\frac{22}{9}$ or $2\frac{4}{9}$; 3a) $\frac{2}{3}$, b) $\frac{25}{9}$ or $2\frac{7}{9}$, c) $\frac{5}{27}$, d) $\frac{5}{36}$; 4a) $\frac{35}{3}$ or $11\frac{2}{3}$, b) 4, c) $\frac{4}{21}$, d) $\frac{30}{7}$ or $4\frac{2}{7}$

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Mini-Lecture 0.4

Using Decimals

Learning Objectives:

1. Understand the meaning of decimals.
2. Change a fraction to a decimal.
3. Change a decimal to a fraction.
4. Add and subtract decimals.
5. Multiply decimals.
6. Divide decimals.
7. Multiply and divide a decimal by a power of 10.
8. Key vocabulary: *decimal, decimal point, decimal places, divisor, dividend, quotient*

Examples:

1. Write each of the following decimals as a fraction or mixed number. State the number of decimal places. Write out in words the way the number would be spoken.

   a) 0.8 b) 3.17 c) 0.029 d) 5.0008

2. Write each fraction as a decimal.

   a) $\frac{4}{5}$ b) $\frac{5}{8}$ c) $\frac{9}{18}$ d) $\frac{5}{15}$

3. Write each decimal as a fraction in simplified form.

   a) 0.3 b) 0.8 c) 3.35 d) 122.004

4. Add or subtract.

   a) 39.1 + 18.6 b) 1.665 + 9.888 c) 48.7 – 2.9 d) 30.44 – 16.3

5. Multiply or divide.

   a) 2.4×1.6 b) 0.581×2.9 c) $54.6 \div 2.6$ d) $0.8112 \div 0.06$

6. Multiply or divide by moving the decimal point.

   a) 7.05×1000 b) 0.0343×100 c) $16{,}544 \div 100$ d) $0.413 \div 1000$

Teaching Notes:

- Most students find adding, subtracting, and multiplying easy.
- Some students have trouble with dividing, especially when the divisor is a decimal.
- Refer students to the charts on ***Adding, Subtracting, Multiplying, and Dividing Decimals*** in the textbook.

Answers: 1a) $\frac{8}{10}$; 1 decimal place; eight tenths, b) $3\frac{17}{100}$; 2 decimal places; three and seventeen hundredths, c) $\frac{29}{1000}$; 3 decimal places; twenty-nine thousandths, d) $5\frac{8}{10{,}000}$; 4 decimal places; five and eight ten-thousandths; 2a) 0.8, b) 0.625, c) 0.5, d) $0.\overline{3}$; 3a) $\frac{3}{10}$, b) $\frac{4}{5}$, c) $3\frac{7}{20}$, d) $122\frac{1}{250}$; 4a) 57.7, b) 11.553, c) 45.8, d) 14.14; 5a) 3.84, b) 1.6849, c) 21, d) 13.52; 6a) 7050, b) 3.43, c) 165.44, d) 0.000413

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Mini-Lecture 0.5

Percents, Rounding, and Estimating

Learning Objectives:

1. Change a decimal to a percent.
2. Change a percent to a decimal.
3. Find the percent of a given number.
4. Find the missing percent when given two numbers.
5. Use rounding to estimate.
6. Key vocabulary: *percent*

Examples:

1. Change the decimal to a percent.

   a) 0.25 b) 0.8 c) 0.0616 d) 4.67 e) 1.4

2. Change the percent to a decimal.

   a) 2% b) 30% c) 9.5% d) 0.044% e) 244.9%

3. Find the missing number or the missing percent.

   a) What is 5% of 80? b) What percent of 80 is 0.8? c) Find 190% of 375.

4. Application problems.

   a) A salesperson earned a commission of $5316 for selling $44,300 worth of batteries to various stores. Find the commission rate.
   b) A $180 table is on sale for 5% off. Find the discount and the sale price.

5. Round each number so that there is one non-zero digit. Then perform the calculation with the rounded numbers.

   a) 631×197 b) $63 + 27 + 13 + 88$ c) Find 3.9% of $8,235.

6. Determine an estimate of the exact answer. Use estimation by rounding.

   a) Estimate the area of Mrs. Smith's garden if it measures $11\frac{2}{3}$ feet by $15\frac{2}{3}$ feet.

   b) The local Burger King registered $338,534 in sales last month. 17% of their sales were for whoppers. Estimate the amount of money spent on whoppers last month.

Teaching Notes:

- Some students remember which way to move the decimal easier if you remind them that, as in the alphabet, move right for ***D***ecimal to ***P***ercent, and left for percent to decimal.
- Refer students to the "how to" charts in this section of the textbook.
- A common mistake students make is to leave the digits to the right of the rounding position intact instead of changing them to zeros after rounding.

Answers: 1a) 25%, b) 80%, c) 6.16%, d) 467%, e) 140%; 2a) 0.02, b) 0.3, c) 0.095, d) 0.00044, e) 2.449; 3a) 4, b) 1%, c) 712.5; 4a) 12%, b) discount: $9, sale price: $171; 5a) 120,000, b) 190, c) $320; 6a) 192 ft^2, b) $60,000

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Mini-Lecture 0.6

Using the Mathematics Blueprint for Problem Solving

Learning Objectives:

1. Use the Mathematics Blueprint to solve real-life problems.

Examples:

1. a) ***Geometry*** The Narbonne's need to replace the deck floor in their backyard. The deck is $10\frac{1}{2}$ feet by $21\frac{1}{2}$ feet. If the new decking costs \$3.50 per square foot, how much will it cost them to replace the deck? (Round your answer to the nearest cent.)

   b) ***Distance*** Melissa is jogging for exercise. This week she ran $1\frac{1}{2}$ miles on Monday, $2\frac{1}{4}$ miles on Tuesday, and on Thursday she ran $2\frac{1}{2}$ times the distance that she ran on Monday. How many miles did she run this week?

   c) ***Real Estate*** In 1985, the average selling price of an existing single-family home in Lowell, MA, was \$145,200. Between 1985 and 1990, the average price decreased by 5%. Then between 1990 and 2008, the average price increased by 67%. What was the average price in 1990? What was the average price in 2008? (Round to the nearest dollar)

   d) ***Budget*** The Price family had an income of \$83,800 last year. If 32% of this income was withheld for various taxes, how much money did the Price family take home last year?

   e) ***Budget*** If the Price family in question d) spent 5% of their take-home income on utilities last year, how much money did they spend on utilities last year?

   f) ***Budget*** If the Price family in question d) spent \$12,240 on food last year, what percent of their take-home income did they spend on food last year?

   g) ***Geometry*** The Carlson family is installing a large rectangular water fountain in their backyard. If the fountain measures about $9\frac{1}{2}$ feet by 8 feet, and is 4.5 feet deep, about how much water will it take to fill the fountain?

Teaching Notes:

- Refer students to the ***Mathematics Blueprint for Problem Solving*** in the textbook.
- Many students have trouble with application problems and will need to see several examples done out step-by-step.
- Encourage students to draw and label a diagram of the problem whenever possible.
- Encourage students to estimate the answers to check if their final solutions make sense.

Answers: 1a) \$790.13, b) $7\frac{1}{2}$ miles, c) 1990-\$137,940, 2008-\$230,360, d) \$56,984, e) \$2849.20, f) about 21.5%, g) 342 cubic feet

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Mini-Lecture 1.1

Adding Real Numbers

Learning Objectives:

1. Identify different types of numbers.
2. Use real numbers in real-life situations.
3. Add real numbers with the same sign.
4. Add real numbers with opposite signs.
5. Use the addition properties for real numbers
6. Key vocabulary: *whole numbers, integers, rational numbers, irrational numbers, real numbers, number line, positive numbers, negative numbers, opposite numbers, additive inverses, absolute value*

Examples:

1. List all numbers from $\{-2/3, 44, \pi, 1.5, 0.\overline{3}\}$ that fall into each category:

   a) whole number b) rational number c) irrational number d) real number

2. Use a real number to represent each situation.

   a) Jerome lost 22.5 pounds b) Mark climbed 2,344 feet up a mountain

3. Find the opposite of each number in (a) and (b). Find the absolute value of each number in (c) and (d).

   a) 9 b) -4.5 c) $|-5|$ d) $\left|\frac{7}{9}\right|$

4. Add real numbers with the same sign.

   a) $-5+(-3)$ b) $5+4$ c) $-2.1+(-7.3)$ d) $4.9+8.1$ e) $-\frac{3}{4}+\left(-\frac{5}{8}\right)$

5. Add real numbers with opposite signs.

   a) $5+(-3)$ b) $-15+8$ c) $6.2+(-3.3)$ d) $-\frac{2}{12}+\frac{3}{24}$

6. Add real numbers with different signs.

   a) $(-15)+3+(-10)$ b) $-5+8+(-3)+(-5)+16$ c) $13.54+(-11.03)+18.22$

Teaching Notes:

- Make sure students are familiar with number lines.
- Some students have never seen absolute value before and will need many examples.
- Some students need to see the addition problems done on a number line first.
- Many students are not familiar with putting negative numbers into a calculator.
- Refer students to the ***Addition Rule for Two Numbers with the Same/Different Sign*** charts in the textbook.

Answers: 1a) 44, b) $-\frac{2}{3}$, 44, 1.5, $0.\overline{3}$, c) π, d) all in set; 2a) –22.5, b) +2,344; 3a) –9, b) 4.5, c) 5, d) $\frac{7}{9}$; 4a) –8, b) 9, c) – 9.4, d) 13, e) $-\frac{11}{8}$ or $-1\frac{3}{8}$; 5a) 2, b) –7, c) 2.9, d) $-\frac{1}{24}$; 6a) –22, b) 11, c) 20.73

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Mini-Lecture 1.2

Subtracting Real Numbers

Learning Objectives:

1. Subtract real numbers with the same or different signs.
2. Key vocabulary: *additive inverse property*

Examples:

1. Subtract the signed numbers by adding the opposite of the second number to the first number.

   a) $3-5$ b) $3-(-5)$ c) $-3-5$

   d) $-3-(-5)$ e) $-20-6$ f) $13-(-2)$

   g) $-\frac{3}{4}-\left(\frac{5}{8}\right)$ h) $5.4-9.2$ i) $-6.6-(-6.6)$

2. First change all subtractions into add the opposite, then perform the calculations.

   a) $3-(-9)+6$ b) $-5.1-7.3-(-12)$ c) $12+(-4)-13$

   d) $-2+8-(-15)+9$ e) $44.9+(-3.01)+(-2.6)$ f) $-2-4+(-5)$

3. a) Find the difference in altitude between a mountain 5436 feet high and a gorge 213 feet below sea level.

   b) Find the difference in temperature in Conway, New Hampshire, between $-3°\text{F}$ during the day and $-12°\text{F}$ during the night.

   c) In January the value of one share of a certain stock was \$45. During the next three days, the value rose $\$5\frac{1}{4}$, fell $\$2\frac{1}{2}$, and fell $\$1\frac{1}{4}$. What was the value of one share at the end of those three days?

Teaching Notes:

- Many students find subtracting signed numbers difficult at first.
- Some students forget to change the sign of the second number after changing subtraction to addition. Encourage students to show the step: $3-5=3+(-5)$
- Emphasize that "subtract a from b" means $b+(-a)$
- Refer students to the ***Subtraction of Real Numbers*** chart in the textbook.

Answers: 1a) –2, b) 8, c) –8, d) 2, e) –26, f) 15, g) $-\frac{11}{8}$ or $-1\frac{3}{8}$, h) –3.8, i) 0; 2a) 18, b) –0.4, c) –5, d) 30, e) 39.29, f) –11; 3a) 5649 ft, b) 9 °F, c) \$46.50

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Mini-Lecture 1.3

Multiplying and Dividing Real Numbers

Learning Objectives:

1. Multiply real numbers.
2. Use the multiplication properties for real numbers.
3. Divide real numbers.

Examples:

1. Multiply. Be sure to write your answer in simplest form.

   a) $(3)(5)$ b) $(4)(-15)$ c) $(-30)(-5)$

   d) $(-24)(3)$ e) $(2.2)(-3.3)$ f) $\left(-\frac{3}{4}\right)\left(-\frac{8}{9}\right)$

2. Divide.

   a) $-16 \div 8$ b) $24 \div 2$ c) $-9 \div -3$ d) $45.6 \div -3.8$

   e) $-17.6 \div -6.4$ f) $-\frac{3}{5} \div \frac{15}{20}$ g) $\frac{\frac{4}{7}}{-\frac{3}{14}}$ h) $\frac{-33.3}{-12}$

3. Multiply each group of signed numbers.

   a) $(-4)(-3)(2)$ b) $5(-7)(3)(-6)(-1)$ c) $9(-3)(5)(0)$

   d) $(-6)(5)(5)\left(\frac{3}{4}\right)$ e) $(5)(1)(-3)(11)(-2)$ f) $8(-2.2)(-4.7)(9)$

Teaching Notes:

- Most students find the multiply and divide rules for signed numbers easy to remember.
- Remind students that multiplication is commutative. So in problem 3(d), they can choose to move the $\frac{3}{4}$ next to the -6 and cancel before multiplying.
- Be sure students understand the difference between $\frac{0}{x}$ and $\frac{x}{0}$ ($x \neq 0$).
- Refer students to the charts ***Multiplication/Division of Real Numbers*** and ***Multiplication Properties for Real Numbers*** in the textbook.

Answers: 1a) 15, b) –60, c) 150, d) –72, e) –7.26, f) $\frac{2}{3}$; 2a) –2, b) 12, c) 3, d) –12, e) 2.75, f) $-\frac{4}{5}$, g) $-\frac{8}{3}$ or $-2\frac{2}{3}$, h) 2.775; 3a) 24, b) –630, c) 0, d) $-\frac{225}{2}$ or $-112\frac{1}{2}$, e) 330, f) 744.48.

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Mini-Lecture 1.4

Exponents

Learning Objectives:

1. Write numbers in exponent form.
2. Evaluate numerical expressions that contain exponents.
3. Key vocabulary: *base, exponent, variable, squared, cubed, n-th power*

Examples:

1. Write in exponent form.

   a) $(4)(4)(4)(4)(4)$ b) $(w)(w)(w)$ c) $(2p)(2p)(2p)(2p)$

2. Evaluate.

   a) 5^2 b) 2^3 c) 3^4 d) $(-5)^2$

   e) -5^2 f) $(-2)^3$ g) -2^3 h) $(-3)^4$

   i) $\left(-\frac{1}{2}\right)^2$ j) $\left(-\frac{2}{3}\right)^3$ k) $\left(\frac{3}{4}\right)^4$ l) $-\left(\frac{2}{3}\right)^2$

   m) $(0.3)^2$ n) $(-1.2)^3$ o) -18^2 p) -8^4

3. Evaluate.

   a) $6^3 + 5^2$ b) $3^4 - 2^5$ c) $(-1)^2 - (-3)^4$

   d) $(-5)^3(-2)^3$ e) $6^2(-3)^3$ f) $2^4(-2)^2$

Teaching Notes:

- Many students do not understand the difference between -3^2 and $(-3)^2$.
- Some students do not know how to say 3^2, or 2^3, or 5^4, etc., in words and need to see the words written out: three squared, two cubed, five to the fourth power, etc.
- Refer students to the chart ***Sign Rule for Exponents*** in the textbook.

Answers: 1a) 4^5, b) w^3, c) $(2p)^4$; 2a) 25, b) 8, c) 81, d) 25, e) –25, f) –8, g) –8, h) 81, i) $\frac{1}{4}$, j) $-\frac{8}{27}$, k) $\frac{81}{256}$, l) $-\frac{4}{9}$, m) 0.09, n) –1.728, o) –324, p) -4096; 3a) 241, b) 49, c) –80, d) 1000, e) –972, f) 64

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Mini-Lecture 1.5

The Order of Operations

Learning Objectives:

1. Use the order of operations to simplify numerical expressions.
2. Key vocabulary: *order of operations*

Examples:

1. Evaluate.

   a) $5 + (-5) + (-8)$ b) $7(-4) + 4$ c) $3(1-9)+5\cdot 4$

   d) $18 \div 2(-3) + (-8)$ e) $64 - 5(9 - 3) + (-21) \div 3$ f) $-9 - (5)(-6) + (-36) \div (-4)$

2. Evaluate.

   a) $\frac{1}{4} - \frac{1}{2} \div \frac{4}{5}$ b) $2.8(-3) + 6(5.1)$ c) $\frac{1}{3} \div \left(-\frac{2}{5}\right) \div \left(-\frac{5}{6}\right) + (-18)$

3. Evaluate.

   a) $-9 - 3^2 - (-6)$ b) $7(-5) + (3 - 5)^3$ c) $6^2 - 4(3) + 24 \div 8$

   d) $\left(\frac{1}{2}\right)^2 + \frac{2}{5}\left(-\frac{3}{4}\right)$ e) $-3.2 - (2.2)^3 - (-4.2)$ f) $0.04 \times 1.2 - (0.5 - 0.7)^3$

Teaching Notes:

- Many students find this section difficult.
- Refer students to the ***Order of Operations for Numbers*** chart in the textbook.
- Point out that, in the order of operations, multiplication/division have equal priority and addition/subtraction have equal priority. Operations with equal priority are done left-to-right.

Answers: 1a) –8, b) –24, c) –4, d) –35, e) 27, f) 30; 2a) $-\frac{3}{8}$, b) 22.2, c) –17; 3a) –12, b) –43, c) 27, d) $-\frac{1}{20}$, e) –9.648, f) 0.056

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Mini-Lecture 1.6

Using the Distributive Property to Simplify Algebraic Expressions

Learning Objectives:

1. Use the distributive property to simplify algebraic expressions.
2. Key vocabulary: *algebraic expression, term, distributive property, factors*

Examples:

1. Multiply. Use the distributive property.

   a) $2(x+6)$ b) $3(4x-2)$ c) $(-2)(x+6)$

   d) $(-5)(-3a-4b)$ e) $(7m-3n)(4)$ f) $5(2p+4q-1)$

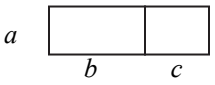
2. Multiply. Use the distributive property.

   a) $-(0.4x+1.2y)$ b) $2.5(1.8x^2-2.9x+1)$ c) $\frac{1}{3}(6x+12y-21)$

   d) $(5a-2b-2)(-ab)$ e) $\frac{2}{3}(-15a+12b+6)$ f) $-0.4x(-2.2x^2-0.4x+0.6)$

3. a) The price of a cell phone was $3x$. A manager's special reduced the price by \$6.00. If the store sold $5y$ cell phones, use the distributive property to find the value of the cell phones sold.

   b) Illustrate the distributive property using the area of two rectangles:



Teaching Notes:

- Some students need to rewrite subtraction as adding the opposite when they first start learning how to distribute.
- Many students make sign errors when distributing.
- Some students need to see several side examples of how to handle multiplying variables such as $x(x)$ or $x(x^2)$ before attempting examples 2(d),(f). Avoid referring to the exponent rule $x^a \cdot x^b = x^{a+b}$, as this will not be covered until chapter 4.
- Stress that the distributive property is valid no matter how many terms are added/subtracted inside the parentheses.

Answers: 1a) 2x + 12, b) 12x – 6, c) –2x – 12, d) 15a + 20b, e) 28m – 12n, f) 10p + 20q – 5; 2a) –0.4x – 1.2y, b) $4.5x^2 – 7.25x + 2.5$, c) 2x + 4y – 7, d) $–5a^2b + 2ab^2 + 2ab$, e) –10a + 8b + 4, f) $0.88x^3 + 0.16x^2 – 0.24x$; 3a) 5y(3x – 6) = 15xy – 30y (dollars), b) a(b + c) = ab + ac

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Mini-Lecture 1.7

Combining Like Terms

Learning Objectives:

1. Identify like terms.
2. Combine like terms.
3. Key vocabulary: *term, like terms, simplify*

Examples:

1. Identify the like terms in each group.

   a) $3x,\ 5x,\ 2y,\ x$ b) $-4x^2,\ 2y^2,\ 3x^2y,\ 9x^2$ c) $22m^2n,\ 5m^2n^3,\ 4m^2n^3$

2. Combine like terms.

   a) $6a - 5b - 4a + 3b$ b) $1.4x + 3.3y - 2.3x + 5y$ c) $-7p - 3 + 4p - 8$

   d) $\frac{2}{3}x + \frac{1}{3}y - \frac{1}{4}x + \frac{1}{4}y$ e) $\frac{2}{5}a^2 - \frac{3}{8}b^2 - \frac{4}{15}a^2 - \frac{5}{12}b^2$ f) $4x^2 + 3x - 6 - 2x + 8 + x^2$

3. Simplify. Use the distributive property to remove parentheses; then combine like terms.

   a) $6(2x - 3y) + 2(3y - 4x)$ b) $3x(x - 2y) - 4(-3x^2 - 5xy)$

   c) $-3(5xy - 11y^2) - y(3x + 4y)$ d) $5(2 - x) - (9 - 12x)$

4. a) A rectangle has sides of length $5x - 2$ meters and $8x + 4$ meters. What is the perimeter of the rectangle?
   b) A triangle has sides of length $3a - 6$ feet, $2a + 9$ feet, and $4a + 2$ feet. Each side is doubled in length. What is the perimeter of the new enlarged triangle?

Teaching Notes:

- Some students do not know that a variable without a numerical coefficient, as in 2(f), actually has a coefficient of 1.
- Many students have difficulty with fractional coefficients, as in 2(d) and (e), and need to see several examples.
- Some students forget to distribute the minus sign in 3(b) and (c). They sometimes understand the problem better if they rewrite subtraction as "add the opposite" at first.
- Some students need to write a 1 in front of the second parenthesis in 3(d) in order to distribute correctly.
- Some students think $2a + 3a$ is $5a^2$.

Answers: 1a) 3x, 5x, x, b) $-4x^2$, $9x^2$, c) $5m^2n^3$, $4m^2n^3$; 2a) 2a – 2b, b) –0.9x + 8.3y, c) –3p – 11, d) $\frac{5}{12}x + \frac{7}{12}y$, *e)* $\frac{2}{15}a^2 - \frac{19}{24}b^2$, *f)* $5x^2 + x + 2$; *3a) 4x – 12y, b)* $15x^2 + 14xy$, *c)* $29y^2 - 18xy$, *d) 7x + 1; 4a) 26x + 4 meters, b) 18a + 10 ft*

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Mini-Lecture 1.8

Using Substitution to Evaluate Algebraic Expressions and Formulas

Learning Objectives:

1. Evaluate an algebraic expression for a specified variable.
2. Evaluate a formula by substituting values.
3. Key vocabulary: *evaluate, substitute, perimeter, area, right angle, altitude*

Examples:

1. Evaluate.

   a) $-3x + 4$; $x = 2$ b) $x^2 + 5x$; $x = -3$ c) $4y - (2x)^2$; $x = -2$, $y = 4$

   d) $5x^2 - 3x + 8$; $x = 3$ e) $\frac{1}{2}x^2 + 3x - 4$; $x = 4$ f) $\frac{a^2 - ab}{2b}$; $a = -2$, $b = -1$

2. Evaluate, using a formula and substituting values.

   a) A field is shaped like a parallelogram. The base measures 94 feet. The altitude measures 52 feet. What is the area of the field?

   b) A section of the Clinton's roof needs to be sealed and re-roofed. The triangular region to be re-roofed has an altitude of 12 feet and a base of 17 feet. What is the area of the region that needs to be re-roofed?

   c) In January, 2004, the average temperature in Kathy's home town was 62°F. Kathy's friend, who lives in Canada, wants to know what that temperature is in degrees Celsius. Find the Celsius temperature. Use $C = \frac{5}{9}(F - 32)$.

   d) While traveling in Canada you see on the map that it is 23 kilometers to the nearest town. Approximately how many miles is it to the nearest town? Use the formula $m = 0.62k$, where m is the number of miles and k is the number of kilometers.

   e) The radius of a café table is 15 inches. What is the area of the table?

Teaching Notes:

- Many students have trouble with word problems.
- Encourage students to use the ***Mathematics Blueprint for Problem Solving*** from Appendix B in the textbook.
- Refer students to the ***Geometric Formulas: Two-Dimensional Figures*** chart in this section of the textbook.
- Do not require students to memorize all the geometric formulas. Provide them with a summary sheet.

Answers: 1a) –2, b) –6, c) 0, d) 44, e) 16, f) –1; 2a) 4888 ft^2, b) 102 ft^2, c) $16.\overline{6}°C$, d) 14.26 miles, e) 706.5 $in.^2$

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Mini-Lecture 1.9

Grouping Symbols

Learning Objectives:

1. Simplify algebraic expressions by removing grouping symbols
2. Key vocabulary: *grouping symbols, fraction bars*

Examples:

1. Simplify by evaluating innermost parentheses first.

   a) $3 + 2(5 - 1)$

   b) $4 - [2 + (8 + 3)]$

   c) $2(3 + 1) + [3(4 - 2) + 4]$

   d) $2 - \{6 - 4[1 - (1 - 3)]\}$

   e) $-2\{4 - 3[2(1 - 3) + 5]\}$

   f) $5\{3 + [2 - (4 - 1)]\} + 6$

2. Simplify by removing grouping symbols and combining like terms.

   a) $3x - 3(y - 4x)$

   b) $-5(a + 3b) + 5(3b - a)$

   c) $5y[-2y^2 + 2(1 - y)]$

   d) $-6[3(2a + b) - 4(2a - 2b)]$

   e) $3(x + 3y) - [2 - 4(x + y)]$

   f) $2[2x - y(3x + 2y) + y^2]$

   g) $6b(5b^2 - 2b - 4) - 3b(5 - b)$

   h) $4b^2 - 2[5b + 3b(2 - b)]$

   i) $5a - \{4b - 5[a - (b - 2a)]\}$

   j) $-2\{3x^2 - 3[2x - (3 - 2x^2)]\}$

3. Explore the purpose of grouping symbols. For part (a), choose a number and follow the described procedure for operations. For part (b), use the variable x instead of a specific number.

   a) Choose a number. Add 2. Multiply the result by 5. Subtract 6 from the new answer. Add 4 to that result. What is your final number?

   b) Use x instead of a specific number. Follow the exact procedure as in part (a), except this time your final answer will be an algebraic expression with grouping symbols.

Teaching Notes:

- Remind students to work from the inside out, and to watch signs when distributing.
- Some students need to see several side examples of how to handle multiplying variables such as $x(x)$ or $x(x^2)$ before attempting problems such as 2(c), (g). Avoid referring to the exponent rule $x^a \cdot x^b = x^{a+b}$, as this will not be covered until chapter 4.

Answers: 1a) 11, b) –9, c) 18, d) 8, e) –2, f) 16; 2a) 15x – 3y, b) –10a, c) $-10y^3 - 10y^2 + 10y$, d) 12a – 66b, e) 7x + 13y – 2, f) $4x - 6xy - 2y^2$, g) $30b^3 - 9b^2 - 39b$, h) $10b^2 - 22b$, i) 20a – 9b, j) $6x^2 + 12x - 18$; 3a) answers vary, b) 5(x + 2) – 6 + 4 = 5x + 8

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Mini-Lecture 2.1

The Addition Principle of Equality

Learning Objectives:

1. Use the addition principle to solve equations of the form $x + b = c$
2. Key vocabulary: *equation, solution, equivalent equations, solving an equation, checking a solution, identity*

Examples:

1. Determine whether the given solution is correct.

   a) Is $x = 3$ the solution to $x + 5 = 8$?

   b) Is $x = -2$ the solution to $-12 = x - 10$?

   c) Is $x = 6$ the solution to $x - 15 = 5$?

   d) Is $x = -9$ the solution to $x + 23 = 30$?

2. Solve for x. Check your answers.

   a) $x - 4 = 16$

   b) $14 = x - 12$

   c) $x + 15 = 18$

   d) $-13 = x + 22$

   e) $21 = -16 + x$

   f) $x - (-6) = 18$

   g) $22 - 7 = x - 5$

   h) $12 - 6 + x = 8 - 2$

   i) $-17 + x - 9 = 2 - 42 + 8$

3. Solve for x. Check your answers.

   a) $\frac{3}{8} + x = \frac{7}{8}$

   b) $\frac{1}{3} + x = \frac{5}{6}$

   c) $x - \frac{1}{5} = 0$

   d) $x - \frac{9}{10} = -\frac{2}{3} + \frac{1}{15}$

   e) $-2.2 + x = 16$

   f) $6.3 = 19.2 + x - 3.2$

Teaching Notes:

- Some students prefer to see the addition property steps written horizontally, while others prefer to see them written under the like term on the other side of the equation.
- Encourage students to write out all of the addition property steps and to avoid using shortcuts until they have mastered these types of equations.
- Encourage students to write the steps for solving the equations in a neat and organized manner. This habit will help immensely when the equations become more complex.
- Encourage students to simplify both sides of the equation before using the addition principle.
- Refer students to ***The Addition Principle*** chart in the textbook.

Answers: 1a) yes, b) yes, c) no, d) no; 2a) x = 20, b) x = 26, c) x = 3, d) x = –35, e) x = 37, f) x = 12, g) x = 20, h) x = 0, i) x = –6; 3a) $x = \frac{1}{2}$, *b)* $x = \frac{1}{2}$, *c)* $x = \frac{1}{5}$, *d)* $x = \frac{3}{10}$, *e) x = 18.2, f) x = –9.7*

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Mini-Lecture 2.2

The Multiplication Principle of Equality

Learning Objectives:

1. Solve equations of the form $\frac{1}{a}x = b$.
2. Solve equations of the form $ax = b$.
3. Key vocabulary: *coefficient, multiplicative inverse*

Examples:

1. Solve for x. Be sure to reduce your answer. Check your solution.

   a) $\frac{1}{5}x = 6$ b) $\frac{1}{4}x = -25$ c) $\frac{x}{12} = 5$ d) $-9 = \frac{x}{9}$

2. Solve for x. Be sure to reduce your answer. Check your solution.

   a) $3x = 9$ b) $-9x = 72$ c) $-11 = 2x$ d) $1.2x = 102$

   e) $-16 = -x$ f) $-x = 100$ g) $-3.5x = -112$ h) $53 = -8x$

3. Determine whether the given solution is correct. If it is not, find the correct solution.

   a) Is 6 the solution for $-2x = 12$? b) Is -45 the solution for $-x = 45$?

4. Mixed practice.

   a) $\frac{1}{9}x = -6$ b) $-43 = 4x$ c) $-6.4x = -137.6$

   d) $-99 = -x$ e) $-8 = \frac{x}{8}$ f) $\frac{x}{15} = 225$

Teaching Notes:

- Some students need to be shown that $\frac{1}{12}x = \frac{1}{12} \cdot \frac{x}{1} = \frac{1 \cdot x}{12 \cdot 1} = \frac{x}{12}$.
- Refer students to the ***Multiplication Principle*** and ***Division Principle*** charts in the textbook.

Answers: 1a) x = 30, b) x = –100, c) x = 60, d) x = –81; 2a) x = 3, b) x = –8, c) x = $-\frac{11}{2}$ or $-5\frac{1}{2}$, d) x = 85, e) x = 16, f) x = –100, g) x = 32, h) x = –6.625; 3a) no, x = –6, b) yes; 4a) x = –54, b) x = –10.75, c) x = 21.5, d) x = 99, e) x = –64, f) x = 3375

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Mini-Lecture 2.3

Using the Addition and Multiplication Principles Together

Learning Objectives:

1. Solve equations of the form $ax + b = c$.
2. Solve equations with the variable on both sides of the equation.
3. Solve equations with parentheses.

Examples:

1. Determine whether the given solution is correct.

   a) Is $x = 12$ a solution for $5x + 4 - 2x = 3x - 5 + x$?
   b) Is $x = 9$ a solution for $5x + 4 - 2x = 3x - 5 + x$?

2. Solve for x. Check your solution.

   a) $8x + 7 = 87$ b) $7x - 8 = 27$ c) $33 = 6x - 3$

   d) $164 = 15x + 14$ e) $\frac{1}{2}x - 8 = -2$ f) $-\frac{2}{3}x - 8 = -32$

3. Solve the equation. Check your solution.

   a) $4x = -2x + 60$ b) $8x - 6 = 3 + 9x$ c) $-6x - 10 = -7 + 10x$

   d) $0.6y - 0.3 = 0.7 - 0.3y$ e) $x - 2 = 20 - x$ f) $-9x + 4 + 7x = -3x + 9$

4. Solve the equation. Check your solution.

   a) $6(2x - 1) = 30$ b) $-1(x + 11) = 20$ c) $5(x + 8) = 6(x - 8)$

   d) $6(x + 9) - (5x - 2) = -3$ e) $0.4x - 0.2(3 - x) = 7.6$ f) $2x - 3(x - 5) = -4x + 15$

Teaching Notes:

- Encourage students to check their solutions, as in problem 1.
- In problem 3, some students prefer to always end up with the variable on the left, while others prefer to always end up with a positive coefficient in front of the variable.
- Some students confuse the different properties and try to subtract the coefficient from the variable instead of dividing it off.
- Some students do not collect the like terms before trying to solve 3(f).

Answers: 1a) no, b) yes; 2a) x = 10, b) x = 5, c) x = 6, d) x = 10, e) x = 12, f) x = 36; 3a) x = 10, b) x = –9, c) $x = -\frac{3}{16}$, d) $y = \frac{10}{9}$ or $1\frac{1}{9}$, e) x = 11, f) x = 5; 4a) x = 3, b) x = –31, c) x = 88, d) x = –59, e) $x = \frac{41}{3}$ or $13\frac{2}{3}$, f) x = 0

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Mini-Lecture 2.4

Solving Equations with Fractions

Learning Objectives:

1. Solve equations with fractions.
2. Key vocabulary: *equation has no solutions, equation has an infinite number of solutions*.

Examples:

1. Determine whether (a) $x = 2$ and (b) $x = -6$ are solutions to the equation.

   $$\frac{1}{2}(x-4)+2=\frac{1}{8}(3x-6)$$

2. Solve. Check your solution.

   a) $\frac{1}{2}x-\frac{1}{2}=-5$ b) $\frac{2}{5}y-\frac{1}{3}y=5$ c) $\frac{7x+5}{2}+\frac{7}{2}=-\frac{4x}{5}$

   d) $\frac{1}{4}(x+6)=\frac{1}{6}(x+8)$ e) $\frac{1}{3}(y+5)+\frac{1}{3}(y-2)=y$

   f) $-\frac{7}{9}x-\left(x+\frac{1}{8}\right)=\frac{1}{72}(x-8)$ g) $\frac{3y+6}{5}=1+\frac{3}{4}y$

3. Solve. Check your solution.

   a) $0.4x+3.9=8.2$ b) $1.4x+3.8=0.8x+0.26$ c) $1.2m-2.4=0.8m-1.36$

   d) $0.45(60)+0.6x=0.5(60+x)$ e) $0.07y+0.15(3000-y)=0.42y$

   f) $1+5(x-2)=12x+3-7x$ g) $3(2x-1)=8x+5-(2x+8)$

Teaching Notes:

- Most students find this section difficult.
- Some students only multiply the fraction terms by the LCD, instead of multiplying every term on each side of the equation by the LCD.
- Some students like to multiply both sides of the equation by a power of 10 when solving decimal equations. Others like to leave the equation in decimal form.
- Some students prefer to make equivalent fractions with common denominators, then set the numerators equal to each other.
- Refer students to the ***Procedure to Solve Equations*** chart in the textbook.

Answers: 1a) no, b) yes; 2a) x = –9, b) y = 75, c) x = $-\frac{60}{43}$ or $-1\frac{17}{43}$, d) x = –2, e) y = 3, f) x = $-\frac{1}{129}$, g) y = $\frac{4}{3}$ or $1\frac{1}{3}$; 3a) x = $\frac{43}{4}$ or 10.75, b) x = $-\frac{59}{10}$ or –5.9, c) m = $\frac{13}{5}$ or 2.6, d) x = 30, e) y = 900, f) no solution, g) infinite solutions

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Mini-Lecture 2.5

Formulas

Learning Objectives:

1. Solve a formula for a specified variable.

Examples:

1. Substitute values into the given formula and solve.

   a) The formula for the perimeter of a rectangle is $P = 2L + 2W$. If the length, L, is 9 meters and the perimeter, P, is 28 meters find the width, W, of the rectangle.

   b) The area of a triangle is given by $A = \frac{1}{2}bh$. If the base, b, is 19 in. and the height, h, is 17 in., find the area.

   c) The formula for calculating simple interest is $I = prt$. If the amount of interest, I, is \$6.00, the principal (amount of money invested), p, is \$150.00, and the rate of interest, r, is 1%, find the amount of time, t in years, the money was invested for.

2. Solve for the indicated variable.

   a) $d = rt$, for r b) $V = \frac{1}{3}Bh$, for h c) $P = 2L + 2W$, for W

   d) $F = \frac{9}{5}C + 32$, for C e) $y = 2x - 5$, for x f) $S = 2\pi rh + 2\pi r^2$, for h

3. Application problems.

   a) During a chemistry experiment, Ken recorded the temperature of a liquid to be 95°F. Using the result from 2(d), find the temperature in degrees Celsius.

   b) A contestant in a 29-mile race finished in 4 hours. What was her average rate during the race, to the nearest tenth? Use the result from 2(a).

Teaching Notes:

- Many students have difficulty with the problems in example 2.
- Most students like to enter all of the given numbers into a formula before solving for one of the variables. So in 3(a), they usually substitute in 95°F, then solve for C.
- Refer students to the ***Procedure to Solve a Formula for a Specified Variable*** chart in the textbook.

Answers: 1a) $W = 5$ meters, b) $A = 161.5$ square inches, c) $t = 4$ years; 2a) $r = \frac{d}{t}$, b) $h = \frac{3V}{B}$, c) $W = \frac{P - 2L}{2}$, d) $C = \frac{5}{9}(F - 32)$, e) $x = \frac{y + 5}{2}$, f) $h = \frac{S - 2\pi r^2}{2\pi r}$; 3a) 35 ℃, b) 7.3 miles per hour

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Mini-Lecture 2.6

Solving Inequalities in One Variable

Learning Objectives:

1. Interpret inequality statements.
2. Graph an inequality on a number line.
3. Translate English phrases into algebraic statements.
4. Solve and graph an inequality.
5. Key vocabulary: *inequalities, "is less than", "is greater than", solution of an inequality, solution set of an inequality, graph of an inequality, solve an inequality*

Examples:

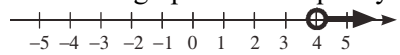
1. Replace the ? by < or >.

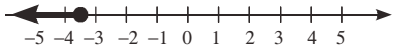
   a) $6 \;?\; -2$ b) $-7 \;?\; 2$ c) $-3.\overline{3} \;?\; -3.3$

2. Graph each inequality on a number line.

   a) $x \geq -2$ b) $x < \frac{2}{3}$

3. Translate each graph to an inequality using the variable x.

   a) 

   b) 

4. Translate each English statement into an inequality.
   a) The cost of shoes must be less than \$70. (Use the variable c.)
   b) The speed of the sports car is more than 116 mph. (Use the variable s.)

5. Solve and graph the result.

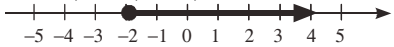
   a) $x - 1 < 4$ b) $6x \leq -30$ c) $\frac{1}{3}x \geq 2$

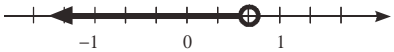
   d) $2x - 6 \leq 4$ e) $4 - 4x > 16$ f) $\frac{1}{3}(x+2) < \frac{2}{5}(x+1)$

Teaching Notes:

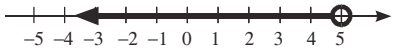
- Some students are unfamiliar with < and > and need to be told to point to the smaller number.
- Many students forget to reverse the direction of the inequality symbol as necessary.
- Some students do better if they move the variable in such a way that it has a positive coefficient whenever possible.
- Refer students to the ***Procedure for Solving Inequalities*** chart in the textbook.

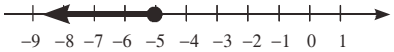
Answers: 1a) >, b) <, c) <;

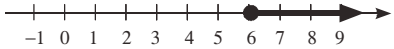
2a) 

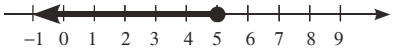
b) 

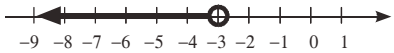
3a) $x > 4$, *b)* $x \leq -3.5$; *4a)* $c < 70$, *b)* $s > 116$

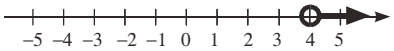
5a) $x < 5$; 

b) $x \leq -5$; 

c) $x \geq 6$; 

d) $x \leq 5$; 

e) $x < -3$; 

f) $x > 4$; 

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