Review Exercises (Ch. 3)

1)

a) $3x + 8 = 11$
$3x = 3$ ç Subtract 8 from both sides of equation
$x = 1$ ç Divide both sides of equation by 3

b) $7 + x = 3 - 4x$
$7 + 5x = 3$ ç Add $4x$ to both sides of equation
$5x = -4$ ç Subtract 7 from both sides of equation
$x = -\frac{4}{5} = -0.8$ ç Divide both sides of equation by 5

c) $5x + 7 = -23$
$5x = -30$ ç Subtract 7 from both sides of equation
$x = -6$ ç Divide both sides of equation by 5

d) $1.2 - x = 0.7 - 0.5x$
$1.2 = 0.7 + 1.5x$ ç Add x to both sides of equation
$0.5 = 1.5x$ ç Subtract 0.7 from both sides of equation
$x = \frac{1}{3}$ ç Divide both sides of equation by 0.5

e) $6 = 2x + 9$
$-3 = 2x$ ç Subtract 9 from both sides of equation
$x = -\frac{3}{2} = -1.5$ ç Divide both sides of equation by 2

f) $7x - 8 = 5x + 13$
$2x - 8 = 13$ ç Subtract $2x$ from both sides of equation
$2x = 21$ ç Add 8 to both sides of equation
$x = \frac{21}{2} = 11.5$ ç Divide both sides of equation by 2

g) $\frac{1}{2}x + 6 = \frac{7}{2}x - 21$
$6 = \frac{6}{2}x - 21$ ç Subtract $\frac{1}{2}x$ from both sides of equation
$6 = 3x - 21$ ç Simplify the fraction
$27 = 3x$ ç Add 21 to both sides of equation
$x = 9$ ç Divide both sides of equation by 3

h) $\frac{2}{3}x - 1 = 6 + \frac{1}{3}x$
$\frac{1}{3}x - 1 = 6$ ç Subtract $\frac{1}{3}x$ from both sides of equation
$\frac{1}{3}x = 7$ ç Add 1 to both sides of equation
$x = 21$ ç Multiply both sides of equation by 3

3)

a)

Time (hrs)	Distance (mi)
1	50
2	100
3	150
4	200
t	$50t$

b) In Section 1.2, we learned DISTANCE = RATE · TIME. In this example, the rate is $50\frac{\text{mi}}{\text{hr}}$. The time of travel is our variable t, so from the formula given above, we see that $50t$ represents the distance (in mi) that is traveled.

c) This solution to the equation $120 = 50t$ represents the amount of time it takes to travel 120 miles at a rate of $50\frac{\text{mi}}{\text{hr}}$.

d) $120 = 50t$
$t = \frac{120}{50} = \frac{12}{5} = 1.4$
It takes 1.4 hrs (1 hour 24 min) to travel 120 miles at a rate of $50\frac{\text{mi}}{\text{hr}}$.

5) $T = 3S + 1$
$28 = 3S + 1$
$27 = 3S$
$S = 9$
9 squares are made from 28 toothpicks.

7)

a) $3x + 2 - x - 5$
$= 3x - x + 2 - 5$ ç Group like terms
$= 2x - 3$ ç Combine like terms

b) $2(x + 1) + 3x - 4$
$= 2x + 2 + 3x - 4$ ç Distributive Property (Fact 2.2)
$= 2x + 3x + 2 - 4$ ç Group like terms
$= 5x - 2$ ç Combine like terms

c) $x - (6 - 4x) + 2x$
$= x + {}^{-}1(6 - 4x) + 2x$ ç Special Property of $^{-}1$ (Fact 2.6-c)
$= x + {}^{-}6 + 4x + 2x$ ç Distributive property (Fact 2.2)
$= x + 4x + 2x - 6$ ç Group like terms
$= 7x - 6$ ç Combine like terms

d) $3(2x - 4) + x^2 - 12$
$= 6x - 12 + x^2 - 12$ ç Distributive Property (Fact 2.2)
$= x^2 + 6x - 12 - 12$ ç Group like terms

$= x^2 + 6x - 24$ ç Combine like terms

e) $3y - x^2 - y + 4x^2$

$= -x^2 + 4x^2 + 3y - y$ ç Group like terms

$= 3x^2 + 2y$ ç Combine like terms

f) $\frac{1}{3} + x + \frac{1}{6} + 2x$

$= x + 2x + \frac{1}{3} + \frac{1}{6}$ ç Combine like terms

$= x + 2x + \frac{2}{6} + \frac{1}{6}$ ç Get a common denominator

$= 3x + \frac{3}{6}$ ç Combine like terms

$= 3x + \frac{1}{2}$ ç Simplify

g) $\frac{1}{2}x - \frac{1}{3}x$

$= \frac{3}{6}x - \frac{2}{6}x$ ç Get a common denominator

$= \frac{1}{6}x$ ç Combine like terms

h) $\frac{3}{4}(2x + 8) - \frac{1}{2}x$

$= \frac{6}{4}x + 6 - \frac{1}{2}x$ ç Distributive property (Fact 2.2)

$= \frac{6}{4}x - \frac{1}{2}x + 6$ ç Combine like terms

$= \frac{3}{2}x - \frac{1}{2}x + 6$ ç Get a common denominator

$= \frac{2}{2}x + 6$ ç Combine like terms

$= x + 6$ ç Simplify

9)

a) $2x + 8 + x = 32$

$3x + 8 = 32$ ç LS

$3x = 24$ ç A

$x = 8$ ç M

b) $5(x - 2) + 9 = 7(x + 3)$

$5x - 10 + 9 = 7(x + 3)$ ç LS

$5x - 1 = 7(x + 3)$ ç LS

$5x - 1 = 7x + 21$ ç RS

$-2x - 1 = 21$ ç A

$-2x = 22$ ç A

$x = -11$ ç M

11) $P = 2L + 2W$

$P = 20$ in, $W = 4$ in

$P = 2L + 2W$

$20 = 2L + 2(4)$
$20 = 2L + 8$
$12 = 2L$
$L = 6$
The rectangle has length of 6 inches.

13)

a) The value for t must be less than 1 hr. Since the northbound train is traveling at a rate of $45\frac{\text{mi}}{\text{hr}}$, it will travel 45 miles in 1 hour. Similarly, the southbound train will travel 55 miles in one hour. Thus after one hour, the trains will be 45 + 55 = 100 miles apart. From this, we can logically conclude that it takes for the trains will be 36 miles apart will be *less than* 1 hour.

b) The distance traveled by the northbound train is $45t$.

c) $45t + 55t = 36$

d) $45t + 55t = 36$
$100t = 36$
$t = \frac{36}{100} = 0.36$
The trains will be 36 miles apart after 0.36 hours. Since there are 60 minutes in one hour, the time (in minutes) it will take the trains to be 36 miles apart is
$0.36\,\text{hrs}\ \ \frac{60\,\text{min}}{1\,\text{hr}} = 21.6\,\text{min}$. (Notice that "hrs" cancel).

15)

a) $x + x + 90 = 180$

b) $x + x + 90 = 180$
$2x + 90 = 180$
$2x = 90$
$x = 45$
Both unknown angles have measures of 45°.

17)

a) $\frac{10}{4} = \frac{x}{18}$
$180 = 4x$
$x = 45$

b) $\frac{9}{x} = \frac{2}{3}$
$27 = 2x$
$x = \frac{27}{2} = 13.5$

c) $\frac{x}{5} = 3$

$x = 15$

d) $\frac{5}{2} = \frac{8}{x+1}$

$5(x+1) = 16$

$5x + 5 = 16$

$5x = 11$

$x = \frac{11}{5} = 2.2$

19) $C = \frac{F - 32}{1.8}$

$20 = \frac{F - 32}{1.8}$

$20(1.8) = F - 32$

$36 = F - 32$

$F = 68$

When it is 20°C, it is 68°F.

21) Let h be the height of the building (in ft).

$\frac{5 \text{ real ft}}{4 \text{ shadow ft}} = \frac{h}{17 \text{ shadow ft}}$

$\frac{5}{4} = \frac{h}{17}$

$85 = 4h$

$h = 21.25$

The height of the building is 21.25 ft.

23) Let p denote the approximate forest deer population. We have

$\frac{42 \text{ tagged deer in forest}}{p \text{ total deer in forest}} \approx \frac{9 \text{ tagged deer in sample}}{22 \text{ total deer in sample}}$.

$\frac{42}{p} \approx \frac{9}{22}$

$924 \approx 9p$

$103 \approx p$

There are around 103 deer in this forest. (An approximation of 100 is fine).