Chapter 4 **Equations**

Chapter 4 Get Ready

Chapter 4 Get Ready **Question 1** **Page 184**

a) $6x + 5x - 3x = 8x$

b) $2y - 5y + 7y = 4y$

c) $8m - 5m + m = 4m$

d) $-3n + 10n - 2n = 5n$

Chapter 4 Get Ready **Question 2** **Page 184**

a) $5v + 2 - 4 - v = 4v - 2$

b) $6 - 2x - 3 + 9x = 7x + 3$

c) $-7y + 6 + 4y - 2 = -3y + 4$

d) $3k - 8 - 5k + 5 = -2k - 3$

Chapter 4 Get Ready **Question 3** **Page 184**

a) $4(2k - 9) = 8k - 36$

b) $-2(5m + 6) = -10m - 12$

c) $3(6x + 1) = 18x + 3$

d) $-7(y - 2) = -7y + 14$

Chapter 4 Get Ready **Question 4** **Page 184**

a) $2(2x - 5) + 3(x + 9) = 4x - 10 + 3x + 27$
$= 7x + 17$

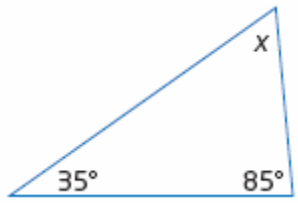
b) $-4(y + 1) + 6(5y - 2) = -4y - 4 + 30y - 12$
$= 26y - 16$

c) $3(7n - 1) - (2n - 3) = 21n - 3 - 2n + 3$
$= 19n$

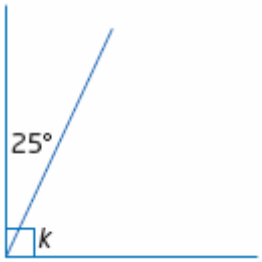
d) $-5(k + 2) - 3(2k - 3) = -5k - 10 - 6k + 9$
$= -11k - 1$

Chapter 4 Get Ready **Question 5** **Page 185**

a) $x = 180° - 35° - 85°$
$= 60°$

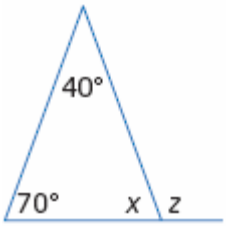


b) $k = 90° - 25°$
$= 65°$

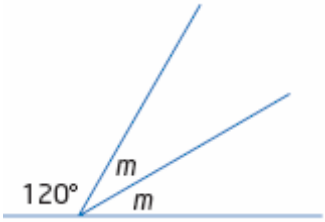


Chapter 4 Get Ready **Question 6 Page 185**

a) $x = 180° - 70° - 40°$
$= 70°$
$z = 180° - x$
$= 180° - 70°$
$= 110°$



b) $2m = 180° - 120°$
$2m = 60°$
$\frac{2m}{2} = \frac{60°}{2}$
$m = 30°$



Chapter 4 Get Ready **Question 7 Page 185**

a) The LCD is 40.

b) The LCD is 18.

Chapter 4 Get Ready **Question 8 Page 185**

a) The LCD is 12.

b) The LCD is 36.

Chapter 4 Get Ready **Question 9 Page 185**

a) $\frac{3}{4} + \frac{7}{12} = \frac{9}{12} + \frac{7}{12}$
$= \frac{16}{12}$
$= \frac{4}{3}$

b) $\frac{7}{8} - \frac{1}{2} = \frac{7}{8} - \frac{4}{8}$
$= \frac{3}{8}$

Chapter 4 Get Ready **Question 10 Page 185**

a) $\frac{5}{8} + \frac{2}{3} = \frac{15}{24} + \frac{16}{24}$
$= \frac{31}{24}$

b) $\frac{11}{12} - \frac{1}{10} = \frac{55}{60} - \frac{6}{60}$
$= \frac{49}{60}$

Chapter 4 Section 1: Solve Simple Equations

Chapter 4 Section 1 **Question 1** **Page 193**

a) $x - 5 = 4$
$x = 9$
The solution is $x = 9$.

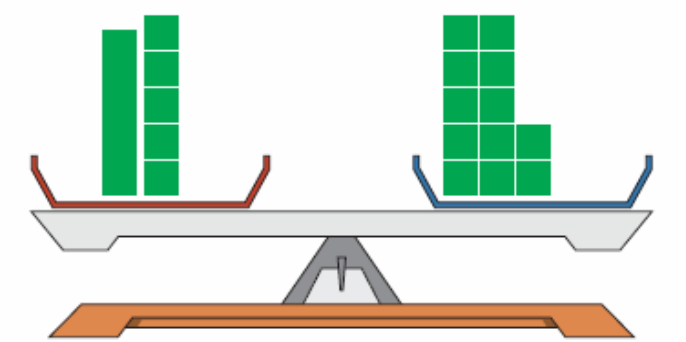
b) $m + 8 = 11$
$m = 3$
The solution is $m = 3$.

c) $y - 3 = 0$
$y = 3$
The solution is $y = 3$.

d) $h + 2 = 6$
$h = 4$
The solution is $h = 4$.

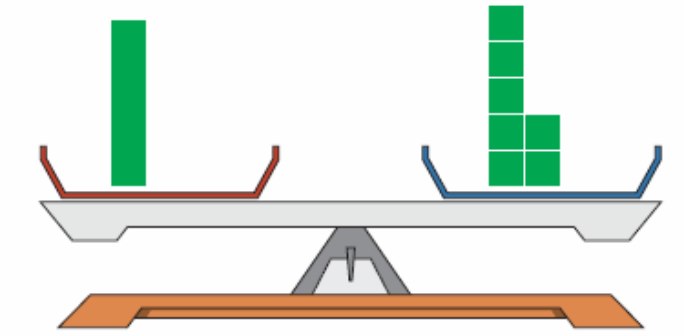
Chapter 4 Section 1 **Question 2** **Page 193**

a) Place one x tile and 5 unit tiles on the left pan. Place 12 unit tiles on the right pan.

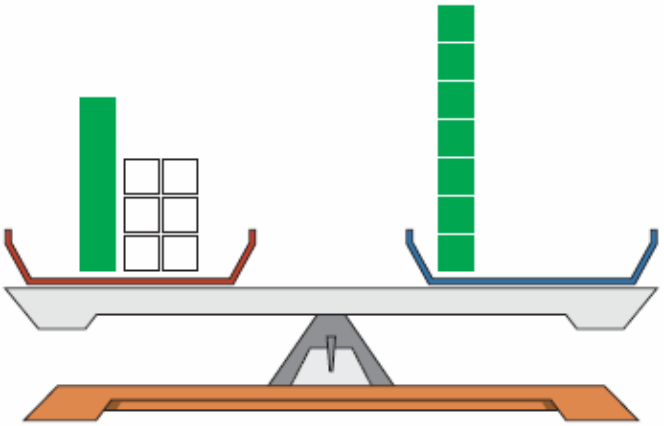


Remove 5 unit tiles from each pan.

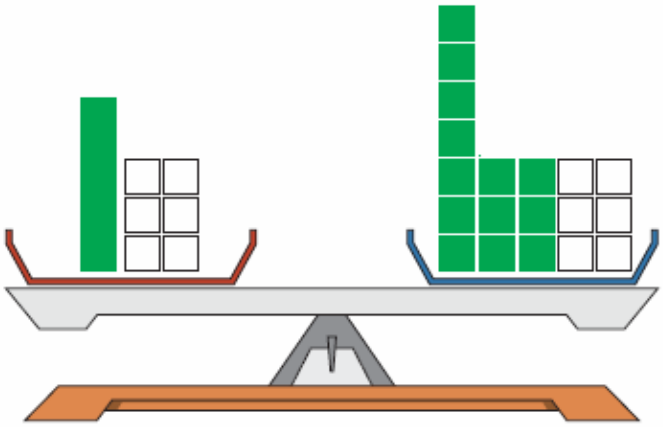
The solution is $x = 7$.



b) Place one x tile and 6 negative unit tiles on the left pan. Place 7 unit tiles on the right pan.

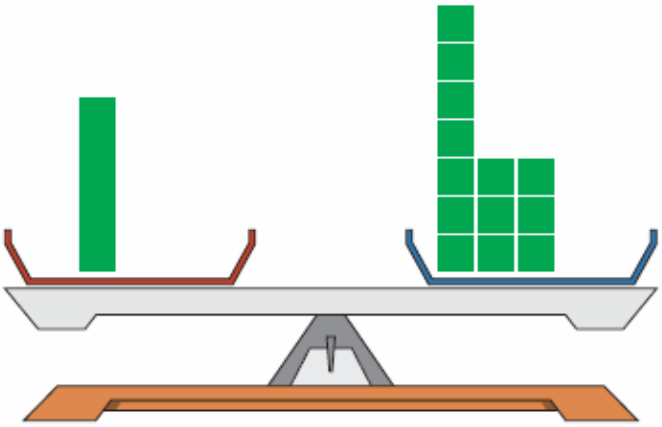


Add 6 zero pairs to the right pan.

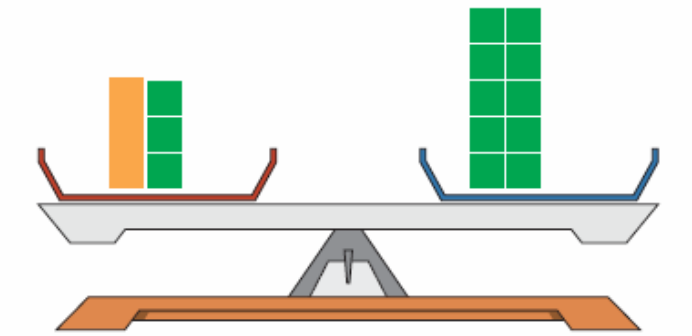


Remove 6 negative unit tiles from each pan.

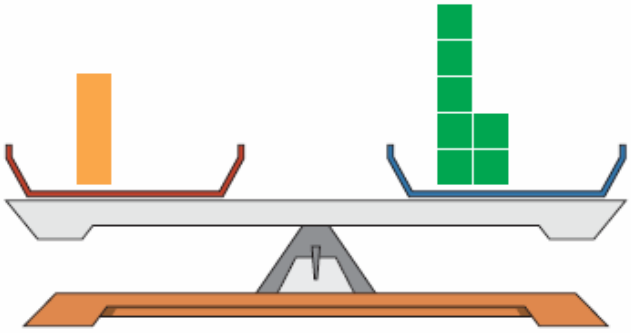
The solution is $x = 13$.



c) Place one y tile and 3 unit tiles in the left pan. Place 10 unit tiles in the right pan.

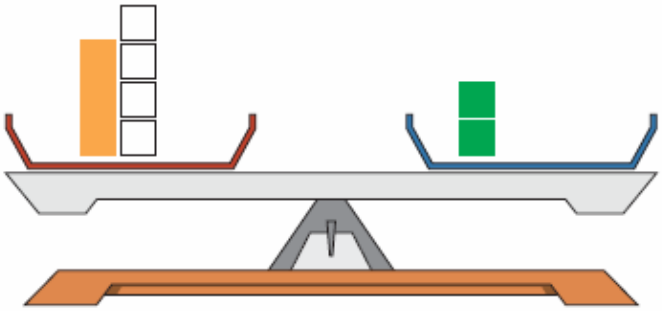


Remove 3 unit tiles from each pan.

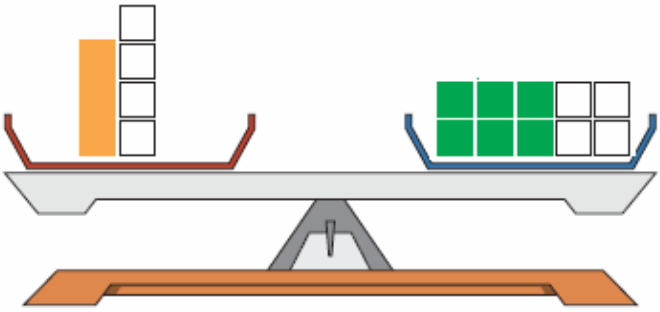


The solution is $y = 7$.

d) Place one y tile and 4 negative unit tiles in the left pan. Place 2 unit tiles in the right pan.

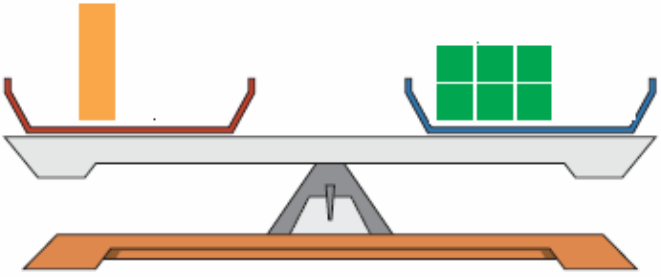


Add 4 zero pairs to the right pan.



Remove 4 negative unit tiles from each pan.

The solution is $y = 6$.



Chapter 4 Section 1 **Question 3** **Page 193**

a) $x+7=12$

$x+7-7=12-7$

$x=5$

The solution is $x = 5$.

b) $n-8=11$

$n-8+8=11+8$

$n=19$

The solution is $n = 19$.

c) $-5+y=-2$

$-5+5+y=-2+5$

$y=3$

The solution is $y = 3$.

d) $-9+h=-6$

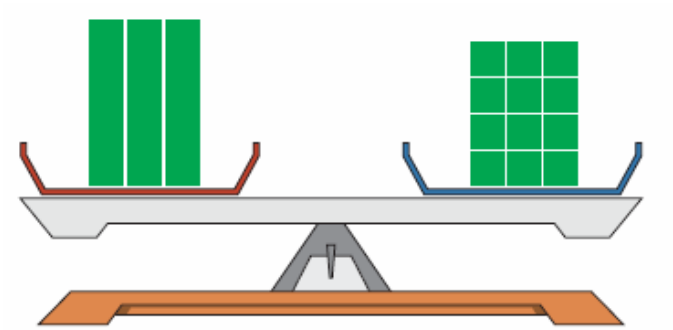
$-9+9+h=-6+9$

$h=3$

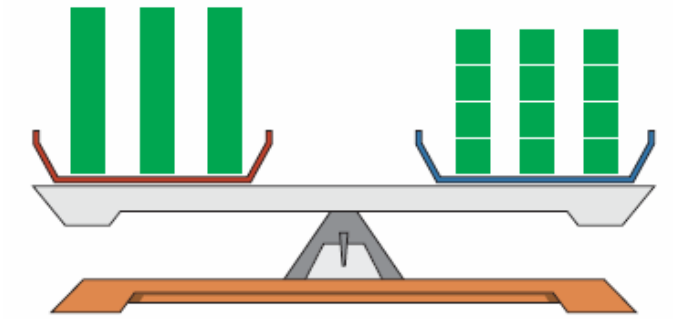
The solution is $h = 3$.

Chapter 4 Section 1 **Question 4** **Page 193**

a) Place three x tiles in the left pan, and 12 unit tiles in the right pan.

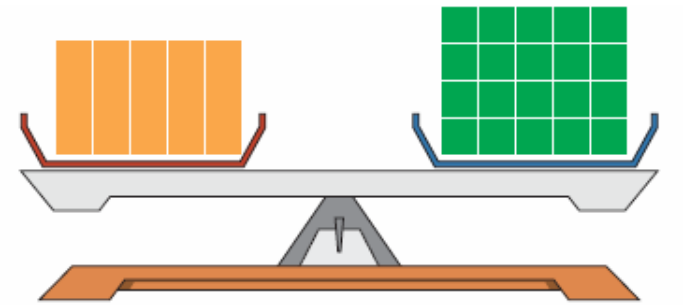


Divide both sides into 3 equal parts.

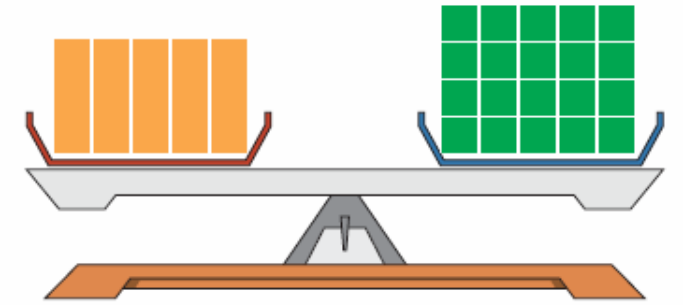


The solution is $x = 4$.

b) Place five y tiles in the left pan and 20 unit tiles in the right pan.

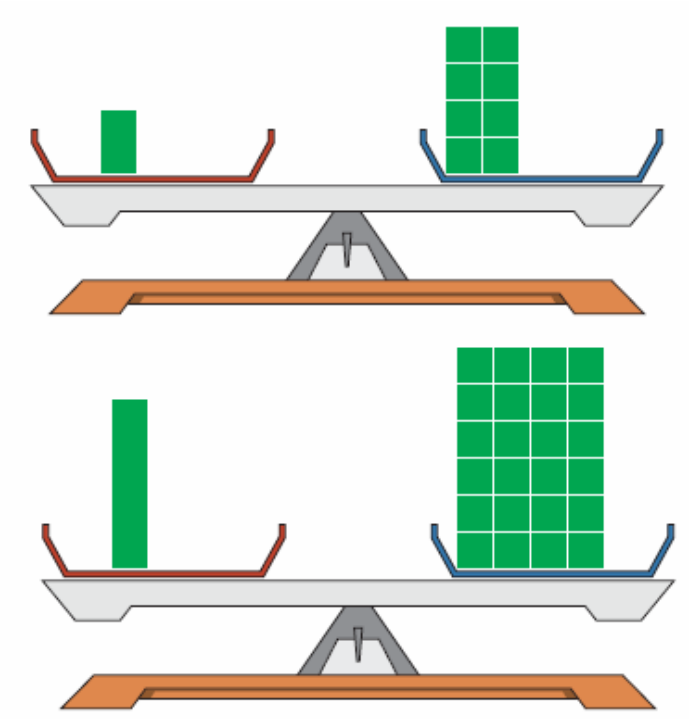


Divide both sides into 5 groups.



The solution is $y = 4$.

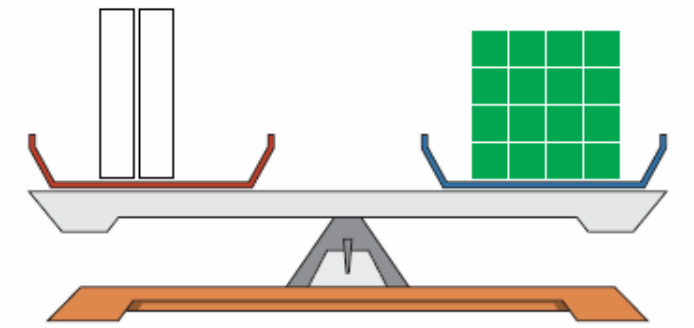
c) Place $\frac{1}{3}$ of an n tile on the left pan, and 8 unit tiles on the right pan.



Multiply the left pan by 3 to obtain a complete n tile. Multiply the right pan by 3 to obtain 24 unit tiles.

The solution is $n = 24$.

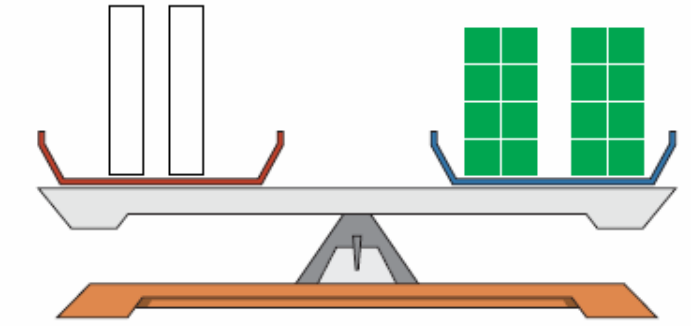
d) Place two negative k tiles on the left pan, and 16 unit tiles on the right pan.



Divide both sides into 2 equal groups.

$-k = 8$

The solution is $k = -8$.



Chapter 4 Section 1 **Question 5 Page 193**

a)

$$4z = -24$$
$$\frac{4z}{4} = \frac{-24}{4}$$
$$z = -6$$

The solution is $z = -6$.

$$\frac{h}{-5} = -6$$
$$\cancel{-5} \times \frac{h}{\cancel{-5}} = -5(-6)$$
$$h = 30$$

The solution is $h = 30$.

c)

$$-6c = -42$$
$$\frac{-6c}{-6} = \frac{-42}{-6}$$
$$c = 7$$

The solution is $c = 7$.

$$-9u = 45$$
$$\frac{-9u}{-9} = \frac{45}{-9}$$
$$u = -5$$

The solution is $u = -5$.

Chapter 4 Section 1 **Question 6** **Page 193**

a)

$$7x-4=10$$
$$7x-4+4=10+4$$
$$7x=14$$
$$\frac{7x}{7}=\frac{14}{7}$$
$$x=2$$

$$\text{L.S.}=7x-4 \quad \text{R.S.}=10$$
$$=7(2)-4$$
$$=14-4$$
$$=10$$

$$\text{L.S.}=\text{R. S.}$$

b)

$$7k+2=16$$
$$7k+2-2=16-2$$
$$7k=14$$
$$\frac{7k}{7}=\frac{14}{7}$$
$$k=2$$

$$\text{L.S.}=7k+2 \quad \text{R.S.}=16$$
$$=7(2)+2$$
$$=14+2$$
$$=16$$

$$\text{L.S.}=\text{R. S.}$$

c)

$$-p+7=0$$
$$-p+7-7=0-7$$
$$-p=-7$$
$$\frac{-p}{-1}=\frac{-7}{-1}$$
$$p=7$$

$$\text{L.S.}=-p+7 \quad \text{R.S.}=0$$
$$=-(7)+7$$
$$=0$$

$$\text{L.S.}=\text{R. S.}$$

d)

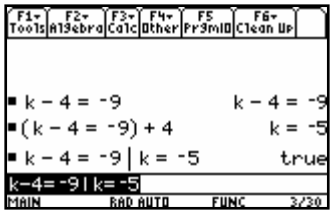
$$-12g-33=0$$
$$-12g-33+33=0+33$$
$$-12g=33$$
$$\frac{-12g}{-12}=\frac{33}{-12}$$
$$g=-\frac{11}{4}$$

$$\text{L.S.}=-12g-33 \quad \text{R.S.}=0$$
$$=-12\left(-\frac{11}{4}\right)-33$$
$$=33-33$$
$$=0$$

$$\text{L.S.}=\text{R. S.}$$

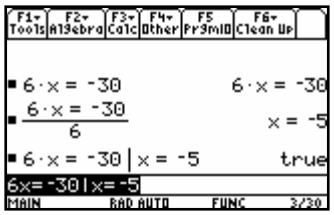
Chapter 4 Section 1 **Question 7 Page 193**

a)



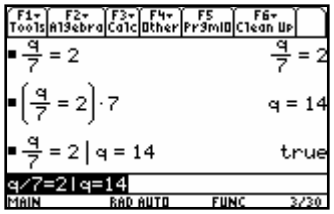
The solution is $k = -5$.

b)



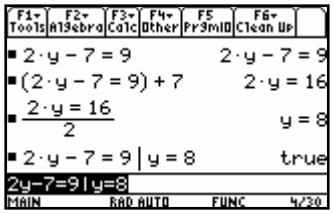
The solution is $x = -5$.

c)



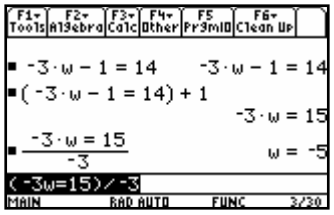
The solution is $q = 14$.

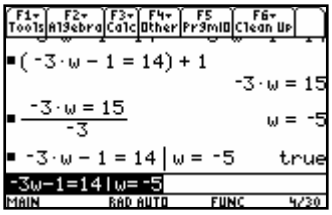
d)



The solution is $y = 8$.

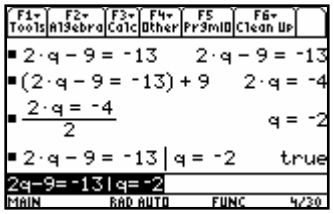
e)





The solution is $w = -5$.

f)



The solution is $q = -2$.

Chapter 4 Section 1 **Question 8** **Page 193**

a)

$$p+9=-2$$
$$p+9-9=-2-9$$
$$p=-11$$

$$\text{L.S.}=p+9 \quad \text{R.S.}=-2$$
$$=(-11)+9$$
$$=-2$$

$$\text{L.S.}=\text{R. S.}$$

The solution is $p=-11$.

b)

$$-5x=35$$
$$\frac{-5x}{-5}=\frac{35}{-5}$$
$$x=-7$$

$$\text{L.S.}=-5x \quad \text{R.S.}=35$$
$$=-5(-7)$$
$$=35$$

$$\text{L.S.}=\text{R. S.}$$

The solution is $x=-7$.

c)

$$\frac{u}{4}=-8$$
$$\cancel{4}\times\frac{u}{\cancel{4}}=4(-8)$$
$$u=-32$$

$$\text{L.S.}=\frac{u}{4} \quad \text{R.S.}=-8$$
$$=\frac{(-32)}{4}$$
$$=-8$$

$$\text{L.S.}=\text{R. S.}$$

The solution is $u=-32$.

d)

$$6r+3=33$$
$$6r+3-3=33-3$$
$$6r=30$$
$$\frac{6r}{6}=\frac{30}{6}$$
$$r=5$$

$$\text{L.S.}=6r+3 \quad \text{R.S.}=33$$
$$=6(5)+3$$
$$=30+3$$
$$=33$$

$$\text{L.S.}=\text{R. S.}$$

The solution is $r=5$.

e)

$$10c - 6 = -16$$
$$10c - 6 + 6 = -16 + 6$$
$$10c = -10$$
$$\frac{10c}{10} = \frac{-10}{10}$$
$$c = -1$$

L.S. $= 10c - 6$ R.S. $= -16$
$= 10(-1) - 6$
$= -10 - 6$
$= -16$

L.S. = R. S.

The solution is $c = -1$.

f)

$$-3v + 6 = -9$$
$$-3v + 6 - 6 = -9 - 6$$
$$-3v = -15$$
$$\frac{-3v}{-3} = \frac{-15}{-3}$$
$$v = 5$$

L.S. $= -3v + 6$ R.S. $= -9$
$= -3(5) + 6$
$= -15 + 6$
$= -9$

L.S. = R. S.

The solution is $v = 5$.

Chapter 4 Section 1 Question 9 Page 193

a) Let n represent the number pies that the customer bought.

$7n = 84$

b)

$$7n = 84$$
$$\frac{7n}{7} = \frac{84}{7}$$
$$n = 12$$

The customer bought 12 pies.

Chapter 4 Section 1 Question 10 Page 194

a) Let n represent the number of jerseys that the team can afford.

$50n = 700$

b)

$$50n = 700$$
$$\frac{50n}{50} = \frac{700}{50}$$
$$n = 14$$

The team can afford to buy 14 jerseys.

Chapter 4 Section 1 **Question 11** **Page 194**

Step	Explanation
$3x - 8 = 7$	Given equation
$3x - 8 + 8 = 7 + 8$	Add 8 to both sides.
$3x = 15$	Simplify by adding integers.
$\frac{3x}{3} = \frac{15}{3}$	Divide both sides by 3.
$x = 5$	Divide integers to give the solution for x.

Chapter 4 Section 1 **Question 12** **Page 194**

a)

$$2k-7=-8$$
$$2k-7+7=-8+7$$
$$2k=-1$$
$$\frac{2k}{2}=\frac{-1}{2}$$
$$k=-\frac{1}{2}$$

$$\text{L.S.}=2k-7 \qquad \text{R.S.}=-8$$
$$=2\left(-\frac{1}{2}\right)-7$$
$$=-1-7$$
$$=-8$$

L.S. = R. S.

The solution is $k=-\frac{1}{2}$.

b)

$$3x+8=2$$
$$3x+8-8=2-8$$
$$3x=-6$$
$$\frac{3x}{3}=\frac{-6}{3}$$
$$x=-2$$

$$\text{L.S.}=3(-2)+8 \qquad \text{R.S.}=2$$
$$=3x+8$$
$$=-6+8$$
$$=2$$

L.S. = R. S.

The solution is $x=-2$.

c)

$$4m-6=12$$
$$4m-6+6=12+6$$
$$4m=18$$
$$\frac{4m}{4}=\frac{18}{4}$$
$$m=\frac{9}{2}$$

$$\text{L.S.}=4m-6 \qquad \text{R.S.}=12$$
$$=4\left(\frac{9}{2}\right)-6$$
$$=18-6$$
$$=12$$

L.S. = R. S.

The solution is $m=\frac{9}{2}$.

d)

$$-9u+8=23$$
$$-9u+8-8=23-8$$
$$-9u=15$$
$$\frac{-9u}{-9}=\frac{15}{-9}$$
$$u=-\frac{5}{3}$$

$$\text{L.S.}=-9u+8 \qquad \text{R.S.}=23$$
$$=-9\left(-\frac{5}{3}\right)+8$$
$$=15+8$$
$$=23$$

L.S. = R. S.

The solution is $u=-\frac{5}{3}$.

Chapter 4 Section 1 **Question 13** **Page 194**

a)

$$8r - \frac{3}{2} = -15$$
$$8r - \frac{3}{2} + \frac{3}{2} = -15 + \frac{3}{2}$$
$$8r = -\frac{30}{2} + \frac{3}{2}$$
$$8r = -\frac{27}{2}$$
$$\frac{8r}{8} = -\frac{27}{2} \times \frac{1}{8}$$
$$r = -\frac{27}{16}$$

The solution is $r = -\frac{27}{16}$.

b)

$$-10h - 6 = -\frac{2}{5}$$
$$-10h - 6 + 6 = -\frac{2}{5} + 6$$
$$-10h = -\frac{2}{5} + \frac{30}{5}$$
$$-10h = \frac{28}{5}$$
$$\frac{-10h}{-10} = \frac{28}{5} \times \left(\frac{1}{-10}\right)$$
$$h = -\frac{28}{50}$$
$$= -\frac{14}{25}$$

The solution is $h = -\frac{14}{25}$.

Chapter 4 Section 1 **Question 14** **Page 194**

a) Let n represent the number of contestants.

$$50n = 2000$$
$$\frac{50n}{50} = \frac{2000}{50}$$
$$n = 40$$

If you rent Royal James Hall, you can begin with 40 contestants.

b) This equation correctly models the cost for Broadway nights. In addition to \$30 per contestant, Broadway Nights charges \$1000.

c)

$$30n + 1000 = 2000$$
$$30n + 1000 - 1000 = 2000 - 1000$$
$$30n = 1000$$
$$\frac{30n}{30} = \frac{1000}{30}$$
$$n \doteq 33.3$$

If you rent Broadway Nights, you can start with 33 contestants.

d) You should rent Royal James Hall. It allows you to start with 40 contestants, while Broadway Nights only allows you 33 contestants.

Chapter 4 Section 1 Question 15 Page 195

a) Let n represent the number of jerseys.

$40n + 75 = 700$

b)
$$40n + 75 = 700$$
$$40n + 75 - 75 = 700 - 75$$
$$40n = 625$$
$$\frac{40n}{40} = \frac{625}{40}$$
$$n = 15.425$$

The team can afford to buy 15 jerseys from Rink Rat.

c) The team should purchase their jerseys from Rink Rat. They can buy 15 from Rink Rat, but only 14 from Ice-wear.

d) Answers will vary. Other factors may include the quality of the materials, the colours available, or the workmanship.

Chapter 4 Section 1 Question 16 Page 195

Let n represent the number of tickets.

Without a membership pass, the equation that models the number of tickets that Marcel can purchase is

$$1.50n = 40$$
$$\frac{1.50n}{1.50} = \frac{40}{1.50}$$
$$n = 26.7$$

Marcel can buy 26 tickets.

With a membership pass, the equation that models the number of tickets that Marcel can purchase is

$$1.25n + 5 = 40$$
$$1.25n + 5 - 5 = 40 - 5$$
$$1.25n = 35$$
$$\frac{1.25n}{1.25} = \frac{35}{1.25}$$
$$n = 28$$

Marcel can buy 28 tickets. He should opt for the membership pass.

Chapter 4 Section 1 Question 17 Page 195

Solutions for the Achievement Checks are shown in the Teacher's Resource.

Chapter 4 Section 1 Question 18 Page 195

a) Let l represent the number of litres of gasoline that the tank holds.

$840l + 5000 = 21\,800$

b)
$$\begin{aligned} 840l + 5000 &= 21\,800 \\ 840l + 5000 - 5000 &= 21\,800 - 5000 \\ 840l &= 16\,800 \\ \frac{840l}{840} &= \frac{16\,800}{840} \\ l &= 20 \end{aligned}$$

The tank can hold 20 L of gasoline.

Chapter 4 Section 1 Question 19 Page 195

a) Let n represent the number of contestants.

$$50n = 4000$$
$$\frac{50n}{50} = \frac{4000}{50}$$
$$n = 80$$

If you rent Royal James Hall, you can begin with 80 contestants.

$$30n + 1000 = 4000$$
$$30n + 1000 - 1000 = 4000 - 1000$$
$$30n = 3000$$
$$\frac{30n}{30} = \frac{3000}{30}$$
$$n = 100$$

If you rent Broadway Nights, you can start with 100 contestants.

If your budget is doubled, you should rent Broadway Nights. It allows you to start with 100 contestants, while Royal James Hall only allows you 80 contestants.

b) Use the "guess and check" method to find that for a budget of \$2500, both venues will permit you to start with 50 contestants.

$$50n = 2500$$
$$\frac{50n}{50} = \frac{2500}{50}$$
$$n = 50$$

$$30n + 1000 = 2500$$
$$30n + 1000 - 1000 = 2500 - 1000$$
$$30n = 1500$$
$$\frac{30n}{30} = \frac{1500}{30}$$
$$n = 50$$

Chapter 4 Section 1 Question 20 Page 195

If m and n are positive integers, possible pairs of values are 1 and 5, 2 and 4, 3 and 3.

Possible values for the expression $3m - 2n$ are

$3(1) - 2(5) = -7$ $3(5) - 2(1) = 13$
$3(2) - 2(4) = -2$ $3(4) - 2(2) = 8$
$3(3) - 2(3) = 3$

Answer E is the only one that matches one of these.

Chapter 4 Section 2 Solve Multi-Step Equations

Chapter 4 Section 2 Question 1 Page 200

a) $3+4m+5m=21$

$3+9m=21$

$3+9m-3=21-3$

$9m=18$

$\frac{9m}{9}=\frac{18}{9}$

$m=2$

The solution is $m = 2$.

b) $16y-8-9y=27$

$7y-8=27$

$7y-8+8=27+8$

$7y=35$

$\frac{7y}{7}=\frac{35}{7}$

$y=5$

The solution is $y = 5$.

c) $46=2-8w-3w$

$46=2-11w$

$46-2=2-11w-2$

$44=-11w$

$\frac{44}{-11}=\frac{-11w}{-11}$

$-4=w$

The solution is $w = –4$.

d) $3d+4-9d+12=0$

$-6d+16=0$

$-6d+16-16=0-16$

$-6d=-16$

$\frac{-6d}{-6}=\frac{-16}{-6}$

$d=\frac{8}{3}$

The solution is $d=\frac{8}{3}$.

Chapter 4 Section 2 **Question 2 Page 200**

a)
$$5x + 9 = 3x + 7$$
$$5x + 9 - 9 = 3x + 7 - 9$$
$$5x = 3x - 2$$
$$5x - 3x = 3x - 2 - 3x$$
$$2x = -2$$
$$\frac{2x}{2} = \frac{-2}{2}$$
$$x = -1$$

The solution is $x = -1$.

b)
$$-2u - 8 = 5u - 1$$
$$-2u - 8 + 8 = 5u - 1 + 8$$
$$-2u = 5u + 7$$
$$-2u - 5u = 5u + 7 - 5u$$
$$-7u = 7$$
$$\frac{-7u}{-7} = \frac{7}{-7}$$
$$u = -1$$

The solution is $u = -1$.

c)
$$4y - 13 = -6y + 7$$
$$4y - 13 + 13 = -6y + 7 + 13$$
$$4y = -6y + 20$$
$$4y + 6y = -6y + 20 + 6y$$
$$10y = 20$$
$$\frac{10y}{10} = \frac{20}{10}$$
$$y = 2$$

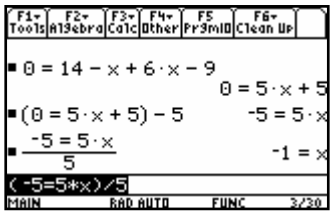
The solution is $y = 2$.

d)
$$7 - 5m = -2 - 2m$$
$$7 - 5m - 7 = -2 - 2m - 7$$
$$-5m = -9 - 2m$$
$$-5m + 2m = -9 - 2m + 2m$$
$$-3m = -9$$
$$\frac{-3m}{-3} = \frac{-9}{-3}$$
$$m = 3$$

The solution is $m = 3$.

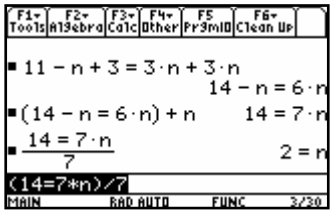
Chapter 4 Section 2 Question 3 Page 200

a)



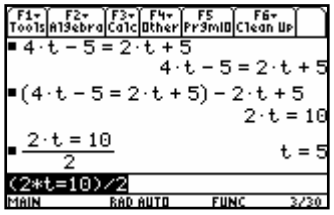
The solution is $x = -1$.

b)



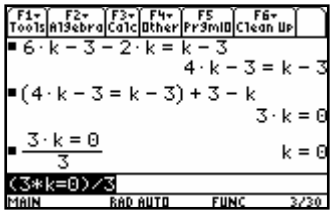
The solution is $n = 2$.

c)



The solution is $t = 5$.

d)



The solution is $k = 0$.

Chapter 4 Section 2 **Question 4 Page 200**

a)

$$\begin{aligned} 2(x-2) &= 4x-2 \\ 2x-4 &= 4x-2 \\ 2x-4+4-4x &= 4x-2+4-4x \\ -2x &= 2 \\ \frac{-2x}{-2} &= \frac{2}{-2} \\ x &= -1 \end{aligned}$$

The solution is $x = -1$.

b)

$$\begin{aligned} 4c+3 &= 3(c-4) \\ 4c+3 &= 3c-12 \\ 4c+3-3-3c &= 3c-12-3-3c \\ c &= -15 \end{aligned}$$

The solution is $c = -15$.

c)

$$\begin{aligned} 6p+4(8-p) &= 22 \\ 6p+32-4p &= 22 \\ 2p+32 &= 22 \\ 2p+32-32 &= 22-32 \\ 2p &= -10 \\ \frac{2p}{2} &= \frac{-10}{2} \\ p &= -5 \end{aligned}$$

The solution is $p = -5$.

d)

$$\begin{aligned} k &= 2(11-k)+14 \\ k &= 22-2k+14 \\ k &= 36-2k \\ k+2k &= 36-2k+2k \\ 3k &= 36 \\ \frac{3k}{3} &= \frac{36}{3} \\ k &= 12 \end{aligned}$$

The solution is $k = 12$.

Chapter 4 Section 2 **Question 5 Page 201**

a)

$$\begin{aligned}
2(x-3)+3(x-2)&=18\\
2x-6+3x-6&=18\\
5x-12&=18\\
5x-12+12&=18+12\\
5x&=30\\
\frac{5x}{5}&=\frac{30}{5}\\
x&=6
\end{aligned}$$

$$\begin{aligned}
\text{L.S.}&=2(x-3)+3(x-2) \qquad \text{R.S.}=18\\
&=2(6-3)+3(6-2)\\
&=6+12\\
&=18
\end{aligned}$$

L.S. = R. S.

The solution is $x = 6$.

b)

$$\begin{aligned}
4(y-1)-(y-5)&=10\\
4y-4-y+5&=10\\
3y+1&=10\\
3y+1-1&=10-1\\
3y&=9\\
\frac{3y}{3}&=\frac{9}{3}\\
y&=3
\end{aligned}$$

$$\begin{aligned}
\text{L.S.}&=4(y-1)-(y-5) \qquad \text{R.S.}=10\\
&=4(3-1)-(3-5)\\
&=8-(-2)\\
&=10
\end{aligned}$$

L.S. = R. S.

The solution is $y = 3$.

c)

$$2(c+2)=5(c+1)-7$$
$$2c+4=5c+5-7$$
$$2c+4=5c-2$$
$$2c+4-4-5c=5c-2-4-5c$$
$$-3c=-6$$
$$\frac{-3c}{-3}=\frac{-6}{-3}$$
$$c=2$$

$$\text{L.S.}=2(c+2) \qquad \text{R.S.}=5(c+1)-7$$
$$=2(2+2) \qquad =5(2+1)-7$$
$$=2(4) \qquad =5(3)-7$$
$$=8 \qquad =8$$

$$\text{L.S.}=\text{R. S.}$$

The solution is $c = 2$.

d)

$$3(t-4)=-2(t+3)+14$$
$$3t-12=-2t-6+14$$
$$3t-12=-2t+8$$
$$3t-12+12+2t=-2t+8+12+2t$$
$$5t=20$$
$$\frac{5t}{5}=\frac{20}{5}$$
$$t=4$$

$$\text{L.S.}=3(t-4) \qquad \text{R.S.}=-2(t+3)+14$$
$$=3(4-4) \qquad =-2(4+3)+14$$
$$=3(0) \qquad =-2(7)+14$$
$$=0 \qquad =0$$

$$\text{L.S.}=\text{R. S.}$$

The solution is $t = 4$.

Chapter 4 Section 2 Question 6 Page 201

a) Let x represent the measure of the supplement. The measure of the angle is $2x$.

$$\begin{aligned} 2x + x &= 180° \\ 3x &= 180° \\ \frac{3x}{3} &= \frac{180°}{3} \\ x &= 60° \end{aligned}$$

The two angles measure 60º and 120º.

b) Let x represent the measure of the supplement. The measure of the angle is $5x$.

$$\begin{aligned} 5x + x &= 180° \\ 6x &= 180° \\ \frac{6x}{6} &= \frac{180°}{6} \\ x &= 30° \end{aligned}$$

The two angles measure 30º and 150º.

Chapter 4 Section 2 Question 7 Page 201

Let x represent the measure of the smallest angle. The measure of the middle-sized angle is $2x$, and the measure of the largest angle is $3x$.

$$\begin{aligned} 3x + 2x + x &= 90° \\ 6x &= 90° \\ \frac{6x}{6} &= \frac{90°}{6} \\ x &= 15° \end{aligned}$$

The angles measure 15º, 30º, and 45º.

Chapter 4 Section 2 Question 8 Page 201

Step	Explanation
L.S. = 2[(−3) + 4] + 5	Substitute the root into the left side.
= 2(1) + 5	Simplify the expression inside the brackets.
= 2 + 5	Multiply.
= 7	Add.
L.S. = 6 − [(−3) + 2]	Substitute the root into the right side.
= 6 − (−1)	Simplify the expression inside the brackets.
= 6 + 1	Subtract by adding the opposite.
= 7	Add.

Chapter 4 Section 2 Question 9 Page 201

a)

$$3x-8=7x+10$$
$$3x-8+8-7x=7x+10+8-7x$$
$$-4x=18$$
$$\frac{-4x}{-4}=\frac{18}{-4}$$
$$x=-\frac{9}{2}$$

$$\text{L.S.}=3x-8 \qquad \text{R.S.}=7x+10$$
$$=3\left(-\frac{9}{2}\right)-8 \qquad =7\left(-\frac{9}{2}\right)+10$$
$$=-\frac{27}{2}-\frac{16}{2} \qquad =-\frac{63}{2}+\frac{20}{2}$$
$$=-\frac{43}{2} \qquad =-\frac{43}{2}$$

L.S. = R. S.

The solution is $x=-\frac{9}{2}$.

b)

$$3+10i = 4i-18$$
$$3+10i-3-4i = 4i-18-3-4i$$
$$6i = -21$$
$$\frac{6i}{6} = -\frac{21}{6}$$
$$i = -\frac{7}{2}$$

$$\text{L.S.} = 3+10i \qquad \text{R.S.} = 4i-18$$
$$= 3+10\left(-\frac{7}{2}\right) \qquad = 4\left(-\frac{7}{2}\right)-18$$
$$= 3-35 \qquad = -14-18$$
$$= -32 \qquad = -32$$

$$\text{L.S.} = \text{R. S.}$$

The solution is $i = -\frac{7}{2}$.

c)

$$-4(u+6) = 2(3u-4)$$
$$-4u-24 = 6u-8$$
$$-4u-24+24-6u = 6u-8+24-6u$$
$$-10u = 16$$
$$\frac{-10u}{-10} = \frac{16}{-10}$$
$$u = -\frac{8}{5}$$

$$\text{L.S.} = -4(u+6) \qquad \text{R.S.} = 2(3u-4)$$
$$= -4\left(-\frac{8}{5}+6\right) \qquad = 2\left(3\left(-\frac{8}{5}\right)-4\right)$$
$$= -4\left(-\frac{8}{5}+\frac{30}{5}\right) \qquad = 2\left(-\frac{24}{5}-\frac{20}{5}\right)$$
$$= -4\left(\frac{22}{5}\right) \qquad = 2\left(-\frac{44}{5}\right)$$
$$= -\frac{88}{5} \qquad = -\frac{88}{5}$$

$$\text{L.S.} = \text{R. S.}$$

The solution is $u = -\frac{8}{5}$.

d)

$$4(k-3) = 2-(2k-6)$$
$$4k-12 = 2-2k+6$$
$$4k-12 = -2k+8$$
$$4k-12+12+2k = -2k+8+12+2k$$
$$6k = 20$$
$$\frac{6k}{6} = \frac{20}{6}$$
$$k = \frac{10}{3}$$

$$\text{L.S.} = 4(k-3) \qquad \text{R.S.} = 2-(2k-6)$$
$$= 4\left(\frac{10}{3}-3\right) \qquad = 2-\left(2\left(\frac{10}{3}\right)-6\right)$$
$$= 4\left(\frac{10}{3}-\frac{9}{3}\right) \qquad = 2-\left(\frac{20}{3}-\frac{18}{3}\right)$$
$$= 4\left(\frac{1}{3}\right) \qquad = \frac{6}{3}-\frac{2}{3}$$
$$= \frac{4}{3} \qquad = \frac{4}{3}$$

$$\text{L.S.} = \text{R. S.}$$

The solution is $k = \frac{10}{3}$.

e)

$$3(p+7)-(4p-1)=-5(2p-3)+1$$
$$3p+21-4p+1=-10p+15+1$$
$$-p+22=-10p+16$$
$$-p+22-22+10p=-10p+16-22+10p$$
$$9p=-6$$
$$\frac{9p}{9}=-\frac{6}{9}$$
$$p=-\frac{2}{3}$$

$$\text{L.S.}=3(p+7)-(4p-1)$$
$$=3\left(-\frac{2}{3}+7\right)-\left(4\left(-\frac{2}{3}\right)-1\right)$$
$$=3\left(-\frac{2}{3}+\frac{21}{3}\right)-\left(-\frac{8}{3}-\frac{3}{3}\right)$$
$$=3\left(\frac{19}{3}\right)-\left(-\frac{11}{3}\right)$$
$$=\frac{57}{3}+\frac{11}{3}$$
$$=\frac{68}{3}$$

$$\text{R.S.}=-5(2p-3)+1$$
$$=-5\left(2\left(-\frac{2}{3}\right)-3\right)+1$$
$$=-5\left(-\frac{4}{3}-\frac{9}{3}\right)+1$$
$$=-5\left(-\frac{13}{3}\right)+1$$
$$=\frac{65}{3}+\frac{3}{3}$$
$$=\frac{68}{3}$$

L.S. = R. S.

The solution is $p=-\frac{2}{3}$.

f)

$$\begin{aligned}
8-(3w-2) &= -5(w-3)-(4w-3)\\
8-3w+2 &= -5w+15-4w+3\\
-3w+10 &= -9w+18\\
-3w+10-10+9w &= -9w+18-10+9w\\
6w &= 8\\
\frac{6w}{6} &= \frac{8}{6}\\
w &= \frac{4}{3}
\end{aligned}$$

$$\begin{aligned}
\text{L.S.} &= 8-(3w-2) & \text{R.S.} &= -5(w-3)-(4w-3)\\
&= 8-\left(3\left(\frac{4}{3}\right)-2\right) & &= -5\left(\frac{4}{3}-3\right)-\left(4\left(\frac{4}{3}\right)-3\right)\\
&= 8-\left(\cancel{3}\left(\frac{4}{\cancel{3}}\right)-2\right) & &= -5\left(\frac{4}{3}-\frac{9}{3}\right)-\left(\frac{16}{3}-\frac{9}{3}\right)\\
&= 8-(4-2) & &= -5\left(-\frac{5}{3}\right)-\frac{7}{3}\\
&= 8-2 & &= \frac{25}{3}-\frac{7}{3}\\
&= 6 & &= 6
\end{aligned}$$

$$\text{L.S.} = \text{R. S.}$$

The solution is $w=\frac{4}{3}$.

Chapter 4 Section 2 Question 10 Page 202

a)

$$3.2x - 7.4 = 2.1x + 1.5$$
$$3.2x - 7.4 + 7.4 - 2.1x = 2.1x + 1.5 + 7.4 - 2.1x$$
$$1.1x = 8.9$$
$$\frac{1.1x}{1.1} = \frac{8.9}{1.1}$$
$$x \doteq 8.1$$

$$\text{L.S.} = 3.2x - 7.4 \qquad \text{R.S.} = 2.1x + 1.5$$
$$\doteq 3.2(8.1) - 7.4 \qquad \doteq 2.1(8.1) + 1.5$$
$$\doteq 18.5 \qquad \doteq 18.5$$
$$\text{L.S.} = \text{R. S.}$$

The solution is $x = 8.1$, to one decimal place.

b)

$$3(2.5d - 1.1) = 2(5.2 - 3.3d)$$
$$7.5d - 3.3 = 10.4 - 6.6d$$
$$7.5d - 3.3 + 3.3 + 6.6d = 10.4 - 6.6d + 3.3 + 6.6d$$
$$14.1d = 13.7$$
$$\frac{14.1d}{14.1} = \frac{13.7}{14.1}$$
$$d \doteq 1.0$$

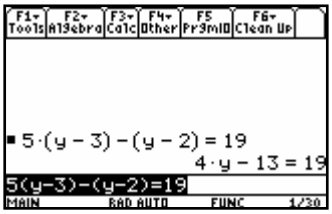
$$\text{L.S.} = 3(2.5d - 1.1) \qquad \text{R.S.} = 2(5.2 - 3.3d)$$
$$\doteq 3(2.5(1.0) - 1.1) \qquad \doteq 2(5.2 - 3.3(1.0))$$
$$\doteq 3(1.4) \qquad \doteq 2(1.9)$$
$$\doteq 4 \qquad \doteq 4$$

$$\text{L.S.} = \text{R. S.}$$

The solution is $d = 1.0$, to one decimal place.

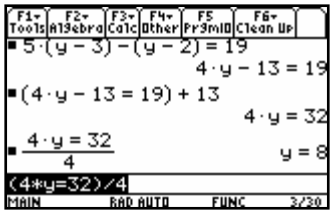
Chapter 4 Section 2 Question 11 Page 202

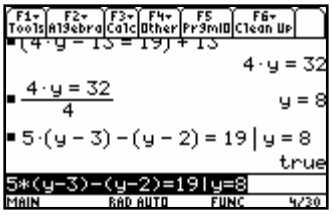
a) b)



c) The CAS has expanded the brackets on the left side of the equation and collected like terms.

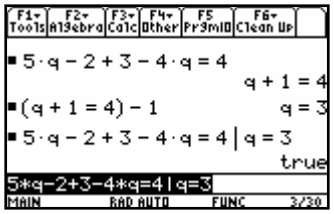
d)



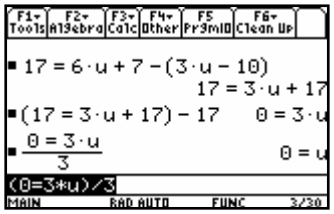


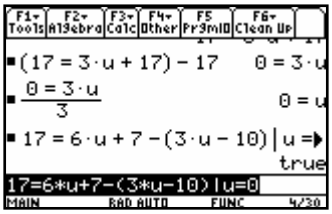
Chapter 4 Section 2 Question 12 Page 202

a)



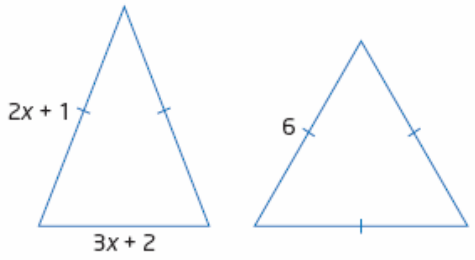
b)





Chapter 4 Section 2 Question 13 Page 202

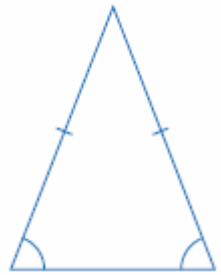
$$2x+1+2x+1+3x+2=6+6+6$$
$$7x+4=18$$
$$7x+4-4=18-4$$
$$7x=14$$
$$\frac{7x}{7x}=\frac{14}{7}$$
$$x=2$$



The two equal sides of the isosceles triangle have a length of $2(2)+1$, or 5 units. The third side has a length of $3(2)+2$, or 8 units. Each side of the equilateral triangle measures 6 units.

Chapter 4 Section 2 **Question 14** **Page 202**

Let x represent the measure of each of the equal angles. The measure of the third angle is $2x$.

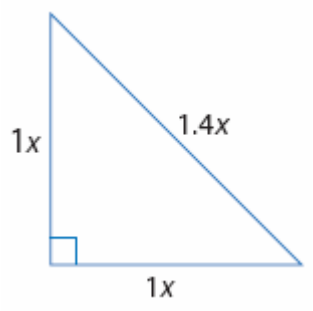


$$\begin{aligned} x + x + 2x &= 180° \\ 4x &= 180° \\ \frac{4x}{4} &= \frac{180°}{4} \\ x &= 45° \end{aligned}$$

Each of the equal angles measures 45º. The third angle measures 90º.

Chapter 4 Section 2 **Question 15** **Page 203**

a)
$$\begin{aligned} 1x + 1x + 1.4x &= 50 \\ 3.4x &= 50 \\ \frac{3.4x}{3.4} &= \frac{50}{3.4} \\ x &\doteq 14.7 \end{aligned}$$

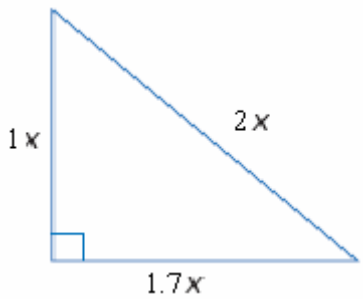


The sides measure 14.7 cm, 14.7 cm, and 20.6 cm, to the nearest tenth of a centimetre.

b) The perimeter is the sum of the sides and this is to be 50 cm. Write and solve the equation $1x + 1x + 1.4x = 50$.

Chapter 4 Section 2 **Question 16** **Page 203**

$$\begin{aligned} 1x + 1.7x + 2x &= 100 \\ 4.7x &= 100 \\ \frac{4.7x}{4.7} &= \frac{100}{4.7} \\ x &\doteq 21.3 \end{aligned}$$



The height of the triangle is about 21.3 cm. The base of the triangle is 1.7×21.3, or about 36.2 cm.

The area of the triangle is $\frac{1}{2} \times 36.2 \times 21.3$, or 386 cm^2, to the nearest square centimetre.

Chapter 4 Section 2 Question 17 Page 203

a)

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

$$\frac{1}{2}x+3=4x-8$$

$$\frac{1}{2}x+3-3-4x=4x-8-3-4x$$

$$\frac{1}{2}x-\frac{8}{2}x=-11$$

$$-\frac{7}{2}x=-11$$

$$-\frac{2}{7}\times\left(-\frac{7}{2}x\right)=-\frac{2}{7}\times(-11)$$

$$x=\frac{22}{7}$$

The solution is $x=\frac{22}{7}$.

b)

$$\frac{1}{3}k+\frac{1}{2}=\frac{1}{4}k$$

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

$$\frac{4}{12}k-\frac{3}{12}k=-\frac{1}{2}$$

$$\frac{1}{12}k=-\frac{1}{2}$$

$$12\times\frac{1}{12}k=12\times\left(-\frac{1}{2}\right)$$

$$k=-6$$

The solution is $k=-6$.

Chapter 4 Section 2 Question 18 Page 203

a)

$$x(x-12) = 30 + x(x+3)$$
$$x^2 - 12x = 30 + x^2 + 3x$$
$$x^2 - 12x - x^2 - 3x = 30 + x^2 + 3x - x^2 - 3x$$
$$-15x = 30$$
$$\frac{-15x}{-15} = \frac{30}{-15}$$
$$x = -2$$

$$\text{L.S.} = x(x-12) \qquad \text{R.S.} = 30 - x(x+3)$$
$$= -2\big((-2)-12\big) \qquad = 30 - 2\big((-2)+3\big)$$
$$= -2(-14) \qquad = 30 - 2(1)$$
$$= 28 \qquad = 28$$

L.S. = R. S.

The solution is $x = -2$.

b)

$$14 - x(x+3) = 2x - x(x-6) + 8$$
$$14 - x^2 - 3x = 2x - x^2 + 6x + 8$$
$$14 - x^2 - 3x = 8x - x^2 + 8$$
$$14 - x^2 - 3x - 14 - 8x + x^2 = 8x - x^2 + 8 - 14 - 8x + x^2$$
$$-11x = -6$$
$$\frac{-11x}{-11} = \frac{-6}{-11}$$
$$x = \frac{6}{11}$$

$$\text{L.S.} = 14 - x(x+3)$$
$$= 14 - \frac{6}{11}\left(\frac{6}{11} + 3\right)$$
$$= 14 - \frac{6}{11}\left(\frac{6}{11} + \frac{33}{11}\right)$$
$$= 14 - \frac{6}{11}\left(\frac{39}{11}\right)$$
$$= \frac{1694}{121} - \frac{234}{121}$$
$$= \frac{1460}{121}$$

$$\text{R.S.} = 2x - x(x-6) + 8$$
$$= 2\left(\frac{6}{11}\right) - \frac{6}{11}\left(\frac{6}{11} - 6\right) + 8$$
$$= 2\left(\frac{6}{11}\right) - \frac{6}{11}\left(\frac{6}{11} - \frac{66}{11}\right) + 8$$
$$= \frac{12}{11} - \frac{6}{11}\left(-\frac{60}{11}\right) + 8$$
$$= \frac{132}{121} + \frac{360}{121} + \frac{968}{121}$$
$$= \frac{1460}{121}$$

L.S. = R. S.

The solution is $x = \frac{6}{11}$.

Chapter 4 Section 2 Question 19 Page 203

Substitute for x and y.

$$\begin{aligned}
3(-4)^2 + k(3)^2 &= 24 \\
48 + 9k &= 24 \\
48 + 9k - 48 &= 24 - 48 \\
9k &= -24 \\
\frac{9k}{9} &= \frac{-24}{9} \\
k &= -\frac{8}{3}
\end{aligned}$$

Answer E.

Chapter 4 Section 2 Question 20 Page 203

Solve equations for each possible combination of two equal sides.

$$\begin{aligned}
5x - 8 &= 3x - 4 \\
5x - 8 + 8 - 3x &= 3x - 4 + 8 - 3x \\
2x &= 4 \\
\frac{2x}{2} &= \frac{4}{2} \\
x &= 2
\end{aligned}$$

$$\begin{aligned}
x + 6 &= 3x - 4 \\
x + 6 - 6 - 3x &= 3x - 4 - 6 - 3x \\
-2x &= -10 \\
\frac{-2x}{-2} &= \frac{-10}{-2} \\
x &= 5
\end{aligned}$$

$$\begin{aligned}
5x - 8 &= x + 6 \\
5x - 8 + 8 - x &= x + 6 + 8 - x \\
4x &= 14 \\
\frac{4x}{4} &= \frac{14}{4} \\
x &= \frac{7}{2}
\end{aligned}$$

Three values of x make the triangle isosceles. Answer D.

Chapter 4 Section 2 Question 21 Page 203

$$\begin{aligned} 3x - 4 &= 2x + 7 \\ 3x - 4 + 4 - 2x &= 2x + 7 + 4 - 2x \\ x &= 11 \end{aligned}$$

This value of x makes the triangle isosceles with a side length of $3(11) - 4 = 29$. Try it in the third side: $5(11) - 8 = 47$. This is not the same as the other two sides.

$$\begin{aligned} 5x - 8 &= 3x - 4 \\ 5x - 8 + 8 - 3x &= 3x - 4 + 8 - 3x \\ 2x &= 4 \\ \frac{2x}{2} &= \frac{4}{2} \\ x &= 2 \end{aligned}$$

This value of x makes the triangle isosceles with a side length of $3(2) - 4 = 2$. Try it in the third side: $2(2) + 7 = 11$. This is not the same as the other two sides.

$$\begin{aligned} 5x - 8 &= 2x + 7 \\ 5x - 8 + 8 - 2x &= 2x + 7 + 8 - 2x \\ 3x &= 15 \\ \frac{3x}{3} &= \frac{15}{3} \\ x &= 5 \end{aligned}$$

This value of x makes the triangle isosceles with a side length of $5(5) - 8 = 17$. Try it in the third side: $3(5) - 4 = 11$. This is not the same as the other two sides.

There is no value of x that makes the triangle equilateral.

Chapter 4 Section 3 **Solve Equations Involving Fractions**

Chapter 4 Section 3 **Question 1 Page 208**

a)

$$\frac{1}{3}(x-2)=5$$
$$3\times\frac{1}{3}(x-2)=3\times5$$
$$x-2=15$$
$$x-2+2=15+2$$
$$x=17$$

The solution is $x = 17$.

b)

$$4=-\frac{2}{3}(p-2)$$
$$3\times4=3\times\left(-\frac{2}{3}(p-2)\right)$$
$$12=-2(p-2)$$
$$12=-2p+4$$
$$12-4=-2p+4-4$$
$$8=-2p$$
$$\frac{8}{-2}=\frac{-2p}{-2}$$
$$-4=p$$

The solution is $p = -4$.

c)

$$\frac{m+4}{3} = 7$$
$$3 \times \frac{m+4}{3} = 3 \times 7$$
$$m + 4 = 21$$
$$m + 4 - 4 = 21 - 4$$
$$m = 17$$

The solution is $m = 17$.

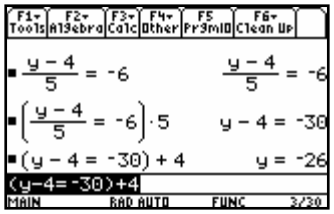
d)

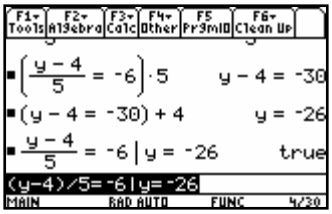
$$-14 = \frac{2(h-3)}{5}$$
$$5(-14) = 5 \times \frac{2(h-3)}{5}$$
$$-70 = 2(h-3)$$
$$-70 = 2h - 6$$
$$-70 + 6 = 2h - 6 + 6$$
$$-64 = 2h$$
$$\frac{-64}{2} = \frac{2h}{2}$$
$$-32 = h$$

The solution is $h = -32$.

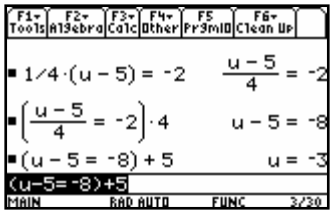
Chapter 4 Section 3 Question 2 Page 208

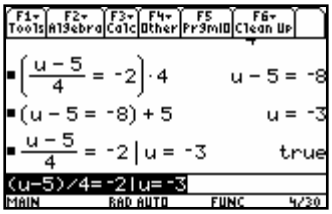
a)



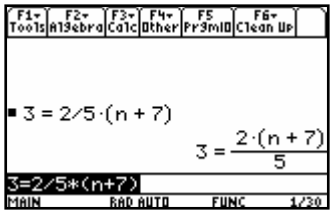


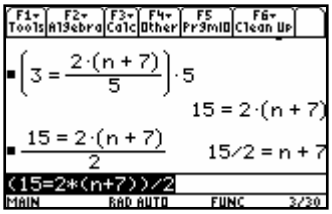
b)

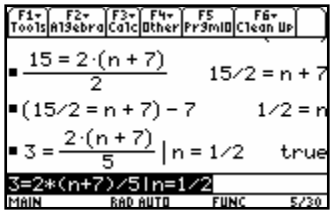




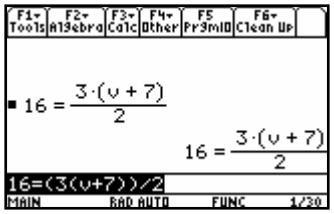
c)

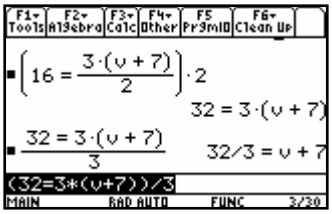


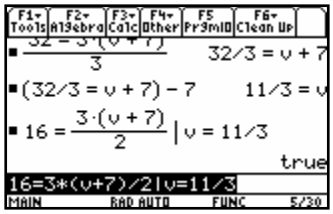




d)







Chapter 4 Section 3 **Question 3 Page 208**

a)

$$\frac{m-3}{4}=\frac{m+1}{3}$$

$$\cancel{12}^{3}\times\frac{m-3}{\cancel{4}_{1}}=\cancel{12}^{4}\times\frac{m+1}{\cancel{3}_{1}}$$

$$3(m-3)=4(m+1)$$

$$3m-9=4m+4$$

$$3m-9+9-4m=4m+4+9-4m$$

$$-m=13$$

$$\frac{-m}{-1}=\frac{13}{-1}$$

$$m=-13$$

$$\text{L.S.}=\frac{m-3}{4} \qquad \text{R.S.}=\frac{m+1}{3}$$

$$=\frac{-13-3}{4} \qquad =\frac{-13+1}{3}$$

$$=\frac{-16}{4} \qquad =\frac{-12}{3}$$

$$=-4 \qquad =-4$$

L.S. = R. S.

The solution is $m=-13$.

b)

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

$$\overset{3}{\cancel{12}}\times\frac{w-1}{\cancel{4}_{1}}=\overset{4}{\cancel{12}}\times\frac{w+2}{\cancel{3}_{1}}$$

$$3(w-1)=4(w+2)$$

$$3w-3=4w+8$$

$$3w-3+3-4w=4w+8+3-4w$$

$$-w=11$$

$$\frac{-w}{-1}=\frac{11}{-1}$$

$$w=-11$$

$$\text{L.S.}=\frac{w-1}{4} \qquad \text{R.S.}=\frac{w+2}{3}$$

$$=\frac{-11-1}{4} \qquad =\frac{-11+2}{3}$$

$$=\frac{-12}{4} \qquad =\frac{-9}{3}$$

$$=-3 \qquad =-3$$

$$\text{L.S.}=\text{R. S.}$$

The solution is $w=-11$.

c)

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

$$\cancel{12}^{3}\times\frac{1}{\cancel{4}_{1}}(x-3)=\cancel{12}^{4}\times\frac{1}{\cancel{3}_{1}}(x-2)$$

$$3(x-3)=4(x-2)$$

$$3x-9=4x-8$$

$$3x-9+9-4x=4x-8+9-4x$$

$$-x=1$$

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

$$x=-1$$

$$\text{L.S.}=\frac{1}{4}(x-3) \qquad \text{R.S.}=\frac{1}{3}(x-2)$$

$$=\frac{1}{4}(-1-3) \qquad =\frac{1}{3}(-1-2)$$

$$=\frac{1}{4}(-4) \qquad =\frac{1}{3}(-3)$$

$$=-1 \qquad =-1$$

L.S. = R. S.

The solution is $x=-1$.

d)

$$\frac{1}{5}(y-3)=\frac{1}{6}(y+4)$$

$$\cancel{30}^{6}\times\frac{1}{\cancel{5}_{1}}(y-3)=\cancel{30}^{5}\times\frac{1}{\cancel{6}_{1}}(y+4)$$

$$6(y-3)=5(y+4)$$

$$6y-18=5y+20$$

$$6y-18+18-5y=5y+20+18-5y$$

$$y=38$$

$$\text{L.S.}=\frac{1}{5}(y-3) \qquad \text{R.S.}=\frac{1}{6}(y+4)$$

$$=\frac{1}{5}(38-3) \qquad =\frac{1}{6}(38+4)$$

$$=\frac{1}{5}(35) \qquad =\frac{1}{6}(42)$$

$$=7 \qquad =7$$

L.S. = R. S.

The solution is $y = 38$.

Chapter 4 Section 3 Question 4 Page 208

a)

$$\frac{2}{3}(5n-1) = -\frac{3}{5}(n+2)$$

$$\cancel{15}^{5} \times \frac{2}{\cancel{3}_{1}}(5n-1) = \cancel{15}^{3} \times \left(-\frac{3}{\cancel{5}_{1}}(n+2)\right)$$

$$10(5n-1) = -9(n+2)$$

$$50n - 10 = -9n - 18$$

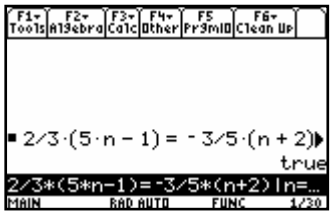
$$50n - 10 + 10 + 9n = -9n - 18 + 10 + 9n$$

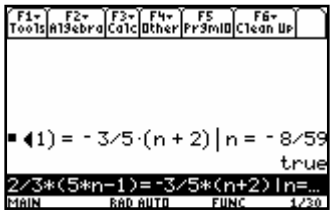
$$59n = -8$$

$$\frac{59n}{59} = \frac{-8}{59}$$

$$n = -\frac{8}{59}$$

The solution is $n = -\frac{8}{59}$.





b)

$$-\frac{3}{4}(d+3) = \frac{4}{5}(3d-2)$$

$$\cancel{20}^{5} \times \left(-\frac{3}{\cancel{4}_{1}}(d+3)\right) = \cancel{20}^{4} \times \frac{4}{\cancel{5}_{1}}(3d-2)$$

$$-15(d+3) = 16(3d-2)$$

$$-15d - 45 = 48d - 32$$

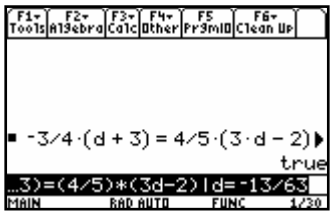
$$-15d - 45 + 45 - 48d = 48d - 32 + 45 - 48d$$

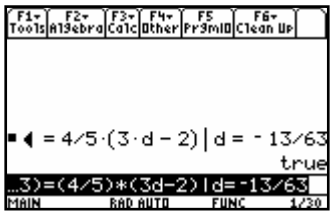
$$-63d = 13$$

$$\frac{-63d}{-63} = \frac{13}{-63}$$

$$d = -\frac{13}{63}$$

The solution is $d = -\frac{13}{63}$.





c)

$$\frac{3c-2}{5} = \frac{2c-1}{3}$$

$$\cancel{15}^{3} \times \frac{3c-2}{\cancel{5}_{1}} = \cancel{15}^{5} \times \frac{2c-1}{\cancel{3}_{1}}$$

$$3(3c-2) = 5(2c-1)$$

$$9c-6 = 10c-5$$

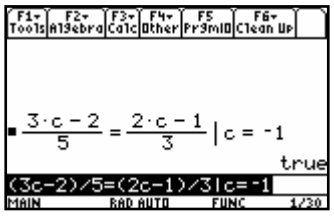
$$9c-6+6-10c = 10c-5+6-10c$$

$$-c = 1$$

$$\frac{-c}{-1} = \frac{1}{-1}$$

$$c = -1$$

The solution is $c = -1$.



d)

$$\frac{5-2a}{4} = \frac{6-a}{5}$$

$$\cancel{20}^{5} \times \frac{5-2a}{\cancel{4}_{1}} = \cancel{20}^{4} \times \frac{6-a}{\cancel{5}_{1}}$$

$$5(5-2a) = 4(6-a)$$

$$25-10a = 24-4a$$

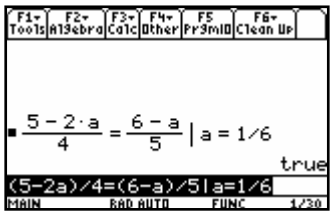
$$25-10a-25+4a = 24-4a-25+4a$$

$$-6a = -1$$

$$\frac{-6a}{-6} = \frac{-1}{-6}$$

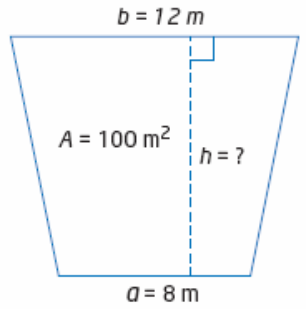
$$a = \frac{1}{6}$$

The solution is $a = \frac{1}{6}$.



Chapter 4 Section 3 **Question 5** **Page 208**

Use the formula for the area of a trapezoid.



$$A = \frac{1}{2}(a+b)h$$
$$100 = \frac{1}{2}(12+8)h$$
$$100 = 10h$$
$$\frac{100}{10} = \frac{10h}{10}$$
$$10 = h$$

The length of the yard from front to back is 10 m.

Chapter 4 Section 3 **Question 6** **Page 209**

a) The error is in the second line, $5(x - 3) = 4(x + 1)$. The numerators on each side of the first line were multiplied by their own denominators. The correct step should be to multiply both sides by 20 (the LCD).

b) The third line is incorrect. In the previous line, the denominators and the 12 were eliminated instead of being simplified. The third line should be $4(3y - 2) = 3(y + 3)$.

Chapter 4 Section 3 **Question 7 Page 209**

a) $C = \frac{5}{9}(F - 32)$

$= \frac{5}{9}(25 - 32)$

$= \frac{5}{9}(-7)$

$= -\frac{35}{9}$

The temperature is about –4ºC.

b)

$C = \frac{5}{9}(F - 32)$

$20 = \frac{5}{9}(F - 32)$

$9 \times 20 = 9 \times \frac{5}{9}(F - 32)$

$180 = 5(F - 32)$

$180 = 5F - 160$

$180 + 160 = 5F - 160 + 160$

$340 = 5F$

$\frac{340}{5} = \frac{5F}{5}$

$68 = F$

The temperature is 68ºF.

Chapter 4 Section 3 **Question 8 Page 209**

Use the formula for the area of a triangle.

$A = \frac{1}{2}bh$

$50 = \frac{1}{2} \times 10 \times h$

$50 = 5h$

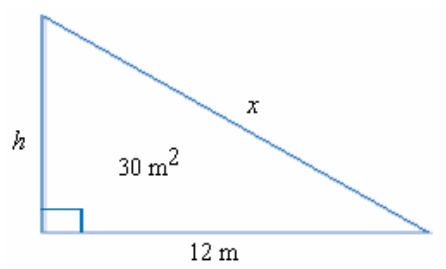
$\frac{50}{5} = \frac{5h}{5}$

$10 = h$

The height of the triangle is 10 cm.

Chapter 4 Section 3 **Question 9 Page 209**

First, use the area formula to find the height of the triangle.



$$A = \frac{1}{2}bh$$
$$30 = \frac{1}{2} \times 12 \times h$$
$$30 = 6h$$
$$\frac{30}{6} = \frac{6h}{6}$$
$$5 = h$$

The height is 5 m. Next, use the Pythagorean theorem to find the length of the hypotenuse x.

$$x^2 = 5^2 + 12^2$$
$$x^2 = 25 + 144$$
$$x^2 = 169$$
$$\sqrt{x^2} = \sqrt{169}$$
$$x = 13$$

The length of the hypotenuse is 13 m.

The length of fence needed to surround the garden is 5 + 12 + 13, or 30 m.

Chapter 4 Section 3 **Question 10 Page 209**

Solutions for Achievement Checks are shown in the Teacher's Resource.

Chapter 4 Section 3 Question 11 Page 210

a)

$$\frac{3p}{4}+\frac{p-5}{3}=\frac{1}{2}$$

$$12\times\left(\frac{3p}{4}+\frac{p-5}{3}\right)=12\times\left(\frac{1}{2}\right)$$

$$\cancel{12}^{3}\times\frac{3p}{\cancel{4}_{1}}+\cancel{12}^{4}\times\frac{p-5}{\cancel{3}_{1}}=\cancel{12}^{6}\times\frac{1}{\cancel{2}_{1}}$$

$$9p+4(p-5)=6$$

$$9p+4p-20=6$$

$$13p-20=6$$

$$13p-20+20=6+20$$

$$13p=26$$

$$\frac{13p}{13}=\frac{26}{13}$$

$$p=2$$

The solution is $p = 2$.

b)

$$\frac{u-3}{4}-2=\frac{3u}{2}+\frac{2u+1}{5}$$

$$20\times\left(\frac{u-3}{4}-2\right)=20\times\left(\frac{3u}{2}+\frac{2u+1}{5}\right)$$

$$\cancel{20}^{5}\times\frac{u-3}{\cancel{4}_{1}}-20\times2=\cancel{20}^{10}\times\frac{3u}{\cancel{2}_{1}}+\cancel{20}^{4}\times\frac{2u+1}{\cancel{5}_{1}}$$

$$5(u-3)-40=30u+4(2u+1)$$

$$5u-15-40=30u+8u+4$$

$$5u-55=38u+4$$

$$5u-55+55-38u=38u+4+55-38u$$

$$-33u=59$$

$$\frac{-33u}{-33}=\frac{59}{-33}$$

$$u=-\frac{59}{33}$$

The solution is $u=-\frac{59}{33}$.

Chapter 4 Section 3 Question 12 Page 210

a)

$$x - 3 = 0$$
$$x - 3 + 3 = 0 + 3$$
$$x = 3$$

$$x - 7 = 0$$
$$x - 7 + 7 = 0 + 7$$
$$x = 7$$

The roots are $x = 3$ and $x = 7$.

b)

$$x = 0$$

$$x - 4 = 0$$
$$x - 4 + 4 = 0 + 4$$
$$x = 4$$

$$x + 2 = 0$$
$$x + 2 - 2 = 0 - 2$$
$$x = -2$$

The roots are $x = 0$, $x = 4$ and $x = -2$.

Chapter 4 Section 3 Question 13 Page 210

Let x represent the length of Diophantus' life. Use the information given in the question to construct an equation.

$$\frac{1}{6}x + \frac{1}{7}x + \frac{1}{12}x + 5 + \frac{1}{2}x + 4 = x$$
$$\frac{14}{84}x + \frac{12}{84}x + \frac{7}{84}x + \frac{42}{84}x + 9 = x$$
$$\frac{75}{84}x + 9 = x$$
$$84 \times \left(\frac{75}{84}x + 9\right) = 84 \times x$$
$$75x + 756 = 84x$$
$$75x + 756 - 75x = 84x - 75x$$
$$756 = 9x$$
$$\frac{756}{9} = \frac{9x}{9}$$
$$84 = x$$

Diophantus was 84 years old when he died.

Chapter 4 Section 4 Modelling With Formulas.

Chapter 4 Section 4 Question 1 Page 215

a) $P = 4s$

$$\frac{P}{4} = \frac{4s}{4}$$

$$\frac{P}{4} = s$$

b) $A = P + I$

$$A - I = P + I - I$$

$$A - I = P$$

c) $C = 2\pi r$

$$\frac{C}{2\pi} = \frac{2\pi r}{2\pi}$$

$$\frac{C}{2\pi} = r$$

d) $y = mx + b$

$$y - mx = mx + b - mx$$

$$y - mx = b$$

Chapter 4 Section 4 **Question 2 Page 215**

a)
$$d = mt + b$$
$$d - b = mt + b - b$$
$$d - b = mt$$
$$\frac{d-b}{t} = \frac{mt}{t}$$
$$\frac{d-b}{t} = m$$

b)
$$P = 2l + 2w$$
$$P - 2l = 2l + 2w - 2l$$
$$P - 2l = 2w$$
$$\frac{P-2l}{2} = \frac{2w}{2}$$
$$\frac{P-2l}{2} = w$$

c)
$$a = \frac{v}{t}$$
$$t \times a = t \times \frac{v}{t}$$
$$ta = v$$

d)
$$v = \frac{d}{t}$$
$$t \times v = t \times \frac{d}{t}$$
$$tv = d$$
$$\frac{tv}{v} = \frac{d}{v}$$
$$t = \frac{d}{v}$$

e)

$$A = \pi r^2$$

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

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

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

$$\sqrt{\frac{A}{\pi}} = r$$

f)

$$P = I^2 R$$

$$\frac{P}{R} = \frac{I^2 R}{R}$$

$$\frac{P}{R} = I^2$$

$$\sqrt{\frac{P}{R}} = \sqrt{I^2}$$

$$\sqrt{\frac{P}{R}} = I$$

Chapter 4 Section 4 **Question 3 Page 215**

a) $C = 2.5(6)$
$= 15 \text{ cm}$

$C = 2.5(36)$
$= 90 \text{ cm}$

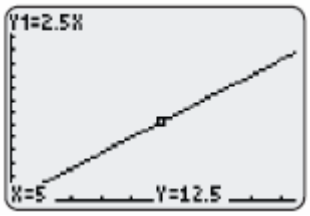
b) $C = 2.5I$
$\frac{C}{2.5} = \frac{2.5I}{2.5}$
$\frac{C}{2.5} = I$

c) $I = \frac{75}{2.5}$
$= 30 \text{ in}$

$I = \frac{100}{2.5}$
$= 40 \text{ in}$

Chapter 4 Section 4 **Question 4 Page 215**

a)



b) The graph is linear. It is a straight line.

c) There are 20 cm in 8 inches. There are 14 inches in 35 cm.

Chapter 4 Section 4 **Question 5 Page 215**

Answers will vary. Sample answers are shown.

a) The equation model shows the relation between the two variables in a concise way. It is easy to obtain values. However, it is difficult to visualize the relation from the equation.

b) The graphical model gives a visual picture of the relationship and you can easily find approximate values from the graph. The disadvantage is that the values obtained by reading the graph may only be approximate.

Chapter 4 Section 4 **Question 6 Page 216**

a) $C = 15n + 250$

b) $C = 15(50) + 250$
$= 750 + 250$
$= 1000$

$C = 15(100) + 250$
$= 1500 + 250$
$= 1750$

Kwok should charge \$1000 for 50 people and \$1750 for 100 people.

c)
$C = 15n + 250$
$C - 250 = 15n + 250 - 250$
$C - 250 = 15n$
$\frac{C - 250}{15} = \frac{15n}{15}$
$\frac{C - 250}{15} = n$

d)
$n = \frac{4000 - 250}{15}$
$= \frac{3750}{15}$
$= 250$

$n = \frac{2000 - 250}{15}$
$= \frac{1750}{15}$
$\doteq 116$

If the budget is \$4000, 250 people could attend the wedding. If the budget is \$2000, 116 people could attend the wedding.

e) It is better to substitute into the rearranged equation. The unknown variable is already isolated, and its value can be calculated more easily.

f) The relation is linear. For a relation to be non-linear, at least one of the variables must have degree greater than or equal to 2. In this formula, all the variables have degree 1. Hence, it is linear.

Chapter 4 Section 4 **Question 7 Page 216**

a) $S = 7(9) + 5(7) + 3(7)$
$= 63 + 35 + 21$
$= 119$

Jodie's score is 119.

b) Use the score formula to determine the stage presence score that Quentin needs to tie Jodie's score:

$119 = 7(9) + 5(6) + 3p$
$119 = 63 + 30 + 3p$
$119 = 93 + 3p$
$119 - 93 = 93 + 3p - 93$
$26 = 3p$
$\frac{26}{3} = \frac{3p}{3}$
$8\frac{2}{3} = p$

If Quentin scores 9 or 10 on stage presence, he will win the competition.

Chapter 4 Section 4 **Question 8 Page 216**

a) $A = \frac{P^2}{16}$
$16 \times A = 16 \times \frac{P^2}{16}$
$16A = P^2$
$\sqrt{16A} = \sqrt{P^2}$
$\sqrt{16A} = P$

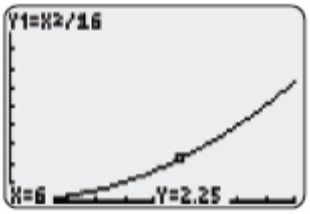
b) $P = \sqrt{16(25)}$
$= \sqrt{400}$
$= 20$

$P = \sqrt{16(50)}$
$= \sqrt{800}$
$\doteq 28.3$

The perimeter of a square with an area of 25 cm^2 is 20 cm.
The perimeter of a square with an area of 50 cm^2 is about 28.3 cm.

Chapter 4 Section 4 **Question 9 Page 217**

a)



b) Since the graph is curved, the relation is non-linear.

c) Answers will vary. A sample answer is shown.

The equation is easily simplified to get an answer. The algebraic model is probably faster than graphing.

d) Answers will vary. A sample answer is shown.

A graphical model provides a clear visual representation. Any ordered pair can easily be found using tools of the graphing calculator.

Chapter 4 Section 4 **Question 10 Page 217**

Step	Explanation
$E = \frac{1}{2}mv^2$	Start with the original formula.
$2E = mv^2$	Multiply both sides of the equation by 2.
$\frac{2E}{m} = \frac{mv^2}{m}$	Divide both sides of the equation by m.
$\frac{2E}{m} = v^2$	Simplify .
$\sqrt{\frac{2E}{m}} = \sqrt{v^2}$	Take the square root of both sides.
$\sqrt{\frac{2E}{m}} = v$	Simplify to isolate v.

Chapter 4 Section 4 **Question 11 Page 218**

a)

$$v = \sqrt{\frac{2E}{m}}$$

Rocco:

$$v = \sqrt{\frac{2 \times 4.2}{5}}$$
$$\doteq 1.3 \text{ m/s}$$

Biff:

$$v = \sqrt{\frac{2 \times 5.2}{5.5}}$$
$$\doteq 1.375 \text{ m/s}$$

Since Biff is faster, he will reach the eucalyptus first.

b) $E \doteq \frac{1}{2}(5)(1.375)^2$
$\doteq 4.73$

Rocco would need to exert about 4.73 – 4.2, or 0.53 more joules of kinetic energy to reach the eucalyptus at the same time as Biff.

Chapter 4 Section 4 **Question 12 Page 218**

a)

$$PV = nRT$$
$$\frac{PV}{P} = \frac{nRT}{P}$$
$$V = \frac{nRT}{P}$$

$$PV = nRT$$
$$\frac{PV}{RT} = \frac{nRT}{RT}$$
$$\frac{PV}{RT} = n$$

$$PV = nRT$$
$$\frac{PV}{nT} = \frac{nRT}{nT}$$
$$\frac{PV}{nT} = R$$

$$PV = nRT$$
$$\frac{PV}{nR} = \frac{nRT}{nR}$$
$$\frac{PV}{nR} = T$$

b) If you want to calculate one specific unknown value, given the values of the other four variables, you can enter the given values in the appropriate form of the formula and evaluate the answer.

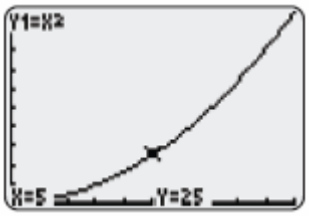
Chapter 4 Section 4 **Question 13 Page 218**

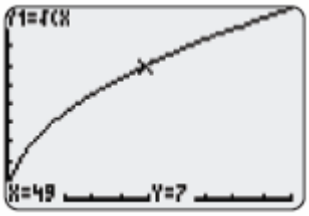
a) $A = l^2$

$\sqrt{A} = \sqrt{l^2}$

$\sqrt{A} = l$

b)





c) Answers will vary. A sample answer is shown.

Both the graphs show a non-linear relationship.

d) Answers will vary. A sample answer is shown.

In the first graph, the curve opens upward. In the second graph, the curve opens sideways.

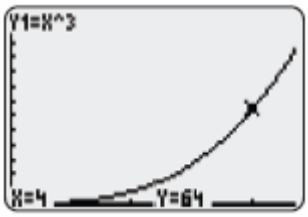
Chapter 4 Section 4 **Question 14 Page 218**

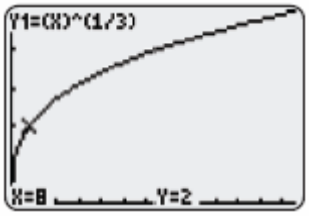
a) $V = l^3$

$\sqrt[3]{V} = \sqrt[3]{l^3}$

$\sqrt[3]{V} = l$

b)





Answers will vary. Sample answers are shown.

Both graphs show a curve. The first graph curves upwards. The second graph curves to the right.

Chapter 4 Section 4 **Question 15 Page 219**

a)

$$d = vt + \frac{1}{2}at^2$$

$$d - \frac{1}{2}at^2 = vt + \frac{1}{2}at^2 - \frac{1}{2}at^2$$

$$\frac{d}{t} - \frac{\frac{1}{2}at^2}{t} = \frac{vt}{t}$$

$$\frac{d}{t} - \frac{1}{2}at = v$$

b)

$$v = \frac{30}{3} - \frac{1}{2} \times 6 \times 3$$

$$= 10 - 9$$

$$= 1$$

The initial speed of the object was 1 m/s.

Chapter 4 Section 4 **Question 16 Page 219**

a)

$$d = vt + \frac{1}{2}at^2$$

$$d - vt = vt + \frac{1}{2}at^2 - vt$$

$$d - vt = \frac{1}{2}at^2$$

$$2 \times (d - vt) = 2 \times \frac{1}{2}at^2$$

$$2(d - vt) = at^2$$

$$\frac{2(d - vt)}{t^2} = \frac{at^2}{t^2}$$

$$\frac{2(d - vt)}{t^2} = a$$

b)

$$a = \frac{2(60 - 1 \times 3)}{3^2}$$

$$= \frac{2(57)}{9}$$

$$\doteq 12.7$$

The acceleration required is about 12.7 m/s^2.

Chapter 4 Section 4 **Question 17 Page 219**

$$s = \frac{w - 10e}{t}$$

$$t \times s = t \times \frac{w - 10e}{t}$$

$$ts = w - 10e$$

$$ts - w = w - 10e - w$$

$$ts - w = -10e$$

$$\frac{ts - w}{-10} = \frac{-10e}{-10}$$

$$\frac{w - ts}{10} = e$$

$$e = \frac{400 - 5 \times 70}{10}$$

$$= \frac{50}{10}$$

$$= 5$$

Saher made 5 errors.

Chapter 4 Section 4 **Question 18 Page 219**

$$p = 2\pi\sqrt{\frac{L}{g}}$$

$$\frac{p}{2\pi} = \frac{2\pi\sqrt{\frac{L}{g}}}{2\pi}$$

$$\frac{p}{2\pi} = \sqrt{\frac{L}{g}}$$

$$\left(\frac{p}{2\pi}\right)^2 = \left(\sqrt{\frac{L}{g}}\right)^2$$

$$\frac{p^2}{4\pi^2} = \frac{L}{g}$$

$$g \times \frac{p^2}{4\pi^2} = g \times \frac{L}{g}$$

$$\frac{gp^2}{4\pi^2} = L$$

$$L = \frac{9.8 \times 1^2}{4\pi^2}$$

$$\doteq 0.248$$

For a period of 1 s, the length must be about 0.248 m.

Chapter 4 Section 4 **Question 19 Page 219**

a) $v = \sqrt{\frac{2GM}{r}}$

$= \sqrt{\frac{2 \times 0.000\,000\,000\,066\,73 \times 5.98 \times 10^{24}}{6.38 \times 10^{6}}}$

$\doteq 11184$

The escape velocity for an Earth satellite is about 11 184 m/s, or 11.18 km/s.

b)

$$v = \sqrt{\frac{2GM}{r}}$$

$$v^2 = \left(\sqrt{\frac{2GM}{r}}\right)^2$$

$$v^2 = \frac{2GM}{r}$$

$$r \times v^2 = r \times \frac{2GM}{r}$$

$$rv^2 = 2GM$$

$$\frac{rv^2}{2G} = \frac{2GM}{2G}$$

$$\frac{rv^2}{2G} = M$$

c)

$$M = \frac{3.397 \times 10^6 \times 5000^2}{2 \times 0.000\,000\,000\,066\,73}$$

$$\doteq 6.36 \times 10^{23}$$

The mass of Mars is 6.36×10^{23} kg.

Chapter 4 Section 5 Modelling With Algebra

Chapter 4 Section 5 Question 1 Page 226

Let n represent the number.

a) triple a number: $3n$

b) four more than a number: $n + 4$

c) half a number: $\frac{1}{2}n$

d) five less than double a number: $2n - 5$

Chapter 4 Section 5 Question 2 Page 226

a) Let n represent the number.

$4n = 112$

b) Let p represent the perimeter.

$p + 12 = 56$

c) Let n represent the number.

$3n + 5 = 29$

d) Let n represent the first integer. The next consecutive integer is $n + 1$.

$n + n + 1 = 63$

Chapter 4 Section 5 **Question 3 Page 227**

a) $4n = 112$

$$\frac{4n}{4} = \frac{112}{4}$$

$$n = 28$$

This represents the number that equals 112 when multiplied by 4.

b) $p + 12 = 56$

$$p + 12 - 12 = 56 - 12$$

$$p = 44$$

This represents the perimeter that when increased by 12 equals 56.

c) $3n + 5 = 29$

$$3n + 5 - 5 = 29 - 5$$

$$3n = 24$$

$$\frac{3n}{3} = \frac{24}{3}$$

$$n = 8$$

This represents the number that, when multiplied by 3, is five less than 29.

d) $n + n + 1 = 63$

$$2n + 1 = 63$$

$$2n + 1 - 1 = 63 - 1$$

$$2n = 62$$

$$\frac{2n}{2} = \frac{62}{2}$$

$$n = 31$$

The sum of this number and the next consecutive number, 32, is 63.

Chapter 4 Section 5 Question 4 Page 227

Let x represent Raoul's age. Esteban's age is $x + 6$.

$$\begin{aligned} x + x + 6 &= 38 \\ 2x + 6 &= 38 \\ 2x + 6 - 6 &= 38 - 6 \\ 2x &= 32 \\ \frac{2x}{2} &= \frac{32}{2} \\ x &= 16 \end{aligned}$$

Raoul is 16, and Esteban is 16 + 6, or 22.

Chapter 4 Section 5 Question 5 Page 227

Let x represent Jamal's score. Fayth's score is $x + 200$.

$$\begin{aligned} x + x + 200 &= 2250 \\ 2x + 200 &= 2250 \\ 2x + 200 - 200 &= 2250 - 200 \\ 2x &= 2050 \\ \frac{2x}{2} &= \frac{2050}{2} \\ x &= 1025 \end{aligned}$$

Jamal scored 1025 points, while Fayth scored 1025 + 200, or 1225 points.

Chapter 4 Section 5 Question 6 Page 227

Let x represent the number of goals scored by Natalie. Chantal scored $x + 8$ goals, while Samara scored $2x$ goals.

$$\begin{aligned} x + x + 8 + 2x &= 52 \\ 4x + 8 &= 52 \\ 4x + 8 - 8 &= 52 - 8 \\ 4x &= 44 \\ \frac{4x}{4} &= \frac{44}{4} \\ x &= 11 \end{aligned}$$

Natalie scored 11 goals, Chantal scored 11 + 8, or 19 goals, and Samara scored 2 × 11, or 22 goals.

Chapter 4 Section 5 Question 7 Page 227

Let d represent the dollar amount of car sales for the week.

$$\begin{aligned}
14 \times 38 + 0.08d &= 1200 \\
532 + 0.08d &= 1200 \\
532 + 0.08d - 532 &= 1200 - 532 \\
0.08d &= 668 \\
\frac{0.08d}{0.08} &= \frac{668}{0.08} \\
d &= 8350
\end{aligned}$$

Kyle must sell \$8350 in order to earn \$1200 for the week.

Chapter 4 Section 5 Question 8 Page 227

a) $E = 5000m + 2n$

b) $E = 5000(1) + 2(500)$
$= 5000 + 1000$
$= 6000$

The winner will earn \$6000 after the first month.

c)
$$\begin{aligned}
74\,000 &= 5000(3) + 2n \\
74\,000 &= 15\,000 + 2n \\
74\,000 - 15\,000 &= 15\,000 + 2n - 15\,000 \\
59\,000 &= 2n \\
\frac{59\,000}{2n} &= \frac{2n}{2n} \\
29\,500 &= n
\end{aligned}$$

29 500 CDs were sold.

d) $E = 5000(6) + 2(50\,000)$
$= 30\,000 + 100\,000$
$= 130\,000$

The artist makes \$130 000 if the CD goes gold after 6 months of touring.

Chapter 4 Section 5 Question 9 Page 227

Let x represent the first integer. The next two consecutive integers are $x + 1$ and $x + 2$.

$$\begin{aligned} x + x + 1 + x + 2 &= 54 \\ 3x + 3 &= 54 \\ 3x + 3 - 3 &= 54 - 3 \\ 3x &= 51 \\ \frac{3x}{3} &= \frac{51}{3} \\ x &= 17 \end{aligned}$$

The three integers are 17, 18, and 19.

Chapter 4 Section 5 Question 10 Page 227

Let x represent the first integer. The next consecutive even integer is $x + 2$.

$$\begin{aligned} x + x + 2 &= -134 \\ 2x + 2 &= -134 \\ 2x + 2 - 2 &= -134 - 2 \\ 2x &= -136 \\ \frac{2x}{2} &= \frac{-136}{2} \\ x &= -68 \end{aligned}$$

The two integers are –68 and –66.

Chapter 4 Section 5 Question 11 Page 227

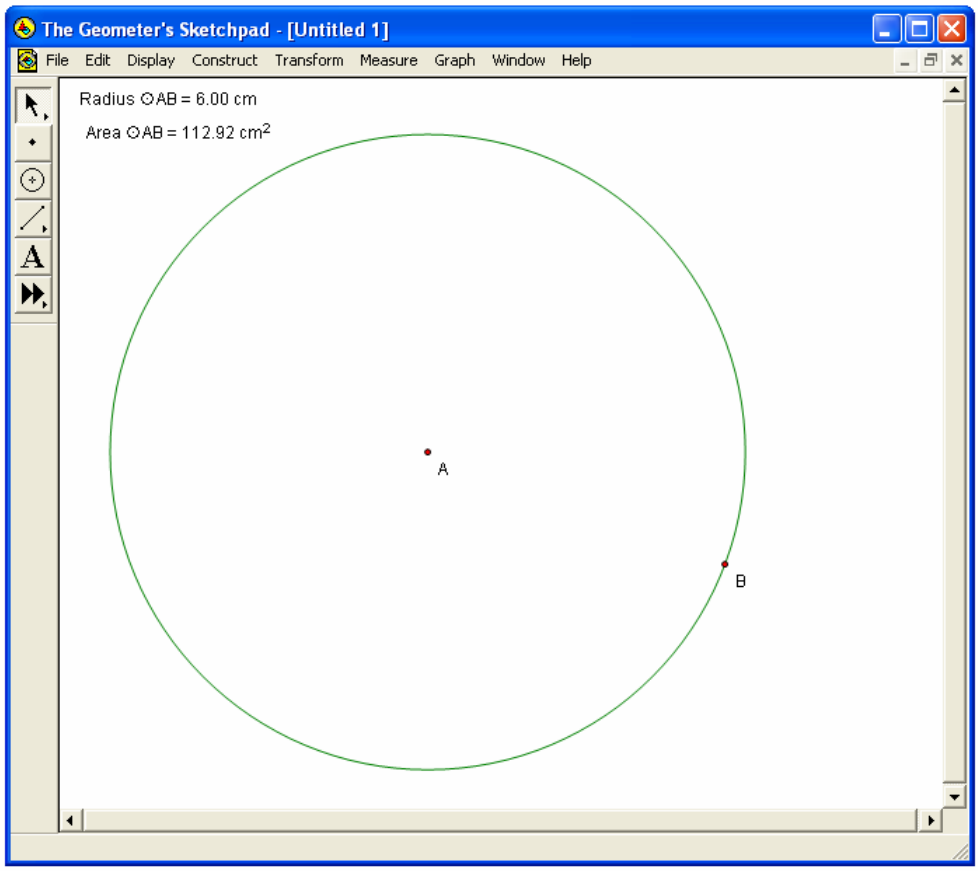
The radius of the garden is 6 m. Let the new radius be represented by $6 + x$.

$$\begin{aligned} \pi(6 + x)^2 &= 3\pi(6)^2 \\ \frac{\pi(6 + x)^2}{\pi} &= \frac{3\pi(6)^2}{\pi} \\ (6 + x)^2 &= 3(6)^2 \\ (6 + x)^2 &= 108 \\ \sqrt{(6 + x)^2} &= \sqrt{108} \\ 6 + x &\doteq 10.4 \\ 6 + x - 6 &\doteq 10.4 - 6 \\ x &\doteq 4.4 \end{aligned}$$

The diameter of the garden must be increase by about 2×4.4, or 8.8 m to triple the area.

Chapter 4 Section 5 Question 12 Page 227

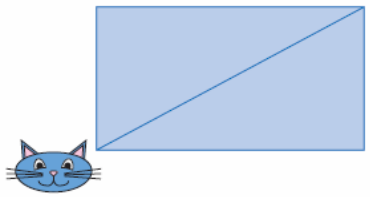
a) Answers will vary. You can model the question using *The Geometer's Sketchpad®*. Construct a circle with a diameter of 6. Measure the diameter and area. Enlarge the circle until the area triples, and note the diameter required. Click here to load the sketch.



b) Modelling the problem with an equation gives an exact answer, but requires several steps for the solution.

Modelling the problem with *The Geometer's Sketchpad®* provides a visual solution, but may not give as exact an answer.

Chapter 4 Section 5 Question 13 Page 228



a) Let w represent the width of the pool. The length is $3w$.

$$\begin{aligned} 3w \times w &= 192 \\ 3w^2 &= 192 \\ \frac{3w^2}{3} &= \frac{192}{3} \\ w^2 &= 64 \\ \sqrt{w^2} &= \sqrt{64} \\ w &= 8 \end{aligned}$$

The width is 8 m, and the length is 3 × 8, or 24 m.

Use the Pythagorean theorem to find the length of the diagonal.

$$\begin{aligned} d^2 &= 8^2 + 24^2 \\ d^2 &= 64 + 576 \\ d^2 &= 640 \\ \sqrt{d^2} &= \sqrt{640} \\ d &\doteq 25.3 \end{aligned}$$

The diagonal measures about 25.3 m. If Laurie swims it twice, she swims 50.6 m.

b) The cat walks a distance of 8 + 24 + 8 + 24, or 64 m. Laurie has to swim 50.6 m, and the cat has to walk 64 m. The speed ratio between Laurie and the cat is 0.75:1. In the time Laurie swims, the cat will be able to walk $\frac{50.6}{0.75} = 67.5$ m, which is more than the cat needs to get back to the starting point. The cat gets back first.

Chapter 4 Section 5 Question 14 Page 228

Answers will vary.

Chapter 4 Section 5 Question 15 Page 228

Solutions for Achievement Checks are shown in the Teacher's Resource.

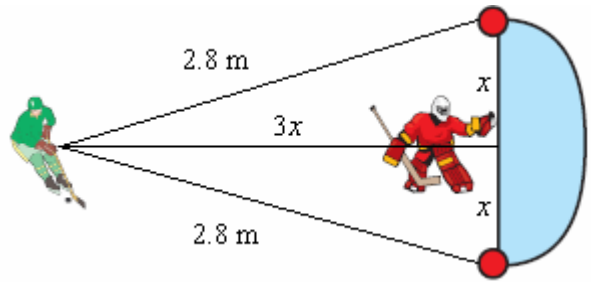
Chapter 4 Section 5 **Question 16** **Page 228**

Let x represent the side length of the board.

$$40^2 = x^2 + x^2$$
$$1600 = 2x^2$$
$$\frac{1600}{2} = \frac{2x^2}{2}$$
$$800 = x^2$$

The area of the board is 800 cm^2. The area of each square is $\frac{800}{64}$, or 12.5 cm^2.

Chapter 4 Section 5 **Question 17** **Page 229**



a) Let x represent the distance from Dougie to either goal. The distance from Johnny to Dougie is $3x$.

$$2.8^2 = (3x)^2 + x^2$$
$$7.84 = 9x^2 + x^2$$
$$7.84 = 10x^2$$
$$\frac{7.84}{10} = \frac{10x^2}{10}$$
$$0.784 = x^2$$
$$\sqrt{0.784} = \sqrt{x^2}$$
$$0.885 \doteq x^2$$

The width of the net is about 2 × 0.885, or 1.77 m.

b) Use the Pythagorean theorem to solve this problem.

c) Answers will vary. A sample answer is shown.

Assume that the goalie, Dougie, is standing exactly midway between the goalposts and on the goal line.

Chapter 4 Section 5 Question 18 Page 229

a)

Planet	Radius of Orbit (AU)	Period of Orbit (Earth Days)	$\frac{(\text{Period})^2}{(\text{Radius})^3}$
Mercury	0.389	87.77	130 870.9915
Venus	0.724	224.70	133 042.5151
Earth	1.0	365.25	133 407.5625
Mars	1.524	686.98	133 331.6600
Jupiter	5.200	4332.62	133 503.0444
Saturn	9.150	10 759.20	151 111.2085

Mean = 135 877.8303

b) $\frac{T^2}{R^3} = K$

c)

$$\frac{(30\,588.70)^2}{R^3} = 135\,877.8303$$

$$R^3 \times \frac{(30\,588.70)^2}{R^3} = R^3 \times 135\,877.8303$$

$$(30\,588.70)^2 = 135\,877.8303R^3$$

$$\frac{(30\,588.70)^2}{135\,877.8303} = \frac{135\,877.8303R^3}{135\,877.8303}$$

$$\frac{(30\,588.70)^2}{135\,877.8303} = R^3$$

$$\sqrt[3]{\frac{(30\,588.70)^2}{135\,877.8303}} = \sqrt[3]{R^3}$$

$$19.025 \doteq R$$

The orbit of the planet Uranus has a radius of about 19.025 AU.

d)

$$\frac{T^2}{30^3} = 135\,877.8303$$

$$30^3 \times \frac{T^2}{30^3} = 30^3 \times 135\,877.8303$$

$$T^2 = 27\,000 \times 135\,877.8303$$

$$\sqrt{T^2} = \sqrt{27\,000 \times 135\,877.8303}$$

$$T \doteq 60\,569.81$$

The period of the orbit of Neptune is about 60 569.81 Earth days.

e) $\frac{90\,588^2}{39.5^3} = 133\,152.7241$

Pluto satisfies Kepler's Third Law.

f) Answers will vary. Kepler's First Law states that planetary orbits are elliptical, with the sun at one focus of the ellipse. Kepler's Second Law says that planets sweep out equal areas in equal times.

Chapter 4 Section 5 Question 19 Page 229

Let x represent the mass of the peel. The mass of the banana is $4x$.

$$\begin{aligned} x + 4x &= 360 \\ 5x &= 360 \\ \frac{5x}{5} &= \frac{360}{5} \\ x &= 72 \end{aligned}$$

The mass of the peel is 72 g.

Chapter 4 Section 5 Question 20 Page 229

$$\begin{aligned} 7 &= 5x - 3 \\ 7 + 3 &= 5x - 3 + 3 \\ 10 &= 5x \\ \frac{10}{5} &= \frac{5x}{5} \\ 2 &= x \end{aligned}$$

$$\begin{aligned} y &= 4(2) + 1 \\ &= 8 + 1 \\ &= 9 \end{aligned}$$

Answer D.

Chapter 4 Review

Chapter 4 Review **Question 1 Page 230**

a) $8 + m = -2$

$8 + m - 8 = -2 - 8$

$m = -10$

The solution is $m = -10$.

b) $k - 7 = -11$

$k - 7 + 7 = -11 + 7$

$k = -4$

The solution is $k = -4$.

c) $3x = 18$

$\frac{3x}{3} = \frac{18}{3}$

$x = 6$

The solution is $x = 6$.

d) $\frac{h}{5} = -4$

$5 \times \frac{h}{5} = 5(-4)$

$h = -20$

The solution is $h = -20$.

Chapter 4 Review **Question 2 Page 230**

a)

$$\begin{aligned} 2y-7 &= 13 \\ 2y-7+7 &= 13+7 \\ 2y &= 20 \\ \frac{2y}{2} &= \frac{20}{2} \\ y &= 10 \end{aligned}$$

$$\begin{aligned} \text{L.S.} &= 2y-7 \qquad \text{R.S.} = 13 \\ &= 2(10)-7 \\ &= 20-7 \\ &= 13 \end{aligned}$$

L.S. = R. S.

The solution is $y = 10$.

b)

$$\begin{aligned} 4+5v &= -21 \\ 4+5v-4 &= -21-4 \\ 5v &= -25 \\ \frac{5v}{5} &= \frac{-25}{5} \\ v &= -5 \end{aligned}$$

$$\begin{aligned} \text{L.S.} &= 4+5v \qquad \text{R.S.} = -21 \\ &= 4+5(-5) \\ &= 4-25 \\ &= -21 \end{aligned}$$

L.S. = R. S.

The solution is $v = -5$.

c)

$$9-2x=-1$$
$$9-2x-9=-1-9$$
$$-2x=-10$$
$$\frac{-2x}{-2}=\frac{-10}{-2}$$
$$x=5$$

$$\text{L.S.}=9-2x \qquad \text{R.S.}=-1$$
$$=9-2(5)$$
$$=9-10$$
$$=-1$$

$$\text{L.S.}=\text{R. S.}$$

The solution is $x = 5$.

d)

$$-3s-6=9$$
$$-3s-6+6=9+6$$
$$-3s=15$$
$$\frac{-3s}{-3}=\frac{15}{-3}$$
$$s=-5$$

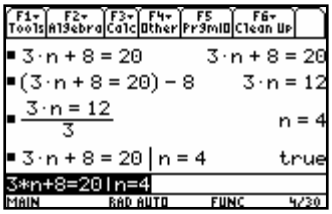
$$\text{L.S.}=-3s-6 \qquad \text{R.S.}=9$$
$$=-3(-5)-6$$
$$=15-6$$
$$=9$$

$$\text{L.S.}=\text{R. S.}$$

The solution is $s = –5$.

Chapter 4 Review Question 3 Page 230

a)



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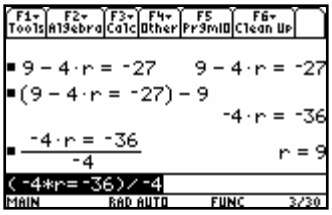
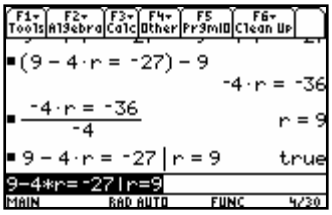
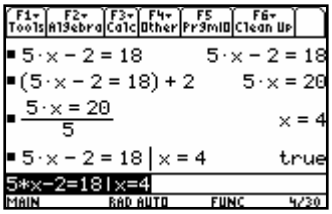
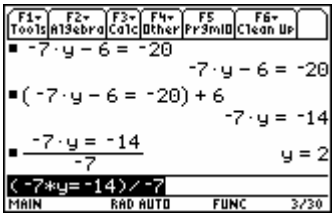


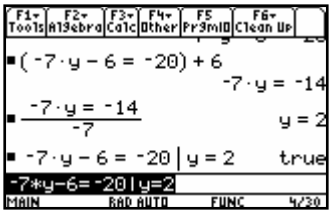


c)



d)





Chapter 4 Review Question 4 Page 230

Let c represent the number of candies that Cindy can afford.

a) $0.12c + 0.70 = 2.50$

b)
$$0.12c + 0.70 = 2.50$$
$$0.12c + 0.70 - 0.70 = 2.50 - 0.70$$
$$0.12c = 1.80$$
$$\frac{0.12c}{0.12} = \frac{1.80}{0.12}$$
$$c = 15$$

Cindy can afford to buy 15 candies.

Chapter 4 Review **Question 5 Page 230**

a) $3+2m+6m=19$

$3+8m=19$

$3+8m-3=19-3$

$8m=16$

$\frac{8m}{8}=\frac{16}{8}$

$m=2$

The solution is $m = 2$.

b) $7w-4+w+12=0$

$8w+8=0$

$8w+8-8=0-8$

$8w=-8$

$\frac{8w}{8}=\frac{-8}{8}$

$w=-1$

The solution is $w = -1$.

c) $3x+7=2x-3$

$3x+7-7-2x=2x-3-7-2x$

$x=-10$

The solution is $x = -10$.

d) $5w-6=-4w+3$

$5w-6+6+4w=-4w+3+6+4w$

$9w=9$

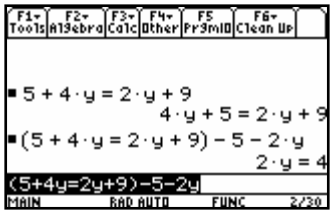
$\frac{9w}{9}=\frac{9}{9}$

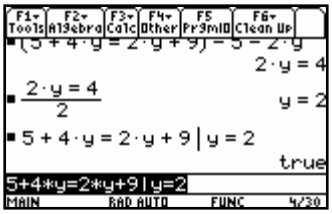
$w=1$

The solution is $w = 1$.

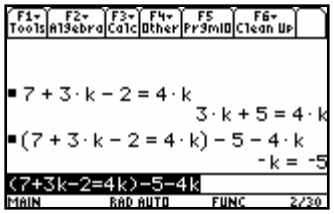
Chapter 4 Review **Question 6 Page 230**

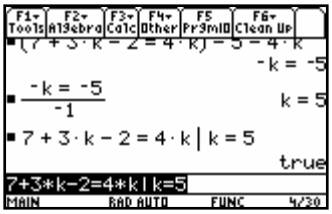
a)



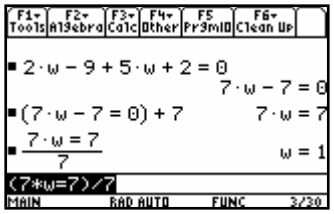


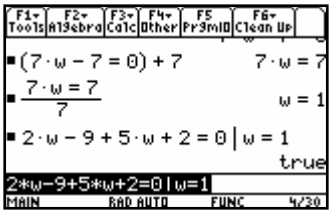
b)



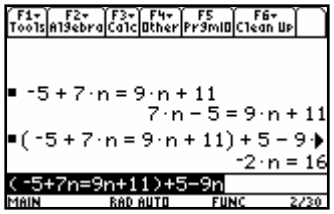


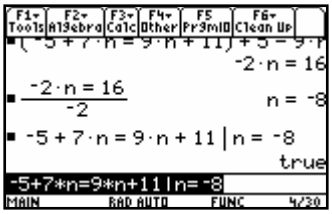
c)





d)





Chapter 4 Review **Question 7 Page 230**

a)

$$\begin{aligned}
4-(3p-2) &= p-10\\
4-3p+2 &= p-10\\
6-3p &= p-10\\
6-3p-6-p &= p-10-6-p\\
-4p &= -16\\
\frac{-4p}{-4} &= \frac{-16}{-4}\\
p &= 4
\end{aligned}$$

$$\begin{aligned}
\text{L.S.} &= 4-(3p-2) \qquad \text{R.S.} = p-10\\
&= 4-(3(4)-2) \qquad\quad = 4-10\\
&= 4-10 \qquad\qquad\quad = -6\\
&= -6
\end{aligned}$$

L.S. = R. S.

The solution is $p = 4$.

b)

$$\begin{aligned}
3+(h-2) &= 5+3h\\
3+h-2 &= 5+3h\\
1+h &= 5+3h\\
1+h-1-3h &= 5+3h-1-3h\\
-2h &= 4\\
\frac{-2h}{-2} &= \frac{4}{-2}\\
h &= -2
\end{aligned}$$

$$\begin{aligned}
\text{L.S.} &= 3+(h-2) \qquad \text{R.S.} = 5+3h\\
&= 3+(-2-2) \qquad\quad = 5+3(-2)\\
&= 3-4 \qquad\qquad\quad = -1\\
&= -1
\end{aligned}$$

L.S. = R. S.

The solution is $h = -2$.

c)

$$\begin{aligned}
2(n-8) &= -4(2n-1) \\
2n-16 &= -8n+4 \\
2n-16+16+8n &= -8n+4+16+8n \\
10n &= 20 \\
\frac{10n}{10} &= \frac{20}{10} \\
n &= 2
\end{aligned}$$

$$\begin{aligned}
\text{L.S.} &= 2(n-8) & \text{R.S.} &= -4(2n-1) \\
&= 2(2-8) & &= -4(2(2)-1) \\
&= 2(-6) & &= -4(3) \\
&= -12 & &= -12
\end{aligned}$$

L.S. = R. S.

The solution is $n = 2$.

d)

$$3(2k-5)-k=4-(3k+7)$$
$$6k-15-k=4-3k-7$$
$$5k-15=-3-3k$$
$$5k-15+15+3k=-3-3k+15+3k$$
$$8k=12$$
$$\frac{8k}{8}=\frac{12}{8}$$
$$k=\frac{3}{2}$$

$$\text{L.S.}=3(2k-5)-\frac{3}{2} \qquad \text{R.S.}=4-(3k+7)$$
$$=3\left(2\left(\frac{3}{2}\right)-5\right)-\frac{3}{2} \qquad =4-\left(3\left(\frac{3}{2}\right)+7\right)$$
$$=3(3-5)-\frac{3}{2} \qquad =4-\left(\frac{9}{2}+\frac{14}{2}\right)$$
$$=-\frac{12}{2}-\frac{3}{2} \qquad =\frac{8}{2}-\frac{23}{2}$$
$$=-\frac{15}{2} \qquad =-\frac{15}{2}$$

L.S. = R. S.

The solution is $k=\frac{3}{2}$.

Chapter 4 Review **Question 8** **Page 230**

$$\begin{aligned} 8x + 3x + x &= 180° \\ 12x &= 180° \\ \frac{12x}{12} &= \frac{180°}{12} \\ x &= 15° \\ 3x &= 45° \\ 8x &= 120° \end{aligned}$$

The angles measure 15º, 45º, and 120º.

Chapter 4 Review **Question 9** **Page 230**

a)

$$\begin{aligned} \frac{1}{3}(x-1) &= 4 \\ 3 \times \frac{1}{3}(x-1) &= 3 \times 4 \\ x - 1 &= 12 \\ x - 1 + 1 &= 12 + 1 \\ x &= 13 \end{aligned}$$

$$\begin{aligned} \text{L.S.} &= \frac{1}{3}(x-1) \quad \text{R.S.} = 4 \\ &= \frac{1}{3}(13-1) \\ &= \frac{1}{3}(12) \\ &= 4 \end{aligned}$$

L.S. = R. S.

The solution is $x = 13$.

b)

$$\frac{b-4}{3} = -5$$

$$3 \times \frac{b-4}{3} = 3(-5)$$

$$b - 4 = -15$$

$$b - 4 + 4 = -15 + 4$$

$$b = -11$$

$$\text{L.S.} = \frac{b-4}{3} \quad \text{R.S.} = -5$$

$$= \frac{-11-4}{3}$$

$$= \frac{-15}{3}$$

$$= -5$$

L.S. = R. S.

The solution is $b = -11$.

c)

$$3 = \frac{3}{4}(p-1)$$
$$4 \times 3 = 4 \times \frac{3}{4}(p-1)$$
$$12 = 3(p-1)$$
$$12 = 3p - 3$$
$$12 + 3 = 3p - 3 + 3$$
$$15 = 3p$$
$$\frac{15}{3} = \frac{3p}{3}$$
$$5 = p$$

L.S. = 3

R.S. $= \frac{3}{4}(p-1)$
$= \frac{3}{4}(5-1)$
$= \frac{3}{4}(4)$
$= 3$

L.S. = R.S.
The solution is $p = 5$.

d)

$$-3 = \frac{5x+4}{7}$$

$$7(-3) = 7 \times \frac{5x+4}{7}$$

$$-21 = 5x+4$$

$$-21-4 = 5x+4-4$$

$$-25 = 5x$$

$$\frac{-25}{5} = \frac{5x}{5}$$

$$-5 = x$$

L.S. $= -3$

R.S. $= \frac{5x+4}{7}$

$$= \frac{5(-5)+4}{7}$$

$$= \frac{-25+4}{7}$$

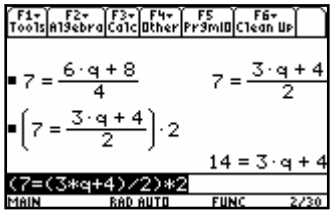
$$= -3$$

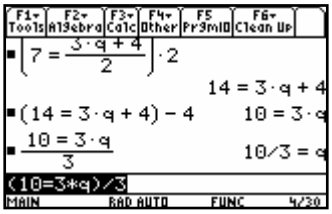
L.S. = R.S.

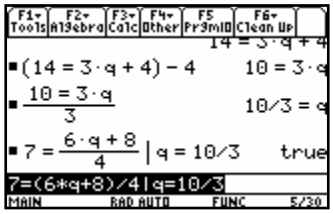
The solution is $x = -5$.

Chapter 4 Review Question 10 Page 231

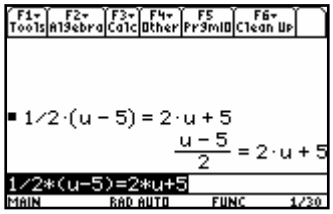
a)

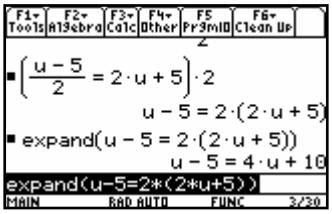


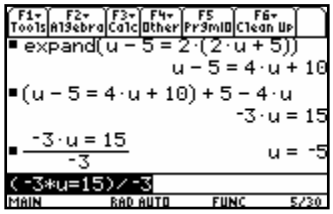


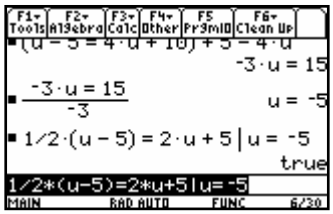


b)









Chapter 4 Review **Question 11 Page 231**

a)

$$\frac{y-8}{3}=\frac{y+4}{2}$$

$$\cancel{6}^{2}\times\frac{y-8}{\cancel{3}_{1}}=\cancel{6}^{3}\times\frac{y+4}{\cancel{2}_{1}}$$

$$2(y-8)=3(y+4)$$

$$2y-16=3y+12$$

$$2y-16-12-2y=3y+12-12-2y$$

$$-28=y$$

The solution is $y=-28$.

b)

$$\frac{2}{3}(w-5)=\frac{3}{4}(w+2)$$

$$\cancel{12}^{4}\times\frac{2}{\cancel{3}_{1}}(w-5)=\cancel{12}^{3}\times\frac{3}{\cancel{4}_{1}}(w+2)$$

$$8(w-5)=9(w+2)$$

$$8w-40=9w+18$$

$$8w-40-8w-18=9w+18-8w-18$$

$$-58=w$$

The solution is $w=-58$.

c)

$$\frac{c+3}{4}=\frac{c-5}{6}$$

$$\cancel{12}^{3}\times\frac{c+3}{\cancel{4}_{1}}=\cancel{12}^{2}\times\frac{c-5}{\cancel{6}_{1}}$$

$$3(c+3)=2(c-5)$$

$$3c+9=2c-10$$

$$3c+9-9-2c=2c-10-9-2c$$

$$c=-19$$

The solution is $c=-19$.

d)
$$\frac{2}{5}(x+3)=\frac{1}{2}(x-5)$$
$$\cancel{10}^{2}\times\frac{2}{\cancel{5}_{1}}(x+3)=\cancel{10}^{5}\times\frac{1}{\cancel{2}_{1}}(x-5)$$
$$4(x+3)=5(x-5)$$
$$4x+12=5x-25$$
$$4x+12-4x+25=5x-25-4x+25$$
$$37=x$$

The solution is $x = 37$.

Chapter 4 Review **Question 12** **Page 231**

a)
$$P=a+b+c$$
$$P-b-c=a+b+c-b-c$$
$$P-b-c=a$$

b)
$$C=\pi d$$
$$\frac{C}{\pi}=\frac{\pi d}{\pi}$$
$$\frac{C}{\pi}=d$$

c)
$$a=\frac{F}{m}$$
$$m\times a=m\times\frac{F}{m}$$
$$ma=F$$

d)
$$d=mt+b$$
$$d-b=mt+b-b$$
$$d-b=mt$$
$$\frac{d-b}{m}=\frac{mt}{m}$$
$$\frac{d-b}{m}=t$$

Chapter 4 Review **Question 13 Page 231**

a) $P = I^2R$

$= 0.5^2(600)$

$= 150$

The power is 150 W.

b) $P = I^2R$

$500 = 2^2R$

$500 = 4R$

$\frac{500}{4} = \frac{4R}{4}$

$125 = R$

The resistance is 125 Ω.

c)

$P = I^2R$

$100 = I^2 4$

$\frac{100}{4} = \frac{4I^2}{4}$

$25 = I^2$

$5 = I$

The current is 5 A.

Chapter 4 Review **Question 14 Page 231**

Let x represent Dina's age. Michelle's age is $2x$, and Juliette's after is $x + 3$.

$$\begin{aligned} x + 2x + x + 3 &= 39 \\ 4x + 3 &= 39 \\ 4x + 3 - 3 &= 39 - 3 \\ 4x &= 36 \\ \frac{4x}{4} &= \frac{36}{4} \\ x &= 9 \end{aligned}$$

Dina is 9, Michelle is 18, and Juliette is 12.

Chapter 4 Review **Question 15 Page 231**

a) Let E represent Sven's earnings, let h represent the number of hours worked, and let n represent the number of hamburgers sold.

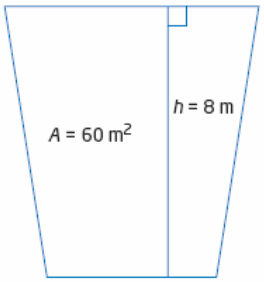
$$\begin{aligned} E &= 7.50h + 0.40n \\ &= 7.50(3) + 0.40(24) \\ &= 22.50 + 9.60 \\ &= 32.10 \end{aligned}$$

Sven earned \$32.10 for a 3-h shift during which he sold 24 hamburgers.

b)
$$\begin{aligned} 100 &= 7.50(6.5) + 0.40n \\ 100 &= 48.75 + 0.40n \\ 100 - 48.75 &= 48.75 + 0.40n - 48.75 \\ 51.25 &= 0.40n \\ \frac{51.25}{0.40} &= \frac{0.40n}{0.40} \\ 128.125 &= n \end{aligned}$$

Sven must sell at least 129 hamburgers to earn \$100 in a 6.5-h shift.

Chapter 4 Review **Question 16** **Page** 231



Let x represent the front width. The back width is $2x$.

Let x represent the increase in depth required to double the area of the garden.

Use the formula for the area of a trapezoid: $A = \frac{1}{2}(a+b)h$.

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

$$\frac{1}{2}(3x)(8+d) = 8(3x)$$

$$2\times\frac{1}{2}(3x)(8+d) = 2\times 8(3x)$$

$$3x(8+d) = 48x$$

$$\frac{3x(8+d)}{3x} = \frac{48x}{3x}$$

$$8+d = 16$$

$$8+d-8 = 16-8$$

$$d = 8$$

Hitori must increase the depth of his garden by 8 m to double its area.

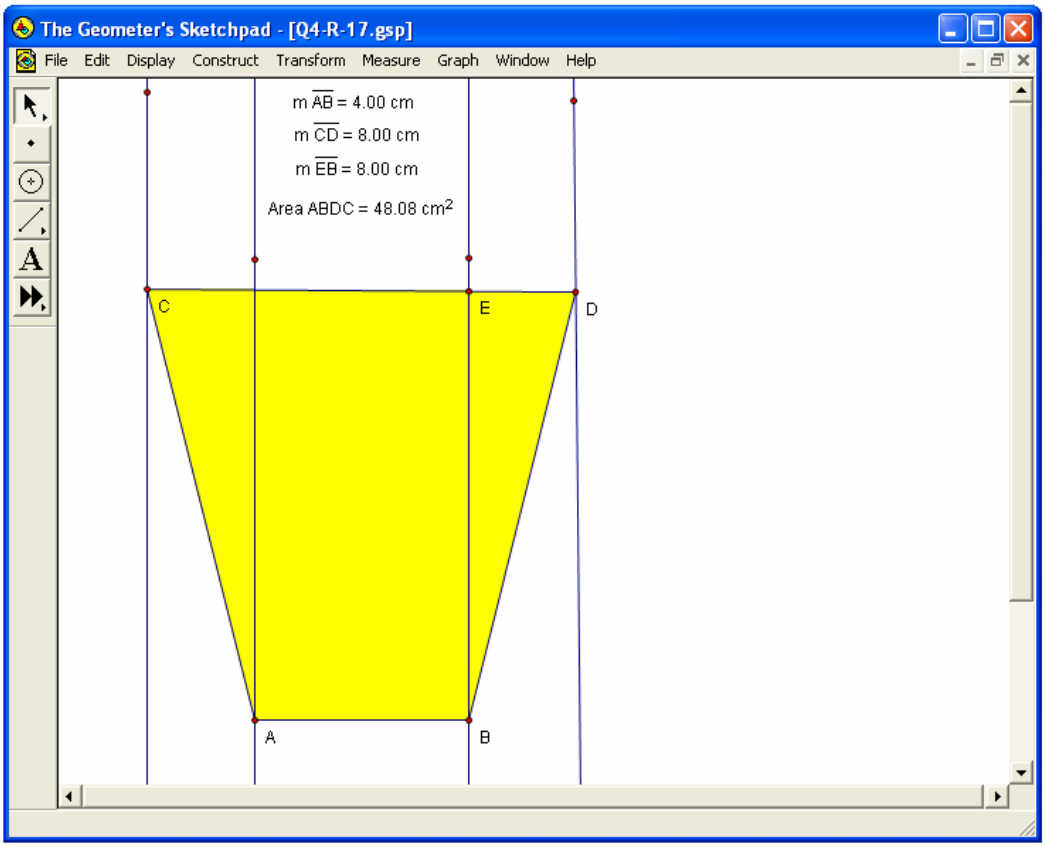
Chapter 4 Review Question 17 Page 231

Answers will vary. A sample answer is shown.

a) You can use *The Geometer's Sketchpad*® to construct a dynamic model of the garden. Draw vertical lines and use them to prevent the front and back widths from changing. Measure the depth, and the area of the garden. Drag points to increase the depth until the area doubles. Click here to load the sketch.

b) Modelling the problem with an equation gives an exact answer, but requires several steps for the solution.

Modelling the problem with *The Geometer's Sketchpad*® provides a visual solution, but may not give as exact an answer.



Chapter 4 Chapter Test

Chapter 4 Chapter Test Question 1 Page 232

$$\begin{aligned} x-2&=-4\\ x-2+2&=-4+2\\ x&=-2 \end{aligned}$$

Answer B.

Chapter 4 Chapter Test Question 2 Page 232

Substitute $k=-3$ in each equation. It works for answer D.

$$\begin{aligned} \text{L.S.}&=4k+1 \qquad \text{R.S.}=-11\\ &=4(-3)+1\\ &=-12+1\\ &=-11 \end{aligned}$$

L.S. = R.S.

Chapter 4 Chapter Test Question 3 Page 232

$$\begin{aligned} s&=\frac{d}{t}\\ t\times s&=t\times\frac{d}{t}\\ ts&=d \end{aligned}$$

Answer C.

Chapter 4 Chapter Test Question 4 Page 232

Let f represent Felix's age. Anthony's age is $f+4$.

$$f+f+4=42$$

Answer C.

Chapter 4 Chapter Test Question 5 Page 232

a)
$$y - 11 = -2$$
$$y - 11 + 11 = -2 + 11$$
$$y = 9$$

The solution is $y = 9$.

b)
$$\frac{h}{7} = -3$$
$$7 \times \frac{h}{7} = 7(-3)$$
$$h = -21$$

The solution is $h = -21$.

c)
$$3k + 5 = 14$$
$$3k + 5 - 5 = 14 - 5$$
$$3k = 9$$
$$\frac{3k}{3} = \frac{9}{3}$$
$$k = 3$$

The solution is $k = 3$.

d)
$$5x - 7 = 8 + 2x$$
$$5x - 7 + 7 - 2x = 8 + 2x + 7 - 2x$$
$$3x = 15$$
$$\frac{3x}{3} = \frac{15}{3}$$
$$x = 5$$

The solution is $x = 5$.

e)
$$\begin{aligned} 7r &= -3(r-2) \\ 7r &= -3r+6 \\ 7r+3r &= -3r+6+3r \\ 10r &= 6 \\ \frac{10r}{10} &= \frac{6}{10} \\ r &= \frac{3}{5} \end{aligned}$$

The solution is $r = \frac{3}{5}$.

f)
$$\begin{aligned} 2y+(y-3) &= 4(y-5) \\ 2y+y-3 &= 4y-20 \\ 3y-3 &= 4y-20 \\ 3y-3+20-3y &= 4y-20+20-3y \\ 17 &= y \end{aligned}$$

The solutions is $y = 17$.

Chapter 4 Chapter Test Question 6 Page 232

a)

$$\frac{1}{3}(2w-6)=-8$$
$$3\times\frac{1}{3}(2w-6)=3(-8)$$
$$2w-6=-24$$
$$2w-6+6=-24+6$$
$$2w=-18$$
$$\frac{2w}{2}=\frac{-18}{2}$$
$$w=-9$$

The solution is $w=-9$.

b)

$$\frac{3a-7}{4}=\frac{4a+5}{3}$$
$$\cancel{12}^{3}\times\frac{3a-7}{\cancel{4}_{1}}=\cancel{12}^{4}\times\frac{4a+5}{\cancel{3}_{1}}$$
$$3(3a-7)=4(4a+5)$$
$$9a-21=16a+20$$
$$9a-21+21-16a=16a+20+21-16a$$
$$-7a=41$$
$$\frac{-7a}{-7}=\frac{41}{-7}$$
$$a=-\frac{41}{7}$$

The solution is $a=-\frac{41}{7}$.

c)

$$\frac{3k}{2}-\frac{k+3}{3}=8-\frac{k+2}{4}$$

$$12\times\left(\frac{3k}{2}-\frac{k+3}{3}\right)=12\times\left(8-\frac{k+2}{4}\right)$$

$$\overset{6}{\cancel{12}}\times\frac{3k}{2}-\overset{4}{\cancel{12}}\times\frac{k+3}{\cancel{3}_{1}}=12\times 8-\overset{6}{\cancel{12}}\times\frac{k+2}{\cancel{4}_{1}}$$

$$6(3k)-4(k+3)=96-3(k+2)$$

$$18k-4k-12=96-3k-6$$

$$14k-12=90-3k$$

$$14k-12+12+3k=90-3k+12+3k$$

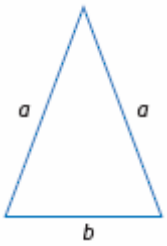
$$17k=102$$

$$\frac{17k}{17}=\frac{102}{17}$$

$$k=6$$

The solution is $k = 6$.

Chapter 4 Chapter Test **Question 7** **Page 232**



a)

$$P=2a+b$$

$$P-2a=2a+b-2a$$

$$P-2a=b$$

b)

$$P=2a+b$$

$$P-b=2a+b-b$$

$$P-b=2a$$

$$\frac{P-b}{2}=\frac{2a}{2}$$

$$\frac{P-b}{2}=a$$

c)

$$a=\frac{P-b}{2}$$

$$=\frac{43-18}{2}$$

$$=\frac{25}{2}$$

$$=12.5$$

Each of the equal sides measures 12.5 cm.

Chapter 4 Chapter Test Question 8 Page 233

Let x represent Charlene's earnings. Kristi's earnings are $x - 150$, and Sacha's earnings are $x + 100$.

$$\begin{aligned} x + x - 150 + x + 100 &= 2050 \\ 3x - 50 &= 2050 \\ 3x - 50 + 50 &= 2050 + 50 \\ 3x &= 2100 \\ \frac{3x}{3} &= \frac{2100}{3} \\ x &= 700 \end{aligned}$$

Charlene earns \$700, Kristi earns \$550, and Sacha earns \$800.

Chapter 4 Chapter Test Question 9 Page 233

$$\begin{aligned} 8 - 2(2p - 3) &= 6 - (p + 3) \\ 8 - 4p + 6 &= 6 - p - 3 \\ 14 - 4p &= 3 - p \\ 14 - 4p - 14 + p &= 3 - p - 14 + p \\ -3p &= -11 \\ \frac{-3p}{-3} &= \frac{-11}{-3} \\ p &= \frac{11}{3} \end{aligned}$$

$$\begin{aligned} \text{L.S.} &= 8 - 2(2p - 3) \\ &= 8 - 2\left(2\left(\frac{11}{3}\right) - 3\right) \\ &= 8 - 2\left(\frac{22}{3} - \frac{9}{3}\right) \\ &= 8 - 2\left(\frac{13}{3}\right) \\ &= \frac{24}{3} - \frac{26}{3} \\ &= -\frac{2}{3} \end{aligned}$$

$$\begin{aligned} \text{R.S.} &= 6 - (p + 3) \\ &= 6 - \left(\left(\frac{11}{3}\right) + 3\right) \\ &= 6 - \left(\frac{11}{3} + \frac{9}{3}\right) \\ &= \frac{18}{3} - \left(\frac{20}{3}\right) \\ &= -\frac{2}{3} \end{aligned}$$

L.S. = R. S.

The solution is $p = \frac{11}{3}$.

Chapter 4 Chapter Test Question 10 Page 233

a) Let E represent Murray's earnings, let h represent the number of hours worked, and let s represent the number of service contracts sold.

$$\begin{aligned} E &= 8.50h + 15s \\ &= 8.50(8) + 15(7) \\ &= 173 \end{aligned}$$

Murray makes \$173 if he sells 7 service contracts in an 8-h shift.

b)
$$\begin{aligned} 790 &= 8.50(40) + 15s \\ 790 &= 340 + 15s \\ 790 - 340 &= 340 + 15s - 340 \\ 450 &= 15s \\ \frac{450}{15} &= \frac{15s}{15} \\ 30 &= s \end{aligned}$$

Murray must sell 30 service contracts to earn \$790 in a 40-h work week.