b)

Predict m.	Evaluate $3m$	Is this the correct solution?
200	$3(200) = 600$	too high
150	$3(150) = 450$	too high
111	$3(111) = 333$	correct

c)

Predict r.	Evaluate $5r - 10$.	Is this the correct solution?
15	$5(15) - 10 = 65$	too low
21	$5(21) - 10 = 95$	correct
25	$5(25) - 10 = 115$	too high

2. a) $x = 64$ **b)** $q = 116$ **c)** $w = 17$ **d)** $c = 12$
e) $e = 7$ **f)** $k = 27$ **g)** $s = 51$ **h)** $u = 31$

3. a) $4x + 100 = 140$, $x = 10$
b) $7x = 294$, $x = 42$
c) $4x - 52 = 212$, $x = 66$

4. a) She multiplied (24 + 12) by the variable. The equation asked for multiplying the variable by 12 only, and then adding 24.
b)

Predict z.	Evaluate $24 + 12z$.	Is this the correct solution?
10	$24 + 12(10) = 144$	too low
15	$24 + 12(15) = 204$	too high
13	$24 + 12(13) = 180$	correct

5. a) $A = 6$ units squared
b) $h = 4$ units
c) $b = 8$ units

8.6 Communicating the Solution for an Equation

1. On the left side there are three containers, so you get $3c$. On the right side there are 15 marbles. The equation is $3c = 15$. Divide both sides of the equation by 3, to determine that $c = 5$. The answer means that each container holds five marbles.

2. a) $5c = 10$, $c = 2$ **b)** $c + 3 = 7$, $c = 4$
c) $4c + 5 = 13$, $c = 2$

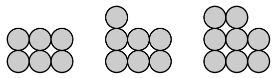
3. On the left side, there are two containers and three marbles. You can write this as $2m + 3$. On the right side there are five marbles. The equation is $2m + 3 = 5$. Subtract 3 from both sides to get $2m = 2$. Divide both sides by 2 to get $m = 1$.

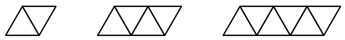
4. Tynessa should have subtracted 6 from both sides before dividing both sides by 2. The correct solution is $c = 3$.

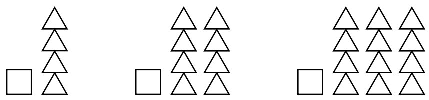
Test Yourself

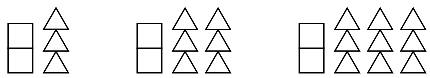
1. a) Start with one square and one triangle. Add one triangle each time. An alternative rule is: Each figure has one square and the same number of triangles as the term number.
b) $t + 1$

2. a) $3b$ **b)** $3 + b$ **c)** $(1 + t) + 1$, or $2 + t$

3. a)


b)


c)


d)


4. a) 9 **b)** 14 **c)** 2 **d)** 10

5. a) $15 + h$ **b)** $40 **c)** $115

6. a) $x = 12$ **b)** $p = 9$ **c)** $m = 2$ **d)** $b = 6$

7. a) $4 + t$ **b)** $4 + t = 16$
c) $t = 12$ **d)** $4 + (12) = 16$

8.

Predict k.	Evaluate $4 + 2k$.	Is this the correct solution?
50	$4 + 2(50) = 104$	too low
52	$4 + 2(52) = 108$	too high
51	$4 + 2(51) = 106$	correct

9. a) $3c = 9$
b) $c = 3$
c) There are three containers on the left side and nine marbles on the right, so the equation is $3c = 9$. Divide both sides by 3 to get $c = 3$.

10. a) $x = 5$ **b)** $x = 3$ **c)** $x = 4$ **d)** $x = 4$

Chapter 9

9.1 Adding Fractions with Pattern Blocks

1. To show $\frac{1}{4}$ of each diagram, shade one section of the square, one section of the circle, and two sections of the rectangle.

2. For example, you could draw a rectangle divided in five equal pieces, and shade two.

3. a) To show $\frac{1}{6}$, shade one section.

b) Repeat part (a).

c) $\frac{2}{6} = \frac{1}{3}$

4. a) To show $\frac{1}{2}$, shade four sections.

b) To show $\frac{1}{8}$, shade one section. Now five sections in total are shaded.

c) $\frac{5}{8}$

9.2 Adding Fractions with Models

1. Chang forgot to convert the fraction $\frac{2}{3}$ into the equivalent fraction $\frac{4}{6}$. He should have coloured four rectangles on the first strip and one rectangle on the second strip to get a total of $\frac{5}{6}$.

2. a) $\frac{2}{4}$, or $\frac{1}{2}$ **b)** $\frac{3}{3}$, or 1
c) $\frac{6}{6}$, or 1 **d)** $\frac{13}{15}$
e) $\frac{7}{8}$ **f)** $\frac{7}{10}$

3. Draw a second arrow that is 5 units long to show $\frac{5}{20}$. Add the two arrows to get $\frac{9}{20}$.

4. a) $\frac{7}{10}$ **b)** $\frac{7}{8}$ **c)** $\frac{8}{8}$, or 1
d) $\frac{11}{24}$ **e)** $\frac{26}{40}$, or $\frac{13}{20}$ **f)** $\frac{17}{30}$

5. $\frac{3}{8}$

6. $\frac{3}{4}$ h

9.3 Multiplying a Whole Number by a Fraction

1. a) 8 squares **b)** $\frac{8}{3}$ **c)** $2\frac{2}{3}$

2. a) $\frac{3}{4}$ **b)** $\frac{6}{5}$, or $1\frac{1}{5}$ **c)** $\frac{5}{2}$, or $2\frac{1}{2}$
d) $\frac{7}{3}$, or $2\frac{1}{3}$ **e)** $\frac{20}{6}$, or $3\frac{1}{3}$
f) $\frac{20}{7}$, or $2\frac{6}{7}$

3. a) 8 **b)** 2, 3 **c)** 3, 2 **d)** 3, 4, 2

9.4 Subtracting Fractions with Models

1. Draw a second arrow to represent $\frac{1}{4}$, or $\frac{3}{12}$. The end of the arrow should start at the tip of the first arrow, and it should point left. The tip of the second arrow will end at the solution: $\frac{5}{12}$.

2. a) $\frac{1}{4}$ **b)** $\frac{1}{10}$ **c)** $\frac{5}{21}$ **d)** $\frac{7}{30}$
e) $\frac{17}{15}$, or $1\frac{2}{15}$ **f)** $\frac{53}{28}$, or $1\frac{25}{28}$

3. $\frac{4}{15}$

9.5 Subtracting Fractions with Grids

1. a) $\frac{7}{20}$

b) Seven squares out of twenty have counters on them.

2. Jody forgot to rearrange the counters to express thirds before removing the counters in one column. Rearranging the counters leaves one full column with 2 counters left over. Removing one column leaves 2 squares out of 21 with counters. The solution is $\frac{2}{21}$.

3. a) $\frac{11}{12}$ **b)** $\frac{34}{15}$, or $2\frac{4}{15}$ **c)** $\frac{3}{8}$
d) $\frac{5}{9}$ **e)** $\frac{4}{12}$, or $\frac{1}{3}$ **f)** $\frac{5}{8}$
g) $\frac{2}{35}$ **h)** $\frac{59}{40}$, or $1\frac{19}{40}$

4. a) $\frac{17}{35}$ of the brownies

b) $\frac{18}{35}$ of the brownies

5. $\frac{17}{24}$ of the CDs

9.6 Adding and Subtracting Mixed Numbers

1. a) 4 **b)** $8\frac{1}{4}$ **c)** $7\frac{5}{6}$ **d)** $8\frac{7}{8}$
e) $16\frac{1}{12}$ **f)** $5\frac{19}{30}$ **g)** $13\frac{5}{18}$ **h)** $8\frac{13}{21}$

2. a) $2\frac{3}{4}$ **b)** $1\frac{4}{5}$ **c)** $3\frac{4}{7}$ **d)** $\frac{3}{8}$
e) $1\frac{1}{2}$ **f)** $1\frac{5}{9}$ **g)** $6\frac{1}{7}$ **h)** $\frac{1}{12}$

3. $1\frac{1}{6} + 3\frac{1}{10} = 4\frac{4}{15}$

4. a) $5\frac{1}{4}$ h **b)** $4\frac{1}{30}$ h **c)** $8\frac{1}{8}$ h

5. $2\frac{5}{6}$ h, or 2 h 50 min

6. a) $7\frac{1}{2}$ years old **b)** $23\frac{1}{8}$ years old
c) $1\frac{2}{5}$ years old

7. $1\frac{1}{12}$ pizzas

8. $3\frac{5}{9}$ h

9. $1\frac{3}{40}$

9.7 Communicating about Estimation Strategies

1. a) Ryan forgot to include the fraction $\frac{9}{12}$ in his estimation. 4 $\frac{9}{12}$ is closer to 5 than to 4.

   b) You can round off 4 $\frac{9}{12}$ to the number 5. Then subtract from 6. Ryan has a little more than one case of pop left over.

2. 2 $\frac{3}{4}$ is a little bit less than 3. 1 $\frac{1}{8}$ is a little bit more than 1. Add 3 and 1 to get about 4 c. of sugar in total.

3. Round off $\frac{1}{3}$ to $\frac{1}{2}$, which is easier to deal with. So the north wall needs a little less than 2 $\frac{1}{2}$ pieces. The west wall needs $\frac{1}{2}$ a piece. For the south wall, round off 1 $\frac{4}{5}$ to get a little less than 2. The east wall needs 3 pieces. Add 2 $\frac{1}{2}$ + $\frac{1}{2}$ + 2 + 3 = 8. Miguel needs a little less than 8 pieces of panelling.

9.8 Adding and Subtracting Using Equivalent Fractions

1. a) The common denominator is 8. The equivalent fractions are $\frac{5}{8}$ and $\frac{6}{8}$.

   b) The common denominator is 10. The equivalent fractions are $\frac{5}{10}$ and $\frac{4}{10}$.

   c) The common denominator is 12. The equivalent fractions are $\frac{11}{12}$ and $\frac{3}{12}$.

   d) The common denominator is 35. The equivalent fractions are $\frac{20}{35}$ and $\frac{28}{35}$.

2. a) The missing values are 2 and 1.
   b) The missing values are 6, 10, 16, and 1.

3. a) $\frac{11}{14}$ b) $\frac{5}{8}$ c) $\frac{14}{9}$, or 1 $\frac{5}{9}$
   d) $\frac{31}{42}$ e) $\frac{13}{8}$, or 1 $\frac{5}{8}$ f) $\frac{37}{40}$
   g) $\frac{9}{20}$ h) $\frac{5}{24}$

4. a) $\frac{1}{6}$ b) $\frac{7}{20}$ c) $\frac{5}{10}$ or $\frac{1}{2}$
   d) $\frac{1}{72}$ e) $\frac{5}{14}$ f) $\frac{5}{12}$ g) $\frac{2}{35}$
   h) $\frac{27}{60}$, or $\frac{9}{20}$

5. 1 $\frac{7}{12}$ h

6. 2 $\frac{1}{3}$ days

7. Indira drank $\frac{1}{15}$ of a bottle more lemonade than Simon.

8. 1 $\frac{1}{7}$ h

9. Jody has finished $\frac{8}{35}$ more of her homework than Sandra.

10. a) $\frac{3}{10}$ b) Colin won $\frac{2}{5}$ more than Kaitlyn.

Test Yourself

1. a) C b) A c) B

2. a) $\frac{3}{4}$ b) $\frac{3}{4}$ c) $\frac{2}{5}$
   d) 1 $\frac{1}{2}$, or $\frac{3}{2}$ e) 3 $\frac{2}{5}$, or $\frac{17}{5}$
   f) 4 $\frac{1}{5}$, or $\frac{21}{5}$

3. a) $\frac{7}{6}$, or 1 $\frac{1}{6}$ b) $\frac{1}{10}$

4. a) $\frac{1}{9}$ b) $\frac{17}{24}$

5. a) 1 b) $\frac{1}{2}$ c) $\frac{1}{10}$ d) $\frac{7}{24}$
   e) $\frac{7}{9}$ f) $\frac{3}{14}$ g) $\frac{43}{40}$, or 1 $\frac{3}{40}$
   h) $\frac{11}{15}$

6. a) 3 $\frac{1}{3}$ b) 2 $\frac{1}{10}$

7. $\frac{1}{6}$

8. a) 4 $\frac{5}{6}$ b) 11 $\frac{11}{12}$ c) 9 $\frac{31}{56}$

9. a) 1 $\frac{3}{5}$ b) 1 $\frac{5}{6}$ c) 4 $\frac{1}{10}$

10. a) $\frac{3}{8}$ b) $\frac{1}{9}$ c) $\frac{1}{18}$

11. $\frac{2}{3}$ of her pay

12. a) 75 $\frac{7}{10}$ years old b) 79 $\frac{11}{12}$ years old
    c) 72 $\frac{3}{10}$ years old

13. a) 1 full box b) $\frac{1}{4}$ of a box

14. $\frac{7}{12}$

15. a) $\frac{7}{8}$ of a tube is a little less than 1 tube. 3 $\frac{1}{6}$ tubes is a little more than 3 tubes. Added together, Kaitlyn used about 4 tubes of paint.

    b) She has about 5 tubes of paint left in total.

16. $\frac{7}{10}$ of the day