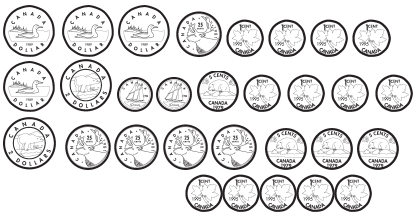
Sample answers have been provided for open-ended questions as indicated. Where applicable, solutions for subsequent parts of a question are based on the sample answer given.

CHAPTER 2: STUDENT BOOK MASTERS

Simple Symbols (22–25)

1. a. equal, 10 ones equals one 10
   two rods. one rod plus 10 ones
   b. not equal, three rods ≠ four rods
   c. equal, $1.38 = $1.38
   The left side has two dimes and three nickels and the right side has three dimes and one nickle. The totals are equal because two nickels = one dime.
   d. equal, 1L = 1000 mL
   500 mL + 500 mL = 1 L
2. a. two squares are greater than three circles
   b. two triangles are less than four circles
   c. one triangle is less than one hexagon
   d. one hexagon is greater than one circle
3. **Sample answers:**



4. **Sample answers:**

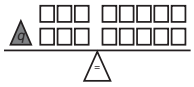
10 + 10 = 20	40 – 20 = 20	4 × 5 = 20
200 ÷ 10 = 20	5 + 5 + 5 + 5 = 20	70 – 50 = 20
10 × 2 = 20	160 ÷ 8 = 20	

5. **Sample answers:**
   a. (9 × 10¢) + (1 × 5¢) + (5 × 1¢)
   b. (3 × 25¢) + (4 × 5¢) + (5 × 1¢)
   c.

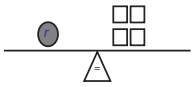
   d. All three representations equal $1.00; each representation is a sum. Each representation used a different number of each type of coin.
   e. (10¢ × 9) + 5¢ + (1¢ × 5) = (25¢ × 3) + (5¢ × 4) + (1¢ × 5)
   f. Different coins can be added to create the same sums. You can show the same sum many ways (e.g., one dime is equal to two nickels, so 5 + 5 = 10).
6. a. = b. ≠ c. = d. ≠
   e. = f. ≠ g. = h. ≠
7. a. This scale will not balance because the left pan has 11 squares and the right pan has eight squares. 11 > 8
   b. This scale will not balance because the left pan has 16 squares and the right pan has seven squares. 16 > 7
   c. This scale will not balance because the left pan (12 × 4) is 48 and the right pan is 40. 48 > 40
   d. This scale will not balance because the left pan (45 ÷ 9) is five and the right pan (3 × 5) is 15. 5 < 15
   e. This scale will not balance because the left pan is 15 and the right pan (15 – 6) is nine. 15 > 9
   f. This scale will not balance because the left pan (8 – 5) is three and the right pan is 15. 3 < 15

Equal All the Time (26–29)

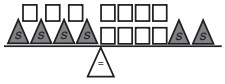
1. a. Anna made an equivalent equation by multiplying both sides of the equation by two. $x = 6$, and $2 \times 6 = 12$
   Both sides of the equation equal 12.
   Belinda did not make an equivalent equation. She multiplied on the left side and added on the right.
   $x = 6$, and $2 \times 6 \neq 8$. She should have added two to x and written $x + 2 = 8$.
   Carissa made an equivalent equation by adding four to both sides of the equation. $x = 6$ and $6 + 4 = 10$
   Both sides of the equation equal 10.
   Danika did not make an equivalent equation. $x = 6$, and $2 \times 6 \neq 3$. She should have divided by two on both sides and written $\frac{x}{2} = 3$.
2. a. Albert should have divided on both sides. Six divided by two is three.
   b. Bertrand added three to six to get nine. $x + 3 + 3$ should be $x + 6$
   c. Carlos should have multiplied by four, $x \div 4 \times 4 = 6 \times 4$ or $x = 24$. Carlos could have subtracted, and then his equation would have been $\frac{x}{4} - 4 = 2$.
   d. Decklan should have added five to both sides of the equation. $x - 5 + 5$ is x. $x = 11$.
3. a. $2x + 14 = 30$ b. $17 = \frac{x}{3} + 10$
   c. $48 = x$ d. $3x = 12$
4. a. subtract 7 from 15, 8 = 8 b. divide by 2, 4 = 4
   c. divide by 12, 5 = 5 d. multiply by 5, 40 = r
   e. add 9, $q = 32$ f. subtract 2, $p = 9$
5. **Sample answers:**
   a.



   b.



   c.



6. a. subtract 9, $g + 9 = 27$ b. add 5, $70 = h - 15$
   c. divide by 4, $8 = k \times 2$ d. multiply by 3, $m = 39$
   e. add 9, $4n = 40$ f. subtract 5, $10 = p \div 4$

Beautiful Balance (30–33)

1. a. The cube weighs more because it take two spheres to balance one cube.
   b. The triangle weighs more because it takes three cubes to balance two triangles.
   c. The sphere weighs more because it take three triangles to balance one sphere.
   d. The cube weighs the most. It takes three cylinders to balance one sphere, so the sphere weighs more than the cylinders. It takes two spheres to balance one cube, so the cube weighs more than the sphere.

2. a. Double each side. Since ● = ■■, ● ● = ■■■■.
   b. Each sphere is equal to two cubes. When we subtract one sphere we must also remove two cubes to balance the scale.
   c. Since one triangle is equal to two cubes, we know that each cube weighs twice as much as one triangle. Since one triangle and one cube equal six spheres, we can determine that one cube weighs the same as one sphere and one triangle equals two spheres. To balance the scale with spheres, we must remove four spheres and one cube.

3. a. $5g$ b. $3g$ c. $7g$
   d. $4g$ e. $1g$ f. $4g$

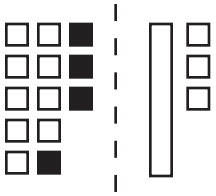
4. a. $z + 3 - 3 = 35 - 3$
   $z = 32$
   b. $21 + 14 = y - 14 + 14$
   $35 = y$
   c. $\frac{5x}{5} = \frac{80}{5}$
   $x = 16$
   d. $w \div 4 \times 4 = 6 \times 4$
   $w = 24$

Rank and Solve (34–35)

1. a. $a = 17 - 5$, $a = 12$
   b. $d = 2223 + 418$, $d = 2641$
   c. $f = 8 \div 8$, $f = 1$
   d. $10 \times 10 = m$, $100 = m$
   e. $1063 - 642 = c$, $421 = c$
   f. $86 + 14 = e$, $100 = e$
   g. $120 \div 12 = h$, $10 = h$
   h. $k = 6(20)$, $k = 120$
   i. $b = 12 - 6$, $b = 6$
   j. $3p = 45$, $p = 45 \div 3$, $p = 15$
   k. $250 = 50n$, $250 \div 50 = n$, $5 = n$
   l. $100 = \frac{g}{10}$, $100 \times 10 = q$, $1000 = q$
   m. $r \div 40 = 25$, $r = 25 \times 40$, $r = 1000$
   n. $g = 56 \div 7$, $g = 8$
   o. $j = 40 \times 5$, $j = 200$

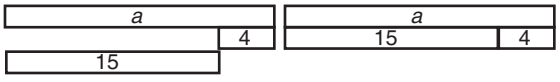
Picture it Solved (36–37)

1. **Sample answers:**
   a. I used white blocks to show the known numbers in the equation. I placed nine on the left side and 13 on the right. To balance the equation, I added black blocks to the left side, until both sides both sides were equal. I added four black blocks, so r must equal 4.

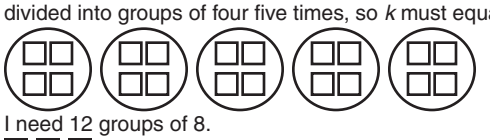


9 + 4 = 13

   b. I used a bar model. $a - 4$ is 15, so 15 + 4 must be a. a is 19.

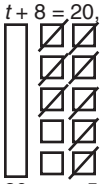


   c. I drew 20 blocks in groups of four. 20 blocks can be divided into groups of four five times, so k must equal five.



   d. I need 12 groups of 8.
   8 8 8 = 24
   8 8 8 = 24 = 96
   8 8 8 = 24
   8 8 8 = 24

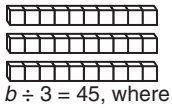
2. a. $t + 8 = 20$, where t = the number of trains last year.



Maddox had 12 trains last year.

   b. $20 - c = 5$, where c = the number of cards played.
   I drew 20 circles then crossed out some of them until I had five left. Then I crossed out 15 circles. Nadia must have played 15 cards.

   c. $30 \div r = 10$, where r = the number of rows
   One rod is equal to 10 ones. I can use three rods to represent 30. I can determine how many rods I need by skip counting by 10s (10, 20, 30). Since I have used three rods, r must be equal to three.



   d. $b \div 3 = 45$, where b = the number of baseball cards.
   I drew rods and blocks to show 45 three times. I grouped them into flats, rods, and ones. 100 + 30 + 5 = 135
   b must equal 135.

   e. (s ÷ 4) – 6 = 5, where s = the secret number
   I pretended her number was 40. I drew four rods |||| then since she divided by four I only used one rod |. I traded it for 10 dots :::::then took away six dots ::. I got four. Ocean's number must have been higher than 40. I tried again with 48. ||||:::: became |: then :::. 48 was too high. I checked 44. ||||:: became |. then ::.. Ocean's number was 44.

Peculiar Properties (38–43)

1. a. Macey's rule and formula show multiplying the term number by two. The rule tells you how to find the even number from the term number, but not how to find the term number from the even number. The equation works both ways.
   b. **Sample answer:**
   Even numbers are skip counting by two or multiples of two. When we multiply two by any number, it results in an even number.

c. **Sample answers:**
Solve using the equation $e = 2t$ where $t = 10$.
$2(10) = 20$. The tenth even number is 20.
Extend the table of values using a pattern.

Term Number	Even Number
1	2
2	4
3	6
4	8
…	…
9	18
10	20

2. a. Kaden's rule and formula explain how to find the odd number. The rule and formula are different because the formula uses symbols such as ×, +, and =, and the rule uses the words double, add, and "to find."

b. **Sample answer:**
The odd number formula is the even number ($2t$) minus one. An odd number is always one away from an even number.

c. **Sample answers:**
Start at three, skip count by two 10 times [3, 5, 7, 9, 11, 13, 15, 17, 19, 21] The tenth odd number is 21.
Use the formula, $2t + 1 = n$ where $t = 10$.
$2(10) + 1 = 21$.

3. a. m = number of millimetres
c = number of centimetres

b. **Sample answers:**
1 cm = 10 mm: 10 m = c, $10(10) = 100$. This says 10 mm is the same as 100 cm. That is wrong. $10c = m$,
$10(1) = 10$. This says 1 cm is the same as 10 mm. This is right. I'll check $10c = m$ with another fact.
10 cm = 100 mm. $10(10) = 100$. This says 10 cm is the same as 100 mm. That is right.

c. Quenton should use the second formula, $10c = m$, to represent the relationship between millimetres and centimetres. I can check by making a table of values and then looking for a pattern.

Centimetres	Millimetres
1	10
2	20
3	30

$m = c \times 10$ or $10c = m$ is the correct formula.

4. a. □□□□■■■■■ = ■■■■■□□□□

b. $4 + 5 = 5 + 4$, $7 + 3 = 3 + 7$, $50 + 4 = 4 + 50$

c. $a + b = b + a$

5. a.  or
Two groups of five or five groups of two equal 10.

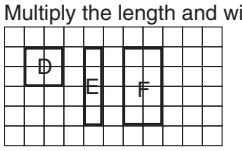
b. $7 \times 9 = 9 \times 7$ $\quad 12 \times 6 = 6 \times 12$ $\quad 3 \times 5 = 5 \times 3$

c. $a \times b = b \times a$

6. a.

Rectangle	A	B	C
width	2	3	4
length	3	4	5
area	6	12	20

b. Multiply the length and width.

c. 

d. D: $2 \times 2 = A$, $4 = A$
E: $1 \times 4 = A$, $4 = A$
F: $2 \times 4 = A$, $8 = A$

e. Count the squares inside each rectangle.
D: $A = 4$, E: $A = 4$, F: $A = 8$

f. $A = l \times w$ $\quad A$ = area $\quad l$ = length $\quad w$ = width
$A = b \times h$ $\quad A$ = area $\quad b$ = base $\quad h$ = height

g. D: $A = 4$, E: $A = 4$, F: $A = 8$

7. a.

Rectangle	A	B	C
width	2	2	2
length	3	4	5
perimeter	10	12	14

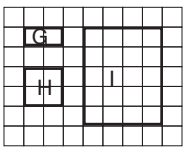
b. Add all four sides together.

c.

Rectangle	D	E	F
width	3	3	3
length	3	4	5
perimeter	12	14	16

d. D: $P = 3 + 3 + 3 + 3$, $P = 12$
E: $P = 3 + 3 + 4 + 4$, $P = 14$
F: $P = 3 + 3 + 5 + 5$, $P = 16$

e. P = perimeter $\quad l$ = length $\quad w$ = width
$P = w + w + l + l$ or $P = 2w + 2l$ or $P = 2(w + l)$

f. **Sample answers:**


G: $P = l + l + w + w$
$P = 2 + 2 + 1 + 1$
$P = 6$
H: $P = 2l + 2w$
$P = 2(2) + 2(2)$
$P = 8$
I: $P = 2(l + w)$
$P = 2(4 + 5)$
$P = 18$

8. a. $f = 10 \times s$, where s is the number of students and f is the total number of fingers.

b. $c = 100 \times m$, where m is the number of metres and c is the total number of centimetres.

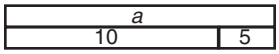
c. **Sample answers:**
$60 \times m$ = number of seconds, m is the number of minutes.
$365 \times y$ = number of days, y is the number of years.

An Age-Old Mystery (44–46)

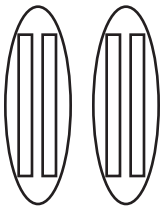
Sample answers:

1. a. $74 = a + 44$
$-44 \quad -44$
$30 = a$

   b. I drew a bar model. Since a – 5 is 10, 10 + 5 must be *a*.
$a = 15$

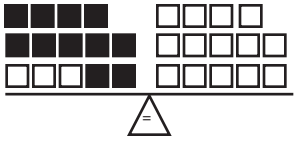


   c. I drew four rods in two groups. I see 20 in each group.
$a = 20$



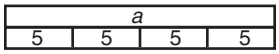
   d. I drew three circles, then added stars to each circle until I had nine stars in each circle. Then I found the total.
$3 \times 9 = 27$

2. a. I set up a balance with three on one side. I put nine and five on the right side. That was 14. Then I added to the left side until it equalled 14. I added 11 to the left. $a = 11$



   b. I rewrote $2 \times a = 20 + 10$ as $2 \times a = 30$, then I solved by dividing both sides into two groups. $a = 15$

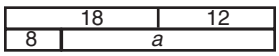
   c. I drew a bar in four parts with five in each part. *a* must be 4×5. $a = 20$



   d. I rewrote $3 \times 5 = a - 5$ as $15 = a - 5$.
$15 = a - 5$
$+5 \quad +5$
$20 = a$

3. a. When six is multiplied by my age, the result is 12. How old am I?
$a \times 6 = 12$
$\div 6 \quad \div 6$
$a = 12$

   b. Eight more than my age is the same as the sum of 18 and 12. How old am I?



$a = 10 + 12$
$a = 22$

   c. When you divide my age by seven, the result is six. How old am I?
$a \div 7 = 6$
$a = 7 \times 6$
$a = 42$

   d. The product of three and 10 is four less than my age. How old am I?
$a - 4 = 3 \times 10$
$a - 4 = 30$
$+4 \quad +4$
$a = 34$

An Equation is Worth 1000 Words (47–51)

1. *s* is the number of sports cards.
$s + 85 = 120$
$-85 \quad -85$
$s = 35$ check: $35 + 85 = 120$

2. *l* is the length of the long side.
$20 = 4 + 4 + l + l$
$20 = 8 + 2l$
$-8 \quad -8$
$12 = 2l$
$\div 2 \quad \div 2$
$6 = l$ check: $2(6) + 2(4) = 20$ cm

3. *t* is the weight of one tire.
$t = 28 \div 4$
$t = 7$ kg
$t = 28$ check: 7 kg × 4 tires = 28 kg

4. *t* is the number of marbles.
$t \div 6 = 7$
$t = 6 \times 7$
$t = 42$ check: 42 marbles ÷ 6 friends = 7

5. F is Frank's age, J is Joe's age.
$F = J - 5$ check:
$F = 20 - 5$
$F = 15$
Frank will be 15 when Joe is 20. Frank is five years younger than Joe.

14	9
15	10
16	11
17	12
18	13
19	14
20	15

6. s is the number of spiders.
$s \times 8 = 56$ check:
$\div 8 \quad \div 8$
$s = 7$

5	40
6	48
7	56

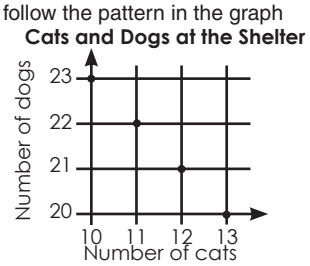
7. *p* is the number of people, *b* is the number of bikes.
$\frac{p}{2} = b$ check:

8	4

$\frac{8}{2} = b$
$4 = b$
Daisy will need four bikes.

8. $12 + c = 33$ where c is the number of cats.
$c = 33 - 12$
$c = 21$
There are 21 cats in the shelter this week.

check: follow the pattern in the graph



9. c is the number of chocolate bars.
$c \times 2 = 100$
$c = 50$ check: $50 \times 2 = 100$

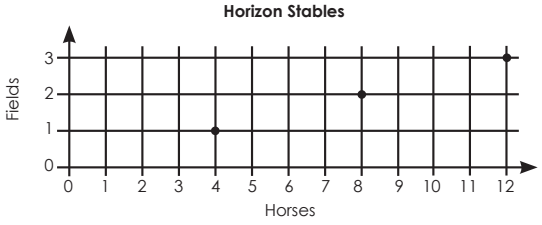
10. s = start number
n = new number
$s + s - 2 = n$
$25 + 25 - 2 = n$
$50 - 2 = n$
$48 = n$

11. a. No, some of them used different letters and some multiplied instead of adding.
b. Yes, $s + s - 2 = n$ and $2s - 2 = n$ are the same because $s + s$ is the same as two times s. $2s - 2 =$ n

12. **Sample answers:**
a. Clayton has 24 candies and eight friends. He wants to share his candies equally. How many candies can he give to each of his friends?
b. Mary had a party at a bowling alley. She received the following table from the bowling alley. How many friends came to Mary's party if the cost was $12?

Number of Friends	Cost ($)
1	5
2	6
3	7

c. Each field at Horses Horizon Stables can hold some horses according to the graph below. How many horses are boarding at the stable if it is using seven fields?



d. Bill is younger than Kenny by 10 years. When Bill is 20, how old will Kenny be?

Bill	Kenny
5	15
10	20
15	25