Advanced Pattern Block Book
Answer Key

1.1 Quadrilateral Force-Out (page 3)

Check students' work.

1.2 Star Time (page 5)

Check students' work.

1.3 Gretles (page 7)

1. No
2. No
3. Yes
4. Yes

1.4 Cover Three (page 9)

Check students' work.

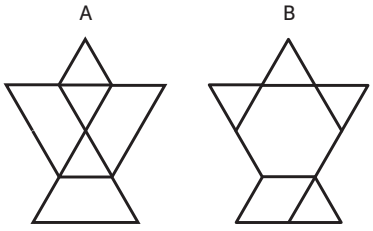
1.5 Towering Hexagons (page 11)

Check students' work.

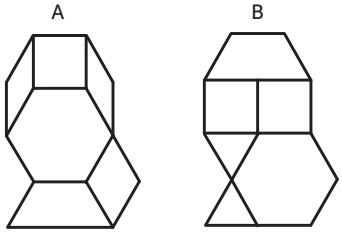
1.6 Take Six (page 13)

Answers will vary. Sample answers:

1.



2.

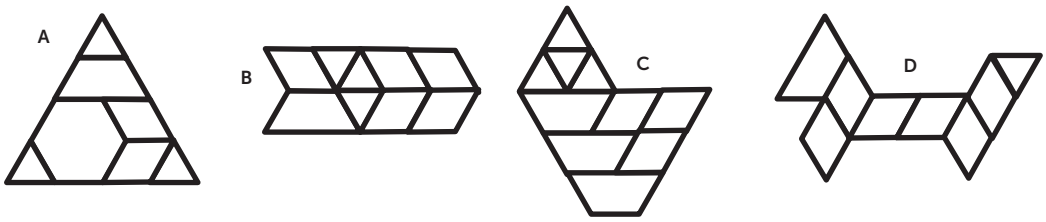


1.7 Countdown 10, 9, 8, ...1! (page 15)

Check students' work.

1.8 Hidden Wonders (page 17)

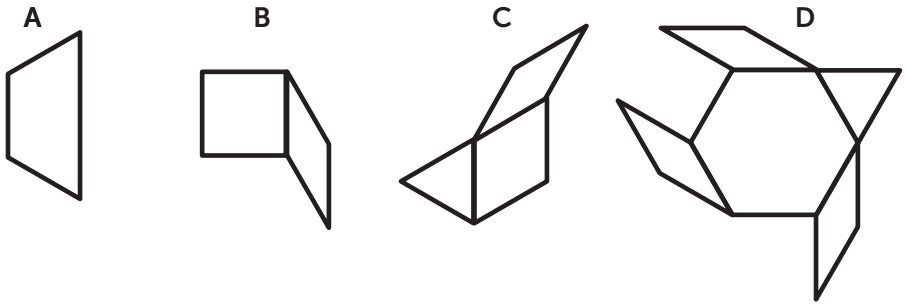
Arrangements will vary. Sample answers:



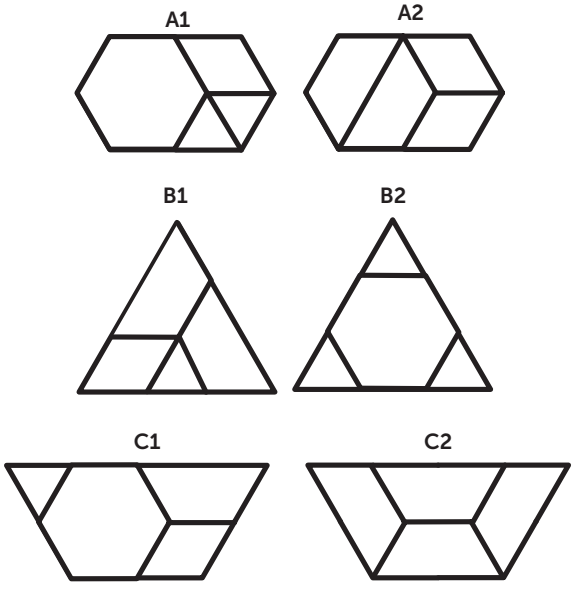
1.9 Both Sides Now (page 19)

Check students' work.

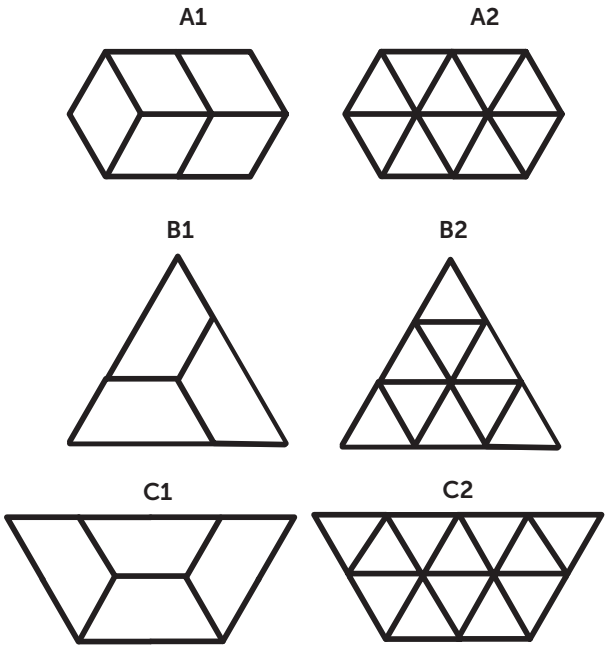
1.10 Asteroids (page 21)



2.1 Any Four (page 25)



2.2 The Same Block (page 27)



2.3 Only One Color (page 29)

Sled:

Block	Guess	Count	Fraction Name
blue rhombus	will vary	7	1/7
triangle	will vary	14	1/14

Cup:

Block	Guess	Count	Fraction Name
blue rhombus	will vary	9	1/9
triangle	will vary	18	1/18

Kite:

Block	Guess	Count	Fraction Name
blue rhombus	will vary	9	1/9
trapezoid	will vary	6	1/6

2.4 Space Station (page 31)

Check students' work.

2.5 Fraction Names (page 33)

A. Check students' work.

B. 1/2; 1/3; 1/6

1. Example: Answer given
2. 4/6 or 2/3 shaded; 2/6 or 1/3 unshaded
3. 1/3 shaded; 2/3 unshaded
4. 3/6 or 1/2 shaded; 3/6 or 1/2 unshaded
5. 2/3 shaded; 1/3 unshaded

2.6 Just One (Hexagon)! (page 35)

1. 2; 1/2
2. 3; 1/3
3. 6; 1/6
4. Example: Answer given.
5. 1 triangle; 1/6
6. 1 rhombus; 1/3
7. 1 trapezoid; 1/2
8. 1 blue rhombus; 1/3
9. 1 trapezoid; 1/2
10. 1 blue rhombus; 1/3
11. 1 triangle; 1/6
12. 1 blue rhombus; 1/3
13. 1 triangle; 1/6

2.7 Cover with One Color (page 37)

A. Example: Answer given.

B. 1/6 + 1/6 + 1/6 = 3/6 or 1/2

C. 1/2 + 1/2 = 1

D. 1/2 + 1/6 = 4/6 or 2/3

E. 1/6 + 1/3 = 3/6 or 1/2

F. 1/6 + 1/6 + 1/6 + 1/6 = 4/6 or 2/3

2.8 The Missing Piece (page 39)

1. Example: Answer given.
2. blue rhombus, 1/6 OR 2 triangles, 2/12 or 1/6
3. 2 blue rhombuses, 1/3 OR 4 triangles, 4/12 or 1/3
4. hexagon, 1/2
5. hexagon, 1/2
6. trapezoid, 1/4

2.9 Some Sum! (page 41)

1. 1/6
2. 3/4
3. 1 triangle + 1 blue rhombus = 1 trapezoid = 1/4
4. 1 blue rhombus + 2 blue rhombuses = l hexagon = 1/2
5. 4 triangles + 1 blue rhombus = 1 hexagon = 1/2
6. 1 trapezoid + 3 blue rhombuses = 3 trapezoids = 3/4

2.10 Changing Values (page 43)

Top: hexagon is 1/2; trapezoid is 1/4; blue rhombus is 1/6; triangle is 1/12

1. Example: Answer given.
2. 1/6 + 1/6 + 1/6 = 1/2
3. 1/2 + 1/4 = 3/4
4. 1/12 + 1/12 + 1/6 = 1/3
5. 1/4 + 1/12 + 1/6 = 1/2
6. 1/4 + 1/12 +1/12 = 5/12
7. 1/6 + 1/12 = 1/4
8. 1/6 + 1/6 + 1/12 + 1/12 = 1/2

3.1 Which Block? (page 47)

1. A. trapezoid
   B. blue rhombus or tan rhombus
   C. hexagon

2. Maggie: triangle

   Bill: tan rhombus

   Vincent: red trapezoid

   Sandi: blue rhombus

3.2 Folded Shapes (page 49)

FIGURE 1

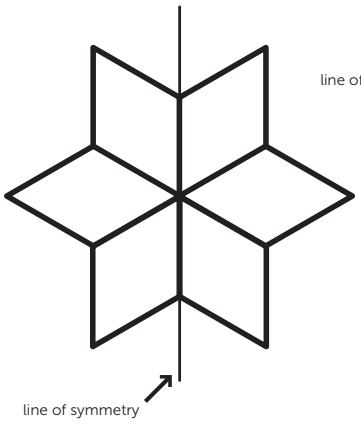


FIGURE 2

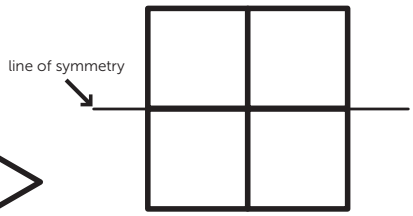


FIGURE 3

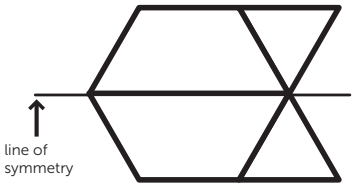
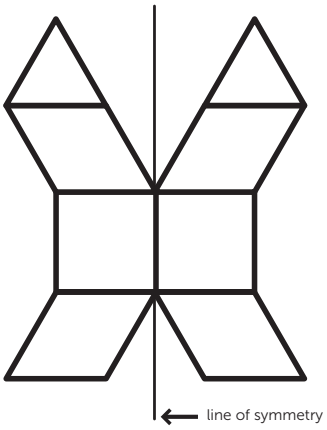
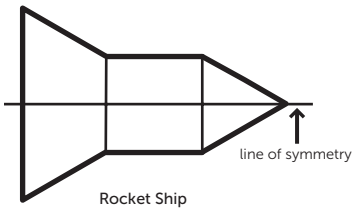


FIGURE 4

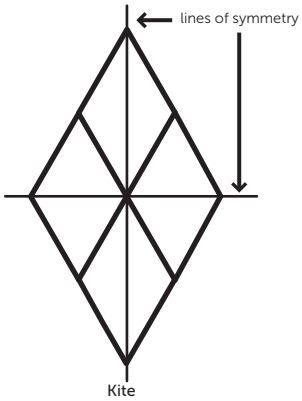


3.3 Simple Symmetry (page 51)

Rocket and Kite:



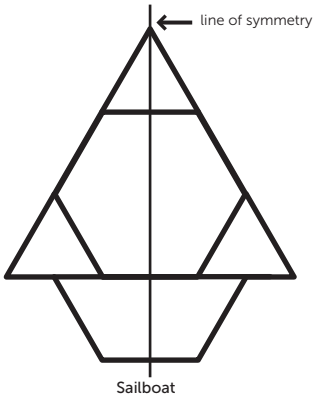
Rocket Ship



Kite

Pinwheel: This figure has rotational symmetry, but not line symmetry.

Sailboat: There is more than one way to cover the sailboat with blocks and keep the line of symmetry. Sample answer:

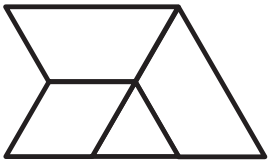


Sailboat

3.4 Copy Cat (page 53)

A

B

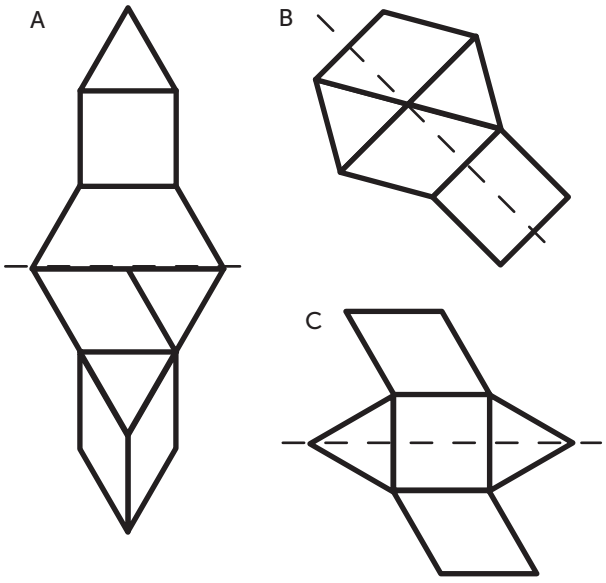


C

3.5 Scrambled Images (page 55)

Check students' work.

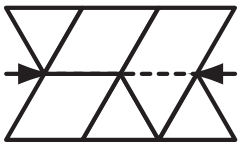
3.6 The Flip Side (page 57)



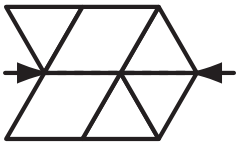
If a figure is flipped twice, it looks like the original figure. If a figure is flipped an even number of times, it looks like the original figure. If a figure is flipped an odd number of times, it is the mirror image of the original figure.

3.7 The Flip Side One More Time (page 59)

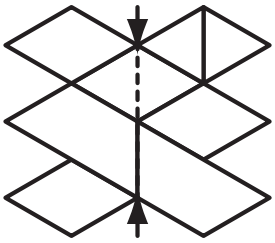
A



B



C



3.8 Turn About (page 61)

Answers given on teacher page.

3.9 One Good Turn Deserves Another (page 63)

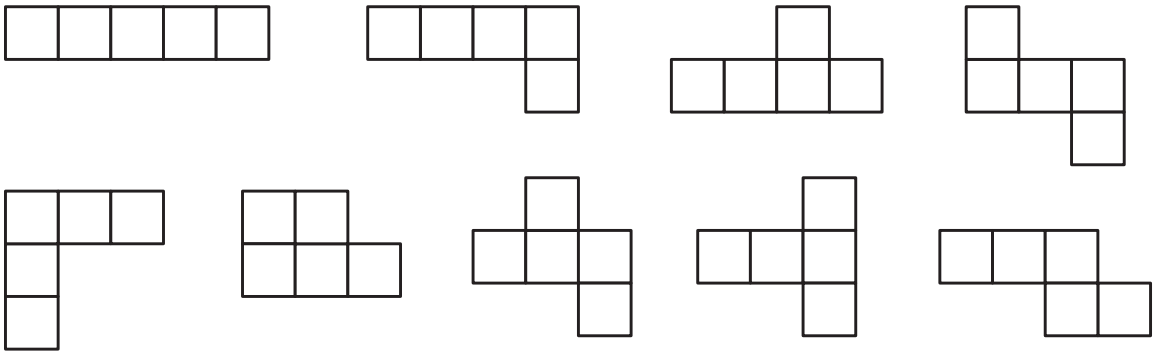
Top 2 figures: Answers given on teacher page.

Bottom 2 figures: 90˚ rotation; 180˚ rotation

3.10 Double Vision (page 65)

Answers given on teacher page.

4.1 Puzzling Pentominoes (page 69)



4.2 Green Packages (page 71)

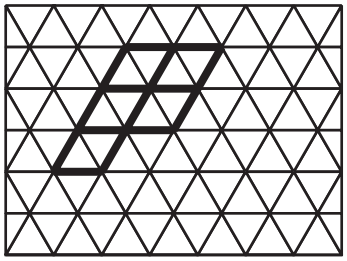
A1 area: 5 triangular units; A2 area: 5 triangular units; Same; The same amount of triangles were used, so the areas are the same.

B1 area: 8 triangular units; B2 area: 8 triangular units; Same; The same amount of triangles were used, so the areas are the same.

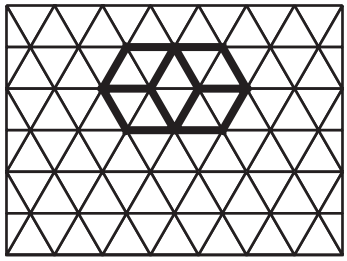
4.3 Blue Packages (page 73)

Answers may vary. Sample answers:

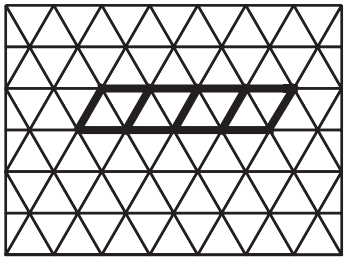
Grid A



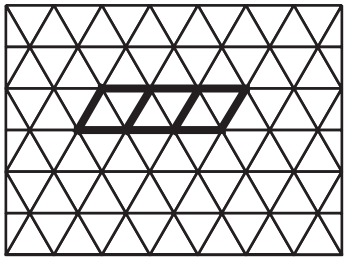
Grid B



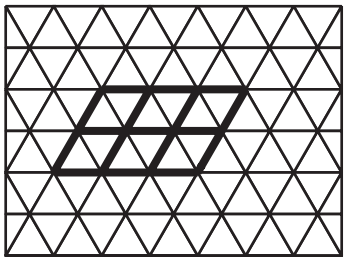
Grid C Area = 8 Perimeter = 10



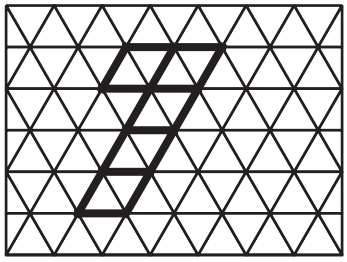
Grid D Area = 6 Perimeter = 8



Grid E Area = 12 Perimeter = 10



Grid F Area = 10 Perimeter = 12



4.4 Remodeling (page 75)

Answers may vary. Sample answers:

Triangle: shortest perimeter: 6 units; longest perimeter: 8 units

Blue rhombus: shortest: 8 units; longest: 10 units

Trapezoid: shortest: 10 units; longest: 14 units

4.5 Blocks and Corners (page 77)

A: 4, 4, 4

B: 4, 4, 4

C: 4, 4, 4

D: 4, 4, 4

E: 3, 3, 3

F: 6, 6, 6

Mystery Shape: 5, 5, 5

4.6 Blocks, Corners, and Intersections (page 79)

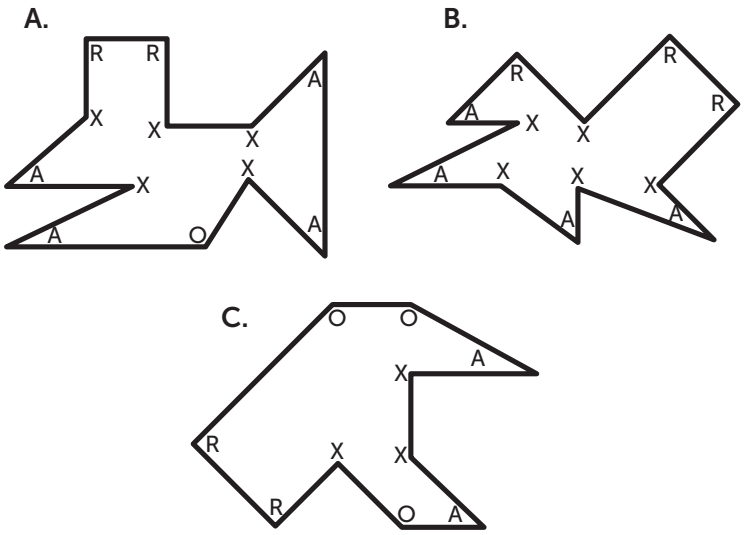
1. Example: Answer is given.
2. Hexagon: All angles are bigger than a right angle.
3. Trapezoid: Angles 1 and 4 are bigger than a right angle. Angles 2 and 3 are smaller than a right angle.
4. Blue rhombus: Angles 1 and 3 are smaller than a right angle. Angles 2 and 4 are bigger than a right angle.
5. Triangle: All angles are smaller than a right angle.
6. Tan rhombus: Angles 1 and 3 are smaller than a right angle. Angles 2 and 4 are bigger than a right angle.

4.7 Viewing All Angles (page 81)

Activity 1:

1, 2, and 3. Answers will vary. Sample answers: trapezoid and blue rhombus; 2 blue rhombuses; hexagon and green triangle.

Activity 2:



4.8 Forming Flowers (page 83)

1. Answers will vary.

2. 12

3. more blocks

4. Answers will vary.

5. Answers will very.

4.9 Degree Power (page 85)

1. 90 degrees

2. 30 degrees, 90 ÷ 3 = 30

Angle A: 60˚

Angle B: 120˚

Angle C: 60˚

Angle D: 120˚

Angle E: 60˚

Angle F: 90˚

Angle G: 150˚

Angle H: 30˚

Angle K: 120˚

4.10 Sum Angles (page 87)

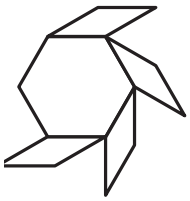
Triangle *ABC:* 60˚, 60˚, 60˚, 180˚

Blue rhombus *DEFG:* 60˚, 120˚, 60˚, 120˚, 360˚

Trapezoid *KLMN:* 60˚, 120˚, 120˚, 60˚; No, the sum is 360˚.

Yes, the sum of the measures of the angles of all quadrilaterals is 360˚.

5.1 Building Patterns (page 91)

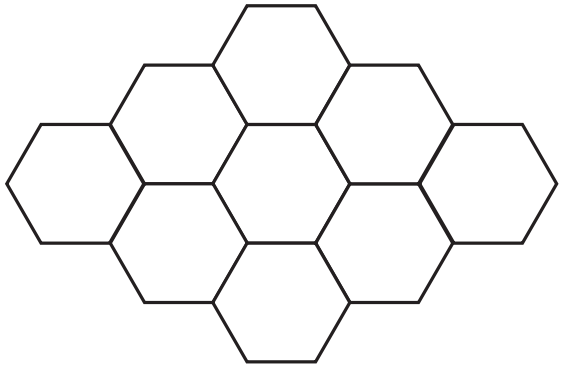
1. 

2. 

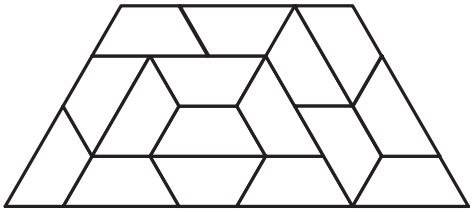
3. 

4. 

5. Check students' work. The next hexagon in the series should be an arrangement of 9 hexagons. Sample answer:



6. Check students' work. The next trapezoid in the series is a trapezoid made of 16 red blocks. Sample answer:



5.2 Triangular Numbers (page 93)

1. A = 1; B = 3; C = 6; D = 10
2. E = 15; F = 21
3.

Triangle	Number of Green Triangles	Total Number of Green Triangles
A	1	1
B	1 + 2	3
C	1 + 2 + 3	6
D	1 + 2 + 3 + 4	10
E	1 + 2 + 3 + 4 + 5	15
F	1 + 2 + 3 + 4 + 5 + 6	21

4. 10, 15, 21

5.3 Square Numbers (page 95)

1. A = 1; B = 4; C = 9; D = 16
2. The number of squares in the next square figure is always the next square number.
3. E = 25; F = 36
4.

Square	Number of Orange Squares	Total Number of Orange Squares
A	1	1
B	1 + 3	4
C	1 + 3 + 5	9
D	1 + 3 + 5 + 7	16
E	1 + 3 + 5 + 7 + 9	25
F	1 + 3 + 5 + 7 + 9 + 11	36

5. 16, 25, 36

5.4 Triangular or Square Numbers (page 97)

1. tan rhombus: (2) = 4, (3) = 9, (4) = 16

   blue rhombus: (2) = 4, (3) = 9, (4) = 16

   trapezoid: (2) = 4, (3) = 9, (4) = 16

2.

Shape	Number of Blocks
1	1
2	4
3	9
4	16
5	25
6	36

Shape	Number of Blocks
1	1
2	4
3	9
4	16
5	25
6	36

Shape	Number of Blocks
1	1
2	4
3	9
4	16
5	25
6	36

5.5 Hexagons or Triangles (page 99)

1.

Number of Hexagons	Number of Triangles
1	6
2	12
3	18
4	24
5	30
6	36
7	42
8	48
9	54
10	60

2. 300 triangles
3. 600 triangles
4. 1,194 triangles
5. To find the number of triangles for any number of hexagons, you would multiply the number of hexagons by 6.
6. If n is the number of hexagons and t is the number of triangles, then $t = 6n$.

5.6 Creating Stars (page 101)

Number of Stars	Number of Blue Rhombuses	Number of Triangles
1	4	8
2	8	16
3	12	24
4	16	32
5	20	40
6	24	48
7	28	56
8	32	64
9	36	72
10	40	80

1. 8
2. 8; 20
3. 16; 40
4. 200; 196; 800

5. 400; 392; 1,600
6. To find the number of blue rhombuses for any number of stars, you would multiply the number of stars by 4.
7. If n is the number of stars and t is the number of triangles, then $t = 8n$.

5.7 Discovering Formulas (page 103)

1. 12 square units
2. 3
3. 4
4. 12 square units
5. 6
6. 2
7. Yes; Check students' work.
8.

Total Area	Rectangle 1		Rectangle 2		Rectangle 3		Rectangle 4	
	Length	Width	Length	Width	Length	Width	Length	Width
12	4	3	6	2	12	1		
18	6	3	9	2	18	1		
24	8	3	6	4	12	2	24	1

9. 24 square units; 24
10. You multiply the length by the width to find the area.
11. $A = l \times w$

5.8 Balances (page 105)

1. 2 blue rhombuses
2. 2 trapezoids
3. 3 blue rhombuses
4. 1 triangle
5. 1 blue rhombus
6. 1 blue rhombus
7. 1 trapezoid
8. 2 blue rhombuses

5.9 Grab Bag Mystery (page 107)

Number of Blue Rhombuses	Number of Trapezoids	Number of △ Replacing the Blue Rhombuses	Number of △ Replacing the Trapezoids	Total Number of Triangles
10	0	20	0	20
9	1	18	3	21
8	2	16	6	22
7	3	14	9	23
6	4	12	12	24
5	5	10	15	25
4	6	8	18	26
3	**7**	6	21	**27**

Answer: Dana took 3 blue rhombuses and 7 trapezoids.

1. 21
2. She would have taken 5 blue rhombuses and 5 trapezoids.

5.10 More Grab Bag Fun (page 109)

Number of Hexagons	Number of Trapezoids	Number of △ Replacing the Hexagons	Number of △ Replacing the Trapezoids	Total Number of Triangles
9	8	54	24	78
10	7	60	21	81
11	6	66	18	84
12	**5**	72	15	**87**

Answer: Mary Grace took 12 hexagons and 5 trapezoids.

1. If she increased the number of hexagons, she would increase the number of triangles for which she could exchange the blocks. This is because there are twice as many triangles in a hexagon as in a trapezoid.
2. $n = 6H + 3T$
3. $H + T = 17$

6.1 Statistics by Design (1) (page 113)

1. Answers will vary.
2. Check students' work.
3. Check students' work.

6.1 Statistics by Design (1) (page 115)

1. Answers will vary.
2. Check students' work.

6.2 Design Your Way (page 117)

6 hexagons; 3 trapezoids; 4 blue rhombuses; 7 squares; 1 tan rhombus; 10 triangles.

Check students' designs made with the given blocks.

6.3 Handfuls (page 119)

Answers will vary. Sample answer: 1/12 + 6/12 + 5/12 = 12/12

6.4 Grab Bag (page 121)

Outcomes	Value in △s	Number of Times Drawn
3 △	3	Answers will vary.
2 △, 1 ◇	4	Answers will vary.
2 △, 1 ▱	5	Answers will vary.
3 ◇	6	Answers will vary.
2 ◇, 1 △	5	Answers will vary.
2 ◇, 1 ▱	7	Answers will vary.
3 ▱	9	Answers will vary.
2 ▱, 1 △	7	Answers will vary.
2 ▱, 1 ◇	8	Answers will vary.
1 △, 1 ▱, 1 ◇	6	Answers will vary.

Graph: Check students' work.

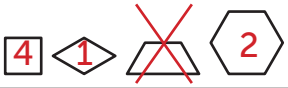
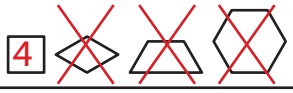
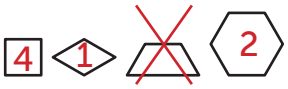
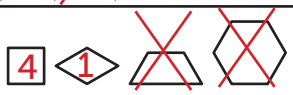
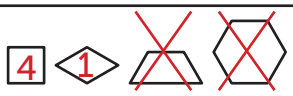
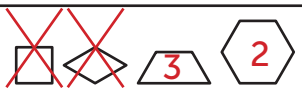
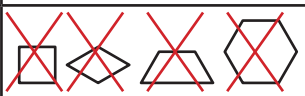
6.5 Sampling (page 123)

Answers will vary. Check students' work.

6.6 Making Predictions (page 125)

Answers will vary. Check students' work.

6.7 All in the Family (page 127)

Rule	Belong	Do Not Belong	Total Belong	Total Do Not Belong
hexagon			2	8
red			3	7
orange or green			4	6
trapezoid			3	7
blue or square			5	5
red or blue			4	6
quadrilateral and a parallelogram			5	5
yellow or a polygon			10	0
orange or a hexagon			6	4
an octagon and yellow			0	10

6.8 Targets (page 129)

Target A

P(S): Answer given.

P(L) = 6/9 or 2/3

Target B

P(S) = 1/10

P(L) = 6/10 or 3/5

Target C

P(S) = 1/6

P(L) = 3/6 or 1/2

6.9 Hitting the Bulls-Eye (page 131)

Target A

Solution 1 (using 1 hexagon and 3 triangles):

P(S) = 3/9 or 1/3

P(L) = 6/9 or 2/3

Solution 2 (using 2 trapezoids, 1 blue rhombus, and 1 triangle):

P(S) = 1/9

P(L) = 6/9 or 2/3

Target B

Solution 1 (using 1 hexagon, 1 blue rhombus, 2 triangles):

P(S) = 2/10 or 1/5

P(L) = 6/10 or 3/5

Solution 2 (using 2 trapezoids and 2 blue rhombuses):

P(S) = 4/10 or 2/5

P(L) = 6/10 or 3/5

Target C

Solution 1 (using 1 trapezoid, 2 blue rhombuses, and 1 triangle):

P(S) = 1/8

P(L) = 3/8

Solution 2 (using 2 trapezoids and 2 triangles):

P(S) = 2/8 or 1/4

P(L) = 6/8 or 3/4

6.10 Designing Probability Experiments (page 133)

Check students' work.