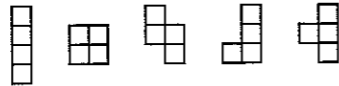


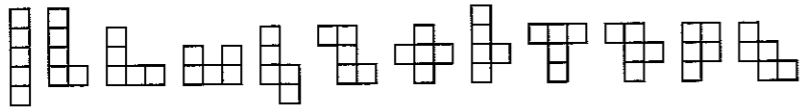
Enrichment 4 Pentominoes

Use linking cubes or centimeter graph paper.

Have your student investigate how many different shapes can be made from 4 squares. The sides must touch along their entire side – all angles must be right angles. There are only five unique shapes (different outlines resulting from flipping or rotating do not count as unique shapes).



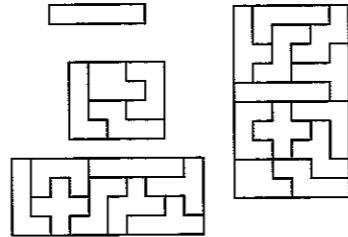
Now let your student see how many unique shapes can be made from 5 squares. There are 12.



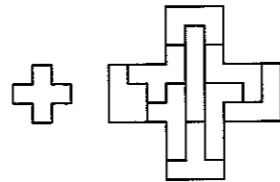
Create each shape with a different color of linking cube, or make two copies of the centimeter graph paper in the appendix, glue together back to back so that the lines line up, or to both sides of a tag board, being careful that the lines line up, and cut out each shape. These are called pentominoes.

Have your student find the perimeter of each of these pentominoes. Is there one pentomino with a perimeter different from the rest?

Have your student build rectangles from these pentominoes. This is a challenging activity. Some examples are given. What is the area of each rectangle? What is the perimeter of each rectangle? The largest rectangle uses all 12 pentominoes. There are 2,339 ways to make a rectangle using all 12 pentominoes.



Take one of the twelve pentominoes. Use some of the others to make a copy three times as large. An example is given for one of the shapes. What is the perimeter and area of the copy?



Play a two-player strategy game. Make a game board with 8 x 8 squares of the same size as the pentominoes. Each player takes a turn placing a pentomino on the board, lining them up with the squares on the board. The last player that can arrange a piece on the board wins.

Answers to Workbook Exercises and Reviews

Exercise 1

- (a) 92 (b) 83
(c) 95 (d) 106
- (a) 91 (b) 57
(c) 98 (d) 135
(e) 106 (f) 104
- (a) 95, 100 (b) 114, 120
- (a) 92 (b) 70 (c) 92 (d) 109

Exercise 2

- (a) 92 (b) 86 (c) 130 (d) 123
(e) 145 (f) 140 (g) 150 (h) 85
- (a) 60 (b) 100
(c) 70 (d) 90
(e) 100 (f) 100
(g) 90 (h) 100
- (a) 105 (b) 102
(c) 141 (d) 166
(e) 182 (f) 135
(g) 190 (h) 195
(i) 197 (j) 198

Exercise 3

- following arrows: 12, 5, 90, 27, 27, 68, 65, 38, 12
- (a) 66, 62, 62
(b) 47, 40, 40
(c) 7, 2, 2
- (a) 22 (b) 10 (c) 60 (d) 3
- (a) 22 (b) 13 (c) 41 (d) 42

Mental Math 10

1. $30 \times 8 =$ _____
2. $49 + 71 =$ _____
3. $32 + 47 =$ _____
4. $623 - 88 =$ _____
5. $123 - 7 =$ _____
6. $49 + 17 =$ _____
7. $420 \div 7 =$ _____
8. $82 - 39 =$ _____
9. $300 \div 5 =$ _____
10. $74 - 6 =$ _____
11. $1000 - 330 =$ _____
12. $2 \times 4000 =$ _____
13. $4000 - 62 =$ _____
14. $57 - 32 =$ _____
15. $1111 - 9 =$ _____
16. $145 + 97 =$ _____
17. $2000 - 340 =$ _____
18. $349 + 5 =$ _____
19. $67 + 56 =$ _____
20. $6 \times 500 =$ _____
21. $7 \times 70 =$ _____
22. $29 + 97 =$ _____
23. $1000 - 293 =$ _____
24. $4000 \div 8 =$ _____
25. $8100 - 9 =$ _____
26. $42 + 8 =$ _____
27. $8100 - 90 =$ _____
28. $182 - 95 =$ _____
29. $100 - 62 =$ _____
30. $8100 \div 9 =$ _____

Mental Math 11

1.
$$\begin{array}{r} 12 \times 5 \\ \swarrow \quad \searrow \\ 10 \times 5 \quad 2 \times 5 \\ \quad \quad = 50 + 10 \\ \quad \quad = \end{array}$$
2. $12 \times 2 = 20 + 4$
 $=$ _____
3. $12 \times 9 = 90 + 18$
 $=$ _____
4. $12 \times 4 =$ _____
5. $12 \times 6 =$ _____
6. $3 \times 12 =$ _____
7. $7 \times 12 =$ _____
8. $8 \times 12 =$ _____
9. $10 \times 12 =$ _____
10. $9 \times 12 =$ _____
11. $11 \times 12 =$ _____
12. $12 \times 12 =$ _____
13.
$$\begin{array}{r} 62 \times 3 \\ \swarrow \quad \searrow \\ 60 \times 3 \quad 2 \times 3 \\ \quad \quad = 180 + 6 \\ \quad \quad = \end{array}$$
14. $27 \times 3 = 60 + 21$
 $=$ _____
15. $12 \times 3 =$ _____
16. $83 \times 3 =$ _____
17. $79 \times 3 =$ _____
18. $44 \times 3 =$ _____
19. $63 \times 3 =$ _____
20. $48 \times 3 =$ _____
21. $58 \times 3 =$ _____
22. $76 \times 3 =$ _____
23. $59 \times 3 =$ _____
24. $73 \times 3 =$ _____
25. $101 \times 3 =$ _____