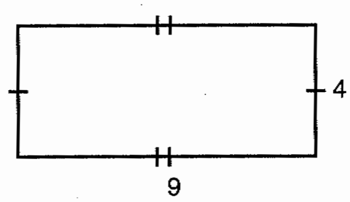
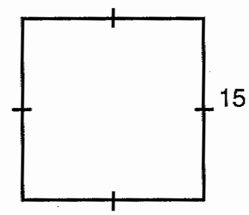
Math 1351 Activity 4(Chapter 13)(Due by EOC Apr. 29) Group #______

Directions: Find the area and perimeter of each polygon. When you have found both answers, look in the box to the right, and find the letter which is next to your answer. To answer the riddle, fill in the blanks at the bottom of the page. Under each blank there is a number for the problem number, and a letter A (for area) or P (for perimeter). Write the correct letter in each space. (For example, 1A would be the area answer letter for problem number one.) Some answers will not have a space in the puzzle.

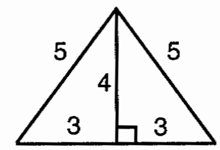
1. A =______ P =______



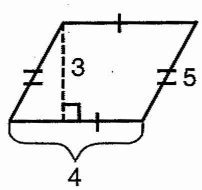
2. A =______ P =______



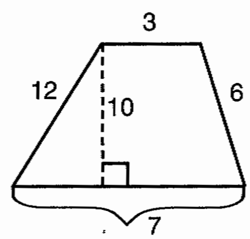
3. A =______ P =______



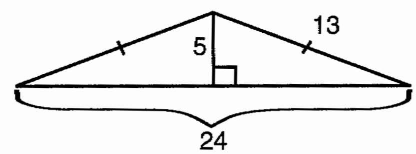
4. A =______ P =______



5. A =______ P =______



6. A =______ P =______



7. Right triangle
b = 6
h = 8
hypotenuse = 10

A =______

P =______

8. Rectangle
1 = 4
w = 3

A =______

P =______

9. Trapezoid
b = 5
b = 9
h = 6
left side = 4
right side = 11

A =______

P =______

10. Square
side = 7.5

A =______

P =______

Answer Box
A = 28
C = 12
D = 42
E = 60
G = 50
H = 18
I = 14
K = 225
N = 30
P = 24
R = 50
S = 36
T = 16
U = 29

Question: Why wouldn't the male battery allow his wife to go shopping anymore?

___ ___ ___ ___ ___ ___ ___
1A 4P 2P 2A 6A 7A 3P

___ ___ ___ ___ ___ ___ ___ ___
3A 4P 5P 6P 5A 8P 10P 5A

___ ___ ___ ___ ___
9P 7P 3P 4P 6A

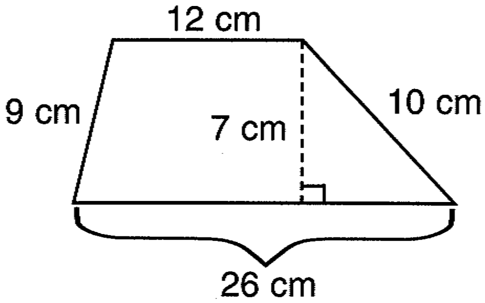
___ ___ ___ ___ ___ ___ ___ ___ ___ ___.
4A 6P 2P 9A 8P 3P 8A 5P 6P 9A

Directions: Find the area and perimeter of each trapezoid. Look for the answer in the Answer Box below and then notice the letter next to it. To solve the riddle, write that letter in the blank space at the bottom of the page that contains the number/letter of the problem. (For example 1A in the riddle represents the area for problem 1. Find the area and its letter in the answer box.) Some answers will not have a space in the puzzle.

1.

A = _____

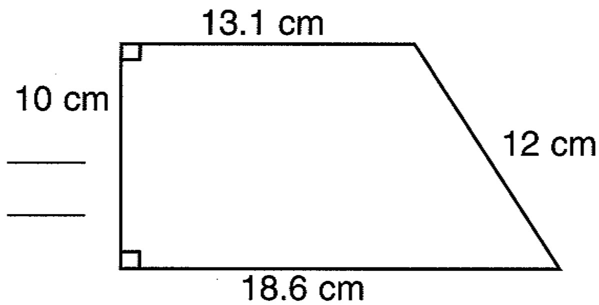
P = _____



2.

A = _____

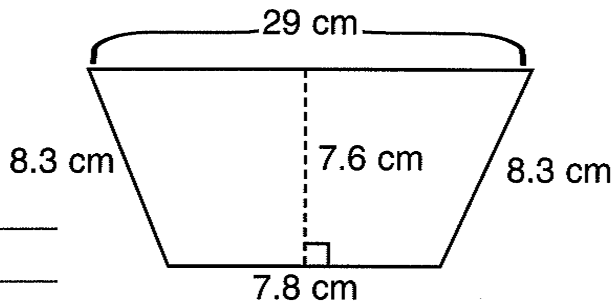
P = _____



3.

A = _____

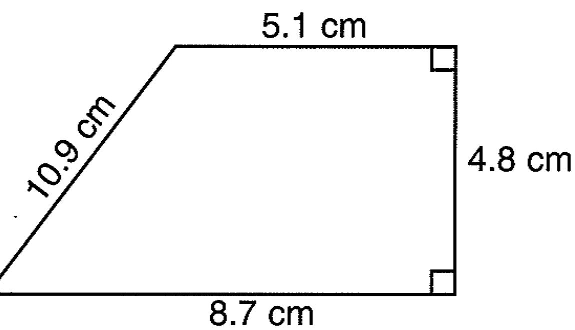
P = _____



4.

A = _____

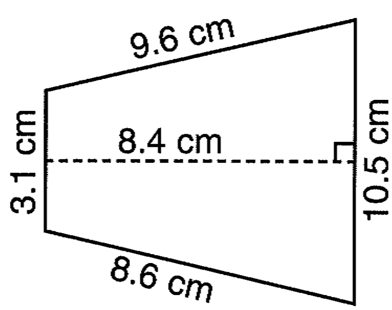
P = _____



5.

A = _____

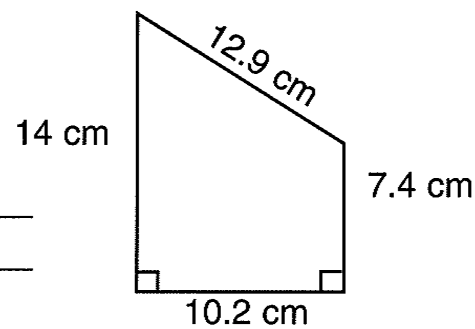
P = _____



6.

A = _____

P = _____



Answer Box

E = 53.4	**Y** = 130	**F** = 30	**N** = 57.12
I = 139.84	" = 53.7	**G** = 57	**S** = 29.5
O = 119.05	**C** = 109.14	**L** = 133	**T** = 31.8
U = 56.8	" = 44.5	**H** = 33.12	

Question: What did the patron say to the chef upon tasting the omelet?

___ ___ ___ ___   ___ ___

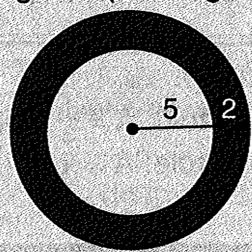
5P 4A 3A 4P   3A 4P

___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___!

2P 3P 1P 1P 6P 6A 3P 1A 1A 3P 5A 5P

To find the area of a shaded region, add or subtract areas of basic figures (rectangle, triangle, circle, and so on).

Example:



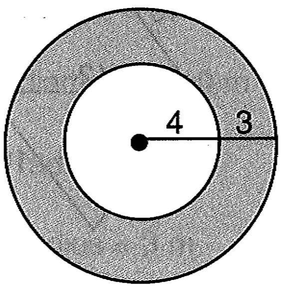
Area of Large Circle $= 7^2\pi = 49\pi$

$-$ Area of Small Circle $= 5^2\pi = 25\pi$

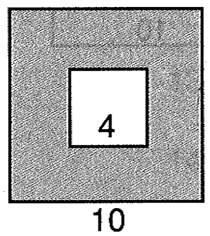
Area of Shaded Ring $= 49\pi - 25\pi = 24\pi$ units^2

Find the area of the shaded regions below. Use your answers to reveal the game James Naismith invented.

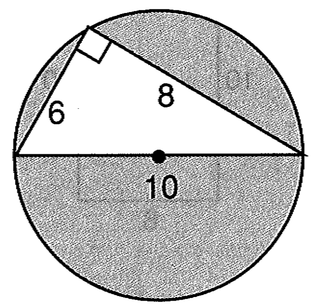
1.



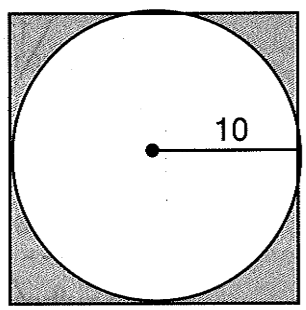
2.



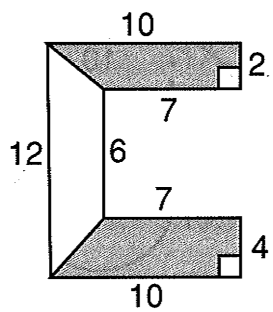
3.



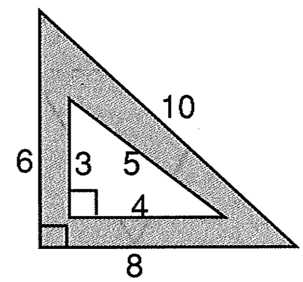
4.



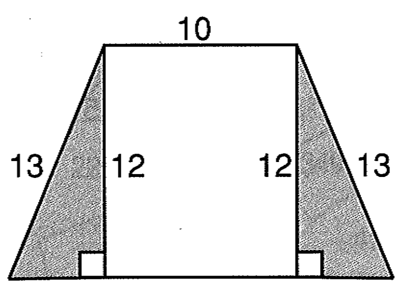
5.



6.



7.



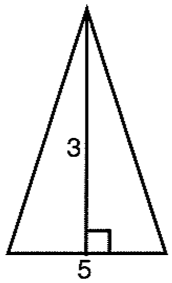
$25\pi - 24$	84	60	$400 - 100\pi$	33π	51	18
A	B	E	K	L	S	T

___ ___ ___ ___ ___ ___ ___ ___ ___ ___

2 3 5 4 7 6 2 3 1 1

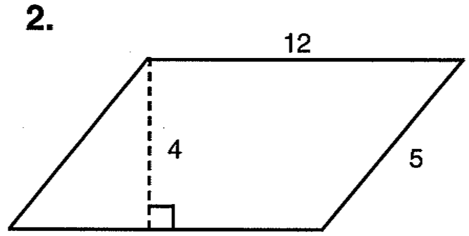
Directions: Find the area of each figure below. Then find each answer in the Answer Box, and notice the letter next to it. Write that letter in the blank at the bottom of the page that contains the number of the problem. The resulting message will be the answer to the riddle.

1.



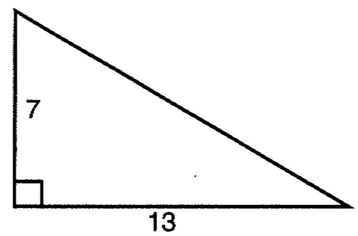
Area = ________ square units

2.



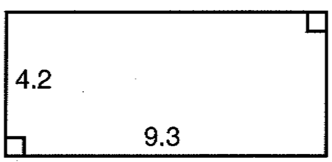
Area = ________ square units

3.



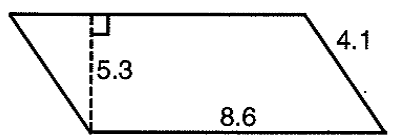
Area = ________ square units

4.



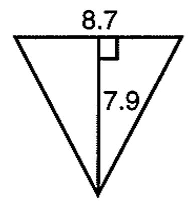
Area = ________ square units

5.



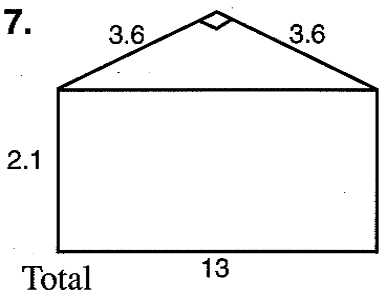
Area = ________ square units

6.



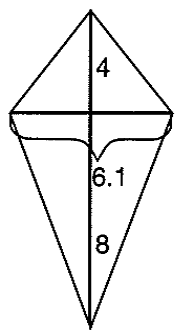
Area = ________ square units

7.



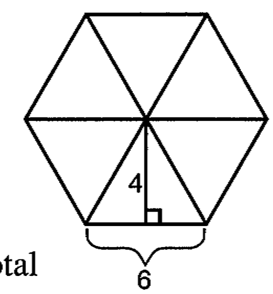
Total Area = ________ square units

8.



Total Area = ________ square units

9.



Total Area = ________ square units

Answer Box (in square units)

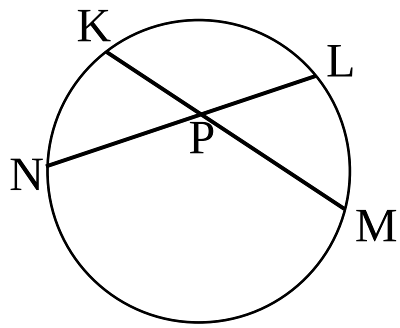
A = 6.3	**D** = 25	**M** = 36.6	**R** = 41.8	**U** = 72	**Y** = 93.1
B = 7.5	**E** = 33.78	**N** = 39.06	**S** = 45.58	**V** = 45.5	
C = 19.6	**I** = 34.365	**O** = 40.2	**T** = 48	**W** = 92.68	

Question: Why did the squirrel try to cross the expressway?

___ ___ ___ ___ ___ ___' ___ ___ ___ ___ ___ ___
6 2 8 9 5 2 3 7 1 7 7 4

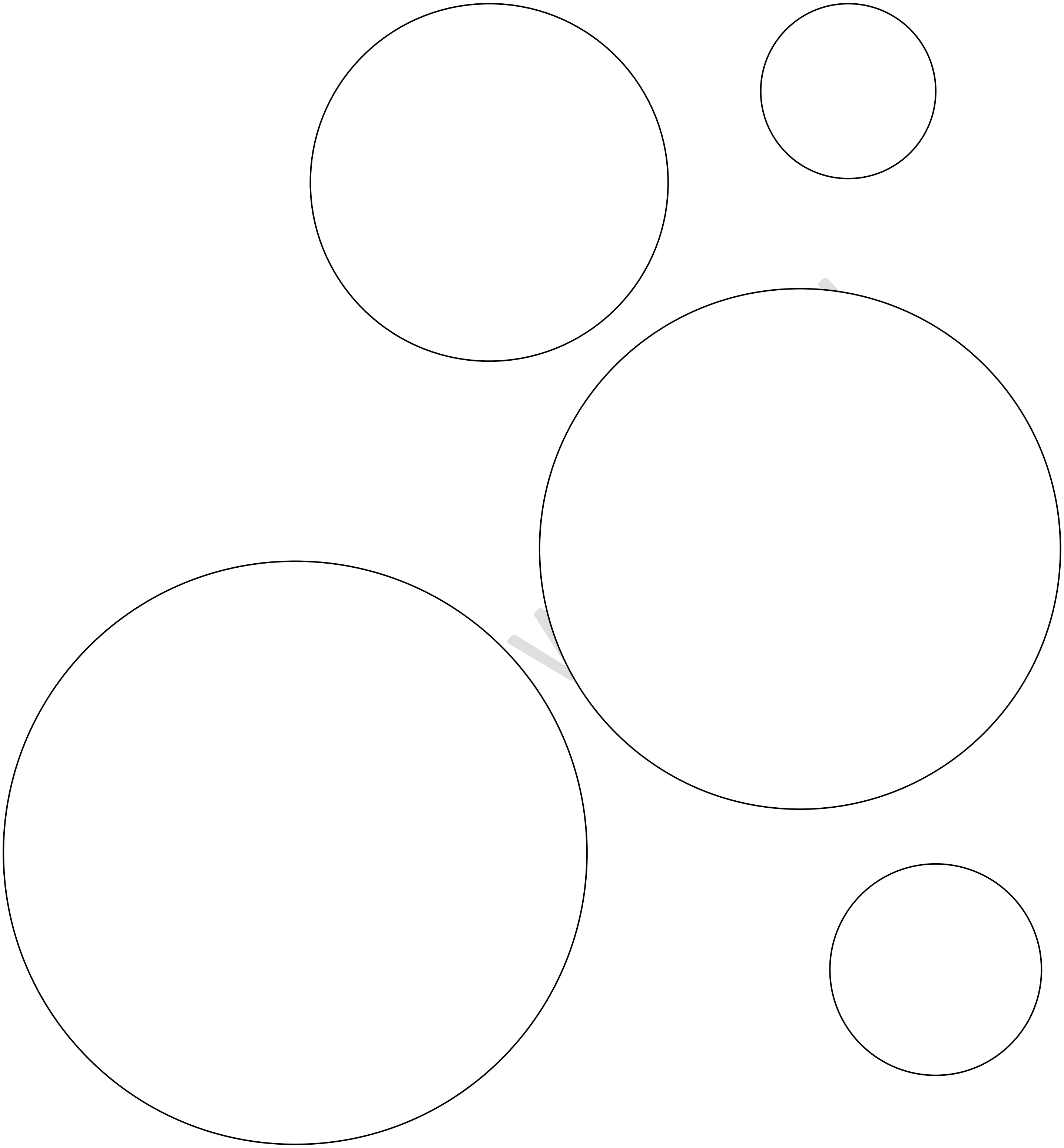
___ ___ ___ ___!
4 9 2 5

1. Draw two chords similar to the following diagram, in each of the five circles on the next page. Then complete the data table.



Measure of KP	Measure of PM	Measure of NP	Measure of PL	$(KP)\cdot(PM)$	$(NP)\cdot(PL)$

2. Write an analysis of the results.



The Converse of the Pythagorean Theorem

The Pythagorean Theorem can be used to determine whether a triangle is ACUTE, RIGHT, or OBTUSE.

the triangle is:	if:
ACUTE	longest side^2 < short side^2 + other short side^2
RIGHT	longest side^2 = short side^2 + other short side^2
OBTUSE	longest side^2 > short side^2 + other short side^2

Determine whether the following lengths create an acute, right, obtuse, or no triangle. Check the corresponding column and place its letter in the blanks below to reveal Kirkpatrick Macmillan's invention.

	lengths	acute	right	obtuse	no triangle
1.	11, 11, 15	T	O	B	R
2.	1, 2, 3	A	N	E	H
3.	3, 4, 5	N	E	D	K
4.	7, 8, 12	L	R	B	P
5.	5, 12, 13	Z	I	Y	F
6.	6, 7, 8	C	D	I	A
7.	5, 9, 11	P	E	Y	N
8.	4, 5, 8	N	P	C	R
9.	9, 12, 15	S	L	E	O
10.	5, 5, 5	E	N	D	R

Triangle Inequalities

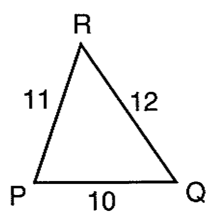
> In one triangle, the longest side is opposite the largest angle and the shortest side is opposite the smallest angle.
>
> When given the lengths of two sides of a triangle, the length of the third side must be greater than their difference, but less than their sum.

Fill in the chart.

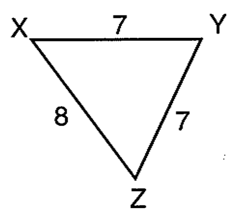
	lengths of two sides of a triangle	third side must be greater than	less than
1.	7 and 12		
2.	15 and 17		
3.	20 and 25		
4.	3 and 4		
5.	9 and 15		
6.	10 and 10		

Place the letter of the largest angle or longest side in the blanks below. Diagrams are not drawn to scale; base your answer on measurements given.

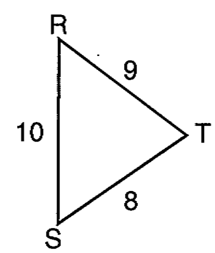
7.



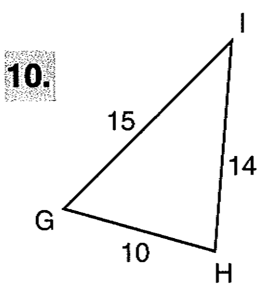
8.



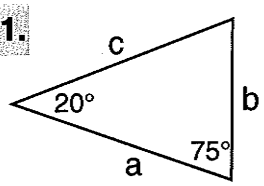
9.



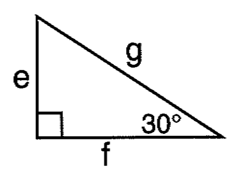
10.



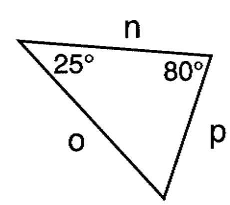
11.



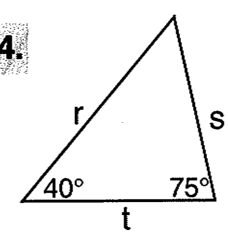
12.



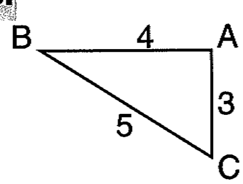
13.



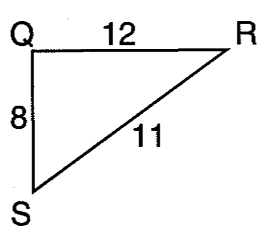
14.



15.



16.



Name a Greek mathematician who is most famous for his theorem about right triangles.

What do basketball players read in their spare time?

Decoder

6	Q
9	N
12	L
100	B
36	T
25	V
412	O
730	C
112	L
24	E
15	P
720	A
4	S
20	M
7	L
60	A
3	T

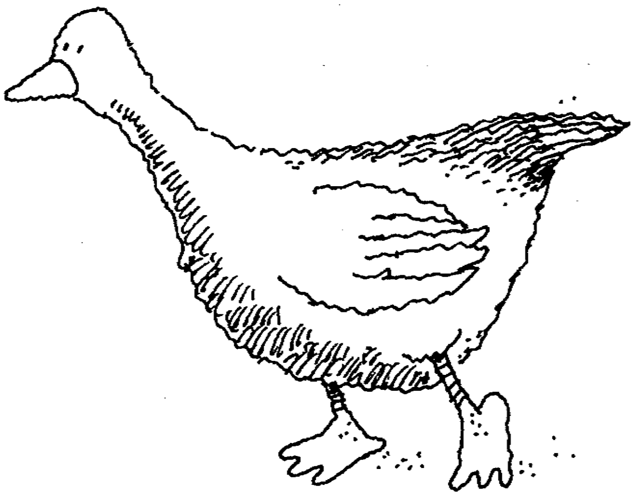
What to Do

Find the answers. Then use the Decoder to solve the riddle by filling in the blanks at the bottom of the page.

1. How many inches are in 1 foot? _______
2. How many feet are in 1 yard? _______
3. How many days are in 1 week? _______
4. How many hours are in 1 day? _______
5. How many quarts are in 1 gallon? _______
6. How many inches are in 3 feet? _______
7. How many feet are in 20 yards? _______
8. How many days are in 16 weeks? _______
9. How many hours are in 30 days? _______

___ ___ ___ ___   ___ ___ ___ ___ ___

6 9 1 3   2 7 8 4 5



What kind of geese come from Portugal?

What to Do

Find the answers. Then use the Decoder to solve the riddle by filling in the blanks at the bottom of the page.

1. How many minutes are in 1 hour? ___________
2. How many minutes are in 3 hours? ___________
3. How many minutes are in half an hour? ___________
4. How many seconds are in 1 minute? ___________
5. How many seconds are in 5 minutes? ___________
6. How many seconds are in 10 minutes? ___________
7. How many minutes are in 1/4 of an hour? ___________
8. How many minutes are in 1 hour and 20 minutes? ___________
9. How many seconds are in 42 minutes? ___________
10. How many seconds are in 13 1/2 minutes? ___________

Decoder

60 minutes ...... E
2,520 minutes F
300 minutes .... B
80 minutes ...... P
6 minutes .... A
2,520 seconds U
100 seconds.... W
120 minutes .... N
180 minutes .... R
30 seconds...... I
15 minutes ...... T
810 seconds.... E
200 seconds.... P
20 minutes ...... M
600 seconds.... S
300 seconds.... O
60 seconds...... G
180 seconds.... C
30 minutes ...... E

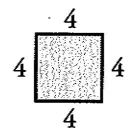
"				"					
___	___	___	___	___	___	___	___	___	___
8	5	2	7	9	4	10	3	6	1

Why do people with colds get plenty of exercise?

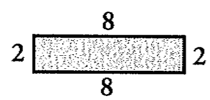
What to Do

Find the answers. Then use the Decoder to solve the riddle by filling in the blanks at the bottom of the page.

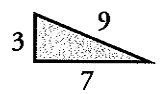
1. **What is the perimeter of this square?** ________



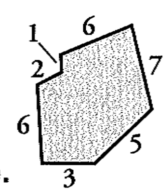
2. **What is the perimeter of this rectangle?** ________



3. **What is the perimeter of this triangle?** ________



4. **What is the perimeter of a square that is 10 inches long on one side?** ________
5. **A square's perimeter is 48 inches. How long is one side of the square?** ________
6. **A triangle with three equal sides has a perimeter of 27 inches. How long is one side of the triangle?** ________
7. **Each side of a pentagon is 11 inches long. What is the pentagon's perimeter?** ________
8. **What is the perimeter of this shape?** ________



9. **A magazine is 11 inches long and 8 inches wide. What is the magazine's perimeter?** ________
10. **A lawn is 23 feet long and 14 feet wide. What is the lawn's perimeter?** ________

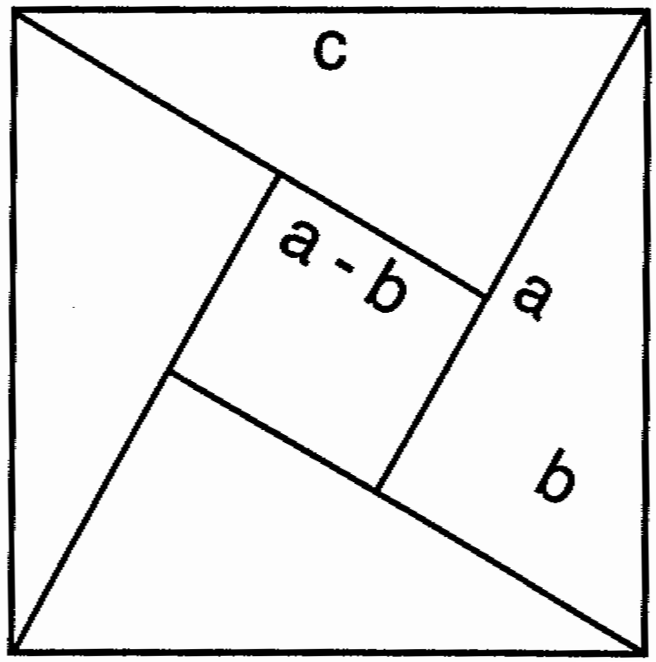
Decoder

19	O
74 inches	Q
30	N
25	A
38 inches	I
12 inches	S
40 feet	X
9 inches	N
15	B
74 feet	R
16	E
10 feet	D
20	R
22	A
32 inches	L
37 feet	M
40 inches	U
55 inches	S
15	C

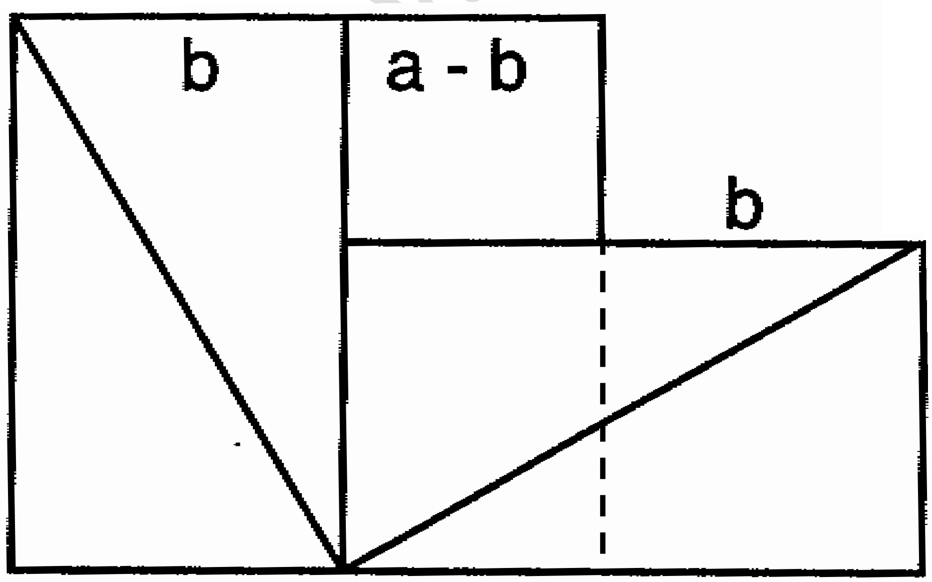
THE ___ ___   ___ ___ ___ ___ ___   ___ ___ ___.

9 2   8 3 5 1 7   10 4 6

The following large square consists of four right triangles and a smaller square. The leg measurements of the right triangles are *a* and *b*, and hypotenuse measurement is *c*. The side measurement of the smaller square is $a-b$. The area of the large square is c^2.



Cut out the four right triangles and the smaller square, and assemble them as below.



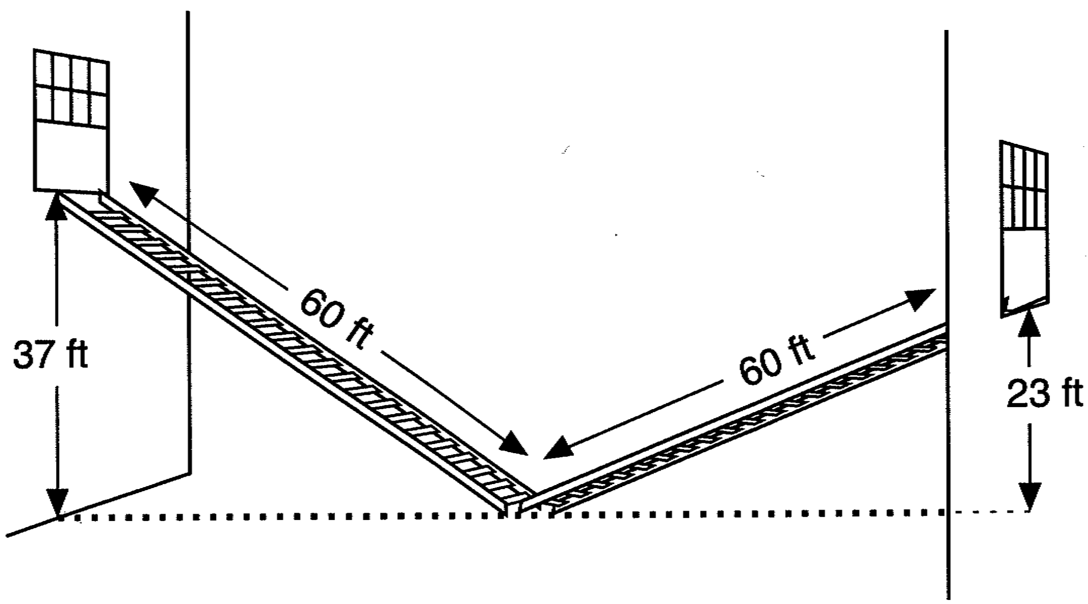
Think of the new shape as the union of two squares, and find their combined area.
How have you proven the Pythagorean Theorem?

Examples from Benjamin Banneker

Benjamin Banneker (1731–1806) is one of the great American heroes of all time. The son and grandson of Africans captured and enslaved, he was fortunate to have been born free. He inherited the family farm, where he worked hard all of his life. As a child he had a few months of schooling. Everything else he had to do on his own. He loved mathematics and science but did not get a chance to learn astronomy until he was in his fifties. Then he performed a near miracle, learning it all in less than a year. In his hand-written journal, he recorded two right triangle examples that interested him. You can solve them here and remember the great man who enjoyed geometry.

On the page in his journal next to the August 1775 astronomy calculations, Banneker wrote, in the style of that time:

> Suppose ladder 60 feet long be placed in a Street so as to reach a window on the one Side 37 feet high, and without moving it at bottom, will reach another window on the other side of the Street which is 23 feet high, requiring the breadth of the Street.

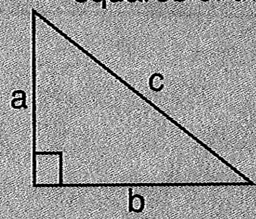


If the length of the ladder is 60 feet, find the width of the street that runs between the buildings.

What is the width of the street? ______________________________

The Pythagorean Theorem

In a right triangle, the square of the hypotenuse is equal to the sum of the squares of the legs.

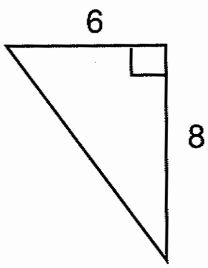


The hypotenuse is opposite the right angle.
The legs form the right angle.

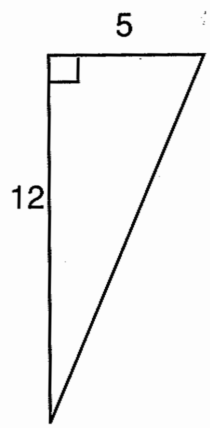
Pythagorean Theorem: $a^2 + b^2 = c^2$

Solve for the missing side. Match your answer in the decoder to find the special name for three integers whose lengths form a right triangle.

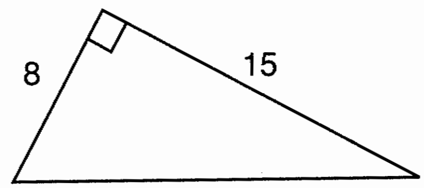
1.



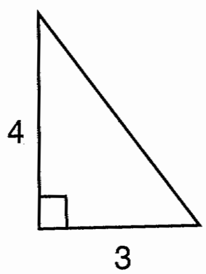
2.



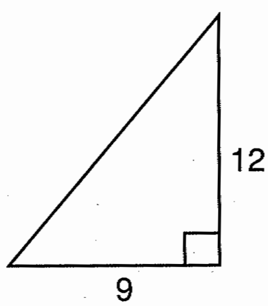
3.



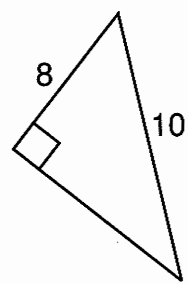
4.



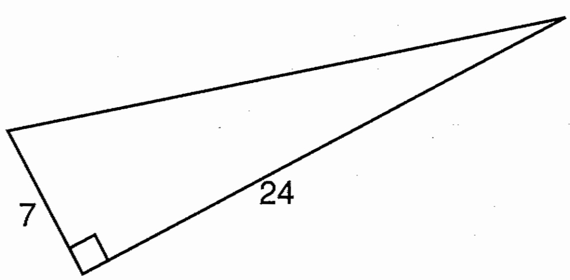
5.



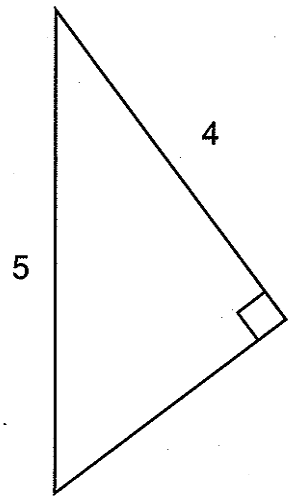
6.



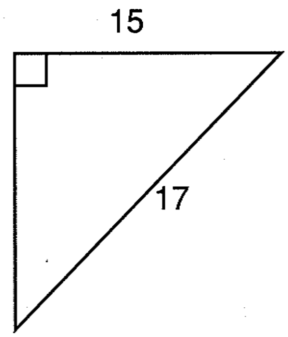
7.



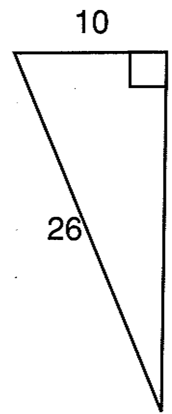
8.



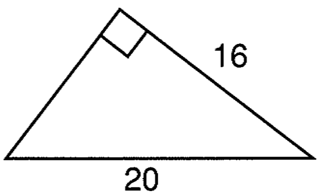
9.



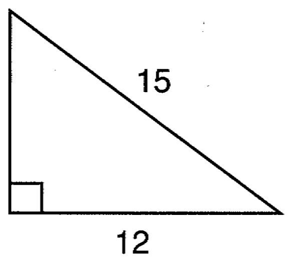
10.



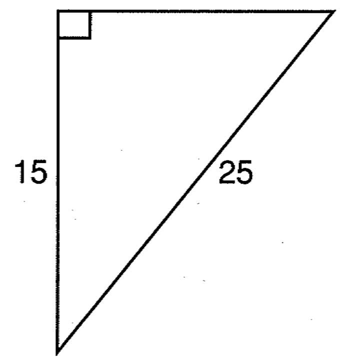
11.



12.



13.

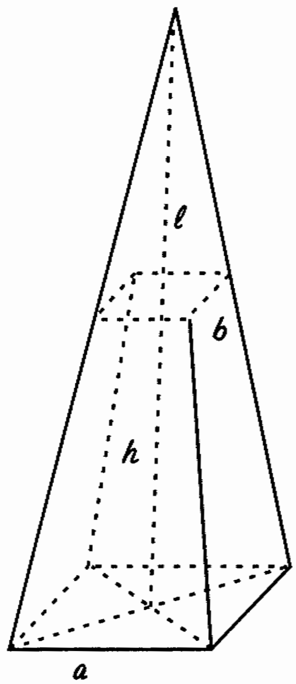


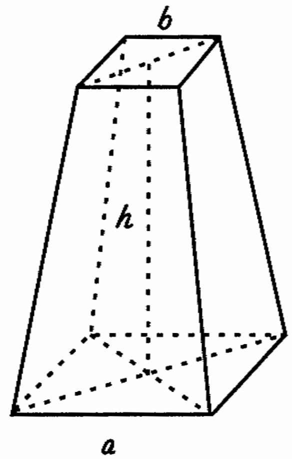
A	E	G	H	I	L	N	O	P	R	S	T	Y
17	5	15	3	10	24	9	20	8	25	12	13	6

___	___	___	___	___	___	___	___	___	___	___
9	6	2	8	3	5	13	7	4	3	12

___	___	___	___	___	___	___
2	7	1	9	10	4	11

The Greatest Pyramid of All





Ancient Egyptian mathematicians made an amazing discovery! They correctly developed the advanced formula for the volume of a truncated pyramid. The formula was

$$v = (1/3)(h)(a^2 + ab + b^2).$$

This complex formula, at least 3800 years old, gives the volume of the truncated (shortened) pyramid shown above. Here h is the height, a^2 is the area of the base, and b^2 is the area of the flat top.

This formula has been called the greatest pyramid of all. Nobody knows how the Egyptians made the discovery. Some believe it was done by a combination of algebra and geometry. Perhaps you, or someone in your class, will solve the mystery one day. Historians assume that Egyptians knew the basic pyramid formula, $v = (1/3)a^2h$. If they subtracted the pyramid cut off from the original pyramid, they would have:

$v = (1/3)a^2(h + l) - (1/3)b^2l$. After some further steps:

$v = (1/3)(h)(a^2 + ab + b^2)$.

Questions for Critical Thinking

1. For a truncated pyramid with $a = 4$ cubits, $b = 2$ cubits, and $h = 6$ cubits:
   (a) Use the correct Egyptian formula for volume, $v = (1/3)(h)(a^2 + ab + b^2)$.
   (b) Use an incorrect Babylonian formula for volume, $v = (1/2)(h)(a^2 + b^2)$.
   (c) Is the error that resulted from using the Babylonian formula small or large?
   (d) Do you think the Egyptians could have found their formula by trial and error?

The sum of the lengths of any two sides of a triangle is greater than the length of the third side.

Determine if segments of the given lengths can make a triangle. If they can, write the corresponding letter in the blanks below.

1, 2, 3 A	3, 4, 5 J	3, 9, 11 U	11, 12, 25 N	2, 2, 3 L
7, 9, 12 I	7, 7, 14 N	3, 7, 9 A	4, 10, 12 M	6, 7, 15 E
3, 3, 8 B	8, 8, 15 O	7, 11, 16 R	1, 18, 24 O	11, 22, 30 G
6, 12, 20 L	6, 8, 12 A	14, 16, 35 I	9, 13, 22 K	13, 15, 25 N

Who was the first successful woman architect?

____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____

Meter Math

Meter	100 Kilometers	Kilometer
Decameter	Decimeter	Millimeter
Hectometer	10 Kilometers	Centimeter

Meter Math

Players
Two players

Materials
5 red disks, 5 blue disks, 1 die, and 2 cubes
Label one cube with the following faces:

10	100	1000	$\frac{1}{10}$	$\frac{1}{100}$	$\frac{1}{1000}$

Label the second cube with the following faces:

m	dm	cm	km	mm	dkm

Object
To get three disks in a row—vertically, horizontally, or diagonally

To Start
Choose the starting player by rolling the die. The player with the higher number goes first.

Rules

1. The starting player throws both cubes and uses the roll to match an equivalent metric measure on the playing board. For example:

10	dm	= 1 meter (cover the "meter" square)

2. Players alternate turns.
3. If a player forms a measure already covered on the board, he or she can remove the opponent's disk and replace it with his or her disk.
4. The first player to get three disks in a row wins.

See the Meter Math Link on my Webpage!!!

PENTOMINOE COVER UP

Cover Up is a strategy game of areas for two players. It uses twelve pentominoes and an 8 x 8 playing board. Pentominoes are the various arrangements of five squares in which every square boarders at least one other square along a full side.

<u>RULES</u>:

1. Place the set of twelve pentominoes in a "pile".

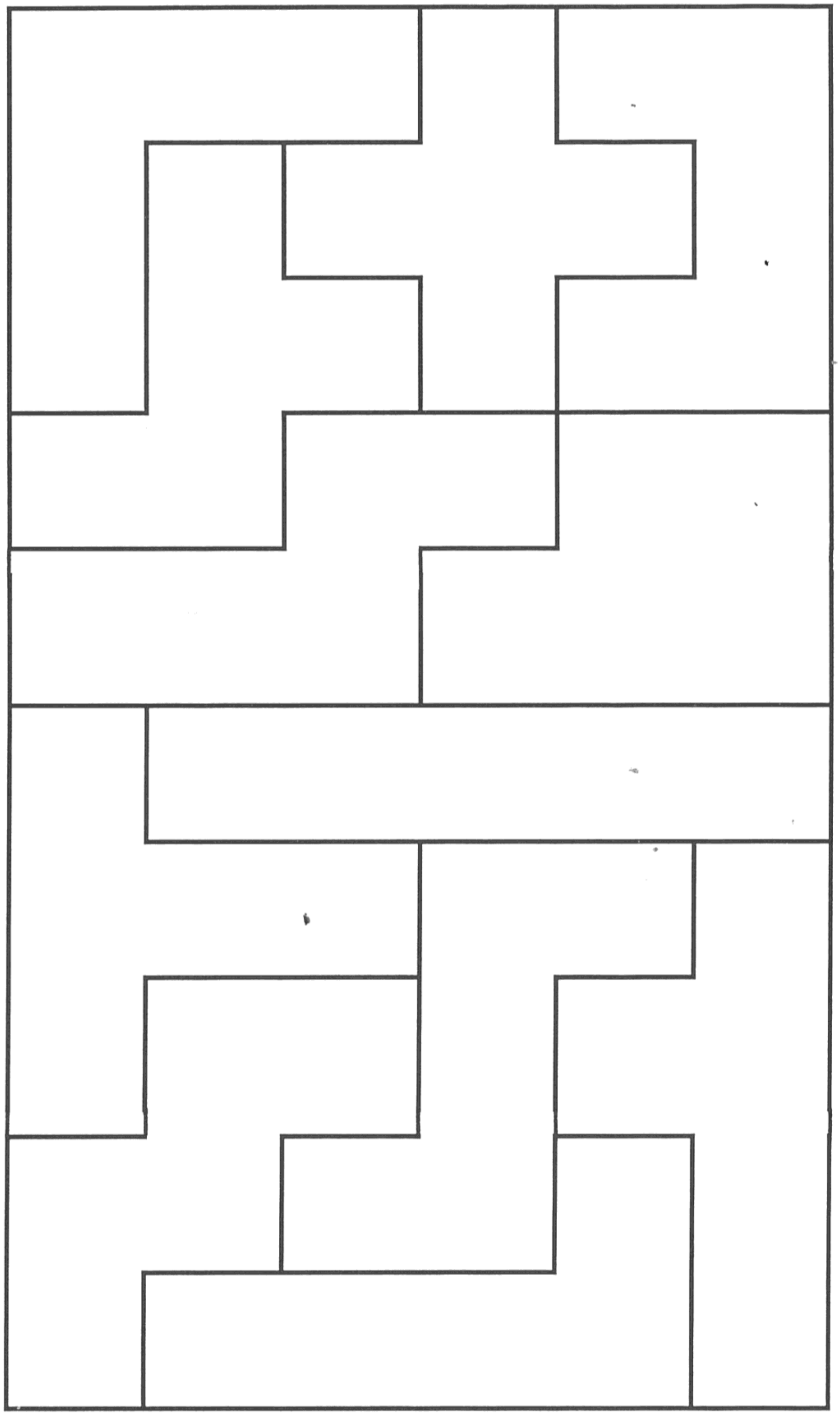
2. Each player draws in turn from the "pile" to form his/her own set of pentominoes to play.

3. Each player in turn plays one of his/her pentominoes anywhere on the playing board.

4. Play continues until a player cannot place any more pentominoes on the board.

5. The winner is the player with the least number of pentominoes left.

Cut out each of the figures.



PENTOMINOE COVER UP
GAMEBOARD