Algebra I
1st Marking Period
Resource Packet

From Accentuate the Negative:
"Measuring Temperature"
"Inventing a New Model"

Problem 1.2 Follow-Up

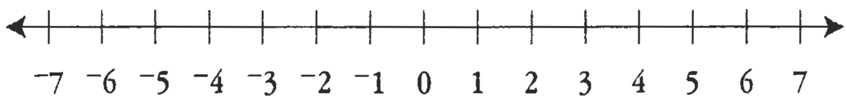
1. Copy each pair of numbers below, inserting > or < to make a true statement.
   a. 53 35 **b.** $^{-}50$ 0 **c.** $^{-}30$ 15 **d.** $^{-}70$ $^{-}90$

2. Order the numbers below from least to greatest.

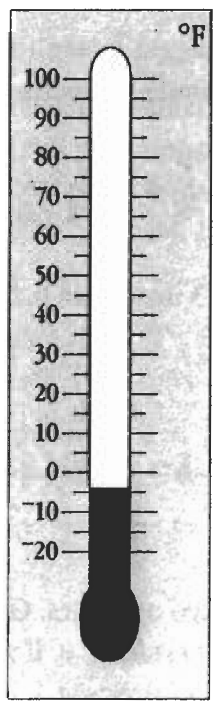
   25, 2, 5, $^{-}3$, 15, $^{-}7$, $^{-}25$, 12, 1, $^{-}4$, 0

1.3 Measuring Temperature

You have used the number line to help you think about whole numbers and fractions and decimals greater than 0. These are all examples of positive numbers. The number line can be extended to the left of 0 to include negative numbers.



A thermometer can be thought of as a vertical number line with the positive numbers above 0 and the negative numbers below 0. The temperature in many places falls below 0° during the winter months. The thermometer below shows a temperature reading of $^{-}4$°F.



Problem 1.3

A. Arrange the following temperatures in order from lowest to highest:

-8°, 4°, 12°, -2°, 0°, -15°

B. The temperature reading on a thermometer is 5°F. Tell what the new reading will be if the temperature

1. rises 10° **2.** falls 2° **3.** falls 10° **4.** rises 7°

C. The temperature reading on a thermometer is -5°F. Tell what the new reading will be if the temperature

1. falls 3° **2.** rises 3° **3.** falls 10° **4.** rises 10°

D. In 1–6, give the temperature halfway between the two given temperatures.

1. 0° and 10° **2.** -5° and 15° **3.** 5° and -15°
4. 0° and -20° **5.** -8° and 8° **6.** -6° and -16°

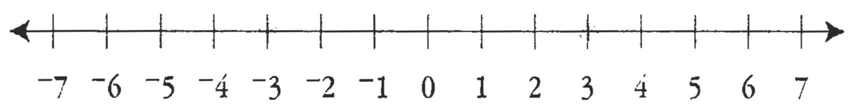
E. In 1–4, tell which temperature reading is farther from -2°.

1. -6° or 6° **2.** -7° or 3° **3.** 2° or -5° **4.** -10° or 5°

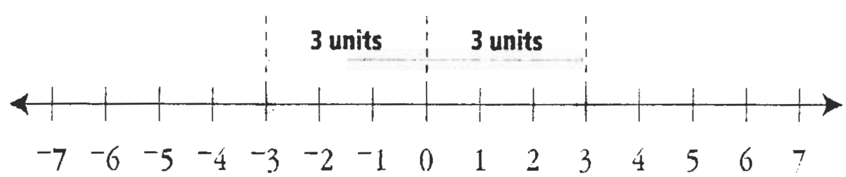
F. Explain how you determined your answer for part 4 of question E.

Problem 1.3 Follow-Up

The numbers -3 and 3 are represented on the number line below.



Notice that both numbers are 3 units from 0, but 3 is to the right of 0, and -3 is to the left of 0.



The numbers -3 and 3 are called opposites. **Opposites** are numbers that are the same distance from 0 but on different sides of 0. If you folded the number line at 0, each number would match up with its opposite.

21. Copy the table below. Study the first two rows, and then complete the table.

Temperature at 9:00 A.M.	Temperature at 9:00 P.M.	Change in temperature from 9:00 A.M. to 9:00 P.M.
⁻3°	5°	8°
5°	⁻3°	⁻8°
⁻10°	3°	
⁻2°	⁻10°	
⁻13°	⁻5°	
2°	⁻12°	
⁻10°		⁻7°
	6°	15°
⁻2°		⁻10°

22. The highest temperature ever recorded in the United States was 56.7°C (about 134°F) in Death Valley, California, on July 10, 1913. The lowest recorded U.S. temperature was ⁻62.2°C (about ⁻80°F) in Prospect Creek, Alaska, on January 23, 1971.

a. In Celsius degrees, what is the difference between the record high and record low temperatures?

b. In Fahrenheit degrees, what is the difference between the record high and record low temperatures?

Connections

23. In MathMania, winning 100 points and then losing 100 points have the effect of "undoing" each other. In other words, since they are opposites, 100 and ⁻100 combine to give 0. Describe three real-life situations in which two events undo each other.

Problem 2.1 Follow-Up

1. You can think of the scoring in MathMania as follows: When a team answers a question correctly, a positive integer is added to their score. When a team answers a question incorrectly, a negative integer is added to their score. For each of the following situations, write an addition sentence that will give the team's score. Assume each team starts with 0 points.
   a. The Brainiacs answer a 200-point question correctly and a 150-point question incorrectly.
   b. The Aliens answer a 100-point question correctly and a 100-point question incorrectly.
   c. The Prodigies answer a 50-point question incorrectly, a 100-point question incorrectly, and a 250-point question correctly.

2. Illustrate each addition problem on a number line and give the answer.
   a. $^{-}2 + {}^{+}2$ **b.** $^{+}8 + {}^{-}8$ **c.** $^{-}1 + {}^{+}1$

3. What happens when you add opposites? Explain how you know your answer is correct.

2.2 Inventing a New Model

In the last problem, you used the number line to help you think about adding integers. In this problem, you will explore another way to model the addition of integers.

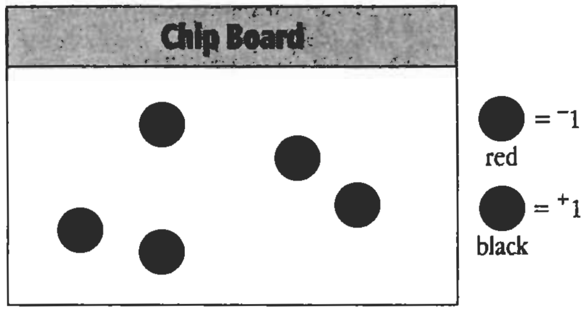
Amber's mother is an accountant. One day, Amber heard her mother talking to a client on the phone. During the conversation, her mother used the phrases "in the red" and "in the black."

That evening at dinner, Amber asked her mother what these terms meant. Her mother said:

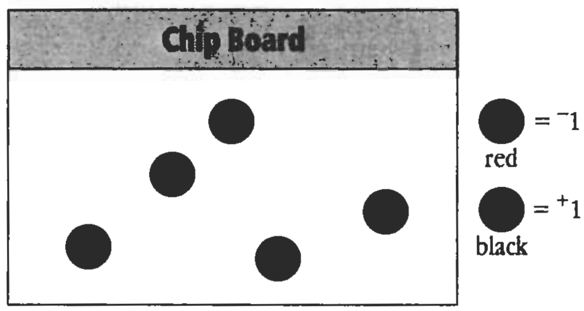
"When people in business talk about income and expenses, they often use colors to describe the numbers they are dealing with. Black refers to profits (or income); red refers to losses (or expenses). A company that is making money, or has money, is 'in the black'; a company that is losing money, or owes money, is 'in the red.'"

Amber was studying integers in her math class and thought she could use these ideas of "in the black" and "in the red" to model the addition of positive and negative integers. Her model uses a chip board and black and red chips. Each black chip represents $^{+}1$, and each red chip represents $^{-}1$.

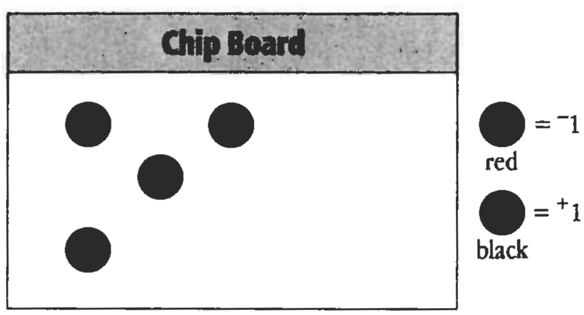
For example, this chip board shows a value of $^{+}5$:



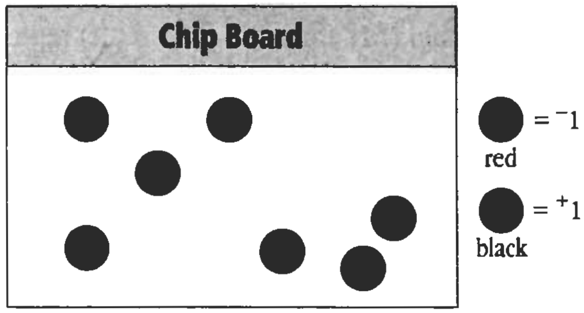
This chip board shows a value of $^{-}5$:



To represent $^{-}4 + {}^{-}3$, Amber started with an empty chip board. She represented $^{-}4$ by putting four red chips on the board.

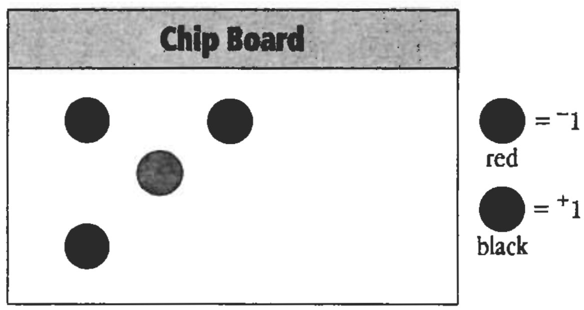


To represent the addition of $^-3$, she put three more red chips on the board.

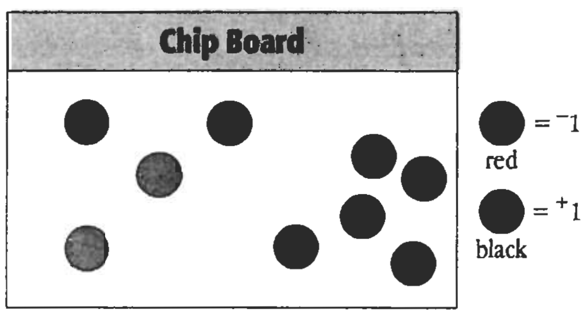


Since there were seven red chips on the board, Amber concluded that the sum of $^-4$ and $^-3$ is $^-7$. She wrote the number sentence $^-4 + ^-3 = ^-7$ to represent what she did on the chip board.

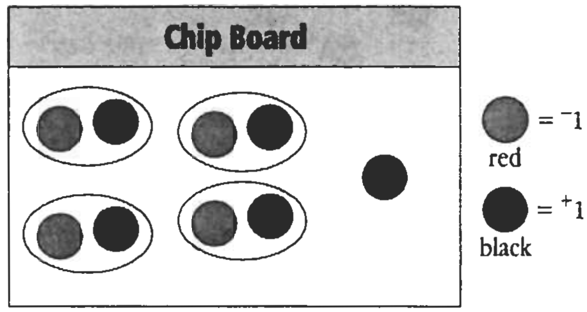
Amber showed her idea to her friend Adil. Adil liked Amber's model, but he wasn't sure how to use it to add a negative integer and a positive integer. Amber explained by modeling $^-4 + ^+5$. She started by clearing the board. She then put four red chips on the board to represent $^-4$.



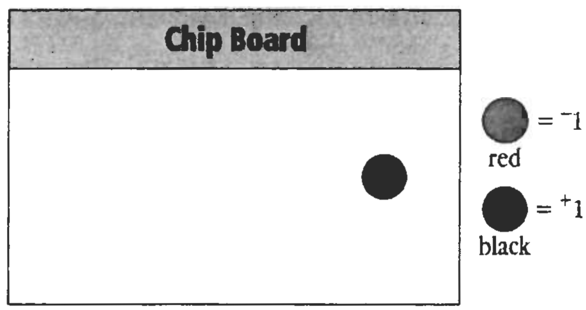
To add +5, Amber added five black chips to the board.



Amber said that next she had to simplify the board so that the answer would be easier to read. She reminded Adil that since $^{+}1$ and $^{-}1$ are opposites, they add to 0. So, a pair consisting of one black chip ($^{+}1$) and one red chip ($^{-}1$) represents 0. Amber formed as many black-red pairs as she could.



Since each black-red pair represents 0, all the black-red pairs can be removed from the board without changing the total value on the board. After Amber removed these "zeros" from the board, only one black chip remained, representing a sum of $^{+}1$.



Adil wrote $^{-}4 + {}^{+}5 = {}^{+}1$ to represent the problem Amber had modeled.

Problem 2.2

A. Use a chip board and black and red chips to find each sum. Draw a series of chip boards to illustrate your work.

1. $^{-}8 + {}^{-}7$ **2.** $^{-}8 + {}^{+}7$ **3.** $^{+}8 + {}^{-}7$ **4.** $^{+}8 + {}^{+}7$

B. Find two combinations of black and red chips that will simplify to represent the given integer. Draw a series of chip boards to prove that each combination works.

1. $^{-}3$ **2.** $^{+}5$

C. Write each combination you found in part B as an addition sentence.

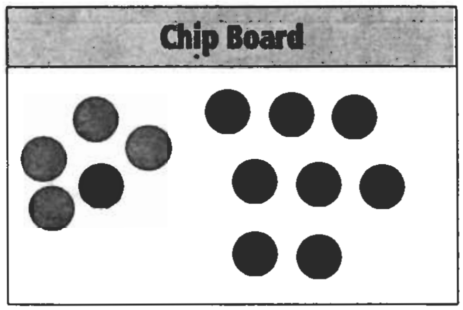
Problem 2.2 Follow-Up

1. What integer added to ${}^{-}8$ gives a sum of ${}^{-}4$?

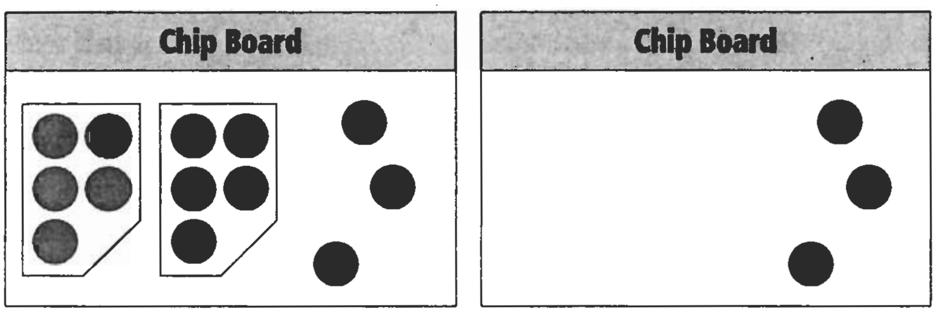
2. Give two integers with a sum that is less than either of the two integers.

3. Give two integers with a sum that is greater than either of the two integers.

Conrado was adding the integers ${}^{-}5$ and ${}^{+}8$ on a chip board. First, he represented ${}^{-}5$ and ${}^{+}8$.



He then rearranged the chips to form a group of five red chips (representing ${}^{-}5$) and a group of five black chips (representing ${}^{+}5$). Since the two groups add to 0, he removed them from the board.



He wrote a series of equations to represent what he had done on the chip board.

$$
\begin{aligned}
{}^{-}5 + {}^{+}8 &= {}^{-}5 + {}^{+}5 + {}^{+}3 \\
&= ({}^{-}5 + {}^{+}5) + {}^{+}3 \\
&= 0 + {}^{+}3 \\
&= {}^{+}3
\end{aligned}
$$

Conrado thought that this method of regrouping to find numbers with a sum of 0 would be a good way to compute sums in his head.

4. Use Conrado's method to compute the following sums in your head.
   a. ${}^{+}9 + {}^{-}7$ **b.** ${}^{-}80 + {}^{+}50$ **c.** ${}^{+}35 + {}^{-}27$ **d.** ${}^{-}8 + {}^{-}5$

As you work on these ACE questions, use your calculator whenever you need it.

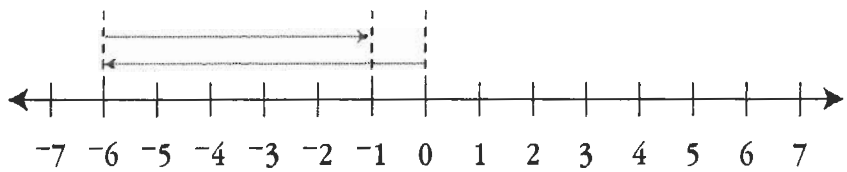
Applications

In 1–3, illustrate the addition problem on a number line, and give the answer.

1. $6 + {}^{-}6$
2. ${}^{-}4 + {}^{-}3 + {}^{-}8$
3. ${}^{+}8 + {}^{-}11 + {}^{-}9$

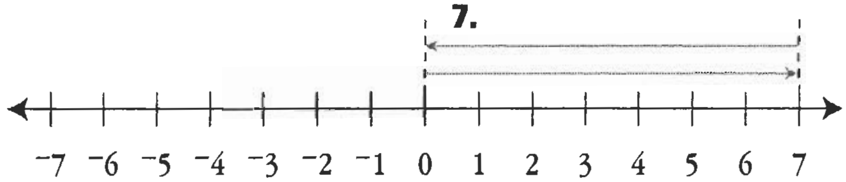
In 4–7, write the addition sentence illustrated by the figure.

4.



5.

7.



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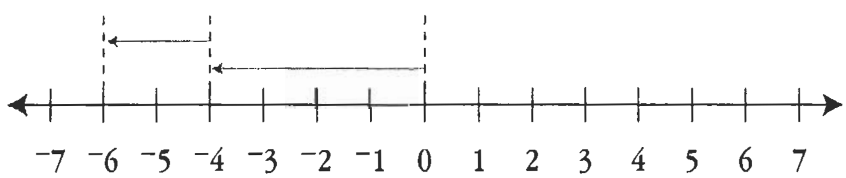
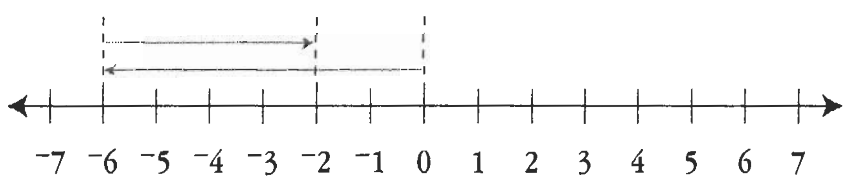
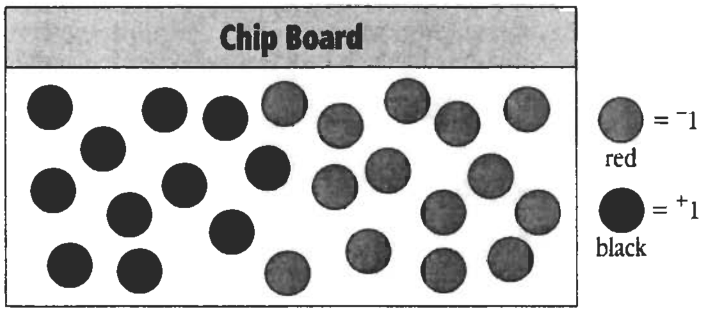




In 8 and 9, use the chip board below.



8. **a.** After you simplify the board by removing zeros (black-red pairs), what chips would remain? What integer do these chips represent?

b. Give another combination of black and red chips that would simplify to give the same result you got in part a.

9. Starting with the board as shown above, the following series of actions takes place. Write an addition sentence to describe each action. (A correct addition sentence will show the previous value represented by the board, the value of the chips that are added, and the new value represented by the board.)

a. Seven black chips are added.

b. Three more black chips are added.

c. Three red chips are added.

10. **a.** Find two combinations of black and red chips that simplify to represent $^{-}11$.

b. Draw a chip board to represent each combination from part a.

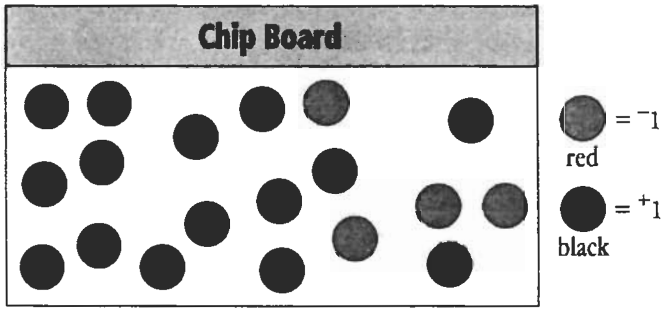
c. Write an addition sentence to represent each combination from part a.

11. **a.** Find two combinations of black and red chips that simplify to represent $^{+}7$.

b. Draw a chip board to represent each combination from part a.

c. Write an addition sentence to represent each combination from part a.

In 12 and 13, use the chip board shown below.



12. After you simplify the board by removing zeros (black-red pairs), what chips would remain? What integer do these chips represent?

13. Starting with the board as shown above, the following series of actions takes place. Write an addition sentence to describe each action. (A correct addition sentence will show the previous value represented by the board, the value of the chips that are added, and the new value represented by the board.)

a. Four black chips are added.

b. Ten red chips are added.

c. Six black chips are added.

d. Eight more black chips are added.

e. Eight red chips are added.

In 14–17, illustrate the addition problem on a number line or a series of chip boards, and give the answer.

14. $^{+}12 + {}^{-}4$ **15.** $^{-}5 + {}^{+}5$

16. $^{+}5 + {}^{-}9$ **17.** $^{-}3 + {}^{-}6$

In 18–26, find the sum.

18. $^{-}105 + {}^{+}65$ **19.** $^{+}1050 + {}^{-}150$ **20.** $^{-}99 + {}^{-}47$

21. $^{+}37 + {}^{-}12 + {}^{-}15$ **22.** $0 + {}^{-}400$ **23.** $^{-}120 + {}^{-}225$

24. $^{-}90 + {}^{-}90$ **25.** $^{-}90 + 0$ **26.** $^{+}35 + {}^{-}35$

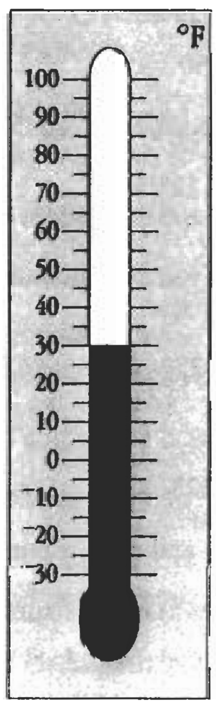
In 27 and 28, decide whether the statement is always true, sometimes true, or always false. Give examples to illustrate your answer.

27. The sum of two negative integers is a negative integer.

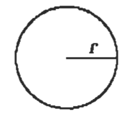
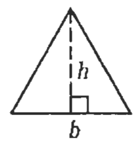
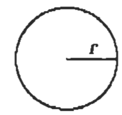
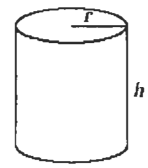
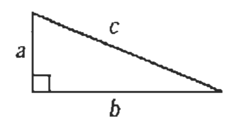
28. The sum of a negative integer and a positive integer is a positive integer.

Connections

29. In Duluth, Minnesota, the temperature at 6:00 A.M. on January 1 was $^{-}30$°F. During the next 8 hours, the temperature rose 38°. Then, during the next 12 hours, the temperature dropped 12°. Finally, in the next 4 hours, it rose 15°. What was the temperature at 6:00 A.M. on January 2?



CMT Formula Chart

Circumference	circle	$C = 2\pi r$	
	pi = π	Use 3.14 OR $\frac{22}{7}$	
Area	triangle	$A = \frac{1}{2}bh$	
	circle	$A = \pi r^2$	
Volume	cylinder	$V = \pi r^2 h$	
Pythagorean Theorem	right triangle	$a^2 + b^2 = c^2$	

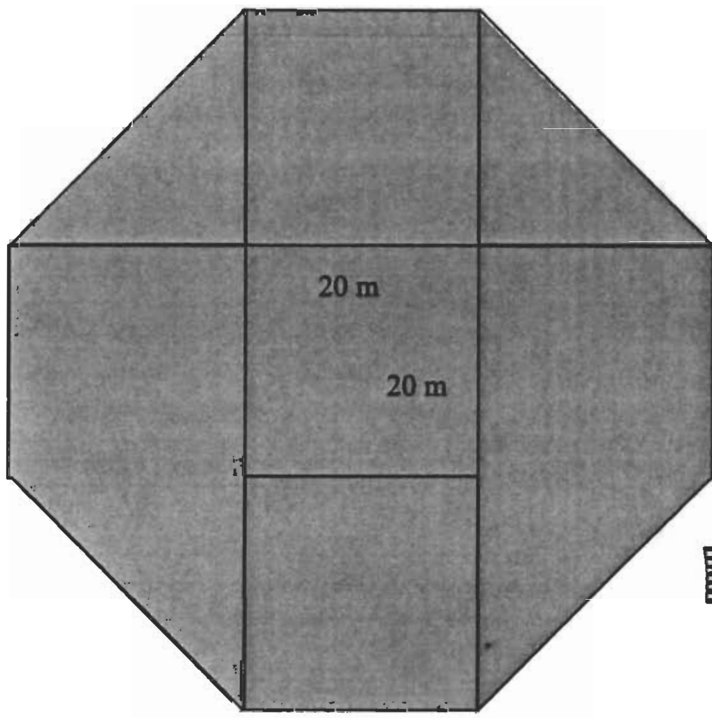
Measurement Conversion

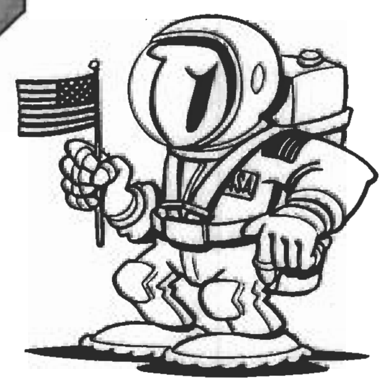
Customary Length	1 mile = 5,280 feet
Customary Volume	1 gallon = 4 quarts 1 quart = 2 pints 1 pint = 2 cups 1 cup = 8 ounces
Customary Weight	1 ton = 2,000 pounds 1 pound = 16 ounces
Time	1 year = 365 days 1 year = 52 weeks

Name____Date___________

Finding Area

1. Find the area of the space station shown below. Note: All vertical and horizontal segments meet at right angles.





2. What is the name of this shape?

3. Do all eight interior angles of the shape have the same measure? What is their measure? Explain your answer.

4. Do all eight sides of this shape have the same measure? Explain your answer.

Name____Date____________

Eyes on Space

Some of the world's biggest telescopes are listed below. In each case, the diameter is given. Find the radius and circumference. Use the pi key on your calculator, and round to the nearest tenth.

Telescope	Diameter	Radius	Circumference
Radio Telescope Arecibo, PR	1000 feet	_______	___________
Very Large Array Socorroo, NM (has 27 units of 82 feet each)	82 feet	_______	___________
Radio Telescope Effelsburg, Germany	100 meters	_______	___________
Hale Telescope Mount Palomar, CA	200 inch	_______	___________
Reflector scope Zelenchukskaya, Russia	236 inches	_______	___________
Yerk's Refractor William's Bay, Wisconsin	40 inches	_______	___________

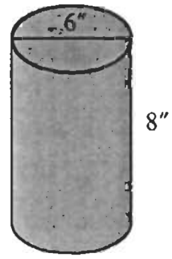
Put the diameters above in order from smallest to largest.
Convert each diameter above to yards. (100 meters is about 330 feet.)

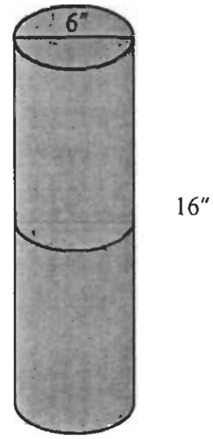
Diameter given above	Equivalent diameter in yards
________________	______________
________________	______________
________________	______________
________________	______________
________________	______________
________________	______________

Name____Date________

Working on All Cylinders

1. Find the volume of the cylinder shown.
   $V = \pi r^2 h$

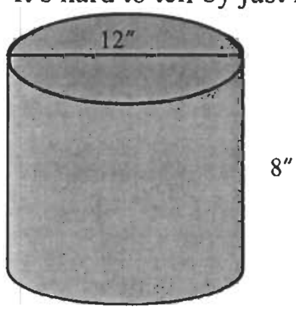




2. What happens to the volume if the height is doubled?

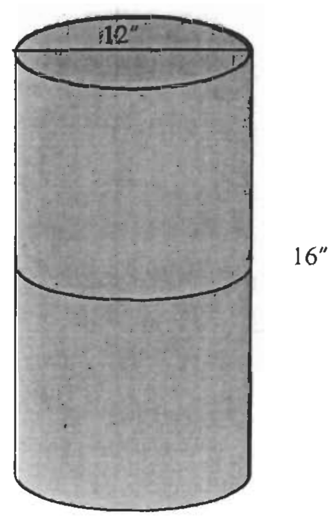
   If h becomes $2h$, Volume becomes $V = \pi r^2(2h) = 2(\pi r^2 h)$
   In other words the new volume is twice the old volume.

3. What happens to the volume if the radius is doubled?
   It's hard to tell by just looking. You may need to calculate the new volume.



If r becomes $2r$, the volume becomes $V=\pi(2r)^2h = 4(\pi r^2 h)$.
In other words, the new volume is four times the old volume.

4. What happens if the radius and height are BOTH doubled?
   If both r and h are doubled, Volume becomes $\pi(2r)^2(2h)$
   or $V = 8(\pi r^2 h)$. Volume is increased by a factor of 8.



5. What will happen to the volume if the height is tripled and
   the radius remains 3″?

6. What will happen to the volume if the radius is tripled and
   the height remains 8″?

7. What will happen to the volume if the radius is doubled and the
   height is tripled?

8. What will happen to the volume if the radius is tripled and the
   height is doubled?

9. What will happen to the volume if the radius and height
   are both tripled?

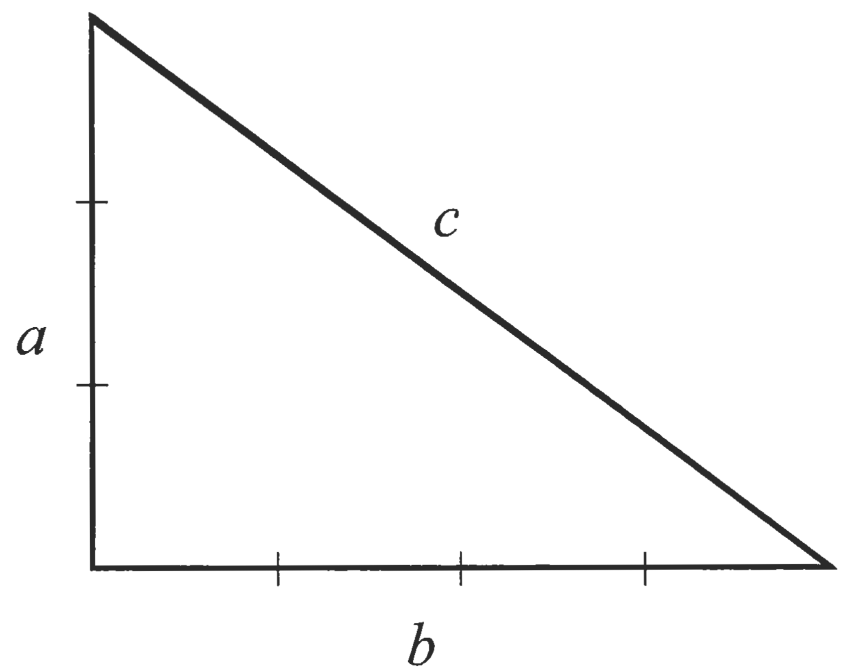
10. How can you change the dimensions of the cylinder to
    increase the volume by a factor of 20?

Name____Date____________

Pythagorean Theorem with Tiles

Materials needed: square tiles, centimeter paper, scissors
Record your results in the table below.

Procedure: Build squares along the sides of the triangle shown below. One square will have side length a, one b, and one c.



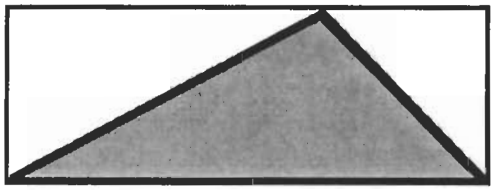
Legs		Hypotenuse	Area of Squares		
a	b	c	a^2	b^2	c^2
3	4	_______	____	____	____
Make other triangles with grid paper and complete the chart below.					
6	8	_______	____	____	____
5	12	_______	____	____	____
8	15	_______	____	____	____

What pattern do you see?

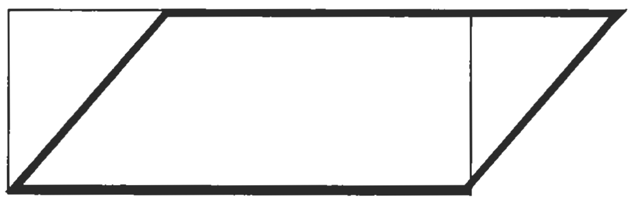
Name____Date____________

Mini Review - Area

1. The area of the rectangle shown is 48 square cm. What is the area of the shaded triangle?

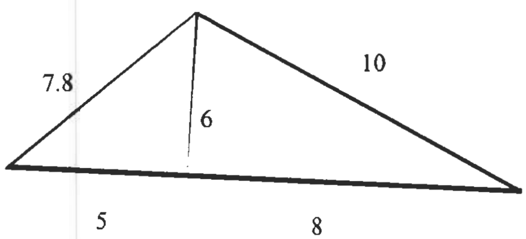


2. The area of the rectangle shown is 48 square cm. What is the area of the parallelogram shown?

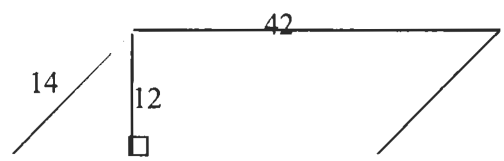


Find the area of each figure shown. Measurements are in inches.

3.

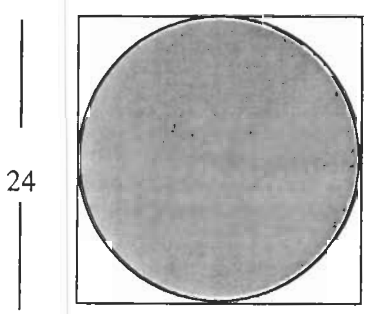


4.

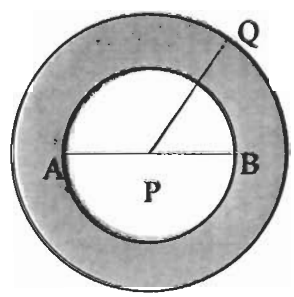


Find the shaded area. Measurements are in centimeters.

5.



6.

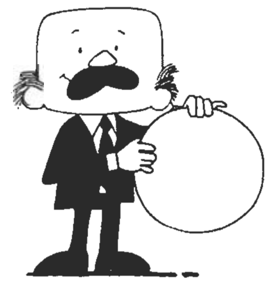


AB = 18, PQ = 12

3.02 Identify the radius, diameter, chord, center, and circumference of a circle; determine the relationships among them.

Notes and textbook references

A. String Along Have a display of cylindrical containers (jars, glasses, cans). Use a string to measure the circumference of the object and its diameter. Record your findings on cards, one measurement on the back and the other on the front. Have students use the information on one side of the card to predict the other measure, then check.



B. Can It! Ask each student to bring two or three different size empty cans. Working together, each pair should measure the diameter of a can using string. Record the length of the string in centimeters. Using the string again, measure the circumference of the can. Measure the string and record its length. Repeat the activity ten times: Ask students to write what they have observed about the relationships of the diameter of a circle to its circumference.

Circle Investigation

Can	Radius	Diameter	Circumference
A			
B			
C			
D			
E			

C. Measuring Activity

Materials needed: Tape measure, a variety of round lids. Have students measure the circumference and diameter of each lid. Record the results and calculate the ratio of circumference to diameter. Use these data to introduce the concept of π as a ratio. If the data are graphed, a nearly linear pattern should form.

D. Sir Cumference and the First Round Table

Sir Cumference and the First Round Table, by Cindy Neuschwander, is a tale about why and how King Arthur's round table became round. It highlights the characteristics of various shapes and gives meaning to the names radius, circumference, and diameter.

Notes and textbook references

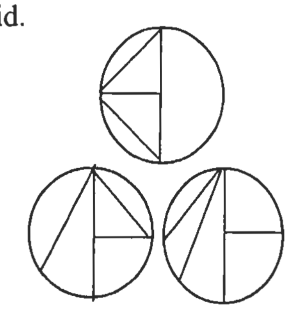
E. **Drawing Circles** Give the students opportunities to practice drawing circles with their compasses. Have them create a design of eight overlapping circles, each having a different radius. Create a stained glass effect by coloring the intersections.

F. **Circle Designs** Have the students construct circles on drawing paper using a compass. Set the compass at the length of the radius of the circle. Place the compass point on any point of the circle. Draw an arc from one point on the circle, through the center, to another point. Repeat the process to create a design. Vary this activity by using oral or written directions.

G. **Radius, Diameter, and Circumference** Have the students trace a circular object, marking the center on the circles. Have students measure the radius with one color of string, the diameter with another color, and the circumference with a third color. Use the strings to determine the relationships between the radius, diameter, and circumference. Because yarn stretches, use colored string if possible.

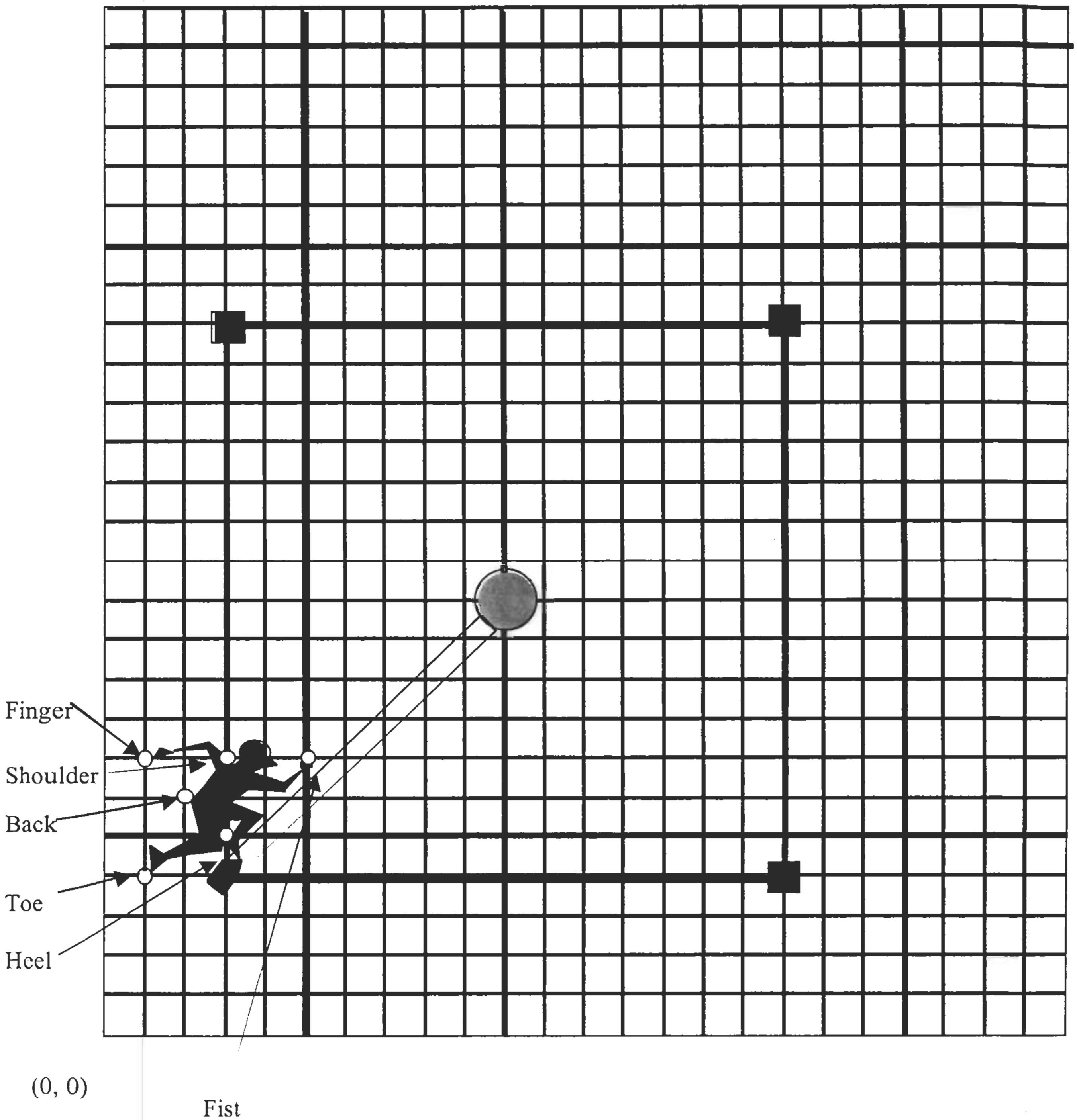
H. **Make Your Own Logo** Using a compass to draw a circle with a radius of 6 cm, create a logo for yourself. Make a border around the edge by drawing a second circle inside the original one. The circles should have the same center and the smaller circle should have a radius of 2 cm.

I. **Drawing Circles - Part II** Another activity might include giving oral directions such as "Draw a circle with a 2″ radius." "Draw a vertical diameter." "Draw two chords, each with an end point where the diameter intersects the circumference." "Draw a radius perpendicular to the diameter." Then have students compare their drawings. How are they alike? How are they different? Have students give oral directions while others draw. They might be asked to write out the dirctions first, in case there are any questions about what was said.



Name____Date___________

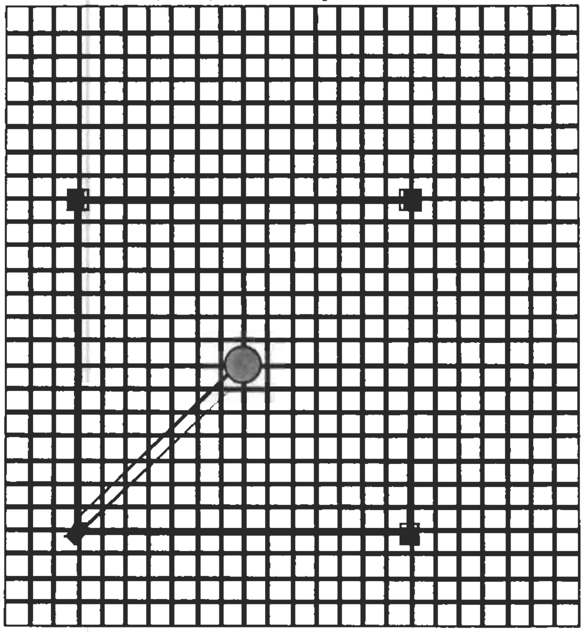
Slammin' Sammy



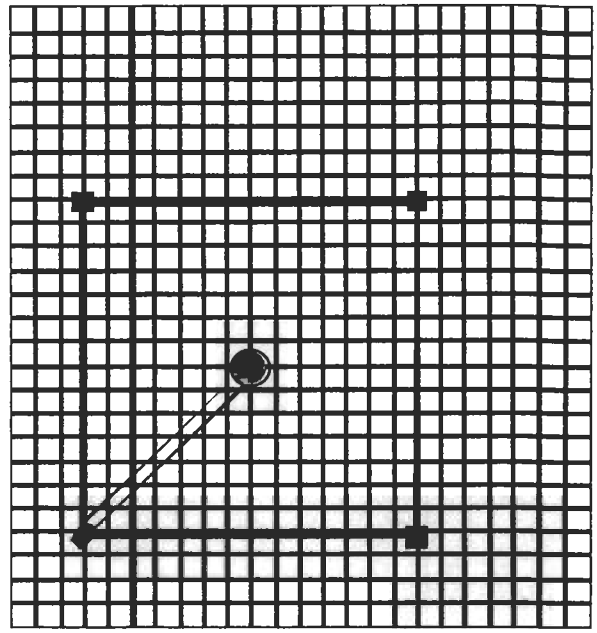
1. Give the coordinates of Sammy's six body parts:
Finger (,) Shoulder (,) Back (,) Toe (,) Heel (,) Fist (,)

Name____Date____________

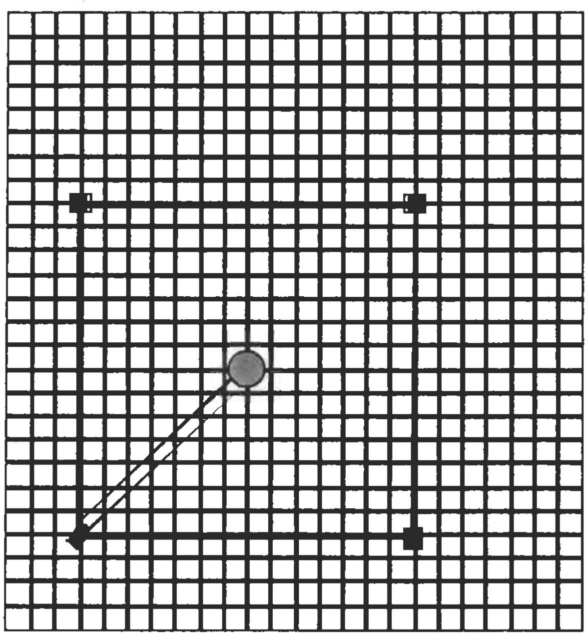
Slammin' Sammy



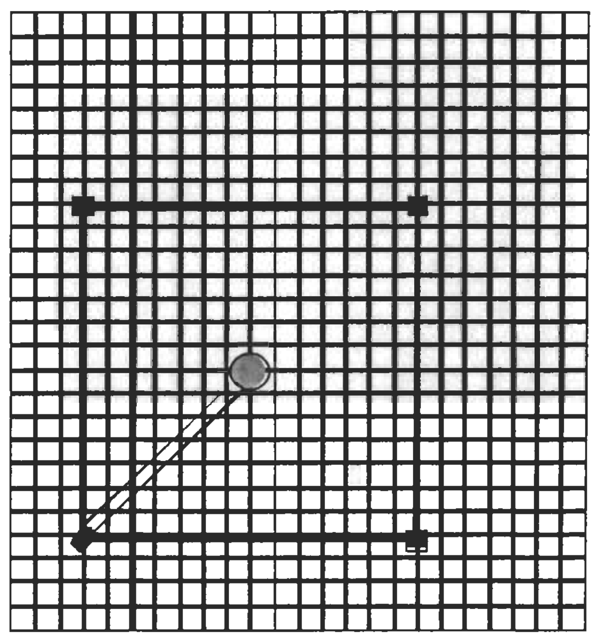
2. Draw Sammy at 1st base and give the coordinates of his five other body parts.
Toe (15, 4)



3. Draw Sammy at 3nd base and give the coordinates of his five other body parts.
Toe (1, 18)



4. Draw Sammy at 2nd base and give the coordinates of his five other body parts.
Toe (17, 18)

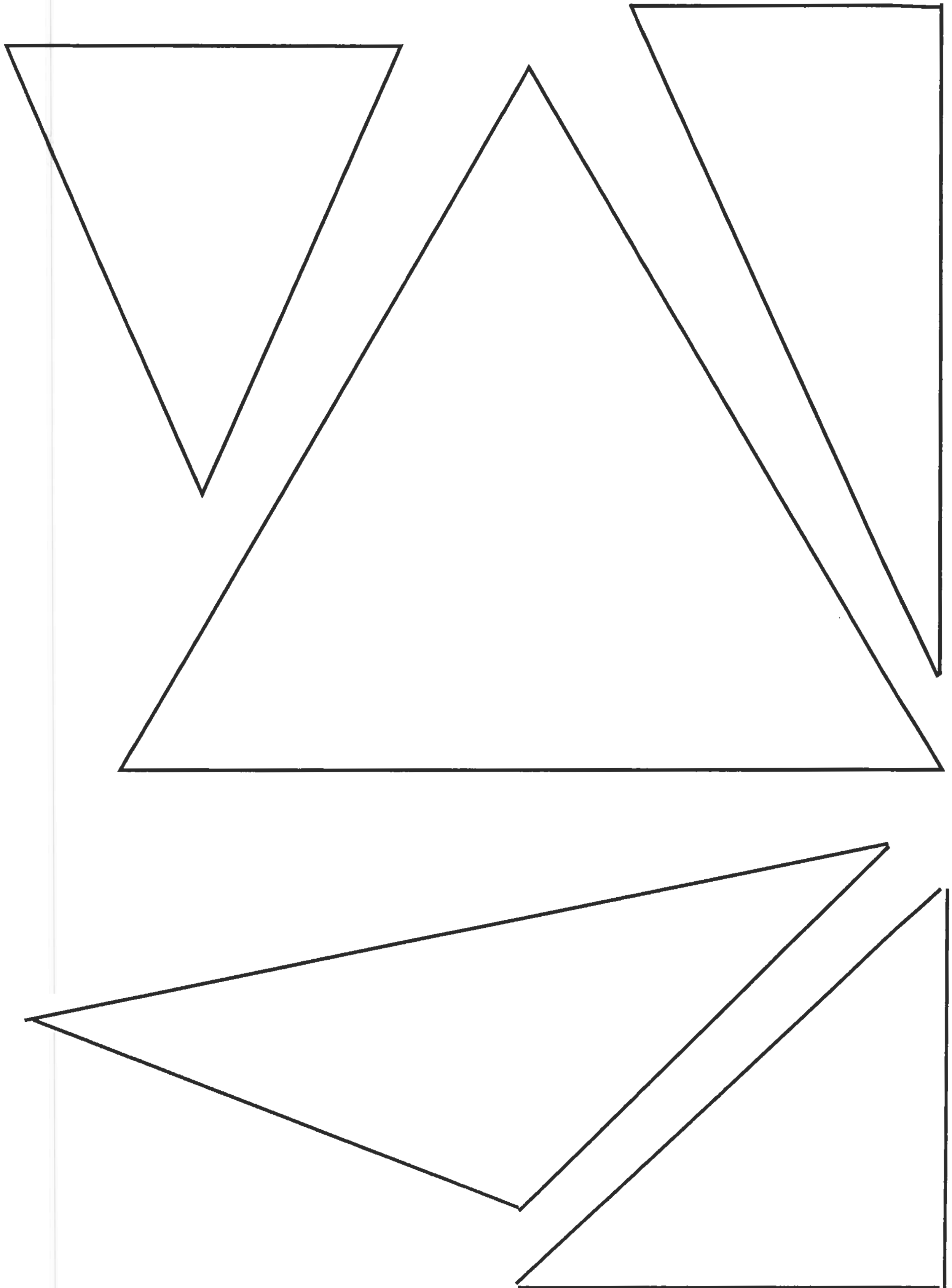


4. Draw Sammy at 2nd base but this time Reflect him to face 3rd base.
Toe (17, 18)

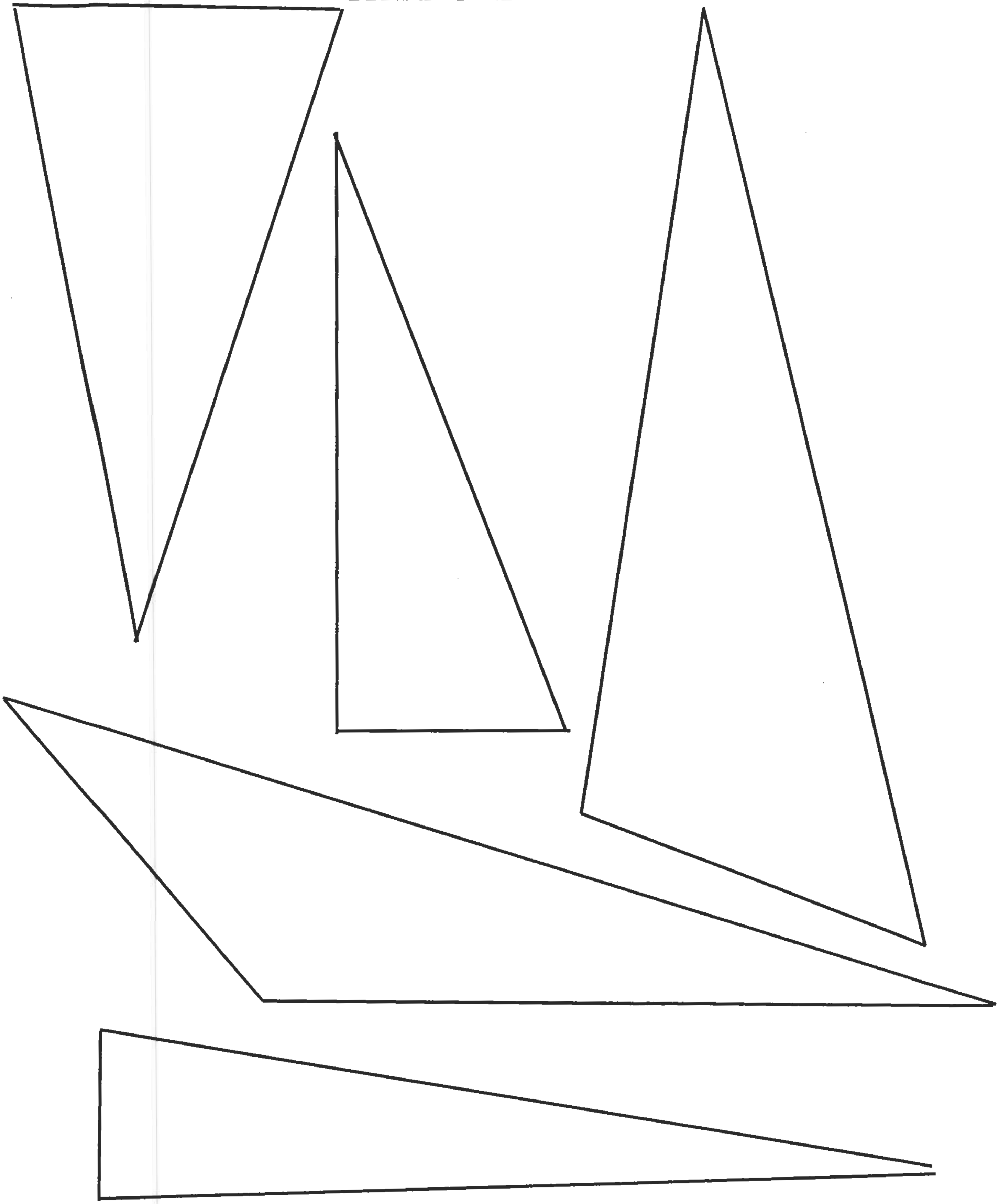
Similarity Investigations

In developing the concept of similarity, students must learn to check the proportionality of sides as well as the congruency of corresponding angle measures. In this investigation, students should cut out the triangle and quadrilateral patterns for use in determining which shapes are similar to the shapes on the similarity investigation sheet. Prompt students to compare corresponding angles by placing the angles on top of each other and to check proportionality of sides by examining how many times each side of one figure will fit on the one being investigated.

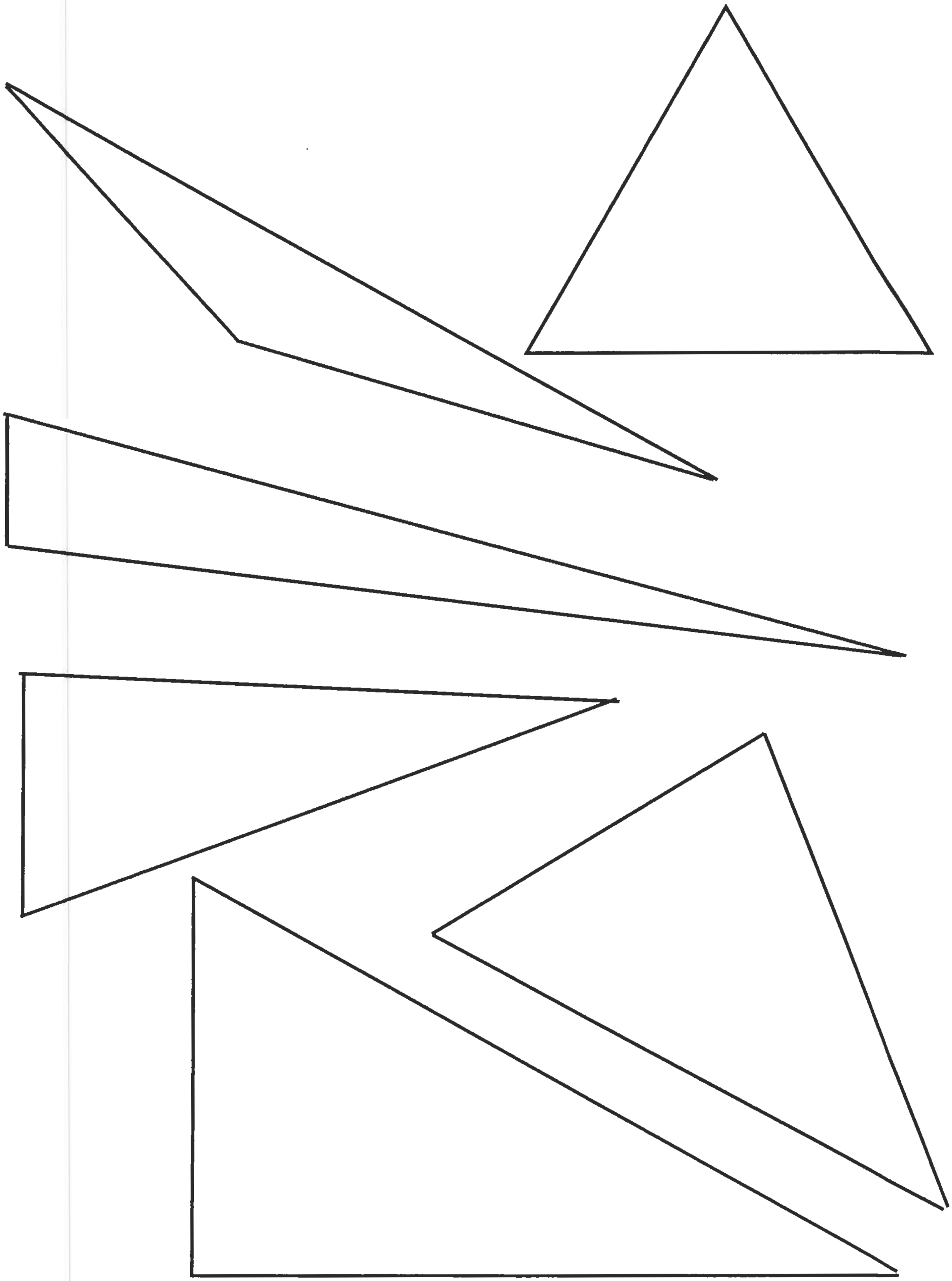
TRIANGLE PATTERNS



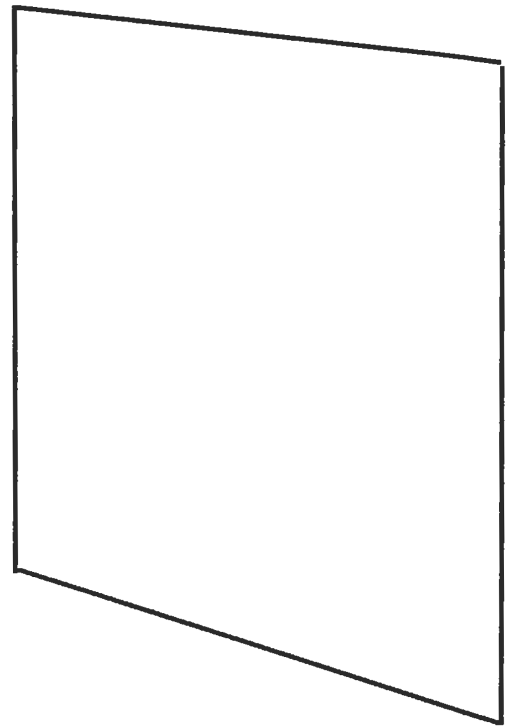
TRIANGLE PATTERNS

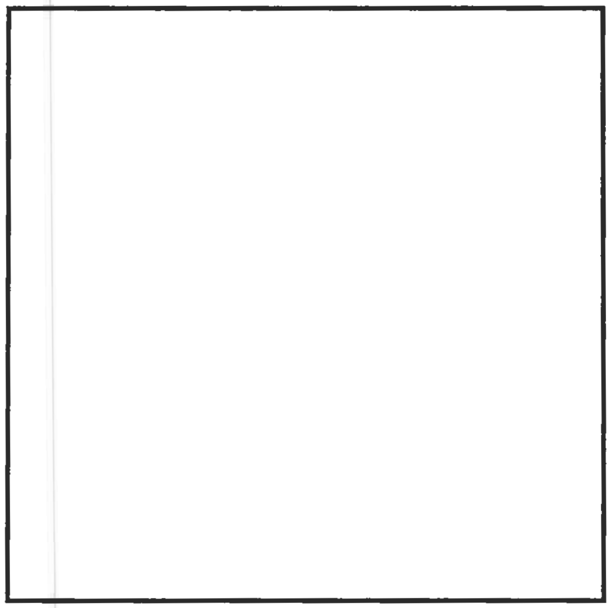


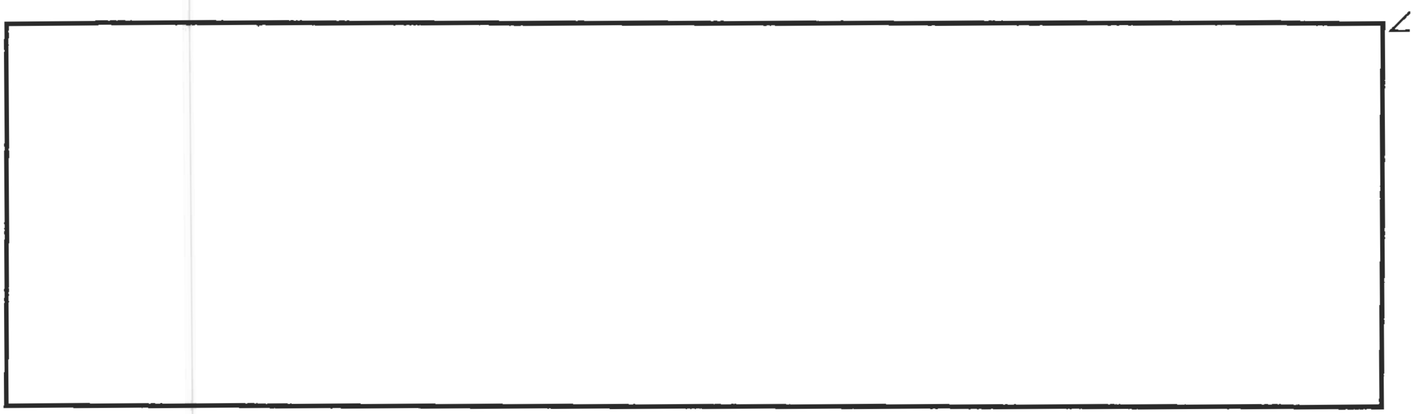
TRIANGLE PATTERNS

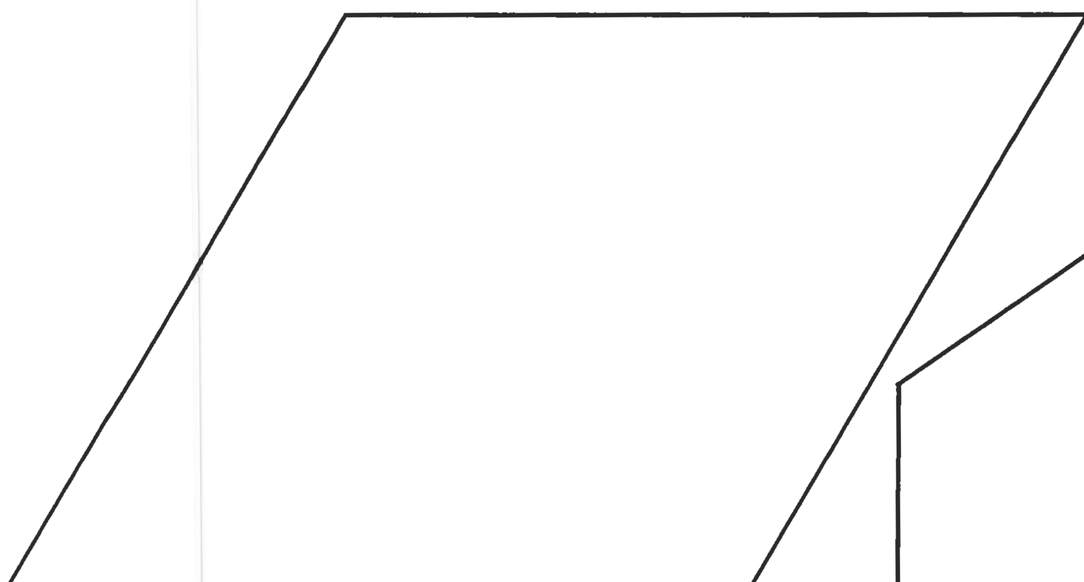


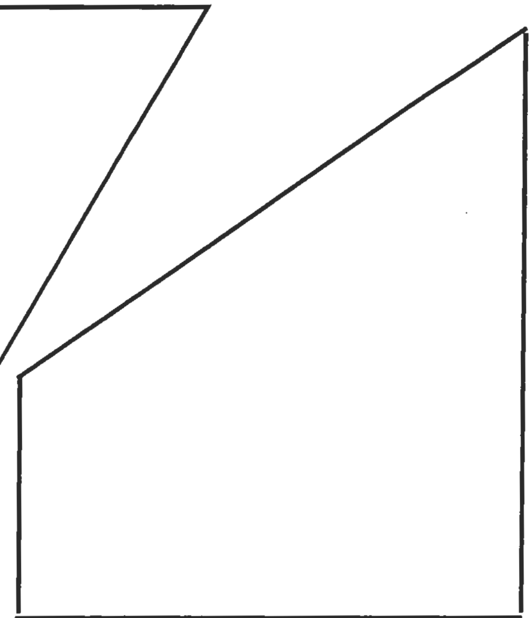
QUADRILATERAL PATTERNS











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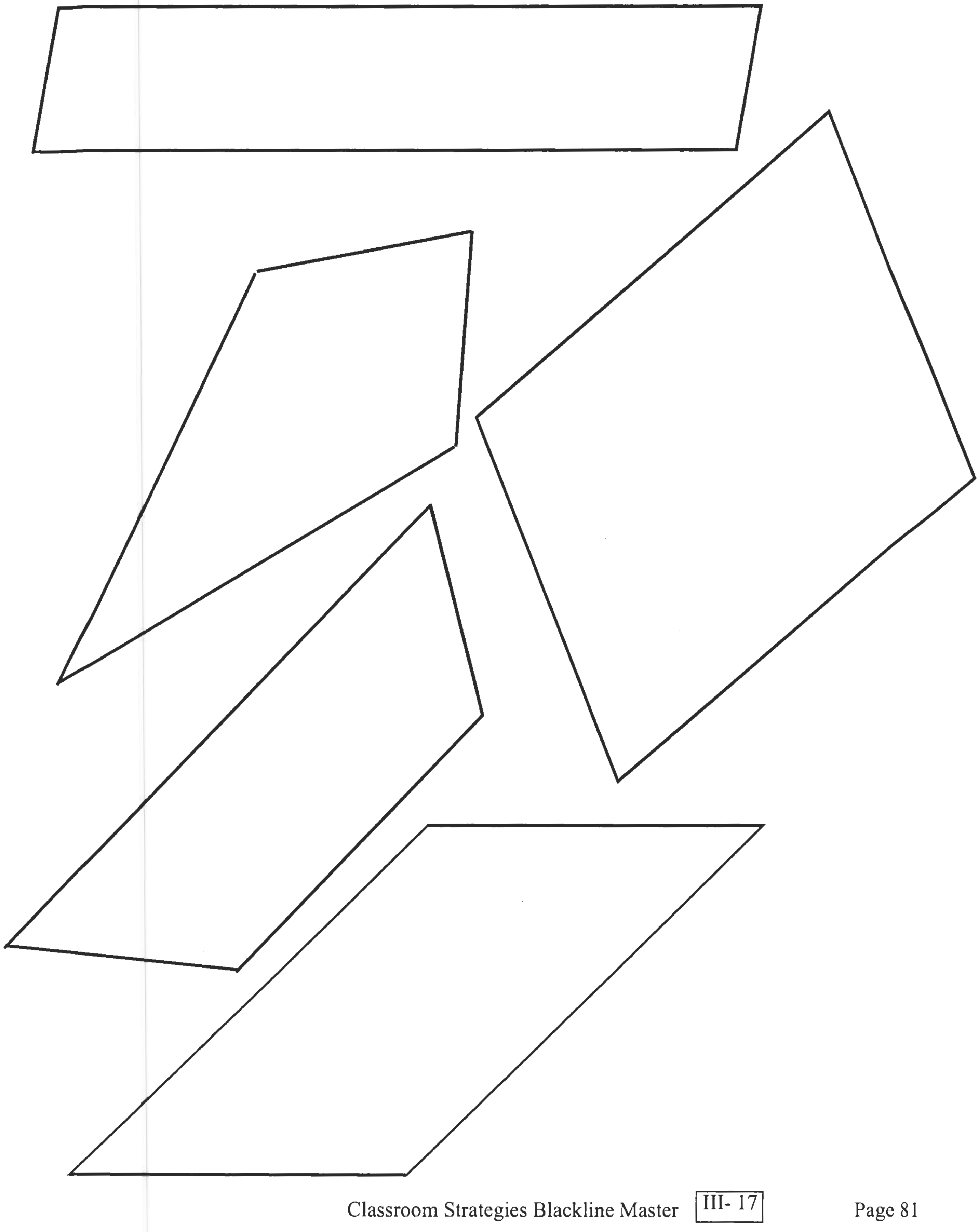

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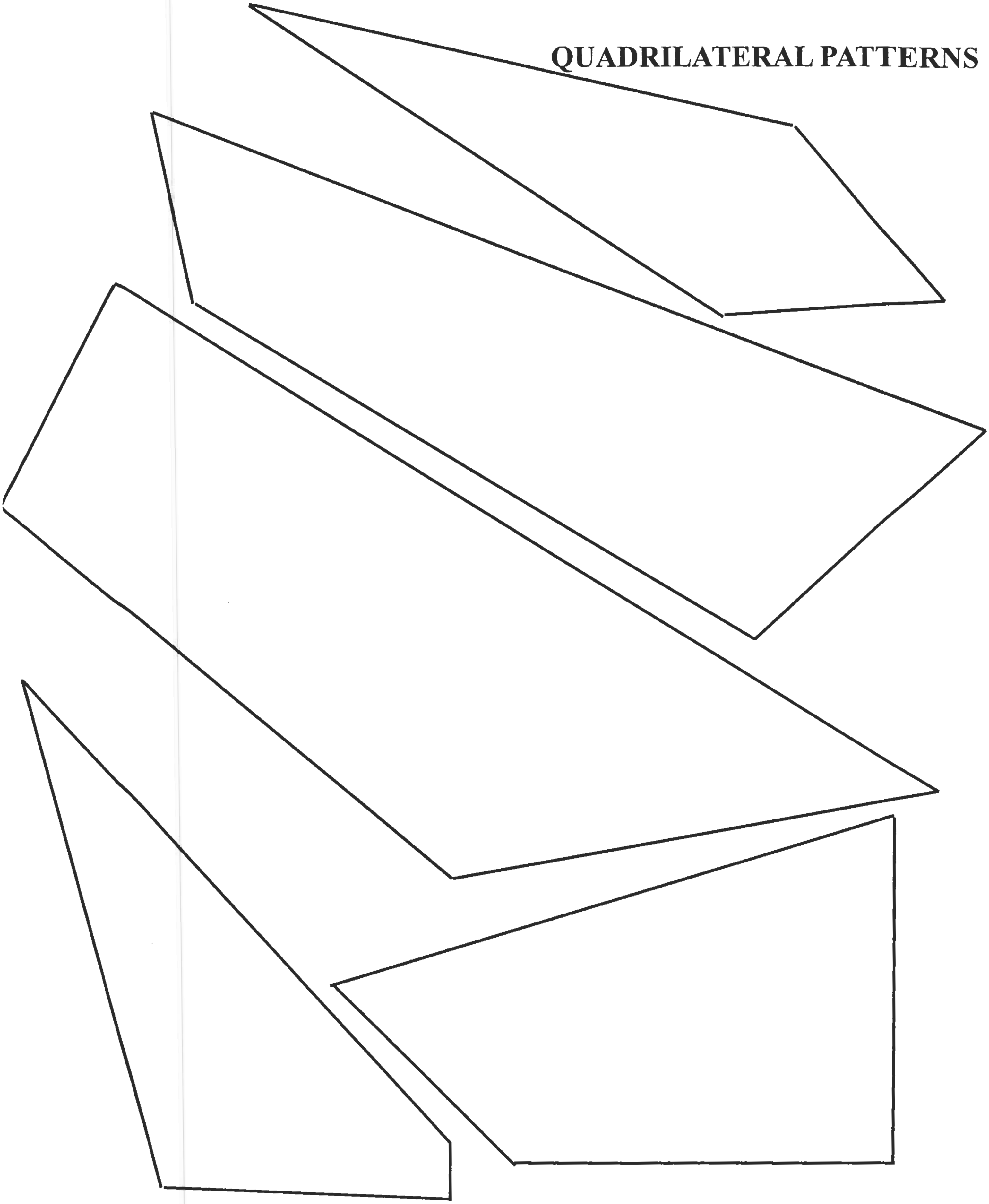
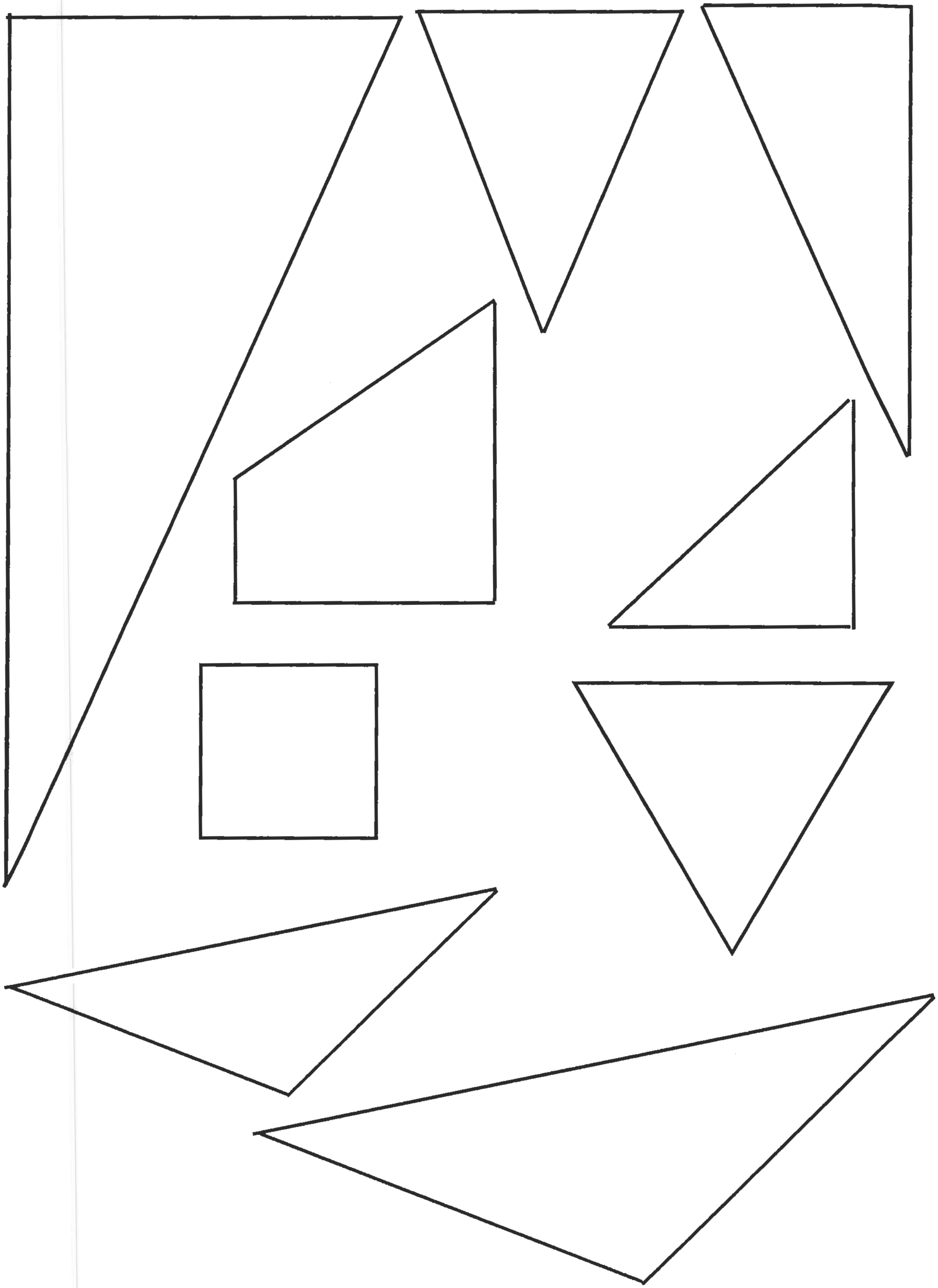
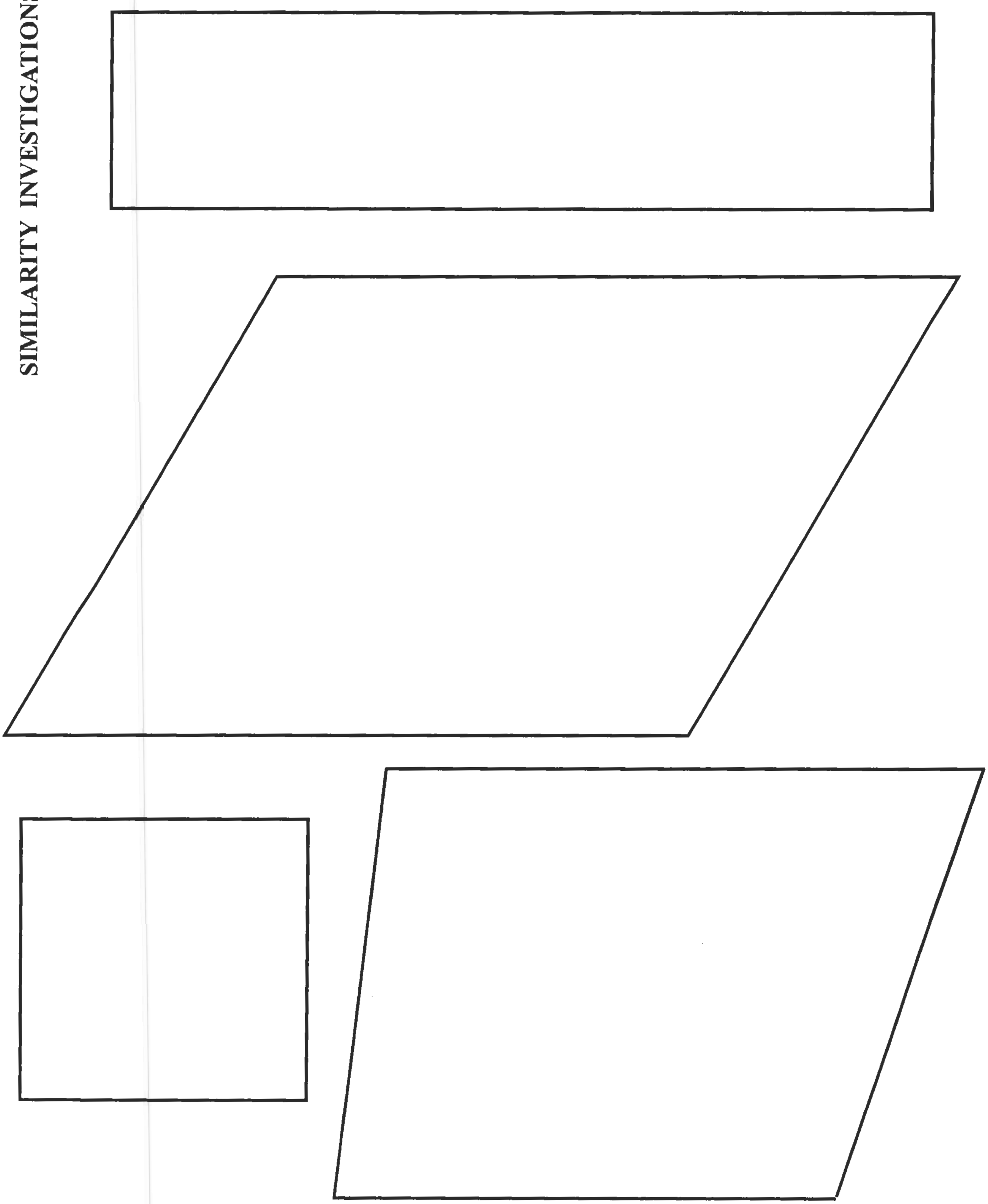


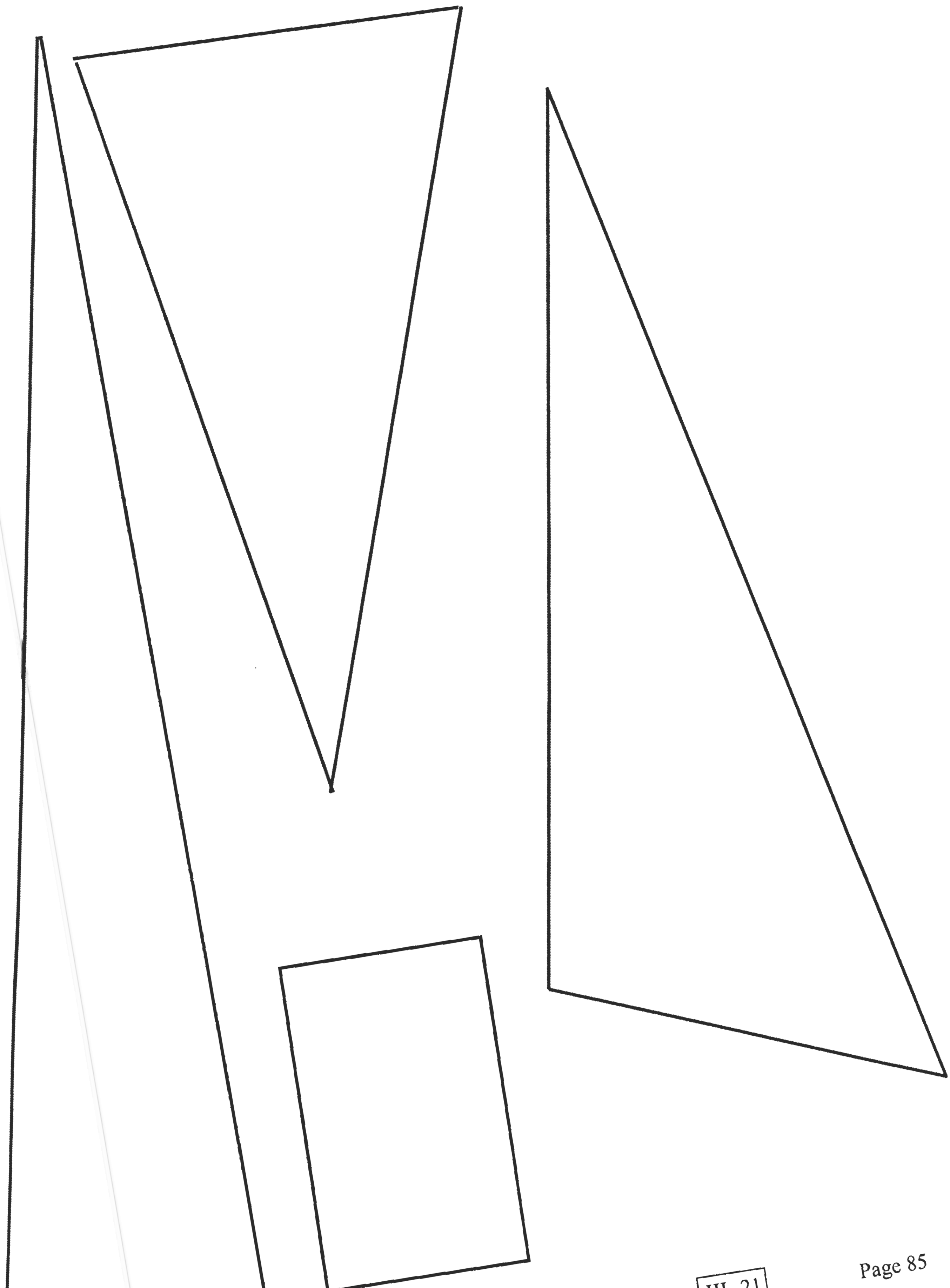
SIMILARITY INVESTIGATIONS



SIMILARITY INVESTIGATIONS



SIMILARITY INVESTIGATIONS



The Fan Club

The task is designed to allow students to develop the concept of similar figures. It is important to note that many students have the misconception that similar shapes are shapes that are the same, but different sizes. This activity should help students conclude that similar shapes have corresponding angles that are congruent and the ratio of sides are proportional.

You must set the stage for this activity by telling a story about Ann who is the president of a fan club and she only allows members in the club who are like her. The students' task is to decide which of the other characters Ann will allow in the fan club and why. The students need to calculate the coordinates of the other characters. Each character is created using Ann's coordinates as the x and y. Each character must be graphed including Ann. For discussion purposes it may be helpful for students to cut out the figures.

Name____Date________

Plotting the Fan Club

Use Ann's points and the rule for each of the other members of the fan club to get their coordinates.
Graph each member on graph paper. Connect the points as you go.

	Ann	Dan	Stan	Lan	Ran
Rule	(x,y)	(2x,2y)	(3x,y)	(3x,3y)	(2x,3y)
Point	SET 1	SET 1	SET 1	SET 1	SET 1
A	(2,0)				
B	(2,4)				
C	(0,4)				
D	(0,5)				
E	(2,5)				
F	(0,8)				
G	(0,12)				
H	(1,15)				
I	(2,12)				
J	(5,12)				
K	(6,15)				
L	(7,12)				
M	(7,8)				
N	(5,5)				
O	(7,5)				
P	(7,4)				
Q	(5,4)				
R	(5,0)				
S	(4,0)				
T	(4,3)				
U	(3,3)				
V	(3,0)				
	connect V to A	connect V to A	connect V to A	connect V to A	connect V to A

	Ann	Dan	Stan	Lan	Ran
Rule	(x,y)	(2x,2y)	(3x,y)	(3x,3y)	(2x,3y)

Point	SET 2 (start over)	SET 2 (start over)	SET 2 (start over)	SET 2 (start over)	SET 2 (start over)
W	(1,8)				
X	(2,7)				
Y	(5,7)				
Z	(6,8)				

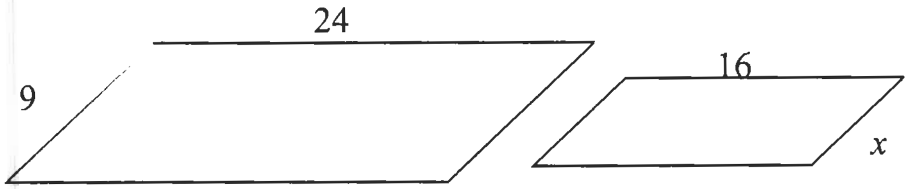
	SET 3 (start over)	SET 3 (start over)	SET 3 (start over)	SET 3 (start over)	SET 3 (start over)
AA	(3,8)				
BB	(4,8)				
CC	(4,10)				
DD	(3,10)				
connect DD to AA		connect DD to AA	connect DD to AA	connect DD to AA	connect DD to AA

	SET 4 (start over)	SET 4 (start over)	SET 4 (start over)	SET 4 (start over)	SET 4 (start over)
EE	(2,11) DOT				
FF	(5,11) DOT				

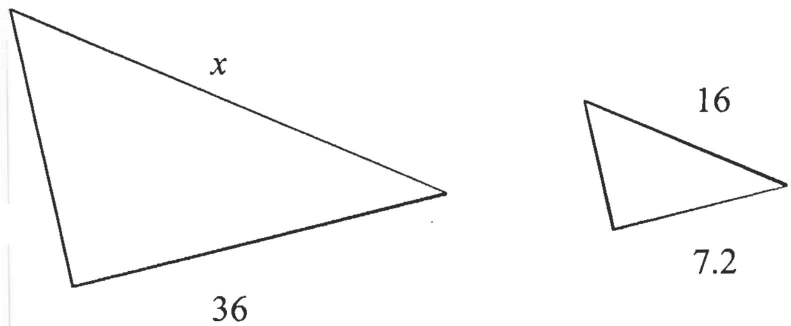
Similar Figures **Name**______________________ **Date**______________

The shapes below are similar. Find x.

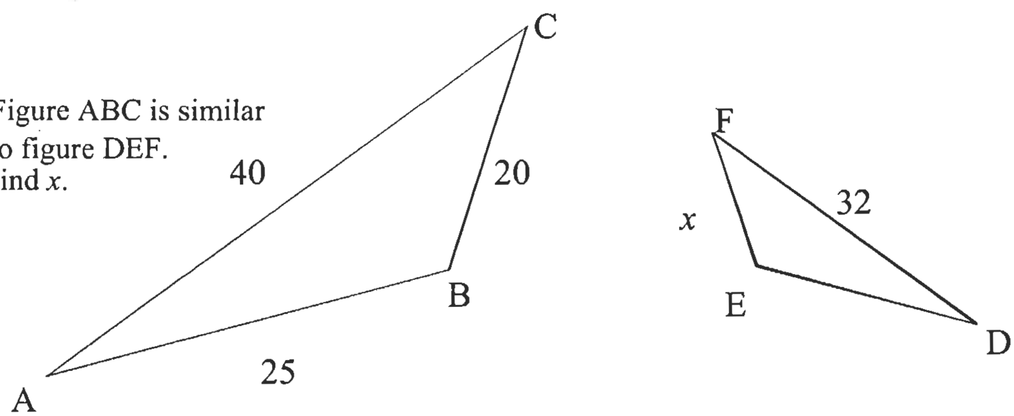
1.



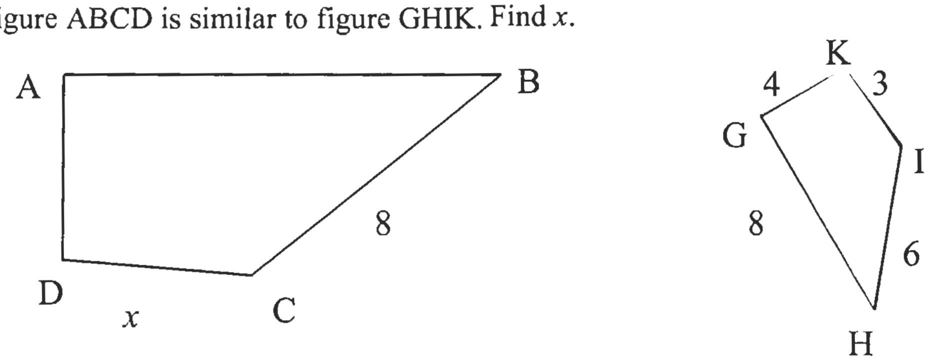
2.



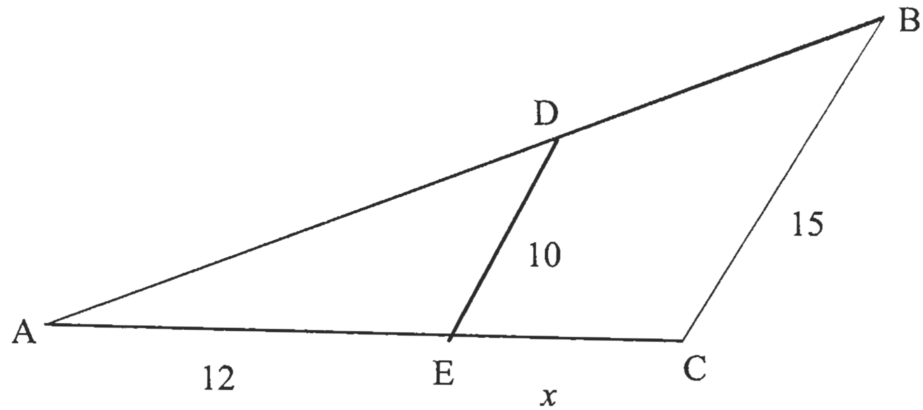
3. Figure ABC is similar to figure DEF. Find x.



4. Figure ABCD is similar to figure GHIK. Find x.



5. Figure ABC is similar to figure ADE. Find x.



6. Figure ABCD is similar to figure AGHI. Find x.