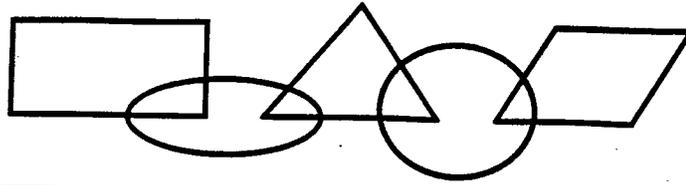


# Durham Math Olympics

BRAIN  
TEASERS #2



School: .....

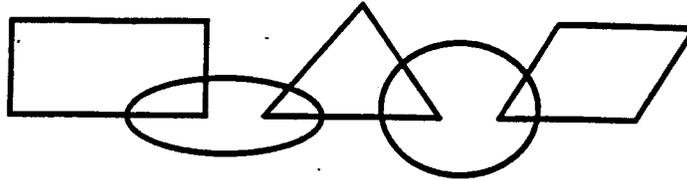
Score: .....

Team Members: .....

1	A watch loses 1 second every 12 hours. At this rate, how many weeks will it be before the watch loses 10 minutes?	Answer:
2	If $m=4$ , find the value of the expression: $(m-1)(m-2)(m-3)(m-4)$	Answer:
3	What is the least possible value of the product of two numbers that are selected from the following group: -11, -7, -3, 2, 6, 8	Answer:
4	A man has \$1.15 made up of 6 American coins (penny, nickel, dime, quarter, half dollar) With these coins, however, he cannot make change of a dollar, nor half dollar, quarter, dime, or nickel. Which 6 coins does he have?	Answer:
5	From Monday to Friday, John sleeps 6 hours each night. On the remaining two nights, he gets half as much sleep as he gets for the first five nights. The total number of hours of sleep he gets in the full week is: (A) 75 (B) 45 (C) 42 (D) 36 (E) 33	Answer:
6	Each of the equal sides of an isosceles triangle is 5 cm longer than the third side. The perimeter of the triangle is 31 cm. The length of each equal side in cm is: (A) 7 (B) 12 (C) 13 (D) 21 (E) 26	Answer:
7	Students sold 42 pizzas in 3 hours. How many pizzas could they sell in 5 hours?	Answer:
8	If $3n-2=16$ , find the value of the following expression: $(3n)(2n-3)$	Answer:
9	Erin's age, when divided by 2,3,4,5 or 6 gives a remainder of 1. Erin's age could be: (A) 21 (B) 31 (C) 41 (D) 51 (E) 61	Answer:
10	While waiting for the school bus, Sally plays a counting game. After taking two steps forward, she must take one step backward. She wishes to reach a tree which is seven steps away from her. Using this rule, the least number of steps she must take to reach the tree is: (A) 10 (B) 11 (C) 12 (D) 17 (E) 21	Answer:

# Durham Math Olympics

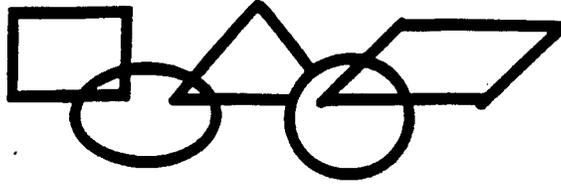
BRAIN  
TEASERS #1



School: ..... Score: .....  
 Team Members: .....  
 .....

1	A ladder, 5m long, is leaning against a wall 12m high. The foot of the ladder is 3m from the base of the wall. The distance, in meters, from the top of the ladder to the top of the wall is: (A) 4 (B) 7 (C) 8 (D) 9 (E) 10	Answer:
2	If the pattern at the right is continued, the number of letters in the "K" column will be: (A) 10 (B) 11 (C) 19 (D) 21 (E) 23	Answer:
3	Sales of baseball gloves at a local store totaled \$473. If each glove sold for the same price and if the price is an exact number of dollars, what was the the number of gloves sold?	Answer:
4	In triangle ABC, angle A is $120^\circ$ and angle B is five times angle C. Find the number of degrees in angle C.	Answer:
5	The answer to $8036-4712$ is closest to: (A) 2000 (B) 3000 (C) 4000 (D) 12 000 (E) 13 000	Answer:
6	By folding the strip of paper on the dotted lines, different numbers can be created. A number which cannot be created by folding the strip is: (A) 125 (B) 356 (C) 238 (D) 258 (E) 147	Answer:
7	"Baker's Dozen" doughnuts are sold only in boxes of 7, 13, 25. To buy 14 doughnuts you must order two boxes of 7 but you cannot buy exactly 15 since no combination of boxes contains 15 doughnuts. The largest number of doughnuts which you cannot order is: (A) 47 (B) 36 (C) 57 (D) 44 (E) 52	Answer:
8	The area of the country called SSUAG is $850\,000\text{ km}^2$ . Two hundred million people live there. Of the answers given, the best approximation of the number of people per square kilometer is: (A) 0.004 (B) 20 (C) 400 (D) 200 (E) 2000	Answer:
9	Find the value of $1^4 + 2^3 + 3^2$	Answer:
10	An isosceles triangle has sides that measure 10 cm and 3 cm. Find the perimeter of the triangle.	Answer:

# Durham Math Olympics



School: ..... Score: .....  
Team Members: .....

*with permission from  
the College*

## NUMBERS ACTIVITY



Instructions:

- Use each of the tiles numbered 0 to 9 once each to solve each of the problems one by one.
- Once you have placed all ten tiles correctly in one problem, remove them and record the answers on the sheet. Proceed to the next problem.
- You will receive one mark for each correctly placed tile.

1

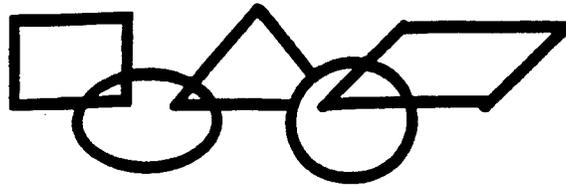
$$12 - (11 - 2) = \square$$

$$\square \times \square - \square = 22$$

$$\square \times (\square - \square) = 56$$

$$\square - \square \times \square = 4$$

# Durham Math Olympics



School: ..... Score: .....  
Team Members: .....

## NUMBERS ACTIVITY



Instructions:

- Use each of the tiles numbered 0 to 9 once each to solve each of the problems one by one.
- Once you have placed all ten tiles correctly in one problem, remove them and record the answers on the sheet. Proceed to the next problem.
- You will receive one mark for each correctly placed tile.

2

$$6 \times 8 \div \square - 10 = 2$$

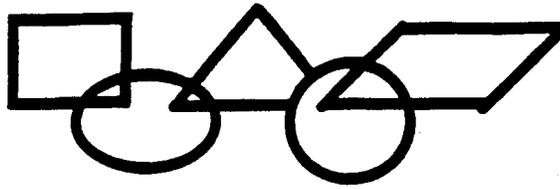
$$2 \times 6 \div \square - 4 = \square$$

$$\square \div 3 + \square \div 4 = 5$$

$$(\square + \square + \square) \div \square = 7$$

$$32 \div 8 \div 2 + 15 \div 5 = \square$$

# Durham Math Olympics



School: ..... Score: .....

Team Members: .....

## NUMBERS ACTIVITY

#3

### Instructions:

- Use each of the tiles numbered 0 to 9 once each to solve each of the problems one by one.
- Once you have placed all ten tiles correctly in one problem, remove them and record the answers on the sheet. Proceed to the next problem.
- You will receive one mark for each correctly placed tile.

③  $(-2) (-6) + 8 =$ 

--	--

$3 \times (-2) + 10 =$ 

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--

 $\times$  ( 

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 $-$ 

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 )  $= 8$

--

 $-$ 

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 $\times$ 

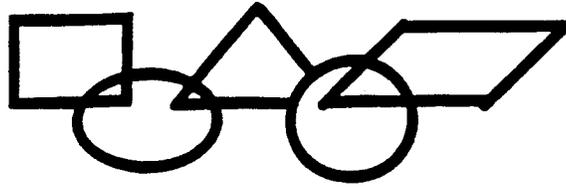
--

 $= -6$

$7 - 4 \times 2 = -$ 

--

# Durham Math Olympics



School: ..... Score: .....

Team Members: .....

## NUMBERS ACTIVITY



Instructions:

- Use each of the tiles numbered 0 to 9 once each to solve each of the problems one by one.
- Once you have placed all ten tiles correctly in one problem, remove them and record the answers on the sheet. Proceed to the next problem.
- You will receive one mark for each correctly placed tile.

4

$$\square^2 = \square \square$$

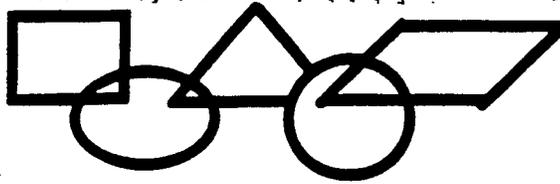
$$2^3 + \square = \square \square$$

$$2 \times \square^2 = 72$$

$$\square^2 + 8 = \square$$

$$(5^2 - 3^2) \div (5 - 3)^3 = \square$$

# Durham Math Olympics



School: .....

Score: .....

Team Members: .....

## NUMBERS ACTIVITY #5

### Instructions:

- Use each of the tiles numbered 0 to 9 once each to solve each of the problems one by one.
- Once you have placed all ten tiles correctly in one problem, remove them and record the answers on the sheet. Proceed to the next problem.
- You will receive one mark for each correctly placed tile.

5

$$6 + 5 \times (-1) = \square$$

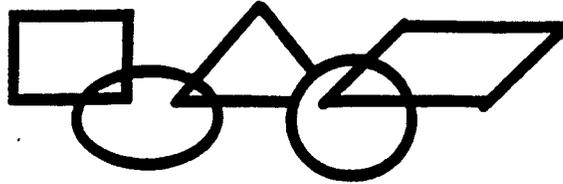
$$(-9)^2 - 1 = \square \square$$

$$\square \times (\square - \square) = -45$$

$$\square - \square \times \square = -17$$

$$4 - 2 \times (-1)^9 = \square$$

# Durham Math Olympics



School: ..... Score: .....  
Team Members: .....

## NUMBERS ACTIVITY # 6

Instructions:

- Use each of the tiles numbered 0 to 9 once each to solve each of the problems one by one.
- Once you have placed all ten tiles correctly in one problem, remove them and record the answers on the sheet. Proceed to the next problem.
- You will receive one mark for each correctly placed tile.

⑥  $-2 - (1 - 5) = \square$

$$40 \div (-2) \times (-3) = \square \square$$

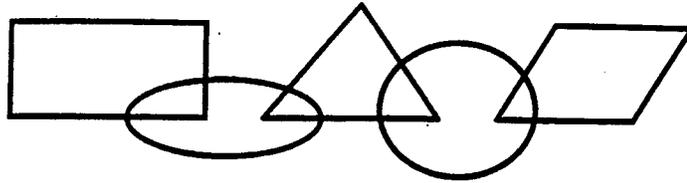
$$\square \times (\square - \square) = -48$$

$$\square - \square \times \square = -13$$

$$(-2)^5 \div (-2)^2 + (-3)^2 = \square$$

# Durham Math Olympics

3-D  
MODELS #1



School: .....

Score: .....

Team Members: .....

.....  
.....

Using the three views:

a) build each model

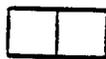
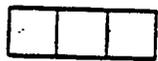
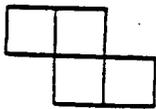
b) find the surface area of each model

TOP

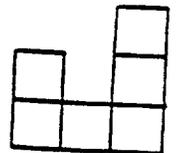
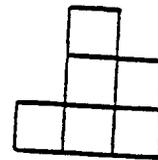
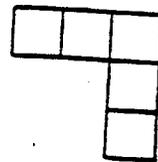
FRONT

SIDE

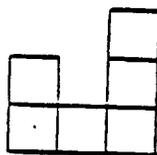
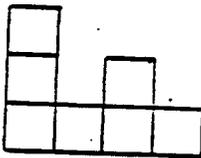
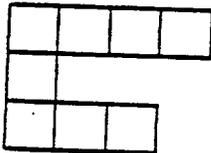
1.



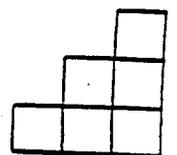
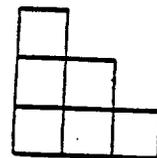
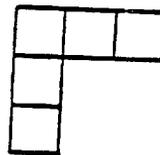
2.



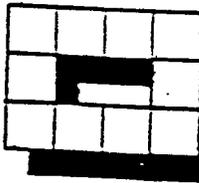
3.



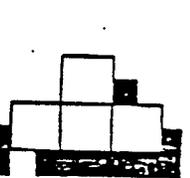
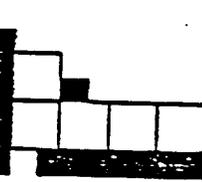
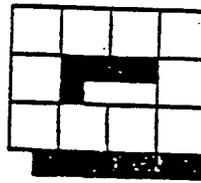
4.



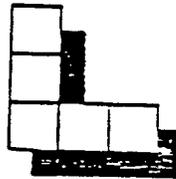
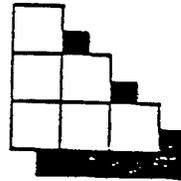
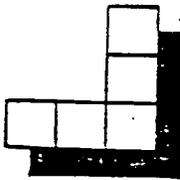
5.



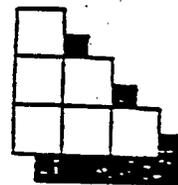
6.

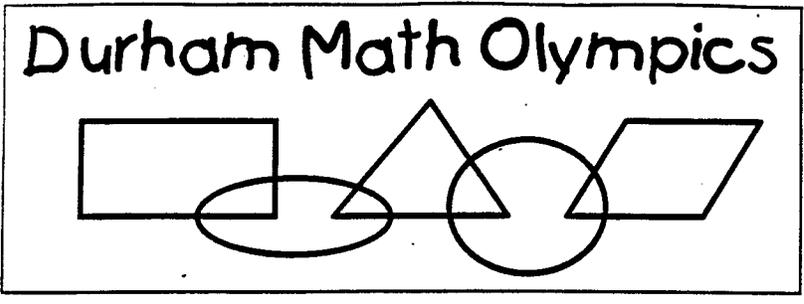


7.



8.



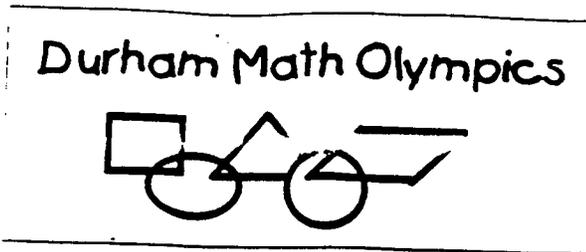


3-D  
MODELS #2

School: ..... Score: .....  
Team Members: .....  
.....

Behind the screen there is a 3-D model.

1. Pick one of your members to be the **observer**.
2. The observer goes to the screen and looks at the model.
3. While at the screen, the observer uses the space below to complete the **TOP**, **FRONT** and **BACK** sketches of the model.
4. The observer goes back to their group and gives the sketches made to the other members.
5. The observer is **not allowed** to communicate in any other way with her/his group.
6. The other members of the group use the observer's sketches to:
  - a) build the model
  - b) find the surface area of the model



School: ..... Score: .....  
 Team Members: .....

## 3-D Puzzles activity

Four 3-dimensional puzzles (numbered 1 to 4) will be hidden, in turn, at the observation stations.

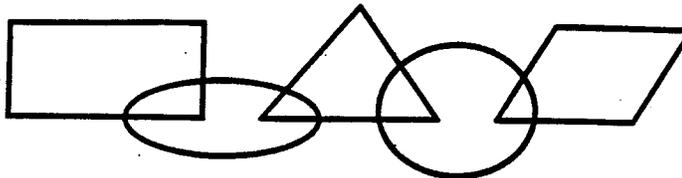
***For each puzzle:***

1. your team has **7 minutes** to reproduce the **3-D Puzzle** out of the materials available at your work station
2. if you touch the puzzle after the 7 minutes are up, your puzzle will be disqualified
3. select an **observer** (write their name in the table below) and send the observer to the station with this sheet
4. the observer shows this sheet to the observation station *monitor* who will place a check mark in the table below to record each visit
5. the observer examines the puzzle carefully (without touching it), returns to the team and provides a verbal description of the puzzle
6. an observer is not allowed to touch the team's puzzle pieces
7. the observer is allowed to visit the observation a maximum of 2 times
8. different members are allowed to become observers for different puzzles

3-D Puzzle	Name of Observer	Visits to Observation Station (1 check mark per visit to a maximum of 2)	Score
# 1			/ 5
# 2			/ 5
# 3			/ 5
# 4			/ 5

# Durham Math Olympics

PUZZLES #2



School: .....

Score: .....

Team Members: .....

For each set, circle the item that does not belong:

①

$1/3, 2/3$	$1/2, 1/2$
$3/4, 1/4$	$2/4, 1/2$
$2/3, 3/2$	$2/8, 3/4$

②

$1/2, 2/3$	$1/4, 3/4$
$8/7, 7/8$	$2/3, 5/3$
$1/4, 1/2$	$4/6, 5/6$

③

$3/2, 1/2$	$5/3, 1/3$
$5/4, 1/4$	$7/6, 1/6$
$7/5, 2/5$	$5/3, 2/3$

④

$4/5, 4/10$	$1/3, 3/9$
$2/4, 3/6$	$5/10, 4/8$
$3/5, 6/10$	$2/7, 6/21$

⑤

$40%$	$4:10$	$2:5$
$0.4$	$8/20$	
$5/2$	$0.40$	$10/40$

⑥

$1.5$	$20%$	$1/5$
$2:10$	$0.2$	$0.20$
	$1:5$	$3/15$

⑦

$(3,2)$	$(4,2)$
$(0,2)$	$(1,2)$
$(4,4)$	$(2,2)$

⑧

$(2,4)$	$(0,0)$
$(5,15)$	$(1,3)$
	$(3,9)$
	$(4,12)$
	$(6,18)$

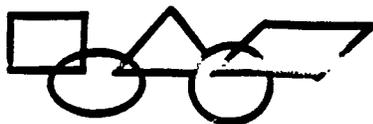
⑨

$(5,3)$	$(6,4)$
$(3,2)$	$(2,0)$
$(9,7)$	$(4,2)$
	$(3,1)$

⑩

$(3,3)$	$(5,8)$
$(6,9)$	$(4,7)$
$(1,4)$	$(9,12)$
	$(0,3)$

# Durham Math Olympics



School: ..... Score: .....

Team Members: .....

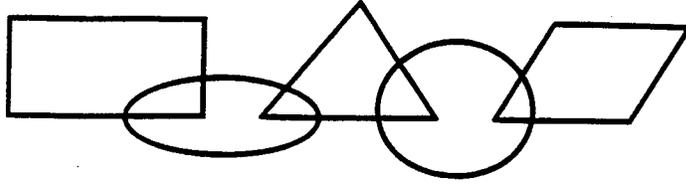
1. Calculate 15% of 225.
2. Calculate  $2\frac{7}{8} \div 1\frac{5}{9}$ .
3. The softball coach recorded the following distances of hits at a practice: 30m, 110m, 90m, 87m, 57m, 101m, 28m, 82m, 77m. Calculate the range of these distances.
4. Calculate  $12 + (-2) - 3$ .
5. Sandy earns 3% commission on each pair of shoes she sells. Find her commission for selling \$398 worth of shoes.
6. A cheetah's top speed over a short distance is 90 km/h. How long would it take the cheetah to cover 500m at top speed?
7. Calculate  $\frac{3 + 18 \div 6}{3 \times 7 \div 7}$ .
8. It takes three hours for two towels hanging on a clothes line to dry. How long before six towels dry?
9. If it takes twelve one-cent stamps to make a dozen, how many three-cent stamps to make a dozen?
10. How much is 5 times one-fifth of 9325615474?
11. Find the next three numbers in the sequence: 6, 9, 12, 15
12. Find the next three numbers in the sequence: 1, 4, 9, 16
13. What is the sum of  $1+2+3+4 \dots + 98+99$  ?
14. Eight people attended a party. If each person shook hands with each other person only once, how many handshakes were there in all?
15. Which is the largest amount? \$45.36, \$45 63, \$45 60, \$45.66
16. Add  $45+33+15+22+27+28$ .
17. If  $m=4$ , find the value of  $(m-1)(m-2)(m-3)(m-4)$ .
18. If  $ab=12$  and  $a+b=7$ , find the values of  $a$  &  $b$ .
19. If  $3x-2=16$ , find the value of  $2x-12$ .
20. A car travels 5 km in 3 minutes. At this rate, how far will it travel in 2 hours?

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.
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12.
13.
14.
15.
16.
17.
18.
19.
20.



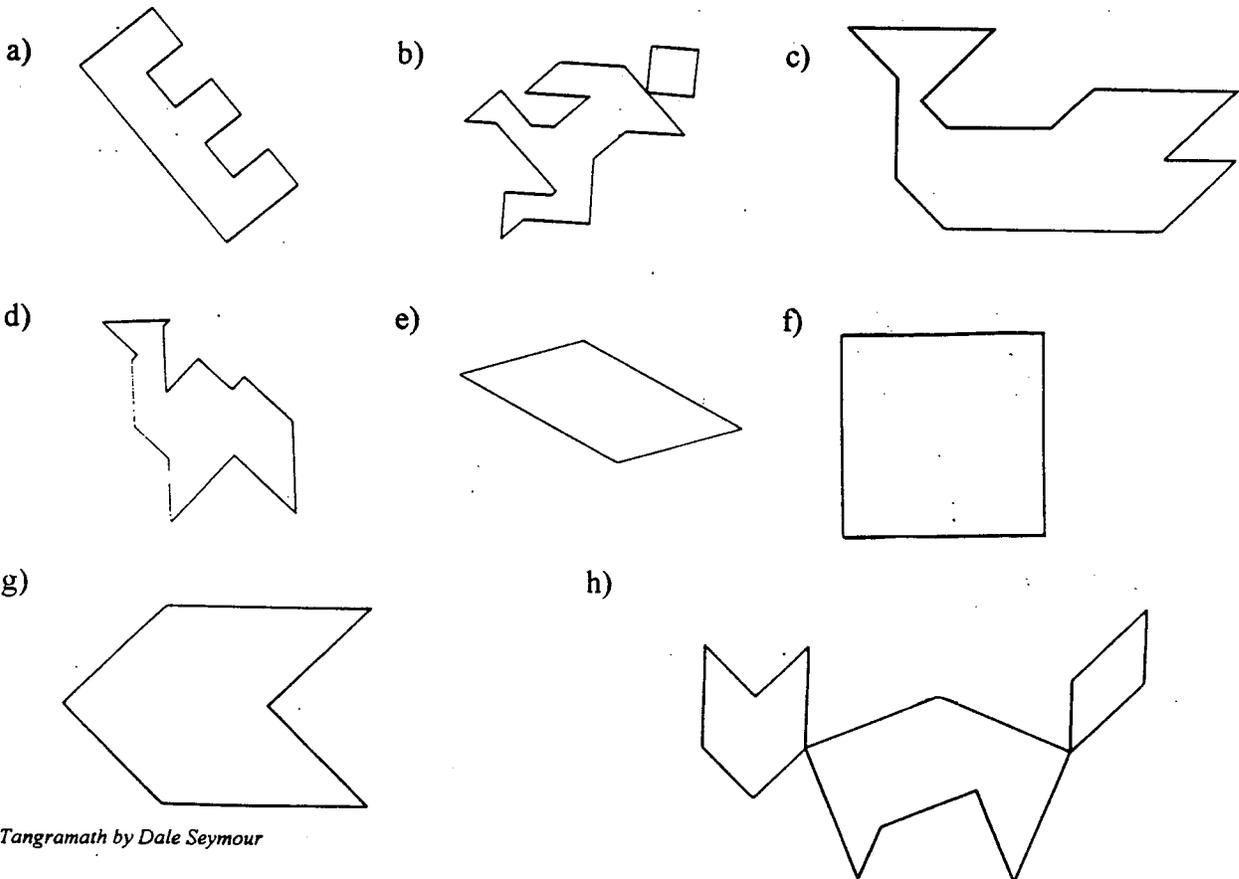
# Durham Math Olympics

TANGRAMS

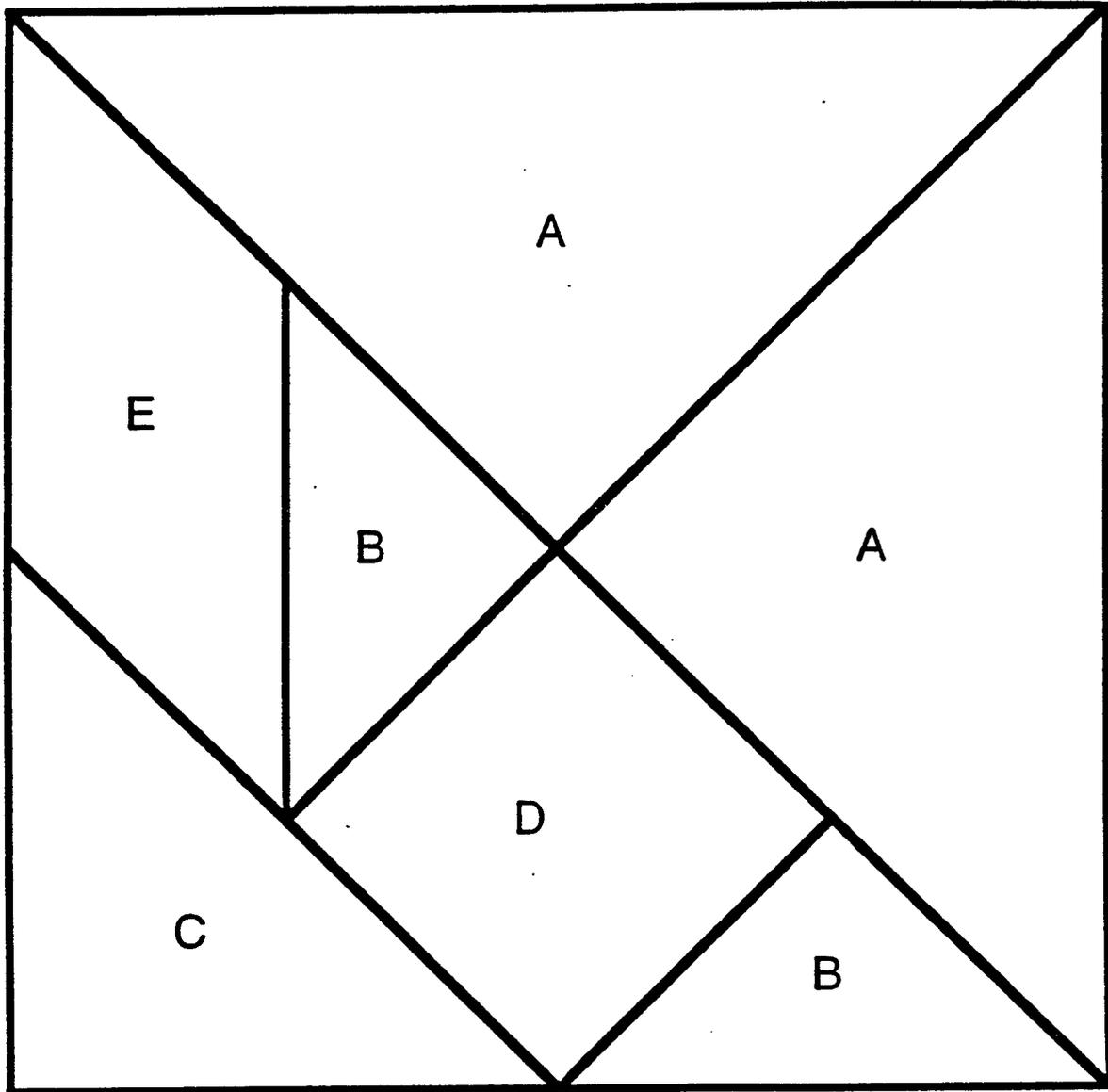


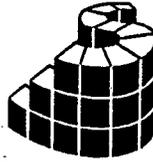
School: ..... Score: .....  
Team Members: .....  
.....

- /2 1. Use the four triangular pieces to make:  
a) a square b) a parallelogram c) a trapezoid d) a triangle
- /2 2. Use all seven tangram pieces, except for the two large triangles to make:  
a) a triangle b) a rectangle (not a square) c) a parallelogram d) a trapezoid
- /2 3. Use two triangles and a parallelogram (not a square) to make:  
a) a rectangle b) a triangle c) a trapezoid d) two different parallelograms
- /2 4. Use two triangles, a square and a parallelogram to make:  
a) a rectangle b) a parallelogram c) a pentagon d) a hexagon
- /2 5. Use three triangles to make:  
a) a square b) a triangle c) a parallelogram d) a trapezoid
- /2 6. Use two triangles and a square to make:  
a) a rectangle b) a triangle c) a parallelogram d) a trapezoid
- /8 7. Use all seven tangram pieces to create each of the following shapes:



# TANGRAM





Scarborough  
Board of  
Education

*Meeting The Challenge*

## SCARBOROUGH MATHEMATICS OLYMPICS

# Event #1 - Two Person

A circle of greatest area is cut out of a 4 metre square of material. If the circle is kept, how much material is discarded?

A square of greatest area is then cut out of the circle. If the new square is kept, how much material is discarded?

What is the total area of discarded material?

**STUDENT NAME**

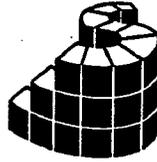
**SCHOOL**

**SCORE**

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*Meeting The Challenge*

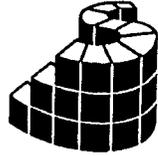
## SCARBOROUGH MATHEMATICS OLYMPICS

# Warm up Exercise 2

When placing each of the digits 2, 4, 5, 6, and 9 in exactly one of the boxes in this subtraction problem, what is the smallest difference possible?

$$\begin{array}{r} \square \square \square \\ - \square \square \\ \hline \end{array}$$





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Education

*Meeting The Challenge*

# **SCARBOROUGH MATHEMATICS OLYMPICS**

## **Event #2 Individual Competition**

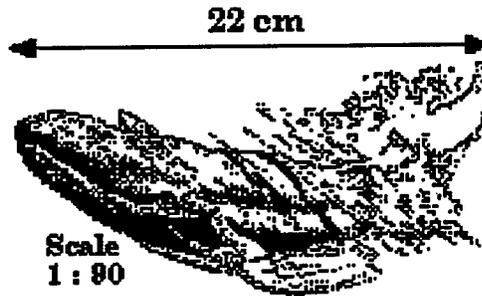
**You have 45 minutes to complete this written competition. All solutions must appear on the accompanying answer sheet. No rough work will be included in your mark.**

**There are 26 questions in this section. Please check to make sure that you have a complete contest paper.**



1.  
Express 360 as a product of its prime factors.

2.  
Find the length of the whale in metres.



3.  
The GO schedule says that a train arrives at Union Station at 21:42. What is the time of day expressed in terms of a twelve hour clock?

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A jar contains approximately 2000 jelly beans. In a sample of 150 jelly beans from the jar,  $\frac{2}{15}$  of them are purple. How many purple jelly beans would you expect to find in the whole jar?

5.  
If the pattern in the table is continued, which of the following expressions should be written in the shaded box?

1	2
2	5
3	10
4	17
•	•
•	•
$n$	

A)  $n + 1$

B)  $2n - 1$

C)  $n^2 - 1$

D)  $n^2 + 1$



6. Which of the following values could represent the area of a square if the length of a side is to be a whole number?

- A)  $18 \text{ cm}^2$  B)  $44 \text{ mm}^2$  C)  $125 \text{ cm}^2$  D)  $99 \text{ m}^2$  E)  $81 \text{ mm}^2$

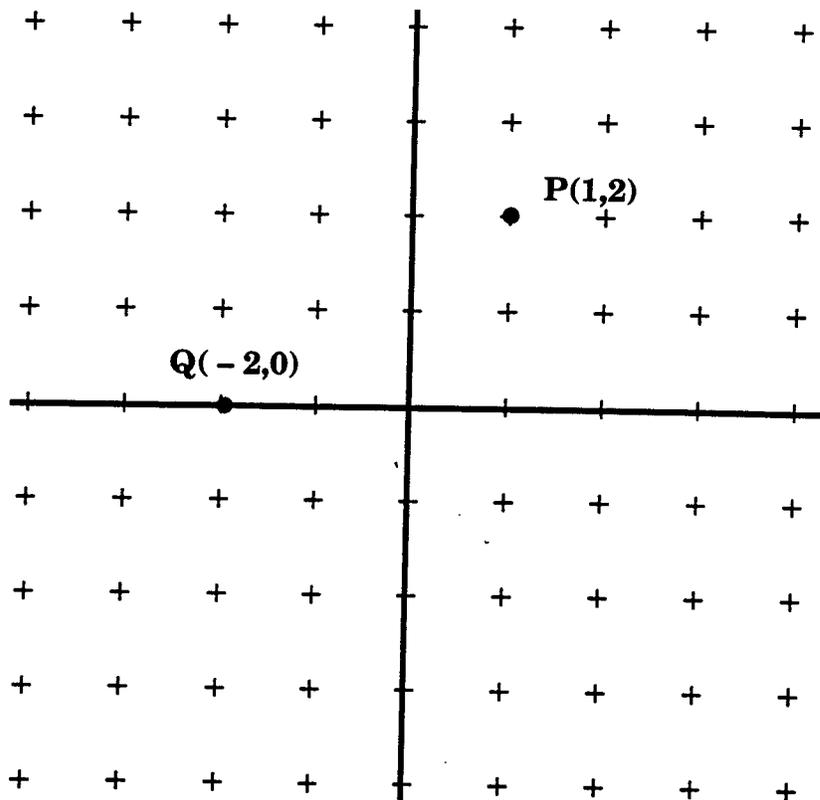
7. The perimeter of a square dance floor is 33.6 m. What is the area?

8. In a circle,  $\pi$  is the ratio of

- A) radius to circumference
- B) circumference to radius
- C) diameter to circumference
- D) circumference to diameter

9. Find the coordinates of a point R so that

- i)  $\triangle PQR$  is an isosceles triangle **AND**
- ii) the x-axis is a line of symmetry of the triangle.

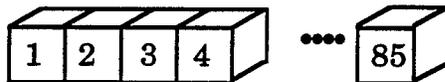




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In what shape(s) will the diagonals **ALWAYS** be congruent?

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The areas of three faces of a rectangular solid are 54, 72, and 108 square centimetres. Find the whole number measures of the edges.

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Find how many phone numbers can be made under the following conditions: (first digit cannot be 0 or 1 because you will get the operator or long distance.)

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- e) The sixth digit is 2.



17.  
Match the pattern with its folded figure.

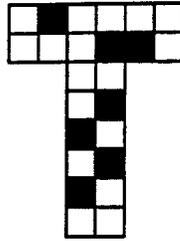


Fig (A)



Fig (B)

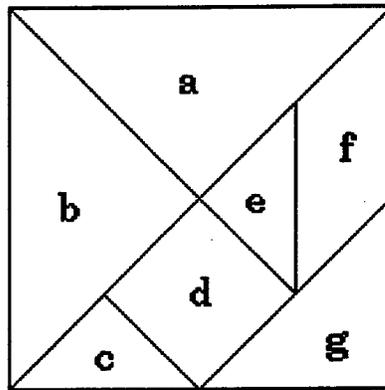


Fig (C)



Fig (D)

18.  
A tangram is an ancient Chinese puzzle in which a square is cut into seven pieces: five triangles, one square, and one parallelogram. If the area of the entire tangram is 1 square unit, what is the area of piece f?



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Adjoin to the digits 739 \_\_\_ \_\_\_ \_\_\_ three more digits so that the resulting number is divisible by 6, 7, 8, and 9.

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After I spilled ink, my paper looked like this. There is no use crying over spilled ink, however it is possible to restore the lost numbers. Rewrite the statement as it appeared before the accident.

18 books each at  
a cost of \$ 93

will cost me a total  
amount of \$3 2.7





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Three cubes of volumes 1, 8, and 27 are glued together at their faces. What is the smallest possible surface area of the resulting configuration?

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A speaker was so boring that one-half of the audience left after a few minutes. Five minutes later, one-third of the remaining audience left. Ten minutes later, one-fourth of those remaining left, leaving only 9 people in the audience. How many people were in the audience at the beginning?

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Suppose that you have a square piece of paper on which you draw the largest possible circle. You cut out the circle and discard the leftover scraps of paper. Inside the circle you draw the largest possible square, cut it out, and discard the leftover scraps of paper. How much of the area of the original square remains?

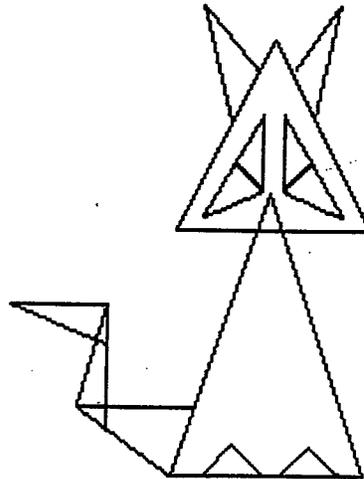
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A farmer is taking eggs to the market to sell. The eggs are in a cart that holds up to 500 eggs. If the eggs are removed from the cart, 2, 3, 4, 5, or 6 at a time, one egg is always left over. If the eggs are removed 7 at a time, no eggs are left over. How many eggs are in the cart?

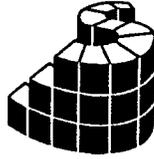
25. A game begins between 6:00 p.m. and 7:00 p.m., and ends between 9:00 p.m. and 10:00 p.m. The minute and hour hand have exchanged places. When does the game start and end?

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How many triangles are contained in the figure?







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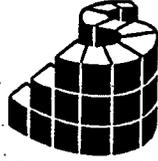
# **SCARBOROUGH MATHEMATICS OLYMPICS**

## **Event #2 Individual Competition**

**You have 45 minutes to complete this written competition. All solutions must appear on the accompanying answer sheet. No rough work will be included in your mark.**

**There are 26 questions in this section. Please check to make sure that you have a complete contest paper.**





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## SCARBOROUGH MATHEMATICS OLYMPICS

# Event #1 - Two Person

A circle of greatest area is cut out of a 4 metre square of material. If the circle is kept, how much material is discarded?

A square of greatest area is then cut out of the circle. If the new square is kept, how much material is discarded?

What is the total area of discarded material?

**STUDENT NAME**

**SCHOOL**

**SCORE**

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## SCARBOROUGH MATHEMATICS OLYMPICS

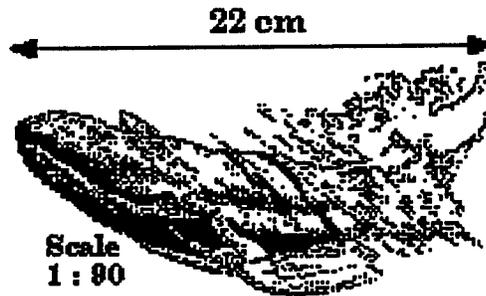
# Warm up Exercise 2

When placing each of the digits 2, 4, 5, 6, and 9 in exactly one of the boxes in this subtraction problem, what is the smallest difference possible?

$$\begin{array}{r} \square \square \square \\ - \quad \square \square \\ \hline \end{array}$$

1.  
Express 360 as a product of its prime factors.

2.  
Find the length of the whale in metres.



3.  
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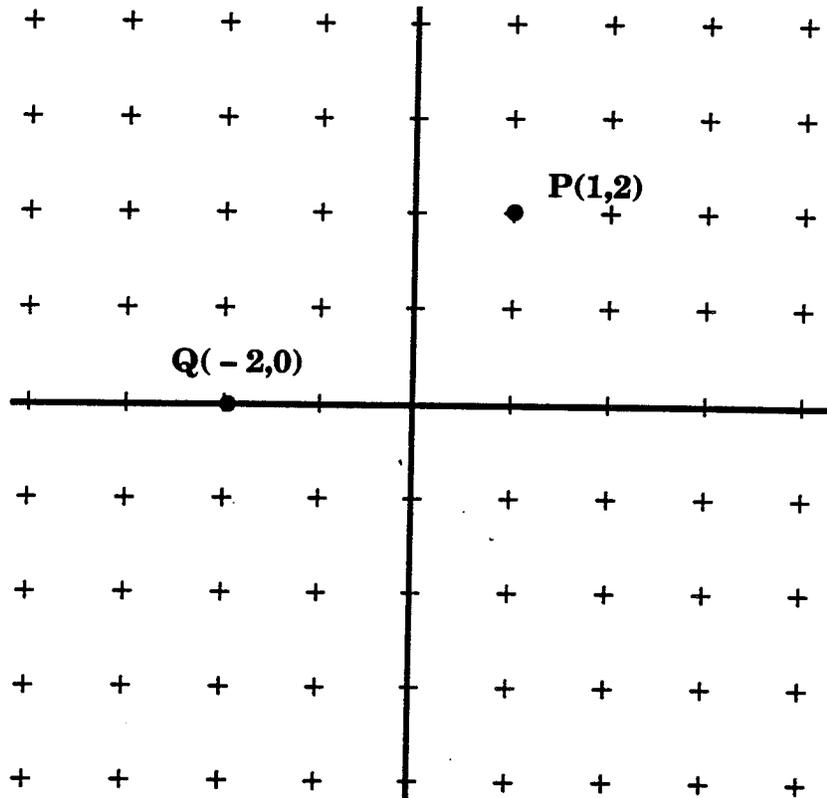
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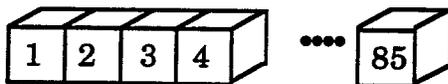
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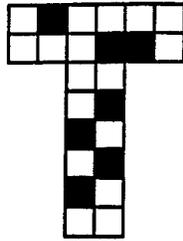


Fig (A)



Fig (B)

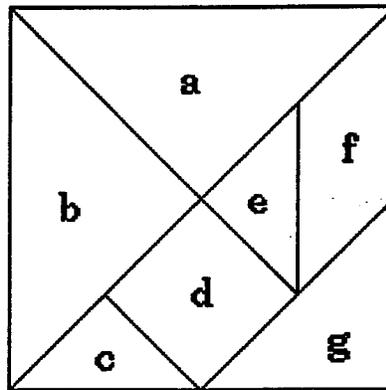


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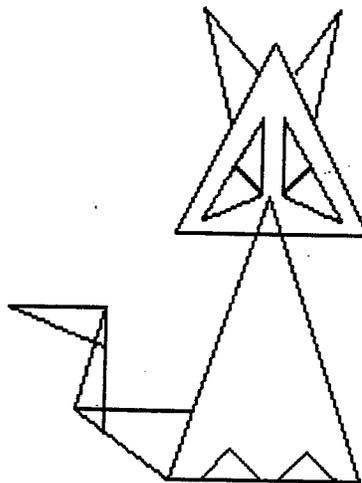
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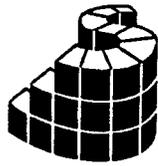
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How many triangles are contained in the figure?







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# **SCARBOROUGH MATHEMATICS OLYMPICS**

## **Event #2 Individual Competition**

**You have 45 minutes to complete this written competition. All solutions must appear on the accompanying answer sheet. No rough work will be included in your mark.**

**There are 25 questions in this section. Please check to make sure that you have a complete contest paper.**



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Education

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# SCARBOROUGH MATHEMATICS OLYMPICS

## Event #2 Individual Competition Answer Sheet

NAME \_\_\_\_\_

SCHOOL \_\_\_\_\_

Question      Answer

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

4. \_\_\_\_\_

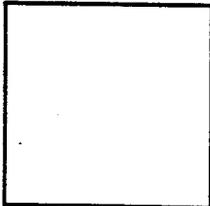
5. \_\_\_\_\_

6. \_\_\_\_\_

7. \_\_\_\_\_

8. \_\_\_\_\_

9. \_\_\_\_\_

10. 

11. \_\_\_\_\_

12. \_\_\_\_\_

13. \_\_\_\_\_

Question      Answer

14. \_\_\_\_\_

15. \_\_\_\_\_

16. \_\_\_\_\_

17. \_\_\_\_\_

18. \_\_\_\_\_

19. \_\_\_\_\_

20. \_\_\_\_\_

21. \_\_\_\_\_

22. \_\_\_\_\_

23. \_\_\_\_\_

24. \_\_\_\_\_

25. \_\_\_\_\_

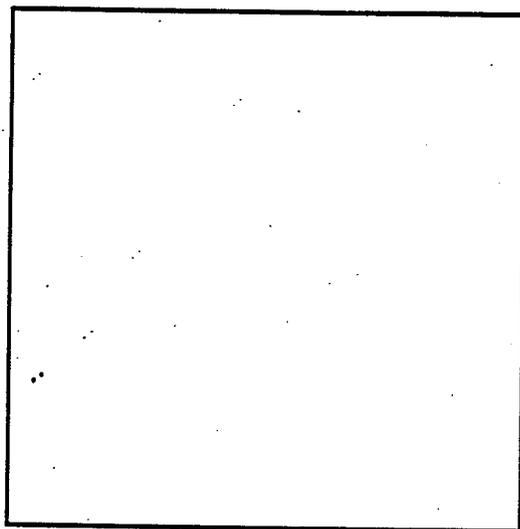
1. How much does a fish weigh, if its tail weighs 4 kg, its head weighs as much as its tail and half its body, and its body weighs as much as its head and tail together?
2. How many positive fractions in simplest form have denominators of 36?
3. Suppose that the dates for this year are written in the form:  
Month Number, Day Number, 97  
without spacing. Which day this year will be a palindrome?
4. Complete this square of numbers:

1	2	3	4
2	5	10	17
3	10	25	52
4	17	52	?

5. The operation @ is defined as  $a @ b = a^2 + 3b$ . Find four pairs of natural numbers such that  $a @ b = 37$ .
6. All the corners were sliced off a cube whose sides were 12 centimetres long. Triangular faces are located where the cube's vertices were. Each triangle is equilateral with 5 centimetre sides. Determine the total number of edges on the new solid.
7. How can you have \$2 in nickels, dimes, and quarters, with the same number of each coin?
8. Bo paints three flowers in four minutes. At this rate, in how many minutes can he paint five flowers?

9. Arrange the four numbers 2,3,4 and 5, along with one plus sign (+) and one equals sign (=), into a valid mathematical equation.

10. Decide where to place a mirror upright on a square to produce an octagonal image.

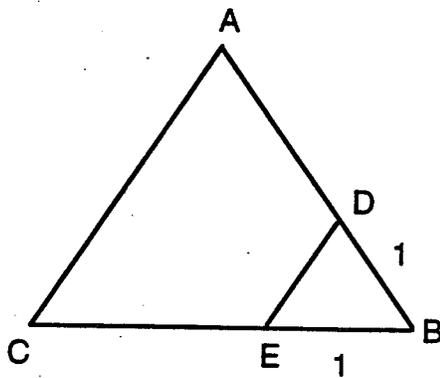


11. The number 33 is a multiple of 11 and leaves a remainder of 1 upon division by 4. Find the next largest integer that is a multiple of 11 and that leaves a remainder of 1 upon division by 4.

12. Suppose that by using the spare tire on her car as much as she uses the other four tires, Coleen drives the car 80 000 km. What is the wear, in km, on each tire?

13. A man on a horse is one kilometre south of a stream that flows due east. He is also one kilometre north and seven kilometres west of his barn. He wants to take his horse to the stream for a drink then return him to the barn. What is the shortest distance he might travel? Express your answer to the nearest metre.

14. As shown in the figure, a triangular corner with side lengths  $DB = EB = 1$  is cut from the equilateral triangle  $ABC$  of side length 3. What is the perimeter of the remaining quadrilateral?



15. A number is chosen at random from the following set:

{0.25, 0.5, 0.75, 0.8, 1, 2, 2.2, 3, 4, 9.7}.

What is the probability that its reciprocal is greater than 1?

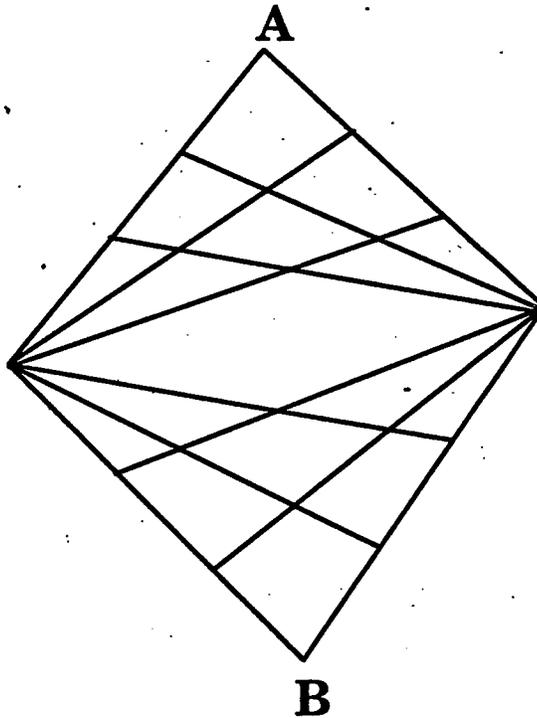
16. If  $x * y = \sqrt{xy}$ , find  $(3 * 48) * 9$ .

17. If each edge of a cube is increased by 50%, what is the percent of increase of the surface area of the cube?

18. In the 6 digit-number,  $2834tu$ ,  $t$  is the tens digit and  $u$  is the units digit. If  $2834tu$  is divisible by 45, find the possible values for  $t$  and  $u$ .

19. All of the ice in a cooler is melted. The cooler has rectangular faces and is 16 inches high. When the cooler is tilted, the water just covers one end face, but only three-fourths of the bottom face. What is the depth of the water when the cooler is made level again?

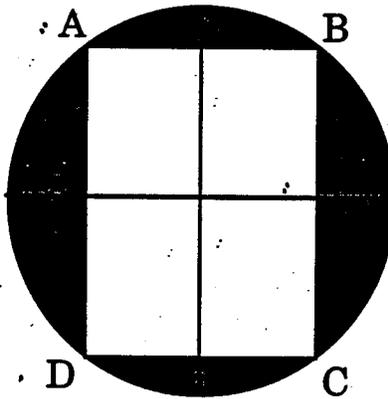
20. If only downward motion is allowed, determine the total number of paths which go from A to B in this figure.



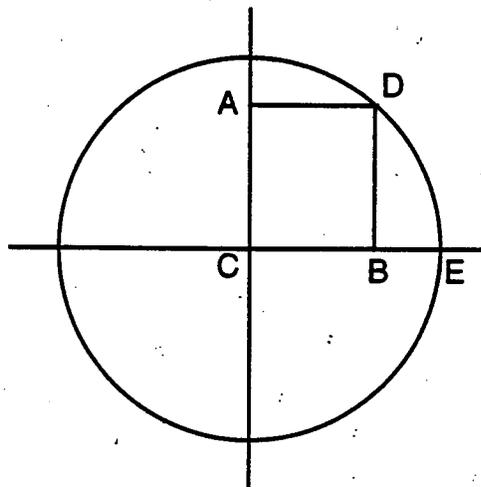
21. Suppose that  $n^*$  means  $1/n$ , the reciprocal of  $n$ . For example,  $5^* = 1/5$ . Which of the following statements are true?

- i)  $3^* + 6^* = 9^*$       ii)  $6^* - 4^* = 2^*$       iii)  $2^* \times 6^* = 12^*$       iv)  $10^* + 2^* = 5^*$

22. ABCD is a rectangle, with A, B, C and D points on the circle. If  $AD = 8$  and  $CD = 6$ , the the area of the shaded region is between which two consecutive integers?

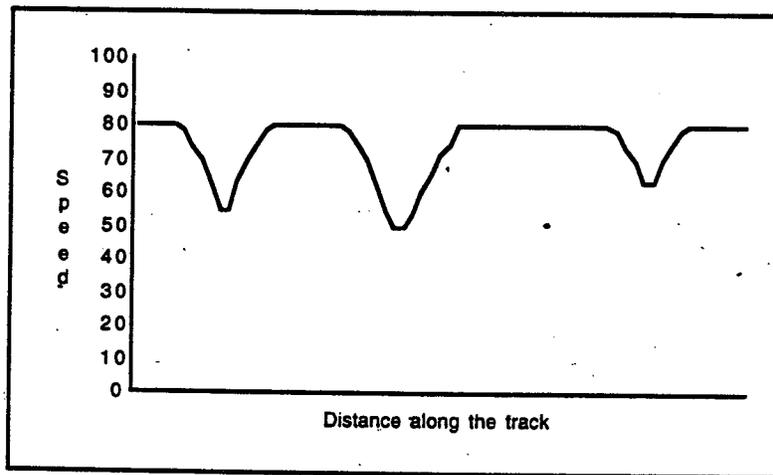


23. What is the length of line segment AB in this circle? ABCD is a rectangle, C is the centre of the circle, and radius EC is 10 cm long.

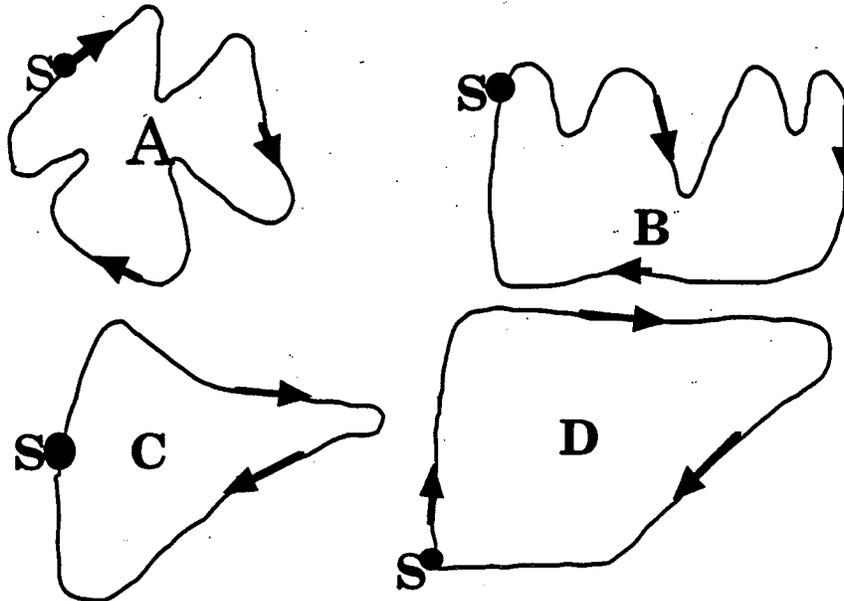


24. A cube has edges of length 10 cm. If a fly lands on a vertex and then walks along just the edges, what is the greatest distance the fly could walk before coming to a vertex a second time and without retracing an edge?

25. The graph below shows how the speed of a racing car varies during the second lap of a race.



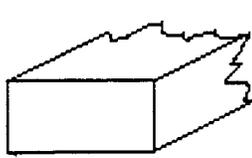
Which of the circuits was it going around? S = starting point.



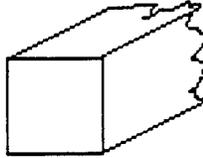


26.

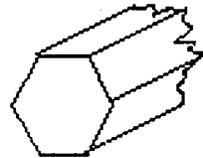
Four lengths of sheet metal, each with a width of 360 mm, are folded to make pipes having cross sections with the same perimeter, one rectangular 60 mm x 120 mm, one square, one hexagonal, and one circular. Which cross section of pipe will allow for the greatest flow of water? Why?



A



B



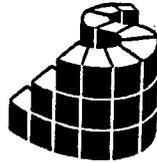
C



D







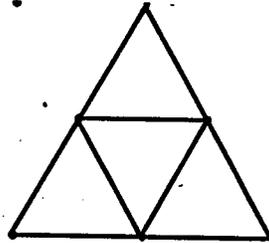
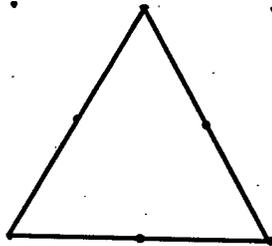
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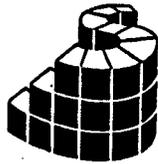
## SCARBOROUGH MATHEMATICS OLYMPICS

# Event #3 - Two Person

The following equilateral triangle has been dissected into four congruent equilateral triangles.



Using the isometric dot paper provided, dissect an equilateral triangle into six congruent triangles.

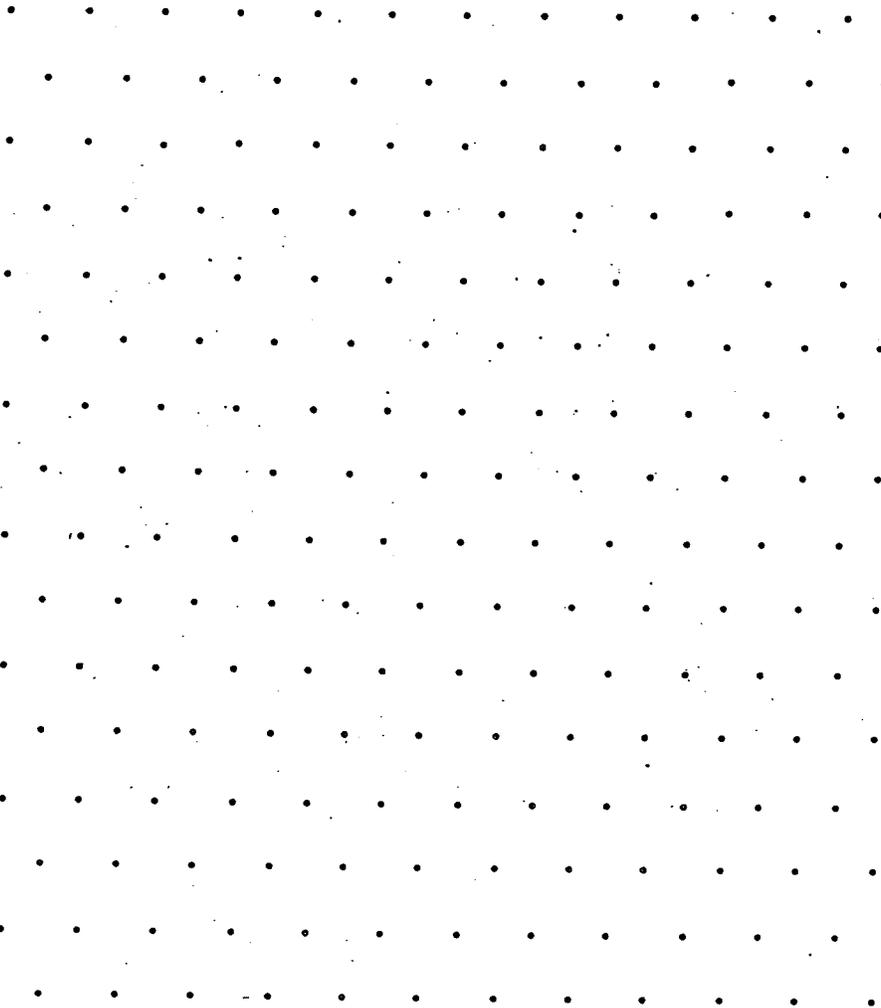


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# SCARBOROUGH MATHEMATICS OLYMPICS

## Event #3 - Two Person



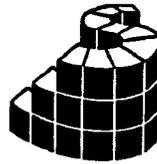
**STUDENT NAME**

**SCHOOL**

**SCORE**

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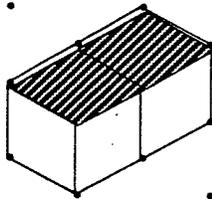
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## SCARBOROUGH MATHEMATICS OLYMPICS

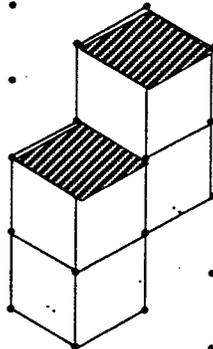
# Event #4 - Two Person

The following series of diagrams represent models built from a set of "cube-a-links". The table on the next page shows an incomplete series of calculations regarding the volume and surface area of each model. Each individual cube has a volume of one unit cubed and each face of an individual cube has an area of one unit squared.

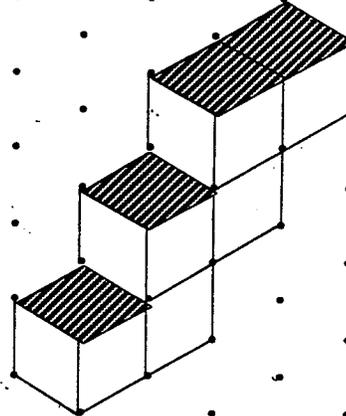
step 1



step 2



step 3



# Task

- a) Sketch the fourth model in this series in the available space on page 1.
- b) Complete the table. The last two entries will be formulns involving the variable  $n$ .

Step	1	2	3	4	$n$
Volume	2	4			
Surface area	10				

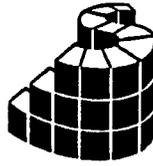
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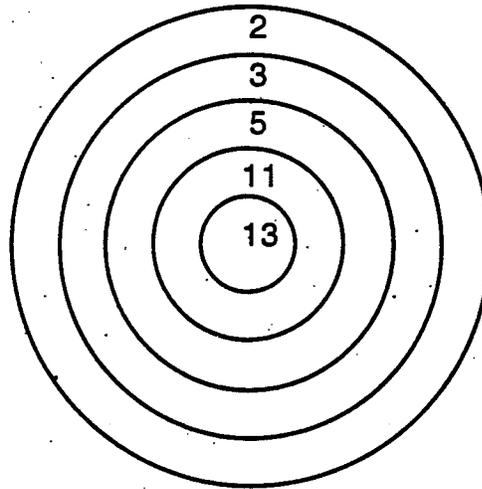
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## SCARBOROUGH MATHEMATICS OLYMPICS

# Event #5 - Four Person

Using only three arrows and this target, which scores between 6 and 39 are NOT possible ?



Answer: \_\_\_\_\_

**STUDENT NAME**

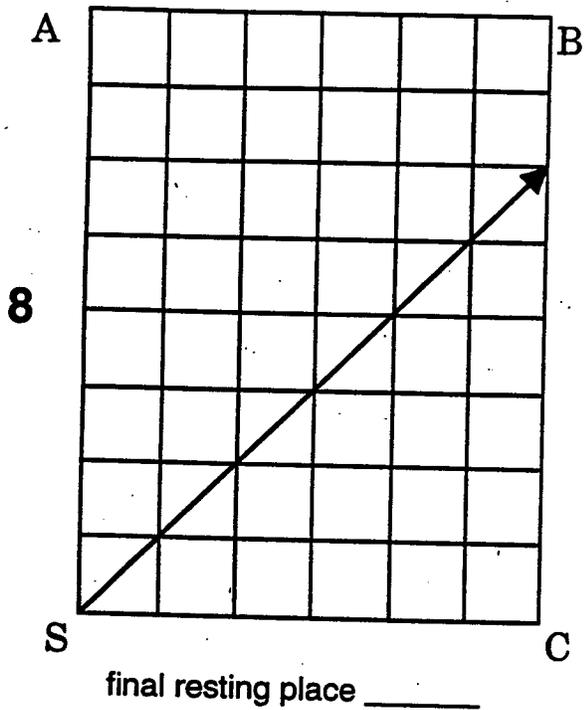
**SCHOOL**

**SCORE**

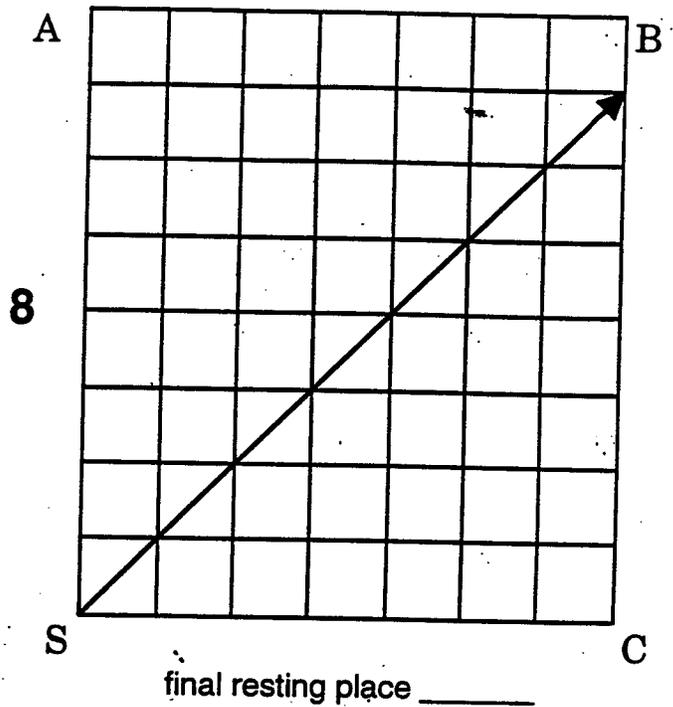
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_____	_____	_____
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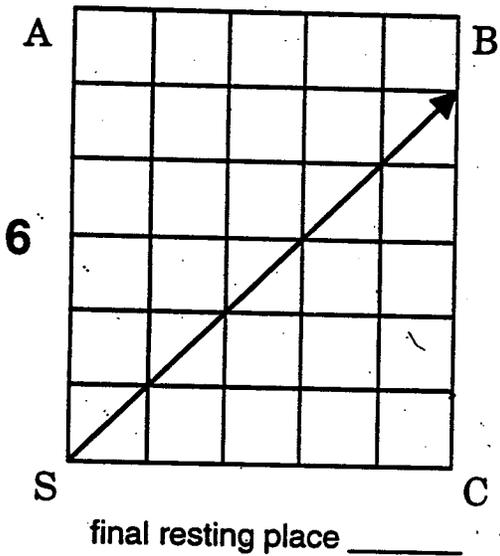
6



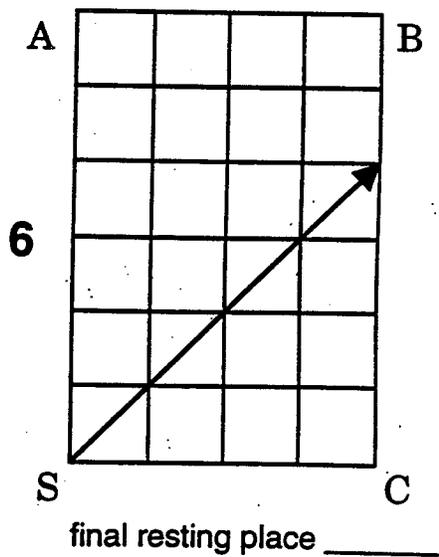
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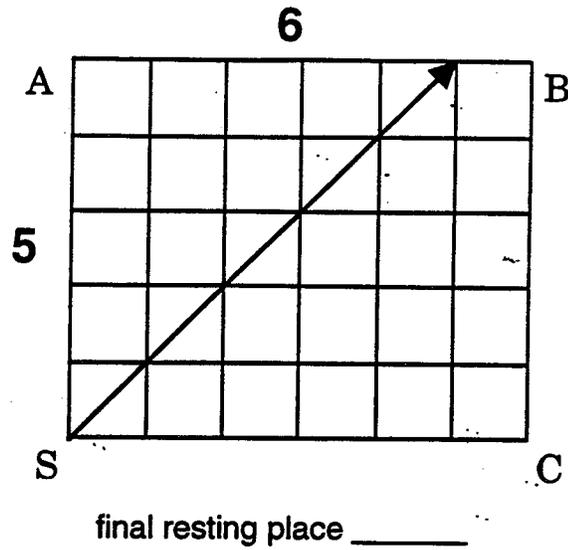
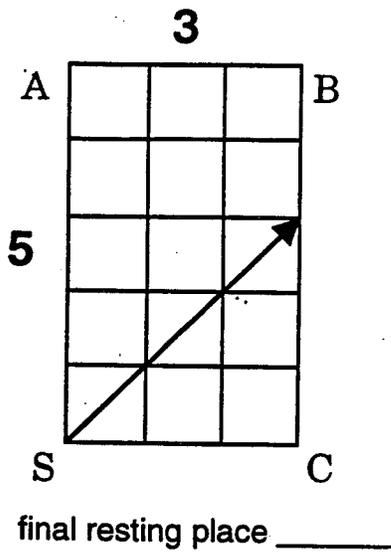


5



4





### Questions

If you were given a table in which  $AB = 101$  units and  $AS = 160$  units, where would the ball finally come to rest?

final resting place \_\_\_\_\_

If you were given a table in which  $AB = 132$  units and  $AS = 141$  units, where would the ball finally come to rest?

final resting place \_\_\_\_\_

**STUDENT NAME**

**SCHOOL**

**SCORE**

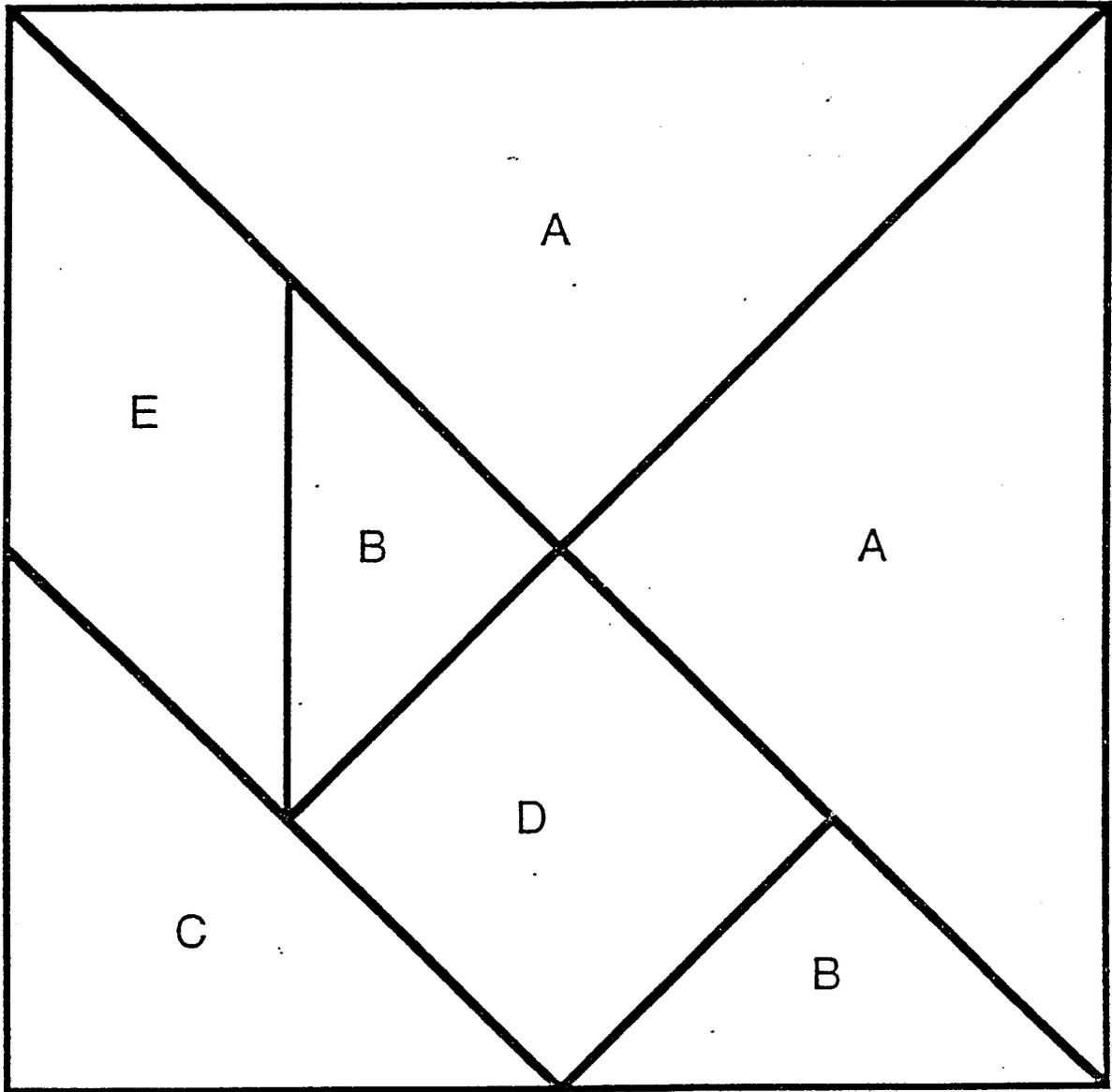
_____	_____	_____
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_____	_____	_____
_____	_____	_____

**INDIVIDUAL/CHAPTER**

**ACTIVITIES**



# TANGRAM

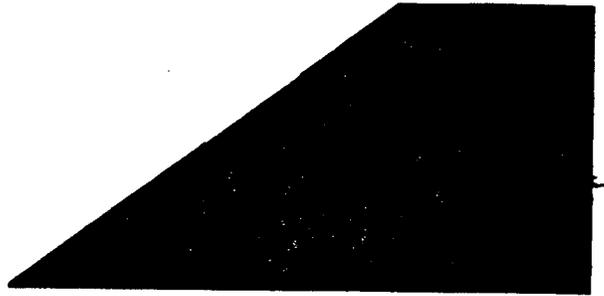


CASSE-TETE CHINOIS



# Tangram Challenge

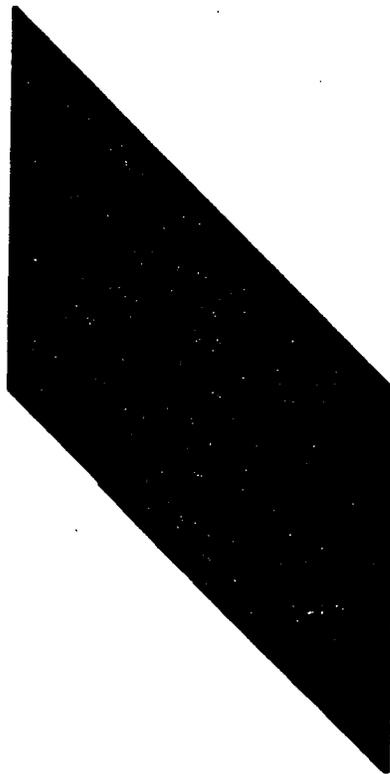
#1



#2

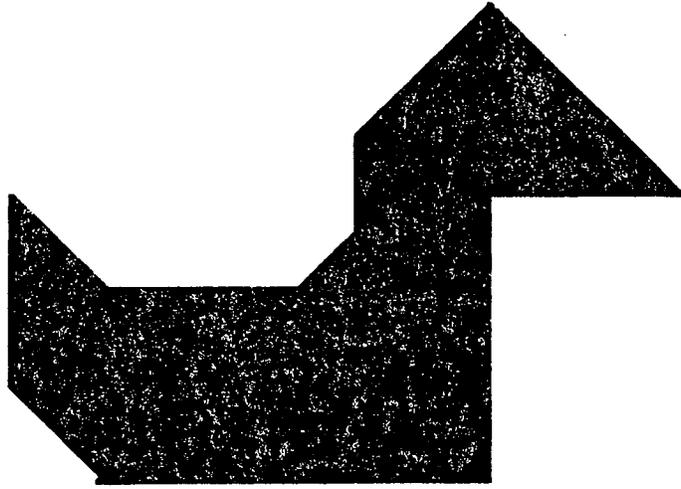


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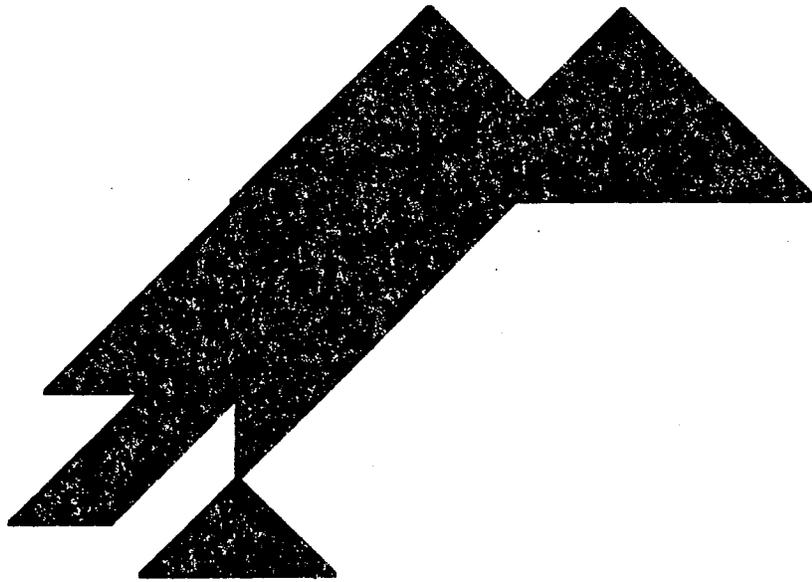




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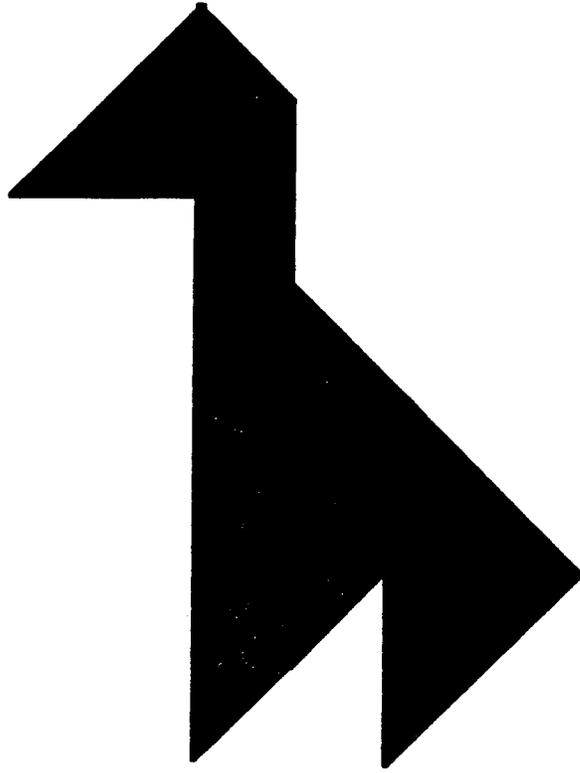


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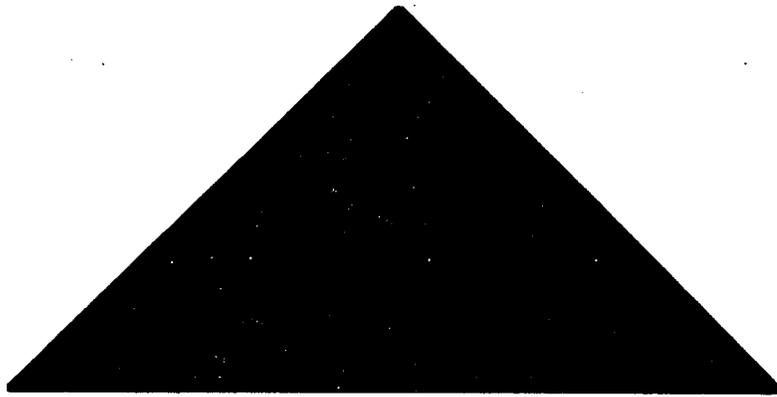




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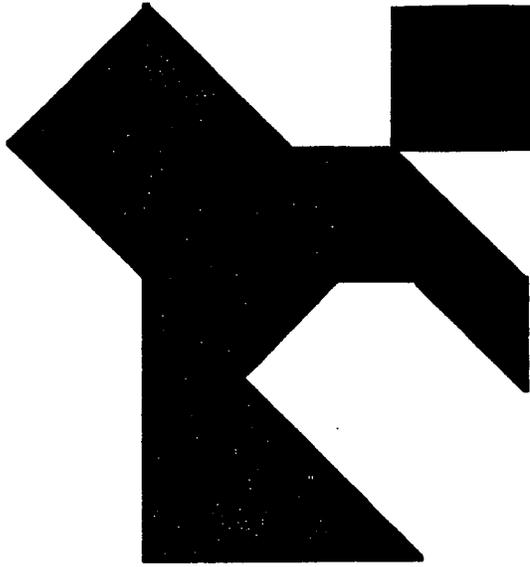


#7





#8

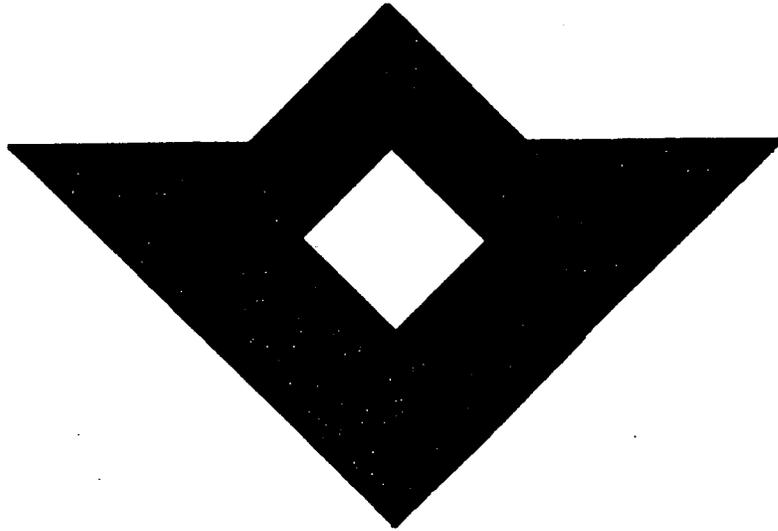


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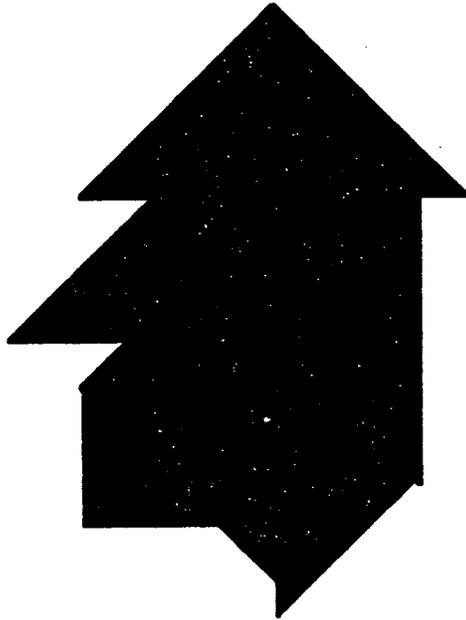




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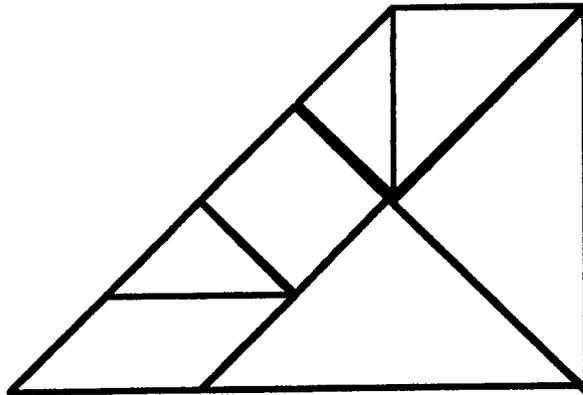
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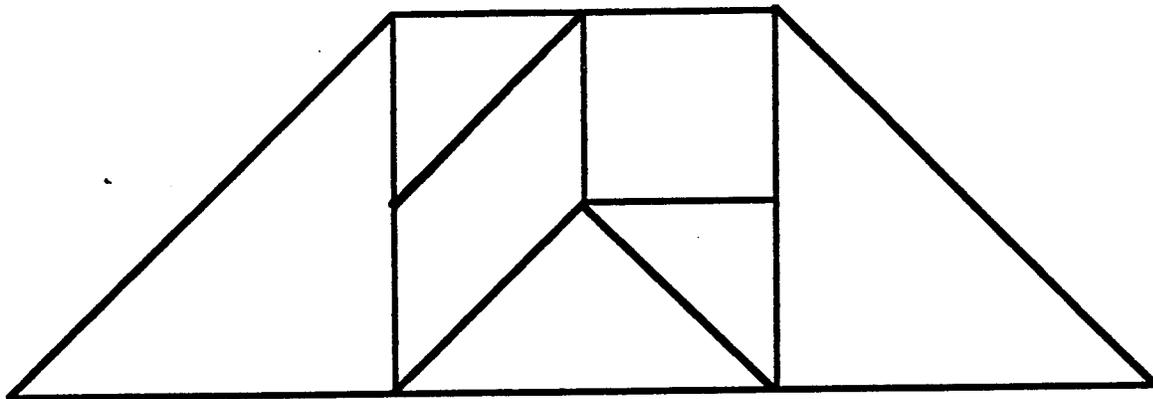


*Tangram Solutions*

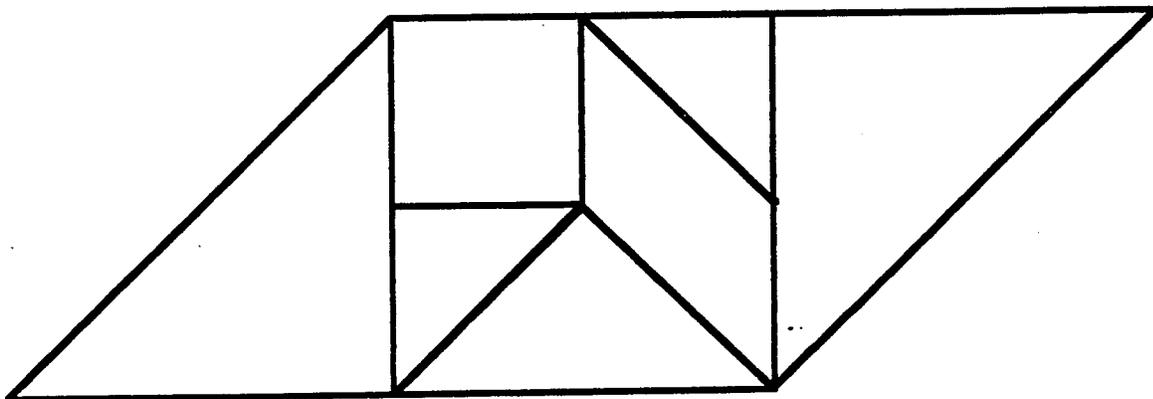
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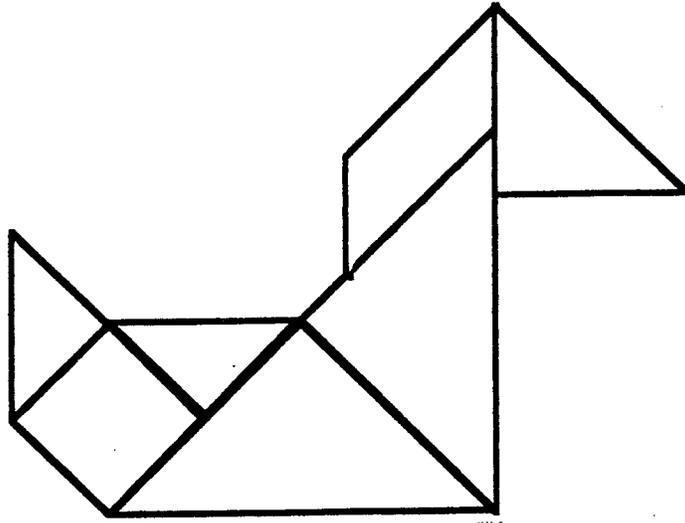
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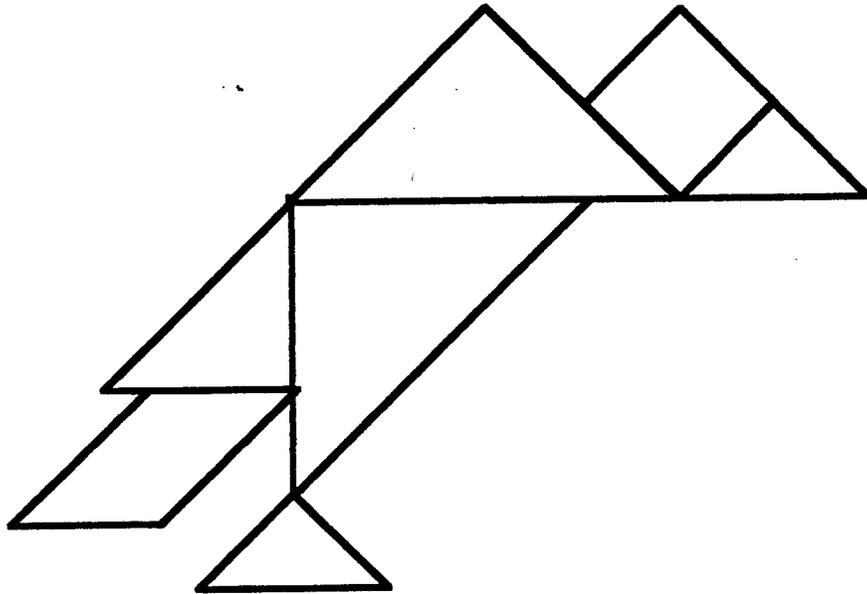
**#3**



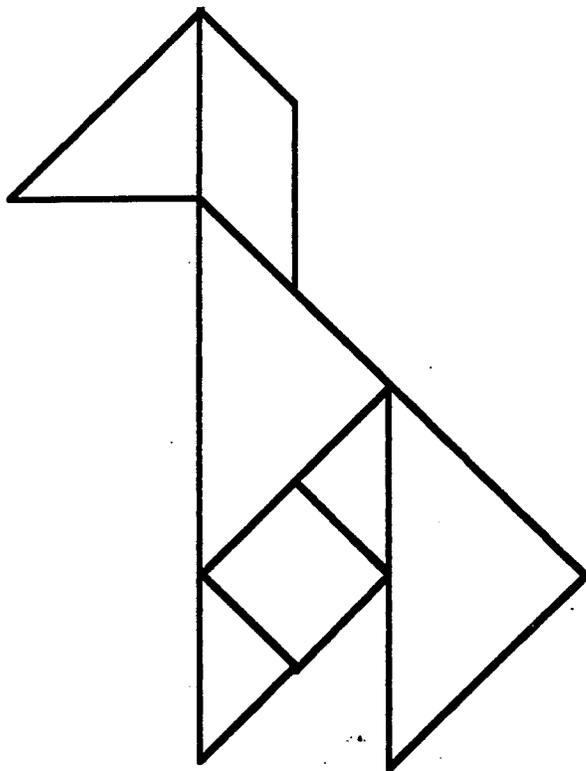
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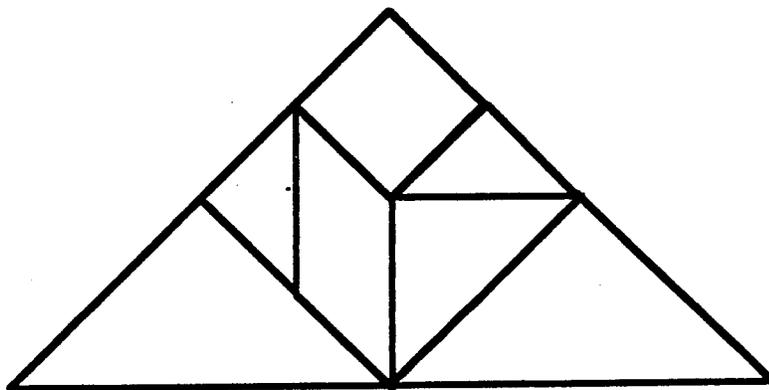
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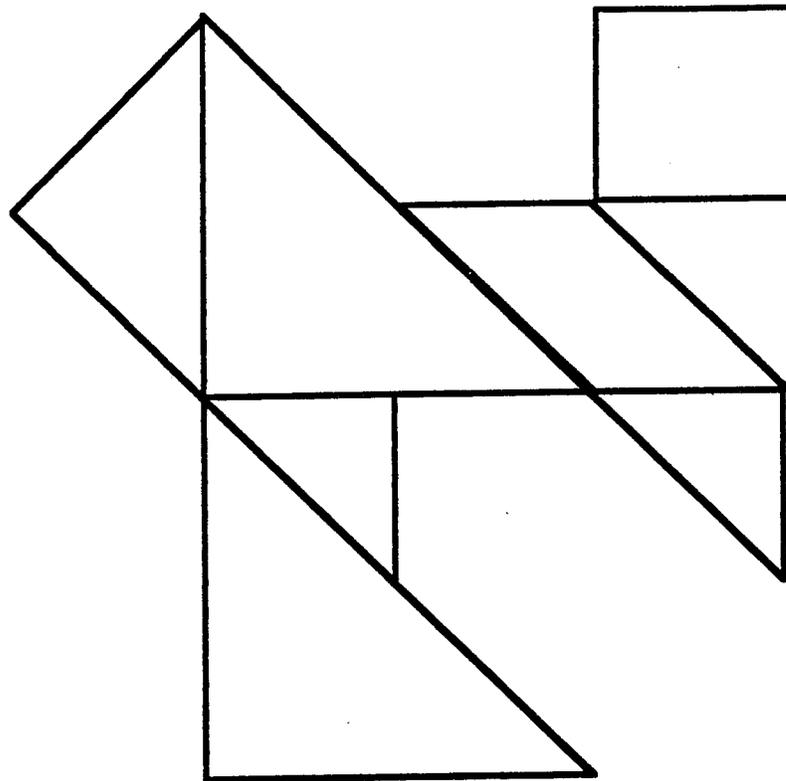
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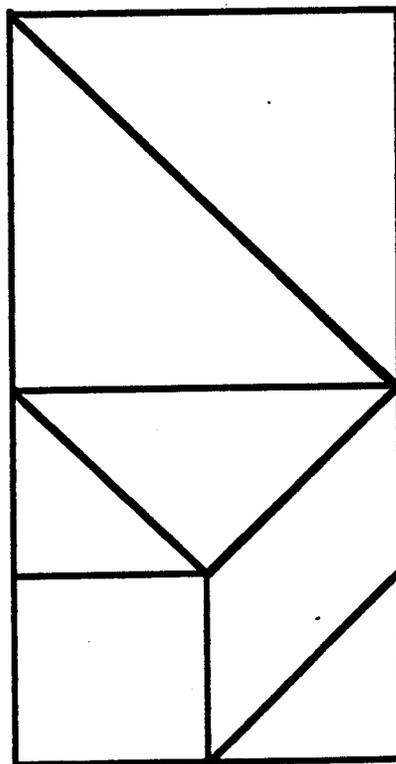
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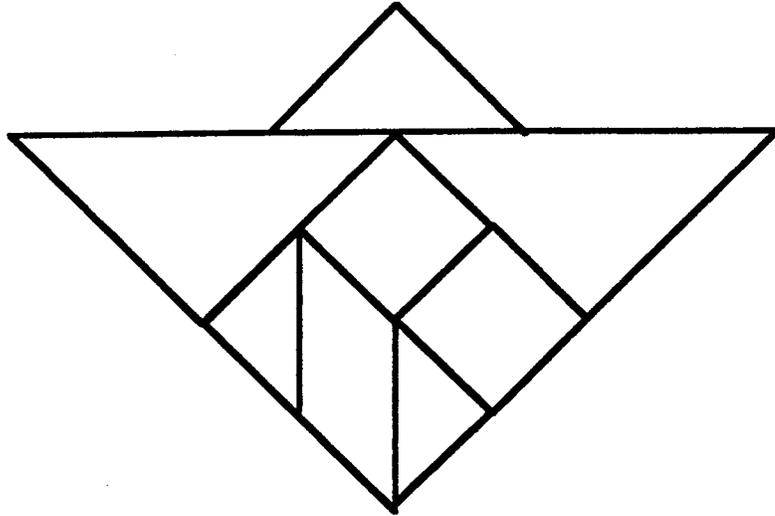
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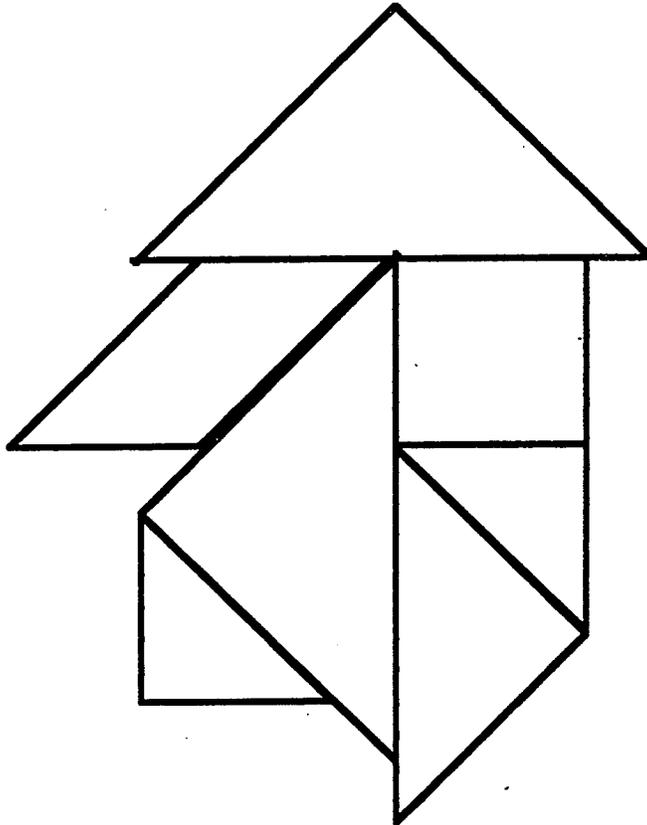
#9



#10



#11

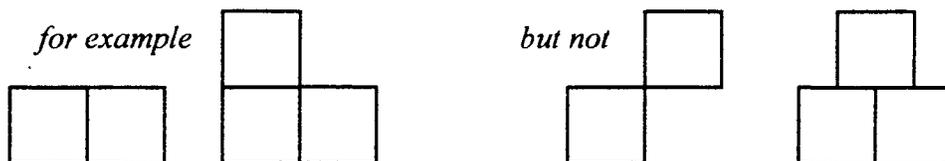




# Around The Garden

## Exercise # 1

Rose Bush is a landscape gardener. Her job is to prepare flower beds in which to display her various blooms. The basic shape of the flower beds is square although she can join beds edge to edge to make larger beds and give the display variety.



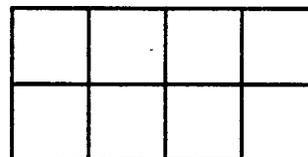
Rosh Bush is expecting many people to come and visit her floral displays. She wants to make sure that as many people as possible are able to see the flowers.



She realizes that in order to do this she has to make the perimeter of the garden as large as possible.

### Sample Configuration

This flower bed is made up of 7 square gardens and has a perimeter of 12.



1. What is the maximum perimeter of a flower bed made up of 7 square beds?
2. What is the maximum perimeter of a flower bed made up of 9 square beds?
3. Copy and complete the following table.

<i>Number of square beds joined</i>	1	2	3	4	5	6	7	8	9
<i>Largest possible perimeter</i>									

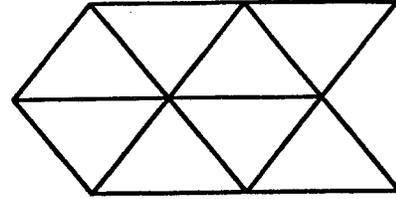
4. What would be the largest possible perimeter of a flower bed made up from 25 square beds?
5. What would be the largest possible perimeter of a flower bed made up from  $n$  square beds?

## Exercise # 2

Rose Bush decided that her square gardens were somewhat boring and she wanted to try another shape. Her son, Thorn, suggested using triangle shaped gardens and she liked that idea.

### *Sample Configuration*

This flower bed is made up from 8 equilateral triangle shaped beds and has a perimeter of 8.



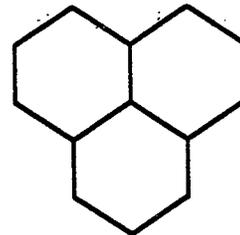
6. What would be the largest possible perimeter of a flower bed made up from 25 equilateral triangular beds?
7. What would be the largest possible perimeter of a bed made up from  $n$  equilateral triangles?

## Exercise # 3

Unfortunately, Rose still isn't satisfied. She liked the idea of using triangles but she wants a garden that is different from everyone else's. In the end, she decides to build some regular hexagonal flower beds.

### *Sample Configuration*

This bed is made up from 3 regular hexagonal beds and has a perimeter of 12.



8. What would be the largest possible perimeter of a bed made up from  $n$  regular hexagons?
9. What would be the largest possible perimeter of a bed made up from  $n$  regular decagons?
10. What would be the largest possible perimeter of a bed made up from  $n$  regular polygon beds each with  $s$  sides?

# INVESTIGATION ANSWER KEY

## Score Card - Around the Garden

The scoring for Around the Garden is split into three sections. In *Exercise 1*, each correct answer is worth 1 point up to a maximum of 5 points. If a score of 5 out of 5 is not obtained for *Exercise 1*, then the remaining two exercises will not be marked. In *Exercise 2*, two points are awarded for each correct answer up to a maximum of 4 points. If a score of 4 out of 4 is not obtained for *Exercise 2*, then the final exercise will not be marked. In *Exercise 3*, 3 points are awarded for each correct answer up to a maximum of 9 points.

### Exercise 1 - 1 mark per question (*maximum of 5*)

1. \_\_\_\_\_ 16
2. \_\_\_\_\_ 20
3. 

Number of square beds joined	1	2	3	4	5	6	7	8	9
Largest possible perimeter	4	6	8	10	12	14	16	18	20
4. \_\_\_\_\_ 52
5. \_\_\_\_\_  $2h+2$

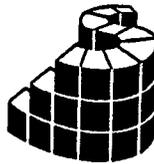
### Exercise 2 - 2 marks per question (*maximum of 4*)

6. \_\_\_\_\_ 27
7. \_\_\_\_\_  $n+2$

### Exercise 3 - 3 marks per question (*maximum of 9*)

8. \_\_\_\_\_  $4h+2$
9. \_\_\_\_\_  $8h+2$
10. \_\_\_\_\_  $(5-2)h+2$





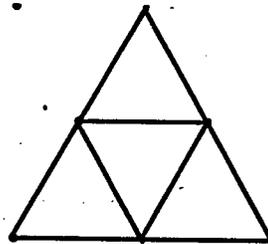
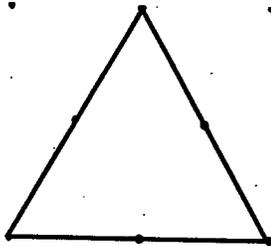
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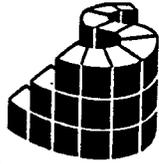
## SCARBOROUGH MATHEMATICS OLYMPICS

# Event #3 - Two Person

The following equilateral triangle has been dissected into four congruent equilateral triangles.



Using the isometric dot paper provided, dissect an equilateral triangle into six congruent triangles.

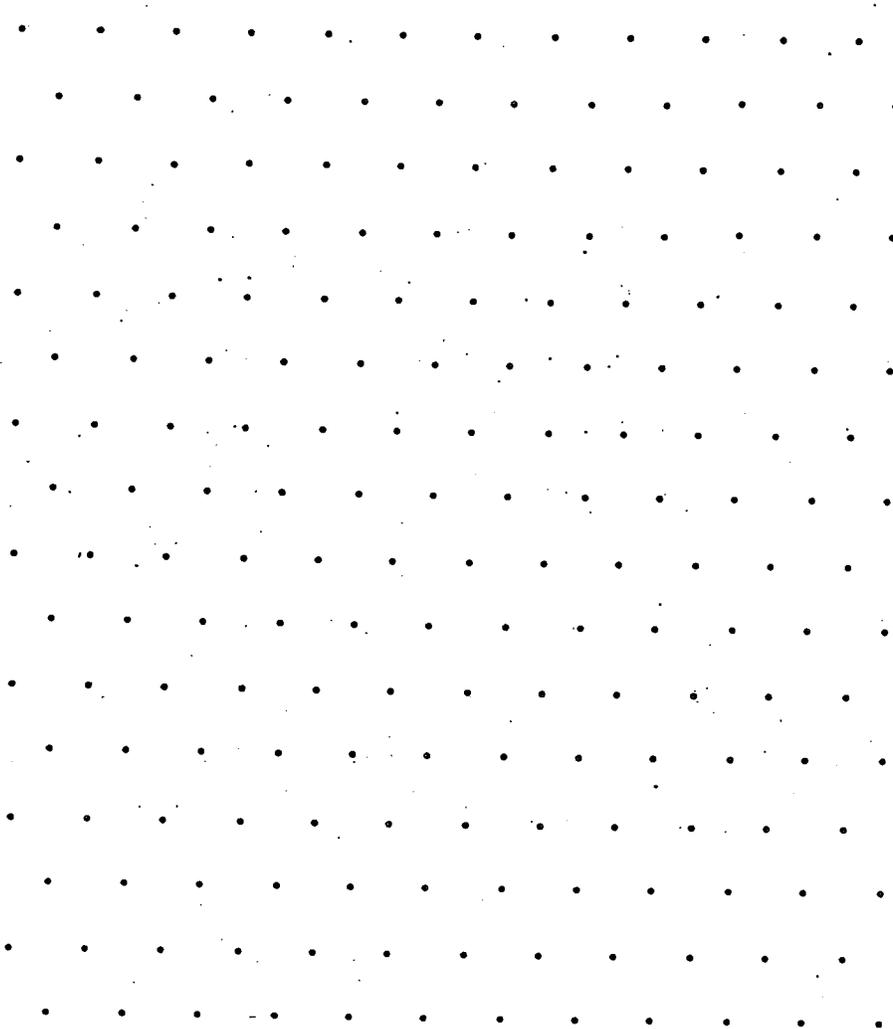


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# SCARBOROUGH MATHEMATICS OLYMPICS

## Event #3 – Two Person



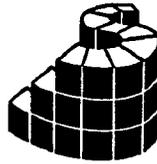
**STUDENT NAME**

**SCHOOL**

**SCORE**

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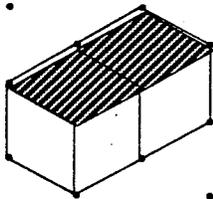
Meeting The Challenge

## SCARBOROUGH MATHEMATICS OLYMPICS

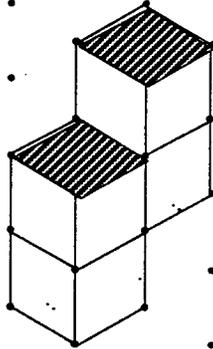
# Event #4 - Two Person

The following series of diagrams represent models built from a set of "cube-a-links". The table on the next page shows an incomplete series of calculations regarding the volume and surface area of each model. Each individual cube has a volume of one unit cubed and each face of an individual cube has an area of one unit squared.

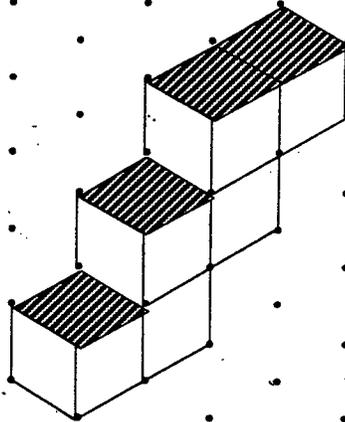
step 1



step 2



step 3



# Task

- a) Sketch the fourth model in this series in the available space on page 1.
- b) Complete the table. The last two entries will be formuls involving the variable  $n$ .

Step	1	2	3	4	$n$
Volume	2	4			
Surface area	10				

**STUDENT NAME**

**SCHOOL**

**SCORE**

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