Abacus

From the Desk of the Abacus Editor

Here is a collection of diverse activities within a Kindergarten to Grade 8 range of difficulty. They are reproducible. We are looking for submissions from Kindergarten, Grade 1 and Grade 2 teachers for upcoming issues. Are there any topics or themes that you would like to see?

Thank you to all who helped create this issue of the Abacus!

– Amy Parker

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Primary Problem Solving

LEVEL: K-2

OBJECTIVE:
To provide an opportunity for problem-solving using logic and visual imagery.

ACKNOWLEDGEMENTS:
These problems are part of problem-solving units developed by the Waterloo County Board of Education, under the direction of Marilyn Philbrick, Co-ordinator, Primary Education.

"On the Farm"

On David's farm there is a rooster, a cat, a rabbit, a dog and an owl. David likes all of the animals but he likes one best of all.

- It has 4 legs.
- It has whiskers.
- It has a short tail.
- Which animal does David like best?

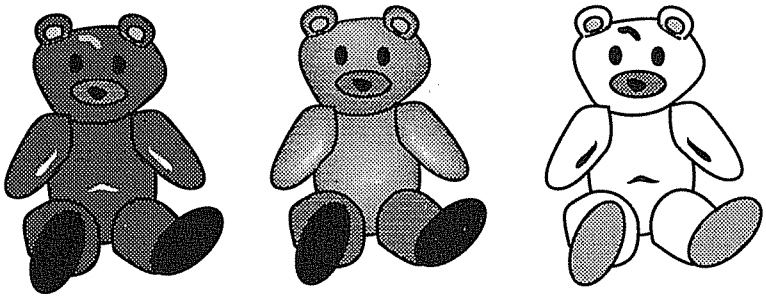
"Home Sweet Home"

An old running shoe, a mug, a can and a bottle were on the bottom of the sea. Along came a fish, a snail, a crab, and a snake who were looking for homes. The snake slithered into the bottle. The crab crawled into the sneaker. The fish wouldn't go near the can. What did each animal choose as its home?

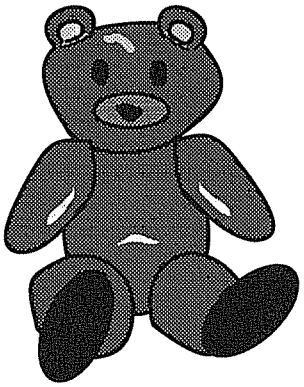
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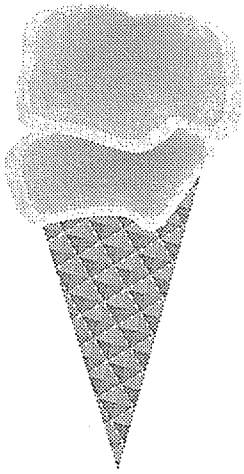
"At the Fair"

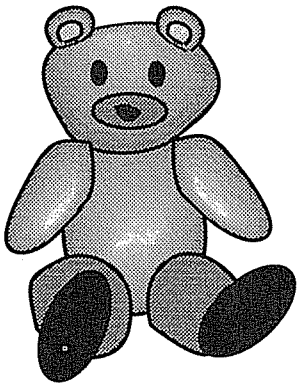


The three bears are at the fair. Their mothers got each of them a treat. Draw a line to match the bear with the treat.

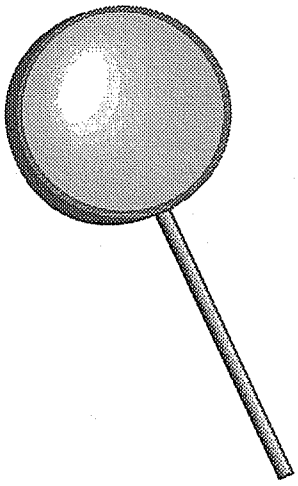


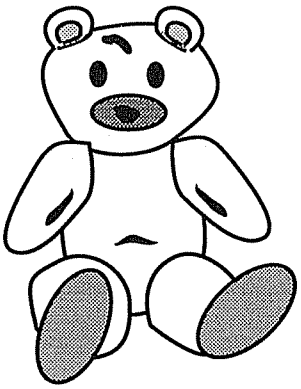
This bear's mother will not let him eat sweets



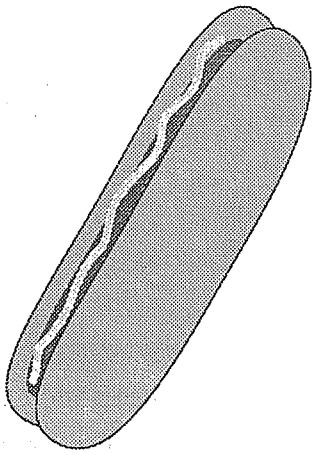


This bear's mother said, "Eat fast, it is melting!"





What treat did this bear get?



Measurement — Mass

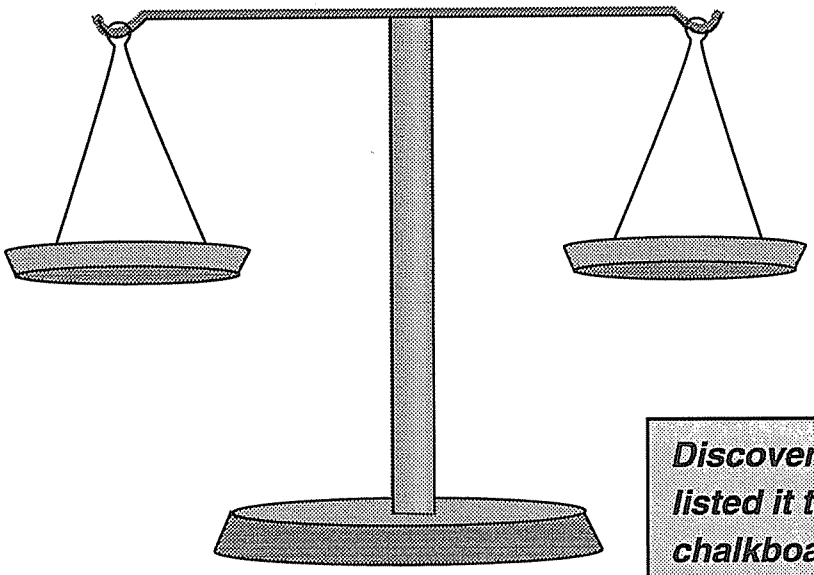
LEVEL: 1-3

OBJECTIVES: 1. To use a balance to determine mass.
2. To explore standard measurements.

ACKNOWLEDGEMENTS: These activities are part of a measurement unit developed by the Perth County Board of Education, under the direction of Gerry Krug, Principal.

CONTENT: The first activity uses a balance and materials for measurement and the second and third activities explore standard measurement.

ACTIVITY 1:



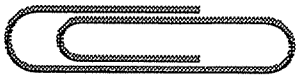
Discover how many of the objects listed it takes to balance a chalkboard brush.

- ☐ marbles to balance the chalkboard brush
- ☐ beans to balance the brush
- ☐ crayons to balance the brush
- ☐ bottle caps to balance the brush
- ☐ magic markers to balance the brush

EXTENSION: Repeat the above, but use another object to replace the chalkboard brush.

EVALUATION: Can students estimate and record their estimation on paper, then compare it with their actual measurement? How close was their estimation? Are the students becoming familiar with the use of a balance?

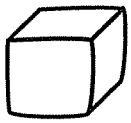
ACTIVITY 2: Using the given diagrams,determine the multiple choice answers.



1 paper clip = 1 g



3 raisins = 1 g



1 cm^3 of water = 1 g

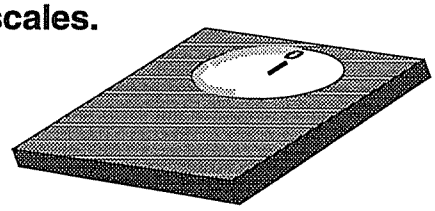
Grams (g) are used to measure the mass of an object.

Which objects have a mass of more than 1 gram?

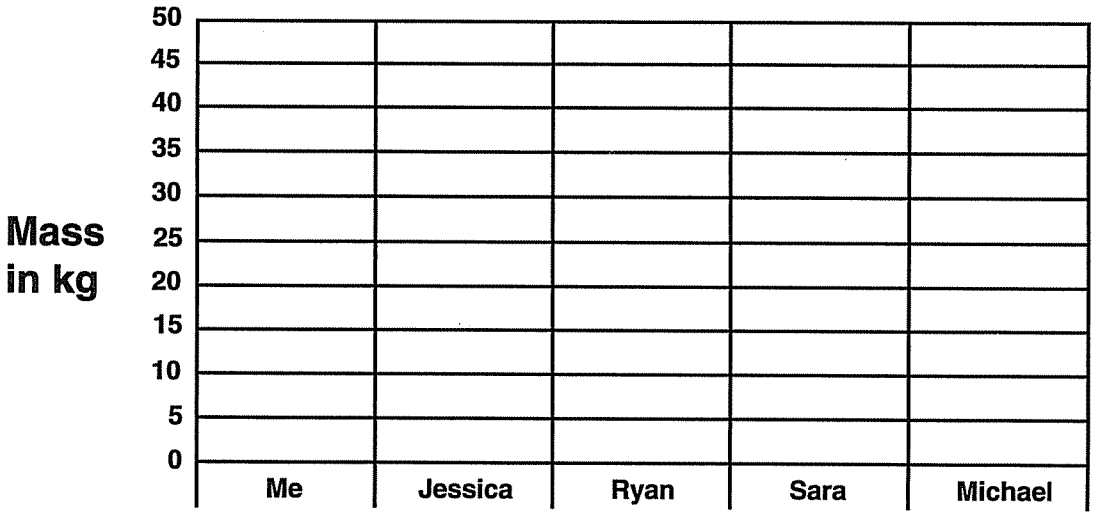
☐ telephone ☐ fork ☐ four leaf clover ☐ spider ☐ pair of glasses
☐ stamp ☐ needle ☐ camera ☐ football helmet

EVALUATION: Is the student developing an understanding of the lightness of a gram?
Does he/she have a reliable anchor from which to base his/her judgment of the weight of a gram?

ACTIVITY 3: Students will need metric weighing scales.



1. Find your mass.
2. Find the mass of each of your four friends.
3. Record the masses on a graph.



Which of the following are more or less than 1 kilogram?

☐ dictionary ☐ jar of water ☐ box of kleenex ☐ pair of shoes
☐ staple ☐ box of chalk ☐ paint bottle

EXTENSION: Find and draw something which has a mass close to 1 kilogram.

EVALUATION: Can the student estimate the weight of a kilogram?

La Mesure

NIVEAU: 4-6

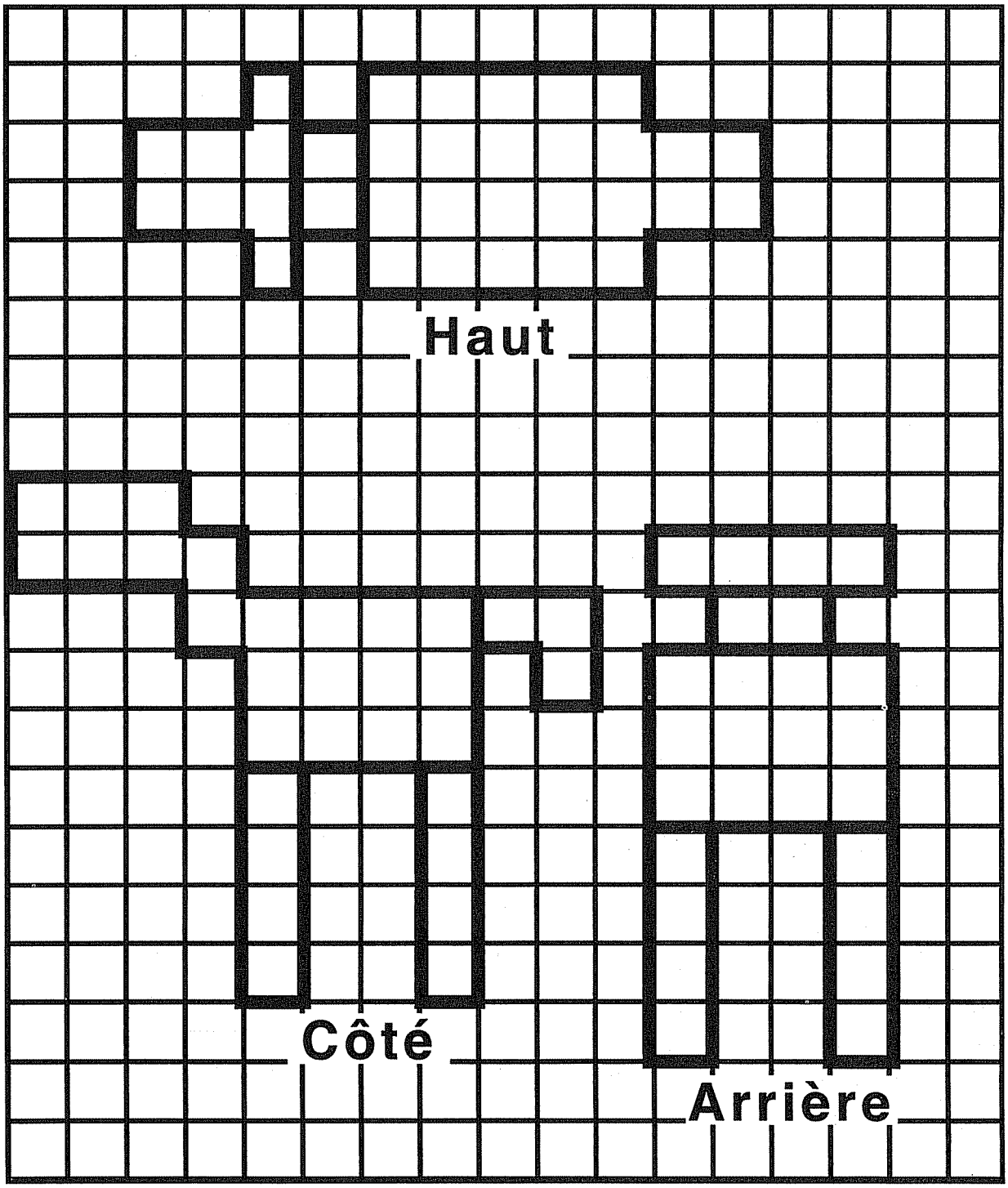
BUT: à mesurer en système métrique

REMERCIEMENTS: à Patricia Zrihen, OAME

ACTIVITES: La Vache Centicube ou le Meuh Métrique

1. Quelle est sa longueur? sa hauteur? sa largeur?
2. Quelle est la longueur de ses jambes?
3. Quelle est la distance entre le haut de sa tête et son dos?
4. Quelle est la distance entre les jambes avant et les jambes arrière? la jambe gauche et la jambe droite?
5. Si tu mets la vache debout dans l'eau jusqu'à ses oreilles, quelle serait la profondeur de l'eau?
6. Quelle est la longueur de la queue?
7. Une fourmi a grimpé sur la vache. Elle a commencé en bas de la patte droite arrière, tout le long du dos, sur le cou, jusqu'a la partie en-dessous de l'oreille droite. Quelle distance a-t-elle parcourue?
8. Un jour où il faisait froid, la vache portait une couverture qui couvrait son dos et touchait presque le sol de chaque côté. Quelle est la longueur de la couverture?
9. Un autre jour, elle portait la couverture dans l'autre sens, de la tête à la queue. La couverture commençait exactement en haut à l'extrémité de sa tête, continuait le long du cou, du dos et de la queue et pendait en arrière. Quelle longueur de la couverture pendait?
10. Une autre fois, pendant que la vache ne bougeait pas (même pas d'un millimètre!) quelqu'un a essayé d'attacher la couverture autour de ses quatre pattes, mais c'était trop court. Combien est-ce qu'il manquait?
11. Finalement, des chèvres sont venues et ont mangé toute la couverture. Chaque chèvre a mangé 1, 2 cm. Combien de chèvres y avait-il?
12. Quel est le volume de (c'est-à-dire combien de cubes y-a-t-il?):
    - la queue
    - la tête
    - le cou
    - les pattes
    - le corps
13. Combien de cubes invisibles sont dans son ventre?
14. Combien de cubes visibles a-t-elle?
15. Quelle est sa masse totale?
16. Quelle est la masse de sa tête? (avec les oreilles mais sans le cou)
17. Quelle est l'aire totale vue:
    - d'en haut?
    - d'en bas?
    - du côté?
    - de devant?
    - de derrière?
18. Invente un autre animal métrique. Propose des questions à son sujet. Indique les réponses.

La Vache Centicube ou le Meuh Métrique



"Jump A Number"

Mathematical Drill Games – Acknowledgements: These games have been developed by Lorna Morrow, North York Board of Education.

LEVEL: 4-6

FOR: 2 players

SKILL: addition with whole numbers

MATERIALS: Game Board , 32 bingo chips or other transparent markers

RULES:

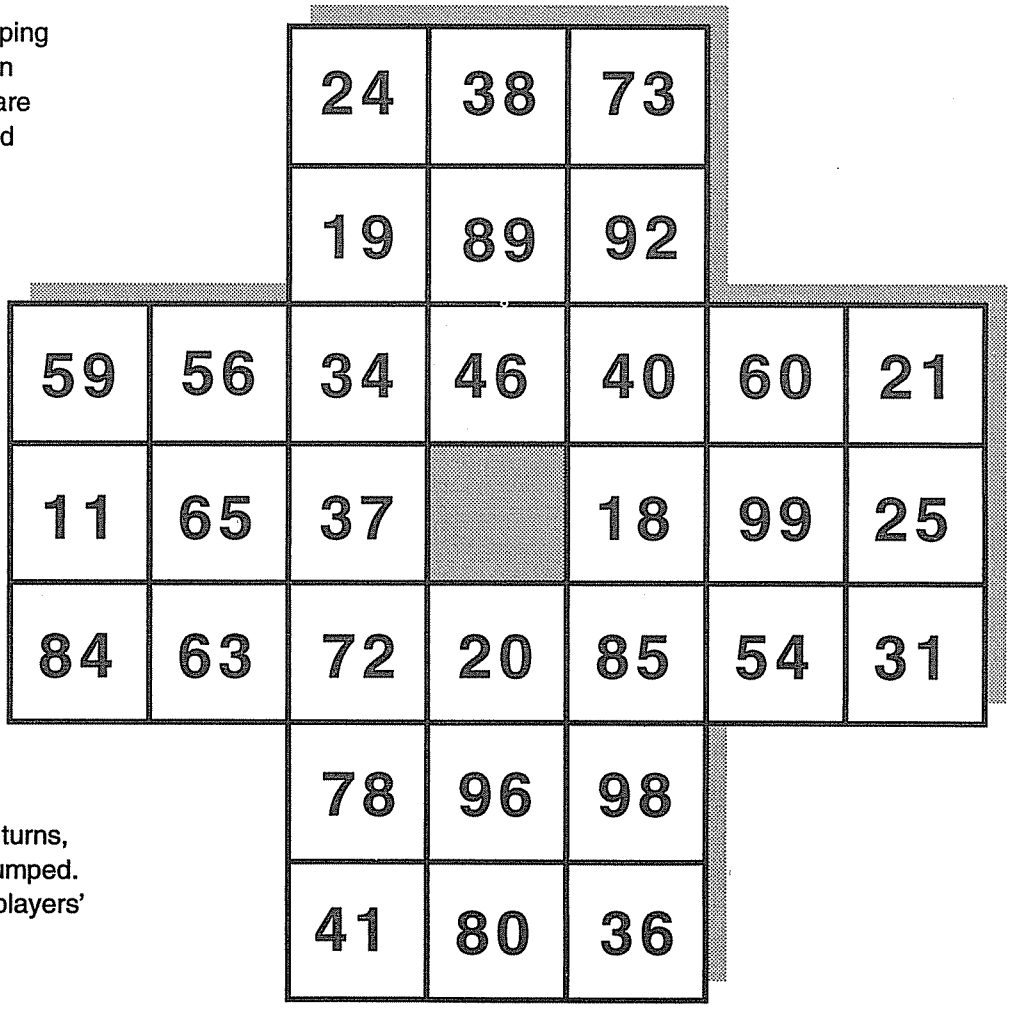
1. Cover each number on the board with a chip. Leave the centre square empty.
2. Chips are moved by jumping over another chip onto an empty space. All jumps are either sideways or up and down.
3. First player jumps over a chip into the centre square. Thus, he/she must jump 18, 46, 37 or 20. The player removes the chip he/she jumped over and records the number under the chip.
4. Next player jumps over a chip into any empty space. Player removes the chip he/she jumped over and records the number under it.
5. Players continue to take turns, recording the numbers jumped. These numbers are the players' scores.
6. The game ends when no more jumps can be made.
7. The player with the highest total score is the winner.

VARIATIONS:

1. Use non-transparent chips.
2. Allow diagonal jumps as well.
3. Each player takes two jumps in a row on his/her turn and records both numbers jumped; or records only the greater number jumped.

ANALYSIS:

1. Is the game easier or harder with non-transparent chips? Why?
2. Compare the strategies used for the original game with those used for variation 3.



"KRYPTO"

LEVEL: 6-8

FOR: 2 to 6 players

SKILLS: arithmetic operations, whole numbers

MATERIALS: a deck of cards, marked as follows:

- 3 each of the numbers 1 through 10;
- 2 each of the numbers 11 through 17;
- 1 each of the numbers 18 through 24.

RULES:

1. Deal 5 cards face-up to each player.
2. Place the next card from the deck face-up in the centre of the playing area.
3. Each player uses his/her 5 cards and the four arithmetic operations to make the number showing on the face-up card in the centre.

e.g. Your hand is:

15, 18, 5, 13, 8, the "target" card is 3.

You might calculate:

$13 - 8 - 5 + 18 - 15 = 3$

or $18 \div (15 - 13) \div (8 - 5) = 3$

or _____

Can you find another way?

4. First player to succeed wins the hand.
5. Continue the play. When there are not enough cards left in the deck for another full round, the game is over.
6. The winning player is the one who has won the most hands.

NOTE: An Impossible hand is extremely rare.

VARIATIONS:

1. Use a different scoring system:
   - Allow 1 point for using 2 cards to make the target number;
   - allow 2 points if 3 cards are used;
   - allow 3 points if 4 cards are used;
   - allow 5 points if all 5 cards are used.

   The winner is the one who has accumulated the greatest number of points.
2. Use the scoring system in variation 1 but allow each player to list as many different ways as he/she can find of making the target number for each hand.
3. Allow the use of square root as an operation. Allow the use of exponents if the exponent is one of the numbered cards or can be made from them.

ANALYSIS: What strategies did you use to try to make the target number? Share ideas.

"THE WINNING AVERAGE"

LEVEL: 7-8

FOR: 2 to 6 players

SKILLS: estimation, averaging

MATERIALS: a set of cards numbered from 1 through 50, a calculator

RULES:

1. Deal all the cards. It will not matter if one player has more than another.
2. Keep all your cards face down in front of you.
3. At a signal from the dealer, each player turns a card face up so it can be seen by all players.
4. Each player then quickly estimates the average of the numbers on the cards.
5. The dealer calculates the correct average using a calculator.
6. The player whose estimate was closest to the actual average wins a point. In case of a tie, both players win a point.
7. The game ends when at least one player is out of cards.
8. The winner is the one with most points.

VARIATIONS:

1. Extend the deck to 60; to 75.
2. Add some negative numbers to the deck.
3. Use a timer to determine how long players have to make their estimates.
4. The player with the estimate farthest from the actual average loses a point.

Acknowledgements – These problems have been developed by the Waterloo County Board of Education, under the direction of Ron Sauer, Co-ordinator of Mathematics.

"Problem Solving using Pattern Blocks"

LEVEL: 4-8

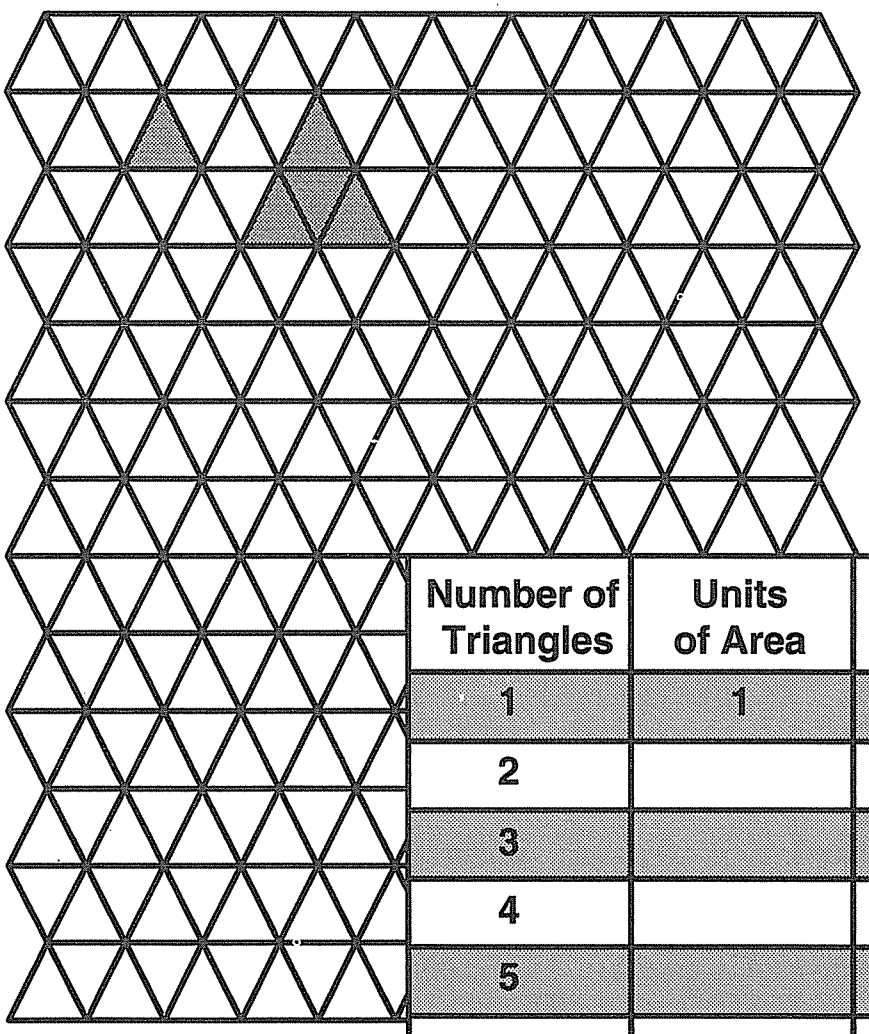
FOR: These materials can be used to provide individual, small group or whole class activities.

OBJECTIVES:

1. To develop problem-solving strategies using activities with pattern blocks.
2. To identify, describe and extend patterns.
3. To determine relationships between perimeter and area.

ACTIVITIES:

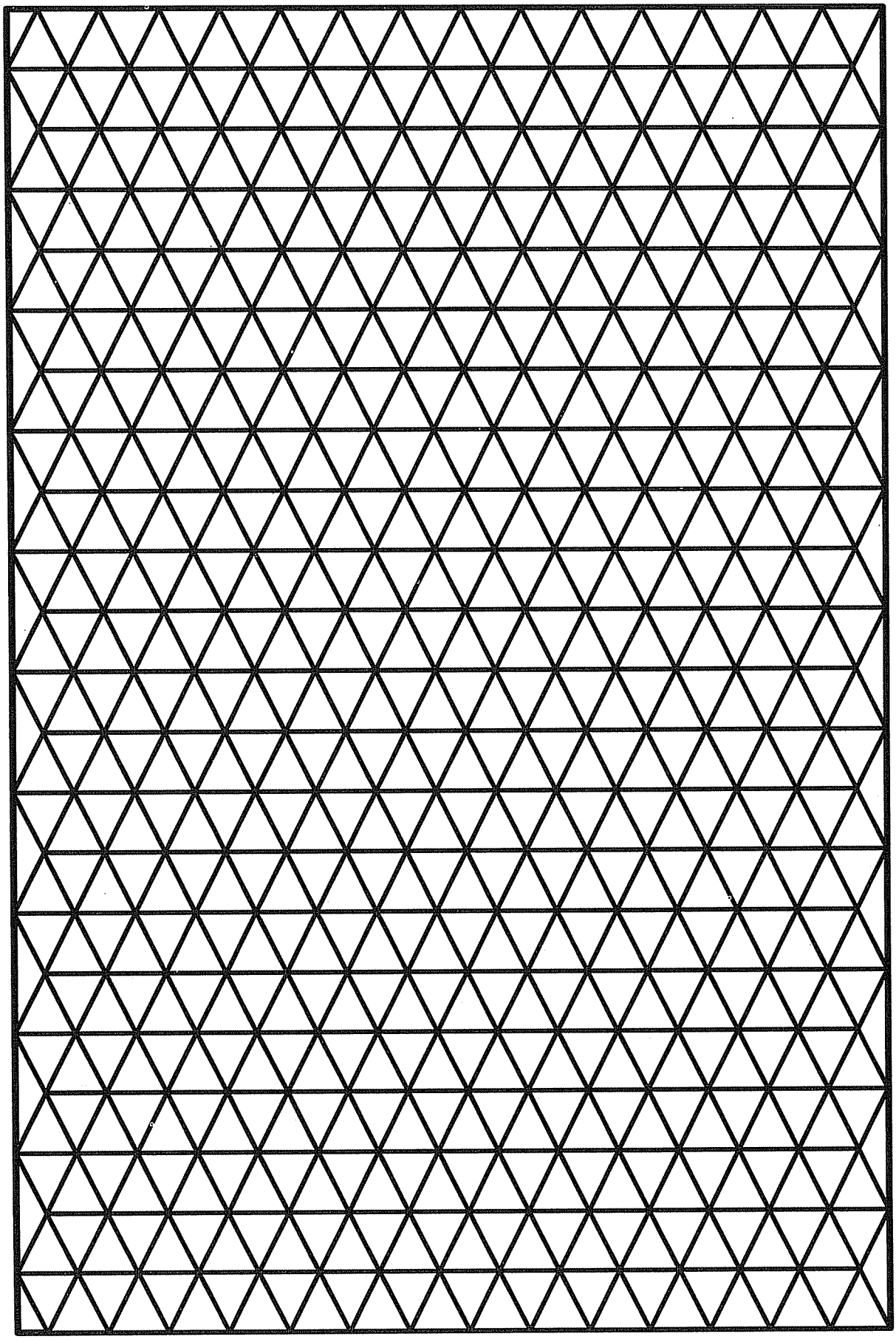
- It takes 1 green pattern block to build the smallest triangle.(The small shaded triangle is one quarter the size of a green pattern block.)
- Build the next largest triangle as shown.
- Continue building larger and larger triangles, recording them on grid paper.
- Fill in the table, and provide opportunities for students to describe the discovered patterns and relationships.



Number of Triangles	Units of Area	Units of Perimeter
1	1	3
2		
3		
4		
5		
6		

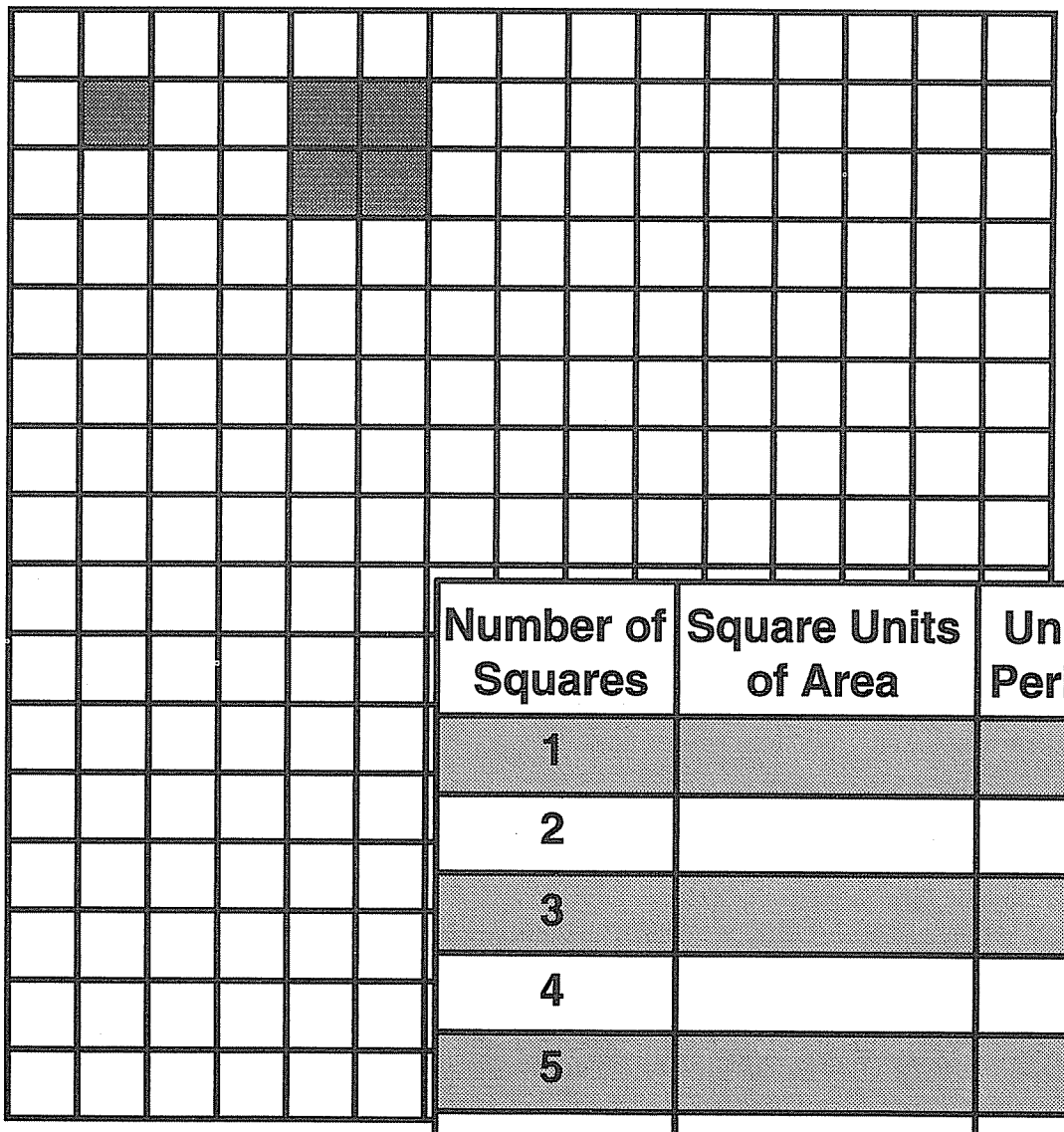
Use your pattern(s) to predict how many blocks would be in triangle 10.

Triangular Grid



Squares and Patterns

- It takes 1 orange pattern block to build the smallest square. (The small shaded square is one quarter the size of an orange pattern block.)
- Build the next largest square as shown.
- Continue building larger and larger squares, recording them on grid paper.
- Fill in the table, and describe any number patterns.



Number of Squares	Square Units of Area	Units of Perimeter
1		
2		
3		
4		
5		
6		

Use your pattern(s) to predict how many blocks would be in square 10.

MEMO TO: Design Team

FROM: Head Office,
Innovative Design Corp.

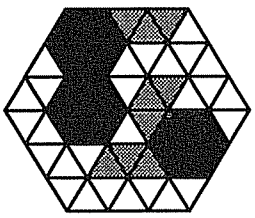
RE: Sweater Designs

We have been contracted to provide hexagon designs for an exclusive sweater company. They want to have as many different designs as possible using the same hexagon outline. Please refer to the Procedures Manual #15423 for detailed instructions. Submit all finished designs to head office.

DESIGN TEAM MATERIALS:

- One or more sets of pattern blocks
- Hexagon Design Template
- Hexagon Design Record Paper

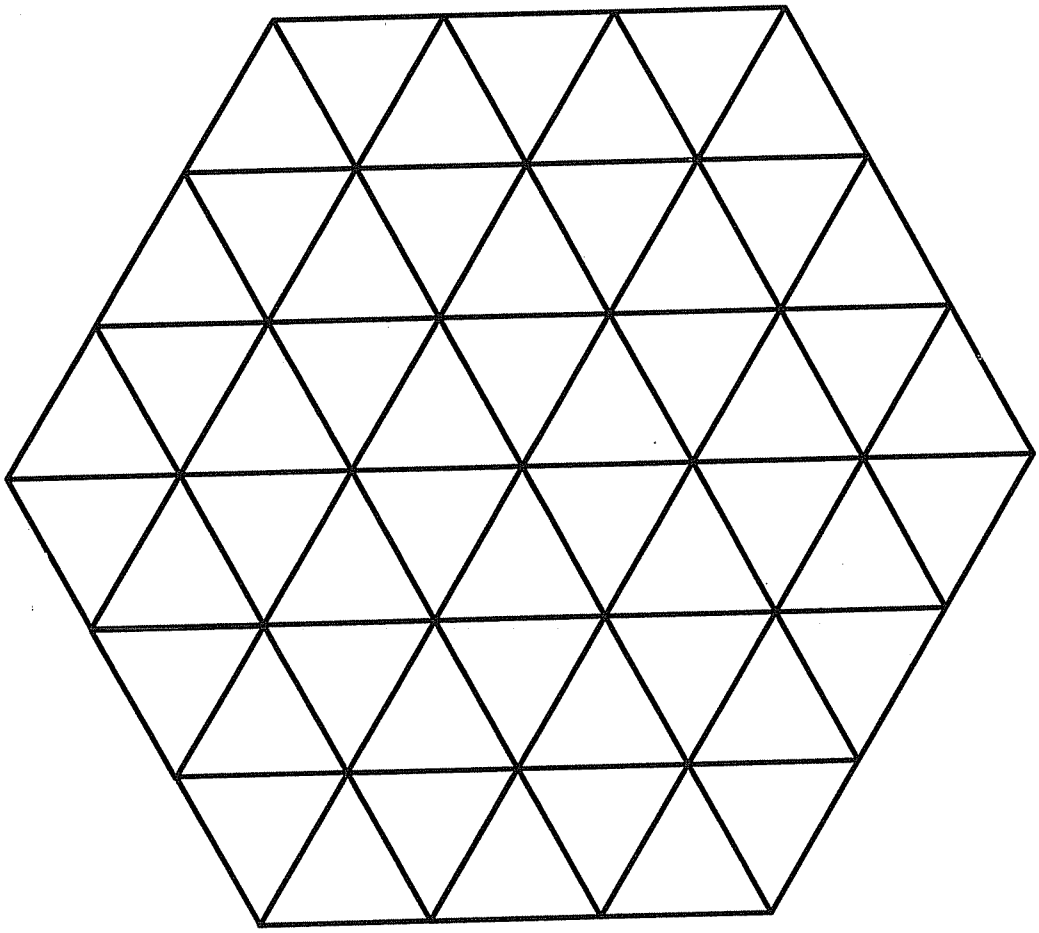
Hexagon Design Project



Innovative Designs Corporation

ACTIVITIES:

This project works well as an independent activity or where a small group of students work in partnership. The "memo" and the excerpt from the "procedures manual" are used to help set a context for the activity. Teachers of younger students may wish to describe the context orally.



PROCEDURES MANUAL #15423:

▲

Cover the hexagon on the Hexagon Design Template with only 12 blocks.

▲

Find a step-by-step way to change this arrangement from 12 blocks, then 13, 14, 15, and so on. There are 19 different ways to cover the hexagon with one set of pattern blocks. If you have more than one set, there are at least 40 different ways.

▲

Record each design by colouring a copy of the hexagon template.

▲

Prepare a portfolio of all designs, and submit to Head Office.