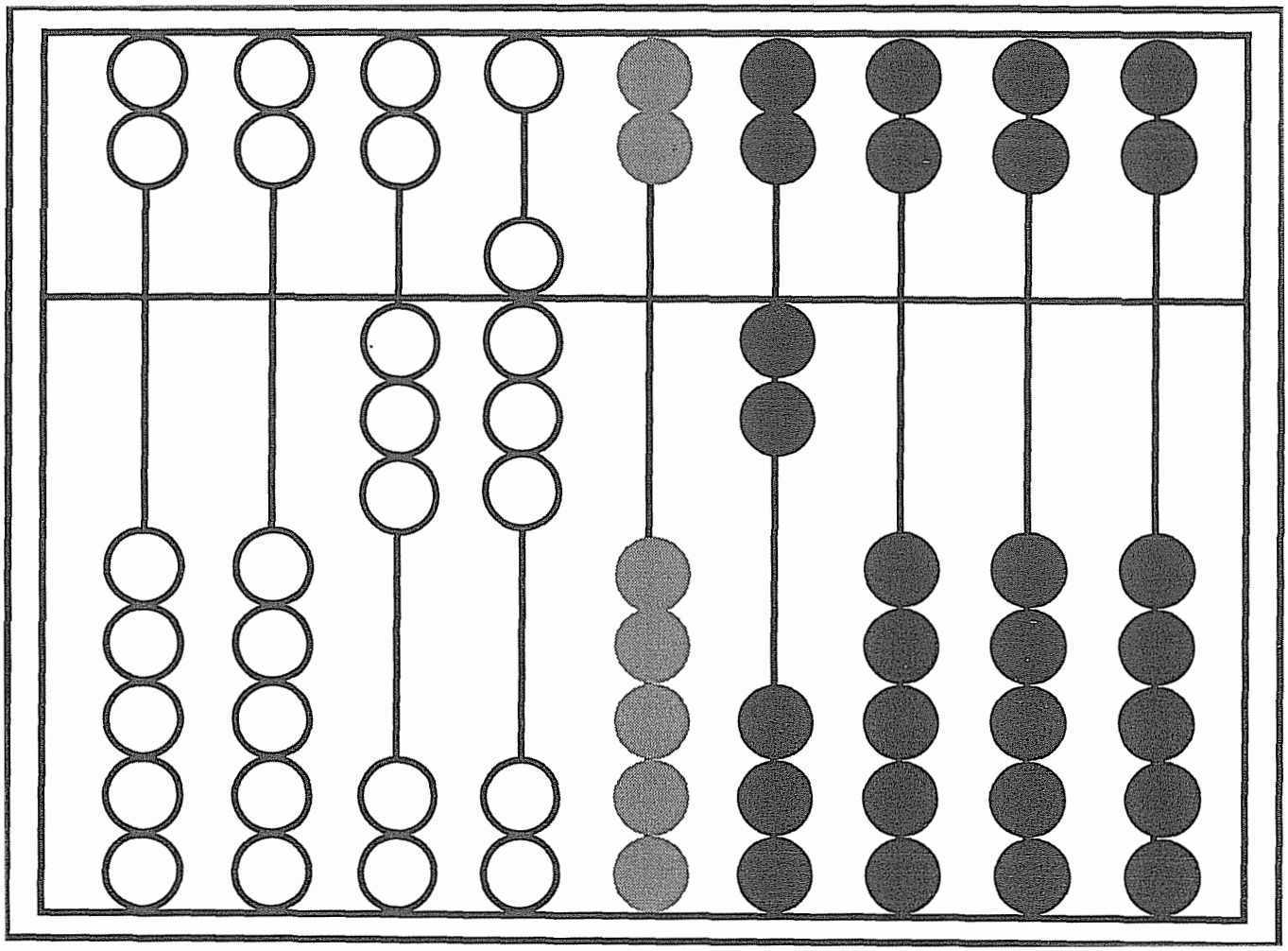
Abacus

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Edited by Frances Schatz

▲ From the Editor's Desk

The past several months have found me sorting through farm files that date back to the thirties from my parents' estate. For armchair reading I have been enjoying Clifford Pickover's newest book, *Surfing Through Hyperspace*. Pickover has magical imagination. For instance, a 4-D guinea pig could eat the contents of a box of cereal without ever putting a hole in the box. Imagine what I thought when I came across containers (sealed but empty) in the old farm house. I'm beginning to think that Pickover's imaginary creatures exist. I have really needed to use Hyperspace thoughts to put this issue of the *Abacus* together too. Welcome to a variety pack.

In the last issue I posed some questions that elementary school students asked me at the market. In the farm files I have found hand-written notes about calculations and conversions which I am going to highlight in this issue. **Pre-Calculator Farm and Home Arithmetic** gives some interesting and quick ways to use old-fashioned mental arithmetic.

Joanne Harris, Centennial Middle School, Georgetown, Ontario has provided a creative geometry game assignment complete with marking rubric. Thank you Joanne for enhancing this journal in a special way.

I continue **Part III, Addition on the Abacus**. Are there any classes who are experimenting and studying the Abacus tool? If so, please write to me and tell me about your project.

Grade 7 and 8 teachers have been asking me for material to help them prepare their students for grade 9 mathematics, especially exams. Thank you to the OAME team led by **Myrna Ingalls** for a sample grade nine January exam. You will find highlights from this exam in this issue. Myrna's committee will be producing more assessment aids to be published later in the *Gazette*.

Be sure to check the StatCan activity for grade 5 by **Susan Stuart** who also suggests we look at that website for other interesting data. This is part of the Statistics article Susan prepared for the *Gazette*.

Thank you to the *Gazette* editors and all who have written or phoned comments to me about the *Abacus*.

Remember, K-8 teachers, ABACUS listens and looks for your ideas of classroom ready activities.

Frances Schatz

▲ Teacher Notes

Sample Grade 9 Mathematics Exam

- This exam will constitute 15% of your overall mark in the course. It will contribute to the Application, Communication, and Knowledge/Understanding Categories of your achievement.
- Answers (the provincial standard) will demonstrate that you can correctly connect many facets of your learning to the problems posed.

Samples of Hints to close the questions in for students who need more structure:

1. a) What type of correlation is shown? Explain.
   b) Is the line of best fit that is shown a good one? Explain.
   a) Name 2 points on the line of best fit that is shown. The scale on the vertical axis is $100 and on the horizontal axis is 1 year.
   b) What is the slope of the line of best fit? What does it measure in this context?
   c) Form the equation of the line of best fit.
   d) What would be the value of this investment in 10 years? Justify your answer.
   e) What would be the approximate value of the investment after 1.5 years? Explain your method.
   f) What is the y-intercept of the line of best fit? Explain its significance in the context.
   g) If the investment stopped gaining interest, what would happen to the graph?
   h) If the rate of growth were to double, what would happen to the graph?

▲Geometry Game Assignment

From the Grade 8 Unit: Geometry

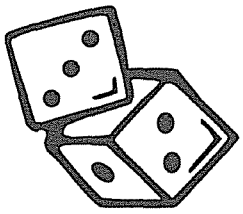
Student Name:

_____**Date:**_____

Expectations for this Subtask to Assess with this Rubric:

- identify and investigate the relationships of angles.
- construct and solve problems involving lines and angles.

Category/Criteria	Level 1	Level 2	Level 3	Level 4
Angles • **number** • **accuracy**	• several angles missing	• one or two angles missing	• includes basic 7 angles from the assignment sheet	• includes more than the 7 angles form the assignment sheet
Game Logistics	• no rules, pieces missing that are needed to play the game	• rules are included but may not be clearly understood dice or markers are not included	• rules are included, any dice or play markers are also included	• clear and detailed rules are available, all dice, markers and accessories are with the game and ready to use.
Workmanship **Neatness** **Legibility**	• game is poorly put together and doesn't survive the trip to school • messy, lines drawn without a ruler • hard to read	• game is adequate, straight lines made without a ruler • relatively neat, usually used a ruler • some difficulty reading	• game is well made, a ruler was used for straight lines, no loose pieces. • neatly made using ruler, pen and markers • easily read	• game is substantial and stands up under use. • outstanding neatness, lettering done with a computer • very easy to read.
Spelling	• many spelling errors	• some spelling errors	• few if any spelling errors	• no spelling errors
Creativity	• clearly a copy of an existing game	• minimal modifications to an existing game	• interesting, • unique, • uses other geometry features.	• extremely "cool" • blows us out of the water • "radical"



▲Geometry Game Assignment Student Worksheet

- Work on your own or with a partner.
- Create a game that incorporates angles in either the game or the board or both.
- Angles that must be included: alternate, corresponding, co-interior, opposite, acute, obtuse, and right angles.
- Include rules for the game such as how many players, how to play, how to win.
- Present the finished game to the class explaining how to play and how angles were included. Remember to include any dice, markers etc. that are needed to play the game.
- Maximum size either covers the top of your desk or a sheet of Bristol board, no minimum size.
- Neatness, legibility, accuracy, spelling and correctness count.

REMEMBER IT'S A GAME HAVE FUN!

▲ABACUS: PART III - ADDITION ON THE ABACUS

By Frances Schatz

There are two steps to the addition process. We can use computer lingo and say "feed in the numbers" and "read out the sum". Addition means combining two or more numbers and the result is a larger number.

Review: The Abacus Rows and Columns

The key to success is to recognize and be able to finger the following facts quickly.

$$6 = 1 + 5$$

recall 5 is a heaven (forefinger) bead while 1 is an earth (thumb) bead.

$$7 = 2 + 5$$

$$8 = 3 + 5$$

$$9 = 4 + 5$$

$$9 = 10 - 1$$

recall 10 is 2 fives in column D or 1 heaven bead in column C.

$$8 = 10 - 2$$

$$7 = 10 - 3$$

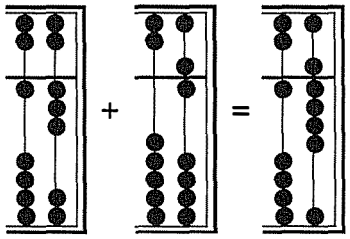
$$6 = 10 - 4$$

Have someone dictate one digit numbers for adding while you add the numbers on the abacus. No pencil or paper is allowed. The speed addition skill will be developed quickly and soon the thumb and forefinger will move more than one column at a time. Can you go faster than pressing the numbers into a calculator? Yes, it can be done. Try the following examples on your abacus while your partner reads the numbers and uses a calculator.

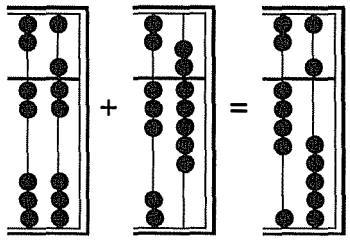
1. 2 + 5 + 7 + 1 + 8 + 5
2. 3 + 8 + 2 + 7 + 1 + 4
3. 1 + 5 + 7 + 9 + 3 + 9
4. 6 + 8 + 1 + 5 + 7 + 9
5. 6 + 6 + 7 + 8 + 9 + 9

Examples:

13 + 6 = 19



27 + 18 = 45



Review

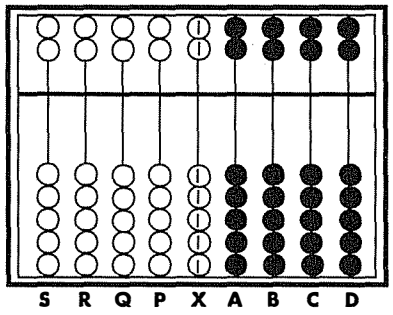


Figure 3

The crossbar divides the abacus into two windows 'heaven' and 'earth'. There are two beads in each column in heaven and five beads in each column in earth. Each column is an axis for counting. Heaven beads count five while earth beads count one. Starting at the right the place values of the nine columns for whole numbers are ones (D), tens (C), hundreds (B), thousands (A), ten thousands (X), hundred thousands (P), millions (Q), ten millions (R), hundred millions (S). The place values change if X is considered to be the decimal point.

▲ EXERCISE:

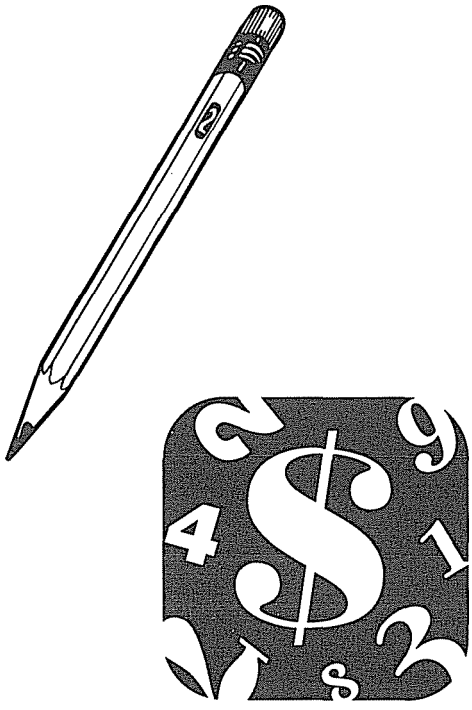
1. 6 + 6
2. 3 + 8
3. 5 + 6
4. 9 + 2
5. 12 + 5
6. 15 + 3
7. 14 + 4
8. 17 + 2
9. 23 + 12
10. 24 + 11
11. 15 + 24
12. 32 + 14
13. 24 + 17
14. 36 + 15
15. 28 + 23
16. 45 + 28
17. 11 + 20 + 8
18. 24 + 16 + 12
19. 12 + 14 + 22 + 13 + 31 + 41 + 33
20. 15 + 16 + 17 + 18 + 19 + 20 + 21
21. 82 + 73 + 69 + 54 + 72
22. 96 + 85 + 72 + 84 + 95 + 60
23. 123 + 42 + 9 + 218 + 13 + 432
24. 555 + 222 + 333 + 666
25. 1231 + 54 + 204 + 198 + 17

Addition of Decimals

Let the decimal point be represented by column X. The tenths place is A, the hundredths is B while P is ones and Q is tens. Try the following examples:

1. 12.3 + 24.5
2. 32.5 + 23.8
3. 26.17 + 15.81
4. 53.29 + 14.67

Part 4 will continue next issue: Subtraction



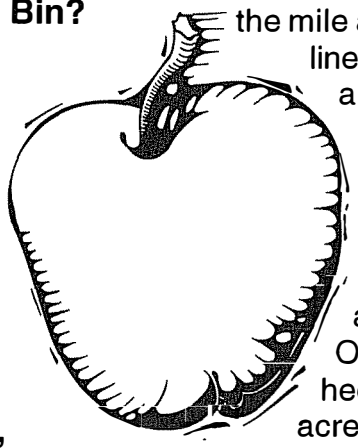
▲Pre-Calculator Farm and Home Arithmetic

Collated from hand-written notes in grandma and grandpa's farm file. By Frances Schatz.

How to Figure Interest

Here is how to find the interest on a given sum, for any number of days, at any rate of interest. At 3%, multiply the principal by the number of days and divide by 120. At 4%, multiply the principal by the number of days and divide by 90. Continue as follows: 5% use 72, 6% use 60, 7% use 52, 8% use 45, 9% use 40, and 10% use 36. In each case, mentally divide your answer by 100; that is, move the decimal place left two places. (Editor note: use your calculator and I = Prt for a check on the accuracy.)

How Much Grain is in the Bin?



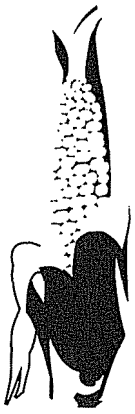
To find the number of bushels of grain or shelled corn in a rectangular bin: multiply the length by the width by the depth (all in feet) and divide by 5/4. 1 bushel of wheat weighs 60 pounds while 1 bushel of shelled corn weighs 56 pounds. 1 pound is 454 grams.

Apples in Litres, Quarts, Bushels or Pounds?

1 bushel of apples weighs about 50 pounds. 1 pound is 0.45 kilograms. 1 bushel is 35239 cubic centimetres while 1 litre is 1000 cubic centimetres. Today apples are sold by the kilogram in stores. At the market you will find the 4 litre basket replacing the 4 quart basket and the 7 litre basket replacing the 6 quart basket. I quart is 1.1 litres. The puzzle is the connection between litres and pounds.

English Customs in Measurement

Distance units were based on the dimensions of the human body. "Inch" is the width of the thumb, "foot" is length of a man's foot, and the "yard" is the distance from the tip of one's nose to the end of the middle finger when arm and hand are held out straight. Then a "fathom" (6 feet) is total arm span.



A Little History about the Acre and the Hectare

These measures describe farm land. The first land measures were by rods where the rod was a fixed length of 16.5 feet. 40 rods make a furlong, the length of the traditional furrow on old English farms. Then in the 1500s, the British Parliament set the length of the mile at 8 furlongs (5280 feet). These are linear measures. An acre is not equal to a square anything. An acre was the area of a standard Anglo-Saxon farm field, one furlong in length but only 4 rods wide (about 43 560 square feet). The family farm where I grew up is a square 100 acres. The assessment and deed describe it as 100 acres. Occasionally, I am asked "how many hectares". According to a 1943 chart, an acre is 0.4047 hectares or 1 hectare is 2.47 acres.

Miscellaneous Measurements

12 articles	= 1 dozen
20 quires	= 1 ream
12 dozen	= 1 gross
5 score	= 1 hundred
20 articles	= 1 score
24 sheets of paper	= 1 quire

If you know any other historical measures, please send them to me.

▲Sample Grade 9 Mathematics Exam

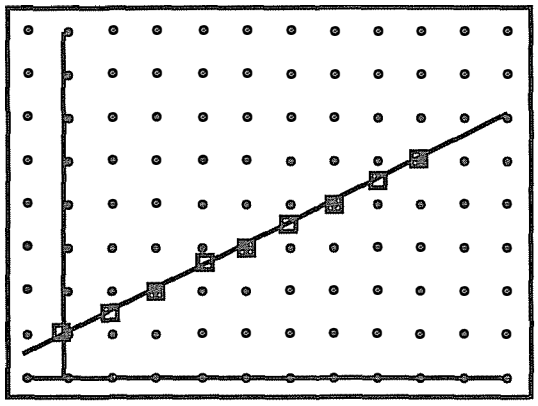
January 2000 **Name** _____

You may use a calculator, but you may not share a calculator. You should work entirely on your own, raising your hand quietly if you have a question for the teacher.

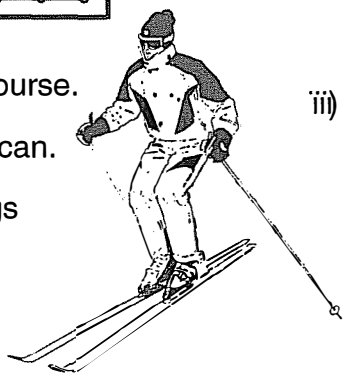
- The following questions require you to apply your knowledge and communicate your understanding of mathematics, in as much detail as you can and in the time allowed.
- You should expect to give more than a simple answer for each question. Your teacher will look to see how much relevant mathematics you have been able to show for each question posed.
- If you are having trouble thinking what mathematics to connect to any problem, let your teacher know. You will be given a hint. Such hints will be taken into account when scoring your paper, but it is wiser to accept a hint than leave a problem poorly answered.

1. You have been shown some information about an investment in the following graph. The independent variable is time in years after Mrs. Namji invested $100 in MathType Software stocks. The dependent variable is the value of her investment in hundreds of dollars.

Describe the information you can deduce from this graph. You should:



- Use the vocabulary of the course.
- Give as much detail as you can.
- Phrase some of your findings in "If..., then..." format.



2. a) **Draw** a sketch of the graph of each relationship described below.

b) **Label** any special features that you have included, stating why these features are important in the context.

c) Show and label, beside the graph, any calculations you do.

i) Ms. Pascos fills her car up with gas before she starts out on a trip to Montreal. Her car holds 50 L of gas. Since she is driving overnight, she is able to maintain a constant speed and her car consumes fuel at a rate of 8 L/100 km.

ii) Mrs. Rossi wants to buy Easter candies for her three children. Laura Secord offers small chocolate pieces at $0.50 per 5 mg item. You should describe your thinking on the values you choose for the independent variable.

iii) Mr. White skis at Whistler/Blackcomb and uses the ski lifts. The lower lift takes skiers from the Whistler village at an elevation of 600 m to the 1837 m level in 10 minutes. Then skiers have to walk over to a second lift which takes skiers to the 2187 m level in 5 minutes.

L1	L2	L3 1
12.000	168.00	197.00
16.000	204.00	221.00
20.000	240.00	245.00
24.000	276.00	269.00
28.000	312.00	293.00
32.000	348.00	317.00
36.000	384.00	341.00
L1(3)=12		

3. This screen shot of a TI83+ calculator shows the number of days for an equipment rental in L1, the cost in $ to rent from Company A in L2, and the cost in $ to rent from Company B in L3. The equipment is identical from the two rental companies.

a) Write an ad for each company, showing:

- cost per day
- down payment taken at the time of taking the equipment from the rental company

Show your calculation and thinking in the table below.

Analysis

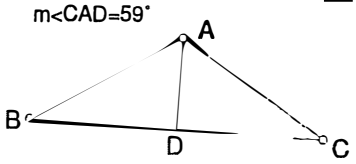
Company A	Company B

b) Discuss which company would be best to use for renting equipment. You should include some statements in "If..., then..." form to show your understanding of the fee structure.

4. Median AD for any ΔABC has been constructed using Geometer's Sketchpad.

m<BAD=59°
m<CAD=59°

Angle(BAD)	51.	48.	40.	59.
Angle(CAD)	45.	48.	47.	59.



~~George made the hy~~pothesis that <BAD = <CAD. He transformed his Sketchpad diagram and created the table of values shown above.

a) What should George conclude?

b) State as many facts as you know to be true about medians in any ΔABC. Show examples of your 'facts' in well labelled diagrams.

5. Given regular pentagon ABCDE, as shown:

i) Form one hypothesis about midpoint pentagon PQRST.

ii) Show the headings in a table you would create to show a sampling of measures that would be used to confirm or refute your hypothesis.

iii) When you transform your Sketchpad pentagon, you can gather many sets of values to add to your table. In your table from part ii, enter 2 full sets of measures that would, if they appeared on your Sketchpad screen, help confirm your hypothesis.

iv) Are there other hypotheses you think that you could confirm about midpoint pentagon PQRST?

