LIGHTING MATHEMATICAL FIRES

Higher Level Thinking

Application Analysis Synthesis Evaluation

Defend Judge Rank Rate Create Develop

Produce Combine Categorize Separate Compare

Classify Solve Construct Employ Use

Understanding

Explain Outline Reorganize

Summarize Restate

Knowledge

Match List Locate Tell Say

Name Find

February 28 2004

COURSE OUTLINE

Session One	Introduction / Math Path / Mathematics Education in Ontario
Session Two	Cooperative Learning in Mathematics/Rich Learning Tasks
Session Three	The Adolescent Learner / The Mathematical Eye [Article Review Due]
Session Four	Patterning And Algebra [Investigations due]
Session Five	Graphing Calculators - Intro to Calculators TI83 Grade Nine and Ten Activities [Article Review Due]
Session Six	Constructivism – Problem Solving and Posing, Learning Mathematics Through Inquiry – Geometry and Spatial Sense [Investigations Due]
Session Seven	Geometer's Sketchpad
Session Eight	Measurement as it Relates to Geometry and Spatial Sense [Geometer's Sketchpad Assignment Due]
Session Nine	Communicating in Mathematics, Designing Rich Assessment Tasks [Article Review Due]
Session Ten	Trigonometric and Quadratic Relationships
Session Eleven	TI83 – Scatter Plots, Lines of Best Fit-Data Management and Probability, Number Sense and Numeration [Investigations Due]
Session Twelve	Probability-Data Management and Probability, Number Sense and Numeration
Session Thirteen	Assessment and Evaluation, Strands, Categories and Rubrics [Investigations Due]
Session Fourteen	**Teaching Models – TIMSS Video, TIPS**
Session Fifteen	**TIPS** [Performance Based Assessment Task and Rubric due]
Session Sixteen	**TIPS**
Session Seventeen	**The "At Risk Student": Programming Strategies**
Session Eighteen	**Mathematics Enrichment: Programming Strategies**
Session Nineteen	**Unit Presentations**
Session Twenty:	**Unit Presentations**

Using Questioning to Stimulate Mathematical Thinking

Posing "What if...?" Questions

1. What if 5 is added to each of 4 numbers, what happens to the mean?

2. What if 5 is subtracted from each of 5 numbers, what happens to the median?

3. What if each of 5 numbers is divided, what happens to the mean?

4. What if you increase the length and width of a rectangle by 50%, how is the area affected?

5. What if you decrease the length of a rectangle by 50%, but leave the width alone, how is the area affected?

6. What if you double the base of a triangle, how is the area affected?

7. What if you multiply the radius of a circle by 3, how is the area affected?

8. What if an item is reduced 20% and then 20% again, what single percent reduction is equivalent?

9. What if you divide the radius of a circle by 5, how is the circumference affected?

10. What if you double each edge of a cube, how is the volume affected?

11. What if you increase the number of sides of a polygon by 1, what happens to the sum of the measures of the interior angles?

12. What if you double the numerator of a fraction and halve the denominator, what happens to the value of the fraction?

13. What if...? [Make up some "What if...?" questions]

Lighting Mathematical Fires: Some Points of Departure

Issues: How would you scaffold each of these problems?

Difference between 'Useful Numeracy' and 'Powerful Numeracy'

False dichotomies in Mathematics Education

Procedural ⟷ Conceptual

1. What are the last two digits of
(14x13x12x11x10x9x8x7x6x5x4x3x2x1)?
How can you be sure?

2. What is the units (or ones) digit of the product.
1 x 3 x 5 x 9 x 11 x 13 x 15 x 17 x 19 x 21 x 23

3. Given that 6 + 7 + 8 + 9 + ... + 483 = 116 871 what is the sum of
8 + 9 + 10 + 11 + ... + 484 + 485?

4. On a $10 purchase, Tom was offered 3 successive discounts of 20%, 10%, and 5% in any order he wished.
He selected the discounts in the order 5%, 10% and 20%.
Which of the following order of discounts would have been better for him?

(a) 20, 10, 5 (b) 20, 5, 10 (c) 5, 20, 10 (d) 10, 20, 5

(e) none of these

5. Find a number with 13 factors.

6. Could the number 1999p + 1 be a prime, if p is prime?

7. Guess which sum is greater. Then check by doing the addition with a pencil or calculator.

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  9 8 7 6 5 4 3 2 1          1 2 3 4 5 6 7 8 9
    8 7 6 5 4 3 2 1          1 2 3 4 5 6 7 8
      7 6 5 4 3 2 1          1 2 3 4 5 6 7
        6 5 4 3 2 1            1 2 3 4 5 6
          5 4 3 2 1            1 2 3 4 5
            4 3 2 1            1 2 3 4
              3 2 1            1 2 3
                2 1            1 2
                  1            1
```

8. Using my calculator I divided two whole numbers under 100 and found the answer was

0.7397260274.

I now cannot remember which two numbers they were.

Can you find them?

9. How does adding one to the digits of any fraction affect its size?

Compare 3/10 with 4/10.

3/10 with 4/11.

Is the effect always the same?

10. Suppose a, b, and c represent whole numbers different from 0.

Also, suppose that a>b>c.

i) What can you say about each of these fractions?

a/b b/a b/c c/b a/c c/a

ii) If possible, tell which is larger.

Justify your thinking.

a/c or b/c a/b or b/b a/b or a/c

11. Suppose that $a > 1$, $0 < b < 1$, and $0 < c < 2$.

Ask students to complete each sentence by filling in the blank with:

<, =, >, or CT (for "can't tell"). [Strand ?]

i) a x b _____a (ii) b x c _____ b (iii) a x b x c ____ b

(iv) a/b ____ a (v) a/c _____ a (vi) b/c _____ b

(vii) c/c ____ c (viii) b/a _____b (ix) b/a _____c/b

12. Write a single formula for area that will work for a rectangle, a parallelogram, a trapezoid, a triangle, and a square.
Explain how it worked.

13. If you connect (0,0) to (5,3) with a line segment, it goes through seven unit squares.
If you connect (0,) to (p,q) where p and q are positive whole numbers, how many squares do you go through?
Experiment, look for patterns, and summarize your findings.

14. How many different types of triangles can you draw?

[Use either the isometric paper or the square dot paper for this exercise].

15. How many different types of quadrilaterals can you draw?

[Again, use either the isometric paper or the square dot paper].

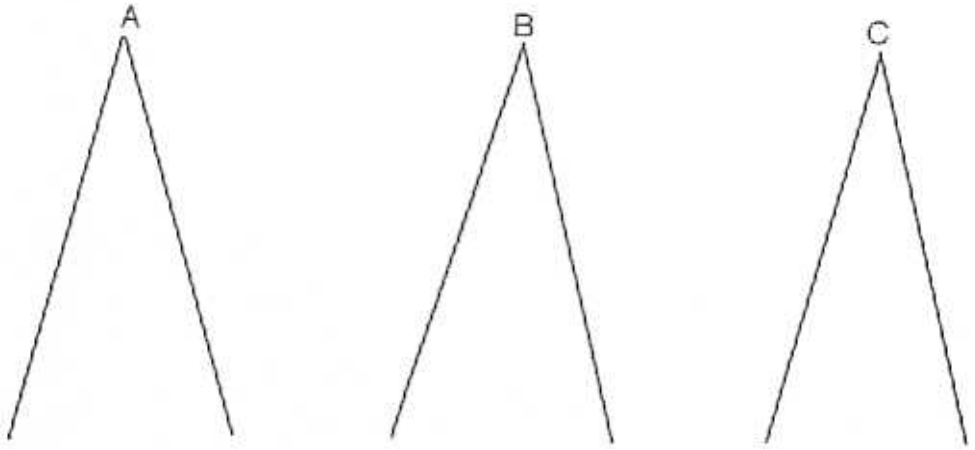
A 'Nice' Probability Tasks

The first class in any subject should be extraordinary. Just as the first few pages of a book or the first few minutes of a movie are critical to capturing the reader or viewer's attention, your first class of the year is critical to capturing the attention and interest of your students. Here is an opening class scenario which you might want to try!

Scenario

The teacher asks the students to clear their desks and choose a partner. The teacher then distributes some string, scissors, and a piece of paper with the heading "Reflections" at the top. She proposes a problem such as the following:

Take the piece of string (2m) and cut it into six pieces of equal length. In pairs, tie the end of the strings together as illustrated below. One student holds all three pairs of string so that the knots are at the top of the first and the six ends are dangling below. The other student randomly ties pairs of strings together.

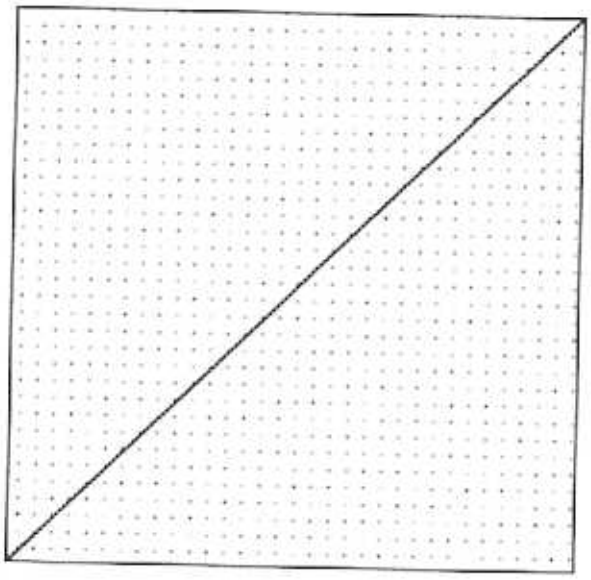


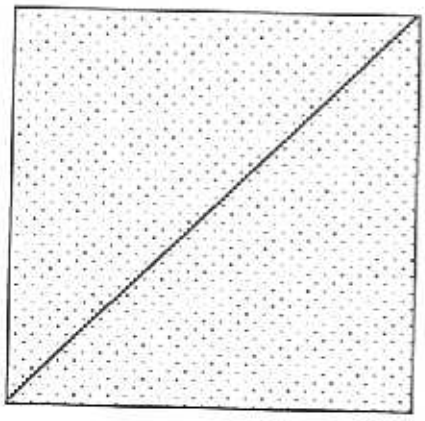
Ask the students: When the string is released what will you find? Which possibilities are most likely? Explain your thinking.

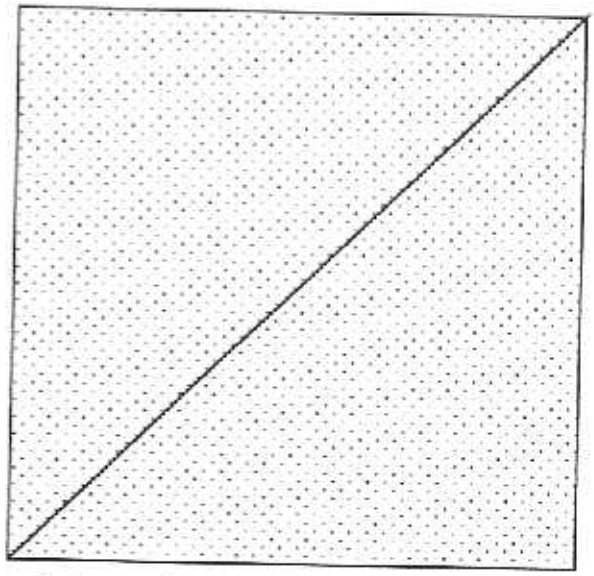
Encourage your students to explain the problem to a parent or sibling at home and to ask them what they think the possibilities might be.

What Is The Limit? Measurement --- The Full Picture

Investigate the value of Perimeter/Diameter for various regular polygons.







Consider:

a. Does your answer depend on the size of the polygon? Why?

b. What happens to the answer as the number of sides of the polygon increases?