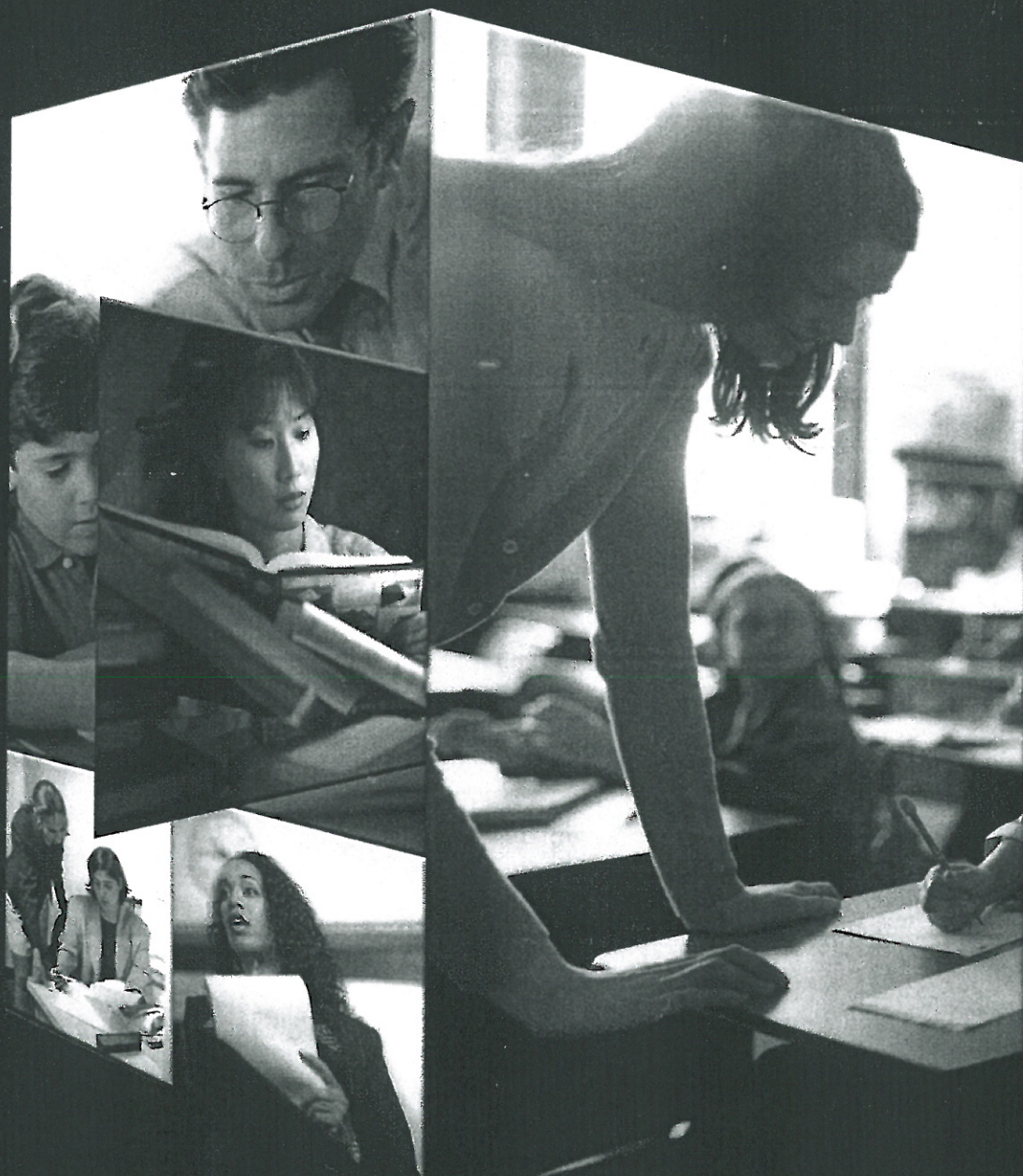


Professional Development Guidebook
for
Perspectives on the
Teaching of Mathematics



NATIONAL COUNCIL OF
TEACHERS OF MATHEMATICS

Companion to the
Sixty-sixth Yearbook

Appendix C

HIGH SCHOOL SORTING ACTIVITY

Matrix of Features Exemplified by Each Task by Category

The purpose of this matrix is to provide a set of counterexamples to assumptions made regarding the categorization of the cognitive level of a task on the basis of surface features of the task.

Features of Tasks	Memo- rization		Procedures without connections						Procedures with connections					Doing Mathematics		
	C	K	B	D	F	G	H	N	E	I	L	M	O	A	J	P
Could use manipulatives			.									.	.			
Could use calculator				
Uses/requires a diagram				
Has real-world context				
Is symbolic or abstract			
Involves multiple steps, actions, or judgments				
Requires an explanation					
Is textbook-like			

TASK A

Find the smallest positive integer that has *exactly* 13 factors.

TASK B

Factor the following polynomials.

1. $x(x + 1) - 3(x + 1)$
2. $x^2 + 5x + 6$
3. $4x^2 - 25$
4. $27x^3 + 8$

TASK C

State the triangular and unit circle definitions for $\sin \theta$, $\cos \theta$, and $\tan \theta$.

TASK D

Your math class has a ratio of boys to girls that is 2:3. If there are 8 boys in your math class, how many girls are there?

TASK E

Biologists have determined that the polynomial function

$$p(t) = -0.0001t^3 + 0.002t^2 + 1.5t + 100$$

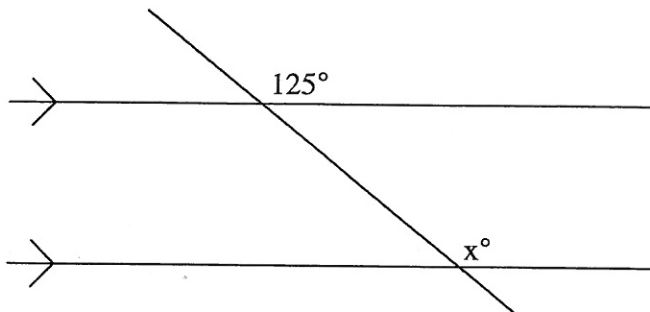
approximates the population t days later of a certain group of wild turkeys left to reproduce on their own with no predators.

- a) Draw a complete graph of the algebraic model $y = p(t)$ of this problem situation.
- b) Find the maximum turkey population and when it occurs. Explain how you know this is the maximum population.
- c) When will the turkey population be extinct? Explain how you know this date.

Source: Demana, Waits, and Clemens, *Precalculus*, (adapted from p. 184) © 1994. Reprinted by permission of Pearson Education, Inc. Publishing as Pearson Addison Wesley.

TASK F

Find the value of x in the figure below. Write a paragraph that explains how you found x .



TASK G

A will states that John is to get 3 times as much money as Mary. The total amount they will receive is \$11,000.

1. Write a system of equations describing this situation.
2. Solve to find the amounts of money John and Mary get.

TASK H

Insert parentheses to make each statement true.

1. $2 \times 14 - 9 - 17 - 14 = 7$
2. $16 + 5 \times 4 \div 2 = 42$
3. $64 \div 8 + 24 - 1 = 1$
4. $36 \div 3 - 9 \div 3 = 1$

TASK I

Solve this equation by factoring.

$$x^2 - 7x + 12 = 0$$

Explain how the factors of the equation relate to the root of the equation and how you could use that information to draw a sketch of the parabola. Then draw the sketch.

TASK J

Postal rates have been figured by the ounce since July 1, 1885. From that date until January 1, 1995, the rates have been as follows.

Nov. 3, 1917	3 cents
July 1, 1919	2 cents
July 6, 1932	3 cents
Aug. 1, 1953	4 cents
Jan. 7, 1963	6 cents
May 16, 1971	8 cents
March 2, 1974	10 cents
Dec. 31, 1975	13 cents
May 29, 1978	15 cents
March 22, 1981	18 cents
Nov. 1, 1981	20 cents
Feb. 17, 1985	22 cents
April 3, 1988	25 cents
Feb. 3, 1991	29 cents

On the basis of the data above, predict the cost of mailing a one-ounce, first-class letter in 2010. Explain your reasoning.

TASK K

Match the following rule to its correct name:

- | | |
|--|---|
| 1. $a + b = b + a$ | a. Identity property for multiplication |
| 2. $(a + b) + c = a + (b + c)$ | b. Commutative property of addition |
| 3. $a(b + c) = ab + ac$ | c. Transitive property |
| 4. $a + 0 = a$ | d. Associative property of addition |
| 5. $a(1) = a$ | e. Identity property for addition |
| 6. If $a = b$, and $b = c$, then $a = c$ | f. Distributive property |

TASK L

Use the table of values below to draw a graph of the function represented. Then use the graph to write the equation of the function. Then use the equation of the function to find $f(5)$, $f(-11)$, and $f(1/2)$. Also use the function to find x if $f(x) = 218$.

x	$f(x)$
1	-1
3	3
0	-3
-2	-7

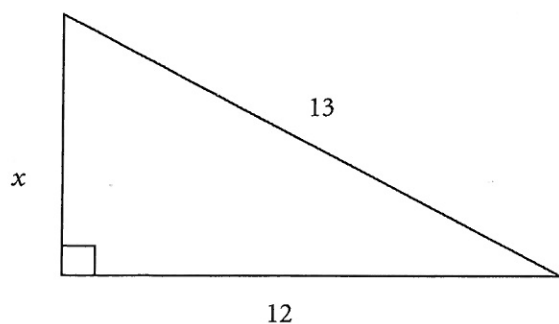
TASK M

A 25-foot ladder is placed against a building. The bottom of the ladder is 7 feet from the building. If the top of the ladder slips down 4 feet, how many feet will the bottom slide out? No, it is not 4 feet. This is a two-step problem, so draw two right triangles.

Source: Serra 1993, p. 396. *Discovering Geometry: An Inductive Approach*, Key Curriculum Press, 1150 65th Street, Emeryville, CA 94608, 1-800-995-MATH, www.keypress.com.

TASK N

Find x .



TASK O

In 1919, Babe Ruth hit the longest home run ever recorded in major-league baseball. In an exhibition game between the Boston Red Sox and the New York Giants, he sent the ball into a parabolic arc. The trajectory of the ball is given by the equation $y = x - 0.0017x^2$, where x represents the horizontal distance (in feet) and y the vertical distance (in feet) of the ball from home plate. Use your graphing calculator (the graph and calculate buttons) to answer the following questions.

1. What was the greatest height reached by the ball?
2. How far from home plate did the ball land?

TASK P

Write the next two rows in this pattern.

			1		
		3		5	
	7		9		11
13		15		17	19
21	23	25	27	29	