SEQUENTIAL MATH — COURSE I

August 17, 1988

Part I

Answer 30 questions from this part. Each correct answer will receive 2 credits. No partial credit will be allowed. Write your answers in the spaces provided on the answer sheet. Where applicable, answers may be left in terms of π or in radical form.   [60]

1. A letter is chosen at random from the word "SPINNER." Find the probability that the letter chosen is an N.   1_____

2. What is the multiplicative inverse of $\frac{3}{4}$?   2_____

3. Solve for x: $\frac{2}{3}x = 12$ 3_____

4. A 10-foot flagpole casts a shadow of 15 feet on level ground. A 6-foot man is standing next to the flagpole. Find the number of feet in the length of the shadow cast by the man.   4_____

5. Let p represent "The cake is chocolate" and let q represent "The ice cream is vanilla." Using p and q, write in symbolic form: "The cake is chocolate and the ice cream is *not* vanilla."   5_____

6. What is the *greatest* whole number that satisfies the inequality $3x - 1 < 8$?   6_____
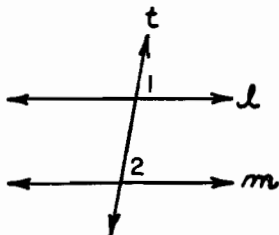
7. Solve for x: $3(x + 5) + x = 7$ 7_____

8. In the accompanying diagram of circle O, $\overline{AB}$ and $\overline{AC}$ are chords. If the measure of arc BC is 80, find m$\angle BAC$.
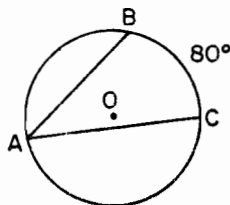
8_____

9. Two numbers are in the ratio $1:3$. If the sum of the two numbers is increased by 2, the result is 18. Find the *smaller* number.   9_____

10. In the accompanying diagram, transversal t intersects parallel lines l and m. If m$\angle 1 = 2x + 40$ and m$\angle 2 = 3x + 20$, find the value of x.

10_____

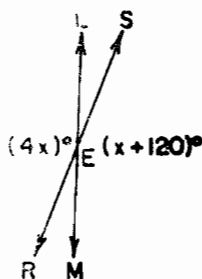11. Solve for x: $0.3x + 0.2 = 5$ 11_____

12. Solve the following system of equations for y:
$$2x + y = 2$$
$$-2x - 3y = -6$$

12_____

13. In the accompanying diagram, lines $\overleftrightarrow{RS}$ and $\overleftrightarrow{LM}$ intersect at E. If $m\angle REL = 4x$ and $m\angle SEM = x + 120$, find x.

$(4x)° \quad E \quad (x+120)°$

R   M

13_____

14. Emily has 5 lemon gumdrops, 8 strawberry gumdrops, and 7 grape gumdrops. If she selects one gumdrop at random, what is the probability that it will be either lemon or strawberry?

14_____

15. Solve for c: $\dfrac{c - 2}{4} = \dfrac{3}{2}$

15_____

16. Express as a trinomial: $(2x - 3)(x + 4)$

16_____

17. What is the radius of a circle whose circumference is 16π?

17_____

18. If $x = 3$ and $y = -5$, find the value of $x - y^2$.

18_____

19. The measures of two complementary angles are represented by $x + 5$ and $4x - 15$. Find the value of x.

19_____

20. Factor: $9x^2 - 1$

20_____

21. If a base angle of an isosceles triangle measures 35, find the measure of the vertex angle.

21_____

Directions (22–35) : For *each* question chosen, write on the answer sheet the *numeral* preceding the word or expression that best completes the statement or answers the question.

22. What is the product of $3x^4$ and $2x^3$?
(1) $5x^7$ (2) $6x^7$ (3) $6x^{12}$ (4) $5x^{12}$

22____

23. Which point lies on the graph of the equation $3x + y = 9$?
(1) $(-1,9)$ (2) $(9,0)$ (3) $(1,1)$ (4) $(0,9)$

23____

24. If $dx - 2 = h$, then x is equal to   (1) $h + \dfrac{2}{d}$

(2) $\dfrac{h - 2}{d}$ (3) $\dfrac{h + 2}{d}$ (4) $\dfrac{h}{d} + 2$

24____

25. Which statement is true if p is false and q is true?

(1) $\sim p \rightarrow q$ (2) $q \rightarrow p$ (3) $p \vee \sim q$ (4) $p \wedge q$ 25____

26. Which inequality is represented by the accompanying graph?

$$-2 \ -1 \ 0 \ 1 \ 2 \ 3 \ 4 \ 5$$

(1) $-1 \leq x \leq 4$ (2) $-1 < x < 4$ (3) $-1 < x \leq 4$

(4) $-1 \leq x < 4$ 26____

27. In Syracuse, high temperatures for six days were recorded at 90°, 84°, 84°, 78°, 73°, and 71°. What is the median temperature for these days?   (1) 84°   (2) 81°   (3) 80°   (4) 78°   27____

28. What is the sum of $\dfrac{2x}{3}$ and $\dfrac{x}{4}$?

(1) $\dfrac{3x}{7}$ (2) $\dfrac{11x}{7}$ (3) $\dfrac{2x^2}{12}$ (4) $\dfrac{11x}{12}$ 28____

29. How many different ways may a set of 4 books be arranged side by side on a shelf?   (1) 16   (2) 256   (3) 24   (4) 4   29____

30. What is the length of the hypotenuse of a right triangle with legs of lengths 7 and 8?   (1) 9   (2) 15   (3) $\sqrt{15}$ (4) $\sqrt{113}$ 30____

31. The expression $\sqrt{50}$ is equivalent to

(1) $5\sqrt{2}$ (2) $25\sqrt{2}$ (3) $2\sqrt{5}$ (4) $5\sqrt{10}$ 31____

32. An example of an irrational number is

(1) $5.\overline{3}$ (2) $\sqrt{5}$ (3) 0   (4) $-11/6$ 32____

33. For which value of x is the expression $\dfrac{x+1}{x-3}$ undefined?

(1) 0   (2) -1 (3) 3   (4) -3 33____

34. The solution set of $x^2 - 2x - 8 = 0$ is

(1) $\{4, -2\}$ (2) $\{-4, 2\}$ (3) $\{-2, 8\}$ (4) $\{6, 2\}$ 34____

35. What is the slope of the line whose equation is $5y = 2x + 10$?

(1) 5/2   (2) 2   (3) 2/5   (4) 5   35____

Part II

Answer four questions from this part.

Show all work unless otherwise directed.   [40]

36. *a* On the same set of coordinate axes, graph the following system of inequalities.
$$y \leq \tfrac{1}{2}x - 3$$
$$y > -2x + 4 \qquad [8]$$

   b Based on the graphs drawn in part *a*, in which solution set(s) does the point whose coordinates are $(0,4)$ lie?   [2]

    (1) $y \leq \tfrac{1}{2}x - 3$, only

    (2) $y > -2x + 4$, only

    (3) both $y \leq \tfrac{1}{2}x - 3$ and $y > -2x + 4$

    (4) neither $y \leq \tfrac{1}{2}x - 3$ nor $y > -2x + 4$

37. *a* Solve the following system of equations algebraically and check:
$$y = 2x - 3$$
$$x - 3y = 24 \qquad [7, 2]$$

   b If the system of equations in part *a* were shown graphically, in which quadrant would the solution lie?   [1]

38. Find three consecutive odd integers such that three times the square of the first integer is twelve more than the product of the second and third integers. [*Only an algebraic solution will be accepted.*]   [4, 6]

39. In the accompanying diagram, $\triangle ABC$ is inscribed in circle O, diameter $\overline{AC}$ is extended to D, and the ratio of the measure of minor arc AB to the measure of minor arc BC is $3:2$.
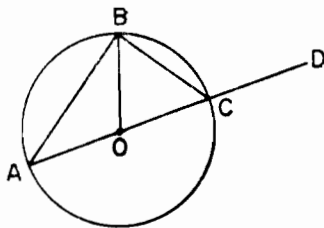
   a Find the measure of
    (1) minor arc AB [3]
    (2) arc ACB [1]

   b Find the measure of
    (1) $\angle BAC$ [2]
    (2) $\angle OBA$ [2]
    (3) $\angle BCD$ [2]

40. *On your answer paper*, complete the truth table for the statement
$$[q \lor (\sim p \land q)] \rightarrow (p \leftrightarrow \sim q). \qquad [10]$$

p	q	$\sim p$	$(\sim p \land q)$	$q \lor (\sim p \land q)$	$\sim q$	$p \rightarrow \sim q$	$[q \lor (\sim p \land q)] \rightarrow (p \rightarrow \sim q)$
T	T						
T	F						
F	T						
F	F						

41. In the accompanying diagram, the width of the inner rectangle is represented by x and the length by $2x - 1$. The width of the outer rectangle is represented by $x + 3$ and the length by $x + 5$.

$x + 3$

x
$2x-1$

$x + 5$
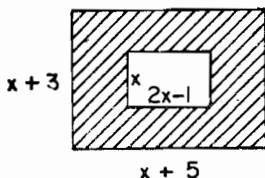
a Express the area of

   (1) the inner rectangle as a binomial in terms of x [2]

             a (1)_____

   (2) the outer rectangle as a trinomial in terms of x [2]

             a (2)_____

   (3) the shaded region as a trinomial in terms of x [2]

             a (3)_____

b If the perimeter of the outer rectangle is 24, what is the value of x?

    [4]   (*b*)_____

42. A math test was given to Ms. Jones' class. The table below shows the time the students took to complete the test.

Time (in minutes)	Frequency
38	7
36	3
34	1
32	6
30	10

Using the data table, determine the

a total number of students who took the test   [1]   *a*_____

b mode   [1]   *b*_____

c median   [2]   *c*_____

d mean, to the *nearest tenth*   [4]   *d*_____

e probability that a student chosen at random completed the
   test in a time that was less than the mean   [2]   *e*_____