Part I

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

1. A letter is chosen at random from the letters of the word "DIGIT." What is the probability that the letter chosen is an "I"?

2. Solve for x: $58 = 10x - 2$

3. The measure of the vertex angle of an isosceles triangle is 100. Find the measure of one of the base angles of the triangle.

4. There are 5 entrances and 3 exits to a large parking lot. Find the total number of different ways a driver can enter and exit the parking lot.

5. If the perimeter of a square is 32, find the area of the square.

6. In the accompanying diagram, parallel lines $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$ are intersected by transversal $\overleftrightarrow{EF}$ at R and S, respectively. If m$\angle BRS = 110$, find m$\angle RSD$.
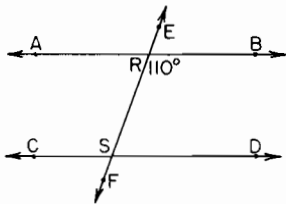

7. The statement, "If I pass this test, then I will celebrate," is represented symbolically by $p \rightarrow q$. Using p and q, express the statement, "If I do not celebrate, then I did not pass this test."

8. Solve for x: $0.02x + 6 = 6.24$

9. On a math test, a score of 60 was the lower quartile (25th percentile). If 20 students took the test, how many received scores of 60 or below?

10. Solve for a: $\dfrac{3a + 1}{4} = \dfrac{5}{2}$

11. If the square of a positive number is decreased by 10, the result is 6. Find the number.

12. The ages of five students are 14, 17, 17, 15, and 16. What is the median age?

13. Solve the following system of equations for x: $6x + y = 15$
$x + y = 5$

14. If two coins are tossed, what is the probability of getting one head and one tail?

15. If $x = 3$ and $y = -2$, find the value of $4xy^2$.

16. What is the diameter of a circle whose circumference is equal to 20π?

17. Evaluate: $\dfrac{5!}{2!}$

18. Solve for x: $5x + 2 = 3(x - 2)$

19. In the accompanying diagram, $\triangle ABC$ is a right triangle with the right angle at C. If $AC = 8$ and $BC = 6$, find AB.
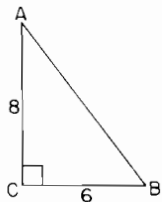

20. Express the product $(x - 3)(x + 8)$ as a trinomial.

21. Solve for R in terms of I, P, and T: $I = PRT$

22. Factor: $9x^2 - 16$

23. From $2x^2 - 3x - 5$ subtract $x^2 - x - 6$.

Directions (24–35): For *each* question chosen, write on the separate answer sheet the *numeral* preceding the word or expression that best completes the statement or answers the question.

24. Which polygon is *not* a quadrilateral?
    (1) rectangle   (2) square   (3) trapezoid   (4) hexagon

25. A root of the equation $x^2 + 2x - 15 = 0$ is
    (1) 0   (2) -2 (3) 3   (4) 5

26. The product of $3x^5$ and $2x^4$ is
    (1) $5x^9$ (2) $6x^9$ (3) $5x^{20}$ (4) $6x^{20}$

27. The measures of two supplementary angles are in the ratio 5:1. What is the measure of the *smaller* angle?
    (1) 150   (2) 75   (3) 30   (4) 15

28. An equation of the line with a slope of -2 and a y-intercept of 3 is
    (1) $y = -2x + 3$ (2) $y = 3x - 2$ (3) $y = 2x + 3$ (4) $y = -2x - 3$

29. When drawn on the same set of axes, the graphs of the equations $y = x - 1$ and $x + y = 5$ intersect at the point whose coordinates are
    (1) $(-5, 6)$ (2) $(2, 1)$ (3) $(3, 2)$ (4) $(4, 1)$

30. If $p \rightarrow q$ is false, then
    (1) both p and q are true   (2) p is true and q is false   (3) both p and q are false   (4) p is false and q is true

31. Which inequality is represented by the graph below?
   (1) $-2 \leq x < 3$ (2) $-2 < x \leq 3$ (3) $-2 \leq x \leq 3$ (4) $x < 3$
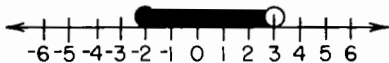
32. In the accompanying diagram of circle O, triangle ROS *must* be which type of triangle?
    (1) equilateral   (3) scalene
   (2) isosceles   (4) right
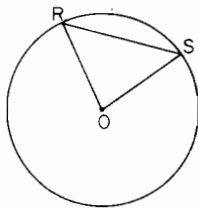
33. The inverse of a statement is $\sim p \rightarrow q$. Which is the statement?
(1) $q \rightarrow \sim p$ (2) $\sim q \rightarrow p$ (3) $p \rightarrow q$ (4) $p \rightarrow \sim q$

34. The expression $\sqrt{48} + \sqrt{27}$ is equivalent to
(1) $7\sqrt{3}$ (2) $\sqrt{75}$ (3) $6\sqrt{3}$ (4) $4\sqrt{6}$

35. In the accompanying diagram, what is the ratio of the measure of angle ACB to the measure of angle AOB?
(1) 1:1   (2) 2:1   (3) 3:1   (4) 1:2
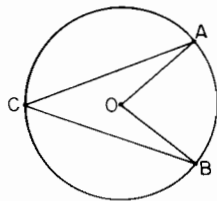
Part II

Answer four questions from this part. Show all work unless otherwise directed.

36. Solve graphically and check: $\begin{array}{l} y = 2x - 1 \\ x + y = 2 \end{array}$ [8,2]

37. Answer *both* a and b.
a. In triangle ABC, the measure of angle B is twice as large as the measure of angle A. The measure of angle C is 20 less than the measure of angle A. Find the measure of angle A. [*Only an algebraic solution will be accepted.*]   [5]
b. Eight more than six times x is less than 39. Find the largest integer for x. [*Only an algebraic solution will be accepted.*]   [5]

38. In the accompanying diagram, $\triangle RST$ is inscribed in circle O with diameter $\overline{RT}$. Radius $\overline{OS}$ is an altitude of $\triangle RST$ and $OS = 4$.
a. Find RT.   [2]
b. Express, in terms of π, the area of circle O.   [2]
c. Find the area of $\triangle RST$.   [2]
d. Express, in terms of π, the area of the shaded region.   [2]
e. Find RS. [Answer may be left in radical form.]   [2]
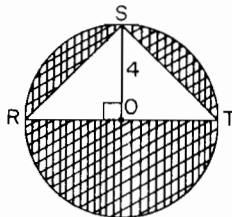
39. Find three consecutive odd integers such that the sum of the first and twice the second is 6 more than the third. [*Only an algebraic solution will be accepted.*]   [5,5]

40. In the accompanying diagram, $ABCD$ is a rectangle and $DEFG$ is a square. The area of $ABCD$ is 80, $CG = 8$, and $AE = 6$. Find the length of the side of square $DEFG$. [*Only an algebraic solution will be accepted.*]   [5,5]
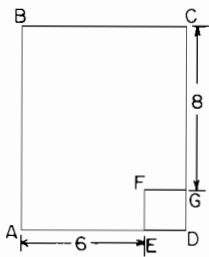
41. A penny, a nickel, and a dime are in a box. Bob randomly selects a coin, notes its value and returns it to the box. He randomly selects another coin from the box.

   a. Draw a tree diagram or list the sample space showing all possible outcomes.   [4]

   b. What is the probability that a nickel will be drawn *at least* once?   [3]

   c. What is the probability that the total value of both coins which were selected will *exceed* 11¢?   [3]

42. *On your answer paper,* construct a truth table for the statement $\sim (p \rightarrow \sim q) \leftrightarrow (p \wedge q)$.   [10]