## 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 Express the sum of $(2y + 3)$ and $(3y - 4)$ as a binomial.

2 Solve for x: $x - 0.2 = 1.8$

3 There are 3 entrances to a school and there are 2 stairways that go to the second floor. In how many different ways can a student enter the school and go to the second floor?

4 Express, in radical form, the length of the hypotenuse of a right triangle whose legs have lengths of 1 and 3.

5 Solve for x: $2(x + 3) = x + 7$

6 In the diagram below of $\triangle ABC$, $m\angle A = 70$ and $m\angle B = 30$. Find the measure of exterior angle BCD.
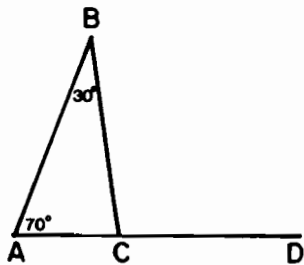
7 As shown in the accompanying diagram, $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$ intersect at point E. If the degree measures of vertical angles AED and CEB are represented by $(3x + 20)$ and $(8x - 5)$, find the value of x.
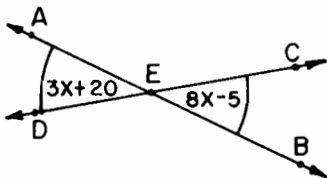
8 The measures of two complementary angles are in the ratio 2:3. Find the measure of the *larger* angle.

9 If the mean of four positive integers is exactly 10, find the sum of the four numbers.

10 Find the value of the expression $3x^3$ when $x = -2$.

11 Solve for x: $\dfrac{x + 1}{8} = \dfrac{1}{2}$

12 Factor: $4x^2 - 9$

13 Find the slope of the line whose equation is $y = -2x - 4$.

14 Thirty percent of what number is 12?

15 Let p represent "I passed the test" and let q represent "I feel proud." Using p and q, write in symbolic form, "I did not pass the test and I do not feel proud."

16 There are 14 girls and 15 boys in a class. If the teacher calls on one student at random, what is the probability the student called on is a girl?

17 A rectangle has an area of 16. If the length of the rectangle is doubled and the width remains the same, what is the area of the new rectangle?

18 A box of plant food recommends adding $1\frac{1}{2}$ ounces of plant food to every 4 quarts of water. How many ounces of plant food should be added to 16 quarts of water?

19 Express as a single fraction: $\dfrac{x}{3} + \dfrac{x}{5}$

20 Express the product $(2x - 5)(4x + 5)$ as a trinomial.

21 Find the mode of the following group of numbers: 8, 8, 9, 10, 11

22 Factor: $x^2 - x - 12$

23 The inverse of a statement is $p \to \sim q$. What is the statement?

24 Solve the following system of equations for x:

$$x + y = 7$$
$$x - y = 1$$

Directions (25–34): 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.

25 If x represents a number, which expression represents a number which is 5 less than 3 times x?
(1) $5x - 3$ (3) $3x - 5$
(2) $5 - 3x$ (4) $3 - 5x$

26 Which is logically equivalent to $p \to q$?
(1) $\sim q \to \sim p$ (3) $q \to p$
(2) $\sim p \to \sim q$ (4) $p \wedge \sim q$

27 The length of a rectangle is three times its width. If the width is represented by x, which expression represents the perimeter of the rectangle?
(1) $6x$ (3) $3x^2$
(2) $8x$ (4) $4x$

28 The accompanying diagram shows the graph of which inequality?

(1) $y > x - 1$ (3) $y < x - 1$

(2) $y \geq x - 1$ (4) $y \leq x - 1$

29 The graph of the equation $y = 5$ intersects the y-axis at the point whose coordinates are

(1) $(-5,5)$ (3) $(5,0)$

(2) $(0,5)$ (4) $(5,5)$

30 If the area of a circle is 16π, the circumference of the circle is

(1) 8π (3) 4π

(2) 8   (4) 4

31 If $x = 1$ and $y = -2$, which expression has a value of 3?

(1) $x + y$ (3) xy

(2) $x - y$ (4) $y - x$

32 The length of an edge of a cube is represented by $5x$. Which expression represents the volume of the cube?

(1) $10x^2$ (3) $5x^3$

(2) $25x^2$ (4) $125x^3$

33 Which point does *not* lie on the graph of the equation $2x + y = 3$?

(1) $(-1, -1)$ (3) $(0,3)$

(2) $(-1,5)$ (4) $(\frac{1}{2},2)$

34 Patty needs a total of $80 to buy a bicycle. She has already saved $35. If she saves $10 a week from her earnings, what is the *least* number of weeks she must work to have enough money to buy the bicycle?

(1) 5   (3) 3
(2) 8   (4) 4

Directions (35): Use compasses and straightedge. Leave all construction lines on the answer sheet.

35 *On the answer sheet*, construct triangle $A'B'C'$ congruent to $\triangle ABC$, using $\overline{B'C'}$ as one side.

Part II

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

36 Solve the following system of equations graphically and check:
$$x + y = -3$$
$$2x - y = 6 \qquad [8,2]$$

37 One number is 4 times another. The sum of the two numbers is less than 12. Find the largest possible values for the two numbers if both are integers. [*Only an algebraic solution will be accepted.*]   [6,4]

38 A garden is in the shape of a square. The length of one side of the garden is increased by 3 feet and the length of an adjacent side is increased by 2 feet. The garden now has an area of 72 square feet. What is the measure of a side of the original square garden? [*Only an algebraic solution will be accepted.*] [5,5]

39 In the diagram below, $\triangle ABC$ is inscribed in circle O. Triangle ABC is isosceles with $\overline{AB} \cong \overline{BC}$. Line EF, which contains point B, is parallel to line AC. The degree measure of arc BC is 150.
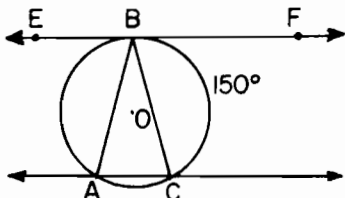
Find:
a the measure of $\angle BAC$ [2]
b the measure of $\angle EBA$ [2]
c the measure of $\angle ABC$ [2]
d the measure of arc AC [2]
e the measure of $\angle ABF$ [2]

40 The table below gives the distribution of test scores for a class of 20 students.

Test Score Interval	Number of Students (frequency)
91–100	1
81–90	3
71–80	3
61–70	7
51–60	6

a Draw a *frequency* histogram for the given data.   [4]

b Which interval contains the median?   [2]

c Which interval contains the lower quartile?   [2]

d What is the probability that a student selected at random scored above 90?   [2]

41 The diagram below represents an arrow attached to a cardboard disc. The arrow is free to spin, but cannot land on a line. The disc is divided into three regions of equal area, one of which is red and the other two blue.
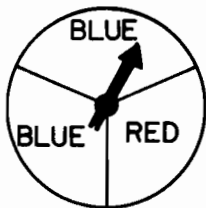
a For any one spin, what is the probability of the arrow:

(1) landing on red   [1]
(2) landing on blue   [1]

b The arrow is spun twice and each outcome is recorded. What is the probability of the arrow:

(1) landing on red on the first spin and blue on the second spin   [2]
(2) landing on blue on both spins   [2]
(3) *not* landing on blue on either spin   [2]
(4) landing on the same color on both spins   [2]

42 *a On your answer paper,* copy and
complete the truth table for the statement
$[p \vee (p \wedge q)] \to \sim q.$ [8]

p	q	$p \wedge q$	$[p \vee (p \wedge q)]$	$\sim q$	$[p \vee (p \wedge q)] \to \sim q$
T	T				
T	F				
F	T				
F	F				

b Is $[p \vee (p \wedge q)] \to \sim q$ a tautology?   [1]

c Justify the answer you gave in part *b*.   [1]