The following information is for your reference in solving some of the problems.
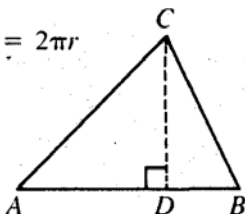
Circle of radius r: Area $= \pi r^2$ Circumference $= 2\pi r$
The number of degrees of arc in a circle is 360.
The measure in degrees of a straight angle is 180.

Triangle: The sum of the measures in degrees of the angles of a triangle is 180.

Definitions of symbols:
= is equal to $\leq$ is less than or equal to
$\neq$ is unequal to $\geq$ is greater than or equal to
< is less than $\parallel$ is parallel to
> is greater than $\perp$ is perpendicular to

If $\angle CDA$ is a right angle, then

(1) area of $\triangle ABC = \dfrac{AB \times CD}{2}$

(2) $AC^2 = AD^2 + DC^2$

Note: Figures that accompany problems in this test are intended to provide information useful in solving the problems. They are drawn as accurately as possible EXCEPT when it is stated in a specific problem that its figure is not drawn to scale. All figures lie in a plane unless otherwise indicated. All numbers used are real numbers.

1. $\left(\frac{4}{5} \div \frac{4}{5}\right) - \left(\frac{5}{6} \div \frac{5}{6}\right) =$
   (A) -2 (B) -1 (C) 0 (D) 1 (E) 2

2. For which of the following value(s) of x is it possible to obtain a value for $\dfrac{x}{3x - 5}$?
   I. $\frac{1}{2}$
   II. 0
   III. $-\frac{5}{3}$
   (A) I only (B) II only (C) III only
   (D) I and II only (E) I, II, and III

3. How many square units are there in the area of square $ABCD$ with coordinates as follows: $A(-4,4)$ $B(4,4)$ $C(4,-4)$ $D(-4,-4)$?
   (A) 12 (B) 16 (C) 32 (D) 64 (E) 100

4. If $\textcircled{x}$ is defined by the equation $\textcircled{x} = \dfrac{\sqrt{x}}{2}$ then $\textcircled{100}$ equals
   (A) 5 (B) 10 (C) 20 (D) 25 (E) 50

5. Which of the following has the largest numerical value?
   (A) $\frac{8}{0.8}$ (B) $\frac{0.8}{8}$ (C) $(0.8)^2$ (D) $\sqrt{0.8}$
   (E) 0.8π

6. The number of washers $\frac{3}{32}$ inch thick that can be cut from a piece of stock $25\frac{1}{2}$ inches long, allowing $\frac{1}{16}$ inch for waste for each cut is
   (A) 160 (B) 163 (C) 260 (D) 272
   (E) 408

7. Mr. Grey left $\frac{1}{3}$ of his property to his wife and the remainder to be divided equally between his two children. If each child received $10,000, then the wife received
   (A) $3333.33 (B) $5000.00 (C) $6666.67
   (D) $10,000.00 (E) $20,000.00

8. Each of the following sets of three numbers could represent the lengths of the sides of a triangle EXCEPT
   (A) 9, 11, 14 (B) 5, 5, 8 (C) 8, 17, 8
   (D) 3, 4, 6 (E) 3, 2, 2

9. There are 216 couples competing in a dance contest. After each half hour one-third of the contestants are eliminated. How many couples will remain eligible for the prize after the first hour?
   (A) 24 (B) 46 (C) 48 (D) 96 (E) 98

10. B equals 30% of
    (A) $30B$ (B) $\frac{B}{30}$ (C) $\frac{30}{B}$ (D) $\frac{3B}{10}$ (E) $\frac{10B}{3}$

11. By how much is $\frac{3}{4}$ larger than 20% of 2?
    (A) $\frac{1}{35}$ (B) $\frac{1}{7}$ (C) $\frac{4}{7}$ (D) $3\frac{3}{7}$ (E) $3\frac{4}{7}$

12. The drawing below represents 3 stacks of playing cards, each with 6 cards. What is the least number of cards that must be moved in order to have a ratio of $1:2:3$ for the distribution of these cards in the stacks?
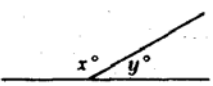   (A) 2 (B) 3 (C) 4 (D) 5 (E) 6

I   II   III

13. If 8 men can do a job in 12 days, what is the percentage increase in number of days required to do the job when 2 men are released?

(A) $16\frac{2}{3}\%$ (B) 25% (C) $33\frac{1}{3}\%$ (D) 40%

(E) 48%.

14. In a class of c pupils there are b boys. The ratio of girls to boys is:

(A) $c:b$ (B) $b:c$ (C) $\dfrac{c-b}{b}$ (D) $\dfrac{b-c}{b}$

(E) $\dfrac{b-c}{c}$

15. If in the number 4315 the digits representing tens and thousands were interchanged, the value of the new number formed in relation to the original number would be

(A) unchanged (B) 280 more (C) 280 less
(D) 2970 more (E) 2970 less

Questions 16-32 each consist of two quantities, one in Column A and one in Column B. You are to compare the two quantities and on the answer sheet fill in circle

A if the quantity in Column A is greater;
B if the quantity in Column B is greater;
C if the two quantities are equal;
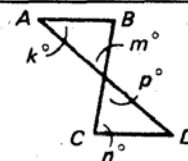D if the relationship cannot be determined from the information given.

Notes:
1. In certain questions, information concerning one or both of the quantities to be compared is centered above the two columns.
2. In a given question, a symbol that appears in both columns represents the same thing in Column A as it does in Column B.
3. Letters such as x, n, and k stand for real numbers.

EXAMPLES		
Column A	Column B	Answers
E1. 2×6	$2 + 6$	● Ⓑ Ⓒ Ⓓ

E2. $180 - x$	y	Ⓐ Ⓑ ● Ⓓ
E3. $p - q$	$q - p$	Ⓐ Ⓑ Ⓒ ●

	Column A	Column B
16.	$\dfrac{(624)(9)(8)}{(4)(3)(2)}$	$\dfrac{(4)(9)(624)}{(5)(4)(3)}$
17.	$\dfrac{1}{\sqrt{81}}$	$\dfrac{1}{0.9}$

	Column A	Column B
18.	$6R^6$	R^7

$$x^2 + y^2 = 61$$

19.	x	y

$$2x + y = 1$$

20.	y	$1 - 2x$

$$x \neq 0$$

21.	$\dfrac{\frac{x}{2}}{\frac{2}{x}}$	$\dfrac{x^2}{2}$

$$25 < \sqrt{x} < 36$$

22.	x	5
23.	$(x + y)(x - y)$	$x^2 - y^2$

AB is parallel to CD and $p = 60$, $k = 40$.

24.	n	m

25.	x^2	$2^2 - y^2$
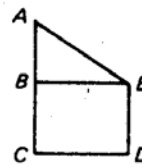
perimeter of square $BCDE = 40$
$AB = BC$

26.	Area of ABE	50

$a = 40$ and $c = 50$

27.	b	d

$$ab = 5$$
$$a^2 + b^2 = 7$$

28.	$(a + b)^2$	12

$$z = 0$$

29.	$\dfrac{(2x)(xz)}{x + y}$	zero
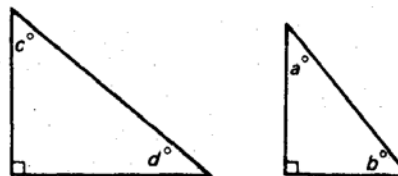
30.

$$x = \sqrt{9} + \sqrt{16}$$

x	5

$$60 + x = y - 40$$

31. The value of $x - y$ | 20

32.

| The area of a square with a perimeter of 16 meters	The area of a rectangle with a perimeter of 16 meters

Solve each of the remaining problems in this section using any available space for scratchwork. Then decide which is the best of the choices given and fill in the corresponding circle on the answer sheet.

33. A certain ore, when refined, yields an average of $1\frac{1}{4}$ pounds of metal to the ton. The number of tons of ore that will be needed to yield 200 pounds of metal is
(A) 40   (B) 80   (C) 160   (D) 200   (E) 250

34.
$$x + 2y = 1\frac{1}{3}$$
$$+x - y = +\frac{1}{3}$$
$$3y =$$
(A) 0   (B) $-\frac{1}{3}$ (C) $\frac{1}{3}$ (D) 1   (E) $1\frac{2}{3}$

35. The fraction $\frac{5Y3X}{2Y8}$, in which X and Y stand for two unknown digits, represents a division which results in a quotient that is a whole number. Which of the follwing is (are) true?
 I. X may equal 2.
 II. X may equal 6 or 0.
 III. X may equal 4.
(A) I only   (B) II only   (C) III only
(D) I and II only   (E) I, II, and III

36. $a - x = 1$
$b + 1 = x$
$ab =$
(A) $x^2 - 1$ (B) x^2 (C) $(x + 1)^2$
(D) $(x - 1)^2$ (E) $x^2 + 1$

37. To obtain a final average of 80% in a certain subject, what grade must a student earn in a test after having an average of 77.5% in four examinations?
(A) 85   (B) 87   (C) 89   (D) 90
(E) more than 90

38. When the radius of a circle is doubled, the area is multiplied by
(A) 2   (B) 2π (C) $2\pi r$ (D) 3.14   (E) 4

39. How many tiles (each one foot square) are necessary to form a one-foot border around the inside of a room which is 24 feet by 14 feet?
(A) 36   (B) 37   (C) 72   (D) 74   (E) 76

40. The area of a triangle whose legs are in the ratio of $2:3$ is 48. The length of the hypotenuse is
(A) $\sqrt{13}$ (B) 8   (C) $4\sqrt{13}$ (D) 12
(E) 208

41. If the perimeter of a square is 16, then its area is
(A) 4   (B) 8   (C) 16   (D) 64   (E) 256

42. A picture frame is 1 foot long and 9 inches wide. How long will a larger picture frame of the same proportions be if it is 3 feet wide?
(A) 4 in.   (B) 4 ft.   (C) 12 ft.   (D) 36 in.
(E) 36 ft.

43. A cow is attached to a rope in a pasture bordered by two fences (each 60 feet long) which meet at an angle of 24°. If the rope attached to the cow is 15 feet long, over how many square feet can the cow graze?
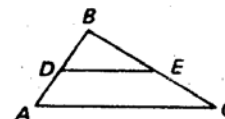(A) 2π (B) 15π (C) 30π (D) 45π
(E) 240π
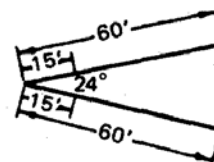
44. The area of a circle is 154. What is the diameter of the circle? $\left(\text{Use } \pi = \frac{22}{7}.\right)$
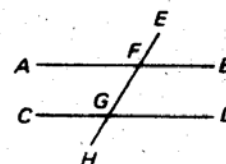(A) 3.14   (B) 7   (C) 14   (D) 21   (E) 49

45. AOC is a diameter of circle O. Line $AB = 12$, $OA = 10$. Find the length of line BC.
(A) 12   (B) 16   (C) 18
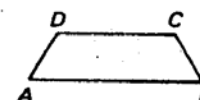(D) 20   (E) 22
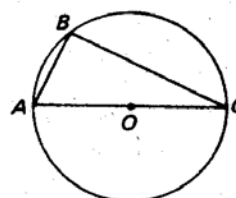
46. In $\triangle ABC$, $AD = DB = 2$, $BE = EC = 3$, $DE = 4$, $AC =$
(A) 6   (B) 7   (C) 8
(D) 9   (E) 12

47. Find the vertex angle of an isosceles triangle if it exceeds each base angle by 30°.
(A) 50°   (B) 70°   (C) 75°   (D) 80°   (E) 105°

48. AB is parallel to CD. $EFGH$ is a straight line. If $\angle AFE$ is 4 times $\angle CGH$, what is the measure of $\angle HGD$?
(A) 36   (B) 120   (C) 135
(D) 144   (E) 160

49. $AB \parallel CD$. $AB = 32$, $BC = 10$, $CD = 20$, $AD = 10$. The area of $ABCD$ is
(A) 72   (B) 112   (C) 128
(D) 208   (E) 256

50. Lines ABC and EDC meet at an angle of 30°. $BF = DF$, $AF = FE$. $\angle EDF \stackrel{\circ}{=} 80$. What is the measure of $\angle BFD$?
(A) 80°   (B) 100°
(C) 130°   (D) 150°
(E) 160°
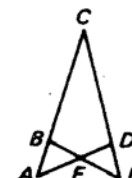
Mathematical Aptitude Section

Note: Each correct answer to the mathematics questions is keyed by number to the corresponding topic in Chapters 9 and 10. These numerals refer to the topics listed below, with specific page references in parentheses.

1. Basic Fundamental Operations (155–157)
2. Algebraic Operations (157–160)
3. Using Algebra (160–164)
4. Exponents, Roots and Radicals (159–160)
5. Inequalities (164–165)
6. Fractions (176–178)
7. Decimals (176)
8. Percent (178–180)

9. Averages (180–181)
10. Motion (182–183)
11. Ratio and Proportion (183–185)
12. Mixtures and Solutions (177–178)
13. Work (185–186)
14. Coordinate Geometry (172–173)
15. Geometry (165–172, 173–176)
16. Quantitative Comparisons (189–192)

ANSWER KEY

1. C (6)	11. A (6,8)	21. B (2,6,16)	31. B (2,16)	41. C (15)
2. D (2)	12. B (11)	22. A (4,16)	32. D (15,16)	42. B (15)
3. D (14,15)	13. C (8,11,13)	23. C (2,16)	33. C (11)	43. B (15)
4. A (2,4)	14. C (11)	24. A (15,16)	34. D (2)	44. C (15)
5. A (4,6,7)	15. E (1)	25. C (15,16)	35. E (1)	45. B (15)
6. B (1)	16. A (1,16)	26. C (15,16)	36. A (2)	46. C (15)
7. D (6)	17. B (4,6,7,16)	27. A (15,16)	37. D (8)	47. D (15)
8. C (15)	18. D (4,16)	28. A (2,16)	38. E (15)	48. D (15)
9. D (6)	19. D (2,16)	29. C (2,16)	39. C (15)	49. D (15)
10. E (3,8)	20. C (2,16)	30. A (4,16)	40. C (15)	50. C (15)