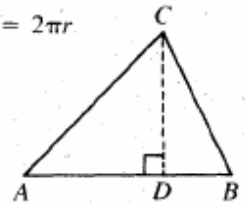
DIAGNOSTIC TEST

SECTION 2 **Time—50 minutes**
50 Questions

In this section solve each problem, using any available space on the page for scratchwork. Then decide which is the best of the choices given and fill in the corresponding circle on the answer sheet.

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.

If $\angle CDA$ is a right angle, then
(1) area of $\triangle ABC = \frac{AB \times CD}{2}$
(2) $AC^2 = AD^2 + DC^2$

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

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. 104% of 25 =
(A) 1 (B) 26 (C) 100 (D) 260 (E) 325

2. 64 is $\frac{2}{7}$ of what number?
(A) $18\frac{2}{7}$ (B) 48 (C) 128 (D) 224 (E) 448

3. $\frac{87955936}{284}$ equals exactly
(A) 309701 (B) 309702 (C) 309703
(D) 309704 (E) 309705

4. When $N = 0$ the value of $\frac{(2K)(NB)}{K + B}$ equals
(A) 0 (B) 1 (C) $\frac{2K}{K + B}$ (D) $K + B$
(E) $\frac{1}{K + B}$

5. If Δ represents an odd integer, which of the following represents an even integer?
(A) $2\Delta + 1$ (B) $2(\Delta + 2)$ (C) $\Delta + \Delta - 1$
(D) $(\Delta - 2)(\Delta + 2)$ (E) 3Δ

6. How many posts are needed for a fence 144 feet long, if the posts are placed 12 feet apart?
(A) 11 (B) 12 (C) 13 (D) 14 (E) 15

7. To get to school, a pupil must spend $\frac{1}{5}$ of an hour walking to the bus and $\frac{1}{3}$ of an hour riding in the bus, and then walk for $\frac{1}{6}$ of an hour to the school. What part of an hour does this pupil spend getting to school?
(A) $\frac{1}{14}$ (B) $\frac{7}{30}$ (C) $\frac{7}{10}$ (D) $\frac{3}{10}$ (E) $\frac{7}{20}$

8. It took Sam 200 minutes to complete the difficult *Sunday Times* crossword puzzle. Stanley did the same puzzle in 160 minutes. By what fraction of an hour was Sam's time longer than Stanley's?
(A) $\frac{1}{5}$ (B) $\frac{1}{4}$ (C) $\frac{2}{5}$ (D) $\frac{1}{2}$ (E) $\frac{2}{3}$

9. R and T are points on straight line PQ on which $PR = RT = TQ$. What percent of PT is PQ?
(A) $1\frac{1}{2}\%$ (B) 50% (C) $66\frac{2}{3}\%$ (D) $33\frac{1}{3}\%$
(E) 150%

10. If 20 teachers in a faculty of 80 are transferred, what percent of the original faculty remains?
(A) 4% (B) 16% (C) 25% (D) 60%
(E) 75%

11. SHURGRO fertilizer contains 18% ammonia plus carbon compounds. If 80% of the ammonia contains the chemical element nitrogen, what percent of this fertilizer is nitrogen?
(A) 14.4% (B) 18% (C) 38% (D) 40%
(E) 62%

12. The enrollment in a university is now 52,500, an increase of 5% over the enrollment last year. By how many students did the enrollment increase this year?
(A) 2500 (B) 47,500 (C) 50,000
(D) 55,000 (E) 57,750

13. When inserted in the parentheses, which of the symbols ($+$, $-$, $\times$, $\div$ or $=$) will make the following a true statement?

$$12t(?)\frac{3t}{\frac{1}{4}} = \frac{4t^2}{\frac{t}{3}}$$

(A) $+$ (B) $-$ (C) $\times$ (D) $\div$ (E) $=$

14. If $2^{n+2} = 8$, then $n =$

(A) -1 (B) $+1$ (C) 2 (D) 3 (E) 4

15. $\sqrt{\frac{1}{16} + \frac{1}{9}}$ equals

(A) $\frac{1}{7}$ (B) $\frac{2}{7}$ (C) $\frac{5}{12}$ (D) $\frac{7}{12}$ (E) $\frac{25}{144}$

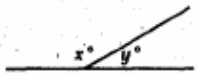
Questions 16-32 each consist of two quantities, one in Column A and one in Column B. You are to compare the two quantities and on the answer sheet fill in circle

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.

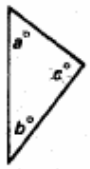
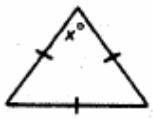
Notes:

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
	In $\triangle ABC$, $\angle B \geq 30$ and $AB = AC$	
16.	The measure of $\angle A$	The measure of $\angle C$
	$a > 1$	
17.	$(a + 1)^2$	$a(a + 2)$
	$a > 1$	
18.	$(a)\left(\frac{1}{17}\right)(48)(6)$	$(48)\left(\frac{a}{17}\right)(12)$
	$x \neq y$ and $x > 1$ and $y > 1$ $4x = 2y$	
19.	y	$2x$

	COLUMN A	COLUMN B
	 Diameter $AB = 10$ $AC = BC$	
20.	Area of ABC	$\sqrt{50}$
21.	The area of a triangle with base $\frac{x}{2}$ and height y	The area of a square with side $\frac{\sqrt{xy}}{2}$
	$x + 5 = y$ $x = \frac{y}{2}$	
22.	$2y$	10
23.	$a - b$	$b - a$
		
24.	Average of a, b, and c	x
25.	The sum of $2\frac{1}{2}$ and its reciprocal	2.5
	$z \neq 0$	
26.	$2z^3$	$3z^2$
	$5b = 12.5$ $3a + 2b = 12.5$	
27.	a	b
	$\frac{x}{6} = \frac{y}{4}$	
28.	$2x$	$3y$
	$\frac{2}{5} + \frac{x}{y} = \frac{7}{5}$	
29.	x	y
	$3x - 2 < 0$	
30.	$3x$	2

COLUMN A	COLUMN B

$\frac{3}{x} = 2$ and $\frac{5}{y} = 2$

31. x | y

In $\triangle ABC$,
side $AB = 9$ units
and side $BC = 4$ units

32. Area of ABC | 18 square units

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. What is $a\%$ of b divided by $b\%$ of a?
(A) a (B) b (C) 1 (D) 10 (E) 100

34. Which of the following is next smaller than one-half?
(A) $\frac{1}{5}$ (B) $\frac{1}{4}$ (C) $\frac{2}{5}$ (D) $\frac{16}{25}$ (E) $\frac{3}{10}$

35. The fraction $\frac{t+n}{n} =$
(A) $\frac{t}{n} + n$ (B) $\frac{t+n}{t}$ (C) $\frac{t}{n} + 1$
(D) $t^2 + 1$ (E) t

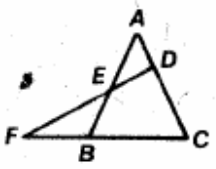
36. If 0.6 is the average of the following: 0.2, 0.8, 1.0, and x, what is the numerical value of x?
(A) 0.2 (B) 0.4 (C) 0.67 (D) 1.3 (E) 2.4

37. $\frac{a^2 - b^2}{(a-b)^2}$ is equal to
(A) $a + b$ (B) $a - b$ (C) $\frac{a+b}{a-b}$ (D) $\frac{a-b}{a+b}$
(E) 1

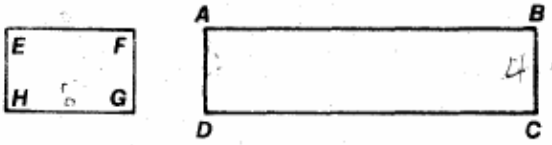
38. If two items cost c¢, how many items can be purchased for x¢?
(A) $\frac{x}{2c}$ (B) $\frac{2c}{x}$ (C) $\frac{2x}{c}$ (D) $\frac{cx}{2}$ (E) $2cx$

39. Four similar glass tumblers just fit into a cubical box. The area of the top of the circular cover of any one of the tumblers is 4π. The area of each side of the box is
(A) 16 (B) 32 (C) 32π (D) 64 (E) 64π

40. $AB = AC$, $FD = FC$, the measure of $\angle DEB \cong 120$. What is the measure of $\angle DFC$?
(A) 10°
(B) 20°
(C) 30°
(D) 50°
(E) 80°

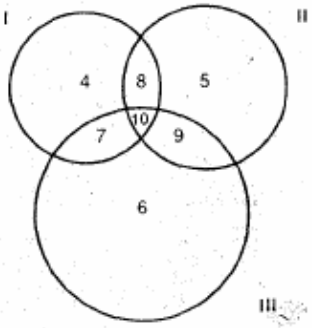


41. The area of square $EFGH$ is equal to the area of rectangle $ABCD$. $GH = 6$ feet, $AD = 4$ feet.

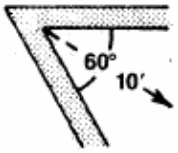


The perimeter of the rectangle (in feet) is
(A) 13 (B) 16 (C) 24 (D) 26 (E) 36

42. Circle I represents all students in a certain high school who are taking mathematics, Circle II represents all who are taking chemistry, and Circle III represents all who are taking physics. Which of the following represents all students who are taking both mathematics and chemistry but not physics?
(A) Region 4 + Region 5 − Region 6
(B) Circle I + Circle II − Circle III
(C) Region 4 + Region 8 + Region 5
(D) Region 8
(E) Circle I + Circle II − Region 10

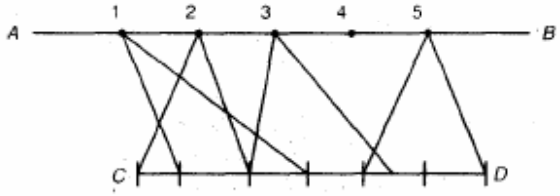


43. A cow is attached to a rope 10 feet long in a pasture bordered by two fences (more than 10 feet long) meeting at an angle of 60°. What is the area of the space in which the cow is grazing?
(A) 20π (B) $\frac{5\pi}{3}$
(C) $\frac{20\pi}{3}$ (D) $\frac{50\pi}{3}$
(E) 100π



44. If the operation ϕ is defined by the equation $x \phi y = 2x + y$, what is the value of a in the equation $2 \phi a = a \phi 3$?
(A) 0 (B) −1 (C) 1 (D) 1.5 (E) −1.5

45. AB is parallel to CD. Line segment CD is divided into six equal segments.



Of the triangles labeled by the numerals 1–5 on their vertices, the triangle with the greatest area is
(A) 1 (B) 2 (C) 3 (D) 4 (E) 5

46. If a and b are both positive numbers, and $a > b$, which of the following could be true?

I. ab is greater than either a or b.
II. ab is greater than b but less than a.
III. ab is less than either a or b.

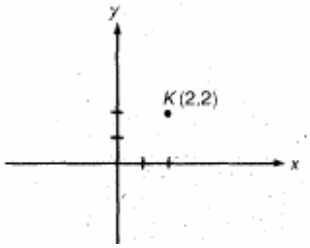
(A) I only (B) II only (C) III only
(D) I and II only (E) I, II, and III

47. A secondhand book is sold for \$1.20, which is $\frac{2}{3}$ of its original price. What was the original price?
(A) \$1.80 (B) \$.80 (C) \$1.60 (D) \$2.00
(E) \$3.80

48. The distance between two points is correctly expressed as 720 statute miles or 630 nautical miles. Which of the following most closely approximates the value of one statute mile in terms of nautical miles?
(A) 0.88 (B) 0.89 (C) 0.90 (D) 1.14
(E) 1.25

49. The average of P numbers is x and the average of N numbers is y. What is the average of all the $(P + N)$ numbers?
(A) $\frac{x + y}{2}$ (B) $x + y$ (C) $\frac{Py + Nx}{xy(P + N)}$
(D) $\frac{x + y}{P + N}$ (E) $\frac{Px + Ny}{P + N}$

50. In this figure K is the vertex of square $KLMN$, not shown. Side KL is parallel to either the x- or y-axis. If the area of $KLMN$ is 16, each of the following could be the coordinates of L EXCEPT
(A) (2,6)
(B) (6,2)
(C) (2, −2)
(D) (−2,2)
(E) (4,4)



ANSWER KEY

Mathematical Aptitude Section

These numerals refer to the topics listed below.

1. Basic Fundamental Operations
2. Algebraic Operations
3. Using Algebra
4. Exponents, Roots and Radicals
5. Inequalities
6. Fractions
7. Decimals
8. Percent
9. Averages
10. Motion
11. Ratio and Proportion
12. Mixtures and Solutions
13. Work
14. Coordinate Geometry
15. Geometry
16. Quantitative Comparisons

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