

CAT

**Previous Year
Solved Question
Papers**

2005

Examination duration: 2 hours

SECTION I

Sub-section I-A: Number of Questions = 10

Note: Questions 1 to 10 carry one mark each.

Directions for Questions 1 to 5: Answer the questions independently of each other.

1. If $x = (16^3 + 17^3 + 18^3 + 19^3)$, then x divided by 70 leaves a remainder of
 - (1) 0
 - (2) 1
 - (3) 69
 - (4) 35
2. A chemical plant has four tanks (A, B, C and D), each containing 1000 litres of a chemical. The chemical is being pumped from one tank to another as follows:

From A to B @ 20 litres/minute
From C to A @ 90 litres/minute
From A to D @ 10 litres/minute
From C to D @ 50 litres/minute
From B to C @ 100 litres/minute
From D to B @ 110 litres/minute

Which tank gets emptied first and how long does it take (in minutes) to get empty after pumping starts?

- (1) A, 16.66
 - (2) C, 20
 - (3) D, 20
 - (4) D, 25
3. Two identical circles intersect so that their centres, and the points at which they intersect, form a square of side 1 cm. The area in sq. cm of the portion that is common to the two circles is
 - (1) $\pi/4$
 - (2) $\frac{\pi}{2} - 1$
 - (3) $\frac{\pi}{5}$
 - (4) $\sqrt{2} - 1$
 4. A jogging park has two identical circular tracks touching each other, and a rectangular track enclosing the two circles. The edges of the rectangles are tangential to the circles. Two friends, A and B, start jogging simultaneously from the point where one of the circular tracks touches the smaller side of the rectangular track. A jog along the rectangular track, while B jogs along the two circular tracks in a figure of eight. Approximately, how much faster than A does B have to run, so that they take the same time to return to their starting point?
 - (1) 3.88%
 - (2) 4.22%

(3) 4.44%

(4) 4.72%

5. In a chess competition involving some boys and girls of a school, every student had to play exactly one game with every other student. It was found that in 45 games both the players were girls, and in 190 games both were boys. The number of games in which one player was a boy and the other was a girl is
- (1) 200
 (2) 216
 (3) 235
 (4) 256

Directions for Questions 6 and 7: Answer the questions on the basis of the information given below.

Ram and Shyam run a race between points **A** and **B**, 5 km apart. Ram starts at 9 a.m. from **A** at a speed of 5 km/hr, reaches **B**, and returns to **A** at the same speed. Shyam starts at 9:45 a.m. from **A** at a speed of 10 km/hr, reaches **B** and comes back to **A** at the same speed.

6. At what time do Ram and Shyam first meet each other?
- (1) 10:00 a.m.
 (2) 10:10 a.m.
 (3) 10:20 a.m.
 (4) 10:30 a.m.
7. At what time does Shyam overtake Ram?
- (1) 10:20 a.m.
 (2) 10:30 a.m.
 (3) 10:40 a.m.
 (4) 10:50 a.m.

Directions for Questions 8 to 10: Answer the questions independently of each other.

8.

$$\text{If } R = \frac{30^{65} - 29^{65}}{30^{64} + 29^{64}} \text{ then}$$

- (1) $0 < R \leq 0.1$
 (2) $0.1 < R \leq 0.5$
 (3) $0.5 < R \leq 1.0$
 (4) $R > 1.0$
9. What is the distance in cm between two parallel chords of lengths 32 cm and 24 cm in a circle of radius 20 cm?
- (1) 1 or 7
 (2) 2 or 14
 (3) 3 or 21

(4) 4 or 28

10. For which value of k does the following pair of equations yield a unique solution for x such that the solution is positive?

$$x^2 - y^2 = 0$$

$$(x - k)^2 + y^2 = 1$$

(1) 2

(2) 0

(3) $\sqrt{2}$ (4) $-\sqrt{2}$

Sub-section I-B: Number of Questions = 20

Note: Questions 11 to 30 carry two marks each.

Directions for Questions 11 to 30: Answer the questions independently of each other.

11. Let $n! = 1 \times 2 \times 3 \times \dots \times n$ for integer $n \geq 1$. If $p = 1! (2 \times 2!) + (3 \times 3!) + \dots + (10 \times 10!)$, then $p + 2$ when divided by $11!$ leaves a remainder of
- (1) 10
(2) 0
(3) 7
(4) 1
12. Consider a triangle drawn on the X-Y plane with its three vertices at $(41, 0)$, $(0, 41)$ and $(0, 0)$, each vertex being represented by its (X, Y) coordinates. The number of points with integer coordinates inside the triangle (excluding all the points on the boundary) is
- (1) 780
(2) 800
(3) 820
(4) 741
13. The digits of a three digit number A are written in the reverse order to form another three digit number B . If $B > A$ and $B - A$ is perfectly divisible by 7, then which of the following is necessarily true?
- (1) $100 < A < 299$
(2) $106 < A < 305$
(3) $112 < A < 311$
(4) $118 < A < 317$
14. If $a_1 = 1$ and $a_{n+1} - 3a_n + 2 = 4n$ for every positive integer n , then a_{100} equals
- (1) $3^{99} - 200$
(2) $3^{99} + 200$
(3) $3^{100} - 200$
(4) $3^{100} + 200$

15. Let S be the set of five digit numbers formed by the digits 1, 2, 3, 4 and 5, using each digit exactly once such that exactly two odd positions are occupied by odd digits. What is the sum of the digits in the rightmost position of the numbers in S ?
- (1) 228
(2) 216
(3) 294
(4) 192
16. The rightmost non zero digit of the number 30^{2720} is
- (1) 1
(2) 3
(3) 7
(4) 9
17. Four points A, B, C and D lie on a straight line in the X-Y plane, such that $AB = BC = CD$, and the length of AB is 1 metre. An ant at A wants to reach a sugar particle at D. But there are insect repellents kept at points B and C. The ant would not go within one metre of any insect repellent. The minimum distance in metres the ant must traverse to reach the sugar particle is
- (1) $3\sqrt{2}$
(2) $1 + \pi$
(3) $\frac{4\pi}{3}$
(4) 5
18. If $x \geq y$ and $y > 1$, then the value of the expression $\log_x \left(\frac{x}{y}\right) + \log_y \left(\frac{y}{x}\right)$ can never be
- (1) -1
(2) -0.5
(3) 0
(4) 1
19. For a positive integer n , let P_n denote the product of the digits of n , and S_n denote the sum of the digits of n . The number of integers between 10 and 1000 for which $P_n + S_n = n$ is
- (1) 81
(2) 16
(3) 18
(4) 9
20. Rectangular tiles each of size 70 cm by 30 cm must be laid horizontally on a rectangular floor of size 110 cm by 130 cm, such that the tiles do not overlap. A tile can be placed in any orientation so long as its edges are parallel to the edges

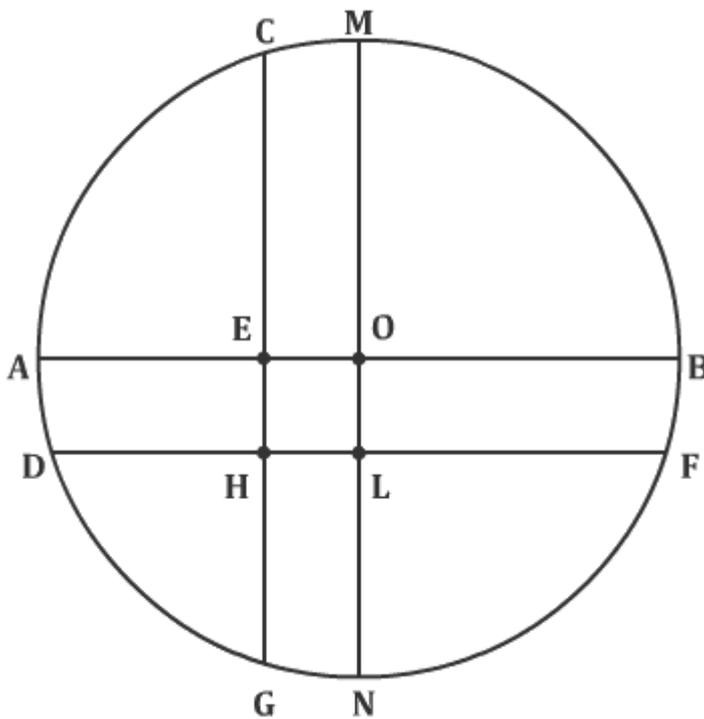
of the floor. No tile should overshoot any edge of the floor. The maximum number of tiles that can be accommodated on the floor is

- (1) 4
- (2) 5
- (3) 6
- (4) 7

21. In the X-Y plane, the area of the region bounded by the graph of $|x + y| + |x - y| = 4$ is

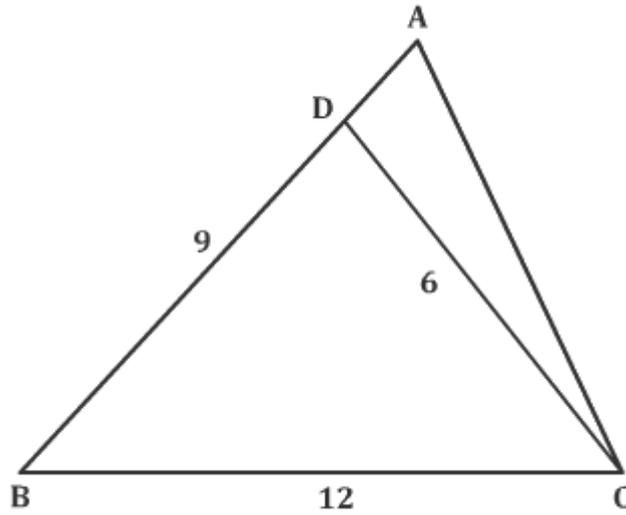
- (1) 8
- (2) 12
- (3) 16
- (4) 20

22. In the following figure, the diameter of the circle is 3 cm. AB and MN are two diameters such that MN is perpendicular to AB. In addition, CG is perpendicular to AB such that $AE:EB = 1:2$, and DF is perpendicular to MN such that $NL:LM = 1:2$. The length of DH in cm is



- (1) $2\sqrt{2} - 1$
- (2) $((2\sqrt{2} - 1))/2$
- (3) $((3\sqrt{2} - 1))/2$
- (4) $((2\sqrt{2} - 1))/3$

23. Consider the triangle ABC shown in the following figure where BC = 12 cm, DB = 9 cm, CD = 6 cm and $\angle BCD = \angle BAC$. What is the ratio of the perimeter of the triangle ADC to that of the triangle BDC?



- (1) $7/9$
 (2) $8/9$
 (3) $6/9$
 (4) $5/9$
24. P, Q, S, and R are points on the circumference of a circle of radius r , such that PQR is an equilateral triangle and PS is a diameter of the circle. What is the perimeter of the quadrilateral PQSR?
- (1) $2r(1 + \sqrt{3})$
 (2) $2r(2 + \sqrt{3})$
 (3) $r(1 + \sqrt{5})$
 (4) $2r + \sqrt{3}$
25. Let S be a set of positive integers such that every element n of S satisfies the conditions
- $1000 \leq n \leq 1200$
 - every digit in n is odd
- Then how many elements of S are divisible by 3?
- (1) 9
 (2) 10
 (3) 11
 (4) 12
- 26.

Let $x = \sqrt{4 + \sqrt{4 - \sqrt{4 + \sqrt{4 - \dots}}}}$ to infinity. Then x equals

- (1) 3
- (2) $\frac{\sqrt{13}-1}{2}$
- (3) $\frac{\sqrt{13}+1}{2}$
- (4) $\sqrt{13}$

27. Let $g(x)$ be a function such that $g(x + 1) + g(x - 1) = g(x)$ for every real x . Then for what value of p is the relation $g(x + p) = g(x)$ necessarily true for every real x ?

- (1) 5
- (2) 3
- (3) 2
- (4) 6

28. A telecom service provider engages male and female operators for answering 1000 calls per day. A male operator can handle 40 calls per day whereas a female operator can handle 50 calls per day. The male and the female operators get a fixed wage of Rs. 250 and Rs. 300 per day respectively. In addition, a male operator gets Rs. 15 per call he answers and a female operator gets Rs. 10 per call she answers. To minimize the total cost, how many male operators should the service provider employ assuming he has to employ more than 7 of the 12 female operators available for the job?

- (1) 15
- (2) 14
- (3) 12
- (4) 10

29. Three Englishmen and three Frenchmen work for the same company. Each of them knows a secret not known to others. They need to exchange these secrets over person-to-person phone calls so that eventually each person knows all six secrets. None of the Frenchmen knows English, and only one Englishman knows French. What is the minimum number of phone calls needed for the above purpose?

- (1) 5
- (2) 10
- (3) 9
- (4) 15

30. A rectangular floor is fully covered with square tiles of identical size. The tiles on the edges are white and the tiles in the interior are red. The number of white tiles is the same as the number of red tiles. A possible value of the number of tiles along one edge of the floor is

- (1) 10
- (2) 12
- (3) 14
- (4) 16

SECTION II

Sub-section II-A: Number of Questions =10

Note: Questions 31 to 40 carry one mark each.

Directions for Questions 31 to 34: The passage given below is followed by a set of four questions.

Choose the best answer to each question.

A game of strategy, as currently conceived in game theory, is a situation in which two or more "players" make choices among available alternatives (moves). The totality of choices determines the outcomes of the game, and it is assumed that the rank order of preferences for the outcomes is different for different players. Thus the "interests" of the players are generally in conflict. Whether these interests are diametrically opposed or only partially opposed depends on the type of game.

Psychologically, most interesting situations arise when the interests of the players are partly coincident and partly opposed, because then one can postulate not only a conflict among the players but also inner conflicts within the players. Each is torn between a tendency to cooperate, so as to promote the common interests, and a tendency to compete, so as to enhance his own individual interests.

Internal conflicts are always psychologically interesting. What we vaguely call "interesting" psychology is in very great measure the psychology of inner conflict. Inner conflict is also held to be an important component of serious literature as distinguished from less serious genres. The classical tragedy, as well as the serious novel, reveals the inner conflict of central figures. The superficial adventure story, on the other hand, depicts only external conflict; that is, the threats to the person with whom the reader (or viewer) identifies stem in these stories exclusively from external obstacles and from the adversaries who create them. On the most primitive level this sort of external conflict is psychologically empty. In the fisticuffs between the protagonists of good and evil, no psychological problems are involved or, at any rate, none are depicted in juvenile representations of conflict.

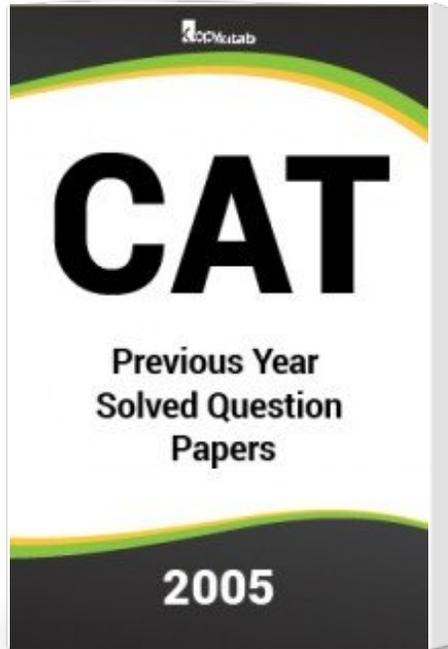
The detective story, the "adult" analogue of a juvenile adventure tale, has at times been described as a glorification of intellectualized conflict. However, a great deal of the interest in the plots of these stories is sustained by withholding the unraveling of a solution to a problem. The effort of solving the problem is in itself not a conflict if the adversary (the unknown criminal) remains passive, like Nature, whose secrets the scientist supposedly unravels by deduction. If the adversary actively puts obstacles in the detective's path toward the solution, there is genuine conflict. But the conflict is psychologically interesting only to the extent that it contains irrational components such as a tactical error on the criminal's part or the detective's insight into some psychological quirk of the criminal or something of this sort. Conflict conducted in a perfectly rational manner is psychologically no more interesting than a standard

Western. For example, Tic-tac-toe, played perfectly by both players, is completely devoid of psychological interest. Chess may be psychologically interesting but only to the extent that it is played not quite rationally. Played completely rationally, chess would not be different from Tic-tac-toe.

In short, a pure conflict of interest (what is called a zero-sum game) although it offers a wealth of interesting conceptual problems, is not interesting psychologically, except to the extent that its conduct departs from rational norms.

31. According to the passage, internal conflicts are psychologically more interesting than external conflicts because
- (1) internal conflicts, rather than external conflicts, form an important component of serious literature as distinguished from less serious genres.
 - (2) only juveniles or very few "adults" actually experience external conflict, while internal conflict is more widely prevalent in society.
 - (3) in situations of internal conflict, individuals experience a dilemma in resolving their own preferences for different outcomes.
 - (4) there are no threats to the reader (or viewer) in case of external conflicts.
32. Which, according to the author, would qualify as interesting psychology?
- (1) A statistician's dilemma over choosing the best method to solve an optimisation problem.
 - (2) A chess player's predicament over adopting a defensive strategy against an aggressive opponent.
 - (3) A mountaineer's choice of the best path to Mt. Everest from the base camp.
 - (4) A finance manager's quandary over the best way of raising money from the market.
33. According to the passage, which of the following options about the application of game theory to a conflict-of-interest situation is true?
- (1) Assuming that the rank order of preferences for options is different for different players.
 - (2) Accepting that the interests of different players are often in conflict.
 - (3) Not assuming that the interests are in complete disagreement.
 - (4) All of the above.
34. The problem solving process of a scientist is different from that of a detective because
- (1) scientists study intimate objects, while detectives deal with living criminals or law offenders.
 - (2) scientists study known objects, while detectives have to deal with unknown criminals or law offenders.
 - (3) Scientists study phenomena that are not actively altered, while detectives deal with phenomena that have been deliberately influenced to mislead.
 - (4) Scientists study psychologically interesting phenomena, while detectives deal with "adult" analogues of juvenile adventure tales.

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