QUANTITATIVE APTITUDE

Questions asked in XLRI Examination held on January 9, 2005

Directions: In each question below, choose the correct alternative from the four options provided.

1. Last year Mr Basu bought two scooters. This year he sold both of them for Rs 30,000 each. On one, he earned 20% profit, and on the other he made a 20% loss. What was his net profit or loss?

(A) He gained less than Rs 2000
(B) He gained more than Rs 2000
(C) He lost less than Rs 2000
(D) He lost more than Rs 2000

2. In an examination, the average marks obtained by students who passed was x%, while the average of those who failed was y%. The average marks of all students taking the exam was z%. Find in terms of x, y and z, the percentage of students taking the exam who failed.

(A) $\frac{(z-x)}{(y-x)}$ (B) $\frac{(x-z)}{(y-z)}$
(C) $\frac{(y-x)}{(z-y)}$ (D) $\frac{(y-z)}{(x-z)}$

3. Three circles A, B and C have a common centre O. A is the inner circle, B middle circle and C is outer circle. The radius of the outer circle C, OP cuts the inner circle at X and middle circle at Y such that OX = XY = YP. The ratio of the area of the region between the inner and middle circles to the area of the region between the middle and outer circle is:

(A) $\frac{1}{3}$ (B) $\frac{2}{5}$
(C) $\frac{3}{5}$ (D) $\frac{1}{5}$

4. The sides of a rhombus ABCD measure 2 cm each and the difference between two angles is 90° then the area of the rhombus is:

(A) $\sqrt{2}$ sq cm (B) $2\sqrt{2}$ sq cm
(C) $3\sqrt{2}$ sq cm (D) $4\sqrt{2}$ sq cm

5. If S_n denotes the sum of the first n terms in an Arithmetic Progression and $S_1 : S_4 = 1 : 10$ then the ratio of first term to fourth term is:

(A) 1 : 3 (B) 2 : 3
(C) 1 : 4 (D) 1 : 5

6. The curve $y = 4x^2$ and $y^2 = 2x$ meet at the origin O and at the point P, forming a loop. The straight line OP divides the loop into two parts. What is the ratio of the areas of the two parts of the loop?

(A) 3 : 1 (B) 3 : 2
(C) 2 : 1 (D) 1 : 1

7. How many numbers between 1 to 1000 (both excluded) are both squares and cubes?

(A) none (B) 1
(C) 2 (D) 3

8. An operation '\$' is defined as follows:
For any two positive integers x and y,

$x\$y = \sqrt{\left(\sqrt{\frac{x}{y}} + \sqrt{\frac{y}{x}}\right)}$ then which of the following is an integer?

(A) 4\$9 (B) 4\$16
(C) 4\$4 (D) None of the above

9. If f(x) = cos(x) then 50th derivative of f(x) is:

(A) sin x (B) – sin x
(C) cos x (D) – cos x

10. If a, b and c are three real numbers, then which of the following is NOT true?

(A) $|a+b| \le |a| + |b|$
(B) $|a-b| \le |a| + |b|$
(C) $|a-b| \le |a| - |b|$
(D) $|a-c| \le |a-b| + |b-c|$

11. If R = {(1, 1), (2, 2), (1, 2), (2, 1), (3, 3)} and S = {(1, 1), (2, 2), (2, 3), (3, 2), (3, 3)} are two relations in the set X = {1, 2, 3}, the incorrect statement is:

(A) R and S are both equivalence relations
(B) $R \cap S$ is an equivalence relations
(C) $R^{-1} \cap S^{-1}$ is an equivalence relations
(D) $R \cup S$ is an equivalence relations

12. If x > 8 and y > – 4, then which one of the following is always true?

(A) xy < 0
(B) $x^2 < -y$
(C) – x < 2y
(D) x > y

13. For n = 1, 2, ... let $T_n = 1^3 + 2^3 + ... + n^3$, which one of the following statements is correct?

(A) There is no value of n for which T_n is a positive power of 2.

(B) There is exactly one value of n for which T_n is a positive power of 2.

(C) There are exactly two values of n for which T_n is a positive power of 2.

(D) There are more than two values of n for which T_n is a positive power of 2.

14. An equilateral triangle is formed by joining the middle points of the sides of a given equilateral triangle. A third equilateral triangle is formed inside the second equilateral triangle in the same way. If the process continues indefinitely, then the sum of areas of all such triangles when the side of the first triangle is 16 cm is:

(A) $256\sqrt{3}$ sq cm

(B) $\frac{256}{3}\sqrt{3}$ sq cm

(C) $\frac{64}{3}\sqrt{3}$ sq cm

(D) $64\sqrt{3}$ sq cm

15. The length of the sides of a triangle are x + 1, 9 – x and 5x – 3. The number of values of x for which the triangle is isosceles is:

(A) 0 (B) 1

(C) 2 (D) 3

16. The expression $\frac{x^2-2x+a^2+b^2}{x^2+2x+a^2+b^2}$ lies between:

(A) $\frac{\sqrt{a^2+b^2}+1}{\sqrt{a^2+b^2}-1}$ and $\frac{\sqrt{a^2+b^2}-1}{\sqrt{a^2+b^2}+1}$

(B) a and b

(C) $\frac{\sqrt{a^2+b^2}+1}{\sqrt{a^2+b^2}-1}$ and 1

(D) $\frac{\sqrt{a^2+b^2}-1}{\sqrt{a^2+b^2}+1}$

17. What is the sum of first 100 terms which are common to both the progressions

17, 21, 25, ... and 16, 21, 26, ... :

(A) 100000 (B) 101100

(C) 111000 (D) 100110

18. Two people agree to meet on January 9, 2005 between 6.00 P.M. to 7.00 P.M., with the understanding that each will wait no longer than 20 minutes for the other. What is the probability that they will meet?

(A) $\frac{5}{9}$ (B) $\frac{7}{9}$

(C) $\frac{2}{9}$ (D) $\frac{4}{9}$

19. If the roots of the equation $\frac{x+a}{x+a+c}+\frac{x+b}{x+b+c}=1$ are equal in magnitude but opposite in sign, then:

(A) $c \geq a$ (B) $a \geq c$

(C) a + b = 0 (D) a = b

20. Steel Express runs between Tatanagar and Howrah and has five stoppages in between. Find the number of different kinds of one-way second class ticket that Indian Railways will have to print to service all types of passengers who might travel by Steel Express?

(A) 49 (B) 42

(C) 21 (D) 7

21. The horizontal distance of a kite from the boy flying it is 30 m and 50 m of cord is out from the roll. If the wind moves the kite horizontally at the rate of 5 km per hour directly away from the boy, how fast is the cord being released?

(A) 3 km per hour

(B) 4 km per hour

(C) 5 km per hour

(D) 6 km per hour

22. Suppose S and T are sets of vectors, where S = {(1,0,0), (0, 0, –5), (0, 3, 4)} and T = {(5, 2, 3), (5, –3, 4)} then:

(A) S and T both sets are linearly independent vectors

(B) S is a set of linearly independent vector, but T is not

(C) T is a set of linearly independent vectors, but S is not

(D) Neither S nor T is a set of linearly indepedent vectors

23. Suppose the function 'f' satisfies the equation f (x + y) = f(x) f(y) ∀x and y. f(x) = 1 + xg(x) where $\lim_{x\to 0} g(x) = T$, where T is a positive integer. If $f^n(x) = kf(x)$ then k is equal to:

(A) T (B) T^n

(C) log T (D) $(\log T)^n$

24. Set of real numbers 'x, y', satisfying, inequations $x - 3y \geq 0$, $x + y \geq -2$ and $3x - y \leq -2$ is:

(A) Empty (B) Finite

(C) Infinite (D) Cannot be determined

25. ABCD is a trapezium, such that AB, DC are parallel and BC is perpendicular to them. If $\angle DAB = 45^\circ$, BC = 2 cm and CD = 3 cm then AB = ?

(A) 5 cm (B) 4 cm

(C) 3 cm (D) 2 cm

26. If F is a differentiable function such that F(3) = 6 and F(9) = 2, then there must exist at least one number 'a' between 3 and 9, such that:

(A) $F'(a) = \frac{3}{2}$ (B) $F(a) = -\frac{3}{2}$

(C) $F'(a) = -\frac{3}{2}$ (D) $F'(a) = -\frac{2}{3}$

27. A conical tent of given capacity has to be constructed. The ratio of the height to the radius of the base for the minimum amount of canvas required for the tent is:

(A) 1 : 2 (B) 2 : 1 (C) $1:\sqrt{2}$ (D) $\sqrt{2}:1$

28. If n is a positive integer, let S(n) denote the sum of the positive divisors of n, including n and G(n) is the greatest divisor of n. If $H(n) = \frac{G(n)}{S(n)}$ then which of the following is the largest?

(A) H(2009) (B) H(2010)
(C) H(2011) (D) H(2012)

29. If the ratio of the roots of the equation

$x^2 - 2ax + b = 0$

is equal to that of the roots

$x^2 - 2cx + d = 0$, then:

(A) $a^2b = c^2d$ (B) $a^2c = b^2d$
(C) $a^2d = c^2b$ (D) $d^2b = c^2a$

30. X and Y are two variable quantities. The corresponding values of X and Y are given below:

X :	3	6	9	12	24
Y :	24	12	8	6	3

Then the relationship between X and Y is given by:

(A) $X+Y \propto X-Y$

(B) $X+Y \propto \frac{1}{X-Y}$

(C) $X \propto Y$

(D) $X \propto \frac{1}{Y}$

Read the following and answer questions 31 to 34 based on the same.

Eight sets A, B, C, D, E, F, G and H are such that
A is a superset of B, but subset of C.
B is a subset of D, but superset of E.
F is a subset of A, but superset of B.
G is a superset of D, but subset of F.
H is a subset of B.

N(A), N(B), N(C), N(D), N(E), N(F), N(G) and N(H) are the number of elements in the sets A, B, C, D, E, F, G and H respectively.

31. Which one of the following could be FALSE, but not necessarily FALSE?

(A) E is a subset of D
(B) E is a subset of C
(C) E is a subset of A
(D) E is a subset of H

32. If P is a new set and P is a superset of A and N(P) is the number of elements in P, then which of the following must be true?

(A) N(G) is smaller than only four numbers
(B) N(C) is the greatest
(C) N(B) is the smallest
(D) N(P) is the greatest

33. If Q and Z are two new sets superset of H and N(Q) and N(Z) is the number of elements of the sets Q and Z respectively, then:

(A) N(H) is the smallest of all
(B) N(E) is the smallest of all
(C) N(C) is the greatest of all
(D) Either N(H) or N(E) is the smallest

34. Which of the following could be TRUE, but not necessarily TRUE?

(A) N(A) is the greatest of all.
(B) N(G) is greater than N(D).
(C) N(H) is the least of all.
(D) N(F) is less than or equal to N(H).

35. If x + y + z = 1 and x, y, z are positive real numbers, then the least value of $(\frac{1}{x}-1)(\frac{1}{y}-1)(\frac{1}{z}-1)$ is:

(A) 4 (B) 8
(C) 16 (D) None of the above

36. ABCD is a square whose side is 2 cm each; taking AB and AD as axes, the equation of the circle circumscribing the square is:

(A) $x^2 + y^2 = (x + y)$
(B) $x^2 + y^2 = 2(x + y)$
(C) $x^2 + y^2 = 4$
(D) $x^2 + y^2 = 16$

37. Two players A and B play the following game. A selects an integer from 1 to 10, inclusive of both. B then adds any positive integer from 1 to 10, both inclusive, to the number selected by A. The player who reaches 46 first wins the game. If the game is played properly, A may win the game if:

(A) A selects 8 to begin with
(B) A selects 2 to begin with
(C) A selects any number greater than 5
(D) None of the above

Read the following and answer questions 38 and 39 based on the same:

The demand for a product (Q) is related to the price (P) of the product as follows:

$Q = 100 - 2P$

The cost (C) of manufacturing the product is related to the quantity produced in the following manner:

$C = Q^2 - 16Q + 2000$

As of now the corporate profit tax rate is zero. But the Government of India is thinking of imposing 25% tax on the profit of the company.

38. As of now, what is the profit-maximizing output?

(A) 22 (B) 21.5
(C) 20 (D) 19

39. If the government imposes the 25% corporate profit tax, then what will be the profit maximizing output?

(A) 16.5 (B) 16.125
(C) 15 (D) None of the above

40. If $X = \frac{a}{(1+r)} + \frac{a}{(1+r)^2} + \ldots + \frac{a}{(1+r)^n}$, then what is the value of $a + a(1 + r) + \ldots + a(1 + r)^{n-1}$?

(A) X [(1 + r) + (1 + r)^2 + ... + (1 + r)^n]

(B) – X (1 + r)^n

(C) X $\frac{(1+r)^n - 1}{r}$

(D) X (1 + r)$^{n-1}$

41. The first negative term in the expansion $\sqrt{(1+2x)^7}$ is the:

(A) 4th term (B) 5th term

(C) 6th term (D) 7th term

42. The sum of the numbers from 1 to 100, which are not divisible by 3 and 5.

(A) 2946 (B) 2732

(C) 2632 (D) 2317

Read the following and answer questions 43 to 47 based on the same.

Five numbers A, B, C, D and E are to be arranged in an array in such a manner that they have a common prime factor between two consecutive numbers. These integers are such that:

A has a prime factor P

B has two prime factors Q and R

C has two prime factors Q and S

D has two prime factors P and S

E has two prime factors P and R

43. Which of the following is an acceptable order, from left to right, in which the numbers can be arranged?

(A) D, E, B, C, A

(B) B, A, E, D, C

(C) B, C, D, E, A

(D) B, C, E, D, A

44. If the number E is arranged in the middle with two numbers on either side of it, all of the following must be true, EXCEPT:

(A) A and D are arranged consecutively

(B) B and C are arranged consecutively

(C) B and E are arranged consecutively

(D) A is arranged at one end in the array

45. If number E is not in the list and the other four numbers are arranged properly, which of the following must be true?

(A) A and D can not be the consecutive numbers.

(B) A and B are to be placed at the two ends in the array.

(C) A and C are to be placed at the two ends in the array.

(D) C and D can not be the consecutive numbers.

46. If number B is not in the list and other four numbers are arranged properly, which of the following must be true?

(A) A is arranged at one end in the array.

(B) C is arranged at one end in the array.

(C) D is arranged at one end in the array.

(D) E is arranged at one end in the array.

47. If B must be arranged at one end in the array, in how many ways the other four numbers can be arranged?

(A) 1 (B) 2

(C) 3 (D) 4

Questions 48 to 50 are followed by two statements labelled as (1) and (2). You have to decide if these statements are sufficient to conclusively answer the question. Give answer:

(A) If statement (1) alone or statement (2) alone is sufficient to answer the question

(B) If you can get the answer from (1) and (2) together but neither alone is sufficient

(C) If statement 1 alone is sufficient and statement (2) alone is also sufficient

(D) If neither statement (1) nor statement (2) is sufficient to answer the question

48. Around a circular table six persons A, B, C, D, E and F are sitting. Who is on the immediate left to A?

Statement 1: B is opposite to C and D is opposite to E

Statement 2: F is on the immediate left to B and D is to the left of B

49. A, B, C, D, E are five positive numbers.

A + B < C + D, B + C < D + E, C + D < E + A.

Is 'A' the greatest?

Statement 1: D + E < A + B

Statement 2: E < C

50. A sequence of numbers a_1, a_2 ..... is given by the rule $a_n^2 = a_{n+1}$. Does 3 appear in the sequence?

Statement 1: $a_1 = 2$

Statement 2: $a_3 = 16$

ANSWERS AND EXPLANATIONS

1. (D) The actual calculations for such a problem are too lengthy

By the direct approach, % Loss = $\frac{x^2}{100} = \frac{20^2}{100} = 4$

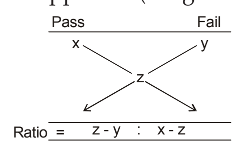
Actual loss = Rs 60,000 × 4%

= Rs 2400 and (2400 > 2000)

2. (A) Again, for this problem, direct approach (allegation diagram) can be used

Let, x > y

z > y



Total = z – y + x – z = x – y

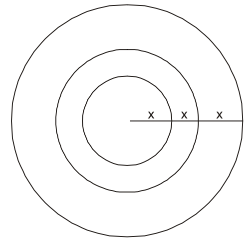
$\therefore$ % failed = $\frac{\text{failed}}{\text{total}} \times 100 = \frac{x-z}{x-y}$ or $\frac{z-x}{y-x}$

3. (C) Area of circle = πr^2

$\therefore$ Required ratio

$= \frac{\pi(2x)^2 - \pi(x^2)}{\pi(3x)^2 - \pi(2x)^2}$

$= \frac{\pi x^2(4-1)}{\pi x^2(9-4)} = \frac{3}{5}$

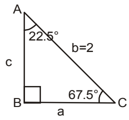


4. (B) From the adjoining diagram,

$x + y = 90°$

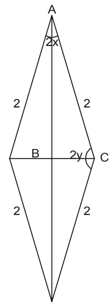
$x - y = 45°$

$x = 67.5°$ and $y = 22.5°$



Consider ΔABC

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$



Thus, area of rhombus = $2\sqrt{2}$ cm^2

5. (C) Use $S_n = \frac{n}{2}[2a + (n-1)d]$ and $T_n = a + (n-1)d$

$$\frac{S_1}{S_4} = \frac{1}{10} = \frac{a}{\frac{4}{2}[2a+3d]}$$

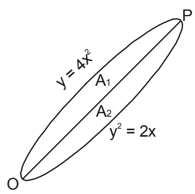
$6a = 6d$ or $a = d$

$$\therefore \frac{T_1}{T_4} = \frac{a}{a+3d} = \frac{a}{4a} = \frac{1}{4}$$

6. (D) The curves $y = 4x^2$ and $y^2 = 2x$ meet at $x = 0$ and $x = \frac{1}{2}$

(Solve simultaneously)

At $x = \frac{1}{2}$, $y = 1$



Equation of OP = $y = 2x - 2$

Ratio of areas = $\frac{A_1}{A_2}$

$$= \frac{\text{area between } y = 2x-2 \text{ and } y = 4x^2}{\text{area between } y = 2x - z \text{ and } y = \sqrt{2x}}$$

Now, for A_1

Put $2x - 2 = 4x^2$ $\therefore x = \frac{1}{2}, x = 1$

and for A_2

Put $2x - 2 = \sqrt{2x}$ $\therefore x = \frac{1}{2}, x = 2$

$$\therefore \text{Ratio} = \frac{\int_{\frac{1}{2}}^{1}(2x-2)dx - \int_{\frac{1}{2}}^{1}(4x^2)dx}{\int_{\frac{1}{2}}^{2}(2x-2)dx - \int_{\frac{1}{2}}^{2}(\sqrt{2x})dx} = \frac{\frac{17}{12}}{\frac{17}{12}} = 1:1$$

7. (B) * Try with whole cubes as they are fewer in number

$4^3 = 64$ and $8^2 = 64$

8. (D) By direct substitution.

9. (D) $\frac{dy}{dx}, \frac{d^2y}{dx^2}, \frac{d^3y}{dx^3}$ and $\frac{d^4y}{dx^4}$ are respectively:

$-\sin x, -\cos x, \sin x$ and $\cos x$

After this, there is repetition of values.

For 50th derivative, $\frac{50}{4} = 12\frac{2}{4}$

Remainder = 2

i.e. 50th derivative = same as $\frac{d^2y}{dy^2} = -\cos x$

10. (C)

11. (A) An equivalence relation is reflexive, symmetric and transitive.

12. (C) Here $x = 9, 10, 11 \ldots. \infty$

$y = -3, -2, -1, 0, 1, 2, 3, \ldots. \infty$

13. (A) $\frac{n(n+1)}{2}$ = odd x even no. $\neq 2^x$

14. (B) Required area = $\frac{\sqrt{3}}{4}[16^2 + (\frac{16}{2})^2 + (\frac{16}{4})^2 + \ldots \infty]$

and sum of GP = $\frac{a}{1-r}$ (when $n = \infty$)

$$\therefore \text{Area} = \frac{\sqrt{3}}{4}\left[\frac{16^2}{1-\frac{1}{4}}\right] = \frac{256\sqrt{3}}{3}$$

15. (D) Equate any 2 values and solve.

16. (C) Let, $\frac{x^2 - 2x + (a^2+b^2)}{x^2 + 2x + (a^2+b^2)} = m$

This becomes a quadratic equation when discriminant, $D \geq 0$

17. (B) $S_n = \frac{n}{2}[2a + (n-1)d]$

Common terms are 21, 41, 61, etc., d = 20

$\therefore S_n = \frac{100}{2}[2 \times 21 + (100-1)20]$

= 101100

18. (D) They can meet when A comes between 6 : 00 = 6 : 40.

and so B can join him between 6 : 20 = 7 : 00

Similarly, the process can be reversed

$\therefore$ Required p = $\left(\frac{40 \text{ minutes}}{60 \text{ minutes}}\right)^2 = \frac{4}{9}$

19. (C) $a = -b$, or $a + b = 0$

Use discriminant, $D = b^2 - 4ac$

20. (B) We have 5 stations + (T + H) = 7 stations

Out of the 7 stations, we have to print tickets connecting any 2; *i.e.* arrangements of 7 things, any 2 at a time, *i.e.* No. of tickets = ${}^7P_2 = 42$

21. (D) $\frac{y}{x} = \frac{5}{3}$

$\frac{dy}{dx} > 1$, *i.e.* > 5, *i.e.* 6

22. (D)

23. (C)

24. (D) $x - 3y \geq 0 \quad x + y \geq -2 \quad 3x - y \leq -2$

$4x \geq -4$ (from equations 2 and 3)

$x \geq -2$

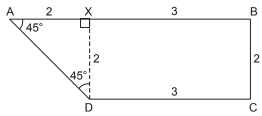
$x \leq 2$

25. (A) Draw DX. As can be seen easily,

AX = DX (Isosceles Δ).

$\therefore$ AX = 2

AB = 2 + 3 = 5 cm



26. (D) From Lagrange's mean value theorem, there is c in (a, b), such that:

$$\frac{f(b)-f(a)}{b-a} = f'(c)$$

Here, $f(a) = f(3) = 6$, $f(b) = f(9) = 2$] given

$$f'(c) \text{ or } f'(a) = \frac{2-6}{9-3} = -\frac{2}{3}$$

27. (D) $v = \frac{1}{3}\pi r^2 h$ for a cone

or $h = \frac{3v}{\pi r^2}$ .... equation 1

Amount of canvas = curved area = S

$= \pi r l = \pi r (r^2 + h^2)^{\frac{1}{2}}$

$$S^2 = \pi^2 r^2 (r^2 + h^2) = \pi^2 r^2 \left(r^2 + \frac{9v^2}{\pi^2 r^4}\right)$$

Let $S^2 = z$

$$\frac{dz}{dr} = \pi^2 \left(4r^3 - \frac{18v^2}{\pi^2 r^3}\right)$$

and $$\frac{d^2z}{dr^2} = \pi^2 \left(12r^2 + \frac{54v^2}{\pi^2 r^4}\right)$$

Put $\frac{dz}{dr} = 0$

$$4r^3 - \frac{18v^2}{\pi^2 r^3} = 0$$

$$2r^6 = \frac{9v^2}{\pi^2}$$

$$9v^2 = 2\pi^2 r^6$$

$$\therefore \frac{d^2z}{dr^2} = \pi^2 \left(12r^2 + \frac{12\pi^2 r^6}{\pi^2 r^4}\right) = \pi^2 (24r^2)$$

= positive quantity

z (*i.e.* S^2) has minimum value if $9v = 2\pi^2 r^6$

i.e. $9\left(\frac{\pi r^2 h}{3}\right)^2 = 2\pi^2 r^6$ *i.e.* $h^2 = 2r^2$ *i.e.* $\frac{h}{r} = \sqrt{2}$

* Such answers must be tabulated and learnt for ready reference.

28. (C) $G_n = n$, $H_n = \frac{n}{S_n}$

29. (C) $x = a \pm \sqrt{a^2 - b} = a + \sqrt{a^2 - b}$ and $a - \sqrt{a^2 - b}$

and $y = c \pm \sqrt{c^2 - d} = c + \sqrt{c^2 - d}$ and $c - \sqrt{c^2 - d}$

$$\frac{a + \sqrt{a^2 - b}}{a - \sqrt{a^2 - b}} = \frac{c + \sqrt{c^2 - d}}{c - \sqrt{c^2 - d}}$$

By reversing componendo and dividendo,

$$\frac{a}{\sqrt{a^2 - b}} = \frac{c}{\sqrt{c^2 - d}}$$

Squaring, $\frac{a^2}{a^2 - b} = \frac{c^2}{c^2 - d}$, *i.e.* $a^2 d = bc^2$

30. (D)

31. (D) Given $B < A \leq C$, $E < B \leq D < G \leq F$

$\downarrow$

$B < F \leq A$

$\downarrow$

$H < B$

From this information,

$H < B < F \leq A \leq C$ ..... (1)

$(< Q, Z)$ $(A < P)$

and $E < B \leq D < G \leq F$ ..... (2)

A is false from (2), B from (1), C from (1 and 2) D "may be" true

32. (D) From 1 and 2

33. (D) From 1 and 2

34. (C) B is true, A and D are false, C "may be" true

35. (D) In any case, since x, y, z >1,

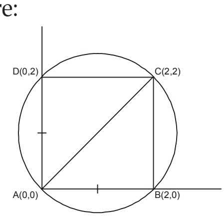
$\frac{1}{x}, \frac{1}{y}, \frac{1}{z} < 1$ (*i.e.* negative)

(–) × (–) × (–) = – (negative quantity)

36. (B) The ends of diameter AC are:

A(0, 0) and C(2, 2)

Equation of the circle with ends of diameter as (x_1, y_1) and (x_2, y_2) is:



$(x - x_1)(x - x_2) + (y - y_1)(y - y_2) = 0$

$(x - 0)(x - 2) + (y - 0)(y - 2) = 0$

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

$x^2 + y^2 = 2(x + y)$

37. (D) Since repetition of numbers is allowed, both are equally free to win the game

38. (C) $C = Q^2 - 16Q + 200$.

Put $Q = 100 - 2P$

$C = 4P^2 - 368P + 8600$

and Profit = Price – Cost

$= (100-2P) - (4P^2 + 368P + 8600)$

Differentiating, $-8P = 366$

$P = \frac{366}{8}$ and $Q = 100 - 2P$, etc.

39. (C)

40. (B) $X = \frac{a}{1+r}[1 + \frac{1}{1+r} + ... \frac{1}{(1+r)^{n-1}}]$

$= \frac{a}{r}[\frac{(1+r)^n - 1}{(1+r)^n}]$

and $S_n = a + a(1 + r) + ... = \frac{a}{r}[1 - (1 + r)^n]$, using GP

$\therefore \frac{S_n}{X} = -(1 + r)^n$

$Sn = -X(1 + r)^n$

41. (C) Let $x = \sqrt{(1+2x)^7} = (1+2x)^{\frac{7}{2}}$

Using Binomial expansion, we have:

$x = 1 + \frac{7}{2}.2x + \frac{7}{2}(\frac{7}{2} - 1)(2x)^2 + ...$

till $\frac{7}{2}(\frac{7}{2} - 4)(2x)^5$

Negative term will come when we have $\frac{7}{2} < n$,

i.e. n = 4. This happens with the 6th term

42. (D) Sum of all numbers,

$S = \frac{100}{2}[1+100] = 5050$ .... using AP

Similarly, sum of multiples of 3,

$S_3 = \frac{33}{2}[3 + 99] = 1683$

Similarly, sum of multiples of 5,

$S_5 = \frac{20}{2}[5 + 100] = 1050$

Required sum

$= 5050 - 1683 - 1050$

$= 2317$

43. (C) We have 3 options:

No. 1

A	D	E	B	C
P	S/P	P/R	R/Q	Q/S

OR

D	A	E	B	C
S/P	P	P/R	R/Q	Q/S

No. 2

A	E	B	C	D
P	P/R	R/Q	Q/S	S/P

No. 3

A	E	D	C	B
P	R/P	P/S	S/Q	Q/R

44. (D) See option (1) [a ✓ b ✓ c ✓ d ×]

45. (B) A—D—C—B

A	D	C	B
P	P/S	S/Q	Q/R

46. (C) —E—A—D—C—

E	A	D	C
R/P	P	P/S	S/Q

OR A—E—D—C

A	E	D	C
P	R/P	P/S	Q/S

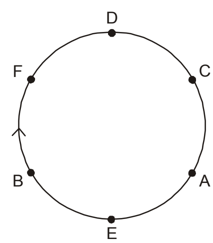
47. (B) B—C—D—E—A

B	C	D	E	A
Q/R	S/Q	P/S	R/P	P

OR B—E—A—D—C

B	E	A	D	C
Q/R	R/P	P	P/S	S/Q

48. (B)



49. (B) A + B < C + D

B + C < D + E

C + D < E + A

D + E < A + B

E < C

Adding, A + 2B < 2A + B *i.e.* B < A

50. (C) Put n = 1 in $a_n^2 = a_{n+1}$

$a_1^2 = a_2$, $a_2^2 = a_3$, $a_3^2 = a_4$, etc

From statement 1: $a_1^2 = a_2$

i.e. $2^2 = a_2$ or $a_2 = 4$

Now, $a_2^2 = a_3$

i.e. $4^2 = a_3$ or $a_3 = 16$, etc

Thus, $a_1 = 2$, $a_2 = 4$, $a_3 = 16$, etc