01. If x and y are positive real numbers such that $\log_x\left(x^2 + 12\right) = 4$ and $3\log_y x = 1$, then $x + y$ equals

    A.   20

    B.   11

    C.   68

    D.   10

---

02. If x and y are real numbers such that $x^2 + (x - 2y - 1)^2 = -4y(x + y)$, then the value $x - 2y$ is

    A.   0

    B.   1

    C.   2

    D.   -1

---

03. If $\sqrt{5x + 9} + \sqrt{5x - 9} = 3(2 + \sqrt{2})$, then $\sqrt{10x + 9}$ is equal to

    A. $4\sqrt{5}$

    B. $2\sqrt{7}$

    C. $3\sqrt{31}$

    D. $3\sqrt{7}$

---

04. Let n be the least positive integer such that 168 is a factor of 1134^n. If m is the least positive integer such that 1134^n is a factor of 168^m, then $m + n$ equals

    A.   12

    B.   9

    C.   15

    D.   24

---

05. The number of integer solutions of equation $2|x|\left(x^2 + 1\right) = 5x^2$ is

---

06. Let α and β be the two distinct roots of the equation $2x^2 - 6x + k = 0$, such that $(\alpha + \beta)$ and $\alpha\beta$ are the distinct roots of the equation $x^2 + px + p = 0$. Then, the value of $8(k - p)$ is

---

07. The equation $x^3 + (2r + 1)x^2 + (4r - 1)x + 2 = 0$ has -2 as one of the roots. If the other two roots are real, then the minimum possible non-negative integer value of r is

08. Brishti went on an 8-hour trip in a car. Before the trip, the car had travelled a total of x km till then, where x is a whole number and is palindromic, i.e., x remains unchanged when its digits are reversed. At the end of the trip, the car had travelled a total of 26862 km till then, this number again being palindromic. If Brishti never drove at more than 110 km/h, then the greatest possible average speed at which she drove during the trip, in km/h, was

   A. 90
   B. 100
   C. 80
   D. 110

---

09. The minor angle between the hours hand and minutes hand of a clock was observed at $8:48$am. The minimum duration, in minutes, after 8.48 am when this angle increases by 50% is

   A. $\frac{36}{11}$
   B. $\frac{24}{11}$
   C. 2
   D. 4

---

10. In an examination, the average marks of 4 girls and 6 boys is 24. Each of the girls has the same marks while each of the boys has the same marks. If the marks of any girl is at most double the marks of any boy, but not less than the marks of any boy, then the number of possible distinct integer values of the total marks of 2 girls and 6 boys is

   A. 19
   B. 21
   C. 20
   D. 22

---

11. A mixture P is formed by removing a certain amount of coffee from a coffee jar and replacing the same amount with cocoa powder. The same amount is again removed from mixture P and replaced with same amount of cocoa powder to form a new mixture Q. If the ratio of coffee and cocoa in the mixture Q is 16 : 9, then the ratio of cocoa in mixture P to that in mixture Q is

   A. 4 : 9
   B. 1 : 3
   C. 5 : 9
   D. 1 : 2

12. The salaries of three friends Sita, Gita and Mita are initially in the ratio 5 : 6 : 7, respectively. In the first year, they get salary hikes of 20%, 25% and 20%, respectively. In the second year, Sita and Mita get salary hikes of 40% and 25%, respectively, and the salary of Gita becomes equal to the mean salary of the three friends. The salary hike of Gita in the second year is

   A. 26%

   B. 28%

   C. 25%

   D. 30%

13. Gita sells two objects A and B at the same price such that she makes a profit of 20% on object A and a loss of 10% on object B. If she increases the selling price such that objects A and B are still sold at an equal price and a profit of 10% is made on object B, then the profit made on object A will be nearest to

   A. 42%

   B. 47%

   C. 45%

   D. 49%

14. Arvind travels from town A to town B, and Surbhi from town B to town A, both starting at the same time along the same route. After meeting each other, Arvind takes 6 hours to reach town B while Surbhi takes 24 hours to reach town A. If Arvind travelled at a speed of 54 km/h, then the distance, in km, between town A and town B is

15. The amount of job that Amal, Sunil and Kamal can individually do in a day, are in harmonic progression. Kamal takes twice as much time as Amal to do the same amount of job. If Amal and Sunil work for 4 days and 9 days, respectively, Kamal needs to work for 16 days to finish the remaining job. Then the number of days Sunil will take to finish the job working alone, is

16. Anil invests Rs. 22000 for 6 years in a certain scheme with 4% interest per annum, compounded half-yearly. Sunil invests in the same scheme for 5 years, and then reinvests the entire amount received at the end of 5 years for one year at 10% simple interest. If the amounts received by both at the end of 6 years are same, then the initial investment made by Sunil, in rupees, is

17. Let C be the circle $x^2 + y^2 + 4x - 6y - 3 = 0$ and L be the locus of the point of intersection of a pair of tangents to C with the angle between the two tangents equal to $60°$. Then, the point at which L touches the line $x = 6$ is

   A. (6,4)

   B. (6,8)

   C. (6,3)

   D. (6,6)

18. A quadrilateral ABCD is inscribed in a circle such that AB : CD = 2 : 1 and BC : AD = 5 : 4. If AC and BD intersect at the point E, then AE : CE equals

   A. 1 : 2
   B. 5 : 8
   C. 8 : 5
   D. 2 : 1

19. In a right-angled triangle ABC, the altitude AB is 5 cm, and the base BC is 12 cm. P and Q are two points on BC such that the areas of ΔABP, ΔABQ and ΔABC are in arithmetic progression. If the area of ΔABC is 1.5 times the area of ΔABP, the length of PQ, in cm, is

20. For some positive and distinct real numbers x, y and z, if $\dfrac{1}{\sqrt{y}+\sqrt{z}}$ is the arithmetic mean of $\dfrac{1}{\sqrt{x}+\sqrt{z}}$ and $\dfrac{1}{\sqrt{x}+\sqrt{y}}$, then the relationship which will always hold true, is

   A. $\sqrt{x}$, $\sqrt{y}$ and $\sqrt{z}$ are in arithmetic progression
   B. $\sqrt{x}$, $\sqrt{z}$ and $\sqrt{y}$ are in arithmetic progression
   C. y, x and z are in arithmetic progression
   D. x, y and z are in arithmetic progression

21. The number of all natural numbers up to 1000 with non-repeating digits is

   A. 585
   B. 504
   C. 648
   D. 738

22. A lab experiment measures the number of organisms at 8 am every day. Starting with 2 organisms on the first day, the number of organisms on any day is equal to 3 more than twice the number on the previous day. If the number of organisms on the nth day exceeds one million, then the lowest possible value of n is

01. Let a, b, m and n be natural numbers such that $a > 1$ and $b > 1$. If $a^m b^n = 144^{145}$, then the largest possible value of $n - m$ is

   A. 580

   B. 290

   C. 579

   D. 289

02. The sum of all possible values of x satisfying the equation $2^{4x^2} - 2^{2x^2 + x + 16} + 2^{2x + 30} = 0$, is

   A. $\frac{3}{2}$

   B. $\frac{5}{2}$

   C. $\frac{1}{2}$

   D. 3

03. For any natural numbers m, n, and k, such that k divides both $m + 2n$ and $3m + 4n$, k must be a common divisor of

   A. $2m$ and $3n$

   B. m and $2n$

   C. $2m$ and n

   D. m and n

04. Any non-zero real numbers x, y such that $y \neq 3$ and $\frac{x}{y} < \frac{x+3}{y-3}$, will satisfy the condition

   A. If $y > 10$, then $-x > y$

   B. If $x < 0$, then $-x < y$

   C. If $y < 0$, then $-x < y$

   D. $\frac{x}{y} < \frac{y}{x}$

05. For some positive real number x, if $\log_{\sqrt{3}}(x) + \frac{\log_x(25)}{\log_x(0.008)} = \frac{16}{3}$, then the value of $\log_3(3x^2)$ is
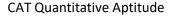
06. The number of positive integers less than 50, having exactly two distinct factors other than 1 and itself, is

07. Let k be the largest integer such that the equation $(x-1)^2 + 2kx + 11 = 0$ has no real roots. If y is a positive real number, then the least possible value of $\frac{k}{4y} + 9y$ is
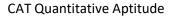
08. In a company, 20% of the employees work in the manufacturing department. If the total salary obtained by all the manufacturing employees is one-sixth of the total salary obtained by all the employees in the company, then the ratio of the average salary obtained by the manufacturing employees to the average salary obtained by the non-manufacturing employees is

    A.   4 : 5

    B.   5 : 6

    C.   5 : 4

    D.   6 : 5

09. Minu purchases a pair of sunglasses at Rs.1000 and sells to Kanu at 20% profit. Then, Kanu sells it back to Minu at 20% loss. Finally, Minu sells the same pair of sunglasses to Tanu. If the total profit made by Minu from all her transactions is Rs.500, then the percentage of profit made by Minu when she sold the pair of sunglasses to Tanu is

    A.   35.42%

    B.   31.25%

    C.   52%

    D.   26%

10. Pipes A and C are fill pipes while Pipe B is a drain pipe of a tank. Pipe B empties the full tank in one hour less than the time taken by Pipe A to fill the empty tank. When pipes A, B and C are turned on together, the empty tank is filled in two hours. If pipes B and C are turned on together when the tank is empty and Pipe B is turned off after one hour, then Pipe C takes another one hour and 15 minutes to fill the remaining tank. If Pipe A can fill the empty tank in less than five hours, then the time taken, in minutes, by Pipe C to fill the empty tank is

    A.   90

    B.   60

    C.   120

    D.   75

11. Ravi is driving at a speed of 40 km/h on a road. Vijay is 54 meters behind Ravi and driving in the same direction as Ravi. Ashok is driving along the same road from the opposite direction at a speed of 50 km/h and is 225 meters away from Ravi. The speed, in km/h, at which Vijay should drive so that all the three cross each other at the same time, is

    A.   58.8

    B.   64.4

    C.   67.2

    D.   61.6

12. Anil borrows Rs 2 lakhs at an interest rate of 8% per annum, compounded half-yearly. He repays Rs 10320 at the end of the first year and closes the loan by paying the outstanding amount at the end of the third year. Then, the total interest, in rupees, paid over the three years is nearest to

   A.   45311

   B.   51311

   C.   33130

   D.   40991

13. The price of a precious stone is directly proportional to the square of its weight. Sita has a precious stone weighing 18 units. If she breaks it into four pieces with each piece having distinct integer weight, then the difference between the highest and lowest possible values of the total price of the four pieces will be 288000. Then, the price of the original precious stone is

   A.   1296000

   B.   1944000

   C.   972000

   D.   1620000

14. A container has 40 liters of milk. Then, 4 liters are removed from the container and replaced with 4 liters of water. This process of replacing 4 liters of the liquid in the container with an equal volume of water is continued repeatedly. The smallest number of times of doing this process, after which the volume of milk in the container becomes less than that of water, is

15. Jayant bought a certain number of white shirts at the rate of Rs 1000 per piece and a certain number of blue shirts at the rate of Rs 1125 per piece. For each shirt, he then set a fixed market price which was 25% higher than the average cost of all the shirts. He sold all the shirts at a discount of 10% and made a total profit of Rs 51000. If he bought both colors of shirts, then the maximum possible total number of shirts that he could have bought is

16. If a certain amount of money is divided equally among n persons, each one receives Rs 352. However, if two persons receive Rs 506 each and the remaining amount is divided equally among the other persons, each of them receive less than or equal to Rs 330. Then, the maximum possible value of n is

17. In a rectangle ABCD, AB = 9 cm and BC = 6 cm. P and Q are two points on BC such that the areas of the figures ABP, APQ, and AQCD are in geometric progression. If the area of the figure AQCD is four times the area of triangle ABP, then BP : PQ : QC is

   A.   1 : 1 : 2

   B.   1 : 2 : 4

   C.   2 : 4 : 1

   D.   1 : 2 : 1

18. A triangle is drawn with its vertices on the circle C such that one of its sides is a diameter of C and the other two sides have their lengths in the ratio $a : b$. If the radius of the circle is r, then the area of the triangle is

A. $\frac{abr^2}{2(a^2+b^2)}$

B. $\frac{abr^2}{a^2+b^2}$

C. $\frac{4abr^2}{a^2+b^2}$

D. $\frac{2abr^2}{a^2+b^2}$

---

19. The area of the quadrilateral bounded by the Y-axis, the line $x = 5$, and the lines $|x - y| - |x - 5| = 2$, is

---

20. Let both the series $a_1, a_2, a_3, \ldots$ and $b_1, b_2, b_3 \ldots$ be in arithmetic progression such that the common differences of both the series are prime numbers. If $a_5 = b_9, a_{19} = b_{19}$ and $b_2 = 0$, then a_{11} equals

A. 79

B. 83

C. 86

D. 84

---

21. If $p^2 + q^2 - 29 = 2pq - 20 = 52 - 2pq$, then the difference between the maximum and minimum possible value of $(p^3 - q^3)$ is

A. 486

B. 189

C. 378

D. 243

---

22. Let a_n and b_n be two sequences such that $a_n = 13 + 6(n - 1)$ and $b_n = 15 + 7(n - 1)$ for all natural numbers n. Then, the largest three digit integer that is common to both these sequences, is

01. For a real number x, if $\frac{1}{2}$, $\frac{\log_3(2^x-9)}{\log_3 4}$, and $\frac{\log_5\left(2^x+\frac{17}{2}\right)}{\log_5 4}$ are in an arithmetic progression, then the common difference is

   A. $\log_4 7$
   B. $\log_4\left(\frac{3}{2}\right)$
   C. $\log_4\left(\frac{7}{2}\right)$
   D. $\log_4\left(\frac{23}{2}\right)$

02. Let n and m be two positive integers such that there are exactly 41 integers greater than 8^m and less than 8^n, which can be expressed as powers of 2. Then, the smallest possible value of $n+m$ is

   A. 14
   B. 42
   C. 16
   D. 44

03. For some real numbers a and b, the system of equations $x+y=4$ and $(a+5)x+\left(b^2-15\right)y=8b$ has infinitely many solutions for x and y. Then, the maximum possible value of ab is

   A. 15
   B. 33
   C. 55
   D. 25

04. If x is a positive real number such that $x^8+\left(\frac{1}{x}\right)^8=47$, then the value of $x^9+\left(\frac{1}{x}\right)^9$ is

   A. $40\sqrt{5}$
   B. $36\sqrt{5}$
   C. $30\sqrt{5}$
   D. $34\sqrt{5}$

05. A quadratic equation $x^2+bx+c=0$ has two real roots. If the difference between the reciprocals of the roots is $\frac{1}{3}$, and the sum of the reciprocals of the squares of the roots is $\frac{5}{9}$, then the largest possible value of $(b+c)$ is

06. The sum of the first two natural numbers, each having 15 factors (including 1 and the number itself), is

07. Let n be any natural number such that $5^{n-1} < 3^{n+1}$. Then, the least integer value of m that satisfies $3^{n+1} < 2^{n+m}$ for each such n, is

_____

08. Rahul, Rakshita and Gurmeet, working together, would have taken more than 7 days to finish a job. On the other hand, Rahul and Gurmeet, working together would have taken less than 15 days to finish the job. However, they all worked together for 6 days, followed by Rakshita, who worked alone for 3 more days to finish the job. If Rakshita had worked alone on the job then the number of days she would have taken to finish the job, cannot be

   A. 17

   B. 21

   C. 16

   D. 20

_____

09. Anil mixes cocoa with sugar in the ratio 3 : 2 to prepare mixture A, and coffee with sugar in the ratio 7 : 3 to prepare mixture B. He combines mixtures A and B in the ratio 2 : 3 to make a new mixture C. If he mixes C with an equal amount of milk to make a drink, then the percentage of sugar in this drink will be

   A. 21

   B. 24

   C. 16

   D. 17

_____

10. The population of a town in 2020 was 100000 . The population decreased by $y\%$ from the year 2020 to 2021 , and increased by $x\%$ from the year 2021 to 2022, where x and y are two natural numbers. If population in 2022 was greater than the population in 2020 and the difference between x and y is 10 , then the lowest possible population of the town in 2021 was

   A. 74000

   B. 75000

   C. 72000

   D. 73000

_____

11. A merchant purchases a cloth at a rate of Rs.100 per meter and receives 5 cm length of cloth free for every 100 cm length of cloth purchased by him. He sells the same cloth at a rate of Rs.110 per meter but cheats his customers by giving 95 cm length of cloth for every 100 cm length of cloth purchased by the customers. If the merchant provides a 5% discount, the resulting profit earned by him is

   A. 4.2%

   B. 15.5%

   C. 16%

   D. 9.7%

12. There are three persons A, B and C in a room. If a person D joins the room, the average weight of the persons in the room reduces by x kg . Instead of D, if person E joins the room, the average weight of the persons in the room increases by $2x$ kg . If the weight of E is 12 kg more than that of D, then the value of x is

   A.   1.5

   B.   2

   C.   0.5

   D.   1

13. A boat takes 2 hours to travel downstream a river from port A to port B, and 3 hours to return to port A. Another boat takes a total of 6 hours to travel from port B to port A and return to port B. If the speeds of the boats and the river are constant, then the time, in hours, taken by the slower boat to travel from port A to port B is

   A. $3(3 - \sqrt{5})$

   B. $12(\sqrt{5} - 2)$

   C. $3(3 + \sqrt{5})$

   D. $3(\sqrt{5} - 1)$

14. A fruit seller has a stock of mangoes, bananas and apples with at least one fruit of each type. At the beginning of a day, the number of mangoes make up 40% of his stock. That day, he sells half of the mangoes, 96 bananas and 40% of the apples. At the end of the day, he ends up selling 50% of the fruits. The smallest possible total number of fruits in the stock at the beginning of the day is

15. The number of coins collected per week by two coin-collectors A and B are in the ratio 3 : 4. If the total number of coins collected by A in 5 weeks is a multiple of 7, and the total number of coins collected by B in 3 weeks is a multiple of 24, then the minimum possible number of coins collected by A in one week is

16. Gautam and Suhani, working together, can finish a job in 20 days. If Gautam does only 60% of his usual work on a day, Suhani must do 150% of her usual work on that day to exactly make up for it. Then, the number of days required by the faster worker to complete the job working alone is

17. Let $\triangle ABC$ be an isosceles triangle such that AB and AC are of equal length. AD is the altitude from A on BC and BE is the altitude from B on AC. If AD and BE intersect at O such that $\angle AOB = 105°$, then $\frac{AD}{BE}$ equals

   A. $2\sin 15°$

   B. $\cos 15°$

   C. $2\cos 15°$

   D. $\sin 15°$

18. A rectangle with the largest possible area is drawn inside a semicircle of radius 2 cm . Then, the ratio of the lengths of the largest to the smallest side of this rectangle is

   A. $2 : 1$

   B. $\sqrt{5} : 1$

   C. $1 : 1$

   D. $\sqrt{2} : 1$

19. In a regular polygon, any interior angle exceeds the exterior angle by 120 degrees. Then, the number of diagonals of this polygon is

20. The value of $1 + \left(1 + \frac{1}{3}\right)\frac{1}{4} + \left(1 + \frac{1}{3} + \frac{1}{9}\right)\frac{1}{16} + \left(1 + \frac{1}{3} + \frac{1}{9} + \frac{1}{27}\right)\frac{1}{64} + \cdots$, is

   A. $\frac{15}{13}$

   B. $\frac{16}{11}$

   C. $\frac{27}{12}$

   D. $\frac{15}{8}$

21. Let $a_n = 46 + 8n$ and $b_n = 98 + 4n$ be two sequences for natural numbers $n \leq 100$. Then, the sum of all terms common to both the sequences is

   A. 15000

   B. 14900

   C. 14602

   D. 14798

22. Suppose $f(x, y)$ is a real-valued function such that $f(3x + 2y, 2x - 5y) = 19x$, for all real numbers x and y. The value of x for which $f(x, 2x) = 27$, is

CollegeBatch.com

QA Slot 1 Answer Key

Question No.	Answer
1	Option D
2	Option B
3	Option D
4	Option C
5	Answer is 3
6	Answer is 6
7	Answer is 2
8	Option B
9	Option B
10	Option B
11	Option C
12	Option A
13	Option B
14	Answer is 972
15	Answer is 27
16	Answer is 20808
17	Option C
18	Option C
19	Answer is 2
20	Option C
21	Option D
22	Answer is 19

QA Slot 2 Answer Key

Question No.	Answer
1	Option C
2	Option C
3	Option B
4	Option C
5	Answer is 7
6	Answer is 15
7	Answer is 6
8	Option A
9	Option B
10	Option A
11	Option D
12	Option B
13	Option A
14	Answer is 7
15	Answer is 407
16	Answer is 16
17	Option C
18	Option D
19	Answer is 45
20	Option A
21	Option C
22	Answer is 967

QA Slot 3 Answer Key

Question No.	Answer
1	Option C
2	Option C
3	Option B
4	Option D
5	Answer is 9
6	Answer is 468
7	Answer is 5
8	Option B
9	Option D
10	Option D
11	Option B
12	Option D
13	Option A
14	Answer is 340
15	Answer is 42
16	Answer is 36
17	Option C
18	Option A
19	Answer is 54
20	Option B
21	Option B
22	Answer is 3

Download CAT Previous Year Question Papers: Download PDF