

General Instructions

- (i) This question paper contains 22 questions. All questions are compulsory.
- (ii) It comprises 19 single-correct multiple-choice questions.
- (iii) Attempt every question; detailed solutions are provided in the companion solutions booklet.

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

- (A) 1
- (B) 2
- (C) 0
- (D) -1

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2. 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) 15
- (B) 12
- (C) 24
- (D) 9

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

- (A) $3\sqrt{7}$
- (B) $4\sqrt{5}$
- (C) $3\sqrt{31}$
- (D) $2\sqrt{7}$

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

- (A) 11
- (B) 20
- (C) 10
- (D) 68

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

- (A) 0
- (B) 3
- (C) 5
- (D) -1

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6. 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

- (A) 2
- (B) -2
- (C) 3
- (D) 0

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

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8. 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) 20
- (B) 22
- (C) 21
- (D) 19

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9. 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

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10. The minor angle between hours hand and minutes hand of a clock was observed at 8:48 am. The minimum deviation (in min) after 8:48 am on when angle increased by 50% is?

- (A) $\frac{24}{11}$
- (B) 4
- (C) $\frac{36}{11}$
- (D) 2

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11. Brishti went on a 8-hour trip in a car, before the trip the car had traveled a total of x kms till then, where x is a whole number and is palindromic, At the end of his trip the car had had traveled a total of 26862 km. If Bristi never drove at more than 110 km/h, then the greatest possible average speed at which see dove is?

- (A) 90
- (B) 80
- (C) 110
- (D) 100

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12. Geeta sells A $\rightarrow$ 20% (Profit) and B $\rightarrow$ 10% (Loss) at the same sp. If she increases SP such that A and B still sold at an equal price and profit of 10% made on B, then profit made on A will be?

- (A) 45%
- (B) 47%
- (C) 42 %
- (D) 49%

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13. A mixture P is formed by removing a certain amount of coffee from a coffee jar and replacing the same amount with cocoa powder and the same amount is again removed from P and replaced with the same amount of cocoa powder to form a mixture Q. If the ratio of coffee and cocoa in Q=16:9. Then the ratio of coca in with P:Q is?

- (A) 1:3
- (B) 4:9
- (C) 1:2
- (D) 5:9

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14. 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

- (A) 40008
- (B) 20008
- (C) 20808
- (D) 10808

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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

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16. 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 [This question was asked as TITA]

- (A) 982 Kms
- (B) 970 Kms
- (C) 974 Kms
- (D) 972 Kms

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17. 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) 2 : 1
- (B) 5 : 8
- (C) 8 : 5
- (D) 1 : 2

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18. 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, 6)
- (B) (6, 8)
- (C) (6, 4)
- (D) (6, 3)

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19. In a right-angled triangle ΔABC , 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

- (A) 2
- (B) 1
- (C) 0
- (D) 3

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

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

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

- (A) 648
- (B) 585
- (C) 504
- (D) 738

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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 n th day exceeds one million, then the lowest possible value of n is

- (A) 15
- (B) 17
- (C) 19
- (D) 23