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NATIONAL INTERACTIVE MATHS OLYMPIAD

NIMO

11 Class | B1 Paper Code

IMPORTANT INFORMATION

1. You are allowed additional 10 minutes to fill the required details in the **RESPONSE SHEET.**
2. The question paper is made as per syllabus guidelines & pattern given in the information Booklet. The Question Paper for Classes 1 to 6 contains 25 Questions each to be answered in 40 minutes. The Question paper for classes 7 to 12 contains 50 Questions each to be answered in 60 minutes. All questions are compulsory. Further instructions are given in the instruction letter to the coordinator teacher.
3. Use the response sheet to mark your responses by darkening the required circle. The response sheet has to be returned to the foundation, duly filled in. The student can retain the Question Paper.

MENTAL ABILITY

1. A clock shows the time as 6 a.m. if the minute hand gains 2 minutes every hour, how many minutes will the clock gain by 9 p.m.?
(1) 30 minutes (2) 25 minutes
(3) 28 minutes (4) None of these.

2. A bag contains 25 paise, 10 paise and 5 paise coins in the ratio 1 : 2 : 3. If their total value is Rs. 30, the number of 5 paise coins is :
(1) 50 (2) 100
(3) 150 (4) None of these

3. Find odd man out :
2, 5, 10, 17, 26, 37, 50, 64
(1) 50 (2) 26
(3) 64 (4) None of these

4. The wheel of an engine, $7\frac{1}{2}$ metres in circumference makes 7 revolutions in 9 seconds. The speed of the train in km per hour is :
(1) 25 (2) 21
(3) 30 (4) None of these

5. Which number is missing?

1 \ 3	3 \ 4	4 \ 7	7 \ 11	11 \ 18	18 \

(1) 29 (2) 28
(3) 27 (4) None of these

6. Fill in the correct number.

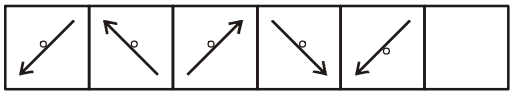
3	5	8	7
10	2	7	13
6	6	14	22
9	2	5	

(1) 11 (2) 12
(3) 13 (4) None of these

7. Which group of numbers has the same but maximum frequency of all digits in the following sequence?
3 7 2 5 3 8 6 3 4 9 7 6 7 4 8 3 2 5 6 7 4
(1) 4, 6 (2) 3, 7, 9
(3) 3, 7 (4) None of these

8. Sandip's mother is the only daughter of Rekha's father. How is Rekha's husband related to Sandip?
(1) Uncle (2) Brother
(3) Father (4) None of these

9. Find out the next figure following the sequence:



(1) 
(2) 
(3) 
(4) None of these

10. In a certain language, FINANCE is coded as GKQESIL, how is 'BANK' coded in that code?
(1) CBOL (2) CCPN
(3) CCQO (4) None of these

MATHEMATICS

11. If $i=\sqrt{-1}$ and n is a positive integer, then $i^n+i^{n+1}+i^{n+2}+i^{n+3}$ is equal to :
(1) 1 (2) i
(3) zero (4) None of these

12. The amplitude of $\frac{1+i\sqrt{3}}{\sqrt{3}+1}$ is
(1) $\frac{\pi}{6}$ (2) $\frac{\pi}{4}$
(3) $\frac{\pi}{3}$ (4) None of these

13. The number of real roots of the equation $(x-1)^2+(x-2)^2+(x-3)^2=0$ is :
(1) 3 (2) 1
(3) 0 (4) None of these

14. If α, β are the roots of $ax^2+bx+c=0$, then $\frac{1}{\alpha}, \frac{1}{\beta}$ are the roots of :
(1) $cx^2+ax+b=0$ (2) $ax^2+cx+b=0$
(3) $cx^2+bx+a=0$ (4) None of these

15. If a, b, c are in A.P. as well as in G.P., then :
(1) $a=b\neq c$ (2) $a=b=c$
(3) $a\neq b\neq c$ (4) None of these

16. If ${}^nC_{r-1}=36, {}^nC_r=84$ and ${}^nC_{r+1}=126$, then r is equal to :
(1) 1 (2) 2
(3) 3 (4) None of these

17. In a football championship, 153 matches were played. Every team played one match with each other. the number of teams participating in the championship is :
(1) 17 (2) 18
(3) 9 (4) None of these

18. If the coefficient of x^7 and x^8 in $\left(2+\frac{x}{3}\right)^n$ are equal then n is :
(1) 56 (2) 55
(3) 45 (4) None of these

19. The number of solutions of $\log_4(x-1)=\log_2(x-3)$ is :
(1) 3 (2) 1
(3) 0 (4) None of these

20. If $f(1)=1$ and $f(n+1)=2f(n)+1$ if $n\geq 1$, then $f(n)$ is equal to :
(1) 2^{n+1} (2) $2^{n-1}-1$
(3) 2^n-1 (4) None of these

21. Which of the following function is periodic ?
(1) $f(x)=x+\sin x$ (2) $f(x)=\cos^2 x$
(3) $f(x)=\cos x^2$ (4) None of these

22. The straight lines $5x+4y=0$, $x+2y-10=0$ and $2x+y+5=0$ are :
(1) concurrent
(2) the sides of an equilateral triangle
(3) the sides of a right-angled triangle
(4) None of these

23. Equation of the chord of the circle $x^2+y^2-4x=0$ whose mid point is (1, 0) is :
(1) $y=2$ (2) $x=1$
(3) $x=2$ (4) None of these

24. In a right angled ΔABC $\sin^2 A+\sin^2 B+\sin^2 C$ is equal to :
(1) zero (2) 1
(3) –1 (4) None of these

25. If in a ΔABC if the angles are in the ratio 1 : 2 : 3 then the ratio of corresponding sides is :
(1) 1 : 2 : 3 (2) $1:3:\sqrt{2}$
(3) $1:\sqrt{3}:2$ (4) None of these

26. If A and B are two independent events, then the probability that only one of A and B occur is :
(1) $P(A)+P(B)-2P(A\cap B)$
(2) $P(A)+P(B)-P(A\cap B)$
(3) $P(A)+P(B)$
(4) None of these

27. A bag contains 30 balls numbered from 1 to 30. One ball is drawn at random. Find the probability that the number of the ball drawn will be a multiple of 3 or 7 :
(1) $\frac{14}{30}$ (2) $\frac{40}{900}$
(3) $\frac{13}{30}$ (4) None of these

28. If $x^2 - 2|x| - 3 = 0$, then x equals

(1) $\{-3,5\}$ (2) $\{-3,3\}$

(3) $\{7,-7\}$ (4) None of these

29. If $\log_{16} x + \log_4 x + \log_2 x = 14$, then x is equal to

(1) 16 (2) 32

(3) 64 (4) None of these

30. The interior and its adjacent exterior angle of a triangle are in the ratio 1 : 2. What is the sum of other two angles of the triangle?

(1) 112° (2) 90°

(3) 120° (4) None of these

31. The equation $\cos x + \sin x = 2$, has

(1) only one solution (2) two solutions

(3) no solution (4) None of these

32. The next term of the sequence 10, 17, 28, 43, ... is

(1) 54 (2) 62

(3) 60 (4) None of these

33. $f(x)$ is a polynomial in x satisfying $f(x)+f\left(\frac{1}{x}\right)=f(x)f\left(\frac{1}{x}\right)$ and $f(2) = 9$ then $f(3) =$ .....

(1) 27 (2) 10

(3) 28 (4) None of these

34. If $f(x)=\frac{2x+3}{3x-5}$ then $f^{-1}(x) =$ .....

(1) $\frac{5x+3}{3x-2}$ (2) $\frac{5+3x}{3-2x}$

(3) $\frac{3x-2}{5x+3}$ (4) None of these

35. $\log_{125} 3$ lies between ..... and .....

(1) $\frac{1}{5}, \frac{1}{4}$ (2) $\frac{1}{4}, \frac{1}{3}$

(3) $\frac{1}{3}, \frac{1}{2}$ (4) None of these

36. If $c = \log_{30} 3$, $d = \log_{30} 5$ the value of $\log_{30} 8$ is

(1) 3 (1-c-d) (2) 2 (1-c-d)

(3) 1-c-d (4) None of these

37. If $\alpha+\beta+\gamma=\frac{\pi}{2}$ and $\cot\alpha, \cot\beta, \cot\gamma$ are in A.P then $\cot\alpha \cot\gamma =$ .....

(1) 1 (2) 2

(3) 3 (4) None of these

38. Statement I : $\frac{\tan(45+\theta)+\tan(45-\theta)}{\cot(45+\theta)+\cot(45-\theta)}=2$

Statement II : $\frac{\tan(45+A)}{\tan(45-A)}=\left(\frac{1+\tan A}{1-\tan A}\right)^2$

which of above statement is correct.

(1) only I (2) only II

(3) both I & II (4) None of these

39. If $\tan^{-1} x = \frac{\pi}{4} - \tan^{-1}\frac{1}{3}$ then $x =$

(1) $\frac{1}{4}$ (2) $\frac{1}{2}$

(3) $\frac{1}{8}$ (4) None of these

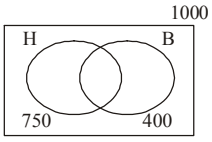
40. An aeroplane flying horizontally 1 km above the ground, is observed at an elevation of 60°. After 10 sec the elevation is observed to be 30°. Then the uniform speed per hour of the aeroplane is

(1) $235\sqrt{2}$ km (2) $235\sqrt{3}$ km

(3) $240\sqrt{3}$ km (4) None of these

ETG INTERACTIVE SECTION

41. Out of 1000 persons, 750 speak Hindi and 400 speak Bengali. How many can speak both Hindi and Bengali?



(1) 180 (2) 170

(3) 150 (4) None of these

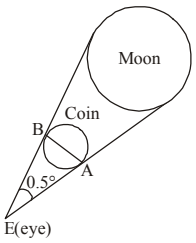
42. There are 200 individuals with a skin disorder, 120 had been exposed to the chemical C_1, 50 to chemical C_2 and 30 to both the chemicals C_1 and C_2. Find the number of individuals exposed to chemical C_2 but not chemical C_1

(1) 15 (2) 20

(3) 30 (4) None of these

43. If the angular diameter of the moon be 0.5° , how far from the eye a coin of diameter 2.2 cm be kept to hide the moon?

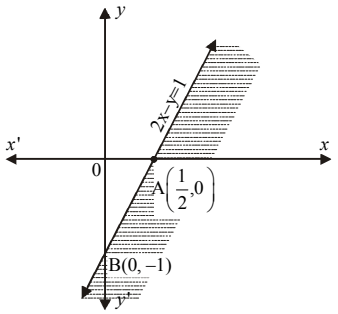
$\left[\theta(radian)=\frac{arc}{radius}\right]$



(1) 210 cm (2) 252 cm

(3) 300 cm (4) None of these

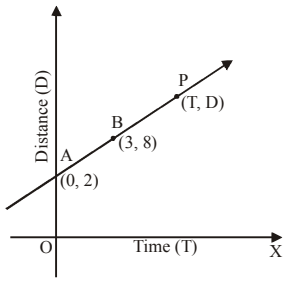
44. Which equation describes given figure?



(1) $2x - y \geq 2$ (2) $2x - y \leq 1$

(3) $2x - y \geq 1$ (4) None of these

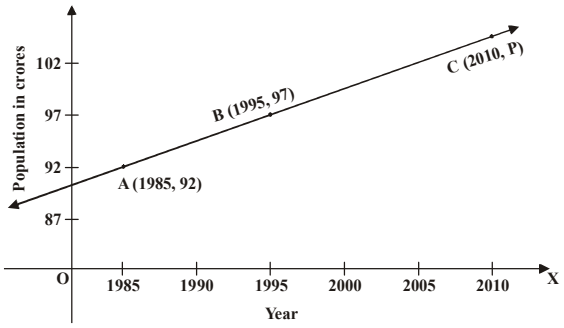
45. In Fig. time and distance graph of a linear motion is given. Two positions of time and distance recorded as, when T = 0, D = 2 and when T = 3, D = 8. Using the concept of slope, find law of motion, i.e. how distance depends upon time.



(1) D = 2T + 1 (2) D = 2(T–1)

(3) D = 2 (T + 1) (4) None of these

46. Consider the following population and year graph.

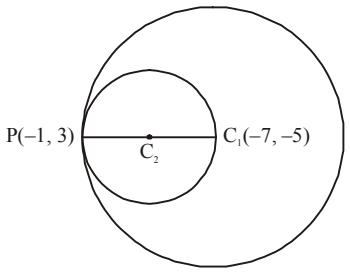


Find the slope of the line *AB* and using it, find what will be the population in the year 2010

(1) 104.5 crores (2) 57 crores

(3) 208 crores (4) None of these

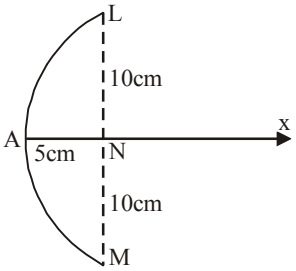
47. Find the equation of a circle of radius 5 which lies within the circle $x^2 + y^2 + 14x + 10y - 26 = 0$ and which touches the given circle at the point (–1, 3).



(1) $(x-4)^2 + (y-1)^2 = 5^2$ (2) $(x+4)^2 + (y+1)^2 = 5^2$

(3) $(x+4)^2 + (y-1)^2 = 5^2$ (4) None of these

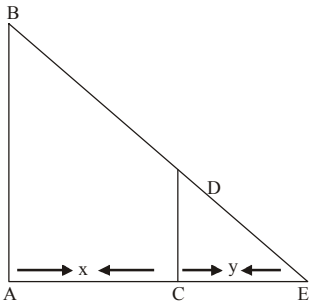
48. If a parabolic reflector is 20 cm in diameter and 5 cm deep, find its focus.



(1) (5, 0) (2) (4, 0)

(3) (3, 0) (4) None of these

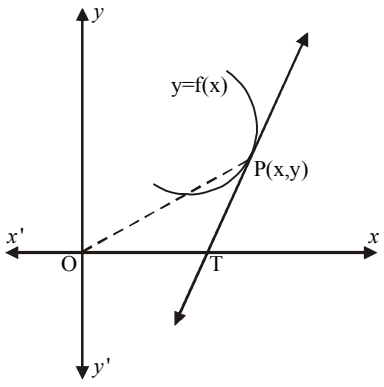
49. A man 2 metres high, walks at a uniform speed of 6 metres per minute away from a lamp post, 5 metres high. Find the rate at which the length of his shadow increases.



(1) 3m / min (2) 4m / min

(3) 3.2 m / min (4) None of these

50. The slope of the tangent at any point on a curve is λ times the slope of the line joining the point of contact to the origin. Formulate the differential equation and hence find the equation of the curve.



(1) $y = Cx^{\lambda}$ (2) $y^2 = Cx^{\lambda}$

(3) $y = Cx^{(\lambda+1)}$ (4) None of these

END OF THE EXAM