EHF

LEARNING FOR LIFE

EDUHEAL FOUNDATION

CLASS 12

LEVEL – 1

Set A1

EHF OLYMPIADS

• 4000 schools • 6 lakh students

• 10 olympiads • Global outreach

EHF NATIONAL INTERACTIVE MATHS OLYMPIAD

Name : .....

Roll No : .....

Class : .....

School : .....

BSE international finance olympiad (BIFO)

NATIONAL IIT-PMT OLYMPIAD (NIPO)

Level - 1 : All Level-1 successful* participants will get certificate, apititude report and online subscription, and school toppers will be eligible for school hero medals.

Level - 2 : School toppers* will be selected for level-2-National level - online computer based interactive test held at exam centres all over India. Besides selection for level-3, winner will get merit certificate, medals, educational CDs, laptop, scholarship and other prizes. There is no level-2 in Art and Cricket.

Level - 3 : Toppers will qualify# for level-3-International level-where you will compete with students globally. Get selected for EHFs International Olympiad training camp. Only Indian organization giving students exposure to global competitions. Represent India & win laurels. Guidance by top scientists. Prizes ranges from cash (millions of $), gadgets, foreign trips, publicity, fame, scholarships, Internships, conference participation and more.

* # See prospectus/website for details

Instructions for the Candidate

1. You are allowed additional 10 minutes to fill the required details in the RESPONSE SHEET (OMR).
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 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.

WEBSITE : WWW.EDUHEALFOUNDATION.ORG
E-MAIL : INFO@EDUHEALFOUNDATION.ORG

ROUGH WORK

MENTAL ABILITY

Read the following information carefully and answer the questions based on it by selecting the correct option from the given alternatives.

A. Five students K, L, M, N and O study in a class, of these:

(i) K and L study Physics and Chemistry

(ii) M and L study Physics and Mathematics

(iii) N and K study Biology and Chemistry

(iv) O and L study Anthropology and Civics

(v) O and N study Chemistry and Mathematics

Questions 1 to 3 are based on the above data:

1. Who among the students studies maximum number of subjects?

(1) O

(2) N

(3) L

(4) K

2. Who among the students studies minimum number of subjects?

(1) O

(2) N

(3) M

(4) None of these

3. Who among the students studies only four subjects?

(1) M

(2) O

(3) N

(4) K

Read the following information carefully and answer the questions based on it by selecting the correct option from the given alternatives.

(i) S, T, U, V, W, X and Y are sitting along a wall facing North direction.

(ii) U is on the immediate right of V.

(iii) T is at an extreme end and has W as his neighbour.

(iv) Y is between W and X.

(v) V is sitting third from the other end.

Questions 4 and 5 are based on the above data:

4. Who is sitting on the left of X?

(1) T

(2) Y

(3) W

(4) None of these

5. Where is S sitting?

(1) Extreme East

(2) Extreme West

(3) In the middle

(4) None of these

6. There are deer and peacocks in a zoo. By counting heads they are 80. The number of their legs is 200. How many peacocks are there ?

(1) 20

(2) 60

(3) 50

(4) None of these

7. A is 3 years older to B and 3 years younger to C, while B and D are twins. How many years older is C to D?

(1) 2 (2) 3

(3) 6 (4) None of these

8. If 2 * 3 = 12, 3 * 4 = 20 and 4 * 5 = 30, then 2 * 6 is

(1) 18 (2) 12

(3) 21 (4) None of these

9. If * means "is greater than", @ means `is less than'; and $ means "is equal to" and if a \$ b and b @ c, then

(1) $c * b$ (2) $c * a$

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

10. Find the measure of the reference angle for a 130° angle.

(1) 30 degree

(2) 50 degree

(3) 70 degree

(4) None of these

11. Use the imaginary number i to rewrite the expression $\sqrt{-16}$ as a complex number.

(1) $4i$ (2) $16i$

(3) $-4i$ (4) None of these

12. Express in the form of a complex number $a + bi$: $\frac{(8+4i)}{(1-i)}$

(1) $3 + 4i$ (2) $2 + 6i$

(3) $5 + 7i$ (4) None of these

13. The minimum value of $|a + b\omega + c\omega^2|$, where a, b and c are all not equal integers and $\omega \neq 1$ is a cube root of unity, is

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

(3) 1 (4) None of these

14. Suppose that A is a 3×3 matrix and det (A) = -3. What is det (4A)?

(1) -34 (2) -192

(3) -12 (3) None of these

15. Let A be a 3×3 matrix, and suppose that the matrix B is obtained from A by the following row operations:

$$R_1 \leftrightarrow R_2; \quad R_3 \rightarrow R_3 + 5R_2$$

If det (A) = 12, what is det (B)?

(1) -60 (2) -12

(3) 12 (4) 60

16. Out of 7 consonants and 4 vowels, how many words of 3 consonants and 2 vowels can be formed?

(1) 24400 (2) 3567

(3) 25200 (4) None of these

17. In how many ways can a group of 5 men and 2 women be made out of a total of 7 men and 3 women?

(1) 1 (2) 126

(3) 63 (4) None of these

18. In the word ENDEA, the number of permutations in which the letter E occurs in the first and last positions is,

(1) 5! (2) 21.5!

(3) 8! (4) None of these

19. Let T_n denote the number of triangles which can be formed using the vertices of a regular polygon of n sides. If $T_{n+1} - T_n = 21$, then what is the value of n?

(1) 7 (2) 9

(3) 11 (4) None of these

20. Find the coefficient of x raised to power 5 in the expansion of $(3x - 2)$ raised to power 8.

(1) -108864

(2) -208564

(3) 785390

(4) None of these

21. Two squares are chosen at random on a chessboard. What is the probability that they have a side in common?

(1) $\frac{1}{18}$ (2) $\frac{64}{4032}$

(3) $\frac{63}{64}$ (4) None of these

22. Two dice are thrown. What is the probability of obtaining a total of 10 or 11?

(1) $\frac{7}{36}$ (2) $\frac{5}{36}$

(3) $\frac{11}{36}$ (4) None of these

23. Sum of digits of a 5 digit number is 41. Find the probability that such a number is divisible by 11?

(1) $\frac{6}{35}$ (2) $\frac{11}{36}$

(3) $\frac{3}{35}$ (4) None of these

24. In a group of 60 people, 27 like cold drinks and 42 like hot drinks and each person likes at least one of the two drinks. How many like both coffee and tea?

(1) 11

(2) 7

(3) 9

(4) None of these

25. Let A = {a, b} and B = {c, d}. Find the number of relations from A to B.

(1) 16 (2) 18

(3) 24 (4) None of these

26. Find $\lim\limits_{x\to 0} \dfrac{\sin(3x) + \tan(2x)}{x - 2\sin(x)}$

(1) 7 (2) –5

(3) 9 (4) None of these

27. Differentiate the following w.r.t. x: tan inverse of $\left[\dfrac{\sin x}{(1+\cos x)}\right]$

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

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

28. Find the indicated limit: $\lim\limits_{x\to 1} \dfrac{[\sqrt[3]{x} - 1]}{[\sqrt{x} - 1]}$

(1) $\dfrac{4}{3}$ (2) $\dfrac{2}{3}$

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

29. Solve the given series: $5^2 + 6^2 + 7^2 + ... + 20^2$

(1) 2840

(2) 2850

(3) 2860

(4) None of these

30. Calculate the sum of 5 + 9 + 13 + ... + 57 + 61.

(1) 549

(2) 649

(3) 495

(4) None of these

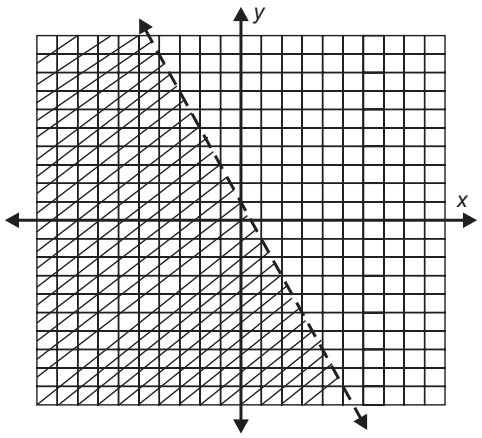
31. Add up all the terms of the Geometric Sequence that halves each time :

$$\{\frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \frac{1}{16}, ...\}$$

(1) 3 (2) 2

(3) 1 (4) None of these

32. Which inequality is represented by the graph at the right?



(1) $y < 2x + 1$ (2) $y < -2x + 1$

(3) $y < \dfrac{1}{2}x + 1$ (4) None of these

33. The graph of $y = 2^x$ contains which of these points?

(1) (0,0) (2) (0,1)

(3) (0,2) (4) (1,1)

34. Find an equation for a sinusoidal function that has period 360°, amplitude 1, and contains the point (270°, –1).

(1) sin(x) (2) cos(x)

(3) tan(x) (4) None of these

35. Find the value of the following:

$$\sin\left[\frac{\pi}{3} - \sin^{-1}\left(\frac{-1}{2}\right)\right]$$

(1) 2 (2) 6

(3) 1 (4) None of these

36. If $\cos(a+b) = \dfrac{4}{5}$, $\sin(a-b) = \dfrac{5}{13}$ and a and b lie between 0 to $\dfrac{\pi}{4}$, find tan 2a.

(1) $\dfrac{17}{25}$ (2) $\dfrac{16}{19}$

(3) $\dfrac{56}{33}$ (4) None of these.

37. Find the mean deviation about the mean for the data: 4, 7, 8, 9, 10, 12, 13, 17

(1) 2

(2) 3

(3) 4

(4) None of these

38. Find the total area between the curve $f(x) = \cos x$ and the x-axis on the interval. $[0, 2\pi]$

(1) 4 sq. units (2) 3 sq. units

(3) 5 sq. units (4) None of these

39. The planes: $2x - y + 4z = 5$ and $5x - 2.5y + 10z = 6$ are:

(1) Perpendicular

(2) Parallel

(3) Passes through the point (0, 0, 54)

(4) None of these

40. The position vectors of points A and B are $\vec{a}$ and $\vec{b}$ respectively. P divides AB in the ratio 3 : 1 and Q is mid-point of AP. Find the position vector of Q.

(1) $7\vec{b} + 9\vec{b}$

(2) $7\vec{b} + 5\vec{a}$

(3) $\dfrac{[5\vec{a} + 3\vec{b}]}{8}$

(4) None of these

INTERACTIVE SECTION

41. If $xy = 1$ and x is greater than 0, which of the following statements is true?

(1) When x is greater than 1, y is negative.

(2) When x is less than 1, y is less than 1.

(3) As x increases, y decreases.

(4) None of these

42. Which one of the following conics is represented by the equation $(x - 3y)(x + 3y) = 36$?

(1) Circle (2) Ellipse

(3) Hyperbola (4) None of these

43. The sum of the infinite series $1 - \left(\frac{1}{2}\right) + \left(\frac{1}{4}\right) - \left(\frac{1}{8}\right) + \ldots$ is

(1) $\dfrac{5}{8}$ (2) $\dfrac{2}{3}$

(3) $\dfrac{3}{5}$ (4) None of these

44. A 45,000 litre water tank is to be filled at the rate of 220 litres per minute. Estimate, to the nearest half an hour, how long it will take to fill the tank.

(1) 4 hours (2) $\dfrac{7}{2}$ hours

(3) 3 hours (4) None of these

45. Find the exact values of $\cos \dfrac{13\pi}{12}$.

(1) $\sqrt{3 + \sqrt{5}}$ (2) $\sqrt{71\pi}$

(3) $-\sqrt{\dfrac{1}{2} + \dfrac{\sqrt{3}}{4}}$ (4) None of these

46. Solve $xy^m = yx^3$ for m.

(1) $m = 5$ (2) $m = 7$

(3) $m = 1 + 2\,\dfrac{\ln(x)}{\ln(y)}$ (4) None of these

47. A circle of center $(-3, -2)$ passes through the points $(0, -6)$ and $(a, 0)$. Find a

(1) $-\sqrt{29}, +\sqrt{29}$ (2) $-3 + \sqrt{21}$

(4) None of these

48. How many radians is 60°?

(1) $\dfrac{\pi}{4}$ (2) $\dfrac{\pi}{3}$

(3) $\dfrac{\pi}{2}$ (4) None of these

49. Write the repeating decimal as a fraction:

.38383838…

(1) $\dfrac{39}{98}$ (2) $\dfrac{38}{99}$

(3) $\dfrac{39}{89}$ (4) None of these

50. In the data set below, what is the variance?

4, 9, 9, 6, 6, 4, 4

(1) 4.3 (2) 6.5

(3) 7.4 (4) None of these

END OF THE EXAM