

CLASS

10

SAMPLE PAPER



## National Cyber Olympiad

The actual test paper has 50 questions. Time allowed : 60 minutes. There are 3 sections, 15 questions in section I, 15 in section II and 20 in section III.

### SYLLABUS

**Section – I (Mental Ability) :** Number system, Introduction to irrational numbers, Algebra, Factorization of polynomials, Ratio and proportion, Linear equations in two variables, Percentage, Profit and loss, Discount, Compound interest, Cost of living index, Sales tax, Banking, Lines and angles, Congruence, Inequalities in a triangle, Concurrent lines in a triangle, Parallelograms, Areas, Construction, Trigonometric ratios, Plane figures, Solids, Polynomials, Quadratic equations.

**Section – II (Logical and Analytical Reasoning) :** Problems based on figures, Find odd numeral out, Series completion, Coding-decoding, Mathematical reasoning, Analytical reasoning, Mirror images, Embedded figures, Direction sense test, Cubes and dice.

**Section – III (Computers and IT) :** Computer system An overview, Computer software, Communication technology, MS-Windows ,MS-Word, MS-Excel, MS-Power Point.



## National Science Olympiad

The actual test paper has 50 questions. Time allowed : 60 minutes. There are 2 sections, 20 questions in section I and 30 in section II.

### SYLLABUS

**Section – I (Mental ability) :** Real Numbers, Polynomials, Pair of Linear Equations in Two Variables, Quadratic Equations, Arithmetic Progressions, Triangles, Coordinate Geometry, Introduction to Trigonometry, Some Applications of Trigonometry, Circles, Constructions, Areas Related to Circles, Surface Areas and Volumes, Statistics, Probability.

**Section – II (Science) :** Chemical Reactions and Equations; Acids, Bases and Salts; Metals and Non-metals; Carbon and its Compounds; Periodic Classification of Elements; Life Processes; Control and Coordination; How do Organisms Reproduce?; Heredity and Evolution; Light Reflection and Refraction; Human Eye and Colourful World; Electricity; Magnetic Effects of Electric Current; Sources of Energy; Our Environment; Management of Natural Resources.



## International Mathematics Olympiad

The actual test paper has 50 questions. Time allowed : 60 minutes. There are 3 sections, 20 questions in section I, 20 in section II and 10 in section III.

### SYLLABUS

**Section – I (Logical Reasoning) :** Direction sense test, Mathematical operations, Number ranking & Time sequence Test, Coding-Decoding, Distance, Speed, Time and general reasoning based on prescribed syllabus.

**Section – II (Mathematical Reasoning) :** Linear Equations in Two Variables, Polynomials, Rational Expressions, Quadratic Equations, Arithmetic Progression (AP), Similar triangles, Circles and their properties, Trigonometric identities and problems related to height and distance, Surface areas and volumes of solid figures, Coordinate geometry.

**Section – III (Everyday Mathematics) :** The Syllabus of this section will be based on the syllabus of Mathematical Reasoning.



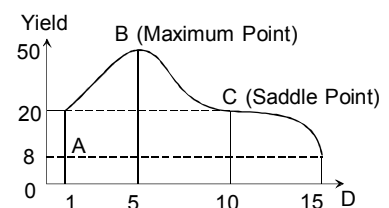
# National Cyber Olympiad

## MENTAL ABILITY

- The value of  $\tan 5^\circ \tan 25^\circ \tan 30^\circ \tan 65^\circ \tan 85^\circ$  is  
(A)  $\sqrt{3}$  (B)  $\frac{1}{\sqrt{3}}$  (C)  $\frac{2}{\sqrt{3}}$  (D)  $\frac{5}{\sqrt{3}}$
- A bag contains 5 red balls and some blue balls. If the probability of drawing a blue ball is double that of a red ball then the number of blue balls in the bag is  
(A) 10 (B) 5 (C) 8 (D) 7
- A cylinder open at both ends has radius  $5/\pi$  cm and height 12 cm. If A and B are diametrically opposite points lying on the top and bottom rims. The shortest distance between A and B is  
(A) 13 cm (B) 17 cm  
(C)  $12\frac{10}{\pi}$  cm (D)  $\sqrt{12^2 + \left(\frac{10}{\pi}\right)^2}$  cm
- Which of the following equations have the same graph?  
I.  $y = x + 3$  II.  $y = \frac{x^2 - 9}{x - 3}$  III.  $(x - 3)y = x^2 - 9$   
(A) I and II only (B) I and III only  
(C) II and III only (D) All of these.
- The value of the real number x satisfying  $\log_9 x - \log_9 \left(\frac{x}{10} + \frac{1}{9}\right) = 1$  is  
(A) 3 (B) 4 (C) 9 (D) 10
- Two numbers are in the ratio of 3 : 5. If 8 is added to each number, the ratio becomes 2 : 3. What are the numbers?  
(A) 24 and 40 (B) 20 and 30 (C) 32 and 42 (D) 35 and 45
- The sum of first 24 terms of the sequence whose  $n$ th term is  $a_n = 3 + \frac{2}{3}n$ , is  
(A) 275 (B) 272 (C) 280 (D) 270.
- The ratio of the volume of a cube to that of a sphere which exactly fits inside the cube is  
(A)  $6 : \pi$  (B)  $\pi : 6$  (C)  $\pi : 12$  (D)  $12 : \pi$

## LOGICAL & ANALYTICAL REASONING

- In a group of five people, K, L and M are ambitious, M, N and R are honest, L, M and N are intelligent and K, M and R are industrious. Among these, neither industrious nor ambitious person(s) would include  
(A) K alone (B) L and R (C) M and N (D) N alone
- On another planet, the local terminology for earth, water, light, air and sky are 'sky', 'light', 'air', 'water' and 'earth' respectively. If someone is thirsty there, what would he drink?  
(A) Sky (B) Water (C) Air (D) Light.
- The yield versus fertilizer input is shown in the given graph:  
Consider the following statements based on this graph:  
1. Yield rate is zero at B and C.  
2. There is no yield with no fertilizer input.  
3. The yield is minimum at D.  
4. The yield is neither minimum nor maximum at C.  
Which of the above statements are correct?  
(A) 1, 2 and 4 (B) 3 and 4 (C) 2 and 3 (D) 1, 3 and 4



12. **Step 1** : Multiply by 2  
**Step 2** : Subtract 1  
**Step 3** : If less than 10, jump to step 1 and continue from there; otherwise proceed to step 4  
**Step 4** : Add 7  
**Step 5** : Divide by 2  
**Step 6** : Add 2  
**Step 7** : Multiply by 2  
 If you start with a value of 6 then calculate **how many times** you had to jump to step 1.  
 (A) 4 (B) 5 (C) 3 (D) 0

13. A, B, C, D, E, F and G are members of a family consisting of four adults and three children, two of whom, F and G are girls. A and D are brothers and A is a doctor. E is an engineer married to one of the brothers and has two children. B is married to D and G is their child. Who is C?  
 (A) G's brother (B) F's father  
 (C) E's daughter (D) A's son

### COMPUTERS & INFORMATION TECHNOLOGY

14. Which of the following high level language is NOT suitable for generating or developing a data file?  
 (A) BASIC (B) FORTRAN  
 (C) COBOL (D) PASCAL
15. The processing speed of a computer is measured in  
 (A) Mega byte (B) 16 bit  
 (C) Mega hertz (D) Milli seconds
16. Which of the following features distinguishes a database file from a mere collection of data  
 (A) Database enables data to be organised for effective use much faster  
 (B) It organises data in rows and columns  
 (C) It gives reference name to each file created  
 (D) It provides search facility
17. Each command is followed by a meaning, match them.
- | <b>Command</b>     | <b>Meaning</b>  |
|--------------------|---|
| 1. STEP            | A. To branch unconditionally out of the normal program sequence to a specified line number. |
| 2. SWAP            | B. To terminate program execution and return to command level.                              |
| 3. STOP            | C. To exchange the values of two variables.   |
| 4. GOTO            | D. To specify the counter increment for each loop in FOR-NEXT statement.                    |
| (A) 1B, 2C, 3D, 4A | (B) 1A, 2B, 3C, 4D  |
| (C) 1D, 2A, 3B, 4C | (D) None of these.  |
18. If X represents "Shweta can read" and Y represents "Shweta can write", then write in terms of X, X', Y and Y' the following statements:  
 (i) **Shweta can read but cannot write**  
 (ii) **Shweta cannot read or write**  
 (A)  $X \cdot Y', X' \cdot Y'$  (B)  $X' \cdot Y, X \cdot Y'$   
 (C)  $X' \cdot Y, X' \cdot Y'$  (D) None of these.
19. Name the smallest addressable set of bits of the computer memory.  
 (A) Byte (B) Word  
 (C) Pixel (D) Digit
20. Which of the following is not a hardware component?  
 (A) Mouse (B) LAN  
 (C) Chip (D) Semiconductor memory.



# National Science Olympiad

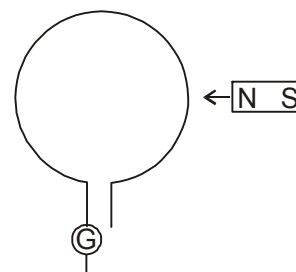
## MENTAL ABILITY

- In an office with 21 staff members,  $\frac{1}{3}$  are men and  $\frac{2}{3}$  are women. To obtain a staff in which  $\frac{1}{4}$  are men, how many women should be hired?  
(A) 7 (B) 5 (C) 3 (D) 2
- A jogger desires to run a certain course in  $\frac{1}{4}$  less time than she usually takes; by what percent must she increase her average running speed to accomplish this goal?  
(A) 20% (B) 25% (C)  $33\frac{1}{3}\%$  (D) 50%.
- A salesman makes a commission of  $x$  percent on the first Rs. 2,000 worth of sale in any given month and  $y$  percent on all further sales during that month. If he makes Rs. 700 from Rs. 4,000 of sales in October and he makes Rs. 900 from Rs. 5,000 of sales in November, what is the value of  $x$  ?  
(A) 2% (B) 5% (C) 10% (D) 15%.
- A magician wants to ship a magic wand to the location of his next show. The rectangular box he has available for this purpose measures 6 inches wide by 8 inches long by 10 inches high. What is the longest cylindrical wand of negligible diameter that can be shipped in this box?  
(A) 10 inches (B)  $8\sqrt{2}$  inches (C)  $8\sqrt{3}$  inches (D)  $10\sqrt{2}$  inches
- The price of sugar increased 20 percent in 2000 and 10 percent in 2001. By approximately what percent would the price at the end of 2001 have to be decreased to restore the price of the sugar to its pre-2000 price?  
(A) 40% (B) 35% (C) 30% (D) 24%.

## SCIENCE

- If the Moon were twice as massive as it is now, and it has stayed in the same orbital radius about the Earth as it has now, its new orbital period (in terms of its current orbital period  $T$ ) would be,  
(A)  $T$  (B)  $\frac{T}{2}$  (C)  $\frac{T}{4}$  (D)  $2T$
- A virtual image is formed by a concave mirror when object is placed  
(A) Between focus and centre of curvature  
(B) Beyond C (C) At infinity (D) Behind the mirror
- No heat loss occurs during flow of charge in super conductors because  
(A) Speed of charge is slow in it (B) It is bad conductor of heat  
(C) It offers zero resistance (D) It generates very small voltage
- How do we know that fission isn't responsible for the sun's energy ?  
(A) Fission doesn't produce enough energy per gram of fuel  
(B) If fission were going on in the sun, the sun would explode  
(C) If fission were going on in the sun, the sun's mass would increase  
(D) There isn't very much fissionable material in the sun.
- Which of the following groups of instruments is required to have communication line between two television relay centres ?  
(A) Microwave link, booster relay, satellite  
(B) Radio telescope, microwave link, booster relay, telephone  
(C) Microwave link, telephone, booster relay, satellite  
(D) All of these

11. In a circular coil of wire if the current is flowing in the anticlockwise direction, the face will be north pole. When there is no current in the coil, if the north pole is brought near the coil, during that time, the current induced in the coil will be
- (A) Clockwise  
 (B) Anticlockwise  
 (C) The current will be in the same direction whether the north pole is brought near or taken away  
 (D) (A) and (C) are correct



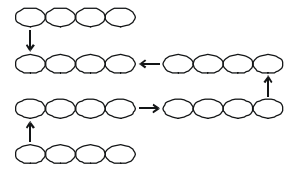
12. During calcination of the ore
- (A) The lower oxides are converted into higher oxides  
 (B) The metal gets oxidised to its highest oxide  
 (C) Volatile impurities are expelled  
 (D) Sulphur present in the ore is converted into  $\text{SO}_2$
13. Which of the following statements is NOT true regarding iron?
- (A) It is hard and brittle. (B) It can be tempered.  
 (C) It cannot be welded. (D) It contains 4 - 5% of carbon
14. Heating of rubber with sulphur is known as
- (A) Galvanisation (B) Sulphonation  
 (C) Vulcanisation (D) Bessemerisation
15. The gas evolved in Bhopal tragedy was
- (A) CO (B)  $\text{CO}_2$  (C) Methyl isocyanate (D)  $\text{N}_2$
16. Which of the following gases forms a stable complex compound (leading to death) with haemoglobin of the human blood ?
- (A) Oxygen (B) Carbon dioxide  
 (C) Carbon monoxide (D) Nitrogen
17. When copper is heated with concentrated  $\text{H}_2\text{SO}_4$  the products obtained are
- (A)  $\text{CuSO}_4 + \text{H}_2$  (B)  $\text{CuSO}_4 + \text{SO}_2 + \text{H}_2$   
 (C)  $\text{CuSO}_4 + \text{SO}_2 + \text{H}_2\text{O}$  (D)  $\text{CuO} + \text{SO}_3 + \text{H}_2$
18. Lathyrism due to consumption of khesari dal is characterised by
- (A) Skeletal deformation and thinning of collagen fibres  
 (B) Skeletal deformities, diabetes mellitus and reproductive failure  
 (C) Retarded growth, precocious puberty and renal dysfunction  
 (D) Cardiovascular abnormalities, mental retardation and delayed puberty.
19. Which one yields more energy?
- (A) Direct burning of cowdung  
 (B) Burning of biogas derived from cowdung  
 (C) Burning of manure derived from cowdung  
 (D) Burning of semidecayed cowdung

20. Mark the incorrect match.

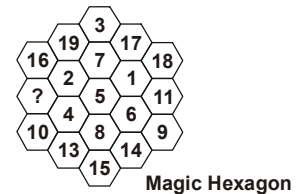
Nutrient	Deficiency	Symptom
(A) Iron	Anaemia	Deficiency of haemoglobin in R.B.C.
(B) Vitamin $\text{B}_1$	Beri beri	Water logging of the tissue, paralysis
(C) Vitamin $\text{B}_4$	Pellagra	Pigeon chest, loss of teeth
(D) Vitamin C	Scurvy	Loosening of teeth, swelling and bleeding of gums

## LOGICAL REASONING

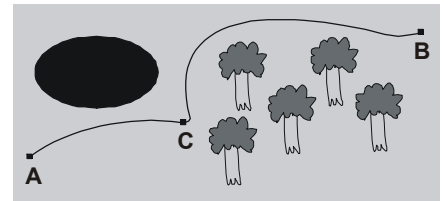
1. There are 6 short pieces of link chain, each having 4 links. It takes 10 seconds to cut a link and 25 seconds to weld it back together. What is the shortest possible time to make the longest chain?
- (A) 175 seconds      (B) 210 seconds  
(C) 150 seconds      (D) 60 seconds



2. What should come at the place of '?' so that every column or diagonal has the same sum?
- (A) 19                      (B) 12  
(C) 13                      (D) 15



3. Points A and B on a map are 12 km apart if you follow the path. A troop of boy scouts leaves point A at 11:00 a.m. They are all carrying packs and travel 3 km/hr until they reach point C at 12:45. If they want to reach point B by 2:00, how fast will they have to go?
- (A) 5.4 km/hr              (B) 6.75 km/hr  
(C) 5.25 km/hr              (D) 1.75 km/hr



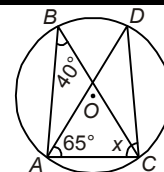
4. A child was looking for his father. He went 90 metres in the East before turning to his right. He went 20 metres before turning to his right again to look for his father at his uncle's place 30 metres from this point. His father was not there. From here he went 100 metres to the North before meeting his father in a street. How far did the son meet his father from the starting point?
- (A) 80 metres              (B) 100 metres              (C) 140 metres              (D) 260 metres

5. If DELHI is coded as 73541 and CALCUTTA as 82589662, how can CALCUT be coded?
- (A) 5279431              (B) 5978213              (C) 8251896              (D) 8543691
6. If 1st October is Sunday, then 1st November will be
- (A) Monday              (B) Tuesday              (C) Wednesday              (D) Thursday

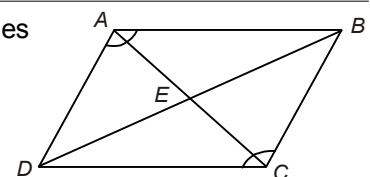
7. If + stands for 'division', × stands for 'addition', – stands for 'multiplication' and ÷ stands for 'subtraction', then which of the following equations is correct?
- (A)  $36 \times 6 + 7 \div 2 - 6 = 20$               (B)  $36 \div 6 + 3 \times 5 - 3 = 45$   
(C)  $36 + 6 - 3 \times 5 \div 3 = 24$               (D)  $36 - 6 + 3 \times 5 \div 3 = 74$

## MATHEMATICAL REASONING

8. If O is the centre of the circle, find the value of x in the following figure.
- (A)  $75^\circ$                       (B)  $40^\circ$   
(C)  $65^\circ$                       (D)  $90^\circ$



9. Parallelogram ABCD is shown in the adjoining figure. Which pair of triangles can be established to be congruent to prove that  $\angle DAB \cong \angle BCD$ ?
- (A)  $\triangle ADC$  and  $\triangle BCD$               (B)  $\triangle AED$  and  $\triangle BEC$   
(C)  $\triangle DAB$  and  $\triangle BCD$               (D)  $\triangle DEC$  and  $\triangle BEA$

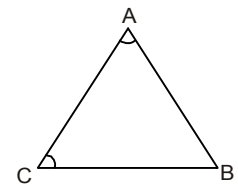


10. What is the complete solution to the equation  $|3 - 6x| = 15$ ?
- (A)  $x = 2; x = 3$               (B)  $x = -2; x = 3$   
(C)  $x = 2; x = -3$               (D)  $x = -2; x = -3$

11. In the figure given here,  $AB > BC$ .

If we assume that  $m\angle A = m\angle C$ , it follows that  $AB = BC$ . This contradicts the given statement that  $AB > BC$ . What conclusion can be drawn from this contradiction?

- (A)  $m\angle A = m\angle B$  (B)  $m\angle A \neq m\angle B$   
 (C)  $m\angle A = m\angle C$  (D)  $m\angle A \neq m\angle C$



12. Which polynomial represents  $(3x^2 + x - 4)(2x - 5)$ ?

- (A)  $6x^3 - 13x^2 - 13x - 20$  (B)  $6x^3 - 13x^2 - 13x + 20$   
 (C)  $6x^3 + 13x^2 + 3x - 20$  (D)  $6x^3 + 13x^2 + 3x + 20$

13.  $2x + 7 \overline{)2x^4 + 21x^3 + 35x^2 - 37x + 46} =$

- (A)  $x^3 + 7x^2 - 7x + 6 - \frac{4}{2x+7}$  (B)  $2x^3 + 14x^2 - 14x + 12 - \frac{4}{2x+7}$   
 (C)  $x^3 - 7x^2 + 7x - 6 + \frac{4}{2x+7}$  (D)  $x^3 + 7x^2 - 7x + 6 + \frac{4}{2x+7}$

14. There are two numbers with the following properties.

- 1) The second number is 3 more than the first number.  
 2) The product of the two numbers is 9 more than their sum.

Which of the following represents possible values of these two numbers?

- (A)  $-6, -3$  (B)  $-4, -1$  (C)  $-1, 4$  (D)  $-3, 6$

15. If  $i = \sqrt{-1}$ , what is the value of  $i^4$ ?

- (A)  $i$  (B)  $-i$  (C)  $1$  (D)  $-1$

16. A copper sphere of diameter 18 cm is drawn into a wire of diameter 4 mm. Find the length of the wire.

- (A) 240 m (B) 242 m (C) 243 m (D) 245 m

17. What is the  $n$ th term in the arithmetic series given below?

$$3 + 7 + 11 + 15 + 19 \dots$$

- (A)  $4n$  (B)  $3 + 4n$  (C)  $2n + 1$  (D)  $4n - 1$

### EVERYDAY MATHEMATICS

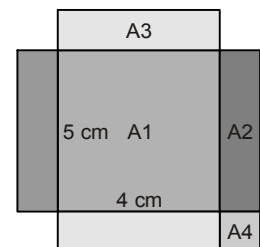
18. Three ducks and two ducklings weigh 32 kg. Four ducks and three ducklings weigh 44 kg. All ducks weigh the same and all ducklings weigh the same. What is the weight of two ducks and one duckling?

- (A) 20 kg. (B) 40 kg.  
 (C) 60 kg. (D) 64 kg.

19. A rectangular sheet of wood has four small squares removed from the corners. It is then cut to make a box that is 5 cm by 4 cm with a volume of  $60 \text{ cm}^3$ . (Four pieces of size A4 are removed.)

Find the original area of the sheet of wood.

- (A) 200 cm sq. (B) 110 cm sq.  
 (C) 96 cm sq. (D) 100 cm sq.



20. A cereal company decided to increase the height of its boxes by 30 percent and reduce the width in order to maintain the same volume.

Initially, length = 20 cm, height = 40 cm, width = 30 cm

What will the new width be if the length stays the same?

- (A) 52 cm (B) 20 cm  
 (C) 23.08 cm (D) 23 cm

