N G S F

NGSE

CLASS 9 Time : 90 Minutes **National Genius Search Examination® : Mains**

Student Name ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

NGSE Roll No ☐☐☐☐☐☐☐   Test Booklet Code:

INSTRUCTIONS TO THE CANDIDATE

1. **DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE ASKED TO DO SO.**
2. Fill the information required in the answer sheet. Your test may not be evaluated if the required details are not entered on the answer sheet.
3. Do not seek clarification on any item in the test booklet from anyone including the test invigilator or the centre supervisor. Use your best judgement.
4. This booklet consists of three sections, as given below :
   a. Mathematics – 20 Questions
   b. Science – 20 Questions
   c. General Knowledge – 5 Questions
   In case of any problem with your test booklet, inform the invigilator immediately. You will be provided with a replacement.
5. Each question carries 2 marks.
   Questions from 1 to 45 have one or more options right. **To score full marks for each question, bubbles for ALL THE RIGHT ANSWER options should be shaded. Shading one or more WRONG bubble/s make the answer wrong. No marks are given for partial answers.**
6. Only **BLACK/BLUE BALL POINT PEN** is to be used for marking answers on OMR sheet. Do not use fountain pens/gel based pens or pencils. Remember that you cannot erase and re-shade the bubbles.
7. Use the margin in the test booklet for rough work. No other piece of paper is permitted to be used for rough work.
8. **NEGATIVE MARKS** are not allotted to any question.
9. Failure to follow instructions and examination norms will lead to disqualification.
10. Complete the feedback form before you leave the examination hall.

PLEASE WAIT FOR THE SIGNAL TO OPEN THE TEST BOOKLET

Open from this side ⟶

09

SECTION 1 : MATHEMATICS

Important Note: Questions from 1 to 45 have one or more options right. To score full marks for each question, bubbles for all the right answer options should be shaded. Shading one or more wrong bubble/s make the answer wrong. No marks are given for partial answers.

01. Wisden was watching the movement of a truck carrying a transparent cylindrical 20 unit long water tank, over a flyover. As the truck moved to the top of the flyover, some water got spilled on the road. He found that the surface of water looks like a rectangle inside the tank and has a perimeter of 56 units. The truck driver told him later, that the diameter of the tank is 10 units. Can you help Wisden to find out the height of water inside the tank, by calculations?
    (a) 4   (b) 5   (c) 6   (d) 8

02. Quana was down with fever and she could not attend her geometry class. Back in school, she tried to copy down the class notes from one of her friend. Here is a part of it.
    (a) Two distinct points in a plane determine a unique line segment
    (b) Two distinct lines in a plane cannot have more than one point in common.
    (c) A distinct line is a part of a line segment.
    (d) There are infinite number of perpendiculars for a line.
    What is / are the incorrect point/s noted by her?

03. Vidya's teacher wrote the following statements on the board and asked her class to pick up the wrong statement/s.
    (a) A square, rectangle and rhombus are parallelograms
    (b) A kite is not a parallelogram but all quadrilaterals are parallelograms
    (c) A parallelogram is a trapezium but a trapezium is not a parallelogram
    (d) A rectangle or a rhombus is not necessarily a square
    What is your answer to her question?

04. Vidya's mother called her for dinner when she was working with a geometry proof. When her mother shouted again, she left for dinner. The unfinished proof on her notebook reads as follows:
    Given An isosceles triangle ABC with D, E and F as the mid-points of sides BC, CA and AB respectively such that AB = AC. AD intersects FE at O.
    Construction: Join DE and DF.
    PROOF since the segment joining the mid-points of two sides of a triangle is parallel to third side and is half of it.
    Therefore,

    $DE \| AB$ and $DE = \frac{1}{2}AB$

    Also $DF \| AC$ and $DF = \frac{1}{2}AC$
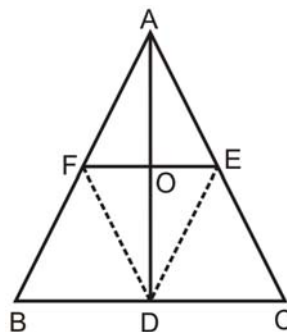
    But, $AB = AC$

    $\Rightarrow \quad \frac{1}{2}AB = \frac{1}{2}AC$

    $\Rightarrow \quad DE = DF$

    Now, $DE = \frac{1}{2}AB \Rightarrow DE = AF$

    And, $DF = \frac{1}{2}AC \Rightarrow DF = AE$

   What she was trying to prove? Select the right option/s   from the following.

(a) $AD \perp FE$ and AD is bisected by FE

(b) O is the incenter of triangle ABC

(c) Diagonals AD and FE bisect each other at right angle.

(d) DEAF is a Rhombus

05. A traffic signal board, indicating 'SCHOOL AHEAD', is an equilateral triangle with side 'a'. Find the area of the signal board, using Heron's formula. If its perimeter is 180 cm, what will be the area of the signal board?

(a) $700\sqrt{3}cm^2$ (b) $900\sqrt{3}cm^2$ (c) $450\sqrt{3}cm^2$ (d) $1200\sqrt{3}cm^2$

06. Quana's class room is 10 m long, 7 m wide and 4 m high. It has one door $3m \times 1.4\,m$ and three windows, each measuring $2\,m \times 1\,m$. The interior walls are to be Painted. The contractor charge Rs. 42 per sq. m. Find the cost of painting.

(a) Rs. 5284   (b) Rs. 28135   (c) Rs. 36216   (d) Rs. 441612

07. Vidya has a hollow bamboo stick of 35 cm long with an inner radius of 12 cm. The thickness of the bamboo stick is 2 cm. Find the volume of the bamboo (wood) in the stick, assuming it is open at either end.

(a) 8312 cm³   (b) 5270 cm³   (c) 5118 cm³   (d) 6114 cm³

08. A cylinder is within the cube touching all the vertical faces. A cone is inside the cylinder. If their heights are same with the same base, find the ratio of their volumes. (Neglect the thickness of the shapes for calculations)

(a) 42 : 22 : 11   (b) 66 : 33 : 11   (c) 42 : 33 : 11   (d) 120 : 80 : 20

09. Richa's garden has been designed in the shape of two identical semicircular of radius of 3 m, as shown in the figure.
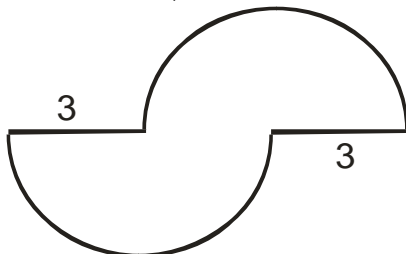
What is the perimeter of the garden?

(a) 18.8m   (b) 21.8m   (c) 24.8m   (d) 28.3m

10. Which triangle, when correctly drawn to scale, will contain a right angle?

11. Vidya gave three sticks of unequal lengths to Wisden. She asked him to form the following and answer her questions.

09

(a) Form two parallel lines intersected by a transversal. What do you observe about each pair of corresponding angles?

(b) In the above formation, what do you observe about the interior angles on the same side of the transversal?

(c) Form two parallel lines intersected by a transversal in such a way that a pair of alternate angles are equal. What do you observe about the pair of lines?

(d) Form two parallel lines intersected by a transversal in such a way that the sum of interior angles on the same side of the transversal is 180^0. What do you observe about the pair of lines?

Shade 'P' for parallel, 'Q' for equal, 'R' for supplementary, 'S' for complimentary and 'T' if Wisden cannot form it.

12. Wisden sent a text message to Vidya "Good Morning! Here is a question for you and for your friends today. Choose the undefined from the following four".

(a) 0^1 (b) $\dfrac{0}{5}$ (c) $\dfrac{5}{0}$ (d) 0^0

13. Factor theorem of polynomials can be used to determine whether a polynomial q(x) is a factor of polynomial p(x) or not without performing actual division. After listing to the explanations, Richa told Vidya to explain it to her in simple statements. Vidya explained the same in four statements. Here is what she said:

(a) $(x + a)$ is a factor of a polynomial p(x) if and only if $p(-a) = 0$

(b) $(ax - b)$ is a factor of a polynomial p(x) if and only if $p(b/a) = 0$

(c) $ax + b$ is a factor of a polynomial p(x) if and only if $p(-b/a) = 0$

(d) $(x - a)(x + b)$ is a factor of a polynomial p(x) if and only if $p(a) = 0$ and $p(b) = 0$

After reading what Richa wrote, Vidya said one of the above four needs a correction. Which statement needs the correction? Shade ' e ' if all the statements are correct.

14. Santa Clause came to Richa's home to wish her Chirstmas. He gave her a small packet containing 5 éclairs, 4 coffee bite and 3 mentos. If a chocolate is selected random wise, the probability that it is an ECLAIRS or MENTOS is:

(a) 1/2   (b) 2/3   (c) 5/12   (d) 2/5

15. A hemispherical bowl of internal diameter 36 cm contains a liquid. This liquid is to be filled in cylindrical bottles of radius 3 cm and height 6 cm. How many bottles are required to empty the bowl?

(a) 46   (b) 52   (c) 64   (d) 72

16. Which of the following statements are right?

(a) Every integer is a rational number

(b) Every natural number is a whole number

(c) Every integer is a whole number

(d) Every rational number is a whole number

17. If $a + b = 10$ and $ab = 21$, find the value of $a^3 + b^3$

(a) 220   (b) 418   (c) 310   (d) 370

18. An angle is 20^0 less than its complement. Find its measure

(a) 70^0 (b) 45^0 (c) 115^0 (d) 35^0

19. The bar graph given below shows the sales of books (in thousands) from six branches of a publishing company during two consecutive years 2010 and 2011. Sales of Books (in thousand numbers) from Six Branches - Delhi, Kolkata, Mumbai, Bangaluru, Chennai and Hyderabad of a publishing Company in 2010 and 2011.
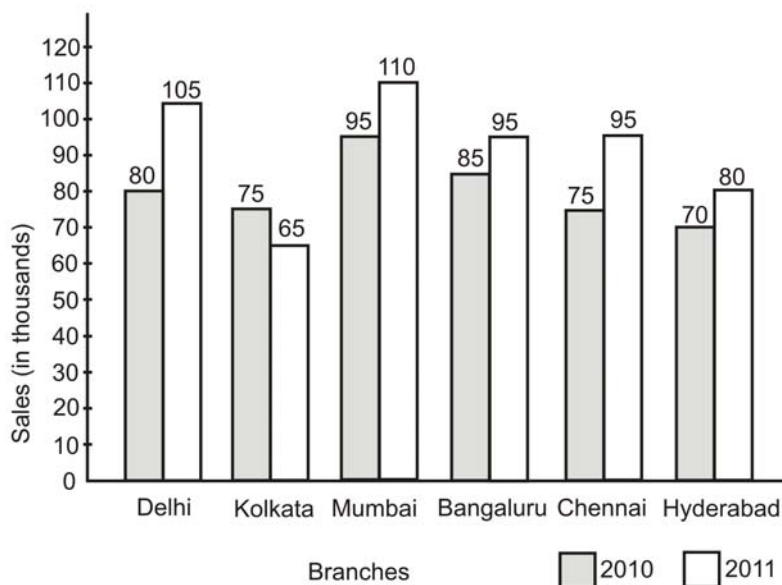
What is the ratio of the total sales of Kolkata branch for both years to the total sales of Bangaluru branch for both years?
(a) 2:3   (b) 3:5   (c) 4:5   (d) 7:9

20. In Question number 19, the total sales of branch Hyderabad for both the years is what percent of the total sales of Mumbai branch for both the years?
(a) 68.54%   (b) 71.11%   (c) 73.17%   (d) 75.55%

SECTION 2: SCIENCE

21. Vidya sprayed room freshener in her classroom before the arrival of the teacher in her class. The smell of perfume spreads out by a process known as
(a) Evaporation   (b) Diffusion   (c) Condensation   (d) Fusion

22. Quana wants to know which of the following factor/s are responsible for the change in state of solid carbon dioxide when kept exposed to air?
(a) Increase in pressure   (b) Decrease in pressure
(c) Increase in temperature   (d) Decrease in temperature

23. It was Richa's turn to classify the given data into elements, compounds and mixtures. She did the following classification.

Options	Elements (P)	Compounds (Q)	Mixture (R)
(a)	Sodium	Calcium carbonate	Soil
(b)	Silver	Coal	Sugar solution
(c)	Tin	Methane	Soap
(d)	Silicon	Carbon dioxide	Blood

Shade the wrong classifications by Richa. Mark 'S' if all classifications against each option is right.

24. Which of the following is expected to show Tyndall effect?
(a) A solution of common salt   (b) Milk
(c) A solution of sodium carbonate (d) Starch solution

25. Calculate the volume in litres of 20g of hydrogen gas at STP.
    (a) 224 litres   (b) 22.4 liters   (c) 200 liters   (d) 20 liters

26. You are asked by your teacher to buy 10 *mol* of distilled water from a shop where small bottles each containing 20*g* of such water are available. How many bottles will you buy ?
    (a) 18   (b) 15   (c) 12   (d) 9

27. Elements having the same number of valence electrons in their atoms have similar
    (a) Combining capacities   (b) Chemical properties
    (c) Atomic sizes   (d) Metallic characters

28. The reaction represented by the equation $CuSO_4 + Fe \rightarrow FeSO_4 + Cu$ is a
    (a) Synthesis reaction   (b) Decomposition reaction
    (c) Neutralization reaction   (d) Displacement reaction

29. Rutherford's alpha particle scattering experiment led to the discovery of
    (a) Nucleus   (b) Electrons   (c) Protons   (d) Neutrons

30. If a particle moves with a constant speed, the distance-time graph is a
    (a) Straight line   (b) Circle   (c) Stairlike line   (d) Polygon

31. What is the percentage of sulphur in sulphuric acid (H_2SO_4)?
    (a) 28.62   (b) 32.65   (c) 18.85   (d) 16.25

32. When we increase the loudness of sound produced by a radio, the property of the sound wave that changes is its
    (a) amplitude   (b) frequency   (c) speed   (d) wavelength

33. Quana, Viday's classmate drops a ball from the top of the building. She hears the sound of the ball hitting the ground 2.057 seconds after dropping it. If she was 19.6 meters above the ground, what is the speed of sound in air (Take g = 9.8m/s^2).
    (a) 312 m/s   (b) 344 m/s   (c) 356m/s   (d) 365m/s

34. Agaricus is a commonly called
    (a) Bread mould   (b) Black mould   (c) Mushroom   (d) Bracket fungi

35. The process of cross-breeding two individuals of different varieties is
    (a) artificial insemination   (b) artificial breeding
    (c) hybridization   (d) tissue culture

36. The rice cultivation in Vidya's ancestral village used to be affected by a disease called Blast. This problem has affected more than 60 countries across the world now. Do you know what the symptoms of Blast are?
    (a) Black powdery masses in the grains
    (b) Brown spots on the margins of leaves
    (c) Dark spots surrounded by yellow rings in all aerial parts
    (d) Red spots on the midribs of leaves

37. Bacteria lack
    (a) endoplasmic reticulum   (b) nucleus   (c) cell wall   (d) cytoplasm

38. Ciliated epithelium occurs in the
    (a) trachea & kidneys (b) trachea & lungs (c) trachea & liver (d) trachea & uterus

39. The centriole is associated with
    (a) DNA synthesis   (b) spindle formation (c) reproduction   (d) ribosomes

40. Plant breeding aims to produce
    (a) disease-free varieties   (b) high-yielding varieties
    (c) early-maturing varieties   (d) weed preventing varieties

SECTION 3 : GENERAL KNOWLEDGE

41. Vidya knew that light reflects. She also knew that good mirror can reflect the entire light falls on it and can give a good image. The school was preparing for Christmas celebrations. Students have decorated Santa Clause with two identical bags full of Christmas gifts hung on both of his shoulders. Now Santa Clause looks like a symmetrical figure if we look at him face to face. Vidya, after a thought, told her teacher: "Teacher if can give me two plane mirrors of the size of Santa, I can create an illusion of infinite Santa using the theory of reflection".
    Teacher asked her: Are you sure? She said yes. Teacher has arranged for two big plane mirrors identical in size and told her: "I can give you two days. If you cannot do it in a day, consult me"
    But Vidya could do it in a day!
    How she has created the illusion of infinite Santas? (You may try it for this Christmas)
    (a) She kept one mirror on the floor and other on the roof facing each other
    (b) She kept one mirror in the front and other on the back facing each other
    (c) She kept one mirror exactly on the left and other exactly on the right facing each other
    (d) She kept the mirrors parallel to each other like in a periscope

42. Why Koodankulam is in the news for quite long?
    (a) Generation of electricity   (b) Extraction of nuclear fuels
    (c) Anti nuclear protest   (d) Nuclear energy conservation

43. Indian scientist Satyendra Nath Bose worked with Albert Einstein in the 1920s made discoveries that led to a kind of particle being named for him.
    It was Peter Higgs, a British physicist, who in the 1960s made advances in the field, resulting the naming of Higgs Boson.
    Do you know what is it popularly called?
    (a) Higgs particle   (b) God particle   (c) Bose particle   (d) Good particle

44. Where did the concept of carbon credit originated?
    (a) Kyoto Protocol   (b) Earth Summit, Rio de Janeiro
    (c) Montreal Protocol   (d) G-8 Summit, Heiligendamm

45. Which of the following Mr. Sam Pitroda is / was associated with?
    (a) Telecom Revolution   (b) National Knowledge Commission
    (c) National Innovation Council   (d) Center for Mathematical Biology

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