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NATIONAL LEVEL SCIENCE TALENT SEARCH EXAMINATION

CLASS - 8

Question Paper Code : 1B107

KEY

1. A	2. D	3. A	4. D	5. C	6. D	7. C	8. D	9. B	10. B
11. A	12. B	13. B	14. B	15. C	16. C	17. C	18. D	19. B	20. A
21. D	22. C	23. C	24. A	25. B	26. C	27. D	28. C	29. A	30. B
31. D	32. C	33. C	34. D	35. C	36. A	37. B	38. D	39. D	40. D
41. C	42. D	43. A	44. B	45. C	46. B	47. A	48. B	49. C	50. C
51. D	52. B	53. A	54. C	55. A	56. B	57. C	58. B	59. A	60. C

SOLUTIONS

MATHEMATICS

01. (A) Volume of a cuboid = $l$bh

$= 8\frac{1}{19} \times 5\frac{8}{17} \times 3\frac{2}{31}$ cubic meters

$= \frac{\cancel{153}^{9}}{\cancel{19}_{1}} \times \frac{\cancel{93}^{3}}{\cancel{17}_{1}} \times \frac{\cancel{95}^{5}}{\cancel{31}_{1}}$ cubic meters

= 135 cubic meters

02. (D) Let the equal side of the isosceles triangle be x cm

Given third side = $\frac{4}{3}x$

Given $x + x + \frac{4}{3}x = 40$ cm

$2x + \frac{4x}{3} = 40$ cm

$\frac{6x+4x}{3} = 40$ cm

$10x = 40 \times 3$ cm

$x = \frac{120}{10}$cm

$x = 12$ cm

Biggest side

$= \frac{4x}{3} = \frac{4}{\cancel{3}_{1}} \times \cancel{12}^{4}$ cm = 16 cm

03. (A) $\sqrt{2024^2 - 2\times 2024 + 1}$

$= \sqrt{(2024)^2 - 2\times 2024\times 1 + 1^2}$

$= \sqrt{(2024-1)^2}$

= 2023

04. (D) $\sqrt[3]{92^3 + 3\times 92^2 \times 8 + 3\times 92\times 8^2 + 8^3}$

$= \sqrt[3]{7,78,688 + 2,03,136 + 17,664 + 512}$

$= \sqrt[3]{10,00,000}$

= 100

05. (C) In a quadrilateral ABCD, given the angles ratio of A, B, C & D = 2 : 4 : 5 : 7

= $2x : 4x : 5x : 7x$

But $\angle A + \angle B + \angle C + \angle D = 360°$

$2x + 4x + 5x + 7x = 360°$

$18x = 360°$

$x = \frac{360°}{18}$

$x = 20°$

∴ Smallest angle = $2x = 2 \times 20° = 40°$

06. (D) $x^2 - \frac{75}{100}x - \frac{9625}{1000} = 0$

$\frac{3}{4}$ $\frac{385}{40}\ \frac{77}{8}$

∴ $\frac{8x^2 - 6x - 77}{8} = 0$

∴ $8x^2 - 6x - 77 = 0 \times 8$

$8x^2 - 28x + 22x - 77 = 0$

$4x(2x - 7) + 11(2x - 7) = 0$

$(2x - 7)(4x + 11) = 0$

$2x - 7 = 0$ (or) $4x + 11 = 0$

$2x = 7$ $4x = -11$

$x = \frac{7}{2}$ $x = \frac{-11}{4}$

$x = -2.75$

07. (C) The second piece is longer than the first piece and the third piece is longer than the second piece. Hence, the shortest piece is the first piece.

Length of first piece = $2x$ cm

Length of second piece = $2(2x) = 4x$ cm

Length of third piece = $(4x + 20)$ cm

Length of rod = $(2x) + (4x) + (4x + 20)$ cm

= $10x + 20$ cm

$= \frac{10(x+2)}{100}$ m = $\frac{x+2}{10}$ m

08. (D) Given $2\pi rh + 2\pi r^2 - 2\pi rh$

= 3872 cm² – 2640 cm²

$2\pi r^2$ = 1232 cm²

$2 \times \frac{22}{7} \times r^2 = 1232$ cm²

$r^2 = \frac{1232^{308^{28}}}{} \times \frac{7}{44_1\ 4_1}$ cm²

$r = \sqrt{2\times 2\times 7\times 7}$ cm²

r = 14 cm

$2 \times \frac{22}{7_1} \times \frac{14^2}{} \text{ cm} \times h = 2640 \text{ cm}^2$

$h = \frac{2640^{1320^{660^{30}}}}{}$ cm² $\times \frac{1}{2 \times 22_1 \times 7_1}$ cm

h = 30 cm

Volume of the cylinder = $\pi r^2 h$

$= \frac{22}{7_1} \times \frac{14^2}{}$ cm × 14 cm × 30 cm

= 18,480 cm³

09. (B) It is in indirection proportion

Given $x_1 = 20$, $y_1 = 35$, $x_2 = 14$, $y_2 = ?$

$x_1 y_1 = x_2 y_2$

$20 \times 35 = 14 \times y_2$

$y_2 = \frac{20\times 35}{14}$

y_2 = 50 days

10. (B) It is in direct proportion

$\therefore$ x_1 = length of the pole = 5 m 60 cm

y_1 = length of the shadow = 3 m 20 cm

x_2 = ?

y_2 = length of the shadow = 6 cm

$\therefore \quad \frac{x_1}{y_1} = \frac{x_2}{y_2}$

$\frac{5 \text{ m } 60 \text{ cm}}{3 \text{ m } 20 \text{ cm}} = \frac{x_2}{6\text{m}}$

$\Rightarrow \quad x_2 = \frac{5.6 \text{ m}}{3.2 \text{ m}} \times 6 \text{ m}$

$= \frac{\cancel{56 \text{ m}}^{7}}{\cancel{32 \text{ m}}_{4}} \times 6 \text{ m}$

$= \frac{42 \text{ m}}{4}$

= 10 m 50 cm

11. (A) Let the principal be ₹ p

Given $p\left(1+\frac{r}{100}\right)^n - p = CI$

$\Rightarrow p\left(1+\frac{5}{100}\right) - p = ₹\ 1324.05$

$p\left(\frac{21}{20} \times \frac{21}{20} \times \frac{21}{20}\right) - p = ₹\ 1324.05$

$\frac{9261p}{8000} - p = ₹\ 1324.05$

$\frac{9261p - 8000p}{8000} = ₹\ 1324.05$

1261p = 8000 × ₹ 1324.05

$p = \frac{₹\ 10592400}{1261} = ₹\ 8400$

$SI = \frac{PTR}{100} = ₹\ 1260$

12. (B) Given $2\pi rh = 352\ cm^2$ and $\pi r^2 h$

$= 1408\ cm^3$

$\therefore \quad \frac{\pi r^2 h}{2\pi rh} = \frac{1408\ cm^2}{352\ cm^2}$

$\therefore \quad \frac{r}{2} = 4$ cm

r = 8 cm

$2 \times \frac{22}{7} \times 8 \times h = 352\ cm^2$

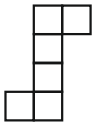
$h = 352 \times \frac{7}{352}$ cm

h = 7 cm

$\therefore$ TSA = $2\pi r(h + r)$

$= 2 \times \frac{22}{7} \times 8 \times 15\ cm^2$

$= 754\frac{2}{7} cm^2$

13. (B) 

14. (B) $\sqrt{15}x^2 + 2x - \sqrt{15} = \sqrt{15}x^2 + 5x - 3x - \sqrt{15}$

$= \sqrt{5}x\left(\sqrt{3}x + \sqrt{5}\right) - \sqrt{3}\left(\sqrt{3}x + \sqrt{5}\right)$

$= \left(\sqrt{3}x + \sqrt{5}\right)\left(\sqrt{5}x - \sqrt{3}\right)$

15. (C) $288 \times n = 2^5 \times 3^2 \times n$

$\therefore$ $2^5 \times 3^2 \times n$ is a perfect cube and perfect square then least value of $n = 2 \times 3^4 = 162$

16. (C) Given $a^2 = 10201\ cm^2$

$a = \sqrt{10{,}201\ cm^2}$

a = 101 cm

perimeter = 4a = 4 × 101 cm = 404 cm

17. (C) $SP = \frac{MP(100 - d)}{100}$

$₹x = \frac{MP(100 - y)}{100}$

$\therefore MP = ₹\frac{100x}{(100 - y)}$

18. (D) Given $\left(\frac{1}{x}\right)^2 = \frac{1}{2.25} \times \frac{1}{6.25}$

$x^2 = (1.5)^2 \times (2.5)^2$

$x^2 = (1.5 \times 2.5)^2$

$x^2 = (3.75)^2$

$x = 3.75$

19. (B) Rise in level = $\frac{\text{Volume of water}}{\text{Base area}}$

$= \frac{500 \times 0.4\ m^3}{80 \times 50\ m^2} = \frac{4}{80} m$

$= \frac{4}{80} \times \frac{100}{20} = 5\ cm$

20. (A) $2^{2024} + 2^{2024} + 2^{2024} + 2^{2024} + 2^{2024} + 2^{2024} + 2^{2024} + 2^{2024}$

$= 8 \times 2^{2024}$

$= 2^3 \times 2^{2024}$

$= 2^{2024+3}$

$= 2^{2027}$

21. (D) Let q_1, q_2, q_3 and q_4 be the four required rational numbers. Then,

$q_1 = \frac{1}{2}\left(\frac{1}{6} + \frac{1}{3}\right) = \frac{1}{2}\left(\frac{1+2}{6}\right) = \frac{1}{4}$

$q_2 = \frac{1}{2}\left(\frac{1}{4} + \frac{1}{3}\right) = \frac{1}{2}\left(\frac{3+4}{12}\right) = \frac{7}{24}$

$q_3 = \frac{1}{2}\left(\frac{1}{4} + \frac{7}{24}\right)$

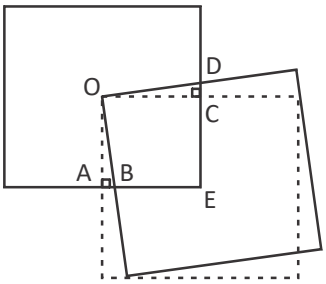
$= \frac{1}{2}\left(\frac{6+7}{24}\right) = \frac{1}{2}\left(\frac{13}{24}\right) = \frac{13}{48}$

and $q_4 = \frac{1}{2}\left(\frac{7}{24} + \frac{13}{48}\right)$

$= \frac{1}{2}\left(\frac{14+13}{48}\right) = \frac{1}{2}\left(\frac{27}{48}\right) = \frac{27}{96}$

$\therefore \frac{1}{4}, \frac{7}{24}, \frac{13}{48}$ and $\frac{27}{96}$ are the required rational numbers between $\frac{1}{6}$ and $\frac{1}{3}$

22. (C)



In ΔAOB, $\angle AOB = x$, then

$\angle BOC = 90° - x$

$\therefore$ $\angle COD = \angle BOD - \angle BOC$

$= 90° - (90° - x)$

$= 90° - 90° + x = x$

$\angle COD = \angle AOB$ $\rightarrow$ (1)

In ΔAOB & ΔCOD

$\angle A = \angle C = 90°$ (angle)

$OA = OC$ (side)

$\angle AOB = \angle COD$

[$\because$ angle & from eq (1)]

$\therefore$ $\Delta AOB \cong \Delta COD$

[$\because$ ASA congruency]

$\therefore$ Area of ΔAOB = area of ΔCOD

Area of shaded region BEDO = area of quadrilateral BECO + are of ΔCOD

= Area of quadrilateral BECO + area of ΔAOB

= Arera of square OAEC = $\frac{1}{4}$ area of original square = 6 cm^2

23. (C) $3x^2 + 24x + 36 = 3(x^2 + 8x + 12)$

$= 3(x^2 + 6x + 2x + 12)$

$= 3(x(x + 6) + 2(x + 6)]$

$= 3(x + 6)(x + 2)$

$\therefore$ Length = $(x + 6)$ breadth = $(x + 2)$ & height = 3

24. (A) $\frac{(67.542)^2 - (32.458)^2}{7000 - 3491.6} = \frac{(67.542 + 32.458)(67.542 - 32.458)}{3508.4}$

$= \frac{100 \times 35.084}{3508.4}$

$= \frac{3508.4}{3508.4} = 1$

25. (B) Among the given 30 numbers composite numbers are 4, 6, 8, 9, 10, 12, 14, 15, 16, 18, 20, 21, 22, 24, 25, 26, 27, 28, 30

$\therefore$ Probability of getting a composite number = $\frac{19}{30}$

PHYSICS

26. (C) The correct order of steps of hearing sound by humans is (i), (ii), (iii) and (iv).

27. (D) Round and smooth spherical objects like rollers or ball bearings reduce friction, They are placed around axles in many machines to allow the axles to turn easily.

28. (C) According to the given graph, spring S is the strongest as it could stretch or extend upto 5 cm only when a load of 400 g was added to the pan attached to the spring.

29. (A) During electrolysis, water splits into respective ions as given below:

$2H_2O \rightarrow 2H_2^{(+)} + O_2^{(-)}$

30. (B) The image formed by a plane mirror is always erect, virtual and of exactly the same size as the object. The image is formed as much behind the mirror as the object is in front of it.

31. (D) Rise of mercury in glass tube causes its expansion in the thermometer due to increase in temperature.

32. (C) The finger should be removed first before the ruler is removed.

33. (C) Rolling a drum of 10 kg on a horizontal surface or on an inclined plane is easier to perform as frictional force is less. Dragging or lifting a drum of 10 kg needs more force and frictional force is also more.

34. (D) All the given reasons are true when the bulb does not glow in the given electric circuit.

35. (C) A series of fast-moving still pictures can create an illusion of movement due to the persistence of vision. Due to this reason, the eye can separate two images only when the interval of separation between them is one-sixteenth of a second.

CHEMISTRY

36. (A) Oxygen, hydrogen, nitrogen and sulphur are also present in small amounts in coal along with carbon.

37. (B) The outermost zone (non-luminous) of the flame is blue. It is the hottest part in the flame because of complete combustion of fuel. Due to more temperature, it can melt metals of high melting point like gold easily.

38. (D) Coal is obtained by carbonisation which is a very slow process (i.e., it takes thousands of years) and requires very high temperature and pressure. Existence of such conditions in laboratory or industry is not possible, so coal cannot be prepared in the laboratory or industry.

39. (D) The blue zone in a LPG flame indicates the hottest and has undergone complete combustion zone.

40. (D) All the given constituents with their uses are obtained after petroleum is refined in a petroleum refinery.

41. (C) Biogas is a smokeless fuel and leaves no residue.

42. (D) Statements I, III and IV are correct.

Natural gas is not obtained by fractional distillation of petroleum. It is formed deep inside the earth along with the petroleum deposits.

43. (A) Kerosene has a low ignition temperature. Hence, it burns to produce large amount of heat energy to reach ignition temperature of wood or coal.

44. (B) Petrol is used as a solvent in dry cleaning.

45. (C) On processing of coal (X), coke (Y – a pure form of carbon), coal tar and coal gas (Z) are obtained.

BIOLOGY

46. (B) Recycling drink cans.

Buying household products designed with less packaging material, help to save our earth.

47. (A) Some living things on earth have become extinct. They became extinct because of over-hunting, the presence of diseases of the destruction of their habitats due to logging or deforestation.

Some living things are in danger of extinction because of over-hunting, poaching, diseases, excessive logging or deforestation.

48. (B) Infected leaves is not an inherited character.

49. (C) Hydro shows budding type of reproduction.

50. (C) An egg must be fertilized by a sperm before it can develop into a baby.

51. (D) Advantages of biotechnology to mankind are better yield of crops, decrease usage of pesticides.

52. (B) The study of microbes is called Microbiology.

53. (A) Bacteria cause typhoid.

54. (C) Fertilized eggs of frog are spawn.

55. (A) Adam's apple in males is found in larynx.

CRITICAL THINKING

56. (B) Based on the puzzle clues and logic.

There are five friends and each has a unique favorite color and fruit.

After applying the clues systematically, we find that Bhavya likes Blue and prefers Mango.

	Alok	Bhavya	Chetan	Divya	Esha
Mango	✘	✔	✘	✘	✘
Orange		✘		✘	✘
Apple		✘			✘
Banana		✘			✘
Grapes	✘	✘	✘	✘	✔

	Alok	Bhavya	Chetan	Divya	Esha
Green					✘
Blue	✘			✘	
Red		✘			
Yellow	✘				
Purple		✘		✘	

57. (C) Conclusion I:

"Dogs cannot survive without this dog food."

The statement says that the food contains all the nutrition a dog will ever need, but it does not imply that dogs cannot survive without it. It merely suggests that this food is nutritionally complete, not that it is the only way for a dog to get its necessary nutrients.

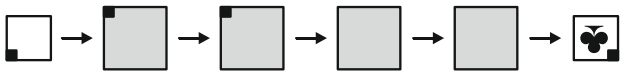
Conclusion II:

"This dog food is the only one in the market which contains all the nutrition the dogs need."

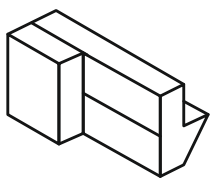
The statement claims that this food contains all the nutrition a dog will ever need, but it does not state that it is the only dog food in the market that does so. The advertisement is focused on promoting its own product, not on comparing it to other products.

Therefore, neither Conclusion I nor Conclusion II logically follows from the given statement.

58. (B)



59. (A)



60. (C) Penguins are exceptions to the rule. This conclusion logically follows from the given information.