



NATIONAL LEVEL SCIENCE TALENT SEARCH EXAMINATION (UPDATED)

CLASS - 8

Question Paper Code : 1P214

KEY

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

SOLUTIONS

MATHEMATICS

01. (A)
$$\frac{243^{0.13} \times 243^{0.07}}{7^{0.25} \times 49^{0.075} \times 343^{0.2}}$$

$$= \frac{(243)^{0.13 + 0.07}}{(7)^{0.25} \times (7^2)^{0.075} \times (7^3)^{0.2}}$$

$$= \frac{(3^5)^{0.2}}{7^{0.25} \times 7^{0.15} \times 7^{0.6}} = \frac{3^{5 \times 0.2}}{7^{0.25+0.15+0.6}}$$

$$= \frac{3}{7}$$

02. (A) Given $\pi r^2 = 38.5 \text{ cm}^2$

$$\frac{22}{7} \times r^2 = 28.5 \text{ cm}^2$$

$$r^2 = \cancel{38.5}^{3.5} \text{ cm}^2 \times \frac{\cancel{7}^{3.5}}{\cancel{22}_1}$$

$$r^2 = (3.5 \text{ cm})^2$$

$$r = 3.5 \text{ cm}$$

Given $2\pi rh = 143 \text{ cm}^2$

$$\cancel{2} \times \frac{22}{\cancel{7}_2} \times \cancel{3.5} \text{ cm} \times h = 143 \text{ cm}^2$$

$$h = \frac{143}{22} \text{ cm}$$

$$h = 6.5 \text{ cm}^2$$

$$\text{TSA} = 2\pi r(h+r)$$

$$= 2 \times \frac{22}{7} \times 3.5 (6.5 + 3.5) \text{ cm}^2$$

$$= 22 \times 10 \text{ cm}^2 = 220 \text{ cm}^2$$

$$\begin{aligned} 03. (D) \quad & \left(\frac{1}{a^3} + \frac{1}{b^3} \right) \left(\frac{2}{a^3} - \frac{1}{a^3 b^3} + \frac{2}{b^3} \right) \\ &= \frac{1}{a^3} \left(\frac{2}{a^3} - \frac{1}{a^3 b^3} + \frac{2}{b^3} \right) + \frac{1}{b^3} \left(\frac{2}{a^3} - \frac{1}{a^3 b^3} + \frac{2}{b^3} \right) \\ &= \left(\frac{1}{a^3} \times \frac{2}{a^3} - \frac{1}{a^3} \times \frac{1}{a^3 b^3} + \frac{1}{a^3} \times \frac{2}{b^3} \right. \\ &\quad \left. + \frac{2}{a^3 b^3} - \frac{1}{a^3} \times \frac{1}{b^3} + \frac{1}{b^3} \times \frac{2}{b^3} + \frac{1}{b^3} \times \frac{1}{b^3} \right) \\ &= \left(\frac{1}{a^3} + \frac{2}{3} - \frac{2}{3} \frac{1}{a^3 b^3} + \frac{1}{a^3 b^3} - \frac{1}{a^3 b^3} + \frac{2}{3} + \frac{1}{b^3} + \frac{2}{3} \right) \end{aligned}$$

$$= a^{\frac{1+2}{3}} + b^{\frac{1+2}{3}} = a^{\frac{3}{3}} + b^{\frac{3}{3}} = (a+b)$$

$$04. (B) \quad \text{In } \triangle ABC, \angle A + \angle B + \angle C = 180^\circ$$

$$\angle B + 120^\circ = 180^\circ$$

$$\angle B = 180^\circ - 120^\circ = 60^\circ$$

$$05. (A) \quad 2\sqrt{3}x^2 - x - 5\sqrt{3}$$

$$= 2\sqrt{3}x^2 - 6x + 5x - 5\sqrt{3}$$

$$= 2\sqrt{3}x(x - \sqrt{3}) + 5(x - \sqrt{3})$$

$$= (x - \sqrt{3})(2\sqrt{3}x + 5)$$

$$06. (A) \quad \text{Rate of interest per quarter} = \frac{10\%}{4} \text{ \& 'n' is number of quarters}$$

Given

$$\text{Rs. } 3,362 = \text{Rs. } 3200 \left(1 + \frac{10}{4 \times 100} \right)^n$$

$$\frac{\text{Rs. } 3362}{\text{Rs. } 3200} = \left(\frac{41}{40} \right)^n$$

$$\left(\frac{41}{40} \right)^2 = \left(\frac{41}{40} \right)^n$$

$$\therefore n = 2$$

$$\text{Time} = 2 \text{ quarters} = 6 \text{ months}$$

$$07. (A) \quad \text{Given}$$

$$\left(\frac{3x+1}{16} \right) - \left(\frac{x+3}{8} \right) = \left(\frac{3x-1}{14} \right) - \left(\frac{2x-3}{7} \right)$$

$$\frac{(3x+1) - 2(x+3)}{16} = \frac{(3x-1) - 2(2x-3)}{14}$$

$$\frac{3x+1-2x-6}{16} = \frac{3x-1-4x+6}{14}$$

$$\frac{(x-5)14}{16} = -x+5$$

$$x - 35 = -8x + 40$$

$$7x + 8x = 40 + 35$$

$$15x = 75$$

$$x = \frac{75}{15} = 5$$

$$08. (B) \quad (-14) \times (-14) \times (-14) = -2744$$

$$x^3 = (-14)^3$$

$$\therefore x = -14$$

$$09. (C) \quad \text{Area of rectangle} = l \times b$$

$$= (x^3 + x^2y + xy^2 + y^3)(x - y) \text{ cm}^2$$

$$= x^3(x-y) + x^2y(x-y) + xy^2(x-y) + y^3(x-y)$$

$$= x^4 - x^3y + x^3y - x^2y^2$$

$$+ x^2y^2 - xy^3 + xy^3 - y^4$$

$$= (x^4 - y^4) \text{ cm}^2$$

$$10. (B) \quad \text{Given } 3^{x-y} = 3^3 \Rightarrow x - y = 3 \rightarrow (1)$$

$$\text{Given } 3^{x+y} = 243 = 3^5$$

$$\Rightarrow x + y = 5 \rightarrow (2)$$

$$\text{eg}(2) - (1) (x + y) - (x - y) = 5 - 3$$

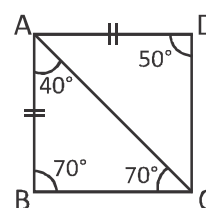
$$x + y - x + y = 2$$

$$2y = 2$$

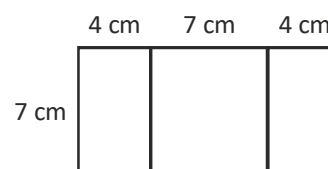
$$y = \frac{2}{2} = 1$$

11. (D) $\sqrt{1^3 + 2^3 + 3^3 + 4^3 + 5^3 + 6^3}$
 $= \sqrt{1 + 8 + 27 + 64 + 125 + 216}$
 $= \sqrt{441} = 21$
12. (D) Given $xy = 45$ & $x - y = 4$
squaring on both sides
 $x^2 + y^2 - 2yx = 16$
 $x^2 + y^2 - 90 = 16$
 $x^2 + y^2 = 106$
13. (B) Sum of length of edges = $12a$
 $12 \times 5 \text{ cm} = 60 \text{ cm}$
14. (C) Number of families having more than 4 children = $8 + 6$
Total families = $4 + 10 + 7 + 8 + 6 = 35$
Percentage of families having more than 4 children = $\frac{14}{35} \times 100\%$
15. (A) $\frac{1}{x-3} - \frac{6}{x^2-9} = \frac{x+3-6}{x^2-9}$
 $= \frac{(x-3)}{(x-3)(x+3)} = \frac{1}{(x+3)}$
16. (D) The three consecutive numbers be $x, x+1$ & $x+2$
Given $2x + 3(x+1) + 4(x+2) = 191$
 $2x + 3x + 3 + 4x + 8 = 191$
 $9x + 11 = 191$
 $9x = 191 - 11 = 180$
 $x = \frac{180}{9} = 20$
17. (D) Volume of tank = Volume of cylinder
 $66 \text{ cm} \times 28 \text{ cm} \times h$
 $= \pi \left(\frac{84}{2} \text{ cm} \right)^2 \times 28 \text{ cm}$
 $h = \frac{22}{7} \times 42^2 \times 28 \times \frac{1}{66} \times \frac{1}{28}$
 $= 84 \text{ cm}$

18. (D) $3^{25} + 3^{26} + 3^{27} + 3^{28} = 3^{25} (1 + 3 + 3^2 + 3^3)$
 $= 3^{25} (4 + 9 + 27)$
 $= 3^{25} \times 40$
 $= 3 \times 3^{24} \times 10 \times 4$
 $= 30 \times 4 \times 3^{24}$
19. (B) $\angle BDA = \angle DBC = q$
[Alternative angles]
 $\angle ACB = \angle DAC = p$
 $\therefore p + q + r + s + t$
 $= p + t + q + s + r$
 $\angle BCA + \angle ACB + \angle ADB + \angle BDC + \angle ADC + 90^\circ$
 $= 180^\circ + 90^\circ$
[adjacent angles of a parallelogram are supplementary]
 $= 270^\circ$
20. (C) In $\triangle ABC$, $\angle BAC = 40^\circ$, $\angle B = 70^\circ$



- $\therefore 40 + 70 + \angle BCA = 180^\circ$
 $\angle BCA = 180^\circ - 110^\circ = 70^\circ$
In $\triangle ABC$, $\angle B = \angle BCA$
 $AC = AB$
But given $AB = AD$
 $AC = AD$
 $\therefore \angle D = \angle DCA = 50^\circ$
In $\triangle ACD$, $50^\circ + 50^\circ + \angle DAC = 180^\circ$
 $\angle DAC = 180^\circ - 100^\circ = 80^\circ$
21. (A) length of new object = $4\text{cm} + 7\text{cm} + 4\text{cm}$
 $= 15\text{cm}$



Breadth of new object = 7cm
Area of new object = $15\text{cm} \times 7\text{cm}$
 $= 105 \text{ cm}^2$

22. (A) $LHS = \cancel{a^3} - \cancel{b^3} + \cancel{b^3} - \cancel{c^3} + \cancel{c^3} - \cancel{a^3} = 0.$

23. (A) It is in inverse proportion

$$\therefore x_1 y_1 = x_2 y_2$$

$$52 \times 35 = 28 \times y_2$$

$$\frac{\cancel{52}^{13} \times \cancel{35}^5}{\cancel{28}_1} = y_2$$

$$y_2 = 65$$

24. (A) Let the cost price be ₹ x

Given profit percentage = 20%

$$\therefore \frac{\text{Profit}}{\text{CP}} \times 100 = 20$$

$$\frac{\text{Profit}}{x} \times 100 = 20$$

$$\therefore \text{Profit} = \frac{20x}{100} = \frac{x}{5}$$

$$\text{Given profit} = ₹ 240 = \frac{x}{5}$$

$$\therefore x = ₹ 240 \times 5 = ₹ 1200$$

$$\therefore SP = CP + \text{Profit} = ₹ 1200 + 240 = ₹ 1440.$$

25. (C) $P \left(1 + \frac{\cancel{10}}{\cancel{100}} \right)^2 - P = \text{Rs. } 630$

$$P \times \frac{11}{10} \times \frac{11}{10} - P = \text{Rs. } 630$$

$$\frac{121P - 100P}{100} = \text{Rs. } 630$$

$$\frac{21P}{100} = \text{Rs. } 630$$

$$P = \frac{\text{Rs. } \cancel{630}^{30} \times 100}{\cancel{21}_1}$$

$$P = \text{Rs. } 3000$$

$$SI = \frac{\text{PTR}}{100} = \frac{\text{Rs. } \cancel{3000} \times 10 \times 2}{\cancel{100}}$$

$$SI = \text{Rs. } 600$$

PHYSICS

26. (C) Snails move using static friction, which prevents slipping. Their muscular contraction exerts a force that is always less than the limiting static friction.

27. (C) Sinusoidal patterns offer minimal energy loss, continuous particle motion, and represent natural oscillation behavior, especially in longitudinal waves.

28. (C) Lemon juice (acid) and tap water (contains dissolved salts) ionize and conduct electricity. Distilled water lacks ions, so the bulb doesn't glow

29. (B) The correct answer is (B) Ali.

Ali is safer inside a car because the car acts as a Faraday cage, conducting lightning safely around the vehicle and protecting its occupants. In contrast, hiding under a tree is dangerous due to:

- Lightning attraction : Trees are tall and more likely to be struck.
- Side flashes : Lightning can jump from the tree to a person nearby.
- Falling debris : Branches can break and cause injury.
- Ground current : Electricity can travel through the ground, shocking anyone near the tree

30. (A) The problem describes an earthquake caused by pressure buildup inside a chamber, which is a process directly related to volcanic activity and the movement of magma. Magma ejection (A) is the only diagram that depicts a volcano and the associated release of material, supporting the alternate cause proposed by the volcanologist. The other options show general geological processes (cracks, plate movement, mountain formation) that do not specifically illustrate the internal pressure release mechanism described.

31. (B) A butterfly's compound eyes consist of numerous ommatidia, each receiving a small fraction of light. This diffused entry prevents overexposure. In contrast, human eyes focus light through a single lens and pupil, making them more sensitive to sudden brightness.
32. (B) Brake pads stop the bicycle by friction between the pad and the wheel rim/disc. When pads are worn out, their effective contact area and gripping material reduce, so the frictional force decreases. As a result, Priya has to squeeze harder to stop, and squeaking may occur due to poor contact.
- Why others are incorrect:
- (A) Wear generally smoothens and thins pads, not increase friction.
- (C) Colour change is irrelevant to friction.
- (D) Magnetic forces have no role in bicycle brakes.
33. (A) Infrasonic waves travel thousands of kilometers through water with minimal energy loss, enabling long-range communication, while ultrasonic waves provide sharp echo feedback for precise detection of nearby objects — giving whales a dual sensory advantage in vast and variable ocean conditions.
34. (B) The soles of a sprinter's shoes are designed with zig-zag or block patterns to improve traction and grip during running. This pattern helps to :
- Enhance grip : The design maximizes friction between the shoe and the surface, especially when running on different types of terrain.
 - Provide controlled friction : The pattern allows for better traction in specific directions, improving the sprinter's ability to accelerate and maintain balance.
35. (B) In physics, "Smooth surface" is treated as frictionless (0) by definition.
- This simplification allows us to ignore friction completely in calculations. A smooth surface means friction is negligible (0). Since the ball is free on a smooth horizontal surface, no tangential frictional force acts, so there is no torque about its center, and rotation is impossible. Therefore, in case (a) the ball slides without rotating, while in case (b), the wheel is pivoted at the center, preventing translation, and the applied force produces rotation about the pivot. Friction can only be considered if the surface were rough or rolling without slipping were specified.
- CHEMISTRY**
36. (D) Diesel, Fuel oil, Heavy oil, Kerosene
- Diesel for vehicles, fuel oil for ships/factories, heavy oil for lubricants, kerosene for domestic fuel.
37. (D) All of the above
- For combustion to take place, three conditions must be met: a combustible substance, the right environment and the ignition temperature of the substance. All of these conditions are necessary for a successful combustion process.
38. (A) Earlier coal gas was used for street lighting and now it is used as a source of heat rather than light.
39. (D) Carbon dioxide and global warming.
- Complete combustion of most fuels produces carbon dioxide (CO_2) as a byproduct. CO_2 is a major greenhouse gas that contributes to global warming by trapping heat in the Earth's atmosphere.
40. (C) Petroleum gas (LPG) has the lowest boiling point around -42°C to 0°C .
- Kerosene is 150°C to 250°C
- Diesel is 200°C to 350°C
- Lubricating oil is 200°C to 300°C

41. (C) Cow dung cakes, wood, kerosene oil, LPG, Hydrogen.

Calorific values in kJ/kg of five fuels in the increasing order are given below.

P : Cow dung cakes = 6000 - 8000

Q : Wood = 17000 - 22000

R : Kerosene oil = 45000

S : LPG = 55000

T : Hydrogen = 150000

42. (C) Bees wax is not a petroleum product.

43. (D) Baking soda and sulphuric acid.

A soda acid fire extinguisher uses baking soda (sodium bicarbonate) and sulphuric acid. When mixed, they produce carbon dioxide gas, which helps to extinguish the fire by displacing oxygen and reducing the fire's ability to continue combustion.

44. (C) I and III only

Coal forms slowly under high pressure and high temperature over millions of years, so it cannot be prepared in the laboratory.

45. (D) The correct option is (D) all of the above. Fire brigades generally pour water on the fire because water achieves all the listed actions.

Water is a highly effective fire extinguishing agent for ordinary combustible materials (like wood, paper, and cloth) because it simultaneously tackles multiple sides of the fire triangle (heat, oxygen and fuel).

- (A) Cools the inflammable substance and bring its ignition temperature down: Water has a high heat capacity and absorbs a large amount of heat from the burning material as it turns into steam. This process cools the material below its ignition temperature, the minimum temperature required for it to continue burning.
- (B) Controls the spreading of fire: By cooling the burning material and surrounding areas, water prevents the fire from spreading to adjacent objects and helps contain the blaze.

- (C) Vapours cut off the air supply to fire: The water rapidly turns into steam (water vapor) when it contacts the intense heat. This steam is less dense than water but expands and surrounds the combustible material, displacing the oxygen in the air and effectively smothering the fire.

Why other options are incorrect

- (A) Cools the inflammable substance and bring its ignition temperature down: This statement is correct, but it is only a partial explanation of how water works.
- (B) Controls the spreading of fire: This is also a correct function of water in firefighting, but it is an incomplete answer as it misses the other primary mechanisms.
- (C) Vapours cut off the air supply to fire: This is another correct function, but again, it's not the complete picture.

Since all three options accurately describe the reasons why fire brigades use water to put out typical fires, d) all of the above is the most comprehensive and correct answer.

BIOLOGY

46. (D) In an ecosystem, energy flows from the sun to producers (plants), then to herbivores, and finally to carnivores.
47. (B) Holes in leaves due to insect damage are not inherited; they are an acquired trait and do not affect the genetic makeup passed through seeds.
48. (B) Both plant and animal cells have a nucleus (control center) and Golgi apparatus (modifies and packages proteins); centrioles and chloroplasts are animal and plant-specific respectively.
49. (B) Diarrhoea and typhoid are often spread via contaminated food/water (fecal-oral route), while others are vector-borne or airborne.
50. (B) Yeast reproduces asexually by forming a small bud that grows and detaches; ferns reproduce by spores, Rhizopus by sporangia, and roses by cuttings/seeds.

51. (C) HIV (AIDS) and hepatitis B are transmitted through contact with infected blood or body fluids (e.g., during unsafe injections, unprotected sex), not through air/water.
52. (C) The structure shown is a sporangium that produces spores; these airborne spores germinate in warm, moist conditions to form new mould.
53. (B) Indirect transmission involves touching a contaminated surface (fomite) and then touching the face/mouth, allowing germs to enter the body.
54. (A) 1-s, 2-r, 3-p, 4-q
Cell membrane controls entry/exit (s), cytoplasm hosts life processes (r), nucleus regulates activities (p), cell wall supports plant shape (q).
55. (B) Standing water is a breeding ground for mosquitoes that transmit dengue, malaria, etc., increasing the risk of disease outbreaks.

CRITICAL THINKING

56. (D) When a paper strip is folded three times in the middle in the same direction and then opened slightly and viewed from the side, the following facts always apply.
- Number of visible folds
Three folds produce
 $2^3 - 1 = 7$
visible creases (peaks and troughs).
 - Alternation rule
Each fold reverses the surface orientation of the strip.
Therefore, adjacent folds must alternate between:
 - Mountain (upward)
 - Valley (downward)
 So the pattern must be either:
 - Up, Down, Up, Down, Up, Down, Up
 - or
 - Down, Up, Down, Up, Down, Up, Down
 Two same-direction folds can never occur next to each other.

Checking the options

- (A) All folds alternate → Possible
- (B) All folds alternate → Possible
- (C) All folds alternate → Possible
- (D) Contains two adjacent folds in the same direction → Violates the alternation rule
57. (B) In options A, C, and D, the dots are placed such that each shape has its own dot(s), and there is one dot common that overlaps all the shapes.
Option B is different because the circle in it does not contain any dot, breaking the pattern seen in the other three options.
58. (A) The paragraph states some states want to ban calculators before sixth grade, while other states require graphing calculators for every middle-school student.
That directly shows at least two differing opinions about calculator use in schools, so (A) is supported.

59. (B)

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25 24 23 22 21

60. (B)

Person	Statement	Truth or Lie ?	Stolen Item
Vidhika	Vaidik stole the painting	Lie	Antique
Pratik	Vaidik stole the Chinese vase	Truth	Painting
Vaidik	I neither stole the painting nor the vase	Lie	Chinese Vase

Only the person who stole the painting tells the truth. By evaluating the statements, we find that Pratik must be the one who stole the painting. This makes Pratik's statement true (Vaidik stole the Chinese vase) and the others false. Therefore, Vidhika stole the antique.