



UNIFIED COUNCIL

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NATIONAL LEVEL SCIENCE TALENT SEARCH EXAMINATION

Paper Code: **UN439 (UPDATED)**

MATHEMATICS

Solutions for Class : 8

1. (D) By verification (or) $x + (x + 1) = 19$

$$2X = 18$$

$$X = 9 \text{ \& } x + 1 = 10.$$

2. (B)
$$\frac{a^3 - b^3}{a^2 + ab + b^3} = \frac{(a - b)(a^2 + ab + b^2)}{(a^2 + ab + b^2)}$$

$$= (a - b) = 0.04 - 0.03 = 0.01$$

3. (C)
$$\begin{array}{r} 2 \overline{) 5184} \\ 2 \overline{) 2592} \\ 2 \overline{) 1296} \\ 2 \overline{) 648} \\ 2 \overline{) 324} \\ 2 \overline{) 162} \\ 3 \overline{) 81} \\ 3 \overline{) 81} \\ 3 \overline{) 9} \\ 3 \end{array}$$

$$\therefore 5184 = (2 \times 2 \times 2) \times (2 \times 2 \times 2) \times (3 \times 3 \times 3) \times 3$$

Hence, 5184 must be divided by 3 to make it a perfect cube.

4. (C)
$$-2 + \frac{1}{2} = \frac{-4+1}{2} = \frac{-3}{2}$$

5. (A)
$$\begin{aligned} x^4 + 2x^2 + 9 &= (x^4 + 6x^2 + 9) - 4x^2 \\ &= (x^2 + 3)^2 - (2x)^2 \\ &= (x^2 + 2x + 3)(x^2 - 2x + 3) \end{aligned}$$

6. (C) $\angle BDC = \angle AED = 36^\circ$
 (Corresponding \angle s, $AE \parallel BD$.)
 $\angle ABD = \angle BDC = 36^\circ$
 (Alternate \angle s, $AB \parallel DC$)
 $\angle ADB = \angle ABD = 36^\circ$

(Base angles of isosceles Δ , since $AB = DC$)

$$\angle BAD = 180^\circ - \angle ABD - \angle ADB$$

(Angle sum of a triangle.)

$$= 180^\circ - 36^\circ - 36^\circ$$

$$= 108^\circ$$

7. (C) $3^n = 729 \Rightarrow 3^n = 3^6 \Rightarrow n = 6$

$$\therefore 3^{3n+1} = 3^{3(6)+1} = 3^{18+1} = 3^{19}$$

8. (A) 114345 is divisible by 9 & 11.

9. (C) Let cost price be ₹ 100. Then M.P. is ₹ 130. After discount of $6\frac{1}{4}\%$ the S.P.

$$\text{is } ₹ 130 \left(\frac{93.75}{100} \right)$$

$$= ₹ 121.875$$

$$\text{Gain\%} = \frac{\text{S.P.} - \text{C.P.}}{\text{C.P.}} \times 100\%$$

$$\Rightarrow \text{Gain\%} = \frac{121.875 - 100}{100} \times 100\%$$

$$= 21.875\%$$

10. (B) Area of shaded region = $15 \times 8\text{cm}^2 - \frac{1}{2} \times 12 \times 8\text{cm}^2$

$$= 120\text{ cm}^2 - 48\text{ cm}^2$$

$$= 72\text{ cm}^2$$

11. (Del)

12. (C) $x + 5 = 20$
 $x = 15$

13. (B) All the sides of a cube have equal measure but the sides of a cuboid have different measures.

14. (B) $x^2 - z^2 - 2xy + 2yz = x^2 - z^2 - 2y(x - z)$
 $= (x + z)(x - z) - 2y(x - z)$
 $= (x - z)(x + z - 2y)$
 $= (x - z)(x - 2y + z)$

15. (C) Let x be the required number. Then $x^2 - x = 12$

$$x(x - 1) = 12$$

By inspection, we have

$$4(4 - 1) = 12$$

$$\Rightarrow 4 \times 3 = 12$$

$$\Rightarrow x = 4$$

16. (B) Degree of constant term is zero.

17. (C) Let the sum be Rs 'P'

$$\text{Given } P\left(1 + \frac{5r}{100}\right) = 1,125$$

$$P\left(1 + \frac{r}{20}\right) = 1,125$$

$$P\left(\frac{20+r}{20}\right) = 1,125 \rightarrow 1$$

$$\text{Given } P\left(1 + \frac{8r}{100}\right) = 1,200$$

$$P\left(1 + \frac{2r}{25}\right) = 1,200$$

$$P\left(\frac{25+2r}{25}\right) = 1,200 \rightarrow 2$$

$$\frac{\text{eq2}}{\text{eq1}} \Rightarrow \frac{P\left(\frac{25+2r}{25}\right)}{P\left(\frac{20+r}{20}\right)} = \frac{1200}{1125}$$

$$= \frac{\left(\frac{25+2r}{25}\right)}{\left(\frac{20+r}{20}\right)} = \frac{16}{15}$$

$$\frac{25+2r}{25} \times \frac{20}{20+r} = \frac{16}{15}$$

$$\frac{25+2r}{5} \times \frac{4}{20+r} = \frac{16}{15}$$

$$\frac{25+2r}{20+r} = \frac{4}{3}$$

$$3(25 + 2r) = 4(20 + r)$$

$$75 + 6r = 80 + 4r$$

$$2r = 5$$

$$r = \frac{5}{2}$$

substitute $r = \frac{5}{2}$ in eq 1

$$\Rightarrow P\left(\frac{20+\frac{5}{2}}{20}\right) = 1,125$$

$$P\left(\frac{45}{2 \times 20}\right) = 1,125$$

$$P\left(\frac{9}{8}\right) = 1125$$

$$P = 1125 \times \frac{8}{9}$$

$$P = 1,000$$

18. (C) Let x be a number. Then the other two numbers are 2x and 3x. According to the problem,

$$x + 2x + 3x = 12$$

$$\Rightarrow 6x = 12 \Rightarrow x = 2$$

\therefore The largest of the numbers is $3x = 6$

19. (A) Volume of each cube = $a^3 = (8\text{cm})^3 = 512\text{cm}^3$

Volume of cuboid = $3 \times \text{volume of each cube} = 1536\text{ cm}^3$.

20. (D) Cost of vegetables and fruits = ₹(x + 3)

Amount given to the shopkeeper

$$= ₹ 10$$

\therefore Change received

$$= ₹ (10 - x - 3)$$

$$= ₹ (7 - x)$$

21. (B) Since x and y are directly proportional, we have

$$\frac{3}{30} = \frac{x_1}{50} \Rightarrow \frac{1}{10} = \frac{x_1}{50}$$

$$\Rightarrow x_1 = \left(\frac{1}{10} \times 50 \right) = 5$$

$$\frac{3}{30} = \frac{x_2}{80} \Rightarrow \frac{1}{10} = \frac{x_2}{80}$$

$$\Rightarrow x_2 = \left(\frac{1}{10} \times 80 \right) = 8$$

$$\frac{3}{30} = \frac{10}{y_1} \Rightarrow \frac{1}{10} = \frac{10}{y_1}$$

$$\Rightarrow (y_1 \times 1) = (10 \times 10) \Rightarrow y_1 = 100$$

$$\therefore x_1 = 5, x_2 = 8 \text{ and } y_1 = 100$$

$$22. (D) \quad \frac{x^{\frac{3}{2}} \times x^{\frac{5}{3}}}{x^{\frac{3}{5}}} \times x^{\frac{77}{30}} = x^{\frac{\frac{3}{2} + \frac{5}{3} - \frac{3}{5} + \frac{77}{30}}{1}}$$

$$= x^{\frac{45+50+77-18}{30}} = x^{\frac{77}{15}}$$

23. (B) No. of families surveyed = 35

No. of families with more than 3 children = 21

$$\therefore \text{The required calculation} = \frac{21}{35} \times 100\%$$

24. (B) Let the cost of pressure cooker be Rs x. & sales be y.

$$\therefore \text{Total amount} = \text{Rs } xy.$$

$$\text{Given new cost} = 80\% x = \frac{80}{100} x = \frac{4x}{5}$$

$$\text{New sales} = 180\% y = \frac{180}{100} y = \frac{9}{5} y$$

$$\text{New amount} = \frac{4x}{5} \times \frac{9y}{5} = \frac{36xy}{25}$$

$$\text{Increased sales} = \frac{36xy}{25} - xy = \frac{11xy}{25}$$

Increased sales %

$$= \frac{(11xy)}{\frac{36xy}{25}} \times 100 = \frac{(11)}{25} \times 100$$

$$= 44\%$$

25. (B) Let length be 5x m and breadth be 3x m.

$$\text{Area} = l \times b = 5x \times 3x \text{ sq m.}$$

$$= 15x^2 \text{ sq m.}$$

We have,

$$15x^2 = 3.75 \text{ hectares} = 37500 \text{ sq m}$$

(Since 1 hectare = 10000 sq m)

$$\Rightarrow x^2 = \frac{37500}{15} = 2500$$

$$\Rightarrow x = 50 \text{ m}$$

$$\therefore \text{Perimeter} = 2(l + b)$$

$$= 2(250 + 150) = 800 \text{ m}$$

$$\text{Cost of fencing} = 800 \times ₹ 5 = ₹ 4000$$

PHYSICS

26. (D) A mirror is called the first artificial aid of vision in Egypt. It took another 4500 years to invent the true spectacles.

27. (C) Due to frictional force between the tyres and the road you need to keep on pedalling a bicycle to keep it going. If you stop pedalling, the bicycle will slow down and stop.

28. (D) All the given activities cause noise pollution.

29. (C) A glass rod when rubbed with silk, the glass rod acquires positive charge and the silk becomes negatively charged.

30. (D) Moving an object away from you involves a pushing force, while moving it towards you involves a pulling force. All the given actions involve both pushing and pulling forces.

31. (D) Copper sulphate solution, graphite and acidified water conduct electricity.

32. (C) When we push the ground with our feet, the friction provides a forward reaction to our push and makes us move forward. (Walking on slippery ground is difficult because the frictional force is not enough to prevent slipping).

33. (D) As per the laws of reflection of light $\angle i = \angle r$. The angle of reflection is 70° , as the angle of incidence is 70° .

34. **(D)** The force due to the electrical charges on objects is called electrostatic force. A plastic ruler acquires negative charge and attracts tiny pieces of paper after rubbing with a woollen cloth, that acquired positive charge.
35. **(D)** Citric acid is present in the lemon juice that acts as an electrolyte.
36. **(C)** The vocal cords in men are about 20 mm long. In women these are about 5 mm shorter. Children have very short vocal cords. This is the reason why the voices of men, women and children are different.
37. **(D)** Natural processes like ripening of a fruit, formation of clouds, the germination of a seed, growth of a child, evaporation from water bodies, solar radiations reaching the earth, production of flowers, fruits by plants etc., are all natural phenomena.
38. **(A)** The loudness of sound depends on its amplitude. Loudness is also proportional to the square of the amplitude of vibration producing the sound. The loudness of sound is expressed in a unit called decibel (dB). Thus, dB expresses both loudness and amplitude.
39. **(D)** When current is passed through molten sodium chloride, sodium is deposited at the negative electrode and the chlorine gas is formed at the positive electrode.
40. **(D)** Unlike charges attract and like charges repel. As the two conducting balls are repelling away from each other, the charge in the conducting balls can be either both positive or both negative.
41. **(D)** In mercury barometers, the atmosphere (or the air) pushes down on the mercury in the trough. This in turn pushes the mercury in the tube up. The height of mercury in the tube is used as a measure of atmospheric pressure. So, higher the level of mercury in the tube irrespective of the shape of the tube, higher is the atmospheric air pressure. The highest level of the mercury inside the barometer indicates the highest air pressure.
42. **(B)** We know that for a reflected ray, the angle that the incident ray makes with the line perpendicular to the surface is equal to the angle made by the reflected ray with this perpendicular line. N is the correct reflected ray of X.
43. **(B)** Pulling involves rolling friction. Coefficient of sliding friction is greater than coefficient of rolling friction. So, it is easier to pull a lawn roller than to push it.
44. **(D)** Saturn is the least dense among all the planets and its density is less than that of water.
45. **(A)** The seismic or fault zones are most prone to earthquakes.
46. **(D)** Nature has provided our eyes with eyelids. We can prevent unwanted light when it is not required and also do not allow any particle to enter into our eyes by closing our eyes.
47. **(A,B)** When the force exerted by both the fingers is the same, the thumb and forefinger will experience different pressures as the areas in contact with the fingers are different. The thumb experiences a greater pressure than the forefinger because the area of the pointed end of the thumb tack touching the thumb is smaller. As per the given question, a thumb tack is gripped between the fore finger and the thumb. It means, the broader portion of the thumb tack is below the fore finger and the pointed end is above the thumb. When a force acts over a large area of an object, it produces a small pressure. But, if the same force acts over a small area of an object, it produces a large pressure. If the position of the thumb tack is reversed with the pointed end below the fore finger and broad end above the thumb, option (B) is also true.
48. **(A)** A shrill sound has a high pitch and a dull sound has a low pitch.
49. **(D)** LED's are extensively used to replace bulbs because they consume less electricity, have longer life and have more power.

50. (D) Holding a glass, writing on a paper and sitting on a chair are the activities which are not possible without friction

CHEMISTRY

51. (D) Coal is of four different varieties: peat, lignite, bituminous and anthracite. Among these, peat is the low grade quality coal. It is formed during the starting stage of coal formation. It has the lowest percentage of carbon around 10%-20%.
52. (C) Potable water should be free from sodium, calcium and magnesium. Potable water should be clean, colourless and odourless, free from bacteria and must contain dissolved oxygen and carbon dioxide.
53. (A) Ductility is the property of a metal by which it can be made into thin wires.
54. (D) Coal when burnt releases sulphur dioxide and smoke that pollutes the air.
55. (B) The substances that have a very low ignition temperature can even catch fire at room temperature without the application of heat. It is known as spontaneous combustion e.g. coal dust and forest fires.
56. (C) Thermoplastics are inert or resistant to most of the chemicals. They are easy to burn, bend, deform easily and do not conduct electricity. They consist of long, linear polymer chains that are linked by weak attractive forces. Thermosetting plastics are made up of long polymer chains that form cross linkages between one another whenever they are heated for the first time. The cross linkages make them hard, heat resistant due to the presence of strong bonds.
57. (A) Metal P reacts both with water and dilute hydrochloric acid. Metal Q does not react with water but reacts with dilute hydrochloric acid. Metal R does not react with water and dilute hydrochloric acid. P, Q, R is the correct reactivity in a decreasing order of given metals.

58. (C) Polystyrene is used to make packaging materials, toys, disposable plates and cups.
59. (C) Kerosene oil is more suitable than petrol in oil lamps because kerosene oil is less volatile than petrol. It costs less and is easy to handle.
60. (B) Magnesium metal does not react with oxygen at room temperature. On heating, magnesium ribbon burns in air giving intense heat and a very bright, white light.
61. (B) Statements (A), (C) and (D) are true. Oxygen is essential for combustion
62. (D) Electrical switches are made from bakelite. Floor tiles and fire proof fabrics are made from melamine.
63. (A) Fuels and hydrocarbons burn in oxygen and form CO_2 , H_2O and give out heat.
 $\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O} + \text{heat}$
64. (C) Petroleum has less density than water so it floats on water. Being, an oil it is insoluble in water
65. (C) Carbon, chlorine, phosphorus and oxygen are all non-metals
66. (D) Burning of plastic products releases harmful and toxic gases like dioxin, carbon dioxide and hydrogen chloride. These gases are dangerous when inhaled by living beings that cause severe respiratory problems.
67. (D) For fires involving inflammable materials like petrol and electrical equipment carbon dioxide (CO_2) is the best extinguisher. CO_2 , being heavier than oxygen, covers the fire like a blanket. As the contact between the fuel and oxygen is cut off, the fire is controlled. The added advantage of CO_2 is that in most of the cases it does not harm the electrical equipment.
68. (C) Aluminium is a light metal. It is a good conductor of heat and electricity. It is malleable and ductile.
69. (A) Oxygen, hydrogen, nitrogen and sulphur are also present in small amounts in coal along with carbon.

70. (D) As plastics are not biodegradable they may enter into water bodies by wind and can block the flow of water in drains. If they accumulate at a particular place. This place then becomes the breeding place for mosquitoes and also increases the risk of flash floods. They remain in the environment for a long time and slowly pollute the land and environment.

BIOLOGY

71. (A) Removing chaff from the grains is called winnowing. In this process, the mixture is dropped on the ground from a height. The heavier seeds fall almost vertically down, whereas the lighter chaff gets blown away by the wind and falls at the distance.
72. (B) Agriculture is the cultivation and breeding of animals, plants and fungi for food, fiber, biofuel and other products used to sustain and enhance human life.
73. (B) We get penicillin antibiotic from the fungus *penicillium notatum*.
74. (B) Echinoderms include starfish, sea urchins and brittle stars. They mostly have fivefold symmetry with spiny outer covering.
75. (C) Viruses are acellular and tiny microorganisms that replicate inside the living cell.
76. (D) Yeast *mucor* and *agaricus* are fungus. The fungal cell walls are made of glucans and chitin.
77. (A) The ascending order is Q - Ribosome ; S - Lysosome; P - Chloroplast; R - Nucleus.
78. (B) *Rhizobium* is a bacteria found in root nodules of leguminous plants like pea, beans etc; aids in fixing atmospheric nitrogen to soil in the form of nitrogenous compounds.
79. (D) When released from testes a human sperm contains only one X or Y chromosome.

80. (D) Amoeba, paramecium and euglena are unicellular protozoans that undergo binary fission.
81. (C) *Mucor* reproduces by spores.
82. (B) *Chlamydomonas* is an alga. It is a plant cell with cell wall.
83. (D) The reproductive cells are also called gametes. Male gamete is known as sperm and female gamete is known as ovum (plural=ova). During sexual reproduction, the male and female gametes (sperm and ovum) fuse to form a single celled zygote. Zygote is the first cell of the next generation. It divides in the mother's womb and forms embryo which further develops into foetus.
84. (D) Cabbage and spinach are the leaf parts of plants with chloroplast. Chloroplasts are absent in tomato and onion.
85. (B) Plasmodium, HIV virus and *Vibrio cholera* are disease causing germs or organisms also called pathogens.
86. (D) Wheat, rice, gram and beans are annuals, beet root, radish and turnip are biennials, mango, rose and teak are perennials.
87. (C) The part labelled as 'R' contains nucleus and protoplasm, which is essential for an organism to live and reproduce.
88. (C) Chromosomes carry genetic information from parents to offspring.
89. (C) The given figure shows crop rotation.
90. (B) Eggs are produced in the ovaries of a woman only a fertilized egg can develop and grow into a foetus.

GENERAL AWARENESS

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|----------|---------|---------|
| 91. (A) | 92. (A) | 93. (C) |
| 94. (B) | 95. (C) | 96. (A) |
| 97. (D) | 98. (B) | 99. (B) |
| 100. (A) | | |

===== The End =====