



UNIFIED COUNCIL
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NATIONAL LEVEL SCIENCE TALENT SEARCH EXAMINATION

Paper Code: UN 421
Solutions for Class : 8

Mathematics

1. (A) Let the three consecutive even numbers be $2x - 2$, $2x$ and $2x + 2$.

We have,

$$(2x - 2) + 2x + (2x + 2) = 234$$

$$\Rightarrow 6x = 234 \Rightarrow x = 39$$

\therefore The least even number

$$= 2x - 2 = 2(39) - 2 = \mathbf{76}$$

2. (A) $x + y = 6$

$$3x - y = 4$$

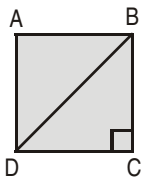
$$4x = 10$$

$$\Rightarrow x = \frac{5}{2}, y = \frac{15}{2} - 4 = \frac{7}{2}$$

$$\therefore x - y = \frac{5}{2} - \frac{7}{2} = \mathbf{-1}$$

3. (A) The solid in option (A) has only 4 faces which is the least compared to the other three.

4. (B)



Let the side of square be x m. Then

$$x^2 = 16900 \text{ m}^2$$

$$\Rightarrow x = \sqrt{16900} \Rightarrow x = 130 \text{ m}$$

$$\text{Diagonal } BD = \sqrt{DC^2 + BC^2}$$

$$= \sqrt{130^2 + 130^2}$$

$$= \mathbf{130\sqrt{2} \text{ m}}$$

5. (D) Let the distance covered by the train in 36 minutes be x km.

Distance covered (in km)	75	x
Time taken (in minutes)	60	36

Since the speed is uniform, less distance will be covered in less time.

So, it is a case of direct proportion.

$$\therefore \text{ Now, } \frac{75}{60} = \frac{x}{36} \Rightarrow \frac{5}{4} = \frac{x}{36}$$

$$\Rightarrow x = \left(\frac{5}{4} \times 36 \right) = 45$$

\therefore The distance covered in 36 minutes is **45 km**.

6. (B) $x = OB = OD$ (Diagonals bisect) = 5
 $y = OA = OC$ (Diagonals bisect) = 12
 $z =$ side of the rhombus = **13** (All sides are equal).

$$7. \text{ (C) } 2016 = 45^2 - 3^2$$

$$= 2025 - 9 = 2016$$

$$2015 = 48^2 - 17^2$$

$$= 2304 - 289$$

$$= 2015$$

$$2013 = 47^2 - 14^2$$

$$= 2209 - 196 = 2013$$

\therefore No matter what two integers you choose, their squares cannot differ by **2014**.

$$\begin{aligned}
 8. \quad (B) \quad & 5^{1/4} \times (125)^{0.25} = 5^{0.25} \times (5^3)^{0.25} \\
 & = 5^{0.25} \times 5^{(3 \times 0.25)} \\
 & = 5^{0.25} \times 5^{0.75} \\
 & = 5^{(0.25+0.75)} \\
 & = 5^1 = 5
 \end{aligned}$$

$$\begin{aligned}
 9. \quad (A) \quad & 17^2 - 13^2 = 289 - 169 = 120 \\
 & 120 + 1 = 121 = 11^2
 \end{aligned}$$

$$\begin{aligned}
 10. \quad (A) \quad & \text{Suppose S.P.} = ₹ 100 \\
 & \text{Profit} = ₹ 20 \\
 & \text{C.P.} = ₹ (100 - 20) = ₹ 80 \\
 & \text{Profit \%} = \frac{\text{Profit}}{\text{C.P.}} \times 100\% \\
 & = \frac{20}{80} \times 100\% = 25\%
 \end{aligned}$$

$$\begin{aligned}
 11. \quad (C) \quad & \text{At } x = 1, \left(3 + \frac{5}{x}\right) \left(9 - \frac{15}{x} + \frac{25}{x^2}\right) \\
 & = \left(3 + \frac{5}{1}\right) \left(9 - \frac{15}{1} + \frac{25}{1}\right) \\
 & = (3 + 5)(9 - 15 + 25) \\
 & = 8 \times 19 = 152
 \end{aligned}$$

$$\begin{aligned}
 12. \quad (B) \quad & \text{Average marks} \\
 & = \frac{m + 20 + 2m - 17 + m - 5}{3} \\
 & = \frac{4m - 2}{3}
 \end{aligned}$$

$$\begin{aligned}
 13. \quad (C) \quad & \text{No. of symbols representing the no. of} \\
 & \text{visitors after Wednesday} = 6 + 4 = 10 \\
 & \text{No. of visitors represented by each} \\
 & \text{symbol} = 6 \\
 & \text{Each symbol} = 6 \\
 & \therefore \text{Total no. of visitors} \\
 & = 10 \times 6 = 60.
 \end{aligned}$$

$$\begin{aligned}
 14. \quad (C) \quad & \text{Let the number be } x. \\
 & x^3 - x^2 = 48 \\
 & x^2(x - 1) = 48 \\
 & = 16 \times 3 = 4^2(4 - 1) \\
 & \therefore x = 4
 \end{aligned}$$

$$\begin{aligned}
 15. \quad (D) \quad & \text{Volume of the cuboid} \\
 & = 7 \times 8 \times 9 = 504 \text{ cm}^3
 \end{aligned}$$

$$\begin{aligned}
 & \text{Volume of the cube cut from the cuboid} \\
 & = 5 \times 5 \times 5 = 125 \text{ cm}^3
 \end{aligned}$$

$$\begin{aligned}
 & \text{Therefore, volume of the remaining} \\
 & \text{cuboid} \\
 & = (504 - 125) \text{ cm}^3 = 379 \text{ cm}^3
 \end{aligned}$$

$$\begin{aligned}
 16. \quad (B) \quad & 1.25 \times 10^n = 125 \times 10^{-2} \times 10^n \\
 & = 125 \times 10^{n-2} \\
 & = 5^3 \times 10^{n-2}
 \end{aligned}$$

If $5^3 \times 10^{n-2}$ is the cube of an integer then $(n - 2)$ should be divisible by 3.

Among the given options, if $n = 2015$, $n - 2 = 2013$ which is divisible by 3.

$$\begin{aligned}
 & \text{If } n = 2015, 1.25 \times 10^{2015} \\
 & = 5^3 \times 10^{2013} \\
 & = 5^3 \times (10^{671})^3 \\
 & = (5 \times 10^{671})^3
 \end{aligned}$$

$$\begin{aligned}
 17. \quad (C) \quad & \text{The ascending order of given numbers is} \\
 & \frac{1}{9}, \frac{5}{9}, \frac{11}{9}. \\
 & \therefore \text{The required sum} \\
 & = \frac{11}{9} + \frac{1}{9} = \frac{12}{9} = \frac{4}{3}
 \end{aligned}$$

$$\begin{aligned}
 18. \quad (A) \quad & \text{M.P.} = ₹ x \\
 & \text{S.P.} = ₹ y \\
 & \text{Discount} = \text{M.P.} - \text{S.P.} \\
 & = ₹ (x - y) \\
 & \text{Discount\%} = \frac{\text{Discount}}{\text{M.P.}} \times 100\% \\
 & = \frac{x - y}{x} \times 100\%
 \end{aligned}$$

$$\begin{aligned}
 19. \quad (B) \quad & \text{When } \pi = 3.142, r = 10, h = 3 \text{ and } l = 4, \\
 & A = 3.142(10)(10 + 2 \times 3 + 4) \\
 & = 31.42(20) = 628.4
 \end{aligned}$$

20. (B) The net is **option (B)** is the net of a cube.

$$\begin{aligned}
 21. \quad (C) \quad & 3^6 = 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 1 \\
 & = 9 \times 3 \times 3 \times 3 \times 3 \times 1 \\
 & = 27 \times 3 \times 3 \times 3 \times 1 \\
 & = 81 \times 3 \times 3 \times 1 \\
 & = 243 \times 3 \times 1 \\
 & = 729 \times 1
 \end{aligned}$$

∴ There are 7 different positive integers among the factors of 3^6 .

22. (B) Let the dimensions of the rectangular block be a, b and c.

Given $ab : bc : ca = 2 : 3 : 4$
and $abc = 9000 \text{ cm}^3$

$$\begin{aligned}\text{Now, } \frac{ab}{abc} : \frac{bc}{abc} : \frac{ca}{abc} \\ = \frac{2}{9000} : \frac{3}{9000} : \frac{4}{9000}\end{aligned}$$

$$\begin{aligned}\therefore c : a : b = 4500 : 3000 : 2250 \\ = 450 : 300 : 225\end{aligned}$$

$$\Rightarrow c : a : b = 30 : 20 : 15$$

$$\therefore a = 20; b = 15; c = 30$$

$$(\text{Also } 20 \times 15 \times 30 = 9000)$$

∴ The shortest side is **15 cm**.

23. (A) $\sqrt[3]{512} \times \sqrt[3]{3.375} = 8 \times 1.5 = 12$

24. (D) Since diagonals of a square are equal and bisect at right angles, triangle AOB is an isosceles right angled triangle.

25. (C) $(5^2)^x = (5^3)^y$ (Since $(a^m)^n = a^{mn}$.)

$$\Rightarrow 5^{2x} = 5^{3y} \Rightarrow 2x = 3y$$

[When bases are equal, powers can be equated.]

$$\Rightarrow \frac{x}{y} = \frac{3}{2}$$

$$\Rightarrow x : y = 3 : 2$$

Physics

26. (C) The inner layer of the eye called the choroid is black. This prevents internal reflections of light inside the human eye.

27. (B) In a longitudinal wave like sound wave, the distance between two consecutive rarefactions or between two consecutive compressions is called wavelength.

28. (B) Friction opposes motion, so it causes wear and tear to surfaces in contact. Friction in the brakes, tyres and steering wheel cover is necessary to provide better grip. Friction is not desirable in an engine.

29. (B) Static electricity is the accumulation of electrical charges on the surface of a material, usually an insulator or a non-conductor. In static electricity, the charges stay on an object without flowing i.e., they are at rest.

30. (B) Forces which act on a body in different directions can cause the object to break or tear.

31. (D) All the statements are true about an electrolytic cell.

32. (B) In option (A), friction is needed for the bicycle to start moving, stopping, slowing down and speeding up.

In option (C), friction is needed to balance the ladder, so that it will not slip.

In option (D), friction is needed to create fire (heat) to strike and light a match stick.

In option (B), friction is not needed to cause a ball to bounce.

33. (C) Persistence of vision is a phenomenon where the brain continues to sense the image even after the object has been removed. This lasts for $1/16^{\text{th}}$ of a second.

34. (A) There are several effects of force. It can change the shape, speed and direction of motion of an object.

35. (C) In a voltaic cell, chemical energy is converted to electrical energy.

36. (C) The loudness of sound depends on the amplitude of vibration. The loudness or softness of a sound produced depends on the amplitude. Larger the amplitude, louder the sound, smaller the amplitude, softer is the sound produced.

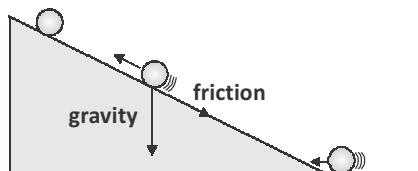
37. (A) The outer layer of the earth, on which we live is called the crust. The thickest part of the earth's crust is the continent.

38. (B) Material Y becomes negatively charged after it is rubbed with fur, because the electrons from the fur get transferred to the material. Thus, the material gains electrons that far out number the protons in it and develops a negative charge.

39. (A) Speed of sound in air is approximately 330 m s^{-1} . Speed of sound in water is approximately 1500 m s^{-1} . Speed of sound in steel is approximately 5000 m s^{-1} .

40. (B) An LED has two leads. One lead is slightly longer than the other. The longer lead is always connected to a positive terminal of the battery while the shorter lead is always connected to a negative terminal of the battery. In circuit (B) switch is present and is in its ON position. Only this makes the LED glow.

41. (D)

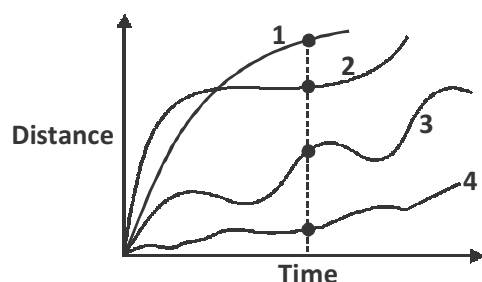


The gravitational force and frictional force are acting against the motion of the ball in this case. Both play a role in decreasing the speed of the ball until it eventually stops moving.

42. (D)

Nocturnal animal like owl needs more light to see at night. The large cornea and pupil allows more light to enter into its eyes. They also have retina with large number of rods and only a few cones.

43. (C)



The one with the greatest amount of friction will be the hardest to move. At any time, the distance travelled by the system is indicated by the four points in the graph. Graph number 4 shows the least distance and hence, the greatest friction.

44. (C)

Venus takes maximum time of 243 days for one rotation around its own axis.

45. (C)

The electric field direction is the direction of the force acting on a positive test charge. The positive charge object repels the positive point charge and the negative charge object attracts the positive point charge.



46. (A)

When the breaks of a bike are on, its wheels cannot rotate. They will simply skid. Then rolling friction will be converted into sliding friction which is comparatively large. Hence, it becomes difficult to move the bike.

47. (D)

Ultrasound is used in all the given three applications.

48. (D)

When an object is placed in front a plane mirror, it forms an image which is virtual, erect and of the same size as the object and laterally inverted.

49. (D)

Zinc can be better than tin for protecting iron from rusting. Zinc being highly electropositive can prevent rusting even when the layer is broken.

50. (A)

Sharpening the knife makes use of frictional force exerted on the knife edge to remove parts of the material through wear and tear.

Chemistry

51. (C)

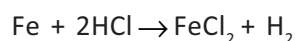
Petroleum is a mixture of various constituents such as petroleum gas (LPG), petrol, kerosene, diesel, lubricating oil, paraffin wax etc. Various constituents or fractions of petroleum are separated in a petroleum refinery.

52. (D)

Carbon monoxide which binds to the haemoglobin prevents oxygen from binding. This causes reduction in the amount of oxygen circulated in the blood which in turn causes inadequate amount of oxygen distributed to the body. Carbon monoxide is poisonous, however it is difficult for us to detect due to its colourless, odourless and tasteless property.

53. (B)

Ammonia gas reacts with HCl to form ammonium chloride. Sodium hydroxide is neutralised by HCl to form salt and water. Silver is too unreactive to react with HCl.



54. (A)

Accumulating metals and transporting them from different collection centers to recycling plants incur cost.

55. (D)

CNG is a cleaner and a less polluting fuel.

56. (A)

When there is a sufficient supply of oxygen, the substances burn completely producing a non-luminous or blue flame. Insufficient supply of oxygen produces a yellow flame due to the glowing of unburnt carbon atoms.

57. (D)

Tincture of iodine is used on wounds as an antiseptic.

58. (B)

Rayon is obtained from natural source and yet it is synthetic.

59. (B)

Coal tar is a mixture of about 200 substances.

60. (A) Incomplete combustion occurs when there is insufficient oxygen as the fuel is burnt. The amount of oxygen is not enough to fully oxidise the fuel and would result in the formation of carbon monoxide.
61. (C) Mg(magnesium) is more reactive than Fe(iron). When connected, Mg will react with O_2 preferentially.
62. (D) Since wool is made from fleece/hair of sheep, it gives smell of burning hair.
63. (C) The type of fuel involved in the combustion determines the type of flame (colour and temperature of a flame varies with the chemical composition of the fuel).
64. (D) Hydrogen is not a fossil fuel.
65. (C) The reaction of aluminium with oxygen to form aluminium oxide is a chemical change which requires energy to occur. It is an irreversible change. The layer of aluminium oxide protects the underlying aluminium from coming into contact with air. This prevents further oxidation and keeps the aluminium shiny.
66. (B) Teflon is thermally most stable and chemically inert.
67. (A) A burning substance will be extinguished if the temperature falls below its ignition temperature.
68. (A) Solid fuels leave more smoke and ash on burning because they contain a large number of impurities.
69. (B) Bakelite is a poor conductor of heat and electricity. It is used for making electrical switches, handles of kettles, pans, lamp holders, pins, plugs etc.
70. (D) Non-metals have low densities, low melting points and are poor conductors of electricity.

Biology

71. (B) Unwanted plants are called weeds.
72. (B) Thyroid gland plays a key role in metamorphosis in frog.
73. (C) Migration is the movement of an animal species from its own habitat to other habitat for a particular period.
74. (D) Plastids are pigmented cell organelles.
75. (A) Rearing of fishes is called pisciculture.
76. (A) Cycas is a green plant that belong to gymnosperms. It contains chloroplast.
77. (A) Red data book contain list of endangered species of plants and animals.
78. (A) Chromosomes distribute genetic information.
79. (D) Fertilisation is external in fish and amphibians.
80. (D) Reduce the dependency on human and animal labour and get the job done faster.
81. (C) Rhizobium bacteria are present in root nodules.
82. (A) A nerve cell is the longest cell in the human body.
83. (C) In the given figure W - virus, X - fungus and Y - protozoan.
84. (A) Options A is euglena which can prepare its own food.
85. (B) Energy flow in an ecosystem is unidirectional.
86. (D) One ova is released at a time in female human beings.
87. (D) Adrenal gland in mammals is located on top of kidney.
88. (B) Viruses cause common cold.
89. (A) Echidna is an oviparous animals.
90. (B) The genetic material found in a sperm is 22 + Y.

