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NATIONAL LEVEL SCIENCE TALENT SEARCH EXAMINATION

Paper Code: UN415

Solutions for Class : 8

Mathematics

1. (A) $4^0 = 1 = 1^4$ (Since $a^0 = 1$.)
 \therefore I and II have equal values.
2. (B) M.P. of cycle = ₹ 880
S.P. of cycle = ₹ 770
Discount = ₹ $(880 - 770) = ₹ 110$
Discount percentage = $\frac{110}{880} \times 100 = 12.5\%$
3. (D) Given $n \neq 0$
Here, n could either positive or negative or a fraction.
If n is -1 , then $2n$ is less than n .
If n is a fraction such as $\frac{1}{2}$ then n^2 will be less than n .
4. (C) If length and breadth of a respectively, its area is A .
After 5% decrease in length and 5% increase in breadth, $l = \frac{95}{100} l$ and $b = \frac{105b}{100}$
Hence its area = $\frac{95 \times 105}{100 \times 100} lb$
Change in area = $lb - \frac{95 \times 105}{10000} lb$
 $= \frac{25}{10000} lb$
 \therefore Percentage decrease in area
 $= \frac{25}{10000} \times 100\% = 0.25\%$
5. (A) Cost of x metres = ₹ d
 \Rightarrow Cost of 1 metre = ₹ $\left(\frac{d}{x}\right)$
 \therefore Cost of y metres = ₹ $\left(\frac{d}{x} \times y\right)$
 $= ₹ \left(\frac{yd}{x}\right)$
6. (A) Let the other rational number be x .
Then,
 $x + \left(\frac{-11}{5}\right) = -3$
 $\Rightarrow x = -3 - \left(\frac{-11}{5}\right)$
 $\Rightarrow x = -3 + \frac{11}{5} = \frac{-3}{1} + \frac{11}{5}$
 $= \frac{-3 \times 5 + 11}{5}$
 $= \frac{-15 + 11}{5} = \frac{-4}{5}$
Hence, the other number is $\frac{-4}{5}$.
7. (C) From the figure, the angle marked 'm' is given by
 $360^\circ - 180^\circ - 45^\circ$
 $= 360^\circ - 225^\circ = 135^\circ$
(or) $m = 180^\circ - 45^\circ = 135^\circ$
8. (C) $72 = 2 \times 2 \times 2 \times 3 \times 3$
If $K = 3$
 $72 \times K = 72 \times 3 = 216 = 6^3$ is a perfect cube.

9. (A) No. of T.V sets sold in May = 50
 Total number of T.V. sets sold
 = 40 + 20 + 60 + 30 + 50 = 200
 \therefore The required percentage
 = $\frac{50}{200} \times 100\% = 25\%$

10. (C) The given solid has 8 faces.

11. (D) $x^2 = 16 \Rightarrow x = \pm 4$ and
 $y^2 = 4 \Rightarrow y = \pm 2$

x	y	$x - y$	$(x - y)^2$
4	2	2	4
-4	2	-6	36
4	-2	6	36
-4	-2	-2	4

\therefore The greatest possible value of
 $(x - y)^2$ is 36.

12. (B) Let the required number be x .

We have,

$$\frac{3x}{4} - \frac{3x}{14} = 150$$

$$\Rightarrow \frac{21x - 6x}{28} = 150$$

$$\Rightarrow x = \frac{150 \times 28}{15} = 280$$

13. (B) ₹ 1331 = ₹ 1000 $\left(1 + \frac{10}{100}\right)^n$

$$\Rightarrow \frac{1331}{1000} = \left(\frac{11}{10}\right)^n$$

$$\Rightarrow \left(\frac{11}{10}\right)^3 = \left(\frac{11}{10}\right)^n \Rightarrow n = 3 \text{ years}$$

14. (A)
$$\frac{7.83 \times 7.83 - 1.17 \times 1.17}{6.66}$$

$$= \frac{(7.83 + 1.17)(7.83 - 1.17)}{6.66}$$

$$= \frac{9 \times 6.66}{6.66} = 9$$

15. (Del) The question has been deleted as the units are not the same in the question and the options.

16. (D) $\frac{1}{4} = 0.25$; $\frac{1}{3} = 0.33$; $\frac{8}{15} = 0.53$

$$\frac{7}{24} = 0.29$$
; $\frac{13}{48} = 0.27$

So $\frac{7}{24}$ and $\frac{13}{48}$ lie between $\frac{1}{4}$ & $\frac{1}{3}$.

17. (C) Let the angles be $3x$, $7x$, $6x$ and $4x$.

$$\therefore 3x + 7x + 6x + 4x = 360^\circ \text{ or}$$

$20x = 360^\circ$ or $x = 18^\circ$. The angles are 54° , 126° , 108° and 72° . We see that adjacent angles are supplementary but opposite angles are not equal. Clearly, it is a trapezium.

18. (A) The smallest value for n such that $5n$ is a square is 5.

$$\Rightarrow 75np = 75 \times 5 \times p$$

$$= 3 \times 5 \times 5 \times 5 \times p$$

To make $75np$ a perfect cube, p will have to have factors 3×3 .

$$\therefore p - q \Rightarrow n + p = 5 + 9 = 14$$

19. (D) If two sets of four consecutive integers have one integer in common, the total in the combined set is 7., and we can write the sets as

$$n + (n + 1) + (n + 2) + (n + 3) \text{ and}$$

$$(n + 3) + (n + 4) + (n + 5) + (n + 6)$$

Note that each term in the second set is 3 more than the equivalent term in the first set. Since there are four terms the total of the difference will be $4 \times 3 = 12$

20. (B) The figure in option(B) gives the top view of the given solid.

21. (D) The number of trees in a row is the same as the number of rows in the garden.

$$\therefore \text{Number of trees in a row} = \sqrt{17956}$$

$$\begin{array}{r|l} 1 & \overline{17956} \\ & \underline{1} \\ 23 & \overline{79} \\ & \underline{69} \\ 264 & \overline{1056} \\ & \underline{1056} \\ & 0 \end{array} \quad 134$$

$$\therefore \text{Number of trees in a row} = 134$$

22. (C) $2^{30} + 2^{30} + 2^{30} + 2^{30}$
 $= 2^{30} (4)$
 $= 2^{30} \times 2^2$
 $= 2^{32}$

23. (D) $\pi r_1^2 h_1 = \pi r_2^2 h_2$

Given: $\frac{h_1}{h_2} = \frac{2}{1}$; $\left(\frac{r_1}{r_2}\right)^2 = \frac{h_2}{h_1} = \frac{1}{2}$

$\Rightarrow \frac{r_1}{r_2} = \frac{1}{\sqrt{2}}$

$\therefore r : r_2 = 1 : \sqrt{2}$

24. (B) $(3x - 4)(5x + 7) = 15x^2 - ax - 28$
 $\Rightarrow 15x^2 + x - 28 = 15x^2 - ax - 28$

Comparing the coefficients of like terms, we get $a = -1$.

25. (D) Let the number of women needed to clear the land in 1 day be 'x'.

Number of women and number of days are inversely proportional.

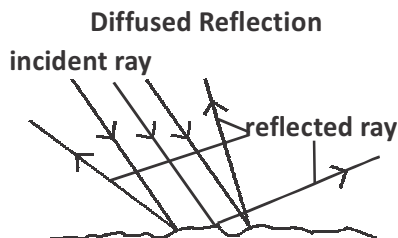
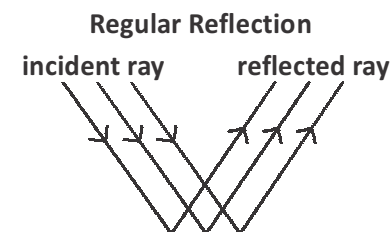
$\therefore 5 : x :: 1 : 4$

$\Rightarrow x = 4 \times 5 = 20$

\therefore Number of more women required
 $= 20 - 5 = 15$.

Physics

26. (C)



Diffused reflection is the reflection of light from a surface such that an incident ray is reflected at many angles rather than at just one angle. A pane of glass as well as a mirror will create a regular reflection (specular reflection), whereas the surface of a horizontal wall will create a diffused reflection.

27. (B) The number of vibrations in one second is the frequency of a sound. The higher the frequency (number of vibrations) is, the higher the pitch of the sound.

28. (D) Friction is the force which opposes motion. It prevents slipping and sliding when moving along a horizontal surface. In ice hockey, friction allows the players to control the puck. In tug-of-war, friction allows the participants to grip the rope tightly. In rock climbing, friction allows the climber to keep a firm grip on the rock and avoid failing. Friction is not useful in swimming because it makes moving through the water more difficult.

29. (B) Electric charge can flow through conductors. Flow of charge in a conductor is called electric current.

30. (C) A force is a push or a pull. A pushing force is exerted on the trolley to move it, frictional force keeps a billiard ball stationary and a magnet exerts a pulling force on the refrigerator door. Sunlight is heat and light energy - there is no force present.

31. (A) Only saltwater is an electrolyte. Alcohol, distilled water and petrol are non-electrolytes.

32. (C) Without friction, we cannot create heat by rubbing our hands. Without friction, cycling and walking will be impossible. To move a table on the floor we need to apply a force. Friction is not required. In the presence of friction, movement will be more difficult.

33. (B) The image formed by a plane mirror of an object placed in front of it is virtual, erect, behind the mirror and of the same size as the object.

34. (D) Frictional force always acts in the opposite direction to the motion of the ball, and hence it cannot change the direction of the rolling steel ball. Gravitational force always acts down to the centre of the Earth, and hence it cannot change the direction of the rolling ball.

Pressure is a scalar quantity; hence it does not have a direction.

Magnetic force can be directed anywhere depending on the position of the magnet. Since the rolling ball is made of

- steel, it will be attracted by the magnet. Hence, magnetic force can change the direction of the ball.
35. (D) Copper sulphate is a suitable electrolyte to electroplate an iron nail with copper.
36. (D) Sound waves are collected by the outer ear and directed to the eardrum. The eardrum vibrates and transmits the vibrations to the ear bones in the middle ear. The inner/internal ear has cochlea, a coiled structure filled with a fluid having tiny hair cells inside where nerve cells convert the sound vibrations into electrical impulses which travel along the nerve to the brain.
37. (D) The way a rock responds to stress depends on its temperature, the speed of stress applied and the confining pressure on the rock.
38. (A) Transferring a charge by touch is called conduction. When an uncharged body is touched with another charged body, the uncharged body gets charged and the total charge on the charged bodies gets equally distributed between the two bodies in contact.
39. (A) We are able to hear sounds that are only within a limited range of frequencies, from about 20 Hz to about 20 000 Hz. Sounds with frequencies that fall outside this range cannot be heard.
40. (D) During the process of electrolysis, electrical energy is converted to chemical energy.
41. (B) Gravitational force is a pulling force exerted by a large object (e.g., the earth) on the other objects. Magnetic force can be a pulling or pushing force exerted by a magnet on magnetic objects or on other the magnets. Both forces do not need physical contact to act on objects.
42. (A) The number of images formed when two plane mirror inclined at an angle of 30° is
- $$n = \frac{360}{\theta} - 1$$
- $$= \frac{360}{30} = 12 - 1 = 11 \text{ images.}$$
43. (C) Friction is useful when we want to slow down the motion of an object or if we want heat to be produced. It is a nuisance when unwanted wear and tear takes place.
44. (D) The Sun is the centre of our solar system. It is a star because it produces light by the fusion of hydrogen atoms to form helium atoms which produces heat and light. The Sun has been the source of heat and light as it is now since the Big Bang, the event that caused the formation of the universe.
45. (C) Lightning is actually a flow of electrons. Electrons will prefer to flow in a medium that is of lower resistance than the air which is a poor conductor. The lightning therefore will prefer to strike something like the metal flagpole that is tall (nearer to the clouds) and is a good conductor.
46. (C) The extension of spring balance measures the force exerted by gravity on the object hung on the hook. The greater the force exerted, the greater the extension of the spring. Hence, the reading will be affected by the location. At places where the gravitational force is larger (e.g. at sea level), readings will be higher than at places where the force is smaller (e.g. on a mountaintop). The spring will lose its elasticity if it is constantly extended. This results in less accurate readings.
47. (B) Among the given options, the speed of sound is least in sea water. Speed of sound is least in gases, medium in liquids and maximum in solids.
48. (B) The Braille system uses 6 dots.
49. (A) When electric current flows through a conductor, some amount of electrical energy is converted into heat energy.
50. (B) Increased friction allows for better grip. Putting rollers under a heavy object reduces its surface area in contact with the ground. Hence, there is less friction when the object is moved.

Chemistry

51. (D) Fossil fuels (like coal, oil and natural gas) are not reusable, recyclable or sustainable.
52. (D) Statement 1 : Ozone layer absorbs harmful radiations such as UV and prevents it from reaching us. When a hole is present, the UV rays are free to pass through the Earth's atmosphere,

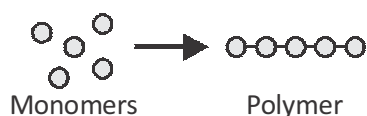
exposing us to this harmful radiations.

Statement 2 : CFCs, stand for chlorofluorocarbons. These substances act as catalyst which decompose the ozone, causing ozone depletion.

Statement 3 : The primary function of the ozone is to absorb the harmful UV radiations. Radio waves are still able to pass through the layer.

53. (D) Some characteristics of metals are:
- (i) Malleable and ductile. Metals can be easily shaped and made into sheets and wires.
 - (ii) Majority of the metals are in solid form at room temperature, except Mercury.
 - (iii) Generally form positive charged ions and help to conduct electricity.

54. (C) A polymer is a big molecule (macromolecule), which is made of many repeating units (monomers) bonded chemically together.



55. (C) During the combustion of fossil fuels, oxygen reacts with the fuel to convert the stored chemical energy into heat and light energy. Complete combustion of the fuel produces carbon dioxide and water.
56. (D) A flame produced by burning a substance always points upwards because the hot gases produced during burning are lighter and rise up.
57. (D) Mercury cannot be used to make drink cans as it is a liquid at room temperature and is poisonous.
58. (D) Strip 'S' is the most absorbent material.
59. (D) A raw material is sustainable if there are lots of reserves of that material.
60. (D) A non-luminous flame (sometimes called a "roaring flame") produces a hot, steady flame in blue due to complete combustion. The fuel is completely burnt in non-luminous flame without leaving any residue. Hence, no soot is produced.
61. (C) The useful properties of the steel alloy for making a car are that it should be strong and hard and is resistant to

corrosion.

62. (D) Recycling material involves reprocessing the material so that it can be used again.
63. (A) Carbon fuels like wood, coal, petroleum release unburnt carbon particles. These fine particles when inhaled by human beings cause respiratory problems like asthma.
64. (C) Bees wax is obtained from beehives.
65. (B) Sulphur is a solid whereas oxygen and hydrogen are gases. Iron, copper and aluminium are all solids and metals. Mercury, water and alcohol are all liquids. Carbon, silicon and phosphorus are all non-metals.
66. (D) Iron is replaced with PVC in the making of water pipes as PVC is cheaper, lighter and does not rust.
67. (B) Persons sleeping in a closed room where coal is burnt is fatal because a poisonous gas, carbon monoxide is released. If this gas is inhaled, it can kill them.
68. (A) Anthracite contains about 90 - 95% of carbon.
69. (D) The three R's, which are to reduce, reuse and recycle the material, will help to increase the life of the reserves of a material.
70. (A) Zinc is higher up the reactivity series compared to copper, indicating that it is a stronger reducing agent compared to copper. Hence, it is more likely to be oxidised to zinc(II) ions while reducing copper(II) ions to copper solid.

Biology

71. (C) Centriole and centrosome are the characteristic feature of animal cells.
72. (D) In the given flow chart X-represents testes, Y-Ovum and Z-fertilization.
73. (B) Bacteria present in the root nodules of the leguminous crop plants have the ability to fix atmospheric nitrogen to form nitrogen compounds. Some of these are used by leguminous plants and the rest are left in the soil to enrich it.
74. (B) Fungus grow mostly in moist, dark and damp places.
75. (B) The given figure represents fertilisation or syngamy of sperm and ovum.

76. (A) Hydra reproduces by budding.
77. (A) Rhizobium bacteria live symbiotically.
78. (B) Nerve cells are the longest cells in our body.
79. (D) The iris of the eye, uterus and bronchi contain smooth muscles.
80. (B) Lysosomes are suicidal bags and mitochondria are the power houses of the cell.
81. (C) Adrenaline hormone is called flight of fight hormone.
82. (A) The correct sequence of the stages of growth is : zygote, embryo, foetus, baby, child, adolescent, adult.
83. (D) Leaving the land or field uncultivated is called field fallow.
84. (D) Fertilization is the process during which a sperm fuses with an egg cell to form a zygote. A female destined zygote have $44 + XX$.
85. (D) Cholera, anthrax tuberculosis and typhoid are bacterial diseases.
86. (C) Bacteriophage is a virus that uses bacteria as a host.
87. (A) Transplantation in paddy, is found flowering plants and vegetable crops.
88. (B) Resources like air, water, soil and sun are natural and renewable resources.
89. (C) Paleontology is the study is fossils.
90. (A) To replinish the nutrients in the soil crop rotation method is used.

