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NATIONAL LEVEL SCIENCE TALENT SEARCH EXAMINATION

Paper Code: UN 421

Solutions for Class : 7

Mathematics

1. (C) Adding the same number on both the sides of an equation does not affect the equality.

2. (C) We have

$$\frac{S.P_2}{100+x_2} = \frac{S.P_2}{100+x_2}$$

$$\Rightarrow \frac{600}{100-20} = \frac{S.P_2}{100+25}$$

$$S.P_2 = ₹ 600 \times \frac{125}{80} = ₹ 937.50$$

3. (A) $(+) \div (+) = (+)$ and $(-) \div (-) = (+)$

4. (A) Part of the cake eaten =

$$\frac{5}{6} \times \frac{2}{3} = \frac{10}{18} = \frac{5}{9}$$

5. (B) The median of a triangle joining its vertex to the midpoint of its opposite side.

6. (A) From the figure,

$$\angle AOC = 50^\circ$$

(Vertically opposite angles)

Given y is thrice x, we have

$$x + 50^\circ + y = 180^\circ$$

(Angle on a straight line)

$$\Rightarrow x + 50^\circ + 3x = 180^\circ$$

$$\Rightarrow 4x = 130^\circ$$

$$\Rightarrow x = \frac{130^\circ}{4} = 32.5^\circ$$

$$\therefore y = 3x = 3(32.5) = 97.5^\circ$$

7. (A) A tossed coin may land with heads or tails up.

8. (C) We have $\angle A + \angle B + \angle C = 180^\circ$

$$(\angle B + \angle C) + (\angle B + \angle C) = 180^\circ$$

$$2(\angle B + \angle C) = 180^\circ$$

$$\angle B + \angle C = 90^\circ$$

$$\text{So, } \angle A = 90^\circ$$

9. (A) $\triangle XYZ \cong \triangle LMN$ by R.H.S. condition as $YZ = MN$, $\angle Y = \angle M$ and $XZ = LN$.

10. (A) Let the principal be ₹ x. Amount

$$= ₹ 3x, T = T \text{ years, } R = 16\frac{2}{3} \%$$

$$\therefore 3x = x \left(1 + \frac{50T}{300} \right)$$

$$\Rightarrow 3 = \left(1 + \frac{T}{6} \right)$$

$$\Rightarrow 3 = \frac{6+T}{6}$$

$$\Rightarrow T = 18 - 6 = 12 \text{ years}$$

11. (A) 0 is identity element with respect to addition of integers.

12. (D) Perimeter = $(2a + 1) + (3a + 2) + (4a - 1) = 92$

$$\Rightarrow 9a + 2 = 92$$

$$\Rightarrow a = \frac{92-2}{9} = \frac{90}{9} = 10$$

13. (D) Required percentage

$$= \frac{p}{0.5p} \times 100\%$$

$$= 200\%$$

14. (C) $a + (b + c) = (a + b) + c$ is associative property of addition.

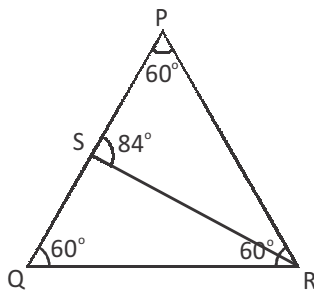
15. (A) Alternate angles for a pair of parallel lines are equal. So, it can be used to construct a line parallel to a given line.

16. (A) Circumference (C) = 88 cm

$$\begin{aligned} \text{Area (A)} &= \frac{C^2}{4\pi} = \frac{88 \times 88}{4 \times \frac{22}{7}} \\ &= 616 \text{ cm}^2 \end{aligned}$$

$$\begin{aligned} \text{Number of plants} &= \frac{A}{11} = \frac{616}{11} \\ &= 56 \end{aligned}$$

17. (B)



$$\angle QRS = 180^\circ - 84^\circ = 96^\circ$$

In $\triangle QRS$,

$$\angle QRS = 180^\circ - 96^\circ - 60^\circ$$

$$= 24^\circ$$

(or)

$$\angle QRS = 84^\circ - 60^\circ = 24^\circ$$

Since, the exterior angle of a triangle is equal to the sum of its interior opposite angles.

18. (B) Percentage increase in the price of petrol = 25%

To compensate the expenses on petrol, percentage of reduction in the travel

$$= \frac{25}{125} \times 100\%$$

$$= 20\%$$

19. (D) Total time taken by Rohit, Peter and Santosh to walk around a circular park

$$= \left(\frac{1}{3} + \frac{2}{5} + \frac{5}{12} \right) h$$

$$= \left(\frac{20 + 24 + 25}{60} \right) h$$

$$= \left(\frac{69}{60} \right) h$$

$$= \frac{69}{60} \times 60 \text{ minutes} = 69 \text{ minutes}$$

20. (C) Total number of sweets = $6x$

Number of sweets each child gets

$$= \frac{6x}{10} = \frac{3x}{5}$$

21. (B) $1\text{m} = 100 \text{ cm} \Rightarrow 1 \text{ m}^2 = 10,000 \text{ cm}^2$

$\therefore 10,000 \text{ sq. cm}$ make 1 sq. m .

22. (Del) Wrongly printed equation

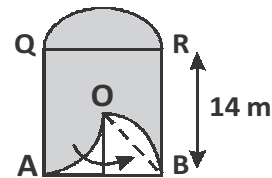
23. (B) $180^\circ < 194^\circ < 360^\circ$

So, 194° is a **reflex angle**.

24. (D) Area of semicircle

$$= \frac{1}{2} \times \frac{22}{7} \times 7 \times 7$$

$$= 77 \text{ m}^2$$



Area of AOBQRQ

$$= \frac{3}{4} \text{ area of Square ABRQ}$$

$$= \frac{3}{4} \times 14 \times 14$$

$$= 147 \text{ m}^2$$

Total shaded area of figure

$$\rightarrow 77 + 147$$

$$= 224 \text{ m}^2$$

25. (C) $\frac{4}{10} + 0 + \frac{9}{1000} = 0.409$

Physics

26. (B) The image distance is always equal to the object distance from the plane mirror.
- $$\frac{\text{Size of image}}{\text{Size of object}} = \frac{\text{Image distance}}{\text{Object distance}} = 1$$
- So, when a person moves closer to a plane mirror, the size of his image in the mirror remains the same.
27. (C) Statements (A), (B) and (D) about speed are correct. Speed is the rate of change of distance with time of an object i.e., the distance travelled by an object per unit time or how fast or slow an object is moving. If an object moves with more speed, it covers more distance in less time. If an object moves with less speed, it covers less distance. But time does not slow down the motion of an object moving with more speed.
28. (D) A black (dark) and dull surface absorbs the most heat.
29. (A) Tungsten is the element that glows and gives out light, it is used for making the filament in bulbs.
30. (B) When an object is placed very close to the concave mirror, the image formed is virtual, erect and magnified.
31. (A) The time period (T) of a simple pendulum is directly proportional to the square root of its length (l). $T \propto \sqrt{l}$
- As the length of the pendulum increases, the time period of the pendulum also increases.
32. (C) 0°C is the freezing point of pure water on celsius scale and 32°F is the freezing point of water on fahrenheit scale. So, 0°C is the same temperature as 32°F .
33. (C) Heating elements in electric cookers and electric irons have a high melting point and a high electrical resistance so that the wire can become very hot for heating purposes. If the heating element has a low melting point, it will cause the heating element to melt. If the heating element has a low electrical resistance, it will not generate sufficient heat for heating.
34. (A) Figure in option (A) correctly represents a law of reflection. The angle between the plane mirror and normal is 90° . The

angle between the incident ray and normal is 30° and the angle between the reflected ray and horizontal plane of plane mirror is 60° .

35. (D) When a substance is heated there will be a change of state, temperature and expansion as given below:
- As the water boils, steam comes out of the water, i.e., water changes its state from liquid to gas. Thus, heat causes change of state.
 - The water becomes warmer or hot due to the sun or when heat is supplied to it, i.e., its temperature rises. Thus, heat causes an increase in temperature.
 - As the water heats up, some of it overflows, i.e., its volume increases. Thus, heat causes expansion.
36. (B) Distance = 2.4 km
- $$\text{Time} = 12 \text{ min} = \frac{12}{60} \text{ h}$$
- $$\text{Average speed} = \left(2.4 \div \frac{12}{60} \right) \text{ km/h}$$
- $$2.4 \times 5 = 12 \text{ km/h}$$
37. (A) The filament of an electric bulb gets heated to such a high temperature that it starts glowing. This glowing filament produces light.
38. (B) Heat travels from high temperature to lower temperature; hence heat will travel from the metal to the room. The temperature of the metal will keep decreasing and the temperature of the room will keep increasing until they reach thermal equilibrium (equal temperature). This temperature will be in between 25°C and 80°C .
39. (A) The backside of the mirror is painted with red paint to prevent the silver coating on the mirror from getting scratched.
40. (D) An electric motor and an electric door-bell both require an electromagnet in order to work. The electric light bulb does not require an electromagnet to work. It makes use of a high resistance wire.
41. (B) Time taken to boil 200 cm^3 of water = 8 minutes
- Time taken to boil 75 cm^3 of water = ?

$$= \frac{75}{200} \times 8 = 3 \text{ minutes}$$

42. (D) A convex lens is a magnifying glass that magnifies small letters in a dictionary and enables us to read clearly. Convex lenses are used as magnifying glasses, in camera, spectacles and microscopes etc.
43. (B) If a body travels with a uniform speed in a constant direction, it is said to be in uniform or constant velocity. An object or rider's velocity is constant only if its speed and direction do not change. Therefore, constant velocity is always motion along a straight line.
44. (A) The most suitable metal for making electromagnets is soft iron, which acts as a magnet only as long as the current is flowing in the wire and loses magnetism once the current flow is stopped.
45. (A) Heat flows from a region of higher temperature to a region of lower temperature. Therefore, transfer of heat can occur when there is a difference in temperatures between the two bodies or regions.
46. (B) Number of revolutions, the spin drier makes in 60 seconds = 600 revolutions.
Number of revolutions, the drier will make in 80 seconds
i.e., 1 minute 20 second
$$= \frac{600}{60} \times 80 = 800 \text{ revolutions.}$$
47. (B) The chemical energy stored in two cells is more than that in one. So, the bulb in the circuit that has one bulb and two cells will glow the brightest.
48. (A) A prism is used for splitting sunlight into seven colours.
49. (B) Stopwatch is the most suitable device for measuring the time of runners in a 100 m marathon.
50. (B) The warm air containing carbon dioxide inside the room rises up and moves out through ventilators and cool fresh air flows into the room through doors and windows to take its place.

Chemistry

51. (B) Due to the phenomenon of sea breeze and land breeze taking place continuously in coastal areas, the climate remains almost

the same throughout the year.

52. (D) If you spill acid on your fingers, you should wash your hands with plenty of water. This dilutes the spilt acid and washes it away.
53. (A) Chemical reaction does not occur when common salt is exposed to air. Coal when burnt in air combines with oxygen to form carbon dioxide and heat is released. Sodium when placed in water forms sodium hydroxide and hydrogen gas is released. Iron reacts with moist air to form rust.
54. (A) An indicator is a chemical substance. It is used to identify acidic, basic and neutral solutions based on change in colour.
55. (D) Options (A), (B) and (C) are the uses of wind that are most beneficial to mankind.
56. (A) In a displacement reaction, a more reactive element displaces/replaces a less reactive element. Iron being more reactive than copper displaces copper from copper sulphate solution.
57. (D) The soil that has become acidic due to excessive use of chemical fertilizers is treated with bases like quick lime (calcium oxide) or slaked lime (calcium hydroxide). If the soil is basic, organic matter is added to release acids and neutralise the basic nature of the soil.
58. (D) Freezing does not purify water.
59. (C) In a combination reaction, two or more reactants combine together to form one or more products. Photosynthesis is an example of a combination reaction as shown below;
- $$6\text{CO}_2 + 12\text{H}_2\text{O} \xrightarrow[\text{Chlorophyll}]{\text{Sunlight}} \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{H}_2\text{O} + 6\text{O}_2 \uparrow$$
60. (B) The energy contained in the gaseous form (vapour) is more than the energy contained in the liquid form (water). Therefore, when vapour changes to water it loses some heat.
61. (A) Sodium hydroxide is a base and it reacts with hydrochloric acid to form sodium chloride (salt) and water. It is a neutralization reaction.
62. (B) Air moves from the region where the air pressure is high to the region where the air pressure is low.
63. (B) The railway tracks undergo expansion in summer and contraction in winter. So, it is a reversible, physical change.
64. (C) Too much of acid in the human stomach causes indigestion. To relieve from this,

Biology

- an antacid, milk of magnesia which contains magnesium hydroxide can be taken. It neutralises the effect of excessive acid in the stomach.
65. (D) Breaking of a glass tumbler is an irreversible, physical change as the broken glass pieces cannot be joined together to form a glass tumbler again. The state of glass cannot be reversed. Hence, it is an irreversible, physical change.
66. (C) In summer, near the equator, the land warms up faster and the temperature increases when compared with the temperature of water in the oceans. The heated air on land rises up and causes the winds to flow from the oceans towards the land carrying water and rain on the land that forms a part of water cycle. This process is known as monsoon.
67. (A) Hydrochloric acid is a strong acid because it ionises completely in water. It has small pH value and has a high concentration of hydrogen ions. It does not contain hydroxide ions as they are present in bases.
68. (D) The water table at a place goes down or depletes due to increase in population, agriculture and industrialization.
- (i) Increase in population needs more water for drinking and other purposes. Construction of more houses, offices, shops, roads etc. need lot of water.
- (ii) Increase in agriculture certainly demands more food production and more water for irrigation.
- (iii) Increase in industrialization. Water is the basic need in industries. Increase in industries needs more water for producing more goods or products.
- Hence, all the three factors are responsible for decrease of water table at a place.
69. (D) The formation of a cyclone is a very complex process. Factors like wind speed and direction, temperature and humidity contribute to the development of a cyclone.
70. (B) The acid present in vinegar is acetic acid.
71. (D) Plasma in the blood transports waste substances and digested food.
72. (A) Top layer or A – Horizon provides shelter for many living organisms.
73. (B) Money plant is an autotroph.
74. (D) Bladderwort is an insectivorous plant.
75. (D) Mucor and rhizopus are non-flowering plants or fungi they reproduce from spores and live in dark places.
76. (C) Sunlight is essential for photosynthesis.
77. (A) We get muscle cramps after heavy exercise is due to the partial breakdown of glucose to produce lactic acid.
78. (C) We get woollen fibre from the fleece of sheep.
79. (A) In the given figure the part labelled as Q is Liver. Liver stores bile juice.
80. (C) Pashmina shawls are woven from the fur of kashmiri goat.
81. (D) Transpiration is beneficial to the plants in several ways such as mineral absorption, water absorption and regulates temperatures.
82. (B) Exchange of gases takes place through stomata by diffusion.
83. (C) Cuscuta (Dodder) is a compete parasitic plant.
84. (A) In humans circulatory system transports digested food and waste substance through blood vessels.
85. (C) Influenza shows symptoms of cold and flu.
86. (D) Pulses, legume and milk are body building foods.
87. (A) Oxidation of food takes place in the presence of oxygen to release energy.
88. (A) Deoxygenated blood is collected and emptied in right auricle.
89. (B) Carbohydrates - noodles, fats - ghee, Vitamins, citrus fruit, Minerals - Iodized salt.
90. (C) Tentacles help the hydra to push food into its body.

