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NATIONAL LEVEL SCIENCE TALENT SEARCH EXAMINATION - UN412

Solutions for Class : 6

Mathematics

1. **(D)** Of the options, only **84, 96** has H.C.F. 12 and difference 12.

2. **(B)** Number of stamps Nithin had = $\frac{2}{5}\times 90 = 36$

No. of stamps Ashwin had = $\frac{3}{5}\times 90 = 54$

To get ratio of 5 : 4, number of stamps Nithin should have = $\frac{5}{9}\times 90 = 50$

$\therefore$ No. of stamps Ashwin must give Nithin = $50 - 36 =$ **14**

3. **(B)** $\angle BAC = 110^o - 48^o - 29^o =$ **33^o**

4. **(A)** Since, $a < 0$, i.e., a is a negative number.

$\therefore$ a, 2a, 4a, 8a are negative numbers.

Hence, '**a**' is the greatest number.

5. **(C)** Total number of parts = 18

Number of shaded parts = 2

Hence, required fraction = $\frac{2}{18} = \mathbf{\frac{1}{9}}$

6. **(B)** 15, 25, 35, 45, 65, 75, 85, 95 $\rightarrow$ 8

50, 51, 52, 53, 54, 55, ..., 59 $\rightarrow$ 11

Hence, 5 appears **19 times** between 10 and 100.

7. **(B)** Number of cubes in the given solid = 11

It forms a $5\times 3\times 2$ cuboid which has 30 cubes.

$\therefore$ Least number of cubes needed to make it a cuboid = $30 - 11 =$ **19**

8. **(B)** Since, two squares can fit in rectangle A and rectangle B.

Side of square C = $42 \div 3 = 14$

Area of square C = $14\times 14 = 196$ cm^2

Since, each rectangle has two squares.

Total area of gives figure = 5×196

= **980 cm^2**

9. **(B)** 347890 rounded off to nearest thousand = 348000

23600 rounded off to nearest thousand = 24000

Their difference = $348000 - 24000 =$ **324000**

10. **(B)** Percentage of pupil who choose soccer

$= 100 - 35 - 17 - 25 = 23\%$

$\therefore$ Number of pupil who choose soccer

= 23% of 1000 = **230**

11. **(C)** $1\frac{2}{5}+1\frac{2}{5}+1\frac{2}{5}+1\frac{2}{5} = 4\left(1\frac{2}{5}\right)$

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

$= \boxed{3}\times\frac{7}{5}+1\frac{2}{5}$

Hence, the missing number is **3**.

12. **(C)** For the product of five integers to be negative, there should be atmost **five** negative integers.

13. **(A)** Factors of 176 = 1, 2, 4, 8, 11, 16, 22, 44, 88, 176

Factors of 182 = 1, 2, 91, 182

Factors of 99 = 1, 3, 9, 11, 33, 99

Factors of 101 = 1, 101

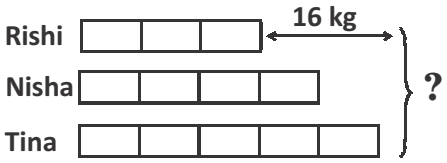
Hence, **176** has most number of divisors.

14. **(D)** Perimeter of plot = $2(4x - 8) + 2(x + 10)$
$= 10x + 4$

Cost of fencing the plot for $x = 5$

$= [10(5) + 4] \times 14 =$ ₹**756**

15. **(D)** $0.75 = \frac{75}{100} = \frac{3}{4}$; $0.8 = \frac{8}{10} = \frac{4}{5}$



2 units $\rightarrow$ 16 kg

1 unit $\rightarrow$ $16 \div 2 = 8$ kg

$3 + 4 + 5 = 12$ units

12 units $\rightarrow$ $12 \times 8 = 96$ kg

Their total mass is **96 kg**.

16. **(C)**

Height of each triangle $= 24 \div 2$

$= 12$ cm

Area of each triangle $= \frac{1}{2} \times 8 \times 12$

$= 48$ cm^2

Total area of shaded parts $= 48 \times 3$

$=$ **144 cm^2**

17. **(B)** In the given number line,

v, w are negative numbers

$\Rightarrow z = 0.25$, $y = 0.75$

x, y are positive numbers $\Rightarrow$ $x = 0.25$, $y = 0.75$

$\therefore$ $v + y = 0$ (since v, y has same value)

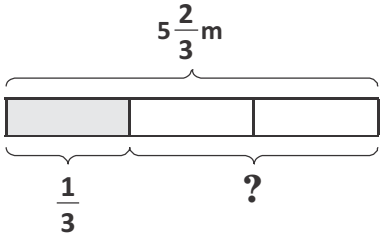
$v + x = -0.75 + 0.25 = -0.50$

$w + x = -0.5 + 0.25 = -0.25$

$v - w = -0.75 - (-0.5) = -0.25$

$\therefore$ $v + x$ gives the least value.

18. **(C)**



Fraction of the required length that Keerthi needs

$= 1 - \frac{1}{3} = \frac{2}{3}$; Since, $5\frac{2}{3}$ m $= \frac{17}{3}$ m

Length of cloth that Keerthi needs

$= \frac{2}{3} \times \frac{17}{3} = \frac{34}{9}$ m

$= 3.777777$ ....m

$\approx$ **3.78 m**

19. **(C)** The greatest common factor of 28 and 36 is 4.

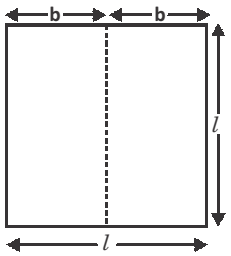
Hence, greatest possible length of each bit $=$ **4 m**

20. **(B)**

4 seat table	5 seat table	Total tables	Total people	
9	10	19	9 x 4 + 10 x 5 = 86	7
10	9	19	10 x 4 + 9 x 5 = 85	7
11	8	19	11 x 4 + 8 x 5 = 84	3

Hence, **8 tables** can seat 5 people.

21. **(C)**



Perimeter of each rectangle = 24 cm

$= 2(l + b)$

$\Rightarrow l + b = 12$ cm

$\Rightarrow l + \frac{l}{2} = 12$ cm

$\Rightarrow \frac{3l}{2} = 12$ cm

$\Rightarrow l = 8$ cm

Area of square $= l^2 = 8 \times 8 = 64$ cm^2

22. **(A)** $1.2 + 0.209 = 1.409$

$\Rightarrow 1.409 - 1 - 0.4 = 0.009$

$\therefore$ $0.009 \div 9 =$ **0.001**

23. **(A)** A : B : C

$6 \times 7 : 5 \times 7 : 11 \times 7$

$= 42 : 35 : 77$

$\therefore$ The value of B and C are **35 and 77** respectively.

24. **(B)** Number of natural numbers divisible by 5 between 1 and 1000 = **199 (excluding 1000)**

25. **(B)** $\frac{1}{4}$ of circle = $\frac{1}{4} \times 360^{o} = 90^{o}$

$\frac{1}{5}$ of circle = $\frac{1}{5} \times 360^{o} = 72^{o}$

$\Rightarrow 90^{o} - 72^{o} = 18^{o}$

$\therefore$ There are **18° degrees more** in $\frac{1}{4}$ of circle than in $\frac{1}{5}$ of circle.

Physics

26. **(D)** If the ball is placed between two sources of light, it will have two shadows instead of three. If the ball is being rotated under a light source, it will have only one shadow. As the ball is round, no matter which side of it is facing the light source, it will create a shadow at the same position.

If the ball is placed under a light source at three different positions, it will have three separate shadows that are not connected to each other. If three sources of light from different positions are shone on the ball, the ball will have three separate shadows that are connected.

27. **(C)** The needle of a compass is a magnet. The needle is suspended on a sharp point to minimise the effect of friction such that the weak magnetic field of the earth can cause the north-seeking pole to point to the north and the south-seeking pole to point to the south. The north-seeking pole of the compass needle is at the arrow head and the south-seeking pole is at the other end.

28. **(B)** 15 km/hour means the cyclists travel 15 km in every 1 hour. After 2 hours, they travel 30 km. Since, two cyclists are moving towards each other at the same time, in 2 hours both travel 30 km and hit each other at the middle point.

29. **(B)** The brightness of the lamps increases when there are more batteries or there are fewer lamps used in a circuit. Lamp R, which has 2 batteries, is the brightest, Lamp P will have $\frac{1}{2}$ the brightness of R. Lamp Q will have $\frac{2}{3}$ the brightness of P. Lamp S will have $\frac{1}{2}$ the brightness of P.

30. **(A)** As we can see the stamps through the plastic, we can conclude that the plastic allows light to pass through it.

31. **(C)** Nickel-cadmium battery is used in mobile phones. It can be recharged.

(i) Alkaline battery is expensive. Produces more current than a dry cell but it cannot be recharged.

(ii) Lead-acid battery contains lead and sulphuric acid. It is large and heavy. It can be recharged but if the battery is not used for a long time it loses its charge. It cannot be used in mobiles.

(iii) Silver oxide-zinc battery is like a button. It is used in watches. It cannot be recharged.

32. **(B)** Length of eraser = 4 cm – 0.5 cm = 3.5 cm

33. **(C)** When a bar magnet is broken into two parts, each broken part has two poles: a North pole (N-pole) and a South pole (S-pole).

34. **(C)** Wooden Chair is an opaque object. As light cannot pass through the wooden chair, its shadow is formed. When light falls on any opaque object, it gets reflected. This reflected light enters our eyes and enables us to see opaque objects.

35. **(B)** All length/distance measurements involve a starting point and an ending point. Depending on the type of length/distance, various measuring instruments like ruler, measuring tape, opisometer etc., are used. Height, length, breadth, thickness , diameter, distance etc., are all length measurements.

36. **(D)** The compass needle is a magnet. When two like poles meet, they will repel away from each other. When repulsion happens, it can be concluded that both items are magnets. When attraction happens, it can only be concluded that either one of the items is a magnet and not necessary both.

37. **(A)** The part 'P' is wrongly labelled. It is zinc can/case which acts as negative electrode in a dry cell and carbon rod acts a positive electrode.

38. **(D)** A brick wall is opaque (does not let light through), glass window is transparent (lets light through without distortion) and a plastic light shade is translucent (lets light through with diffuse scattering), Only in option (D) are the objects correctly placed under the headings. The other options are incorrect.

39. **(B)** From the tabulated results of students 'X' and 'Y' with respect to the use of their finger spans to measure the length of their teacher's table, statement (B) is correct.

(i) 25 finger spans of student 'X' indicate that he has long fingers.

(ii) 31 finger spans of student 'Y' indicate that he has short fingers.

We can conclude that different people have different sized body parts.

40. **(C)** The process by which a magnetic material, such as iron or steel, becomes magnetised by a magnetic field is known as magnetic induction.

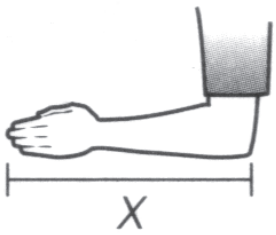
41. **(B)** The wires in a closed circuit should connect to the metal casing and the metal tip of the bulb. Hence, the filament must be connected to both the metal casing and metal tip in order for the current to flow through. Option (A) is wrong as only the metal tip is connected to the filament. Option (C) is wrong as only the metal casing is connected to the filament. Option (D) is not correct as there is no connection between the filament to the metal casing and tip.

42. **(B)** Fabric is a translucent material. It forms a light shadow as it allows light to pass through it partially. Metal is an opaque object. It forms a dark shadow because light cannot pass through it completely.

Clear glass is a transparent material. It does not form a shadow as light passes through it completely.

43. **(D)** Magnetic force can pass through non-magnetic materials such as rubber.

44. **(A)** A cubit of a person measures the length from his/her elbow upto his/her longest finger tip.



1 Foot = 304 .8 mm

1 Fathom = 6 feet

Finger span's vary in length from person to person.

45. **(D)** In order to connect X and Y, the switch arm needs to be switched to position X. As a result, electricity will be able to flow through the circuit X to light up the bulb.

46. **(C)** Comparison between sand paper and a mirror are true in options (A), (B) and (D). A mirror can produce images when objects are placed in front of it. A sand paper is opaque. When light falls on a piece of sand paper, it is reflected and scattered at different angles. It absorbs light and does not form images when objects are placed in front of it.

47. **(C)** When the light from the light source shines on the clear blue plastic sheet, only blue light will pass through the blue plastic sheet. As the ball is opaque, the blue light will be blocked by the ball. Thus, a dark round shadow is formed on the screen.

48. **(C)** Mercury, a liquid metal is grouped wrongly. It should be placed in metals as it conducts electricity. Steel, nickel and brass are metals which can conduct electricity. Rubber and glass are non-metals which cannot conduct electricity.

49. **(C)** Electromagnets are used in electric bells, electric motors, electric trains, toy cars, fans, cranes, radios, mobiles etc.

50. **(C)** A potter shaping a pot on its axis in the middle as the wheel is rotating. It is an example of rotatory motion.

Chemistry

51. **(B)** Evaporation is the cause for lowering the level of water in the beaker. Evaporation is a continuous process, that occurs all the time, at any temperature from all water bodies, wet substances etc.

Condensation : When water vapour is cooled, it changes to water.

Boiling : Change of water into water vapour at a fixed temperature of 100 ^{o}C.

Freezing : Change of liquid water to solid ice at 0 ^{o}C

52. **(B)** Sea water has many salts in dissolved form and common salt has a major share of 3.5 - 3.8% in it.

Evaporation of any liquid depends on the surface area exposed to the atmosphere, temperature, humidity and wind speed. Among the given containers, container in option (B) has greater surface area. So, evaporation takes place faster in it and produces salt first.

53. **(A)** Copper is a metal. Metals are good conductors of heat and electricity.

54. **(C)** A bar of chocolate when placed in the sun for 2 hours absorbs heat from the sun and changes to liquid. Plastic bucket, metal spoon and rubber band absorb heat from the sun but this temperature is not sufficient for them to convert into liquid form.

55. **(D)** Statements (A), (B) and (C) are true of water vapour in the air. Water is a liquid. Water vapour is a gaseous form of water.

56. **(B)** Things in Group X are made from plant/tree parts. Things in Group Y are made from materials found in the ground. Things in Group Z are made from animals. The balloon is made from rubber sap which is obtained from the rubber tree.

57. **(B)** The only gas in the atmospheric air which supports burning of substances is oxygen. It is the second major gas in the atmosphere.

58. **(C)** Since, evaporation only removes all the solvent, all the dissolved solute including any dissolved impurities will remain.

59. **(B)** 'X' is melting of wax which is a physical and reversible change. When solid wax is heated, it melts and changes to liquid. On cooling, it changes to solid again. There is only a change in state. Hence, it is a physical and reversible change. 'Y' is making of ice from water. There is change of state from liquid water to solid ice. It is a physical and reversible change.

60. **(D)** (i) A brick breaks easily when dropped from a height.

(ii) It sinks in water.

(iii) It is made of clay which does not allow light to pass through.

61. **(C)** Beaker X is smaller than beaker Y. Beaker X contains less oxygen than beaker Y.

62. **(A)** Boiling: When a substance absorbs heat or heated continuously, it starts boiling. It is a fast, man-made process.

Evaporation: When a substance absorbs heat from the sun or surroundings of its own and changes from liquid to gaseous state, it is called evaporation. Evaporation of water is a slow, natural process.

Condensation : When water vapour is cooled, it changes to water. It is a natural process.

Freezing : Change of liquid water to solid ice at 0 ^{o}C. It is a man-made process.

63. **(A)** The most important property of a raincoat is to keep the user dry i.e., waterproof.

64. **(D)** In all the cases, dust is filtered out from the air by using filtration method.

65. **(C)** Evaporation is the fastest on a sunny and windy day with low humidity.

66. **(B)** Ceramic and plastic are man-made materials. Tin is a metal obtained from the ground. Wood is obtained from trees.

67. **(B)** When alum is added to muddy water, a part of it dissolves. The molecules/particles in alum get attached to the mud, clay or dust particles which become heavier and settle down at the bottom. This water is filtered and boiled to obtain water that is clear, clean free from germs. This process is called coagulation or loading.

68. **(A)** (i) Heat from the sun causes water to evaporate from lakes, seas and rivers and changes to water vapour.

(ii) Water vapour that rises in the air, is cooled and condensed to form millions of tiny droplets of water.

(iii) These droplets float about and form clouds. The clouds get heavy when a lot of water condenses.

(iv) The water droplets fall back to the earth as rain.

69. **(B)** Butter changes its state when it gains or loses heat.

70. **(B)** Candle II is placed in a container that has no holes but has a lid. Hence, external air cannot enter. Burning requires oxygen. Once the oxygen in the container is used up, the candle will be extinguished.

Biology

71. **(B)** Chloroplasts are found mostly in a leaf. A leaf synthesises food for the plant.

72. **(C)** Vitamins are protective food.

73. **(B)** An algae is a food producer.

74. **(D)** Fishes have endoskeleton made of cartilage, scorpion with exoskeleton and worm with hydrostatic skeleton.

75. **(D)** Calyx is the outermost whorl of flower. It provide protection to reproductive parts.

76. **(A)** Roots growing towards water of plants to stimulus is true.

77. **(C)** The joint that is shown in the given figure is of hinge joint. A hinge joint is very strong that can only move back and forth like a regular door.

78. **(D)** Flattened body shape of cockroach help it to crawl between crevices and spaces easily.

79. **(C)** Stigma provide the platform to the pollens to germinate.

80 **(C)** Green plants are food producers and they are also called autotrophs.

81. **(D)** As per the given information, animal X is an aquatic animal that breathes through gills, and animal Y is an aquatic animal breathes through lungs.

82. **(A)** Blubber is a layer of fat fat under the skin of polar region animals this helps them to keep their body warm to prevent cold.

83. **(D)** Root hairs absorb water from the soil and is conducted to leaves through roots and water carrying tubes in the stem.

84. **(D)** The transport system in plant carries sugar, water and mineral salts.

85. **(B)** Cashew nuts and full cream milk contain fat.

86. **(D)** Camels stores their food and fat in their humps.

87. **(B)** Carrot contains a nutrient called β-carotene, β-carotene is converted into vitamin A in the human intestine by the action of bile produced by the liver.

88. **(B)** Oesophagus or food pipe is a part of the digestive system.

89. **(D)** Shedding leaves, having thick fleshy leaves and leaves with waxy surface help a xerophytic plant to prevent loss of water from the plant.

90. **(A)** Moulds and bacteria are decomposers.