NATIONAL TALENT SEARCH EXAMINATION-2019-20, DELHI

MENTAL APTITUDE TEST (MAT) PAPER & HINTS & SOLUTION

1. What is sum of all positive factors of 256?
(1) 526 (2*) 511 (3) 625 (4) 562

Sol. Positive factors of 256 are
1, 2, 4, 8, 16, 32, 64, 188, 256
Sum $\Rightarrow$ a = 1, r = 2, n = 9

Sum $\Rightarrow \frac{a(r^n-1)}{r-1} = \frac{1(2^9-1)}{2-1}$

$\Rightarrow$ 511

2. Value of $\frac{X}{X+1}+\frac{X+1}{X}-\frac{1}{X(X+1)}$ will be?
(1) X^2 (2) 1 (3) X (4*) 2

Sol. $\frac{X}{X+1}+\frac{X+1}{X}-\left(\frac{X+1-X}{X(X+1)}\right)$

$\Rightarrow \frac{X}{X+1}+\frac{X}{X}+\frac{1}{X}-\frac{X+1}{X(X+1)}+\frac{X}{X(X+1)}$

$\Rightarrow \frac{X}{X+1}+1+\frac{1}{X}-\frac{1}{X}+\frac{1}{X+1}$

$\Rightarrow \frac{(X+1)}{(X+1)}+1$ = 1 + 1 = 2

3. Sum of sequence 5 + 6 + 7 + 8 + ……..+ 19 will be?
(1*) 180 (2) 175 (3) 185 (4) 190

Sol. 5 + 6 + 7 +……..+ 19

Here a = 5, d = 1, n = 15 $S_n = \frac{n}{2}[2a + (n-1)d]$

$S_n = \frac{15}{2}(10 + 14 \times 1) = \frac{15}{2} \times 24 = 15 \times 12 = 180$

4. If three Numbers are in Ratio $\frac{1}{2}:\frac{2}{3}:\frac{3}{4}$. Difference between largest and smallest is 27 then numbers are?
(1*) 54, 72, 81 (2) 24, 45, 51 (3) 64, 72, 91 (4) 54, 65, 81

Sol. $\frac{1}{2}:\frac{2}{3}:\frac{3}{4}$ = 6 : 8 : 9
$\Rightarrow$ 9x – 6x = 27
x = 9
Numbers 54, 72, 81

5. Which of the following number will completely divide the value of $(3^{25} + 3^{26} + 3^{27} + 3^{28})$
(1) 35 (2*) 40 (3) 50 (4) 45

Sol. $(3^{25} + 3^{26} + 3^{27} + 3^{28})$
$\Rightarrow 3^{25}(1 + 3 + 9 + 27)$
$\Rightarrow 3^{25} \times 40$

6. Rohan's score on the mid-term exam was 75, and his score on the final exam was 90. If the weight of the final exam is twice that of mid-term, what is Rohan's final score in the course?
(1) 82.5 (2) 80 (3) 85.5 (4*) 85

Sol. Rohan's final score $\Rightarrow \frac{75\times1+90\times2}{3} = 85$

7. A grandmother, mother and daughter wish to arrange themselves in a row in order to be photographed. How many different ways can they arrange themselves?
(1*) 6 (2) 3 (3) 18 (4) 9

Sol. Ways $\Rightarrow$ GDM, GMD DGM, DMG, MDG, MGD

8. At the time of marriage a man was 6 year older than his wife, but 12 year after the marriage his age was $\frac{6}{5}$ times the age of his wife. Their ages (in years) at the time of the marriage were?
(1) 26, 20 (2*) 24, 18 (3) 27, 21 (4) 30, 24

Sol. Let man's age $\Rightarrow$ x year
Man's wife's age $\Rightarrow$ y years
$x = y + 6$ ……(i)
$(x + 12) = \frac{6}{5}(y + 12) \Rightarrow 5x + 60 = 6y + 72$
$\Rightarrow 5x - 6y - 12 = 0$……..(ii)
Solve equation 1 & 2 $x = 24$ & $y = 18$

9. If we throw a dice, what is the probability of obtaining a result that is less than 4. If we know that the result obtained was an even number?
(1) $\frac{1}{2}$ (2) $\frac{2}{3}$ (3*) $\frac{1}{3}$ (4) $\frac{4}{5}$

Sol. Total positive outcome (less than 4) = 3
Ways a certain outcome (even number) = 1
$p = \frac{1}{3}$

10. There are 10 balls in a box, 5 white and 5 black. Two balls are removed randomly from the box, one after another. The first ball that is removed is black and it is not returned to the box. What is the probability that the second ball that is removed is also black?
(1) $\frac{5}{9}$ (2*) $\frac{4}{9}$ (3) $\frac{3}{9}$ (4) $\frac{1}{2}$

Sol. 5 white & 5 Black = 10 balls
1 ball removed, total balls = 9
Black ball left = 4
$P(B) = \frac{4}{9}$

11. Some equation are based on the basis of a certain system. Using the same pattern solve the unsolved equation. If 10 – 3 = 12, 12 – 4 = 13, 14 – 5 = 14, what is 16 – 6 = ?
(1) 10 (2*) 15 (3) 16 (4) 18

Sol. $10 - 3 = 12 \Rightarrow 10 - 3 + 5 = 12$
$12 - 4 = 13 \Rightarrow 12 - 4 + 5 = 13$
$14 - 5 = 14 \Rightarrow 14 - 5 + 5 = 14$
$16 - 6 \Rightarrow 16 - 6 + 5 = 15$

12. Excluding stoppages, the speed of a bus is 54 kmph and including stoppages, it is 45 kmph. For how many minutes does the bus stop per hour?
(1) 9 (2*) 10 (3) 12 (4) 20

Sol. Speed of bus = 54km/hr
Including Stoppages = 45/hr
It will stop $\Rightarrow \frac{9}{54}$ hr $\Rightarrow \frac{9}{54} \times 60$ = 10minutes

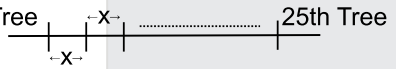
13. If 40% of 1620 + 30% of 960 = ?% of 5200?
(1) 12 (2) 24 (3) 5 (4*) 18

Sol. $\frac{40}{100} \times 1620 + \frac{30}{100} \times 960 = \frac{x \times 5200}{100}$

$x = \frac{4 \times 162 + 3 \times 96}{52} = 18$

14. In a row, 25 trees are planted at equal distance from each other. The distance between 1st and 25th tree is 30m. What is the distance between 3rd and 15th tree?
(1) 8m (2*) 15m (3) 16m (4) 18m

Sol.



Let gap = x there are 24 gaps

$24x = 30$ $x = \frac{30}{24}$

Between 3rd to 15th = 12 gaps

Distance = $12 \times \frac{30}{24}$ = 15m

15. In a school, the bell is rung once after each half an hour. The school starts at 8:00AM and close at 1:30PM. The bell is rung 3 times continuously at the time beginning at the time of lunch break at 10:00 and 10:30AM and at the end. How many times is the bell rung every day?
(1) 21 (2) 22 (3) 19 (4*) 20

Sol. Bell rung 20 times

Time	8	8:30	9	9:30	10	10:30	11	11:30	12	12:30	1	1:30
Bell	3	1	1	1	3	3	1	1	1	1	1	3

16. If 80% of A = 50% of B and = x% of A than value of x will be?
(1) 145 (2) 170 (3) 150 (4*) 160

Sol. $\frac{80}{100} = \frac{50B}{100} \Rightarrow \frac{B}{A} = \frac{8}{5}$, $x = \frac{B}{A} \times 100$

$x = \frac{8}{5} \times 100 = 160$

17. The mean of five consecutive numbers is 7. Which is the highest number?
(1) 10 (2) 7 (3*) 9 (4) 8

Sol. (n – 2), (n – 1), n, (n +1), (n + 2)

$\Rightarrow \frac{(n-2)+(n+1)+n+(n+1)+(n+2)}{5} = 7$

$\Rightarrow 5n = 35$ $n = 7$ highest number = 9

18. Find the value of $x^3 + y^3 + z^3 - 3xyz$. If $x + y + z = 15$ and $x^2 + y^2 + z^2 = 51$?

(1) 540 (2*) –540 (3) –225 (4) 765

Sol. $x^3 + y^3 + z^3 - 3xyz = (x + y + z)(x^2 + y^2 + z^2 - xy - yz - zx)$

$\Rightarrow (x + y + z)^2 = x^2 + y^2 + z^2 + 2(xy + yz + zx)$

$\Rightarrow xy + yz + zx = \frac{15 \times 15 - 51}{2} = 87$

$\Rightarrow x^3 + y^3 + z^3 - 3xyz = 15(51 - 87) = 15 \times (-36) = -540$

19. If Area of any Triangles is 384 cm^2 and its sides are in Ratio 3 : 4 : 5 then perimeter of triangle will be?

(1) 60cm (2) 48cm (3) 64cm (4*) 96cm

Sol. Sides are $\Rightarrow$ 3x, 4x, 5x

$S \Rightarrow \frac{3x + 4x + 5x}{2} = 6x$

$\Delta = \sqrt{S(S-a)(S-b)(S-c)} \Rightarrow 384 = \sqrt{6x \times 3x \times 2x \times x}$

$384 = 6x^2 \quad x = 8, \quad p = 12x \Rightarrow 12 \times 8 = 96$ cm

20. $\frac{13}{48}$ is equal to

(1) $\frac{1}{3+\frac{1}{1+\frac{1}{16}}}$ (2) $\frac{1}{3+\frac{1}{1+\frac{1}{1+\frac{1}{8}}}}$ (3*) $\frac{1}{3+\frac{1}{1+\frac{1}{2+\frac{1}{4}}}}$ (4) $\frac{1}{3+\frac{1}{1+\frac{1}{8}}}$

Sol. $\frac{1}{3+\frac{1}{1+\frac{1}{\frac{9}{4}}}} = \frac{1}{3+\frac{1}{\frac{13}{9}}} = \frac{1}{\frac{48}{13}} = \frac{13}{48}$

21. If for any two numbers a and b, the operation $ is defined as follows: a $ b = a × (a + b), then (2 $ 0) $ 1 = ?

(1) 12 (2) 10 (3*) 20 (4) 4

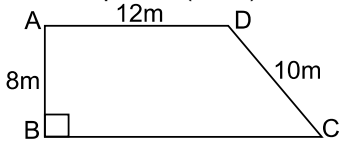
Sol. a $ b = a × (a + b)

$\Rightarrow$ (2 $ 0) $ 1 = [2 × (2 + 0)] $ 1

$\Rightarrow$ 4 $ 1

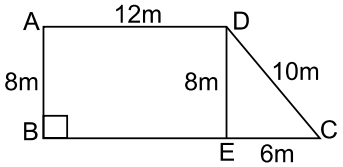
$\Rightarrow$ 4 × (4 + 1) = 20

22. The accompanying figure shows a right + trapezoid (AB||BC) based on this information and the information in the figure, the area of the trapezoid (in m^2) is?



(1) 150 (2*) 120 (3) 108 (4) 96

Sol.



Let DE $\perp$ BC Area of trapezoid = $\frac{1}{2}$(Sum of parallel sides) × Height

$\Rightarrow \frac{1}{2}(12 + 18) \times 8 = 120m^2$

Direction (23 to 25) find the missing numbers in the number series.

23. 4, 8, 28, ? , 244

(1) 69 (2) 75 (3*) 80 (4) 90

Sol.

$$\underset{\times 3-4}{4} \quad \underset{\times 3+4}{8} \quad \underset{\times 3-4}{28} \quad \underset{\times 3+4}{80} \quad 244$$

24. 4, 7, 12, 19, 28, 39, ?

(1) 48 (2*) 52 (3) 55 (4) 58

Sol.

$$\underset{+3}{4} \quad \underset{+5}{7} \quad \underset{+7}{12} \quad \underset{+9}{19} \quad \underset{+11}{28} \quad \underset{+13}{39} \quad 52$$

25. 10080, 1680, ? , 84, 28, 14

(1) 840 (2) 168 (3) 108 (4*) 336

Sol.

$$10080 \quad \underset{\div 6}{1680} \quad \underset{\div 5}{336} \quad \underset{\div 4}{84} \quad \underset{\div 3}{28} \quad \underset{\div 2}{14}$$

26. The compound interest on Rs. 30,000 at 7% per annum is Rs. 4,347. The period (in year) is?

(1) 1 (2*) 2 (3) 3 (4) 3.5

Sol. C.I = A – P

A = CI + P $\Rightarrow$ 4347 + 30000

A = 34347

$$A = P\left(1+\frac{R}{100}\right)^T \Rightarrow 34347 = 30000\left(1+\frac{t}{100}\right)^T$$

$$\frac{34347}{30000} = \left(\frac{107}{100}\right)^T \Rightarrow \frac{11490}{10000} = \left(\frac{107}{100}\right)^T$$

$$\Rightarrow \left(\frac{107}{100}\right)^2 = \left(\frac{107}{100}\right)^T \Rightarrow T = 2$$

27. Among the numbers $\sqrt{2}, \sqrt[3]{9}, \sqrt[4]{16}, \sqrt[5]{32}$ the greatest one is:

(1) $\sqrt{2}$ (2*) $\sqrt[3]{9}$ (3) $\sqrt[4]{16}$ (4) $\sqrt[5]{32}$

Sol. $2^{\frac{1}{2}}, 9^{\frac{1}{3}}, 16^{\frac{1}{4}}, 32^{\frac{1}{5}}$

$\Rightarrow 2^{\frac{1}{2}}, 9^{\frac{1}{3}}, 2^1, 2^1 \Rightarrow 2^{\frac{6}{2}}, 9^{\frac{6}{3}}, 2^6, 2^6$

$\Rightarrow 2^3, 9^2, 2^5, 2^6$

28. If $x + \frac{1}{x} = 2$ and x is real, then the value of $x^{17} + \frac{1}{x^{19}}$ is

(1) 1 (2) 0 (3*) 2 (4) –2

Sol. $x + \frac{1}{x} = 2 \Rightarrow (x-1)^2 = 0 \quad x = 1$

$\Rightarrow x^{17} + \frac{1}{x^{19}} \Rightarrow 1 + 1 = 2$

29. To win a 20 over match, the run rate is required 7.2. If in the end of 15th over, the run rate is 6. Then to win the match the required run rate is?

(1) 1.2 (2) 13.2 (3*) 10.8 (4) 12

Sol. Let runs = x

$= 15 \times 6 + x \times 5 = 7.2 \times 20$

$= x = 54 \quad \Rightarrow$ required run rate $= \frac{54}{5} = 10.8$

30. If P and Q are H.C.F and L.C.F of two algebraic expression respectively and P + Q = x + y then what will be value of $P^3 + Q^3$?

(1*) $x^3 + y^3$ (2) $x^3 - y^3$ (3) x + y (4) x – y

Sol. $P + Q = x + y, \quad PQ = xy$

$(P + Q)^3 = P^3 + Q^3 = 3PQ(P + Q)$

$\Rightarrow P^3 + Q^3 = (x + y)^3 - 3xy(x + y) = x^3 + y^3$

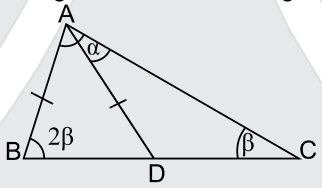
31. Pipe A and B can fill a tank in 12 minutes and 16 minutes respectively. Both pipe are kept open for x minutes and then B is closed and A fills the rest of tank in 5 minutes. The value of x will be?

(1*) 4 minutes (2) 6 minutes (3) 5 minutes (4) 7 minutes

Sol. $\frac{x+5}{12} + \frac{x}{16} = 1 \quad \Rightarrow \quad \frac{4x + 20 + 3x}{48} = 1$

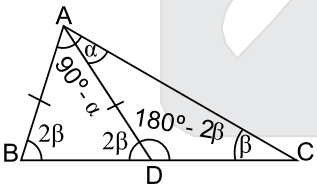
$\Rightarrow \quad x = \frac{48 - 20}{7} = \frac{28}{7} = 4$

32. The accompanying figure shows right triangle ABC and isosceles ABD (AB = AD). Based on this information and the information in the figure, the value of angle α is?



(1) 60° (2) 45° (3*) 30° (4) 25°

Sol.



$\Rightarrow$ In ΔABD, $90 - \alpha + 2\beta + 2\beta = 180°$

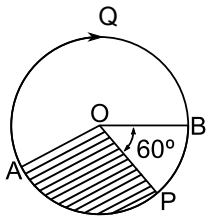
$\Rightarrow \quad 4\beta - \alpha = 90° \quad$ .....(i)

$\Rightarrow$ In ΔABC, $3\beta + 90° = 180°$

$\Rightarrow \quad \beta = 30° \quad$ .....(ii)

$\Rightarrow \quad \alpha = 4\beta - 90° = 30°$

33. The accompanying figure shows a circle whose centre is O and radius is 10cm. The shaded sector equals $\frac{1}{6}$ of the area of the circle. Based on this information and the information in figure the length (in cm) of the are AQB is?



(1) 30π (2*) $\frac{40}{3}\pi$ (3) $\frac{20}{3}\pi$ (4) 20π

Sol. $\Rightarrow$ Angle of shaded region $\Rightarrow \frac{360^\circ}{6} = 60^\circ$

$\Rightarrow$ Shaded sector = $\frac{1}{6}$ of area of circle

$\Rightarrow$ Angle in arc AQB = $360^\circ - 120^\circ = 240^\circ$

$\Rightarrow$ Length of arc AQB = $\frac{240}{360}2\pi r$

$\Rightarrow \frac{240}{360}\times 2\pi \times 10$

$\Rightarrow \frac{2}{3}\times 20\pi \qquad \Rightarrow \frac{40\pi}{3}$

34. If length of a Rectangle is increased by 25% and its width decreased by 20% then of the following which change in the area of rectangle occur?

(1) 10% Increase (2) 16% Increase (3) 5% Decrease (4*) No change

Sol. $\Rightarrow$ Let length = x cm & width = y cm

$\Rightarrow$ Original Area = xy cm^2

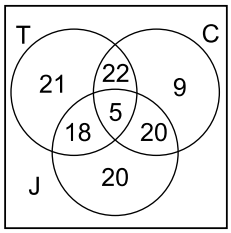
$\Rightarrow$ New Area $\Rightarrow \frac{125x}{100}\times\frac{80y}{100} = xy$

$\Rightarrow \frac{1000xy}{1000} = xy$ no change

35. A official meeting is attended by 130 department employees of them 66 drink tea, 56 drink coffee and 63 drink juice, 27 can drink either tea or coffee, 25 can drink coffee of juice and 23 can drink juice and tea. 5 employees can drink any of the three. How many drink only tea?

(1*) 21 (2) 22 (3) 18 (4) 20

Sol. 130



36. Of the three number, the sum of the first two is 55, third is 65, and sum of third with thrice of the first is 110. The third number is?

(1) 25 (2) 30 (3*) 35 (4) 28

Sol. Let numbers are x, y & z

$x + y = 55$ .....(i)

$y + z = 65$ .....(ii)

$z + 3x = 110$ .....(iii)

Equation (i) – (ii) $\Rightarrow$ $x - z = -10$ $\Rightarrow$ $x = z - 10$

In Equation (iii) $z + 3(z - 10) = 110$

$4z = 140$ $\Rightarrow z = 35$

Directions: (37 to 40) Study the following table and answer questions given below :

EMPLOYEES SOURCE OF INCOME (Rs.)					
	K	**L**	**M**	**N**	**O**
Salary	12000	6000	21000	9000	12000
Bonus	2400	1200	4500	2400	3000
Overtime	5400	2100	6000	5100	6000
Arrears	6000	5400	12000	4200	7500
Miscellaneous	1200	300	1500	300	1500
Total	**27000**	**15000**	**45000**	**21000**	**30000**

37. The employee who has minimum ratio of income from arrear to income from salary is?

(1) K (2) L (3) M (4*) N

Sol. N has the minimum ratio $\rightarrow \frac{4200}{9000} = \frac{7}{15}$

38. The employee who earns maximum bonus in comparison to his total income?

(1) M (2*) N (3) L (4) K

Sol. N has maximum bonus $\rightarrow \frac{2400}{21000} \Rightarrow \frac{24}{210}$

39. The employee who has maximum percentage of his salary out of the income?

(1) K (2) L (3*) M (4) O

Sol. M has maximum percentage $\rightarrow \frac{21000}{45000} \times 100 = 46.66\%$

40. The income from overtime is what percentage of the income from the arrears in case of employees in category O?

(1*) 80 (2) 75 (3) 25 (4) 20

Sol. $\frac{6000}{7500} \times 100 = 80\%$

41. The ratio of the present ages of Mohan and Suresh is 4:5. Five years ago, the ratio of their ages was 7:9. Their present ages was (in year) are:

(1*) 40, 50 (2) 18, 25 (3) 40, 60 (4) 20, 25

Sol. Mohan Suresh

4x 5x

Before 5 years $\Rightarrow \frac{4x - 5}{5x - 5} = \frac{7}{9}$

$36x - 45 = 35x - 35$

$x = 10$

Mohan $\Rightarrow$ 40

Suresh $\Rightarrow$ 50

42. For a business lunch in a certain restaurant, you may choose one of 3 different first courses and one of 4 different main course. In addition to first course and the main courses, you have a choice of a soup or dessert. How many different combinations of three course business lunch does this restaurant offers?
(1) 12 (2) 14 (3) 18 (4*) 24

Sol. $3 \times 4 \times 2 \Rightarrow 24$

43. If the length of a rectangular plot of land is increased by $12\frac{1}{2}\%$ and the breadth is decreased by 10% its area is?
(1) Decreased by 1.25% (2) Decreased by 2/5% (3) Increased by 2.5% (4*) Increased by 1.25%

Sol. % change in Area= $\left(\pm a \pm b \pm \frac{a \times b}{100}\right)\%$

$$= \frac{25}{2} - 10 - \frac{\frac{25}{2}}{100} \times 10$$

$$\Rightarrow \quad \left(\frac{5}{2} - \frac{5}{4}\right)\%$$

$$\Rightarrow \quad \frac{5}{4}\%$$

44. K is an even number and P is an odd number. Which of the following statement is not correct?
(1*) P – K – 1 is an odd number (2) P + K + 1 is an even number
(3) P × K + P is an odd number (4) $P^2 + K^2 + 1$ is an even number

Sol. $\Rightarrow$ K is even, p is odd
$\Rightarrow$ P + K + 1
$\Rightarrow$ e + o + 0 $\Rightarrow$ Even

45. All of the liquid filling a cuboidal container that measures 2cm × 10cm × 20cm is poured into cylindrical container with a base radius of 5cm. What height (in cm) will the surface of the liquid reach in the cylindrical container?
(1*) $\frac{16}{\pi}$ (2) $\frac{40}{\pi}$ (3) 8π (4) 8

Sol. $\Rightarrow$ Volume of cuboidal = Volume of Cylinder
$\Rightarrow 2 \times 10 \times 20 = \pi(5)^2 \times h$
$\Rightarrow \frac{2 \times 10 \times 20}{25} = h$
$\Rightarrow h = \frac{16}{\pi}$

46. $(0 < \theta < 90)$ If $\tan\theta + \cot\theta = 2$ then what will be value of $\tan^{100}\theta + \cot^{100}\theta$?
(1*) 2 (2) $2\sqrt{3}$ (3) 1 (4) $\frac{1}{\sqrt{3}}$

Sol. $\Rightarrow \tan\theta + \cot\theta = 2$
$\Rightarrow x + \frac{1}{x} = 2$
$\Rightarrow x^2 - 2x + 1 = 0 \quad \Rightarrow (x-1)^2 = 0$
$\Rightarrow x = 1$
$\tan\theta = 1$
$\tan^{100}\theta + \cot^{100}\theta$
$\Rightarrow (1)^{100} + (1)^{100} \Rightarrow 2$

47. What is the coefficient of $a^2 b^2$ in the expansion of $(a + b)^4$.

(1) 1 (2*) 6 (3) 2 (4) 3

Sol. $(a + b)^4 = {}^4c_0 a^4 b^0 + {}^4c_1 a^3 b + {}^4c_2 a^2 b^2 + {}^4c_3 ab^3 + {}^4c_4 a^0 b^4$

$\Rightarrow {}^4c_2 a^2 b^2 \Rightarrow {}^4c_2 \Rightarrow \frac{|4}{|2|2}$

$\Rightarrow \frac{4\times3\times2\times1}{2\times2} \Rightarrow 6$

48. In a class composed of x girls, y boys. What part of the class is composed of girls?

(1) y(x + y) (2) $\frac{x}{xy}$ (3*) $\frac{x}{(x+y)}$ (4) $\frac{y}{xy}$

Sol. $\Rightarrow$ x girls, y boys

Girls part $\frac{x}{x+y}$

49. The expression $2^{6n} - 4^{2n}$, where n is a natural number is always divisible by?

(1) 15 (2) 18 (3) 36 (4*) 48

Sol. $\Rightarrow 2^{6n} - 4^{2n}$

$\Rightarrow 6^{4n} - 16^n$

$\Rightarrow$ Divisible by 64 – 16 $\Rightarrow$ 48

50. If $x = 2 - 2^{\frac{1}{3}} + 2^{\frac{2}{3}}$ then the value of $x^3 - 6x^2 + 18x + 18$ is–

(1) 22 (2) 33 (3*) 40 (4) 45

Sol. $\Rightarrow x = 2 - 2^{\frac{1}{3}} + 2^{\frac{2}{3}}$

$\Rightarrow (x-2)^3 = \left(2^{\frac{2}{3}} - 2^{\frac{1}{3}}\right)^3$

$\Rightarrow x^3 - 8 - 3 \times 2 \times x(x-2) = 2^2 - 2 - 3 \times 2^{\frac{2}{3}} \times 2^{\frac{1}{3}} (2^{\frac{2}{3}} - 2^{\frac{1}{3}})$

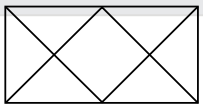
$\Rightarrow x^3 - 8 - 6x^2 + 12x = 4 - 2 - 6(x-2)$

$\Rightarrow x^3 - 6x^2 + 18x = 14 + 8 = 22$

$\Rightarrow x^3 - 6x^2 + 18x - 22 = 0$

$\Rightarrow x^3 - 6x^2 + 18x + 18 = 22 + 18 = 40$

51. In this given figure how many triangle are there?



(1*) 12 (2) 10 (3) 14 (4) 8

52. If Amit's father is Ketan's father's only son and Ketan has neither a brother nor a daughter. What is the relation between Ketan and Amit?

(1) Uncle-Nephew (2) Father-Daughter (3*) Father-Son (4) Cousin

53. In a certain code language 'si po re' means 'book is thick', 'ti na re' means 'bag is heavy', 'ka si' means 'interesting book' and 'de ti' means 'that bag' what should stand for 'that bag is interesting' in that code language?

(1) ka re na ti (2) de si re ka (3) tip o ka na (4*) de ti re ka

Sol. Si Po re $\Rightarrow$ Book is thick

ti na re $\Rightarrow$ bag is heavy

ka si $\Rightarrow$ interesting book

de ti $\Rightarrow$ that bag

bag ⇒ ti
that ⇒ de
is ⇒ re
book ⇒ si
interesting ka

54. In a certain language 'PRINCIPAL' is written as 'MBOQSOMVW' and 'TEACHER' is written as 'FDVSZDB'. Then how is 'CAPITAL' written in that code?
(1*) SVMOFVW (2) SVMODVW (3) BVMODVM (4) SVMIDVW

Sol. P R I N C I P A L
M B O Q S O M V W
T E A C H E R ⇒ F D V S Z D B
C A P I T A L ⇒ S V M O F V W

55. In a certain language ROPE is written as%57$, DOUBT is written as 35#8* and LIVE is written as @24$. How TROUBLE is written in that code?
(1*) *%5#@$ (2) *%#58@$ (3) *%5#8@4 (4) *%#58$@

Sol. R O P E ⇒ % 5 7 $
D O U B T ⇒ 3 5 # 8 *
L I V E ⇒ @ 2 4 $
T R O U B L E ⇒ * % 5 # 8 @ $

56. If $ means 'Pluse(+)'. # means 'minus(–), @ means 'multiplied(×), and * means 'Divided(÷)' then what is the value of 16$4@5#72*8
(1) 29 (2) 25 (3*) 27 (4) 36

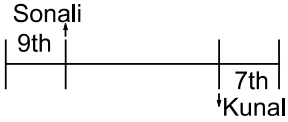
Sol. $ ⇒ +
⇒ –
@ ⇒ ×
* ⇒ ÷
1 6 $ 4 @ 5 # 7 2 *
16 + 4 × 5 – 72 ÷ 8
16 + 20 – 9
16 + 11 ⇒ 27

57. In the number '5321648' how many digit will be as far away from the beginning of the number if digit arranged in ascending order as they are in the number?
(1) None (2*) One (3) Two (4) Three

Sol. 5 3 2 1 6 4 8
Ascending order 1 2 3 4 5 6 8

58. In a class of 35 students Kunal is placed seventh from the bottom. Where as Sonali is placed ninth from top. Pulkit is placed exactly in between the two. What is Kunal's position form Pulkit?
(1) 9th (2*) 10th (3) 11th (4) 12th

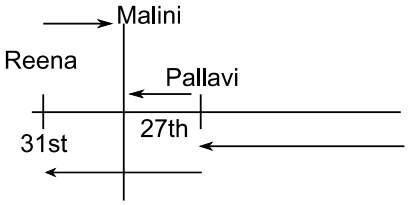
Sol. Total students 35



Kunal from top ⇒ (35 – 7) + 1
⇒ 29th
Pulkit Position ⇒ 19th Top
Kunal is 10th from Pulkit

59. In a row of girls facing north, Reena is 10^{th} to the left of Pallavi. Who is 21^{st} from the right end. If malini, who is 17^{th} from the left end is fourth to the right of Reena, how manyg girls are there in a row?
(1) 37 (2*) 43 (3) 44 (4) Data Inadeguate

Sol.

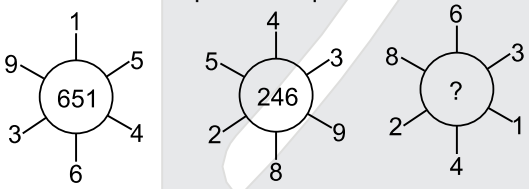


Total Girls = 17 + 27 – 1 = 43
Malini's Position 17^{th} from left & 27^{th} from right

60. Anupriya was born on 29^{th} Nov, 1970, which was Sunday. When her next birthday will fall on Sunday?
(1) 1975 (2) 1976 (3*) 1981 (4) 1982

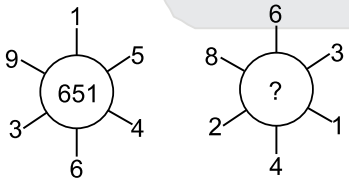
Sol. Born $\Rightarrow$ 29^{th} November 1970 Sunday
1971 $\Rightarrow$ +1
1972 $\Rightarrow$ +2
1973 $\Rightarrow$ +1
1974 $\Rightarrow$ +1
1975 $\Rightarrow$ +1
1976 $\Rightarrow$ +2
1977 $\Rightarrow$ +1
1978 $\Rightarrow$ +1
1979 $\Rightarrow$ +1
1980 $\Rightarrow$ +2
1981 $\Rightarrow$ +1

61. Which one will replace the question mark?



(1) 262 (2*) 622 (3) 631 (4) 824

Sol.



9 – 3 = 6 8 – 2 = 6
6 – 1 = 5 6 – 4 = 2
5 – 4 = 1 3 – 1 = 2

62. If + means ÷ , – means ×, × means + and ÷ means – then, 4 + 6 × 9 ÷6 – 2 × 5?
(1) $\frac{4}{6}$ (2*) $\frac{8}{3}$ (3) 2 (4) $\frac{9}{2}$

Sol. + $\Rightarrow$ ÷
– $\Rightarrow$ ×
× $\Rightarrow$ +
÷ $\Rightarrow$ –

$\Rightarrow 4 + 6 \times 9 \quad \div 6 - 2 + 5$

$\Rightarrow 4 \div 6 + 9 - 6 \times 2 + 5$

$\Rightarrow \frac{2}{3} + 9 - 12 + 5$

$\Rightarrow \frac{2}{3} + 2$

$\Rightarrow \frac{8}{3}$

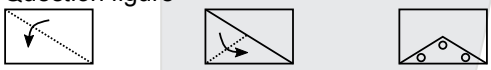
Direction (63 – 66) in the Question given below piece of paper folded and cut as shown below in question paper, from the given answer figure.

63. Question figure

Answer figure

(1*)  (2)  (3)  (4) 

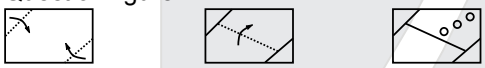
64. Question figure



Answer figure

(1)  (2)  (3)  (4*) 

65. Question figure



Answer figure

(1*)  (2)  (3)  (4) 

66. Question figure

Answer figure

(1)  (2)  (3*)  (4) 

67. In the matrix below, the numbers in the cells follow some rules. Identify the number which when substituted for? Maintaining for the same rule?

4	1	2
13	11	6
153	120	?

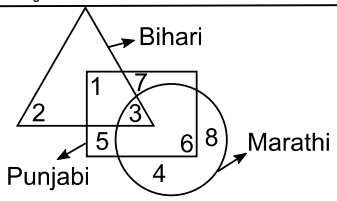
(1*) 32 (2) 45 (3) 16 (4) 48

Sol. $13^2 - 4^2 = 153$

$11^2 - 1^2 = 120$

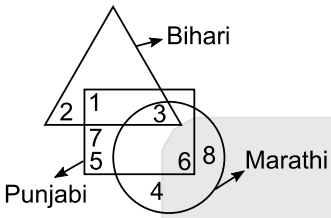
$6^2 - 2^2 = 32$

Direction (68-72). The venn diagram given below is about a small circle is Marathi and triangle is Bihari Square is Punjabi



68. What is the total number of Biharis?
(1) 5 (2*) 6 (3) 7 (4) 8

Sol. Total number of bihari = 2 + 1 + 3 = 6



69. What is the total number of Punjabi?
(1*) 22 (2) 28 (3) 29 (4) 35

Sol. Total number of Punjabi = 1 + 7 + 3 + 5 + 6 = 22

70. What is the total number of Marathi?
(1) 20 (2) 15 (3) 22 (4*) 21

Sol. Total number of Marathi = 3 + 6 + 8 + 4 = 21

71. How many Bihari which are not Punjabi?
(1) 1 (2*) 2 (3) 3 (4) 4

Sol. Bihari which are not Punjabi = 6 – 4 = 2

72. How many Punjabi which are not Marathi?
(1) 10 (2) 11 (3) 12 (4*) 13

Sol. Punjabi which are not Marathi = 22 – 9 = 13

73. Indian became a republic on 26th January, 1950. Which day of the week was it?
(1) Monday (2) Tuesday (3*) Thursday (4) Saturday

Sol. Day on 26th January 1950 $\Rightarrow$ Thursday

$\Rightarrow 1600 \Rightarrow 0$

$\Rightarrow 1900 \Rightarrow 1$

$\Rightarrow 1949 \Rightarrow 12 \times 2 + 37 \times 1 = \dfrac{24+37}{7} = 5$

$\Rightarrow 26$ January $\dfrac{26}{7} = 5$

$\Rightarrow \dfrac{11\,\text{Odd Day}}{7} \Rightarrow$ 4 Odd Day Thursday

74. At what angle (larger) are two hands of a clock inclined at 48 minute past 12?
(1*) 264° (2) 263° (3) 265° (4) 266°

Sol. $\Rightarrow \theta\left|30H - \dfrac{11}{2}M\right|$

$\Rightarrow \theta\left|30 \times 12 - \dfrac{11}{2} \times 48\right|$

$\Rightarrow \theta = \pm\left|360° - 264°\right|$

$\Rightarrow \theta = 96°$

$\Rightarrow$ Larger angle $\Rightarrow 360^\circ - 96^\circ = 264^\circ$

75. A clock is set right at 4am. The clock loses 20 minutes in 24 hours. What will be the time, when the clock indicate 3am, on 4th day?

(1) 5am (2*) 4am (3) 3am (4) 4pm

Sol. $\Rightarrow$ Clock set at 4am

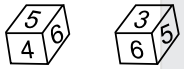
$\Rightarrow$ In 24 hours cases $\Rightarrow \frac{20}{60} \Rightarrow \frac{1}{3}$ hour

$\Rightarrow$ Loses 1 hour in 72 hours. It means it shows 3am when actual time is 4am.

76. A die has four different positions. Find the number on the face opposite to 3?

(1) 1 (2) 2 (3*) 4 (4) 6

Sol. 5 & 6 Common



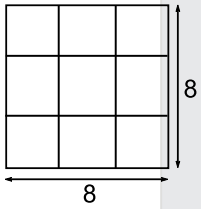
Opposite of 3 is 4.

Directions: (77 to 79) are based on given information:– A solid cube is painted red on all faces. The side of the cube is 8cm. It is cut into smaller cubes of side 2cm. Answer the following question

77. How many cubes have three faces coloured?

(1) 4 (2) 6 (3*) 8 (4) 12

Sol. 3 Faces $\Rightarrow$ 8



78. How many cubes have two faces coloured?

(1) 8 (2) 16 (3) 36 (4*) 24

Sol. 2 faces colored $\Rightarrow$ 24

79. How many cubes have only one face coloured?

(1) 16 (2*) 24 (3) 32 (4) 36

80. Choose the correct option to complete the matrix?

4C	2B	3A
28A	10C	45B
7C	?	15B

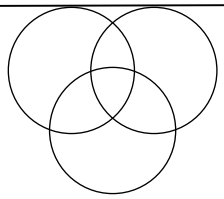
(1) 15A (2) 12B (3*) 5A (4) 8C

Sol. $\Rightarrow$ 4 × 7 = 28

$\Rightarrow$ x × 2 = 10

$\Rightarrow$ x = 5A

81. Which of the following is the best represented in diagram?



(1) Chair, Table, Furniture
(2*) Doctor, Social Person, Honest Person
(3) Family, Parents, Children
(4) Gold Jewellary, Silver Jewellary, Ornaments

Sol. Doctor, Social Person, Honest Person

Direction: (82 to 84) study the letter series given below and answer the question that follows.
HDYSMWNBQPOCRTBLZVEGUF

82. Which two neighbours in the given arrangement are farthest in the alphabetical order?
(1) B and Q (2*) D and Y (3) U and F (4) V and E

Sol. HDYSMWNBQPOCRTBLZVEGUF
BQ Difference is 17 – 2 = 15
DY Difference is 25 – 4 = 21
UF Difference is 21 – 6 = 15
VE Difference is 22 – 5 = 17

83. Which letter has the same neighbours as in the alphabetical order through they have change places?
(1) M (2) N (3*) O (4) F

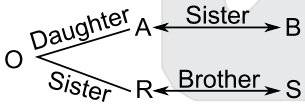
Sol. In the given series 'P' is the neighbor of 'O'

84. Which three letters have the same distance as they have in the alphabetical order through they have changed places?
(1) HMP (2) NQZ (3) QOE (4*) YLF

Sol. In the given series
Y - L = 13
L - F = 6

85. A and B are sisters. R and S are brothers. Daughter of A is the sister of R. Then which relation between B and S?
(1*) Aunt (2) Grand Mother (3) Sister (4) Mother

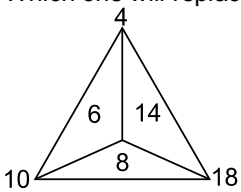
Sol.

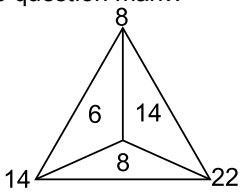


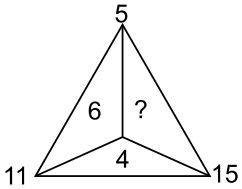
86. Abhay is the husband of Neena and Sunita is the mother of Abhay. Sohan is the uncle of Neeraj. Who is the relation between Sohan and Neena?
(1) Jeth (2) Devar (3) Bhatija (4) Jeth/Devar

Sol. **BONUS**

87. Which one will replace the question mark?



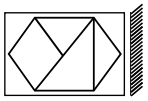


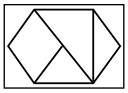
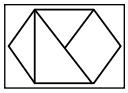
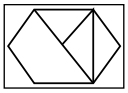
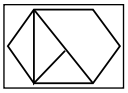


(1) 8 (2) 14 (3*) 10 (4) 6

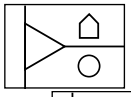
Sol. 18 – 4 = 14
22 – 8 = 14
15 – 5 = 10

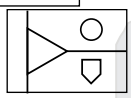
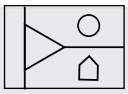
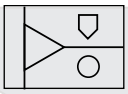
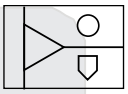
88. Choose the correct mirror image of figure (x) from given alternatives:



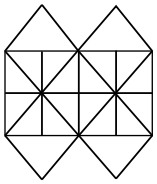
(1)  (2*)  (3)  (4) 

89. Choose the correct water image of figure (x) from given alternatives:



(1*)  (2)  (3)  (4) 

90. Which is the minimum number of straight lines needed to construct the following figure?



(1) 13 (2) 15 (3*) 16 (4) 17

Direction: (91 to 95). A cube is coloured red on all of its faces. It is then cut into 64 smaller cube of equal size. The smaller cube so obtained are now separated.

91. How many smaller cubes have no surface coloured?

(1) 24 (2) 16 (3*) 8 (4) 10

No face colored $= (n-2)^3$
$= (2)^3$
$= 8$

92. How many smaller cube will have at least two surfaces painted with red coloured?

(1) 4 (2) 18 (3*) 32 (4) 24

Sol. Number of cubes with at least two faces painted

Two faces painted $= (n-2) \times 12$
$= 24$

Three faces painted $= 8$

Total $= 32$

93. How many smaller cubes have two surfaces painted with red coloured?

(1*) 24 (2) 8 (3) 12 (4) 20

94. How many smaller cubes have only three surfaces painted with red coloured?

(1) 0 (2) 12 (3) 24 (4) 6

Sol. **Bonus**

95. A 6cm cube is cut into 2cm smaller cube. How many smaller cubes can be obtained from their?

(1) 108 (2) 156 (3*) 27 (4) 64

Sol. $\frac{6^3}{2^3} = 3^3 = 27$

Direction : (96 to 100) Read the following information and answer the questions which follow:

1. 'A × B' means 'A' is father of 'B'
2. 'A + B' means 'A' is daughter of 'B'
3. 'A ÷ B' means 'A' is mother of 'B'
4. 'A – B' means 'A' is brother of 'B'

96. If P + Q – R ÷ T, how is T related to P?
(1) Aunt (2) Brother (3) father (4*) Cousin

Sol. P + Q – R ÷ T

$$P \xleftarrow{\text{Daughter}} Q \xleftarrow{\text{Brother}} R \xleftarrow{\text{Mother}} T$$

Cousin

97. Which of the following means that R is the wife of P?
(1) P× R – Q – T (2) P ÷ T ÷ R – Q (3) P ÷ R – Q + T (4*) P × T – Q + R

98. If 'P × T ÷ Q + R', how is R related to P?
(1) Daughter (2) Husband (3*) Son in law (4) Daughter in law

99. If P ÷ R – Q × T. How is P related to T?
(1*) Grandmother (2) Mother in law (3) Sister (4) Grandfather

100. If P ÷ Q + R × T, How Q is related to T?
(1) Aunt (2*) Sister (3) Brother (4) None of these