Date: 17/11/2019

West Bengal

Aakash
Medical | IIT-JEE | Foundations
(Divisions of Aakash Educational Services Limited)

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Answers & Solutions

for

NTSE (Stage-I) 2019-20

INSTRUCTIONS TO CANDIDATES

Read the following instructions carefully before you open the question booklet.

1. Use blue/black ballpoint pen only. There is no negative marking.
2. Part I : MAT : 1 - 100 questions

   Part II : SAT : 1 - 100 questions
3. This test booklet contains 200 questions of one mark each. All the questions are compulsory.
4. Answer each question by darkening the one correct alternative among the four choices on the OMR SHEET with blue/black ballpoint pen.

   Example:

	Q. No.	Alternatives
Correct way :	1	① ② ● ④
	Q. No.	Alternatives
Wrong way :	1	⊗ ② ③ ④

   Student must darkening the right oval only after ensuring correct answer on OMR Sheet.
5. Students are not allowed to scratch / alter / change out an answer once marked on OMR Sheet, by using white fluid / eraser / blade / tearing / wearing or in any other form.
6. Separate sheet has been provided for rough work in this test booklet.
7. Please handover the OMR Sheet to the invigilator before leaving the Examination Hall.
8. Darken completely the ovals of your answer on OMR Sheet in the time limit allotted for that particular paper.
9. Your OMR Sheet will be evaluated through electronic scanning process. Incomplete and incorrect entries may render your OMR Sheet invalid.
10. Use of electronic gadgets, calculator, mobile etc., is strictly prohibited.

PART-I : MENTAL ABILITY TEST (MAT)

(Questions 1–15)

Direction : Read the questions 1–15 carefully and give answer by filling the circle of the letter denoting your selected answer on the OMR Answer-Sheet.

1. $x^5 - 1$ is divided by $2x + 1$, then the absolute value of the remainder is

(1) 21 (2) 26

(3) $\frac{33}{12}$ (4) $\frac{33}{32}$

Answer (4)

Sol. $2x + 1 = 0 \Rightarrow x = -\frac{1}{2}$

$$x^5 - 1 = \left(-\frac{1}{2}\right)^5 - 1 = -\frac{1}{32} - 1 = -\frac{33}{32}$$

$\therefore$ Absolute value = $\frac{33}{32}$

2. A mother was 30 years old when her son was born. Now the sum of ages of mother and son is 40 years. What would be the age of the son after 10 years?

(1) 5 years (2) 15 years

(3) 20 years (4) 10 years

Answer (2)

Sol. Let mother's present age be x years

Son's age = (x – 30) years

Given : x + x – 30 = 40

$\Rightarrow$ x = 35 years

$\therefore$ Son's age after 10 years = 35 – 30 + 10

= 15 years

3. If the difference between circumference and diameter of a circle is 60 cm, then the area of the circle is

(1) 661 square cm (2) 166 square cm

(3) 616 square cm (4) 484 square cm

Answer (3)

Sol. $2\pi r - 2r = 60$

$$\Rightarrow 2r\left(\frac{22}{7} - 1\right) = 60$$

$$\Rightarrow r = 14 \text{ cm}$$

$$\text{Area} = \frac{22}{7} \times 14^2 = 616 \text{ cm}^2$$

4. A metallic spherical shell of internal and external diameters 4 cm and 8 cm respectively, is melted and recast into the form of a cone of base diameter 8 cm. The height of the cone is

(1) 12 cm (2) 14 cm

(3) 15 cm (4) 18 cm

Answer (2)

Sol. $\frac{4}{3}\pi\left((4)^3 - (2)^3\right) = \frac{1}{3}\pi \times 4^2 \times h$

$$\Rightarrow h = \frac{56}{4} = 14 \text{ cm}$$

5. If median of a distribution is 28 and mean is 27.5, then mode is

(1) 29.5 (2) 28.5

(3) 29.0 (4) 27.0

Answer (3)

Sol. Mode = 3 Median – 2 Mean

= 3 × 28 – 2 × 27.5

= 29

6. The value of $a^3 + b^3 + c^3 - 3abc$ when a + b + c = 9 and $a^2 + b^2 + c^2 = 29$ is

(1) 9 (2) 3

(3) 27 (4) 81

Answer (3)

Sol. $(a+b+c)^2 = 9^2$

$\Rightarrow$ $a^2 + b^2 + c^2 + 2(ab+bc+ca) = 81$

$\Rightarrow$ $2(ab + bc + ca) = 52$

$\Rightarrow$ $ab + bc + ca = 26$

Now, $a^3+b^3+c^3 - 3abc$

$= (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ca)$

$= 9(29 - 26) = 27$

7. The angles of elevation of top and bottom of a flag kept on a flag post at 30 metre distance are 45° and 30° respectively. What is the height of the flag?

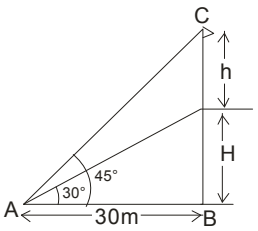
(1) 17.32 metre (2) 14.32 metre

(3) 12.68 metre (4) 20.78 metre

Answer (3)

Sol. Let height of flag = hm

Given : $\tan 30° = \frac{H}{30}$



$\Rightarrow H = 10\sqrt{3}m = 17.32\ m$

Also, $\tan 45° = \frac{H+h}{30}$

$\Rightarrow$ h = 30 – 17.32 = 12.68 m

8. The average of 11 results is 50. If the average of first six results is 49 and that of last six numbers is 52, find the sixth result.

(1) 65 (2) 72

(3) 56 (4) 47

Answer (3)

Sol. $\frac{a_1 + a_2 + ... + a_{11}}{11} = 50$

$\Rightarrow a_1 + a_2 + ... + a_{10} + a_{11} = 550$.....(i)

$\frac{a_1 + a_2 + ... + a_6}{6} = 49 \Rightarrow a_1 + a_2 + ... + a_6 = 294$...(ii)

$\frac{a_6 + a_7 + ... + a_{11}}{6} = 52 \Rightarrow a_6 + a_7 + ... + a_{11} = 312$...(iii)

(ii) + (iii) – (i) gives

a_6 = 294 + 312 – 550 = 56

9. The roots of $2kx^2 + 5kx + 2 = 0$ are equal if k is equal to

(1) $\frac{16}{25}$ (2) $\frac{13}{16}$

(3) 2 (4) $1\frac{2}{15}$

Answer (1)

Sol. Roots are equal

$\therefore b^2 - 4ac = 0$

$\Rightarrow (5k)^2 - 4 \times 2k \times 2 = 0$

$\Rightarrow 25k^2 - 16k = 0$

$\Rightarrow k(25k - 16) = 0$

$\Rightarrow k = \frac{16}{25}$

10. A fair unbiased die is thrown twice and in both cases the difference of numbers appeared on the upper face was observed. The probability of getting the difference to be 3 is

(1) $\frac{1}{3}$ (2) $\frac{1}{6}$

(3) $\frac{1}{12}$ (4) $\frac{1}{36}$

Answer (2)

Sol.

↓ \ →	1	2	3	4	5	6
1	0	1	2	(3)	4	5
2	1	0	1	2	(3)	4
3	2	1	0	1	2	(3)
4	(3)	2	1	0	1	2
5	4	(3)	2	1	0	1
6	5	4	(3)	2	1	0

$\text{Probability} = \frac{\text{No. of favourable outcomes}}{\text{Total number of outcomes}} = \frac{6}{36} = \frac{1}{6}$

11. If $(p+q) : \sqrt{pq} = 2:1$, then p : q will be

(1) 2 : 1 (2) 1 : 2

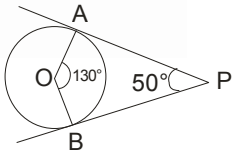
(3) 1 : 1 (4) 1 : 5

Answer (3)

Sol. $\frac{p+q}{\sqrt{pq}} = \frac{2}{1} \Rightarrow p + q = 2\sqrt{pq} \Rightarrow p^2 + q^2 + 2pq = 4pq$

$\Rightarrow p^2 + q^2 - 2pq = 0 \Rightarrow (p-q)^2 = 0 \Rightarrow p = q \Rightarrow \frac{p}{q} = \frac{1}{1}$

12. In the given figure, PA and PB are tangents from P to a circle with centre O. If , $\angle AOB = 130°$ then find $\angle APB$.



(1) 40° (2) 55°

(3) 50° (4) 60°

Answer (3)

Sol. $\angle AOB = 130°$(Given)

$\angle PAO = \angle PBO = 90°$ (since PA and PB are tangents to the circle)

$\therefore \angle APB = 360° - \angle AOB - \angle PAO - \angle PBO$

= 360° – 130° – 90° – 90°

= 50°

13. If $\cos^4\theta - \sin^4\theta = \frac{1}{3}$, then the value of $\tan^2\theta$ will be

(1) $\frac{1}{2}$ (2) $\frac{1}{3}$

(3) $\frac{2}{3}$ (4) $\frac{1}{4}$

Answer (1)

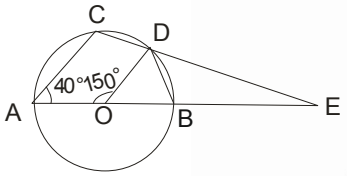
Sol. $\cos^4\theta - \sin^4\theta = \frac{1}{3} \Rightarrow (\cos^2\theta - \sin^2\theta)(\cos^2\theta + \sin^2\theta) = \frac{1}{3}$

$\Rightarrow (2\cos^2\theta - 1) = \frac{1}{3} \Rightarrow 2\cos^2\theta = \frac{4}{3}$

$\Rightarrow \cos^2\theta = \frac{2}{3}$

$\therefore \sin^2\theta = 1 - \cos^2\theta = \frac{1}{3}$

$\therefore \tan^2\theta = \frac{\sin^2\theta}{\cos^2\theta} = \frac{1}{2}$

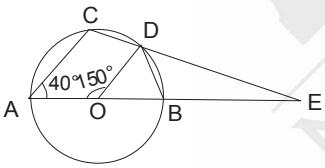
14. 

In the figure the value of $\angle BED$ is

(1) 25° (2) 40°

(3) 35° (4) 30°

Answer (3)

Sol. 

$\angle AOD + \angle DOB = 180°$ (Linear pair)

$\therefore \angle BOD = 30°$

Now, ΔBOD is an isosceles triangle since OB=OD (radius of circle)

$\therefore \angle OBD = \angle ODB$

Now, in ΔBOD

$\angle BOD + 2\angle ODB = 180° \Rightarrow \angle ODB = 75°$

$\therefore \angle OBD = \angle ODB = 75°$

ABCD is a cyclic quadrilateral

$\therefore \angle ACD + \angle ABD = 180°$

$\Rightarrow \angle ACD = 105°$

Now, in ΔACE

$\angle ACE + \angle CAE + \angle CEA = 180°$

$\Rightarrow 105° + 40° + \angle CEA = 180°$

$\therefore \angle AEC = 35°$

$\therefore \angle BED = 35°$

15. If $\left(1+4x^2\right)\cos\theta = 4x$, then $\frac{1+2x}{1-2x}$ =

(1) $\text{cosec}\theta + \cot\theta$ (2) $\text{cosec}\theta - \cot\theta$

(3) $\sec\theta + \tan\theta$ (4) $\sec\theta - \tan\theta$

Answer (1)

Sol. $(1+4x^2)\cos\theta = 4x$

$\Rightarrow \frac{1}{\cos\theta} = \frac{1+4x^2}{4x}$

$\Rightarrow \frac{1+\cos\theta}{1-\cos\theta} = \frac{(1+2x)^2}{(1-2x)^2}$ (Using componendo–dividendo)

$\Rightarrow \frac{\sqrt{1+\cos\theta}}{\sqrt{1-\cos\theta}} = \frac{1+2x}{1-2x}$

$\Rightarrow \frac{1+2x}{1-2x} = \frac{\sqrt{1+\cos\theta}}{\sqrt{1-\cos\theta}} \times \frac{\sqrt{1+\cos\theta}}{\sqrt{1+\cos\theta}}$

$\Rightarrow \frac{1+2x}{1-2x} = \frac{1+\cos\theta}{\sqrt{\sin^2\theta}} = \frac{1+\cos\theta}{\sin\theta}$

$\Rightarrow \frac{1+2x}{1-2x} = \text{cosec}\theta + \cot\theta$

(Questions 16–25)

Direction : In each question 16 to 25 there are two words separated by ' : ' and other two separated from the first two by the symbol '::'. Find the relation between two sets of words and select one word from the right side of ':' which have the same relation as left set of word of '::'. Fill the circle of the letter denoting your selected answer on the OMR Answer-Sheet.

16. Lamp : Oil :: Bulb : ?

(1) Electricity (2) Bright

(3) Holder (4) Switch

Answer (1)

Sol. Electricity

17. Whale : Mammal :: Frog : ?

(1) Amphibian (2) Reptile

(3) Fish (4) Mollusc

Answer (1)

Sol. Amphibian

18. King : Palace :: Eskimo : ?

(1) Cavaran (2) Asylum

(3) Monastery (4) Igloo

Answer (4)

Sol. Igloo

19. Cobbler : Leather :: Carpenter : ?

(1) Paper (2) Wood

(3) Hammer (4) Cloth

Answer (2)

Sol. Wood

20. Stethoscope : Heartbeat :: ? : Temperature : ?

(1) Heat (2) Mercury

(3) Scale (4) Thermometer

Answer (4)

Sol. Thermometer

21. Light : Darkness :: Knowledge : ?

(1) Ignorance (2) Intelligence

(3) Brightness (4) Creativity

Answer (1)

Sol. Ignorance

22. 841 : 29 :: 289 : ?

(1) 23 (2) 33

(3) 17 (4) 13

Answer (3)

Sol. $841=(29)^2$ $289 = (17)^2$

23. C : I : : D : ?

(1) L (2) P

(3) M (4) N

Answer (2,1)

Sol. Two possible answers

(2) logic 1: Position of C alphabetically = 3

Position of I alphabetically = 9 = $(3)^2$

Position of D alphabetically = 4

Position of required alphabet = $4^2=16$

$\therefore$ Alphabet = P

(1) logic 2 : Position of C alphabetically = 3

Position of I alphabetically = $9=3\times3$

Position of D alphabetically = 4

Position of required alphabet = $4\times3=12$

$\therefore$ Alphabet = L

24. Heart : Cardiologist :: Kidney :?

(1) Endocrinologist (2) Orthodontist

(3) Nephrologist (4) Urologist

Answer (3)

Sol. Nephrologist

25. Poet : Poem :: Dramatist : ?

(1) Dialogue (2) Stage

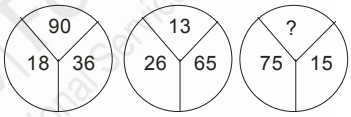
(3) Play (4) Direction

Answer (3)

Sol. Play

(Questions 26–55)

Direction : In questions 26–55, numbers are placed in figures on the basis of some rules. One place in the figure is indicated by the interrogation sign (?). Find out the correct alternative to replace the question mark and indicate your answer by filling the circle of the corresponding letter of alternatives in the OMR Answer-Sheet.

26. 

(1) 105 (2) 60

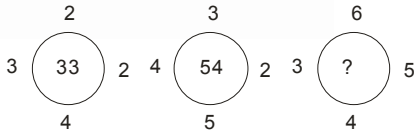
(3) 30 (4) 45

Answer (3)

Sol. $36=18\times2$ | $26=13\times2$ | $?=15\times2$

$90=18\times5$ | $65=13\times5$ | $75=15\times5$

So the answer is = 30

27. 

(1) 94 (2) 86

(3) 82 (4) 78

Answer (2)

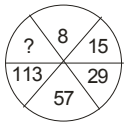
Sol. $33 = 4^2+3^2+2^2+2^2$

$54 = 5^2+4^2+3^2+2^2$

$? = 4^2+3^2+6^2+5^2=86$

So the answer is = 86

28.

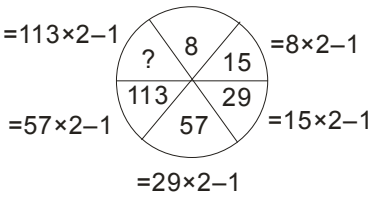


(1) 220 (2) 224

(3) 221 (4) 225

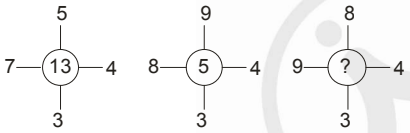
Answer (4)

Sol.



So the answer is = 113×2–1 = 225

29.

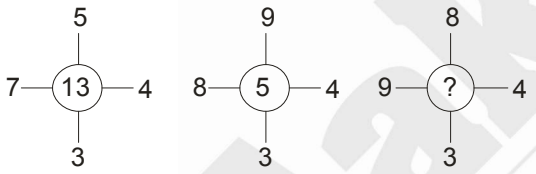


(1) 12 (2) 15

(3) 18 (4) 14

Answer (1)

Sol.



So the answer is = 12

30.

31	17	58	87
68	19	61	56
91	22	70	50
10	142	11	?

(1) 3 (2) 6

(3) 7 (4) 9

Answer (3)

Sol.

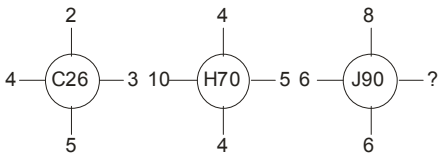
31	17	58	87
68	19	61	56
91	22	70	50
10	142	11	?

Sum of each column = 200

So the answer is = 200 – (87 + 56 + 50)

= 200 – 193 = 7

31.

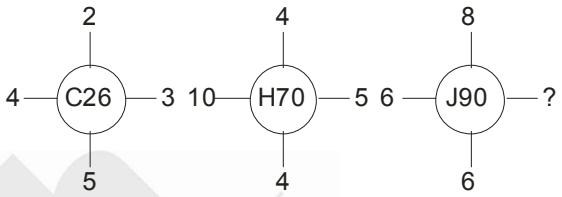


(1) 2 (2) 3

(3) 4 (4) 5

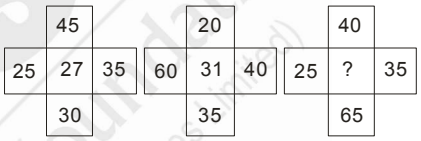
Answer (1)

Sol.



So the answer is = 2

32.

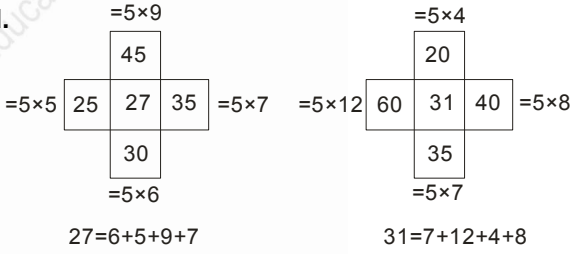


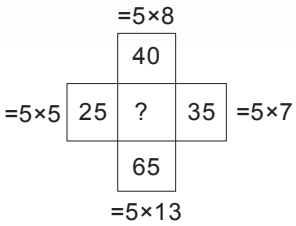
(1) 33 (2) 36

(3) 45 (4) 60

Answer (1)

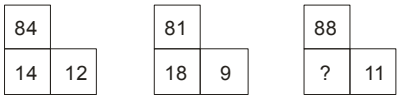
Sol.





So the answer is = 13+5+8+7=33

33.

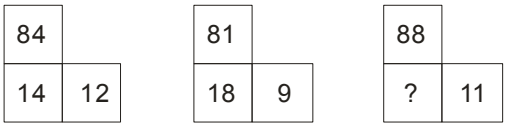


(1) 16 (2) 61

(3) 21 (4) 81

Answer (1)

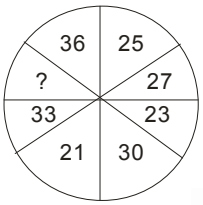
Sol.



$14=\frac{84}{12}\times 2$ $18=\frac{81}{9}\times 2$ $?=\frac{88}{11}\times 2=16$

So the answer is = 16

34.

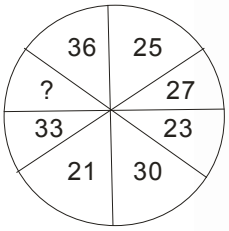


(1) 35 (2) 32

(3) 22 (4) 19

Answer (4)

Sol.



Logic 1 : |36 – 30| = 6 (vertically opposite terms)

|25 – 21| = 4

|27 – 33| = 6

|23 – x| = 4

So x = $\boxed{19}$

Logic 2 : Alternate sectors

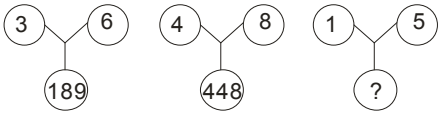
$\boxed{19}$ + 2 = 21, 21 + 2 = 23

23 + 2 = 25

Likewise, 27 + 3 = 30, 30 + 3 = 33, 33 + 3 = 36

So the answer is = 19

35.

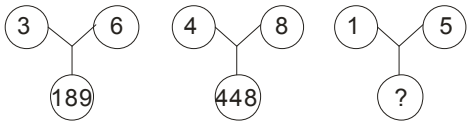


(1) 124 (2) 125

(3) 126 (4) 224

Answer (1)

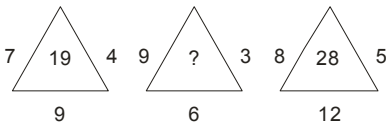
Sol.



$189=6^3-3^3$ $448=8^3-4^3$ $?=5^3-1=124$

So the answer is = 124

36.

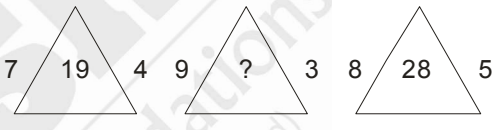


(1) 27 (2) 21

(3) 28 (4) 33

Answer (2)

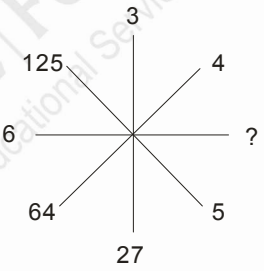
Sol.



19=7×4–9 ?=9×3–6=21 28=8×5–12

So the answer is = 21

37.

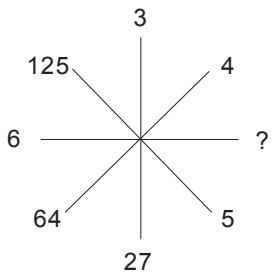


(1) 164 (2) 181

(3) 216 (4) 200

Answer (3)

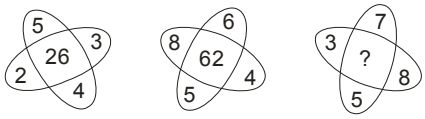
Sol.



$27 = 3^3$ $64 = 4^3$ $125 = 5^3$

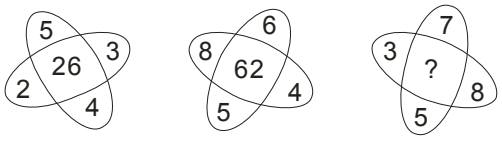
So ? = 6^3 = 216

So the answer is = 216

38. 

(1) 71 (2) 59
(3) 62 (4) 55

Answer (2)

Sol. 

26=5×4+3×2 62=5×6+8×4 ?=5×7+3×8
?=59

So the answer is = 59

39.

5	9	15
16	29	?
49	89	147

(1) 48 (2) 45
(3) 51 (4) 54

Answer (1)

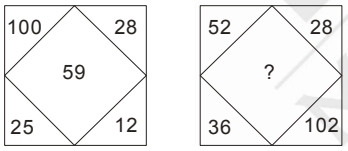
Sol.

5	9	15
16	29	x
49	89	147

16–5=11, 49–16=33 | 29–9=20, 89–29=60 | x–15, 147–x

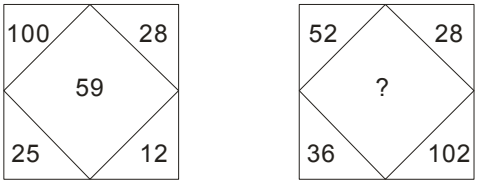
11×3=33 20×3=60 3×(x-15)=147–x
x = 48

So the answer is = 48

40. 

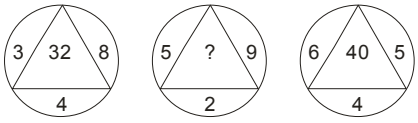
(1) 50 (2) 90
(3) 218 (4) 64

Answer (2)

Sol. 

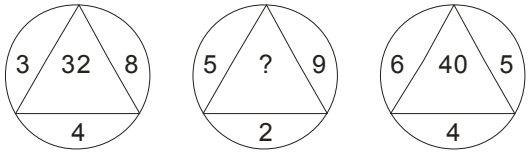
59=(100+12)–(28+25) ?=(102+52)–(28+36)
?=90

So the answer is = 90

41. 

(1) 27 (2) 35
(3) 54 (4) 30

Answer (4)

Sol. 

$32=\frac{8\times4\times3}{3}$ $?=\frac{5\times9\times2}{3}$ $40=\frac{6\times5\times4}{3}$
?=30

So the answer is = 30

42.

5	8	12
7	1	4
9	3	?
108	27	96

(1) 4 (2) 5
(3) 3 (4) 6

Answer (4)

Sol.

5	8	12
7	1	4
9	3	?
108	27	96

108 = (5 + 7) × 9
27 = (8 + 1) × 3

$96 = (12 + 4) \times ? \Rightarrow ? \ \frac{96}{16} = 6$

So the answer is = 6

43.

B	F	K
E	I	N
?	N	S

(1) K (2) O
(3) F (4) J

Answer (4)

Sol.

B	F	K
E	I	N
?	N	S

B (C D E) F (G H I J) K
3 4

E (F G H) I (J K L M) N
3 4

J (K L M) N (O P Q R) S
3 4

So the answer is = J

44.

Z	A	Y	B
T	E	S	F
Q	L	P	?

(1) M (2) N

(3) P (4) O

Answer (1)

Sol.

Z	A	Y	B
T	E	S	F
Q	L	P	?

$Y \to Z$, $A \to B$

$S \to T$, $E \to F$

$P \to Q$, $L \to \boxed{M}$

So the answer is = M

45.

7	3	8
4	9	6
5	1	2
90	91	?

(1) 92 (2) 94

(3) 104 (4) 93

Answer (3)

Sol.

7	3	8
4	9	6
5	1	2
90	91	?

$90 = 7^2 + 4^2 + 5^2$

$91 = 3^2 + 9^2 + 1^2$

$? = 8^2 + 6^2 + 2^2 = 104$

So the answer is = 104

46.

2	7	14
3	4	? → Let it be = x
75	165	285

(1) 7 (2) 5

(3) 1 (4) 4

Answer (2)

Sol.

2	7	14
3	4	?
75	165	285

then $\frac{75}{3+2} = 15$

$\frac{165}{7+4} = 15$

$\frac{285}{14+x} = 15 \Rightarrow x = 5$

So answer is = 5

47.

2	1	4	6	?	3
6	0	60	210	120	24

(1) 2 (2) 8

(3) 5 (4) 7

Answer (3)

Sol.

2	1	4	6	?	3
6	0	60	210	120	24

$6 = 2 \times (2^2 - 1)$
$0 = 1 \times (1^2 - 1)$
$60 = 4 \times (4^2 - 1)$
$210 = 6 \times (6^2 - 1)$

So $120 = 5 \times (5^2 - 1)$
So the answer is = 5

48.

3 6 2
5 12 4 5 18 2 5 ? 2
2 3 9

(1) 15 (2) 18

(3) 17 (4) 16

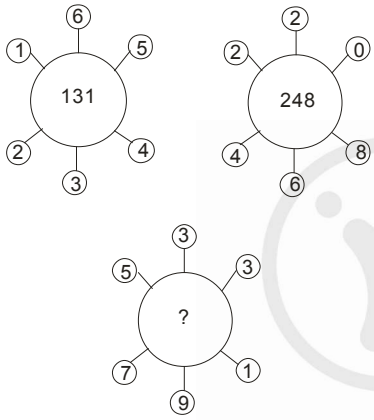
Answer (2)

Sol.

3 5 [12] 4 2	6 5 [18] 2 3	2 5 [?] 2 9
$\frac{5\times4\times3\times2}{10}=12$	$\frac{5\times6\times3\times2}{10}=18$	$\frac{5\times2\times2\times9}{10}=18$

So the answer is = 18

49.

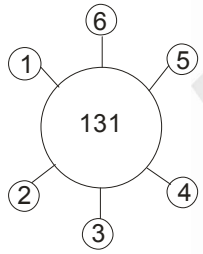


(1) 132 (2) 320

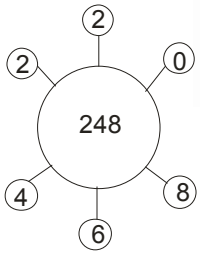
(3) 274 (4) 262

Answer (4)

Sol.



1 = |1 – 2|
3 = |6 – 3|
1 = |5 – 4|

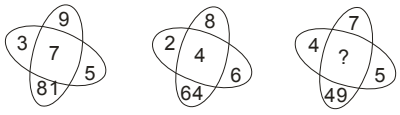


2 = |2 – 4|
4 = |2 – 6|
8 = |0 – 8|

Likewise : |5–7|=2, |3–9|=6, |3–1|=2

So 262 is the answer

50.

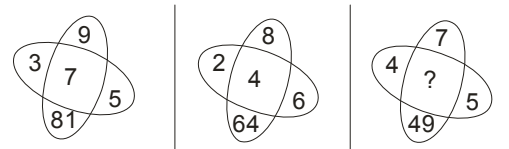


(1) 1 (2) 8

(3) 6 (4) 4

Answer (3)

Sol.



$\left(\frac{81}{9}+3\right)-5=7$ $\left(\frac{64}{8}+2\right)-6=4$ $\left(\frac{49}{7}+4\right)-5=6$

So the answer is = 6

51.

3C	27D	9E
7I	21K	3M
4D	?	7J

(1) 11E (2) 28G

(3) 35I (4) 48F

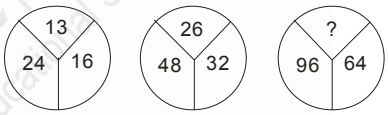
Answer (2)

Sol.

3C	27D	9E	27 = 3 × 9, Ⓒ D E
7I	21K	3M	21 = 3 × 7, I J Ⓚ L M
4D	?	7J	28 = 4 × 7, D E F Ⓖ H I J

So the answer is = 28G

52.

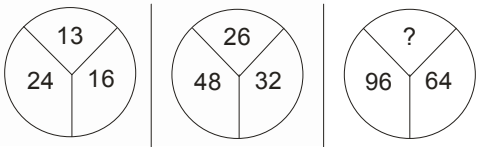


(1) 60 (2) 39

(3) 32 (4) 52

Answer (4)

Sol.



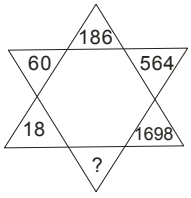
48 = 24 × 2
96 = 48 × 2

32 = 16 × 2
64 = 32 × 2

26 = 13 × 2
? = 26 × 2 = 52

So the answer is 52

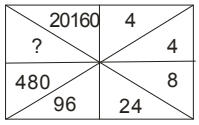
53.



(1) 5052 (2) 5100

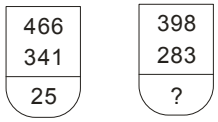
(3) 5094 (4) 4860

Answer (2)

54. 

(1) 860 (2) 1140
(3) 2880 (4) 3240

Answer (3)

55. 

(1) 29 (2) 23
(3) 35 (4) 26

Answer (2)

(Questions 56–70)

Direction **:** In each of the following questions 56 to 70, a number series is given with one term missing. Choose the correct alternative that will continue the same pattern and replace the question mark in the given series.

56. 132, 253, 374, 495, ?

(1) 5165 (2) 5123
(3) 5116 (4) 5102

Answer (3)

57. 8, 18, 32, 50, 72, ?

(1) 76 (2) 98
(3) 80 (4) 70

Answer (2)

58. 1, 0, 3, 2, 5, 6, ?, 12, 9, 20

(1) 9 (2) 10
(3) 7 (4) 8

Answer (3)

59. 7, 8, 18, 57, ?, 1165

(1) 174 (2) 232
(3) 224 (4) 228

Answer (2)

60. 10, 11, 14, 23, 50, ?

(1) 10 (2) 104
(3) 70 (4) 131

Answer (4)

Sol. $+3^0$

$+3^1$

$+3^2$

$+3^3$

So $+3^4 = 81$

61. 4, 8, 28, 80, 244, ?

(1) 278 (2) 428
(3) 628 (4) 728

Answer (4)

Sol. 4, 8, 28, 80, 244, ?

$8 \times 3 + 4$ $80 \times 3 + 4$

$9 \times 3 - 4$ $28 \times 3 - 4$ $244 \times 3 - 4$

$732 - 4$

$= 728$

62. 1, 1, 2, 6, 24, ?, 720

(1) 100 (2) 104
(3) 108 (4) 120

Answer (4)

Sol. 1, 1, 2, 6, 24 , ____,720
0 1 4 18

$1 \times 1 = 1$

$1 \times 2 = 2$

$2 \times 3 = 6$

$6 \times 4 = 24$

$24 \times 5 = 120$

$120 \times 6 = 720$

63. 2, 7, 27, 107, 427, ?

(1) 1262 (2) 1707
(3) 4027 (4) 4207

Answer (2)

Sol. 2, 7, 27, 107, 427, _____
5 20 80 320
×4 ×4 ×4 ×4
=1280 + 427 = 1707

64. 3, 8, 18, ?, 53, 78

(1) 30 (2) 35
(3) 33 (4) 32

Answer (3)

Sol. 3, 8, 18, _____ , 53, 78
5 10 15 20 25

65. 11, 29, 55, ?, 131

(1) 110 (2) 81
(3) 89 (4) 78

Answer (3)

Sol. 11, 29, 55, ___, 131
18 26 34
8 8

66. 198, 194, 185, 169, ?

(1) 92 (2) 136

(3) 144 (4) 112

Answer (3)

Sol. 198 194 185 169 144
4 9 16 25

67. 4, 11, 30, 67, 128, ?

(1) 219 (2) 228

(3) 231 (4) 237

Answer (1)

Sol. 4 11 30 67 128 219
7 19 37 61 91
12 18 24 30

68. 17, 43, 81, 131, ?

(1) 375 (2) 468

(3) 300 (4) 193

Answer (4)

Sol. 17 43 81 131 193
26 38 50 62

69. How many terms are there in the series ?

4, 7, 10, 13,...,148

(1) 25 (2) 49

(3) 37 (4) 51

Answer (2)

Sol. $\frac{148-4}{3}+1=\frac{144}{3}+1=49$

70. In the series 4, 10, 16, ... what will be the 23rd term ?

(1) 136 (2) 150

(3) 161 (4) 125

Answer (1)

Sol. 4 + (23 – 1) × 6

4 + 22 × 6 = 136

(Question 71–80)

Direction : In each of the questions 71 to 80 there are four items, three of which are alike by some means or other while one is out of the class. Find out the odd item and indicate your answer by filling the circle of the corresponding letter on the OMR Answer-Sheet.

71. (1) Iron (2) Steel

(3) Gold (4) Tin

Answer (2)

Sol. Steel is not element

72. (1) RKD (2) UNG

(3) MTF (4) SLE

Answer (3)

Sol. Not difference by 7

73. (1) Botany (2) English

(3) Physics (4) Chemistry

Answer (2)

Sol. English is not Science

74. (1) Mumbai (2) Chennai

(3) Kolkata (4) Bengaluru

Answer (4)

Sol. Bengaluru is not port city

75. (1) Carrom (2) Golf

(3) Cricket (4) Hockey

Answer (1)

Sol. Carrom

76. (1) Eye (2) Ears

(3) Throat (4) Nose

Answer (3)

Sol. Throat

77. (1) Cumin (2) Groundnut

(3) Clove (4) Pepper

Answer (2)

Sol. Groundnut

78. (1) Temple (2) Worship

(3) Church (4) Mosque

Answer (2)

Sol. Worship

79. (1) 70, 80 (2) 54, 62

(3) 28, 32 (4) 42, 24

Answer (4)

Sol. First term is greater than second term

80. (1) Square (2) Circle

(3) Parallelogram (4) Rectangle

Answer (2)

Sol. Circle

Direction (Q.81 to Q.83) : Choose the correct one.

81. If the clock reads 6:20 and if the minute hand points North-East, in which direction will the hour hand point ?

(1) West (2) South-East

(3) East (4) North-East

Answer (3)

Sol. East

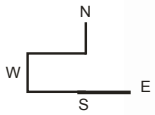
82. A boy starts walking toward West, he turns right and again he turns right and then turns left at last. Towards which direction is he walking now?

(1) West (2) North

(3) South (4) East

Answer (2)

Sol. North



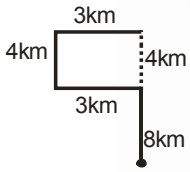
83. Arun travels 8 km towards the North, turns left and travels 3km and then again turns right and covers another 4km. He then turns right and travels another 3km. How far is he from the starting point?

(1) 18 km (2) 11 km

(3) 12 km (4) 15 km

Answer (3)

Sol. 12 km



Direction (Q.84 & Q.85) : Choose the correct one.

84. Arrange the given words in the sequence in which they occur in dictionary and then choose the correct sequence.

(1) Leaf (2) Learned

(3) Leave (4) Leak

(5) Leader

(1) 5,1,4,2,3 (2) 5,1,4,3,2

(3) 3,5,1,4,2 (4) 1,4,2,3,5

Answer (1)

85. Arrange the given words in the sequence in which they occur in dictionary and then choose the correct sequence.

(1) Select (2) Seldom

(3) Send (4) Selfish

(5) Selter

(1) 1,2,4,5,3 (2) 2,1,5,4,3

(3) 3,5,4,1,2 (4) 5,3,2,1,4

Answer (3)

Sol. (in descending order)

(Questions 86-90)

86. If P means –, Q means +, R means ÷ and S means ×, then what is the value of 18P6Q4S6R2?

(1) 24 (2) 12

(3) 26 (4) 128

Answer (1)

Sol. $18-6+4\times6\div2 = 24$

87. If 5*6=35, 8*4=28, 6*8=?

(1) 46 (2) 34

(3) 23 (4) 38

Answer (1)

88. If '+' stands for 'multiplication', '<' stands for 'division', '÷' stands for 'subtraction', '–' stands for 'addition' and '×' stands for 'greater than', identify which expression is correct ?

(1) $20-4\div4+8<2\times26$

(2) $20\times8+15<5\div9-8$

(3) $20<2+10\div4-6\times100$

(4) $20<5+25\div10-2\times96$

Answer (3)

Sol. $20\div2\times10-4+6>100$

$10\times10-4+6>100$

$100-4+6>100$

$102>100$

89. If '÷' means '+', '–' means '÷', '×' means '–' and '+' means '×', then $32\div8-4\times12+4=$?

(1) 12 (2) 21

(3) –41 (4) –14

Answer (4)

Sol. $32+8\div4-12\times4 = 32+2-48$

$= 34-48=-14$

90. Which one of the following will be possible when you interchange the numbers 4 and 5 and the signs '+' and '×' ?

(1) 5×4+10=30 (2) 10×4+5=50

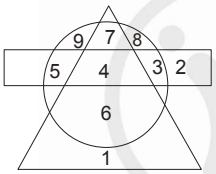
(3) 20+5×4=85 (4) 5+15×4=90

Answer (3)

Sol. 20×4+5 = 85

(Q.91 to Q.95) :

Direction : Study the following figure carefully and answer the questions given below it. The rectangle represents employed persons and the triangle represents educated persons and the circle represents villagers.



91. Which regions indicate villagers are neither employed nor educated?

(1) 6, 1 (2) 8, 9

(3) 3, 2 (4) 7, 8

Answer (2)

92. Which regions represent educated persons are villagers?

(1) 7,4 (2) 4,6

(3) 6,1 (4) 7,4,6

Answer (4)

93. Which region represents educated persons are both villagers and employed?

(1) 2 (2) 8

(3) 4 (4) 9

Answer (3)

94. Which region represents educated persons are neither villagers nor employed?

(1) 9 (2) 1

(3) 3 (4) 6

Answer (2)

95. Which region indicates employed persons are neither villagers nor educated ?

(1) 8 (2) 7

(3) 9 (4) 2

Answer (4)

(Q.96 & Q.97) :

Direction : Choose the correct one.

96. If A+B means A is the brother of B, A–B means A is the sister of B and A ×B means A is the father of B, Which of the following means that C is the son of A?

(1) A–B×C+B (2) B–C+A×B

(3) A+B–B×C (4) A×B–C+B

Answer (4)

97. Looking at a photograph a person said "I have no brother or sister but that man's father is my father's son". At whose photograph was the person looking at?

(1) His son's (2) His nephew's

(3) His father's (4) His own

Answer (1)

(Q.98 to Q.100) :

A is B's brother, C is A's mother, D is C's father and E is B's son.

98. How is E related to A?

(1) Cousin (2) Nephew

(3) Uncle (4) Grandson

Answer (2)

99. How is D related to B?

(1) Father (2) Uncle

(3) Brother (4) Grandfather

Answer (4)

100. How is E related to C?

(1) Uncle (2) Nephew

(3) Cousin (4) Grandson

Answer(4)

❑ ❑ ❑

PART-II : SCHOLASTIC APTITUDE TEST (SAT)

1. If $23x - 29y = 98$ and $29x - 23y = 110$, then the value of $\sqrt{x^2+y^2}$ is

(1) $\sqrt{10}$ (2) $\sqrt{5}$

(3) 10 (4) 7

Answer (1)

Sol. $23x - 29y = 98$ ...(i)

$29x - 23y = 110$ ...(ii)

$x - y = 4$ [(i) + (ii)]

$x + y = 2$ [(ii) – (i)]

$2x = 6$

$x = 3$

$y = -1$

$\therefore \quad \sqrt{x^2+y^2} = \sqrt{10}$

2. If $x = \frac{y}{y+1}$ and $y = \frac{a-2}{2}$, then the value of $x(y+2)+\frac{x}{y}+\frac{y}{x}$ is

(1) 1 (2) 0

(3) –1 (4) a

Answer (4)

Sol. $x = \frac{y}{y+1}$ $\qquad y = \frac{a-2}{2}$

$$x = \frac{\frac{a-2}{2}}{\frac{a-2}{2}+1} = \frac{a-2}{a}$$

$$\therefore \quad x(y+2)+\frac{x}{y}+\frac{y}{x}$$

$$\frac{a-2}{a}\left(\frac{a-2}{2}+2\right)+\left(\frac{\frac{a-2}{a}}{\frac{a-2}{2}}\right)+\left(\frac{\frac{a-2}{2}}{\frac{a-2}{a}}\right) = a$$

3. If $\sin\theta + \sin^3\theta = \cos^2\theta$, then the value of $\cos^6\theta - 4\cos^4\theta + 8\cos^2\theta$ is

(1) 1 (2) 4

(3) 2 (4) 0

Answer (2)

Sol. $\sin\theta + \sin^3\theta = \cos^2\theta$

$\sin\theta(1+ 1 - \cos^2\theta) = \cos^2\theta$

$\sin^2\theta(2 - \cos^2\theta)^2 = \cos^4\theta$

$(1 - \cos^2\theta)(4 + \cos^4\theta - 4\cos^2\theta) = \cos^4\theta$

$4 + \cos^4\theta - 4\cos^2\theta - 4\cos^2\theta - \cos^6\theta + 4\cos^4\theta$

$= \cos^4\theta$

$\cos^6\theta - 4\cos^4\theta + 8\cos^4\theta = 4$

4. If $x^2 + y^2 = 2\sqrt{2}x + 4\sqrt{2}y - 10$, then the value of $\frac{x}{y}$ is

(1) $\frac{1}{2}$ (2) $\frac{1}{4}$

(3) 2 (4) 4

Answer (1)

Sol. $x^2 + y^2 = 2\sqrt{2}x + 4\sqrt{2}y - 10$

$\left(x-\sqrt{2}\right)^2 + \left(y-2\sqrt{2}\right)^2 = 0$

$x = \sqrt{2}; y = 2\sqrt{2}$

5. If $x + y = 12$, then the maximum value of xy will be

(1) 20 (2) 30

(3) 36 (4) 40

Answer (3)

Sol. AM $\geq$ GM

$\frac{x+y}{2} \geq \sqrt{xy}$

$\frac{12}{2} \geq \sqrt{xy}$

$xy \leq 36$

6. If $\frac{4+\sqrt{5}}{2}$ and $\frac{4-\sqrt{5}}{2}$ be the roots of a quadratic equation, then the quadratic equation will be

(1) $4x^2 - 17x - 9 = 0$

(2) $6x^2 - 16x - 9 = 0$

(3) $x^2 - 5x + 8 = 0$

(4) $4x^2 - 16x + 11 = 0$

Answer (4)

Sol. $x_1 = \frac{4+\sqrt{5}}{2}$

$x_2 = \frac{4-\sqrt{5}}{2}$

$x_1 + x_2 = 4$

$x_1 . x_2 = \frac{11}{4}$

$x^2 - (x_1 + x_2)x + x_1x_2 = 0$

$x^2 - 4x + \frac{11}{4} = 0$

$4x^2 - 16x + 11 = 0$

7. If $\sin^4x + \sin^2x = 1$, then the value of $\cot^4x + \cot^2x$ will be

(1) 0 (2) 1

(3) 2 (4) 4

Answer (2)

Sol. $\frac{1}{\text{cosec}^4x} + \frac{1}{\text{cosec}^2x} = 1$

$1+\text{cosec}^2x = \text{cosec}^4 x$

$1 + 1 + \cot^2x = 1 + \cot^4x + 2\cot^2x$

$\cot^4x + \cot^2x = 1$

8. $\sqrt{a\sqrt{b\sqrt{c\sqrt{d}}}} =$

(1) $a^{1/2}b^{1/4}c^{1/8}d^{1/16}$ (2) $(abcd)^{1/16}$

(3) $(abcd)^{1/8}$ (4) $a^{1/2}b^{1/2}c^{1/2}d^{1/2}$

Answer (1)

Sol. $\sqrt{a\sqrt{b\sqrt{c\sqrt{d}}}} = a^{\frac{1}{2}}b^{\frac{1}{4}}c^{\frac{1}{8}}d^{\frac{1}{16}}$

9. A train goes from Sealdah to Ranaghat with velocity 60 km/hr and returns from Ranaghat to Sealdah with velocity 80 km/hr. The average velocity of the train will be

(1) 70 km/hr (2) $68\frac{4}{7}$ km/hr

(3) $70\frac{4}{7}$ km/hr (4) 68 km/hr

Answer (2)

Sol. Average Velocity $= \frac{2V_1V_2}{V_1+V_2} = \frac{2\times60\times80}{60+80}$

$= \frac{2\times60\times80}{140} = \frac{480}{7} = 68\frac{4}{7}$ km/hr

10. The triangle formed by the points (7, 9), (3,–7) and (–3, 3) is

(1) Equilateral

(2) Isosceles

(3) Scalene

(4) Right angled and Isosceles

Answer (4)

Sol. A(7, 9) B(3, –7) C(–3, 3)

$AB = \sqrt{272}$

$BC = \sqrt{136}$

$CA = \sqrt{136}$

$AB^2 = BC^2 + AC^2$

11. In a cuboid the length of the diagonal is p, the sum of areas of all the surfaces is q and the sum of lengths of coinitial edges is r. Then which one of the following relations is true?

(1) $r = 4\sqrt{p^2+q^2}$ (2) $r = \sqrt{4(p^2+q)}$

(3) $r = \sqrt{p^2+q}$ (4) $r = 4\sqrt{p^2-q}$

Answer (3)

Sol. $p = \sqrt{\ell^2+b^2+h^2}$

$q = 2(\ell b + bh + \ell h)$

$r = \ell + b + h$

$p^2 + q^2 = (\ell + b + h)^2$

$\ell + b + h = \sqrt{p^2+q}$

$r = \sqrt{p^2+q}$

12. If a cube has surface area s and volume V, then the volume of the cube with surface area 2s will be

(1) 2V (2) $2\sqrt{2}V$

(3) 4V (4) $\sqrt{2}V$

Answer (2)

Sol. $S = 6a^2$ $\quad 2 \times 6a^2 = 6a_1^2$

$V = a^3$ $\quad a_1 = \sqrt{2}a$

$V_1 = a_1^3 = 2\sqrt{2}a^3 = 2\sqrt{2}V$

$\therefore V_1 = 2\sqrt{2}V$

13. Average of 1st 100 natural numbers is

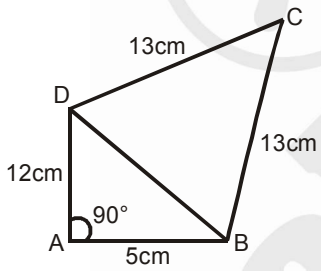
(1) 50 (2) 50.5

(3) 505 (4) 51.5

Answer (2)

Sol. $\text{Avg} = \dfrac{5050}{100} = 50.5$

14. In the figure given bellow, ABCD is a quadrilateral and if $\overline{AB} = 5$ cm, $\overline{AD} = 12$ cm, $\overline{BC} = \overline{CD} = 13$ cm, then the area of the quadrilateral ABCD is



(1) $\dfrac{1}{4}\left(120 + 169\sqrt{3}\right)$ sq. cm

(2) $\dfrac{1}{4}\left(120 - 169\sqrt{3}\right)$ sq. cm

(3) $\dfrac{1}{4}\left(60 + 169\sqrt{3}\right)$ sq. cm

(4) $\dfrac{1}{4}\left(60 - 169\sqrt{3}\right)$ sq. cm

Answer (1)

Sol. Area of $(\square ABCD) = \dfrac{1}{2} \times 5 \times 12 + \dfrac{\sqrt{3}}{4} \times (13)^2$

$= 30 + \dfrac{169\sqrt{3}}{4} = \dfrac{120 + 169\sqrt{3}}{4}$

15. Area of a triangle whose lengths of medians are 9 cm, 12 cm and 15 cm will be

(1) 72 sq. cm (2) 36 sq. cm

(3) 154 sq. cm (4) 108 sq. cm

Answer (1)

Sol. Area $= \dfrac{4}{3}\sqrt{s(s-p)(s-q)(s-r)}$

Where p, q, r are lengths of medians and

$s = \dfrac{p+q+r}{2}$; Hence area of triangle = 72 sq. cm

16. The relation which will be obtained by eliminating θ from $x = a\sec^n\theta$ and $y = b\tan^n\theta$ is

(1) $\left(\dfrac{x}{a}\right)^{\frac{1}{n}} + \left(\dfrac{y}{b}\right)^{\frac{1}{n}} = 1$ (2) $\left(\dfrac{x}{a}\right)^2 - \left(\dfrac{y}{b}\right)^2 = 1$

(3) $\left(\dfrac{x}{a}\right)^{\frac{1}{n}} - \left(\dfrac{y}{b}\right)^{\frac{1}{n}} = 1$ (4) $\left(\dfrac{x}{a}\right)^{\frac{2}{n}} - \left(\dfrac{y}{b}\right)^{\frac{2}{n}} = 1$

Answer (4)

Sol. $\sec\theta = \left(\dfrac{x}{a}\right)^{\frac{1}{n}}$ $\quad \tan\theta = \left(\dfrac{y}{b}\right)^{\frac{1}{n}}$

$\sec^2\theta - \tan^2\theta = 1$

17. If ABCD is a cyclic quadrilateral, then the value of $\left(\tan\dfrac{A}{2}\tan\dfrac{C}{2} + \tan\dfrac{B}{2}\tan\dfrac{D}{2}\right)$ is

(1) 1 (2) $\dfrac{1}{2}$

(3) 3 (4) 2

Answer (4)

Sol. $\tan\left(\dfrac{\pi - C}{2}\right).\tan\dfrac{C}{2} + \tan\left(\dfrac{\pi - D}{2}\right).\tan\dfrac{D}{2}$

= 1 + 1 = 2

18. 4 unbiased coins are tossed simultaneously. The probability that two tails occur will be

(1) $\dfrac{3}{8}$ (2) $\dfrac{3}{16}$

(3) $\dfrac{4}{16}$ (4) $\dfrac{5}{16}$

Answer (1)

Sol.
$$\begin{vmatrix} T & T & H & H \\ T & H & T & H \\ T & H & H & T \\ H & T & T & H \\ H & T & H & T \\ H & H & T & T \end{vmatrix} \quad \therefore \frac{6}{16} = \frac{3}{8}$$

19. The roots of the equation $x^2–5x–2=0$

(1) Real and Rational

(2) Imaginary

(3) Real and equal

(4) Real and Irrational

Answer (4)

Sol. $X^2 – 5x – 2 = 0$

$$x = \frac{5 \pm \sqrt{25+8}}{2}$$

$$x = \frac{5 \pm \sqrt{33}}{2}$$

20. If $\sum f_i x_i = 216$, $\sum f_i = 16$ and weighted mean = 13.5 + P, then the value of P will be

(1) 1

(2) 0.1

(3) 0.01

(4) 0

Answer (4)

Sol. $\frac{\sum f_i x_i}{\sum f_i} = 13.5 + P$

$$\frac{216}{16} = 13.5 + P$$

13.5 = 13.5 + P

P = 0

21. The distance-time graph of a particle at time t makes an angle 45° with the time axis. After 1 s it makes an angle 60° with the time axis. What is the average acceleration of the particle during this time interval ?

(1) $\left(\sqrt{3}-1\right)$ unit

(2) $\left(\sqrt{3}+1\right)$ unit

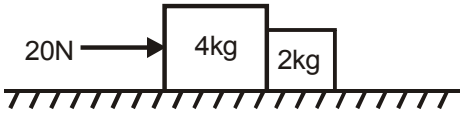
(3) $\sqrt{3}$ unit

(4) 1 unit

Answer (1)

Sol. $< a >= \frac{\Delta v}{\Delta t} = \frac{\tan 60° - \tan 45°}{1} = \sqrt{3} - 1$

22. Two blocks of mass 4 kg and 2 kg are placed side by side on a smooth horizontal table and a horizontal force of 20 N is applied on the 4 kg block as shown in the figure. The normal reaction between the two blocks will be



(1) 10/3 N (2) 20/3 N

(3) 25/3 N (4) 40/3 N

Answer (2)

Sol. $a_c = \frac{20}{6} = \frac{10}{3}$ m/s^2 $\therefore F_{42} = 2 \times \frac{10}{3} = \frac{20}{3}$N

23. All other conditions remaining same, if the velocity of sound in oxygen and hydrogen gases are given by V_O and V_H respectively, then which one of the following is correct ?

(1) $V_H = 2V_O$ (2) $V_H = 4V_O$

(3) $V_H = V_O$ (4) $V_O = 4V_H$

Answer (2)

Sol. $V_{sound} = \sqrt{\frac{\gamma RT}{M}}$ $\therefore \frac{V_O}{V_H} = \sqrt{\frac{2}{32}} = \frac{1}{4}$

24. All other conditions remaining same, if the temperature of a gas medium drops by 1%, the velocity of sound in that medium will

(1) Increase by 0.5% (2) Remain unchanged

(3) Decrease by 0.5% (4) Decrease by 2%

Answer (3)

Sol. $v \propto \sqrt{T}$ $\therefore \frac{\Delta v}{v} = \frac{1}{2}\frac{\Delta T}{T} = -\frac{1}{2} \times 1 = -0.5\%$

25. A beam of light is incident at 60° to a plane separating two medium. The reflected and refracted rays are found to be perpendicular to each other. What is the refractive index of the second medium with respect to the first medium ?

(1) $1/\sqrt{3}$ (2) 1/3

(3) $\sqrt{3}$ (4) 3

Answer (3)

Sol. $\tan 60° = \mu_{21} = \sqrt{3}$

26. The peak value of A.C. voltage on a 220 V mains is

(1) $240\sqrt{2}$ V (2) $230\sqrt{2}$ V

(3) $220\sqrt{2}$ V (4) $110\sqrt{2}$ V

Answer (3)

Sol. $V_{rms} = \frac{V_{peak}}{\sqrt{2}} \therefore V_{peak} = 220\sqrt{2}$ V

27. Two rain drops reach the earth with terminal velocities in the ratio 4 : 9. What is the ratio of their radii ? [Take all other conditions remain same.]

(1) 4 : 9 (2) 2 : 3

(3) 16 : 81 (4) 9 : 4

Answer (2)

Sol. $v_T \propto r^2 \therefore \frac{v_1}{v_2} = \frac{4}{9} = \left(\frac{r_1}{r_2}\right)^2 \therefore \frac{r_1}{r_2} = \frac{2}{3}$

28. The absolute refractive indices of water and glass are 4/3 and 3/2 respectively. Which is the refractive index of glass with respect to water ?

(1) 1.125 (2) 1.5

(3) 1.25 (4) 1.52

Answer (1)

Sol. $\frac{\mu_{glass}}{\mu_{water}} = \frac{\frac{3}{2}}{\frac{4}{3}} = \frac{9}{8} = 1.125$

29. A block of ice is floating in water keeping 1/11-th part of its volume above water level. Taking density of water as 1 g/cm^3, what is the nearest value of density of the ice block ?

(1) 0.81 g/cm^3 (2) 0.91 g/cm^3

(3) 0.11 g/cm^3 (4) 1.11 g/cm^3

Answer (2)

Sol. $\frac{\rho_{ice}}{\rho_{water}} = \frac{V_{submerged}}{V_{ice}} = \frac{10}{11} \therefore \rho_{ice} = \frac{10}{11}$ g/cc $\approx$ 0.91 g/cc

30. A and B are two radioactive substances having half life periods T_A and T_B respectively. If $T_A = 3T_B$ and λ_A and λ_B are the respective disintegration constants, what relation between them is correct?

(1) $\lambda_B : \lambda_A = 3:1$ (2) $\lambda_B : \lambda_A = 1:3$

(3) $\lambda_B : \lambda_A = 2:3$ (4) $\lambda_B : \lambda_A = 3:2$

Answer (1)

Sol. $T_{half} \propto \frac{1}{\lambda} \therefore \frac{T_A}{T_B} = \frac{\lambda_B}{\lambda_A} = 3$ or, $\lambda_B = 3\lambda_A$

31. In the equation of motion $S = at^2 + bt$; S and t are distance and time respectively and a and b are constants. The unit of a and b are respectively given by

(1) m/s^2, m/s (2) m/s^2, m/s^2

(3) m/s^2, m/s^3 (4) m/s, m/s^2

Answer (1)

Sol. $a = \frac{S}{t^2}$ =m/s^2, $b = \frac{S}{t}$ =m/s

32. When electromagnetic wave propagates, the angle between the electric field and the magnetic field is given by

(1) 0° (2) 90°

(3) 45° (4) 135°

Answer (2)

Sol. $\vec{E}.\vec{B} = 0$ $\therefore$ Required angle 90°.

33. The three sides of a triangle are of equal resistances of value R each. What is the equivalent resistance between any two vertexes of the triangle?

(1) 3R (2) 2R

(3) R/3 (4) 2R/3

Answer (4)

Sol. $R_{eq} = \frac{2R.R}{3R} = \frac{2R}{3}$

34. Number of neutrons in a parent nucleus 'A' which gives $^{14}_{7}N$ after two successive β emission would be

(1) 6 (2) 7

(3) 8 (4) 9

Answer (4)

Sol. $^{14}_{5}Y \xrightarrow{-\beta} {}^{14}_{6}X \xrightarrow{-\beta} {}^{14}_{7}N$

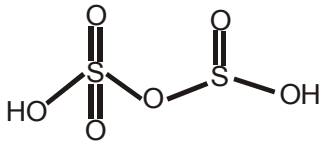
$\therefore$ Number of neutron in Parent nucleus = 14 – 5 = 9

35. The anhydride of Pyrosulphuric acid is

(1) SO_2 (2) SO_3

(3) S_2O_3 (4) S_2O_7

Answer (2)

Sol. Pyrosulphuric acid ≡ 

$\therefore \quad H_2S_2O_7 \rightarrow H_2O + S_2O_6$ or SO_3

36. Which Ammonium compound does not produce Ammonia gas on heating?

(1) $(NH_4)_2SO_4$ (2) $(NH_4)_2CO_3$

(3) NH_4NO_2 (4) NH_4Cl

Answer (3)

Sol. $NH_4NO_2 \xrightarrow{\Delta} N_2 + 2H_2O$

37. The compound which contains Ionic as well as Covalent bond is

(1) H_2O_2 (2) KCN

(3) KCl (4) CH_2Cl

Answer (2)

Sol. $K^{\oplus}\overset{\ominus}{C} \equiv N$

38. In the following compounds which two are not isomer to each other ?

(1) $(CH_3)_2CHCH_3$, $(CH_3)_2CHCH_2CH_3$

(2) CH_3CH_2OH, $CH_3–O–CH_3$

(3) $C_2H_5–O–C_2H_5$, $CH_3–O–C_3H_7$

(4) CH_3CH_2CHO, CH_3COCH_3

Answer (1)

Sol. As $(CH_3)_2CHCH_3$ and $(CH_3)_2CHCH_2CH_3$

are homologous but not isomer as they have different molecular formula.

39. The reaction of $AgNO_3$ with Acetylene shows which type of property of Acetylene ?

(1) Acidic (2) Oxidizing

(3) Basic (4) Reducing

Answer (1)

Sol. $2AgNO_3 + H – C \equiv C – H \rightarrow 2HNO_3 + Ag_2C_2$

As acetylene contains acidic hydrogen, so it is acidic.

40. In the titration of a weak acid and weak base, no indicator is suitable for locating the end point. This is due to

(1) Indicator not changing its colour

(2) pH change being much less at the equivalence point

(3) Neutralization reaction is very slow

(4) Neutralization reaction is very fast

Answer (2)

Sol. Fact

41. What is the number of molecules of CO_2 which contains 8 gms of O_2 ?

(1) 1.5×10^{23} molecules

(2) 2.0×10^{23} molecules

(3) 1.5×10^{22} molecules

(4) 2.0×10^{22} molecules

Answer (1)

Sol. Number of moles of O_2 = Number of moles of CO_2

$$\therefore \quad \frac{\text{Number of molecules}}{6.023 \times 10^{23}} = \frac{8}{32}$$

$$N = \frac{6.023}{4} \times 10^{23} = 1.5 \times 10^{23}$$

42. Which reagent will be helpful in differentiating ethanoic acid from ethanol ?

(1) Br_2/CCl_4

(2) Dilute NaOH solution

(3) Dilute HCl solution

(4) $NaHCO_3$ solution

Answer (4)

Sol. As

$CH_3COOH + NaHCO_3 \rightarrow CH_3COONa + CO_2\uparrow + H_2O$

$C_2H_5OH + NaHCO_3 \rightarrow$ no reaction

Acetic acid shows effervescence when dissolved in $NaHCO_3$ solution but with ethanol reaction does not occur.

43. Which statement about the Cathode and Anode of an electrolytic cell is correctly applicable ?

(1) Oxidation occurs at Cathode and Cathode is a negative electrode

(2) Reduction occurs at Cathode and Anode is a negative electrode

(3) Oxidation occurs at Anode and Anode is a positive electrode

(4) Reduction occurs at Anode and Cathode is a positive electrode

Answer (3)

Sol. In anode oxidation takes place

i.e. $A^{\ominus} \longrightarrow A + e^{-}$

or $A \rightarrow A^{+} + e^{-}$

Also as the electrode accepts e^{-}, hence it must be +ve in charge.

44. A sample of aqueous $CuSO_4$ was divided into two equal parts. Through one of these, H_2S gas was passed and through the other a small amount of dilute NH_3 solution was added. The colour of the precipitates formed in these two cases will be respectively

(1) Black and Brown (2) Bluish-White and Black

(3) Brown and Black (4) Black and Bluish-white

Answer (4)

Sol. $CuSO_4(aq.) + H_2S(g) \rightarrow \underset{\text{Black}}{CuS\downarrow} + H_2SO_4(aq.)$

$CuSO_4(aq.) + 2NH_4OH(aq.) \rightarrow \underset{\substack{\text{Bluish}\\\text{White}}}{Cu(OH)_2\downarrow} + (NH_4)_2SO_4$

45. Among the four element Li, Na, K, Be, which one has the highest first Ionization energy ?

(1) Li (2) Be

(3) K (4) Na

Answer (2)

Sol. As 'Be' have fulfilled s-orbital, therefore it is difficult to remove the 1st electron. Hence have highest first Ionization energy.

46. Under the identical conditions of temperature, the density of a gas 'A' is three times that of gas 'B' while molecular mass of gas 'B' is twice that of gas 'A'. The ratio of pressures of 'A' and 'B' will be

(1) 6:1 (2) 1:6

(3) 2:3 (4) 3:2

Answer (1)

Sol. $P_AM_A = d_ART_A$

$P_BM_B = d_BRT_B$

$\therefore \frac{P_AM_A}{d_AT_A} = \frac{P_BM_B}{d_BT_B}$

$d_A = 3d_B$

$M_B = 2M_A$

$T_A = T_B$

$\therefore \frac{P_A}{P_B} = \frac{M_Bd_A}{M_Ad_B} = \frac{2M_A3d_B}{M_A \cdot d_B} = 6:1$

47. ACTH stimulates production of

(1) Glucocorticoids (2) Adrenaline

(3) Thyroxine (4) Gonadotropins

Answer (1)

Sol. ACTH is Adreno Cortico Tropic Hormone that is released by anterior pituitary. It acts on adrenal cortex to stimulate the production of adrenal cortex hormones, like glucocorticoids. The release of adrenaline from adrenal medulla is under the control of sympathetic nervous system. The release of thyroxine is under the control of TSH [Thyroid Stimulating Hormone] released from anterior pituitary. Gonadotropins are under the control of GnRH.

48. The enzyme, secreted in your mouth helps to digest the rice that you are having in your lunch is

(1) Salivary amylase (2) Pepsin

(3) Trypsin (4) Intestinal lipase

Answer (1)

Sol. Rice contains complex carbohydrates like starch which is hydrolysed by salivary amylase enzyme also called ptyalin.

Starch $\xrightarrow{\text{Salivary amylase}}$ Maltose

49. Mendel choose the following plant for his experiment related to heredity :
(1) *Pisum sativum* (Matar)
(2) *Hibiscus rosasinensis* (Jaba)
(3) *Mirabilis jalapa* (Sandhyamalati)
(4) None of the above

Answer (1)

Sol. Mendel selected pea plant because it has many distinct alternative traits, it produces large number of seeds, complete its life span in one season, shows self pollination and it is easy to cross pollinate them artificially to develop fertile hybrids.

50. The membrane enclosing the heart is known as
(1) Epicardium (2) Pericardium
(3) Supracardium (4) Endocardium

Answer (2)

Sol. Heart is protected by a two layered covering called pericardium. The outer layer of pericardium is parietal pericardium and the inner layer is visceral pericardium. In between these two layers, pericardial cavity is present which is filled with pericardial fluid.

51. Analogous organs are those which have
(1) Common origin and common functions
(2) Common origin but different functions.
(3) Similar functions but different origins.
(4) Different functions and different origins.

Answer (3)

Sol. Analogous organs are similar in function but differ in origin and show no common ancestry. They are anatomically different. For example : Wings of bat and bird

52. Plants that have pneumatophores and show vivipary are known as
(1) Mesophytes (2) Halophytes
(3) Psammophytes (4) Hydrophytes

Answer (2)

Sol. Halophytes grow in swampy area, so to carry out respiration some negatively geotropic roots develop to get oxygen called pneumatophores. And because of salty water seed germination starts white it is inside the fruits, which remains attached to the plant. Such condition is called vivipary.

53. Passive immunity is obtained through injecting
(1) Antibiotics (2) Vaccines
(3) Antigens (4) Antibodies

Answer (4)

Sol. When preformed antibodies are injected to provide quick immune response it is called as passive immunisation. Vaccines are antigenic proteins of pathogens that stimulate antibody production in the body. This is called active immunisation.

54. A transition area between two biomes is known as
(1) Ecozone (2) Biotope
(3) Ecotone (4) Buffer zone

Answer (3)

Sol. Ecotone is the transition zone or overlapping zone between two communities. Example- an area of marshland between a river and the river bank.

55. Identify the wrong one.
(1) Mollusca $\rightarrow$ Pseudopodia
(2) Cnidaria $\rightarrow$ Nematocyst
(3) Annelida $\rightarrow$ True coelome
(4) Echinodermata $\rightarrow$ Water vascular system

Answer (1)

Sol. Pseudopodia are cytoplasmic processes found in protozoans like *Amoeba* that help in their movement.

56. Air sacs in birds help in
(1) Double respiration
(2) Increase of body weight
(3) Storage of more food
(4) Loss in lung functions

Answer (1)

Sol. In birds lungs receive fresh air from air sacs during expiration also. It is called as double breathing.

57. Vasopressin is synthesized in
(1) Adenohypophysis
(2) Thyroid
(3) Hypothalamus
(4) Neurohypophysis

Answer (3)

Sol. Vasopressin also called Anti-Diuretic Hormone [ADH] is synthesized in hypothalamus and is released from posterior pituitary / neurohypophysis.

58. The Acharya Jagadish Chandra Bose Indian Botanic Garden is situated in
(1) Shibpur, Howrah (near Kolkata)
(2) Dehradun
(3) Lucknow
(4) Chennai

Answer (1)

Sol. Acharya Jagadish Chandra Bose Indian Botanic Garden previously known as Indian Botanic Garden and the Calcutta Botanic Garden. It exhibits a wide variety of rare plants.

59. Chromosomes are made up of
(1) DNA (2) RNA
(3) Protein (4) All of the above

Answer (4)

Sol. Chromosome composed of DNA, basic proteins histones, RNA and some non-histone proteins.

60. The symbol of WWF (World Wildlife Fund) is
(1) Giant Panda
(2) Tiger
(3) Rhododendron
(4) White Bear

Answer (1)

Sol. The inspiration for the WWF logo come from Chi-Chi : a giant panda that was living at the London Zoo in 1961, the same year WWF was created. Panda symbolizes peace and gentle strength and also good luck and positive thought.

61. "I am the Revolution and I destroyed the Revolution"— Whose speech it was?
(1) Louis XIV
(2) Alexander II
(3) Nepoleon Bonaparte
(4) Bismarck

Answer (3)

Sol. Napoleon Bonaparte

62. Which of the following countries, mentioned was not the member of the Axis power in the First World War?
(1) Germany (2) Austria
(3) Italy (4) Turkey

Answer (3)

Sol. Italy

63. The Russian Revolution took place in
(1) 1789 AD (2) 1857 AD
(3) 1911 AD (4) 1917 AD

Answer (4)

Sol. 1917 AD

64. The first Secretary General of the UNO was
(1) Trygve Lie (2) Ban Ki Moon
(3) Hammer Shield (4) Boutros Boutros Ghali

Answer (1)

Sol. Trygve Lie

65. Sui Munda was the leader of
(1) The Munda Rebellion
(2) The Kol Rebellion
(3) The Chuarh Rebellion
(4) The Santhal Rebellion

Answer (2)

Sol. Kol Rebellion

66. The editor of the 'Bengal Gazette' was
(1) Marshman
(2) Surendranath Bandyopadhyay
(3) James Augustus Hickey
(4) William Carrey

Answer (3)

Sol. James Augustus Hickey

67. The first woman graduate of Calcutta University was
(1) Kadambini Ganguly
(2) Sarala Devi Chaudhurani
(3) Swarna Kumari Devi
(4) Kalpana Dutta

Answer (1)

Sol. Kadambini Ganguly

68. Mr. Allan Octavian Hume, who was the founder of the Indian National Congress was a
(1) Journalist
(2) Civil Servant
(3) Politician
(4) Police

Answer (2)

Sol. Civil Servent

69. The first president of "All India Trade Union Congress" was
(1) Byomkesh Chakraborty
(2) Surendranath Halder
(3) Lala Lajpat Rai
(4) Qutubuddin Ahmed

Answer (3)

Sol. Lala Lajpat Rai

70. 'Vaikom Satyagraha' was started in
(1) Kerala
(2) Andhra Pradesh
(3) Maharashtra
(4) Gujarat

Answer (1)

Sol. Kerala

71. The Poona Pact (1932) was signed between
(1) Gandhiji and Lord Irwin
(2) Gandhiji and B. R. Ambedker
(3) Gandhiji and Chamberlin
(4) Gandhiji and Ramsay Macdonald

Answer (2)

Sol. Gandhiji and B.R. Ambedkar

72. The writer of the book named 'Udbastu' was
(1) Hiranmoy Bandyopadhayay
(2) Prafulla Kumar Chakraborty
(3) Prabhash Chandra Lahiri
(4) Dakshinaranjan Basu

Answer (1)

Sol. Hiranmoy Bandyopadhayay

73. We separate our planet as two hemispheres — East and West. If you want to put your two legs in two hemisphere, then you must visit following country
(1) Italy (2) Germany
(3) Netherlands (4) France

Answer (4)

74.Limestone is an example of
(1) Igneous rock (2) Sedimentary rock
(3) Metamorphic rock (4) None of the above

Answer (2)

75. If the location of Kolkata is 22°30′ North and 88°30′ East, what will be the latitude and longitude of the Antipode of Kolkata ?
(1) 22°30′ South and 88°30′ West
(2) 22°30′ South and 91°30′ West
(3) 58°30′ South and 88°30′ West
(4) 91°30′ South and 108°30′ West

Answer (2)

76. The processes of waste management involve
(1) Reuse of waste
(2) Recycling of waste
(3) Reduction of waste
(4) All of the above

Answer (4)

77. One depositional feature of the Glacier is
(1) Roche Mountonnee
(2) Cravasse
(3) Fjords
(4) Drumlins

Answer (4)

78. Which of the following is not suitable for the character of an 'Isobar' ?
(1) The unit of isobar is millibar
(2) When the isobars are very near to each other, the wind blows faster
(3) When the isobars are not very close to each other, the movement of wind is slower
(4) Sometimes the isobars are perpendicular to each other

Answer (4)

79. Canary current flows along the coast of
(1) Portugal (2) Peru
(3) Japan (4) India

Answer (1)

80. Which of the following is not a right bank tributary of the Ganga river ?
(1) Yamuna (2) Son
(3) Damodar (4) Gomti

Answer (4)

81. Crops grown during April, May and June are known as
(1) Zayed crops (2) Kharif crops
(3) Rabi crops (4) Spring crops

Answer (1)

82. Lamba in Gujarat is famous for
(1) Hydel Power (2) Wind Power
(3) Atomic Power (4) Thermal Power

Answer (2)

83. India's first petro-chemical industry is
(1) UCIL (2) HPL
(3) IPL (4) NOCIL

Answer (4)

84. Diamond Quadrilateral related to
(1) Metro Rail
(2) High Speed Railways
(3) Roadways
(4) Waterways

Answer (2)

85. 'The Prience' was written by
(1) Plato (2) Aristotle
(3) Laski (4) Machiavelli

Answer (4)

86. 'Fundamental Duties' of the citizen of India are described in the Constitution of India under chapter
(1) III (2) IV
(3) V (4) VI

Answer (2)

87. How many members of the Rajya Sabha can be nominated by the President of India ?
(1) 2 (2) 4
(3) 6 (4) 12

Answer (4)

88. The President of India can Proclaim 'National Emergency' according to Article _____.
(1) 350 (2) 352
(3) 356 (4) 360

Answer (2)

89. The 'Joint Session' of the Parliament in India is presided over by the _____.
(1) Vice-President
(2) Speaker of the Lok Sabha
(3) Governor
(4) President

Answer (2)

90. In Parliamentary System of the Cabinet remains responsible to the _____.
(1) President (2) Prime Minister
(3) Legislature (4) Supreme Court

Answer (3)

91. The term of the non-permanent members of the Security Council of the U.N.O. is _____.
(1) 2 years (2) 3 years
(3) 4 years (4) 5 years

Answer (1)

92. The Upper House of the State Legislature is _____.
(1) Legislative Assembly
(2) Legislative Council
(3) Lok Sabha
(4) Rajya Sabha

Answer (1)

93. National Income of a country is the total of
(1) All the incomes of the persons of a country
(2) The income generated by the public sector
(3) The factor incomes
(4) (2) and the total of all incomes from abroad

Answer (3)

94. Which of the following taxes is not useful to lower the inequality in income ?
(1) Goods and Service Tax
(2) Income Tax
(3) Wealth Tax
(4) Profession Tax

Answer (1)

95. In which form of market there is no control on price by an individual seller ?
(1) A market where there is a large number of buyers and large number of sellers
(2) A market where there is a large number of buyers and a single seller
(3) A market where there is a single seller and a single buyer
(4) A market where there is few sellers and a large number of buyers

Answer (1)

96. Suppose, x denotes the rate of interest on the securities sold by Central Bank to Commercial Banks and y denotes the rate of interest on the loans taken by Commercial Banks from Central Bank. Now to lower the capacity of Commercial Banks to provide loans which one is necessary in the time of inflation?
(1) y must be less than x
(2) y must be greater than x
(3) x and y must be equal
(4) It is not dependent on x and y

Answer (2)

97. The earning of a factor of production from an alternative use is known as the _____ of that factor of production.
(1) Money Cost (2) Real Cost
(3) Average Cost (4) Opportunity Cost

Answer (4)

98. If the price elasticity of demand for a goods is inelastic and there is no substitute goods in the market, an increase in its price will cause the total expenditure of consumers of the goods to
(1) Increase (2) Decrease
(3) Remain same (4) Become zero

Answer (3)

99. Which one of the following is not a characteristic of a Capitalist Economy ?
(1) Private Ownership of resources
(2) Freedom of enterprise
(3) Consumer sovereignty
(4) Existence of Central Planning Authority

Answer (4)

100. Human Development Index measures _____ of an economy.
(1) Birth rate
(2) Death rate
(3) Quality of education
(4) Quality of life

Answer (4)

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