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Path to success
KOTA (RAJASTHAN)

Pre Nurture & Career Foundation Division
For Class 6th to 10th, NTSE & Olympiads

SOLUTION
NATIONAL TALENT SEARCH EXAMINATION 2017 Stage-2
MENTAL ABILITY TEST (MAT)

1. Some translated words in an artificial Language (in which the word order is not necessarily same) are given below

mie	pie	sie	good person sing
pie	sie	rie	sing good lyrics
tie	rie	sie	love good lyrics

What is the translation for "person love lyrics" ?

(1) pie tie rie   (2) tie rie sie   (3) rie mie tie   (4) sie mie pie

Ans. (3)

Sol.

mie pie sie   good person sing ....(1)

pie sie rie   sing good lyrics ....(2)

tie rie sie   love good lyrics ....(3)

From (1), (2) & (3) code for <u>good</u> is <u>sie</u>

From (2) & (3) code for <u>lyrics</u> is <u>rie</u>

From (1) & (2) code for <u>sing</u> in <u>pie</u>

So code for a <u>person</u> is <u>mie</u>.

From (3) code for <u>love</u> is <u>tie</u>.

2. In the given sequence, some letters are missing. Which of the given options can fill the blanks in the correct order from left to right ?
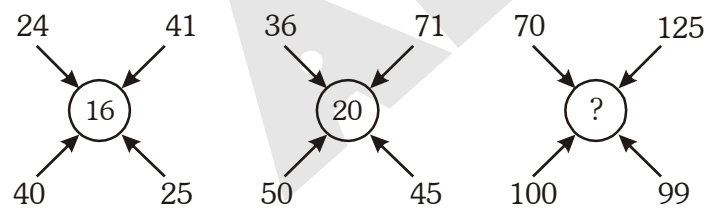
ab_ab_aaa_bbaaa_bbbb

(1) abab   (2) abba   (3) aabb   (4) baba

Ans. (2)

Sol. ab/**a**ab**b**/aaa**b**bb/aaa**a**bbbb

3. Identify the number in the position of '?'
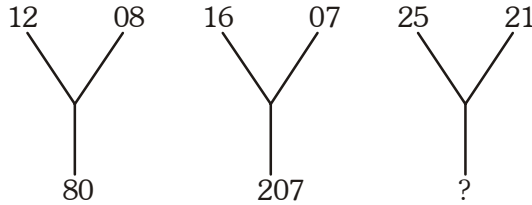

(1) 24   (2) 28   (3) 32   (4) 36

Ans. (2)

Sol. $\dfrac{(41+40)-(24+25)}{2} = 16$

$\dfrac{(71+50)-(36+45)}{2} = 20$

$\dfrac{(125+100)-(70+99)}{2} = 28$

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4. Find the missing number.

| (1) 184 | (2) 210 | (3) 241 | (4) 425 |

Ans. (1)

Sol.

$12^2 - 8^2$	$16^2 - 07^2$	$25^2 - 21^2$
$144 - 64$	$256 - 49$	$625 - 441$
$= 80$	$= 207$	$= 184$

5. If A, B, C, D are distinct decimal digits, then which of the following options is correct ?

$$\begin{array}{r} A\,4\,B\,C \\ \times C \\ \hline 1\,A\,1\,D\,C \end{array}$$

(1) A = 3   B = 7   C = 5   D = 9   (2) A = 2   B = 3   C = 6   D = 5
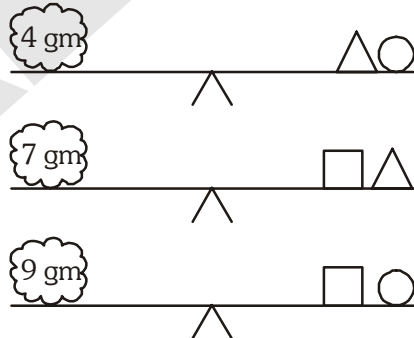(3) A = 3   B = 8   C = 6   D = 5   (4) A = 2   B = 3   C = 5   D = 7

Ans. (4)

Sol.

$$\begin{array}{r} A\,4\,B\,C \\ \times C \\ \hline 1\,A\,1\,D\,C \end{array} \Rightarrow \begin{array}{l} A = 2 \\ B = 3 \\ C = 5 \\ D = 7 \end{array} \quad \begin{array}{r} 2\,4\,3\,5 \\ \times 5 \\ \hline 1\,2\,1\,7\,5 \end{array}$$

6. Observe the following figures representing a balance.

Which of the following figures represents the correct balance ?

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Ans. **(3)**

Sol. $4 = \triangle \bigcirc$ .... (1)

$7 = \square \triangle$ .... (2)

$9 = \square \bigcirc$ .... (3)

From (1) & (2)

$9 = \square + \bigcirc$

$3 = \square - \bigcirc$

$12 = 2 \square$

$\square = 6$

$\triangle = 1$

$\bigcirc = 3$

7. Choose appropriate option from given alternatives such that the relationship defined by ':' is preserved.

PNIJ : LIFC and VTRP : _____

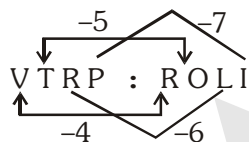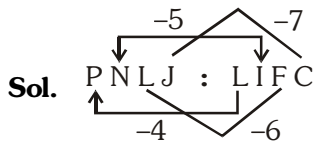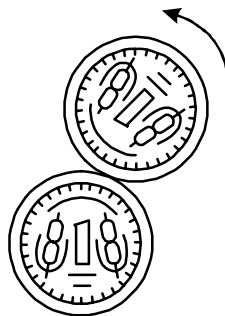(1) ROLI (2) SOLH (3) RPOM (4) DMEN

Ans. **(1)**

Sol.

8. A coin is in a fixed position. Another identical coin is rolled around the edge of the first one. How many complete revolutions will be made by the revolving coin before it reaches its starting position ?

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

Ans. **(2)**

Sol. The point of contact no. both the stationary coin and the rotating coin must move the same distance, half the circumference of the coin.

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9. If South-East becomes North; and North-East becomes West; then West becomes

(1) North – East (2) South – East (3) North – West (4) South – West

Ans. **(2)**

Sol. South-East becomes North → Changes by 135° ACW

West becomes → South east

10. A cube is 6 cm in length, breadth and height. It is painted red on two opposite faces, black on the other two opposite faces and green on the left over faces. It is then cut into 216 cubes of side 1 cm. How many small cubes have no face painted ?

(1) 16 (2) 8 (3) 64 (4) 24

Ans. **(3)**

Sol. $\sqrt[3]{216}$ = 6

Number of small cubes have no face painted = $(6 – 2)^3$ = 64

11. Find the odd–one out of the following terms :

EF22, JK42, GH24, VW90, IJ38

(1) EF22 (2) GH24 (3) IJ38 (4) VW90

Ans. **(2)**

Sol. Sum of positions value of alphabets × 2 = Given number

EF 22 → 5 + 6 = 11 × 2 ⇒ 22

12. Choose the conclusions which logically follow from the given statements.
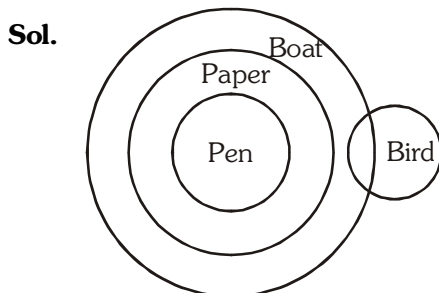
Statement:

All the pens are papers

All the papers are boats

Some birds are boats.

Conclusions :

(A) Some boats are pens

(B) Some birds are papers

(C) None of the pens are birds

(1) Only A and B (2) Only A (3) Only C (4) Only A and C

Ans. **(2)**

Sol.

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13. How many quadrilaterals are there in the given figure ?
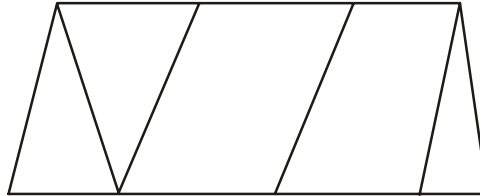
(1) 10 (2) 11 (3) 12 (4) 13

Ans. (3)

Sol.
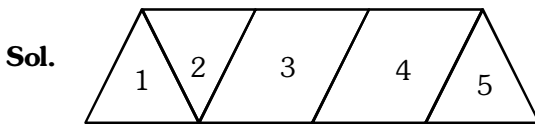
Quadilateral are

12, 123, 1234, 12345
23, 234, 2345
3, 34, 345
4, 45
= 12

14. Which of the following alternatives will fit in place of 'M' ?
255, 3610, 4915, M, 8125

(1) 5100 (2) 5420 (3) 6420 (4) 6422

Ans. (3)

Sol.

5^2 6^2 7^2 8^2 9^2
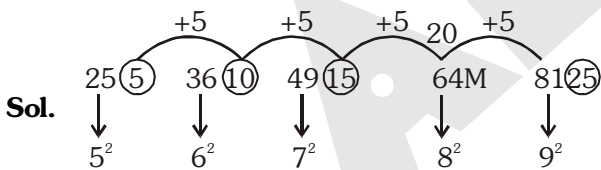
15. Which of the following alternatives will fit in place of 'M' ?
L6, O8, R11, M, X25, A42, D75

(1) U15 (2) U16 (3) W14 (4) U14

Ans. (2)

Sol.

L 6, O 8, R 11, M, X25, A 42, D 75

+3 +3 +3 +3 +3 +3
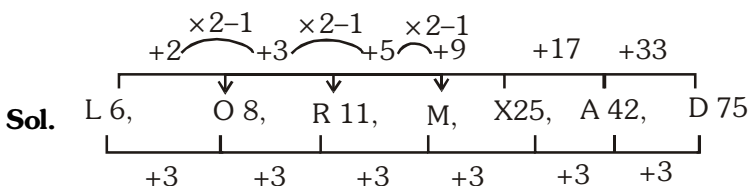
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16. Which of the following alternatives will fit in place of 'M' ?

7	3	6	2
2	8	5	4
1	1	2	4
4	2	1	M

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

Ans. (3)

Sol. $7 + 2 + 1 + 4 = 14$

$3 + 8 + 1 + 2 = 14$

Similarly

$2 + 4 + 4 + M = 14$

$\boxed{M = 4}$

17. If 'Σ' means '$\times$', 'δ' means '$\div$', 'σ' means '$+$' and '$\propto$' means '$-$' then evaluate the following expression usuing standard operator precedence.

$56\delta(6\sigma8)\Sigma4\propto1$

(1) 52   (2) 24   (3) 15   (4) 43

Ans. (3)

Sol. $56 \div (6 + 8) \times 4 - 1$

$56 \div 14 \times 4 - 1$

$4 \times 4 - 1$

$16 - 1 = 15$

18. With what operators, should the symbols @ and < be replaced so that the following expression is valid.

$100 - 81 \div 27 @ 3 < 6 = 115$

(1) + and −   (2) × and ÷   (3) + and ×   (4) ÷ and −

Ans. (3)

Sol. $100 - 81 \div 27 @ 3 < 6 = 115$

$\Rightarrow 100 - 81 \div 27 @ 3 \times 6$

$\Rightarrow 100 - 3 + 18$

$\Rightarrow 100 + 18 - 3$

$\Rightarrow 118 - 3 \Rightarrow 115$

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19. x is an integer such that it leaves a remainder of 2 when divided by 3, leaves a remainder of 3 when divided by 5, and leaves a remainder of 5 when divided by 7. What could be a possible value of x from among the following options ?

(1) 53   (2) 68   (3) 74   (4) 83

Ans. (2)

Sol. According to the questions, the number is

$x = 3Q_1 + 2$

Also, $x = 5Q_2 + 3$

and $x = 7Q_3 + 5$

from above

$x = 3Q_1 + 2 = 5Q_2 + 3 = 7Q_3 + 5$

$\Rightarrow$ On solving we get $Q_1 = 22$, $Q_2 = 13$, $Q_3 = ?$

so the solution is $x = 68$

20. In how many ways can you distribute 10 identical balls into two non-identical boxes so that none are empty ?

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

Ans. (3)

Sol.

Box 1	9	8	7	6	5	4	3	2	1
Box 2	1	2	3	4	5	6	7	8	9

Clearly total ways are 9.

21. One line forms two regions in a plane. Similarily, two lines in a plane can form a maximum of four regions. These are shown in the figures below :
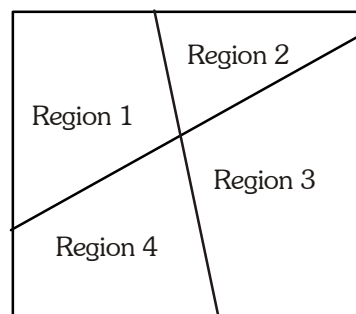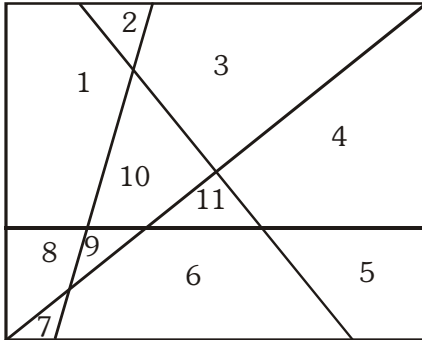

What is the maximum number of regions that can be formed by 4 lines in a plane ? Lines need not be concurrent.

(1) 7   (2) 8   (3) 10   (4) 11

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Ans. (4)

Sol.

22. You need to take n arbitrary points on or inside a square of side 2 cm such that there will always be a pair of points at a distance of not more than $\sqrt{2}$ cm . What is the minimum value of n ?

(1) 2   (2) 4   (3) 5   (4) 8

Ans. (3)

Sol.
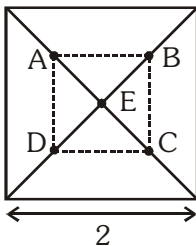
Minimum No. of points inside a square of side 2 cm are A, B, C, D, E whose pairwise distance is not more than $\sqrt{2}$.

23. The following facts are known about an unknown number X:
I : The sum of digits of X is 15.
II : The unit's digit of X is 6.
Then which of the following statement is certainly true about X ?

(1) X is divisible by 3 but not by 6   (2) X is divisible by 6 but not by 9
(3) X is not divisible by 6 but divisible by 9   (4) X is divisible by both 6 and 9

Ans. (2)

Sol. Sum of digit's is divisible by 3 and unit digit is even $\rightarrow$ number is divisible by 6.
and sum of digit is not divisible by 9.

24. The average age of A, B and C is 43 years. Which of the following statements are required to find the eldest among them ?
Statements:
I : Age of C is 65 years.
II : Age of A is 25 years.

(1) I is sufficient   (2) Both I and II are required
(3) I and II together are not sufficient   (4) II is sufficient

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Ans. (1)

Sol. $\dfrac{A+B+C}{3} = 43$ $\therefore$ A + B + C = 129

If C = 65   A + B = 64

Since sum of ages of A + B is less than age of C, hence statement I alone is sufficient.

Direction (Questions 25 – 26)

A class is to be taught five subjects – Hindi, Physics, Chemistry, Biology and Mathematics by five different teachers – A, B, C, D and E in five periods (1 to 5). A teacher can teach in only one of the periods. The following details are available about the teaching.

- A teaches mathematics which is not taught in the first period.
- Physics is taught by D in an even numbered period.
- Chemistry is taught in an odd period, and it precedes mathematics period.
- E teaches in the first period.
- C teaches Chemistry but not in the first or the last periods.
- Hindi is taught in the last period.

Sol.

	Phy	Chem	Bio	Maths	Hindi
A	×	×	×	4	×
B	×	×	×	×	5
C	×	3	×	×	×
D	2	×	×	×	×
E	×	×	1	×	×

25. Which of the following statements is necessarily true?

(1) Third period is of Hindi taught by B

(2) Second period is of Physics taught by C

(3) Fourth period is of Mathematics taught by A

(4) Fifth period of Biology taught by D

Ans. (3)

26. Which subject is taught by B?

(1) Physics   (2) Chemistry   (3) Biology   (4) Hindi

Ans. (4)

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27. A solid metallic cylinder of radius 12 cm and height 175 cm is melted and moulded into another solid cylinder of height 63 cm. What is the radius of the new cylinder?

    (1) 14   (2) 4π (3) 20   (4) 5π

Ans. (3)

Sol. Volume of C_1 = Volume of C_2

$$\pi R_1^2 h_1 = \pi R_2^2 h_2$$

$$12^2 \times 175 = R_2^2 \times 63$$

$$\therefore R_2 = 20$$

28. Choose the option which shows the correct mirror image of the characters given below.

$$D\ I\ V\ E\ R\ T\ 6\ 4\ 7\ 5\ A\ L\ E$$

(1) $D\ I\ \Lambda\ E\ \text{Я}\ \bot\ \text{Ҫ}\ \text{ҍ}\ \lrcorner\ \text{Ƨ}\ \forall\ \Gamma\ E$ (2) $D\ I\ \Lambda\ E\ \text{Я}\ \bot\ 9\ \text{ҍ}\ \lrcorner\ \text{Ƨ}\ \forall\ \Gamma\ E$

(3) $D\ I\ \Lambda\ E\ \text{Я}\ \bot\ \text{Ҫ}\ \text{ҍ}\ \lrcorner\ \text{Ƨ}\ \forall\ \Gamma\ E$ (4) $D\ I\ \Lambda\ E\ \text{Я}\ \bot\ \text{Ҫ}\ \text{ҍ}\ \lrcorner\ \text{Ƨ}\ A\ \Gamma\ E$

Ans. (3)

Sol. By observation

$$D\ I\ \Lambda\ E\ \text{Я}\ \bot\ \text{Ҫ}\ \text{ҍ}\ \lrcorner\ \text{Ƨ}\ \forall\ \Gamma\ E$$

Direction (Questions 29 – 30)

    There are 150 students in a class. 20 students play both hockey and kabaddi. The same numbers of students play only football. 35 students play both hockey and football but not kabaddi. 25 play both football and kabaddi but not hockey. The number of students who play only hockey is the same as the number of students who do not play any of three mentioned games and the number of students who play only hockey is half of the number of students who play only football.

Sol.
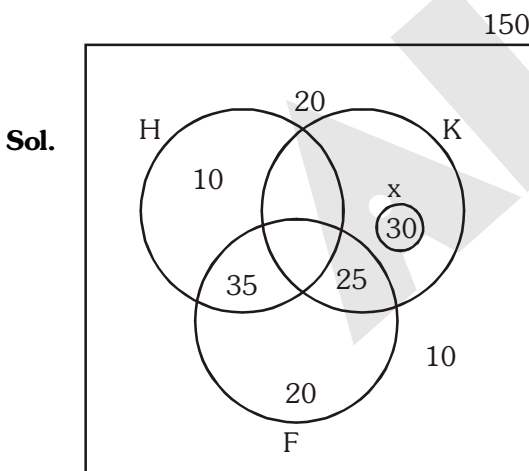
29. How many students play only kabaddi?

    (1) 10   (2) 20   (3) 30   (4) 40

Ans. (3)

30. How many students play only hockey?

    (1) 10   (2) 15   (3) 20   (4) 25

Ans. (1)

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31. What will be the number in the blank box?

1	3
2	14

4	6
5	77

7	9
8	

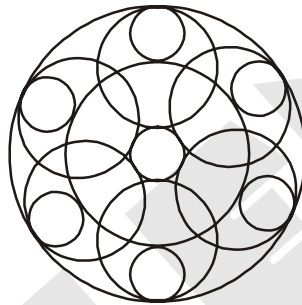(1) 98   (2) 128   (3) 189   (4) 194

Ans. (4)

Sol.
$1^2 + 2^2 + 3^2 = 14$
$4^2 + 5^2 + 6^2 = 77$
$\therefore \ 7^2 + 8^2 + 9^2 = 194$

32. What is the total number of circles in the figure given below?

(1) 13   (2) 14   (3) 15   (4) 16

Ans. (3)

Sol. By observation

33. A bucket contains milk mixed with water, of which 3 parts are water and 5 parts are milk. A part of the mixture is removed from the bucket and is replaced by water. What portion of the mixture should have been removed so that the new mix contains milk and water in equal proportion?

(1) $\dfrac{1}{3}$ (2) $\dfrac{1}{4}$ (3) $\dfrac{1}{5}$ (4) $\dfrac{1}{6}$

Ans. (3)

Sol. let total quantity be x litre

water = $\dfrac{3x}{8}$ lit   milk = $\dfrac{5x}{8}$ lit

let y lit mixture is removed

water removed = $\dfrac{3y}{8}$, milk removed = $\dfrac{5y}{8}$

$\therefore$ According to question.

$$\dfrac{3x}{8} - \dfrac{3y}{8} + y = \dfrac{5x}{8} - \dfrac{5y}{8}$$

on solving we get $\boxed{\dfrac{y}{x} = \dfrac{1}{5}}$

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34. You need to colour the circles in such a way that no two circles connected by a line get the same colour. What is the minimum number of distinct colours needed to colour all the circles in the figure?
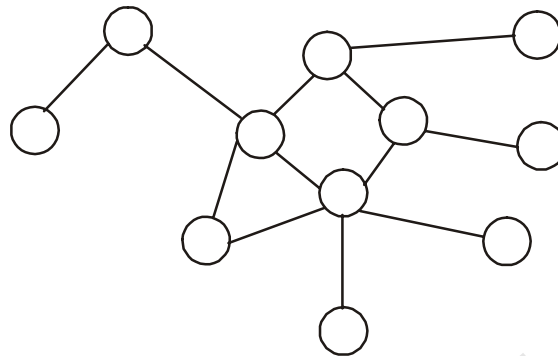
(1) 4   (2) 5   (3) 6   (4) 7

Ans. (1)

Sol.

35. From each box you can move only to the immediate right box or the immediate top box. You cannot move into or through a shaded box. How many ways are there to move from the box marked S to the box marked D?

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

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Ans. (3)
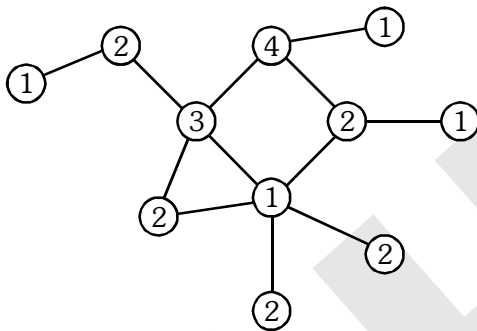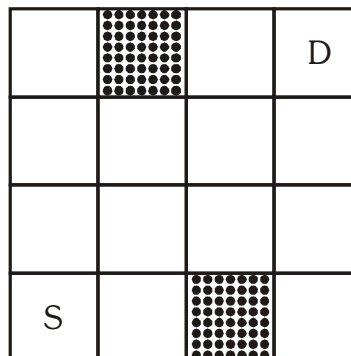
Sol.

	0	5	(12)
1	3	5	7
1	2	2	2
S	1	0	

36. Which number will come in the place of '**M**' ?

16	7	2	20
25	8	2	30
36	9	5	24
49	10	7	M

(1) 21   (2) 32   (3) 40   (4) 63

Ans. (1)

Sol. $\sqrt{16} \times (7-2) = 20$

$\sqrt{25} \times (8-2) = 30$

$\sqrt{36} \times (9-5) = 24$

$\sqrt{49} \times (10-7) = 21$

37. The square of the length of a rod AB is 72 cm². If we place the rod in the corner of a room, so that the end A is always on the edge between the two walls of the corner and the end B is always on the floor, what is the maximum possible area of the triangle formed by the rod, the edge between the walls and the floor?

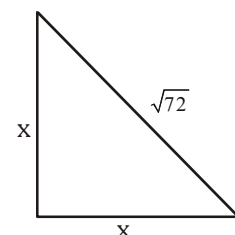(1) 6 cm²   (2) 12 cm²   (3) 18 cm²   (4) 24 cm²

Ans. (3)

Sol. Area of right triangle is maximum, when base is equal to perpendicular.

$x^2 + x^2 = \left(\sqrt{72}\right)^2$

$x = 6$ cm

$\therefore$ Area $= \dfrac{1}{2} \times 6 \times 6 = 18$ cm²

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38. What is the missing term "?" in the following series?

2, 6, 6, 5, 10, 4, 14, 3, 18, ?

(1) 1   (2) 2   (3) 19   (4) 22

Ans. (2)

Sol. Alternate series

2, 6, 10, 14, 18

6, 5, 4, 3, **2**

39. In the question given below, there are two statements followed by two conclusions. You have to take the given statements to be true even if they seem to be at variance from commonly known facts. Read all the conclusions, and then decide which of the given conclusions logically follows from the given statements?

Statements :

Some kings are queens

All the queens are beautiful.

Conclusions:

I . All the kings are beautiful

II. All the queens are kings.

(1) Only I follows   (2) Only II follows

(3) Neither I nor II follows   (4) Both I and II follow

Ans. (3)

Sol.
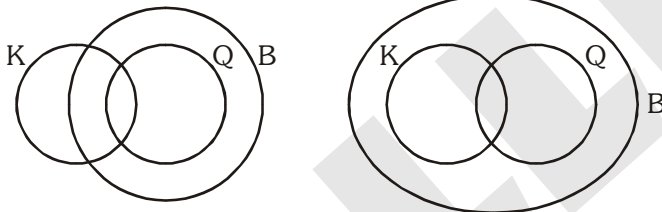
All kings are beautiful → not follows

All the queens are kings → not follows

∴ Neither I nor II follows

40. If prime numbers are assigned to English alphabets from A to Z in order MAT will be :

(1) 31 1 67   (2) 41 1 67   (3) 37 2 71   (4) 41 2 71

Ans. (4)

Sol.

2	3	5	7	11	13	17	19	23	29	31
A	B	C	D	E	F	G	H	I	J	K

37	41	43	47	53	59	61	67	71	73	79
L	M	N	O	P	Q	R	S	T	U	V

83	89	97
W	X	Y

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41. What number comes inside the square in place of '**X**'
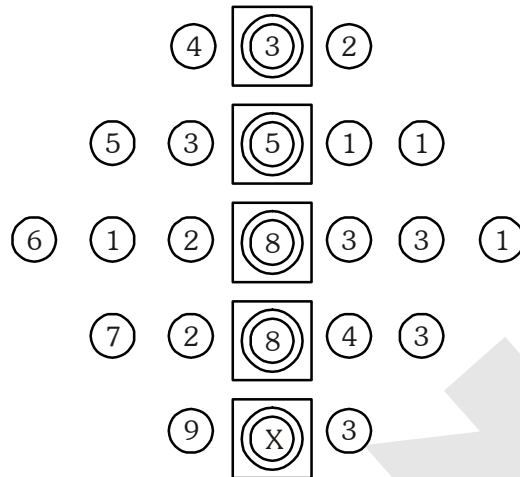
(1) 5   (2) 6   (3) 7   (4) 8

Ans. **(2)**

Sol. $\dfrac{4+2}{2} = 3$, $\dfrac{5+3+1+1}{2} = 5$

$\therefore \dfrac{9+3}{2} = 6$

42. Find the alphabet that will replace '?'

I	2	2	3	1	5
II	3	4	2	4	2
III	H	P	I	?	Y

(1) A   (2) D   (3) O   (4) N

Ans. **(1)**

Sol. $2^3 = 8 = H$

$2^4 = 16 = P$

$3^2 = 9 = I$

$1^4 = 1 = A$

$\boxed{5^2 = 25 = Y}$

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43. In a certain language IMPHAL is coded as JLRFDI. How will MYSURU be coded in the same language?

(1) NXUSUR   (2) RUSUXN   (3) NXSUUR   (4) NXTTUR

Ans. **(1)**

Sol.

I   M   P   H   A   L

+1   −1   +2   −2   +3   −3

J   L   R   F   D   I

∴   M   Y   S   U   R   U

   +1   −1   +2   −2   +3   −3

   N   X   U   S   U   R

44. What time should the IV clock show?
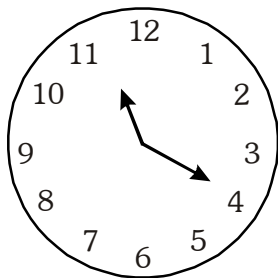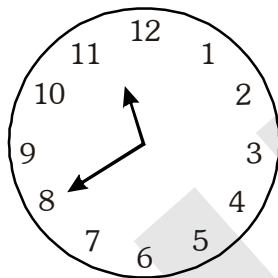
(I)   (I)   (III)
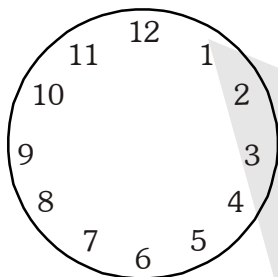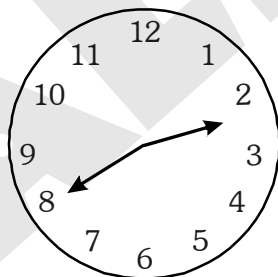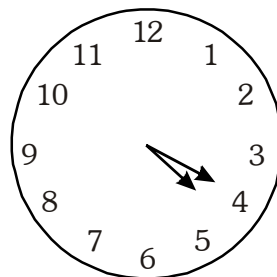
(IV)   (V)   (VI)

(1) 1:00   (2) 1:20   (3) 1:40   (4) 2:00

Ans. **(1)**

Sol.

(I)	11 : 20	+20
(II)	11 : 40	+40
(III)	12 : 20	+60
(IV)	1 : 20	+80
(V)	2 : 40	+100
(VI)	4 : 20	

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45. How many crosses should be there in the box marked with '?'?

(1) 1   (2) 2   (3) 3   (4) 4
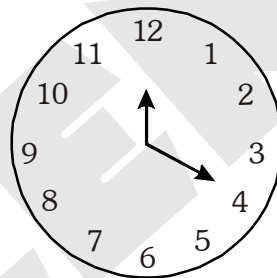
Ans. **(4)**

Sol. Total number of X is the given pair as

4, 6, 8, 10, 12

46. Find the missing term.

a, b, d, __, p

(1) h   (2) i   (3) j   (4) k

Ans. **(1)**

Sol. Pattern is : +1, +2, +4, +8, +16

47. A is East of B and West of C, D is South-West of C, and B is South-East of E.

When seen from West to East, which of the following sequences are possible?

I: EBDAC

II: DEBAC

III: EBADC

IV: EDBAC

(1) I and III   (2) I, III and IV   (3) I, II and III   (4) all, I, II, III and IV

Ans. **(4)**

Sol.
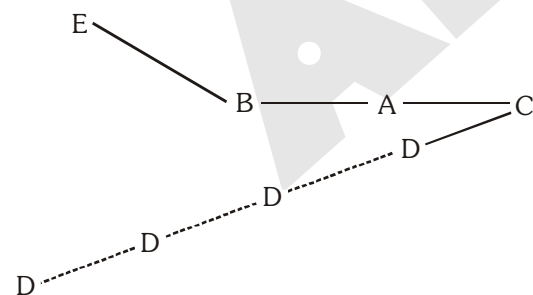
In the above figure when seen from west to east, then possible sequence are -

EBDAC, DEBAC, EBADC, EDBAC

48. A, B, C and D are to be seated in a row. C and D cannot be on adjacent seat. Also, B cannot be at the third place. Which of the following must be false?

(1) A is at the fourth place   (2) A is at the third place

(3) A is at the second place   (4) A is at the first place

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Ans. (4)

Sol.

Clearly, from the figure A will not sit at the first place.

49. Mrs. Kirandeep, a driving instructor, has to arrange training schedule for some of her pupils. She has 8 new pupil who wish to book either a morning or evening of a particular day. The appointment can be given for Tuesday, Wednesday, Friday and Saturday. The instructor instructs only one pupil in morning and one in the evening session.

● Mrs. Sabita is only available Tuesday morning but Mr. Aaditya can make any time on a Wednesday.

● Mrs. Firdaus is free on Tuesday all day but Mr. Naved is only free Wednesday evening.

● Mrs. Seema is only available Friday morning whereas Mrs. Ritu can only make Saturday evening.

● Mrs. Shalu is available all day Fridays whereas Mr. Ronald can make any time on a Saturday.

Which of the following two should have morning appointments?
(1) Mr. Ronald and Mrs. Shalu
(2) Mr. Ronald and Mrs. Firdaus
(3) Mr. Aaditya and Mrs. Firdaus
(4) Mr. Aaditya and Mr. Ronald

Ans. (4)

Sol.

	Tuesday	Wednesday	Thusday	Friday	Saturday
Morning	Mrs.Sabita	Mr.Aaditya		Mrs. Seema	Mr.Ronald
Evening		Mr. Naved		Mrs. Firadus	Mrs. Ritu

Clearly, Mr. Aaditya & Mr. Ronald have morning appointments.

50. Just before sunset Veena and Zeba were talking to each other standing face-to-face. If Veena sees Zeba's shadow to be exactly towards the right of Zeba, which direction was Veena facing?
(1) South
(2) North
(3) East
(4) North-East

Ans. (1)

Sol.