02-A 2015-16 (FOR CLASS-X)

ROLL NO.

MENTAL ABILITY TEST (MAT)
(QUESTION No. 01 – 50)

01
MAT

Time : 45 Minutes **Max. Marks : 50**

INSTRUCTIONS TO CANDIDATES

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

1. Use blue/black ball point pen only. There is no negative marking.
2. This test booklet contains 50 questions of one mark each. All the questions are compulsory.
3. Answer each questions by darkening the one correct alternative among the four choices on the OMR SHEET with black/blue ball point pen.

Example :

Correct way :

Q.No.	Alternatives
1	(1) (2) ● (4)

Wrong way :

Q.No.	Alternatives
1	~~(1)~~ ~~(2)~~ (3)✔ (4)

Student must darken the right oval only after ensuring correct answer on OMR sheet.

4. Students must darken the right oval only after ensuring correct answer on the OMR sheet.
5. Students can not scratch/alter/change out an incorrect 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.
   * Take all your question booklets with you.
8. Darken completely the ovals of your answers 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.

MENTAL ABILITY TEST (MAT)

1. If $\frac{p}{q}+\frac{q}{p}=2$, what is the value of $\left(\frac{p}{q}\right)^{23}+\left(\frac{q}{p}\right)^{7}$

(1) 0 (2) 2 (3) -2 (4) none of these

2. Parth misses a train by 1 hour, if he travels at a speed of 4 km/h. If he increases his speed to 5km/h, he still misses the train by 24 minutes. At what speed he should travel so that he reaches the station exactly on time.

(1) 15 km/h (2) 8 km/h (3) 10 km/h (4) 6 km/h

3. If 3A=4B, 2C=3B, Find A : B : C

(1) 6:8:9 (2) 8:6:9 (3) 9:8:6 (4) 8:9:6

4. Find HCF of $\frac{6}{5},\frac{4}{15},\frac{2}{5}$

(1) $\frac{6}{15}$ (2) $\frac{2}{15}$ (3) $\frac{2}{5}$ (4) $\frac{4}{15}$

5. The present price of car is Rs.7290/-. If its value decreased every year by 10%, then its value three years back was

(1) Rs.11,500/- (2) Rs.10,500/- (3) Rs.10,000/- (4) Rs.8,000/-

6. The simplified value of $\frac{1}{\sqrt{2}+\sqrt{3}-\sqrt{5}}+\frac{1}{\sqrt{2}-\sqrt{3}-\sqrt{5}}$ is

(1) 1 (2) 0 (3) $\sqrt{2}$ (4) $\frac{1}{\sqrt{2}}$

7. $3^{2x-y}=3^{x+y}=\sqrt{27}$, then what will be the value of 3^{x-y}?

(1) $\frac{1}{\sqrt{27}}$ (2) 3 (3) $\frac{1}{\sqrt{3}}$ (4) $\sqrt{3}$

8. In a 100m race, A beats B by 20m or 5 seconds, Find the speed of A

(1) 5 m/sec (2) 4 m/sec (3) 6m/sec (4) 8 m/sec

9. $\sqrt{11\sqrt{11\sqrt{11\sqrt{11.....\infty}}}}$ = ?

(1) $\sqrt[16]{11^{14}}$ (2) $\sqrt[16]{11^{4}}$ (3) 11 (4) $\sqrt[16]{11^{15}}$

10. The unit's digit in the product of first 60 odd natural numbers is

(1) 7 (2) 0 (3) 5 (4) none of these

11. The salary of a worker is first increased by 12% and thereafter it was reduced by 12%, what was the change in the salary

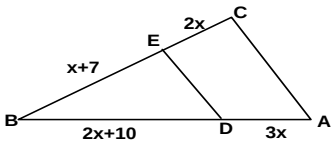
(1) 1.44% decrease (2) 1% increase (3) no change (4) 1.44% increase

12. If $x^{47}+1$ is divided by x^2-1, the remainder will be

(1) $x-1$ (2) $x+1$ (3) x (4) $-x$

13. In the figure given below, DE||AC, find the value of x.

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



14. In the certain examination, 77% candidates passed in English and 34% failed in Mathematics. If 13% failed in both the subjects and 784 candidates passed in both the subjects, then the total number of candidates was

(1) 1200 (2) 1400 (3) 1600 (4) 1800

15. What is the value of $\frac{160}{2\times7}+\frac{160}{7\times12}+\frac{160}{12\times17}+\frac{160}{17\times22}+\frac{160}{22\times27}+\frac{160}{27\times32}$

(1) 17 (2) 15 (3) 13 (4) 11

16. 4 boys and 3 girls spent Rs.120 on the average, of which boys spend Rs.150 on the average, then the average amount spent by girls is

(1) Rs.80 (2) Rs.60 (3) Rs.90 (4) Rs.100

17. An empty pool being filled with water at a constant rate takes 8 hours to fill $\frac{3}{5}$ th of its capacity. How much more time will it take to finish filling the pool?

(1) 5 hours 30 minutes (2) 5 hours 20 minutes
(3) 4 hours 48 minutes (4) 4 hours 50 minutes

18. Value of $x\left[\left(1+\frac{1}{x}\right)\left(1+\frac{1}{x+1}\right)\left(1+\frac{1}{x+2}\right)-1\right]$ is

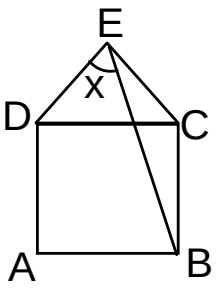
(1) 3 (2) 2x (3) 5x (4) 1

19. If 2tan x = 1, then value of $\frac{\cos x+2\sin x}{\cos x-\sin x}$ is.

(1) 1 (2) 0 (3) 4 (4) 2

20. In the figure given below, equilateral triangle EDC surmounts square ABCD. Find the angle DEB represented by x

(1) 60° (2) 15°
(3) 30° (4) 45°



21. Simplify the value of $\frac{3.75\times3.75+1.25\times1.25-2\times3.75\times1.25}{3.75\times3.75-1.25\times1.25}$

(1) 5.0 (2) 0.5 (3) 2.5 (4) 1.5

22. When my father was 31, I was 8. Now he is twice as old as I am. How old am I?

(1) 23 years (2) 46 years (3) 22 years (4) 24 years

23. Raj wanted to type the first 200 natural numbers, how many times does he have to press the keys

(1) 489 (2) 492 (3) 400 (4) 365

24. The mean of x and $\frac{1}{x}$ is N. Then the mean of x^2 and $\frac{1}{x^2}$ is

(1) N^2 (2) N^2-2 (3) $2N^2-1$ (4) $4N^2-2$

25. Which is the greatest among $\sqrt[6]{100}$, $\sqrt[3]{12}$, and $\sqrt{3}$

(1) $\sqrt{3}$ (2) $\sqrt[6]{100}$ (3) $\sqrt[3]{12}$ (4) cannot be determined

26. In a code language 'TIGER' is written as 'RIGET'. How 'CROWN' will be written in the same code?

(1) NRWCO (2) NROWC (3) ROWRC (4) NOWCR

27. Find the next term in the following series
APZLT, CQYNR, ERXPP, GSWRN, ITVTL.

(1) KUUVJ (2) KVUUJ (3) JUVUR (4) KVUVJ

28. In the following series of numbers, find out how many times 1, 3 and 7 have appeared together, 7 being in the middle and 1 and 3 either side of 7
29731737713317385713771739 06

(1) 3 times (2) 4 times (3) 2 times (4) 5 times

29. If 25th December of 2008 was Thursday, what will be the day on 1st January of 2010?

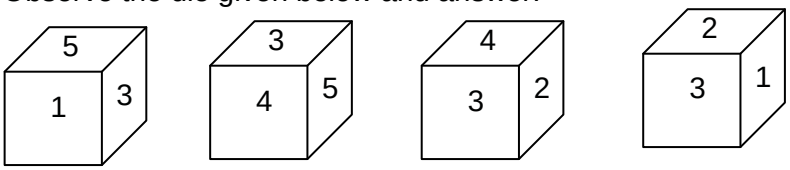
(1) Friday (2) Monday (3) Wednesday (4) Sunday

30. Six faces of a cube are coloured black, brown, green, red, white and blue, such that Red is at the bottom, Brown is adjacent to Black, Black is adjacent to white, Red is opposite to Blue, Green is between Red & Blue. Which colour is opposite to Brown?

(1) Blue (2) Black (3) White (4) Green

Direction (Q. No. 31-32)

Observe the die given below and answer:



31. Which number is opposite to 4

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

32. What is the sum of numbers on two faces when one number is 5 & the other is on its opposite face?

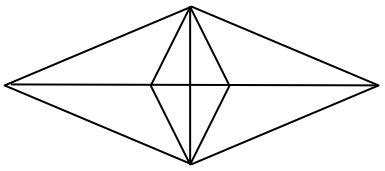
(1) 5 (2) 9 (3) 7 (4) 6

33. Five persons namely P, Q, R, S & T are enjoying picnic sitting in the park. P is mother of R who is wife of T. S is brother of P and Q is the husband of P. How is R related to Q?

(1) Daughter (2) Daughter in Law (3) Son (4) Sister

34. What is the number of triangles in the figure given below:

(1) 22 (2) 24
(3) 16 (4) 18



35. Read the following information carefully and answer the questions given below it:
Six students A, B, C, D, E & F are sitting in a closed circle facing the teacher standing at the centre. E is to the left of the D, C is between A & B. F is between E and A. Who is to the right of C?

(1) A (2) B (3) C (4) D

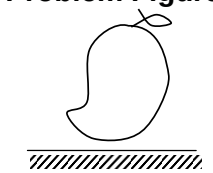
36. During a military training Ashu is seventh from the left and Puru is twelfth from the right in a row. If they interchange their positions, Ashu becomes twenty second from the left. How many candidates are there in the row?
(1) 31 (2) 32 (3) 33 (4) 49

37. A man walked 30m towards south. Then, turned to his right and walked 30m. He again turned to his left and walked 20m. At last he turned to his left and walked 30m. How far is he from his starting point?
(1) 20m (2) 80m (3) 50m (4) 60m

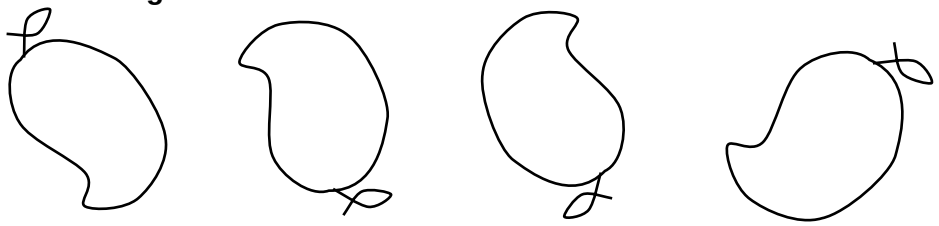
38. Dinesh entered the conference room ten minutes before 12:30 hours for meeting. He came 20 minutes before Naresh who was 30 minutes late. At what time, the meeting was scheduled?
(1) 12:10 (2) 12:20 (3) 12:40 (4) 12:50

Direction for Question Number 39, 40
Choose the correct mirror image of the given figures from the alternatives when the mirror is at MN

39. **Problem Figure**



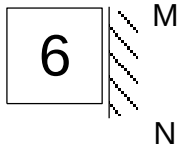
Answer Figure



(a) (b) (c) (d)

(1) a (2) b (3) d (4) c

40. **Problem figure**



Answer figure

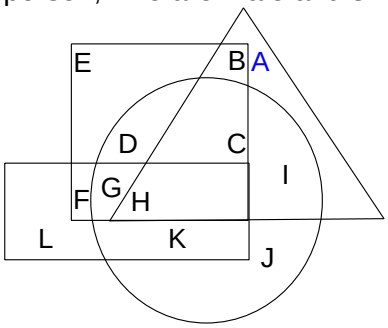
(a) (b) (c) (d)

(1) d (2) b (3) c (4) a

41. If 1×2 = 32, 4×3 = 712, 4×7 = 1128 then 5×1 will be equal to
(1) 63 (2) 64 (3) 65 (4) 66

42. If '+' means '–', '–' means 'x', 'x' means '÷' and '÷' means '+' then 15×3 ÷5+5–2 equals
(1) 2 (2) 0 (3) 1 (4) 5

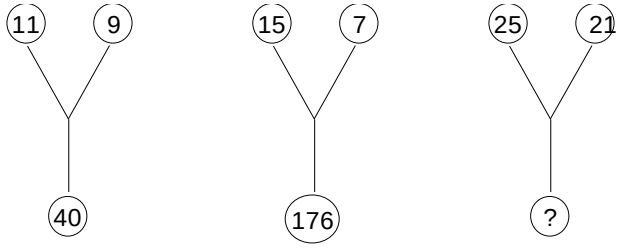
43. In the following diagram, the square represents girls, the circle represents tall person, the triangle is for tennis player and the rectangle stands for swimmers. Which letter represents tall person, who are male and swimmers but do not play tennis?



(1) I (2) J (3) K (4) L

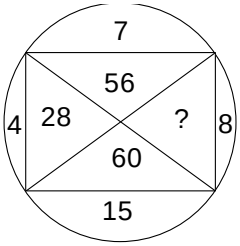
Directions (Question Number 44–46)
Which one will replace the question mark?

44.



(1) 105 (2) 184 (3) 255 (4) 196

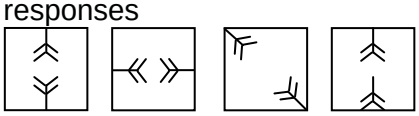
45.



(1) 18 (2) 33 (3) 120 (4) 145

46. 3,15, 35, ——?——, 99, 143
(1) 48 (2) 63 (3) 80 (4) 95

47. Directions (Question No. 47–48)
In each of the following questions select the one which is different from the other three responses



(a) (b) (c) (d)

(1) a (2) b (3) c (4) d

48.

121	231	341	301

(a) (b) (c) (d)

(1) d (2) c (3) b (4) a

49. If $324 + 289 = 35$

$441 + 484 = 43$

$625 + 400 = 45$

Then $256 + 729 = ?$

(1) 35 (2) 34 (3) 33 (4) 43

50. 'P' indicates '+', 'R' indicates '÷' 'T' indicates '–' and 'w' indicates 'x', then what will be the value of the following expression 40R8W10T12P16

(1) 50 (2) 30 (3) 70 (4) 54

NTSE
STAGE I (MAT)
HINTS & SOLUTIONS

1. 2

Sol. $p^2 + q^2 = 2pq$

$p^2 + q^2 - 2pq = 0$

$(p-q)^2 = 0$

p = q

$\left(\frac{p}{q}\right)^{23} + \left(\frac{q}{p}\right)^{7}$

= 1 + 1 = 2

2. 4

Sol. Let distance be d.

$\therefore \frac{d}{4} - \frac{d}{5} = \frac{36}{60}$

$\frac{d}{20} = \frac{36}{60}$

d = 12 km

$\therefore$ Actual time to reach on time = $\frac{12}{4} - 1$= 2 hrs

$\therefore$ Required speed = 6 km/hr

3. 2

Sol. 3A = 4B, 2C = 3B

$\frac{A}{B} = \frac{4}{3} = \frac{8}{6}, \frac{B}{C} = \frac{2}{3} = \frac{6}{9}$

$\therefore$ A : B : C = 8 : 6 : 9

4. 2

Sol. HCF = $\frac{\text{hcf}(6,4,2)}{\text{lcm}(5,15,5)}$

= 2/15

5. 3

Sol. $7290 = x\left(1 - \frac{10}{100}\right)^3$

$7290 = x\left(\frac{9}{10}\right)^3$

$\frac{7290 \times 1000}{729} = x$

x = Rs 10000

6. 4

Sol. $\frac{1}{\sqrt{2}+\sqrt{3}-\sqrt{5}} + \frac{1}{\sqrt{2}-\sqrt{3}-\sqrt{5}}$

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

$$= \frac{2\left(\sqrt{2}-\sqrt{5}\right)}{\left(\sqrt{2}-\sqrt{5}\right)^2-\left(\sqrt{3}\right)^2}$$

$$= \frac{2\left(\sqrt{2}-\sqrt{5}\right)}{7-2\sqrt{10}-3}$$

$$= \frac{2\left(\sqrt{2}-\sqrt{5}\right)}{4-2\sqrt{10}}$$

$$= \frac{2\left(\sqrt{2}-\sqrt{5}\right)}{2\sqrt{2}\left(\sqrt{2}-\sqrt{5}\right)} = \frac{1}{\sqrt{2}}$$

7. 4

Sol. $3^{2x-y} = 3^{x+y} = \sqrt{27} = 3^{3/2}$

$$2x-y = x+y = \frac{3}{2}$$

$$2x-y = \frac{3}{2}$$

And $x + y = \frac{3}{2}$

$x = 1, y = ½$

$\therefore\ 3^{x-y} = 3^{1/2} = \sqrt{3}$

8. 1

Sol. Speed of A = a m/s

Speed of B = b m/s

$$\therefore\ \frac{100}{b}-\frac{100}{a}=5 \text{ and } \frac{80}{b}=\frac{100}{a}$$

$$= \frac{a}{b}=\frac{5}{4}\Rightarrow b=\frac{4a}{5}$$

$$\frac{100}{\frac{4a}{5}}-\frac{100}{a}=5$$

Solving, we get a = 5 m/s

9. 3

Sol. $\sqrt{11\sqrt{11\sqrt{11\sqrt{11...\infty}}}} = x$

$$x^2 = 11x$$

$$x^2-11x=0$$

$$x(x-11)=0$$

$$x\neq 0,\Rightarrow x=11$$

10. 3

Sol. Since there are only odd multiples of 5, unit digit in the product will be 5.

11. 1

Sol. Final change = reduction by $\left(\frac{12}{100}^2\right)\%$

= reduction by 1.44%

12. 2

Sol. Let the remainder be ax + b

$f(1) \Rightarrow 2 = a + b$

$f(-1) \Rightarrow 0 = -a + b$

$\Rightarrow 2b = 2$

$b = 1, a = 1$

$\therefore$ Remainder = x + 1

13. 3

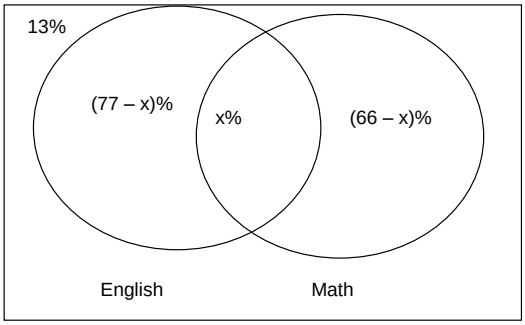
Sol. $\frac{x+7}{2x} = \frac{2x+10}{3x}$ {basic proportionality theorem}

$\Rightarrow 3x + 21 = 4x + 20$

$\Rightarrow x = 1$

14. 2

Sol.



$13 + 77 - x + x + 66 - x = 100$

$156 - x = 100$

$x = 56$

$\therefore$ 56% of total = 784

Total = $\frac{784 \times 100}{56} = 1400$

15. 2

Sol. $\frac{160}{2\times7} + \frac{160}{7\times12} + \frac{160}{12\times17} + \ldots \frac{160}{27\times32}$

$= 32\left[\frac{5}{2\times7} + \frac{5}{7\times12} + \ldots + \frac{5}{27\times32}\right]$

$= 32\left[\frac{1}{2} - \frac{1}{7} + \frac{1}{7} - \frac{1}{12} + \ldots + \frac{1}{27} - \frac{1}{32}\right]$

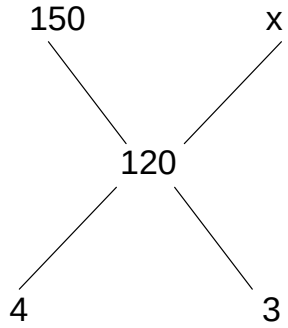
$= 32\left[\frac{1}{2} - \frac{1}{32}\right]$

$= 32\left[\frac{16-1}{32}\right]$

$= 15$

16. 1

Sol. By rule of allegation



$$\frac{150-120}{120-x}=\frac{3}{4}$$

$$\Rightarrow \frac{30}{120-x}=\frac{3}{4}$$

$\Rightarrow 120 - x = 40$

$\Rightarrow x = 80$

17. 2

Sol. $$\frac{8}{3/5}=\frac{x}{2/5}$$

x = 16/3 hours

= 5 hours 20 minutes

18. 1

Sol. $$x\left[\left(1+\frac{1}{x}\right)\left(1+\frac{1}{x+1}\right)\left(1+\frac{1}{x+2}\right)-1\right]$$

$$= x\left[\frac{x+1}{x}.\frac{x+2}{x+1}.\frac{x+3}{x+2}-1\right]$$

$$= x\left[\frac{x+3}{x}-1\right]$$

$$= x\left[\frac{x+3-x}{x}\right]$$

= 3

19. 3

Sol. tan x = ½

$$\frac{\cos x+2\sin x}{\cos x-\sin x}=\frac{1+\frac{2\sin x}{\cos x}}{1-\frac{\sin x}{\cos x}}\left(\text{dividing numerator and denominator by } \cos x\right)$$

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

$$= \frac{1+1}{1-\frac{1}{2}} = 4$$

20. 4

Sol. EC = BC

$\angle BCE = 90 + 60 = 150^o$

$\angle CEB = \angle CBE = 15^o$

$\Rightarrow x = 45^o$

21. 2

Sol. $\dfrac{(3.75)^2+(1.25)^2-2\times(3.75)(1.25)}{(3.75)^2-(1.25)^2}$

$= \dfrac{3.75-1.25}{3.75+1.25}=\dfrac{2.5}{5}=\dfrac{1}{2}=0.5$

$\left[\because \dfrac{(a-b)^2}{a^2-b^2}=\dfrac{a-b}{a+b}\right]$

22. 1

Sol. Let my present age be x

Difference of ages = 31 – 8 = 23

$\therefore$ father = x + 23

x + 23 = 2 x

x = 23

23. 2

Sol. Number of digits used = $(1\times 9)+(2\times 90)+(3\times 101)=492$

24. 3

Sol. $x+\dfrac{1}{x}=2N$

$x^2+\dfrac{1}{x^2}+2=4N^2$

$x^2+\dfrac{1}{x^2}=4N^2-2$

$\therefore$ mean of x^2 and $\dfrac{1}{x^2}=\dfrac{1}{2}\left(4N^2-2\right)=2N^2-1$

25. 3

Sol. $100^{1/6},12^{1/3},3^{1/2}$

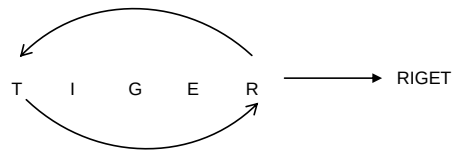
$\Rightarrow (100)^{1/6},\left(12^2\right)^{1/6},\left(3^3\right)^{1/6}$

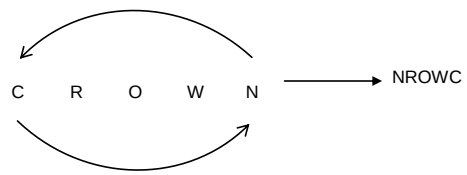
$\Rightarrow 100^{1/6},144^{1/6},27^{1/6}$

$\therefore$ greatest = $12^{1/3}=\sqrt[3]{12}$

26. 2

Sol.





27. 1

Sol. The pattern is +2, +1, –1, +2, –2 respectively of letters as in the English Alphabet.

28. 1

Sol. 3 times

2 9 7 3 1 7 3 7 7 1 3 3 1 7 3 8 5 7 1 3 7 7 1 7 3 9 0 6

29. 1

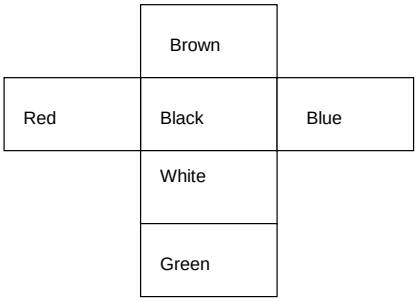
Sol. 25^{th} December 2008 $\rightarrow$ Thursday

1^{st} January 2009 $\rightarrow$ Thursday

1^{st} January 2010 $\rightarrow$ Friday

30. 3

Sol. The net of the cube that is formed is like



$\therefore$ Brown is opposite white.

31. 1

Sol. adjacent to 3 $\rightarrow$ 1, 5, 4, 2

$\Rightarrow$ opposite to 3 $\rightarrow$ 6

adjacent to 4 $\rightarrow$ 3, 6, 5, 2

$\Rightarrow$ opposite to 4 $\rightarrow$ 1

$\Rightarrow$ opposite to 5 $\rightarrow$ 2

32. 3

Sol. 2 is opposite to 5

So, sum of the two numbers is 7.

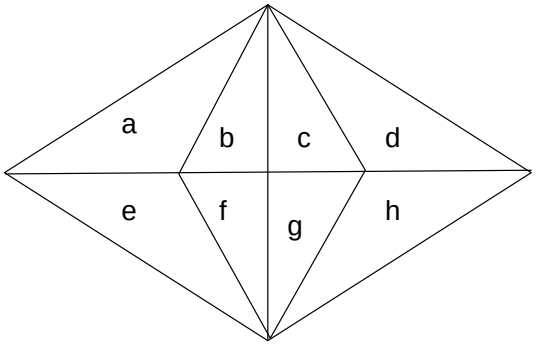
33. 1

Sol. Q is P's husband and R is P's daughter.

$\Rightarrow$ R is daughter of Q

34. 2

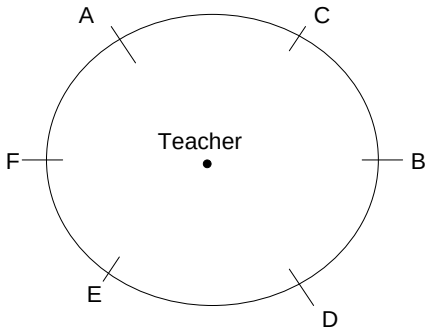
Sol.



The triangles are: a, b, c, d, e, f, g, h, ab, bc, cd, ef, fg, gh, bf, cg, abc, bcd, efg, fgh, abcd, efgh, abef, cdgh

35. 1

Sol.



$\therefore$ A is to the right of C.

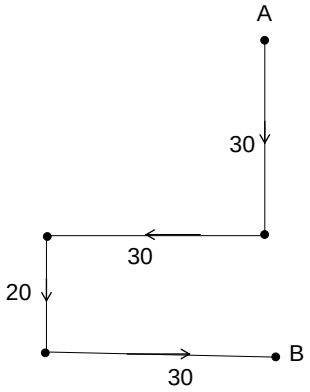
36. 3

Sol. Puru's position = 12^{th} from right = 22^{nd} from left.

$\therefore$ Number of students = 22 + 12 – 1 = 33

37. 3

Sol.



The distance between A and B = 30 + 20 = 50 m.

38. 1

Sol. Dinesh entered at 12:20.

$\Rightarrow$ Naresh entered at 12:40

$\Rightarrow$ meeting time = 12:10

39. 2

Sol. By observation.

40. 3

Sol. By observation.

41. 3

Sol. Pattern is:-

a x b = (sum of a, b) (product of a, b)

42. 2

Sol. $15 \times 3 \div 5 + 5 - 2$

$\Rightarrow 15 \div 3 + 5 - 5 \times 2$

= 5 + 5 – 10

= 0

43. 3

Sol. The required region is the region outside square and triangle but common to rectangle and

44. 2

Sol. $11^2 - 9^2 = 40$

Similarly, answer = 25^2 - 21^2

= 184

45. 3

Sol. 7 x 8 = 56

15 x 4 = 60

7 x 4 = 28

$\Rightarrow$ missing number = 8 x 15 = 120

46. 2

Sol. 1 x 3, 3 x 5, 5 x 7, 7 x 9, 9 x 11, 11 x 13

47. 4

Sol. In all other figures, the two inner elements are identical but rotated.

48. 1

Sol. In all except 301, difference of first two digits is the third digit.

49. 4

Sol. The pattern is $a + b = \sqrt{a} + \sqrt{b}$

$\therefore$ Answer = 16 + 27 = 43

50. 4

Sol. 40 R 8 W 10 T 12 P 16

$\Rightarrow$ 40 $\div$ 8 x 10 – 12 + 16

= 54