



LAYING THE FOUNDATION

NATA MOCK PAPER -2

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SECTION 1A-(MATHEMATICS)

1. The sum to infinity of the progression $9 - 3 + 1 - \frac{1}{3} + \dots$ is
 - 1) 9
 - 2) $\frac{9}{2}$
 - 3) $\frac{27}{4}$
 - 4) $\frac{15}{2}$

2. If ${}^n C_{12} = {}^n C_6$ then ${}^n C_2 = \dots$
 - 1) 72
 - 2) 153
 - 3) 306
 - 4) 2556

3. The middle term in the expansion of $\left(x - \frac{1}{x}\right)^{18}$ is
 - 1) ${}^{18}C_9$
 - 2) $-{}^{18}C_9$
 - 3) ${}^{18}C_{10}$
 - 4) $-{}^{18}C_{10}$

4. If α, β, γ are the roots of the equation $2x^3 - 3x^2 + 6x + 1 = 0$, then $\alpha^2 + \beta^2 + \gamma^2$ is equal to
 - 1) $-\frac{15}{4}$
 - 2) $\frac{15}{4}$
 - 3) $\frac{9}{4}$
 - 4) 4

5. The digit in the units place in the number 7^{289} is
 - 1) 9
 - 2) 7
 - 3) 1
 - 4) 3

6. When 2^{301} is divided by 5, the least positive remainder is
 - 1) 4
 - 2) 8
 - 3) 2
 - 4) 6

7. The contrapositive of "If two triangles are identical, then these are similar" is
 - 1) If two triangles are not similar then these are not identical.
 - 2) If two triangles are not identical then these are not similar.
 - 3) If two triangles are not identical then these are similar.
 - 4) If two triangles are not similar then these are identical.

8. The contrapositive of the inverse of $p \rightarrow \sim q$ is

1) $\sim q \rightarrow p$

2) $p \rightarrow q$

3) $\sim q \rightarrow \sim p$

4) $\sim p \rightarrow \sim q$

9. The converse of the contrapositive of $p \rightarrow q$ is

1) $\sim p \rightarrow q$

2) $p \rightarrow \sim q$

3) $\sim p \rightarrow \sim q$

4) $\sim q \rightarrow p$

10. If ω is a complex cube-root of unity then, $\begin{vmatrix} 1 & \omega & \omega^2 \\ \omega & \omega^2 & 1 \\ \omega^2 & 1 & \omega \end{vmatrix}$ is equal to

1) -1

2) 1

3) 0

4) ω

11. The solutions of the equation $\begin{vmatrix} x & 2 & -1 \\ 2 & 5 & x \\ -1 & 2 & x \end{vmatrix} = 0$ are

1) $3, -1$

2) $-3, 1$

3) $3, 1$

4) $-3, -1$

12. If $A = \begin{bmatrix} 3 & 5 \\ 2 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 17 \\ 0 & -10 \end{bmatrix}$ then, $|AB|$ is equal to

1) 80

2) 100

3) -110

4) 92

13. The inverse of the matrix $\begin{bmatrix} 5 & -2 \\ 3 & 1 \end{bmatrix}$ is

1) $\frac{1}{11} \begin{bmatrix} 1 & 2 \\ -3 & 5 \end{bmatrix}$

2) $\begin{bmatrix} 1 & 2 \\ -3 & 5 \end{bmatrix}$

3) $\frac{1}{13} \begin{bmatrix} -2 & 5 \\ 1 & 3 \end{bmatrix}$

4) $\begin{bmatrix} 1 & 3 \\ -2 & 5 \end{bmatrix}$

14. The projection of the vector $2\hat{i} + \hat{j} - 3\hat{k}$ on the vector $\hat{i} - 2\hat{j} + \hat{k}$ is

1) $-\frac{3}{\sqrt{14}}$

2) $\frac{3}{\sqrt{14}}$

3) $-\sqrt{\frac{3}{2}}$

4) $\frac{3}{\sqrt{2}}$

15. A unit vector perpendicular to the plane containing the vectors $\hat{i} - \hat{j} + \hat{k}$ and $-\hat{i} + \hat{j} + \hat{k}$ is

1) $\frac{\hat{i} - \hat{j}}{\sqrt{2}}$

2) $\frac{\hat{i} + \hat{k}}{\sqrt{2}}$

3) $\frac{\hat{j} - \hat{k}}{\sqrt{2}}$

4) $\frac{\hat{i} + \hat{j}}{\sqrt{2}}$

16. If \hat{a} , \hat{b} and \hat{c} are mutually perpendicular unit vectors, then $|\hat{a} + \hat{b} + \hat{c}|$ is equal to

1) 3

2) $\sqrt{3}$

3) $\sqrt{a^2 + b^2 + c^2}/3$

4) 1

17. The identity element in the group $M = \left\{ \begin{pmatrix} x & x \\ x & x \end{pmatrix} \mid x \in R, x \neq 0 \right\}$ with respect to matrix multiplication is

1) $\begin{pmatrix} 1 & 1 \\ 1 & 1 \end{pmatrix}$

2) $\frac{1}{2} \begin{pmatrix} 1 & 1 \\ 1 & 1 \end{pmatrix}$

3) $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$

4) $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$

18. In the group $G = \{1, 3, 7, 9\}$ under multiplication modulo 10, the inverse of 3 is

1) 1

2) 3

3) 7

4) 9

19. In the group $\{0, 1, 2, 4, 5\}$ under addition modulo 6 a subgroup is

1) $\{0, 2, 5\}$

2) $\{1, 4, 5\}$

3) $\{0, 1, 3\}$

4) $\{0, 2, 4\}$

20. In the group $(\mathbb{Q}^+, *)$ of positive rational numbers w.r.t. the binary operation $*$ defined

$a * b = \frac{ab}{3} \forall a, b \in \mathbb{Q}^+$ the solution of the equation $5 * x = 4^{-1}$ in \mathbb{Q}^+ is

1) $\frac{27}{20}$

2) $\frac{20}{27}$

3) $\frac{1}{20}$

4) 20

21. $(0, -1)$ and $(0, 3)$ are two opposite vertices of a square. The other two vertices are
- 1) $(0, 1)$, $(0, -3)$
 - 2) $(3, -1)$, $(0, 0)$
 - 3) $(2, 1)$, $(-2, 1)$
 - 4) $(2, 2)$, $(1, 1)$
22. The equation to the line bisecting the join of $(3, -4)$ and $(5, 2)$ and having its intercepts on the x -axis and the y -axis in the ratio $2 : 1$ is
- 1) $x + y - 3 = 0$
 - 2) $2x - y = 9$
 - 3) $x + 2y = 2$
 - 4) $2x + y = 7$
23. The distance between the pair of parallel lines $x^2 + 2xy + y^2 - 8ax - 8ay - 9a^2 = 0$ is
- 1) $2\sqrt{5}a$
 - 2) $\sqrt{10}a$
 - 3) $10a$
 - 4) $5\sqrt{2}a$
24. The equation to the circle with centre $(2, 1)$ and touching the line $3x + 4y = 5$ is
- 1) $x^2 + y^2 - 4x - 2y + 5 = 0$
 - 2) $x^2 + y^2 - 4x - 2y - 5 = 0$
 - 3) $x^2 + y^2 - 4x - 2y + 4 = 0$
 - 4) $x^2 + y^2 - 4x - 2y - 4 = 0$
25. The condition for a line $y = 2x + c$ to touch the circle $x^2 + y^2 = 16$ is
- 1) $c = 10$
 - 2) $c^2 = 80$
 - 3) $c = 12$
 - 4) $c^2 = 64$
26. The two circles $x^2 + y^2 - 2x + 22y + 5 = 0$ and $x^2 + y^2 + 14x + 6y + k = 0$ intersect orthogonally provided k is equal to
- 1) 47
 - 2) -47
 - 3) 49
 - 4) -49
27. The radius of the circle $x^2 + y^2 + 4x + 6y + 13 = 0$ is
- 1) $\sqrt{26}$
 - 2) $\sqrt{13}$
 - 3) $\sqrt{23}$
 - 4) 0
28. The centre of the circle $x = 2 + 3 \cos \theta$, $y = 3 \sin \theta - 1$ is
- 1) $(3, 3)$
 - 2) $(2, -1)$
 - 3) $(-2, 1)$
 - 4) $(-1, 2)$
29. The sum of the focal distances of any point on the conic $\frac{x^2}{25} + \frac{y^2}{16} = 1$ is
- 1) 10
 - 2) 9
 - 3) 41
 - 4) 18

30. The eccentricity of the hyperbola $\frac{x^2}{16} - \frac{y^2}{25} = 1$ is

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

2) $\frac{3}{5}$

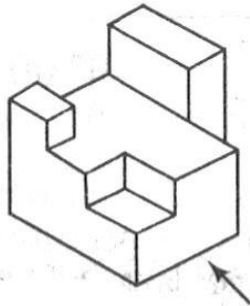
3) $\frac{\sqrt{41}}{4}$

4) $\frac{\sqrt{41}}{5}$

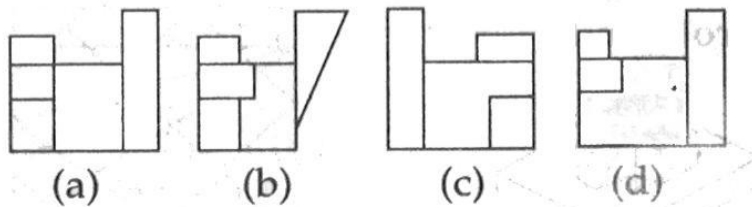
SECTION 1B-(MENTAL ABILITY)

31. The 3-D problem figure shows an object. Identify the correct front view, from amongst the answer figures, looking in the direction of arrow?

Problem figure

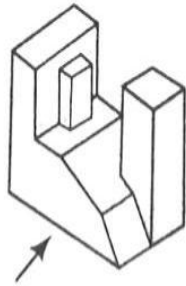


Answer Figures

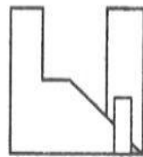


32. The 3-D problem figure shows an object. Identify the correct front view, from amongst the answer figures, looking in the direction of arrow?

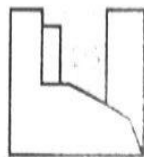
Problem figure



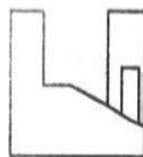
Answer Figures



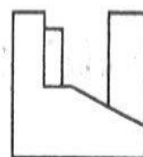
(a)



(b)



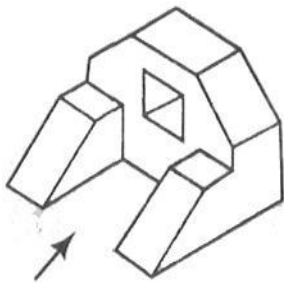
(c)



(d)

33. The 3-D problem figure shows an object. Identify the correct front view, from amongst the answer figures, looking in the direction of arrow?

Problem figure



Answer Figures



(a)



(b)



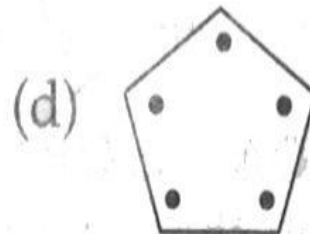
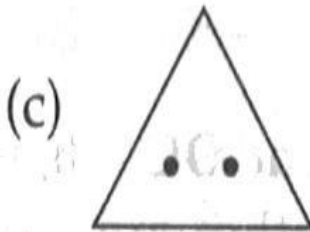
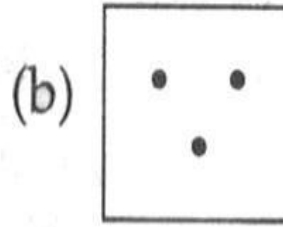
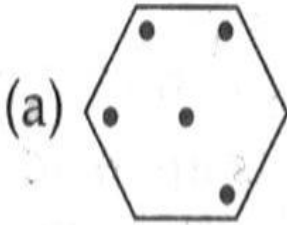
(c)



(d)

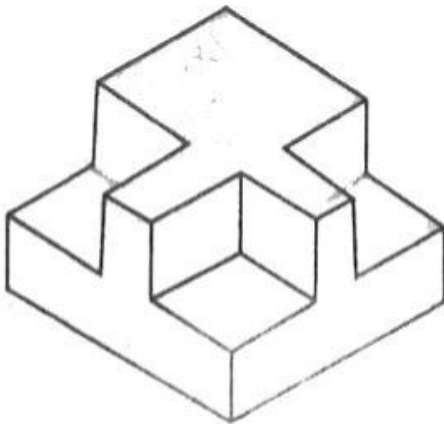
34. Find the odd figure out in the problem figure given below?

Problem figure



35. Find out the total number of surfaces of the object given below in the problem figure?

Problem figure



(a) 15

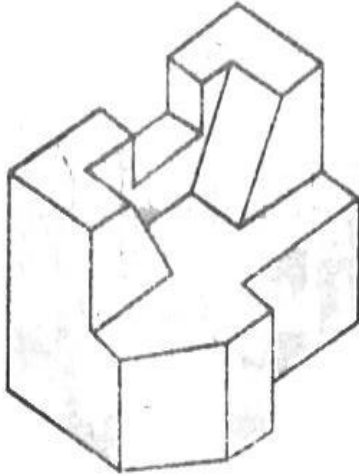
(b) 12

(c) 13

(d) 14

36. Find out the total number of surfaces of the object given below in the problem figure?

Problem figure



(a) 20

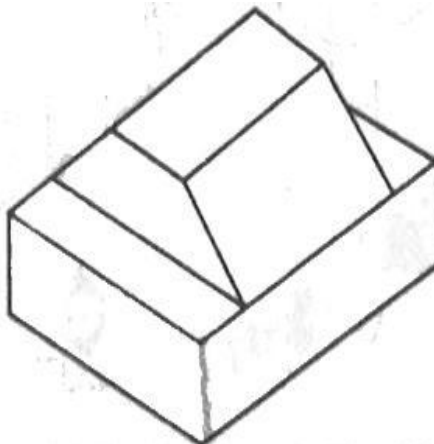
(b) 17

(c) 19

(d) 18

37. Find out the total number of surfaces of the object given below in the problem figure?

Problem figure



(a) 12

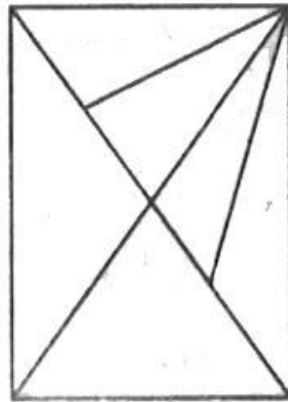
(b) 15

(c) 14

(d) 13

38. How many total number of triangles are there in the problem figure below?

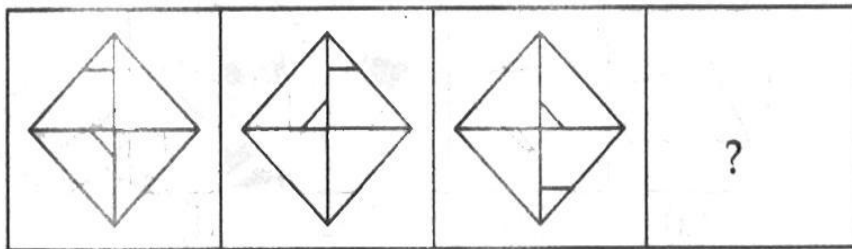
Problem figure



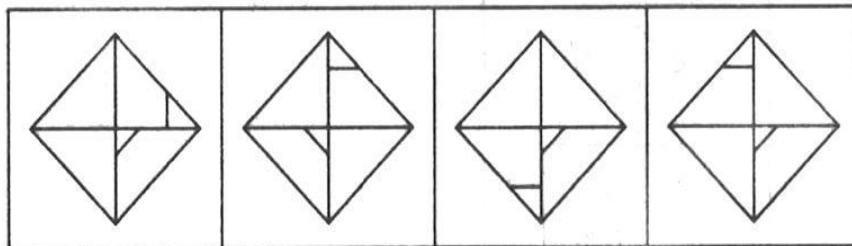
- (a) 13 (b) 15 (c) 14 (d) 16

39. Which one of the answers figures will complete the sequence of the theproblem figures?

Problem figure



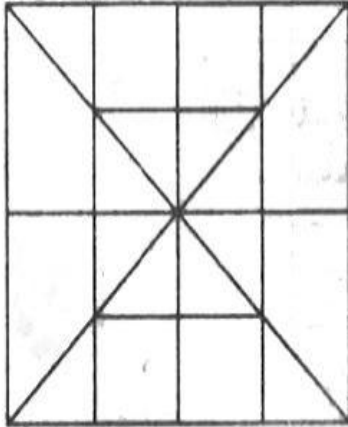
Answer Figures



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

40. How many total number of squares are there in the problem figure given below?

Problem figure

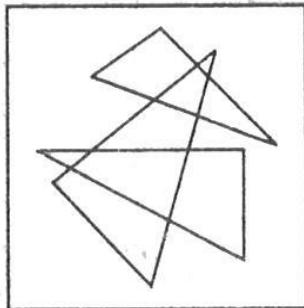


- (a) 20
- (c) 16

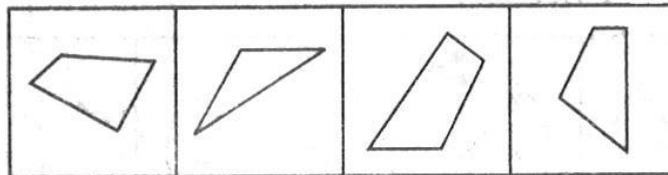
- (b) 13
- (d) 19

41. One of the following answer figures is hidden in the problem figure, in the same size and direction. Select, which one is correct?

Problem figure



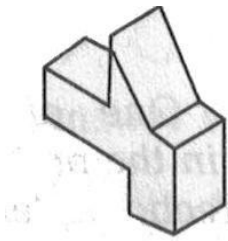
Answer Figures



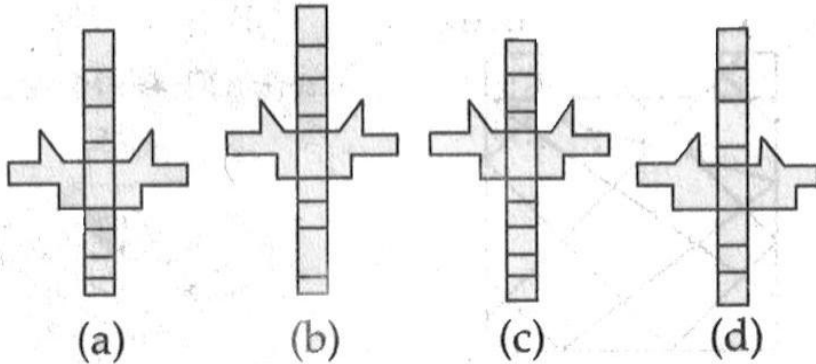
- (a)
- (b)
- (c)
- (d)

42. Which one of the answer figures, shows the correct view of the 3-D problem figure after the problem figure is opened up?

Problem figure

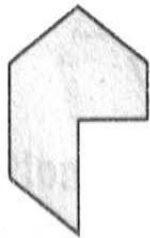


Answer Figures

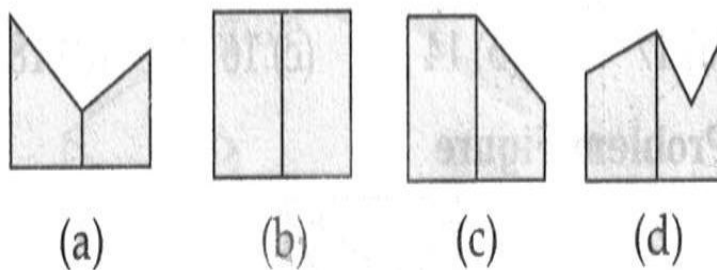


43. The problem figure shows the top view of an object. Identify its correct front view, from amongst the answer figures.

Problem figure

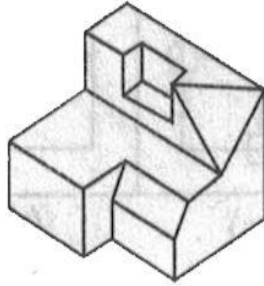


Answer Figures

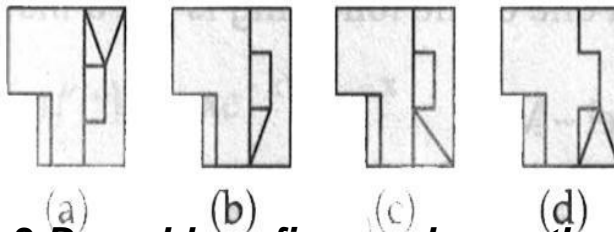


44. The 3-D problem figure shows the view of an object. Identify its correct top view, from amongst the answer figures.

Problem figure

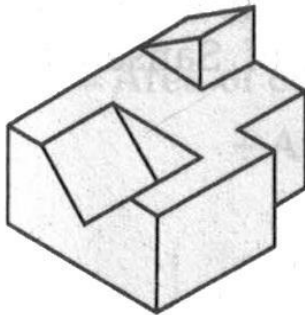


Answer Figures

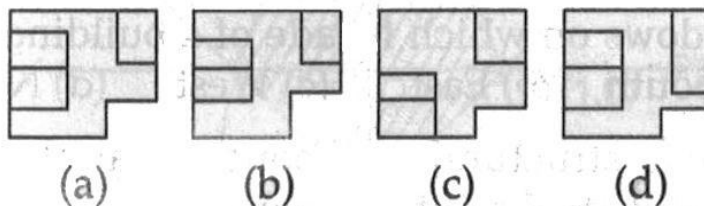


45. The 3-D problem figure shows the view of an object. Identify its correct top view, from amongst the answer figures.

Problem figure



Answer Figures



46. Identify the well known architect and his masterpiece ?



- a) *Le Corbusier, Villa Savoye*
- b) *Le Corbusier, Villa La Roche*
- c) *Pierre Jeanneret, Villa Jeanneret*
- d) *Frank Lloyd Wright, Robie House*

47. Identify the designer of the given picture of the building ?



- a) *Pierre Jeanneret*
- b) *Le Corbusier*
- c) *Richard*
- d) *BV Doshi*

48. Identify the material shown in the following figure.



- a) *Stone*
- b) *Clay*
- c) *Cement*
- d) *Concrete*

49. Identify the material shown in the following figure.



- a) *Rapid hardening cement*
- b) *Quick setting cement*
- c) *White cement*
- d) *Pozzalona cement*

50. Identify the component of the building shown in the figure.



- a) Walls
- b) Stairs
- c) Doors
- d) Columns

51. Identify the component of the building shown in the figure.



- a) Partition
- b) Parapet
- c) External wall
- d) Chajja

52. Identify the architectural element shown in the figure.



- a) Abacus
- b) Arcade
- c) Keystone
- d) Aisle

53. Identify the architectural element shown in the figure.



- a) Abacus
- b) Arcade
- c) Keystone
- d) Flying buttress

54. Who is the architect of India International Centre?

- A. Joseph A Stein**
- B. MM Rana**
- C. Charles Correa**
- D. BV Doshi**

55. Which is not a Manchester city in India?

- A. Kanpur**
- B. Coimbatore**
- C. Allahabad**
- D. New Delhi**

56. Which country consumes and buys most gold in the world?

- A. Iran**
- B. UAE**
- C. India**
- D. USA**

57. Where is Stonehenge located?

- A. France**
- B. Germany**
- C. UK**
- D. Italy**

58. Which city is related to Sir Lutyens?

- A. Chandigarh**
- B. Mumbai**
- C. New Delhi**
- D. Kolkata**

59. Which kind of vessels is used in Summer in Indian Households

- A. Steel**
- B. Aluminuim**
- C. Clay**
- D. Wood**

60. Which of the following Architects said “less is bore”?

- A. FL Wright**
- B. Robert Venturi**
- C. Philip Johnson**
- D. Frank O Gehry**

SECTION 2-(DRAWING ABILITY)

1.IMAGINE YOU ARE ABOUT TO TAKE A DIVE IN A SWIMMING POOL ,DRAW A SCENE OF PUBLIC SWIMMING POOL.(40 MARKS)



**2.USING 4 CRACK JACK ,3 MARIE,3 ORIO AND 4 PARLE G BISCUITS
MAKE AN INTERESTING 3D COMPOSITION AND SHOW THE EFFECT
OF LIGHT AND SHADOW**

