

I – Arch Nata Coaching Centre

JEE (B. ARCH) 2020 – JANUARY (S1)

1. The set of all positive real value of k , for which the equation $x^3 - 9x^2 + 24x - k = 0$ has three distinct real roots, is the interval:
 - a) (18,21)
 - b) (16,20)
 - c) (14,18)
 - d) (12,16)
2. In a certain town, 25% families own a phone, 15% families own a car, 65% families own neither a phone nor a car and 2000 families own both a car and a phone. Consider the following Statements (S_1):

(S_1) : 35% families own at least one of a car or a phone.
 (S_2) : 40,000 families live in the town.

 Then:
 - a) Both (S_1) and (S_2) are false.
 - b) Both (S_1) and (S_2) are true.
 - c) (S_1) is true and (S_2) is false.
 - d) (S_1) is true and (S_2) is true.
3. The integral $\int \frac{(2 \sin \theta - 1) \cos \theta}{5 - \cos^2 \theta - 4 \sin \theta} d\theta$ is equal to: (where C is a constant of integration)
 - a) $3 \log_e(2 - \cos \theta) + \frac{2}{2 - \sin \theta} + C$
 - b) $2 \log_e(2 - \sin \theta) + \frac{3}{2 - \sin \theta} + C$
 - c) $3 \log_e(2 + \cos \theta) + \frac{2}{2 - \cos \theta} + C$
 - d) $2 \log_e(2 + \sin \theta) + \frac{3}{2 - \sin \theta} + C$
4. The Boolean expression $\sim(p \vee q) \vee (\sim p \wedge q)$ is equivalent to:
 - a) p
 - b) $\sim p$
 - c) q
 - d) $\sim q$
5. Let X be a random variable which takes values k with the probability kp , where $k = 1, 2, 3, 4$ and $p \in (0, 1)$. Then the standard deviation of X is:
 - a) $\sqrt{7}$
 - b) $\sqrt{10}$
 - c) 3
 - d) 1
6. If $f(x) = \begin{vmatrix} \sin x & \cos x & \tan x \\ x^3 & x^2 & x \\ 2x & 1 & x \end{vmatrix}$, $x \in \left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$, then $\lim_{x \rightarrow 0} \frac{f(x)}{x^2}$ is equal to:
 - a) 0
 - b) 3
 - c) 1
 - d) 2
7. For non-zero real numbers l, m, n and a , let $f(x) = lx^3 + mx + n$ and $f(a) = f(4a)$. Then the value $x \in [a, 4a]$, at which the tangent to the curve $y = f(x)$ is parallel to the x -axis, is:
 - a) $\sqrt{5}a$
 - b) $3a$
 - c) $2a$
 - d) $\sqrt{7}a$
8. Let C be the circle concentric with the circle, $2x^2 + 2y^2 - 6x - 10y = 183$ and having area $\left(\frac{1}{10}\right)^{th}$ of the area of this circle. Then a tangent to C , parallel to the line, $3x + y = 0$ makes an intercept on the y -axis, which is equal to:
 - a) -10
 - b) -4
 - c) 17
 - d) 14
9. Let $S = 3 + 55 + 333 + 5555 + 33333 + \dots$ upto 22 terms. If $9S + 88 = A(10^{22} - 1)$, then A is equal to:
 - a) $\frac{450}{99}$
 - b) $\frac{530}{99}$
 - c) $\frac{630}{88}$
 - d) $\frac{350}{88}$
10. If $x = e^t \sin t$ and $y = e^t \cos t$, t is a parameter, then the value of $\frac{d^2x}{dy^2} + \frac{d^2y}{dx^2}$ at $t = 0$, is:
 - a) -2
 - b) $\frac{1}{2}$
 - c) 2
 - d) 0
11. If an ellipse has center at $(0, 0)$, a focus at $(-3, 0)$ and the corresponding directrix is $3x + 25 = 0$, then it passes through the point:
 - a) $(-5, -4)$
 - b) $\left(\frac{5}{2}, 4\right)$
 - c) $\left(-5, -\frac{4}{\sqrt{2}}\right)$
 - d) $\left(\frac{5}{\sqrt{2}}, \frac{4}{\sqrt{2}}\right)$
12. If the roots α and β of the equation, $x^2 - \sqrt{2}x + c = 0$ are complex for some real number $c \neq 1$ and $\left|\frac{\alpha - \beta}{1 - \alpha\beta}\right| = 1$, then a value of c is:
 - a) $-2 + \sqrt{6}$
 - b) $4 - \sqrt{6}$
 - c) $3 - \sqrt{6}$
 - d) $-1 + \sqrt{6}$
13. If the probability of a shooter A not hitting a target is 0.5 and that for the shooter B is 0.7, then the probability that either A or B fails to hit the target is:
 - a) 0.20
 - b) 0.35
 - c) 0.25
 - d) 0.85
14. If θ is the angle between the line $\vec{r} = (\hat{i} + 2\hat{j} - \hat{k}) + \lambda(\hat{i} - \hat{j} + 2\hat{k})$, $\lambda \in \mathbf{R}$ and the plane $\vec{r} \cdot (2\hat{i} - \hat{j} + \hat{k}) = 4$, then a value of $\cos \theta$ is:

a) $\frac{\sqrt{11}}{6}$

b) $\frac{\sqrt{35}}{6}$

c) $\frac{\sqrt{13}}{6}$

d) $\frac{\sqrt{7}}{3}$

15. The area (in sq. units) of the region enclosed by the lines, $ax \pm by \pm c = 0$ ($a, b, c \in \mathbf{R}$ are positive and distinct) is:

a) $\frac{2b^2}{ac}$

b) $\frac{2a^2}{bc}$

c) $\frac{2c^2}{ab}$

d) $\frac{4c^2}{ab}$

16. The value of $\cot \frac{\pi}{24}$ is:

a) $1 + \sqrt{2} + \sqrt{3} + \sqrt{6}$

b) $1 - \sqrt{2} + \sqrt{3} + \sqrt{6}$

c) $2 + \sqrt{2} + \sqrt{3} - \sqrt{6}$

d) $2 + \sqrt{2} + \sqrt{3} + \sqrt{6}$

17. Let P be the point of intersection of two lines $\frac{x+10}{1} = \frac{y-21}{7} = \frac{z+11}{5}$ and $\frac{x-1}{5} = \frac{y-46}{9} = \frac{z}{3}$. If Q be the point $(-10, 21, -11)$; then PQ is equal to:

a) 3

b) 5

c) $5\sqrt{3}$

d) $5\sqrt{2}$

18. The area (in sq. units) of the region, $R = \{(x, y) : y \leq x^2, y \leq 2x + 3, x \leq 1 \text{ and } y + 1 \geq 10\}$ is:

a) $\frac{11}{3}$

b) $\frac{13}{3}$

c) $\frac{10}{3}$

d) $\frac{8}{3}$

19. If α and β are the coefficients of x^8 and x^{-24} respectively, in the expansion of $(x^4 + 2 + \frac{1}{x^4})^{10}$ in powers of x , then $\frac{\alpha}{\beta}$ is equal to:

a) 39

b) 26

c) $\frac{32}{3}$

d) $\frac{13}{2}$

20. Let A be a 2×2 matrix such that $3A^2 + 6A - 4I = 0$. Then a value of $|A + I|$ is:

a) $-\frac{7}{\sqrt{3}}$

b) $-\frac{7}{3}$

c) $\sqrt{\frac{7}{3}}$

d) $\frac{3}{7}$

21. If $y = y(x)$ is the solution of the differential equation, $x \frac{dy}{dx} = y(\log_e y - \log_e x + 1)$, when $y(1) = 2$, then $y(2)$ is equal to _____.

22. If $S = \{z \in \mathbf{C} : \bar{z} = iz^2\}$, then maximum value of $|z - \sqrt{3} - i|^2$ on S is _____

23. $\lim_{y \rightarrow 0} \frac{(y-2)+2\sqrt{1+y+y^2}}{2y}$ is equal to _____.

24. The interior angles of a polygon are all obtuse and are in A.P. If the smallest angle is 120° and common difference of this A.P. is 5° , then the number of sides of the polygon is _____.

25. The largest value of $n \in \mathbf{N}$ for which $\frac{74}{{}^n P_n} > \frac{{}^{n+3} P_3}{{}^{n+1} P_{n+1}}$ is _____.

APTITUDE:

1. Which one of the following floorings is ideal for indoor badminton courts?

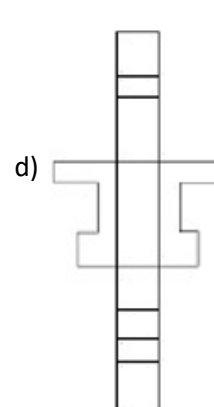
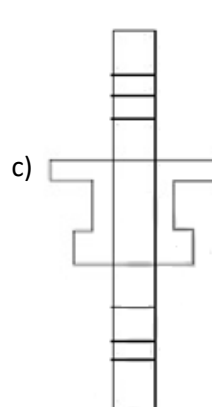
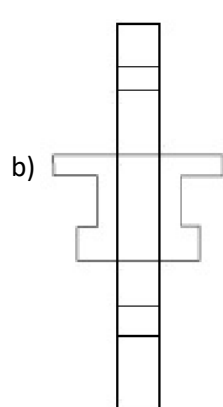
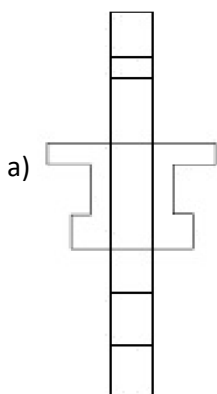
a) Granite

b) Brick

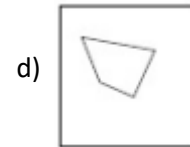
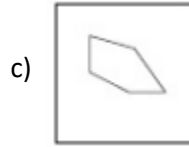
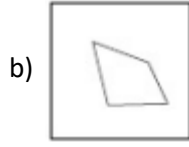
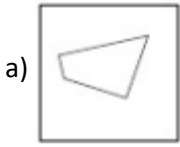
c) Marble

d) Wood

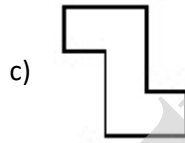
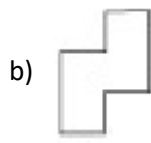
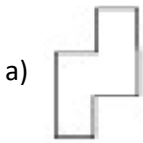
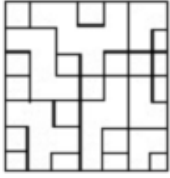
2. The 3-D figure shows the view of an object. Identify the correct view when the figure is opened up, from amongst the answer figure.



3. Find the odd figure out of the problem figures given below.



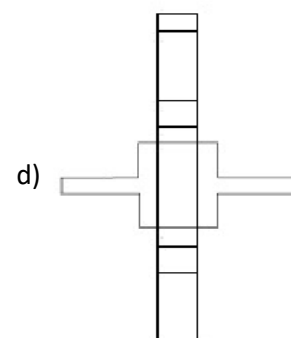
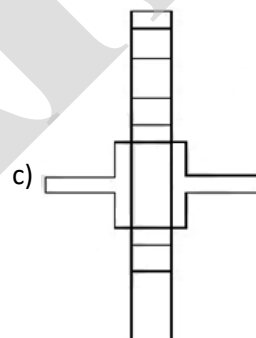
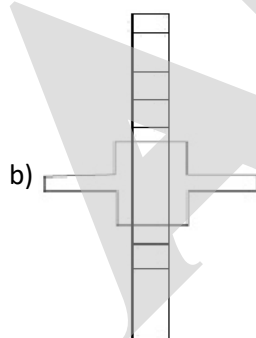
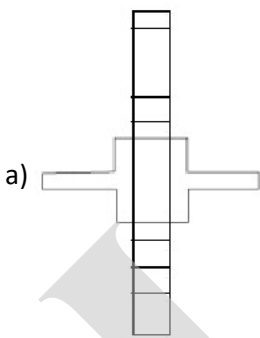
4. One of the following answer figures is hidden in the problem figure in the same size and direction. Select the correct one.



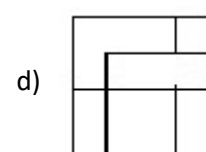
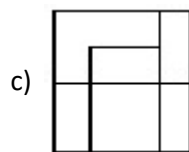
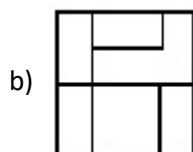
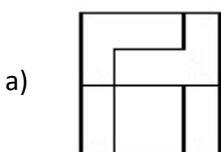
5. In the Northern Hemisphere the summer sun sets in which one of the following directions?

- a) North East b) South West c) North West d) South East

6. The 3-D figure shows the view of an object. Identify the correct view when the figure is opened up, from amongst the answer figure.



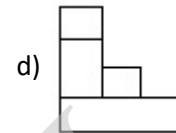
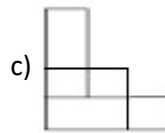
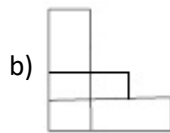
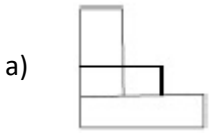
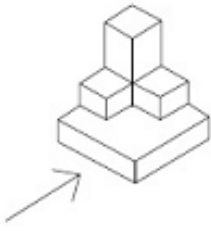
7. The 3-D figure shows the view of an object. Identify the correct top view from amongst the answer figure.



8. In which one of the following States is the Konark Sun Temple?

- a) Andhra Pradesh b) Haryana c) Odisha d) Karnataka

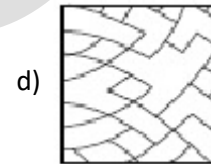
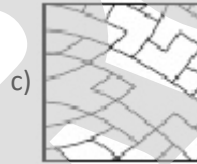
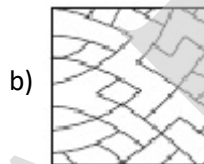
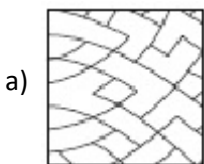
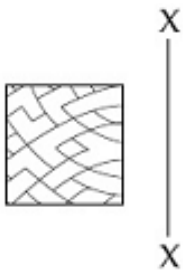
9. The 3-D figure shows the view of an object. Identify the correct view in the direction of the arrow, from amongst the answer figure.



10. In which one of the following countries are Zen gardens popular?

- a) China b) Pakistan c) Thailand d) Japan

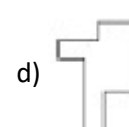
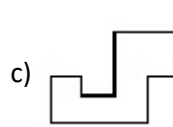
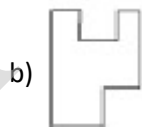
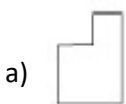
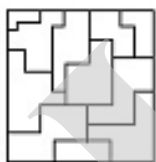
11. Which one of the answer figures is the correct image of the problem figure with respect to $X - X'$?



12. Which one of the following colors absorbs all light falling on it?

- a) Green b) Black c) Pink d) Blue

13. One of the following answer figures is hidden in the problem figure in the same size and direction. Select the correct one.

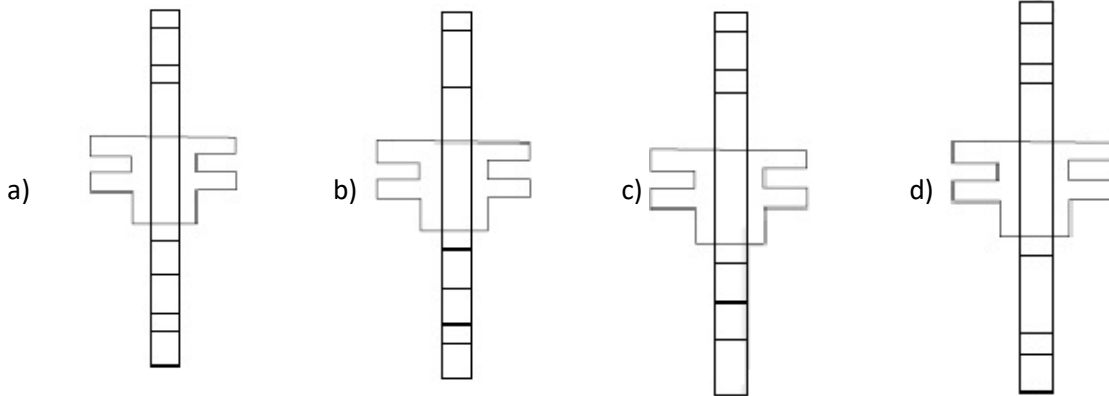


14. Which one of the following architects designed the Madhya Pradesh Assembly Building?

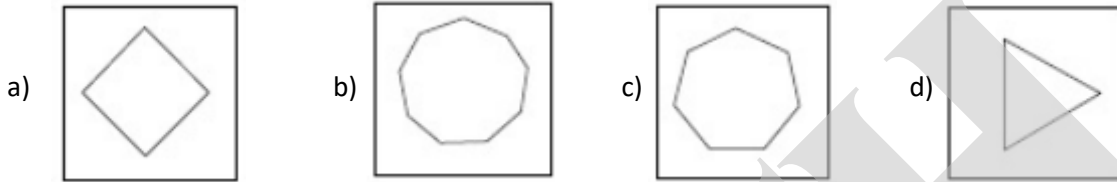
- a) Charles Correa b) B.V. Doshi c) A.P. Kanvinde d) Raj Rewal

15. The 3-D figure shows the view of an object. Identify the correct view when the direction figure is opened up, from amongst the answer figure.

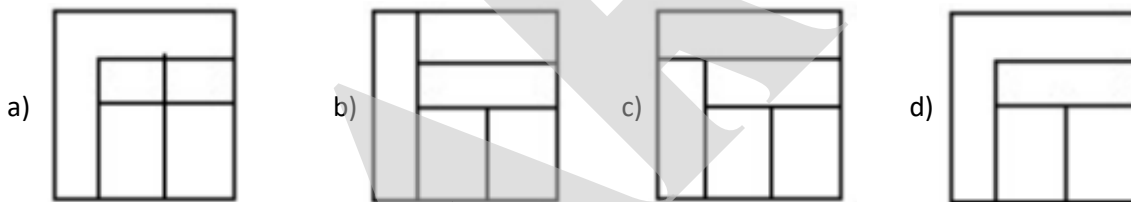
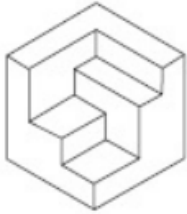




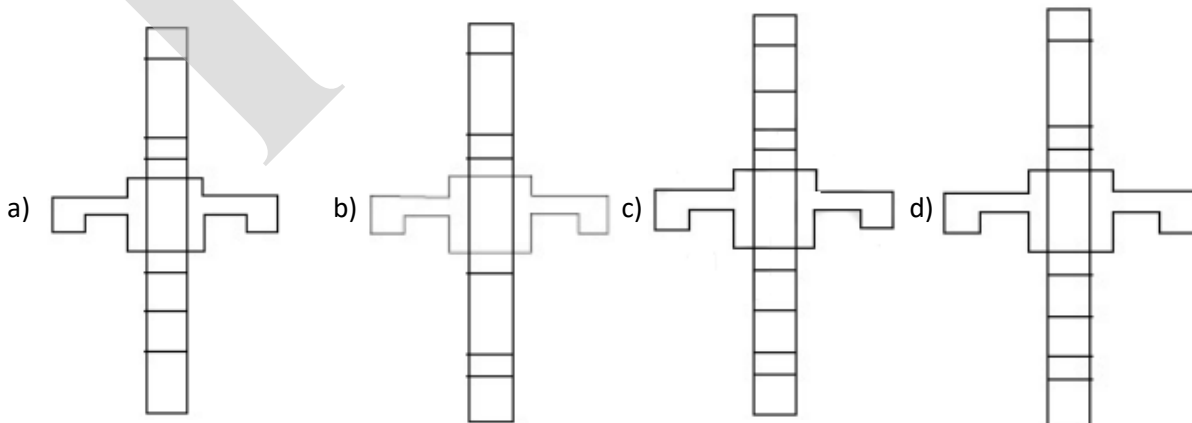
16. Find the odd figure out of the problem figures given below.



17. The 3-D figure shows the view of an object. Identify the correct top view from amongst the answer figure.



18. The 3-D figure shows the view of an object. Identify the correct view when the figure is opened up, from amongst the answer figure.



19. The Louvre in Paris is which one of the following?

- a) A Banquet Hall
- b) A Dance Hall
- c) A Residence
- d) A Museum

20. What is the normal height of a doorway in residence?

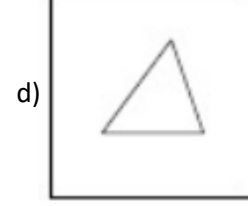
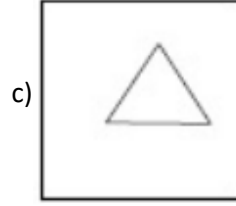
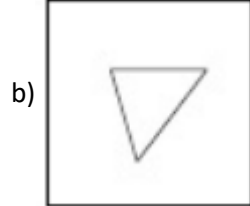
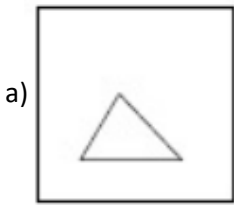
a) 2.8 meters

b) 2.1 meters

c) 1.5 meters

d) 2.5 meters

21. Find the odd figure out of the problem figures given below.



22. What is the thickness of a half brick thick wall?

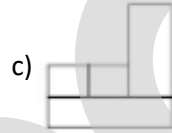
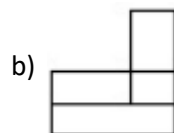
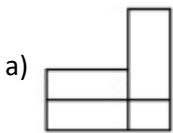
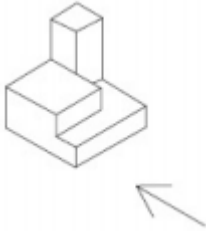
a) 4.5"

b) 8"

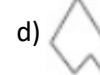
c) 9"

d) 6"

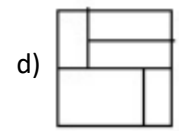
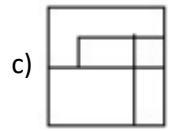
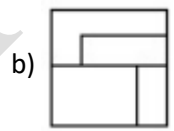
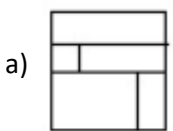
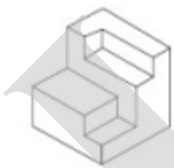
23. The 3-D figure shows the view of an object. Identify the correct view in the direction of the arrow, from amongst the answer figure.



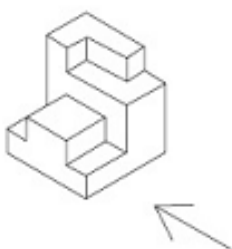
24. One of the following answer figures is hidden in the problem figure in the same size and direction. Select the correct one.



25. The 3-D figure shows the view of an object. Identify the correct top view from amongst the answer figure.

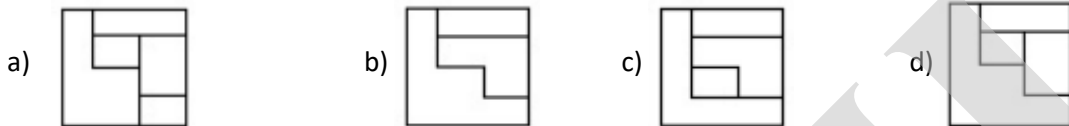
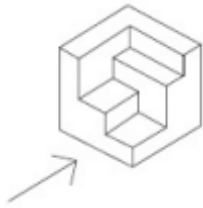


26. The 3-D figure shows the view of an object. Identify the correct view in the direction of the arrow, from amongst the answer figure.





27. The 3-D figure shows the view of an object. Identify the correct view in the direction of the arrow, from amongst the answer figure.



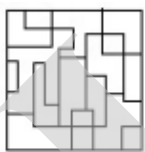
28. Which one of the answer figures is the correct mirror image of the problem figure with respect to $X - X$?



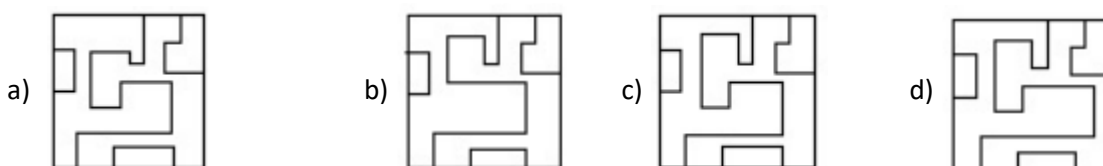
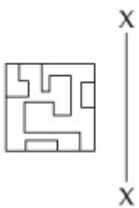
29. In which one of the following countries is Piazza San Marco located?

- a) Italy
- b) Germany
- c) France
- d) England

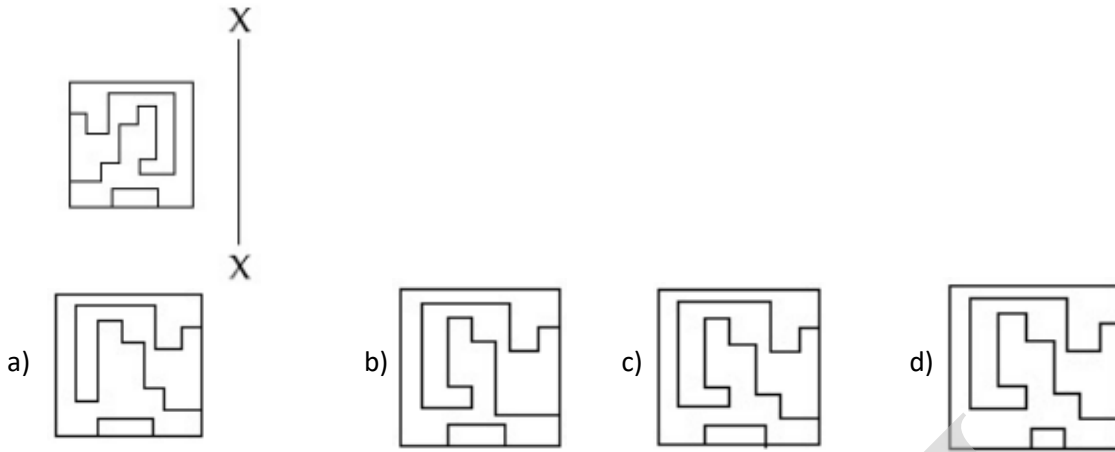
30. One of the following answer figures is hidden in the problem figure in the same size and direction. Select the correct one.



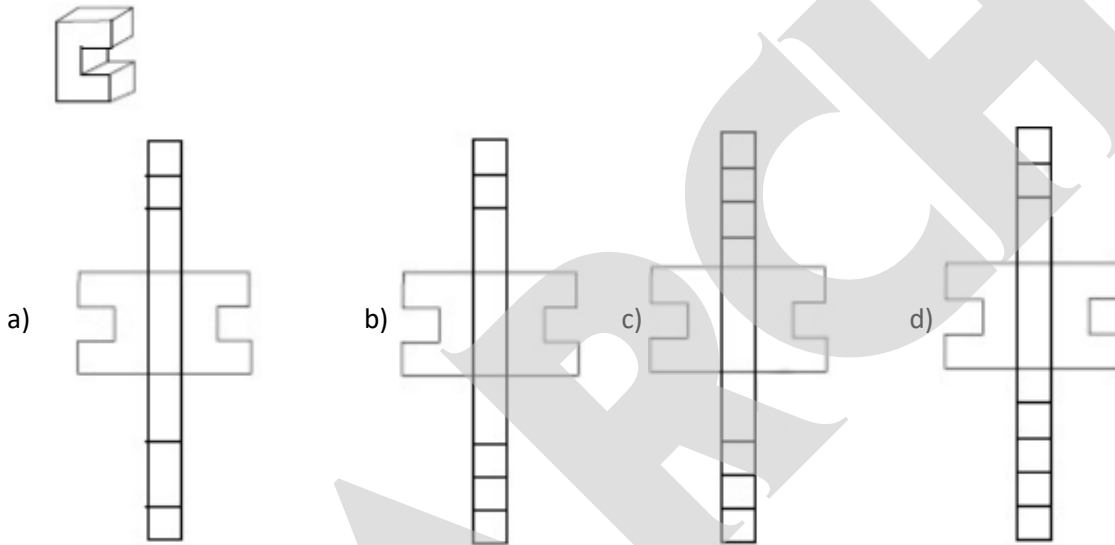
31. Which one of the answer figures is the correct mirror image of the problem figure with respect to $X - X$?



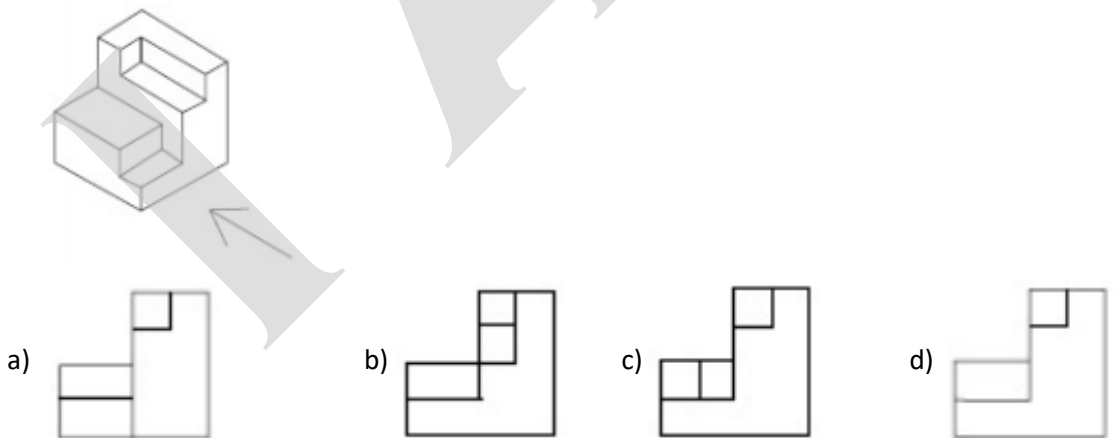
32. Which one of the answer figures is the correct mirror image of the problem figure with respect to $X - X$?



33. The 3-D figure shows the view of an object. Identify the correct view when the figure is opened up, from amongst the answer figures.



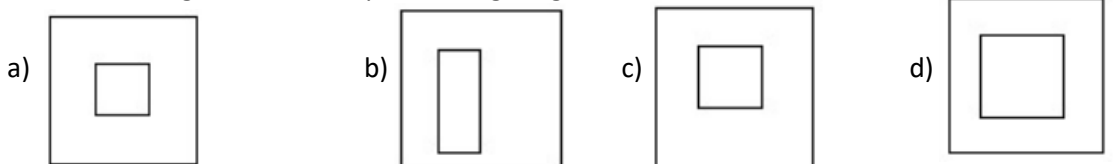
34. The 3-D figure shows the view of an object. Identify the correct view in the direction of the arrow, from amongst the answer figures.



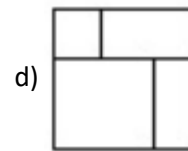
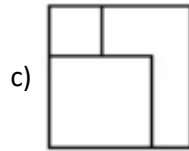
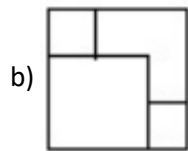
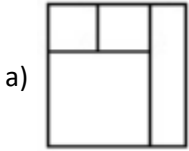
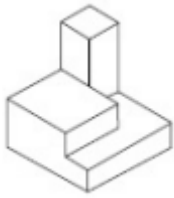
35. Which one of the following colors is perceived as cowardice?

- a) Pink
- b) Yellow
- c) Orange
- d) Purple

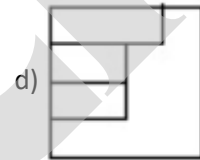
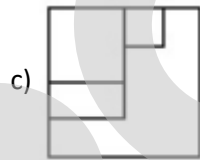
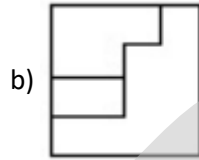
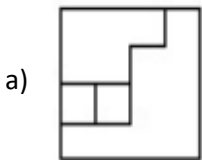
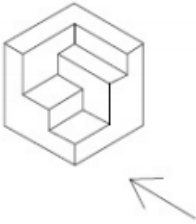
36. Find the odd figure out of the problem figure given below.



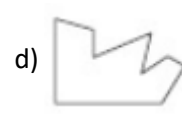
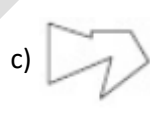
37. The 3-D figure shows the view of an object. Identify the correct top view from amongst the answer figures.



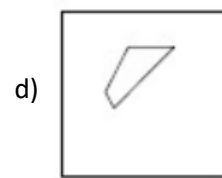
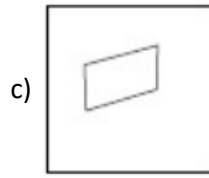
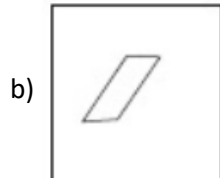
38. The 3-D figure shows the view of an object. Identify the correct view in the direction of the arrow, from amongst the answer figures.



39. One of the following answer figures is hidden in the problem figure in the same size and direction. Select the correct one.



40. Find the odd figure out of the problem figures given below.



41. What is the purpose of louvers in buildings?

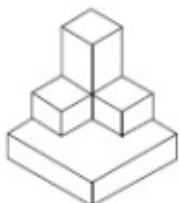
a) As sun breakers

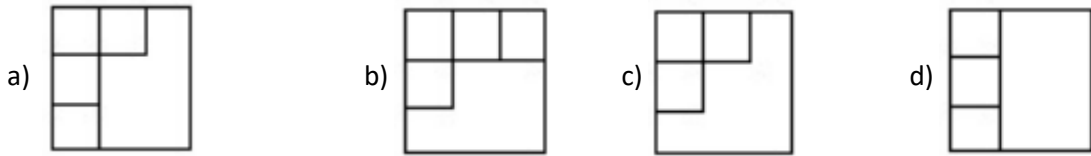
b) To stop wind from entering

c) To support buildings

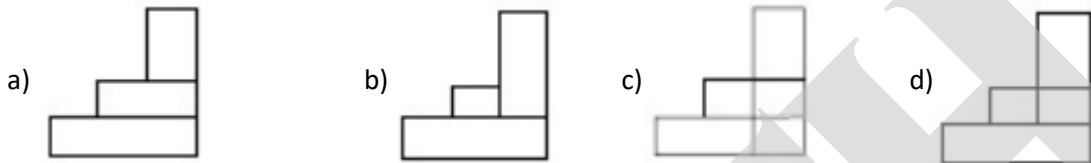
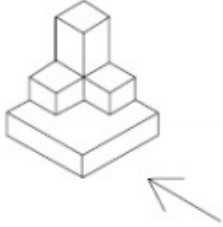
d) To hide something

42. The 3-D figure shows the view of an object. Identify the correct top view from amongst the answer figures.

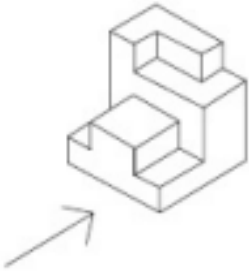




43. The 3-D figure shows the view of an object. Identify the correct view in the direction of the arrow, from amongst the answer figures.



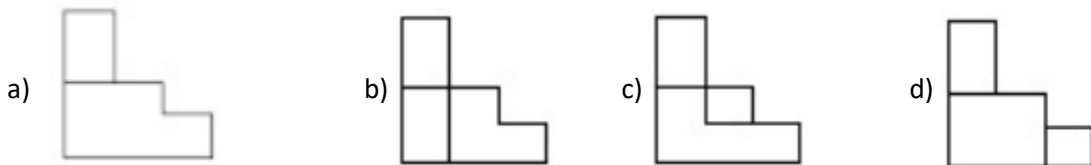
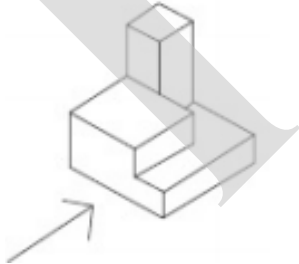
44. The 3-D figure shows the view of an object. Identify the correct view in the direction of the arrow, from amongst the answer figures.



45. Which one of the following textures describes the surface of a mirror?

- a) Grainy
- b) Coarse
- c) Shiny
- d) Wrinkled

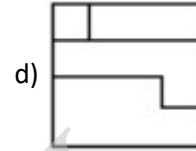
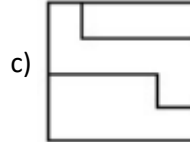
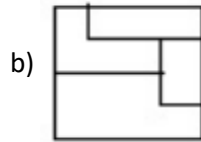
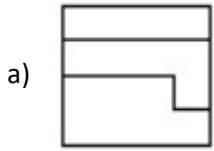
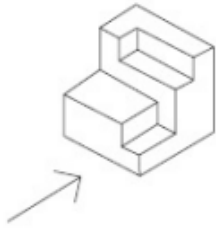
46. The 3-D figure shows the view of an object. Identify the correct view in the direction of the arrow, from amongst the answer figures.



47. Chhatrapati Shivaji Terminus is located in which one of the following cities?

- a) Bangalore
- b) Kolkata
- c) Mumbai
- d) Delhi

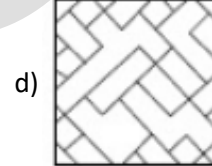
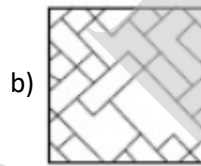
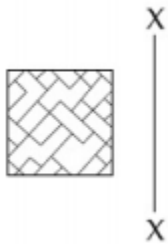
48. The 3-D figure shows the view of an object. Identify the correct view in the direction of the arrow, from amongst the answer figures.



49. In which one of the following situations are trusses normally used in buildings?

- a) Large Span Buildings
- b) Buildings in Deserts
- c) High Rise Buildings
- d) Under water Buildings

50. Which one of the answer figures is the correct mirror image of the problem figure with respect to $X - X$?



DRAWING:

1. In the space provided for the answer of this question, draw an aesthetic composition appropriate to this space using only cylinders. There is no restriction to numbers, sizes, placement and directions of these shapes. Color this composition so that it becomes visually exciting.
2. Draw from imagination a gymnast doing exercise.

OR

Draw from imagination a scene of a school playground with children playing.

OR

Draw from memory a grand parents face.

ANSWER KEY:

MATHS									
1	2	3	4	5	6	7	8	9	10
B	B	B	B	D	C	D	C	B	D
11	12	13	14	15	16	17	18	19	20
D	C	D	A	C	D	C	A	B	B
21	22	23	24	25					
8.00	9.00	1.00	9.00	6.00					
APTITUDE									
1	2	3	4	5	6	7	8	9	10
D	D	C	C	C	D	A	C	A	D
11	12	13	14	15	16	17	18	19	20
A	B	A	A	A	A	D	D	D	B
21	22	23	24	25	26	27	28	29	30
B	A	D	D	B	A	B	B	A	C
31	32	33	34	35	36	37	38	39	40
C	C	B	D	B	B	C	B	B	D
41	42	43	44	45	46	47	48	49	50
A	C	D	A	C	B	C	C	A	A