# JEE Main 2020 Paper 2A (B.Arch) Jan 6 Shift 2 Question Paper

Conducted by the National Testing Agency (NTA)

**Time Allowed: 3 Hours** **B.Arch** **Maximum Marks: 400**

## General Instructions

(i) This is **Paper 2A (B.Arch)** of **JEE (Main) 2020**, conducted by the National Testing Agency on **6 Jan 2020**.

(ii) The paper contains **77 questions**; attempt **77** as specified in the section table. The maximum score is **400 marks**.

(iii) Multiple choice questions have four options. Select one answer. Each correct answer carries **4 marks**; an incorrect answer carries **−1 mark**.

(iv) Numerical value questions carry **4 marks** for a correct answer and **0 marks** for an incorrect answer. Unanswered questions carry **0 marks**.

(v) The Drawing section contains **two questions of 50 marks each**. Follow the alternatives and instructions printed within each question.

(vi) All questions are compulsory.

| Section | Questions | To attempt | Marks |
|---|---|---|---|
| Mathematics | 25 | 25 | 100 |
| Aptitude Test | 50 | 50 | 200 |
| Drawing | 2 | 2 | 100 |

## Mathematics

**1.** 4 marks

If $A=\{1, 2, 3, 4\}$, then the number of functions on the set A, which are not one - one, is :

1. 232
2. 240
3. 248
4. 256

**2.** 4 marks

The sum of the values of $x$ satisfying the equation, $\sqrt{x}(\sqrt{x}-4)-3|\sqrt{x}-2|+6=0$ $(x \geq 0)$, is :

1. 26
2. 25
3. 10
4. 8

**3.** 4 marks

If m be the least value of $|z-3+i4|^2+|z-5-i2|^2$, $z \in \mathbb{C}$ attained at $z=z_0$, then the ordered pair $(|z_0|, m)$ is equal to :

1. $(\sqrt{13}, 10)$
2. $(\sqrt{17}, 20)$
3. $(\sqrt{17}, 10)$
4. $(\sqrt{13}, 20)$

**4.** 4 marks

If for some $c < 0$, the quadratic equation, $2cx^2 - 2(2c-1)x + 3c^2 = 0$ has two distinct real roots, $\frac{1}{a}$ and $\frac{1}{b}$, then the value of the determinant, $\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix}$ is :

1. 2
2. 0
3. $\frac{4}{3}$
4. 1

**5.** 4 marks

Let $A = \begin{bmatrix} x & 2y \\ -1 & y \end{bmatrix}; x, y \in \mathbf{R}$.

If $AA^T = \begin{bmatrix} 1 & 0 \\ 0 & \alpha \end{bmatrix} (\alpha \in \mathbf{R})$, then $\alpha + y^2$ is equal to :

1. 1
2. $\sqrt{2} - 1$
3. 2
4. $\sqrt{2}$

**6.** 4 marks

Let $S_n$ denote the sum of the first n terms of an A.P., $a_1, a_2, a_3, \ldots, a_n$. If $a_5 + a_9 = 1$ and $S_9 = 6$, then which one of the following is not true ?

1. $S_{13} = \frac{13}{2}$
2. $a_{13} = 0$
3. $a_6 + a_8 = 1$
4. $S_6 = \frac{19}{2}$


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**7.** 4 marks

If $\sum_{r=1}^{9}\left(\frac{r+3}{2^r}\right){}^9C_r = \alpha\left(\frac{3}{2}\right)^9 + \beta$, then

$\alpha+\beta$ is equal to :

1. 2
2. 9
3. 3
4. 6

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**8.** 4 marks

Let a function, $f:(-1, 3) \to \mathbf{R}$ be defined as $f(x) = \min\{x[x], |x[x]-2|+2\}$, where $[x]$ denotes the greatest integer $\le x$. Then $f$ is :

1. neither continuous nor differentiable at exactly 3 points.
2. not continuous at two points and not differentiable at 3 points.
3. neither continuous nor differentiable at exactly two points.
4. not continuous at only one point and not differentiable at three points.

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**9.** 4 marks

$\lim_{x \to 1}\left\{\log_e\left(e^{x(x-1)} - e^{x(1-x)}\right) - \log_e(4x(x-1))\right\}$ is equal to :

1. 1
2. $-\log_e 2$
3. $-2\log_e 2$
4. $1-\log_e 2$

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**10.** 4 marks

The function $f(x)=e^{x+1}\,(4x^2-16x+11)$ is :

1. increasing in $\left(-\infty, -\frac{1}{2}\right) \cup \left(\frac{5}{2}, \infty\right)$
2. increasing in $(-\infty, -2) \cup (2, \infty)$
3. decreasing in $\left(-\infty, -\frac{5}{2}\right) \cup \left(\frac{1}{2}, \infty\right)$
4. decreasing in $\left(-\infty, \frac{1}{2}\right) \cup \left(\frac{5}{2}, \infty\right)$

**11.** 4 marks

The area (in sq. units) of the region $\left\{(x, y) : \frac{1}{2} \le y \le \sin x,\ 0 \le x \le \pi\right\}$ is :

1. $\sqrt{3} - \frac{\pi}{3}$
2. $3 - \frac{\pi}{3}$
3. $3 - \frac{2\pi}{3}$
4. $\sqrt{3} - \frac{\pi}{6}$

**12.** 4 marks

If $x = x(y)$ is the solution of the differential equation, $y\,dx - (x + 2y^2)\,dy = 0$, with $x(-\pi) = \pi^2$, then $x$ is equal to :

1. $2y^2 - \pi^2$
2. $-2y^2 + 3\pi y$
3. $-y^2 - 2\pi y$
4. $2y^2 + \pi y$

**13.** 4 marks

A ray of light is projected from the origin at angle of $60^\circ$ with the positive direction of $x$-axis towards the line, $y=2$, which gets reflected from the point $(\alpha, 2)$. Then the distance of the reflected ray of light from the point $(2, 2)$ is :

1. $\sqrt{3}-1$
2. $2\left(1-\frac{1}{\sqrt{3}}\right)$
3. $3-\sqrt{3}$
4. $1-\frac{1}{\sqrt{3}}$

**14.** 4 marks

Let the ellipse, $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$, $a > b$, pass through the point $(2, 3)$ and have eccentricity equal to $\frac{1}{2}$. Then equation of the normal to this ellipse at $(2, 3)$ is :

1. $2y-x=4$
2. $2x-y=1$
3. $3x-y=3$
4. $3x-2y=0$

**15.** 4 marks

If a variable plane in 3-dimensional space moves in such a way that the sum of the reciprocals of its intercepts on the $x$ and $y$-axes exceeds the reciprocal of its intercept on the $z$-axis by 2, then all such planes will pass through the point :

1. $\left(\frac{1}{2}, \frac{1}{2}, \frac{1}{2}\right)$
2. $\left(\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}\right)$
3. $\left(\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}\right)$
4. $\left(\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}\right)$

**16.** 4 marks

If the volume of a parallelopiped whose coterminous edges are $\vec{a} = \hat{i} + \hat{j} + 2\hat{k}$, $\vec{b} = 2\hat{i} + \lambda\hat{j} + \hat{k}$ and $\vec{c} = 2\hat{i} + 2\hat{j} + \lambda\hat{k}$ is 35 cu.m, then a value of $\vec{a}\cdot\vec{b} + \vec{b}\cdot\vec{c} - \vec{c}\cdot\vec{a}$ is :

1. 2
2. $-14$
3. $-10$
4. 22

**17.** 4 marks

If $10\sin^4\alpha + 15\cos^4\alpha = 6$, $\alpha \in \left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$, then $27\,\text{cosec}^6\alpha + 8\sec^6\alpha$ is equal to :

1. 280
2. 270
3. 250
4. 240

**18.** 4 marks

A bag contains 6 red balls and 10 green balls. 3 balls are drawn from it one by one randomly without replacement. If the 3rd drawn ball is red, then the probability that the first two drawn balls are green is :

1. 3/7
2. 3/8
3. 9/56
4. 9/49

**19.** 4 marks

Let the data 4, 10, $x$, $y$, 27 be in the increasing order. If the median of the data is 18 and its mean deviation about mean is 7.6, then the mean of this data is :

1. 15.5
2. 16
3. 16.5
4. 17

**20.** 4 marks

Which of the following is not equivalent to $\sim p \wedge q$ ?

1. $\sim(p \vee \sim q)$
2. $\sim p \rightarrow \sim q$
3. $\sim (q \rightarrow p)$
4. $\sim p \wedge (\sim p \rightarrow q)$

**21.** Numerical value · 4 marks

If the total number of ways in which 8-digit numbers can be formed by using all the digits 0, 1, 2, 3, 4, 5, 7, 9 such that no two even digits appear together is (5!)k, then k is equal to _____.

**22.** Numerical value · 4 marks

Let $f(x) = \begin{cases} |x-3|, & \text{if } x < -1 \\ 3x+4, & \text{if } x \geq -1 \end{cases}$,

$g(x) = x^2 - bx - 2$ $(x \in \mathbf{R})$ and b is a real constant. If $gof$ is continuous at $x = -1$, then b is equal to _____.

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**23.** Numerical value · 4 marks

If $\int e^{2x}(\cos x + 7\sin x)\,dx = e^{2x}g(x) + c$, where c is a constant of integration, then $g(0) + g\left(\frac{\pi}{2}\right)$ is equal to _____.

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**24.** Numerical value · 4 marks

If the line joining the points $(-1, 2, 5)$ and $(3, 4, -10)$ intersects the $xy$-plane at the point $(x, y, z)$, then $\frac{y}{x}$ is equal to _____.

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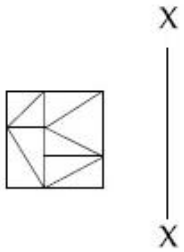
**25.** Numerical value · 4 marks

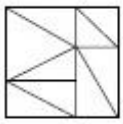
Let $a, b \in \mathbf{R}$ and $a > 0$. If the tangent at the point $(2, 2)$ to the circle $x^2 + y^2 = 8$ touches the parabola $y^2 = 4a(x - b)$, then $b - a$ is equal to _____.

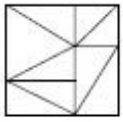
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**26.** 4 marks

Which one of the answer figures is the correct mirror image of the problem figure with respect to X – X ?




1. 

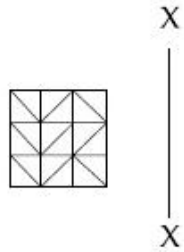
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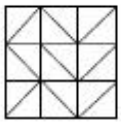
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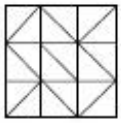
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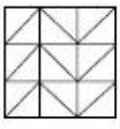
**27.** 4 marks

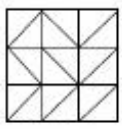
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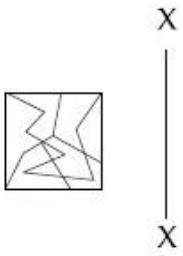
2. 

3. 

4. 

**28.** 4 marks

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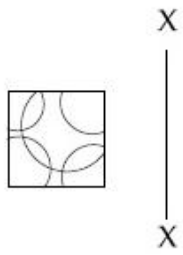
2. 

3. 

4. 

**29.** 4 marks

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1. 

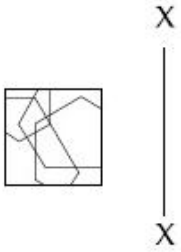
2. 

3. 

4. 

**30.** 4 marks

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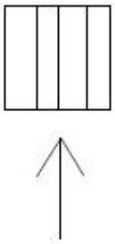
2. 

3. 

4. 

**31.** 4 marks

The problem figure shows the top view of an object. Identify the correct elevation from amongst the answer figures looking in the direction of the arrow.



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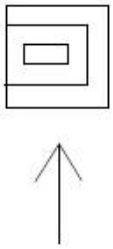
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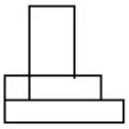
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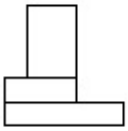
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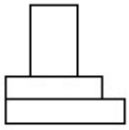
**32.** 4 marks

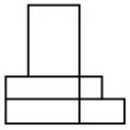
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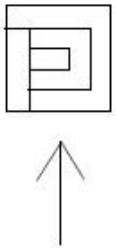
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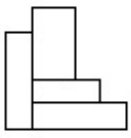
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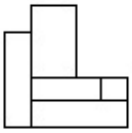
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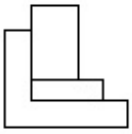
**33.** 4 marks

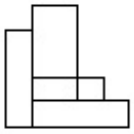
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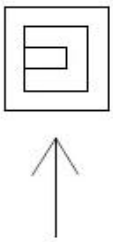
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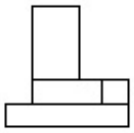
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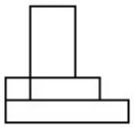
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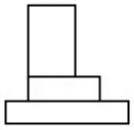
**34.** 4 marks

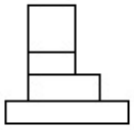
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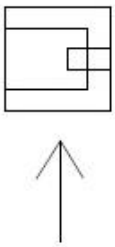
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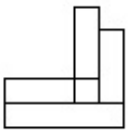
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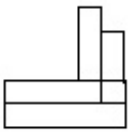
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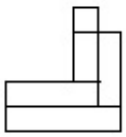
**35.** 4 marks

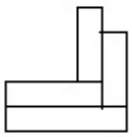
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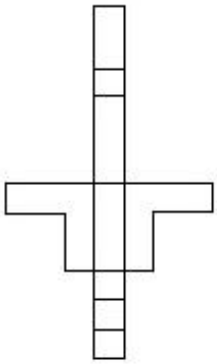
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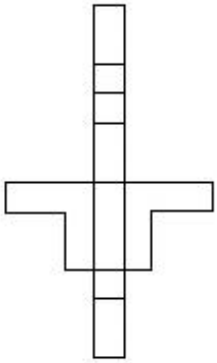
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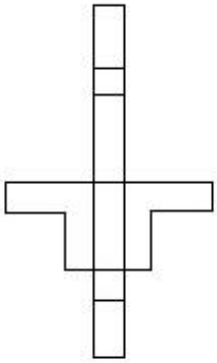
**36.** 4 marks

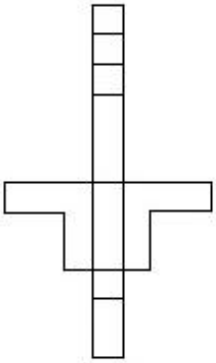
The 3 - D figure shows the view of an object. Identify the correct view when the figure is opened up, from amongst the answer figures.



1. 

2. 

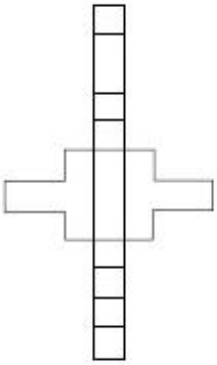
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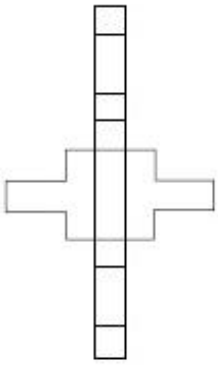
4. 

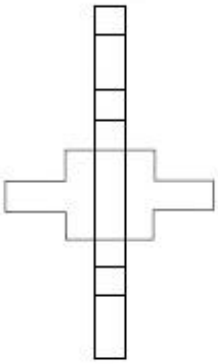
**37.** 4 marks

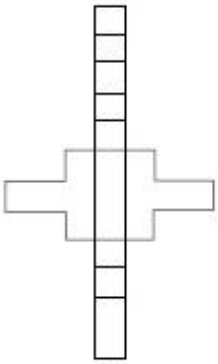
The 3 - D figure shows the view of an object. Identify the correct view when the figure is opened up, from amongst the answer figures.



1. 

2. 

3. 

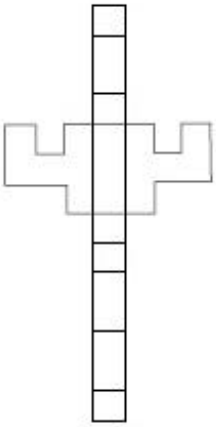
4. 

**38.** 4 marks

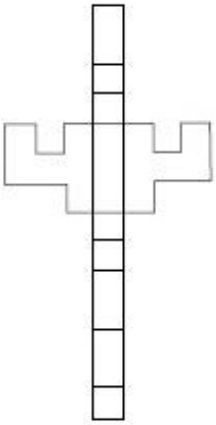
The 3 - D figure shows the view of an object. Identify the correct view when the figure is opened up, from amongst the answer figures.



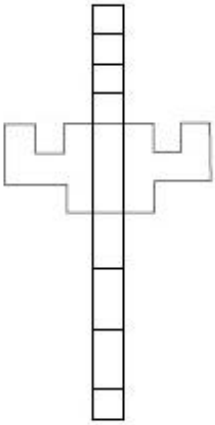
1.



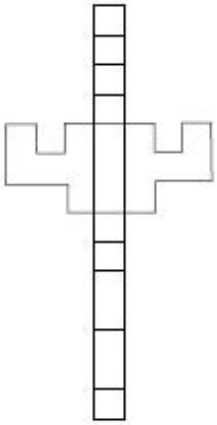
2.



3.



4.

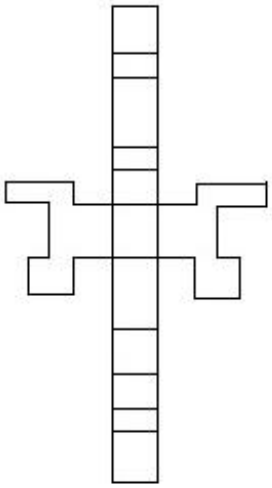


**39.** 4 marks

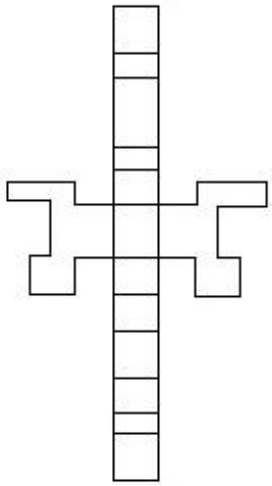
The 3 - D figure shows the view of an object. Identify the correct view when the figure is opened up, from amongst the answer figures.



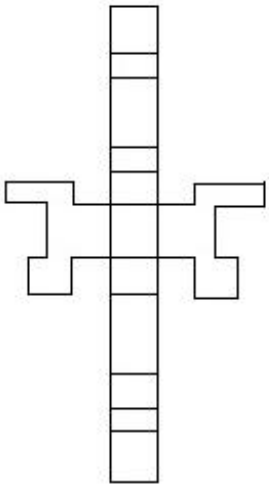
1.



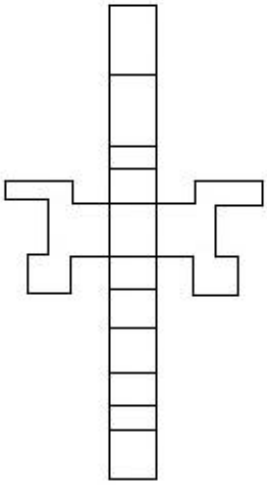
2.



3.



4.

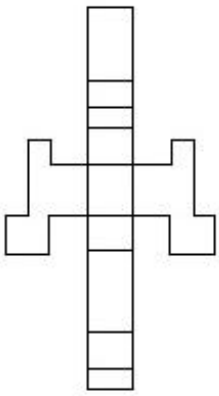


**40.** 4 marks

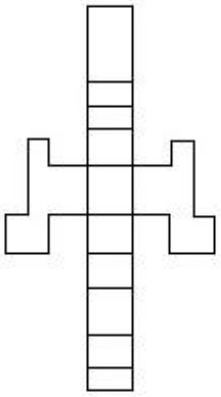
The 3 - D figure shows the view of an object. Identify the correct view when the figure is opened up, from amongst the answer figures.



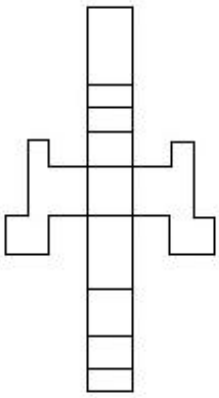
1.



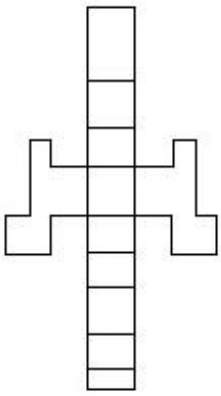
2.



3.

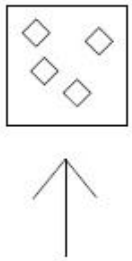


4.

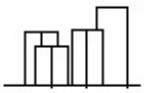


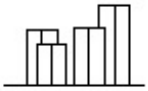
**41.** 4 marks

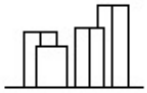
The problem figure shows the top view of objects. Looking in the direction of the arrow, identify the correct elevation, from amongst the answer figures.



1. 

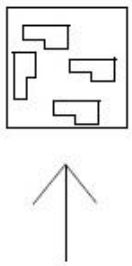
2. 

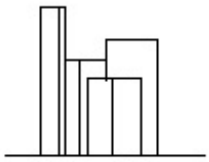
3. 

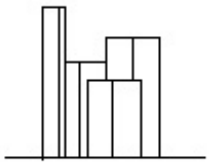
4. 

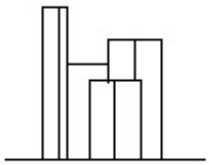
**42.** 4 marks

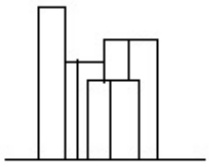
The problem figure shows the top view of objects. Looking in the direction of the arrow, identify the correct elevation, from amongst the answer figures.



1. 

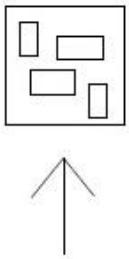
2. 

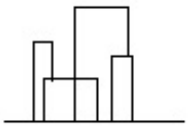
3. 

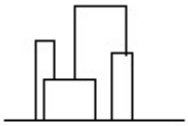
4. 

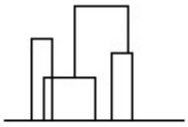
**43.** 4 marks

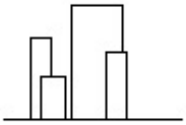
The problem figure shows the top view of objects. Looking in the direction of the arrow, identify the correct elevation, from amongst the answer figures.



1. 

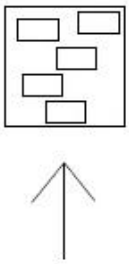
2. 

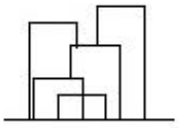
3. 

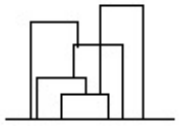
4. 

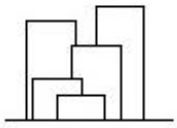
**44.** 4 marks

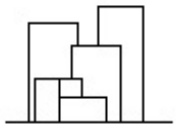
The problem figure shows the top view of objects. Looking in the direction of the arrow, identify the correct elevation, from amongst the answer figures.



1. 

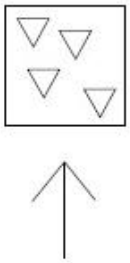
2. 

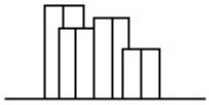
3. 

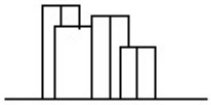
4. 

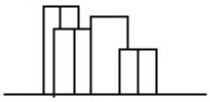
**45.** 4 marks

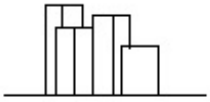
The problem figure shows the top view of objects. Looking in the direction of the arrow, identify the correct elevation, from amongst the answer figures.



1. 

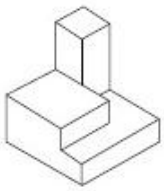
2. 

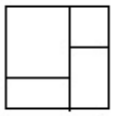
3. 

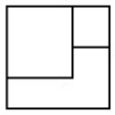
4. 

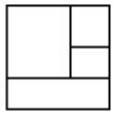
**46.** 4 marks

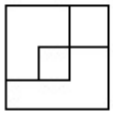
The 3 – D figure shows the view of an object. Identify the correct top view from amongst the answer figures.



1. 

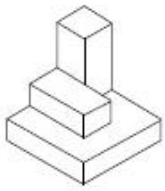
2. 

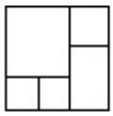
3. 

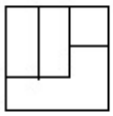
4. 

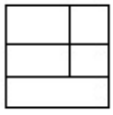
**47.** 4 marks

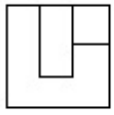
The 3 – D figure shows the view of an object. Identify the correct top view from amongst the answer figures.



1. 

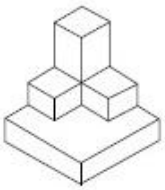
2. 

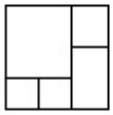
3. 

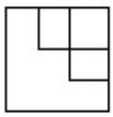
4. 

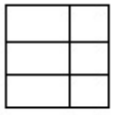
**48.** 4 marks

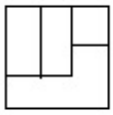
The 3 – D figure shows the view of an object. Identify the correct top view from amongst the answer figures.



1. 

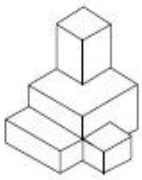
2. 

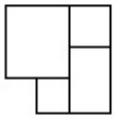
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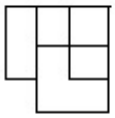
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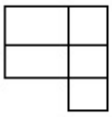
**49.** 4 marks

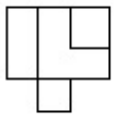
The 3 – D figure shows the view of an object. Identify the correct top view from amongst the answer figures.



1. 

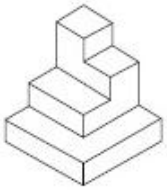
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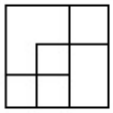
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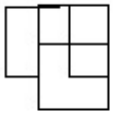
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**50.** 4 marks

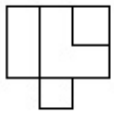
The 3 – D figure shows the view of an object. Identify the correct top view from amongst the answer figures.



1. 

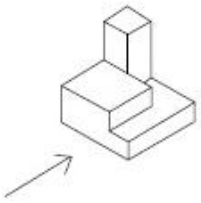
2. 

3. 

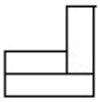
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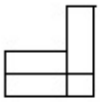
**51.** 4 marks

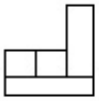
The 3 – D figure shows the view of an object. Identify the correct view in the direction of the arrow, from amongst the answer figures.



1. 

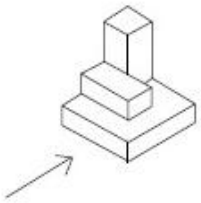
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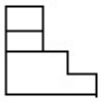
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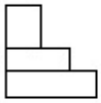
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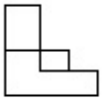
**52.** 4 marks

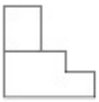
The 3 – D figure shows the view of an object. Identify the correct view in the direction of the arrow, from amongst the answer figures.



1. 

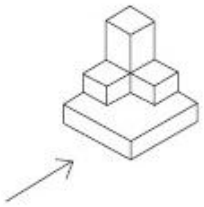
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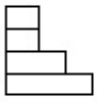
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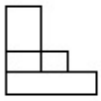
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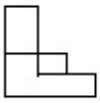
**53.** 4 marks

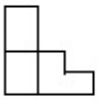
The 3 – D figure shows the view of an object. Identify the correct view in the direction of the arrow, from amongst the answer figures.



1. 

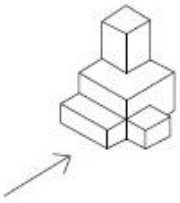
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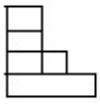
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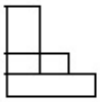
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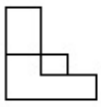
**54.** 4 marks

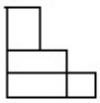
The 3 – D figure shows the view of an object. Identify the correct view in the direction of the arrow, from amongst the answer figures.



1. 

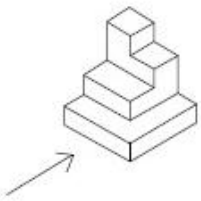
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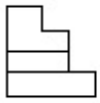
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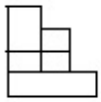
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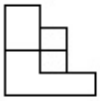
**55.** 4 marks

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.



1. 

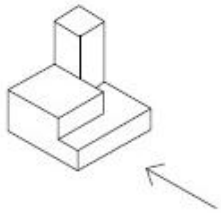
2. 

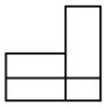
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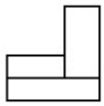
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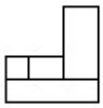
**56.** 4 marks

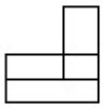
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1. 

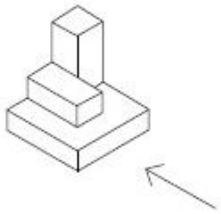
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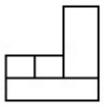
3. 

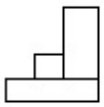
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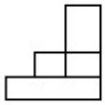
**57.** 4 marks

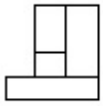
The 3 – D figure shows the view of an object. Identify the correct view in the direction of the arrow, from amongst the answer figures.



1. 

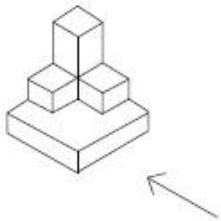
2. 

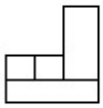
3. 

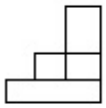
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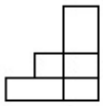
**58.** 4 marks

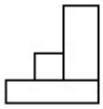
The 3 – D figure shows the view of an object. Identify the correct view in the direction of the arrow, from amongst the answer figures.



1. 

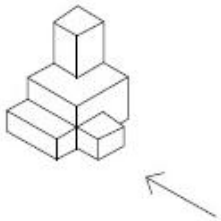
2. 

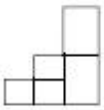
3. 

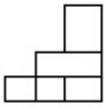
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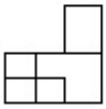
**59.** 4 marks

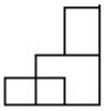
The 3 – D figure shows the view of an object. Identify the correct view in the direction of the arrow, from amongst the answer figures.



1. 

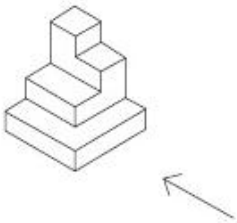
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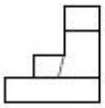
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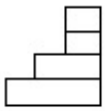
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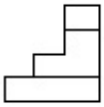
**60.** 4 marks

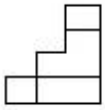
The 3 – D figure shows the view of an object. Identify the correct view in the direction of the arrow, from amongst the answer figures.



1. 

2. 

3. 

4. 

**61.** 4 marks

Buckingham Palace is the Residence of which one of the following ?

1. Queen of England
2. King of Netherlands
3. King of Prussia
4. King of Nepal

**62.** 4 marks

In the Northern Hemisphere the winter sun rises from which one of the following directions ?

1. North East
2. North West
3. South East
4. South West

**63.** 4 marks

Which one of the following is a purpose for installing false ceilings ?

1. Supporting the walls
2. Making the building water proof
3. Making the space acoustically effective
4. Making the building fire proof

**64.** 4 marks

What amongst the following is the thickness of a two brick wall ?

1. 18″
2. 20″
3. 16″
4. 22″

**65.** 4 marks

Where from among the following is the famous St. Peters located ?

1. Denmark
2. Norway
3. Rome
4. Venice

**66.** 4 marks

In which State in India are the large Tea Gardens located ?

1. Punjab
2. Uttar Pradesh
3. Kerala
4. Odisha

**67.** 4 marks

Where from the following is the National Gallery of Modern Art located ?

1. Bangalore
2. Lucknow
3. New Delhi
4. Mysore

**68.** 4 marks

Which one of the following is a secondary color ?

1. Green
2. Red
3. Yellow
4. Blue

**69.** 4 marks

Which one of the following is considered to be a calming color ?

1. Red
2. Orange
3. Green
4. Blue

**70.** 4 marks

What is the texture of sand-paper ?

1. Coarse
2. Glossy
3. Smooth
4. Shiny


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**71.** 4 marks

What is the purpose of a chimney in a building ?

1. To give strength to a building
2. To hold the building up
3. To take out the smoke from a fire place
4. To make the building water proof

**72.** 4 marks

What among the following would be the ideal material for flooring of a steel factory ?

1. Wood
2. Tiles
3. Granite
4. Steel

**73.** 4 marks

Who was the architect of the LIC Building in Connaught Place, New Delhi ?

1. Raj Rewal
2. Charles Correa
3. Louis Kahn
4. Zaha Hadid

**74.** 4 marks

Who was the architect of the glass pyramid at the Louvre Paris ?

1. Frank Lloyd Wright
2. Walter Gropius
3. I.M. Pei
4. Charles Correa

**75.** 4 marks

Who amongst the following is an architect?

1. Geoffery Bawa
2. Sharmila Tagore
3. Louis Armstrong
4. Donald Trump

## Drawing

**76.** 50 marks

In the space provided for the answer of this question, draw an aesthetic composition appropriate to this space using only equilateral triangles. There is no restriction to numbers, sizes, placement and directions of these shapes. Color this composition so that it becomes visually exciting.

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**77.** 50 marks

Draw from imagination a mother cooking in the kitchen.

OR

Draw from imagination a beautiful building.

OR

Draw from memory the face of one of your parent.

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