JEE Main 2017 Paper 2 (B.Arch/B.Plan) Apr 2 Single sitting (Offline) Question Paper

Conducted by the Central Board of Secondary Education (CBSE)

Time Allowed: 3 Hours **B.Arch / B.Planning** **Maximum Marks: 390**

General Instructions

(i) This is **Paper 2 (B.Arch/B.Plan)** of **JEE (Main) 2017**, conducted by CBSE on **2 Apr 2017**.

(ii) The paper contains **82 questions**: 30 Mathematics, 50 Aptitude Test and two Drawing questions. The maximum score is **390 marks**.

(iii) Each Mathematics and Aptitude Test question has four options. Select one answer. Award **4 marks** for a correct answer, deduct **1 mark** for an incorrect answer and award **0 marks** for an unanswered question.

(iv) The Drawing section carries **70 marks**: Question 81 contains parts (a) and (b), carrying 20 marks each; Question 82 carries 30 marks.

(v) Answer the Drawing questions on separate sheets. Follow the alternatives and instructions printed within each question.

(vi) All questions are compulsory, subject to the alternatives in the Drawing section.

Section	Questions	To attempt	Marks
Mathematics	30	30	120
Aptitude Test	50	50	200
Drawing	2	2	70

Mathematics

1. 4 marks

If A and B be two finite sets such that the total number of subsets of A is 960 more than the total number of subsets of B, then $n(A) - n(B)$ (where $n(X)$ denotes the number of elements in set X) is equal to :

(1) 2 (2) 3

(3) 4 (4) 6

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2. 4 marks

If λ_1 and λ_2 are the two values of λ such that the roots α and β of the quadratic equation, $\lambda(x^2 - x) + x + 5 = 0$ satisfy $\frac{\alpha}{\beta} + \frac{\beta}{\alpha} + \frac{4}{5} = 0$, then $\frac{\lambda_1}{\lambda_2^2} + \frac{\lambda_2}{\lambda_1^2}$ is equal to :

(1) 536 (2) 512

(3) 504 (4) 488

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3. 4 marks

If $(x + iy)^2 = 7 + 24i$, then a value of $(7 + \sqrt{-576})^{\frac{1}{2}} - (7 - \sqrt{-576})^{\frac{1}{2}}$ is :

(1) $-3i$ (2) $2i$

(3) 6 (4) $-6i$

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4. 4 marks

Let S be the set of all real values of 'a' for which the following system of linear equations

$$ax + 2y + 5z = 1$$
$$2x + y + 3z = 1$$
$$3y + 7z = 1$$

is consistent. Then the set S is :

(1) equal to $\mathbf{R}$ (2) equal to $\mathbf{R} - \{1\}$

(3) equal to $\{1\}$ (4) an empty set

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5. 4 marks

For all real numbers x, y and z, the determinant

$$\begin{vmatrix} 2x & xy - xz & y \\ 2x + z + 1 & xy - xz + yz - z^2 & 1 + y \\ 3x + 1 & 2xy - 2xz & 1 + y \end{vmatrix}$$ is equal to :

(1) zero (2) $(x - y)(y - z)(z - x)$

(3) $(x - yz)(y - z)$ (4) $(y - xz)(z - x)$

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6. 4 marks

An urn contains 5 red, 4 black and 3 white marbles. Then the number of ways in which 4 marbles can be drawn from it so that at most 3 of them are red, is :

(1) 455 (2) 460

(3) 490 (4) 495

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7. 4 marks

If the digits at ten's and hundred's places in $(11)^{2016}$ are x and y respectively, then the ordered pair (x, y) is equal to :

(1) $(1,6)$ (2) $(6,1)$

(3) $(8,1)$ (4) $(1,8)$

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8. 4 marks

Let a_1, a_2, a_3, a_4, a_5 be a G.P. of positive real numbers such that the A.M. of a_2 and a_4 is 117 and the G.M. of a_2 and a_4 is 108. Then the A.M. of a_1 and a_5 is :

(1) 108 (2) 117

(3) 144.5 (4) 145.5

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9. 4 marks

If the sum of the first 15 terms of the series $3 + 7 + 14 + 24 + 37 + \ldots$ is 15 k, then k is equal to :

(1) 122 (2) 81

(3) 119 (4) 126

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10. 4 marks

$\lim_{x \to 0} \frac{\log(\sin 7x + \cos 7x)}{\sin 3x}$ equals :

(1) $\frac{7}{3}$ (2) $\frac{14}{3}$

(3) $\frac{1}{3}$ (4) $\frac{1}{3}\log 7$

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11. 4 marks

If the function $f : \mathbf{R} \to \mathbf{R}$, defined by

$$f(x) = \begin{cases} ax, & x < 2 \\ ax^2 - bx + 3, & x \geq 2 \end{cases}$$

is differentiable, then the value of $f'(-3) + f'(3)$ is equal to :

(1) 3 (2) 4

(3) $\frac{15}{2}$ (4) 0

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12. 4 marks

The sum of the abscissae of the points where the curves, $y = kx^2 + (5k+3)x + 6k + 5$, $(k \in \mathbf{R})$, touch the x-axis, is equal to :

(1) $-\frac{19}{3}$ (2) $-\frac{10}{3}$

(3) $\frac{5}{3}$ (4) $-\frac{4}{3}$

13. 4 marks

Water is running into an underground right circular conical reservoir, which is 10 m deep and radius of its base is 5 m. If the rate of change in the volume of water in the reservoir is $\frac{3}{2}\pi$ m^3 /min., then the rate (in m/min) at which water rises in it, when the water level is 4 m, is :

(1) $\frac{3}{8}$ (2) $\frac{1}{8}$

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

14. 4 marks

The integral $\int \frac{x+2}{(x^2+3x+3)\sqrt{x+1}}dx$ is equal to :

(where C is a constant of integration)

(1) $\frac{1}{\sqrt{3}}\tan^{-1}\left[\frac{x}{\sqrt{3}(x+1)}\right]+C$ (2) $\frac{2}{\sqrt{3}}\tan^{-1}\left[\frac{x}{\sqrt{3}(x+1)}\right]+C$

(3) $\frac{2}{\sqrt{3}}\cot^{-1}\left[\frac{x}{\sqrt{x+1}}\right]+C$ (4) $\frac{1}{\sqrt{3}}\cot^{-1}\left[\frac{x\sqrt{3}}{\sqrt{x+1}}\right]+C$

15. 4 marks

The integral $\int_{\pi/24}^{5\pi/24} \frac{dx}{1+\sqrt{\tan 2x}}$ is equal to :

(1) $\frac{\pi}{3}$ (2) $\frac{\pi}{12}$

(3) $\frac{\pi}{6}$ (4) $\frac{\pi}{18}$

16. 4 marks

If the line, $y = mx$, bisects the area of the region

$\{(x,y) : 0 \le x \le \frac{3}{2},\ 0 \le y \le 1 + 4x - x^2\}$, then m equals :

(1) $\frac{9}{8}$ (2) $\frac{13}{3}$

(3) $\frac{13}{6}$ (4) $\frac{39}{16}$

17. 4 marks

The order and the degree of the differential equation of all ellipses with centre at the origin, major axis along x-axis and eccentricity $\frac{\sqrt{3}}{2}$ are, respectively :

(1) 1, 1 (2) 2, 1

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

18. 4 marks

If an equilateral triangle, having centroid at the origin, has a side along the line, $x + y = 2$, then the area (in sq. units) of this triangle is :

(1) 6 (2) $6\sqrt{3}$

(3) $\frac{9}{2}\sqrt{3}$ (4) $3\sqrt{6}$

19. 4 marks

The equation of the circle, which is the mirror image of the circle, $x^2 + y^2 - 2x = 0$, in the line, $y = 3 - x$ is :

(1) $x^2 + y^2 - 6x - 8y + 24 = 0$ (2) $x^2 + y^2 - 8x - 6y + 24 = 0$

(3) $x^2 + y^2 - 4x - 6y + 12 = 0$ (4) $x^2 + y^2 - 6x - 4y + 12 = 0$

20. 4 marks

The product of the perpendiculars drawn from the foci of the ellipse, $\frac{x^2}{9} + \frac{y^2}{25} = 1$ upon the tangent to it at the point $(\frac{3}{2}, \frac{5\sqrt{3}}{2})$, is :

(1) 9 (2) $\frac{189}{13}$

(3) 18 (4) $3\sqrt{13}$

21. 4 marks

Which one of the following points **does not** lie on the normal to the hyperbola, $\frac{x^2}{16} - \frac{y^2}{9} = 1$ drawn at the point $(8, 3\sqrt{3})$?

(1) $(13, -\frac{1}{\sqrt{3}})$ (2) $(12, \frac{1}{\sqrt{3}})$

(3) $(11, \sqrt{3})$ (4) $(10, \sqrt{3})$

22. 4 marks

If the shortest distance between the lines $x + 2\lambda = 2y = -12z$, $x = y + 4\lambda = 6z - 12\lambda$ is $4\sqrt{2}$ units, then a value of λ is :

(1) 2 (2) $\sqrt{2}$

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

23. 4 marks

The perpendicular distance from the point $(3, 1, 1)$ on the plane passing through the point $(1, 2, 3)$ and containing the line, $\vec{r} = \hat{i} + \hat{j} + \lambda(2\hat{i} + \hat{j} + 4\hat{k})$, is :

(1) $\frac{1}{\sqrt{11}}$ (2) $\frac{4}{\sqrt{41}}$

(3) 0 (4) $\frac{3}{\sqrt{11}}$

24. 4 marks

Three vectors $\vec{a}$, $\vec{b}$ and $\vec{c}$ are such that $|\vec{a}| = 1$, $|\vec{b}| = 2$, $|\vec{c}| = 4$ and $\vec{a} + \vec{b} + \vec{c} = \vec{0}$. Then the value of $4\vec{a} \cdot \vec{b} + 3\vec{b} \cdot \vec{c} + 3\vec{c} \cdot \vec{a}$ is equal to :

(1) -68 (2) -26

(3) -34 (4) 27

25. 4 marks

Two numbers are selected at random (without replacement) from the first six positive integers. If X denotes the smaller of the two numbers, then the expectation of X, is :

(1) $\frac{14}{3}$ (2) $\frac{13}{3}$

(3) $\frac{7}{3}$ (4) $\frac{5}{3}$

26. 4 marks

If A and B are two independent events such that $P(A) = \frac{3}{10}$ and $P(A \cup B) = \frac{4}{5}$, then $P(A \cap B)$ is equal to :

(1) $\frac{1}{5}$ (2) $\frac{1}{10}$

(3) $\frac{3}{14}$ (4) $\frac{3}{35}$

27. 4 marks

A bag contains three coins, one of which has head on both sides, another is a biased coin that shows up heads 90% of the time and the third one is an unbiased coin. A coin is taken out from the bag at random and tossed. If it shows up a head, then the probability that it is the unbiased coin, is :

(1) $\frac{5}{12}$ (2) $\frac{5}{24}$

(3) $\frac{1}{3}$ (4) $\frac{3}{8}$

28. 4 marks

The value of $\frac{1}{\cos 285^\circ} + \frac{1}{\sqrt{3}\sin 255^\circ}$, is :

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

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

29. 4 marks

An observer standing at a point P on the top of a hill near the sea-shore notices that the angle of depression of a ship moving towards the hill in a straight line at a constant speed is 30°. After 45 minutes, this angle becomes 45°. If T (in minutes) is the total time taken by the ship to move to a point in the sea where the angle of depression from P of the ship is 60°, then T is equal to :

(1) $45(1 + \sqrt{3})$ (2) $45(1 + \frac{2}{\sqrt{3}})$

(3) $45(2 + \frac{1}{\sqrt{3}})$ (4) $45(1 + \frac{1}{\sqrt{3}})$

30. 4 marks

Which one of the following statements is a tautology ?

(1) $(p \vee q) \rightarrow q$

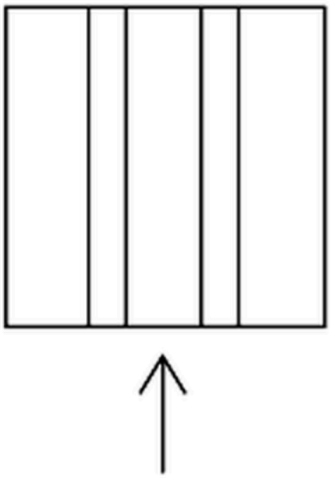
(2) $p \vee (p \rightarrow q)$

(3) $p \vee (q \rightarrow p)$

(4) $p \rightarrow (p \rightarrow q)$

31. 4 marks

Directions : (For Q. No. 31 to 33). 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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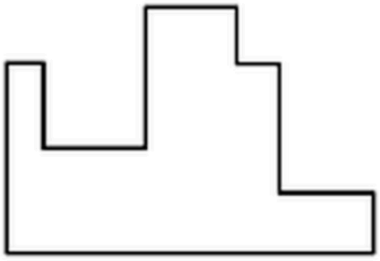

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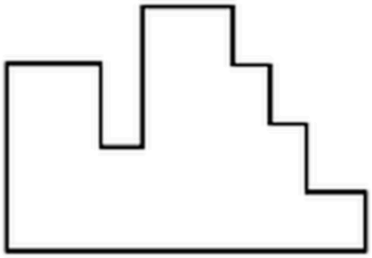

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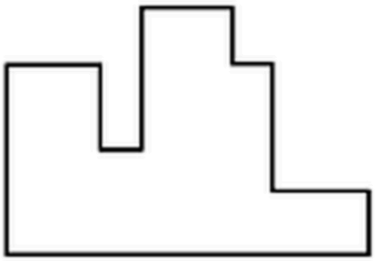

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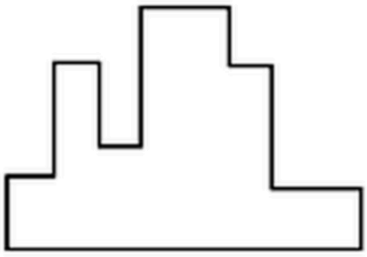

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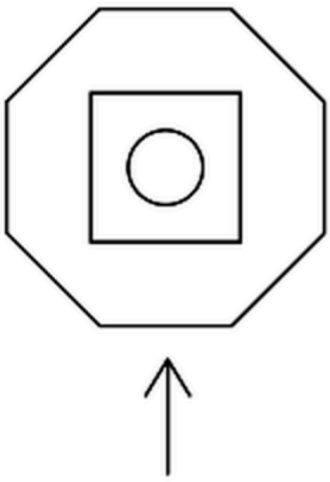

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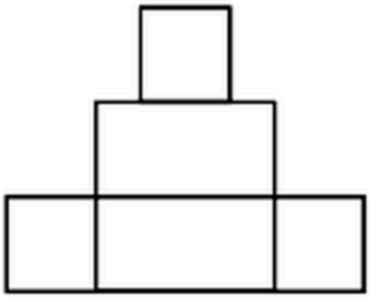

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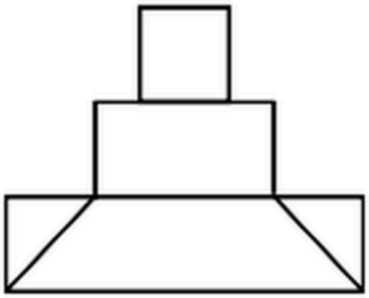

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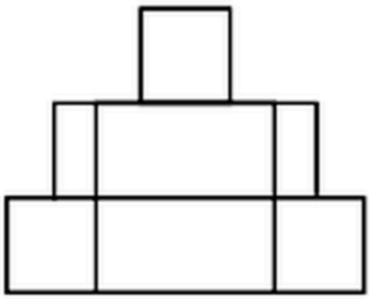

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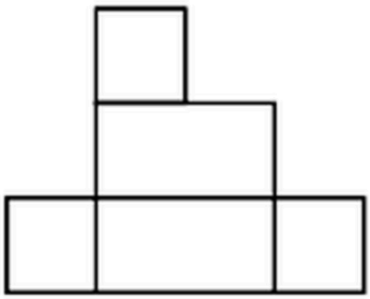

33. 4 marks

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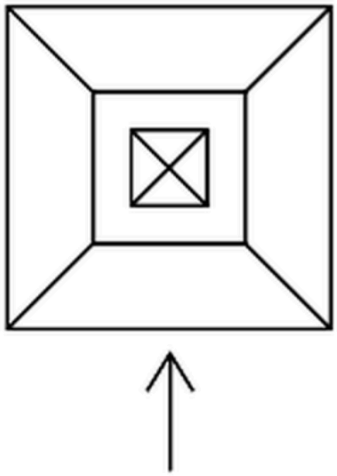

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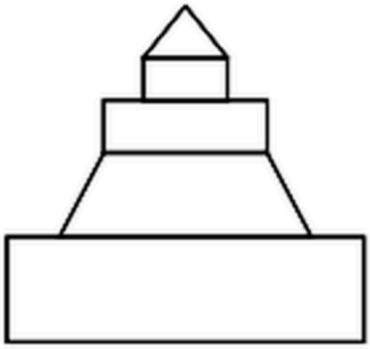

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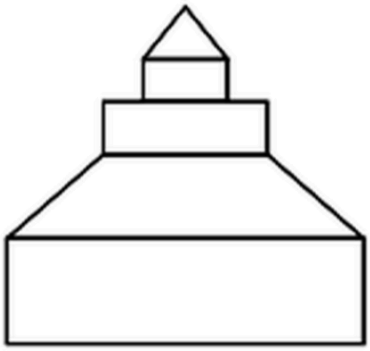

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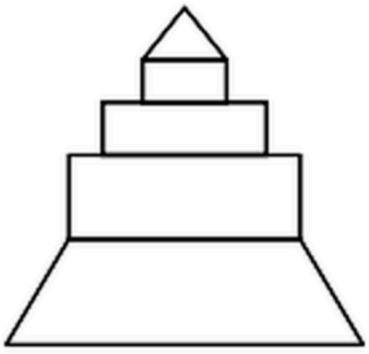

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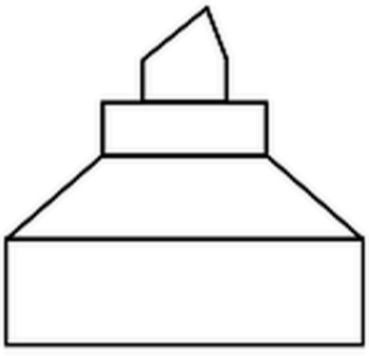
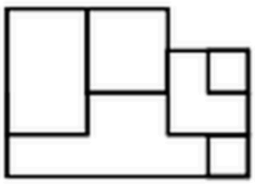


34. 4 marks

Directions : (For Q. No. 34 to 36). Identify the correct 3-D figure from amongst the answer figures, which has the same elevation, as given in the problem figure on the left.



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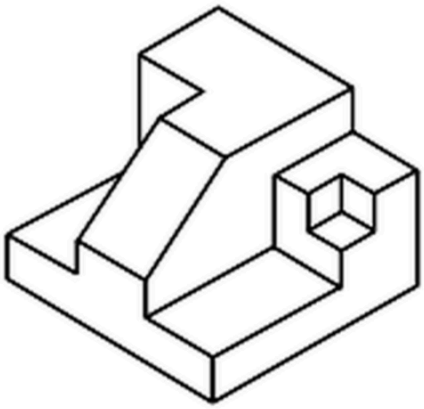

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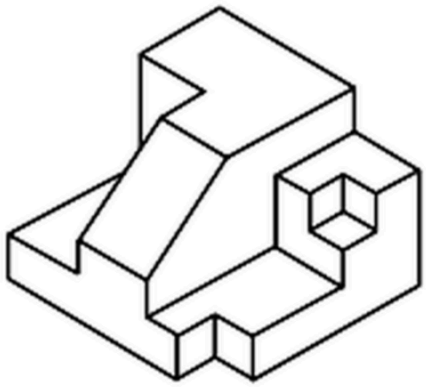

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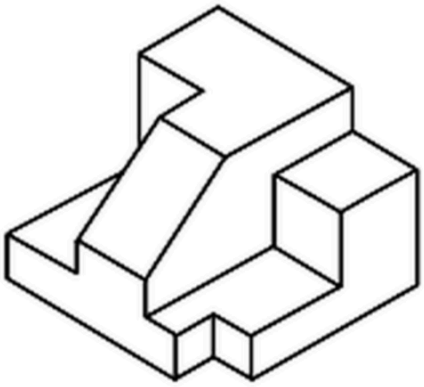

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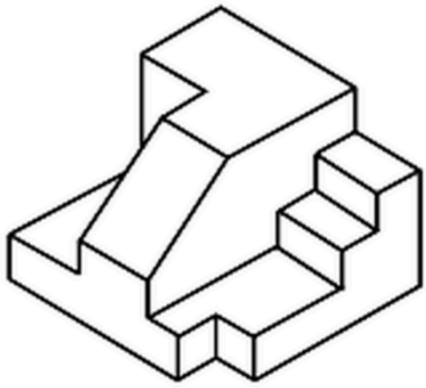

35. 4 marks

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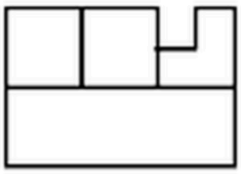

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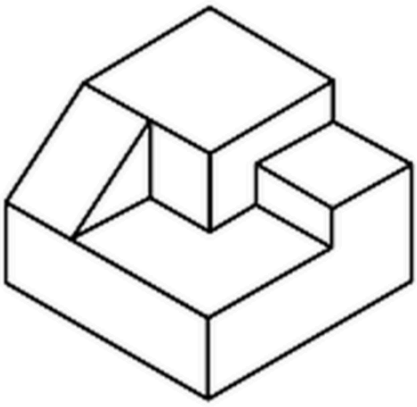

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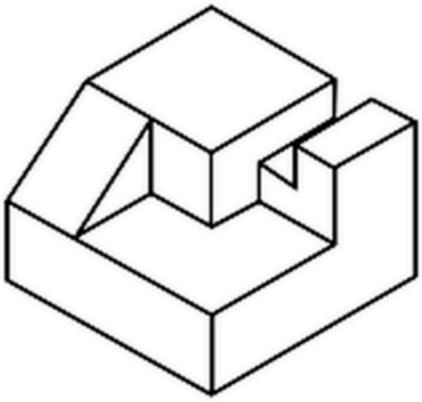

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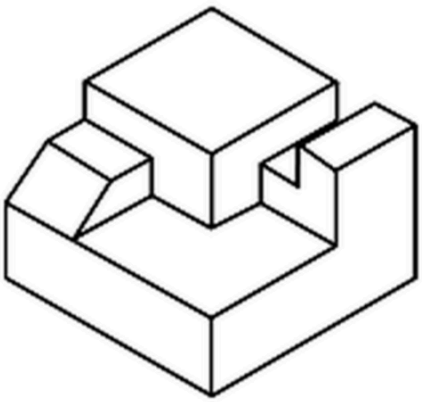

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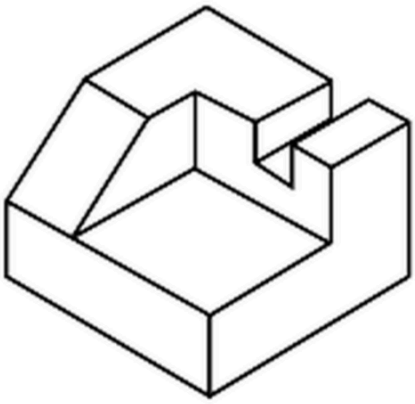

36. 4 marks

Directions : (For Q. No. 34 to 36). Identify the correct 3-D figure from amongst the answer figures, which has the same elevation, as given in the problem figure on the left.



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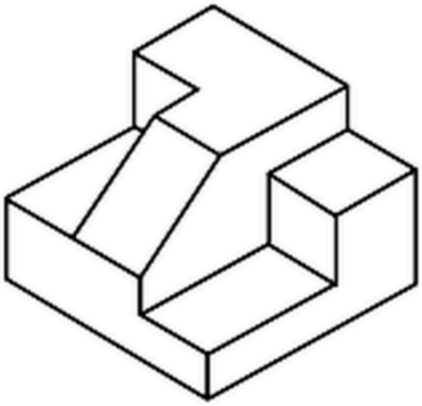

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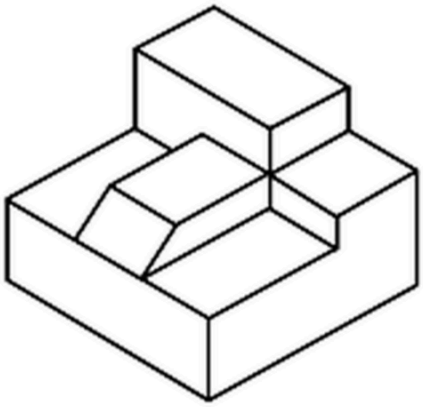

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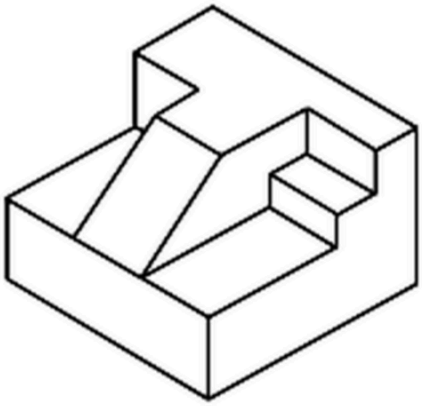

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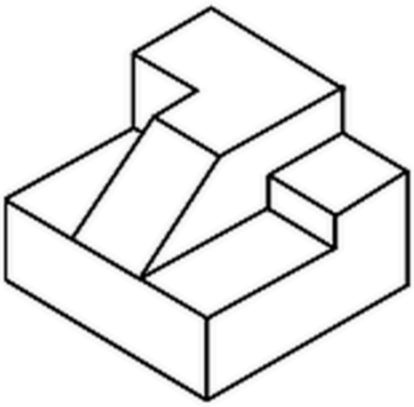
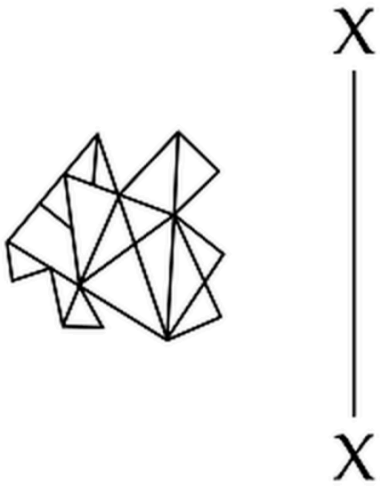


37. 4 marks

Directions : (For Q. No. 37 to 40). Which one of the answer figures is the correct mirror image of the problem figure with respect to X - X ?



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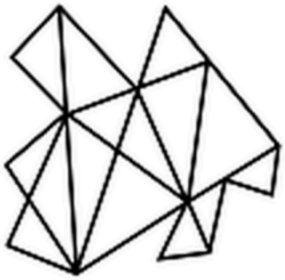

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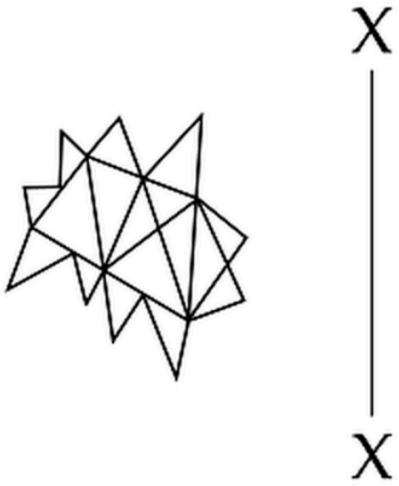
(4)

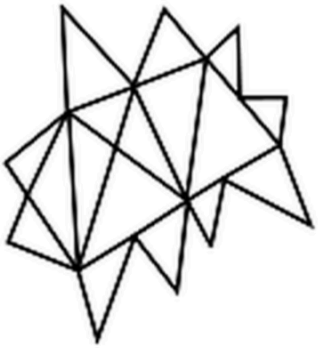


38. 4 marks

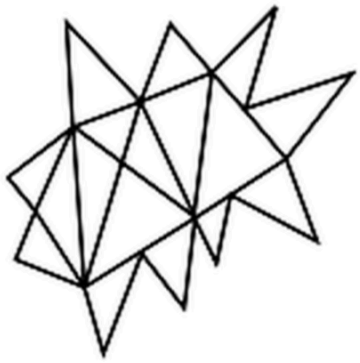
Directions : (For Q. No. 37 to 40). Which one of the answer figures is the correct mirror image of the problem figure with respect to X - X ?



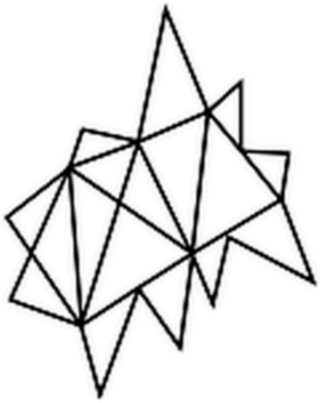
(1)



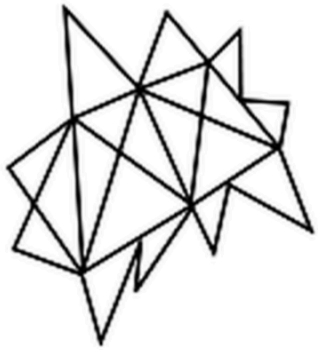
(2)



(3)

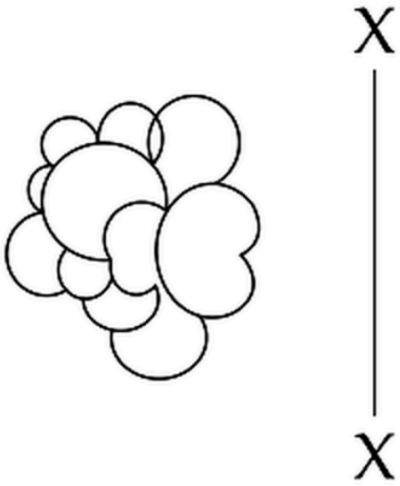


(4)

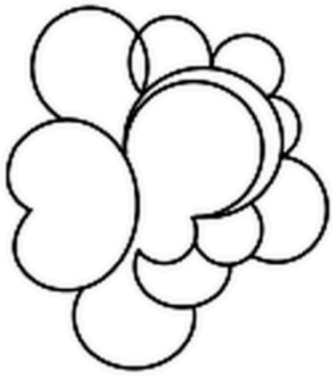


39. 4 marks

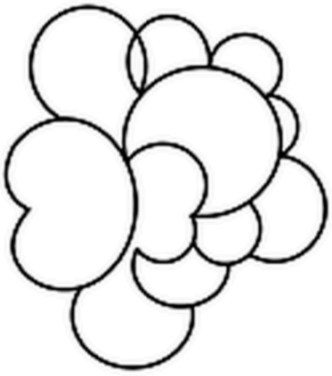
Directions : (For Q. No. 37 to 40). Which one of the answer figures is the correct mirror image of the problem figure with respect to X - X ?



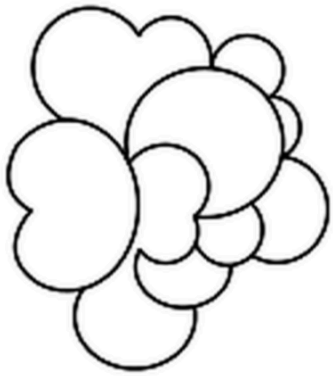
(1)



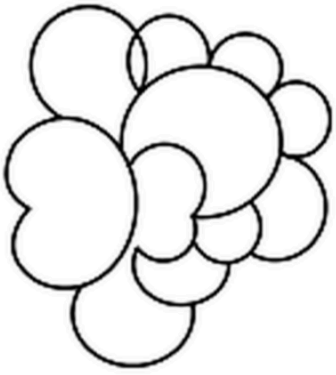
(2)



(3)

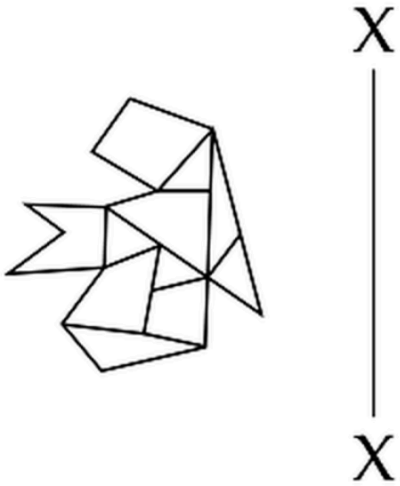


(4)

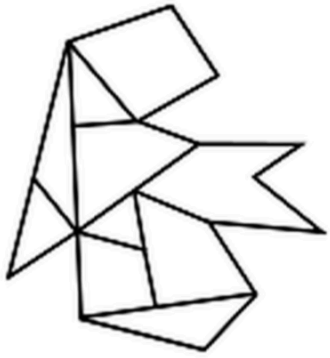


40. 4 marks

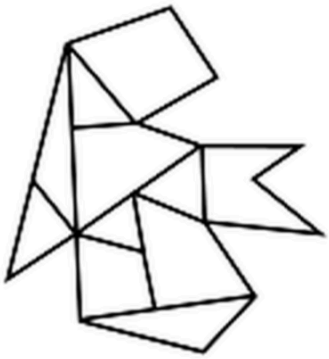
Directions : (For Q. No. 37 to 40). Which one of the answer figures is the correct mirror image of the problem figure with respect to X - X ?



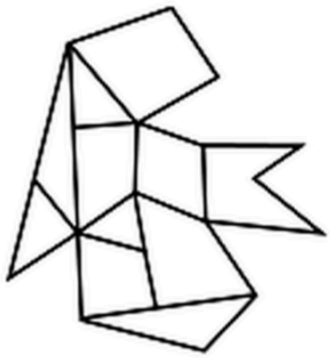
(1)



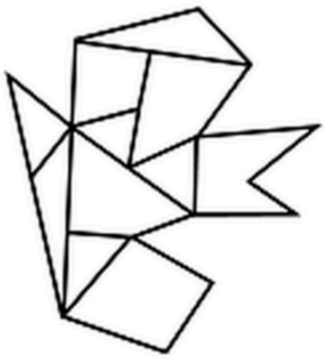
(2)



(3)



(4)



41. 4 marks

Directions : (For Q. No. 41 and 42). Which one of the answer figures will complete the sequence of the three problem figures ?



(1)



(2)



(3)

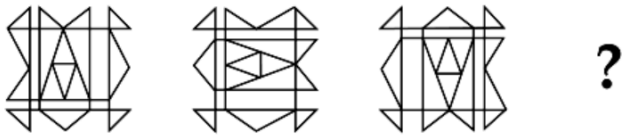


(4)

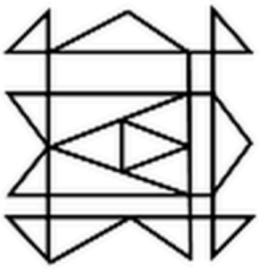


42. 4 marks

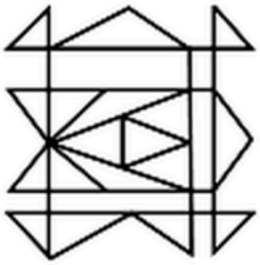
Directions : (For Q. No. 41 and 42). Which one of the answer figures will complete the sequence of the three problem figures ?



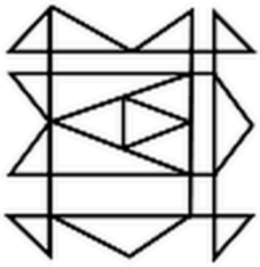
(1)



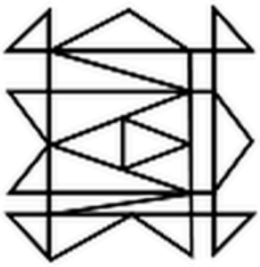
(2)



(3)

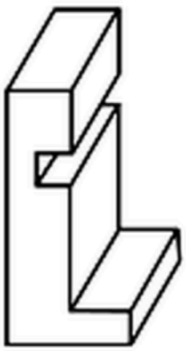


(4)

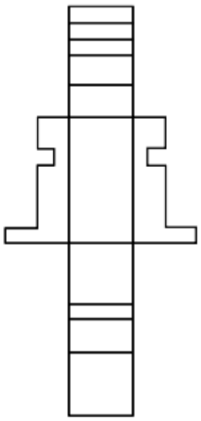


43. 4 marks

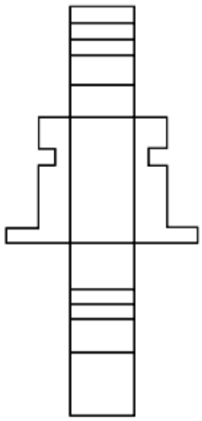
Directions : (For Q. No. 43 to 45). Which one of the answer figures shows the correct view of the 3-D problem figure after the problem figure is opened up ?



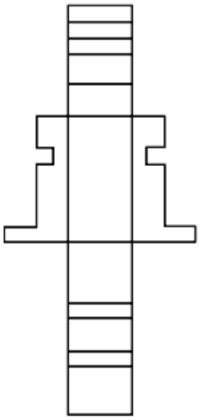
(1)



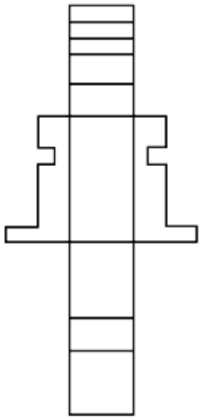
(2)



(3)

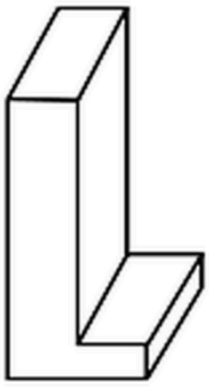


(4)

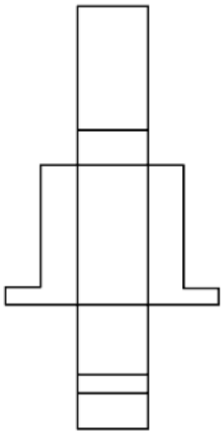


44. 4 marks

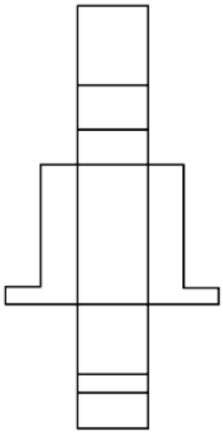
Directions : (For Q. No. 43 to 45). Which one of the answer figures shows the correct view of the 3-D problem figure after the problem figure is opened up ?



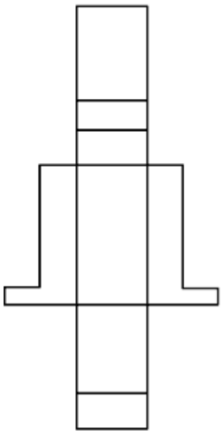
(1)



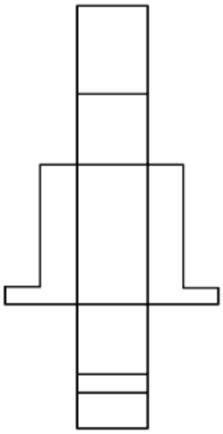
(2)



(3)



(4)

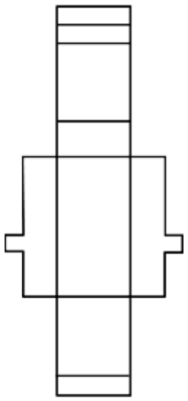


45. 4 marks

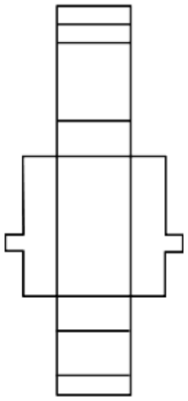
Directions : (For Q. No. 43 to 45). Which one of the answer figures shows the correct view of the 3-D problem figure after the problem figure is opened up ?



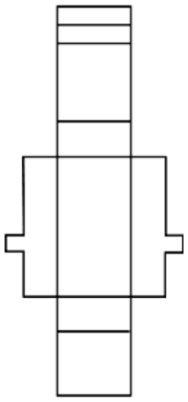
(1)



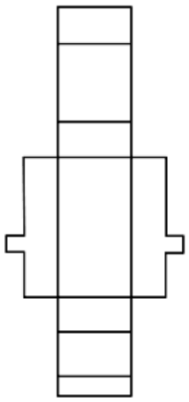
(2)



(3)

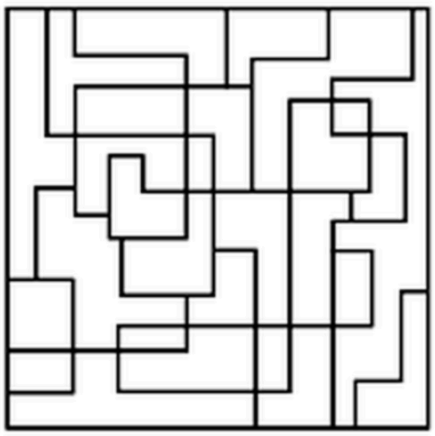


(4)

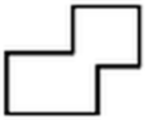


46. 4 marks

Directions : (For Q. No. 46). One of the following answer figures is hidden in the problem figure in the same size and direction. Select the correct one.



(1)



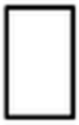
(2)



(3)

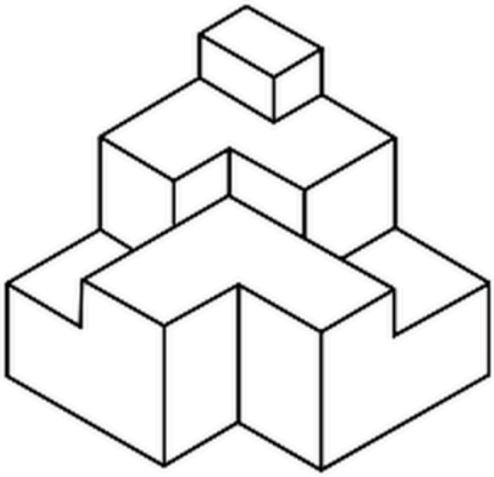


(4)

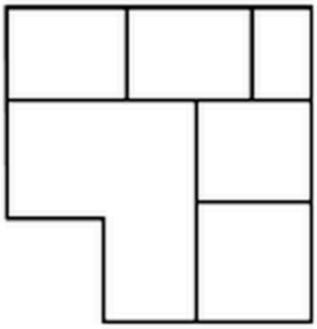


47. 4 marks

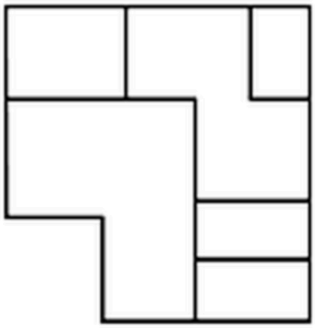
Directions : (For Q. No. 47 to 50). The 3-D figure shows the view of an object. Identify the correct top view from amongst the answer figures.



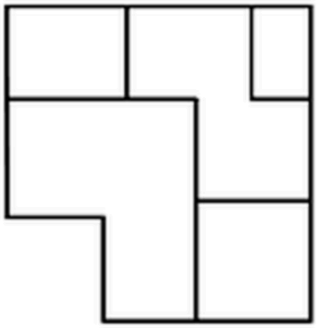
(1)



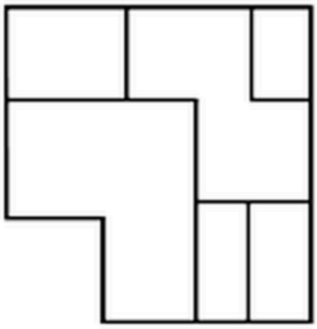
(2)



(3)

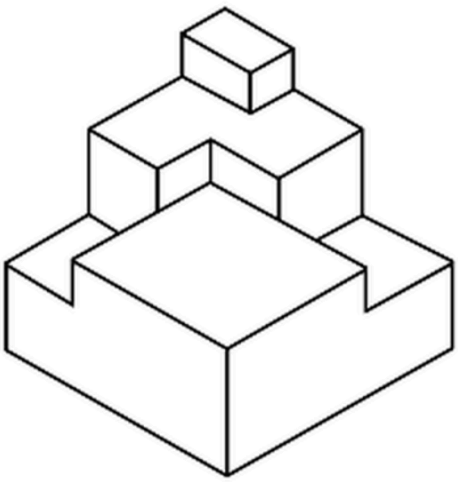


(4)

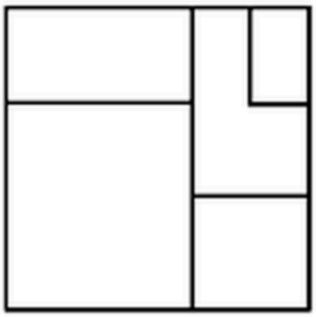


48. 4 marks

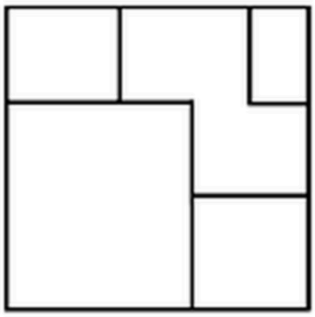
Directions : (For Q. No. 47 to 50). The 3-D figure shows the view of an object. Identify the correct top view from amongst the answer figures.



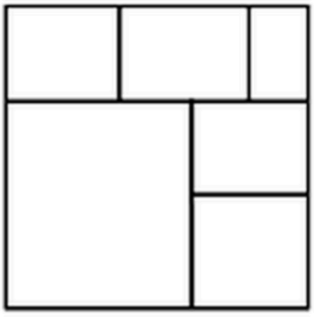
(1)



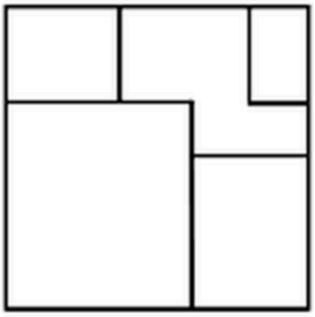
(2)



(3)

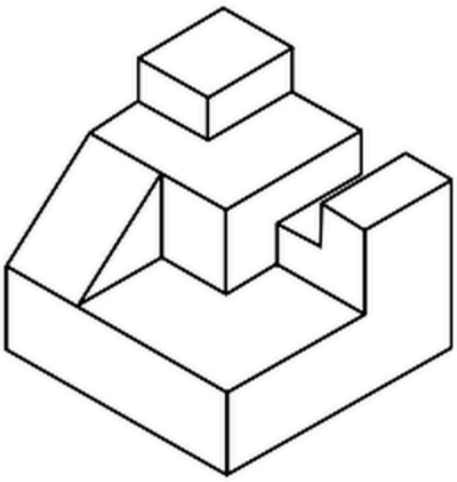


(4)

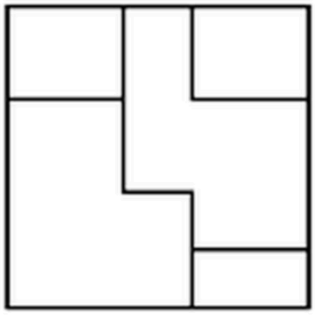


49. 4 marks

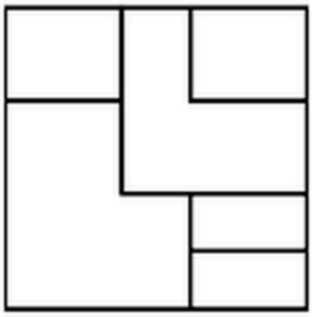
Directions : (For Q. No. 47 to 50). The 3-D figure shows the view of an object. Identify the correct top view from amongst the answer figures.



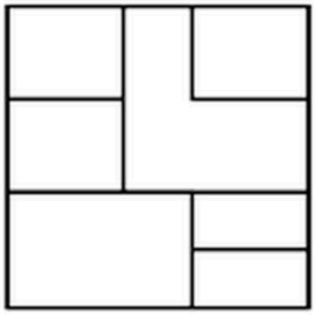
(1)



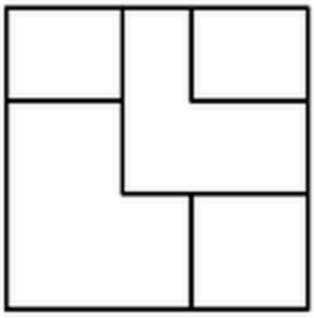
(2)



(3)

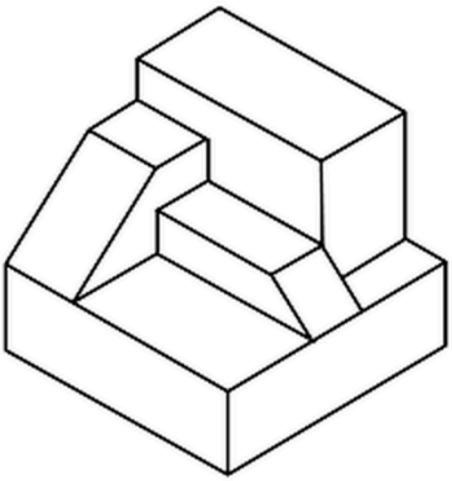


(4)

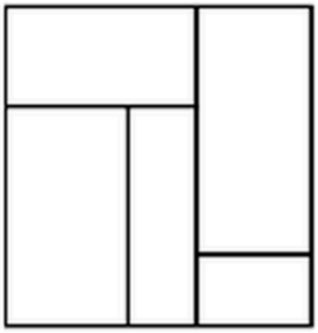


50. 4 marks

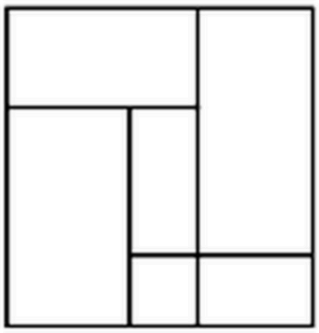
Directions : (For Q. No. 47 to 50). The 3-D figure shows the view of an object. Identify the correct top view from amongst the answer figures.



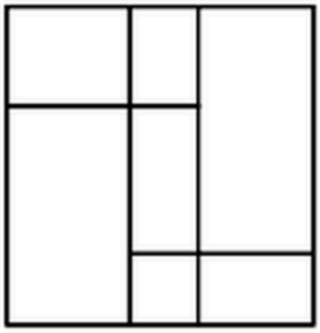
(1)



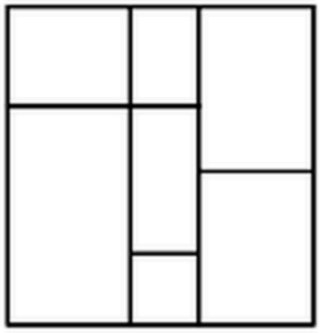
(2)



(3)

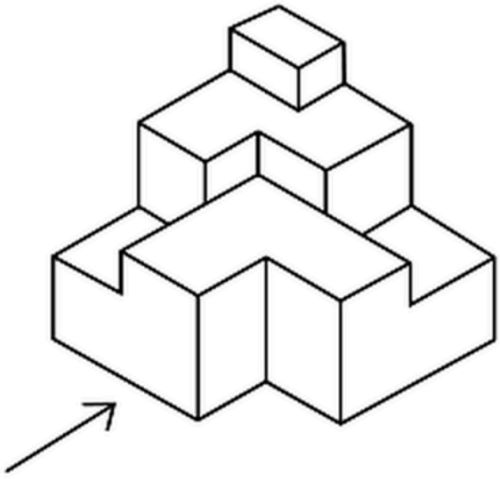


(4)

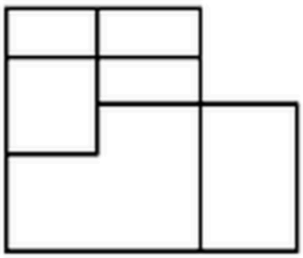


51. 4 marks

Directions : (For Q. No. 51 to 53). The 3–D problem figure shows a view of an object. Identify the correct front view, from amongst the answer figures, looking in the direction of arrow.



(1)



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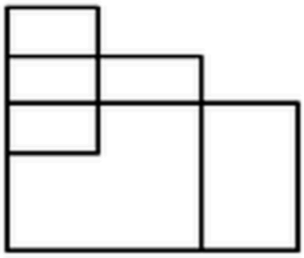

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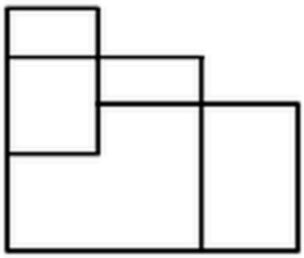

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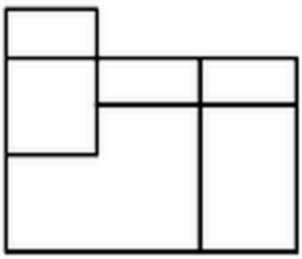
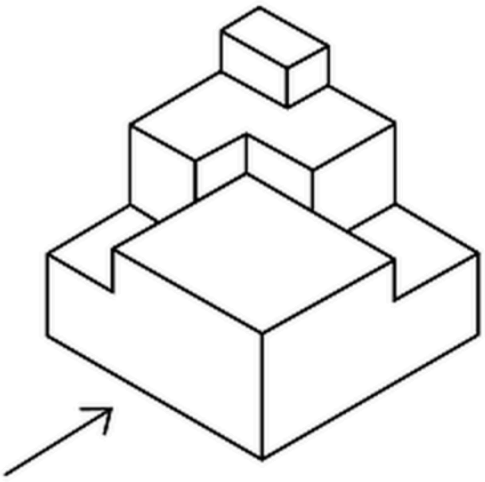


52. 4 marks

Directions : (For Q. No. 51 to 53). The 3–D problem figure shows a view of an object. Identify the correct front view, from amongst the answer figures, looking in the direction of arrow.



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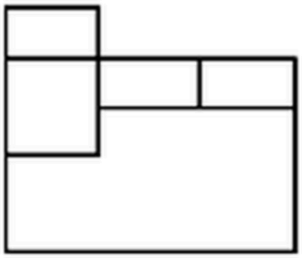

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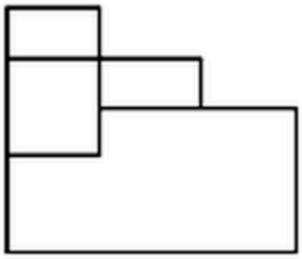

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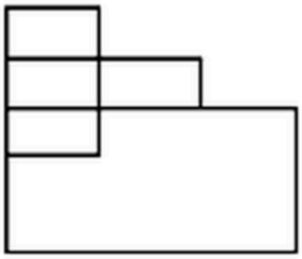

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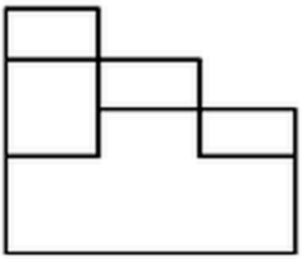
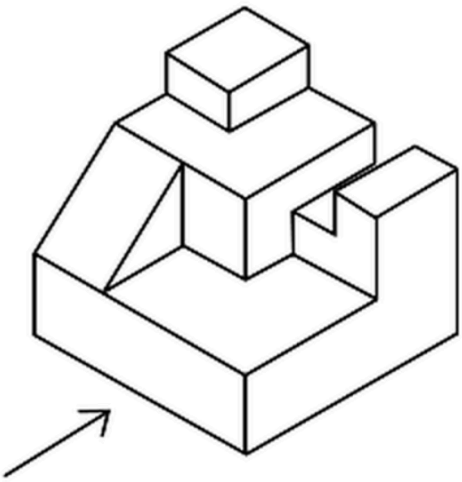


53. 4 marks

Directions : (For Q. No. 51 to 53). The 3–D problem figure shows a view of an object. Identify the correct front view, from amongst the answer figures, looking in the direction of arrow.



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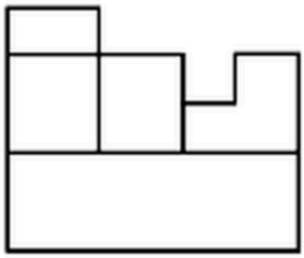

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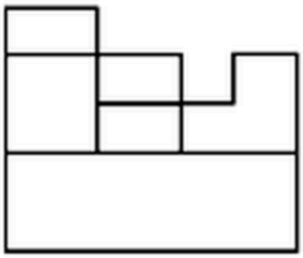

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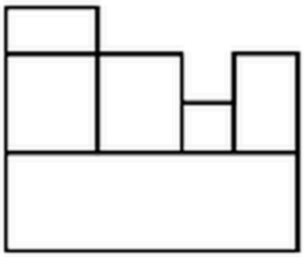

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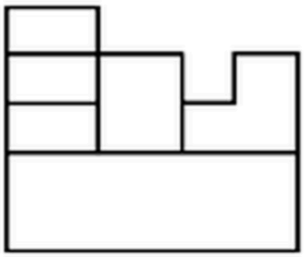
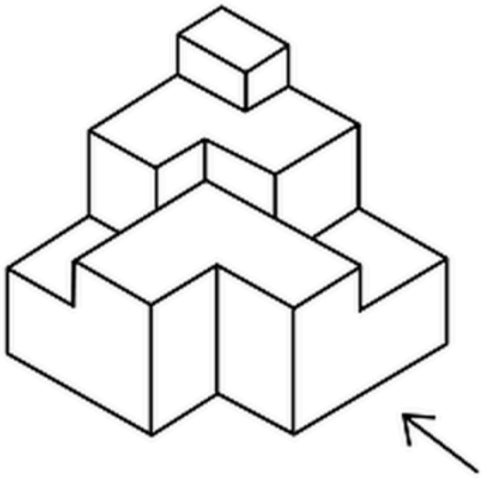


54. 4 marks

Directions : (For Q. No. 54 to 56). The 3-D problem figure shows a view of an object. Identify the correct front view, from amongst the answer figures, looking in the direction of arrow.



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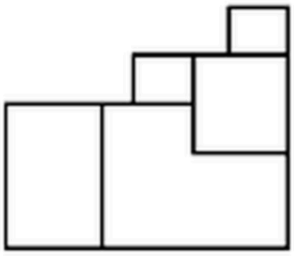

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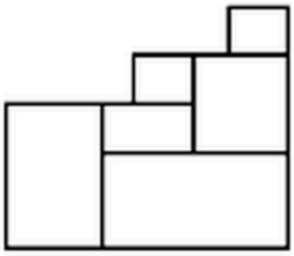

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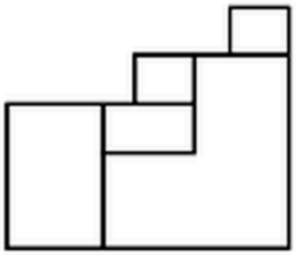

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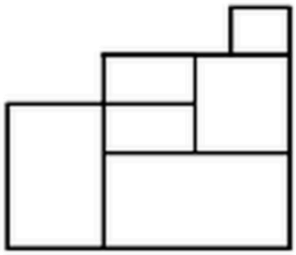
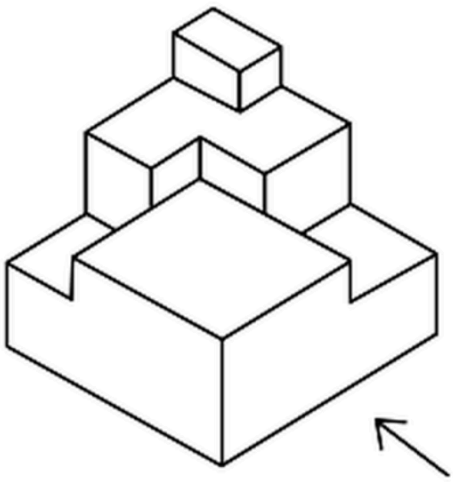
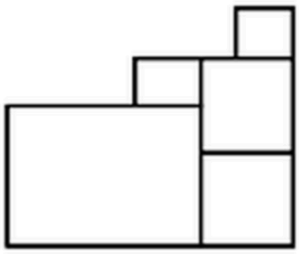


55. 4 marks

Directions : (For Q. No. 54 to 56). The 3-D problem figure shows a view of an object. Identify the correct front view, from amongst the answer figures, looking in the direction of arrow.



(1)



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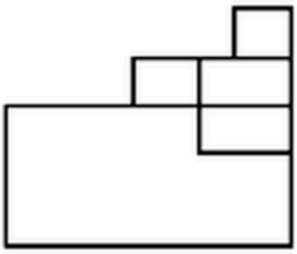

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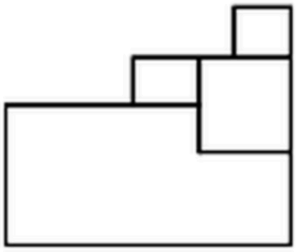

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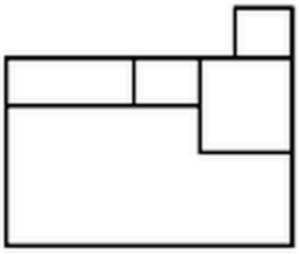
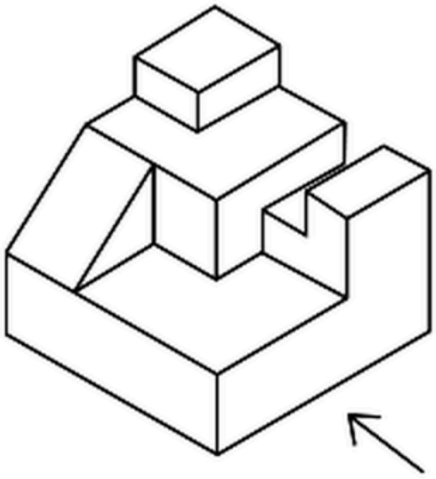


56. 4 marks

Directions : (For Q. No. 54 to 56). The 3-D problem figure shows a view of an object. Identify the correct front view, from amongst the answer figures, looking in the direction of arrow.



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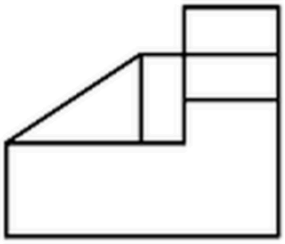

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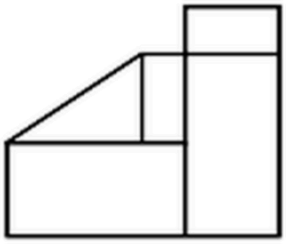

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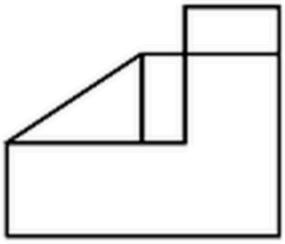

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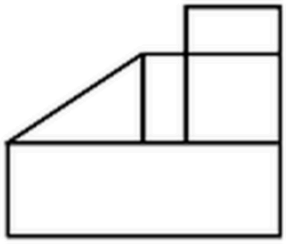
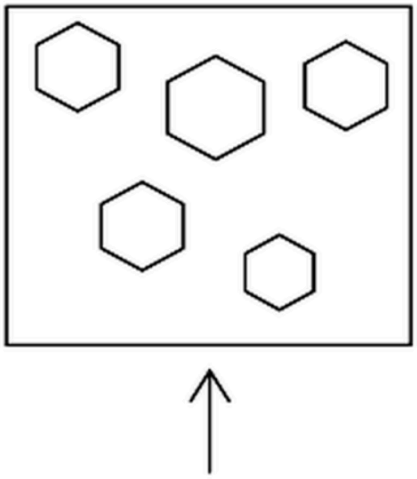


57. 4 marks

Directions : (For Q. No. 57 to 60). 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.



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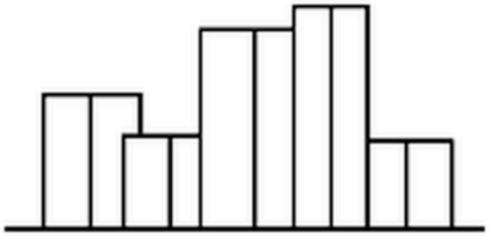

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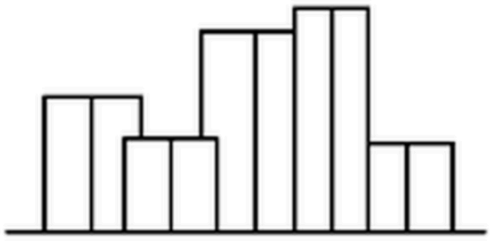
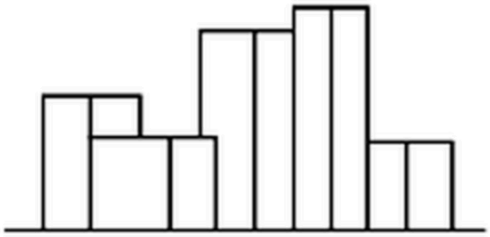


(3)



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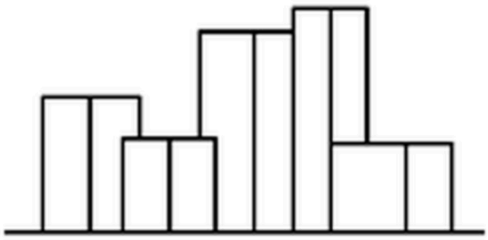
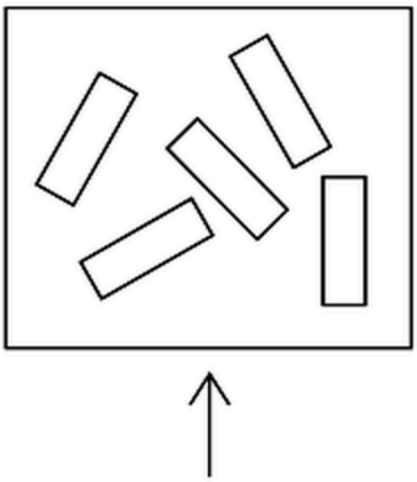
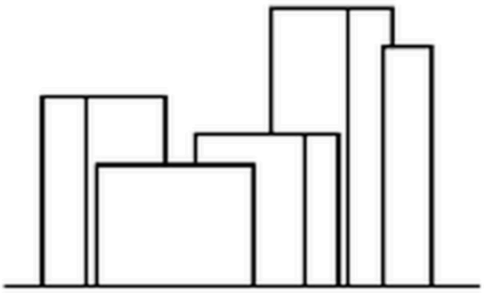


58. 4 marks

Directions : (For Q. No. 57 to 60). 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)



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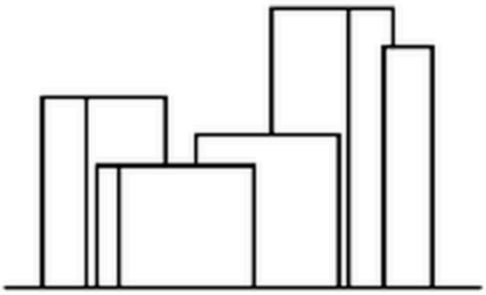

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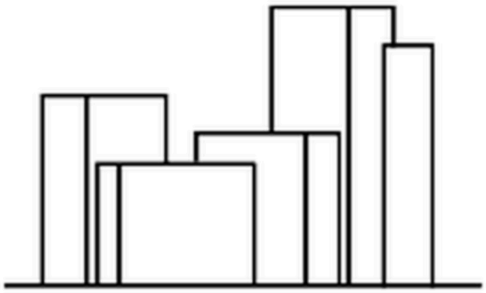

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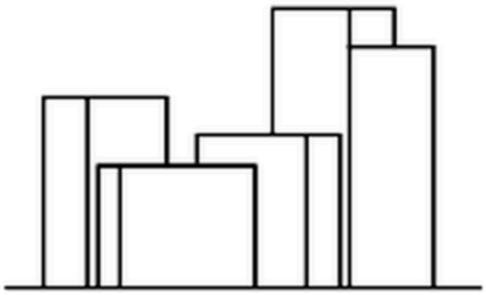
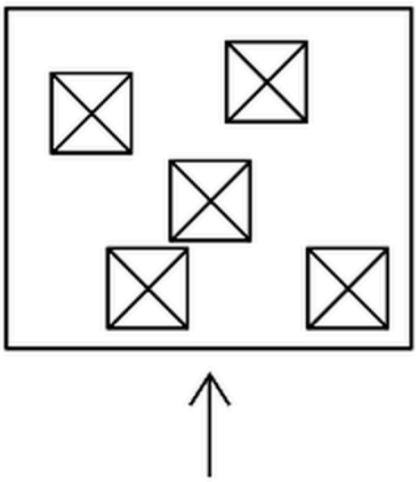
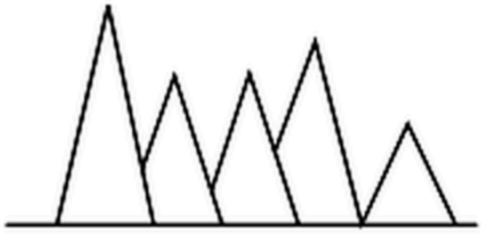


59. 4 marks

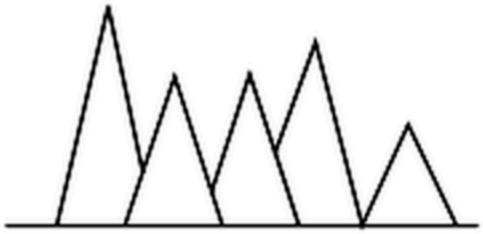
Directions : (For Q. No. 57 to 60). The problem figure shows the top view of objects. Looking in the direction of the arrow, identify the correct elevation, from amongst the answer figures.



(1)



(2)



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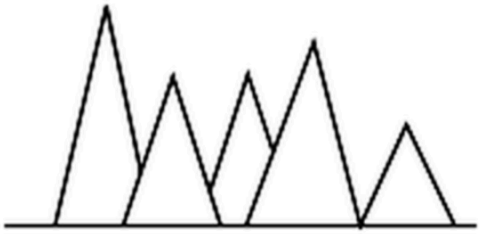

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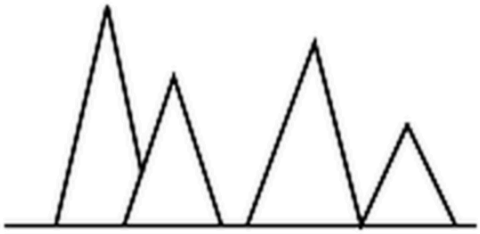
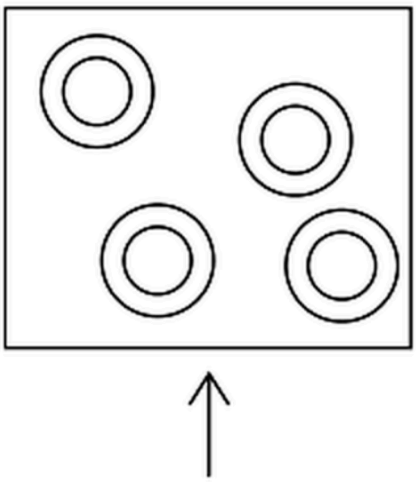
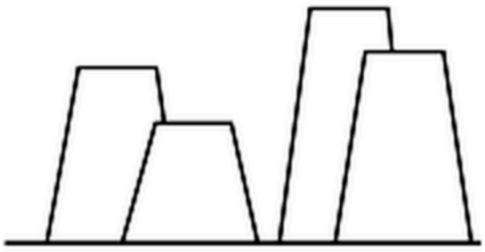


60. 4 marks

Directions : (For Q. No. 57 to 60). 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)



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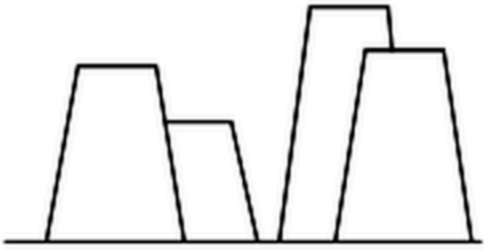

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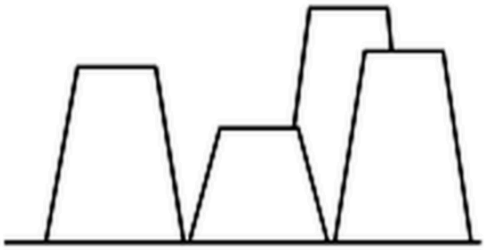

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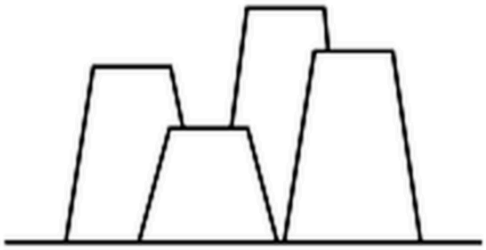
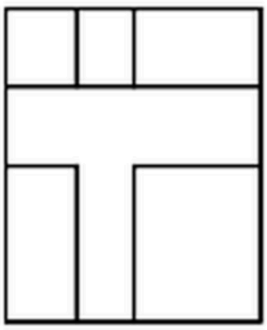
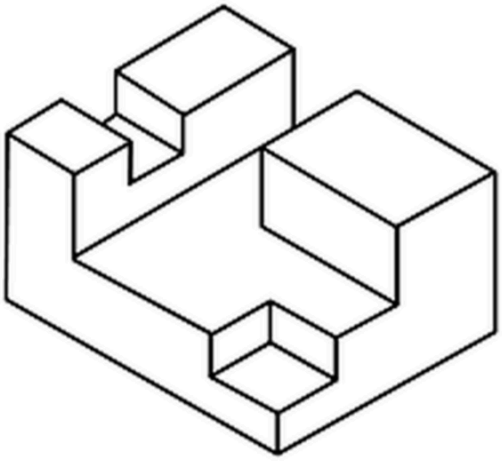


61. 4 marks

Directions : (For Q. No. 61). From the top view given in the problem figure identify the correct 3-D figure from amongst the answer figures.



(1)



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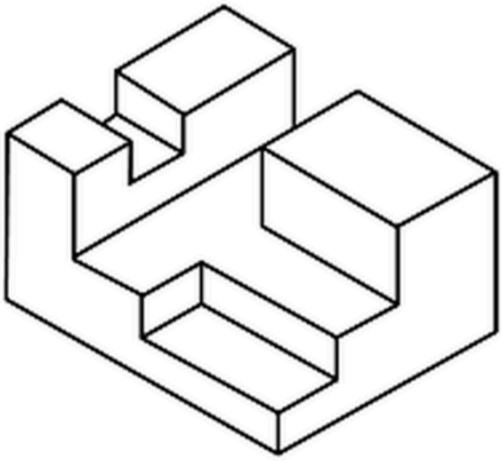

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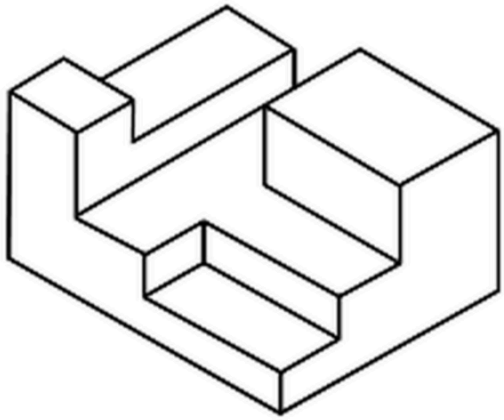
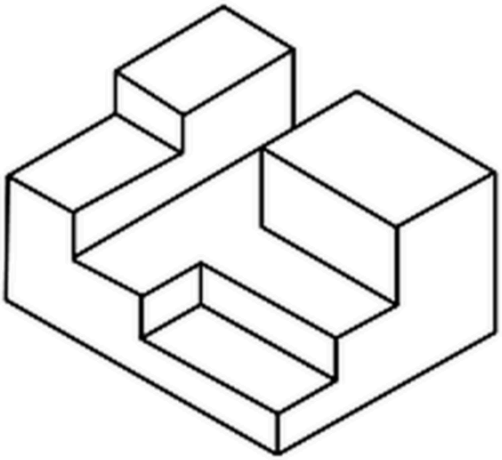
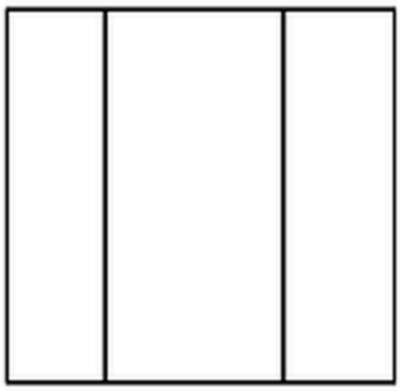


(4)

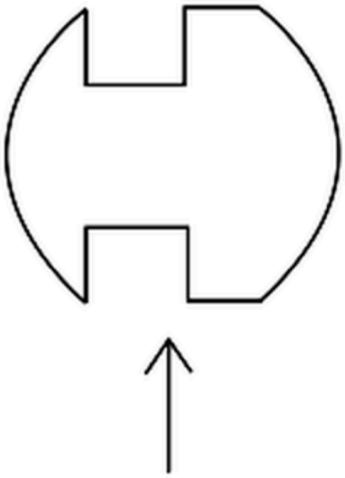


62. 4 marks

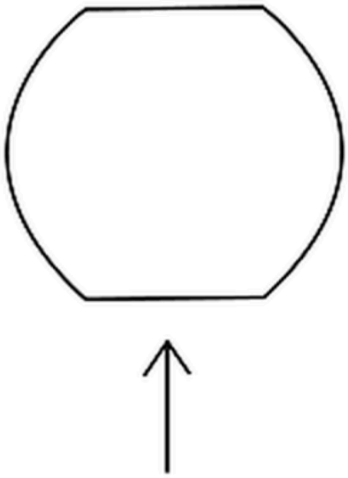
Directions : (For Q. No. 62 and 63). The problem figure shows the elevation of an object. Identify the correct top view from amongst the answer figures.



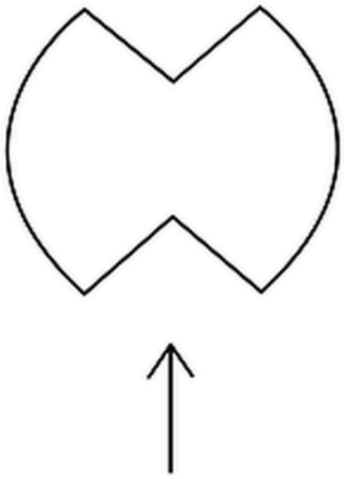
(1)



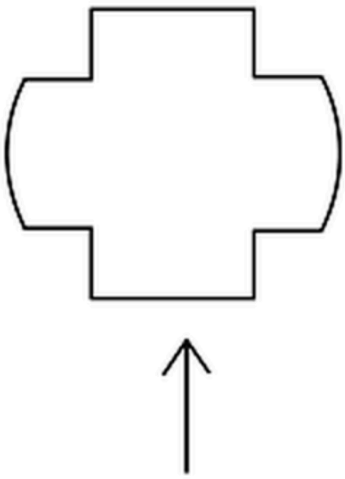
(2)



(3)

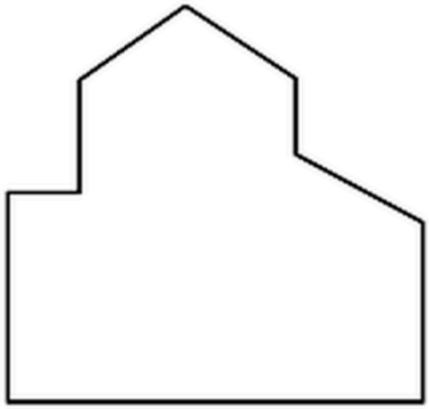


(4)

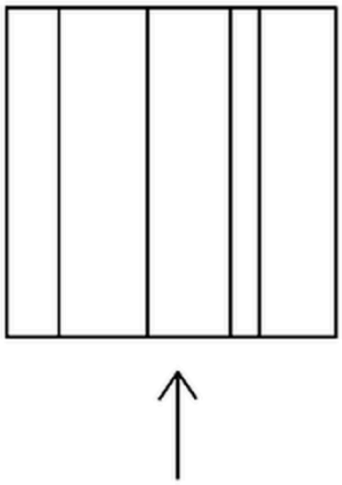


63. 4 marks

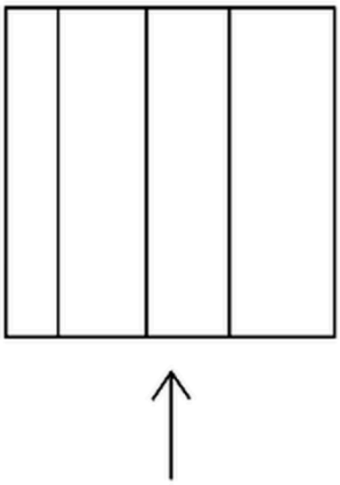
Directions : (For Q. No. 62 and 63). The problem figure shows the elevation of an object. Identify the correct top view from amongst the answer figures.



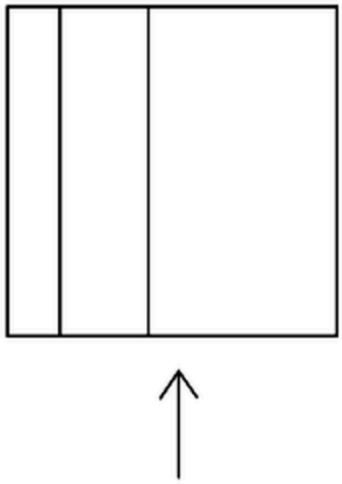
(1)



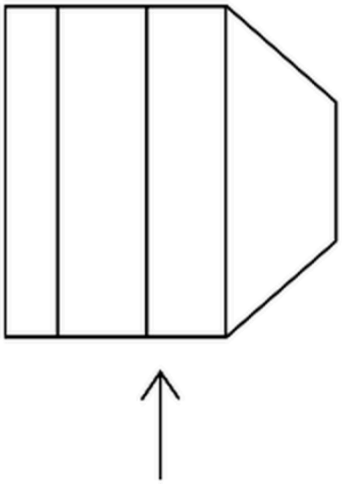
(2)



(3)



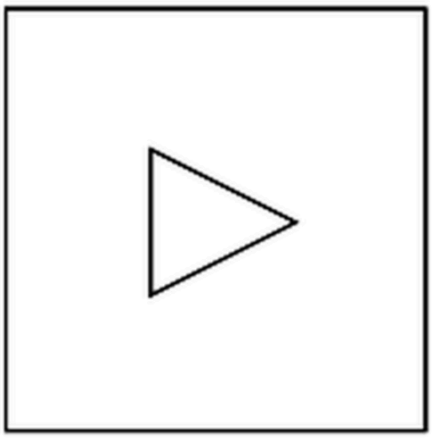
(4)



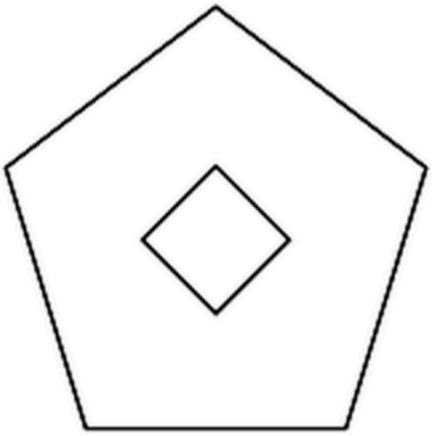
64. 4 marks

Directions : (For Q. No. 64 and 65). Find the odd figure out of the problem figures given below.

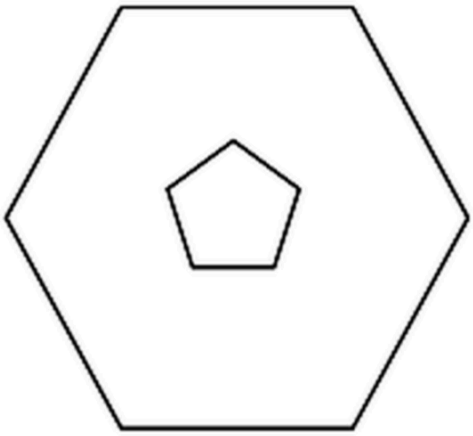
(1)



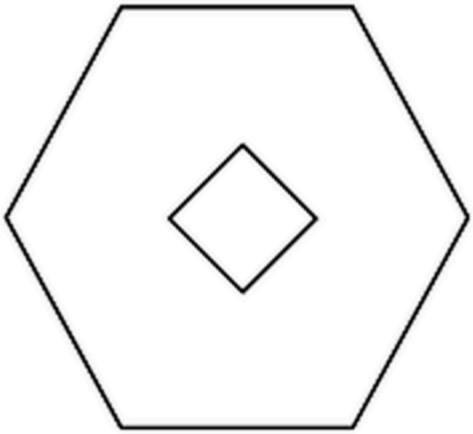
(2)



(3)



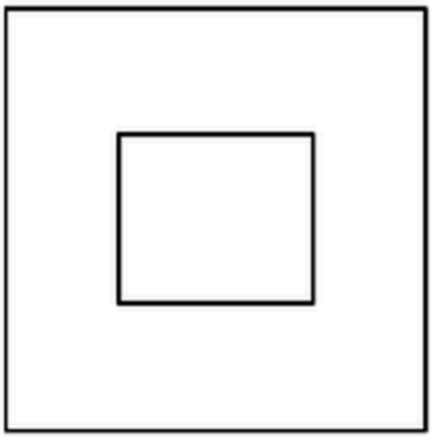
(4)



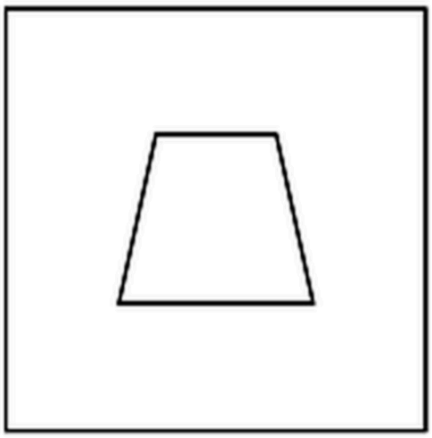
65. 4 marks

Directions : (For Q. No. 64 and 65). Find the odd figure out of the problem figures given below.

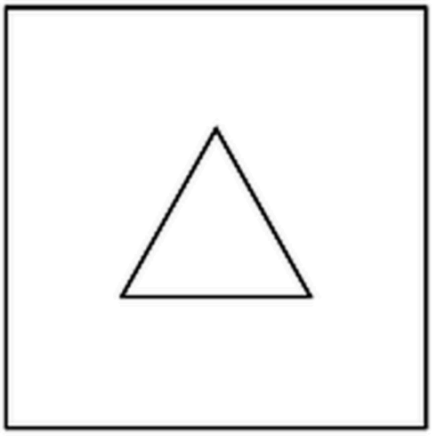
(1)



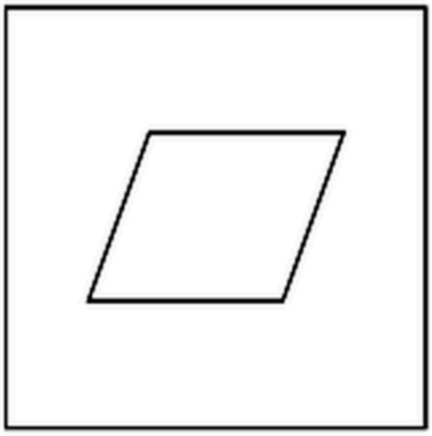
(2)



(3)



(4)



66. 4 marks

Which color is obtained by mixing red and yellow colors ?

(1) Purple

(2) Pink

(3) Orange

(4) Brown

67. 4 marks

Salim Chisti mosque is located in :

(1) Gwalior

(2) Fatehpur Sikri

(3) Hyderabad

(4) Delhi

68. 4 marks

Temperature of the Earth due to the 'Greenhouse Effect' :

(1) Increases
(2) Decreases
(3) Remains constant
(4) Keeps increasing/decreasing

69. 4 marks

Vertical sun protectors over wall openings help in cutting off summer sun rays on :

(1) South side
(2) West side
(3) North side
(4) On all sides

70. 4 marks

Which one of the following is not a load bearing component in a building ?

(1) Column
(2) Beam
(3) Partition wall
(4) Concrete floor slab

71. 4 marks

Which type of roof will provide maximum protection from heat radiation in a building ?

(1) Painted aluminium sheeting
(2) Concrete slab with plaster
(3) Concrete slab with mud and brick tiles
(4) Concrete slab, water proofed and covered with a roof garden

72. 4 marks

Ellora temples are :

(1) Made in marble
(2) Built in sandstone
(3) Cut out of rock
(4) Built in wood

73. 4 marks

Gol Gumbaj of Bijapur is :

(1) A Fort
(2) A Mausoleum
(3) A Palace
(4) A Mosque

74. 4 marks

Buland Darwaza is located in :

(1) Fatehpur Sikri
(2) Red Fort
(3) Agra Fort
(4) Golconda

75. 4 marks

Big Ben is a :

(1) Clock Tower
(2) Palace
(3) Mosque
(4) Temple

76. 4 marks

IGBC stands for :

(1) International Great Beautiful City
(2) Indian Green Building Council
(3) Indian Great Building Center
(4) Indian Government Biological Center

77. 4 marks

Solar energy is converted to electrical energy by :

(1) Photovoltaic cells
(2) Electro magnets
(3) Bio technology
(4) Rain water

78. 4 marks

The ruins of Hampi are located in which State ?

(1) Karnataka
(2) Andhra Pradesh
(3) Kerala
(4) Tamil Nadu

79. 4 marks

What is Venice famous for ?

(1) Canals
(2) Mountains
(3) Valleys
(4) Springs

80. 4 marks

Pyramids are located in :

(1) Rome
(2) Egypt
(3) Greece
(4) Ethiopia

Drawing

81. 40 marks

(a) Make an interesting. Design using outer profile of keys.

(b) Draw a picture of your favourite film star's face as realistic as possible.

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82. 30 marks

Design a t-shirt in the topic of Save plants.

OR

Imagine that you've an examiner in a class room & test is going on, from your memory, draw the view.

OR

Imagine you are sitting on a merry go round, draw the view.
