



Code-R

PAPER-2 (B. ARCH.) OF JEE (MAIN)

JEE (MAIN) 2018

TEST PAPER WITH SOLUTION & ANSWER KEY

Date: 08-04-2018 | Duration : 3 Hours | Max. Marks: 390

IMPORTANT INSTRUCTIONS / महत्त्वपूर्ण निर्देश

A. General :	A. सामान्य :
1. Immediately fill in the particulars on this page of the test booklet with black ball point pen.	1. परीक्षा पुस्तिका के इस पृष्ठ पर आवश्यक विवरण काले बॉल पाइंट पेन से तत्काल भरें।
2. This Test Booklet consists of three parts - Part I, Part II and Part III. Part I Aptitude Test has 50 objective type questions of consisting of FOUR(4) marks for each correct response. Part II Mathematics Test has 30 objective type questions consisting of FOUR(4) marks for each correct response. Mark your answers for these questions in the appropriate space against the number corresponding to the question in the Answer Sheet placed inside this Test Booklet. Use Black Ball Point Pen only for writing particulars/markings responses of Side-1 and Side-2 of the Answer Sheet. Part III consists of 2 questions carrying 70 marks which are to be attempted on a separate Drawing Sheet which is also placed inside the Test Booklet. Marks allotted to each question are written against each question. Use colour pencils or crayons only on the Drawing Sheet. Do not use water colours. For each incorrect response in Part I and Part II, one-fourth (¼) of the total marks allotted to the question from the total score. No deduction from the total score, however, will be made if no response is indicated for an item in the Answer Sheet.	2. इस परीक्षा पुस्तिका के तीन भाग हैं— भाग I, भाग II, भाग III, पुस्तिका के भाग I में अभिरुचि परीक्षण में 50 वस्तुनिष्ठ प्रश्न हैं जिसमें प्रत्येक प्रश्न के सही उत्तर के लिये चार(4) अंक हैं। भाग II में गणित के 30 वस्तुनिष्ठ प्रश्न हैं जिनमें प्रत्येक सही उत्तर के लिए चार(4) अंक हैं। इन प्रश्नों का उत्तर इस परीक्षा पुस्तिका में रखे उत्तर पत्र में संगत क्रम संख्या के गोले में गहरा निशान लगाकर दीजिए। उत्तर पत्र के पृष्ठ-1 एवं पृष्ठ-2 पर वांछित विवरण लिखने एवं उत्तर अंकित करने हेतु केवल काले बॉल पाइंट पेन का ही प्रयोग करें। पुस्तिका के भाग III में 2 प्रश्न हैं जिनके लिए 70 अंक निर्धारित हैं। यह प्रश्न इसी परीक्षा पुस्तिका के अंदर रखी ड्राइंग शीट पर करने हैं। प्रत्येक प्रश्न हेतु निर्धारित अंक प्रश्न के सम्मुख अंकित है। ड्राइंग शीट पर केवल रंगीन पेंसिल अथवा क्रेयोन का ही प्रयोग करें। पानी के रंगों का प्रयोग न करें। भाग I और भाग II में प्रत्येक गलत उत्तर के लिए उस प्रश्न के लिए निर्धारित कुल अंकों में से एक-चौथाई (¼) अंक कुल योग में से काट लिए जाएंगे। यदि उत्तर पत्र में किसी प्रश्न का कोई उत्तर नहीं दिया गया है, तो कुल योग में से कोई अंक नहीं काटें जाएंगे।
3. There is only one correct response for each question in Part I and Part II. Filling up more than one response in each question will be treated as wrong response and marks for wrong response will be deducted accordingly as per instruction 2 above.	3. इस परीक्षा पुस्तिका के भाग I और भाग II में प्रत्येक प्रश्न का केवल एक ही सही उत्तर है। एक से अधिक उत्तर देने पर उसे गलत उत्तर माना जायेगा और उपरोक्त निर्देश 2 के अनुसार अंक काट लिये जायेंगे।
4. The test is of 3 hours duration. The maximum marks are 390.	4. परीक्षा की अवधि 3 घण्टे है। अधिकतम अंक 390 है।
5. On completion of the test, the candidates must hand over the Answer Sheet of Mathematics and Aptitude Test Part-I & II and the Drawing Sheet of Aptitude Test-Part III alongwith Test Booklet for Part III to the Invigilator in the Room/Hall. Candidates are allowed to take away with them the Test Booklet of Aptitude Test & Mathematics Part I & II.	5. परीक्षा समाप्त होने पर, अभ्यर्थी गणित एवं अभिरुचि परीक्षण भाग I एवं भाग II का उत्तर पत्र एवं अभिरुचि परीक्षण भाग III की ड्राइंग शीट एवं परीक्षा पुस्तिका भाग III हाल/कक्ष निरीक्षक को सौंपकर ही परीक्षा हाल/कक्ष छोड़े। अभ्यर्थी अभिरुचि परीक्षण एवं गणित भाग I एवं II की परीक्षा पुस्तिका अपने साथ ले जा सकते हैं।
6. The CODE for this Booklet is R. Make sure that the CODE printed on Side-2 of the Answer Sheet and on the Drawing Sheet (Part III) is the same as that on this booklet. Also tally the Serial Number of the Test Booklet, Answer Sheet and Drawing Sheet and ensure that they are same. In case of discrepancy in Code or Serial Number, the candidate should immediately report the matter to the Invigilator for replacement of the Test Booklet, Answer Sheet and the Drawing Sheet.	6. इस पुस्तिका का संकेत R है। यह सुनिश्चित कर लें कि इस पुस्तिका का संकेत, उत्तर पत्र के पृष्ठ-2 एवं ड्राइंग शीट (भाग-III) पर छपे संकेत से मिलता है। यह भी सुनिश्चित कर लें कि परीक्षा पुस्तिका, उत्तर पत्र एवं ड्राइंग शीट पर क्रम संख्या मिलती है। अगर संकेत या क्रम संख्या भिन्न हो, तो अभ्यर्थियों को निरीक्षक से दूसरी परीक्षा पुस्तिका, उत्तर पत्र एवं ड्राइंग शीट लेने के लिए उन्हें तुरन्त इस त्रुटि से अवगत कराएँ।
7. Do not fold or make any stray mark on the Answer Sheet.	7. उत्तर पत्र को न मोड़ें एवं न ही उस पर अन्य निशान लगाएँ।

Name of the Candidate (in Capital letters) : _____

Roll Number : in figures : in words : _____

Name of Examination Centre (in Capital letters) : _____

Candidate's Signature : _____ Invigilator's Signature : _____

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ADMISSIONS OPEN

Classes: V to XII & XII+

Target: JEE (Main+Advanced)

JEE (Main) | AIIMS/ NEET

Pre-foundation | Commerce & CLAT

Total No. of Selections

JEE (Adv) 2017

6241

Classroom: 4095 | DLP + eLP: 2146

NEET 2017

2975

Classroom: 1724 | DLP + eLP: 1251

JEE (Main) 2017

24519

Classroom: 17800 | DLP + eLP: 6719

ResoNET Dates

15th & 22nd April 2018

Test Timings: 9 AM to 12 Noon

Part-I / भाग-I

Mathematics / गणित

1. If $f(x) + 2f(1-x) = x^2 + 1, \forall x \in \mathbb{R}$, then the range of f is :

- (1) $\left[-\infty, \frac{1}{3}\right]$ (2) $\left[-\frac{1}{3}, \infty\right)$ (3) $\left[-\frac{1}{3}, \frac{1}{3}\right]$ (4) $\left[\frac{1}{3}, \infty\right)$

यदि $f(x) + 2f(1-x) = x^2 + 1$, सभी $\forall x \in \mathbb{R}$, के लिए तो f का परिसर है:

- (1) $\left[-\infty, \frac{1}{3}\right]$ (2) $\left[-\frac{1}{3}, \infty\right)$ (3) $\left[-\frac{1}{3}, \frac{1}{3}\right]$ (4) $\left[\frac{1}{3}, \infty\right)$

Ans. (2)

Sol. $f(x) + 2f(1-x) = x^2 + 1$... (i)

$x \rightarrow 1-x;$

$f(1-x) + 2f(x) = (1-x)^2 + 1$... (ii)

Solving (i) & (ii)

$f(x) + 2f(1-x) = x^2 + 1$

$2f(x) + f(1-x) = (1-x)^2 + 1 \times 2$

- - -

$-3f(x) = (x^2 + 1) - 2[(1-x)^2 + 1]$

$= (x^2 + 1) - 2(1 + x^2 - 2x + 1)$

$-3f(x) = -x^2 + 4x - 3$

$f(x) = -x^2 + 4x - 3$

$f(x) = 1/3(x^2 - 4x + 3) \therefore f(x) \in [-1/3, \infty)$

2. Let $A = \{z \in \mathbb{C} : |z| = 25\}$ and $B = \{z \in \mathbb{C} : |z + 5 + 12i| = 4\}$. Then the minimum value of $|z - \omega|$, for $z \in A$ and $\omega \in B$, is :

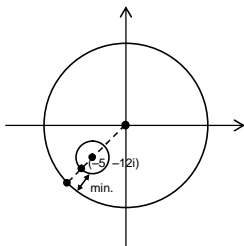
- (1) 6 (2) 7 (3) 8 (4) 9

माना $A = \{z \in \mathbb{C} : |z| = 25\}$ तथा $B = \{z \in \mathbb{C} : |z + 5 + 12i| = 4\}$. है, तो $z \in A$ तथा $\omega \in B$ के लिए $|z - \omega|$, का न्यूनतम मान है:

- (1) 6 (2) 7 (3) 8 (4) 9

Ans. (3)

Sol.



$\therefore |Z - w|_{\min.} = 8$

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3. If the product of the roots of the equation $x^2 - 5kx + 2e^{2\log_e |k|} - 1 = 0$ is 49, then the sum of the squares of the roots of the equation is :

(1) 525 (2) 527 (3) 576 (4) 627

यदि समीकरण $x^2 - 5kx + 2e^{2\log_e |k|} - 1 = 0$ के मूलों का गुणनफल 49 है, तो समीकरण के मूलों के वर्गों का योग है:

(1) 525 (2) 527 (3) 576 (4) 627

Ans. (2)

Sol. $x^2 - 5kx + 2e^{2\log_e |k|} - 1 = 0$

$$x^2 - 5kx + (2k^2 - 1) = 0 \rightarrow (\alpha, \beta)$$

$$\alpha + \beta = 5k$$

$$\alpha\beta = 2k^2 - 1 = 49$$

$$\therefore k = \pm 5$$

$$\begin{aligned} \therefore \alpha^2 + \beta^2 &= (\alpha + \beta)^2 - 2\alpha\beta \\ &= (25)^2 - 98 \\ &= 527 \end{aligned}$$

4. If $A = \begin{bmatrix} 2 & 52 & 152 \\ 4 & 106 & 358 \\ 6 & 162 & 620 \end{bmatrix}$, then the determinant of the matrix $\text{adj}(2A)$ is equal to :

यदि $A = \begin{bmatrix} 2 & 52 & 152 \\ 4 & 106 & 358 \\ 6 & 162 & 620 \end{bmatrix}$, है, तो आव्यूह $\text{adj}(2A)$ का सारणिक (Determinant) बराबर है:

(1) 64 (2) 256 (3) 2048 (4) 4096

Ans. (4)

Sol. $|\text{adj}(2A)| = |2A|^{n-1} = 2^{n(n-1)} \cdot |A|^{n-1}$

$$|A| = 8$$

$$\therefore |\text{adj}(2A)| = 2^6 \cdot 8^2 = 2^{12} = 4096$$

5. Let S be the set of all real values of λ for which the system of linear equations

$$\lambda x + y + z = 5\lambda$$

$$2\lambda x + 2y - z = 1$$

$$3y + z = 9$$

has infinitely many solutions. Then S;

(1) equals R (2) is a singleton.
(3) contains exactly two elements (4) is an empty set






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यदि λ के सभी वास्तविक मानों का समुच्चय S है जिनके लिए रेखिक समीकरण निकाय

$$\lambda x + y + z = 5\lambda$$

$$2\lambda x + 2y - z = 1$$

$$3y + z = 9$$

के अनंत हल हैं, तो S :

(1) R के बराबर है।

(2) एक समुच्चय (singleton) है।

(3) में मात्र दो अवयव है।

(4) एक रिक्त समुच्चय है।

Ans. (4)

Sol. $\lambda x + y + z = 5\lambda$

$$2\lambda x + 2y - z = 1$$

$$3y + z = 9$$

There is no such value of ' λ ' for which $\Delta = \Delta x = \Delta y = \Delta z = 0$.

Hence, S is an empty set.

6. In order to get through in an examination of nine papers a candidate has to pass in more papers than the number of papers in which he fails. The number of ways in which he can fail, in this examination is :

9 प्रश्न पत्रों की एक परीक्षा पास करने के लिए, एक परीक्षार्थी को उन प्रश्नों पत्रों की संख्या जिसमें वह पास नहीं है, उससे अधिक प्रश्न पत्रों में पास होना आवश्यक है। इस परीक्षा में अनुत्तीर्ण होने के तरीकों की संख्या है:

(1) 128

(2) 255

(3) 256

(4) $9 \times (8)!$

Ans. (3)

Sol. Number of ways in which he can fail

$$= {}^9C_5 + {}^9C_6 + {}^9C_7 + {}^9C_8 + {}^9C_9$$

$$= 126 + 84 + 36 + 9 + 1$$

$$= 256$$

7. Let T_r denote the r^{th} term in the binomial expansion of $(a+1)^{50}$. If $T_{25} + T_{27} = \frac{125}{52} T_{26}$ then the sum of all the values of a is :

$(a+1)^{50}$ के द्विपद प्रसार में माना r वां पद T_r है। यदि $T_{25} + T_{27} = \frac{125}{52} T_{26}$ है, तो a के सभी मानों का योग है:

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

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

(3) 2

(4) $\frac{5}{2}$

Ans. (4)

Sol. $T_r = {}^{50}C_{r-1} \cdot a^{51-r}$

$$T_{25} + T_{27} = \left(\frac{125}{52} \right) \cdot T_{26}$$






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$$\Rightarrow {}^{50}C_{24} \cdot a^{26} + {}^{50}C_{26} \cdot a^{24} = \left(\frac{125}{52}\right) {}^{50}C_{25} \cdot a^{25}$$

$$\Rightarrow a^2 + 1 = \left(\frac{125}{52}\right) \left(\frac{{}^{50}C_{25}}{{}^{50}C_{24}}\right) \cdot a$$

$$\Rightarrow a^2 + 1 = \frac{5a}{2}$$

$$\Rightarrow 2a^2 - 5a + 2 = 0 \rightarrow (a_1, a_2) \quad \therefore a_1 + a_2 = \frac{5}{2}$$

8. In an ordered set of four numbers, the first 3 are in A.P and the last 3 are in G.P. whose common ratio is $7/4$. If the product of the first and fourth of these number is 49, then the product of the second and third of these is :

चार संख्याओं के एक कथित समुच्चय में प्रथम 3 समांतर श्रेणी में है तथा अंतिम 3 गुणोत्तर श्रेणी में है जिसका सार्वअनुपात $7/4$ है। यदि इसमें से प्रथम तथा चौथी संख्याओं का गुणनफल 49 है, तो दूसरी तथा तीसरी संख्याओं का गुणनफल है:

- (1) 60 (2) 112 (3) 128 (4) 144

Ans. (2)

Sol. Let $a, \frac{16}{a}, \frac{28}{a}, \frac{49}{a} \rightarrow$ four numbers

↓

A.P.

$$\therefore \frac{32}{a} = a + \frac{28}{a} \Rightarrow a^2 + 28 = 32 \Rightarrow a^2 = 4$$

$$\therefore \text{product of } 2^{\text{nd}} \text{ and } 3^{\text{rd}} = \left(\frac{16}{a}\right)\left(\frac{28}{a}\right) = \frac{16 \times 28}{4} = 112$$

9. If $e^{(\sin^2 x + \sin^4 x + \sin^6 x + \dots + \text{ad inf.}) \log_e 2}$ $\left(0 < x < \frac{\pi}{2}\right)$ satisfies the equation $y^2 - 5y + 4 = 0$, then

$\frac{\sin x}{\cos x - \sin x}$ is equal to :

यदि $e^{(\sin^2 x + \sin^4 x + \sin^6 x + \dots + \text{ad inf.}) \log_e 2}$ $\left(0 < x < \frac{\pi}{2}\right)$ समीकरण $y^2 - 5y + 4 = 0$, को संतुष्ट करता है, तो

$\frac{\sin x}{\cos x - \sin x}$ बराबर है:

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

Ans. (1)






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Sol. $e^{(\sin^2 x + \sin^4 x + \sin^6 x + \dots \infty) \cdot \log_e 2}$
 $= e^{\left(\frac{\sin^2 x}{1 - \sin^2 x}\right) \cdot \log_e 2} = e^{\tan^2 x \cdot \log_e 2} = 2^{\tan^2 x}$
 $y^2 - 5y + 4 = 0$
 $(y - 1)(y - 4) = 0$
 $y = 1, 4$
 $\therefore 2^{\tan^2 x} = 2^0, 2^2$
 $\tan^2 x = 0, 2$
 $\therefore \tan x = \sqrt{2} \quad [\because x \in (0, \pi/2)]$
 $\frac{\sin x}{\cos x - \sin x} = \frac{\tan x}{1 - \tan x} = \frac{\sqrt{2}}{1 - \sqrt{2}} = -(2 + \sqrt{2})$

10. Let $f(x) = x \left[\frac{1}{x} \right]$ for all $x (\neq 0) \in \mathbb{R}$ where for each $t \in \mathbb{R}$, $[t]$ denotes the greatest integer less than or equal to t . Then:

माना सभी $x (\neq 0) \in \mathbb{R}$ के लिए $f(x) = x \left[\frac{1}{x} \right]$ जहाँ प्रत्येक $t \in \mathbb{R}$ के लिए $[t]$ सबसे बड़ा पूर्णांक दर्शाता है जो t के बराबर अथवा t से छोटा है:

(1) $\lim_{x \rightarrow 0^+} f(x) = 0$ (2) $\lim_{x \rightarrow \frac{1}{3}^+} f(x) = 1$ (3) $\lim_{x \rightarrow \frac{1}{2}^-} f(x) = 1$ (4) $\lim_{x \rightarrow 2^-} f(x) = 1$

Ans. (2)

Sol. $f(x) = x \left[\frac{1}{x} \right] = x \left(\frac{1}{x} - \left\{ \frac{1}{x} \right\} \right) = 1 - x \left\{ \frac{1}{x} \right\}$
 $= \lim_{x \rightarrow 0^+} f(x) = 1, \lim_{x \rightarrow 1/3^+} f(x) = 1, \lim_{x \rightarrow \frac{1}{2}^-} f(x) = \frac{1}{2}, \lim_{x \rightarrow 2^-} f(x) = 0$

11. If $f(x) = \begin{cases} 72^x - 9^x - 8^x + 1 \\ \sqrt{2} - \sqrt{1 + \cos x} \end{cases}$ is a continuous function in the interval $[0, 2\pi)$, then k is equal to :

यदि $f(x) = \begin{cases} 72^x - 9^x - 8^x + 1 \\ \sqrt{2} - \sqrt{1 + \cos x} \end{cases}$ अंतराल $[0, 2\pi)$, में संतत फलन है, तो k बराबर है:

(1) 4 (2) 18 (3) 24 (4) 36

Ans. (3)

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Sol. $f(x) = \begin{cases} \frac{(9^x - 1)(8^x - 1)}{\sqrt{2} - \sqrt{1 + \cos x}}; x \neq 0 \\ k\sqrt{2} \cdot \log_e 2 \cdot \log_e 3; x = 0 \end{cases}$

$$= \lim_{x \rightarrow 0} \frac{(9^x - 1)(8^x - 1)}{\sqrt{2} - \sqrt{1 + \cos x}} = \lim_{x \rightarrow 0} \frac{\left(\frac{9^x - 1}{x}\right)\left(\frac{8^x - 1}{x}\right)}{\left(\frac{1 - \cos x}{x^2}\right)} \cdot (\sqrt{2} + \sqrt{1 + \cos x})$$

$$\Rightarrow k\sqrt{2} \ln 2 \cdot \ln 3 = 2(\ln 9)(\ln 8) \times 2\sqrt{2} \Rightarrow k = 24$$

12. If $y = y(x)$ is an implicit function of x given by $y \cos x + x \cos y = \pi$; then $y''(0)$ is equal to :
यदि $y = y(x)$ x में एक अस्पष्ट (implicit) फल है जो $y \cos x + x \cos y = \pi$ द्वारा प्रदत्त है, तो $y''(0)$ बराबर है:

- (1) π (2) $-\pi$ (3) 0 (4) 2π

Ans. (1)

Sol. $y \cdot \cos x + x \cdot \cos y = \pi$; $y(0) = \pi$
 $y' \cdot \cos x + y(-\sin x) + x \cdot (-\sin y) \cdot y' + \cos y = 0$
 put, $x = 0 \Rightarrow y' + \cos y = 0$
 $y' = 1$
 $(\cos x - x \cdot \sin y)y' = \sin x \cdot y - \cos y$
 $\Rightarrow (\cos x - x \cdot \sin y)y'' + (-\sin x - x \cdot \cos y \cdot y' - \sin y) y' = \cos x \cdot y + \sin x \cdot y' + \sin y \cdot y'$
 put, $x = 0$;
 $y''(0) = \pi$

13. For each $x \in \mathbb{R}$, let $f(x) = |x - 1|$, $|x - 1|$, $g(x) = \cos x$ and $\phi(x) = f(g(2\sin x)) - g(f(x))$. Then ϕ is :

- (1) differentiable at each point of \mathbb{R} (2) not differentiable at 0
 (3) not differentiable at 1 (4) differentiable only in $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$

सभी $x \in \mathbb{R}$ के लिए माना $f(x) = |x - 1|$, $|x - 1|$, $g(x) = \cos x$ तथा $\phi(x) = f(g(2\sin x)) - g(f(x))$ है, तो ϕ

- (1) \mathbb{R} के प्रत्येक बिन्दु पर अवकलनीय है। (2) 0 पर अवकलनीय नहीं है।
 (3) 1 पर अवकलनीय नहीं है। (4) केवल $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$ में अवकलनीय है।

Ans. (1)

Sol. $f(x) = |x - 1|$
 $g(x) = \cos x$
 $\phi(x) = f(g(2\sin x)) - g(f(x)) = |\cos(\sin x) - 1| - \cos |x - 1|$
 $1 - \cos(2\sin x) - \cos |x - 1|$
 differentiable at each point of \mathbb{R} .






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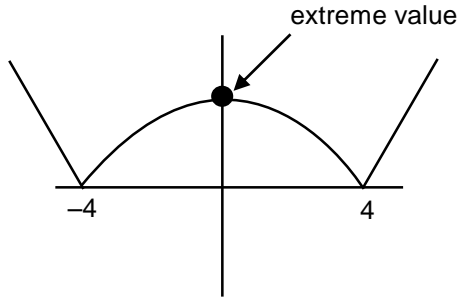
14. If $f(x) = |x^2 - 16|$ for all $x \in \mathbb{R}$, then the total number of points of \mathbb{R} at which $f : \mathbb{R} \rightarrow \mathbb{R}$ attains local extreme values is :

यदि सभी $x \in \mathbb{R}$ के लिए $f(x) = |x^2 - 16|$ है, तो \mathbb{R} के उन बिंदुओं की संख्या जहाँ $f : \mathbb{R} \rightarrow \mathbb{R}$ स्थानीय परम मान लेता है, है

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

Ans. (1)

Sol. $f(x) = |x^2 - 16|$



15. Let

$$I = \int \frac{e^x}{e^{4x} + e^{2x} + 1} dx, \int \frac{e^{-x}}{e^{-4x} + e^{-2x} + 1} dx, \text{ then } J - I \text{ equals :}$$

माना

$$I = \int \frac{e^x}{e^{4x} + e^{2x} + 1} dx, \int \frac{e^{-x}}{e^{-4x} + e^{-2x} + 1} dx \text{ है, तो } J - I \text{ बराबर है :}$$

$$(1) \frac{1}{2} \log_e \left| \frac{e^{4x} - e^{2x} + 1}{e^{4x} + e^{2x} + 1} \right| + C$$

$$(2) \frac{1}{2} \log_e \left| \frac{e^{2x} + e^x + 1}{e^{2x} - e^x + 1} \right| + C$$

$$(3) \frac{1}{2} \log_e \left| \frac{e^{2x} - e^x + 1}{e^{2x} + e^x + 1} \right| + C$$

$$(4) \frac{1}{2} \log_e \left| \frac{e^{4x} - e^{2x} + 1}{e^{4x} - e^{2x} + 1} \right| + C$$

Ans. (3)

Sol. $I = \int \frac{e^x}{e^{4x} + e^{2x} + 1}$

$$I = \int \frac{e^{-x}}{e^{-4x} + e^{-2x} + 1} dx$$

$$= \int \frac{e^{3x}}{e^{4x} + e^x + 1} dx$$

$$J - I = \int \frac{e^{3x} - e^x}{e^{4x} + e^{2x} + 1} dx$$

$$J - I = \int \frac{e^x(e^{2x} - 1)}{e^{4x} + e^{2x} + 1} dx$$

$$e^x = t$$

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$$J-I = \int \frac{t^2 - 1}{t^4 + t^2 + 1} dt$$

$$J-I = \int \frac{1 - \frac{1}{t^2}}{t^2 + 1 + \frac{1}{t^2}} dt$$

$$J-I = \int \frac{\left(1 - \frac{1}{t^2}\right) dt}{\left(t + \frac{1}{t}\right)^2 - 1}$$

$$t + \frac{1}{t} = z$$

$$\left(1 - \frac{1}{t^2}\right) dt = dz$$

$$J-I = \int \frac{dz}{z^2 - 1}$$

$$= \frac{1}{2} \ln \left| \frac{z-1}{z+1} \right| + c$$

$$= \frac{1}{2} \ln \left| \frac{t + \frac{1}{t} - 1}{t + \frac{1}{t} + 1} \right| + c$$

$$= \frac{1}{2} \ln \left| \frac{t^2 - t + 1}{t^2 + t + 1} \right| + c$$

$$= \frac{1}{2} \ln \left| \frac{e^{2x} - e^x + 1}{e^{2x} + e^x + 1} \right| + c$$

16. If $\int x^5 \sqrt{\frac{1+x^2}{1-x^2}} dx = m\pi + n$, then the ordered pair (m,n) is equal to

यदि $\int x^5 \sqrt{\frac{1+x^2}{1-x^2}} dx = m\pi + n$, है, तो क्रमित युग्म (m,n) बराबर है :

(1) $\left(\frac{1}{3}, \frac{1}{8}\right)$

(2) $\left(\frac{1}{8}, \frac{2}{3}\right)$

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

(4) $\left(\frac{1}{8}, \frac{1}{3}\right)$

Ans. (4)






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Sol. Use formula

$$= \int_0^{\pi/4} \frac{1 + \cos 4\theta}{2} d\theta + \int_0^{\pi/4} \frac{\cos 6\theta - 3 \cos 2\theta}{4} d\theta$$

$$= \frac{\pi}{8} + \frac{1}{3} = m\pi + n$$

$$(m, n) = \left(\frac{1}{8}, \frac{1}{3} \right)$$

option (4)

17. The area (in sq. units) of the region bounded by the curve, $12y = 36 - x^2$ and the tangents drawn to it at the points, where the curve intersects the x-axis is

वक्र $12y = 36 - x^2$ तथा उस पर उन बिन्दुओं, जहाँ वक्र x-अक्ष क प्रतिच्छेद करती है, पर खींची गई स्पर्शरेखा के बीच घिरे का क्षेत्रफल (वर्ग इकाइयों में) है :

(1) 12

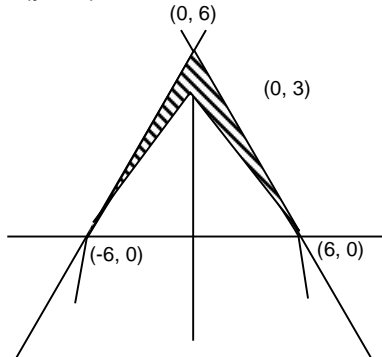
(2) 18

(3) 27

(4) 6

Ans. (1)

Sol $x^2 = 36 - 12y$
 $x^2 = -12(y - 3)$



Required Area =

$$= 2 \left(\frac{1}{2} \times 6 \times 6 - \int_0^6 \frac{36 - x^2}{12} dx \right) = 2 \left(18 - \frac{1}{12} \left(36 \times 6 - \frac{216}{3} \right) \right)$$

$$= 2 \left(18 - \frac{1}{12} (216 - 72) \right) = 2 (18 - 12) = 12$$

18. Let $y = y(x)$ be the solution of the differential equation :

$$x \log_e x \frac{dy}{dx} + y = 3x \log_e x, (x > 1) \text{ If } y(e) = 0, \text{ then } y(e^2) \text{ is equal to}$$

माना $y = y(x)$ अवकल समीकरण

$$x \log_e x \frac{dy}{dx} + y = 3x \log_e x, (x > 1) \text{ का हल है। यदि } y(e) = 0 \text{ है, तो } y(e^2) \text{ बराबर है :}$$

(1) e^2

(2) $\frac{1}{2} e^2$

(3) $\frac{3}{2} e^2$

(4) $3e^2$

Ans. (3)

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Sol. $x \ln x \frac{dy}{dx} + y = 3x \ln x$

$$\frac{dy}{dx} + \frac{1}{x \ln x} y = 3$$

$$\text{IF} = e^{\int \frac{1}{x \ln x} dx}$$

$$= \ln x$$

$$y \cdot \ln x = \int 3 \cdot \ln x \, dx + C$$

$$y \cdot \ln x = 3 \cdot x(\ln x - 1) + C$$

$$y(e) = 0$$

$$0 = 3e(0) + C$$

$$C = 0$$

$$y \ln x = 3x(\ln x - 1)$$

$$y(e^2) = ?$$

$$2y = 3e^2(2 - 1)$$

$$y = \frac{3}{2} e^2$$

19. Let the straight lines, $5x - 3y + 15 = 0$ and $5x + 3y - 15 = 0$ form a triangle with the x-axis. Then the radius of the circle circumscribing this triangle is

माना रेखाएँ $5x - 3y + 15 = 0$ तथा $5x + 3y - 15 = 0$ तथा x- अक्ष के साथ एक त्रिभुज बनाते हैं, तो त्रिभुज के परिवृत्त की त्रिज्या है :

(1) $\frac{8}{5}$

(2) $\frac{17}{5}$

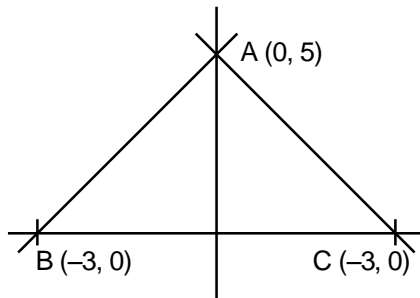
(3) $\frac{12}{5}$

(4) $\frac{16}{5}$

Ans. (4)

Sol. $5x - 3y + 15 = 0$

$$5x + 3y - 15 = 0$$



Circumcentre $(0, 9/5)$

$$\text{Radius} = \frac{16}{5}$$

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20. The mirror image of the circle $x^2 + y^2 - 10x - 10y = 0$ in the line $x + y + 5 = 0$ is a circle passing through the point :

वृत्त $x^2 + y^2 - 10x - 10y = 0$ का रेखा $x + y + 5 = 0$ में दर्पण प्रतिबिंब एक वृत्त है जो जिस बिन्दु से होकर जाता है, वह है -

- (1) $(-3, -7)$ (2) $(-9, -7)$ (3) $(-3, -11)$ (4) $(-9, -11)$

Ans. (3)

Sol. $x^2 + y^2 - 10x - 10y = 0$

C $(5, 5)$

and Radius = $5\sqrt{2}$

Image of centre of circle in

$x + y + 5 = 0$

$$\frac{x-5}{1} = \frac{y-5}{1} = \frac{-2(15)}{2}$$

C' $(-10, -10)$

Eqn. $(x + 10)^2 + (y + 10)^2 = 50$

Passing through $(-3, -11)$

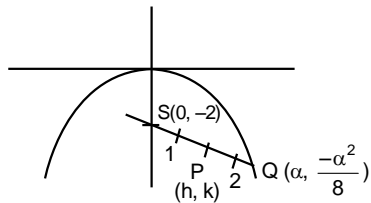
21. Let S the focus of the parabola, $x^2 + 8y = 0$ and Q be any point on it. If P divides the line segment SQ in the ratio 1 : 2, then the locus of P is

माना परवलय $x^2 + 8y = 0$ की नाभि S है तथा Q उस पर कोई बिन्दु है। यह बिन्दु P, रेखाखण्ड SQ को 1 : 2 के अनुपात में बाँटता है, तो P का बिन्दुपथ है :

- (1) $9x^2 + 24y + 32 = 0$ (2) $9y^2 + 32 = 0$ (3) $32x^2 + 24x + 32 = 0$ (4) $32y^2 + 27x + 36 = 0$

Ans. (1)

Sol. $x^2 = -8y$



$$\frac{SP}{PQ} = \frac{1}{2} \quad \Rightarrow \quad h = \frac{\alpha}{3} \quad \text{and} \quad k = \frac{-\alpha^2}{8} - 4$$

$$\alpha = 3h \quad \text{and} \quad 3k = \frac{-\alpha^2}{8} - 4$$

$$3k = -\frac{9h^2}{8} - 4$$

$$24k = -9h^2 - 32$$

$$9h^2 + 24k + 32 = 0$$

$$9x^2 + 24y + 32 = 0$$

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22. Let $\theta \in \left(0, \frac{\pi}{2}\right)$. If the eccentricity of the hyperbola $x^2 - \cos^2\theta - y^2 = 6\cos^2\theta$ is $\sqrt{3}$ times the eccentricity of the ellipse $x^2 + y^2 \cos^2\theta$ then θ is equal to

माना $\theta \in \left(0, \frac{\pi}{2}\right)$ यदि अतिपरवलय $x^2 - \cos^2\theta - y^2 = 6\cos^2\theta$ की उत्केन्द्रता, दीर्घवृत्त $x^2 + y^2 \cos^2\theta$ की उत्केन्द्रता का $\sqrt{3}$ गुनी है, तो θ बराबर है :

- (1) $\frac{\pi}{6}$ (2) $\frac{\pi}{4}$ (3) $\cos^{-1}\left(\frac{1}{\sqrt{3}}\right)$ (4) $\frac{\pi}{3}$

Ans. (2)

Sol. Hyperbola

$$\frac{x^2}{6} - \frac{y^2}{6\cos^2\theta} = 1$$

$$\therefore b^2 = a^2 (e_1^2 - 1)$$

$$6\cos^2\theta = 6 (e_1^2 - 1)$$

$$e_1 = \sqrt{1 + \cos^2\theta}$$

and ellipse

$$\frac{x^2}{30\cos^2\theta} + \frac{y^2}{30} = 1$$

$$\therefore b > a$$

$$30\cos^2\theta = 30 (1 - e_2^2)$$

$$e_2 = \sqrt{1 - \cos^2\theta}$$

$$\text{given } e_1 = \sqrt{3} e_2$$

$$\sqrt{1 + \cos^2\theta} = \sqrt{3} \sqrt{1 - \cos^2\theta}$$

squaring

$$1 + \cos^2\theta = 3 (1 - \cos^2\theta)$$

$$1 + \cos^2\theta = 3 - 3\cos^2\theta$$

$$4\cos^2\theta = 2$$

$$\cos^2\theta = \frac{1}{2} \Rightarrow \theta = \frac{\pi}{4}$$

23. If the line $\frac{x-1}{4} = \frac{y+3}{2} = \frac{z+5}{1}$ lies in the plane $2x + ly + mz = 16$, then $l^2 + m^2$ is equal to

यदि रेखा $\frac{x-1}{4} = \frac{y+3}{2} = \frac{z+5}{1}$, समतल $2x + ly + mz = 16$, में स्थित है, तो $l^2 + m^2$ बराबर है :

- (1) 16 (2) 20 (3) 98 (4) 85

Ans. (2)






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Sol. $\frac{x-1}{4} = \frac{y+3}{-2} = \frac{z+5}{1}$ lies in plane $2x + \ell y + mz = 16$

∴ point (1, -3, -5) lies in plane

$$2 - 3\ell - 5m = 16$$

$$3\ell + 5m = -14 \quad \dots\dots\dots(1)$$

and

$$8 - 2\ell + m = 0$$

$$2\ell - m = 8 \quad \dots\dots\dots(2)$$

solving $\ell = 2, m = -4$

$$\ell^2 + m^2 = 20$$

24. The equation of the plane passing through the line of intersection of the planes $\vec{r} \cdot (2\hat{i} - 3\hat{j} + 4\hat{k}) = 1$ and $\vec{r} \cdot (\hat{i} - \hat{j}) + 4 = 0$ and perpendicular to the plane $\vec{r} \cdot (2\hat{i} - \hat{j} - \hat{k}) + 4 = 0$, is :

उस समतल का समीकरण, जो समतलों $\vec{r} \cdot (2\hat{i} - 3\hat{j} + 4\hat{k}) = 1$ तथा $\vec{r} \cdot (\hat{i} - \hat{j}) + 4 = 0$ की प्रतिच्छेदी रेखा से होकर जाता है, तथा समतल $\vec{r} \cdot (2\hat{i} - \hat{j} - \hat{k}) + 4 = 0$ के लंबवत है, है :

(1) $\vec{r} \cdot (\hat{i} - 2\hat{j} + 4\hat{k}) = 3$	(2) $\vec{r} \cdot (\hat{i} - 2\hat{j} + 4\hat{k}) = 5$
(3) $\vec{r} \cdot (2\hat{i} - \hat{j} + 5\hat{k}) = 3$	(4) $\vec{r} \cdot (2\hat{i} - \hat{j} + 5\hat{k}) = 5$

Ans. (2)

Sol. $2x - 3y + 4z = 1 \dots\dots\dots(1)$

$x - y + 4 = 0 \dots\dots\dots(2)$

not plane passes through line of intersection of plane (1) and plane (2)

$$(2x - 3y + 4z - 1) + \lambda (x - y + 4) = 0$$

$$(2 + \lambda)x - (3 + \lambda)y + 4z + (4\lambda - 1) = 0 \dots\dots\dots(3)$$

plane (3) is perpendicular to plane

$$2x - y - z + 4 = 0 \dots\dots\dots(4)$$

so $2(2 + \lambda) + (1)(3 + \lambda) - 4 = 0$

$$2\lambda + 4 + \lambda + 3 - 4 = 0$$

$$3\lambda = -3$$

$$\lambda = -1$$

so required plane

$$x - 2y + 4z - 5 = 0$$

$$\Rightarrow \vec{r} \cdot (\hat{i} - 2\hat{j} + 4\hat{k}) = 5$$

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25. If \hat{a} , \hat{b} , \hat{c} be three unit vectors, \hat{b} and \hat{c} are non-parallel, such that $\hat{a} \times (\hat{b} \times \hat{c}) = \frac{\hat{b} + \hat{c}}{2}$, then the angle between \hat{a} and \hat{b} is :

यदि \hat{a} , \hat{b} , \hat{c} तीन एकक सदिश हैं, \hat{b} तथा \hat{c} समांतर नहीं है, ऐसे कि $\hat{a} \times (\hat{b} \times \hat{c}) = \frac{\hat{b} + \hat{c}}{2}$ है, तो \hat{a} तथा \hat{b} के बीच का कोण है :

- (1) $\frac{\pi}{6}$ (2) $\frac{2\pi}{3}$ (3) $\frac{\pi}{4}$ (4) $\frac{3\pi}{4}$

Ans. (2)

Sol. $|\hat{a}| = |\hat{b}| = |\hat{c}| = 1$

\hat{b} is not parallel to \hat{c}

$$\hat{a} \times (\hat{b} \times \hat{c}) = \frac{1}{2}\hat{b} + \frac{1}{2}\hat{c} \Rightarrow (\hat{a} \cdot \hat{c})\hat{b} - (\hat{a} \cdot \hat{b})\hat{c} = \frac{1}{2}\hat{b} + \frac{1}{2}\hat{c}$$

$$-(\hat{a} \cdot \hat{b}) = \frac{1}{2} \quad \text{let } \hat{a} \wedge \hat{b} = \theta$$

$$-|\hat{a}| |\hat{b}| \cos\theta = \frac{1}{2} \Rightarrow -\cos\theta = \frac{1}{2}$$

$$\cos\theta = -\frac{1}{2} \Rightarrow \theta = \frac{2\pi}{3}$$

26. A box contains 6 red ball and 2 black balls. Two balls are drawn, at random, from it without replacement. if X denotes the number of red balls drawn then E(X) is equal to :

एक बक्से में 6 लाल गेंदें हैं तथा 2 काली गेंदें है बक्से में से दो गेंदें यादृच्छया, बिना प्रतिस्थापना के, निकाली जाती है। यदि X निकाली गई लाल गेंदों की संख्या दर्शाता है, तो E(X) बराबर है :

- (1) $\frac{3}{2}$ (2) $\frac{1}{2}$ (3) $\frac{5}{2}$ (4) $\frac{27}{28}$

Ans. (1)

Sol. $P(x = 0) = \frac{{}^2C_2}{{}^8C_2} = \frac{1}{28}$

$$P(x = 1) = \frac{{}^6C_1 \times {}^2C_1}{{}^8C_2} = \frac{12}{28}$$

$$P(x = 2) = \frac{{}^6C_2}{{}^8C_2} = \frac{15}{28}$$

$$E(x) = \frac{\sum p_i x_i}{\sum p_i} = \frac{0 + 1 \cdot \frac{12}{28} + 2 \cdot \frac{15}{28}}{1} = \frac{12 + 30}{28} = \frac{42}{28} = \frac{3}{2}$$






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27. A six faced die is so biased that it is thrice likely to show an even number than an odd number, when thrown. If the die is thrown twice, the probability that sum of the numbers on the die is even is :

एक षड्फलकीय पासे को इस प्रकार अभिनत (biased) बनाया गया है कि इसें फेंकने पर एक सम संख्या आने की संभावना, एक विषम संख्या के आने की संभावना की तीन गुनी है। यदि पासा दो बार उछाला गया, तो पासे पर अंको का योग एक सम संख्या आने की प्रायिकता है :

- (1) $\frac{3}{4}$ (2) $\frac{5}{8}$ (3) $\frac{7}{9}$ (4) $\frac{3}{8}$

Ans. (2)

Sol. P (Even) = 3P (odd)

$$P(E) + P(O) = 1$$

$$3P(O) + P(O) = 1$$

$$P(O) = \frac{1}{4}$$

$$P(E) = \frac{3}{4}$$

$$\text{Now } P(\text{sum even}) = P(EE) + P(OO)$$

$$= \frac{3}{4} \times \frac{3}{4} + \frac{1}{4} \times \frac{1}{4}$$

$$= \frac{10}{16} = \frac{5}{8} \text{ Ans 2}$$

28. The total number of $x \in [0, 2\pi]$ which satisfy the equation $4(\cos^{10}x + \sin^2x) = 4 + \sin^6x \sin^2(2x)$, is :
 $x \in [0, 2\pi]$ में स्थित ऐसी कुल संख्याएँ जो समीकरण $4(\cos^{10}x + \sin^2x) = 4 + \sin^6x \sin^2(2x)$ को संतुष्ट करती है, की संख्या है :

- (1) 2 (2) 3 (3) 5 (4) 6

Ans. (3)

Sol. $x \rightarrow [0, 2\pi]$

$$4(\cos^{10}x + \sin^2x) = 4 + \sin^6x \sin^2(2x)$$

$$4\cos^{10}x - 4\cos^2x = \sin^6x (4\sin^2x \cos^2x)$$

$$\cos^{10}x - \cos^2x - \sin^8x \cos^2x = 0$$

$$\cos^2x [\cos^8x - \sin^8x - 1] = 0$$

$$\cos^2x (\cos^8x - (\sin^8x + 1)) = 0$$

$$\cos^2x = 0 \quad \cos^8x = \sin^8x + 1$$

$$x = \frac{\pi}{2}, \frac{3\pi}{2} \quad \cos^8x = 1 \quad \text{and } \sin^8x = 0$$

$$x = 0, \pi, 2\pi \quad x = 0, \pi, 2\pi.$$

so number of solutions = 5






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29. $\tan \left(\frac{1}{2} \sin^{-1} \frac{4}{5} + \frac{1}{2} \cos^{-1} \frac{15}{17} \right)$ is equal to :

$\tan \left(\frac{1}{2} \sin^{-1} \frac{4}{5} + \frac{1}{2} \cos^{-1} \frac{15}{17} \right)$ बराबर है :

(1) $\frac{6}{7}$

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

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

(4) $\frac{9}{22}$

Ans. (1)

Sol. $\tan \left(\frac{1}{2} \left(\sin^{-1} \frac{4}{5} + \cos^{-1} \frac{15}{17} \right) \right)$

$\tan \left(\frac{1}{2} \left(\tan^{-1} \frac{4}{5} + \tan^{-1} \frac{8}{15} \right) \right)$

$\tan \left(\frac{1}{2} \tan^{-1} \frac{\left(\frac{4}{5} + \frac{8}{15} \right)}{1 - \frac{4}{5} \times \frac{8}{15}} \right)$

$\tan \left(\frac{1}{2} \tan^{-1} \left(\frac{60 + 24}{45 - 32} \right) \right)$

$\tan \left(\frac{1}{2} \tan^{-1} \left(\frac{84}{13} \right) \right)$

$\tan (0)$

$= \frac{6}{7}$

Ans. 1

Let $\frac{1}{2} \tan^{-1} \frac{84}{13} = \theta$

$\tan^{-1} \frac{84}{13} = 2\theta$

$\tan 2\theta = \frac{84}{13}$

$\frac{2 \tan \theta}{1 - \tan^2 \theta} = \frac{84}{13}$

$13 \tan \theta = 42 (1 - \tan^2 \theta)$

$42 \tan^2 \theta + 13 \tan \theta - 42 = 0$

$(7 \tan \theta - 6) (6 \tan \theta + 7) = 0$

$\tan \theta = \frac{6}{7}$ or $-\frac{7}{6}$ (Not possible)






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30. The Boolean expression $(p \wedge q) \vee ((\sim q) \vee p)$ is equivalent to :

बूलीय (Boolean) व्यंजक $(p \wedge q) \vee ((\sim q) \vee p)$ के समतुल्य है:

(1) $\sim p \vee q$

(2) $\sim q \vee p$

(3) $p \vee q$

(4) $(\sim p) \vee (\sim q)$

Ans. (2)

Sol.

q	$\sim q$	$p \wedge q$	$(\sim q) \vee p$	$(p \wedge q) \vee (\sim q) \vee p$
T	F	T	T	T
F	T	F	T	T
T	F	F	F	F
F	T	F	T	T

column V and VI are identical. So option (2) correction






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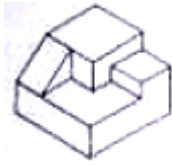
Part-II / भाग-II

Aptitude Test / अभिरुचि परीक्षण

Directions (For Q. NO 31 to 34)

For the elevation given in the problem figure identify the correct 3-D figure from amongst the answer figure.

निर्देश (प्र. 31 से 34 के लिए) दी गयी प्रश्न आकृति के सम्मुख दृश्य को सही 3-D उत्तर आकृतियों में से पहचानिये।



(1)



(2)

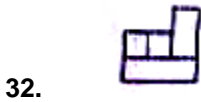


(3)



(4)

Ans. (2)



(1)



(2)

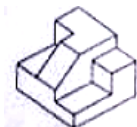
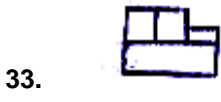


(3)



(4)

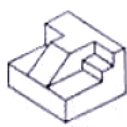
Ans. (3)



(1)



(2)



(3)



(4)

Ans. (4)

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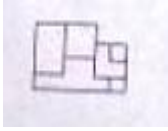
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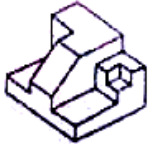
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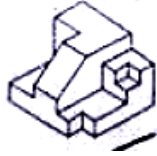
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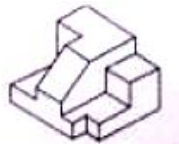
34.



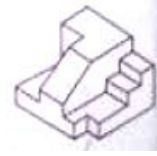
(1)



(2)



(3)



(4)

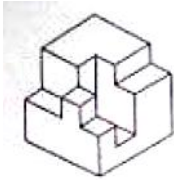
Ans. (2)

Directions (For Q. NO 35 to 37)

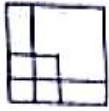
The 3-D figure shows the view of an object. Identify the correct top view from amongst the answer figures.

निर्देश (प्र. 35 से 37 के लिए)

3-D प्रश्न आकृति में एक वस्तु के एक दृश्य को दिखाया गया है। इसका सही ऊपरी दृश्य उत्तर आकृतियों में से पहचानिये।



35.



(1)



(2)

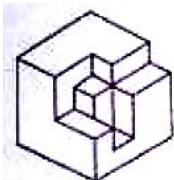


(3)

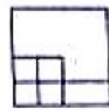


(4)

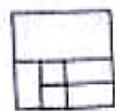
Ans. (2)



36.



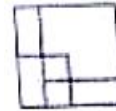
(1)



(2)



(3)



(4)

Ans. (3)

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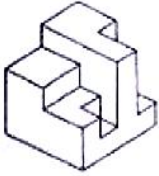
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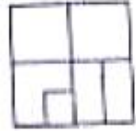
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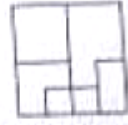
37.



(1)



(2)



(3)



(4)

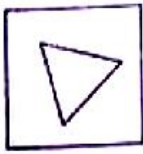
Ans. (1)

Directions (For Q. NO 38 to 41)

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

निर्देश (प्र. 38 से 41 के लिए)

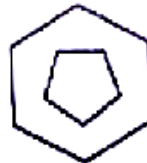
नीचे दी गयी प्रश्न आकृतियों में से विषम आकृति पहचानिये।



(1)



(2)



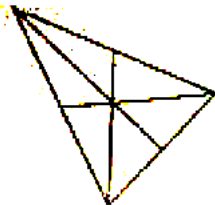
(3)



(4)

38.

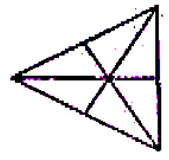
Ans. (4)



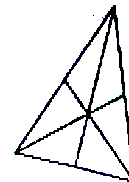
(1)



(2)



(3)



(4)

39.

Ans. (3)

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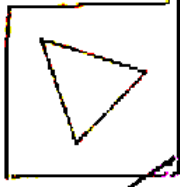
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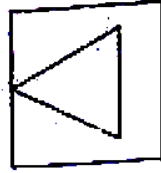
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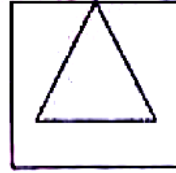
40.



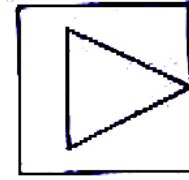
(1)



(2)



(3)



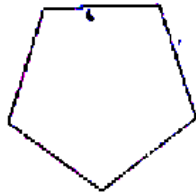
(4)

Ans. (1)

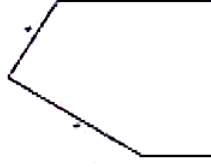
41.



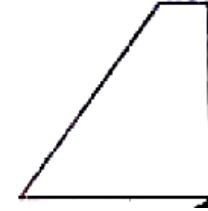
(1)



(2)



(3)



(4)

Ans. (4)

Direction : (For Q. No. 42 to 47)

Which one of answer figures will complete the sequence of the three problem figures?

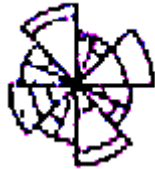
निर्देश: (प्र. 42 से 47 के लिए)

उत्तर आकृतियों में से कौन-सी आकृति को तीन प्रश्न आकृतियों में लगाने से अनुक्रम (sequence) पूरा हो जायेगा?

Problem Figures/प्रश्न आकृतियाँ

Answer Figures/उत्तर आकृतियाँ

42.



?



(1)



(2)



(3)



(4)

Ans. (2)

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43.



(1)



(2)



(3)



(4)

Ans.

(1)

44.



(1)



(2)



(3)

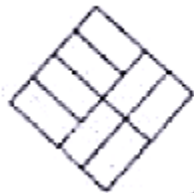
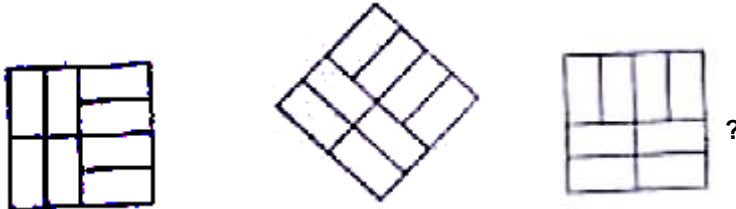


(4)

Ans.

(3)

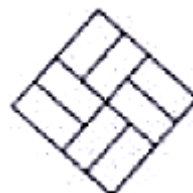
45.



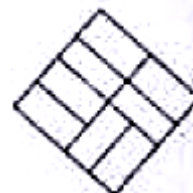
(1)



(2)



(3)



(4)

Ans.

(1)






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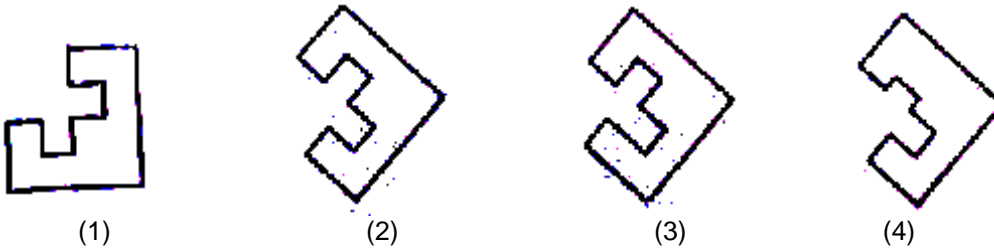
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46.



Ans. (1)

47.



Ans. (2)






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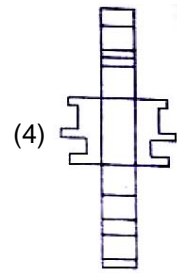
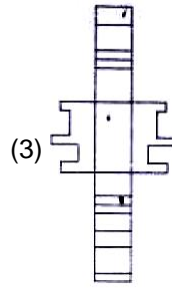
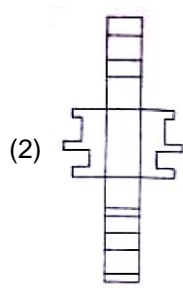
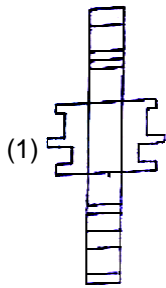
Direction : (For Q. No. 48 to 53)

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

निर्देश : (प्र०स० 48 से 53)

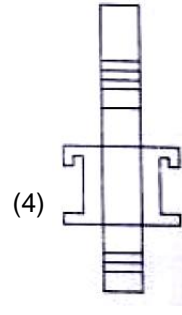
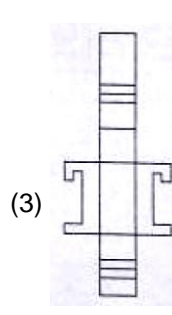
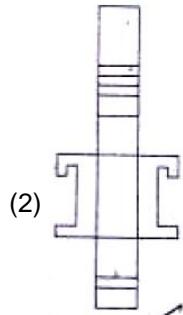
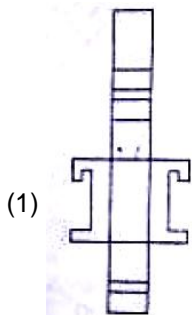
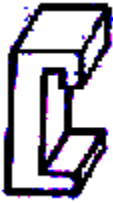
3-D प्रश्न आकृति को खोलने पर, उत्तर आकृतियों में से सही दृश्य कौन सा है?

48.



Ans. (1)

49.



Ans. (2)

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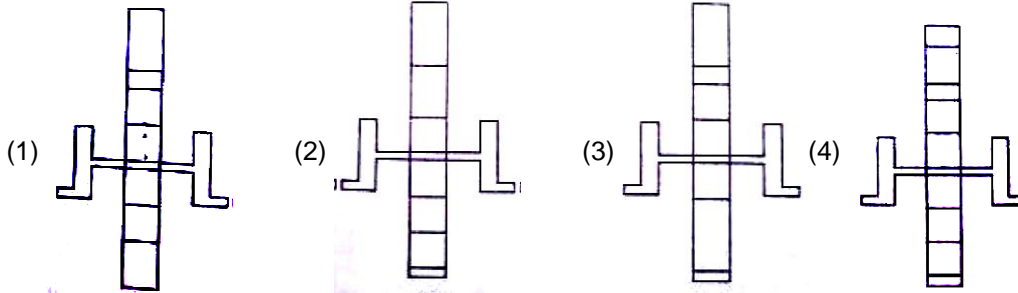
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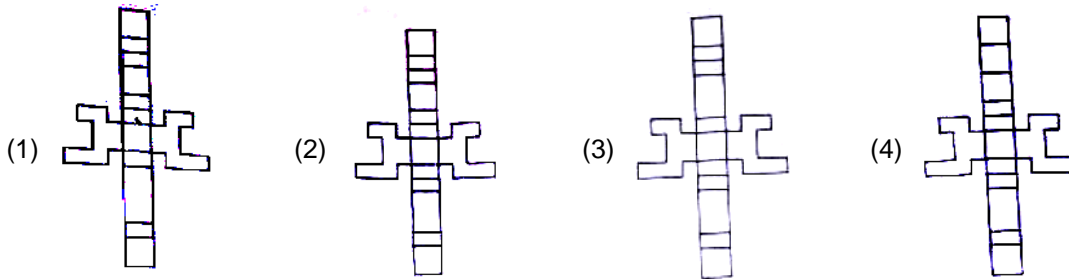
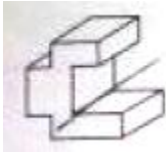
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50.



Ans. (4)

51.



Ans. (2)

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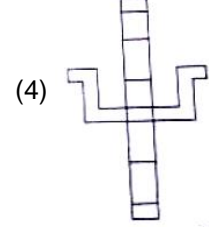
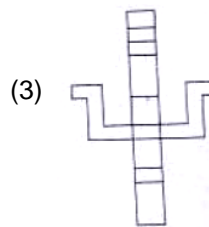
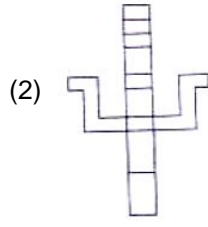
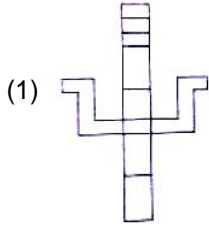
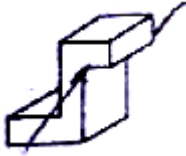
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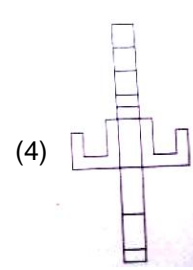
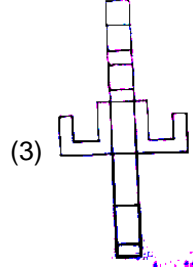
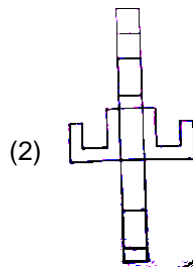
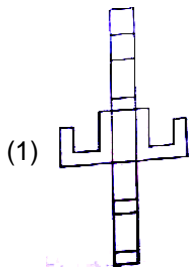
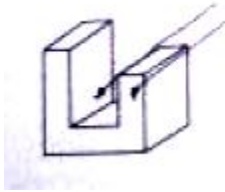
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52.



Ans. (4)

53.



Ans. (2)

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Directions (For Q. No. 54 to 57)

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.

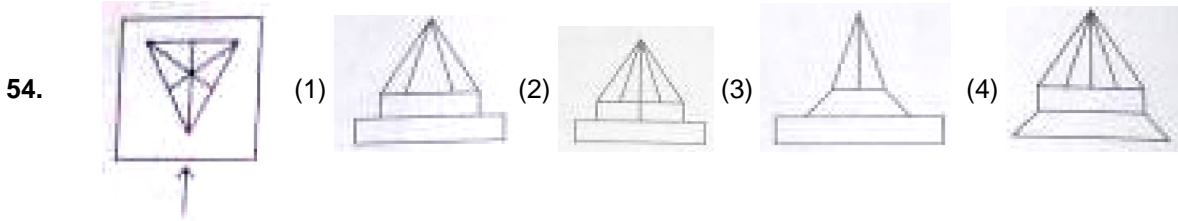
निर्देश : (प्र. सं. 54 से 57 के लिए)

प्रश्न आकृति में वस्तुओं का ऊपरी दृश्य दिखाया गया है। तीर की दिशा में देखते हुए उत्तर आकृतियों में से सही सम्मुख दृश्य पहचानिये।

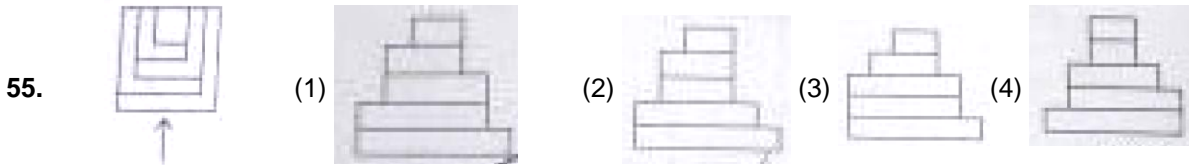
Problem figure /

Answer figure / उत्तर आकृतियाँ

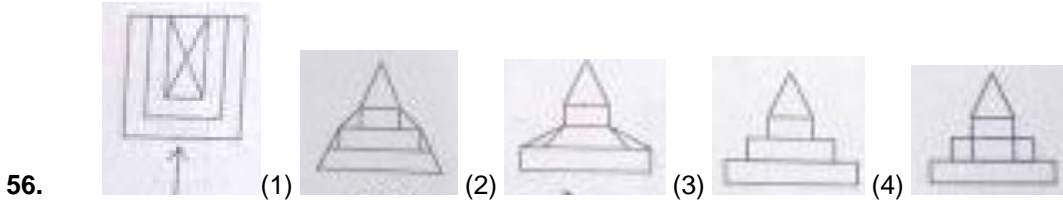
प्रश्न आकृति



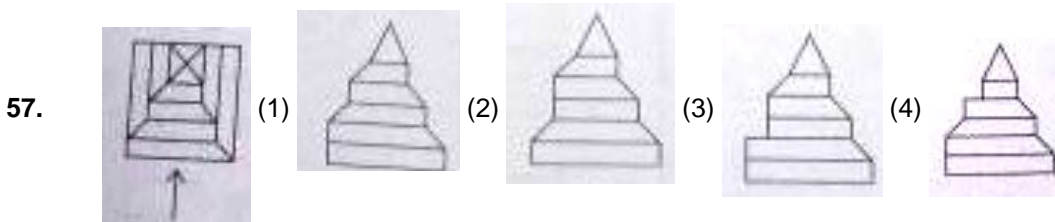
Ans. (2) (In this answer are doubtful (2) OR Bonus)



Ans. (1)



Ans. (3)



Ans. (2)






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Directions (For Q. No. 58 to 61)

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

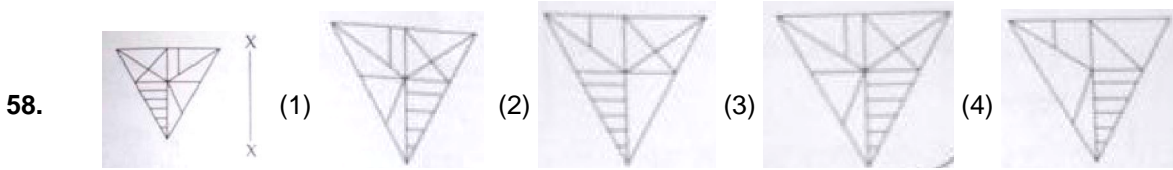
निर्देश : (प्र. सं. 58 से 61 के लिए)

उत्तर आकृतियों में से कौन-सी आकृति दी गयी प्रश्न आकृति का X - X से सम्बन्धित सही दर्पण प्रतिबिम्ब हैं?

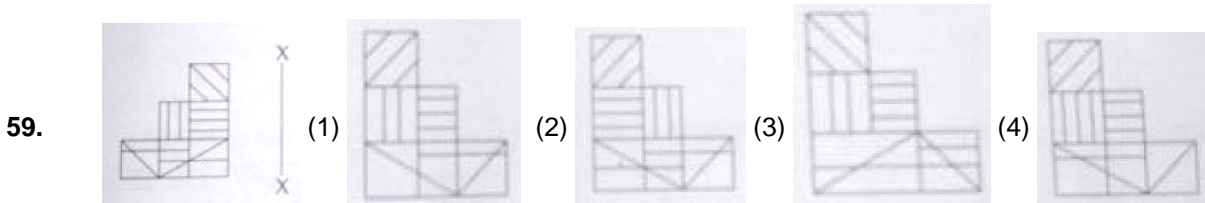
Problem figure /

Answer figure / उत्तर आकृतियाँ

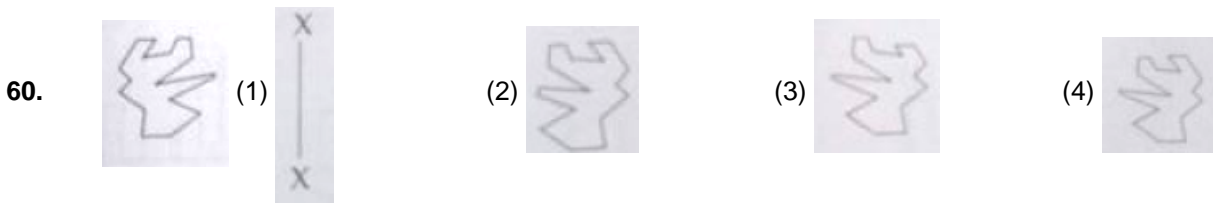
प्रश्न आकृति



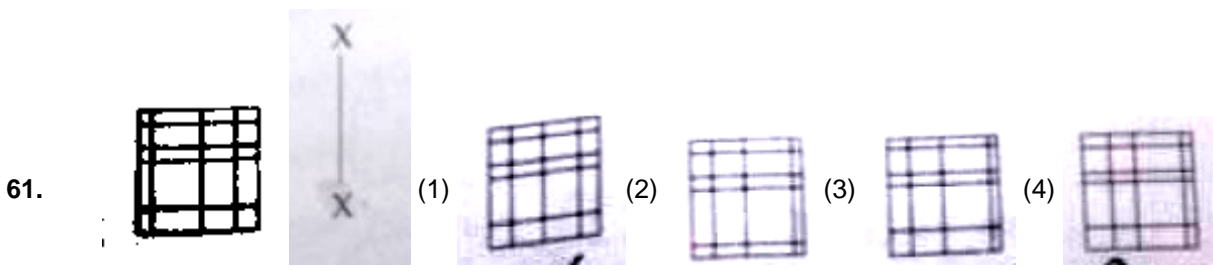
Ans. (3)



Ans. (2)



Ans. (4)



Ans. (2)

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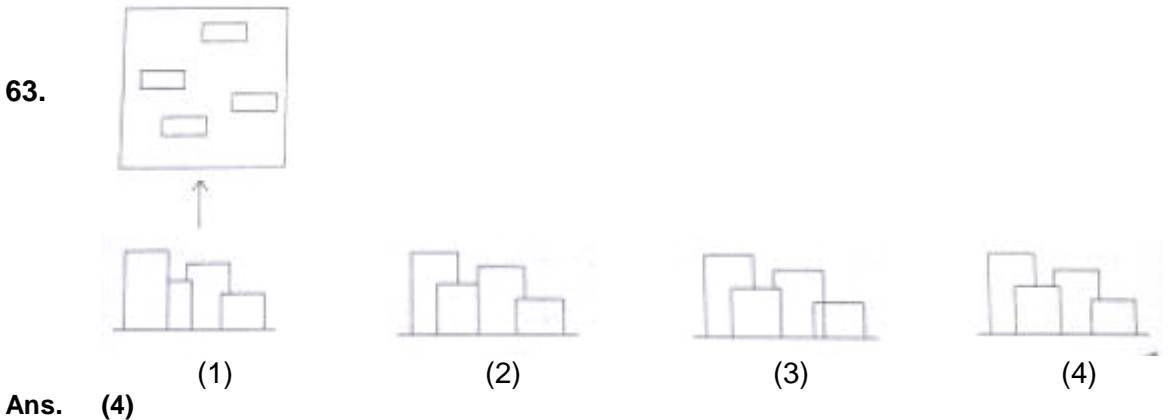
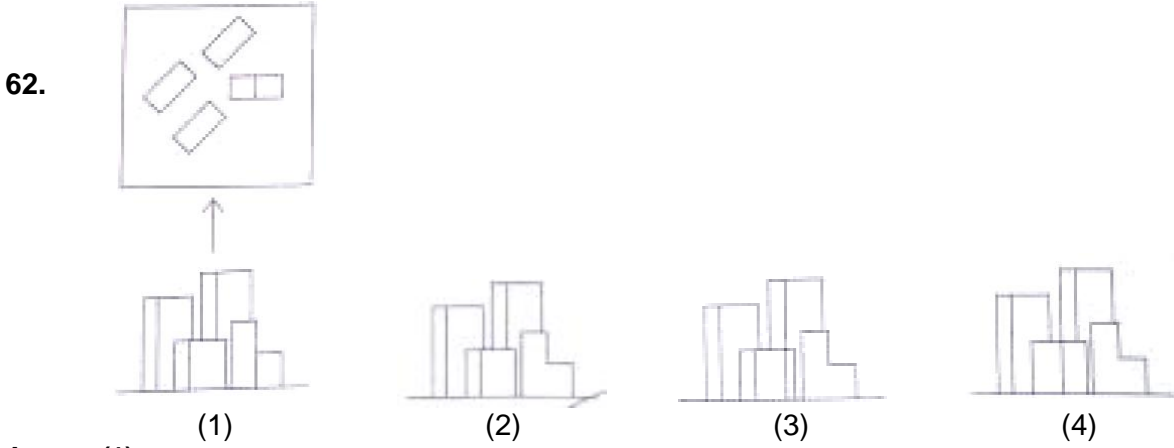
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Direction (For Q. No 62 to 65)

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

निर्देश : (प्र. 62 से 65 के लिए)

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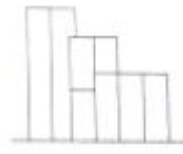
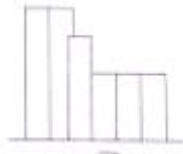
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64.



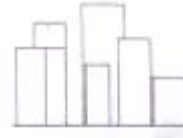
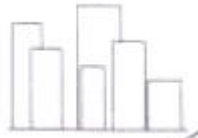
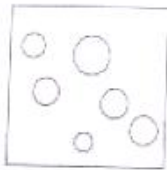
(1)
Ans. (1)

(2)

(3)

(4)

65.



(1)

(2)

(3)

(4)

Ans. (2)

66. Which out of the following is the country called the "Root of the world"?

(1) Japan

(2) Tibet

(3) Monogolia

(4) Uzbekistan

निम्नलिखित में से कौन सा देश "रूफ ऑफ द वर्ल्ड" कहलताता है?

(1) जापान

(2) तिब्बत

(3) मंगोलिया

(4) उज्बेकिस्तान

Ans. (2)

67. Which one of the following has a better insulation value?

(1) A concrete wall

(2) A brick wall

(3) A cavity wall

(4) A stone wall

निम्न में से कौन सा बेहतर इन्सुलेशन मान है?

(1) एक कंक्रीट की दीवार

(2) इस ईट की दीवार

(3) एक गुहा दीवार

(4) एक पत्थर की दीवार

Ans. (3)

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68. Which one of the following is a renewable source of energy?
(1) coal (2) Natural Gas (3) Ocean waves (4) Oil
निम्नलिखित में से कौन-सी ऊर्जा का अक्षय स्रोत है ?
(1) कोयला (2) प्राकृतिक गैस (3) महासागर लहरें (4) तेल

Ans. (3)

69. Charles correa was which of the following ?
(1) A british Architect (2) An Indian Architect
(3) An American Architect (4) A Brazilian Architect
चार्ल्स कोरिया निम्नलिखित में से कौन था?
(1) एक ब्रिटिश वास्तुकार (2) एक भारतीय वास्तुकार
(3) एक अमेरिकी वास्तुकार (4) एक ब्राजीली वास्तुकार

Ans. (2)

70. Who amongst the following is not a qualified architect?
(1) Remo fernandes (2) Arundhati Roy (3) Satish Gujral (4) B.V. Doshi
निम्नलिखित में से कौन एक योग्य वास्तुकार नहीं है?
(1) रेमो फर्नांडीस (2) अरुंधति राय (3) सतीश गुजराल (4) बी.वी.दोशी

Ans. (1)

71. Ellora group of temples represent which of the following ?
(1) Hindu Religion (2) Buddhist Religion
(3) Jain Relision (4) All of the oabove
एलोरा समुह का मंदिर निम्न में से किस का प्रतिनिधित्व करता है?
(1) हिंदु धर्म (2) बौद्ध धर्म (3) जैन धर्म (4) उपरोक्त सभी

Ans. (4)

72. parthenon is located in which country?
(1) Romania (2) Russia (3) Greece (4) Japan
पार्थेनन किस देश में स्थित है?
(1) रोमानिया (2) रूस (3) ग्रीस (4) जापान

Ans. (3)

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73. Which of the following is equivalent to the Nobel prize in architecture ?

- (1) Academy Award (2) padma shree
(3) Pritzker Prize (4) Star of Architecture

निम्नलिखित में से कौन सा वास्तुकला में नोबेल पुरस्कार के बराबर है?

- (1) अकादमी ेमोनिया (2) रूस (3) ग्रीस (4) जापान

Ans. (3)

74. An escalator looks like which one of the following ?

- (1) Ladder (2) Staircase (3) Ramp (4) Lift

एक एस्केलेटर निम्नलिखित में से किसके जैसा दिखता है ?

- (1) सीढ़ी (2) सीढ़ी (स्टरकेस) (3) रैंप (4) लिफ्ट

Ans. (2)

75. Who amongst the following is an architect ?

- (1) Vikram Singh (2) Lauri Baker (3) Khushwant Singh (4) Ruskin Bond

निम्नलिखित में से एक वास्तुकार कौन है ?

- (1) विक्रम सेठ (2) लौरी बैंकर (3) खुशवंत सिंह (4) रस्किन बान्ड

Ans. (2)

76. Burj Khalifa is located in which one of the following countries ?

- (1) Saudi Arabia (2) Dubai (3) Turkey (4) Afghanistan

बुर्ज खलीफा किस देश में स्थित है ?

- (1) सऊदी अरब (2) दुबई (3) तुर्की (4) अफगानिस्तान

Ans. (2)

77. Which of the following is the most striking feature of the Sydney Opera House ?

- (1) Entrance Hall (2) Interior Design (3) Sail shaped roof (4) Location

निम्न में से कौनसी सिडनी ओपेरा हाऊस की सबसे महत्वपूर्ण विशेषता है ?

- (1) प्रवेश हॉल (2) आंतरिक डिजाइन (3) पाल आकार की छत (4) स्थान

Ans. (3)






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78. Which one of the following is an odd combination ?

- (1) Forts and Jaipur (2) Lakes and Udaipur
(3) Temples and Madurai (4) Rain and Kutch

निम्न में से कौन सा एक अजीब संयोजन है ?

- (1) किले और जयपुर (2) झीलें और उदयपुर
(3) मंदिर और मदुरी (4) वर्षा और कच्छ

Ans. (4)

79. Tsunami is a result of which of the following ?

- (1) Sea storms (2) Earthquakes in coastal areas
(3) Earthquakes in the sea bed (4) Strong ocean waves

सुनामी को निम्न में से किस का परिणाम है ?

- (1) सागर तूफान (2) तटीय इलाकों में भूकंप
(3) समुद्र तल में भूकंप (4) सशक्त महासागर लहरें

Ans. (3)

80. Chandigarh was planned by an architect who was which of the following ?

- (1) American (2) French (3) German (4) Australian

चंडीगढ़ को एक वास्तुकार द्वारा नियोजित किया गया था जो निम्नलिखित में से था ?

- (1) अमेरिकी (2) फ्रेंच (3) जर्मन (4) ऑस्ट्रेलियाई

Ans. (2)

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*Approximate Duration