

NATA 2017
Question Paper
C

MGAD-2017

Total Duration : Three Hours

Read the following Instructions carefully:

1. **Do not open the seal of this question booklet until you are asked to do so.**
2. The test is of three (3) hours duration in total. The maximum marks is 200, out of which Part-A is carrying 120 marks (to be completed within **first 90 minutes**) and the rest is for Part-B.
3. **Question Booklet** - This question booklet contains 16 (sixteen) pages. All rough works related to **Part-A** (Q. No. 1 to 60) must be done within the blank pages provided in this question booklet. Questions of **Part-B** (Drawing test) are also included in the question booklet.
4. **OMR Answer Sheet** - One Optical Mark Recognition (OMR) sheet is inserted within the question booklet. It needs to be **slid out of the question booklet** prior to commencement of test, when instructed by the invigilator and particulars are to be filled in item 1 to 6. The OMR sheet is to be used for answering the questions under Part-A (Q. 1 to 20 for Mathematics and Q. 21 to 60 for General Aptitude). **The OMR Answer Sheet must be handed over to the invigilator on completion of the first 90 minutes from time of test commencement.**
5. **Part-A** (Mathematics & General Aptitude) contains altogether sixty (60) questions, which need to be answered on the single OMR sheet, included in the booklet. Each correct answer fetches 2 marks. There is no negative marking for wrong answer. However, wrong answers will affect the rank in case of tie breaking.
6. There is one correct answer to each question which needs to be darkened in the bubble appropriately on the aforesaid OMR sheet using **blue/ black ballpoint pen**. Correct method to darken the bubbles is indicated under the instructions in OMR sheet. Filling up more than one response in any question will be treated as wrong answer.
7. **Drawing Booklet** - A separate booklet containing a top page and drawing sheets bound together is to be used for the drawings under Part-B. Drawing sheets or any part of the booklet must not be used for any rough work. The first page of the Drawing booklet needs to be filled in appropriately with particulars of the candidate at the indicated places.
8. **Part-B** (Drawing test) consists of two (2) questions carrying 40 marks each which are to be attempted on the specified sheets of the aforesaid Drawing booklet. Use of colour pencils and quick-drying ink pens are allowed for the Drawings. Use of water/ Oil colours and crayons are not allowed.
9. On completion of the test duration, the candidate must hand over the Drawing booklet to the invigilator on duty. Candidates are allowed to take away with them the Question Booklet.
10. No part of the Question Booklet, OMR Sheet and Drawing Booklet shall be detached/ folded or defaced under any circumstances. Violation of these conditions will lead to disqualification of candidature.
11. Handle the Question Booklet, OMR Sheet and Drawing Booklet with care. Under no circumstances another set will be provided.
12. Each candidate must show on demand his/her printed Admit card, Photograph (same as the one uploaded) and a valid Photo identity (e.g. Aadhar, Voter card) to the invigilator and/or observer.
13. Use of Electronic/Manual Calculator or Drawing instruments (such as scale, compass etc.) is not allowed. Candidates are not allowed to carry any textual material, printed or written, bits of papers, pager, mobile phone, electronic device or any other material except the items specified above.
14. If a candidate is found impersonating, his/her candidature will be cancelled outright and the concerned examinee will be handed over to the Police.

PART A — (Mathematics)

1. If the function $f(x) = \begin{cases} x^2 - (A+2)x + A & \text{for } x \neq 2 \\ 2 & \text{for } x = 2 \end{cases}$

is continuous at $x = 2$, then

- (A) $A = 0$ (B) $A = 1$
 (C) $A = 2$ (D) $A = 3$

2. A point moves so that the sum of the squares of its distances from the six faces of a cube given by $x = \pm 1, y = \pm 1, z = \pm 1$ is 10 units. The locus of the point is

- (A) $x^2 + y^2 + z^2 = 2$ (B) $x^2 + y^2 + z^2 = 1$
 (C) $x + y + z = 2$ (D) $x + y + z = 1$

3. The number of solutions of the pair of equations $2 \sin^2 \theta - \cos 2\theta = 0$ and $2 \cos^2 \theta - 3 \sin \theta = 0$ in the interval $[0, 2\pi]$ is

- (A) zero (B) two
 (C) one (D) four

4. m men and w women are to be seated in a row so that all women sit together. The number of ways in which they can be seated is

- (A) ${}^{m+w}C_w$ (B) $m!w!$
 (C) $m!(w-1)!$ (D) $(m+1)!w!$

5. If $A = \begin{bmatrix} \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} & 0 \\ -\frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} & 0 \\ 0 & 0 & 1 \end{bmatrix}$, then A^{-1} is

- (A) A (B) A^T
 (C) A^2 (D) A^3

6. If a, b, c are non-zero, then number of solutions of $\frac{2x^2}{a^2} - \frac{y^2}{b^2} - \frac{z^2}{c^2} = 0$,

$-\frac{x^2}{a^2} - \frac{y^2}{b^2} + \frac{2z^2}{c^2} = 0$, $-\frac{x^2}{a^2} + \frac{2y^2}{b^2} - \frac{z^2}{c^2} = 0$ is

- (A) 6 (B) 8
 (C) 9 (D) infinite

7. The points $(a, 2)$, $(0, b)$, $(1, 1)$ are collinear. Then

(A) $ab = a + b + 2$

(B) $ab = a + b - 2$

(C) $ab = a + b$

(D) $ab = a - b$

8. Derivative of $\sin x$ with respect to $\cos x$ is

(A) $\tan x$

(B) $-\tan x$

(C) $\cot x$

(D) $-\cot x$

9. Solution of the differential equation $\frac{dy}{dx} = y^2$ with the condition $y(1) = 1$ is

(A) $2y - xy = 1$

(B) $2y + xy = 1$

(C) $2y - xy = 0$

(D) $2y + xy = 0$

10. Let a, b, c be distinct real numbers such that $\Delta = \begin{vmatrix} 2014 & 2015 & 2013 + a^{-1} \\ 2015 & 2016 & 2013 + b^{-1} \\ 2016 & 2017 & 2013 + c^{-1} \end{vmatrix} = 0$. Then

(A) a, b, c are in A.P.

(B) a, b, c are in G.P.

(C) a^2, b^2, c^2 are in A.P.

(D) a, b, c are in H.P.

11. The sum of the perpendicular distances from the origin to the planes

$12x - 3y + 4z + 26 = 0$ and $2x - 4y + 4z + 18 = 0$ is

(A) 5

(B) 44

(C) 25

(D) 8

12. The value of λ for which the straight line $(2x + 3y + 4) + \lambda(6x - y + 12) = 0$ is parallel to y -axis is

(A) 1

(B) 2

(C) 3

(D) 4

13. The value of $\int_{-\frac{\pi}{4}}^{\frac{\pi}{4}} (x^2 \sin x + x^3) dx$ is

(A) $\frac{1}{2} + \frac{\pi^4}{64}$

(B) $\frac{1}{2} - \frac{\pi^4}{64}$

(C) 0

(D) $\frac{\pi^4}{64}$

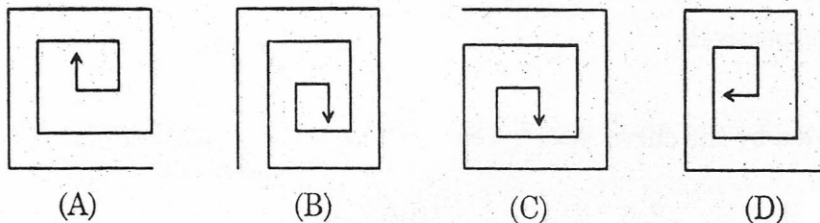
14. If ${}^n C_7 = {}^n C_4$, then the value of n is
 (A) 14 (B) 12
 (C) 11 (D) 10
15. The degree and order of the differential equation $\left(\frac{d^3 y}{dx^3}\right)^2 + \left(\frac{dy}{dx}\right)^4 + y^3 = 0$ is
 (A) 3 and 2 respectively (B) 4 and 3 respectively
 (C) 2 and 3 respectively (D) 2 and 4 respectively
16. The area bounded by the curve $y = x^3, y = 0, x = 1$ is
 (A) 1 (B) $\frac{1}{2}$
 (C) $\frac{1}{3}$ (D) $\frac{1}{4}$
17. The probability that a man will live for 10 more years is $\frac{1}{4}$ and the probability that his wife will live for 10 more years is $\frac{1}{3}$. The probability that neither the husband nor the wife will be alive after 10 years is
 (A) $\frac{5}{12}$ (B) $\frac{1}{2}$
 (C) $\frac{7}{12}$ (D) $\frac{11}{12}$
18. The monthly rate of sales for the first 11 months of the year of a certain salesman was ₹ 12,000. But due to his illness during the last month, the average sales for the whole year came down to ₹ 11,375. The value of the sale during the last month was
 (A) ₹ 4,500 (B) ₹ 6,000
 (C) ₹ 10,000 (D) ₹ 8,000
19. The system of linear equations $-2x + y + z = a, x - 2y + z = b, x + y - 2z = c$ have infinitely many solutions if
 (A) $a = 0, b = 0, c = 0$ (B) $a + b = c$
 (C) $a + b + c = 0$ (D) $a + b - c = 0$
20. Value of the determinant $\begin{vmatrix} 1 & w & w^2 \\ w & w^2 & 1 \\ w^2 & 1 & w \end{vmatrix}$, where w is the cube root of unity is
 (A) 1 (B) 0
 (C) w (D) w^2

PART A — (General Aptitude)

21. World Environment Day is observed on :

- (A) February 14 (B) May 01
(C) June 05 (D) August 06

22. Find the odd one from the figures below. Ignore the direction of arrow head.



23. Gypsum is a

- (A) mechanically formed sedimentary rock
(B) igneous rock
(C) chemically precipitated sedimentary rock
(D) metamorphic rock

24. Which of the following is a scalar quantity?

- (A) energy (B) momentum
(C) torque (D) impulse

25. A heavy ladder resting in the floor and against a vertical wall may not be in equilibrium if

- (A) floor is smooth and wall is rough
(B) floor is rough and wall is smooth
(C) both floor and wall are rough
(D) both floor and wall are smooth

26. The type of roof suitable in plains where rainfall is meagre and temperature is high is

- (A) pitched and slope (B) flat
(C) vault (D) shell

27. The angle which an inclined plane makes with the horizontal when a body placed on it is about to slide down is known as angle of

- (A) limiting friction (B) inclination
(C) repose (D) overturning

28. A truncated (horizontally cut in mid-way) hexagonal pyramid has following numbers of surfaces, edges and vertices respectively.
- (A) 8, 16, 12 (B) 6, 12, 10
(C) 6, 16, 10 (D) 8, 18, 12
29. A circle is inscribed within an equilateral triangle of area $\sqrt{3}$ sqm. The circumference of the circle is
- (A) $\frac{\pi}{\sqrt{3}}$ m (B) $\pi\sqrt{3}$ m
(C) $\frac{2\pi}{\sqrt{3}}$ m (D) $2\pi\sqrt{3}$ m
30. The linear scale of a map is 1 cm = 2 m. The drawing dimensions of an on-site rectangular plot measuring 25 m \times 40 m will be
- (A) 50 cm \times 80 cm (B) 25 cm \times 40 cm
(C) 12.5 cm \times 20 cm (D) 5 cm \times 8 cm
31. When a clock is seen through a mirror, the hour arm and minute arm are seen at 9 and 4 respectively, so that the time seen is 9 : 20. What will be the actual time after 15 minutes?
- (A) 2:35 (B) 3:35
(C) 3:55 (D) 2:55
32. Length of a solid diagonal of a cube is 6 cm. The volume of the cube is
- (A) $24\sqrt{3}$ cm³ (B) 8 cm³
(C) $12\sqrt{3}$ cm³ (D) 27 cm³

33. Nurse Merry has worked more night shifts in a row than Nurse Sujata, who has worked five. Nurse Ruma has worked fifteen night shifts in a row, more than Nurses Merry and Sujata combined. Nurse Priti has worked eight night shifts in a row, less than Nurse Merry. How many night shifts in a row has Nurse Merry worked?

- (A) 10 (B) 9
(C) 8 (D) 7

34. Unscramble and find the odd one among the following

- (A) NEMJIAS (B) ORES
(C) MAGNO (D) SOULT

35. X is 1 km northeast of Y. Y is 1 km southeast of Z. W is 1 km west of Z. P is 1 km south of W. Q is 1 km east of P. What is the distance between X and Q in km?

- (A) $\sqrt{5}$ (B) $\sqrt{3}$
(C) $\sqrt{2}$ (D) 3

36. In a group of four children, Som is younger to Riaz. Shiv is elder to Ansu. Ansu is youngest in the group. Which of the following statements is/are required to find the eldest child in the group?

- Statements :
1. Shiv is younger to Riaz.
2. Shiv is elder to Som.

- (A) Statements 1 and 2 are both required to determine the eldest child
(B) Statement 2 by itself determines the eldest child
(C) Statements 1 and 2 are not sufficient to determine the eldest child
(D) Statement 1 by itself determines the eldest child

37. Given below are two statements followed by two conclusions. Assuming these statements to be true, decide which one logically follows.

Statements :

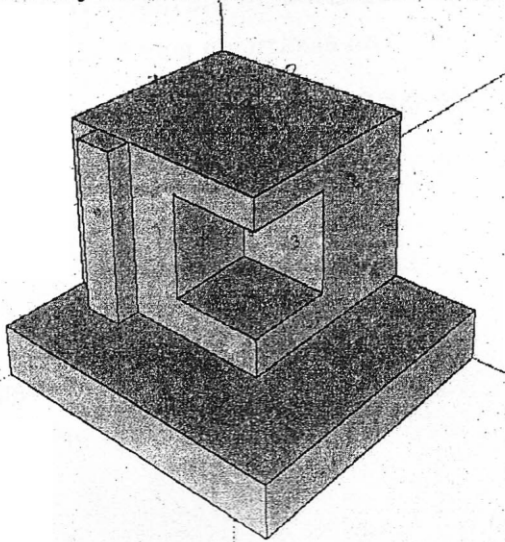
- I. All film stars are playback singers.
II. All film directors are film stars.

Conclusions :

- I. All film directors are playback singers.
II. Some film stars are film directors.

- (A) Only conclusion I follows (B) Only conclusion II follows
(C) Both conclusions I and II follow (D) Neither conclusion I nor II follows

38. How many surfaces are there in the model? Consider all seen and unseen surfaces.



(A) 21

(B) 17

(C) 12

(D) 15

39. A horizontal supporting crosspiece over an opening is called

(A) Lattice

(B) Leader

(C) Lancet

(D) Lintel

40. A square is drawn on 1st quadrant of XY plane having consecutive coordinates (counter-clockwise, starting from left bottom) as $P(2,3)$, $Q(7,3)$, $R(7,8)$, $S(2,8)$ respectively. Thereafter, each side of the square is doubled considering P as a fixed point and the new square becomes $PQ'R'S'$. Now this new square is mirrored with respect to X axis. What will be the coordinates for the image of R' ?

(A) $(7, -8)$

(B) $(12, -13)$

(C) $(-12, -13)$

(D) $(-7, 8)$

41. What secondary colour is obtained by mixing Blue and Red colours?

(A) Pink

(B) Brown

(C) Orange

(D) Purple

42. What is Texture?

(A) Solid colour

(B) Type of shape

(C) Lines drawn in colour

(D) The way a surface looks and feels

43. In a project, the share of material and labour costing is 3:2. In the labour component, the electrician gets 5%. What is the total project cost if an electrician gets ₹ 25,000/-?

- (A) ₹ 12.5 Lakh (B) ₹ 25 Lakh
 (C) ₹ 125 Lakh (D) ₹ 62.5 Lakh

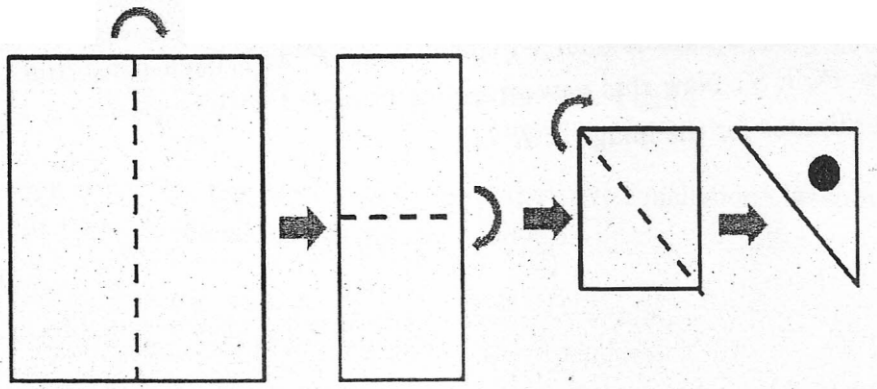
44. From a point O, two persons A and B started their journey on XY plane. A went 7 km along north and stopped. B went 5 km west and then 5 km south and stopped. What is the shortest distance between A and B?

- (A) 13 km (B) 7 km
 (C) 12 km (D) 3 km

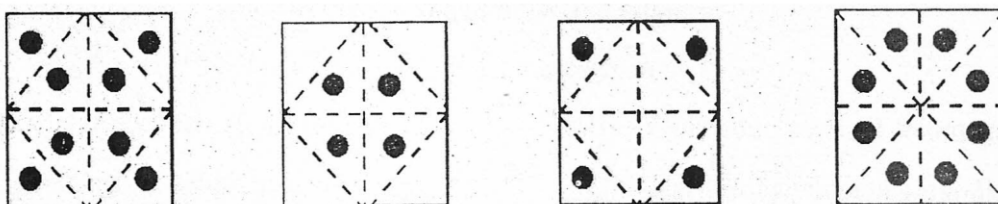
45. Three cubes of side 2 cm are glued surface to surface horizontally such that it produces a cuboid. What is the surface area of the cuboid?

- (A) 72 cm^2 (B) 68 cm^2
 (C) 64 cm^2 (D) 56 cm^2

46.



A square paper is folded as shown in the figure (above). A circular hole is created in the triangular portion. Now the paper is unfolded. What will be the right diagram?

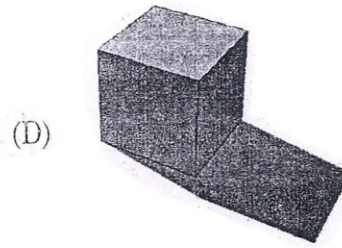
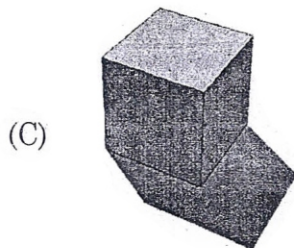
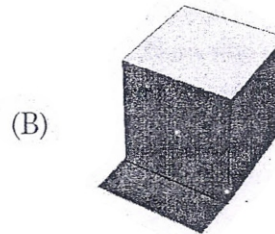
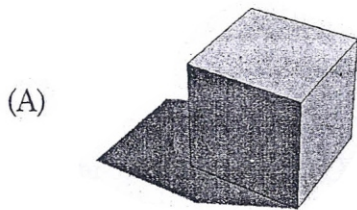
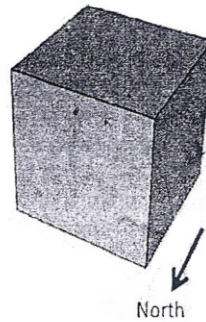


- (A) (B) (C) (D)

47. Building acoustics concerns

- (A) Water related issues
- (B) Sound related issues
- (C) Ventilation related issues
- (D) Daylight related issues

48. Choose the appropriate shadow pattern of this cube (below) at 3:00 p.m. in India.



49. Fly ash is a waste product from which of the following:

- (A) Nuclear installation
- (B) Coal mine
- (C) Thermal power plant
- (D) Iron ore conversion

50. French influence in architecture is found at

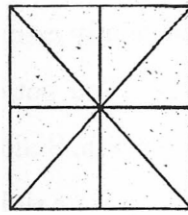
- (A) Kerala
- (B) Sikkim
- (C) Goa
- (D) Puducherry

51. How many bricks of dimension $20\text{ cm} \times 10\text{ cm} \times 10\text{ cm}$ are required to build a wall 12 m long, 3 m high and 30 cm wide, if 10% of the wall is comprised of mortar?

- (A) 4860
- (B) 5200
- (C) 4600
- (D) 5000

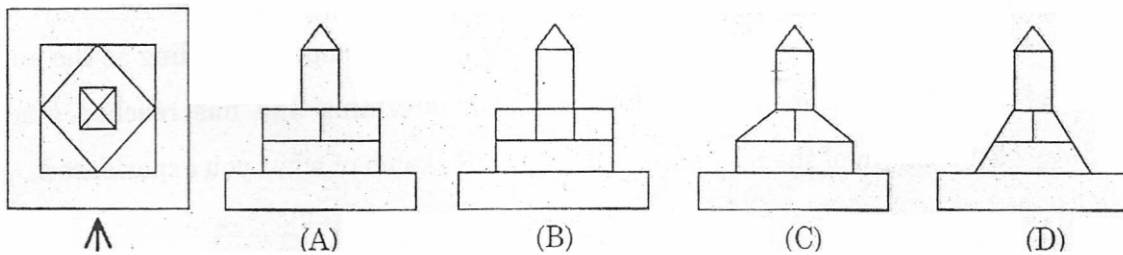
52. A directional post is erected on a crossing. Due to heavy storm it turned in such a way that the arrow which was first showing South is now showing East. A car went in a direction thinking it is West. In what direction is the car actually moving?
- (A) North (B) West
(C) East (D) South
53. Let E and F be any two sets. Which of the following statements is NOT correct?
- (A) $E - F = E - (E \cap F)$
(B) $(E \cup F) - F = E - (E \cap F)$
(C) $E - (E \cap F) = E \cap F^C$
(D) $(E \cup F) - F = (E - F) \cup (E \cap F)$
54. A set P has 20 elements. The number of subsets of P containing odd number of elements is
- (A) $2^{18} + 20$ (B) 2^{19}
(C) $2^{19} - 1$ (D) $2^{20} - 128$
55. Let $P = \{1, 3, 5, 7, 9\}$ and $R = \{(1, 3), (3, 5), (1, 5), (9, 7), (7, 5), (9, 5)\}$. Then R
- (A) is not reflexive but symmetric and transitive
(B) is neither reflexive nor symmetric but transitive
(C) is neither transitive nor symmetric but reflexive
(D) is an equivalence relation
56. Let $P = \{1, 2, 3\}$, $Q = \{2, 3, 4\}$. Then the number of elements in $P \times Q$ is
- (A) 9 (B) 7
(C) 6 (D) 4

57. How many total number of triangles are there in the figure given below?



- (A) 16
- (B) 17
- (C) 18
- (D) 20

58. The left most figure below shows the top view of an object. Identify the correct elevation from amongst the answer figures, looking in the direction of arrow.



59. Which one of the following consumes least amount of electricity?

- (A) Tungsten bulb
- (B) Fluorescent tube
- (C) Light Emitting Diodes (LED)
- (D) Compact Fluorescent lamp (CFL)

60. Green Architecture is promoted these days because

- (A) it costs less initially
- (B) it is environment friendly
- (C) it lasts longer
- (D) it uses good colours

PART B — (Drawing Test)

1. One late afternoon, you along with your family members were enjoying a boat ride along a river and viewed a spectacular sunset. You noticed that the boat was moving from south to north and all of you were facing north. Suddenly, your youngest brother shouted and told everybody to see the river bank on your right side. You saw a series of high-rise apartment buildings interspersed with trees. But, in the middle, there was a beautiful river ghat, a garden and a small white mosque adjacent to it. Lots of birds were flying around and sitting on its golden dome. In the concrete jungle, the small structure seemed to be a nice relief. Develop a coloured sketch (use dry colour) of what you experienced.
2. You are waiting in a railway platform for catching a local train. Some people are also waiting there with small and big luggage. Few people are sitting on wooden benches. There is a small food shop. You saw that the roof above is sloped. Standing at the entry point of the platform you noticed that the train is coming and has reached almost midway of the length of the platform. Draw a pencil sketch of what you experienced.