Booklet Code A

Entrance Examination (February 2014)

Master of Computer Applications (MCA)

Time: 2 Hours **Max. Marks: 100**

Hall Ticket Number:

INSTRUCTIONS

1. (a) Write your Hall Ticket Number in the above box AND on the OMR Sheet.
   (b) Fill in the OMR sheet, the Booklet Code **A** given above at the top left corner of this sheet. Candidates should also read and follow the other instructions given in the OMR sheet.
2. All answers should be marked clearly in the OMR answer sheet only.
3. This objective type test has two parts: Part A with 25 questions and Part B with 50 questions. Please make sure that all the questions are clearly printed in your paper.
4. Every correct answer of **PART-A** carries **2(two) marks** and for every wrong answer **0.66 mark will be deducted**.
5. Every correct answer of **PART-B** carries **1(one) mark** and for every wrong answer **0.33 mark will be deducted**.
6. Do not use any other paper, envelope etc for writing or doing rough work. All the rough work should be done in your question paper or on the sheets provided with the question paper at the end.
7. During the examination, anyone found indulging in copying or have any discussions will be asked to leave the examination hall.
8. Use of non-programmable calculator and log-tables is allowed.
9. Use of mobile phone is NOT allowed inside the hall.
10. Hand-over the OMR answer sheet along with the question paper at the end of the examination to the invigilator.
11. Candidate should write and darken the correct Booklet Code of the question paper in the OMR answer sheet, without which such OMR answer sheets cannot be evaluated. The defaulting candidates in marking the Booklet Code in the OMR sheet shall not have any claim on their examination and the University shall not be held responsible for the lapse on the part of the candidate.

Part A

1. A student was asked to add the first few natural numbers (that is, $1 + 2 + 3 + \ldots$) so long as her patience permitted. As she stopped, she gave the sum as 575. When the teacher declared the result wrong, the student discovered that she had missed one number in the sequence during addition. The number she missed was:

   A. less than 10

   B. 10

   C. 15

   D. more than 15

2. A five member research group is chosen from computer scientists(CS) A, B, C and D and mathematicians E, F, G and H. At least 3 CS must be in the research group. However
   A refuses to work with D
   B refuses to work with E
   F refuses to work with G
   D refuses to work with F
   If B or C is chosen which of the following is necessarily true:

   I. A is definitely chosen **II.** D is definitely chosen **III.** Either F or G is chosen.

   A. I only

   B. II only

   C. III only

   D. II and III only

3. How many binary strings of length 10 contain at least three 1's and at least three 0's?

   A. 672

   B. 912

   C. 11520

   D. 140

4. The first six Prime Ministers of a country had an average tenure of 6 years. What is the approximate tenure of the 7th Prime Minister if the average tenure of first nine Prime Ministers is 5.25 years and the duration of the tenure of the 7th, 8th, and 9th Prime Ministers are in the ratio 1:2:3?

   A. 1 year 3 months 18 days

   B. 1 year 10 months 15 days

   C. 2 years

   D. 1 year 6 months

5. The three words "MCA SCIS UH" are flashed on a digital sign board. The words individually are switched on from a switch-off position at regular intervals of 4,7 and 9 seconds respectively. After they are switched on, the words are switched off after 2 sec, 3 sec and 4 sec respectively. If at time 't' all the words happened to switch off simultaneously, find the least time at which all three words will switch on simultaneously.

   A. 252 sec

   B. 126 sec

   C. 94 sec

   D. 38 sec

6. In the following multiplication, each * represents a digit. What is the multi-

plier?

$$
\begin{array}{ccccc}
 & & 2 & 3 & 5 \\
 & \times & & * & * \\
\hline
 & * & * & * & * \\
* & * & * & * & \\
\hline
* & * & 5 & 6 & * \\
\hline
\end{array}
$$

A. 24

B. 96

C. 48

D. 12

7. Now the time is 4 O' clock. By 5 O' clock, the minute hand overtakes the hour hand between 4 and 5. In 24 hours, that is by 4 O'clock tomorrow, how many times does the minute hand overtake the hour hand?

A. 24

B. 12

C. 23

D. 22

8. Ram and Shyam take a vacation at their grandparents' house. During the vacation, they do any activity together. They either played tennis in the evening or practiced Yoga in the morning, ensuring that they do not undertake both the activities on any single day. There were some days when they did nothing. Out of the days that they stayed at their grandparents' house, they involved in one of the two activities on 22 days. However, their grandmother while sending an end of vacation report to their parents stated that they did not do anything on 24 mornings and they did nothing on 12 evenings. How long was their vacation?

A. 36 days

B. 14 days

C. 29 days

D. cannot be determined

9. The product of the numbers 1 to 100 (both inclusive) is a huge number. What is the number of zeros that this number will have at the right hand end?

A. 20

B. 24

C. 100

D. 22

10. $a, b, c, d,$ and e are five consecutive integers in increasing order of size. Which one of the following expressions is not an odd number?

A. $ab + c$

B. $ac + d$

C. $ab + d$

D. $ac + e$

11. Think of any 3-digit number and write it down twice side-by-side to form a 6-digit number. Eg: if the number you think is 123, then 6-digit number is 123123. Which of the following is FALSE about such 6 digit number?

A. They are always divisible by 3

B. They are always divisible by 7

C. They are always divisible by 11

D. They are always divisible by 13

12. Yana and Gupta leave from points x and y towards y and x respectively simultaneously and travel in the same

route. After meeting each other on the way, Yana takes 4 hours to reach her destination, while Gupta takes 9 hours to reach his destination. If the speed of Yana is 48 km/hr, what is the speed of Gupta?

A. 72 kmph

B. 32 kmph

C. 20 kmph

D. 30 kmph

13. A Car rental agency has the following rental plans.
Plan A: If a car is rented for 5 hours or less the charge is Rs. 60 per hour or Rs. 12 per kilometer whichever is more.
Plan B: If the car is rented for more than 5 hours, the charge is Rs. 50 per hour or Rs. 7.50 per kilometer, whichever is more.
Atul rented a car from this agency, drove it for 30 kilometers and ended up paying Rs. 300. For how many hours did he rent the car?

A. 3

B. 4

C. 5

D. 6

Read the following passage and answer the 14–16 based on this passage by choosing the most suitable answer to the question:
Natural selection cannot possibly produce any modification in a species exclusively for the good of another species though throughout nature one species incessantly takes advantage of, and profits by, the structures of others. But natural selection does often produce structures for the direct injury of other animals, as we see in the fang of the adder. If it could be proved that any part of the structure of any one species, had been formed for the exclusive good of another species, it would annihilate my theory. It is admitted that the rattle snake has a poison fang for its own defence, but some authors suppose that at the same time it is furnished with a rattle, to warn its prey. I would almost as soon believe that the cat curls its end of its tail when preparing to spring, in order to warn the doomed mouse. It is a much more probable view that the rattle snake uses its rattle, in order to alarm the many birds and beasts which are known to attack even the most venomous species. (*-Charles Darwin in The Origin of Species*).

14. What, according to the author is a contradiction to the theory of Natural selection?

A. Natural selection creates changes in a species so that it helps other species

B. Natural selection creates changes in a species so that it can harm other species

C. Natural selection creates changes in a species so that it can defend itself

D. None of the above

15. Why, according to the author, does the rattle snake have a rattle?

A. To warn its prey

B. in self defence

C. to scare any attacker

D. for no reason

16. From the passage give an example of a structure that is produced to cause direct harm to other animals.

 A. rattle of a rattle snake

 B. curl of a cat's tail

 C. poison fang of a snake

 D. fang of the adder

17. There are 6 coins in a purse whose value is Rs 1.15. The possible denominations of the coins are Rs 1, 50ps, 25ps, 10ps, 5ps. Which denomination CANNOT be in the purse, if from the 6 coins, no change can be given for Rs 1, 50ps, 25ps or 10ps?

 A. 5ps

 B. 10ps

 C. 25ps

 D. 50ps

18. Let X be a four-digit number that is a multiple of 9 with exactly three consecutive digits being same. How many such Xs are possible?

 A. 12

 B. 16

 C. 19

 D. 20

19. Find 9 integers from 1 to 20 (both inclusive) such that no combination of any 3 of the nine integers form an arithmetic progression.

 A. 1, 2, 6, 7, 9, 14, 15, 18, 20

 B. 1, 2, 4, 7, 9, 14, 16, 19, 20

 C. 2, 3, 6, 8, 12, 15, 17, 18, 20

 D. 2, 3, 5, 8, 12, 15, 16, 19, 20

20. A hundred apples have to be divided between 25 people so that nobody gets an even number of apples. In how many ways can this be done?

 A. 100

 B. 25

 C. 1

 D. 0

21. Let $X = \{1, 2, 3, \ldots, 3000\}$. What is the number of elements of X which are divisible by 3 or 11 but not by 33?

 A. 1182

 B. 1092

 C. 1272

 D. 1091

22. How many words can be made with letters of the word INTERMEDIATE if the positions of the vowels and consonants are preserved?

 A. 151200

 B. 21600

 C. 43200

 D. 7200

23. There are 51 houses on a street. Each house has an address between 1000 to 1099 (both inclusive). Which one of the following is definitely true?

 I At least one house has an odd numbered address

 II At least one house has an even numbered address

 III There will be at least two houses with consecutive addresses

 IV There will be more than two houses with consecutive addresses

A. I and III

B. II and III

C. I, II and III

D. I, II and IV

24. Each of the three persons A, B and C belong to either TRUE family whose members always speak truth or FALSE family whose members always lie. If A says "Either I or B belong to a different family from the other two", which of the following is definitely true?

A. A belongs to TRUE family

B. B belongs to TRUE family

C. C belongs to FALSE family

D. B belongs to FALSE family

25. How many ordered pairs of integers (a, b) are needed to guarantee that there are two ordered pairs (a_1, b_1) and (a_2, b_2) such that $a_1 \ mod \ 5 = a_2 \ mod \ 5$ and $b_1 \ mod \ 5 = b_2 \ mod \ 5$?

A. 13

B. 16

C. 26

D. 25

Part B

26.

$$\text{Let } f(x) = \frac{1}{\sqrt{1-x}} + \frac{1}{\sqrt{x+3}}.$$

Then the domain of the real function f is

A. $(-\infty, -3) \cup (1, \infty)$

B. $(1, \infty)$

C. $(-\infty, 1) \cap (-3, \infty)$

D. $x \neq 1, x \neq -3$

27. Consider $x^2 - 3x - 2 < 10 - 2x$. This inequality holds when

A. $x > 4$ and $x < -3$

B. $x < 4$ and $x > -3$

C. $x < 2$ and $x > -3$

D. $x^2 = 12$

28.

$$\lim_{x \to 4} \frac{\sqrt{x} - 2}{4 - x} = ?$$

A. -1/2

B. -1/4

C. 0

D. $1/\sqrt{2}$

29. $f(x) = \sum_{n=1}^{m} (x - n)^2$ has a minimum at x_0. Then $x_0 = ?$

A. $1 + \frac{1}{2} + \frac{1}{3} + \ldots + \frac{1}{m}$

B. $\frac{m(m+1)}{2}$

C. $\frac{m+1}{2}$

D. $\frac{1}{m}(1 + \frac{1}{2} + \frac{1}{3} + \ldots + \frac{1}{m})$

30. The number of surjections from $A = \{1, 2, 3, \ldots n\}, n \geq 2$ onto $B = \{a, b\}$ is

A. $\binom{n}{2}$

B. ${}^{n}P_2$

C. $2^n - 2$

D. $2^n - 1$

31. Let Φ denote the null set and $P(S)$ denote the power set of S. Then how many elements does $P(P(\Phi))$ have?

A. 0

B. 1

C. 2

D. 3

32. In a town of 10,000 families, it was found that 40% families buy newspaper A, 20% buy newspaper B, 10% buy newspaper C, 5% buy A and B, 3% buy B and C, and 4% buy A and C. If 2% buy all the newspapers, then the number of families who do not buy any of the newspapers A, B, C is

A. 3300

B. 1400

C. 4000

D. 1200

33. Suppose

$$f(n) = \left(1 + \frac{1}{n}\right)^n, n \in N, n \geq 2. \text{ Then}$$

A. $1 < f(n) < 2$

B. $2 < f(n) < 3$

C. $3 < f(n) < 4$

D. $0 < f(n) < 1$

34. Number of relations on a set of n elements is equal to

A. n^2

B. 2^n

C. 2^{n^2}

D. n

35. If $[x]$ denotes the integer part of x, then

$$\int_1^3 \left[\sqrt{[x^2]}\right] dx$$

is equal to

A. 4

B. $\sqrt{2} - 1$

C. 1

D. 3

36.

$$\sum_{k=1}^{n} \frac{1}{k(k+1)} \text{ is equal to}$$

A. $\frac{1}{n}$

B. $\frac{1}{n+1}$

C. $\frac{n}{n+1}$

D. $\frac{1}{n(n+1)}$

37. If

$$\int_{12}^{-10} f(x)dx = 6, \int_{100}^{-10} f(x)dx = -2,$$

$$\text{and} \int_{100}^{-5} f(x)dx = 4 \text{ then} \int_{-5}^{12} f(x)dx = ?$$

A. 0

B. -12

C. 4

D. -2

38. Find $\int_{-3}^{-2} \frac{dx}{x}$

A. $\log 2 - \log 3$

B. $\log 3 - \log 2$

C. undefined

D. 1

39. The value of the integral

$$\int_0^{\pi/9} \frac{\sec 3x \tan 3x}{(2 + \sec 3x)^{1/3}} dx$$

is equal to

A. $\frac{1}{2}(4^{2/3} - (2 + \sqrt{2})^{2/3})$

B. $\frac{1}{2}(4^{2/3} - 3^{2/3})$

C. $\frac{1}{2}(4^{2/3} - (2^{2/3}))$

D. $\frac{1}{2}(4^{2/3} - (\sqrt{3})^{2/3})$

40. Derivative of $\sin x^2$ with respect to $2x^2$ is

A. $\frac{1}{2}\cos^2 x$

B. $\cos\left(\frac{x^2}{2}\right)$

C. $2\cos x^2$

D. $\frac{1}{2}\cos x^2$

41. Find dy/dx if

$$y = \int_{sinx}^{x^2} (1+t)dt$$

A. $2x(1+x^2) - \cos x(1+\sin x)$

B. $x^2 - \sin x$

C. $x^2(1+\frac{x^2}{2}) - \sin x(1+\sin^2 x/2)$

D. $2x - \cos x$

42. Determine the set of all the values of α for which the point (α, α^2) lies inside the triangle formed by the lines
$2x + 3y - 1 = 0$
$x + 2y - 3 = 0$
$5x - 6y - 1 = 0$

A. $(\frac{-3}{2}, -1) \cup (\frac{1}{2}, 1)$

B. $(\frac{-3}{2}, \frac{1}{3}) \cup (\frac{1}{2}, 1)$

C. $(\frac{-3}{2}, 1)$

D. $(-1, 1)$

43. A ray of light is sent along the line $x - 2y - 3 = 0$. On reaching the line $3x - 2y - 5 = 0$, the ray is reflected from it. Find the equation of the line containing the reflected ray.

A. $29x - 2y - 31 = 0$

B. $2x + y - 3 = 0$

C. $2x + 3y - 5 = 0$

D. $2x + 29y - 31 = 0$

44. In a triangle ABC, where $A = (-4, 2), B = (2, 1)$ and $C = (-4, -5)$, find $\angle ACB$.

A. 30°

B. 45°

C. 25°

D. 60°

45. The length and breadth of a rectangle formed by the lines
$x + y = 5, x - y = 0,$
$x + y = 10$ and $x - y = 4$ is

A. $2\sqrt{2}, \sqrt{12.5}$

B. 4, 5

C. 1, 10

D. $\sqrt{12.5}, \sqrt{20.5}$

46. From the top of a mountain of 60m height, the angles of depression of the top and the bottom of a tower are observed to be 30° and 60° respectively. Find the height of the tower.

A. 40m

B. 50m

C. 55m

D. 30m

47. In a convex pentagon ABCDE, the sides have lengths 1, 2, 3, 4 and 5, though not necessarily in that order. Let F, G, H, and I be the mid-points of the sides AB, BC, CD and DE respectively. Let X be the mid-point of segment FH, and Y be the mid-point of segment GI. The length of segment

XY is an integer. Find all the possible values for the length of side AB.

A. 1 or 2

B. 2 or 4

C. 3 only

D. 4 only

48. Find the minimum and maximum values of the function $(10\cos\theta + 24\sin\theta)$

A. -10, 24

B. -25, 25

C. -26, 26

D. 10, 24

49. Find a value of

$$\sqrt{2+\sqrt{2+2\cos 4\theta}}$$

A. $2\cos 2\theta$

B. $\cos 2\theta$

C. $2\cos\theta$

D. $\sin 2\theta$

50. The value of $\sin(2\sin^{-1}(0.6))$

A. 0.96

B. $\sin(1.2)$

C. 0.48

D. $\sin(1.6)$

51. If α is a non-real root of $x^6 = 1$, then evaluate

$$\frac{\alpha^5+\alpha^3+\alpha+1}{\alpha^2+1}$$

A. α^2

B. 0

C. α

D. $-\alpha^2$

52. The solution set of

$$(5+4\cos\theta)(2\cos\theta+1)=0$$

in the interval $[0, 2\pi]$ is

A. $\{\pi/3, \pi\}$

B. $\{\pi/3, 2\pi/3\}$

C. $\{2\pi/3, 4\pi/3\}$

D. $\{2\pi/3, 5\pi/3\}$

53. If $\cos\theta - 4\sin\theta = 1$, find $\sin\theta + 4\cos\theta$.

A. ± 1

B. 0

C. ± 2

D. ± 4

54. Consider the matrix

$$A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$$

Which of the following vectors are eigen vectors of A with respect to the eigen value -3?

$$x_1 = \begin{bmatrix} 1 \\ 2 \\ -1 \end{bmatrix}, \; x_2 = \begin{bmatrix} -2 \\ 1 \\ 0 \end{bmatrix}, \; x_3 = \begin{bmatrix} 3 \\ 0 \\ 1 \end{bmatrix}$$

A. x_1, x_2

B. x_2 only

C. x_2, x_3

D. x_1, x_2 and x_3

55. If the system of equations
$ax + y + z = 0,$
$x + by + z = 0$
and $x + y + cz = 0, (a, b, c \neq 1)$ has a non-trivial solution, then the value of

$$\frac{a}{1-a} + \frac{1}{1-b} + \frac{1}{1-c} = ?$$

E-9

A. a

B. 1

C. 0

D. -1

56. For the matrix

$$A = \begin{bmatrix} 1 & -4 & 2 & -2 \\ 4 & 7 & -3 & 5 \\ 3 & 0 & 8 & 0 \\ -5 & -1 & 6 & 9 \end{bmatrix},$$

the co-factor A_{31} is

A. 14

B. -14

C. 204

D. 250

57. Consider the matrix

$$A = \begin{bmatrix} 1 & -2 & 2 \\ 0 & 2 & 0 \\ 1 & 1 & 3 \end{bmatrix}$$

Then $A^3 - 9A$ is

A. an identity matrix

B. a matrix with all entries 10

C. a diagonal matrix

D. a matrix with all entries 0

58. The determinant of the matrix

$$\begin{bmatrix} a^2 & a & 1 \\ \cos(nx) & \cos(n+1)x & \cos(n+2)x \\ \sin(nx) & \sin(n+1)x & \sin(n+2)x \end{bmatrix}$$

is independent of

A. n

B. a

C. x

D. none of these

59.

$$f(x) = \begin{vmatrix} x & 8 & 8 \\ 2 & x & 8 \\ 2 & 2 & x \end{vmatrix}$$

has local maximum at ?

A. 4

B. -4

C. 16

D. $\sqrt{8^2 - 2^2}$

60. The general solution of the differential equation

$$\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = e^{2x} \; is$$

A. $(c_1 + c_2x)\,e^x + e^{2x}$

B. $c_1e^x + e^{2x}$

C. $c_1xe^x + e^{2x}$

D. $(c_1 + c_2x)\,e^x + 2e^{2x}$

61. The differential equation for all circles passing through the origin and having centres on the x-axis is

A. $x^2 - y^2 + 2xy\frac{dy}{dx} = 0$

B. $x^2 - y^2 - 2xy\frac{dy}{dx} = 0$

C. $x^2 + y^2 + 2xy\frac{dy}{dx} = 0$

D. $x^2 + y^2 - 2xy\frac{dy}{dx} = 0$

62. Let A and B be two events such that the probabilities $Pr(A' \cap B) = 0.20$ and $Pr(A \cap B) = 0.15$. Find $Pr(A|B)$.

A. 3/4

B. 1/4

C. 4/7

D. 3/7

63. A purse contains a 1-rupee coin and three 1-dollar coins, a second purse contains two 1-rupee coins and four 1-dollar coins, and a third purse contains three 1-rupee coins and a 1-dollar coin. If a coin is taken out from one of the purses selected at random, find the probability that it is a rupee.

    A. 4/9

    B. 1/12

    C. 1/9

    D. 1/4

64. A box contains 50 bolts and 150 nuts. Half of the bolts and half of the nuts are rusted. If one item is chosen at random, then the probability that it is rusted or is a bolt is

    A. 2/4

    B. 3/4

    C. 5/8

    D. 5/6

65. Suppose M is the mode and S^2 the variance of n observations. If a positive constant 'a' is added to all the observations, the mode and variance of these observations will be respectively

    A. M, S^2

    B. $M - a, S^2$

    C. $M + a, S^2 + a$

    D. $M + a, S^2$

66. Using only the probabilities $Pr(A \cup B)$ and $Pr(A \cap B)$, which of the following probabilities cannot be calculated?

    A. $Pr(A \Delta B)$

    B. $Pr(A' \cup B')$

    C. $Pr(A' \cap B')$

    D. $Pr(B)$

67. A, B, C and D are playing a card game which has many rounds. In each round, A, B, C and D cut a pack of 52 cards successively in the given order. What is the probability that A cuts a spade first in the game? What is the probability that B cuts a spade first?

    A. $\frac{1}{4}, \frac{1}{4}$

    B. $\frac{64}{175}, \frac{48}{175}$

    C. $\frac{3}{4}, \frac{1}{4}$

    D. $\frac{64}{255}, \frac{48}{255}$

68. A normal 8×8 chess-board is made up of 64 black and white cells. A smaller square is being cut randomly such that the cut is made only along the boundaries of the cells. What is the probability of getting a 4×4 square?

    A. 16/204

    B. 16/203

    C. 4/64

    D. 4/16

69. Representation of $\frac{-27}{32}$ in 2's complement form assuming 8 bits are used to represent is

    A. 0.1101100

    B. 1.0010100

    C. 1.1101100

    D. 0.0010100

70. The value of $(FAC)_{16} - (786)_{16}$ in base 8 is

    A. 4046

    B. 2076

E-9

C. 726

D. 4166

71. If the equation $x^2 - 25x + 156 = 0$ has roots $(9)_{10}$ and $(10)_{10}$, in which base is the equation represented?

A. 11

B. 7

C. 8

D. 9

72. An n-digit decimal number is encoded in binary form as follows: every odd numbered digit from the most significant digit is encoded using Binary Coded Decimal(BCD) form and the rest of the even numbered digits are encoded using 4-bit Gray code. What is the encoded form for the decimal number 8743?

A. 1000 0100 0010 0010

B. 1000 0101 0010 0010

C. 1000 0101 0100 0010

D. 1000 0100 0100 0010

Consider the flowchart given in Figure 1 and answer the questions 73 – 75.
The function REVERSE(N) reverses the digits of the number N

73. If $N = 255$ what is the value of A when the algorithm halts?

A. 1515

B. 6666

C. 5151

D. 5555

74. If N = 75. what is the sum of the digits of N when the algorithm halts?

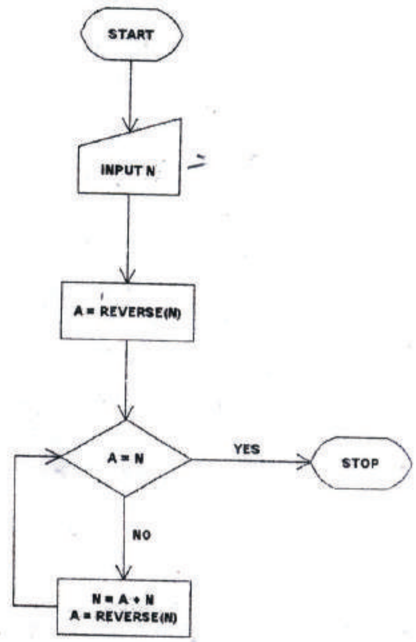

Figure 1: FlowChart

A. 6

B. 12

C. 18

D. 24

75. If N = 255, how many times is the statement $A = N$ executed?

A. 3

B. 2

C. 5

D. 4