Booklet Code : A

ENTRANCE EXAMINATION – 2016

Master of Computer Applications (MCA)

Time : 2 Hours Max. Marks : 100

Hal 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** 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. **There is negative marking**. Every correct answer in **Part A** carries **2 (two)** marks and for every wrong answer **0.66 marks will be deducted**. Every correct answer in **Part B** carries **1 (one) mark** and for every wrong answer **0.33 marks will be deducted**.

5. 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.

6. Use of non-programmable calculator and log-tables is allowed.

7. Use of mobile phone is NOT allowed inside the hall.

8. Hand over the **OMR answer sheet** at the end of the examination to the Invigilator.

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Part A

1. A watch which gains 5 seconds in 3 minutes was set right at 7 a.m. In the afternoon of the same day, when the watch indicated quarter past 4hrs, the true time is:

   A. 4hrs

   B. 3hrs $59\frac{7}{12}$min

   C. 3hrs $58\frac{7}{11}$min

   D. 4hrs $2\frac{3}{11}$min

2. In how many different ways can the letters of the word 'LEADER' be arranged in such a way that the vowels always come together?

   A. 144

   B. 72

   C. 720

   D. 48

3. Find the odd man out in the following series? 844, 211, 120, 752, 541, 303

   A. 211

   B. 303

   C. 120

   D. 844

4. A rectangular park $60m$ long and $40m$ wide has two concrete crossroads running in the middle of the park and rest of the park has been used as a lawn. If the area of the lawn is 2109 *sq.m.*, then what is the width of the road?

   A. 2.91m

   B. 5.82m

   C. 1.91m

   D. 3m

5. Insert the missing number in the series 16, 33, 65, 131, 261, ...

   A. 721

   B. 521

   C. 613

   D. 523

6. Find the wrong number in the series 7, 8, 18, 57, 228, 1165, 6996

   A. 8

   B. 228

   C. 57

   D. 1165

7. If D = the day (1-366) in year Y, then the day of the week for D can be calculated using the following formula:

   $$d = (D+Y+\frac{Y-1}{4}-\frac{Y-1}{100}+\frac{Y-1}{400}) \, mod \, 7$$

   where d=1 would mean Sunday, 2 = Monday and so on. Which of the following days can the first day of a century NOT be?

   A. Monday

   B. Thursday

   C. Friday

   D. Saturday

8. If A and B run a race, then A wins by 60 seconds. If B and C run the same race, then B wins by 30 seconds. Assuming that C maintains a uniform speed to find the time taken by C to finish the race, which of the following statements are needed?

   I A and C run the same race and A wins by 375 metres.

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II The length of the race is 1 km

A. Both I and II are needed to answer the question

B. Either I or II alone is sufficient to answer the question

C. Both are not sufficient to answer the question

D. Not enough information to answer the question

9. Consider the following statements: There are **six** villages A, B, C, D, E and F.

   (a) F is 1km to the west of D

   (b) B is 1km to the east of E

   (c) A is 2km to the north of E

   (d) C is 1km to the east of A

   (e) D is 1km to the south of A

   Which three villages are in a stratight line?

   A. A, C, B

   B. A, D, E

   C. C, B, F

   D. E, B, D

10. Three persons A B and C wore shirts of black, blue and orange colours (not necessarily in that order) and pants of green, yellow and orange colours (not necessarily in that order). No persons wear shirt and pants of the same colour. Further it is given that:

    (a) A did not wear shirt of black colour.

    (b) B did not wear shirt of blue colour.

    (c) C did not wear shirt of orange colour.

    (d) A did not wear pant of green colour.

    (e) B wore a pant of orange colour.

    What were the colours of the pants and shirts worn by C respectively?

    A. Orange and Black

    B. Yellow and Blue

    C. Green and Blue

    D. Yellow and Black

11. There are five hobby clubs in a college viz., photography, yachting, chess, electronics and gardening. The gardening group meets every second day, the electronics group meets every third day, the chess group meets every fourth day, the yachting group meets every fifth day and the photography group meets every sixth day. How many times do all the five groups meet on the same day within 360 days?

    A. 12

    B. 18

    C. 30

    D. 6

12. Four political parties W, X, Y and Z decided to set up a joint candidate for the coming elections. The formula agreed by them was the acceptance of a candidate of the most of the parties. Four aspiring candidates A, B, C and D approached the parties for their ticket.

    (a) A was acceptable to W but not Z.

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(b) B was acceptable to Y but not X.

(c) C was acceptable to W and Y.

(d) D was acceptable to W and X.

Further, candidate B was preferred by W and Z, candidate C was preferred by X and Z and candidate A was acceptable to X but not Y; who got the ticket?

A. A

B. B

C. C

D. D

13. Raman walks 100m from his house towards North. From there he goes 100m towards West. Here is the house of Shyam. From there they both go to the market which is in the perfect South-West direction from Shyam's house. If the market is exactly to the West of Raman's house, then how far is the market from Raman's house?

A. 200m

B. 100m

C. 150m

D. 250m

14. How many three digit numbers can generated from 1,2,3,4,5,6,7,8,9 such that the digits are in ascending order.

A. 80

B. 81

C. 83

D. 84

15. Two cubes of sides 6 cm each are kept side by side to form a rectangular parallelopiped. What is the surface area of the rectangular parrallelopiped?

A. 360

B. 180

C. 288

D. 432

16. The sum of the length of all the edges of a rectangular box is 12 cm. If the total surface area of the box is 5 sq. cm., then length of its diagonal is

A. 13cm

B. 2cm

C. 3cm

D. Not enough information to find the diagonal

17. If South-East becomes North, North-East becomes West and so on, what will West become?

A. North-East

B. South-East

C. North-West

D. South-West

18. In the following number line, how many times do the two consecutive numbers have a difference of 2? 7 5 9 5 2 3 5 9 4 8 5 9 5 4 5 9 3 5 5 9 5 3 5 9 4 5 2 5 3 5 6 5 9

A. 9

B. 7

C. 5

D. 8

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19. The letters L, M, N, O, P, Q, R, S and T in their order are substituted by nine integers 1 to 9 but not in that order. 4 is assigned to P. The difference between P and T is 5. The difference between N and T is 3. What is the integer assigned to N?

A. 7

B. 5

C. 4

D. 6

20. In a class of 45 students a boy is ranked 20^{th}. When two boys joined his rank dropped by one. What is his new rank from the end?

A. 25^{th}

B. 26^{th}

C. 27^{th}

D. 28^{th}

21. In five flats, one above the other, live five professionals. The professor has to go up to meet his IAS officer friend. The doctor is equally friendly to all, and has to go up as frequently as go down. The engineer has to go up to meet his Lawyer friend above whose flat lives the professors friend. From the ground floor to the top floor, in what order do the five professionals live?

A. Engineer, Professor, Doctor, IAS officer, Lawyer

B. Professor, Engineer, Doctor, IAS officer, Lawyer

C. IAS officer, Engineer, Doctor, Professor, Lawyer

D. Professor, Engineer, Doctor, Lawyer, IAS officer

22. If '245' means 'Art and Talent' in a certain code language, '316' means 'Callous to Generous', '147' means 'Callous and Polite' then what is the code used for 'to' ?

A. Only 3

B. 3 or 6

C. Only 1

D. Only 6

23. In a 100m race, Bipin, Chandan, Danny and Feroz won the first four prizes, not necessarily in the same order. Each of these four sprinters hails from a different city among Delhi, Mumbai, Kolkata and Chennai. Given the following conditions, who got the first prize?

(a) Bipin is not from Kolkata and didn't get the first prize. The person from Chennai is the winner. Danny is from Mumbai.

(b) Feroz is either from Delhi or from Chennai.

A. Danny

B. Chandan

C. Feroz

D. Cannot be determined

24. If $\log 2 = 0.3010$ and $\log 3 = 0.4771$, the value of $\log_5 512$ is

A. 2.870

B. 3.876

C. 2.867

D. 3.912

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25. The least perfect square which is divisible by 21,36 and 66 is

    A. 213444

    B. 214344

    C. 214434

    D. 231444

Part B

26. The sum of the series $1.2.3 + 2.3.4 + 3.4.5 + \cdots + 18.19.20$ is

    A. 24560

    B. 45450

    C. 44820

    D. 35910

27. Find the sum of the series $1.1! + 2.2! + 3.3! + \cdots + 10.10!$ is

    A. 39916801

    B. 39916800

    C. 39916799

    D. 29999999

28. In a triangle, three angles are in Arithmetic Progression and ratios of smallest angle to largest angle is 1:5. What is the smallest angle?

    A. $\frac{\pi}{8}$

    B. $\frac{\pi}{10}$

    C. $\frac{\pi}{9}$

    D. $\frac{\pi}{6}$

29. 2's complement of 010101.0101 is

    A. 101011.1010

    B. 101010.1010

    C. 101010.1011

    D. 101011.0010

30. A logic circuit has three input bits: x_0, x_1 and x_2, where x_0 is the least significant bit and x_2 is the most significant bit. The output from the circuit is 1 when its input is any of the 3-bit numbers 1,4,5 or 6; otherwise, the output is 0. Which of the following expressions represents the output from this circuit? (x_2' is complement of x_2)

    A. $x_2 + x_1 + x_0$

    B. $x_2' x_0 + x_2 x_1'$

    C. $x_1' x_0 + x_2 x_0'$

    D. $x_2' x_0 + x_1 x_0$

31. Let A be a 4×4 matrix. Suppose that a matrix B is obtained from A by using following row operations:

    - $R1 \longleftrightarrow R2$
    - $R3 \longleftrightarrow 4 \times R3$
    - $R4 \longleftrightarrow R2$
    - $R2 \longleftrightarrow R2 + 3 \times R3$

    If $|A| = 20$, then what is $|B|$?

    A. -80

    B. 5

    C. -5

    D. 80

32. Two vectors a and b are perpendicular to each other such that length of a is 8 and length of b is 3. What is $\|a - 2b\|$?

    A. 10

    B. 2

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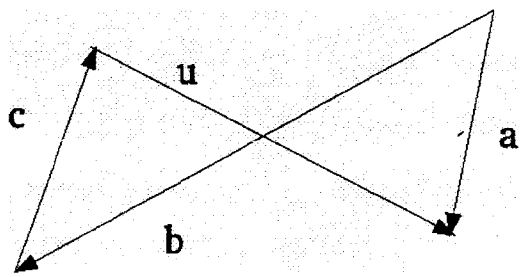

Figure 1: Vectors a, b and c

C. 6

D. 12

33. Express Vector u in terms of vectors a, b and c shown in Fig. 1.

A. $a-b-c$

B. $-a+b+c$

C. $a+b+c$

D. $-a-b-c$

34. Logic X-OR operation of Hexadecimal numbers (4AC0) and (B53F) is

A. AACB

B. FFFF

C. 0000

D. ABCD

35. A circle $x^2+y^2-x-3y-\frac{25}{2}=0$ has a chord $x-y-1=0$ which forms the diameter of another circle. What is the equation representing this second circle?

A. $x^2+y^2-3x-y-\frac{21}{2}=0$

B. $x^2+y^2-3y-x-\frac{21}{2}=0$

C. $x^2+y^2+3x-y-\frac{21}{2}=0$

D. $x^2+y^2+x-3y-\frac{21}{2}=0$

36. The equation of the locus of a point, which moves so that the sum of its distances from two given points (ae, 0) and (-ae, 0) is equal to $2a$, is

A. $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ where $b^2=a^2(1-e^2)$

B. $\frac{x^2}{b^2}+\frac{y^2}{a^2}=1$ where $b^2=a^2(1-e^2)$

C. $(ax)^2+(by)^2=1$ where $b^2=a^2(1-e^2)$

D. $(bx)^2+(ay)^2=1$ where $b^2=a^2(1-e^2)$

37. All values of α for which the point (α, α^2) lies inside the triangle formed by the lines $2x+3y-1=0$, $x+2y-3=0$ and $5x-6y-1=0$ are

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

B. $\alpha\in(\frac{-3}{2},\frac{-3}{4})\cup(\frac{1}{2},1)$

C. $\alpha\in(-1,\frac{-3}{4})\cup(\frac{1}{2},1)$

D. $\alpha\in(\frac{-5}{2},-1)\cup(\frac{1}{2},1)$

38. 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. $2x-29y-31=0$

B. $29x-2y-13=0$

C. $2x-29y-13=0$

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

39. Which is the equation of a line whose slope is undefined?

A. $Y=7$

B. $X=-5$

C. $X=Y$

D. $X+Y=0$

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40. $y = e^{-3x}$ is a solution of the differential equation

    A. $3\frac{dy}{dx} + y = 0$

    B. $\frac{dy}{dx} + y^3 = 0$

    C. $\frac{dy}{dx} + 3y = 0$

    D. $\frac{dy}{dx} + 3y^2 = 0$

41. The area of the region bounded by the curve $y^2 = 4x$, y-axis, and the line $y = 3$ is

    A. 9/4 sq. units

    B. 28/3 sq. units

    C. 3/4 sq. units

    D. 9/16 sq. units

42. Let c_1 and c_2 be constants. The general solution of the differential equation $\frac{d^2y}{dx^2} - y = 0$ is:

    A. $y = c_1e^x + c_2e^{-x}$

    B. $y = c_1e^x$

    C. $y = c_2e^{-x}$

    D. $y = c_1e^{x^2} + c_2e^{-x^2}$

43. Let the set S contain all strings w of 0s and 1s which have the following property: w contains an equal number of occurrences of 01 and 10. Which of the following words DOES NOT belong to S?

    A. 1010101

    B. 101010

    C. 0101010

    D. All of the above

44. Let $\mathbb{N}_2^+$ denote the natural numbers greater than or equal to 2. Let m be a relation with n, mRn if $gcd(m, n) > 1$. The binary relation R on $\mathbb{N}_2$ is

    A. Reflexive, Not Symmetric, Transitive

    B. Reflexive, Symmetric, Transitive

    C. Reflexive, Symmetric, Not Transitive

    D. Reflexive, Not Symmetric, Not Transitive

45. If two sets A and B have 500 elements in common, then the number of common elements in the sets $A \times B$ and $B \times A$ is:

    A. 500^2

    B. 500

    C. 1000

    D. 2^{500}

46. What is the number of points of intersection between the graphs given by the functions $f(x) = x^3 + 2$ and $g(x) = x^2$, where $x \in R$?

    A. 2

    B. 3

    C. 0

    D. 1

47. Let $f(x) = 4x(1 - x)$ be defined for all $x \in R$. Then, the number of real numbers which satisfy the equation, $f(x) = x$ is

    A. 0

    B. 1

    C. 2

    D. 3

48. The correlation coefficient between X and Y where $Y = X^3$ and X follow normal distribution with mean 0 and variance 1 is

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A. 0

B. $\frac{1}{\sqrt{15}}$

C. $\frac{2}{\sqrt{15}}$

D. $\frac{3}{\sqrt{15}}$

49. There are 13 players and the deck of cards are distributed equally amongst all the players at random. What is the probability of a player getting all the queens?

A. $\frac{1}{3\times4^3\times47}$

B. $\frac{1}{3^4\times4\times47}$

C. $\frac{1}{3^3\times4^4\times47}$

D. $\frac{1}{3^3\times4^3\times47}$

50. Let X be a binomial random variable with $n = 5$ and $p = 0.5$ and $Y = X mod 2$. Probablity of $Y = 0$ is

A. $\frac{1}{2^5}$

B. $\frac{1}{2^3}$

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

D. 1

51. The coefficient variation for the data X = [16 98 96 49 81 15 43 92 80 96] is:

A. 33.05

B. 49.63

C. 66.6

D. 99.93

52. Which of the following is not a linear mapping given that $f : R^2 \longrightarrow R^2$?

A. $(x_1, x_2) \longrightarrow (x_2, x_1)$

B. $(x_1, x_2) \longrightarrow (x_1 + x_2, x_2)$

C. $(x_1, x_2) \longrightarrow (x_1 + 1, x_2)$

D. $(x_1, x_2) \longrightarrow (10, 0)$

53. The function f is twice differentiable and the graph of f has no points of inflection. If $f(6) = 3$, $f'(6) = -\frac{1}{2}$ and $f''(6) = -2$ which of the following could be the value of $f(7)$?

A. 2

B. 2.5

C. 2.9

D. 3

54. A spherical balloon is being inflated at a rate of $1m^3/s$. How is the diameter of the balloon changing at the instant when the radius of the balloon is $2m$?

A. $\frac{1}{4\pi}m/s$

B. $\frac{1}{16\pi}m/s$

C. $\frac{1}{8\pi}m/s$

D. None of the above

55. $\int_1^e \frac{ln(x^2)}{x}dx =$

A. 0

B. e

C. $e - 1$

D. 1

56. Find the arc-length of the curve given by the parametric equations $x = \frac{t^2}{\sqrt{2}}$ and $y = \frac{t^3}{3}$, where $0 \leq t \leq 1$.

A. $\sqrt{3} + \frac{2\sqrt{2}}{3}$

B. $\sqrt{2} + \sqrt{3}$

C. $\sqrt{3} - \sqrt{2}$

D. $\sqrt{3} - \frac{2\sqrt{2}}{3}$

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57. Let $w = \log(u^2+v^2)$ where $u = e^{(x^2+y)}$ and $v = e^{(x+y^2)}$. Then

$$\frac{\partial w}{\partial x}\Big|_{x=0,y=0}$$

A. 0

B. 1

C. 2

D. 4

58. The differential equation of all the ellipses centred at the origin is:

A. $y^2 + x(y')^2 - yy' = 0$

B. $xyy'' + x(y')^2 - yy' = 0$

C. $yy'' + x(y')^2 - xy' = 0$

D. None of the above

59. The differential equation $\frac{dy}{dx} = (x+y+1)^2$ is

A. separable

B. linear

C. homogeneous

D. None of the above

60. A 120 gallon tank initially contains 90 *lb* of salt dissolved in 90 gallons of water. Solution containing 2 *lb*/gallon of salt flows into the tank at the rate of 4 gallons/min and the well-stirred mixture flows out of the tank at the rate of 3 gallons/min. A differential equation for the amount x (in *lb*) of salt in the tank is:

A. $\frac{dx}{dt} + \frac{x}{30} = 8$

B. $\frac{dx}{dt} + \frac{3x}{90+2t} = 4$

C. $\frac{dx}{dt} + \frac{3x}{90+t} = 8$

D. $\frac{dx}{dt} + 90x = 2$

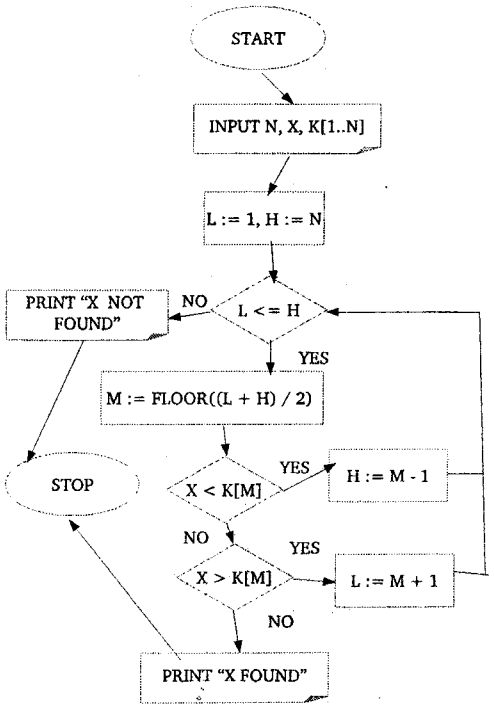

Figure 2: FlowChart

Questions 61–63 are based on the flowchart shown in Fig. 2.

61. If the following are the elements in K, 3 7 9 16 73 97 683 923 3883 9003 then the number of iterations to determine whether 7 is in K is:

A. 3

B. 2

C. 1

D. 4

62. How many total iterations are needed to find if an element is not in K given that there are N elements in K?

A. N

B. N^2

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C. $\log N$

D. $N-1$

63. If the following are the elements in K, 3 5 7 12 17 28 49 67 89 101 121 138 147 164 189 201 220 345 567 879 903 1001, if we are in the third iteration searching for 1001, what is the number pointed to by M?

A. 567

B. 345

C. 879

D. 903

64. Let $f : \mathbb{R} \to \mathbb{R}$ be the function defined by

$$f(x) = \frac{\sin x}{|x| + \cos x}$$

Then,

A. f is differentiable at all $x \in \mathbb{R}$

B. f is not differentiable at $x = 0$

C. f is not differentiable at $x = \frac{\pi}{2}$

D. f is differentiable at $x = 0$ but f' is not continuous at $x = 0$

65. If f is a continuous function on the closed interval $[a, b]$. which of the following MUST be true?

A. There is a number c in the open interval (a, b) such that $f(c) = 0$.

B. There is a number c in the open interval (a, b) such that $f(a) < f(c) < f(b)$.

C. There is a number c in the closed interval $[a, b]$ such that $f(c) \geq f(x)$ for all $x \in [a, b]$.

D. There is a number c in the open interval (a, b) such that $f'(c) = 0$.

66. If $\int_0^1 f(x)dx = 2$ and $\int_0^4 f(x)dx = -3$, then, $\int_1^4 (3f(x) + 2)dx =$

A. -13

B. -9

C. 3

D. 21

67. In the interval $(-2\pi, 0)$, the function $f(x) = \sin(\frac{1}{x^3})$ changes sign:

A. Never

B. Once

C. More than once but finite number of times

D. Infinite number of times

68. A set $S = \{s | s = \frac{3m+5}{m+2}, m \geq 0\}$ has

A. both maximum element and minimum element in it

B. neither a minimum element nor a maximum element in it

C. a minimum element but not a maximum element in it

D. a maximum element but not a minimum element in it

69. Let function $f : X \to X$ and g is its inverse function, i.e.,

$$g \circ f(x) = x, \forall x \in X$$

then

A. f is always 1-to-1 and onto

B. f must be 1-to-1 but not always onto

C. f must be onto but not always 1-to-1

D. None of the above is always true

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70. Centers of two circles are separated by 30cms. Radius of first circle is 40cm and radius of second circle is 50cm. What is the length of the common chord?

A. 24

B. 48

C. 40

D. 56

71. Which of the following are true for all real values of x? All arguments are given in radians.

I $\sin(\frac{\pi}{2}+x) = \cos(\frac{\pi}{2}-x)$

II $2+2\sin(x)-\cos^2(x) \geq 0$

III $\sin(x+\frac{3\pi}{2}) = \cos(\pi - x)$

IV $\sin(x)\cos(x) \leq \frac{1}{4}$

A. I and II

B. I and III

C. III and IV

D. II and III

72. For all sets A, B and C, which of the following statements is TRUE?

A. $A-(B-C) = (A-B)-C$

B. $(A-B)\cap(C-B) = (A\cap C)-B$

C. $(A-B)\cap(C-B) = A-(B\cup C)$

D. If $A\cap C = B\cap C$ then $A = B$

73. A teacher tells her students that although she always use an average to calculate their course grades, she gives more weight to the final exam grade. She assures students that if they can perform well on final, then even if they performed poorly on the other exams, they must have learned the material. For three semesters she kept track of how students did on the final and how they did in the course which is given below. What is the probability that a student, taken at random from the class, would have passed her course?

	Course	
Final	Pass	Fail
Pass	142	34
Fail	89	56

A. 0.62

B. 0.52

C. 0.72

D. 0.42

74. Which among the following functions is not periodic

A. $\log_e(\sin(x))$

B. $e^{\cos(x)}$

C. $\frac{10}{100+\sin(x)+\cos(x)}$

D. $\sin(e^x)$

75. The number of roots of the equation $X^2+\sin^2(X) = 1$ in the closed interval $[0, \frac{\pi}{2}]$ is

A. 0

B. 1

C. Finite and greater than 1

D. Infinite

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