kd education academy (9582701166)

Time : 5 Hour | **STD 11 Maths** | **Total Marks : 220**

kd 90+ ch-2 relation and functions

*** Choose the right answer from the given options. [1 Marks Each]** **[40]**

1. $f(x) = \sqrt{9 - x^2}$. Find the range of the function:
   (A) R (B) R+ (C) [-3, 3] (D) [0, 3]

2. The domain of the function $f(x) = \sqrt{2 - 2x - x^2}$ is:
   (A) $[-\sqrt{3}, \sqrt{3}]$ (B) $[-1, -\sqrt{3}, -1 + \sqrt{3}]$
   (C) $[-2, 2]$ (D) $[-2 - \sqrt{3}, -2 + \sqrt{3}]$

3. Let n(A) = m and n(B) = n, Then, the total number of non-empty relations that can be defined from A to B is:
   (A) mn (B) -1mn (C) 2mn -1 (D) 2mn -1

4. The range of $f(x) = \frac{1}{1-2\cos x}$ is:
   (A) $\left[\frac{1}{3}, 1\right]$ (B) $\left[-1, \frac{1}{3}\right]$
   (C) $\left(-\infty, -1\right) \cup \left[\frac{1}{3}, \infty\right)$ (D) $\left[-\frac{1}{3}, 1\right]$

5. If $f(x) = \frac{x - 1^3}{x^3}$ then $f(x) + f\left(\frac{1}{x}\right)$ is equal to:
   (A) $2x^3$ (B) $\frac{1}{x^3}$
   (C) 0 (D) 1

6. If $f(x) = \frac{\sin^4 x + \cos^2 x}{\sin^2 x + \cos^4 x}$ for $x \in R$, then f(2002) =
   (A) 1 (B) 2 (C) 3 (D) 4

7. $f(x) = \sqrt{9 - x^2}$. Find the domain of the function:
   (A) (0, 3) (B) (0, 3) (C) (-3, 3) (D) (-3, 3)

8. If set A has 2 elements and set B has 3 elements then how many subsets does A × B have?
   (A) 6 (B) 8 (C) 32 (D) 64

9. If $3f(x) + 5f\left(\frac{1}{x}\right) = \frac{1}{x} - 3$ for all non-zero x, then f(x) =
   (A) $\frac{1}{14}\left(\frac{3}{x} + 5x - 6\right)$ (B) $\frac{1}{14}\left(-\frac{3}{x} + 5x - 6\right)$
   (C) $\frac{1}{14}\left(-\frac{3}{x} + 5x + 6\right)$ (D) None os these.

10. If $2f(x) - 3f\left(\frac{1}{x}\right) = x^2 (x \neq 0)$, then f(2) is equal to:
    (A) $-\frac{7}{4}$ (B) $\frac{5}{2}$ (C) -1 (D) None of these.

11. Choose the correct answers:

The domain of the function f given by $f(x) = \frac{x^2+2x+1}{x^2-x-6}$.

(A) R – {3, –2} (B) R – {–3, 2} (C) R – [3, –2] (D) R – (3, –2)

12. If $f(x) = \log\left(\frac{1+x}{1-x}\right)$ and $g(x) = \frac{3x+x^3}{1+3x^2}$, then f(g(x)) is equal to:

(A) f(3x) (B) {f(x)}3 (C) 3f(x) (D) -f(x)

13. The range of the function: $f(x) = \sqrt{(x-1)(3-x)}$:

(A) (-1, 1) (B) (-1, 1) (C) (-3, 3) (D) (-3, 1)

14. The domain of definition of $f(x) = \sqrt{\frac{x+3}{(2-x)(x-5)}}$ is:

(A) $(-\infty, -3] \cup (2, 5)$ (B) $(-\infty, -3] \cup (2, 5)$

(C) $(-\infty, -3] \cup [2, 5]$ (D) None of these.

15. If A = {1, 2, 3}, B = {1, 4, 6, 9} and R is a relation from A to B defined by 'x' is greater than y. The range of R is

(A) {1, 4, 6, 9} (B) {4, 6, 9} (C) {1} (D) none of these.

16. If A = {1, 2, 4}, B = {2, 4, 5}, C = {2, 5}, then (A - B) × (B - C) is:

(A) {(1, 2), (1, 5), (2, 5)} (B) {(1, 4)}

(C) (1, 4) (D) none of these.

17. Let R be a relation on N defined by x + 2y = 8. The domain of R is:
    a. {2, 4, 8}
    b. {2, 4, 6, 8}
    c. {2, 4, 6}
    d. {1, 2, 3, 4}

18. If the set A has p elements, B has q elements, then the number of elements in A × B is:
    a. p + q
    b. p + q + 1
    c. pq
    d. p^2

19. If R is a relation from a finite set A having m elements of a finite set B having n elements, then the number of relations from A to B is:
    a. 2^{mn}
    b. 2^{mn} - 1
    c. 2mn
    d. m^n

20. If R is a relation on a finite set having n elements, then the number of relations on A is:

a. 2^n

b. 2^{n^2}

c. n^2

d. n^n

21. If $e^{f(x)} = \frac{10+x}{10-x}$, $x \in (-10, 10)$ and $f(x) = kf\left(\frac{200x}{100+x^2}\right)$, then k =

a. 0.5

b. 0.6

c. 0.7

d. 0.8

22. The domain of definition of the function $f(x) = \sqrt{\frac{x-2}{x+2}} + \sqrt{\frac{1-x}{1+x}}$ is:

a. $(-\infty, -2] \cap [2, -\infty)$

b. $[-1, 1]$

c. ϕ

d. None of these.

23. The domain of definition of $f(x) = \sqrt{x-3-2\sqrt{x-4}} - \sqrt{x-3+2\sqrt{x-4}}$ is:

a. $[4, \infty)$

b. $(-\infty, 4]$

c. $(4, \infty)$

d. $(-\infty, 4)$

24. If $f(x) = \log\left(\frac{1+x}{1-x}\right)$ and $g(x) = \frac{3x+x^3}{1+3x^2}$, then f(g(x)) is equal to:

a. f(3x)

b. $\{f(x)\}^3$

c. 3f(x)

d. -f(x)

25. If $f(x) = \frac{2^x+2^{-x}}{2}$, then f(x + y)f(x - y) is equal to:

a. $\frac{1}{2}[f(2x) + f(2y)]$

b. $\frac{1}{2}[f(2x) - f(2y)]$

c. $\frac{1}{4}[f(2x) + f(2y)]$

d. $\frac{1}{4}[f(2x) - f(2y)]$

26. If $f(x) = \log\left(\frac{1+x}{1-x}\right)$, then $f\left(\frac{2x}{1+x^2}\right)$ is equal to:

a. $\{f(x)\}^2$

b. $\{f(x)\}^3$

c. 2f(x)

d. 3f(x)

27. If $f(x)=\frac{\sin^4 x+\cos^2 x}{\sin^2 x+\cos^4 x}$ for $x \in R$, then f(2002) =
    a. 1
    b. 2
    c. 3
    d. 4

28. If f : R → R be given by for all $f(x)=\frac{4^x}{4^x+2}$ $x \in R$, then:
    a. f(x) = f(1 - x)
    b. f(x) + f(1 - x) = 0
    c. f(x) + f(1 - x) = 1
    d. f(x) + f(x - 1) = 1

29. The domain of the function f given by $f(x)=\frac{x^2+2x+1}{x^2-x-6}$.
    a. R – {3, –2}
    b. R – {–3, 2}
    c. R – [3, –2]
    d. R – (3, –2)

30. Domain of $\sqrt{a^2-x^2}(a>0)$ is.
    a. (-a, a)
    b. [-a, a]
    c. [0, a]
    d. (-a, 0]

31. If $A=\{a,b,c,d\}$ and $B=\{p,q,r,s\}$ then a realtion from A to B is :
    (A) $\{(a,p),(b,r),(c,r)\}$ (B) $\{(a,p),(b,q),(c,r),(s,d)\}$
    (C) $\{(b,a),(q,b),(c,r)\}$ (D) $\{(c,s),(d,s),(r,a),(q,b)\}$

32. A relation R is defined on N such that $xRy \Leftrightarrow x+4y=16$, then the range of R is :
    (A) $\{1,2,4\}$ (B) $\{1,3,4\}$ (C) $\{1,2,3\}$ (D) $\{2,3,4\}$

33. The set builder form of relation $\{(1,2),(2,5),(3,10),(4,17) \ldots\ldots\ldots\}$ on N is :
    (A) $\{(x,y)/x,y \in N, y=2x+1\}$ (B) $\{(x,y)/x,y \in N, y=x^2+1\}$
    (C) $\{(x,y)/x,y \in N, y=3x-1\}$ (D) $\{(x,y)/x,y \in N, y=x+3\}$

34. If R is a relation on $\{1,2,3\}$ such that x is divisor of y, then R is :
    (A) $\{(1,1),(2,2),(3,3),(1,2),(1,3)\}$ (B) $\{(1,1),(2,2),(3,3)\}$
    (C) $\{(1,1),(1,2),(1,3)\}$ (D) $\{(1,1),(1,2),(1,3),(2,3)\}$

35. If $f: R \to R$ is a function $f(x+y)=f(x)+f(y) \forall x$, $y \in R$ and $f(1)=7$ then $\sum_{r=1}^{n} f(r)$ is :
    (A) $\frac{7n}{2}$ (B) $\frac{7(n+1)}{2}$ (C) $7n(n+1)$ (D) $\frac{7n(n+1)}{2}$

36. Which of the following rules is not a function from R to R ?

(A) $f(x) = x^2$ (B) $f(x) = \sqrt{x}$ (C) $f(x) = x^{1/3}$ (D) $f(x) = x^3$

37. If $A = \{2,4,5,7\}, B = \{2,3,4,6,8\}$ and a relation R is defined from set A to set B such that $xRy \Leftrightarrow x$ is divisor of y, then range of R is :

(A) $\{2,3,6,8\}$ (B) $\{2,4,6,7\}$ (C) $\{2,4,6,8\}$ (D) $\{4,6,8\}$

38. If $n(A) = p, n(B) = q$ then the number of relation from A to B is :

(A) $2^{pq} + 1$ (B) $2^{pq} - 1$ (C) 2^{pq-1} (D) 2^{pq}

39. If $f : R \to R, f(x) = \sin \pi x$ then the range of f is :

(A) $\{x/-\pi \leq x \leq \pi\}$ (B) $\{x/-\pi < x < \pi\}$ (C) $\{x/-1 < x < 1\}$ (D) $\{x/-1 \leq x \leq 1\}$

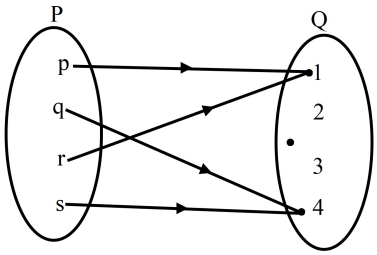
40. The range of function $f(x) = \cos \frac{x}{3}$ is :

(A) $(0, \infty)$ (B) $(-\frac{1}{3}, \frac{1}{3})$ (C) $[-1,1]$ (D) $[0,1]$

*** A statement of Assertion (A) is followed by a statement of Reason (R). [3]**
Choose the correct option.

41. **Directions:** In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

Assertion: The following arrow diagram represents a function.



Reason: Let f : R - {2} → R be defined by $f(x) = \frac{x^2-4}{x-2}$ and g : R → R be defined by g(x) = x + 3, Then, f = g.

a. A is true, R is true; R is a correct explanation of A.
b. A is true, R is true; R is not a correct explanation of A.
c. A is true; R is false.
d. A is false; R is true.

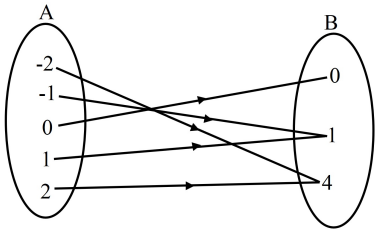
42. **Directions:** In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

Assertion: If f : R → R and g : R → R are defined by f(x) = 2x + 3 and g(x) = x^2 + 7, then the values of x such that g{f(x)} = 8 are -1 and 2. **Reason:** If f : R → R be given by $f(x) = \frac{4^x}{4^x+2}$ for all $x \in R$, then f(x) + f(1 - x) = 1.

a. A is true, R is true; R is a correct explanation of A.
b. A is true, R is true; R is not a correct explanation of A.
c. A is true; R is false.
d. A is false; R is true.

43. **Directions:** In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

Consider the following statements



Assertion: The figure shows a relationship between the sets A and B. Then, the relation in Set - builder form is {(x, y) : y = x^2, x, $y \in N$ and $-2, \leq x \leq 2$}.
Reason: The above Relation in Roster form is {(-1, 1), (2, 4), (0, 0), (1, 1), (2, 4)}.

a. A is true, R is true; R is a correct explanation of A.
b. A is true, R is true; R is not a correct explanation of A.
c. A is true; R is false.
d. A is false; R is true.

*** Answer the following questions in one sentence. [1 Marks Each]** **[17]**

44. If $\left(\frac{x}{3}+1, y-\frac{2}{3}\right)=\left(\frac{5}{3}, \frac{1}{3}\right)$, find the values of x and y.
45. If the set A has 3 elements and set B = {3, 4, 5}, then find the number of elements in A $\times$ B.
46. If $A \times B$= {(a, x), (a, y), (b, x), (b, y)}, find A and B.
47. Let A and B be two sets such that n(A) = 3 and n(B) = 2. If (x, 1), (y, 2), (z, 1) are in A $\times$ B., find A and B, where x, y and z are distinct elements.
48. Let A = {1, 2, 3, . . . 14}. Define a relation R from A to A by R = {(x, y): 3x - y = 0, where $x, y \in A$}. Write down its domain, codomain and range.
49. If A = {9, 10, 11, 12,13} and f : A $\rightarrow$ N be defined by f(n) = the highest prime factor of n, then find the range of f.
50. If (x + 1, y – 2) = (3, 1), find the values of x and y
51. If R is a relation defined on the set Z of integers by the rule $(x, y) \in R \Leftrightarrow x^2+y^2=9$, then write domain of R.
52. If A = {1, 2, 3}, B = {4, 5, 6}, the given following are relations from A to B? Give reason in support of your answer.
    {(4, 2), (4, 3), (5, 1)}
53. What is the fundamental difference between a relation and a function? Is every relation a function?
54. Write the domain and range of function f(x) given by $f(x)=\frac{1}{\sqrt{x-|x|}}$
55. Find the domain of each of the following functions given by:
    $f(x)=\frac{3x}{28-x}$

56. If f and g are real function defined by f(x) = x^2 + 7 and g(x) = 3x + 5, find following:
f(3) + g (– 5)

57. A relation R is defined on a set $A = \{1,2,3,4,5,6\}$ such that $xRy \Leftrightarrow x + 2y = 8$, then write the domain of R.

58. If $f(x) = \frac{x}{x+1}$, then write the value of $f\left(\frac{p}{q}\right)$.

59. If $A = \{2,3,5,7\}$ and $f : A \to N, f(x) = x^3 + 2$, then find the range of function.

60. If $f(x) = \tan x$ then write the value of $f(x) + f(\pi - x)$.

*** Given section consists of questions of 2 marks each.** **[26]**

61. Let $f = \left\{\left(x, \frac{x^2}{1+x^2}\right) : x \in R\right\}$ be a function from R into R. Determine the range of f.

62. Find the domain of the function $f(x) = \frac{x^2+2x+1}{x^2-8x+12}$.

63. If f (x) = x^2, find $\frac{f(1.1)-f(1)}{(1.1-1)}$

64. Find the inverse relation R^{-1} in the following case:
$R = \{(x, y) : x, y \in N, x + 2y = 8\}$

65. If $a \in \{2,4,6,9\}$ and $b \in \{4,6,18,27\}$, then form the set of all ordered pairs (a, b) such that a divides b and a < b.

66. Find the inverse relation R^{-1} in the following case:
R is a relation from {11, 12, 13} to (8, 10, 12} defined by y = x - 3.

67. If f : R → R be defined by f(x) = x^2 + 1, then find $f^{-1}\{17\}$ and $f^{-1}\{-3\}$.

68. Find the domain of the following real valued functions of real variable:
$f(x) = \frac{x^2+2x+1}{x^2-8x+12}$

69. If $f(x) = \frac{x-1}{x+1}$, then show that.
$f\left(\frac{1}{x}\right) = -f(x)$

70. If f and g are real function defined by f(x) = x^2 + 7 and g(x) = 3x + 5, find following:
$\frac{f(t)-f(5)}{t-5}$, if $t \neq 5$

71. Find the domain of following function given by:
$f(x) = \frac{x^3-x+3}{x^2-1}$

72. Draw the graph of function $f(x) = |x| + 1$.

73. A relation R is defined on the set of integers such that $xRy \Leftrightarrow x^2 + y^2 = 25$ then write R and R^{-1} as the set of ordered pairs and also find its domain.

*** Given section consists of questions of 3 marks each.** **[66]**

74. Let R be the set of real numbers. Define the real function f: R $\rightarrow$ R by f(x) = x + 10 and sketch the graph of this function.

75. Draw the graph of the function f : R $\rightarrow$ R defined by f (x) = x^3, x $\in$ R.

76. Let f, g: $R \rightarrow R$ be defined, respectively by f(x) = x + 1, g(x) = 2x – 3. Find f + g, f – g and $\frac{f}{g}$.

77. Let A = {1, 2, 3} and B = {3, 4}. Find A × B and show it graphically.

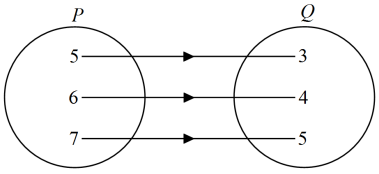
78. If A = {1, 2, 4} and B = {1, 2, 3}, represent following sets graphically:
A × B

79. If A = {1, 2, 3}, B = {3, 4} and C = {4, 5, 6}, find
$\mathrm{A} \times (\mathrm{B} \cap \mathrm{C})$

80.
    i. If $\left(\frac{a}{3}+1, b-\frac{2}{3}\right)=\left(\frac{5}{3}, \frac{1}{3}\right)$, find the values of a and b.
    ii. f(x + 1, 1) = (3, y - 2), find the values of x and y.

81. If $a \in [-1,2,3,4]$ and $b \in [0,3,6]$, write the set of all ordered pairs (a, b) such that a + b= 5.

82. A = {1, 2, 3, 5} and B = {4, 6, 9}. Define a relation R from A to B by
R = {(x, y): the difference between x and y is odd, $x \in A, y \in B\}$ Write R in Roster form.



83. Let R be a relation on N × N defined by:
$(a, b)\ R\ (c, d) \Leftrightarrow a+d=b+c$ for all $(a, b),(c, d) \in N \times N$ Show that:
$(a, b)\ R\ (c, d)$ and $(c, d)\ R\ (e, f) \Rightarrow (a, b)\ R\ (e, f)$ for all $(a, b),(c, d),(e, f) \in N \times N$

84. If A = {1, 2, 3}, B = {3, 4} and C = {4, 5, 6}, find
$(A \times B) \cup (A \cup C)$

85. If A = {1, 2, 3}, B = {4}, C = {5}, then verify that:
$A \times (B \cap C)=(A \times B) \cap (A \times C)$

86. Let A and B be two sets. Show that the sets A × B and B × A have elements in common iff the sets A and B have an elements in common.

87. Write the following relation as the sets of ordered pairs:
A relation R on the set {1, 2, 3, 4, 5, 6, 7}defined by $(x, y) \in R \Leftrightarrow x$ is relatively prime to y.

88. If A = {1, 2, 3} and B = {2, 4}, what are A × B, B × A, A × A, B × B and $(A \times B) \cap (B \times A)$?

89. Determine the domain and range of the relation R defined by:
R = {(x, x^3): x is a prime number less than 10}

90. The function f is defined by $f(x) = \begin{cases} x^2, & 0 \le x \le 3 \\ 3x, & 3 \le x \le 10 \end{cases}$
The relation g is defined by $g(x) = \begin{cases} x^2, & 0 \le x \le 2 \\ 3x, & 2 \le x \le 10 \end{cases}$ Show that f is a function and g is not a function.

91. Let f and g be two real functions defined by $f(x) = \sqrt{x+1}$ and $g(x) = \sqrt{9-x^2}$ Then describe the following functions:
f + g

92. Let X = {1, 2, 3, 4} and Y = {1, 5, 9, 11, 15, 16}. Determine which of the following sets are functions from X to Y:
f_2 = {(1, 1), (2, 7), (3, 5)}

93. Find the domain of the following real valued functions of real variable:
$f(x) = \frac{1}{\sqrt{x^2-1}}$

94. Find the range of the following function given by:
$f(x) = \frac{3}{2-x^2}$

95. If $f(x) = y = \frac{ax-b}{cx-a}$ then prove that f(y) = x.

*** Given section consists of questions of 5 marks each.** **[60]**

96. If A = {1, 2, 3}, B = {4}, C = {5}, then verify that:
$A \times (B \cup C) = (A \times B) \cup (A \times C)$

97. Let A = {1, 2}, B = {1, 2, 3, 4}, C = {5, 6} and D = {5, 6, 7, 8}. Verify that:
$A \times C \subset B \times D$

98. If A = {2, 3}, B = {4, 5}, C = {5, 6}, find $A \times (B \cap C)$, $A \times (B \cap C), (A \times B) \cup (A \times C)$.

99. If A = {-1, 1}, find A × A × A.

100. Determine the domain and range of the relation R defined by:
$R = \{(x, x, +5) : x \in \{0,1,2,3,4,5\}\}$

101. Let f and g be two real functions defined by $f(x) = \sqrt{x+1}$ and $g(x) = \sqrt{9-x^2}$ Then describe the following functions:
g - f

102. Let f and g be two real functions defined by $f(x) = \sqrt{x+1}$ and $g(x) = \sqrt{9-x^2}$ Then describe the following functions:
$f^2 + 7f$

103. Let f and g be two real functions defined by $f(x) = \sqrt{x+1}$ and $g(x) = \sqrt{9-x^2}$ Then describe the following functions:

$\frac{5}{g}$

104. Let f and g be two real functions defined by $f(x) = \sqrt{x+1}$ and $g(x) = \sqrt{9-x^2}$ Then describe the following functions:

fg

105. Let f and g be two real functions defined by $f(x) = \sqrt{x+1}$ and $g(x) = \sqrt{9-x^2}$ Then describe the following functions:

$\frac{f}{g}$

106. If $f(x) = \log_e(1-x)$ and $g(x) = [x]$, then determine the following functions:

$\left(\frac{f}{g}\right)\left(\frac{1}{2}\right)$

107. Is g = {(1, 1), (2, 3), (3, 5), (4, 7)} a function? Justify. If this is described by the relation, $g(x) = \alpha x + \beta$, then what values should be assigned to α and β?

*** Case study based questions** **[8]**

108. Ordered Pairs The ordered pair of two elements a and 3 is denoted by (a, b) : a is first element (or first component) and d is second element (or second component). Two ordered pairs are equal if their corresponding elements are equal. ie. (a, b) = (c, d)

⇒ a = c and b = d

Cartesian Product of Two Sets For two non-empty sets A and B, the cartesian product A . B is the set of all ordered pairs of elements from sets Aand B. In symbolic form, it can be written as

$A \cdot B = \{(a,b) : a \in A, b \in B\}$

Based on the above topics, answer the following questions.

If (a - 3, 6 + 7) = (3, 7), then the value of aand d are:

6, 0

3, 7

7, 0

3, -7

If (x + 6, y - 2) = (0, 6), then the value of x and y are:

6, 8

-6, -8

-6, 8

6, -8

If (x + 2, 4) = (5, 2x + y), then the value of x and y are:

-3, 2

3, 2

-3, -2

Let A and B be two sets such that A . B consists of 6 elements. If three elements of A . B are (1, 4), (2, 6) and (3, 6), then

(A . B) = (B . A)

$(A \cdot B) \neq (B \cdot A)$

A . B = {(1, 4), (1, 6), (2, 4)}

None of the above

If m(A . B) = 45, then n(A) cannot be

15

17

5

9

109. Method to Find the Sets When Cartesian Product is Given For finding these two sets, we write first element of each ordered pair in first set say A and corresponding second element in second set B (say). Number of Elements in Cartesian Product of Two Sets If there are p elements in set A and g elements in set B, then there will be pq elements in A . B i.e. if n(A) = p and n(B) = q, then n(A . B) = pq.

Based on the above two topic, answer the following questions.

i. If A . B = {(a, 1), (b, 3), (a, 3), (b, 1), (a, 2), (b, 2)}. Then, A and B are:
   a. {1, 3, 2}, {a, b}
   b. {a, b}, {1, 3}
   c. {a, b}, {1, 3, 2}
   d. None of these

ii. If the set A has 3 elements and set B has 4 elements, then the number of elements in A . B is:
   a. 3
   b. 4
   c. 7
   d. 12

iii. A and B are two sets given in such a way that A . B contains 6 elements. If three elements of A . B are (1, 3), (2, 5) and (3, 3), then A, B are:
   a. {1, 2, 3}, {3, 5}
   b. {3, 5,}, {1, 2, 3}
   c. {1, 2}, {3, 5}
   d. {1, 2, 3}, {5}

iv. The remaining elements of A . B in (iii) is:
   a. (5, 1), (3, 2), (3, 5)
   b. (1, 5), (2, 3), (3, 5)
   c. (1, 5), (3, 2), (5, 3)
   d. None of the above

v. The cartesian product P . P has 16 elements among which are found (a, 1) and (b, 2). Then, the set P is:

a. {a, b}
b. {1, 2}
c. {a, b,1, 2}
d. {0, b, 1, 2, 4}

----- The only way to do great work is to love what you do. -----