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cosa

B - SECTION - III
SCIENCE (PCM)
MATHEMATICS

81. If $\cot \alpha = 2 \tan \beta$, then what is the value

of $\frac{\cos(\alpha - \beta)}{\cos(\alpha + \beta)}$?

- (A) 2
- (B) 3
- (C) 4
- (D) 5

$\cot \alpha = 2 \tan \beta$
 $\Rightarrow \frac{\cos \alpha}{\sin \alpha} = 2 \frac{\sin \beta}{\cos \beta}$
 $\Rightarrow \frac{\cos \alpha \cos \beta}{\sin \alpha \sin \beta} = 2$

82. If $\tan^{-1} x + \tan^{-1} y = \frac{\pi}{4}$, then what is the value of $x + y + xy$?

- (A) 0
- (B) 1
- (C) -1
- (D) 2

1

83. The volume of a solid circular cylinder of height 16 cm is 2464 cubic cm. What is the radius of its base in cm?

(take $\pi = \frac{22}{7}$)

- (A) 28
- (B) 21
- (C) 14
- (D) 7

84. A circle is inscribed in an equilateral triangle. If the side of the said triangle

is 42 cm, then what is the area of the circle in sq cm? (take $\pi = \frac{22}{7}$)

- (A) 362
- (B) 462
- (C) 154
- (D) 2848

42
28

85. What is the value of the determinant

$$\begin{vmatrix} x & a & x+a \\ y & b & y+b \\ z & c & z+c \end{vmatrix} ?$$

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

86. Let Set $A = \{1, 2, 3\}$. Define a relation R on A as $R = \{(1, 2), (2, 1)\}$, then which of the following relations is true?

- (A) Symmetric but neither reflexive nor transitive
- (B) Reflexive but neither transitive nor symmetric
- (C) Transitive but neither reflexive nor symmetric
- (D) Reflexive and transitive but not symmetric

87. If $f(x)$ is an invertible function, what is

$f^{-1}(x)$ if $f(x) = \frac{3x - 2}{5}$:

(A) $\frac{3x - 2}{5}$

(B) $\frac{3x + 2}{5}$

(C) $\frac{5x + 2}{3}$

(D) $\frac{5x - 2}{3}$

88. What is the number of subsets of a set containing 5 elements?

(A) 4

(B) 8

(C) 16

(D) 32

89. If $|x| < 5$, then which of the following is true for x ?

(A) Only $x < 5$

(B) Only $x > 5$

(C) $-5 < x < 5$

(D) $-5 \leq x \leq 5$

90. If α and β are two roots of the equation $\sqrt{3}x^2 + 5\sqrt{5}x - 4 = 0$, then what is the value of $\alpha^2\beta^2$?

(A) $\frac{125}{3}$

(B) $\frac{16}{3}$

(C) $\frac{3}{125}$

(D) $\frac{3}{16}$

91. If G is a group, then for every $a \in G$,

(1) what is $(a^{-1})^{-1}$?

(A) a

(B) $2a$

(C) a^{-2}

(D) a^2

92. If $y = \cos(x^2)$, then what is the derivative of y with respect to x ?

(A) $\sin(x^2)$

(B) $-\sin x^2$

(C) $2x \sin(x^2)$

(D) $-2x \sin(x^2)$

93. What is the value of K , if the function

$f(x) = \begin{cases} Kx^2 & , x \geq 1 \\ 4 & , x < 1 \end{cases}$ is continuous at

$x = 1$?

(A) 1

(B) -1

(C) 4

(D) -4

94. What is the value of $2^2 + 4^2 + 6^2 + \dots + 20^2$?

- (A) 770
- (B) 1155
- (C) 1540
- (D) 385×385

95. What is the value of e correct upto 2 places of decimal ?

- (A) 1.72
- (B) 2.72
- (C) 3.72
- (D) 4.72



96. If the slope and x-intercept of the line $3x - y + K = 0$ are equal then what is the value of K ?

- (A) 0
- (B) -1
- (C) 3
- (D) -9

Handwritten work for Q96: $(-1)^2 = 4 \cdot 3 \cdot k$
 $1 = 12k$
 $k = \frac{1}{12}$

97. What is the equation of a circle whose radius is 4 and which is concentric with the circle $x^2 + y^2 + 2x - 6y = 0$?

- (A) $x^2 + y^2 + 6x - 2y + 6 = 0$
- (B) $x^2 + y^2 - 2x + 6y = 0$
- (C) $x^2 + y^2 + 2x - 6y - 6 = 0$
- (D) $x^2 + y^2 + 2x + 6y + 6 = 0$

Handwritten work for Q97: $(1+1+4) - 0 = 4$
 $= 6 - 0 = 6$

98. What is the distance of the plane $2x - y + 2z + 1 = 0$ from the origin ?

- (A) $\frac{1}{3}$
- (B) $\frac{2}{3}$
- (C) $\frac{3}{3}$
- (D) $\frac{4}{3}$

Handwritten work for Q98: $(-2, 1, 2)$
 $\sqrt{(-2)^2 + 1^2 + 2^2} = \sqrt{4+1+4} = \sqrt{9} = 3$
 Distance = $\frac{|1|}{3} = \frac{1}{3}$

99. A coin is tossed three times. What is the probability of getting at most 2 heads ?

- (A) $\frac{7}{8}$
- (B) $\frac{5}{8}$
- (C) $\frac{3}{8}$
- (D) $\frac{1}{8}$

- Handwritten work for Q99: $\rightarrow h, t$
 $\rightarrow h, h, t, t, h$
 $\rightarrow h, h, t, h, h$
 h, t, h, t, h

100. What is the median of the scores

26, 8, 18, 12, 20, 29, 30, 31, 29, 33,

16, 18?

- (A) 20
- (B) 22
- (C) 23
- (D) 24

Handwritten work for Q100: $29 + 30 = \frac{59}{2}$
 $8, 12, 16, 18, 20, 22, 23, 24, 26, 29, 30, 31, 33$