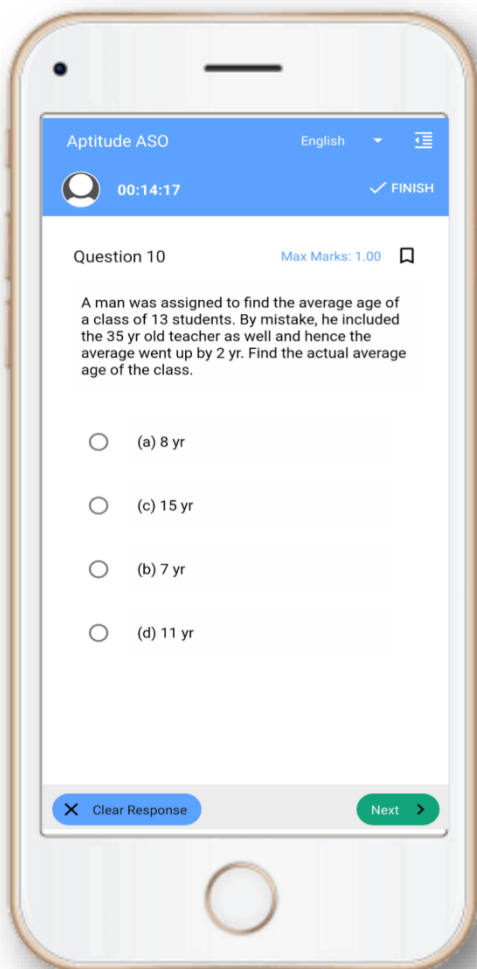


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$$\frac{\cos A \cos B - \sin A \sin B}{\cos A \cos B + \sin A \sin B}$$

**B - SECTION - III**  
**SCIENCE (PCM)**  
**MATHEMATICS**

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

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

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

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

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

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)  
22/7  
154

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

(1)

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

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

(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  $\alpha$  and  $\beta$  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  $a \in G$ ,

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

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

$x = 1$  ?

(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)  $385 \times 385$

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:  $\sqrt{1^2 + (-3)^2} = 4$   
 $1 + 9 = 16$   
 $16 - 6 = 10$

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:  $(-2, 1, 2)$   $\rightarrow 1$   
 $\sqrt{(-2)^2 + 1^2 + 2^2} = 3$   
 $\frac{|1|}{3} = \frac{1}{3}$

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:  $\rightarrow h, t$   
 $\rightarrow h, h, t, h, t, t, h, t, t, t$   
 $\rightarrow h, h, t, h, h, h, t, t, t$   
 $\rightarrow h, t, h, t, h, t, h, t$

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:  $29 + 30 = \frac{59}{2} = 29.5$   
8, 12, 16, 18, 20, 26  
29, 29, 30, 31, 33