[STRAIGHT OBJECTIVE TYPE]

 $[8 \times 3 = 24]$

Given $\log_{10} 2 = a$ and $\log_{10} 3 = b$. If $3^{x+2} = 45$. The value of x in terms of a and b is Q.1

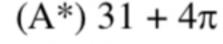
(A)
$$\frac{a-1}{b}$$
 (B*) $\frac{1-a}{b}$ (C) $\frac{1+a}{b}$ (D) $\frac{b}{1-a}$

$$(B^*) \frac{1-a}{b}$$

(C)
$$\frac{1+a}{b}$$

(D)
$$\frac{b}{1-a}$$

Q.2 Circles of radius 2 are centered at the vertices of a triangle with sides lengths 8, 11 and 12. Find the length of a belt that fits tightly around those three circles as shown in the figure.



(B)
$$31 + 6\pi$$

(C)
$$31 + \pi$$

(D)
$$31 + 2\pi$$

Q.3 If $\log_9 x + \log_4 y = \frac{7}{2}$ and $\log_9 x - \log_8 y = -\frac{3}{2}$, then x + y equals (A) 35(B)41

(C*) 67



Q.4 Let a > 1 be a fixed real number. If S is the set of real number x that are solutions to the equation

$$a^{2\log_2 x} = 5 + 4x^{\log_2 a}$$
, then

(A*) S contains exactly one real number

(B) S contains more than two, but finitely many, real numbers

(C) S contains exactly two real numbers

(D) S contains infinitely many real numbers

The solution set of the equation $\log_{10}(3x^2+12x+19) - \log_{10}(3x+4) = 1$ is Q.5

(A) a null set

(B) a singleton

(C*) a set consisting of exactly two elements (D) a set consisting of more than two elements

Suppose n be an integer greater than 1, let $a_n = \frac{1}{\log_n 2002}$. Suppose $b = a_2 + a_3 + a_4 + a_5$ and Q.6

 $c = a_{10} + a_{11} + a_{12} + a_{13} + a_{14}$. Then (b - c) equals

(A)
$$\frac{1}{1001}$$
 (B) $\frac{1}{1002}$ (C*) -1

(B)
$$\frac{1}{1002}$$

$$(C^*) - 1$$

(D) - 2

The value of $\log_2(\sqrt[3]{2+\sqrt{5}} + \sqrt[3]{2-\sqrt{5}})$ is equal to

(A) 1

(B*) 0 (C) $\frac{1}{2}$

 $(D) \log_2 3$

Let $\alpha = \sqrt{19 - 8\sqrt{3}} + \sqrt{7 + 4\sqrt{3}}$ and $\beta = \sqrt{83 - 18\sqrt{2}} - \sqrt{6 - 4\sqrt{2}}$, then $\log_2\left(\frac{\alpha}{\beta}\right)$ lies in the Q.8

interval

$$(A)(-2,-1)$$

(A) (-2,-1) (B*) $\left(\frac{-1}{2},0\right)$ (C) (0,1)

(D) $\left(-1, \frac{-1}{2}\right)$

[SUBJECTIVE]

A rail road curve is to be laid out on a circle. If the track is to change direction by 280 in a distance of Q.9 44 meters. Find the radius of the curve (in metre). (use $\pi = 22/7$) [4] [Ans. 90]

If $15 \sin^4 \alpha + 10\cos^4 \alpha = 6$, then find the value of $8 \csc^6 \alpha + 27\sec^6 \alpha$.

[Ans. 250]

[6]