Answer on Question # 68395 – Physics – Mechanics- Relativity:

Question: A 50kg boy suspends himself from a point on a rope tied horizontally between two vertical poles. The two segments of the rope are then inclined at angles 30 degrees and 60 degrees respectively to the horizontal. The tensions in the segments of the rope in newton's are

a) 100.0 and 25.0

b) 25.0 and 43.3

c) 50.0 and 25.0

d) 100.0 and 43.0

Solution:

T_1 and T_2 are forces of tension.

mg is the weight of the boy = 50 x10 = 500 N   [Consider g = 10 m/sec^2]

Newton's first law of motion on y-axis:

$$mg = T_1 \sin 30^0 + T_2 \sin 60^0 \quad \text{.................................... (1)}$$

Newton's first law of motion on x-axis:

$$T_1 \cos 30^0 = T_2 \cos 60^0 \quad \text{.......................................(2)}$$

$$\text{Or, } T_1 = (\tfrac{1}{\sqrt{3}}) T_2 \quad \text{...(3)}$$

Now put the value of T_1 in equation (1) we get,

$$T_2 = \frac{500}{1.15465} = 433.03 \text{ N} = 433 \text{ Newton (approx).}$$

And T_1 from equation(3) we get,

$$T_1 = 433.03 \times \frac{1}{\sqrt{3}} = 250.01 \text{ N} = 250 \text{ Newton (approx).}$$

Answer:

So, the two tensions are given by 250 N and 433 N respectively.   **(Correct answer)**

But as per the option , we see that option (b) have 25 N and 43.3 N . I think there is a mistake of one decimal place in the given option. So, as per the option concern correct option is(b).

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