Answer on Question 51616, Physics, Other

Question:

On a rainy day, the coefficient of friction between the tires of a motorbike and a flat curved road is reduced to half its usual value (when it is not raining). What is the ratio of the maximum safe speed on the rainy day for rounding the curved road to its usual value?

Solution:

Let's first obtain the formula for maximum safe speed of a motorbike when it is not raining. In the case of a motion of the motorbike along a flat curved road, the force of friction provides the necessary centripetal force:

$$F_c = F_{fr},$$

$$\frac{mv_{usual}^2}{R} = \mu N = \mu mg,$$

$$\frac{v_{usual}^2}{R} = \mu g,$$

$$v_{usual} = \sqrt{\mu R g}.$$

From the condition of the question we know that on a rainy day the coefficient of friction between the tires of a motorbike and a flat curved road is reduced to half its usual value, so we can write the formula for maximum safe speed of a motorbike for this case:

$$v_{rainy} = \sqrt{\frac{1}{2}\mu R g}.$$

Finally we can get the ratio of the maximum safe speed on the rainy day for rounding the curved road to its usual value:

$$\frac{v_{rainy}}{v_{usual}} = \sqrt{\frac{\frac{1}{2}\mu R g}{\mu R g}} = \sqrt{0.5} = 0.71.$$

Answer:

The ratio of the maximum safe speed on the rainy day for rounding the curved road to its usual value is $\frac{v_{rainy}}{v_{usual}} = 0.71$.