Answer on Question #75258, Physics Mechanics Relativity

Calculate the force of gravity between a newborn baby of mass 4 kg and the obstetrician of mass 65 kg, who is 0.1 m from the baby.

Which exerts more gravitational force on the baby, Mars or the obstetrician?

By how much?

Solution.

The force of gravity between a newborn baby and the obstetrician

$$F = G \cdot \frac{m_1 \cdot m_2}{R^2} = 6.67 \cdot 10^{-11} \cdot \frac{4 \cdot 65}{0.1^2} = 1734.2 \cdot 10^{-9} \text{ N}$$

Gravitational force between a newborn baby and Mars (when Mars is at a minimum distance from the Earth)

$$F_{\min r} = 6.67 \cdot 10^{-11} \cdot \frac{4 \cdot 6.423 \cdot 10^{23}}{(55.76 \cdot 10^9)^2} = 55.1 \cdot 10^{-9} \text{ N}$$

Gravitational force between a newborn baby and Mars (when Mars is at a maximum distance from the Earth)

$$F_{\max r} = 6.67 \cdot 10^{-11} \cdot \frac{4 \cdot 6.423 \cdot 10^{23}}{(401 \cdot 10^9)^2} = 1.066 \cdot 10^{-9} \text{ N}$$

Where: $m_{Mars} = 6.423 \cdot 10^{23}$ kg - the mass of Mars

$r_{min} = 55.76 \cdot 10^9$ m - minimum distance from the Mars

$r_{max} = 401 \cdot 10^9$ m - maximum distance from the Mars

By how much?

$$\frac{F}{F_{\min r}} = \frac{1734.2 \cdot 10^9}{55.1 \cdot 10^9} = 31.47$$

$$\frac{F}{F_{\max r}} = \frac{1734.2 \cdot 10^9}{1.066 \cdot 10^9} = 1626.83$$

Answer: $F = 1734.2 \cdot 10^{-9}$ N; $F_{\min r} = 55.1 \cdot 10^{-9}$ N; $F_{\max r} = 1.066 \cdot 10^{-9}$ N;
$\frac{F}{F_{\min r}} = 31.47$; $\frac{F}{F_{\max r}} = 1626.83$.