Intuitively we expect the centripetal force should depend on $r$, $m$, and $v$, and only on these variables.

**Assume:** The form of the force to be $F = k m^x r^y v^z$, where $k$ is dimensionless.

Determine expressions for $x$, $y$, and $z$ in the function $F = k m^x r^y v^z$.

A) $x = 1$, $y - z = 1$, $z = -2$  
B) $x = 1$, $y + z = 1$, $z = 2$  
C) $x = 1$, $y + z = 1$, $z = -2$  
D) $x = 2$, $y + z = 2$, $z = -2$  
E) $x = 1$, $y + z = 2$, $z = 2$

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\[ [F] = [m a] = M \frac{L}{T^2} = M L T^{-2}, \]

\[ [k m^n r^y v^z] = M^x L^y \frac{L^z}{T^z} = M^x L^{y+z} T^{-z} \]

Therefore $M L T^{-2} = M^x L^{y+z} T^{-z}$

By equating powers of $M$, $L$, and $T$, we have $x = 1$, $y + z = 1$, and $z = 2$.

Or, substituting $z = 2$ into $y + z = 1$, we have $y = -1$.

That is, $x = 1$, $y = -1$, and $z = 2$, and the equation for $F$ is

\[ F = m^1 \frac{v^2}{r^1} = m \frac{v^2}{r}, \]

as expected. $F = m^1 \frac{v^2}{r^1} = m \frac{v^2}{r}$ is commonly called the centripetal force.

Answer **B**.

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