

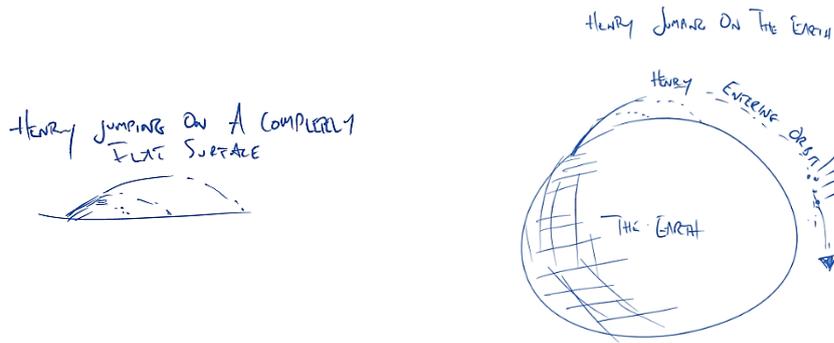
# The science of orbit



It's the same as what Wallagoot Jean said!

*"The moon falls towards earth but just keeps on missing  
And so it goes round and round.  
Orbit's like falling down towards something,  
But never quite hitting the ground"*

If an object goes fast enough sideways that the earth curves enough before it lands, then it'll enter orbit!



We can calculate the speed that Henry needs to go into orbit with two equations. The first one is:

$$F = G \frac{Mm}{R^2}$$

This is the equation of gravity that Isaac Newton found out in 1687. It shows us that the gravity force between two objects goes up with how much they weight (their masses  $m$  and  $M$ ) and goes down quickly with distance between them ( $R$ ).  $G$  is a number that tells us how strong the force is.

The second equation is:

$$F = \frac{mv^2}{R}$$

This is the force that's needed to keep an object (with mass  $m$ ) in circular motion at speed  $v$ , and is called the 'Centripetal' Force. If you've got a tennis ball in a sock (with length  $R$ ) and you spin it around your head, it's how much force you need to pull on the sock to keep the ball going around (instead of flying off).

If Henry is orbiting Earth just above its surface, and the gravitational force is just enough to keep him moving in a circle, then we can equate the two forces:

$$G \frac{Mm}{R^2} = \frac{mv^2}{R}$$

Rearranging everything so that we can find  $v$  – the speed that Henry needs to reach, we get:

$$v = \sqrt{G \frac{M}{R}}$$

Which for the earth is: 7900 metres per second or 28,440 kilometres per hour. Which is pretty fast!

But it's really just the same as what Wallagoot said...

- Nij

**HENRY**  
the flying emu