**Answer on Question#40417 – Physics - Mechanics | Kinematics | Dynamics**

Why centrifugal force is called pseudo force?

**Solution:**

Centrifugal force is a particular example of a fictitious(pseudo) force. It is introduced so that Newton's second law holds in a rotating reference frame.

Newton's second law says

$$F = ma$$

This means that whenever we find an object accelerating (speeding up, slowing down, turning, or some combination), we can look around and find a physical reason why this happens. For example, a dropped stone accelerates towards the Earth, and this is due to Earth's gravity; if we drop the stone far from Earth, it won't fall. Your car turns a corner. This happens due to friction with the road. If the road were perfectly slick, the car would simply slide.

Newton's second law holds in an inertial reference frame. It is simply a fact that such reference frames exist, and that they are all related to each other by moving past each other at constant velocities. (This becomes more complicated in general relativity, but that is not a major concern in everyday situations.)

However, suppose you are in a train that begins accelerating forward (from the stationary track's point of view), and you are looking out the window at a ball sitting on the sidewalk nearby. From your reference frame in the train, the ball is accelerating backwards. However, there is no obvious source of a force on the ball that would make it accelerate backwards. This means that in an accelerating frame, Newton's second law doesn't work.

Sometimes we would still like to do physics in such an accelerating frame, so we simply invent a new force, called a fictitious force, and say that the ball has a fictitious force of just the right amount needed to give it the acceleration we observe. Since the ball's acceleration is $a_b = -a_t$ with $a_t$ the acceleration of the train in an inertial frame, we need to introduce a fictitious force

$$F_{fict} = -ma_t = ma_b$$

That way, Newton's laws still work and we can do physics as normal as long as the train's acceleration stays the same. We could, for example, play billiards in the accelerating train, noticing the the balls have curved trajectories across the table, and these curved trajectories would be perfectly explained by a fictitious force −mat acting on each ball (with m changing for balls with different masses). Keep in mind that the fictitious force points in the opposite direction of the train's acceleration. If the train accelerates forward, the ball appears to accelerate backwards, so the fictitious force must point backwards.

Another type of accelerating frame is a rotating reference frame, for example a carousel. On the carousel, every part is accelerating towards the center. Therefore, to do physics in this frame, we must introduce a fictitious force

$$F = -ma_c$$

As before $a_c$ is the acceleration of the carousel at any point. Because this acceleration points in towards the center of the carousel, the fictitious force points the opposite direction - out towards the edge. This fictitious force is called the centrifugal force.

Introducing the centrifugal force lets us do physics from the point of view of the rotating carousel, with the caveat that we can only handle statics this way. If things are actually moving on the carousel, we need to include the Coriolis force, which pushes things sideways. (See derivation here or some discussion of it in my answers here or here.)

As for whether the centrifugal force is "real", it depends on what that means. In an inertial frame, each force can be traced back to some physical interaction like the exchange of a photon. That's not true for the centrifugal force. This is the essential difference people are referencing when they say the centrifugal force and other fictitious forces "are not real".