Another Example: Roll angle for a 3-min turn

Equation to solve for roll angle ϕ:

For an aircraft flying at airspeed v, for a turn radius r,

$$\frac{v^2}{r} = g \tan\phi$$

justification: Lift $L = g\cos\phi$,
centrifugal force $v^2/r = L\sin\phi = g\tan\phi$.
Use $r = vT/(2\pi)$ where T is the time for a 360°turn:

$$\phi = \arctan\left(\frac{2\pi v}{gT}\right)$$

```
TAS <- 150        ## assumed airspeed, m/s
gravity <- 9.8    ## m/(s^2)
Time <- 60 * 3    ## time in seconds
## the following prints the required roll angle in degrees
atan (2 * pi * TAS / (gravity * Time)) * 180 / pi
## [1] 28.1149
```