Period & Frequency

Period (T): the time it takes to make exactly one rotation/revolution.

units: seconds (s) or minutes (min)

Frequency (f): the number of rotations/revolutions in exactly one second or one minute.

units: revolutions/second (rps) aka Hertz (Hz)

or revolutions/minute (rpm)

Period or Frequency?

- A skater spins 3 times in 1 second.
- A car goes around a track in 45 seconds.
- In one minute, the dryer rotates 30 times.
- The earth rotates once in 24 hours.

Period or Frequency?

- A skater spins 3 times in 1 second.

  Frequency

- A car goes around a track in 45 seconds.

  Period

- In one minute, the dryer rotates 30 times.

  Frequency

- The earth rotates once in 24 hours.

  Period

Changing Units: Period

Remember 1: changing units is just multiplying by 1!

Remember 2: 1 minute = 60 seconds!

Example 1: How many seconds is 3.5 minutes?

$$(3.5\ \cancel{minutes})\left(\frac{60\ seconds}{1\ \cancel{minute}}\right) = 210\ seconds$$

Example 2: How many minutes is 20 seconds?

$$(20\ \cancel{seconds})\left(\frac{1\ minute}{60\ \cancel{seconds}}\right) = 0.33\ minutes$$

Changing Units: Frequency

Remember 1: changing units is just multiplying by 1!

Remember 2: 1 minute = 60 seconds!

Example 1: How many revolutions/second is 15 rpm?

$$\left(\frac{15\ revolutions}{1\ \cancel{minute}}\right)\left(\frac{1\ \cancel{minute}}{60\ seconds}\right) = \frac{0.25\ revolutions}{second} = 0.25\ rps$$

Example 2: How many rpm is 3 Hz?

$$\left(\frac{3\ revolutions}{1\ \cancel{second}}\right)\left(\frac{60\ \cancel{seconds}}{1\ minute}\right) = \frac{180\ revolutions}{minute} = 180\ rpm$$

$$f = \frac{1}{T} \quad \textit{also written as} \quad T = \frac{1}{f}$$

Pay attention to units: s <-> rps and min <-> rpm

Example 1: What is the frequency of something rotating once every 0.2 seconds?

$f = \frac{1}{T}$ $f = \frac{1}{0.2}$ $f = 5\ rps$ *notice "seconds" –> "rps"*

Example 2: What is the period of something rotating at 20 rpm?

$T = \frac{1}{f}$ $T = \frac{1}{20}$ $T = 0.05\ minutes$ *notice "rpm" –> "minutes"*

Pay attention to units: s <-> rps and min <-> rpm

Example 3: What is the frequency in Hz of something rotating once every 5 minutes?

$f = \frac{1}{T}$ $f = \frac{1}{5}$ $f = 0.2\ rpm$ *notice "minutes" –> "rpm"*

$$\left(\frac{0.2\ revolutions}{1\ \cancel{minute}}\right)\left(\frac{1\ \cancel{minute}}{60\ seconds}\right) = \frac{0.0033\ revolutions}{second} = 0.0033\ Hz$$

——————— *or* ———————

$$(5\ \cancel{minutes})\left(\frac{60\ seconds}{1\ \cancel{minute}}\right) = 300\ seconds$$

$f = \frac{1}{T}$ $f = \frac{1}{300}$ $f = 0.0033\ rps$ *notice "seconds" –> "rps"*

Pay attention to units: s <-> rps and min <-> rpm

Example 4: What is the period in seconds of something rotating at 4 rpm?

$T = \frac{1}{f}$ $T = \frac{1}{4}$ $T = 0.25\ minutes$ *notice "rpm" –> "minutes"*

$$(0.25\ \cancel{minutes})\left(\frac{60\ seconds}{1\ \cancel{minute}}\right) = 15\ seconds$$

——————————— *or* ———————————

$$\left(\frac{4\ revolutions}{1\ \cancel{minute}}\right)\left(\frac{1\ \cancel{minute}}{60\ seconds}\right) = \frac{0.0667\ revolutions}{second} = 0.0667\ rps$$

$T = \frac{1}{f}$ $T = \frac{1}{0.0667}$ $T = 15\ seconds$ *notice "rps" –> "seconds"*