

Instructions

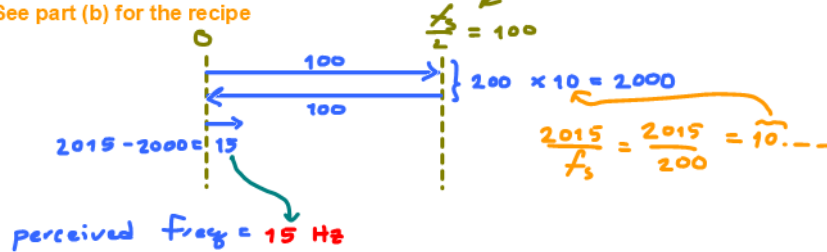
1. Separate into groups of no more than three persons.
2. The group cannot be the same as your former group.
3. Only one submission is needed for each group.
4. **Write down all the steps** that you have done to obtain your answers. You may not get full credit even when your answer is correct without showing how you get your answer.
5. **Do not panic.**

Name	ID
Prapun	555

1. Suppose we input  $\cos(2\pi(\text{XXXX})t)$  into plotspect with sampling rate  $f_s = 200$  samples/sec. Find the perceived frequency (the freq. that plotspect sees) when

a) XXXX = 2015

See part (b) for the recipe



b) XXXX = the last four digit of the ID of a person in your group

General recipe for  $\cos(2\pi f_0 t)$ :

To find the perceived freq., we will use the "folding technique":

- i) Consider the window of freq. from 0 to  $\frac{f_s}{2}$ .
- ii) Start from 0, increase the freq. to  $f_0$ .  
Fold back at 0 and  $\frac{f_s}{2}$  if necessary.

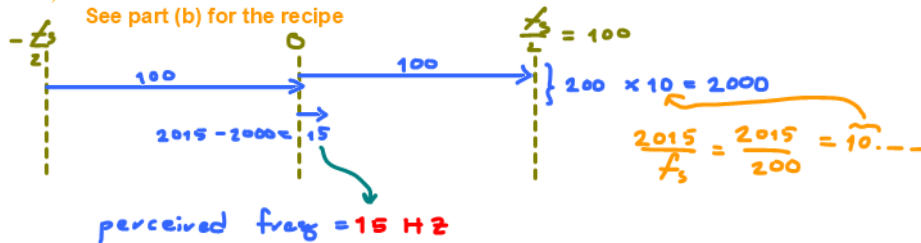
See solutions of HW 8 for the derivation

2. Suppose we input  $e^{j(2\pi(\text{XXXX})t)}$  into plotspect with sampling rate  $f_s = 200$  samples/sec.

Find the perceived frequency (the freq. that plotspect sees) when

a) XXXX = 2015

See part (b) for the recipe



b) XXXX = the last four digit of the ID of a person in your group

General recipe for  $e^{j2\pi f_0 t}$ :

To find the "perceived" frequency, we will use the "tunneling technique":

- i) consider the window of freq. from  $-\frac{f_s}{2}$  to  $+\frac{f_s}{2}$ .
- ii) start from 0.

If  $f_0 > 0$ , increase the freq. to  $f_0$  (going to the right)

restart at  $-\frac{f_s}{2}$  when  $\frac{f_s}{2}$  is reached.

If  $f_0 < 0$ , decrease the freq. to  $f_0$  (going to the left)

restart at  $+\frac{f_s}{2}$  when  $-\frac{f_s}{2}$  is reached.

This is the "tunneling" part.

See solutions of HW 8 for the derivation