week 9 Studio 2

Activity 1

1. V_{CC} → 5V
   Trigger → Pin 12
   Echo → Pin 11
   GND → GND

7.

Distance 'd' (cm)	Duration for '2d' (μs)	Duration for 'd' (μs)
0	0	0
10	583	292
20	1180	590
30	1740	870
40	2330	1165
50	2900	1450
60	3500	1750
70	4030	2015
80	4620	2310
90	5220	2610
100	5810	2905

9. Duration (μs) = 29 × Distance (cm)

10. gradient of duration vs distance = $\frac{1}{\text{speed of sound in air}}$

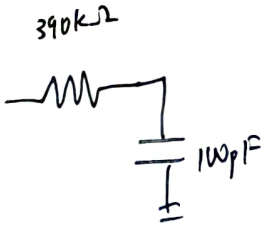
$\frac{1}{29} = 0.034483\ cm\,\mu s^{-1}$

$= 345 m\,s^{-1}$ quite close to theoretical value of $340 m\,s^{-1}$

11. multiply duration by $\frac{340}{2 \times 10^4}$ change pwmth to cm instead of μs

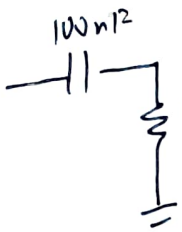
Activity 2

4.

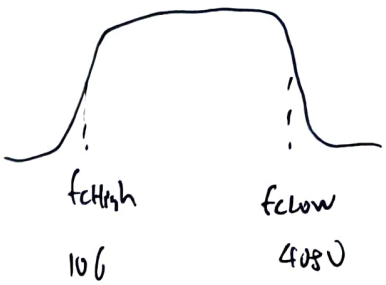


acts as a low pass filter

$$f_{c\,low} = \frac{1}{2\pi RC} = 4080\text{Hz}$$



acts as a high pass filter



$$f_{c\,High} = \frac{1}{2\pi RC} = 106\text{Hz}$$

$$\frac{0 - V_-}{10k} = \frac{V^- - V_{out1}}{100k} \Rightarrow \frac{V_{out1}}{V^-} = 1 + \frac{100k}{10k} = \boxed{11}$$ → gain