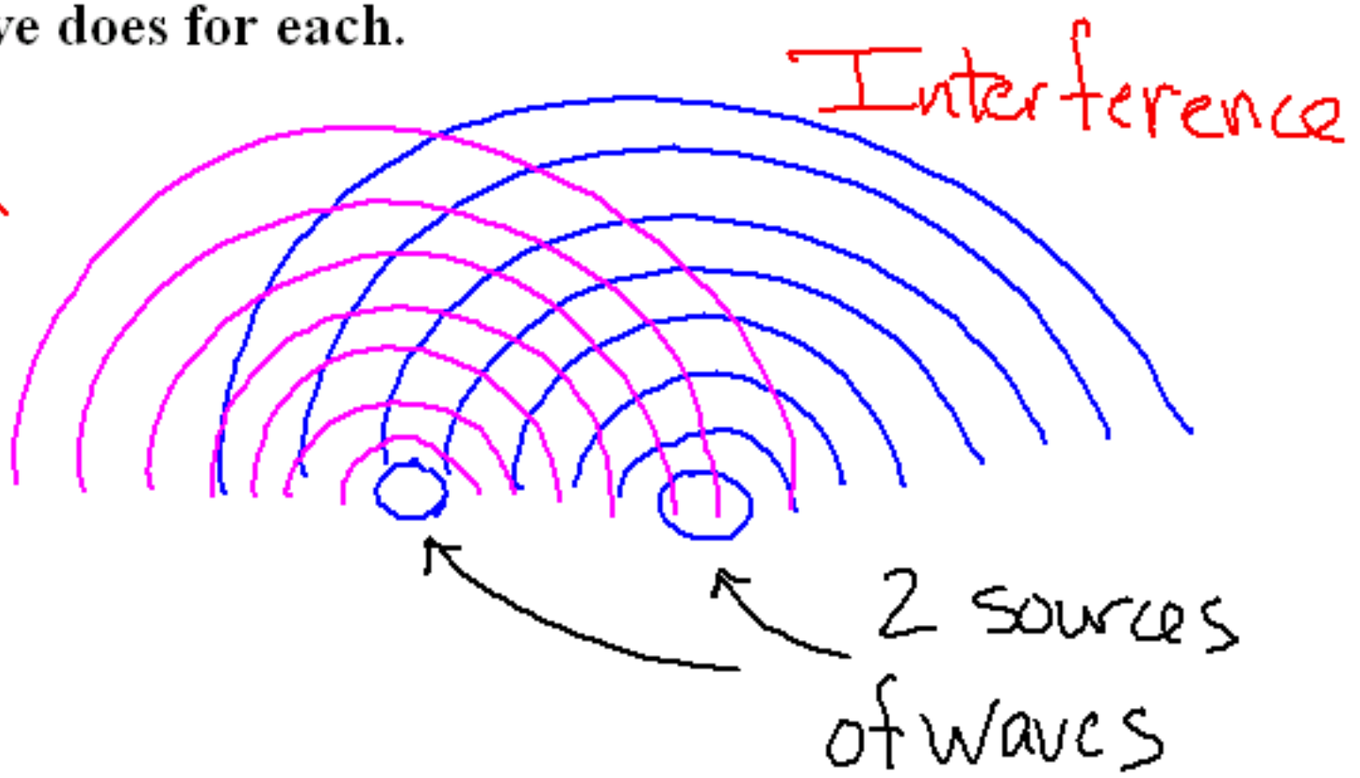
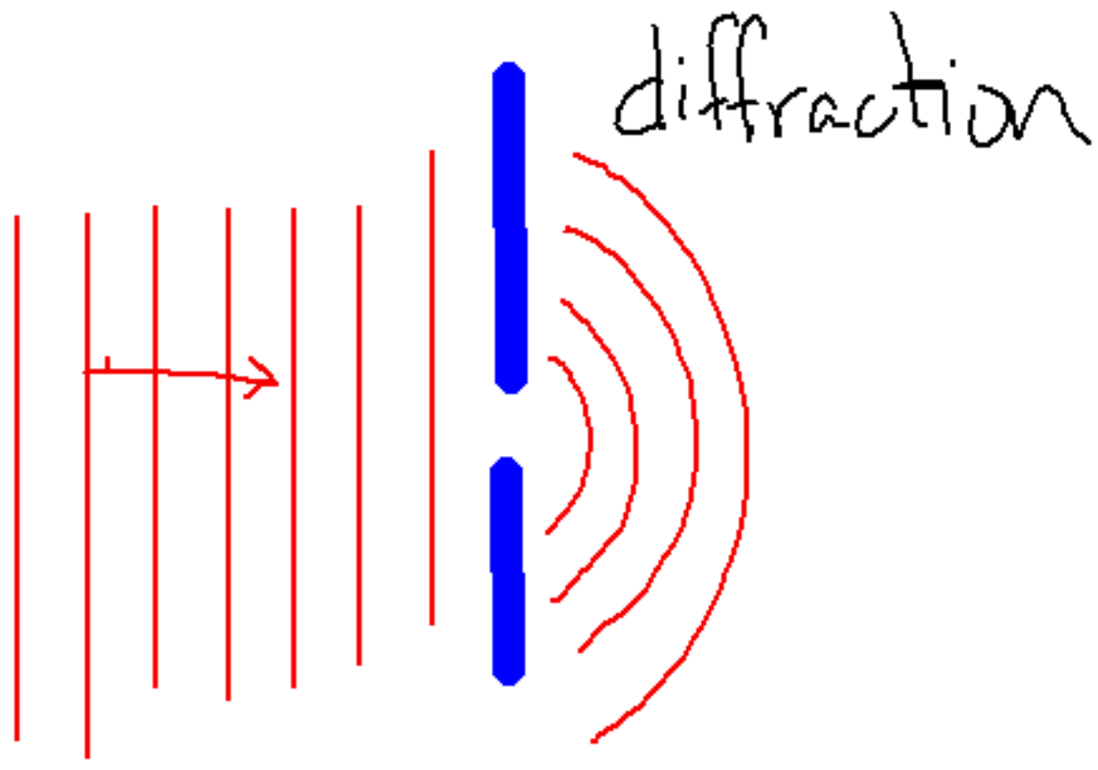
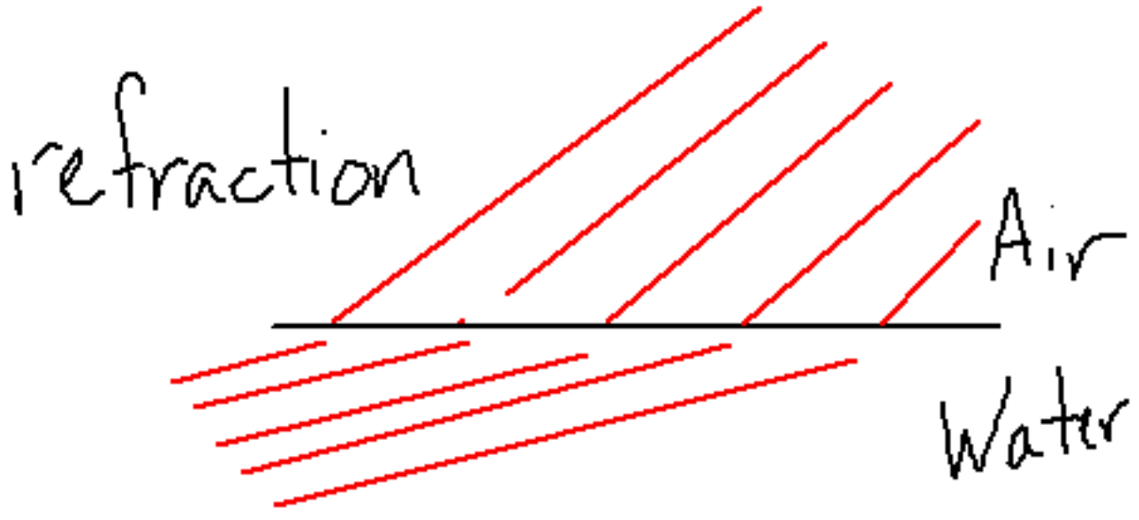
Station 1

Draw a picture of each of the following wave behaviors: reflection, interference, diffraction or refraction. In addition to the picture, pleas provide an explanation of what the wave does for each.







Station 2

1. A crest of amplitude 5 cm meets an opposing trough of amplitude 4 cm.

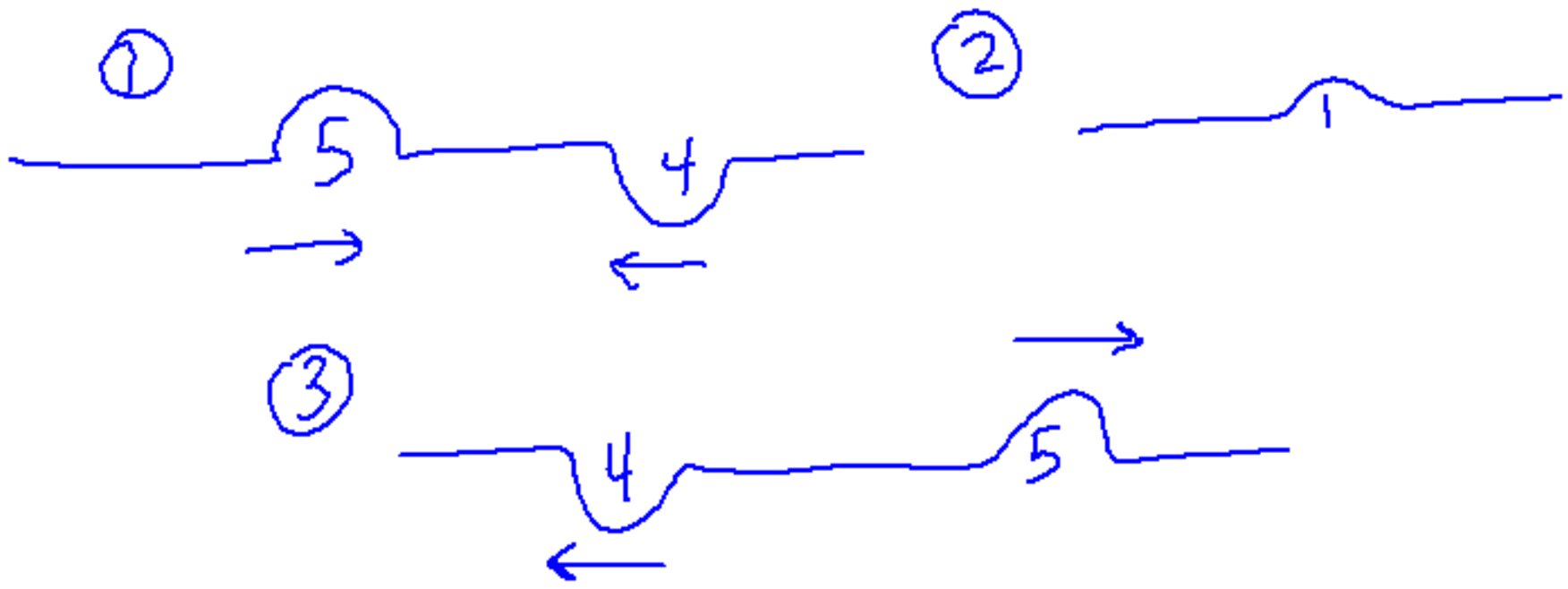
a) What type of interference does this represent?

destructive int.

b) What is the amplitude at the point where the interference occurs?

$+5 + -4 = +1$

c) Draw a diagram for this type of superposition.



2. A crest of amplitude 6 cm meets an opposing crest of amplitude 6 cm.

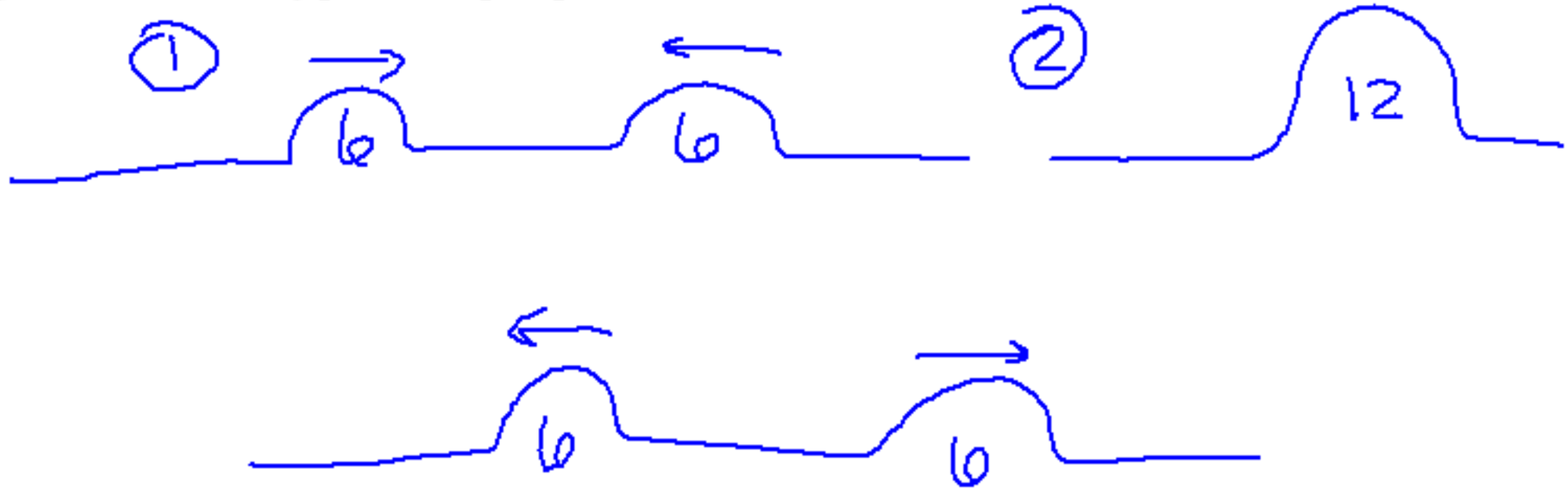
a) What type of interference does this represent?

constructive int.

b) What is the amplitude at the point where the interference occurs?

6 + 6 = 12 cm

c) Draw a diagram for this type of superposition.



Station 3

1. A wave generator produces 22.5 pulses in 5.50 s.

a) What is it frequency?

$$f = \frac{\text{cycles}}{\text{time}} = \frac{22.5}{5.5\ s} = 4.09\ Hz$$

b) What is its period?

$$T = 1/f = \frac{1}{4.09} = 0.244\ s$$

Five pulses are generated every 0.100 s in a tank of water. What is the speed of the wave if the wavelength of the surface wave is 1.20 cm? (100 cm = 1 m)

$$\lambda = \frac{1.20\text{cm} \mid 1\text{ m}}{100\text{cm}} = .012\text{m}$$

$$f = \frac{5}{.10s} = 50\text{Hz}$$

$$s = \lambda f$$

$$s = (.012)(50)$$

$$s = .60\text{m/s}$$

Station 4

1. If sound travels at 5600 m/s through a steel rod, what is the wavelength, given a wave frequency of 2480 Hz?

$s = 5600\ m/s$

$f = 2480\ Hz$

$s = \lambda f$

$5600 = \lambda(2480)$

$\lambda = 2.26 m$

2. The wavelength of a sound produced by a tuning fork is 1.30 m. The fork has a frequency of 256 Hz. What is the wave velocity?

$\lambda = 1.30 m$

$f = 256\ Hz$

$v = \lambda f = (1.30)(256)$

$v = 332.8\ m/s$

Station 5

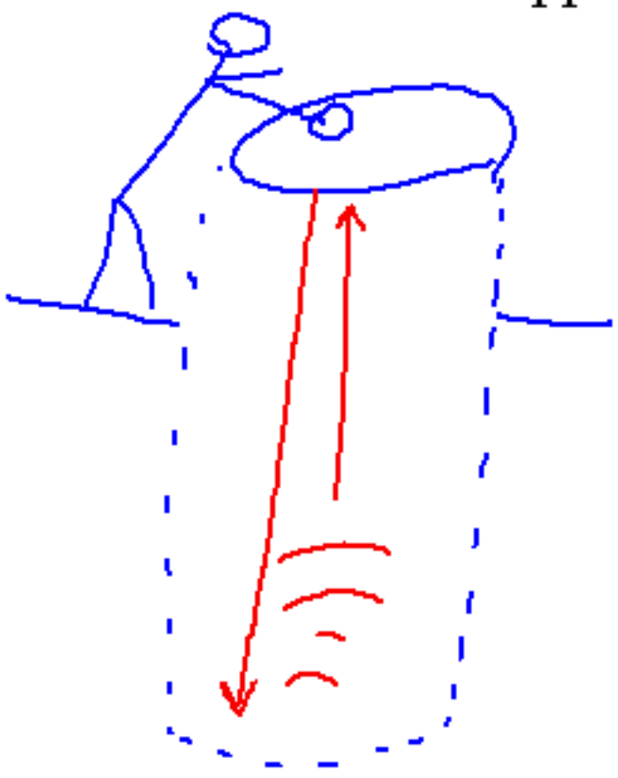
1. What is the wavelength of a sound made by a violin string vibrating at 640 Hz if the wave is traveling at 350 m/s?

$f = 640\ Hz$ $\quad s = \lambda f$

$s = 350\ m/s$ $\quad 350 = 640\lambda$

$\boxed{\lambda = .55\ m}$

2. A stone is dropped into a mineshaft. If an echo is heard 1.45 s after the stone was dropped, how deep was the mineshaft?



$t = 1.45\ s$

divide by 2

$\frac{1.45}{2} = 0.725\ s$

if $s = 340\ m/s$

$s = \frac{d}{t}$

$340 = \frac{d}{.725}$

$d = 246.5\ m$

Station 6

1. The wavelength of blue light is about 4.5×10^{-7} m. If the speed of light is constant at 3.0×10^{8} m/s, what is the frequency?

$s = \lambda f$

$3.0 \times 10^{8} = (4.5 \times 10^{-7}) f$

$f = 6.67 \times 10^{14}$ Hz

2. The distance from Earth to the moon is about 3.8×10^{8} m. A beam of light is sent to the moon and, after it reflects, returns to Earth. How long did it take to make the **round trip**? (Remember $v = 3.0 \times 10^{8}$ m/s)

$d = 2(3.8 \times 10^{8} m)$

$= 7.6 \times 10^{8} m$

$s = \frac{d}{t}$

$3.0 \times 10^{8} = \frac{7.6 \times 10^{8}}{t}$

$t = 2.53 s$

Station 7

1. Describe radio waves in terms of their wavelength and frequency.

Radio waves have large wavelengths and low frequency.

2. Describe x-rays in terms of their wavelength and frequency.

X-rays have shortwave lengths and high frequency.

True or False - **Light needs a medium to travel?**

False