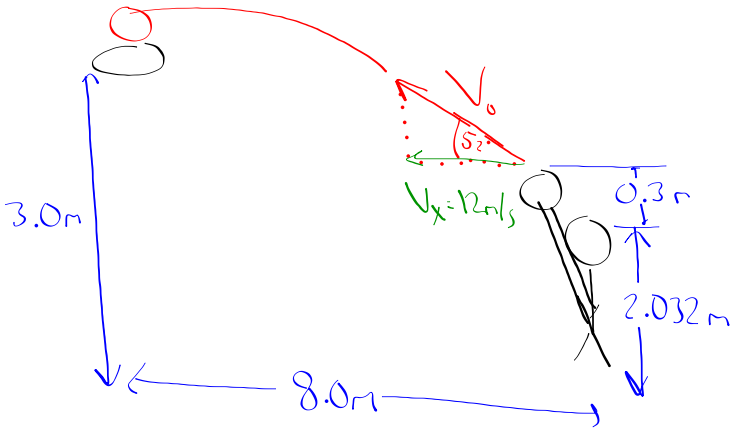
Pretest

Scenario 1



$$V_x = \frac{d_x}{t}$$

$$t = \frac{d_x}{V_x} = \frac{8.0\text{m}}{12\text{m/s}}$$

$$t = 0.67\text{s}$$

$$\cos\theta = \frac{V_x}{V_0}$$

$$V_0 = \frac{V_x}{\cos\theta}$$

$$V_0 = \frac{12}{\cos 52}$$

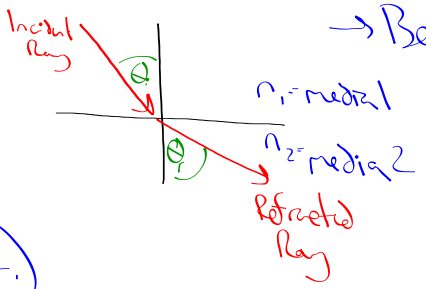
$$V_0 = 19.49\text{m/s}$$

Scenario 2

1.) Refraction

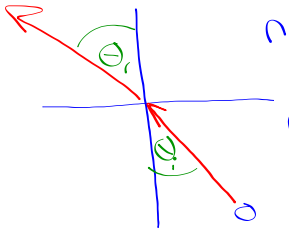
2.) Light travelling from one media to the next. It changes direction as it does so
→ Bend towards/away from the normal

3.)



4.) $n_i \sin\theta_i = n_r \sin\theta_r$

5.) If coin is light source:

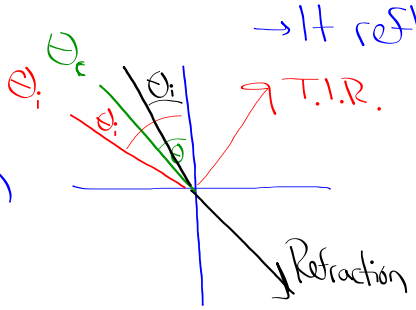


$\theta_i < \theta_r$
→ From slow to fast
→ Refract away from the normal

6.) Critical Angle - The limit to which light can refract in a given substance

7.) $\theta_i > \theta_c$ → No refraction occurs
→ It reflects!

8.) Total Internal Reflection

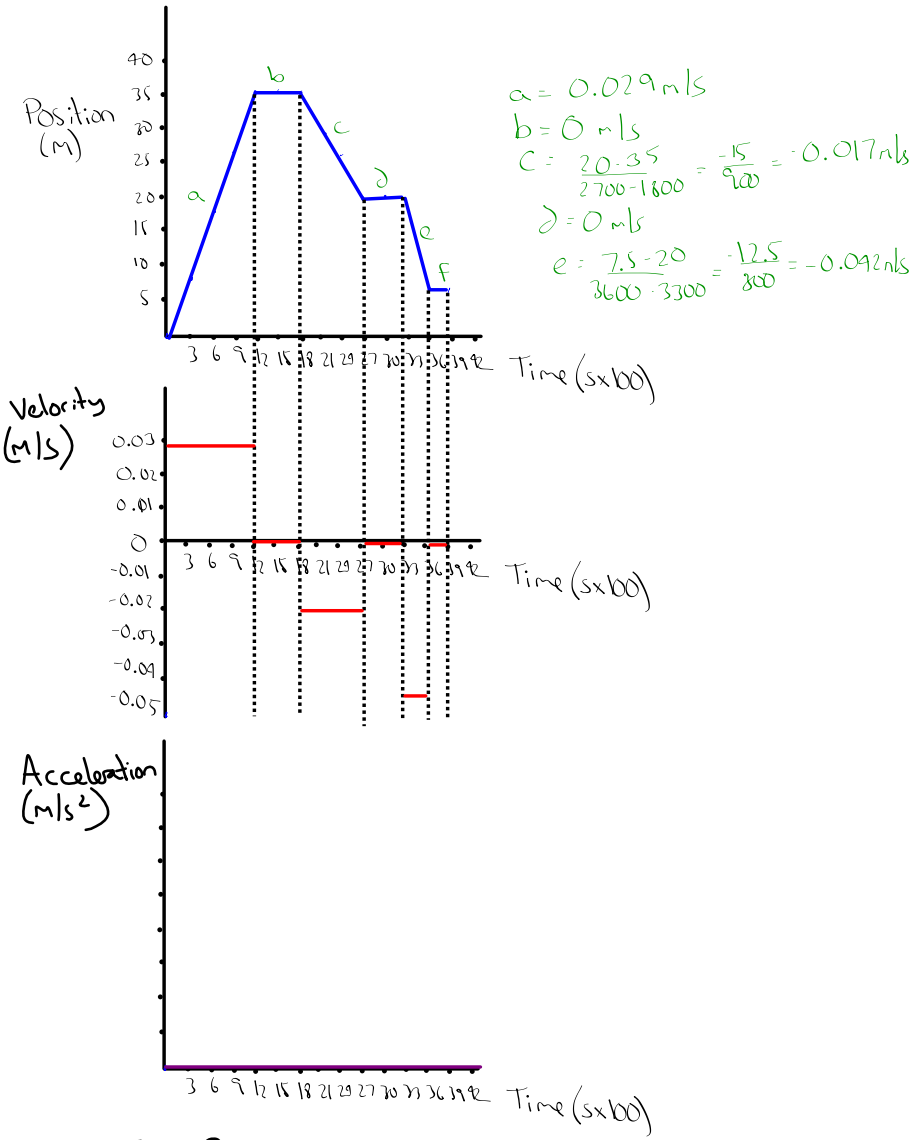


Scenario 3

Scale: 1cm : 0.5m
×0.5 → Actual Position

Time (min)	Time (s) ×60	Position (cm)	Actual Position (m)
0	0	0	0
5	300	17.5	8.75
10	600	35	17.5
15	900	52.5	26.25
20	1200	70	35
25	1500	70	35
30	1800	70	35
35	2100	60	30
40	2400	50	25
45	2700	40	20
50	3000	40	20
55	3300	40	20
60	3600	15	7.5
65	3900	15	7.5

1 min / 60s



a = 0.029 m/s
b = 0 m/s
c = $\frac{20-35}{2700-1800} = \frac{-15}{900} = -0.017$ m/s
d = 0 m/s
e = $\frac{7.5-20}{3600-3300} = \frac{-12.5}{300} = -0.042$ m/s

Task 2

V_{avg} = Since velocity constant from 0-15 min (0-900s)
Look at slope
= 0.029 m/s

Task 3

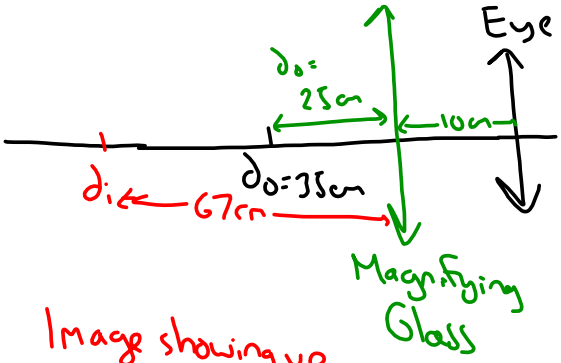
V = 0.029 m/s

Scenario 4

$F = 40\text{cm}$

$d_o = 75\text{cm}$

Ideal



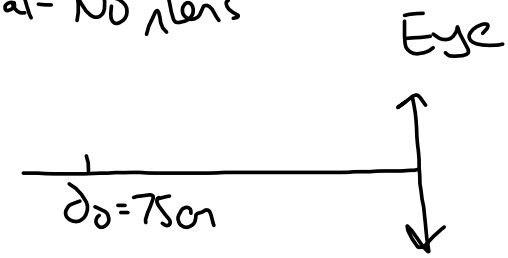
Magnifying Glass

Image showing up 77 cm away from eye (67cm+10)

Therefore she can see with the Magnifying glass.

Initial- No lens

Magnifying



$$\frac{1}{F} = \frac{1}{d_o} + \frac{1}{d_i}$$

$$\frac{1}{F} - \frac{1}{d_o} = \frac{1}{d_i}$$

$$\frac{25 \times 1}{25 \times 40} - \frac{1 \times 40}{25 \times 40} = \frac{1}{d_i}$$

$$\frac{25 - 40}{1000} = \frac{1}{d_i}$$

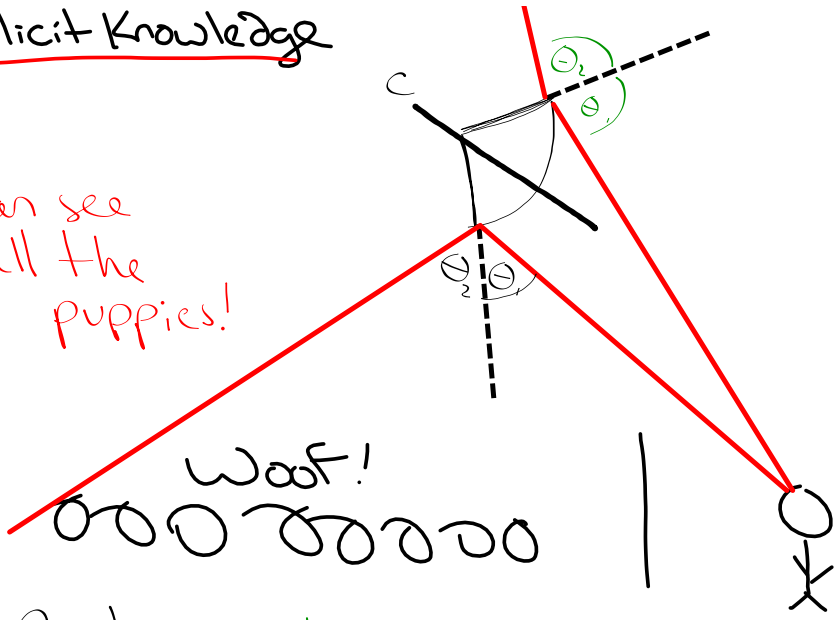
$$\frac{-15}{1000} = \frac{1}{d_i}$$

$$d_i = -67\text{cm}$$

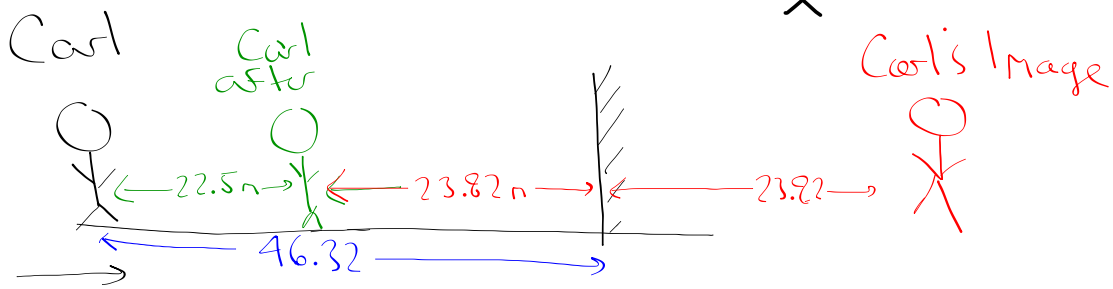
Explicit Knowledge

1.)

Can see all the puppies!



2.)



$v = 0.25 m/s$

$t = 90 s$

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

$d = v \cdot t$

$d = (0.25 m/s)(90 s)$

$d = 22.5 m$

Carl's new distance from mirror: $46.32 - 22.5$

$= 23.82 m$

Distance of image to mirror $= 23.82 m$

Distance between Carl & Image $= 23.82 + 23.82$

$= \boxed{47.64 m}$

3.)

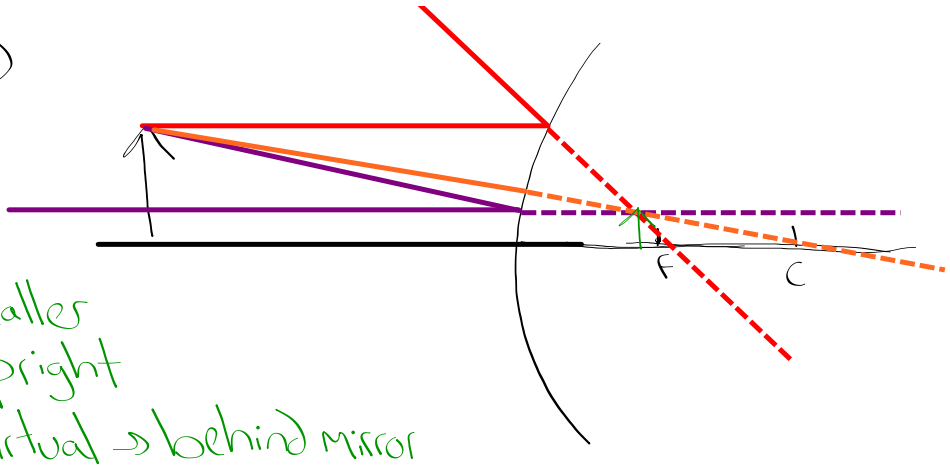
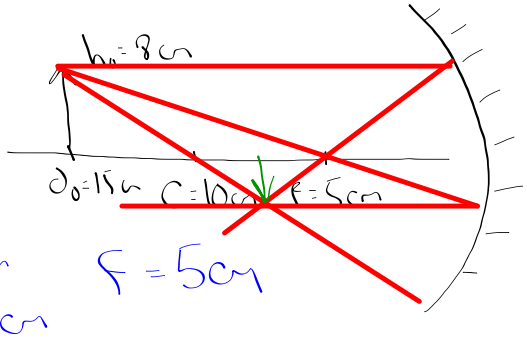


Image
- Smaller
- Upright
- Virtual → behind mirror
→ Diverging rays

9.)



$h_o = 8cm$
$d_o = 15cm$
$h_i = ?$
$d_i = ?$
$M = ?$

$f = 5cm$

$$\frac{1}{f} = \frac{1}{d_o} + \frac{1}{d_i}$$

$$\frac{1}{f} - \frac{1}{d_o} = \frac{1}{d_i}$$

$$3 \times \frac{1}{3 \times 5} - \frac{1}{15} = \frac{1}{d_i}$$

$$\frac{3-1}{15} = \frac{1}{d_i}$$

$$\frac{2}{15} = \frac{1}{d_i}$$

$$\boxed{d_i = 7.5cm}$$

$$\frac{h_i}{h_o} = -\frac{d_i}{d_o}$$

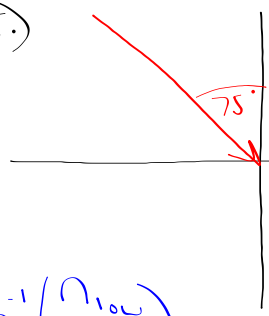
$$\frac{h_i}{8} = -\frac{7.5}{15}$$

$$\boxed{h_i = -4cm}$$

$$M = \frac{h_i}{h_o} = \frac{-4}{8} = -0.5\times$$

Image
- Smaller
- inverted
- Real
- Converging

5.)



n_1 = glass = 1.52

n_2 = water = 1.33

A.)

$\theta_c = \sin^{-1}\left(\frac{n_{low}}{n_{high}}\right)$

$\theta_c = \sin^{-1}\left(\frac{1.33}{1.52}\right)$

$\theta_c = 61.04°$

$\theta_i > \theta_c$ ∴ No refraction

B.) Total Internal Reflection occurs

6.)

$n = 1.00$ (I - Air) | $n_2 = ?$ (II - ?)

θ_i	θ_r
10°	8°
30°	22.5°
50°	35°
70°	45.5°

$n_1 \sin\theta_i = n_2 \sin\theta_r$

$\frac{n_1 \sin\theta_i}{\sin\theta_r} = n_2$

i) $\frac{1.0 \sin 10}{\sin 8} = 1.25$

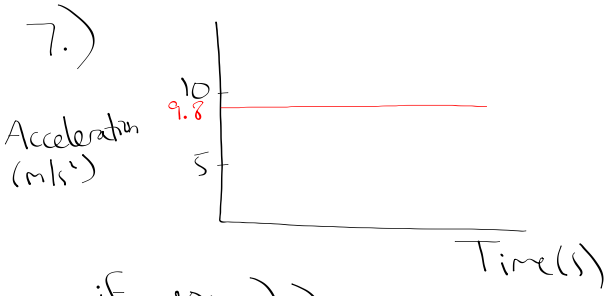
ii) $\frac{1.0 \sin 30}{\sin 22.5} = 1.31$

iii) $\frac{1.0 \sin 50}{\sin 35} = 1.34$

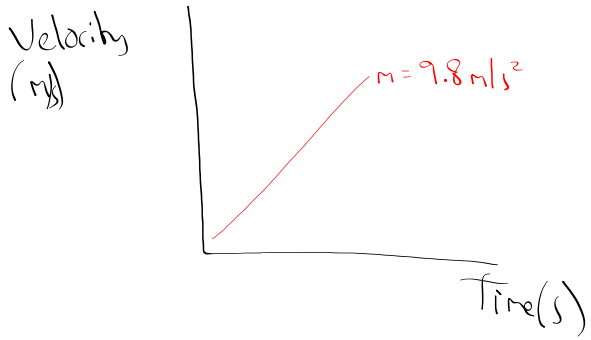
iv) $\frac{1.0 \sin 70}{\sin 45.5} = 1.32$

Avg $n = 1.31 \rightarrow$ Ice

7.)



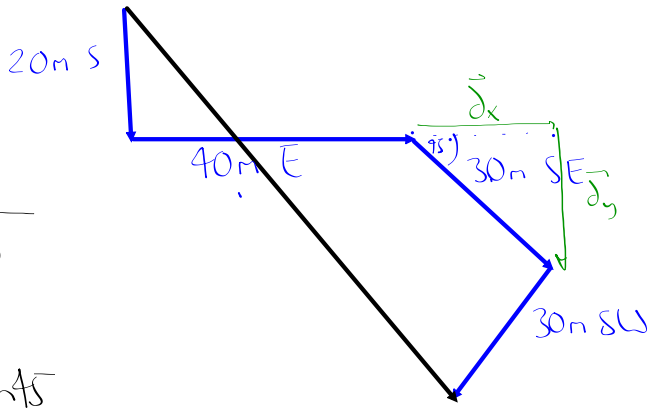
if you did



8.) A.) Total Distance

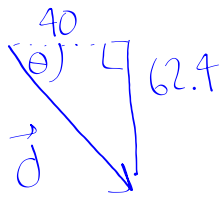
$20 + 40 + 30 + 30 = 120\text{m}$

B.)



1cm : 10m

	x	y
	0	−20
	40	0
	$30\cos 45$ (21.2)	$-30\sin 45$ (−21.2)
	$-30\cos 45$ (−21.2)	$-30\sin 45$ (−21.2)
$\vec{R}$	40	−62.4



$\vec{d} = \sqrt{40^2 + 62.4^2}$

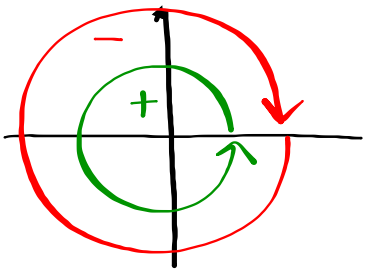
$\theta = \tan^{-1}\left(\frac{62.4}{40}\right)$

$\theta = 57.3°$

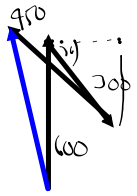
$\vec{d} = 74.1\text{m}$

$\vec{d} = 74.1\text{m}\ [\text{E } 57.3°\text{ S}]$

9.)

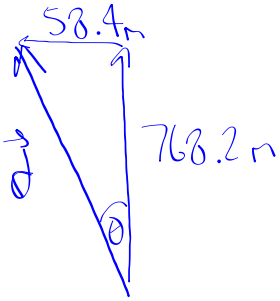


x	y
0	600
$300\cos 30$ 259.8	$-300\sin 30$ −150
$-450\cos 45$ −318.2	$450\sin 45$ 318.2
R −58.4	768.2



$\vec{d} = \sqrt{(768.2)^2 + (58.4)^2}$

$\vec{d} = 770.4\ m$



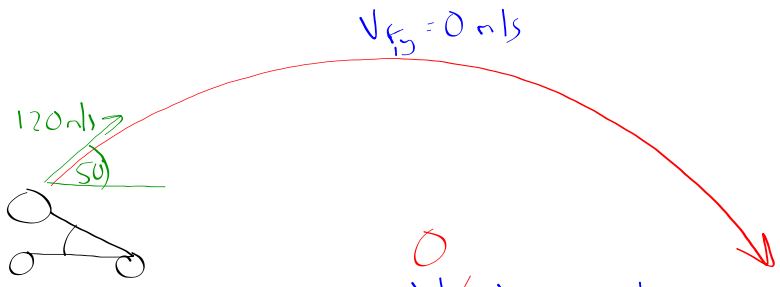
$\theta = \tan^{-1}\left(\frac{58.4}{768.2}\right)$

$\theta = 4.3°$

$\vec{d} = 770.4\ m\ [N4.3°W]$

10)

A.)



V_i 120 m/s, 50°

$V_{iy} = 120 \sin 50$

$V_{iy} = 91.93$ m/s

$V_{ix} = 120 \cos 50$

$V_{ix} = 77.13$ m/s

0

$V_{fy} = V_{iy} + g t_{1/2}$

$\frac{-V_{iy}}{g} = t_{1/2}$

$\frac{-91.93}{-9.8} = t_{1/2}$

$t_{1/2} = 9.38$ s $\times 2$

$t_{total} = 18.76$ s

B.) $v_x = \frac{d_x}{t}$

$d_x = v_x \cdot t$

$= (77.13 \text{ m/s})(18.76 \text{ s})$

$d_x = 1446.96$ m

C.) 0

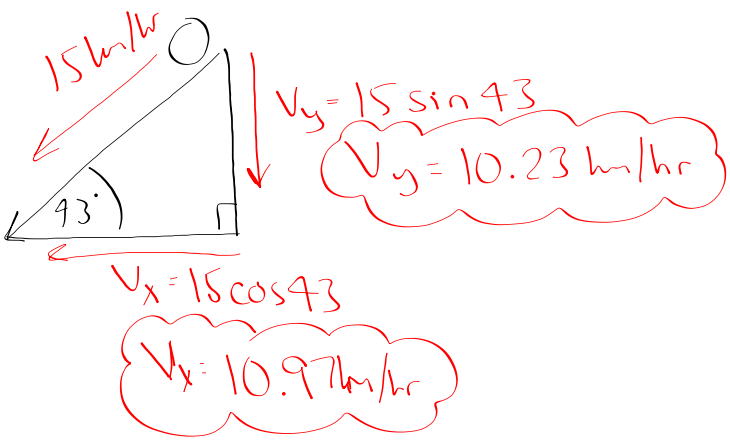
$V_{fy}^2 = V_{iy}^2 + 2 g d_y$

$\frac{-V_{iy}^2}{2g} = d_y$

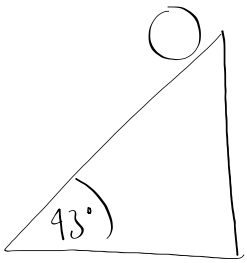
$\frac{-(91.93)^2}{2(-9.8)} = d_y$

$d_y = 431.18$ m

11)



What if?



What is a?