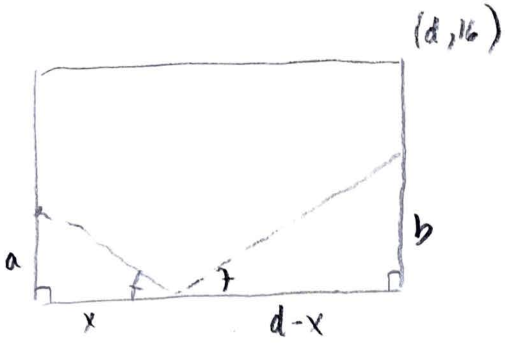
(20)



$$\frac{a}{b} = \frac{x}{d-x} \Rightarrow ad - ax = bx$$

$$ad = ax + bx = x(a+b)$$

$$x = \frac{ad}{a+b}$$

(22) $d = 24$

if $a=6$ & $b=8$, then $x = \frac{6 \cdot 24}{6+8} = \frac{72}{7} \approx 10.286$

if $a=9$ & $b=8$, then $x = \frac{9 \cdot 24}{9+8} = \frac{216}{17} \approx 12.706$

if $a=6$ & $b=14$, then $x = \frac{6 \cdot 24}{6+14} = \frac{36}{5} = 7.2$

if $a=9$ & $b=14$, then $x = \frac{9 \cdot 24}{9+14} = \frac{216}{23} \approx 9.39$

The width of the window must be $12.706 - 7.2$ (the extremes) $= 5.5$ ft

(23)

$$a = \frac{bx}{d-x}$$

$$= \frac{8(12)}{28-12} = \frac{96}{16} = 6$$

OR

$$= \frac{8(13.5)}{28-13.5} = \frac{108}{14.5} = \frac{216}{29}$$

width $= \frac{216}{29} - 6 = \frac{42}{29} \approx 1.45$ ft

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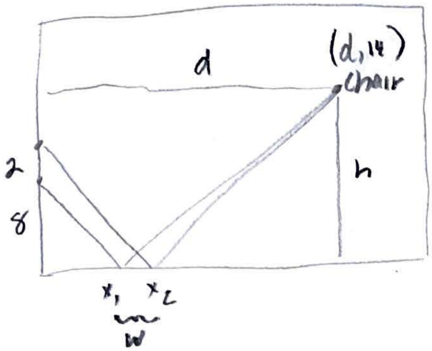

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which?

$$\frac{8}{14} = \frac{x_1}{d-x_1}$$

$$8d - 8x_1 = 14x_1$$

$$8d = 8x_1 + 14x_1 = x_1(8+14)$$

$$\frac{4d}{11} = \frac{8d}{22} = x_1$$

$$\frac{5}{7}\ \cancel{\frac{10}{14}} = \frac{x_2}{d-x_2}$$

$$5d - 5x_2 = 7x_2$$

$$x_2 = \frac{5d}{12}$$

$$w = x_2 - x_1 = \frac{5d}{12} - \frac{4d}{11} = \frac{55d - 48d}{132} = \frac{7d}{132}$$

this is linear!

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$$\frac{8}{h} = \frac{x_1}{20-x_1}$$

$$160 - 8x_1 = hx_1$$

$$x_1 = \frac{160}{h+8}$$

$$\frac{10}{h} = \frac{x_2}{20-x_2}$$

$$200 - 10x_2 = hx_2$$

$$x_2 = \frac{200}{h+10}$$

$$w = x_2 - x_1 = \frac{200}{h+10} - \frac{160}{h+8} = \frac{200(h+8) - 160(h+10)}{h^2+18h+80}$$

$$= \frac{40h}{h^2+18h+80}$$

(28) As h gets larger, the denominator will grow more quickly than the numerator (since h is being squared!) $\therefore$ w gets smaller this is like an <u>inverse</u> <u>relationship</u>.

(29) If (20,14), then

$$w = \frac{40(14)}{14^2+18(14)+80} = 1.06 \text{ ft}$$

(30/31) If h changes by 1 ft.:

$$\Delta w = \frac{7(21)}{132} - \frac{7(20)}{132} \approx .053$$

If h changes by a foot:

$$\Delta w = \frac{40 \cdot 15}{15^2+18(15)+80} - 1.06 \approx .017$$

so a horizontal change has an almost 3X bigger effect on the width of the mirror as a vertical change in the positon of the chair.

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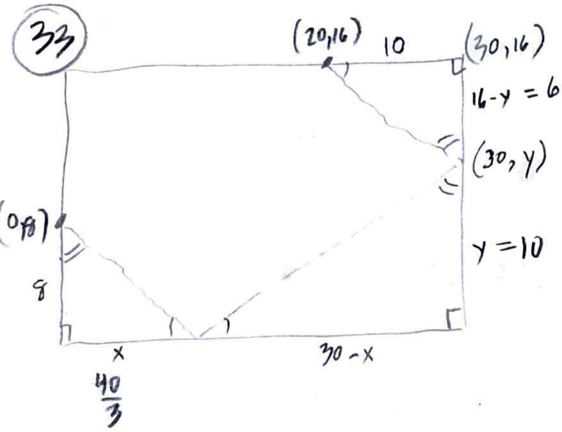

$$\frac{8}{x} = \frac{16-y}{10}$$

$$80 = 16x - xy$$

$$x = \frac{80}{16-y}$$

$$\frac{8}{x} = \frac{y}{30-x}$$

$$240 - 8x = yx$$

$$x = \frac{240}{y+8}$$

$$\frac{80}{16-y} = \frac{240}{y+8}$$

$$\frac{8}{24} = \frac{1}{3} = \frac{16-y}{y+8}$$

$$y+8 = 48 - 3y$$

$$4y = 40$$

$$y = 10$$

$$x = \frac{80}{16-y} = \frac{40}{3}$$

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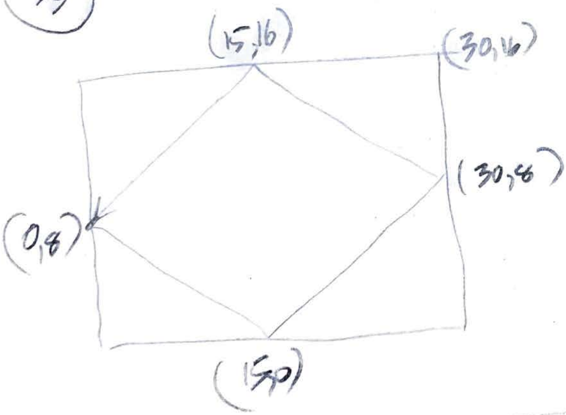
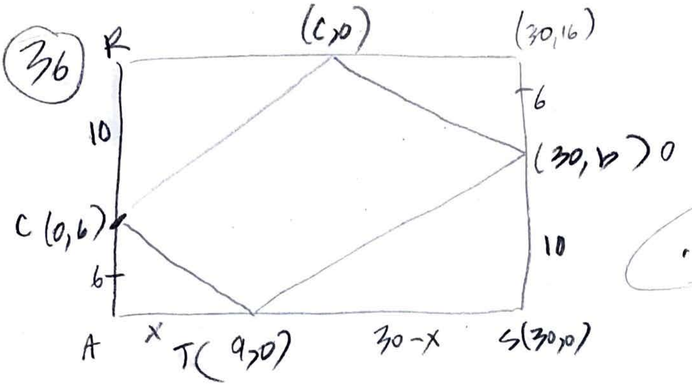


Δ's are all congruent!

(36)



The opposite Δs must be ≅ for this to work.

$\therefore b = 10$

So, $\frac{6}{x} = \frac{10}{30-x}$

$x = \frac{45}{4} = 11.25$

$a = 11.25$

$\therefore c = 30 - 11.25 = 18.75 = \frac{75}{4}$

If, insted $C = (0,11)$, then

$AR = 5$ & $b = 5$

$\frac{11}{5} = \frac{x}{30-x}$

$330 - 11x = 5x$

$x = a = \frac{165}{8} = 20.625$

$c = 30 - 20.625 = \frac{75}{8} = 9.375$

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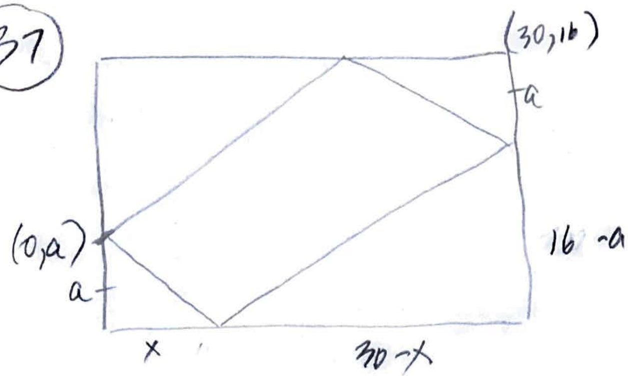

$$\frac{a}{16-a} = \frac{x}{30-x}$$

$$30a - \cancel{ax} = 16x - \cancel{ax}$$

$$x = \frac{30a}{16} = \frac{15a}{8}$$