① 

$x+2y=80$

$x=80-2y$

$x=80-2(20)$

$x=40$

$A=xy$

$A=(80-2y)y$

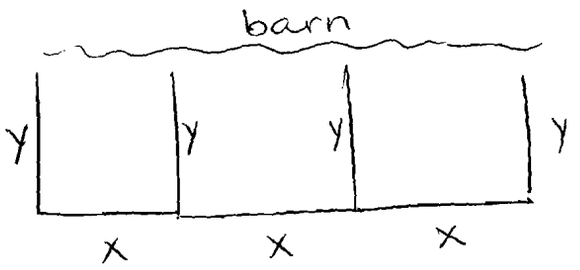
$A=80y-2y^2$

$A'=80-4y$

$0=80-4y$

$20=y$

40 ft by 20 ft

② 

$3x+4y=80$

$3x=80-4y$

$x=\frac{80-4y}{3}$

$x=\frac{80-4(10)}{3}$

$x=13.333$

each pen 13.333 yds by 10 yds

entire area 40 yds by 10 yds

$A=3xy$

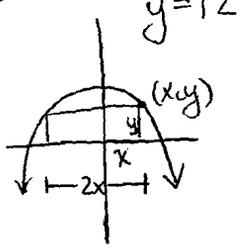
$A=3\left(\frac{80-4y}{3}\right)y$

$A=80y-4y^2$

$A'=80-8y$

$0=80-8y$

$y=10$

③ 

$y=12-x^2$

$A=2xy$

$A=2x(12-x^2)$

$A=24x-2x^3$

$A'=24-6x^2$

$0=24-6x^2$

$x=2$

$y=12-(2)^2$

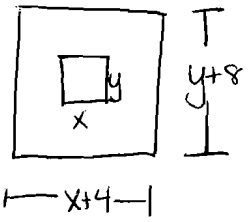
$y=12-4$

$y=8$

dimensions

4 by 8

④



$xy = 50$

$y = \frac{50}{x}$

$y = 10$

$(x+4)(y+8) = A$

$(x+4)\left(\frac{50}{x}+8\right) = A$

$50 + 8x + 200x^{-1} + 32 = A$

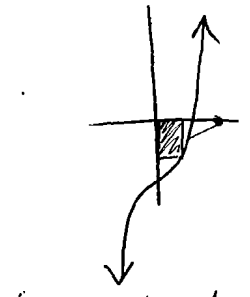
$8 - 200x^{-2} = A$

$x = 5$

5^{cm} by 10^{cm} for printed region

9^{cm} by 18^{cm} for entire playbill

⑤ $g(x) = x^3 - 6$



(no rectangle needed)

$d = \sqrt{(x-5)^2 + (x^3-6-0)^2}$

$d = \sqrt{(x-5)^2 + (x^3-6)^2}$

$d = \sqrt{x^2 - 10x + 25 + x^6 - 12x^3 + 36}$

$d = \sqrt{x^6 - 12x^3 + x^2 - 10x + 61}$

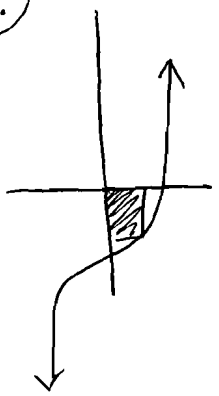
$0 = d' = \frac{1}{2}(x^6 - 12x^3 + x^2 - 10x + 61)^{-1/2}(6x^5 - 36x^2 + 2x - 10)$

$x = 1.848$ $\quad y = (1.848)^3 - 6$

$y = -.311$

$(1.848, -.311)$

⑥.



$A = xy$

$A = x(x^3 - 6)$

$A = x^4 - 6x$

$A' = 4x^3 - 6$

$0 = 4x^3 - 6$

$x = 1.145$

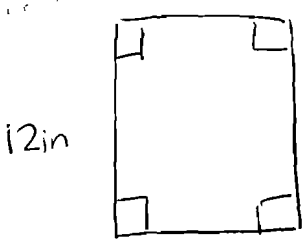
$y = (1.145)^3 - 6$

$y = -4.499$

dimensions (not coordinates)

1.145 by 4.499

(7)



$V = (12-2x)(8-2x)x$

$V = (96 - 24x - 16x + 4x^2)x$

$V = 4x^3 - 40x^2 + 96x$

$V' = 12x^2 - 80x + 96$

$0 = 4(3x - 20x + 24)$

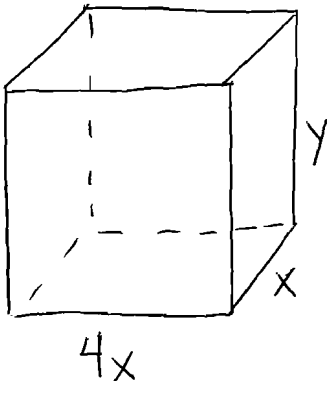
$x = 1.569$ ~~$x = 5.097$~~

$12 - 2(1.569) = 8.862$ in by

$8 - 2(1.569) = 4.862$ in by

1.569 in by

(8)



$V = (4x)(x)(y)$

$V = 4x^2y$

$384 = 4x^2y$

$\frac{384}{4x^2} = y$

$96x^{-2} = y$

$C = 4(4x)(x) + 4(2)(xy) + 4(2)(4x)(x) + 10(4x)(x)$

$C = 16x^2 + 8xy + 32xy + 40x^2$

$C = 16x^2 + 40xy + 40x^2$

$C = 56x^2 + 40xy$

$C = 56x^2 + 40x(96x^{-2})$

$C = 56x^2 + 3840x^{-1}$

$0 = C' = 112x - 3840x^{-2}$

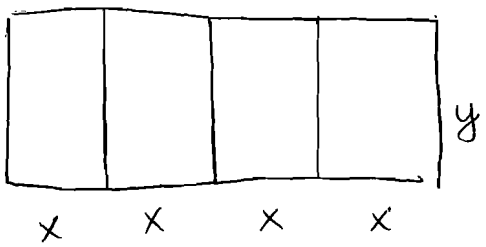
$x = 3.249$

$4x = 4(3.249) = 12.996$ ft

$96x^{-2} = 96(3.249)^{-2} = 9.094$ ft

3.249 ft

(9)



$4xy = 429$

$y = \frac{429}{4x}$

$20(8x) + 20(2y) + 12(3y) = C$

$160x + 40y + 36y = C$

$160x + 76y = C$

$160x + 76\left(\frac{429}{4x}\right) = C$

$160x + 8151x^{-1} = C$

$160 - 8151x^{-2} = C' = 0$

$x = 7.137$

$y = \frac{429}{4(7.137)} = 15.027$

each pen 7.137 m by 15.027 m

entire pen 28.548 m by 15.027 m