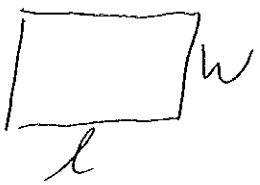
WORKSHEET #2 SOLVING QUADRATIC WORD PROBLEMS

1. Find the dimensions and the maximum area of a rectangle, if its perimeter is 24 inches.



$2l+2w=24$
$2w=24-2l$
$w=12-l$

$A=l\cdot w$
$A=l\cdot(12-l)$
$=12l-l^2$
$=-1l^2+12l+0$
$a=-1\ b=12,\ c=0$

$V=\frac{-12}{2(-1)}=\frac{-12}{-2}=6.$

Max area: $6(12-6)=6\cdot 6$
$=36\ in^2$

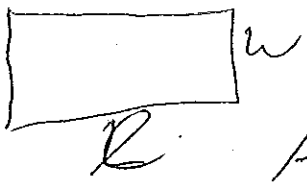
2. A rocket is shot upward with an initial velocity of 40 feet per second. Its height above the ground after t seconds is given by $h(t)= 40t -16t^2$. What is its maximum height? When will it return to earth?

$y=40t-16t^2$
$y=-16t^2+40t+0$
$a=-16,\ b=40,\ c=0$

Max: $V=\frac{-40}{2(-16)}=\frac{40}{32}=1.25$ sec
$y=-16(1.25)^2+40(1.25)=25$ ft

Ground
$x=\frac{-40\pm\sqrt{40^2-4(-16)(0)}}{2(-16)}$
$=\frac{-40\pm\sqrt{40^2}}{-32}=\frac{-40\pm\sqrt{1600}}{-32}$
$\frac{-40\pm 40}{-32}\rightarrow\frac{0}{-32}$ OR $\frac{-80}{-32}$
0 OR 2.5 sec

3. Sally has 400 yards of fencing and wishes to enclose a rectangular area. Find the dimensions and the maximum area.



$2l+2w=400$
$2w=400-2l$
$w=200-l$

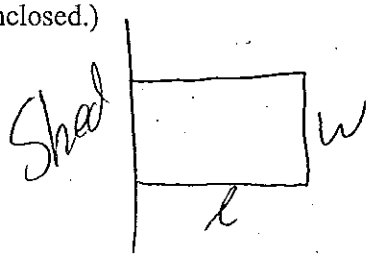
$A=l\cdot w$
$A=l\cdot(200-l)$
$A=200l-l^2$

$A=-1l^2+200l+0$
$a=-1,\ b=200,\ c=0$

V: $\frac{-200}{2(-1)}=\frac{-200}{-2}=100$

$A=100(200-100)$
$100(100)=10{,}000$

4. Van has 120 feet of fence to make a rectangular pen for his rabbits. If a shed is used as one side of the pen, what would the length and width be for maximum area? (Only three sides are enclosed.)



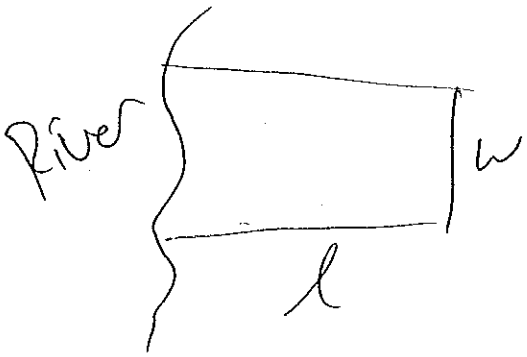
$2l+w=120$
$w=120-2l$

$A=l\cdot w$
$A=l\cdot(120-2l)$
$A=120l-2l^2$
$A=-2l^2+120l+0$
$a=-2,\ b=120,\ c=0$

Max: $\frac{-120}{2(-2)}=\frac{-120}{-4}=30.$

$A=30(120-2(30))$
$30(120-60)$
$30\cdot 60=1800.$

5. A farmer has 3000 feet of fencing to enclose a rectangular plot that borders a river. If the farmer does not fence the side bordering the river, what is the largest area that can be enclosed?



$2l+w=3000$

$w=3000-2l$

$A=l\cdot w$

$A=l\cdot(3000-2l)$

$=3000l-2l^2$

Max: $\frac{-3000}{2(-2)}=\frac{3000}{-4}$

750

$A=750(3000-2(750))$

$750(3000-1500)$

$750(1500)=1{,}125{,}000$

6. The power in megawatts, produced between midnight and noon, is given by $P(x)=h^2-12h+210$, where h is the hour of the day. $a=1, b=-12, c=210$

a. At what time does the minimum power production occur? $\frac{-(-12)}{2(1)}=\frac{12}{2}=6$ hours

b. What is the minimum power production?

$6^2-12(6)+210$

$36-72+210=174$ mega watts

c. During what hour(s) is the power production 187 megawatts?

$187=h^2-12h+210$

$0=h^2-12h+23$

$h=\frac{12\pm\sqrt{(-12)^2-4(1)(23)}}{2(1)}=\frac{12\pm\sqrt{144-92}}{2}$

$=\frac{12\pm\sqrt{52}}{2}=9.61$ or 2.39

ANSWERS:

1. Dimensions 6 inches x 6 inches Area 36 square inches
2. Height 25 feet Hit the ground 2.5 seconds
3. Dimensions 100 yards x 100 yards Area 10,000 square yards
4. Dimensions 30 feet x 60 feet Area 1800 square feet
5. Area 1,125,000 square feet
6. a. 6:00 A.M. b. 174 megawatts c. 3rd hour (between 2:00 and 3:00A.M.) and 10th hour (between 9:00 A.M. and 10:00 A.M.)