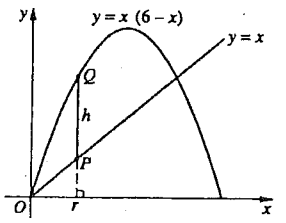
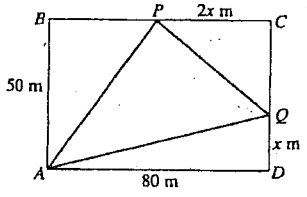
PAST EXAMINATION QUESTIONS : QUADRATIC INEQUALITIES

1. (a) The diagram shows part of the line $y = x$ and part of the curve $y = x(6 - x)$. The point P lies on the line and the point Q lies on the curve. The x-coordinate of both P and Q is r, where $0 \leq r \leq 5$, and the distance PQ is denoted by h. Express h in terms of r and hence find the greastest value of h as r varies.



(b) The diagram shows a rectangular field $ABCD$ with $AB = 50$ m and $AD = 80$ m. The field is partitioned by three straight fences AP, AQ and PQ. The distance of P from C is twice the ditance of Q from D. Given that $DQ = x$ m, show that the area, A m^2, of triangle APQ is given by $A = x^2 - 40x + 2000$. Given that x varies, find the stationary value of A and determine whether this is maximium or a minimum value. (J94/P1/13)



2. Find the range of values of x for which $(x - 1)(5 - x) > 3$. (N94/P1/4b)

3. Three variables x, y and z are related by the equation $z = xy$. Given that $x + 2y = 15$, find the stationary value of z and determine whether this is a maximum or a minimum value. (N94/P1/12a)

4. Find the range of values of x for which $x(x + 5) \geq -6$. (J95/P1/8a)

5. Find the range of values of x for which $4x(4 - x) \geq 15$. (N95/P1/8a)

6. The function f is defined by $f: x \mapsto 2x^2 - 6x + 5$, for the domain $1 \leq x \leq 4$. Find the range of f. (J96/P1/14c)

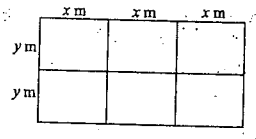
7. Find the range of values of x for which $(2x - 1)(x + 4) > 18$. (N96/P1/7a)

8. Calculate the range of values of c for which $3x^2 - 9x + c > 2{\cdot}25$ for all values of x. (J97/P1/9b)

9. Find the range of values of x for which $3x^2 - 5x + 4 > 3 - x^2$. (N97/P1/4)

10. Find the range of the function $f: x \mapsto 2x^2 - 6x + 7$ for the domain $0 \leq x \leq 4$. (J98/P1/9)

11. A sports club wishes to use 720 m of fencing to make six equal-sized rectangular courts placed adjacent to each other as shown in the diagram. Given that each court measures x m by y m, show that the total area of all six courts, A m^2, is given by $A = \frac{3}{4}(720x - 9x^2)$. Given that x and y may vary, find the dimensions of each court for which A is a maximum. (J98/P1/10b)



12. Find the range of values of x for which $x(10 - x) \geq 24$. (N98/P1/3a)

1. (a) $h = 5r - r^2$, $6\frac{1}{4}$

   (b) 1600, minimum

2. $2 < x < 4$

3. $28\frac{1}{8}$, maximum

4. $x \leq -3$ or $-2 \leq x$

5. $1\frac{1}{2} \leq x \leq 2\frac{1}{2}$

6. $\frac{1}{2} \leq y \leq 13$

7. $x < -5\frac{1}{2}$ or $x > 2$

8. $c < 9$

9. $x < -\frac{1}{4}$ or $1 < x$

10. $2\frac{1}{2} \leq f(x) \leq 15$

11. 40 m by 45 m

12. $4 \leq x \leq 6$