# PAST EXAMINATION QUESTIONS: QUADRATIC INEQUALITIES

1. Find the values of x for which the expression $6 - 7x - 3x^2$ is negative. (J61/P1/6i)

2. Find the range of values of x for which the expression $12x^2 + 7x - 10$ is negative. (J62/P2/7ii)

3. Find the range of values of x for which the expression $4x^2 + 11x - 20$ is negative. (N62/P1/5iii)

4. The side AB of a rectangle $ABCD$ is 12 cm and the side AD is 9 cm. P is a point in the side CD and Q is the point in the side BC such that the angle APQ is a right angle. Taking DP as x cm, express BQ in terms of x. P now moves along CD and Q along BC so that angle APQ remains a right angle. Calculate the least value of BQ. (J65/P2/8i)

5. The expression $p + qx - x^2$ has its greatest value 5 when $x = 2$. Find the numerical values of p and q. (J66/P1/4i)

6. The lengths of the two smaller sides of a right-angled triangle are x cm and y cm. A square is constructed on each side of the triangle and the exterior points of the squares are joined to form a hexagon as in the diagram. Show that the area of the hexagon is $2\left(x^2 + xy + y^2\right)$ cm^2. Given that $x + y = 10$, determine the minimum area of the hexagon. (J70/P1/7)
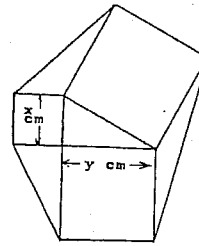

7. Fig. 1(a) shows a vertical section of a greenhouse which is built against a brick wall AD. The general arrangement is shown in Fig. 1(b). The length of the greenhouse is 10 metres and the ends are brick walls. The roof and the front are to be made of glass and the total area of glass available is 60 m^2. The roof slopes at an angle of 30° to the horizontal. Taking the length of AB as x metres, prove that the volume of the greenhouse is $5x\left(12 - x\sqrt{3}\right)$ m^3. Hence find the value of x which makes the volume of the greenhouse a maximum. (N70/P2/8).
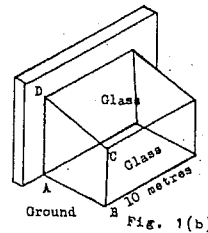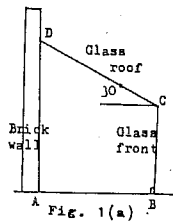
8. The figure shows a trapezium $ABCD$ in which the angles A and D are right angles, $AB = 6$ cm, $AD = 10$ cm, and $DC = 26$ cm. A rectangle $PQRD$ is inscribed in the trapezium. Denoting QR by x cm, express RC, DR and the area of $PQRD$ in terms of x. Find the maximum area of $PQRD$. (J71/P2/3)
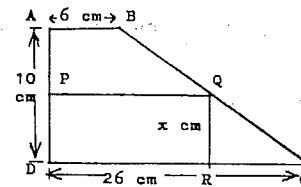
9. The triangle XYZ shown in the figure has $XY = XZ = 13$ cm and $YZ = 10$ cm. The rectangle $PQRS$ is inscribed in the triangle so that PQ is parallel to YZ and PS and QR are parallel to XM where M is the midpoint of YZ. Given that $SM = MR = x$ cm and $QR = y$ cm express y in terms of x, and show that, if the area of the rectangle is A cm^2, then $A = \frac{24x}{5}(5 - x)$. Hence find the value of x for which the area is a maximum and the value of the maximum area. (N72/P2/7)
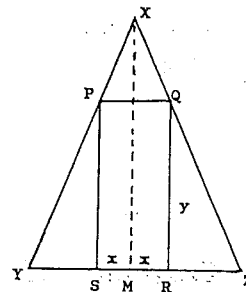
10. Find the range of values of x for which $2 - x - x^2$ is positive. (J73/P1/5ii)

11. Given that $x + 2y = 4$, calculate the minimum value of $x^2 + xy - y^2$. (N73/P1/7ii)

1. $x < -3$ or $x > \frac{2}{3}$
2. $-\frac{5}{4} < x < \frac{2}{3}$
3. $-4 < x < \frac{5}{4}$
4. $\frac{x^2 - 12x + 81}{9}$, 5 cm
5. $p = 1$, $q = 4$
6. 150 cm²
7. $2\sqrt{3}$
8. $2x$, $26 - 2x$, $x(26 - 2x)$; $84\frac{1}{2}$ cm²
9. $\frac{12(5-x)}{5}$; $2\frac{1}{2}$; 30
10. $-2 < x < 1$
11. -20