C1 ALGEBRA Worksheet I

1 Solve each pair of simultaneous equations.

a $y = 3x$
$y = 2x + 1$

b $y = x - 6$
$y = \frac{1}{2}x - 4$

c $y = 2x + 6$
$y = 3 - 4x$

d $x + y - 3 = 0$
$x + 2y + 1 = 0$

e $x + 2y + 11 = 0$
$2x - 3y + 1 = 0$

f $3x + 3y + 4 = 0$
$5x - 2y - 5 = 0$

2 Find the coordinates of the points of intersection of the given straight line and curve in each case.

a $y = x + 2$
$y = x^2 - 4$

b $y = 4x + 11$
$y = x^2 + 3x - 1$

c $y = 2x - 1$
$y = 2x^2 + 3x - 7$

3 Solve each pair of simultaneous equations.

a $x^2 - y + 3 = 0$
$x - y + 5 = 0$

b $2x^2 - y - 8x = 0$
$x + y + 3 = 0$

c $x^2 + y^2 = 25$
$2x - y = 5$

d $x^2 + 2xy + 15 = 0$
$2x - y + 10 = 0$

e $x^2 - 2xy - y^2 = 7$
$x + y = 1$

f $3x^2 - x - y^2 = 0$
$x + y - 1 = 0$

g $2x^2 + xy + y^2 = 22$
$x + y = 4$

h $x^2 - 4y - y^2 = 0$
$x - 2y = 0$

i $x^2 + xy = 4$
$3x + 2y = 6$

j $2x^2 + y - y^2 = 8$
$2x - y = 3$

k $x^2 - xy + y^2 = 13$
$2x - y = 7$

l $x^2 - 5x + y^2 = 0$
$3x + y = 5$

m $3x^2 - xy + y^2 = 36$
$x - 2y = 10$

n $2x^2 + x - 4y = 6$
$3x - 2y = 4$

o $x^2 + x + 2y^2 - 52 = 0$
$x - 3y + 17 = 0$

4 Solve each pair of simultaneous equations.

a $x - \dfrac{1}{y} - 4y = 0$
$x - 6y - 1 = 0$

b $xy = 6$
$x - y = 5$

c $\dfrac{3}{x} - 2y + 4 = 0$
$4x + y - 7 = 0$

5 The line $y = 5 - x$ intersects the curve $y = x^2 - 3x + 2$ at the points P and Q.
Find the length PQ in the form $k\sqrt{2}$.

6 Solve the simultaneous equations

$$3^{x-1} = 9^{2y}$$
$$8^{x-2} = 4^{1+y}$$

7 Given that

$$(A + 2\sqrt{3})(B - \sqrt{3}) \equiv 9\sqrt{3} - 1,$$

find the values of the integers A and B.

1 Find the set of values of x for which

a $2x + 1 < 7$ **b** $3x - 1 \geq 20$ **c** $2x - 5 > 3$ **d** $6 + 3x \leq 42$

e $5x + 17 \geq 2$ **f** $\frac{1}{3}x + 7 < 8$ **g** $9x - 4 \geq 50$ **h** $3x + 11 < 7$

i $18 - x > 4$ **j** $10 + 4x \leq 0$ **k** $12 - 3x < 10$ **l** $9 - \frac{1}{2}x \geq 4$

2 Solve each inequality.

a $2y - 3 > y + 4$ **b** $5p + 1 \leq p + 3$ **c** $x - 2 < 3x - 8$

d $a + 11 \geq 15 - a$ **e** $17 - 2u < 2 + u$ **f** $5 - b \geq 14 - 3b$

g $4x + 23 < x + 5$ **h** $12 + 3y \geq 2y - 1$ **i** $16 - 3p \leq 36 + p$

j $5(r - 2) > 30$ **k** $3(1 - 2t) \leq t - 4$ **l** $2(3 + x) \geq 4(6 - x)$

m $7(y + 3) - 2(3y - 1) < 0$ **n** $4(5 - 2x) > 3(7 - 2x)$ **o** $3(4u - 1) - 5(u - 3) < 9$

3 Find the set of values of x for which

a $x^2 - 4x + 3 < 0$ **b** $x^2 - 4 \leq 0$ **c** $15 + 8x + x^2 < 0$ **d** $x^2 + 2x \leq 8$

e $x^2 - 6x + 5 > 0$ **f** $x^2 + 4x > 12$ **g** $x^2 + 10x + 21 \geq 0$ **h** $22 + 9x - x^2 > 0$

i $63 - 2x - x^2 \leq 0$ **j** $x^2 + 11x + 30 > 0$ **k** $30 + 7x - x^2 > 0$ **l** $x^2 + 91 \geq 20x$

4 Solve each inequality.

a $2x^2 - 9x + 4 \leq 0$ **b** $2r^2 - 5r - 3 < 0$ **c** $2 - p - 3p^2 \geq 0$

d $2y^2 + 9y - 5 > 0$ **e** $4m^2 + 13m + 3 < 0$ **f** $9x - 2x^2 \leq 10$

g $a^2 + 6 < 8a - 9$ **h** $x(x + 4) \leq 7 - 2x$ **i** $y(y + 9) > 2(y - 5)$

j $x(2x + 1) > x^2 + 6$ **k** $u(5 - 6u) < 3 - 4u$ **l** $2t + 3 \geq 3t(t - 2)$

m $(y - 2)^2 \leq 2y - 1$ **n** $(p + 2)(p + 3) \geq 20$ **o** $2(13 + 2x) < (6 + x)(1 - x)$

5 Giving your answers in terms of surds, find the set of values of x for which

a $x^2 + 2x - 1 < 0$ **b** $x^2 - 6x + 4 > 0$ **c** $11 - 6x - x^2 > 0$ **d** $x^2 + 4x + 1 \geq 0$

6 Find the value or set of values of k such that

a the equation $x^2 - 6x + k = 0$ has equal roots,

b the equation $x^2 + 2x + k = 0$ has real and distinct roots,

c the equation $x^2 - 3x + k = 0$ has no real roots,

d the equation $x^2 + kx + 4 = 0$ has real roots,

e the equation $kx^2 + x - 1 = 0$ has equal roots,

f the equation $x^2 + kx - 3k = 0$ has no real roots,

g the equation $x^2 + 2x + k - 2 = 0$ has real and distinct roots,

h the equation $2x^2 - kx + k = 0$ has equal roots,

i the equation $x^2 + kx + 2k - 3 = 0$ has no real roots,

j the equation $3x^2 + kx - x + 3 = 0$ has real roots.

1 Solve each of the following inequalities.

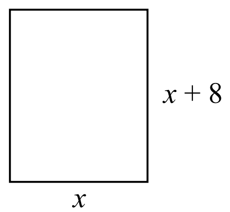
a $\frac{1}{2}y + 3 > 2y - 1$

b $x^2 - 8x + 12 \geq 0$

2 Find the set of integers, n, for which

$$2n^2 - 5n < 12.$$

3



The diagram shows a rectangular birthday card which is x cm wide and $(x + 8)$ cm tall.

Given that the height of the card is to be at least 50% more than its width,

a show that $x \leq 16$.

Given also that the area of the front of the card is to be at least 180 cm^2,

b find the set of possible values of x.

4 Find the set of values of x for which

$$(3x - 1)^2 < 5x - 1.$$

5 Given that $x - y = 8$,

and that $xy \leq 240$,

find the maximum value of $(x + y)$.

6 Solve the inequality

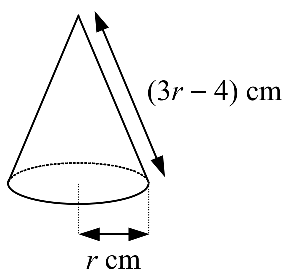
$$(3t + 1)(t - 4) \geq 2t(t - 7).$$

7 Given that the equation $2x(x + 1) = kx - 8$ has real and distinct roots,

a show that $k^2 - 4k - 60 > 0$,

b find the set of possible values of k.

8



A party hat is designed in the shape of a right circular cone of base radius r cm and slant height $(3r - 4)$ cm.

Given that the height of the cone must not be more than 24 cm, find the maximum value of r.