

# SHARP

## Worksheet 2: Equations and Inequalities

### Grade 11 Mathematics

1. Complete the square for each of the following:

- |                              |                         |       |
|------------------------------|-------------------------|-------|
| a) $x^2 + 2x$                | b) $x^2 + 5x$           | (R)   |
| c) $3x^2 + 12x$              | d) $\frac{1}{2}x^2 + x$ | (R/C) |
| e) $x^2 - 3x + 4$            | f) $x^2 - 4x + 5$       | (R)   |
| g) $3x^2 + 7x - 9$           | h) $2x^2 - 3x + 5$      | (C)   |
| i) $\frac{1}{3}x^2 + 4x - 9$ | j) $5x^2 - 7x + 6$      | (C)   |

2. Solve for  $x$  (to two decimal places where necessary):

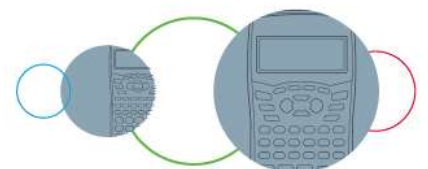
- |                            |                                 |     |
|----------------------------|---------------------------------|-----|
| a) $3x^2 - 23x + 14 = 0$   | b) $x^2 - 19x + 21 = 0$         | (C) |
| c) $x^2 + 5x - 66 = 0$     | d) $2x^2 - 13x - 24 = 0$        | (R) |
| e) $2x^2 - 15x + 30 = 0$   | f) $2(x^2 - 5x + 2) = x - 1$    | (C) |
| g) $2x(x - 3) = 5x - 12$   | h) $3x^2 - 13x + 12 = 0$        | (C) |
| i) $4(5x^2 - x + 1) = 17x$ | j) $x^2 - \frac{1}{2}x - 3 = 0$ | (C) |

3. Solve for  $x$ :

- |                                   |                               |     |
|-----------------------------------|-------------------------------|-----|
| a) $8 - x \leq 3x$                | b) $4(x - 5) > -3(2 - x)$     | (R) |
| c) $3x(x - 3) \leq 30$            | d) $3x(x - 1) \geq 2(5x - 2)$ | (C) |
| e) $2x(x - 1) > 3(15 - x)$        | f) $2x(x - 2) < 3(5 - x)$     | (C) |
| g) $2x^2 - 3x - 50 \leq 6(x + 1)$ | h) $4x(x - 8) > 5x - 9$       | (C) |
| i) $2x(1 - x) \geq 10 - 7x$       | j) $x(x + 10) < 7(2x - 3)$    | (C) |

4. Solve the following simultaneous equations for  $x$  and  $y$ :

- |                             |     |                                    |     |
|-----------------------------|-----|------------------------------------|-----|
| a) $y = -\frac{2}{x+3} + 4$ | and | $8y = x + 25$                      | (C) |
| b) $-y = 2x^2 - 19x + 9$    | and | $y = -3x + 39$                     | (C) |
| c) $y = x^2 + x - 30$       | and | $y - 2x = 0$                       | (R) |
| d) $y = \frac{3}{x-6} + 1$  | and | $x - y = 3$                        | (C) |
| e) $y = \frac{8}{x-1} - 5$  | and | $\frac{1}{2}y = 2x - 2\frac{1}{2}$ | (C) |



5. Given  $y = (x + 3)(x^2 - 2)(x^2 + 3)$ , determine the values of  $x$  that are:
- a) real (R)
  - b) irrational (R)
  - c) non-real (R)
  - d) integer (R)
6. Determine the nature of the roots of the following:
- |                      |                    |     |
|----------------------|--------------------|-----|
| a) $x^2 + x - 1$     | b) $2x^2 + 3x - 5$ | (R) |
| c) $x^2 - x - 30$    | d) $3x^2 + 5$      | (R) |
| e) $5x^2 - 43x + 24$ | f) $x^2 - 2x + 1$  | (R) |
| g) $5x^2 - 3x + 43$  | h) $x^2 + 4x + 3$  | (R) |
| i) $x^2 + 3x + 6$    | j) $x^2 - 4$       | (R) |
7. If the area of a circle is  $x^2\pi$  determine the perimeter of the rectangle whose short side is the radius of the circle and whose long side is 5m longer than the short side, given that the area is  $6m^2$ . (P)
8. A ball is thrown up into the air 3m from the base of a building. It lands 6m from the base of the building and follows the shape of a negative parabola. If an arrow is shot at the ball and follows the path of  $2y = 3x - 9$ , determine the point where the arrow will hit the ball. (P)
9. Referring to question 8, determine the maximum height of the ball by completing the square. (C)
10. The base of a certain seabed is given in the picture. The seabed has an equation of  $xy - 2x = 3$  for  $x > 0$ . A drill is planned to go through the seabed at angle of  $45^\circ$  to the base of the rock (hint: use  $\tan \theta = m$ ) and comes from the ship with the coordinates (5; 7). Determine the coordinates where the drill will meet the sand. (P)

