Question 1

Worked Solution

Solve $x^2 + 2x < 3$.

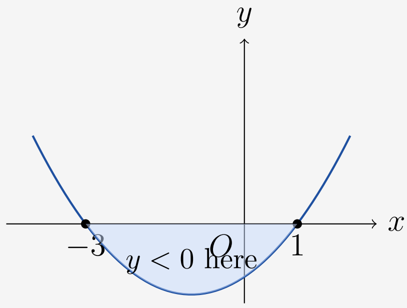
Rearrange to zero on one side:

$$x^2 + 2x - 3 < 0$$

Find critical values by solving $x^2 + 2x - 3 = 0$:

$$(x+3)(x-1) = 0 \implies x = -3 \text{ or } x = 1$$

Sketch to find the correct region:



The parabola is U-shaped. It is *below* the x-axis (i.e. $y < 0$) **between** the roots.

$$-3 < x < 1$$

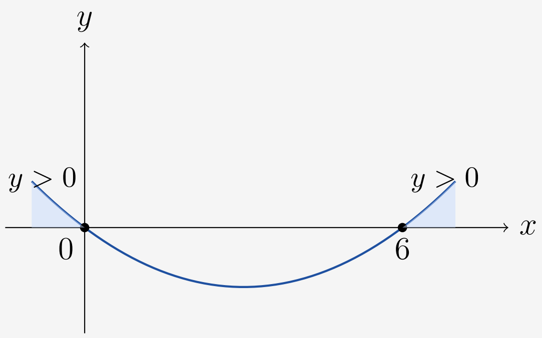
Question 2

Worked Solution

Solve $x(x-6) > 0$.

Expanding: $x^2 - 6x > 0$. Critical values from $x(x-6) = 0$: $x = 0$ or $x = 6$.

Sketch:



The parabola is U-shaped. It is *above* the x-axis **outside** the roots.

$$x < 0 \quad \text{or} \quad x > 6$$

Question 3

Worked Solution

Solve $\frac{5x-3}{2} < x+5$.

Multiply both sides by 2:

$$5x - 3 < 2x + 10$$

$$3x < 13$$

$$x < \frac{13}{3}$$

Question 4

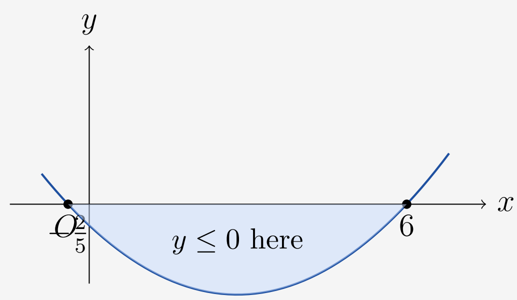
Worked Solution

Solve $5x^2 - 28x - 12 \leq 0$.

Find critical values by solving $5x^2 - 28x - 12 = 0$:

$$(5x+2)(x-6) = 0 \implies x = -\frac{2}{5} \text{ or } x = 6$$

Sketch:



The parabola is U-shaped. It is *below* the x-axis **between** the roots.

$$-\frac{2}{5} \leq x \leq 6$$

Question 5

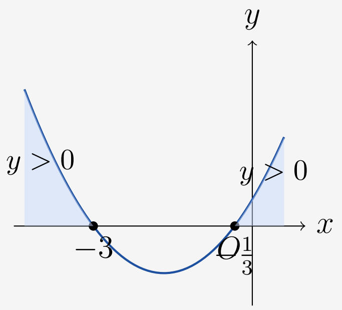
Worked Solution

Solve $3x^2 + 10x + 3 > 0$.

Find critical values by solving $3x^2 + 10x + 3 = 0$:

$$(3x+1)(x+3) = 0 \implies x = -\frac{1}{3} \text{ or } x = -3$$

Sketch:



The parabola is U-shaped. It is *above* the x-axis **outside** the roots.

$$x < -3 \quad \text{or} \quad x > -\frac{1}{3}$$

Question 6

Worked Solution

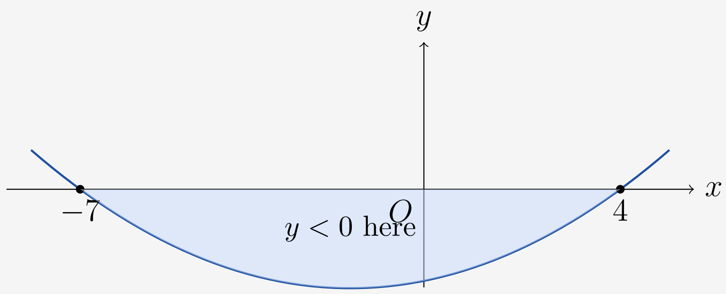
Part (i) — Rectangular tile, area < 112 cm^2:

Area $= 4x(x+3) = 4x^2 + 12x$. Set up inequality:

$$4x^2 + 12x < 112 \implies 4x^2 + 12x - 112 < 0 \implies x^2 + 3x - 28 < 0$$

Factorise: $(x+7)(x-4) = 0 \implies x = -7$ or $x = 4$.

Sketch:



Region is between roots: $-7 < x < 4$. Since x is a length, $x > 0$:

$$0 < x < 4$$

Part (ii) — Perimeter of L-shaped tile between 20 cm and 54 cm:

The L-shaped tile has edges: $4y$, $6x+3 \to 4y$, $(y+3)$, $2y$, $(6x+3)-(2x+1) = 4y-1$...

Reading from the diagram: the 6 edges are $4y$, $(y+3)$, $4y$, y, $2y$, $2y+3$ wait — using the mark scheme approach:

Perimeter $= 4y + (y+3) + 2y + y + 2y + 3 = 10y + 6$

Set up double inequality:

$$20 < 10y + 6 < 54$$

$$14 < 10y < 48$$

$$1.4 < y < 4.8$$

$$1.4 < y < 4.8$$

Question 7

Worked Solution

Width $= x$ m, length $= x + 10$ m.

Part (i) — Perimeter > 64 m:

$$2(x + x + 10) > 64 \implies 2(2x + 10) > 64 \implies 4x + 20 > 64 \implies 4x > 44$$

$$x > 11$$

Part (ii) — Area < 299 m^2, show $(x - 13)(x + 23) < 0$:

Area $= x(x + 10) < 299$:

$$x^2 + 10x - 299 < 0$$

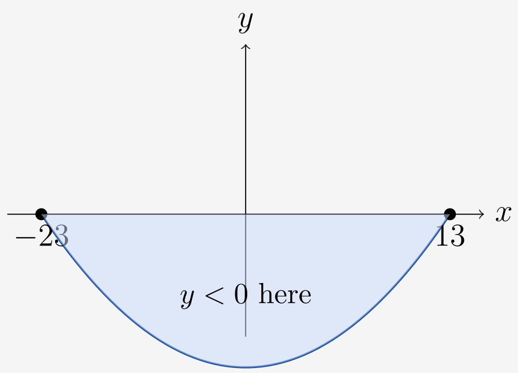
Check: $(x - 13)(x + 23) = x^2 + 23x - 13x - 299 = x^2 + 10x - 299$ ✓

So $(x - 13)(x + 23) < 0$. □

Part (iii) — Combined solution:

Solve $(x - 13)(x + 23) < 0$: critical values $x = 13$ and $x = -23$.

Sketch (schematic — roots not to scale):



Region between roots: $-23 < x < 13$.

Combined with $x > 11$ from part (i), and $x > 0$ (width):

$$11 < x < 13$$

End of Worked Solutions — ALevelMathsRevision.com