

When a quadratic function is given in vertex form, there are two ways to determine the x-intercepts:

- Set $y = 0$ and solve for x by opposite operations
- Set $y = 0$ and expand and simplify to standard form then apply the quadratic formula

Ex. Determine the x-intercepts of the quadratic function $f(x) = 4(x + 1)^2 - 9$

Method 1: Convert to standard form

Method 2: Solve by opposite operations

We can change a quadratic function from standard form to vertex form by determining the vertex.

Ex. Write the quadratic function $g(x) = -2x^2 - 12x - 11$ in vertex form.

Mixed problems

1. A trucking company has modeled the monthly fuel cost for each truck $C(v) = 0.004v^2 - 0.76v + 210$ where v represents the driving speed (in km/h) on the highway.
 - a) Determine the most efficient speed for the company to operate their trucks.
 - b) Determine the minimum monthly fuel cost for each truck.
2. Fireworks are being launched from a two-storey high platform so that their height above the ground (in metres) can be modelled by the equation $h = -5t^2 + 30t + 6.25$, where t is the time after each firework is launched (in seconds). How long it will take a firework to reach a height of 50 m above the ground?
3. Some math students are firing a potato launcher from the deck of their cottage and analysing the flight of each potato. They have modelled the height of a potato above the water, h metres, using the function $h = -4.9t^2 + 29.4t + 16$, where t is the time in seconds after the potato is launched.
 - a) For how long is each potato in the air?
 - b) Determine the maximum height that each potato reaches above the water.
4. An 8 x 10 inch photograph is being mounted on mat board so that the mat board provides a boarder around the photograph that has an equal width on all sides. Determine the dimensions of the mat board so that area of the boarder is equal to the area of the photograph.
5. A 4 x 6 inch photograph is being cropped by an equal amount on its length and width in order to reduce its area by 25%. Determine the new dimensions of the photograph.
6. A commuter train carries 2000 passengers daily between two cities. The cost to ride the train is \$7. Market research shows that for every \$0.10 increase in the fare, 40 fewer passengers will choose to ride the train. What fare should be charged in order to maximise revenue?
7. Graph the quadratic function $f(x) = 3x^2 + 30x + 67$ and write its equation in vertex form.
8. A serve in volleyball can be modelled by the quadratic function $h(t) = -4.9t^2 + 2t + 2.3$, where h is the height of the ball above the court (in metres) and t is the time after it was served (in seconds).
 - a) Determine the maximum height that the ball reaches above the court
 - b) How long does the ball take to reach a player on the other team who contacts it at a height of 0.5 metres above the court?
9. State the number of x-intercepts on each parabola. Justify your answers.
 - a) $y = 2(x - 3)^2 + 4$
 - b) $y = -(x - 7)^2$
10. Show that it is not possible to solve the quadratic equation $7x^2 + 3 = 9x$.