109. Key Features of Quadratic Graphs (Roots, Intercepts, Turning Points)

Practice Questions

1. Find the roots (x-intercepts) of $y = x^2 - 5x + 6$ by factorising. Give your answer as coordinates.
2. Find the y-intercept of $y = x^2 - 4x + 3$. Give your answer as a coordinate.
3. Find the turning point of $y = x^2 - 6x + 8$ by using the symmetry method. Give your answer as a coordinate.
4. Identify the axis of symmetry for the graph of $y = x^2 - 8x + 10$. Give your answer as an equation.
5. Factorise $y = x^2 - 7x + 12$ and state its roots. Give your answer as coordinates.
6. Find the x-values where $y = 0$ for $y = x^2 - 2x - 3$ by factorising. Give your answer as coordinates.
7. The equation $y = x^2 + 4x - 5$ is given. Find the roots by solving $x^2 + 4x - 5 = 0$. Give your answer as coordinates.
8. Determine if $y = -x^2 + 6x - 5$ has a maximum or minimum turning point. State whether it is a maximum or minimum.
9. Solve $y = x^2 - 9$ to find the x-intercepts. Give your answer as coordinates.
10. Find the roots and y-intercept of $y = 2x^2 - 8x + 6$ by factorising and substituting $x = 0$. Give your answers as coordinates.

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Scenario Questions

1. A ball is thrown into the air, and its height h (in metres) after t seconds is given by $h = -5t^2 + 20t$. Find the time when the ball reaches the maximum height and its maximum height. Give your answers as values.
2. A bridge has an arch represented by $y = -x^2 + 6x$. Find the highest point of the arch and its x-value. Give your answers as coordinates.
3. A factory's production follows $y = -2x^2 + 12x - 10$, where y is the profit in £1000s and x is the number of products made. Find the number of products that give the maximum profit. Give your answer as a value.
4. A rocket follows the equation $h = -4t^2 + 16t + 20$, where h is the height in metres and t is time in seconds. Find when the rocket reaches the ground. Give your answer as a value.
5. A football follows the path $y = -x^2 + 4x + 3$. Find the highest point of its path. Give your answer as a coordinate.
6. A company's revenue is given by $y = -3x^2 + 18x + 5$, where x is the number of items sold. Find the number of items that give the highest revenue. Give your answer as a value.
7. A firework follows the equation $h = -2x^2 + 10x + 6$. Find the maximum height reached and the time it takes to reach it. Give your answers as values.
8. A satellite dish has a parabolic shape represented by $y = -x^2 + 8x - 12$. Find the lowest point of the dish. Give your answer as a coordinate.
9. A skateboard ramp follows $y = x^2 - 6x + 8$. Find where it touches the ground (roots). Give your answer as coordinates.
10. A factory's production follows $y = -5x^2 + 25x$, where y is the total items produced and x is the hours worked. Find the maximum number of items that can be produced. Give your answer as a value.

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Practice Questions

1. Roots: (2, 0), (3, 0)
2. y-intercept: (0, 3)
3. Turning point: (3, -1)
4. Axis of symmetry: $x = 4$
5. Roots: (3, 0), (4, 0)
6. x-intercepts: (-1, 0), (3, 0)
7. Roots: (-5, 0), (1, 0)
8. Maximum turning point
9. x-intercepts: (-3, 0), (3, 0)
10. Roots: (1, 0), (3, 0); y-intercept: (0, 6)

Scenario Questions

1. Time at maximum height: 2 seconds; Maximum height: 20 metres
2. Highest point: (3, 9)
3. Number of products for maximum profit: 3
4. Time when rocket reaches the ground: 5 seconds
5. Highest point: (2, 7)
6. Number of items for highest revenue: 3
7. Maximum height: 18.5 metres; Time to reach maximum height: 2.5 seconds
8. Lowest point: (4, 4)
9. Roots: (2, 0), (4, 0)
10. Maximum number of items: 31.25