

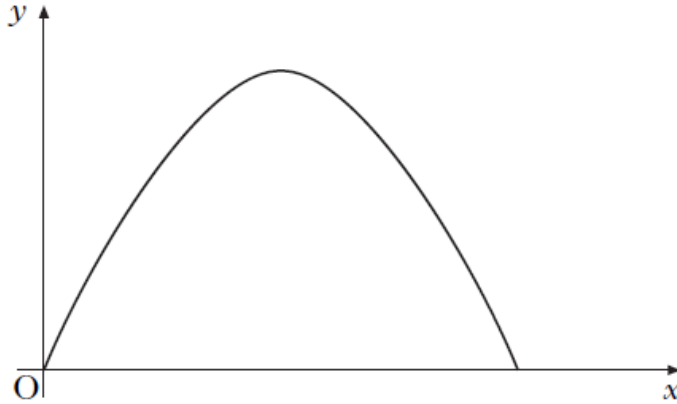
Nat 5 Quadratics summary

- | | | | |
|----|---|---|---|
| 1. | Expand the brackets | (a) $(x - 3)(x + 3)$ | 2 |
| | | (b) $(2x + 1)(x - 5)$ | 2 |
| | | (c) $(x + 3)(x^2 - 2x - 3)$ | 3 |
| | | | |
| 2. | Factorise | (a) $x^2 - 4x - 5$ | 2 |
| | | (b) $3x^2 - 12$ | 3 |
| | | (c) $5x^2 - 8x - 4$ | 2 |
| | | | |
| 3. | Solve the equation | $x^2 - 3x - 4 = 0$ | 3 |
| | | | |
| 4. | Solve the equation | $x^2 - 3x = 10$ | 3 |
| | | | |
| 5. | Write | $x^2 + 4x + 1$ in completed square form | 2 |
| | | | |
| 6. | Sketch the graph of | $y = (x - 2)^2 + 5$ | 3 |
| | | | |
| 7. | Find the maximum value of | $12 + 4x - x^2$ | 3 |
| | | | |
| 8. | Solve the equation | $3x^2 - 2x - 10 = 0$,
give your answer correct to 2 decimal place | 4 |
| | | | |
| 9. | Determine the nature of the roots of the equation | $2x^2 + 3x - 1 = 0$ | 3 |

10. The profit made by a publishing company of a magazine is calculated by the formula $y = x(240 - x)$

Where y is the profit (in pounds) and x is the selling price (in pence) of the magazine.

The graph below represents the profit y against the selling price x



Find the maximum profit that the company can make from sales of the magazine.

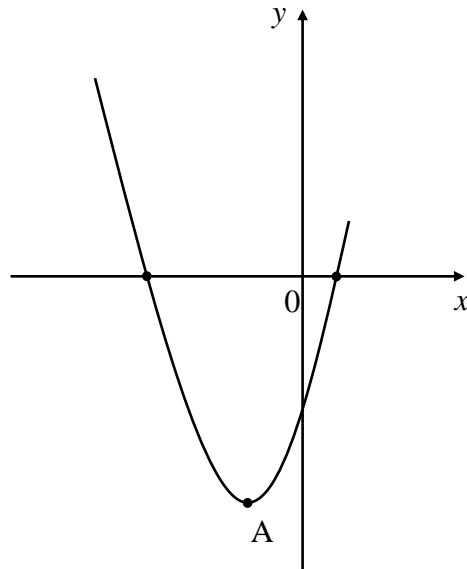
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11. The diagram shows part of the graph of $y = x^2 + 6x - 7$

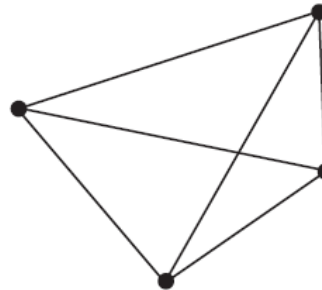
(a) Find the coordinates of the roots of the quadratic graph **2**

(b) Find the equation of the axis of symmetry **1**

(c) Hence find the coordinates of the turning point A **2**



12. The minimum number of roads joining four towns together is 6 as shown in the diagram



The minimum number of roads, r , joining n towns to each other is given by the formula $r = \frac{1}{2} n (n - 1)$

- (a) State the minimum number of roads needed to join 7 towns to each other **1**
 (b) When $r = 55$, show that $n^2 - n - 110 = 0$ **2**
 (c) Hence find **algebraically** the value of n **3**

Answers

1. (a) $x^2 - 9$
 (b) $2x^2 - 9x - 5$
 (c) $x^3 - 2x^2 - 3x + 3x^2 - 6x - 9 = x^3 + x^2 - 9x - 9$
2. (a) $(x - 5)(x + 1)$
 (b) $3(x^2 - 4) = (x + 2)(x - 2)$
 (c) $(5x + 2)(x - 2)$
3. $(x - 4)(x + 1) = 0$, $(x - 4) = 0$ or $(x + 1) = 0$, **$x = 4$ and $x = -1$**
4. $x^2 - 3x - 10 = 0$, $(x - 5)(x + 2) = 0$, **$x = 5$ and $x = -2$**
5. $(x + 2)^2 - 3$
6. Turning point at **(2, 5)**, y-intercept at **(0, 9)**
7. Using $x = -b/2a$ for the x-coordinate of the turning point
 Turning point is (2, 16) so maximum value is **y = 16**
8. $a = 3$, $b = -2$, $c = -10$ discriminant $b^2 - 4ac = 124$ **$x = 2.19$, $x = -1.52$**
9. $a = 2$, $b = 3$, $c = -1$ discriminant $b^2 - 4ac = (3)^2 - 4(2)(-1) = 17$
 $17 > 0$, so this quadratic has **real, distinct roots**
10. Roots of the equation are $x = 0$ and $240 = 0$,
 turning point is (120, 14400) **Profit is £14400**

11. (a) roots are $(-7,0)$, $(1,0)$ (b) $x = -3$, (c) $A(-3, -16)$
 12. (a) $r = \frac{1}{2} 7(7 - 1) = 21$
 (b) $55 = \frac{1}{2} n(n - 1)$, $110 = n(n - 1)$, $110 = n^2 - n$, $n^2 - n - 110 = 0$
 (c) $n^2 - n - 110 = 0$, $(n - 11)(n + 10)$, $n = 11$, $n = -10$, $n = 11$

Extra help – Quadratics

	Examples to read	Questions to try
1	Expanding Brackets Ex 3.6 - 3.8 Pages 31/33	Q2,3 Page 32, Q1 Page 33
2	Factorising expressions Ex 4.2 – 4.8 Pages 37/40	Q1 Page 37, Q1 Page 38 Q1 Page 39, Q1 Page 40
3/4	Solving quadratic equations algebraically Ex 19.1 & 19.2 Pages 184/5	Q4 Page 185, Q1 Page 186
5.	Completing the square Ex 5.1 Page 43	Q3 Page 43
6	Sketching a graph in completed square form Ex 17.3 & 17.4 Pages 164/5	Q1 Page 165
7	Turning points Ex 17.6 Page 169	Q5 (iii) Page 173
8	Quadratic Formula Ex 19.4 & 19.5 Pages 187/8	Q2 Page 188
9	Properties of the discriminant Ex 19.14 Page 199	Q1 Page 201
10/11	Problem solving with graphs Ex 17.7 Page 170 Ex 18.1 Page 175 Ex 18.4 Page 181	Q3 Page 172 Q2 Page 176 Q1 Page 180
12	Problem solving with quadratic equations Ex 19.11 – 19.13 Pages 194/5	Q2,3 & 9 Pages 196/7