Quadratics and Parabolas - Practice 2

16 questions | 47 marks | 60 minutes

A second paper combining tables, graph sketches and explanation.

Equivalent correct methods earn the corresponding marks.

1. Expand $(x-5)(x+2)$. [2 marks]

$x^2+2x-5x-10=x^2-3x-10.$

Answer: $x^2-3x-10$

2. Expand $(3x-1)^2$. [2 marks]

$(3x)^2-2(3x)(1)+1=9x^2-6x+1.$

Answer: $9x^2-6x+1$

3. Factorise $x^2+2x-24$. [2 marks]

$6-4=2$ and $6(-4)=-24.$

Answer: $(x+6)(x-4)$

4. Factorise $x^2-10x+25$. [2 marks]

$-5-5=-10$ and $(-5)(-5)=25.$

Answer: $(x-5)^2$

5. Solve $x^2+4x=12$. [3 marks]

$x^2+4x-12=(x+6)(x-2)=0.$

Answer: $x=-6,2$

6. Solve $(x-3)^2=0$. How many distinct real solutions are there? [2 marks]

Both identical factors give the same root 3.

Answer: $x=3$; one distinct solution.

7. Complete a table for $y=-x^2+2x+3$ at $x=-1,0,1,2,3$. [3 marks]

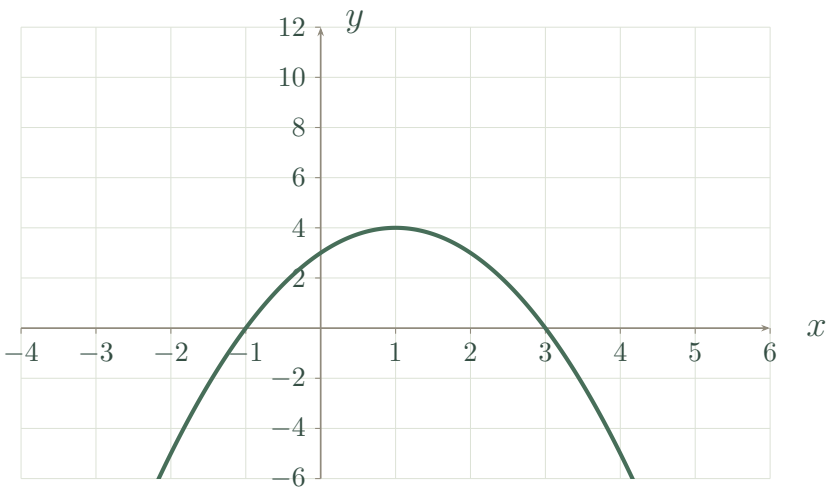
At -1, $-1-2+3=0$.

The other outputs are $3,4,3,0$.

Answer: $0,3,4,3,0$

8. Plot $(-1,0),(0,3),(1,4),(2,3),(3,0)$ and sketch the quadratic curve. [4 marks]

Model answer: $y=-x^2+2x+3$



Plot all five points.

Join smoothly with symmetry about $x=1$.

Answer: A smooth downward parabola; turn $(1,4)$; roots $-1,3$.

9. For $y = 2(x-1)^2 - 3$, give the turn and compare it with $y = (x-1)^2 - 3$. [3 marks]

The square is zero at $x = 1$.

The coefficient 2 makes it narrower on identical scales.

Answer: $(1, -3)$; same turn and double the vertical distance from it.

10. Find the axis and turning point of $y = (x+3)(x-5)$. [3 marks]

$\frac{-3+5}{2} = 1$.

$y = 4(-4) = -16$ at $x = 1$.

Answer: $x = 1$; $(1, -16)$.

11. Which output list could come from a quadratic rule? Explain using changes. [3 marks]

Equal input steps

x	A	B
0	1	1
1	3	2
2	5	5
3	7	10

A has constant first difference 2, so is linear.

B matches $x^2 + 1$.

Answer: B: first differences $1, 3, 5$; second differences $2, 2$.

12. Check $x^2 - 4x - 21 = (x-7)(x+3)$ by expansion. [2 marks]

$x^2 + 3x - 7x - 21 = x^2 - 4x - 21$.

Answer: The claim is correct.

13. Two positive lengths differ by 4 cm and have product $77\ \text{cm}^2$. Find them. [4 marks]

$x(x+4)=77$.

$(x+11)(x-7)=0$; reject $x=-11$.

Answer: 7 cm and 11 cm

14. Expand $(x+2)^2-x^2$. Is the result quadratic or linear? [3 marks]

$x^2+4x+4-x^2=4x+4$.

The squared terms cancel.

Answer: $4x+4$, linear.

15. Use $f(x)=x^2-2$ to locate its positive root between consecutive tenths. [3 marks]

$f(1.4)=-0.04$ and $f(1.5)=0.25$.

The continuous graph changes sign.

Answer: Between 1.4 and 1.5.

16. A ball has modelled height $h=-t^2+6t+7$ metres, for $t\geq 0$ seconds. [6 marks]

(a) When does it reach the ground? [3 marks]

$t^2-6t-7=(t-7)(t+1)=0$.

Reject $t=-1$.

Answer: 7 s

(b) Find its greatest height. [3 marks]

The roots $-1, 7$ have midpoint 3.

$h(3)=-9+18+7=16$.

Answer: 16 m at $t=3$ s.