Year 9 Quadratics and Parabolas - Applications Test

Name: _____ Date: _____

12 questions | 50 marks | 70 minutes

1. [4 marks]

(a) Expand $(x+3)(x+5)$.

(b) Factorise $x^2+7x+12$.

2. Solve $x^2-6x=0$. Give both solutions. [3 marks]

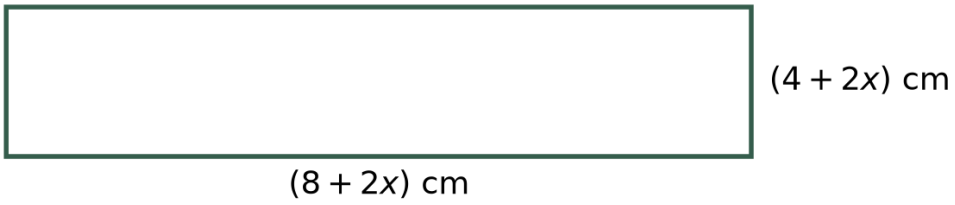
3. A rectangular garden is x metres wide and $(x + 3)$ metres long. Its area is 40 square metres. [4 marks]

(a) Write an equation for the area.

(b) Find the width and length. Explain why you reject one solution.

4. A photo is 8 cm wide and 4 cm high. A border of width x cm is added on every side. The photo and border together have area 96 square centimetres. [4 marks]

Outside dimensions of the photo and border



(a) Write an equation using the outside dimensions.

(b) Show that it simplifies to $x^2 + 6x - 16 = 0$.

(c) Find the border width.

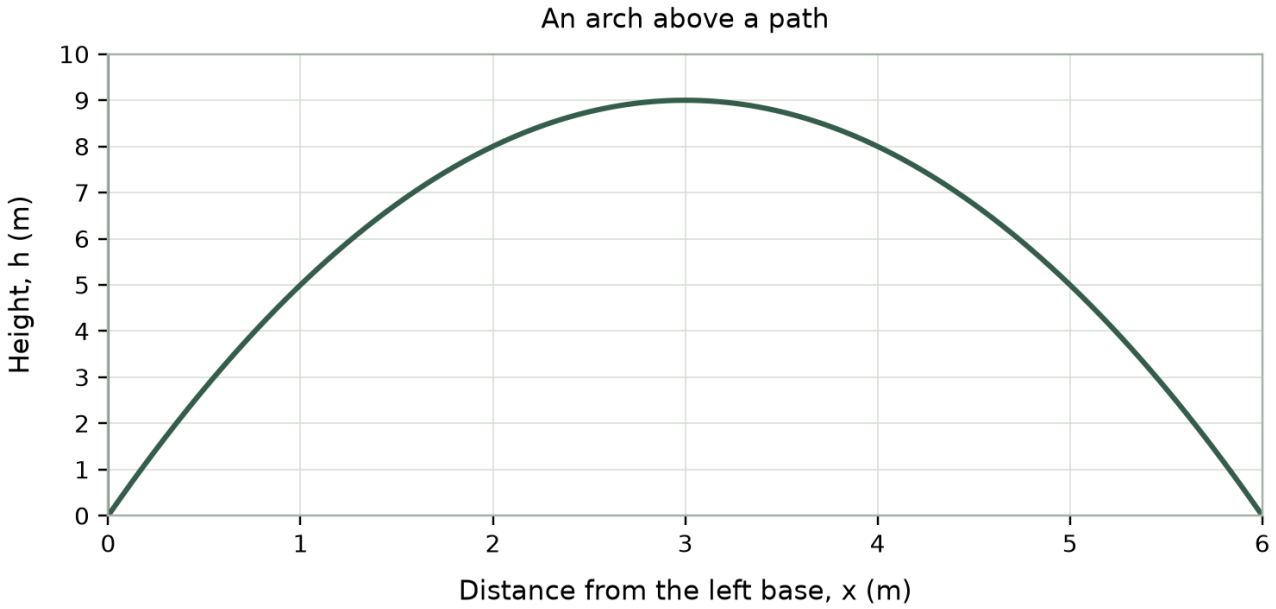
5. A gardener uses 20 m of fencing for three sides of a rectangle. A wall forms the fourth side. Each side at right angles to the wall has length x metres. [5 marks]

(a) Write the length of the fenced side parallel to the wall.

(b) Write the area A in terms of x.

(c) The same area rule can be written $A = 50 - 2(x - 5)^2$. Use this form to find the largest possible area and the rectangle's dimensions. Explain why it is the largest.

6. The graph shows an arch. Its height is $h = -x^2 + 6x$, where x is the distance from its left base. Both distances are in metres. [5 marks]



(a) Read the width of the arch at ground level.

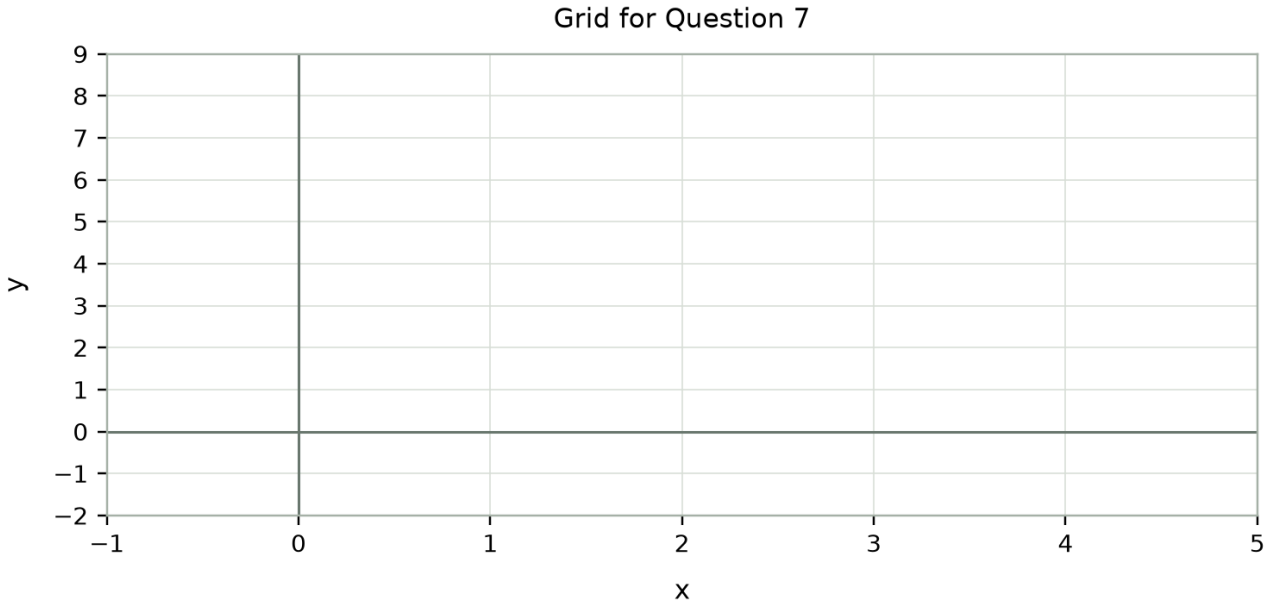
(b) State its greatest height and the value of x there.

(c) Use the rule to find both places where the arch is 8 m high.

7. Use $y = x^2 - 4x + 3$. [5 marks]

(a) Make a table of values for $x = 0, 1, 2, 3, 4$.

(b) Plot the points on the grid and join them with a smooth curve.



(c) State the turning point and the axis of symmetry.

(d) Use your graph to solve $x^2 - 4x + 3 = 0$.

8. A pattern has these values: $n = 0, 1, 2, 3$ give $T = 2, 5, 10, 17$. Two rules are suggested: $T = 3n + 2$ and $T = n^2 + 2n + 2$. [4 marks]

(a) Which rule fits all four values? Show a calculation that distinguishes the rules.

(b) Use that rule to find T when $n = 4$.

(c) Explain why checking only $n = 0$ and $n = 1$ would not settle which rule to use.

9. A stall's profit is modelled by $P = -p^2 + 10p - 16$, where p is the ticket price in dollars and P is profit in dollars. Use prices from 0 to 10 dollars. [4 marks]

(a) Find the two prices that give zero profit.

(b) Find the profit when the price is 4 dollars.

(c) Is a price of 9 dollars profitable? Show a calculation.

10. Mia solves $(x-4)(x+3)=0$ and writes $x=4$ or $x=3$. [4 marks]

(a) Correct her solutions and explain the sign error.

(b) If x is a length in metres, which solution is allowed? Explain why.

(c) Check $x=3$ in the original equation to show why it is not a solution.

11. A monic quadratic has x-intercepts at $x=-2$ and $x=5$. Here, monic means that the coefficient of x^2 is 1. [4 marks]

(a) Write its rule in factorised form.

(b) Expand your rule.

(c) State the y-intercept.

(d) State the axis of symmetry.

12. Two curves have rules $y = 9 - (x - 3)^2$ and $y = 9 - 2(x - 3)^2$. [4 marks]

(a) State the turning point shared by both curves.

(b) Find each y value at $x = 2$.

(c) Which curve is narrower? Use your values to explain.

(d) The first curve is moved up 2 units. Write its new rule.