

# Algebra

## Algebra

## Task 1

## Graphs

<b>Student Task</b>	Work with linear and quadratic functions, their graphs, and equations.
<b>Core Idea 1 Functions and Relations</b>	<b>Understand patterns, relations, and functions.</b> <ul style="list-style-type: none"><li>Analyze functions of one variable by investigating local and global behavior including slopes as rates of change, intercepts, and zeros.</li></ul>
<b>Core Idea 3 Algebraic Properties and Representations</b>	<b>Represent and analyze mathematical situations and structures using algebraic symbols.</b> <ul style="list-style-type: none"><li>Understand the meaning of equivalent forms of expressions, equations, inequalities, or relations.</li><li>Write equivalent forms of equations, inequalities and systems of equations and solve them.</li><li>Use symbolic algebra to represent and explain mathematical relationships.</li></ul>

*Mathematics in this task:*

- Distinguish between linear and quadratic equations and their graphical representations
- Ability to graph a linear equation
- Ability to locate points on a graph and interpret their meaning
- Use algebra to find the intersections of two equations

*Based on teacher observation, this is what algebra students knew and were able to do:*

- Find the coordinates where the graphs intersect
- Give a reason for connecting equations with their graphs
- Draw a graph of  $y=3x$

*Areas of difficulties for algebra students:*

- Finding values for  $x$ , where one graph or equation is less than another
- Using algebra to find the points of intersection for two equations
- Knowing that the equations should equal each other at the points of intersection
- Using factoring as a tool to solve a quadratic equation
- Understanding that you can't divide by 0

*Strategies used by successful students:*

- Making a table of values to help them graph
- Understanding  $y=mx+b$  and using it to help them graph
- Substitution

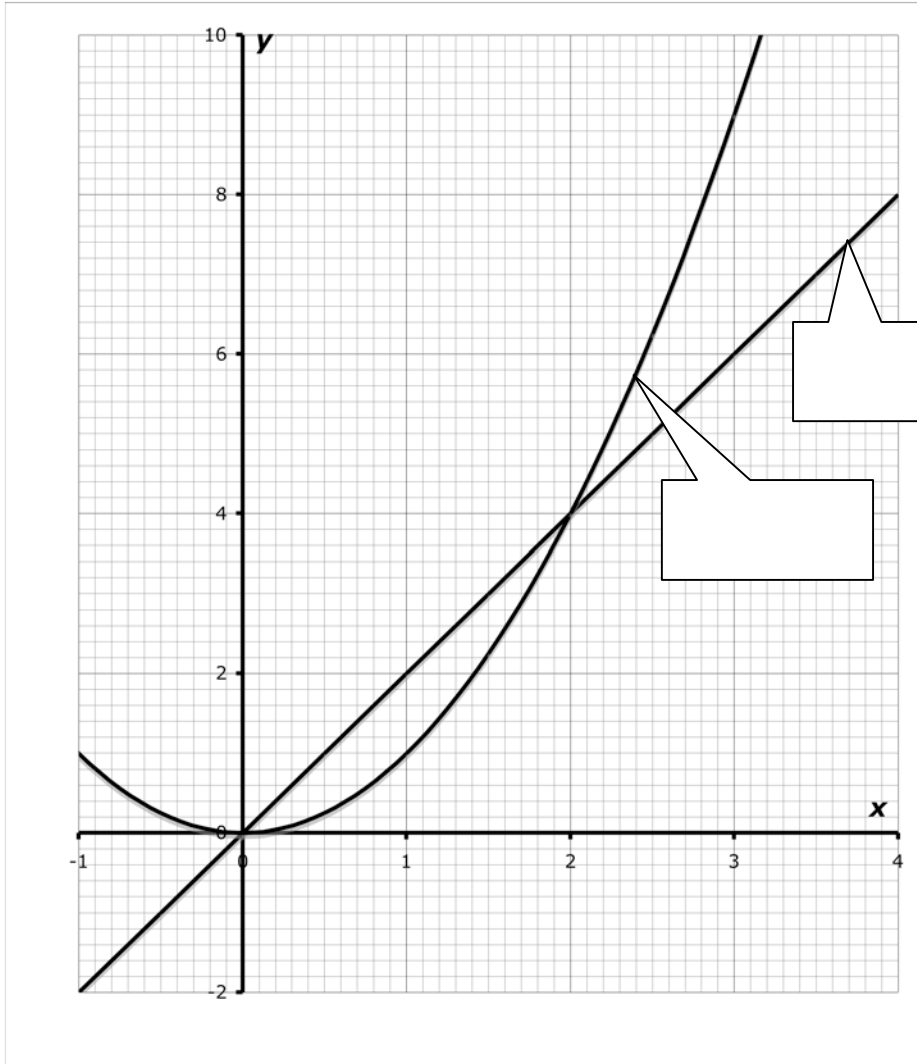
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# Graphs

This problem gives you the chance to:

- work with linear and quadratic functions their graphs and equations
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This diagram shows the graphs of  $y = x^2$  and  $y = 2x$ .



1. Fill in the labels to show which graph is which. Explain how you decided.

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2. Use the diagram to help you complete this statement:

$2x$  is greater than  $x^2$  when  $x$  is between \_\_\_\_\_ and \_\_\_\_\_

3. The graphs of  $y = x^2$  and  $y = 2x$  cross each other at two points.

a. Write down the coordinates of these two points. \_\_\_\_\_

b. Show how you can use algebra to find the coordinates of the two points where the two graphs cross.

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4.

a. On the diagram, draw the graph of  $y = 3x$ .

b. What are the coordinates of the points where  $y = x^2$  and  $y = 3x$  meet?

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c. Where do you think that the graphs of  $y = x^2$  and  $y = nx$  meet? \_\_\_\_\_

d. Use algebra to prove your answer.

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Task 1: Graphs	Rubric	
The core elements of performance required by this task are: • work with linear and quadratic functions their graphs and equations  Based on these, credit for specific aspects of performance should be assigned as follows	points	section points
1. Graphs correctly labelled and convincing reason given	1	1
2. Gives correct answer: between <b>0 and 2</b>	1	1
3.a Gives correct answer: <b>(0, 0) and (2, 4)</b> b Shows correct reasoning to justify the answers in 3.a, such as: When the graphs meet, $x^2 = 2x$ $\therefore x^2 - 2x = 0$ $x(x - 2) = 0$ So $x = 0$ or $x = 2$ When $x = 0$ , $y = 0$ and when $x = 2$ , $y = 4$ So the coordinates are $(0, 0)$ and $(2, 4)$	1           1	           3
4.a Correct graph drawn  b Gives correct answer: <b>(0, 0) and (3, 9)</b>  c Gives correct answer: <b>(0, 0) and (n, n<sup>2</sup>)</b>  d Shows correct work such as: When the graphs meet, $x^2 = nx$ $\therefore x^2 - nx = 0$ $x(x - n) = 0$ So $x = 0$ or $x = n$ When $x = 0$ , $y = 0$ and when $x = n$ , $y = n^2$ So the coordinates are $(0, 0)$ and $(n, n^2)$	1  1  1       1	                4
<b>Total Points</b>		<b>9</b>