Year 9 Linear and Quadratic Graphs – Revision Notes

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Year 9 · Maths · Linear and Quadratic Graphs · Key ideas and worked examples

For grown-ups and learners: read each part and try the worked example. Then work through the sheets: Foundation, Developing, Challenge, then Mixed Practice to revise everything. Show your working: it earns marks in tests and helps you spot mistakes.

1. Linear functions from words

A fixed amount plus a rate gives **y = mx + c**: a plan costing $15 a month plus $2 per gigabyte is y = 2x + 15. When a fixed total is shared between two kinds of item, the function is **ax + by = c**. For example, adult tickets at $5 and child tickets at $3 costing $60 in total give 5x + 3y = 60.

Example: A 36 m rope is cut into x pieces 2 m long and y pieces 3 m long, with none left over. Write an equation connecting x and y.
→ Total = cost of the x items + cost of the y items
→ 2x + 3y = 36
Answer: 2x + 3y = 36

2. Tables of values and plotting

For a line such as 2x + 3y = 12, put x = 0 to find where it crosses the y-axis (y = 4). Put y = 0 for the x-axis (x = 6), then join the points. For **y = x² ± a**, square first: (−3)² = 9. The graph is a symmetrical **U-shaped curve** with its lowest point at (0, ±a).

Example: For the line 2x + 5y = 20, find y when x = 0 and 5.
→ 5y = 20 − 2x
→ Points: (0, 4), (5, 2)
Answer: 4, 2

3. The equation of a straight line

Gradient = change in y ÷ change in x. A line through (0, 1) and (4, 3) has gradient 2/4 = **1/2**, so y = (1/2)x + 1. If a line goes down from left to right, it has a negative gradient. Rearrange ax + by = c to compare: 4x + 2y = 10 gives 2y = −4x + 10, so **y = −2x + 5** (gradient −2, y-intercept 5).

Example: Write 3x + 3y = 5 in the form y = mx + c. State the gradient.
→ Subtract 3x: 3y = −3x + 5
→ Divide by 3: y = −x + 5/3
Answer: y = −x + 5/3; gradient −1

4. Real-life graphs and compound measures

A **compound measure** combines two quantities: speed (km/h), rate of flow (litres per minute), density (g/cm³). On a distance–time graph the **gradient is the speed**, a horizontal part means stopped, and a steeper line means faster. Change minutes to hours before working out a speed in km/h: 90 km in 45 minutes is 90 ÷ 0.75 = 120 km/h.

Example: A metal has a density of 9.5 g/cm³. Find the mass of a 40 cm³ block of the metal.
→ Mass = density × volume
→ 9.5 × 40 = 380 g
Answer: 380 g

Think like a mathematician: test a few cases (**specialising**), look for the rule that always works (**generalising**), and explain why you are sure (**convincing**). When you check someone's working, say what is wrong and how to **improve** it.

Common mistakes: reading the gradient of 2x + y = 6 as 2 instead of −2. Writing $(-2)^2 = -4$. Dividing the change in x by the change in y. Using minutes instead of hours for km/h. Thinking a flat line on a distance–time graph means steady speed.