GRADEUP

AQA (GCSE Notes)

Chapter 3: Algebra

Q1. Simplify the algebraic fraction: $(2x^2 - 4x) / (4x)$.

Q2. Expand and simplify: $(x + 3)(x - 7)$.

Q3. Plot the graph of $y = -x + 2$ for values of x from -3 to 3.

Q4. Find the equation of a circle with centre (4, -2) and radius 6.

Q5. Solve the equation: $3x + 5 = 2x - 4$.

Q6. Solve the equation: $x^2 - 4x = 5$.

Q7. Expand and simplify: $(x - 2)^2 - (x + 1)(x - 1)$.

Q8. Rearrange the formula $y = 3x + 2$ to make x the subject.

Q9. Sketch the graph of $y = (x - 1)(x + 3)$.

Q10. Solve the inequality: $4x - 7 > 2x + 1$.

Q11. Sketch the graph of $y = x^2 - 4x + 3$.

Q12. Use the iteration formula $x_{n+1} = \sqrt{(7 + x_n)}$ to find the next two terms after $x_0 = 2$.

Q13. Find the area under the curve $y = 2x$ between $x = 1$ and $x = 4$.

Q14. Draw the graph of $y = x^2 - 6x + 8$ and label the turning point.

Q15. Expand and simplify: $(x + 4)^2 - 3(x - 2)$.

Q16. Solve the quadratic equation $x^2 + 2x - 15 = 0$ by factorising.

Q17. Draw a graph to show how the distance changes over time if someone walks 3 km in 1 hour, rests for 30 minutes, and then runs 3 km in 30 minutes.

Q18. Write down the nth term of the sequence: 3, 7, 11, 15, ...

Q19. Solve the simultaneous equations:
$x + y = 10$
$x - y = 4$

Q20. Sketch the graph of $y = |x - 2|$.

GRADEUP

Q21. Solve the equation $x^2 - 3x - 10 = 0$ using the quadratic formula.

Q22. Describe the transformation of the graph $y = f(x)$ when it becomes $y = f(x + 3)$.

Q23. Simplify: $(x^2 - 9)/(x^2 - x - 6)$.

Q24. Factorise: $x^2 - 10x + 21$.

Q25. Draw the graph of $y = 2x + 1$ and find its gradient.

Q26. Find the centre and radius of the circle with equation $x^2 + y^2 - 4x + 2y - 20 = 0$.

Q27. Solve the equation: $2(x - 3) = 4x + 1$.

Q28. Rearrange the formula $A = \pi r^2$ to make r the subject.

Q29. Sketch the graph of $y = (x - 2)^2 - 1$.

Q30. Solve the inequality $x^2 - 5x + 6 \leq 0$.

Q31. Plot the graph of $y = x^3 - 3x$.

Q32. Use the iteration formula $x_{n+1} = (10 - x_n^2)/2$ with $x_0 = 1$ to find x_1 and x_2.

Q33. Estimate the area under the curve $y = x^2$ between $x = 0$ and $x = 2$ using 4 trapeziums.

Q34. Sketch the graph of $y = -x^2 + 4x - 3$.

Q35. Factorise completely: $2x^2 - 8$.

Q36. Solve: $(x - 1)(x + 5) = 0$.

Q37. A person drives at 60 km/h for 2 hours and then at 80 km/h for 1 hour. Draw a distance-time graph.

Q38. Find the next two terms of the sequence: 5, 9, 15, 23, ...

Q39. Solve the simultaneous equations:
$2x + 3y = 12$
$x - y = 4$

Q40. Sketch the graph of $y = 1/x$.

Q41. Solve the equation $x^2 + 4x + 1 = 0$ using the quadratic formula.

Q42. Describe the transformation of the graph $y = f(x)$ to $y = 2f(x)$.

Q43. Simplify: $(2x^2 + 4x)/(2x)$.

Q44. Expand and simplify: $(x + 2)(x + 5)$.

Q45. Draw the graph of $y = -2x + 4$ and find the y-intercept.

Q46. Write the equation of a circle with centre at (0, 0) and radius 7.

Q47. Solve the equation: $3(x + 2) = 2x + 7$.

Q48. Make t the subject of the formula: $s = ut + \frac{1}{2}at^2$.

Q49. Sketch the graph of $y = (x + 1)(x - 3)$.

Q50. Solve the inequality: $(x - 1)(x - 4) > 0$.

Q51. Plot the point with coordinates $(-3, 2)$ and describe which quadrant it lies in.

Q52. A point moves from (4, -5) to (-2, 3). Find the change in x and y.

Q53. Write the equation of the circle with centre at (3, -2) and radius 5.

Q54. Find the gradient of the tangent to the circle $x^2 + y^2 = 25$ at the point (3, 4).

Q55. Find the equation of a line that passes through the point (2, 3) and has a gradient of -4.

Q56. A line has the equation $y = 2x + 5$. Find the y-intercept and gradient.

Q57. Sketch the graph of $y = 3^x$ for x values from -2 to 2.

Q58. Sketch the graph of $y = \sin(x)$ for $0° \leq x \leq 360°$.

Q59. Sketch the graph of $y = \cos(x)$ for $0° \leq x \leq 360°$.

Q60. Sketch the graph of $y = \tan(x)$ for $0° \leq x \leq 360°$.

Q61. Draw the graph of $y = x^2 - 4x + 3$ for x values from 0 to 5.

Q62. Draw the graph of $y = -x^2 + 6x - 5$.

Q63. Plot the graph of $y = 2x + 1$ for x values from -3 to 3.

Q64. Plot the graph of $y = -3x + 2$ for x values from -2 to 2.

Q65. Sketch the graph of $y = x^3 - 3x$.

Q66. Sketch the graph of $y = -x^3 + 4$.

Q67. A straight line has the equation $y = 5x - 7$. Write down the gradient and the y-intercept.

Q68. Find the gradient of the line that passes through the points (1, 2) and (4, 8).

GRADEUP

Q69. Write the equation of a line parallel to $y = -2x + 3$ that passes through the point (0, -1).

Q70. Is the line $y = 4x + 2$ parallel to $y = 4x - 5$? Explain your answer.

Q71. Find the equation of a line perpendicular to $y = 2x - 1$ and passing through (3, 4).

Q72. Explain why the lines $y = -0.5x + 2$ and $y = 2x + 1$ are perpendicular.

Q73. A graph shows distance against time. Describe what the gradient of the line represents.

Q74. A line goes through the points (0, 0) and (5, 10). Plot the line and interpret its meaning.

Q75. A graph shows speed against time. What does the area under the graph represent?

Q76. Find the turning point of the quadratic function $y = x^2 - 6x + 8$.

Q77. Complete the square for the expression $x^2 + 4x + 1$.

Q78. Complete the square for the quadratic $x^2 - 10x + 9$.

Q79. Find the roots of the equation $x^2 + 2x - 8 = 0$.

Q80. Find the x-intercepts and y-intercepts of $y = x^2 - 5x + 6$.

Q81. A quadratic graph has a minimum at (2, -4). Write the completed square form of the equation.

Q82. Find the coordinates of the turning point for $y = x^2 + 6x + 5$.

Q83. A line has the equation $y = 3x + 4$. Find the gradient and interpret it as a rate of change.

Q84. Sketch the graph of $y = -2x^2$ and state the shape.

Q85. A speed-time graph is a triangle with base 4 seconds and height 20 m/s. Find the area under the graph.

Q86. On a graph of distance against time, explain what a flat section means.

Q87. Translate the graph of $y = x^2$ two units to the right.

Q88. Translate the graph of $y = \sin(x)$ three units up.

Q89. Reflect the graph of $y = x^2$ in the x-axis.

Q90. Reflect the graph of $y = \cos(x)$ in the y-axis.

Q91. Describe the transformation that maps $y = f(x)$ to $y = f(x) + 5$.

Q92. Describe the transformation that maps $y = f(x)$ to $y = -f(x)$.

Q93. Reflect the graph of $y = x^3$ in the line $y = x$.

Q94. Translate the graph of $y = \tan(x)$ one unit to the left.

Q95. Translate the graph of $y = x^2 - 4$ three units down.

Q96. Reflect the graph of $y = x$ in the line $x = 0$.

Q97. Describe the transformation from $y = x^2$ to $y = (x + 3)^2 - 2$.

Q98. Sketch the graph of $y = x^2$ and show a translation of -2 in the x-direction.

Q99. Sketch the graph of $y = -x^2 + 4$ and label its turning point.

Q100. Explain the effect of the transformation $y = f(x - 2)$ on the graph of $y = f(x)$.

Q101. Solve the equation $3x + 7 = 2x + 12$.

Q102. Solve the equation $5x - 9 = 3x + 11$.

Q103. Solve the equation $4(x + 2) = 2x - 6$.

Q104. Solve the equation $7 - 3x = 2x + 12$.

Q105. Solve the equation $6x + 1 = 4x - 5$.

Q106. Solve the equation $2(x - 4) = 3(x + 2)$.

Q107. Solve the equation $5(x + 3) = 2x + 21$.

Q108. Solve the equation $4x - 7 = 3(x + 1)$.

Q109. Solve the equation $2x - 5 = 4 - x$.

Q110. Solve the equation $3(x - 2) = 2x + 5$.

Q111. Estimate the solution to the equation $x + 2 = 3$ using a graph.

Q112. Use a graph to find an approximate solution to $2x - 1 = x + 3$.

Q113. Find the solution to $x - 4 = 0.5x + 2$ using a graph.

Q114. Estimate where the lines $y = x + 3$ and $y = 2x - 1$ meet.

Q115. Use a graph to find the value of x for which $3x = x + 8$.

Q116. Use a graph to solve $x + 5 = 2x - 1$ approximately.

Q117. Estimate the solution to $x - 2 = -2x + 4$ from a graph.

Q118. Find an approximate solution to $x + 1 = 3 - x$ using a graph.

GRADEUP

Q119. Use a graph to solve $4x - 3 = x + 6$ approximately.

Q120. Estimate the solution of $2x + 4 = 3x - 1$ using a graph.

Q121. Solve the quadratic equation $x^2 + 5x + 6 = 0$ by factorising.

Q122. Solve the equation $x^2 - 3x - 10 = 0$ by factorising.

Q123. Solve $x^2 + 7x + 10 = 0$ by factorising.

Q124. Solve $x^2 - x - 6 = 0$ by factorising.

Q125. Solve $x^2 - 9 = 0$ by factorising.

Q126. Solve $2x^2 + 5x + 2 = 0$ by factorising.

Q127. Solve $x^2 + 4x - 5 = 0$ by factorising.

Q128. Solve $x^2 - 4x = 0$ by factorising.

Q129. Solve $x^2 - 6x + 9 = 0$ by factorising.

Q130. Solve $x^2 - 2x - 8 = 0$ by factorising.

Q131. Solve the equation $x^2 + 6 = 5x$ by rearranging and factorising.

Q132. Solve $x^2 - 2x = 8$ by rearranging and factorising.

Q133. Solve $x^2 + 3x = 10$ by rearranging and factorising.

Q134. Solve $x^2 = 4x + 12$ by rearranging and factorising.

Q135. Solve $x^2 + x = 6$ by rearranging and factorising.

Q136. Solve $x^2 - 5 = 2x$ by rearranging and factorising.

Q137. Solve $x^2 + 4x = -3$ by rearranging and factorising.

Q138. Solve $x^2 = 2x + 3$ by rearranging and factorising.

Q139. Solve $x^2 - 2x - 3 = 0$ by rearranging and factorising.

Q140. Solve $x^2 = 3x - 10$ by rearranging and factorising.

Q141. Solve the equation $x^2 + 6x + 5 = 0$ by completing the square.

Q142. Solve $x^2 - 4x - 1 = 0$ by completing the square.

Q143. Solve $x^2 + 2x - 3 = 0$ by completing the square.

Q144. Solve $x^2 - 8x + 10 = 0$ by completing the square.

Q145. Solve $x^2 + x - 2 = 0$ by completing the square.

Q146. Solve $2x^2 + 3x - 5 = 0$ using the quadratic formula.

Q147. Solve $x^2 - x - 1 = 0$ using the quadratic formula.

Q148. Solve $3x^2 - 2x + 4 = 0$ using the quadratic formula.

Q149. Solve $x^2 + 4x + 1 = 0$ using the quadratic formula.

Q150. Solve $x^2 - 6x + 9 = 0$ using the quadratic formula.

Q151. Estimate the solution to $x^2 - 4 = 3x$ using a graph.

Q152. Use a graph to solve $x^2 + 2x = 8$ approximately.

Q153. Find the approximate solution to $x^2 = x + 6$ using a graph.

Q154. Estimate the solution to $x^2 - 3x = 10$ using a graph.

Q155. Use a graph to solve $x^2 + 4x + 3 = 0$ approximately.

Q156. Estimate where the curve $y = x^2 - x$ and the line $y = 3$ meet.

Q157. Use a graph to estimate solutions of $x^2 = 2x + 4$.

Q158. Find an approximate solution to $x^2 - 5 = x$ using a graph.

Q159. Estimate the roots of $x^2 - 2x - 4 = 0$ using a graph.

Q160. Estimate the values of x for which $x^2 + 3x - 7 = 0$ using a graph.

Q161. Solve the equations $x + y = 10$ and $x - y = 2$.

Q162. Solve $x + 2y = 12$ and $3x - y = 7$.

Q163. Solve $2x + y = 5$ and $x - y = 1$.

Q164. Solve $x - 2y = 4$ and $3x + y = 13$.

Q165. Solve $4x - y = 9$ and $x + y = 3$.

Q166. Solve $2x + 3y = 6$ and $x - y = 2$.

Q167. Solve $5x - 2y = 8$ and $x + 4y = 3$.

Q168. Solve $3x + 2y = 12$ and $x - y = 1$.

GRADEUP

Q169. Solve $x + y = 9$ and $x - 3y = 3$.

Q170. Solve $2x - y = 7$ and $3x + y = 5$.

Q171. Use a graph to find where $x + y = 8$ and $x - y = 2$ meet.

Q172. Use a graph to estimate the solution to $2x + y = 10$ and $x - y = 1$.

Q173. Estimate the solution to $x + 3y = 9$ and $x - y = 5$ using a graph.

Q174. Use a graph to solve $3x - y = 6$ and $x + y = 4$.

Q175. Estimate where $4x + y = 10$ and $x - 2y = 1$ meet using a graph.

Q176. Use a graph to estimate the solution to $2x - y = 3$ and $x + y = 6$.

Q177. Estimate the point of intersection for $x + 2y = 7$ and $3x - y = 4$ using a graph.

Q178. Use a graph to find the solution of $x + y = 5$ and $2x - y = 4$.

Q179. Estimate the solution to $3x + y = 7$ and $x - y = 2$ using a graph.

Q180. Use a graph to solve $x + y = 6$ and $x - 2y = 0$.

Q181. Solve the equations $y = x^2 + 2x - 3$ and $y = x + 1$.

Q182. Solve $y = x^2 - 4$ and $y = 2x + 1$.

Q183. Solve the equations $y = x^2 + x - 6$ and $y = 3x$.

Q184. Solve $y = x^2 - 3x + 2$ and $y = 4x - 5$.

Q185. Solve the equations $y = x^2 - x - 2$ and $y = x - 4$.

Q186. Solve $y = x^2 + 4$ and $y = 2x$.

Q187. Solve $y = x^2 - 5x + 6$ and $y = x + 2$.

Q188. Solve the equations $y = x^2 - 2x$ and $y = x - 3$.

Q189. Solve $y = x^2 - 2$ and $y = 3x - 4$.

Q190. Solve the equations $y = x^2 + 3x$ and $y = 2x + 1$.

Q191. Use iteration to find an approximate solution to the equation $x^3 + x - 1 = 0$, starting with $x = 0.5$ and using the formula $x = (1 - x^3)^{1/1}$.

Q192. Starting with $x = 1$, use iteration to solve $x = \sqrt{(3x + 1)}$ for three steps.

Q193. Use the iteration formula $x = 2 + 1/x$ to approximate a solution to $x^2 - 2x - 1 = 0$, starting at $x = 1$.

Q194. Find an approximate solution to the equation $x = (5 - x^2)/2$ using iteration, starting at $x = 1$.

Q195. Given the formula $A = l \times w$, express the width w in terms of A and l.

Q196. A taxi company charges a fixed fee plus a rate per kilometre. If the total cost is C, the fixed fee is f, and the rate per km is r, write a formula for C in terms of f, r, and d (distance).

Q197. Translate the statement “double the number, then subtract 3 gives 7” into an algebraic equation.

Q198. A number added to its square is 20. Write and solve the equation.

Q199. A number is subtracted from 10, and the result is squared. The result is 25. Write an equation and solve it.

Q200. Write down two equations based on the statements: “The sum of two numbers is 12. Their difference is 4.” Solve them and interpret the result.

Q201. The sum of three times a number and 4 equals the number minus 2. Form and solve an equation.

Q202. A rectangle has a length that is 3 times its width. The perimeter is 48 cm. Form and solve an equation to find the dimensions.

Q203. A two-digit number has a sum of digits equal to 10. The number is 4 times the tens digit. Find the number using algebra.

Q204. Find the solution to the equation $3x - 7 = 2x + 5$.

Q205. Solve the equation $5(2x - 1) = 3(x + 4)$.

Q206. Solve for x: $4x + 3 = 2x - 1$.

Q207. Solve for x: $2(x + 4) = 3(x - 2)$.

Q208. Solve the inequality $3x - 7 < 2x + 5$.

Q209. Solve the inequality $2x + 4 > 5x - 2$.

Q210. Solve the inequality $5x - 3 \leq 3x + 1$.

Q211. Solve the inequality $-2x + 6 \geq x - 1$.

Q212. Solve the inequality $2(x + 1) < x + 5$.

Q213. Solve the inequality $3(x - 2) \geq 2x + 1$.

Q214. Solve the simultaneous inequalities: $x > 3$ and $2x - 1 \leq 7$.

Q215. Solve the simultaneous inequalities: $2 < x \leq 5$ and $x - 1 > 0$.

Q216. Solve the quadratic inequality $x^2 - 4 < 0$.

Q217. Solve the inequality $x^2 - 5x + 6 > 0$.

Q218. Solve the inequality $x^2 + x - 6 \leq 0$.

Q219. Solve the quadratic inequality $x^2 - x - 12 < 0$.

Q220. Represent the solution to the inequality $x > 3$ on a number line.

Q221. Represent the solution to the inequality $-2 \leq x < 4$ on a number line.

Q222. Represent the solution set of $x < -1$ or $x \geq 2$ on a number line.

Q223. Represent the solution set for $x \geq -3$ and $x \leq 2$ using a number line.

Q224. Represent the solution to $1 < x \leq 5$ using set notation.

Q225. Represent the solution set of $-2 < x < 3$ using set notation and a number line.

Q226. Represent the solution set of $x \leq -1$ or $x > 4$ using set notation and a number line.

Q227. Draw a graph to represent the solution set of $x \geq -2$ and $x < 3$.

Q228. Show the graph for the solution to the inequality $y < 2x - 1$.

Q229. Draw the graph of the region that satisfies $y \leq x + 2$ and $y > -x + 1$.

Q230. Use iteration to approximate a root of the equation $x^2 - 4x + 3 = 0$ using $x = \sqrt{(4x - 3)}$, starting at $x = 1.5$.

Q231. Use the iteration formula $x = 1 / (x + 1)$ to solve $x^2 + x - 1 = 0$ approximately.

Q232. Starting from $x = 1.5$, use the iteration $x = (6 - x^2)/2$ to solve $x^2 + 2x - 6 = 0$.

Q233. Translate the situation "Sarah earns £50 plus £3 per hour" into a formula for her total earnings E in terms of hours worked h.

Q234. A mobile plan costs a flat fee plus 10p per text. Write a formula for the total cost C in terms of the number of texts t.

Q235. A car rental company charges £20 per day plus £0.10 per mile. Write a formula for the total cost T in terms of the number of days d and miles m.

Q236. Write an expression for the area of a triangle with base b and height h.

Q237. Two numbers have a sum of 15 and a difference of 3. Write and solve the equations.

Q238. A man is three times as old as his son. In 5 years, he will be twice as old. Find their current ages using equations.

Q239. The length of a rectangle is 5 cm more than its width. The area is 84 cm². Form and solve the equation.

Q240. Solve the inequality $4x - 7 \leq 2x + 5$.

Q241. Solve for x: $3(x - 2) < 2(x + 4)$.

Q242. Solve for x: $5 - 2x \geq 4x + 1$.

Q243. Solve the simultaneous inequalities: $x > -2$ and $x < 4$.

Q244. Solve: $1 < 2x + 3 \leq 7$.

Q245. Solve the inequality $x^2 - 1 \geq 0$.

Q246. Solve the quadratic inequality $x^2 - 2x - 8 \leq 0$.

Q247. Solve the inequality $x^2 + 4x + 3 > 0$ and represent the solution on a number line.

Q248. Represent the solution to $-1 < x \leq 3$ using a number line and set notation.

Q249. Represent the solution to $x < -2$ or $x \geq 5$ on a graph and in set notation.

Q250. Represent the solution to the inequality $y > 2x - 3$ on a graph.