2.5 Simultaneous Equations: Linear and Quadratic: 30-minute Pack

AQA 8365 · Calculator allowed · about 30 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Solve the simultaneous equations $2x + y = 11$ and $x - y = 1$.

(Total for Question 1 is 1 mark)

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2 Solve the simultaneous equations $4x - y = 7$ and $2x + y = 11$.

(Total for Question 2 is 1 mark)

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3 Solve the simultaneous equations $5x - 3y = 19$ and $2x + 3y = 16$.

(Total for Question 3 is 1 mark)

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4 Solve the simultaneous equations $xy = 12$ and $y = x + 4$.

(Total for Question 4 is 5 marks)

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5 Find the number of points where the curve $y = x^2 + 2x - 6$ meets the line $y = 4x - 7$. You must show your working.

(Total for Question 5 is 4 marks)

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6 A circle has equation $x^2 + y^2 = 145$. A line has equation $x - y = 1$. Find the coordinates of the points where the line meets the circle.

(Total for Question 6 is 5 marks)

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7 Two numbers have a sum of 15. The sum of their squares is 113. Find the two numbers.

(Total for Question 7 is 5 marks)

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8 A line has equation $y = kx + 4$, where k is a constant. A curve has equation $y = x^2 + 2x + 8$.

(a) Show that the x-coordinates of the points of intersection of the line and the curve satisfy $x^2 + (2 - k)x + 4 = 0$. **(2)**

(b) Hence find the range of values of k for which the line intersects the curve at two distinct points. **(4)**

(Total for Question 8 is 6 marks)

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Mark scheme · 2.5 Simultaneous Equations: Linear and Quadratic: 30-minute Pack

Question 1

x = 4 and y = 3 cao	**B1**

Answer: x = 4, y = 3

Question 2

x = 3 and y = 5 cao	**B1**

Answer: x = 3, y = 5

Question 3

x = 5 and y = 2 cao	**B1**

Answer: x = 5, y = 2

Question 4

substitutes y = x + d into xy = c	**M1**
rearranges to $x^2 + 4x - 12 = 0$	**M1**
solves	**M1**
both x values correct	**A1**
(-6, -2) and (2, 6) cao	**A1**

Answer: (-6, -2) and (2, 6)

Question 5

equates the expressions for y	**M1**
rearranges to $x^2 - 2x + 1 = 0$	**M1**
discriminant ($b^2 - 4ac$) = 0	**M1**
1 point (the line is a tangent) with a correct conclusion from the discriminant	**A1**

Answer: 1 point (the line is a tangent)

Question 6

rearranges the line to make x or y the subject and substitutes	**M1**
obtains a quadratic in one variable	**M1**
solves the quadratic	**M1**
both x values (or both y values) correct	**A1**
(-8, -9) and (9, 8) cao	**A1**

Answer: (-8, -9) and (9, 8)

Question 7

square the sum, $(x + y)^2 = x^2 + 2xy + y^2 = 225$	**M1**
substitute $x^2 + y^2 = 113$ to find $2xy = 225 - 113$	**M1**
xy = 56 oe	**A1**
form and solve the quadratic $t^2 - 15t + 56 = 0$, e.g. (t - 7)(t - 8) = 0	**M1**
the two numbers are 7 and 8 oe	**A1**

Answer: 7 and 8

Question 8

(a) set kx + 4 equal to $x^2 + 2x + 8$	**M1**
(a) cso: correctly rearrange to $x^2 + (2 - k)x + 4 = 0$	**A1**

(a) Answer: $x^2 + (2 - k)x + 4 = 0$ (shown)

(b) write the discriminant condition $(2 - k)^2 - 4(1)(4) > 0$	**M1**
(b) expand and simplify to $k^2 - 4k - 12 > 0$ oe	**M1**
(b) factorise or otherwise find the critical values k = 6 and k = -2	**A1**
(b) k > 6 or k < -2 oe	**A1**

(b) Answer: k > 6 or k < -2

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