

One linear and one non-linear equation

About 50 minutes Calculator allowed 40 marks



Hints online, answers free with an account:
mathswariz.uk/worksheets/gcse-one-linear-and-one-non-linear-equation/

Date _____

A Do Now

The first question is what today's lesson needs. The others bring back earlier topics.

- A1** Needed today [2 marks]

4 burgers and 4 salads cost £7.00. 4 burgers and 3 salads cost £6.35. Find the cost of one burger and the cost of one salad.

A2 Last lesson [2 marks]

Write $x^2 + 4x - 7$ in the form $(x + p)^2 + q$. Hence write down the coordinates of the turning point of $y = x^2 + 4x - 7$.

Answer

Answer

- A3** From chapter 9 [2 marks]

A ring is made from a circle of radius 12 cm with a circle of radius 10 cm cut from its centre. Find the area of the ring, in terms of π .

A4 From chapter 16 [2 marks]

Expand and simplify $(5 + \sqrt{11})^2$.

Answer

Answer

B Example, then your turn

Your teacher works through each example with you. Then try the one beside it.

EXAMPLE 1

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

Hint Both equal y , so set $x^2 + 2x = 3x + 6$. Find each x , then put it into the LINE to get y .

- B1** Solve the simultaneous equations $y = x^2 + 5x$ and $y = x + 12$. [3 marks]

Answer $x = \dots, y = \dots$ and $x = \dots, y = \dots$

EXAMPLE 2

Solve the simultaneous equations

$x^2 + y^2 = 10$ and $y = x + 2$.

Hint Replace y in the circle by $(x + 2)$, expand, and collect everything on one side.

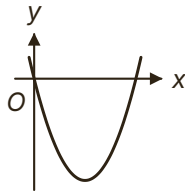
B2 Solve the simultaneous [3 marks]

equations $x^2 + y^2 = 58$ and

$y = x + 4$.

Answer $x = \dots, y = \dots$ and $x = \dots, y = \dots$ **C Practice**

C1 The graph of $y = x^2 - 4x$ is [2 marks]
drawn. Find the equation of the
straight line to draw on it to
solve $x^2 - x - 5 = 0$.

Answer $y = \dots$

C2 Two numbers add up to 15. The [3 marks]
sum of their squares is 113. Find
the two numbers.

Answer and

C3 Show that the line $y = x + 6$ [2 marks]
does not meet the circle
 $x^2 + y^2 = 16$.

C4 Solve the simultaneous [4 marks]
equations $x^2 + y^2 = 28$ and
 $y = 2x - 1$. Give your answers
correct to 2 decimal places.

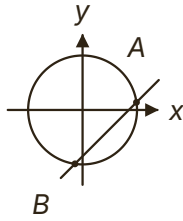
Answer $x = \dots, y = \dots$ and $x = \dots, y = \dots$ **D Exam-style questions**

D1 Tom solves $y = x^2 + 6$ and $y = 9x - 8$ together. He writes " $x^2 - 9x + 14 = 0$, so [3 marks]
 $x = 2$ or $x = 7$."

Explain why Tom's answer is not complete, and write down the full solution.

Answer $x = \dots, y = \dots$ and $x = \dots, y = \dots$

D2 The circle $x^2 + y^2 = 82$ and the line $y = x - 8$ meet at the points A and B .



Not drawn
accurately

(a) Show that the x -coordinates of A and B satisfy $x^2 - 8x - 9 = 0$. [3 marks]

(b) Hence find the coordinates of A and B . You must show your working. [3 marks]

Answer $(\dots, \dots)$ and $(\dots, \dots)$

(c) Work out the length of AB . Give your answer as a surd in its simplest form. [2 marks]

Answer $AB = \dots$

Total for D2: 8 marks

E Extension

No route is given. The hints are at the end of the sheet. Use one at a time.

E1 The line $y = 5x + k$ touches the curve $y = x^2 + 3x + 9$ at exactly one point. Find [4 marks]
the value of k and the coordinates of the point.

Answer $k = \dots$ $(\dots, \dots)$

Extension hints

Cover these with paper. Uncover one at a time.

- E1** **Hint 1** Set the two expressions for y equal.
Hint 2 $x^2 - 2x + (9 - k) = 0$ must have exactly one solution.
Hint 3 $4 - 4(9 - k) = 0$ gives $k = 8$. Then $(x - 1)^2 = 0$, so $x = 1$ and $y = 13$.

How did it go?

Colour one circle on each line: not yet, nearly, yes.

I can solve a linear and a quadratic equation together. ☐ ☐ ☐

I can find where a line meets a circle. ☐ ☐ ☐

I can choose a line to solve a quadratic on a graph. ☐ ☐ ☐