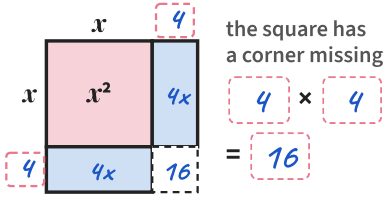
Completing the square

ANSWERS

1

Complete the square for $x^2 + 8x + 3$



the square has a corner missing

4 × 4 = 16

halve the number of x

4

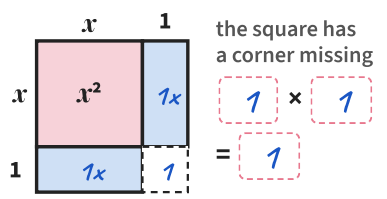
$(x + 4)^2 - 16 + 3$

Turning point $(-4, -13)$

Answer $(x + 4)^2 - 13$

2

Complete the square for $x^2 + 2x + 6$



the square has a corner missing

1 × 1 = 1

halve the number of x

1

$(x + 1)^2 - 1 + 6$

Turning point $(-1, 5)$

Answer $(x + 1)^2 + 5$

3

Complete the square for

$x^2 - 12x + 30$

halve the number of x

−6

$(x - 6)^2 - 36 + 30$

Turning point $(6, -6)$

Answer $(x - 6)^2 - 6$

4

Complete the square for

$x^2 + 14x + 40$

7

$(x + 7)^2 - 49 + 40$

Turning point $(-7, -9)$

Answer $(x + 7)^2 - 9$

5

Complete the square for $x^2 + 7x + 10$

Half of 7 is a fraction. Keep it as a fraction.

half of 7 is $\frac{7}{2}$, and $(\frac{7}{2})^2 = \frac{49}{4}$

$(x + \frac{7}{2})^2 - \frac{49}{4} + 10$

Turning point $(-\frac{7}{2}, -\frac{9}{4})$

Answer $(x + \frac{7}{2})^2 - \frac{9}{4}$

6

Find the smallest value of

$x^2 - 4x + 11$ and the value of x that gives it.

$(x - 2)^2 + 7$

7, when $x = 2$

Answer

7

Sam writes

$x^2 + 10x + 1 = (x + 5)^2 - 24$

He says the turning point is (5, −24).

Explain his mistake and give the right turning point.

$x + 5 = 0$ when $x = -5$

$(-5, -24)$

Answer

8

Solve $x^2 - 4x - 2 = 0$ by completing the square. Give your answers in surd form.

$(x - 2)^2 - 6 = 0$

$(x - 2)^2 = 6$, so $x - 2 = \pm\sqrt{6}$

$x = 2 \pm \sqrt{6}$

Completing the square *further practice*

ANSWERS

9

Complete the square for $x^2 - 8x + 1$. Then write down the turning point of $y = x^2 - 8x + 1$.

half of -8 is -4, and $(-4)^2 = 16$

Answer $(x - 4)^2 - 15$, $(4, -15)$

10

Write $x^2 - 3x + 5$ in the form $(x + p)^2 + q$. Then write down its turning point.

half of -3 is $-\frac{3}{2}$, squared is $\frac{9}{4}$

$-\frac{9}{4} + 5 = \frac{11}{4}$

Answer $(x - \frac{3}{2})^2 + \frac{11}{4}$, $(\frac{3}{2}, \frac{11}{4})$

11

Find the turning point of the graph of $y = x^2 + 12x + 20$ without drawing it.

$y = (x + 6)^2 - 16$

Answer $(-6, -16)$

12

The temperature in a greenhouse, T°C, t hours after midnight is $T = t^2 - 10t + 32$. Find the lowest temperature, and the time it happens.

$T = (t - 5)^2 + 7$

Answer 7 °C, at 5 am

13

Show that $x^2 + 6x + 12$ is positive for every value of x.

$x^2 + 6x + 12 = (x + 3)^2 + 3$

$(x + 3)^2 \geq 0$, so it is at least 3

Answer at least 3, so always positive

14

Solve $x^2 - 8x + 5 = 0$ by completing the square. Give your answers in surd form.

$(x - 4)^2 = 11$

$x - 4 = \pm\sqrt{11}$

Answer $x = 4 \pm \sqrt{11}$

15

Ayo says the turning point of $y = x^2 - 2x + 4$ is below the x axis. Is she right? Show how you know.

$y = (x - 1)^2 + 3$

Answer No: it is (1, 3), above the axis

16

Leah writes $x^2 + 12x + 5 = (x + 6)^2 + 5$. Explain her mistake. Then complete the square correctly.

$(x + 6)^2$ is $x^2 + 12x + 36$: take away 36

$(x + 6)^2 - 36 + 5$

Answer $(x + 6)^2 - 31$