

1. Write $x^2 + 8x + 5$ in the form $(x + a)^2 + b$, where a and b are integers. Hence state the turning point.
2. Write $x^2 - 10x + 4$ in the form $(x + a)^2 + b$, where a and b are integers. Hence state the turning point.
3. Write $x^2 + 2x - 7$ in the form $(x + a)^2 + b$, where a and b are integers. Hence state the turning point.
4. Write $x^2 - 4x + 2$ in the form $(x + a)^2 + b$, where a and b are integers. Hence state the turning point.
5. Write $x^2 + 12x - 3$ in the form $(x + a)^2 + b$, where a and b are integers. Hence state the turning point.
6. Write $x^2 - 2x + 9$ in the form $(x + a)^2 + b$, where a and b are integers. Hence state the turning point.
7. Write $x^2 + 6x + 1$ in the form $(x + a)^2 + b$, where a and b are integers. Hence state the turning point.
8. Write $x^2 - 14x + 6$ in the form $(x + a)^2 + b$, where a and b are integers. Hence state the turning point.
9. Write $x^2 + 4x - 12$ in the form $(x + a)^2 + b$, where a and b are integers. Hence state the turning point.
10. Write $x^2 - 8x + 20$ in the form $(x + a)^2 + b$, where a and b are integers. Hence state the turning point.

Question 1

Start with $x^2 + 8x + 5$.

Take the x^2 and x terms: $x^2 + 8x$.

Half the coefficient of x : half of 8 is 4.

Form the square: $(x + 4)^2 = x^2 + 8x + 16$.

We only want $x^2 + 8x$, so we have added an extra +16.

$$x^2 + 8x + 5 = (x + 4)^2 - 16 + 5$$

$$= (x + 4)^2 - 11.$$

Turning point: $(x, y) = (-4, -11)$.

Question 2

Start with $x^2 - 10x + 4$.

Take $x^2 - 10x$.

Half the coefficient of x : half of -10 is -5.

Form the square: $(x - 5)^2 = x^2 - 10x + 25$.

We only want $x^2 - 10x$, so we have added an extra +25.

$$\text{So } x^2 - 10x + 4 = (x - 5)^2 - 25 + 4$$

$$= (x - 5)^2 - 21.$$

Turning point: $(x, y) = (5, -21)$.

Question 3

Start with $x^2 + 2x - 7$.

Take $x^2 + 2x$.

Half the coefficient of x : half of 2 is 1.

Form the square: $(x + 1)^2 = x^2 + 2x + 1$.

We only want $x^2 + 2x$, so we have added an extra +1.

$$\text{So } x^2 + 2x - 7 = (x + 1)^2 - 1 - 7$$

$$= (x + 1)^2 - 8.$$

Turning point: $(x, y) = (-1, -8)$.

Question 4

Start with $x^2 - 4x + 2$.

Take $x^2 - 4x$.

Half the coefficient of x : half of -4 is -2.

Form the square: $(x - 2)^2 = x^2 - 4x + 4$.

We only want $x^2 - 4x$, so we have added an extra +4.

$$\text{So } x^2 - 4x + 2 = (x - 2)^2 - 4 + 2$$

$$= (x - 2)^2 - 2.$$

Turning point: $(x, y) = (2, -2)$.

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Question 5

Start with $x^2 + 12x - 3$.

Take $x^2 + 12x$.

Half the coefficient of x : half of 12 is 6.

Form the square: $(x + 6)^2 = x^2 + 12x + 36$.

We only want $x^2 + 12x$, so we have added an extra +36.

So $x^2 + 12x - 3 = (x + 6)^2 - 36 - 3$

$= (x + 6)^2 - 39$.

Turning point: $(x, y) = (-6, -39)$.

Question 6

Start with $x^2 - 2x + 9$.

Take $x^2 - 2x$.

Half the coefficient of x : half of -2 is -1.

Form the square: $(x - 1)^2 = x^2 - 2x + 1$.

We only want $x^2 - 2x$, so we have added an extra +1.

So $x^2 - 2x + 9 = (x - 1)^2 - 1 + 9$

$= (x - 1)^2 + 8$.

Turning point: $(x, y) = (1, 8)$.

Question 7

Start with $x^2 + 6x + 1$.

Take $x^2 + 6x$.

Half the coefficient of x : half of 6 is 3.

Form the square: $(x + 3)^2 = x^2 + 6x + 9$.

We only want $x^2 + 6x$, so we have added an extra +9.

So $x^2 + 6x + 1 = (x + 3)^2 - 9 + 1$

$= (x + 3)^2 - 8$.

Turning point: $(x, y) = (-3, -8)$.

Question 8

Start with $x^2 - 14x + 6$.

Take $x^2 - 14x$.

Half the coefficient of x : half of -14 is -7.

Form the square: $(x - 7)^2 = x^2 - 14x + 49$.

We only want $x^2 - 14x$, so we have added an extra +49.

So $x^2 - 14x + 6 = (x - 7)^2 - 49 + 6$

$= (x - 7)^2 - 43$.

Turning point: $(x, y) = (7, -43)$.

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Question 9

Start with $x^2 + 4x - 12$.

Take $x^2 + 4x$.

Half the coefficient of x : half of 4 is 2.

Form the square: $(x + 2)^2 = x^2 + 4x + 4$.

We only want $x^2 + 4x$, so we have added an extra +4.

So $x^2 + 4x - 12 = (x + 2)^2 - 4 - 12$

$= (x + 2)^2 - 16$.

Turning point: $(x, y) = (-2, -16)$.

Question 10

Start with $x^2 - 8x + 20$.

Take $x^2 - 8x$.

Half the coefficient of x : half of -8 is -4.

Form the square: $(x - 4)^2 = x^2 - 8x + 16$.

We only want $x^2 - 8x$, so we have added an extra +16.

So $x^2 - 8x + 20 = (x - 4)^2 - 16 + 20$

$= (x - 4)^2 + 4$.

Turning point: $(x, y) = (4, 4)$.