Completing the Square 1

1: Solve the following:

a) Write $x^2 + 4x$ in the form $(x + p)^2 + q$.

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b) Write $x^2 + 8x + 24$ in the form $(x + p)^2 + q$.

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c) Write $x^2 - 2x + 8$ in the form $(x + p)^2 + q$.

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2: Solve the following:

a) Write $x^2 - 8x + 20$ in the form $(x + p)^2 + q$ and hence find the line of symmetry.

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b) Write $x^2 + 10x + 35$ in the form $(x + p)^2 + q$ and hence find the line of symmetry.

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c) Write $x^2 + 6x + 1$ in the form $(x + p)^2 + q$ and hence find the line of symmetry.

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3: Solve the following:

a) Write $x^2 + 2x - 8$ in the form $(x + p)^2 + q$ and hence find the minimum value.

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b) Write $x^2 - 4x + 13$ in the form $(x + p)^2 + q$ and hence find the minimum value.

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c) Write $x^2 - 10x + 23$ in the form $(x + p)^2 + q$ and hence find the minimum value.

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4: Solve the following:

a) Write $x^2 - 6x + 14$ in the form $(x + p)^2 + q$ and hence find co-ordinates of the vertex.

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b) Write $x^2 + 4x + 6$ in the form $(x + p)^2 + q$ and hence find co-ordinates of the vertex.

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c) Write $x^2 - 2x - 2$ in the form $(x + p)^2 + q$ and hence find co-ordinates of the vertex.

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Answers: Completing the Square 1

1: a) $x^2 + 4x = (x + 2)^2 - 4$ b) $x^2 + 8x + 24 = (x + 4)^2 + 8$

   c) $x^2 - 2x + 8 = (x - 1)^2 + 7$

2: a) $x^2 - 8x + 20 = (x - 4)^2 + 4$ $\therefore$ line of symmetry is $x = 4$.

   b) $x^2 + 10x + 35 = (x + 5)^2 + 10$ $\therefore$ line of symmetry is $x = -5$.

   c) $x^2 + 6x + 1 = (x + 3)^2 - 8$ $\therefore$ line of symmetry is $x = -3$.

3: a) $x^2 + 2x - 8 = (x + 1)^2 - 9$ $\therefore$ minimum value is $x = -9$.

   b) $x^2 - 4x + 13 = (x - 2)^2 + 9$ $\therefore$ minimum value is $x = 9$.

   c) $x^2 - 10x + 23 = (x - 5)^2 - 2$ $\therefore$ minimum value is $x = -2$.

4: a) $x^2 - 6x + 14 = (x - 3)^2 + 5$ $\therefore$ vertex is $(3, 5)$.

   b) $x^2 + 4x + 6 = (x + 2)^2 + 2$ $\therefore$ vertex is $(-2, 2)$.

   c) $x^2 - 2x - 2 = (x - 1)^2 - 3$ $\therefore$ vertex is $(1, -3)$.