COMPLETING THE SQUARE

EQUIVALENT EXPRESSIONS

NO CALCULATOR

Ref: G243.3S1

A1 Express $x^2 - 2x$ in the form $(x + a)^2 + b$	**A2** Express $x^2 + 14x$ in the form $(x + h)^2 + k$	**A3** Express $x^2 + 5x$ in the form $(x + m)^2 + n$	**A4** Express $x^2 - 13x$ in the form $(x + p)^2 + q$
B1 Express $x^2 + 18x$ in the form $(x + p)^2 + q$	**B2** Express $x^2 + 21x$ in the form $(x + m)^2 + n$	**B3** Express $x^2 + 10x$ in the form $(x + h)^2 + k$	**B4** Express $x^2 - x$ in the form $(x + a)^2 + b$
C1 Express $x^2 - 4x + 20$ in the form $(x + h)^2 + k$	**C2** Express $x^2 - 3x - 10$ in the form $(x + p)^2 + q$	**C3** Express $x^2 + 14x + 6$ in the form $(x + a)^2 + b$	**C4** Express $x^2 + 9x + 8$ in the form $(x + m)^2 + n$
D1 Express $3x^2 + 12x$ in the form $a(x + b)^2 + c$	**D2** Express $5x^2 + 10x + 20$ in the form $a(x + b)^2 + c$	**D3** Express $2x^2 - 6x + 5$ in the form $a(x + b)^2 + c$	**D4** Express $2x^2 + 9x - 3$ in the form $a(x + b)^2 + c$

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Ref: G243. **3S1**

A1 Express $x^2 - 2x$ in the form $(x + a)^2 + b$ $x^2 - 2x = (x-1)^2 - 1^2$ $= (x-1)^2 - 1$	**A2** Express $x^2 + 14x$ in the form $(x + h)^2 + k$ $x^2 + 14x = (x+7)^2 - 7^2$ $= (x+7)^2 - 49$	**A3** $x^2 + 5x = \left(x + \frac{5}{2}\right)^2 - \left(\frac{5}{2}\right)^2$ $= \left(x + \frac{5}{2}\right)^2 - \frac{25}{4}$	**A4** $x^2 - 13x = \left(x - \frac{13}{2}\right)^2 - \left(\frac{13}{2}\right)^2$ $= \left(x - \frac{13}{2}\right)^2 - \frac{169}{4}$
B1 Express $x^2 + 18x$ in the form $(x + p)^2 + q$ $x^2 + 18x = (x+9)^2 - 9^2$ $= (x+9)^2 - 81$	**B2** $x^2 + 21x = \left(x + \frac{21}{2}\right)^2 - \left(\frac{21}{2}\right)^2$ $= \left(x + \frac{21}{2}\right)^2 - \frac{441}{4}$	**B3** Express $x^2 + 10x$ in the form $(x + h)^2 + k$ $x^2 + 10x = (x+5)^2 - 5^2$ $= (x+5)^2 - 25$	**B4** $x^2 - x = \left(x - \frac{1}{2}\right)^2 - \left(\frac{1}{2}\right)^2$ $= \left(x - \frac{1}{2}\right)^2 - \frac{1}{4}$
C1 Express $x^2 - 4x + 20$ in the form $(x + h)^2 + k$ $x^2 - 4x + 20 = (x-2)^2 - 2^2 + 20$ $= (x-2)^2 + 16$	**C2** $x^2 - 3x - 10 = \left(x - \frac{3}{2}\right)^2 - \left(\frac{3}{2}\right)^2 - 10$ $= \left(x - \frac{3}{2}\right)^2 - \frac{49}{4}$	**C3** Express $x^2 + 14x + 6$ in the form $(x + a)^2 + b$ $x^2 + 14x + 6 = (x+7)^2 - 7^2 + 6$ $= (x+7)^2 - 43$	**C4** $x^2 + 9x + 8 = \left(x + \frac{9}{2}\right)^2 - \left(\frac{9}{2}\right)^2 + 8$ $= \left(x + \frac{9}{2}\right)^2 - \frac{49}{4}$
D1 Express $3x^2 + 12x$ in the form $a(x + b)^2 + c$ $3\left[x^2 + 4x\right] = 3\left[(x+2)^2 - 2^2\right]$ $= 3(x+2)^2 - 12$	**D2** Express $5x^2 + 10x + 20$ in the form $a(x + b)^2 + c$ $5\left[x^2 + 2x\right] + 20 = 5\left[(x+1)^2 - 1^2\right] + 20$ $= 5(x+1)^2 - 5 + 20$ $= 5(x+1)^2 + 15$	$2\left[x^2 - 3x\right] + 5 = 2\left[\left(x - \frac{3}{2}\right)^2 - \left(\frac{3}{2}\right)^2\right] + 5$ $= 2\left[\left(x - \frac{3}{2}\right)^2 - \frac{9}{4}\right] + 5$ $= 2\left(x - \frac{3}{2}\right)^2 + \frac{1}{2}$	$2\left[x^2 + \frac{9}{2}x\right] - 3 = 2\left[\left(x + \frac{9}{4}\right)^2 - \left(\frac{9}{4}\right)^2\right] - 3$ $= 2\left[\left(x + \frac{9}{4}\right)^2 - \frac{81}{16}\right] - 3$ $= 2\left(x + \frac{9}{4}\right)^2 - \frac{105}{8}$

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