

**4.1 Completing The Square : Tougher Problems****4.1.1 Example**

By completing the square, solve the equation :

$$2x^2 + 3x - 3 = 0$$

Give your answer in the form  $a \pm b\sqrt{33}$  for some constants  $a$  and  $b$ .

**4.1.2 Model Solution :**

Pull out the coefficient of  $x^2$  from the terms in  $x^2$  and  $x$  :

$$2\left[x^2 + \frac{3}{2}x\right] - 3 = 0$$

Complete the square within the square brackets :

$$2\left[\left(x + \frac{3}{4}\right)^2 - \frac{9}{16}\right] - 3 = 0$$

Expand the square brackets :

$$2\left(x + \frac{3}{4}\right)^2 - \frac{9}{8} - 3 = 0$$

Tidy up :

$$2\left(x + \frac{3}{4}\right)^2 - \frac{9}{8} - \frac{24}{8} = 0$$

$$2\left(x + \frac{3}{4}\right)^2 - \frac{33}{8} = 0$$

$$\left(x + \frac{3}{4}\right)^2 = \frac{33}{16}$$

Square root both sides :

$$x + \frac{3}{4} = \pm\sqrt{\frac{33}{16}}$$

$$x = -\frac{3}{4} \pm \frac{\sqrt{33}}{4}$$

[ 4 marks ]

## 4.2 Exercise

*Any solution based entirely on graphical  
or numerical methods is not acceptable*

Marks Available : 36

### Question 1

Without using a calculator, use the method of  
completing the square to solve these equations;

(i)  $2x^2 + 7x + 1 = 0$

[ 4 marks ]

(ii)  $5x^2 + 7x + 1 = 0$

[ 4 marks ]

( iii )      $3x^2 + 5x + 1 = 0$

[ 4 marks ]

( iv )      $10x^2 + 3x - 2 = 0$

[ 4 marks ]

**Question 2**

Without using a calculator, by completing the square, solve the equation;

$$5x^2 + 4x - 2 = 0$$

[ 4 marks ]

**Question 3**

Without using a calculator, by completing the square, show that the solutions to the equation;  $2x^2 - 12x + 17 = 0$  are;

$$x = 3 \pm \frac{\sqrt{2}}{2}$$

[ 4 marks ]

**Question 4**

Without using a calculator, by completing the square, show that the solutions to the equation;  $2x^2 + 2x - 1 = 0$  are;

$$x = -\frac{1}{2} \pm \frac{\sqrt{3}}{2}$$

[ 4 marks ]

**Question 5**

By completing the square, solve the equation;  $9x^2 + 6x - 17 = 0$

[ 4 marks ]

### Question 6

By completing the square, solve the equation;  $9x^2 - 6x - 26 = 0$

[ 4 marks ]

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Teachers may obtain detailed worked solutions to the exercises by email from [MHHShrewsbury@Gmail.com](mailto:MHHShrewsbury@Gmail.com)