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## SEC 3 ELEMENTARY MATHEMATICS (BONUS)

### 1.4 SOLVING QUADRATIC EQUATIONS BY GRAPHICAL METHOD

#### 1.4 WORKED EXAMPLE 1

The variables  $x$  and  $y$  are connected by the equation

$$y = 2x^2 - x - 5$$

Some corresponding values of  $x$  and  $y$  are given in the table below.

$x$	-2	-1	0	1	2	3
$y$	5	$a$	-5	-4	1	10

- (a) Calculate the value of  $a$ .
- (b) Using a scale of 2 cm to 1 unit, draw a horizontal  $x$ -axis for  $-2 \leq x \leq 3$  and a scale of 1 cm to 1 unit, draw a vertical  $y$ -axis  $-5 \leq y \leq 10$ .

On your axes, plot the points given in the table and join them smoothly.

- (c) Use your graph to find the solutions of the equation  $2x^2 - x - 5 = 0$ .

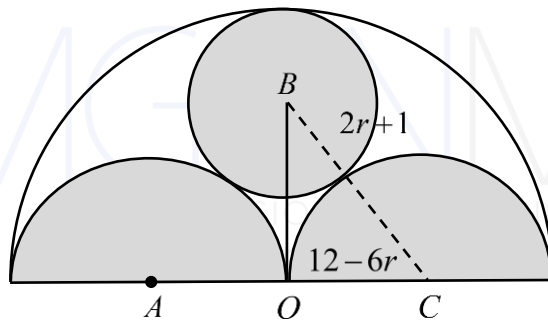
1.6 APPLICATIONS OF QUADRATIC EQUATIONS IN REAL-WORLD CONTEXTS

1.6 WORKED EXAMPLE 2

In the diagram, the circle with centre at  $B$  has a radius  $(2r+1)$  cm.

The semicircle with centre at  $A$  and the semicircle with centre at  $C$  are identical and each has a radius  $(12-6r)$  cm.

$O$  is the centre of the largest semicircle.



- (a) Write down an expression, in terms of  $r$ , for
  - (i)  $BC$ ,
  - (ii)  $BO$ .
- (b) By using Pythagoras Theorem, form an equation in  $r$  and show that it reduces to  $18r^2 - 57r + 42 = 0$ .
- (c) Solve the equation  $18r^2 - 57r + 42 = 0$  to find the possible value of  $r$ .
- (d) Find the area of the unshaded region. [Take  $\pi = 3.142$ ]