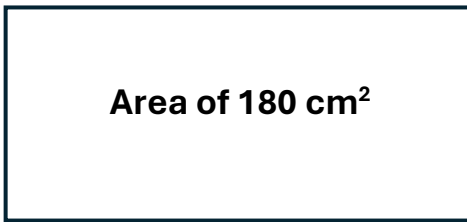


Sample pages – Demonstrate Mathematical Reasonings. Advanced Skills (p. 7 and p. 74)

M1.4 A rectangle below has an area of 180 cm^2 , a length of $4x - 2$ cm and width of $2x$ cm.

Find the value of x and the length and width of the rectangle.



$2x$

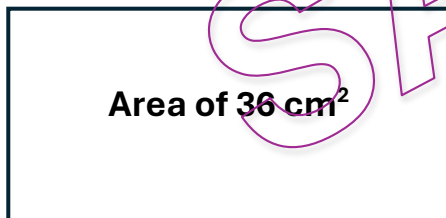
$4x - 2$

Note: for secure M/E, the equation in step e) should be solved algebraically, i.e. by factorising:

Solution	
a)	
b)	
c)	
d)	
e)	
f)	
g)	

M1.5 A rectangle below has an area of 36 cm^2 , a length of $10 - 2x$ cm and width of $3x$ cm.

Find the value of x and the length and width of the rectangle.



$3x$

$10 - 2x$

Note: for secure M/E, the equation in step e) should be solved algebraically, i.e. by factorising:

Solution	
a)	
b)	
c)	
d)	
e)	
f)	
g)	
h)	
i)	
j)	
k)	

E16 Example. Solve the following simultaneous equations.

$$\begin{cases} 7x - 2y = 1 & (1) \\ 2x + 3y = 11 & (2) \end{cases}$$

Solution

- a) Adjust the coefficients of y by multiplying equation (1) by 3 and the equation (2) by 2:

$$\begin{cases} 3(7x - 2y) = 3 \times 1 \\ 2(2x + 3y) = 2 \times 11 \end{cases}$$

- b) Expand and then add:

$$\begin{cases} 21x - 6y = 3 \\ 4x + 6y = 22 \end{cases} \rightarrow 21x + 4x = 3 + 22$$

- c) Simplify and solve:

$$25x = 25, \rightarrow x = 1$$

- d) Substitute $x=1$ into equation (2):

$$2 \times 1 + 3y = 11$$

- e) Simplify and solve for y:

- $2 + 3y = 11$
- $3y = 11 - 2$
- $3y = 9$
- $y = 3$

- f) *Answer:* $x = 1, y = 3$

E16.1 Solve the following simultaneous equations.

$$\begin{cases} 4x - 2y = 8 & (1) \\ x + 5y = 2 & (2) \end{cases}$$

Solution

- a)

- b)

- c)

- d)

- e)

- f)

Step-by-step solutions (p. 7 and p.74)

M1.4 A rectangle below has an area of 180 cm^2 , a length of $4x - 2$ cm and width of $2x$ cm.

Find the value of x and the length and width of the rectangle.



$$4x - 2$$

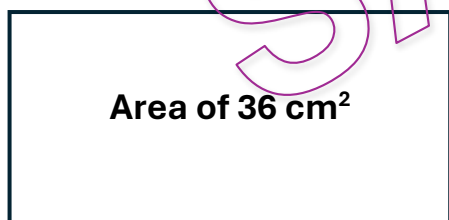
Note: for secure M/E, the equation in step e) should be solved algebraically, i.e. by factorising:

Solution

- h) Area = length x width:
 $2x(4x - 2) = 180$
- i) Expand the equation above:
 $8x^2 - 4x = 180$
- j) Move 180 to the left side:
 $8x^2 - 4x - 180 = 0$
- k) Use graphics calculator:
 $X = 5$ or $x = -4.5$.
- l) $X = 4.5$ cm is only valid solution
- m) $4x - 2 = 18$ cm, $2x = 10$ cm
- n) Answer 18 cm and 10 cm

M1.5 A rectangle below has an area of 36 cm^2 , a length of $10 - 2x$ cm and width of $3x$ cm.

Find the value of x and the length and width of the rectangle.



$$10 - 2x$$

Note: for secure M/E, the equation in step e) should be solved algebraically, i.e. by factorising:

Solution

- l) Area = length x width:
- m) $3x(10 - 2x) = 36$
- n) Expand the equation above:
- o) $30x - 6x^2 = 36$
- p) Move 36 to the left side:
 $30x - 6x^2 - 36 = 0$
- q) Rearrange:
 $-6x^2 + 30x - 36 = 0$ or
 $6x^2 - 30x + 36 = 0$
- r) Use graphics calculator:
 $X = 3$ or $x = 2$.
- s) Both are valid solutions**
- t) When $x = 3$, $10 - 2x = 4$ cm, $3x = 9$ cm
- u) When $x = 2$, $10 - 2x = 6$ cm, $3x = 6$ cm
- v) Answer 4 cm and 9 cm or 6 cm and 6 cm

E16 Example. Solve the following simultaneous equations.

$$\begin{cases} 7x - 2y = 1 & (1) \\ 2x + 3y = 11 & (2) \end{cases}$$

Solution

- j) Adjust the coefficients of y by multiplying equation (1) by 3 and the equation (2) by 2:

$$\begin{cases} 3(7x - 2y) = 3 \times 1 \\ 2(2x + 3y) = 2 \times 11 \end{cases}$$

- k) Expand and then add:

$$\begin{cases} 21x - 6y = 3 \\ 4x + 6y = 22 \end{cases} \rightarrow \begin{cases} 21x + 4x = 3 + 22 \end{cases}$$

- l) Simplify and solve:

$$25x = 25, \rightarrow x = 1$$

- m) Substitute $x=1$ into equation (2):

$$2 \times 1 + 3y = 11$$

- n) Simplify and solve for y:

- $2 + 3y = 11$
- $3y = 11 - 2$
- $3y = 9$
- $y = 3$

- o) *Answer:* $x = 1, y = 3$

E16.1 Solve the following simultaneous equations.

$$\begin{cases} 4x - 2y = 8 & (1) \\ x + 5y = 2 & (2) \end{cases}$$

Solution

- j) Adjust the coefficients of y by multiplying equation (1) by 5 and the equation (2) by 2:

$$\begin{cases} 5(4x - 2y) = 5 \times 8 \\ 2(x + 5y) = 2 \times 2 \end{cases}$$

- k) Expand and then add:

$$\begin{cases} 20x - 10y = 40 \\ 2x + 10y = 4 \end{cases} \rightarrow \begin{cases} 20x + 2x = 40 + 4 \end{cases}$$

- l) Simplify and solve:

$$22x = 44, \rightarrow x = 2$$

- m) Substitute $x=2$ into equation (2):

$$2 + 5y = 2$$

- n) Simplify and solve for y:

- $2 + 5y = 2$
- $5y = 2 - 2$
- $5y = 0$
- $y = 0$

- o) *Answer:* $x = 2, y = 0$