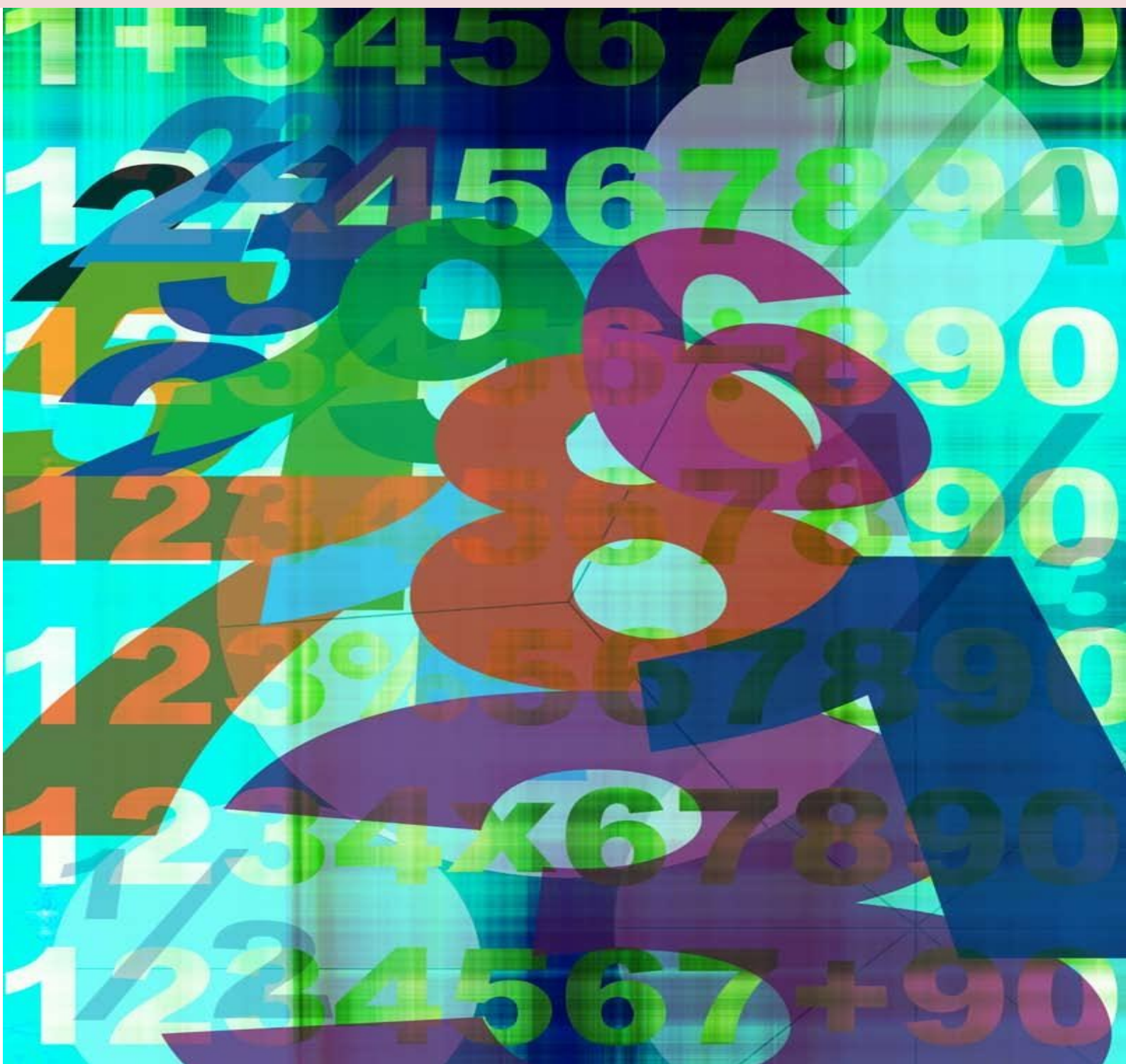


Practice Sheets and Solutions

Functional Mathematics

Level 4 Unit 2: Algebra



Acknowledgements

This booklet is part of a pack of resources for Functional Mathematics Level 4 which FÁS commissioned for use in their training programmes. A similar set of resources has been developed for Functional Mathematics Level 3.

A team from the National Adult Literacy Agency (NALA) and the National Centre for Excellence in Mathematics and Science Teaching and Learning (NCEMS-TL) developed and edited the materials.

NALA:

Bláthnaid Ní Chinnéide
Mary Gaynor
Fergus Dolan
John Stewart
Dr Terry Maguire (Institute of Technology, Tallaght)

NCEMS-TL:

Prof. John O'Donoghue
Dr. Mark Prendergast
Dr. Miriam Liston
Dr. Niamh O'Meara

FÁS:

John O'Neill
Louise MacAvin

We are grateful to Kathleen Cramer and her team in Newbridge Youth Training and Development Centre who gave feedback on extracts from the Level 3 materials.

Practice Sheet A1**Practice Sheet A1****Task 1**

To play snooker in the local club, you pay an admission charge of €3.50 and an additional charge of €2 per hour.

The total cost (C) of playing snooker when t is time in hours, can be expressed by $C = 2t + 3.5$.

Use this expression to calculate the cost of playing snooker for 4 hours.

Task 2

The cost of a tennis racket is €24 and the cost of a tennis ball is €1.50.

Write an expression for the cost (C) of x rackets and y tennis balls.

Use this expression to determine the cost when a person buys 4 rackets and 6 tennis balls.

Practice Sheet A1**Task 3**

In soccer, teams get 3 points for games won (w) and one point for games drawn (d).

The total points (P) gained by one team can be expressed by $P = 3w + d$.

Use this expression to calculate the total points Manchester City in the 2011 season. In that season Manchester City won 21 games and drew 8.

Task 4

Evaluate the following if $a = -2$ and $b = 3$ and $c = 1$:

a) $3c - 2b =$ _____

b) $4b + 2c - b =$ _____

c) $-3a - c =$ _____

d) $b + a + c =$ _____

e) $-a - b - c =$ _____

Practice Sheet A2**Practice Sheet A2****Task 1**

Write each of the following as a single term to a power:

a) $2 \times 2 \times 2 \times 2 \times 2$ _____

b) $3^{12} \times 3^6$ _____

c) 2×2^2 _____

d) $4^{12} \div 4^5$ _____

e) $5^5 \div 5^5$ _____

Task 2

Write each of the following as a single term to a power:

a) $(3^2)^3 \times 3^5$ _____

b) $(2^4)^4 \times 2^4$ _____

c) $(3^2)^3 \times (3)^4$ _____

d) $(4^2)^3 \div 4$ _____

e) $4^5 \div (4^2)^2$ _____

Practice Sheet A2**Task 3****Evaluate the following:**

a) 33^0 _____

b) $(4 \times b)^2$ _____

c) $(3d)^3$ _____

d) 999^0 _____

e) $b \times (2b)^3$ _____

Practice Sheet A3**Practice Sheet A3****Task 1**

Convert the following from index to log form:

a) $4^4 = 256$ _____

b) $3^5 = 243$ _____

c) $2^6 = 64$ _____

d) $10^2 = 100$ _____

e) $12^2 = 144$ _____

Task 2

Convert the following from log to index form:

a) $\text{Log}_{10}1000 = 3$ _____

b) $\text{Log}_864 = 2$ _____

c) $\text{Log}_4256 = 4$ _____

d) $\log_21 = 0$ _____

e) $\log_55 = 1$ _____

Practice Sheet A3**Task 3**

An earthquake measured 5.5 on the Richter scale.

How many times more intense was this earthquake compared with the smallest earthquake that can be measured?

Task 4

How much more intense is an earthquake that measures 7 on the Richter scale when compared with an earthquake that measures 2 on the Richter scale?

Practice Sheet A4**Practice Sheet A4****Task 1**

Solve the following equations for x

a) $3x = 33$

b) $x + 12 = 22$

c) $2x - 6 = 14$

d) $8 + 5x = x + 24$

e) $3x + 2 = -x - 34$

Task 2

A car park charges €4 for the first hour and €1.20 for each additional hour of parking.

A driver paid €10 for parking there. How many hours did he stay?

Practice Sheet A4**Task 3**

Alan purchased 5 tickets for a basketball game at the national arena.

A booking fee of €2 was added to the price of each ticket.

If the total cost was €110 what was the price of one ticket?

Task 4

The perimeter of a tennis court 24m long is 64m.

Find the width of the court.

Practice Sheet A5**Practice Sheet A5****Task 1**

Translate each of these relationships into a formula.

- a) When looking at a thunderstorm, **first** we see the lightning and **then** after a few seconds we hear the thunder.

We can use the **relationship between those two events to figure out how many kilometres** away a bolt of lightning hits the ground.

To figure out that **distance, d**, we count the **number of seconds, t**, between the flash of lightning and the sound of thunder and then we **divide it by 3**.

Write a formula to show that relationship.

- b) We can find the **area, a**, of the top of a can of coke by squaring the **radius, r**, and multiplying this by **pi**.

Practice Sheet A5**Task 2**

Use the formulae from Task 1 to evaluate the following:

- a) To figure how far away in kilometres a bolt of lightning hits the ground, d , we divide the number of seconds, t , between the flash of lightning and the associated sound of thunder by 3.

How many kilometres away does a bolt hit the ground if the number of seconds is 2?

- b) We can find the area, a , of the top of a can of coke by squaring the radius, r , and multiplying this by pi.

What is the area of a can of coke if the radius is 2.54 cm?

Use 3.14 for pi.

Practice Sheet A6**Task 2**

Solve the following linear inequalities for x:

a) $x + 4 \leq 5$ _____

b) $3x - 2 \geq 7$ _____

c) $7 - x < 2$ _____

d) $2(x - 1) \leq x - 5$ _____

e) $2x - 5 \geq 3x - 2$ _____

Practice Sheet A7**Practice Sheet A7****Task 1**

Solve the following for x and y:

a) $x + y = 7$
 $2x + y = 12$

b) $2x + 3y = 9$
 $4x + y = 13$

c) $2x + y = 7$
 $3x - 2y = 0$

d) $3x - 2y = 7$
 $4x + y = 13$

e) $x = 3 + 4y$
 $y = 2 + 3x$

Task 2

Practice Sheet A7

Emma buys 3 pens and 2 pencils for €2.80.

Thomas buys 1 pen and 4 pencils for €2.60.

How much are the pens and how much are the pencils?

Task 3

At a football match, the people in the **stand** paid **€15** each for their ticket.

Those on the **terraces** paid **€8** each. The **total takings** were **€27,000**.

If the people in the **stand** had paid **€12** and those on the **terraces** had paid **€6**, the total takings would have been **€20,400**.

How many spectators were at the match?

Practice Sheet A8**Practice Sheet A8**

Solve the following quadratic equations using the Guide Number Method:

a) $(x - 4)(x + 1) = 0$

b) $(2x - 1)(3x + 6) = 0$

c) $x^2 + 9x + 14 = 0$

d) $x^2 - 2x - 8 = 0$

e) $x^2 + 2x - 15 = 0$

f) $2x^2 - 5x + 2 = 0$

g) $4x^2 - 12x + 5 = 0$

Practice Sheet A8

h) $4x^2 - 29x + 7 = 0$

i) $3x^2 - 13x - 10 = 0$

j) $16x^2 - 100 = 0$

Practice Sheet A9**Practice Sheet A9****Task 1**

Solve the following quadratic equations using the Formula Method:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

a) $x^2 + 6x + 4 = 0$

b) $x^2 + 2x - 5 = 0$

c) $x^2 - 2x - 7 = 0$

d) $2x^2 + 5x + 1 = 0$

e) $3x^2 - x - 1 = 0$

f) $2x^2 - 3x - 4 = 0$

g) $5x^2 = x + 9$

Task 2

Practice Sheet A9

The length of a rectangular shaped garden is 2 times as long as its width. If its area is 162 m^2 , find the length and width of the lawn.

Task 3

The length of a rectangular shaped garden is 5 times as long as its width. If its area is 314 m^2 , find the length and width of the lawn.

Solution Sheet A1**Solution Sheet A1****Task 1**

$$C = 2t + 3.5$$

To play for 4 hours;

$$C = 2(4) + 3.5$$

$$C = 8 + 3.5$$

$$\mathbf{C = €11.50}$$

Task 2

$$C = 24x + 1.5y$$

Buy 4 rackets and 6 tennis balls;

$$C = 24(4) + 1.5(6)$$

$$C = 96 + 9$$

$$\mathbf{C = €105}$$

Task 3

$$P = 3w + d$$

21 wins and 8 draws;

$$P = 3(21) + 8$$

$$P = 63 + 8$$

$$\mathbf{P = 71}$$

Solution Sheet A1**Task 4**

If $a = -2$ and $b = 3$ and $c = 1$ evaluate:

a) $3c - 2b = -3$

b) $4b + 2c - b = 11$

c) $-3a - c = 5$

d) $b + a + c = 2$

e) $-a - b - c = -2$

Solution Sheet A2**Solution Sheet A2****Task 1**

Write each of the following as a single term to a power

a) $2 \times 2 \times 2 \times 2 \times 2 = 2^5$

b) $3^{12} \times 3^6 = 3^{18}$

c) $2 \times 2^2 = 2^3$

d) $4^{12} \div 4^5 = 4^7$

e) $5^5 \div 5^5 = 5^0$

Task 2

Write each of the following as a single term to a power

a) $(3^2)^3 \times 3^5 = 3^{11}$

b) $(2^4)^4 \times 2^4 = 2^{20}$

c) $(3^2)^3 \times (3)^4 = 3^{10}$

d) $(4^2)^3 \div 4 = 4^5$

e) $4^5 \div (4^2)^2 = 4^1$

Solution Sheet A2**Task 3**

Evaluate the following

a) $33^0 = 1$

b) $(4 \times b)^2 = 16b^2$

c) $(3d)^3 = 27d^3$

d) $999^0 = 1$

e) $b \times (2b)^3 = 8b^4$

Solution Sheet A3**Solution Sheet A3****Task 1**

a) $4^4 = 256$ $\text{Log}_4 256 = 4$

b) $3^5 = 243$ $\text{Log}_3 243 = 5$

c) $2^6 = 64$ $\text{Log}_2 64 = 6$

d) $10^2 = 100$ $\text{Log}_{10} 100 = 2$

e) $12^2 = 144$ $\text{Log}_{12} 144 = 2$

Task 2

a) $\text{Log}_{10} 1000 = 3$ $10^3 = 1000$

b) $\text{Log}_8 64 = 2$ $8^2 = 64$

c) $\text{Log}_4 256 = 4$ $4^4 = 256$

d) $\log_2 1 = 0$ $2^0 = 1$

e) $\log_5 5 = 1$ $5^1 = 5$

Solution Sheet A3**Task 3**

$$R = 5.5$$

$$\Rightarrow \log_{10} I = 5.5$$

$$I = 10^{5.5}$$

$$\text{Intensity} = 316,227.766$$

Task 4

$$R = 7$$

$$\Rightarrow \log_{10} I = 7$$

$$I = 10^7$$

$$\text{Intensity} = 10,000,000$$

$$R = 2$$

$$\Rightarrow \log_{10} I = 2$$

$$I = 10^2$$

$$\text{Intensity} = 100$$

An earthquake that measure 7 on the Richter scale is 100,000 times more intense than an earthquake that measures 2 on the Richter scale.

Solution Sheet A4**Solution Sheet A4****Task 1**

Solve the following equations for 'x'

f) $3x = 33$ $x = 11$

g) $x + 12 = 22$ $x = 10$

h) $2x - 6 = 14$ $x = 10$

i) $8 + 5x = x + 24$ $x = 4$

j) $3x + 2 = -x - 34$ $x = -9$

Task 2

Allow x to represent the number of hours,

$$1.20x + 4 = 10$$

$$1.20x + 4 - 4 = 10 - 4$$

$$1.20x = 6$$

$$x = 5$$

He stayed 5 hours in the car park.

Solution Sheet A4**Task 3**

Allow x to represent the price of a ticket'

Booking fee is $5 \times €2 = €10$

$$5x + 10 = 110$$

$$5x + 10 - 10 = 110 - 10$$

$$5x = 100$$

$$x = 20$$

The price of one ticket is €20

Task 4

$$\text{Perimeter (P)} = 2L + 2W$$

$$64 = 2(24) + 2W$$

$$64 = 48 + 2W$$

$$16 = 2W$$

$$W = 8$$

Solution Sheet A5**Solution Sheet A5****Task 1**

a) $d = \frac{t}{3}$

b) $a = \pi r^2$

Task 2

a) $d = \frac{t}{3}$

When $t = 2$

$$d = \frac{2}{3}$$

The bolt hits the ground $\frac{2}{3}$ kilometres away.

b) $a = \pi r^2$

$$a = 3.14(2.54)^2$$

$$a = 3.14(6.4516)$$

$$a = 20.258 \text{ cm}^2$$

Solution Sheet A6**Solution Sheet A6****Task 1**

a) $3 < 8$

b) $-2 < 2$

c) $4 > -3$

d) $12 = (6 \times 2)$

e) $(4 + 1) > (-4 - 1)$

Task 2

a) $x + 4 \leq 5$ $x \leq 1$

b) $3x - 2 \geq 7$ $x \geq 3$

c) $7 - x < 2$ $x > 5$

d) $2(x - 1) \leq x - 5$ $x \leq -3$

e) $2x - 5 \geq 3x - 2$ $x \leq -3$

Solution Sheet A6**Task 3**

a) Allow x to represent number of weeks:

$$1000 - 50x \geq 300$$

b) $1000 - 50x \geq 300$

$$1000 - 1000 - 50x \geq 300 - 1000$$

$$-50x \geq -700$$

$$50x \leq 700$$

$$x \leq 14$$

The number of weeks that Sean can withdraw money from his account is 14 or less.

Solution Sheet A7**Solution Sheet A7****Task 1**

a) $x = 5, y = 2$

b) $x = 3, y = 1$

c) $x = 2, y = 3$

d) $x = 3, y = 1$

e) $x = -1, y = -1$

Task 2

Allow x to represent the cost of a pen.

Allow y to represent the cost of a pencil.

$$3x + 2y = 2.80$$

$$x + 4y = 2.60$$

Solve the equations simultaneously for x and y .

$$x = 0.60, y = 0.50$$

Pen costs €0.60

Pencil costs €0.50

Solution Sheet A7**Task 3**

Allow x to represent the number of seated spectators.

Allow y to represent the number of standing spectators.

$$15x + 8y = 27000$$

$$12x + 6y = 20400$$

Solve the equations simultaneously for x and y .

$$x = 200, y = 3000$$

There were 200 seated spectators and 3000 standing spectators.

3200 spectators were at the event in total.

Solution Sheet A8**Solution Sheet A8**

a) $(x - 4)(x + 1) = 0$

$x = 4$ or $x = -1$

b) $(2x - 1)(3x + 6) = 0$

$x = \frac{1}{2}$ or $x = -2$

c) $x^2 + 9x + 14 = 0$

$x = 7$ or $x = 2$

d) $x^2 - 2x - 8 = 0$

$x = -2$ or $x = 4$

e) $x^2 + 2x - 15 = 0$

$x = -5$ or $x = 3$

f) $2x^2 - 5x + 2 = 0$

$x = \frac{1}{2}$ or $x = 2$

g) $4x^2 - 12x + 5 = 0$

$x = \frac{1}{2}$ or $x = \frac{5}{2}$

h) $4x^2 - 29x + 7 = 0$

$x = \frac{1}{4}$ or $x = 7$

i) $3x^2 - 13x - 10 = 0$

$x = -\frac{2}{3}$ or $x = 5$

j) $16x^2 - 100 = 0$

$x = \frac{5}{2}$ or $x = -\frac{5}{2}$

Solution Sheet A9**Solution Sheet A9****Task 1**

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

a) $x^2 + 6x + 4 = 0$

$x = -5.24 \text{ or } x = -0.76$

b) $x^2 + 2x - 5 = 0$

$x = -3.45 \text{ or } x = 1.45$

c) $x^2 - 2x - 7 = 0$

$x = -1.83 \text{ or } x = 3.83$

d) $2x^2 + 5x + 1 = 0$

$x = -2.28 \text{ or } x = -0.22$

e) $3x^2 - x - 1 = 0$

$x = -0.43 \text{ or } x = 0.77$

f) $2x^2 - 3x - 4 = 0$

$x = -0.85 \text{ or } x = 2.35$

g) $5x^2 = x + 9$

$x = -1.25 \text{ or } x = 1.45$

Solution Sheet A9**Task 2**

If we allow width = x , then length = $2x$

$$2x^2 = 162$$

$$2x^2 - 162 = 0$$

$$2x^2 + 0x - 162 = 0$$

Solve using Guide Number or formula: $x = 9$ or $x = -9$

Width cannot be negative, therefore width = 9m

If width = 9, then length = $2(9) = 18\text{m}$

Task 3

If we allow width = x , then length = $5x$

$$5x^2 = 314$$

$$5x^2 - 314 = 0$$

$$5x^2 + 0x - 314 = 0$$

Solve using Guide Number or formula: $x = 7.92$ or $x = -7.92$

Width cannot be negative, therefore width = 7.92m

If width = 7.92, then length = $5(7.92) = 39.6\text{m}$

1+34567890



Ireland's EU Structural Funds
Programmes 2007 - 2013

Co-funded by the Irish Government
and the European Union



EUROPEAN SOCIAL FUND