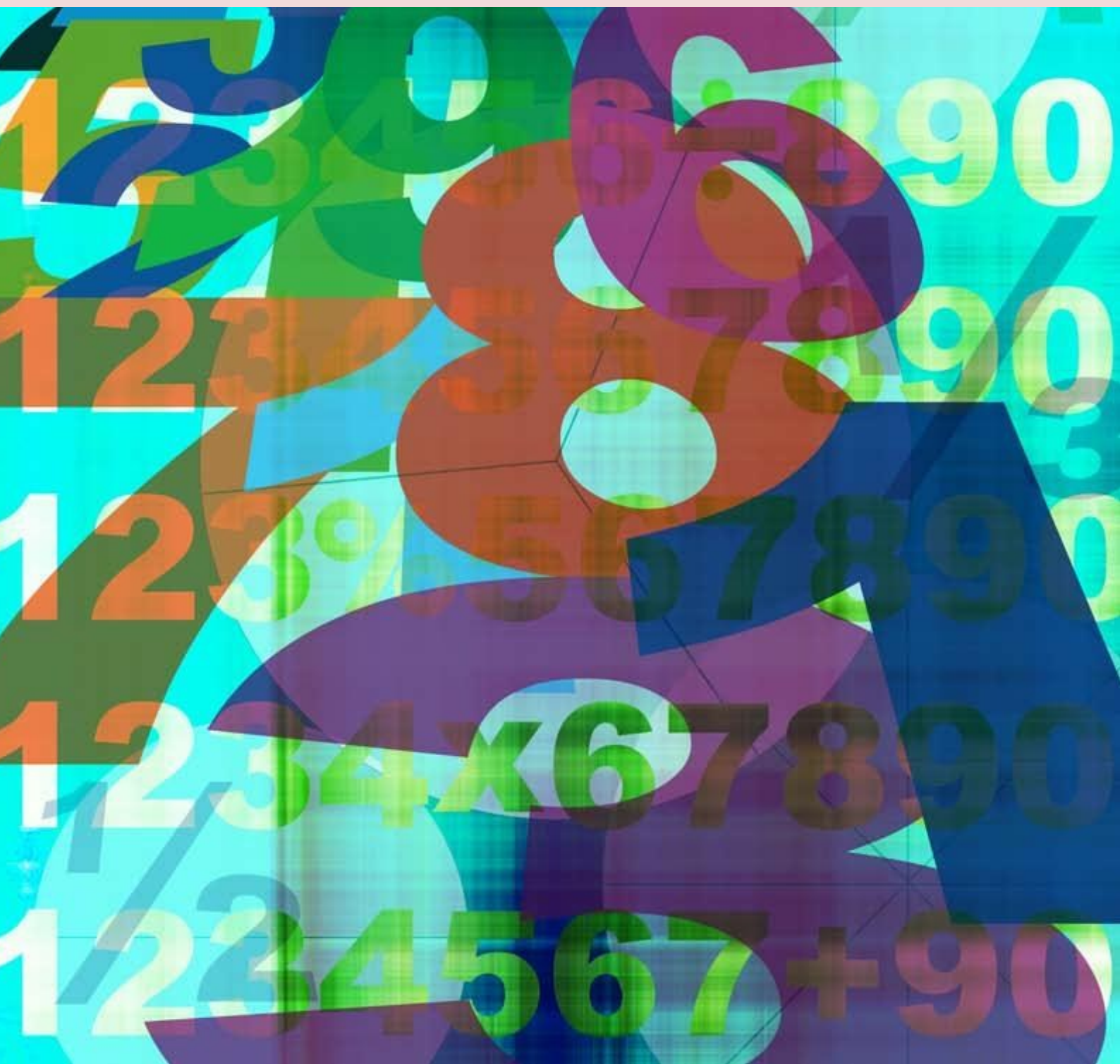


Answers to tasks in Learner Pack

Functional Mathematics

Level 4 Unit 2: Algebra



Functional Mathematics Level 4 Unit 2: Answers to tasks in Learner Pack

Acknowledgements

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Answers for Activity A1: Keeping the score

Activity

Keeping the score

A1

Task 1

a) Allow different variables to represent the numerical value of different scores

- a goal = a
- an over is worth = b
- a behind is worth = c

$$\text{Total score (S)} = 6a + 3b + 1c$$

b) Calculate the total score of each team.

$$\begin{aligned}\text{Ireland: } S &= 6(2) + 3(19) + 1(23) \\ &= 12 + 57 + 23 \\ &= \mathbf{92}\end{aligned}$$

$$\begin{aligned}\text{Australia: } S &= 6(0) + 3(28) + 1(18) \\ &= 0 + 84 + 18 \\ &= \mathbf{102}\end{aligned}$$

Australia won the series

Answers for Activity A1: Keeping the score

Task 2

a)

- try = a
- try conversion = b
- drop goal = c
- penalty goal = d

$$\text{Total Score (S)} = 5a + 2b + 3c + 3d$$

a) Leinster's total score = $5(1) + 2(1) + 3(2) + 3(2)$

$$\text{Leinster's total score} = 5 + 2 + 6 + 6 = \mathbf{19}$$

b) $16 = 5(1) + 2(1) + 3(0) + 3d$

$$16 = 5 + 2 + 0 + 3d$$

$$16 = 7 + 3d$$

$$9 = 3d$$

$$3 = d$$

Leicester Tigers scored **3 penalties** in the match.

Answers for Activity A2: Indices

Activity

Indices

A2

Task 1

$$4^{13} \times 4^{16} = 4^{29}$$

Task 2

$$6^{115} \div 6^{48} = 6^{67}$$

Task 3

$$(3^5)^{18} = 3^{90}$$

Task 4

$$(3 \times a)^{18} = 3^{18} \times a^{18}$$

Task 5

Using the rules of indices evaluate the following

a) $16^0 = 1$

b) $6392^0 = 1$

Answers for Activity A2: Indices

Practise your skills

- Which is bigger?
 - a) Three cubed or five squared?
 3^3 is 27
 5^2 is 25
Three cubed is bigger.
 - b) Fifteen squared or six cubed?
 15^2 is 225
 6^3 is 216
Fifteen squared is bigger.

Answers for Activity A3: The Richter scale

Activity

The Richter scale

A3

Task 1

Convert the following from index to log form:

a) $5^3 = 125$ $\log_5 125 = 3$

b) $8^2 = 64$ $\log_8 64 = 2$

c) $2^5 = 32$ $\log_2 32 = 5$

Task 2

Convert the following from log to index form:

a) $\log_5 625 = 4$ $5^4 = 625$

b) $\log_2 128 = 7$ $2^7 = 128$

c) $\log_3 243 = 5$ $3^5 = 243$

Task 3

$$R = 9.5$$

$$\Rightarrow \log_{10} I = 9.5$$

$$I = 10^{9.5}$$

$$\text{Intensity} = 3,162,277,660$$

Answers for Activity A3: The Richter scale

Task 4

$$R = 6$$

$$\Rightarrow \log_{10} I = 6$$

$$I = 10^6$$

$$\text{Intensity} = 1,000,000$$

$$R = 3$$

$$\Rightarrow \log_{10} I = 3$$

$$I = 10^3$$

$$\text{Intensity} = 1,000$$

An earthquake that measure 6 on the Richter Scale is 1,000 times more intense than an earthquake that measures 3 on the Richter scale.

Answers for Activity A4: Car rental

Activity

Car rental

A4

Task 1

- a) Allow x represent number of kilometres and d represent number of days.

$$84 = 0.15x + 30 + 15d$$

b) $84 = 0.15x + 30 + 15d$

$$84 = 0.15x + 30 + 15(2)$$

$$84 = 0.15x + 30 + 30$$

$$84 = 0.15x + 60$$

$$24 = 0.15x$$

$$x = 160$$

160 kilometres were driven.

Answers for Activity A4: Car rental

Task 2

- a) Allow x represent number of kilometres and d represent number of days.

$$\text{Option A} = 90d$$

$$\text{Option B} = 30d + 0.30x$$

- b) Option A = $90d$

$$\text{Option A} = 90(3) = \text{€}270$$

$$\text{Option B} = 30d + 0.30x$$

$$\text{Option B} = 30(3) + 0.30(680)$$

$$\text{Option B} = 90 + 204 = \text{€}294$$

Option A is cheaper so Eoin should rent the car from Rentalcars.com

Answers for Activity A5: Using formulae

Activity

Using formulae

A5

Task 1

Speed = 100kmph

Braking distance is $d = (s/10)^2$

$$d = (s/10)^2$$

$$d = (100/10)^2$$

$$d = 10^2$$

$$d = 100 \text{ metres}$$

Speed = 60kmph

Braking distance is $d = (s/10)^2$

$$d = (s/10)^2$$

$$d = (60/10)^2$$

$$d = 6^2$$

$$d = 36 \text{ metres}$$

The braking distance is 64 metres greater for a car travelling at 100kmph than a car travelling at 60kmph.

Answers for Activity A5: Using formulae

Task 2

In baseball, a batting average, a , is calculated by dividing the number of hits made, h , by the number of times up at the bat, n .

a) $a = h/n$

b) $a = 4189/11429$

$a = 0.367$

Answers for Activity A6: Taxi fares

Activity

Taxi fare

A6

Task 1

a) Initial charge is €4.45

Amount per kilometre is €1.35

b) Allow k to represent number of kilometres.

$$1.35k + 4.45 \leq 16$$

c) $1.35k + 4.45 \leq 16$

$$1.35k + 4.45 - 4.45 \leq 16 - 4.45$$

$$1.35k \leq 16 - 4.45$$

$$1.35k \leq 11.55$$

$$k \leq 8.56$$

John can travel 8 kilometres without exceeding his budget.

Answers for Activity A6: Taxi fares

Task 2

a) Initial charge is €4.45

Amount per kilometre is €1.35

Extra (for extra passenger) is €1

b) Allow k to represent number of kilometres.

$$1.35k + 4.45 + 1 \leq 21$$

c) $1.35k + 4.45 + 1 \leq 21$

$$1.35k + 5.45 \leq 21$$

$$1.35k + 5.45 - 5.45 \leq 21 - 5.45$$

$$1.35k \leq 15.55$$

$$k \leq 11.52$$

They can travel 11 kilometres without exceeding their budget.

d) $1.03k + 4.10 + 1 \leq 21$

$$1.03k + 5.10 \leq 21$$

$$1.03k + 5.10 - 5.10 \leq 21 - 5.10$$

$$1.03k \leq 15.90$$

$$k \leq 15.44$$

If it wasn't a Bank Holiday they could travel 15 kilometres without exceeding their budget. They only live 14 kilometres away so they would have had enough money for the taxi fare to get all the way home.

Answers for Activity A7: Exam time

Activity

Exam time

A7

Task 1

- a) Allow x to represent the number of questions worth two points.
Allow y to represent the number of questions worth five points.

$$x + y = 50$$

$$2x + 5y = 145$$

- b) $x + y = 50$

$$2x + 5y = 145$$

Label the equations A and B

$$x + y = 50 \quad [A]$$

$$2x + 5y = 145 \quad [B]$$

Get the same coefficients for either x or y . If we multiply equation [A] by 2 then we will have the same x coefficients

$$2x + 2y = 100 \quad [A]$$

$$2x + 5y = 145 \quad [B]$$

Functional Mathematics Level 4 Unit 2: Answers to tasks in Learner Pack

Answers for Activity A7: Exam time

If we multiply equation [A] by -1 then we will have opposite signs

$$-2x - 2y = -100 \quad [A]$$

$$2x + 5y = 145 \quad [B]$$

Add the two equations together

$$-2x - 2y = -100 \quad [A]$$

$$\underline{2x + 5y = 145} \quad [B]$$

$$3y = 45$$

Solve for y

$$3y = 45$$

$$y = 15$$

Replace y in either equation to solve for x

$$x + y = 50$$

$$x + 15 = 50$$

$$x = 50 - 15$$

$$x = 35$$

- a) There are 35 two point questions on the test.
- b) There are 15 five point questions on the test.

Answers for Activity A7: Exam time

Task 2

- a) Allow x to represent the number of correct answers.
Allow y to represent the number of incorrect answers.

$$x + y = 40$$

$$5x - 3y = 56$$

b) $x + y = 40$

$$5x - 3y = 56$$

Label the equations A and B

$$x + y = 40 \quad [A]$$

$$5x - 3y = 56 \quad [B]$$

Get the same coefficients for either x or y . If we multiply equation [A] by 3 then we will have the same y coefficients

$$3x + 3y = 120 \quad [A]$$

$$5x - 3y = 56 \quad [B]$$

We already have opposite signs so we can add the two equations

$$3x + 3y = 120 \quad [A]$$

$$\underline{5x - 3y = 56} \quad [B]$$

$$8x = 176$$

Solve for x

$$8x = 176$$

$$x = 22$$

Functional Mathematics Level 4 Unit 2: Answers to tasks in Learner Pack

Answers for Activity A7: Exam time

Replace x in either equation to solve for y

$$x + y = 40$$

$$22 + y = 40$$

$$y = 40 - 22$$

$$y = 18$$

Kenny answered 22 questions correctly.

Answers for Activity A7: Exam time

Practise your skills

- a) Allow x to represent the number of penalties scored.
Allow y to represent the number of penalties missed.

$$x + y = 10$$

$$3x - 2y = 15$$

b) $x + y = 10$

$$3x - 3y = 15$$

Label the equations A and B

$$x + y = 10 \quad [A]$$

$$3x - 2y = 15 \quad [B]$$

Get the same coefficients for either x or y . If we multiply equation [A] by 2 then we will have the same y coefficients.

$$2x + 2y = 20 \quad [A]$$

$$3x - 2y = 15 \quad [B]$$

We already have opposite signs so we can add the two equations.

$$2x + 2y = 20 \quad [A]$$

$$\underline{3x - 2y = 15} \quad [B]$$

$$5x = 35$$

Solve for x

$$5x = 35$$

$$x = 7$$

Functional Mathematics Level 4 Unit 2: Answers to tasks in Learner Pack

Answers for Activity A7: Exam time

Replace x in either equation to solve for y

$$x + y = 10$$

$$7 + y = 10$$

$$y = 10 - 7$$

$$y = 3$$

Robbie scored 7 penalties and missed 3 penalties.

Answers for Activity A8: Quadratic equations

Activity

Quadratic equations

A8

Taking out a Common Factor

Examples: Factorise each of the Following

a) $5t + 10s = 5(t + 2s)$

b) $15q - 30p = 15(q - 2p)$

c) $2x^2 + 6x = 2x(x + 3)$

Factorising by Grouping

Examples: Factorise each of the Following

a) $ac + bc + 3a + 3b = c(a + b) + 3(a + b)$
 $= (c + 3)(a + b)$

b) $2ab + 2bc + 3ad + 3cd = 2b(a + c) + 3d(a + c)$
 $= (2b + 3d)(a + c)$

c) $4x - 4y + ax - ay = 4(x - y) + a(x - y)$
 $= (4 + a)(x - y)$

Answers for Activity A8: Quadratic equations

Task 1

a) $x^2 + 3x + 2 = 0$ $(x + 2)(x + 1) = 0$
 $x = -2$ or $x = -1$

b) $x^2 + 7x + 10 = 0$ $(x + 5)(x + 2) = 0$
 $x = -5$ or $x = -2$

c) $x^2 + 5x + 6 = 0$ $(x + 3)(x + 2) = 0$
 $x = -3$ or $x = -2$

Task 2

a) $x^2 - 5x + 4 = 0$ $(x - 4)(x - 1) = 0$
 $x = 4$ or $x = 1$

b) $x^2 - 10x + 25 = 0$ $(x - 5)(x - 5) = 0$
 $x = 5$ or $x = 5$

c) $x^2 - 5x + 6 = 0$ $(x - 3)(x - 2) = 0$
 $x = 3$ or $x = 2$

Answers for Activity A8: Quadratic equations

Task 3

a) $x^2 - 4x - 5 = 0$

$(x - 5)(x + 1) = 0$

$x = 5$ or $x = -1$

b) $6x^2 - x - 2 = 0$

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

$x = -\frac{1}{2}$ or $x = \frac{2}{3}$

c) $9x^2 - 9x - 28 = 0$

$(3x - 7)(3x + 4) = 0$

$x = \frac{7}{3}$ or $x = -\frac{4}{3}$

Task 4

a) $x^2 - 4 = 0$

$(x - 2)(x + 2) = 0$

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

b) $4x^2 - 16 = 0$

$(2x - 4)(2x + 4) = 0$

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

c) $9x^2 - 25 = 0$

$(3x - 5)(3x + 5) = 0$

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

Answers for Activity A9: Garden dimensions

Activity

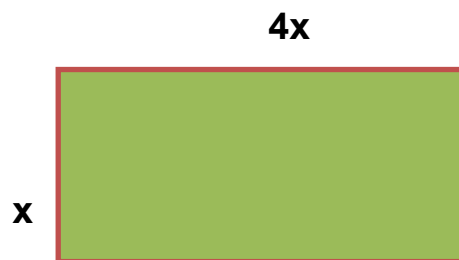
Garden dimensions

A9

Task 1

If **width** = x

then **length** = $4x$



$$\begin{aligned}\text{Area of rectangle} &= \text{length} \times \text{width} \\ &= 4x(x) = 4x^2\end{aligned}$$

$$\text{Area of lawn} = 323$$

$$4x^2 = 323$$

$$4x^2 - 323 = 0$$

$$4x^2 + 0x - 323 = 0$$

If we try to solve this using the Guide Number method, my GN will be -1292 . No factors of -1292 will add to give me the x coefficient of 0 . Therefore, we have to solve this equation using the **formula method**.

See the steps on next page.

Functional Mathematics Level 4 Unit 2: Answers to tasks in Learner Pack

Answers for Activity A9: Garden dimensions

Step 1: Label the values a, b and c

$$a = 4 \text{ (x}^2 \text{ coefficient)}$$

$$b = 0 \text{ (x coefficient)}$$

$$c = -323 \text{ (constant)}$$

Step 2: Substitute the values for a, b and c into the formula to solve for x

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

$$x = \frac{-(0) \pm \sqrt{(0)^2 - 4(4)(-323)}}{2(4)}$$

$$x = \frac{0 \pm \sqrt{5168}}{8}$$

$$x = \frac{\pm 71.89}{8}$$

$$x = \frac{71.89}{8} \quad \text{or} \quad x = \frac{-71.89}{8}$$

$$x = 8.99 \text{ or } x = -8.99$$

Width cannot be negative, therefore width = 8.99m

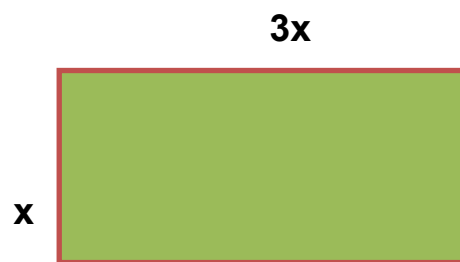
If width = 8.99, then length = $4(8.99) = 35.96\text{m}$

Answers for Activity A9: Garden dimensions

Task 2

If we allow **width = x**

Then **length = 3x**



$$\begin{aligned}\text{Area of rectangle} &= \text{length} \times \text{width} \\ &= 3x(x) = 3x^2\end{aligned}$$

$$\text{Area of lawn} = 323$$

$$3x^2 = 282$$

$$3x^2 - 282 = 0$$

$$3x^2 + 0x - 282 = 0$$

If we attempt to solve this using the Guide Number method, the GN will be - 846.

No factors of - 846 will add to give me the x coefficient of 0. Therefore, we have to solve this equation using the **formula method**.

See the steps on next page.

Functional Mathematics Level 4 Unit 2: Answers to tasks in Learner Pack

Answers for Activity A9: Garden dimensions

Step 1: Label the values a, b and c

$$a = 3 \text{ (x}^2 \text{ coefficient)}$$

$$b = 0 \text{ (x coefficient)}$$

$$c = -282 \text{ (constant)}$$

Step 2: Substitute the values for a, b and c into the formula to solve for x

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

$$x = \frac{-(0) \pm \sqrt{(0)^2 - 4(3)(-282)}}{2(3)}$$

$$x = \frac{0 \pm \sqrt{3384}}{6}$$

$$x = \frac{\pm 58.17}{6}$$

$$x = \frac{58.17}{6} \quad \text{or} \quad x = \frac{-58.17}{6}$$

$$x = 9.7 \text{ or } x = -9.7$$

Width cannot be negative, therefore width = 9.7m

If width = 9.7, then length = 3(9.7) = 29.1m

1 + 3 4 5 6 7 8 9 0



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