

Past Paper Solutions - National 5 Mathematics

Produced By Mrs Pamela Marnell

Page: Topic: Factorising

15.01

$$p^2 - 4q^2$$
$$= (p - 2q)(p + 2q)$$

15.02

$$4x^2 - y^2$$
$$= (2x - y)(2x + y)$$

15.03

$$x^2 - 4y^2$$
$$= (x - 2y)(x + 2y)$$

15.04

$$3y^2 - 6y$$
$$= 3y(y - 2)$$

15.05

$$5x^2 - 45$$
$$= 5(x^2 - 9)$$
$$= 5(x - 3)(x + 3)$$

15.06

$$2p^2 - 5p - 12$$
$$(2p + 3)(p - 4)$$

Past Paper Solutions - National 5 Mathematics

Produced By Mrs Pamela Marnell

Page: Topic: Factorising

15.07

$$2x^2 - 7x - 15$$
$$(2x + 3)(x - 5)$$

15.08

$$y^2 + y - 6$$
$$(y - 2)(y + 3)$$

15.09

$$x^2 - 16$$
$$(x - 4)(x + 4)$$

15.10

$$3x^2 - 5x - 2$$
$$(3x + 1)(x - 2)$$

15.11

$$4a^2 - 9b^2$$
$$(2a + 3b)(2a - 3b)$$

15.12

$$9a^2 - 25$$
$$= (3a + 5)(3a - 5)$$

Past Paper Solutions - National 5 Mathematics

Produced By Mrs Pamela Marnell

Page:

Topic: Factorising

15.13

$$2x^2 - 6x$$

$$2x(x - 3)$$

15.14

$$2x^2 + 7x - 4$$

$$(2x - 1)(x + 4)$$

15.15

$$2x^2 - 9x - 5 = 0$$

$$(2x + 1)(x - 5)$$

$$2x = -1 \quad x = 5$$

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

15.16

$$x^2 = 7x$$

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

$$x(x - 7) = 0$$

$$x = 0 \quad x = 7$$

15.17

$$3x^2 - 7x + 2$$

$$(3x - 1)(x - 2)$$

15.18

$$x^2 - 5x - 24$$

$$(x + 3)(x - 8)$$

Past Paper Solutions - National 5 Mathematics

Produced By Mrs Pamela Marnell

Page:

Topic: _____

Factorising

15.19

$$4p^2 - 49$$

$$= (2p - 7)(2p + 7)$$

15.20

$$x^2 + x - 6$$

$$(x - 2)(x + 3)$$

15.21

$$2x^2 - 18$$

$$2(x^2 - 9)$$

$$2(x - 3)(x + 3)$$

15.22

$$6y - y^2 = 0$$

$$y(6 - y) = 0$$

$$y = 0 \quad 6 - y = 0$$

$$6 = y$$

$$y = 6$$

15.23

$$2x^2 + 5x - 12 = 0$$

$$(2x - 3)(x + 4) = 0$$

$$2x = 3 \quad x = -4$$

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

15.24

$$a^2 + 2ab + b^2$$

$$(a + b)(a + b)$$

$$94^2 + 2 \times 94 \times 6 + 6^2$$

$$(94 + 6)(94 - 6)$$

$$= 100 \times 88 = \underline{\underline{8800}}$$

Past Paper Solutions - National 5 Mathematics

Produced By Mrs Pamela Marnell

Page:

Topic: Factorising

15.25

$$d = \frac{n(n-3)}{2}$$

$$d = 20$$

$$\frac{n(n-3)}{2} = 20$$

$$n(n-3) = 40$$

$$n^2 - 3n = 40$$

$$n^2 - 3n - 40 = 0$$

$$(n + 5)(n - 8) = 0$$

$$n = -5$$

$$n = 8$$

$n = 8$ sides can't be negative

15.26

$$x^2 - y^2$$

$$= (x - y)(x + y)$$

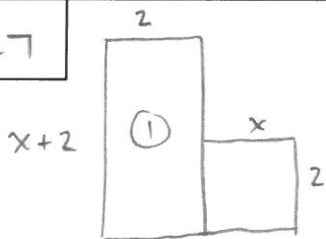
$$9.3^2 - 0.7^2$$

$$= (9.3 - 0.7)(9.3 + 0.7)$$

$$= 8.6 \times 10$$

$$= 86$$

15.27



a)

$$A = l \times b$$

$$A = l \times b$$

$$\textcircled{1} 2(x+2)$$

$$\textcircled{2} x \times 2$$

$$= 2x + 4$$

$$= 2x$$

$$\text{Total Area} = 2x + 4 + 2x$$

$$= 4x + 4$$

$$\text{b) } A = 18 \quad A = 4x + 4$$

$$4x + 4 = 18$$

$$4x = 14$$

$$x = \frac{14}{4}$$

15.28

$$\text{a) } A = l \times b$$

$$= (x+7)(x+3)$$

$$= x^2 + 3x + 7x + 21$$

$$= x^2 + 10x + 21$$

$$\text{b) } A = x^2 + 10x + 21$$

$$A = 45$$

$$x^2 + 10x + 21 = 45$$

$$x^2 + 10x + 21 - 45 = 0$$

$$x^2 + 10x - 24 = 0$$

$$(x - 2)(x + 12) = 0$$

$$\textcircled{x = 2} \quad x = -12$$

length can't be negative

Past Paper Solutions - National 5 Mathematics

Produced By Mrs Pamela Marnell

Page: Topic: Factorising

15-29

$$\begin{aligned} \text{a) } A &= L \times b \\ &= x(x+2) \\ &= x^2 + 2x \end{aligned}$$

$$\begin{aligned} \text{b) } A &= L \times b \quad x+1 \\ &= (x+1)(x+1) \\ &= x^2 + 2x + 1 \end{aligned}$$



The square is 1cm^2 larger than the rectangle

15-30

 $x+1$  $3x+2$ x  $3x$

$$\text{a) } (3x+2)(x+1)$$

$$x(3x) = 3x^2$$

$$\text{Path} = 3x^2$$

$$\text{Path} + \text{Lawn} = \text{Full}$$

$$3x^2 + 3x^2 = 3x^2 + 5x + 2$$

$$6x^2 - 3x^2 - 5x - 2 = 0$$

$$\text{a) } 3x^2 - 5x - 2 = 0$$

$$\text{b) } 3x^2 - 5x - 2 = 0$$

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

$$3x = -1$$

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

$$\boxed{x=2}$$

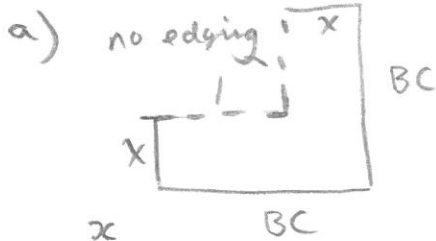
length

Past Paper Solutions - National 5 Mathematics

Produced By Mrs Pamela Marnell

Page: Topic: Factorising

15.31

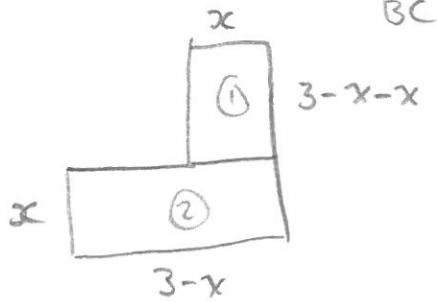


$$x + x + BC + BC = 6$$

$$2BC = 6 - 2x$$

$$BC = 3 - x$$

b)

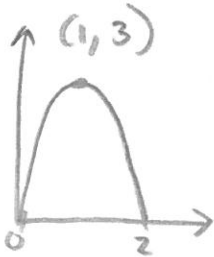


$$\begin{aligned} \textcircled{1} A &= l \times b \\ &= x(3-2x) \\ &= 3x - 2x^2 \end{aligned}$$

$$\begin{aligned} \textcircled{2} A &= l \times b \\ &= x(3-x) \\ &= 3x - x^2 \end{aligned}$$

$$\text{Total Area} = 6x - 3x^2 \quad (\textcircled{1} + \textcircled{2})$$

c)



$$\begin{aligned} 6x - 3x^2 &= 0 \\ 3x(2-x) &= 0 \\ x=0 \quad x=2 \end{aligned}$$

$$\begin{aligned} x=1 \quad y &= 6(1) - 3(1)^2 \\ &= 6 - 3 = \underline{\underline{3\text{m}^2}} \end{aligned}$$

15.32

a) $x + 30$

$$\begin{aligned} \text{b) } A &= (x+30)(x+20) \\ &= x^2 + 50x + 600 \end{aligned}$$

$$\begin{aligned} \text{c) Original Area} &= 30 \times 20 \\ &= 600 \end{aligned}$$

Increase by 40%

$$10\% = 60$$

$$40\% = 240$$

$$\text{new area} = 840$$

$$x^2 + 50x + 600 = 840$$

$$x^2 + 50x - 240 = 0$$

*solve using quadratic formula

Past Paper Solutions - National 5 Mathematics

Produced By Mrs Pamela Marnell

Page:

Topic: Factorising

15.33

$$W = \frac{1}{4}(m^2 - 4m + 272)$$

$$W = 83$$

$$\frac{1}{4}(m^2 - 4m + 272) = 83 \quad \times 4$$

$$m^2 - 4m + 272 = 332$$

$$m^2 - 4m + 272 - 332 = 0$$

$$m^2 - 4m - 60 = 0$$

$$(m - 10)(m + 6) = 0$$

$$m = 10 \quad m = -6$$

Age can't be negative

15.34

$$a) \quad r = \frac{1}{2}n(n-1) \quad n=7$$

$$r = \frac{1}{2}(7)(7-1)$$

$$r = \frac{1}{2}(7)(6) = \frac{1}{2} \text{ of } 42 = 21$$

$$b) \quad r = 55$$

$$r = \frac{1}{2}n(n-1)$$

$$\frac{1}{2}n(n-1) = 55$$

$$n(n-1) = 110$$

$$n^2 - n = 110$$

$$n^2 - n - 110 = 0$$

$$c) \quad n^2 - n - 110 = 0$$

$$(n - 11)(n + 10) = 0$$

$$n = 11 \quad n = -10$$

number of towns can't be negative

Past Paper Solutions - National 5 Mathematics

Produced By Mrs Pamela Marnell

Page:

Topic: Factorising

15.35

a) $w + 2$

b) original = 12×10 extension : 40% of 120
 = 120
 10% = 12
 40% = 48 m²

$$(w)(w+2) = 48$$

$$w^2 + 2w = 48$$

$$w^2 + 2w - 48 = 0$$

c) $(w + 8)(w - 6) = 0$


$$w = -8 \quad w = 6$$


width = $\underline{6}$ length = $6 + 2$
 = 8

15.36

Area large

Area Small

a)  $x = x^2$

 $y = y^2$

Area frame : $x^2 - y^2 = 48$
 $(x+y)(x-y) = 48$

b) $x = 13$ $(13 - 11)(13 + 11) = 48$
 $y = 11$ $(2)(24) = 48 \checkmark$

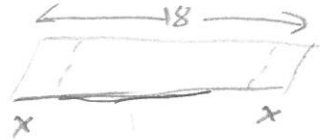
Past Paper Solutions - National 5 Mathematics

Produced By Mrs Pamela Marnell

Page: Topic: Factorising

15.37

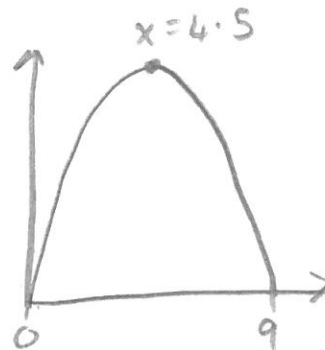
a) $w = 18 - 2x$



b) $V = A \times l$

$$\begin{aligned} V &= x(18 - 2x) \times 100 \\ &= 100x(18 - 2x) \\ &= 1800x - 200x^2 \end{aligned}$$

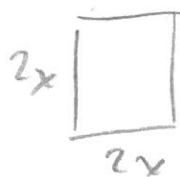
$$\begin{aligned} \text{c) } 1800x - 200x^2 &= 0 \\ 200x(9 - x) &= 0 \\ x = 0 \quad x = 9 \end{aligned}$$



$$\begin{aligned} x = 4.5 \quad y &= 1800(4.5) - 200(4.5)^2 \\ &= 4050 \text{ cm}^3 \end{aligned}$$

15.38

Surface Area



$$\begin{aligned} 2x \times 2x &= 4x^2 \times 6 \\ &= 24x^2 \end{aligned}$$

Volume



$$\begin{aligned} \text{Volume} &= A \times l \\ &= 4x^2 \times 2x \\ &= 6x^3 \end{aligned}$$

$$\begin{aligned} 24x^2 - 6x^3 &= 0 \\ 6x^2(x - 4) &= 0 \\ x = 0 \quad x = 4 \end{aligned}$$

Past Paper Solutions - National 5 Mathematics

Produced By Mrs Pamela Marnell

Page:

Topic: Factorising

15.39

a) i) $13 + 2x$ ii) $9 - 2x$ width

$$A = l \times b$$

$$= (13 + 2x)(9 + 2x)$$

$$= 117 + 26x + 18x + 4x^2$$

$$A = 4x^2 + 44x + 117$$

$$A = 270$$

$$A \Rightarrow 4x^2 + 44x + 117 = 270$$

$$4x^2 + 44x + 117 - 270 = 0$$

$$4x^2 + 44x - 153 = 0$$

b) Quadratic Formula

$$a = 4$$

$$b = 44$$

$$c = -153$$

$$b^2 - 4ac$$

$$= 44^2 - (4 \times 4 \times -153)$$

$$= 4384$$

$$\frac{-44 \pm \sqrt{4384}}{2 \times 4}$$

$$\frac{-44 + \sqrt{4384}}{8}$$

$$x = 2.8$$

$$\frac{-44 - \sqrt{4384}}{8}$$

$$= -13.8$$