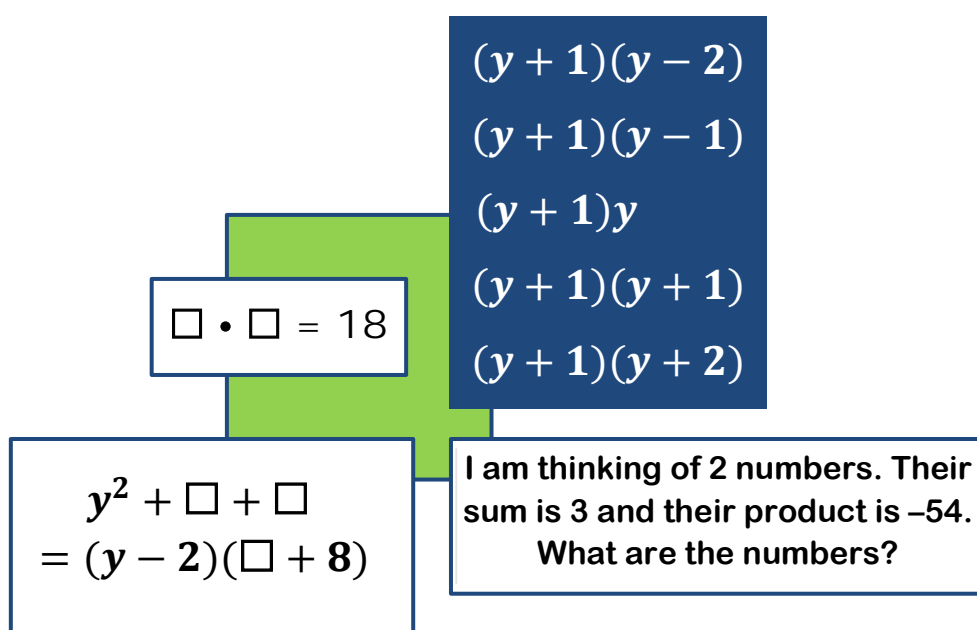


# Matters.of.Factors

WORKING WITH PRODUCTS AND FACTORS

VERSION 1.0



## **Matters.of.Factors: Working with products and factors**

These materials were produced by the Wits Maths Connect Secondary (WMCS) project at the University of the Witwatersrand.

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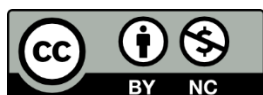
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## About this booklet

This booklet contains 22 worksheets on Products and Factors for Grade 9 learners, together with answers. There are many worksheets that can also be used for revision with Grade 10s.

The worksheets provide practice for learners. We assume they have already been taught the content. Each worksheet begins with products and factors of numbers. Then it moves into algebraic examples. We want learners see the relationship between multiplying factors and factorising expressions: the one process “undoes” the other. For example:

If you are asked to multiply out  $2x(3x - 4)$ , you get  $6x^2 - 8x$ .

If you are asked to factorise  $6x^2 - 8x$ , you get  $2x(3x - 4)$ .

There are many questions that deal with both processes at the same time. Here are 3 examples:

$$3a \times \_ \times \_ = 6a^2bc$$

$$3p(p + \_) = \_ + 12pr$$

$$t^2 + t + \_ = (t - 5)(t + \_)$$

The booklet is divided into 4 sections based on the content and level of difficulty of the examples in the worksheets. Answers are provided for every question.

In general, the worksheets in each section get more difficult as you go down the alphabet.

e.g. Worksheet 2B is easier than Worksheet 2C but more challenging in parts than Worksheet 2A.

## Contents

Section	Content	No. of worksheets
1	Simple products, HCF	4
2	HCF, difference of 2 squares	5
3	HCF, difference of 2 squares, difference of 2 squares with HCF, guided factorisation, trinomials with minor variations	7
4	HCF, trinomials including those with HCF, simplifying expressions before factorising, sums and products that involve variables	6

## Worksheet 1A

### Questions

- 1) Find a number that makes the following statements true.
  - a)  $3 \times \square = 30$
  - b)  $\square \times 10 = 30$
  - c)  $\square \times \square = 30$
- 2) What can we put in the boxes ( $\square$ ) to make the statements true?
  - a)  $2p \cdot 3p = \square$
  - b)  $\square \cdot \square = 6p^2$
- 3) Find a pair of factors that satisfies each of the following statements:
  - a) The sum of two numbers is zero and product is  $-25$ .
  - b) The sum of two numbers is zero and their product is  $-9p^2$ .
- 4) Expand the following:
  - a)  $2(x + 3) =$
  - b)  $2(-x + 3) =$
  - c)  $-2(-x + 3) =$
  - d)  $-2(-x - 3) =$
- 5) Multiply out:
  - a)  $5(x - 2) =$
  - b)  $5x(x - 2) =$
  - c)  $5x(x^2 - 2x - 3) =$
  - d)  $-5x(x^2 - 2x) - 3 =$
- 6) Insert the missing values ( $\square$ ) to make the following statements true:
  - a)  $2x(x - \square) = 2x^2 - 8x$
  - b)  $2x(\square - 4) = -2x^2 - 8x$
  - c)  $-2x(\square - 4) = 2x^3 + \square$
  - d)  $(x + \square)(x + \square) = x^2 - 25$
  - e)  $(5 + \square)(5 + \square) = 25 - t^2$

In these materials we use a place-holder ( $\square$ ) to indicate that any number can be put inside the box. The number might be positive or negative. We can also put letters and even algebraic expressions inside the box.

For example,

Given the item:  $\square \cdot \square = 16$ , we could put many different pairs of values in the boxes, such as:  $2 \times 8$ ,  $4 \times 4$ ,  $-2 \times -8$ ,  $36 \times \frac{1}{2}$

Given the item:  $\square \cdot \square = 10k^3$ , we could put many different terms in the boxes, such as:  $2k \times 5k^2$ ,  $-10 \times (-k^3)$ ,  $10k \times k^2$

## Worksheet 1A

### Answers

Questions	Answers
1) Find a number that makes the following statements true.	1)
a) $3 \times \square = 30$	a) 10
a) $\square \times 10 = 30$	b) 3
b) $\square \times \square = 30$	c) Many possible pairs of answers (e.g. 1 and 30; -2 and -15; $\frac{1}{2}$ and 60)
2) What can we put in the boxes ( $\square$ ) to make the statements true?	2)
a) $2p \cdot 3p = \square$	a) $6p^2$
a) $\square \cdot \square = 6p^2$	b) Many possible answers (e.g. 6 and $p^2$ , $-2p$ and $-3p$ )
3) Find a pair of factors that satisfies each of the following statements:	3)
a) The sum of two numbers is zero and product is -25.	a) -5 and 5
b) The sum of two numbers is zero and their product is $-9p^2$ .	b) $-3p$ and $+3p$
4) Expand the following:	4)
6) Insert the missing values ( $\square$ ) to make the following statements true:	6)
a) $2(x + 3) =$	a) $2x + 6$
a) $2x(x - \square) = 2x^2 - 8x$	a) 4
b) $2(-x + 3) =$	b) $-2x + 6$
b) $2x(\square - 4) = -2x^2 - 8x$	b) $-x$
c) $-2(-x + 3) =$	c) $2x - 6$
c) $-2x(\square - 4) = 2x^3 + \square$	c) $-x^2, 8x$
d) $-2(-x - 3) =$	d) $2x + 6$
d) $(x + \square)(x + \square) = x^2 - 25$	d) 5; -5 <b>or</b> -5; 5
5) Multiply out:	5)
e) $(5 + \square)(5 + \square) = 25 - t^2$	e) $t; -t$ <b>or</b> $-t; t$
a) $5(x - 2) =$	a) $5x - 10$
b) $5x(x - 2) =$	b) $5x^2 - 10x$
c) $5x(x^2 - 2x - 3) =$	c) $5x^3 - 10x^2 - 15x$
d) $-5x(x^2 - 2x) - 3 =$	a) $-5x^3 + 10x^2 - 3$

## Worksheet 1B

### Questions

1) Find a number that makes the following statements true:

a)  $\square \times 3(-2) = 12$

b)  $-12 = -6 \times \square$

c)  $-12 = 12 \times \square$

2) Insert the missing values ( $\square$ ) to make the statements true:

a)  $q \cdot \square = 6q^2$

b)  $-q \times \square = 6q^2$

c)  $-2q \times \square = 6q^2$

3) Complete the following to make the statements true:

a)  $(6 + \square) \times \square = 21$

b)  $(6 + \square) \times \square - 1 = 26$

c)  $(6 + \square) \times \square - 1 = -10$

4) Complete the following to make the statements true:

a)  $-6(q + \square) = -6q + 30q^2$

b)  $-6(q + \square) = -30q$

c)  $\square(\square + 6q) = 30q - 5$

5) Multiply out and simplify:

a)  $-3x(y - 2) + 2x(3 - 2y) =$

b)  $(y + 4)(y + 3) =$

c)  $(y + 4)(y - 3) =$

d)  $(y - 4)(y - 3) =$

e)  $(y - 4)(y + 3) =$

f) Look at your answers to Q5b – Q5e. What is the same? What is different? What causes these similarities and differences?

In these materials we use a place-holder ( $\square$ ) to indicate that any number can be put inside the box. The number might be positive or negative.

We can also put letters and even algebraic expressions inside the box. For example, Given the item:  $\square \cdot \square = 16$ , we could put many different pairs of values in the boxes, such as:  $2 \times 8$ ,  $4 \times 4$ ,  $-2 \times -8$ ,  $36 \times \frac{1}{9}$ . Given the item:  $\square \cdot \square = 10k^3$ , we could put many different terms in the boxes, such as:  $2k \times 5k^2$ ,  $-10 \times (-k^3)$ ,  $10k \times k^2$ .

## Worksheet 1B

### Answers

Questions		Answers
1) Find a number that makes the following statements true:		1)
a) $\square \times 3(-2) = 12$		a) $-2$
b) $-12 = -6 \times \square$		b) $2$
c) $-12 = 12 \times \square$		c) $-1$
2) Insert the missing values ( $\square$ ) to make the statements true:		2)
a) $q \cdot \square = 6q^2$		a) $6q$
b) $-q \times \square = 6q^2$		b) $-6q$
c) $-2q \times \square = 6q^2$		c) $-3q$
3) Complete the following to make the statements true:		3) There are many possibilities in Q3, some examples are given below
a) $(6 + \square) \times \square = 21$		a) $(6 + 1) \times 3 = 21$ or $(6 + (-13)) \times (-3) = 21$ or $(6 + (-9)) \times (-7) = 21$
b) $(6 + \square) \times \square - 1 = 26$		b) $(6 + 3) \times 3 - 1 = 26$ or $(6 + (-15)) \times (-3) - 1 = 26$ or $(6 + (-9)) \times (-9) - 1 = 26$
c) $(6 + \square) \times \square - 1 = -10$		c) $(6 + 3) \times (-1) - 1 = -10$ or $(6 + (-5)) \times (-9) - 1 = -10$ or $(6 + (-7)) \times 9 - 1 = -10$
4) Complete the following to make the statements true:		4)
a) $-6(q + \square) = -6q + 30q^2$		a) $-5q^2$
b) $-6(q + \square) = -30q$		b) $4q$
c) $\square(\square + 6q) = 30q - 5$		c) $5; -1$
5) Multiply out and simplify:		5)
a) $-3x(y - 2) + 2x(3 - 2y) =$		a) $-3xy + 6x + 6x - 4xy = 12x - 7xy$
b) $(y + 4)(y + 3) =$		b) $y^2 + 7y + 12$
c) $(y + 4)(y - 3) =$		c) $y^2 + y - 12$
d) $(y - 4)(y - 3) =$		d) $y^2 - 7y + 12$
e) $(y - 4)(y + 3) =$		e) $y^2 + y - 12$
f) Look at your answers to Q5b – Q5e. What is the same? What is different? What causes these similarities and differences?	f) All answers have $y^2$ and 12. The sign of 12 depends on the signs of constants in the brackets. The middle term and its sign depends on the answer from adding the 2 products containing $y$ .	

## Worksheet 1C

### Questions

1) Choose the correct answer:

a)  $2 + 5 \times 3 - 1 = \underline{\hspace{2cm}}$

Possible answers: 20 or 16 or 12

b)  $(2 \times 5) + (2 \times 5) + (2 \times 5) = \underline{\hspace{2cm}}$  Possible answers:  $3(2 \times 5)$  or  $(2 \times 5)^3$

2) Fill in the missing values:

a)  $2a \times a = \square$

b)  $3 \times a = \square$

c)  $2p \cdot \square = -4p^3$

d)  $\square \cdot \frac{1}{3a} = a$

3) Factorise

a)  $3a^2 + 9a$

b)  $2pr + 6p - 4p^3$

c)  $-2x^2 + 6x + 2y$

4) Simplify the following:

a)  $(x - 2)(-6x) =$

b)  $(x - 2)(x - 6) =$

c)  $(x - 2) + (x - 6) =$

d)  $(x - 2)x - 6 =$

e)  $x - 6(x - 2) =$

5) Simplify the following:

a)  $(x - 2)(-6) =$

b)  $(x - 2)(-6)x =$

c)  $x - 2(-6) =$

d)  $x - 2 - 6 =$

e)  $(-6x) - (x - 2) =$

In these materials we use a place-holder ( $\square$ ) to indicate that any number can be put inside the box. The number might be positive or negative. We can also put letters and even algebraic expressions inside the box.

For example,

Given the item:  $\square \cdot \square = 16$ , we could put many different pairs of values in the boxes, such as:  $2 \times 8$ ,  $4 \times 4$ ,  $-2 \times -8$ ,  $36 \times \frac{1}{2}$

Given the item:  $\square \cdot \square = 10k^3$ , we could put many different terms in the boxes, such as:  $2k \times 5k^2$ ,  $-10 \times (-k^3)$ ,  $10k \times k^2$



# Matters.of.Factors

WORKING WITH PRODUCTS AND FACTORS

## Worksheet 1C

### Answers

Questions	Answers
1) Answer the following:	1)
a) $2 + 5 \times 3 - 1 =$	a) 16
b) $(2 \times 5) + (2 \times 5) + (2 \times 5) =$ __	b) $3(2 \times 5)$
2) Fill in the missing values:	2)
a) $2a \times a = \square$	a) $2a^2$
b) $3 \times a = \square$	b) $3a$
c) $2p \cdot \square = -4p^3$	c) $-2p^2$
d) $\square \cdot \frac{1}{3a} = a$	d) $3a^2$
3) Factorise:	3)
a) $3a^2 + 9a$	a) $3a(a + 3)$
b) $2pr + 6p - 4p^3$	b) $2p(r + 3 - 2p^2)$
c) $-2x^2 + 6x + 12y$	c) $-2(x^2 - 3x - 6y)$ or $2(-x^2 + 3x + 6y)$
4) Answer the following:	4)
a) $(x - 2)(-6x) =$	a) $-6x^2 + 12x$
b) $(x - 2)(x - 6) =$	b) $x^2 - 8x + 12$
c) $(x - 2) + (x - 6) =$	c) $2x - 8$
d) $(x - 2)x - 6 =$	d) $x^2 - 2x - 6$
e) $x - 6(x - 2) =$	e) $-5x + 12$
5) Simplify the following:	5)
a) $(x - 2)(-6) =$	a) $-6x + 12$
b) $(x - 2)(-6)x =$	b) $-6x^2 + 12x$
c) $x - 2(-6) =$	c) $x + 12$
d) $x - 2 - 6 =$	d) $x - 8$
e) $(-6x) - (x - 2) =$	e) $-7x + 2$

## Worksheet 1D

### Questions

1) Fill in the missing values:

a)  $8 \times \square = 4$

b)  $\square \cdot \frac{1}{3} = 9$

c)  $\square \cdot \frac{1}{3} = 18$

d)  $3 + \square = 7 + 9 = \triangle + 10$

2) Complete the following:

a)  $2a + \square = 5a$

b)  $-2a + \square = 5a$

c)  $2a - \square = 5a$

3) Complete the following:

a)  $3a(2 + a + c) =$

b)  $3a + (2 + a + c) =$

c)  $3a - (2 + a + c) =$

d)  $3a - (2 + a - c) =$

4) Complete the following:

a)  $3a(\underline{\hspace{2cm}}) = 3a^2 + 9ab$

b)  $3a(\underline{\hspace{2cm}}) = a^2 - 6ab$

c)  $3a\left(\underline{\hspace{1cm}} - \frac{1}{3}ab\right) = ab - \underline{\hspace{2cm}}$

5) Factorise:

a)  $3a - 12ab =$

b)  $9a + 6ab - 3a^2 =$

In these materials we use a place-holder ( $\square$ ) to indicate that any number can be put inside the box. The number might be positive or negative. We can also put letters and even algebraic expressions inside the box.

For example,

Given the item:  $\square \cdot \square = 16$ , we could put many different pairs of values in the boxes, such as:  $2 \times 8$ ,  $4 \times 4$ ,  $-2 \times -8$ ,  $36 \times \frac{1}{2}$

Given the item:  $\square \cdot \square = 10k^3$ , we could put many different terms in the boxes, such as:  $2k \times 5k^2$ ,  $-10 \times (-k^3)$ ,  $10k \times k^2$

# Matters.of.Factors

WORKING WITH PRODUCTS AND FACTORS

## Worksheet 1D

### Answers

Questions	Answers
1) Fill in the missing values:	1)
a) $8 \times \underline{\quad} = 4$	a) $\frac{1}{2}$
b) $\square \cdot \frac{1}{3} = 9$	b) 27
c) $\square \cdot \frac{1}{3} = 18$	c) 54
d) $3 + \square = 7 + 9 = \triangle + 10$	d) $3 + 13 = 7 + 9 = 6 + 10$
2) Complete the following:	2)
a) $2a + \square = 5a$	a) $3a$
b) $-2a + \square = 5a$	b) $7a$
c) $2a - \square = 5a$	c) $-3a$
3) Complete the following:	3)
a) $3a(2 + a + c) =$	a) $6a + 3a^2 + 3ac$
b) $3a + (2 + a + c) =$	b) $4a + 2 + c$
c) $3a - (2 + a + c) =$	c) $2a - 2 - c$
d) $3a - (2 + a - c) =$	d) $2a - 2 + c$
4) Complete the following:	4)
a) $3a(\underline{\quad\quad\quad}) = 3a^2 + 9ab$	a) $3a(a + 3b) = 3a^2 + 9ab$
b) $3a(\underline{\quad\quad\quad}) = a^2 - 6ab$	b) $3a\left(\frac{a}{3} - 2b\right) = a^2 - 6ab$
c) $3a\left(\underline{\quad} - \frac{1}{3}ab\right) = ab - \underline{\quad}$	c) $3a\left(\frac{b}{3} - \frac{1}{3}ab\right) = ab - a^2b$
5) Factorise	5)
a) $3a - 12ab =$	a) $3a(1 - 4b)$
b) $9a + 6ab - 3a^2 =$	b) $3a(3 + 2b - a)$

## Worksheet 2A

### Questions

- 1) What is the product of negative 3 and 7?
- 2) What number multiplied by 4 gives negative 28?
- 3) Each of the following has an error. Write a correct statement for each.
  - a)  $-3t \times -2tr = 6tr$
  - b)  $-3p^2 \times p = -4p^3$
  - c)  $q^2 \times p^3 = qp^5$
- 4) Multiply  $(3x + 10y)(3x - 10y)$
- 5) Choose the correct product of  $(3x + 10y)(3x + 10y)$  from the list below:
  - a)  $9x^2 + 100y^2$
  - b)  $9x^2 + 30xy + 100y^2$
  - c)  $9x^2 + 60xy + 100y^2$
  - d)  $9x^2 + 60xy + 10y^2$
- 6) Factorise completely if possible:
  - a)  $3x + 6x^2$
  - b)  $4p^2 - q^2$
  - c)  $4p^2 + q^2$
  - d)  $4p^2 - 16q^2$
- 7) Choose the correct factors of  $a^2 - 5a + 6$  from the following list:
  - a)  $(a - 6)(a + 1)$
  - b)  $(a - 1)(a - 6)$
  - c)  $(a - 3)(a - 2)$
  - d)  $(a - 3)(a + 2)$

In these materials we use a place-holder ( $\square$ ) to indicate that any number can be put inside the box. The number might be positive or negative. We can also put letters and even algebraic expressions inside the box. For example,

Given the item:  $\square \cdot \square = 16$ , we could put many different pairs of values in the boxes, such as:  $2 \times 8$ ,  $4 \times 4$ ,  $-2 \times -8$ ,  $36 \times \frac{1}{2}$

Given the item:  $\square \cdot \square = 10k^3$ , we could put many different terms in the boxes, such as:  $2k \times 5k^2$ ,  $-10 \times (-k^3)$ ,  $10k \times k^2$

# Matters.of.Factors

WORKING WITH PRODUCTS AND FACTORS

## Worksheet 2A

### Answers

Questions	Answers
1) What is the product of negative 3 and 7?	1) $-21$
2) What number multiplied by 4 gives negative 28?	2) $-7$
3) Each of the following has an error. Write the correct statement	3)
a) $-3t \times -2tr = 6tr$	a) $-3t \times -2tr = 6\cancel{t}^2r$ (or correctly change LHS)
b) $-3p^2 \times p = -4p^3$	b) $-3p^2 \times p = -3p^3$ (or correctly change LHS)
c) $q^2 \times p^3 = qp^5$	c) $q^2 \times p^3 = \mathbf{q^2p^3}$ (or correctly change LHS)
4) Multiply $(3x + 10y)(3x - 10y)$	4) $9x^2 - 100y^2$
5) Choose the correct product of $(3x + 10y)(3x + 10y)$ from the list below:	5)
a) $9x^2 + 100y^2$	b) $9x^2 + 30xy + 100y^2$
c) $9x^2 + 60xy + 100y^2$	d) $9x^2 + 60xy + 10y^2$
c) $9x^2 + 60xy + 100y^2$	c) $9x^2 + 60xy + 100y^2$
6) Factorise completely if possible:	6)
a) $3x + 6x^2$	a) $3x(1 + 2x)$
b) $4p^2 - q^2$	b) $(2p - q)(2p + q)$
c) $4p^2 + q^2$	c) $4p^2 + q^2$ i.e. cannot be factorised
d) $4p^2 - 16q^2$	d) $4(p - 2q)(p + 2q)$
7) Choose the correct factors of $a^2 - 5a + 6$ from the following list:	7)
a) $(a - 6)(a + 1)$	b) $(a - 1)(a - 6)$
c) $(a - 3)(a - 2)$	d) $(a - 3)(a + 2)$
c) $(a - 3)(a - 2)$	c) $(a - 3)(a - 2)$

## Worksheet 2B

### Questions

1) Fill in the missing values

a)  $8 \times \underline{\quad} = 64$

b)  $-3 \times \underline{\quad} = 27$

c)  $\square \cdot \square = 36$

2) Determine the numbers in each of the following:

a) The product of 2 numbers is  $-9$  and their sum is  $0$ .

b) The product of 2 numbers is  $-10$  and their sum is  $9$ .

3) Answer the following:

a)  $-a \cdot 3b = \underline{\quad}$

b)  $\square \cdot \square = 12pr$

4) Determine the following:

a)  $3p(p + \underline{\quad}) = \underline{\quad} + 12pr$

b)  $(3b - a)(4b - a) =$

c) What is the product of:  $5 - k$  and  $5 + k$ ?

5) Factorise if possible:

a)  $x^2 - 9 =$

d)  $x^2 + 9 =$

b)  $x^2 - 9x =$

e)  $x^2 + 9x =$

c)  $x^2 - 9x + 18 =$

f)  $x^2 + 9x + 18 =$

6) Factorise if possible:

a)  $m^2 - 9m - 10 =$

b)  $m^2 + 9m - 10 =$

c)  $m^2 + 9m + 10 =$

In these materials we use a place-holder ( $\square$ ) to indicate that any number can be put inside the box. The number might be positive or negative. We can also put letters and even algebraic expressions inside the box. For example,

Given the item:  $\square \cdot \square = 16$ , we could put many different pairs of values in the boxes, such as:  $2 \times 8$ ,  $4 \times 4$ ,  $-2 \times -8$ ,  $36 \times \frac{1}{2}$

Given the item:  $\square \cdot \square = 10k^3$ , we could put many different terms in the boxes, such as:  $2k \times 5k^2$ ,  $-10 \times (-k^3)$ ,  $10k \times k^2$

**Worksheet 2B**

**Answers**

Questions	Answers
1) Fill in the missing values	1)
a) $8 \times \underline{\hspace{1cm}} = 64$	a) 8
b) $-3 \times \underline{\hspace{1cm}} = 27$	b) -9
c) $\square \cdot \square = 36$	c) 6 and 6; 2 and 18; $\frac{1}{2}$ and 72; -3 and -12; etc.
2) Determine the numbers in each of the following:	2)
a) The product of 2 numbers is -9 and their sum is 0.	a) 3 and -3
b) The product of 2 numbers is -10 and their sum is 9.	b) -1 and 10
3) Answer the following:	3)
a) $-a \cdot 3b = \underline{\hspace{1cm}}$	a) $a)-3ab$
b) $\square \cdot \square = 12pr$	b) 12 and $pr$ ; $3p$ and $4r$ ; -2 and $-6pr$ ; $24p$ and $\frac{r}{2}$ ; etc.
4) Determine the following:	4)
a) $3p(p + \underline{\hspace{1cm}}) = \underline{\hspace{1cm}} + 12pr$	a) $3p(p + 4r) = 3p^2 + 12pr$
b) $(3b - a)(4b - a) = \underline{\hspace{1cm}}$	b) $12b^2 - 7ab + a^2$
c) What is the product of: $5 - k$ and $5 + k$ ?	c) $25 - k^2$
5) Factorise if possible:	5)
a) $x^2 - 9 =$	a) $(x - 3)(x + 3)$
b) $x^2 - 9x =$	b) $x(x - 9)$
c) $x^2 - 9x + 18 =$	c) $(x - 6)(x - 3)$
d) $x^2 + 9 =$	d) Cannot be factorised
e) $x^2 + 9x =$	e) $x(x + 9)$
f) $x^2 + 9x + 18 =$	f) $(x + 6)(x + 3)$
6) Factorise if possible:	6)
a) $m^2 - 9m - 10 =$	a) $(m - 10)(m + 1)$
b) $m^2 + 9m - 10 =$	b) $(m - 1)(m + 10)$
c) $m^2 + 9m + 10 =$	c) Cannot be factorised

## Worksheet 2C

### Questions

1) Complete the following:

a)  $5x \cdot 8 =$

b)  $5x \cdot 8x =$

c)  $5x \cdot 8y =$

d)  $\square \cdot \square = 40x^2$

2) The product of two numbers is  $-40$  and their sum is  $-3$ . What are the numbers?

3) Multiply:

a)  $t(t + 8)$

b)  $(5t + 8)(t - 2)$

4) Factorise if possible:

a)  $4y^2 - 8y$

b)  $8m^2 - n^2$

c)  $n^2 - 3n - 40$

5) Complete:

a)  $b^2 + \underline{\hspace{1cm}} - 16 = (b - 2)(\underline{\hspace{1cm}})$

b)  $(t - \underline{\hspace{1cm}})(t + 4) = t^2 - 8t - \underline{\hspace{1cm}}$

In these materials we use a place-holder ( $\square$ ) to indicate that any number can be put inside the box. The number might be positive or negative. We can also put letters and even algebraic expressions inside the box. For example,

Given the item:  $\square \cdot \square = 16$ , we could put many different pairs of values in the boxes, such as:  $2 \times 8$ ,  $4 \times 4$ ,  $-2 \times -8$ ,  $36 \times \frac{1}{2}$

Given the item:  $\square \cdot \square = 10k^3$ , we could put many different terms in the boxes, such as:  $2k \times 5k^2$ ,  $-10 \times (-k^3)$ ,  $10k \times k^2$



## Worksheet 2C

### Answers

Questions	Answers
1) Complete the following:	1)
a) $5x \cdot 8 =$	a) $40x$
b) $5x \cdot 8x =$	b) $40x^2$
c) $5x \cdot 8y =$	c) $40xy$
d) $\square \cdot \square = 40x^2y$	d) Any of the following or other correct factors: $5x \cdot 8xy$ or $-5x \cdot -8xy$ or $5x^2 \cdot 8y$ or $10x \cdot 4x$
2) The product of two numbers is $-40$ and their sum is $-3$ . What are the numbers?	2) $-8$ and $5$
3) Multiply:	3)
a) $t(t + 8)$	a) $t^2 + 8t$
b) $(5t + 8)(t - 2)$	b) $5t^2 - 2t - 16$
4) Factorise if possible:	3)
a) $4y^2 - 8y$	a) $4y(y - 2)$
b) $8m^2 - n^2$	b) $(8m^2 - n^2)$ or cannot be factorised
c) $n^2 - 3n - 40$	c) $(n - 8)(n + 5)$
5) Complete:	4)
a) $b^2 + \underline{\hspace{1cm}} - 16 = (b - 2)(\underline{\hspace{1cm}})$	a) $6b; (b + 8)$
b) $(t - \underline{\hspace{1cm}})(t + 4) = t^2 - 8t - \underline{\hspace{1cm}}$	b) $12; 48$

## Worksheet 2D

### Questions

1)  $5(3 + 4) = 5 \times \square + 5 \times \square$

2) List all factors of the numbers in the table. The first one has been completed for you:

Number or expression	Factors
a) $2 \times 3$	1; 2; 3; 6
b) $2 + 3$	
c) $2a$	
d) $2 + 2a$	
e) $2 + a$	

3) I am thinking of 2 numbers. Their sum is 7 and their product is 12. What are the numbers?

4) I am thinking of 2 numbers. Their sum is  $-1$  and their product is  $-30$ . What are the numbers?

5) Complete to make the statements true:

a)  $2p \cdot \square = pt$

b)  $2p + \underline{\hspace{2cm}} = p + t$

6) Multiply out:

a)  $-2v(v + 3) =$

b)  $(y + 2)(y - 3) =$

c)  $(-2x - 3y)(-2y - 3z) =$

7) Fill in the boxes to make the statements true:

a)  $4y^2 - 8y = 4y(\square + \square)$

b)  $3y^2 - \square = \square(y - 2)$

c)  $y^2 + \square + \square = (y + 2)(\square - 1)$

8) Factorise:

a)  $2y^3 + 4y^2 - 2b^2y =$

b)  $p^2 + 7p + 12 =$

c)  $m^2 - m - 30 =$

In these materials we use a place-holder ( $\square$ ) to indicate that any number can be put inside the box. The number might be positive or negative. We can also put letters and even algebraic expressions inside the box. For example,

Given the item:  $\square \cdot \square = 16$ , we could put many different pairs of values in the boxes, such as:  $2 \times 8$ ,  $4 \times 4$ ,  $-2 \times -8$ ,  $36 \times \frac{1}{2}$

Given the item:  $\square \cdot \square = 10k^3$ , we could put many different terms in the boxes, such as:  $2k \times 5k^2$ ,  $-10 \times (-k^3)$ ,  $10k \times k^2$

## Worksheet 2D

### Answers

Questions	Answers																								
1) $5(3 + 4) = 5 \times \square + 5 \times \square$	1) $5(3 + 4) = 5 \times 3 + 5 \times 4$																								
2) List all factors of the numbers in the table. The first one has been completed for you:	2)																								
<table border="1"> <thead> <tr> <th>Number or expression</th><th>Factors</th></tr> </thead> <tbody> <tr> <td>a) <math>2 \times 3</math></td><td>1; 2; 3; 6</td></tr> <tr> <td>b) <math>2 + 3</math></td><td></td></tr> <tr> <td>c) <math>2a</math></td><td></td></tr> <tr> <td>d) <math>2 + 2a</math></td><td></td></tr> <tr> <td>e) <math>2 + a</math></td><td></td></tr> </tbody> </table>	Number or expression	Factors	a) $2 \times 3$	1; 2; 3; 6	b) $2 + 3$		c) $2a$		d) $2 + 2a$		e) $2 + a$		<table border="1"> <thead> <tr> <th>Number or expression</th><th>Factors</th></tr> </thead> <tbody> <tr> <td>a) <math>2 \times 3</math></td><td>1; 2; 3; 6</td></tr> <tr> <td>b) <math>2 + 3</math></td><td>1; 5</td></tr> <tr> <td>c) <math>2a</math></td><td>1 and <math>2a</math>; 2 and <math>a</math></td></tr> <tr> <td>d) <math>2 + 2a</math></td><td>1 and <math>(2 + 2a)</math>; 2 and <math>(1 + a)</math></td></tr> <tr> <td>e) <math>2 + a</math></td><td>1 and <math>(2 + a)</math></td></tr> </tbody> </table>	Number or expression	Factors	a) $2 \times 3$	1; 2; 3; 6	b) $2 + 3$	1; 5	c) $2a$	1 and $2a$ ; 2 and $a$	d) $2 + 2a$	1 and $(2 + 2a)$ ; 2 and $(1 + a)$	e) $2 + a$	1 and $(2 + a)$
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b) $2p + \underline{\hspace{2cm}} = p + t$	b) $-p + t$																								
6) Multiply out:	6)																								
a) $-2v(v + 3) =$	a) $-2v^2 - 6v$																								
b) $(y + 2)(y - 3) =$	b) $y^2 - y - 6$																								
c) $(-2x - 3y)(-2y - 3z) =$	c) $4xy + 6xz + 6y^2 + 9yz$																								
7) Fill in the boxes to make the statements true:	7)																								
a) $4y^2 - 8y = 4y(\square + \square)$	a) $4y^2 - 8y = 4y(y + (-2))$																								
b) $3y^2 - \square = \square(y - 2)$	b) $3y^2 - 6y = 3y(y - 2)$																								
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b) $p^2 + 7p + 12 =$	b) $(p + 3)(p + 4)$																								
c) $m^2 - m - 30 =$	c) $(m - 6)(m + 5)$																								

## Worksheet 2E

### Questions

1) Find four different ways to make 48 in each of the statements below:

a)  $\square \times (-\square) \times (-8) = 48$

b)  $(-\square) \times (-\square) \times (-6) = 48$

2) Find a pair of factors that satisfies each of the following statements:

a) The sum of two numbers is 10 and their product is 25.

b) The sum of two numbers is zero and their product is -25.

c) The sum of two terms is zero and their product is  $9p^2$ .

3) Copy and complete the following to make the statements true:

a)  $x^2 - 2x + 6x - 12 = x(x - 2) + 6(\underline{\hspace{1cm}})$

b)  $x(\underline{\hspace{1cm}}) - 6(\underline{\hspace{1cm}}) = x^2 - 8x + 12$

c)  $x^2 - 6x + 2x - 12 = x(\underline{\hspace{1cm}}) + 2(\underline{\hspace{1cm}})$

d)  $x^2 - 6x + 2x - 12 = (x + 6)(\square - \square)$

4) Complete the following to make the statements true:

a)  $(m - \square)(m + \square) = m^2 - 25$

b)  $(a + \square)(a + \square) = a^2 - 49$

c)  $x^2 + \square + 49 = (x + 7)(x + \square)$

d)  $x^2 - \square + \square = (x - 8)^2$

In these materials we use a place-holder ( $\square$ ) to indicate that any number can be put inside the box. The number might be positive or negative. We can also put letters and even algebraic expressions inside the box. For example,

Given the item:  $\square \cdot \square = 16$ , we could put many different pairs of values in the boxes, such as:  $2 \times 8$ ,  $4 \times 4$ ,  $-2 \times -8$ ,  $36 \times \frac{1}{2}$

Given the item:  $\square \cdot \square = 10k^3$ , we could put many different terms in the boxes, such as:  $2k \times 5k^2$ ,  $-10 \times (-k^3)$ ,  $10k \times k^2$

# Matters.of.Factors

WORKING WITH PRODUCTS AND FACTORS

## Worksheet 2E

### Answers

Questions	Answers
1) Find four different ways to make 48 in each of the statements below:	1)
a) $\square \times (-\square) \times (-8) = 48$	a) Many possible answers which must give a product of -6, e.g. 3 and -2; 6 and 1; -6 and -1
b) $(-\square) \times (-\square) \times (-6) = 48$	b) Many possible answers which must give a product of -8, e.g. 4 and 2; -4 and -2; 16 and $\frac{1}{2}$
2) Find a pair of factors that satisfies each of the following statements:	2)
a) The sum of two numbers is 10 and their product is 25.	a) 5 and 5
b) The sum of two numbers is zero and product is -25.	b) 5 and -5
c) The sum of two terms is zero and their product is $9p^2$ .	c) $3p$ and $-3p$
3) Copy and complete the following to make the statements true:	3)
a) $x^2 - 2x + 6x - 12 = x(x - 2) + 6(\square)$	a) $x(x - 2) + 6(x - 2)$
b) $x(\square) - 6(\square) = x^2 - 8x + 12$	b) $x(x - 2) - 6(x - 2)$
c) $x^2 - 2x + 6x - 12 = x(\square) + 6(\square)$	c) $x(x - 2) + 6(x - 2)$
d) $x^2 - 2x + 6x - 12 = (x + 6)(\square - \square)$	d) $(x + 6)(x - 2)$
4) Complete the following to make the statements true:	4)
a) $(m - \square)(m + \square) = m^2 - 100$	a) $(m - 10)(m + 10) = m^2 - 100$
b) $(a + \square)(a + \square) = a^2 - 49$	b) $(a + 7)(a + (-7)) = a^2 - 49$
c) $x^2 + \square + 49 = (x + 7)(x + \square)$	c) $x^2 + 14x + 49 = (x + 7)(x + 7)$
d) $x^2 - \square + \square = (x - 8)^2$	d) $x^2 - 16x + 64 = (x - 8)(x - 8) = (x - 8)^2$

## Worksheet 3A

### Questions

- 1) Fill in  $=$  or  $\neq$  in the box to make the statements true.
  - a)  $3 + (4 + 5) \square 3 + 4 + 3 + 5$
  - b)  $3(4 \times 5) \square 3 \times 4 \times 3 \times 5$
- 2) The product of 2 numbers is 9 and their sum is 10. What are the numbers?
- 3) The product of 2 numbers is 9 and their sum is  $-6$ . What are the numbers?
- 4) The product of 2 factors is  $6p$ . What could these factors be?
- 5) Work out:
  - a)  $p \cdot p =$
  - b)  $p + p =$
  - c)  $p + p \cdot p =$
- 6) Multiply out:
  - a)  $(v + 2)(v - 3) =$
  - b)  $(v - 2)(v + 3) =$
  - c)  $(v - 2)(v - 3) =$
- 7) Factorise where possible:
  - a)  $r^2 + 10r + 9 =$
  - b)  $r^2 + 10r - 9 =$
  - c)  $r^2 - 10r + 9 =$
  - d)  $r^2 - 8r - 9 =$
  - e)  $r^2 + 8r - 9 =$
  - f)  $r^2 + 6r + 9 =$
  - g)  $r^2 - 6r + 9 =$

In these materials we use a place-holder ( $\square$ ) to indicate that any number can be put inside the box. The number might be positive or negative. We can also put letters and even algebraic expressions inside the box. For example,

Given the item:  $\square \cdot \square = 16$ , we could put many different pairs of values in the boxes, such as:  $2 \times 8$ ,  $4 \times 4$ ,  $-2 \times -8$ ,  $36 \times \frac{1}{2}$

Given the item:  $\square \cdot \square = 10k^3$ , we could put many different terms in the boxes, such as:  $2k \times 5k^2$ ,  $-10 \times (-k^3)$ ,  $10k \times k^2$

# Matters.of.Factors

WORKING WITH PRODUCTS AND FACTORS

## Worksheet 3A

### Answers

Questions	Answers
1) Fill in = or $\neq$ in the box to make the statements true.	1) a) $\neq$ b) $\neq$
a) $3 + (4 + 5) \square 3 + 4 + 3 + 5$ b) $3(4 \times 5) \square 3 \times 4 \times 3 \times 5$	2) 9 and 1 3) -3 and -3
2) The product of 2 numbers is 9 and their sum is 10. What are the numbers?	4) 6 and $p$ ; 1 and $6p$ ; 2 and $3p$ ; $2p$ and 3; -1 and - $6p$ etc.; $\frac{p}{2}$ and 12 etc.
3) The product of 2 numbers is 9 and their sum is -6. What are the numbers?	5) a) $p^2$ b) $2p$ c) $p + p^2$
4) The product of 2 factors is $6p$ . What could these factors be?	6) a) $v^2 - v - 6$ b) $v^2 + v - 6$ c) $v^2 - 5v + 6$
5) Work out: a) $p \cdot p =$ b) $p + p =$ c) $p + p \cdot p =$	7) a) $(r + 1)(r + 9)$ b) cannot be factorised c) $(r - 1)(r - 9)$ d) $(r + 1)(r - 9)$ e) $(r - 1)(r + 9)$ f) $(r + 3)(r + 3)$ or $(r + 3)^2$ g) $(r - 3)(r - 3)$ or $(r - 3)^2$
6) Multiply out: a) $(v + 2)(v - 3) =$ b) $(v - 2)(v + 3) =$ c) $(v - 2)(v - 3) =$	
7) Factorise where possible: a) $r^2 + 10r + 9 =$ b) $r^2 + 10r - 9 =$ c) $r^2 - 10r + 9 =$ d) $r^2 - 8r - 9 =$ e) $r^2 + 8r - 9 =$ f) $r^2 + 6r + 9 =$ g) $r^2 - 6r + 9 =$	

## Worksheet 3B

### Questions

- 1)  $7 \times \underline{\quad} = 21$
- 2) What numbers can we put in the boxes to make the statement true:  $\square \cdot \square = 35$
- 3) What number multiplied by 6 gives 42?
- 4) The sum of 2 numbers is  $-2$ . What are the numbers?
- 5) The product of 2 numbers is 42 and their sum is 23. What are the numbers?
- 6) The sum of 2 numbers is  $-2$  and their product is  $-35$ . What are the numbers?
- 7)  $4a \cdot 7a = \underline{\quad}$
- 8) What terms can we put in the boxes to make the statement true:  $\square \cdot \square = 14p^3$
- 9) Multiply out:
  - a)  $3k(k + 7) =$
  - b)  $(3 - k)(k - 7) =$
- 10) What is the product of  $x + 6$  and  $x + 7$ ?
- 11) Factorise:
  - a)  $6x - 42 =$
  - b)  $x^2 - 2x =$
  - c)  $x^2 + 12x + 35 =$
  - d)  $x^2 - 2x - 35 =$
  - e)  $x^2 - 23x + 42 =$

In these materials we use a place-holder ( $\square$ ) to indicate that any number can be put inside the box. The number might be positive or negative. We can also put letters and even algebraic expressions inside the box. For example,

Given the item:  $\square \cdot \square = 16$ , we could put many different pairs of values in the boxes, such as:  $2 \times 8$ ,  $4 \times 4$ ,  $-2 \times -8$ ,  $36 \times \frac{1}{9}$

Given the item:  $\square \cdot \square = 10k^3$ , we could put many different terms in the boxes, such as:  $2k \times 5k^2$ ,  $-10 \times (-k^3)$ ,  $10k \times k^2$



## Worksheet 3B

### Answers

Questions	Answers
1) $7 \times \underline{\quad} = 21$	1) 3
2) What numbers can we put in the boxes to make the statement true: $\square \cdot \square = 35$	2) e.g. 5 and 7; -5 and -7; 70 and $\frac{1}{2}$ Pay attention to negatives and fractions
3) What number multiplied by 6 gives 42?	3) 7
4) The sum of 2 numbers is -2. What are the numbers?	4) e.g. -4 and 2; -5 and 3; -100 and 98
5) The product of 2 numbers is 42 and their sum is 23. What are the numbers?	5) 2 and 21
6) The sum of 2 numbers is -2 and their product is -35. What are the numbers?	6) -7 and 5
7) $4a \cdot 7a = \underline{\quad}$	7) $28a^2$
8) What terms can we put in the boxes to make the statement true: $\square \cdot \square = 14p^3$	8) e.g. $7p^2$ and $2p$ ; 14 and $p^3$ ; $-2p^2$ and $-7p$
9) Multiply out:	9)
a) $3k(k + 7) =$	a) $3k^2 + 21k$
b) $(3 - k)(k - 7) =$	b) $-k^2 + 10k - 21$
10) What is the product of $x + 6$ and $x + 7$ ?	10) $x^2 + 13x + 42$
11) Factorise:	11)
a) $6x - 42 =$	a) $6(x - 7)$
b) $x^2 - 2x =$	b) $x(x - 2)$
c) $x^2 + 12x + 35 =$	c) $(x + 7)(x + 5)$
d) $x^2 - 2x - 35 =$	d) $(x - 7)(x + 5)$
e) $x^2 - 23x + 42 =$	e) $(x - 21)(x - 2)$

## Worksheet 3C

### Questions

- 1)  $14 \times \_ = 70$
- 2) The number 5 is added to itself 13 times. What is the result?
- 3) Which factors of  $-10$  give a sum of  $-3$ ?
- 4)  $5a \times a + 5 =$
- 5) What is the product of  $5x$  and  $x + 5$ ?
- 6) What is the product of  $5x$  and  $-5x$ ?
- 7) What is the sum of  $5x$  and  $-5x$ ?
- 8) Multiply out:
  - a)  $5(x + 25) =$
  - b)  $(2x + 5)(2x + 5) =$
  - c)  $(2x + 5)(2x - 5) =$
- 9) Determine the product of:
  - a)  $\frac{1}{x}$  and  $x$
  - b)  $\frac{1}{x-5}$  and  $x - 5$
- 10) Factorise fully:
  - a)  $5x - 10 =$
  - b)  $2x^2 - 50 =$
  - c)  $x^2 + 2x - 5x - 10 =$
  - d)  $t^2 - 3t - 10 =$

In these materials we use a place-holder ( $\square$ ) to indicate that any number can be put inside the box. The number might be positive or negative. We can also put letters and even algebraic expressions inside the box. For example,

Given the item:  $\square \cdot \square = 16$ , we could put many different pairs of values in the boxes, such as:  $2 \times 8$ ,  $4 \times 4$ ,  $-2 \times -8$ ,  $36 \times \frac{1}{2}$

Given the item:  $\square \cdot \square = 10k^3$ , we could put many different terms in the boxes, such as:  $2k \times 5k^2$ ,  $-10 \times (-k^3)$ ,  $10k \times k^2$

# Matters.of.Factors

WORKING WITH PRODUCTS AND FACTORS

## Worksheet 3C

### Answers

Questions	Answers
1) $14 \times \underline{\quad} = 70$	1) 5
2) The number 5 is added to itself 13 times. What is the result?	2) 65
3) Which factors of $-10$ give a sum of $-3$ ?	3) 2 and $-5$
4) $5a \times a + 5 =$	4) $5a^2 + 5$
5) What is the product of $5x$ and $x + 5$ ?	5) $5x^2 + 25x$
6) What is the product of $5x$ and $-5x$ ?	6) $-25x^2$
7) What is the sum of $5x$ and $-5x$ ?	7) 0
8) Multiply out:	8)
a) $5(x + 25) =$	a) $5x + 125$
b) $(2x + 5)(2x + 5) =$	b) $4x^2 + 20x + 25$
c) $(2x + 5)(2x - 5) =$	c) $4x^2 - 25$
9) Determine the product of:	9)
a) $\frac{1}{x}$ and $x$	a) 1
b) $\frac{1}{x-5}$ and $x - 5$	b) 1
10) Factorise:	10)
a) $5x - 10 =$	a) $5(x - 2)$
b) $2x^2 - 50 =$	b) $2(x - 5)(x + 5)$
c) $x^2 + 2x - 5x - 10 =$	c) $(x + 2)(x - 5)$
d) $t^2 - 3t - 10 =$	d) $(t + 2)(t - 5)$



## Worksheet 3D

### Answers

Questions	Answers
1) What values can we put in the boxes to make the statement true: $\square \cdot \square = -18$	1) -2 and 9; 3 and -6; 18 and -1; -180 and $\frac{1}{10}$ ; etc.
2) What number multiplied by 6 gives -42?	2) -7
3) The product of 2 numbers is -54. What are the numbers?	3) -6 and 9; 18 and -3; -2 and 27, etc.
4) The product of two numbers is -6 and their sum is -5. What are the numbers?	4) -6 and 1
5) The difference between 2 numbers is 5 and their product is 66. What are the numbers?	5) 11 and 6
6) What terms can we put in the boxes to make the statement true: $\square \cdot \square = -6a^2b$	6) $-3ab$ and $2a$ ; $-a$ and $6ab$ ; $-6b$ and $a^2$ ; etc.
7) You are asked to simplify: $4p(-5p) =$ Noni says: "4 times -5 is -20, and $p$ subtract $p$ is zero. So the answer is -20". Explain what is wrong with Noni's reasoning and give the correct answer.	7) Correct answer: $-20p^2$ . Noni needs to see that the question is a product of 2 monomials, i.e. $(4p) \times (-5p)$ . We multiply the coefficients, and then $p \times p = p^2$
8) Multiply out:	8)
a) $(t - 6)6 =$	a) $6t - 36$
b) $(t - 6)(t - 6) =$	b) $t^2 - 12t + 36$
c) $(t - 6)(t + 6) =$	c) $t^2 - 36$
9) Complete: $\square(a - \square) = -3a - 12$	9) $-3(a - (-4)) = -3a - 12$
10) Factorise:	10)
a) $6ab + 54b =$	a) $6b(a + 9)$
b) $-12x^2 - 6x =$	b) $-6x(2x + 1)$
c) $x^2 + 13x + 42 =$	c) $(x + 7)(x + 6)$
d) $p^2 - 5p - 6 =$	d) $(p - 6)(p + 1)$
11) Complete: $t^2 + t + \square = (t - 5)(t + \square)$	11) $t^2 + t + (-30) = (t - 5)(t + 6)$

## Worksheet 3E

### Questions

- 1) Find the values of:
  - a)  $(3) \times (-6)$
  - b)  $(-3) \times (-6)$
  - c) Negative 3 multiplied by positive 6
- 2) If 324 divided by 12 is 27, what is the product of 27 and 12?
- 3) Find 2 numbers if their product is negative 18 and their sum is positive 3.
- 4) Write 3 **pairs** of factors of  $6p^2$ .
- 5) Complete the following:
  - a)  $3a \times b \times 2c = \underline{\hspace{2cm}}$
  - b)  $3a \times \underline{\hspace{2cm}} = 6a^2bc$
  - c)  $3a \times \underline{\hspace{2cm}} \times \underline{\hspace{2cm}} = 6a^2bc$
- 6) Find the following products:
  - a)  $3p^2(2 + p)$
  - b)  $3p^2(2 \times p)$
- 7) Complete:  $2p - 10 = -2(\underline{\hspace{1cm}} + \underline{\hspace{1cm}})$
- 8) Factorise completely:
  - a)  $-5k^2 + 20q^4$
  - b)  $x^2 - 7x + 6$
  - c)  $k^2 + 3k - 18$

In these materials we use a place-holder ( $\square$ ) to indicate that any number can be put inside the box. The number might be positive or negative. We can also put letters and even algebraic expressions inside the box. For example,

Given the item:  $\square \cdot \square = 16$ , we could put many different pairs of values in the boxes, such as:  $2 \times 8$ ,  $4 \times 4$ ,  $-2 \times -8$ ,  $36 \times \frac{1}{2}$

Given the item:  $\square \cdot \square = 10k^3$ , we could put many different terms in the boxes, such as:  $2k \times 5k^2$ ,  $-10 \times (-k^3)$ ,  $10k \times k^2$

**Worksheet 3E**

**Answers**

Questions	Answer
1) Find the values of:	1)
a) $(3) \times (-6)$	a) $-18$
b) $(-3) \times (-6)$	b) $18$
c) Negative 3 multiplied by positive 6.	d) $-18$
2) If 324 divided by 12 is 27, what is the product of 27 and 12?	2) $324$
3) Find 2 numbers if their product is negative 18 and their sum is positive 3.	3) $6$ and $-3$
4) Write 3 <b>pairs</b> of factors of $6p^2$	4) Any 3 of the following: (or any other) $3p \times 2p$ ; $-3p \times -2p$ $2 \times 3p^2$ ; $-2 \times -3p^2$ ; $2p^2 \times 3$ ; $6p \times p$ ; $6p^2 \times 1$ .
5) Complete the following:	5)
a) $3a \times b \times 2c = \underline{\hspace{2cm}}$	a) $6abc$
b) $3a \times \underline{\hspace{2cm}} = 6a^2bc$	b) $2abc$
c) $3a \times \underline{\hspace{2cm}} \times \underline{\hspace{2cm}} = 6a^2bc$	d) Any of the following or other correct factors $2a \times bc$ ; or $2 \times abc$ ; or $-2a \times -bc$
6) Find the following products:	6)
a) $3p^2(2 + p)$	a) $6p^2 + 3p^3$
b) $3p^2(2 \times p)$	b) $6p^3$
7) Complete: $2p - 10 = -2(\underline{\hspace{2cm}} + \underline{\hspace{2cm}})$	7) $2p - 10 = -2(-\mathbf{p} + \mathbf{5})$
8) Factorise completely:	8)
a) $-5k^2 + 20q^4$	a) $-5(k - 2q^2)(k + 2q^2)$
b) $x^2 - 7x + 6$	b) $(x - 6)(x - 1)$
c) $k^2 + 3k - 18$	c) $(k + 6)(k - 3)$

## Worksheet 3F

### Questions

1) Fill in the boxes/spaces to make the statements true.

a)  $3(2 - 5) = 3 \times \square + 3 \times \square$

b)  $5(a + b) = 5 \times \square + 5 \times \square$

c)  $p(7 - \square) = p \times \square - p \times pq = \underline{\hspace{2cm}}$

2) What is the result when we add three groups of  $(x + y)$ ? Show how you got your answer.

3) Is 3 a factor of 24? How do you know?

4) Is  $p$  a factor of  $p^2$ ? How do you know?

5) Is  $p$  a factor of  $p^2 - 1$ ? How do you know?

6) The sum of two numbers is 0 and their product is  $-16$ . What are the numbers?

7) The sum of two numbers is  $-10$  and their product is 25. What are the numbers?

8) Multiply out:

a)  $(v + 3)^2 =$

b)  $(v - 3)^2 =$

c)  $(v - 3)(v + 3) =$

d)  $(v + 3)(v - 3) =$

e) Look at your answers to Q8a – Q8d. What is the same and what is different? What causes the similarities and the differences?

9) Factorise completely:

a)  $4 - m^2 =$

b)  $4 - 4m^2 =$

c)  $4 - 9m^2 =$

d)  $3(m^2 - 10m + 25) =$

In these materials we use a place-holder ( $\square$ ) to indicate that any number can be put inside the box. The number might be positive or negative. We can also put letters and even algebraic expressions inside the box. For example,

Given the item:  $\square \cdot \square = 16$ , we could put many different pairs of values in the boxes, such as:  $2 \times 8$ ,  $4 \times 4$ ,  $-2 \times -8$ ,  $36 \times \frac{1}{2}$

Given the item:  $\square \cdot \square = 10k^3$ , we could put many different terms in the boxes, such as:  $2k \times 5k^2$ ,  $-10 \times (-k^3)$ ,  $10k \times k^2$



# Matters.of.Factors

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## Worksheet 3F

### Answers

Questions	Answers
1) Fill in the boxes/spaces to make the statements true.	1)
a) $3(2 - 5) = 3 \times \square + 3 \times \square$	a) 2; -5
b) $5(a + b) = 5 \times \square + 5 \times \square$	b) a; b
c) $p(7 - \square) = p \times \square - p \times pq = \underline{\hspace{2cm}}$	c) $p(7 - pq) = p \times 7 - p \times pq = 7p - p^2q$
2) What is the result when we add three groups of $(x + y)$ ? Show how you got your answer.	2) $(x + y) + (x + y) + (x + y) = 3(x + y)$ or $3x + 3y$
3) Is 3 a factor of 24? How do you know?	3) Yes. $\frac{24}{8} = 3$ or $8 \times 3 = 24$
4) Is $p$ a factor of $p^2$ ? How do you know?	4) Yes. $\frac{p^2}{p} = p$ or $p \cdot p = p^2$
5) Is $p$ a factor of $p^2 - 1$ ? How do you know?	5) No. We can't multiply $p$ by a factor that will give $p^2 - 1$
6) The sum of two numbers is 0 and their product is -16. What are the numbers?	6) -4; 4
7) The sum of two numbers is -10 and their product is 25. What are the numbers?	7) -5; -5
8) Multiply out:	8)
a) $(v + 3)^2 =$	a) $v^2 + 6v + 9$
b) $(v - 3)^2 =$	b) $v^2 - 6v + 9$
c) $(v - 3)(v + 3) =$	c) $v^2 - 9$
d) $(v + 3)(v - 3) =$	d) $v^2 - 9$
e) Look at your answers to Q8a to Q8d. What is the same and what is different? What causes the similarities and the differences?	e) All have $v^2$ and all have constant of 9. The sign of 9 depends on the factors being multiplied. Q8c and Q8d only have 2 terms because the terms in $v$ "cancel each other out". Q8c and Q8d have the same answer because multiplication is commutative.
9) Factorise completely:	9)
a) $4 - m^2 =$	a) $(2 - m)(2 + m)$
b) $4 - 4m^2 =$	b) $4(1 - m)(1 + m)$
c) $4 - 9m^2 =$	c) $(2 - 3m)(2 + 3m)$
d) $3(m^2 - 10m + 25) =$	d) $3(m - 5)^2$

## Worksheet 3G

### Questions

- 1)  $4 \times \square = 36$
- 2) What values can we put in the boxes to make the statement true:  $\square \cdot \square = 45$
- 3) The sum of 2 numbers is  $-5$ . What are the numbers?
- 4) What number multiplied by  $-9$  gives  $-72$ ?
- 5) The sum of 2 numbers is 0 and their product is  $-81$ . What are the numbers?
- 6) The product of 2 numbers is 63 and their sum is  $-16$ . What are the numbers?
- 7)  $4m \cdot \square = 12m^2n$
- 8) What terms can we put in the boxes to make the statement true:  $\square \cdot \square = 18k^5$
- 9) Multiply out:
  - a)  $2(x - 9y) =$
  - b)  $(x + 9)(3 + x) =$
- 10) What is the product of  $x - 9$  and  $x - 7$ ?
- 11) Factorise fully:
  - a)  $6k - 9k^2 =$
  - b)  $x^2 + 14x + 45 =$
  - c)  $x^2 - x - 72 =$
  - d)  $m^2 - 81 =$
  - e)  $9x^2 - 36 =$

In these materials we use a place-holder ( $\square$ ) to indicate that any number can be put inside the box. The number might be positive or negative. We can also put letters and even algebraic expressions inside the box. For example,

Given the item:  $\square \cdot \square = 16$ , we could put many different pairs of values in the boxes, such as:  $2 \times 8$ ,  $4 \times 4$ ,  $-2 \times -8$ ,  $36 \times \frac{1}{2}$

Given the item:  $\square \cdot \square = 10k^3$ , we could put many different terms in the boxes, such as:  $2k \times 5k^2$ ,  $-10 \times (-k^3)$ ,  $10k \times k^2$

# Matters.of.Factors

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## Worksheet 3G

### Answers

Questions	Answers
1) $4 \times \underline{\quad} = 36$	1) 9
2) What values can we put in the boxes to make the statement true: $\square \cdot \square = 45$	2) e.g. 9 and 5; 3 and 15; 90 and $\frac{1}{2}$ ; -9 and -5 Should include negatives and fractions
3) The sum of 2 numbers is -5. What are the numbers?	3) e.g. -8 and 3; -10 and 5; -100 and 95
4) What number multiplied by -9 gives -72?	4) 8
5) The sum of 2 numbers is 0 and their product is -81. What are the numbers?	5) 9 and -9
6) The product of 2 numbers is 63 and their sum is -16. What are the numbers?	6) -7 and -9
7) $4m \cdot \square = 12m^2n$	7) $3mn$
8) What terms can we put in the boxes to make the statement true: $\square \cdot \square = 18k^5$	8) e.g. $9k$ and $2k^4$ ; $-6k^3$ and $-3k^2$
9) Multiply out:	9)
a) $2(x - 9y) =$	a) $2x - 18y$
b) $(x + 9)(3 + x) =$	b) $x^2 + 12x + 27$
10) What is the product of $x - 9$ and $x - 7$ ?	10) $x^2 - 16x + 63$
1.1) Factorise fully:	11)
a) $6k - 9k^2 =$	a) $3k(2 - 3k)$
b) $x^2 + 14x + 45 =$	b) $(x + 5)(x + 9)$
c) $x^2 - x - 72 =$	c) $(x - 9)(x + 8)$
d) $m^2 - 81 =$	d) $(m - 9)(m + 9)$
e) $9x^2 - 36 =$	e) $9(x^2 - 4) = 9(x - 2)(x + 2)$

## Worksheet 4A

### Questions

- 1) Write down 4 factor pairs of 12.
- 2) Which factors of  $-12$  give a sum of 1?
- 3) Which factors of  $-12$  give a sum of  $-1$ ?
- 4)  $4a \times 5b =$
- 5) What is the product of  $4b$  and  $a + 5$ ?
- 6) Multiply out and write answers in descending powers of  $x$ :
  - a)  $4x(25 + x) =$
  - b)  $(5 + x)(2x + 5) =$
  - c)  $(2x + 5)(5 - 2x) =$
- 7) True or false? Justify your answer.
  - a) The product of  $\frac{1}{2x^2}$  and  $-2x^2$  is  $-1$ .
  - b) The quotient when  $8x^3$  is divided by  $2x^2$  is 4.
- 8) Factorise:
  - a)  $x^2 - x - 12 =$
  - b)  $4x^2 - 10x =$
  - c)  $2x^2 - 8x^3 =$
  - d)  $3x^2 + 3x - 36 =$

In these materials we use a place-holder ( $\square$ ) to indicate that any number can be put inside the box. The number might be positive or negative. We can also put letters and even algebraic expressions inside the box. For example,

Given the item:  $\square \cdot \square = 16$ , we could put many different pairs of values in the boxes, such as:  $2 \times 8$ ,  $4 \times 4$ ,  $-2 \times -8$ ,  $36 \times \frac{1}{2}$

Given the item:  $\square \cdot \square = 10k^3$ , we could put many different terms in the boxes, such as:  $2k \times 5k^2$ ,  $-10 \times (-k^3)$ ,  $10k \times k^2$

# Matters.of.Factors

WORKING WITH PRODUCTS AND FACTORS

## Worksheet 4A

### Answers

Questions	Answer
1) Write down 4 factor pairs of 12.	1) 1 and 12; 2 and 6; 3 and 4; $\frac{1}{2}$ and 24, etc.
2) Which factors of $-12$ give a sum of 1?	2) 4 and $-3$
3) Which factors of $-12$ give a sum of $-1$ ?	3) $-4$ and 3
4) $4a \times 5b =$	4) $20ab$
5) What is the product of $4b$ and $a + 5$ ?	5) $4ab + 20b$
6) Multiply out and write answers in descending powers of $x$ :	6)
a) $4x(25 + x) =$	a) $4x^2 + 100x$
b) $(5 + x)(2x + 5) =$	b) $2x^2 + 15x + 25$
c) $(2x + 5)(5 - 2x) =$	c) $-4x^2 + 25$
7) True or false? Justify your answer.	7)
a) The product of $\frac{1}{2x^2}$ and $-2x^2$ is $-1$ .	a) True. $\frac{1}{2x^2} \cdot (-2x^2) = -1$
b) The quotient when $8x^3$ is divided by $2x^2$ is 4.	b) False. The correct answer is $4x$ .
8) Factorise:	8)
a) $x^2 - x - 12 =$	a) $(x - 4)(x + 3)$
b) $4x^2 - 10x =$	b) $2x(2x - 5)$
c) $2x^2 - 8x^3 =$	c) $2x^2(1 - 4x)$
d) $3x^2 + 3x - 36 =$	d) $3(x + 4)(x - 3)$

## Worksheet 4B

### Questions

1) Fill in the missing values

a)  $4 \times 5 \times \square = 120$

b)  $\square \times 6 \times 7 = -210$

c)  $3(4) \times \square = -20$

2) The product of three consecutive natural numbers is 990. Find the numbers.

3) Fill in the missing monomial:  $4a \times 5a^2 \times \square = 120a^6$

4) What is the product of:  $2b$ ,  $3b$  and  $4b$ ?

5) What is the sum of these 4 terms:  $3x$ ;  $-4x$ ;  $5x$ ;  $-6x$ ?

6) Multiply out:

a)  $2(3x - 4) =$

b)  $(x + 5)(2x + 6) =$

c)  $(3x - 4)5x + 6 =$

7) What is the product of these 3 terms:  $2x - 1$ ;  $2x + 1$  and  $2$ ?

8) Factorise:

a)  $x^2 - 5x + 6 =$

b)  $x^2 - 5x - 6 =$

c)  $3 - 12x^2 =$

d)  $3k - 12k^2 =$

e)  $3(x - 3) - 12(x - 3)^2 =$

In these materials we use a place-holder ( $\square$ ) to indicate that any number can be put inside the box. The number might be positive or negative. We can also put letters and even algebraic expressions inside the box. For example,

Given the item:  $\square \cdot \square = 16$ , we could put many different pairs of values in the boxes, such as:  $2 \times 8$ ,  $4 \times 4$ ,  $-2 \times -8$ ,  $36 \times \frac{1}{9}$

Given the item:  $\square \cdot \square = 10k^3$ , we could put many different terms in the boxes, such as:  $2k \times 5k^2$ ,  $-10 \times (-k^3)$ ,  $10k \times k^2$

# Matters.of.Factors

WORKING WITH PRODUCTS AND FACTORS

## Worksheet 4B

### Answers

Questions	Answers
1) Fill in the missing values	1)
a) $4 \times 5 \times \square = 120$	a) 6
b) $\square \times 6 \times 7 = -210$	b) -5
c) $3(4) \times \square = -20$	c) $\frac{-5}{3}$
2) The product of three consecutive natural numbers is 990. Find the numbers.	2) 9, 10 and 11
3) Fill in the missing monomial: $4a \times 5a^2 \times \square = 120a^6$	3) $6a^3$
4) What is the product of: $2b$ , $3b$ and $4b$ ?	4) $24b^3$
5) What is the sum of these 4 terms: $3x$ ; $-4x$ ; $5x$ ; $-6x$ ?	5) $-2x$
6) Multiply out:	6)
a) $2(3x - 4) =$	a) $6x - 8$
b) $(x + 5)(2x + 6) =$	b) $2x^2 + 16x + 30$
c) $(3x - 4)5x + 6 =$	c) $15x^2 - 20x + 6$
7) What is the product of these 3 terms: $2x - 1$ ; $2x + 1$ and $2$ ?	7) $8x^2 - 2x$
8) Factorise:	8)
a) $x^2 - 5x + 6 =$	a) $(x - 3)(x - 2)$
b) $x^2 - 5x - 6 =$	b) $(x - 6)(x + 1)$
c) $3 - 12x^2 =$	c) $3(1 - 2x)(1 + 2x)$
d) $3k - 12k^2 =$	d) $3k(1 - 4k)$
e) $3(x - 3) - 12(x - 3)^2 =$	e) $3(x - 3)[1 - 4(x - 3)] = 3(x - 3)(13 - 4x)$

## Worksheet 4C

### Questions

- 1) What values can we put in the boxes to make the statement true:  $\square \cdot \square = -12$
- 2) What number multiplied by  $\frac{1}{2}$  gives  $-24$ ?
- 3) The product of two numbers is 12 and their sum is  $-7$ . What are the numbers?
- 4) The sum of 2 numbers is 11 and their product is  $-12$ . What are the numbers?
- 5) True or false:  $m + n - m + n = 0$
- 6) Consider the expression  $p = -2ab$ .  
What values can we give to  $a$  and  $b$  so that  $p = 24$ ?
- 7) Simplify the following expressions:
  - a)  $(m - 3) - 4 =$
  - b)  $-4(m - 3) =$
  - c)  $a - (a - b) - a =$
  - d)  $(a - b)(b - a) =$
- 8) Factorise fully:
  - a)  $12ab + 36b - 6 =$
  - b)  $49 - k^2 =$
  - c)  $p(p - 4) - 12 =$
- 9) Thabo says it is impossible to factorise this expression:  $x^2 + 13x - 12$   
Do you agree? Explain.

In these materials we use a place-holder ( $\square$ ) to indicate that any number can be put inside the box. The number might be positive or negative. We can also put letters and even algebraic expressions inside the box. For example,

Given the item:  $\square \cdot \square = 16$ , we could put many different pairs of values in the boxes, such as:  $2 \times 8$ ,  $4 \times 4$ ,  $-2 \times -8$ ,  $36 \times \frac{1}{2}$

Given the item:  $\square \cdot \square = 10k^3$ , we could put many different terms in the boxes, such as:  $2k \times 5k^2$ ,  $-10 \times (-k^3)$ ,  $10k \times k^2$



## Worksheet 4C

### Answers

Questions	Answers
1) What values can we put in the boxes to make the statement true: $\square \cdot \square = -12$	1) 3 and -4; 6 and -2; 24 and $-\frac{1}{2}$ ; 12 and -1
2) What number multiplied by $\frac{1}{2}$ gives -24?	2) -48
3) The product of two numbers is 12 and their sum is -7. What are the numbers?	3) -3 and -4
4) The sum of 2 numbers is 11 and their product is -12. What are the numbers?	4) 12 and -1
5) True or false: $m + n - m + n = 0$	5) False. Answer is $2n$ .
6) Consider the expression $p = -2ab$ . What values can we give to $a$ and $b$ so that $p = 24$ ?	6) $-2ab = 24$ which means that $ab = -12$ e.g. $a = 3, b = -4$ ; $a = 6, b = -2$ ; $a = -4, b = 3$ ; etc.
7) Simplify the following expressions:	7)
a) $(m - 3) - 4 =$	a) $m - 7$
b) $-4(m - 3) =$	b) $-4m + 12$
c) $a - (a - b) - a =$	c) $-a + b$ or $b - a$
d) $(a - b)(b - a) =$	d) $-a^2 + 2ab - b^2$
8) Factorise fully:	8)
a) $12ab + 36b - 6 =$	a) $6(2ab + 6b - 1)$
b) $49 - k^2 =$	b) $(7 - k)(7 + k)$
c) $p(p - 4) - 12 =$	c) $(p - 6)(p + 2)$
9) Thabo says it is impossible to factorise this expression: $x^2 + 13x - 12$ Do you agree? Explain.	9) Thabo is correct. The constant is -12 which means the factors have different signs and they must add to 13. The largest sum would be obtained from $+12 - 1 = 11$ .

## Worksheet 4D

### Questions

1) What values can we put in the boxes to make the statement true:  $\square \cdot \square = -3$

2) The product of two numbers is  $-20$  and their sum is  $1$ . What are the numbers?

3) What value/s must be put in the boxes to make the statements true?

a)  $-3p \cdot \square = 12p$

b)  $-3p - \square = 12p$

c)  $\square \cdot \square \cdot \square = 15p^4$

4) Multiply out and simplify:

a)  $-2(k - 3)4 =$

b)  $-(2k - 3)4 =$

c)  $(2a - 3)(4 + 3a) =$

d)  $(3d - k)(7k - d) =$

5) Complete:  $\square (\square - 4) = z + 20$

6) Factorise fully, if possible:

a)  $r^2 + 3r + 10 =$

b)  $x^2 + 4(3x + 5) =$

c)  $p^2 - p - 90 =$

d)  $p^2 - 15p - 100 =$

e)  $4r^2 + 16 =$

In these materials we use a place-holder ( $\square$ ) to indicate that any number can be put inside the box. The number might be positive or negative. We can also put letters and even algebraic expressions inside the box. For example,

Given the item:  $\square \cdot \square = 16$ , we could put many different pairs of values in the boxes, such as:  $2 \times 8$ ,  $4 \times 4$ ,  $-2 \times -8$ ,  $36 \times \frac{1}{9}$

Given the item:  $\square \cdot \square = 10k^3$ , we could put many different terms in the boxes, such as:  $2k \times 5k^2$ ,  $-10 \times (-k^3)$ ,  $10k \times k^2$

## Worksheet 4D

### Answers

Questions	Answers
1) What values can we put in the boxes to make the statement true: $\square \cdot \square = -3$	1) $-3$ and $1$ ; $-1$ and $3$ ; $6$ and $-\frac{1}{2}$ ; $-9$ and $\frac{1}{3}$ ; etc.
2) The product of two numbers is $-20$ and their sum is $1$ .	2) $-4$ and $5$
3) What value/s must be put in the boxes to make the statements true?	3)
a) $-3p \cdot \square = 12p$	a) $-4$
b) $-3p - \square = 12p$	b) $-15p$
c) $\square \cdot \square \cdot \square = 15p^4$	c) $3 \times 5 \times p^4$ ; $p \times p \times 15p^2$ ; $-3p \times -5 \times p^3$ ; etc.
4) Multiply out and simplify:	4)
a) $-2(k-3)4 =$	a) $-8k + 24$
b) $-(2k-3)4 =$	b) $-8k + 12$
c) $(2a-3)(4+3a) =$	c) $6a^2 - a - 12$
d) $(3d-k)(7k-d) =$	d) $-7k^2 + 22kd - 3d^2$ or $-3d^2 + 22dk - 7k^2$
5) Complete: $\underline{\hspace{1cm}} (\underline{\hspace{1cm}} - 4) = z + 20$	5) $-5 \left( -\frac{2}{5} - 4 \right) = z + 20$
6) Factorise fully, if possible:	6)
a) $r^2 + 3r + 10 =$	a) Does not factorise
b) $x^2 + 4(3x + 5) =$	b) $(x + 10)(x + 2)$
c) $p^2 - p - 90 =$	c) $(p - 10)(p + 9)$
d) $p^2 - 15p - 100 =$	d) $(p - 20)(p + 5)$
e) $4r^2 + 16 =$	e) $4(r^2 + 4)$

## Worksheet 4E

### Questions

1) Evaluate the following statements:

a)  $3 \times (5 - 5) =$

b)  $(3 \times 5) - 5 =$

c)  $6 + 3(3 - 1) =$

d)  $6 - 3(3 - 1) =$

2) Find a number/s to make both statements true:

a)  $-6 \times \square = 12$  and  $-6 + \square = -8$

b)  $6 \times \square = -12$  and  $6 - \square = 8$

c)  $\square \times \square = 12$  and  $\square + \square = -7$

d)  $\square \times \square = -12$  and  $\square - \square = -7$

3) The sum of two terms is  $2x$ . Give three possible pairs of terms.

4) The product of two terms is  $8x^2$  and their sum is  $6x$ . What are the terms?

5) The product of two terms is  $-9x$  and their sum is  $3x - 3$ . What are the terms?

6) Complete the following to make the statements true:

a)  $2(\square - \square) = 4 + 2n$

b)  $-2n(\square + \frac{n}{2}) = 8n^2 + \square$

7) Complete the following to make the statements true:

a)  $(y + 2)(y + 3) = y^2 + \square + \square$

b)  $(y + 2)(y + a) = y^2 + y(\square + \square) + 2a$

c)  $(y + a)(y + \square) = y^2 + \square + a^2$

In these materials we use a place-holder ( $\square$ ) to indicate that any number can be put inside the box. The number might be positive or negative. We can also put letters and even algebraic expressions inside the box. For example,

Given the item:  $\square \cdot \square = 16$ , we could put many different pairs of values in the boxes, such as:  $2 \times 8$ ,  $4 \times 4$ ,  $-2 \times -8$ ,  $36 \times \frac{1}{2}$

Given the item:  $\square \cdot \square = 10k^3$ , we could put many different terms of in the boxes, such as:  $2k \times 5k^2$ ,  $-10 \times (-k^3)$ ,  $10k \times k^2$

## Worksheet 4E

### Answers

Questions	Answers
1) Evaluate the following statements:	1)
a) $3 \times (5 - 5) =$	a) 0
b) $(3 \times 5) - 5 =$	b) 10
c) $6 + 3(3 - 1) =$	c) 12
d) $6 - 3(3 - 1) =$	d) 0
2) Find a number/s to make both statements true:	2)
a) $-6 \times \square = 12$ and $-6 + \square = -8$	a) -2
b) $6 \times \square = -12$ and $6 - \square = 8$	b) -2
c) $\square \times \square = 12$ and $\square + \square = -7$	c) -4; -3 or -3; -4
d) $\square \times \square = -12$ and $\square - \square = -7$	d) -4; 3 or 4; -3 and -4; 3 or -3; 4
3) The sum of two terms is $2x$ . Give three possible pairs of terms.	3) $x + x$ ; $3x - 1x$ ; $4x - 2x$ ; $\frac{1}{2}x + \frac{3}{2}x$ ; ... or any 3 feasible pairs
4) The product of two terms is $8x^2$ and their sum is $6x$ . What are the terms?	4) $2x$ ; $4x$ or $-2x$ ; $-4x$ or $-\frac{8}{4}x$ ; $\frac{12}{3}x$
5) The product of two terms is $-9x$ and their sum is $3x - 3$ . What are the terms?	5) $3x$ and $-3$
6) Complete the following to make the statements true:	6)
a) $2(\square - \square) = 4 + 2n$	a) $2$ ; $-n$
b) $-2n(\square + \frac{n}{2}) = 8n^2 + \square$	b) $-4n$ ; $-n^2$
7) Complete the following to make the statements true:	7)
a) $(y + 2)(y + 3) = y^2 + \square + \square$	a) $5y$ and $6$
b) $(y + 2)(y + a) = y^2 + y(\square + \square) + 2a$	b) $y(a + 2)$
c) $(y + a)(y + \square) = y^2 + \square + a^2$	c) $(y + a)(y + a) = y^2 + 2ay + a^2$

## Worksheet 4F

### Questions

1) Find a pair of factors that satisfies each of the following statements:

- a) The sum of two numbers is 2 and their product is  $-48$ .
- b) The sum of two numbers is  $-19$  and their product is  $48$ .

2) Factorise if possible:

- |               |                 |                  |
|---------------|-----------------|------------------|
| a) $4 - 4x =$ | e) $4 - 4x^2 =$ | i) $4x - 4x^2 =$ |
| b) $4 - 3x =$ | f) $4 - 3x^2 =$ | j) $4x - 3x^2 =$ |
| c) $4 - 2x =$ | g) $4 - 2x^2 =$ | k) $4x - 2x^2 =$ |
| d) $4 - x =$  | h) $4 - x^2 =$  | l) $4x - x^2 =$  |

3) Copy and complete the following to make the statements true:

- a)  $4 - 2x + 3y - 6 = 2(2 - x) + 3(\quad)$
- b)  $4x - 4x^2 - 6y - 6 = 4x(\quad) - 6(\quad)$
- c)  $x^2 - 8x + 6x - 48 = x(\quad) + 6(\quad)$
- d)  $x^2 - 8x + 6x - 48 = (x + 6)(\square - \square)$
- e)  $x(\quad) - 3(\quad) = x^2 - 19x + 48$

4) Copy and complete the following to make the statements true

- a)  $(a - \square)(a + \square) = a^2 - 100$
- b)  $(a + \square)(a + \square) = a^2 - 64$
- c)  $x^2 + \square + 25 = (x + 5)(x + \square)$
- d)  $x^2 + \square + y^2 = (x + y)(x + y)$
- e)  $(k - 1)^2 - 1 = \square(\square - 2)$

In these materials we use a place-holder ( $\square$ ) to indicate that any number can be put inside the box. The number might be positive or negative. We can also put letters and even algebraic expressions inside the box. For example,

Given the item:  $\square \cdot \square = 16$ , we could put many different pairs of values in the boxes, such as:  $2 \times 8$ ,  $4 \times 4$ ,  $-2 \times -8$ ,  $36 \times \frac{1}{2}$

Given the item:  $\square \cdot \square = 10k^3$ , we could put many different terms of in the boxes, such as:  $2k \times 5k^2$ ,  $-10 \times (-k^3)$ ,  $10k \times k^2$

# Matters.of.Factors

WORKING WITH PRODUCTS AND FACTORS

## Worksheet 4F

### Answers

Questions		Answers			
1) Find a pair of factors that satisfies each of the following statements:		2)			
a) The sum of two numbers is 2 and their product is $-48$ .		a) 8 and $-6$			
b) The sum of two numbers is $-19$ and their product is 48.		c) $-16$ and $-3$			
3) Factorise if possible:		2)			
a) $4 - 4x =$	e) $4 - 4x^2 =$	i) $4x - 4x^2 =$	a) $4(1 - x)$	e) $4(1 - x)(1 + x)$	i) $4x(1 - x)$
b) $4 - 3x =$	f) $4 - 3x^2 =$	j) $4x - 3x^2 =$	b) Does not factorise	f) Does not factorise	j) $x(4 - 3x)$
c) $4 - 2x =$	g) $4 - 2x^2 =$	k) $4x - 2x^2 =$	c) $2(2 - x)$	g) $2(2 - x^2)$	k) $2x(2 - x)$
d) $4 - x =$	h) $4 - x^2 =$	l) $4x - x^2 =$	d) Does not factorise	h) $(2 - x)(2 + x)$	l) $x(4 - x)$
3) Copy and complete the following to make the statements true.		3)			
a) $4 - 2x + 3y - 6 = 2(2 - x) + 3(\rule{1cm}{0.4pt})$		a) $4 - 2x + 3y - 6 = 2(2 - x) + 3(\mathbf{y - 6})$			
a) $4x - 4x^2 - 6y - 6 = 4x(\rule{1cm}{0.4pt}) - 6(\rule{1cm}{0.4pt})$		b) $4x - 4x^2 - 6y - 6 = 4x(\mathbf{1 - x}) - 6(\mathbf{y + 1})$			
b) $x^2 - 8x + 6x - 48 = x(\rule{1cm}{0.4pt}) + 6(\rule{1cm}{0.4pt})$		c) $x^2 - 8x + 6x - 48 = x(\mathbf{x - 8}) + 6(\mathbf{x - 8})$			
c) $x^2 - 8x + 6x - 48 = (x + 6)(\square - \square)$		d) $x^2 - 8x + 6x - 12 = (x + 6)(\mathbf{x - 8})$			
d) $x(\rule{1cm}{0.4pt}) - 3(\rule{1cm}{0.4pt}) = x^2 - 19x + 48$		e) $x(\mathbf{x - 16}) - 3(\mathbf{x - 16}) = x^2 - 19x + 48$			
4) Copy and complete the following to make the statements true.		4)			
a) $(a - \square)(a + \square) = a^2 - 100$		a) $(a - \mathbf{10})(a + \mathbf{10}) = a^2 - 100$			
a) $(a + \square)(a + \square) = a^2 - 64$		b) $(a + \mathbf{8})(a + (-\mathbf{8})) = a^2 - 64$			
b) $x^2 + \square + 25 = (x + 5)(x + \square)$		c) $x^2 + \mathbf{10x} + 25 = (x + 5)(x + 5)$			
c) $x^2 + \square + y^2 = (x + y)(x + y)$		d) $x^2 + \mathbf{2xy} + y^2 = (x + y)(x + y)$			
d) $(k - 1)^2 - 1 = \square(\square - 2)$		e) $(k - 1)^2 - 1 = k^2 - 2k + 1 - 1 = k^2 - 2k = k(\mathbf{k - 2})$			