UNIT TEST #018 | Australian Curriculum Mathematics | UTM9T1U2

Algebraic Techniques, and Scientific Notation

9 Unit Test

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Instructions: Read all questions carefully to ensure you understand what is being asked. When completing your official tests / exams, your grade will be based upon your: **understanding, fluency, reasoning, and problem solving,** so ensure you show all lines of working and draw accurate, labelled diagrams where necessary. (ACiQ|9.0 Mathematics standard elaborations found on final page (general assessment marking standards)). [Practise tests are marked out of a score of 10]. For multiple choice questions, tick or fill in the circle next to the corresponding letter under the question.

Check your work if you have time. *Remember:* you don't have to start at question one, it's always best to firstly look through the test, highlight the easy looking questions and complete them first, then secondly, go back through and work on the harder questions. Good luck! And remember to breathe!

$$\sum = \frac{\quad}{10} = \quad \%$$

Part 1: Multiple Choice (2 marks)

Question 1:

a) Expand the expression $(x+3)(x-5)$ **.**

A. $x^2 - 15$ **B.** $x^2 - 2x - 15$ **C.** $x^2 + 8x - 15$ **D.** $x^2 + 2x - 15$

◯ A ◯ B ◯ C ◯ D

Space for question 1…

b) Round 1.25794 **to three significant figures.**

A. 1.3 **B.** 1.25 **C.** 1.26 **D.** 1.27

◯ **A** ◯ **B** ◯ **C** ◯ **D**

Space for question 1b…

Question 2:

a) Which of the following is a factor of $x^2 - 9$ **?**

A. $x - 3$ **B.** $x + 3$ **C. Both** A **and** B **D. Neither** A **nor** B

◯ **A** ◯ **B** ◯ **C** ◯ **D**

Space for question 2a…

b) What is $1{,}278{,}319{,}000{,}000$ **in scientific notation ?**

A. 1.27×10^{12} **B.** 1.279×10^{12} **C.** 1.27832×10^{12} **D.** 1.278319×10^{12}

◯ **A** ◯ **B** ◯ **C** ◯ **D**

Space for question 2b…

Part 2: Short Answer (4 marks)

Question 3:

a) Factorise the quadratic expression $x^2 + 5x + 6$ **.**

b) Multiply $(1.25 \times 10^3) \times (4 \times 10^8)$ **.**

Question 4:

a) Expand and simplify $(2x-1)^2$ **.**

b) Evaluate $((a+bx)\times 10^3)^0$ **.**

Part 3: Problem Solving (4 marks)

Question 5:

a) Solve the quadratic equation $x^2 - 7x + 12 = 0$ by factoring.

b) Convert $0.6666\dot{6}$ to a fraction.

Question 6:

a) A rectangle has an area of $x^2 + 7x + 10$ square units. Find the dimensions of the rectangle by factoring the area expression.

b) The distance from Earth to the Sun is approximately $149{,}600{,}000\,kilometres$. The radius of the earth is $\approx 6{,}400\,km$, express the ratio of the Earth's radius to its distance to the Sun in scientific notation with three significant figures.

Solutions

1a. (0.5 marks)

B. $x^2 - 2x - 15$.

Remember, mathematicians sometimes use the symbol ($\cdot$) instead of ($\times$) so we don't get ($\times$) confused with (x)
E.g. $2 \times x \equiv 2 \cdot x$

- Using the distributive property (FOIL method):

$$(x+3)(x-5) = x \cdot x + x \cdot -5 + 3 \cdot x + 3 \cdot -5$$
$$= x^2 - 5x + 3x - 15$$
$$= x^2 + 3x - 5x - 15$$
$$= x^2 - 2x - 15 .$$

($+ \times - = -$) If signs are:
opposite → change to $-$
same → change to $+$

b. (0.5 marks)

C. 1.26

2a. (0.5 marks)

C. Both A and B .

This is a difference of two squares :

$$x^2 - 9 = x^2 - 3^2$$
$$= (x-3)(x+3) .$$

Rule for difference of two squares:
$a^2 - b^2 = (a+b)(a-b)$

b. (0.5 marks)

D. 1.278319×10^{12} .

3a. (1 mark)

Find two numbers that multiply to 6 and add to 5 :

$$x^2 + 5x + 6 = (x+2)(x+3) .$$

b. (1 mark)

Multiply the numbers and add the exponents:
$(1.25 \times 10^3) \times (4 \times 10^8)$

$$1.25 \times 4 = 5$$
$$10^3 \times 10^8 = 10^{3+8}$$
$$= 10^{11}$$

Result: 5×10^{11} .

4a. (1 mark)

Using the binomial theorem or by squaring and expanding:

$$(2x-1)^2 = (2x-1)(2x-1)$$
$$= 2x \cdot 2x + -1 \cdot 2x + -1 \cdot 2x + -1 \cdot 1$$
$$= 4x^2 - 2x - 2x - 1$$
$$= 4x^2 - 4x + 1 .$$

b. (1 mark)

Anything to the power of zero, equals one.

So $((a+bx)\times 10^3)^0 = 1$.

5a. (1 mark)

Find two numbers that multiply to 12 and add to -7 :

$$x^2 - 7x + 12 = 0$$
$$(x-3)(x-4) = 0\,.$$

$$\rightarrow (x-3) = 0$$
$$x - 3 + 3 = 0 + 3$$
$$x = 3\,,$$

$$\rightarrow (x-4) = 0$$
$$x - 4 + 4 = 0 + 4$$
$$x = 4\,.$$

So,

$x = 3$ or $x = 4$.

b. (1 mark)

Let $x = 0.6666\ldots$

$= 0.\dot{6}$:

$\rightarrow 10x = 6.666\ldots$ Choose 1 decimal place, i.e. $0.\dot{6}$ so do: $x \times 10$

Now,

$$\rightarrow 9x = 10x - x$$
$$= 6.6666... - 0.6666\ldots$$
$$= 6\,,$$

$$\rightarrow 9x = 6$$
$$\frac{9x}{9} = \frac{6}{9}$$
$$x = \frac{6}{9}$$
$$= \frac{6\div 3}{9\div 3}$$
$$= \frac{2}{3}\,,$$

$$0.666\dot{6} = \frac{2}{3}\,.$$

6a. (1 mark)

Factor the quadratic:

$$x^2 + 7x + 10 = (x + 2)(x + 5).$$
$$= Length \times Width$$

So, the dimensions of the rectangle are :

$L \times W \Rightarrow (x + 2)$ units by $(x + 5)$ units.

b. (1 mark)

Firstly divide $149{,}600{,}000\,km$ by $6{,}400\,km$:

$\rightarrow 6{,}400 \div 149{,}600{,}000$

$= 0.00004278074$

Then round to three significant figures:

$= 0.0000427\underset{\uparrow}{8}$

$= 0.0000428$

Then convert to scientific notation:

$4.28 \times 10^{-5}\,km$.

$$\sum = \frac{}{10} = \quad \%$$

General Assessment Marking Standards

Remember: When your official tests are marked, they won't be a score out of 10, they will be a grade (A,B,C,D,E) based on the following standards:

ACiQ | v9.0

Year 9 Mathematics standard elaborations

		A	B	C	D	E
		The folio of student work contains evidence of the following:				
Mathematical proficiencies	**Understanding**	accurate and consistent identification, representation, description and connection of mathematical concepts and relationships in complex unfamiliar, complex familiar, and simple familiar situations	accurate identification, representation, description and connection of mathematical concepts and relationships in complex familiar and simple familiar situations	identification, representation, description and connection of mathematical concepts and relationships in simple familiar situations	partial identification, representation and description of mathematical concepts and relationships in some simple familiar situations	fragmented identification, representation and description of mathematical concepts and relationships in isolated and obvious situations
	Fluency	choice, use and application of comprehensive facts, definitions, and procedures to find solutions in complex unfamiliar, complex familiar, and simple familiar situations	choice, use and application of effective facts, definitions, and procedures to find solutions in complex familiar and simple familiar situations	choice, use and application of facts, definitions, and procedures to find solutions in simple familiar situations	choice and use of partial facts, definitions, and procedures to find solutions in some simple familiar situations	choice and use of fragmented facts, definitions and procedures to find solutions in isolated and obvious situations
	Reasoning	comprehensive explanation of mathematical thinking, strategies used, and conclusions reached in complex unfamiliar, complex familiar, and simple familiar situations	detailed explanation of mathematical thinking, strategies used, and conclusions reached in complex familiar and simple familiar situations	explanation of mathematical thinking, strategies used, and conclusions reached in simple familiar situations	partial explanation of mathematical thinking, strategies used, and conclusions reached in some simple familiar situations	fragmented explanation of mathematical thinking, strategies used, and conclusions reached in isolated and obvious situations
	Problem-solving	purposeful use of problem-solving approaches to find solutions to problems.	effective use of problem-solving approaches to find solutions to problems.	use of problem-solving approaches to find solutions to problems.	partial use of problem-solving approaches to make progress towards finding solutions to problems.	fragmented use of problem-solving approaches to make progress towards finding solutions to problems.

Key shading emphasises the qualities that discriminate between the A–E descriptors

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