



Indices, Scientific Notation, Rational Numbers, and Surds

8 Unit Test

Free and always will be!

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!

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

Part 1: Multiple Choice (2 marks)

Question 1:

a) What is the value of 3^4 ?

A. 12

B. 81

C. 64

D. 27

☐ A

☐ B

☐ C

☐ D

b) Which number is equivalent to 10^3 ?

A. 100

B. 1,000

C. 10,000

D. 1,000,000

☐ A

☐ B

☐ C

☐ D



Question 2:

a) What is the result of $-8 + 5$?

A. -3

B. 3

C. -13

D. 13

☐ A

☐ B

☐ C

☐ D

b) Which of these is the correct order from least to greatest?

A. $-3, -1, 0, 1, 3$

B. $3, 1, 0, -1, -3$

C. $0, -1, -3, 1, 3$

D. $-3, 0, 1, -1, 3$

☐ A

☐ B

☐ C

☐ D

Part 2: Short Answer (4 marks)

Question 3:

a) Simplify the expression $5^2 \times 5^3$.

b) Solve the following multiplication: $-3 \times (-4)$.



Question 4:

a) Express the number 0.001 as a power of 10 .

b) Perform the division: $\frac{-15}{-3}$.

Part 3: Problem Solving (4 marks)

Question 5:

a) Convert 7.5×10^4 to a standard number.



b) Calculate the following expression involving rational numbers: $\frac{-5}{2} + \frac{3}{4}$.

Question 6:

a) A temperature drops from -2°C to -8°C . By how many degrees did the temperature decrease?



b) Simplify $\sqrt{48}$ as much as possible without using a calculator.



Solutions

1a. (0.5 marks)

B. 81.

$$\begin{aligned}
 &= 3^4 \\
 &= 3 \times 3 \times 3 \times 3 \\
 &= 81.
 \end{aligned}$$

b. (0.5 marks)

B. 1,000.

$$\begin{aligned}
 &= 10^3 \\
 &= 10 \times 10 \times 10 \\
 &= 1,000.
 \end{aligned}$$

2a. (0.5 marks)

A. -3. - Adding a positive number to a negative number results in a lesser negative number.

b. (0.5 marks)

A. -3, -1, 0, 1, 3. - Negative numbers are less than zero, and the numbers increase in value from left to right.

3a. (1 mark)

Using the law of indices where you add the exponents when multiplying:

$$\begin{aligned}
 5^2 \times 5^3 &= 5^{2+3} \\
 &= 5^5 \\
 &= 3125.
 \end{aligned}$$

b. (1 mark)

-3 times -4 gives a positive result because multiplying two negatives results in a positive:

(- × - = +) If signs are:

opposite → change to -

same → change to +

$$\begin{aligned}
 -3 \times (-4) &= 3 \times 4 \\
 &= 12.
 \end{aligned}$$

4a. (1 mark)

$$0.001 = 10^{-3}.$$

Because it is one thousandth, or $\frac{1}{10^3}$.

b. (1 mark)

Dividing two negative numbers gives a positive result:

$$\begin{aligned}
 \frac{-15}{-3} &= \frac{15}{3} \\
 &= 5.
 \end{aligned}$$



5a. (0.5 marks)

$$\begin{aligned} & 7.5 \times 10^4 \\ & = 7.5 \times 10,000 \\ & = 75,000. \end{aligned}$$

b. (1.5 marks)

First, find a common denominator (4 in this case):

$$\begin{aligned} \frac{-5 \times 2}{2 \times 2} &= \frac{-10}{4} \\ &\rightarrow \frac{-5}{2} + \frac{3}{4} \\ &= \frac{-10}{4} + \frac{3}{4} \\ &= \frac{-10 + 3}{4} \\ &= \frac{-7}{4}. \end{aligned}$$

6a. (1 mark)

The decrease in temperature is calculated as:

$$\begin{aligned} &\rightarrow -8^\circ\text{C} - (-2^\circ\text{C}) \\ &= -8^\circ\text{C} + 2^\circ\text{C} \\ &= -6^\circ\text{C}. \end{aligned}$$

The temperature decreased by 6 degrees.

($- \times - = +$) If signs are:

opposite \rightarrow change to $-$

same \rightarrow change to $+$



b. (1 mark)

Factorise 48 into prime factors: $48 = 16 \times 3$

$$48 = 2^4 \times 3$$

$$\begin{aligned}\rightarrow \sqrt{48} &= \sqrt{2^4 \times 3} \\ &= \sqrt{2^4} \times \sqrt{3} && \text{Remember, } \sqrt{x} = x^{\frac{1}{2}}. \\ &= (2^4)^{\frac{1}{2}} \times \sqrt{3} \\ &= 2^{4 \times \frac{1}{2}} \times \sqrt{3} \\ &= 2^{\frac{4}{2}} \times \sqrt{3} \\ &= 2^2 \sqrt{3} \\ &= 4\sqrt{3}.\end{aligned}$$

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



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 8 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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