UNIT TEST #004 | Australian Curriculum Mathematics | UTM7T2U4

ACACIA TUTORING

Rates, Ratios, and Algebraic Expressions

7 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) Write the ratio of 16 **boys to** 44 **girls in its simplest form.**

A. $6 : 4$ **B.** $16 : 4$ **C.** $4 : 16$ **D.** $4 : 11$

◯ **A** ◯ **B** ◯ **C** ◯ **D**

Space for Q1a...

b) If the ratio of cats to dogs in a shelter is $10 : 9$, and there are 15 dogs, how many cats are there?

A. 14 **B.** 15 **C.** 16 **D.** 17

◯ **A** ◯ **B** ◯ **C** ◯ **D**

Space for Q1b...

Question 2:

a) What is the value of x in the equation $3x + 5 = 14$?

A. 2 **B.** 3 **C.** 4 **D.** 5

◯ **A** ◯ **B** ◯ **C** ◯ **D**

Space for Q2a...

b) Which expression represents "8 less than a number y" ?

A. $y - 8$ **B.** $8 - y$ **C.** $y + 8$ **D.** $8y$

◯ **A** ◯ **B** ◯ **C** ◯ **D**

Space for Q2b...

Part 2: Short Answer (4 marks)

Question 3:

a) A map scale is given as $1\,cm : 20\,km$. If a distance on the map measures $3.5\,cm$, what is the actual distance?

b) If a car travels $330\,km$ in $3\,hours$, what is its average speed in km/h ?

Question 4:

a) Express the following using algebra:

I. The sum of a number p and 7.5 multiplied by a number q .
II. The result of subtracting 3 from a number r .

b) Solve for x :

I. $x + 9 = 15$ **.**
II. $2x = 10$ **.**

Part 3: Problem Solving (4 marks)

Question 5:

a) The Shanghai Maglev train travels at a constant speed of $431\,km/h$, if the East Coast of Australia had a Maglev train, how long would it take to travel between Brisbane to Sydney $\approx 1{,}000\,km$? Write your final answer in hours and minutes, rounding to the nearest minute.

b) Which is the faster, Printer 1: 10 pages in 29 seconds, or Printer 2: 12 pages in 32 seconds ? Write their rates in pages per minute.

Question 6:

a) Sam has some apples. If he gives away 4 apples, he has 8 left. How many apples did Sam start with? Write this as an equation then solve it.

b) A box has some chocolates. If you double the number of chocolates and then add 6, you get 20. How many chocolates are in the box?

Solutions

1a. (0.5 marks)

D. $4:11$

The ratio $16:44$ is divisible by 4,

$$16:44 = 16 \div 4 : 44 \div 4$$
$$= 4:11.$$

b. (0.5 marks)

D. 17.

For every 10 cats, there are 9 dogs. So, if there are 15 dogs:

$$= \frac{10 \text{ cats}}{9 \cancel{\text{dogs}}} \times 15 \cancel{\text{dogs}}$$
$$= \frac{10 \times 15}{9}$$
$$= \frac{150}{9}$$
$$= 16.66\dot{6} \text{ cats.}$$

As we can't have $0.66\dot{6}$ of a cat, we round up to 17 cats.

2a. (0.5 marks)

B. 3.

Solve by subtracting 5 from both sides to get $3x = 9$, then divide by 3:

$$\rightarrow 3x + 5 = 14$$
$$3x \cancel{+5} \cancel{-5} = 14 - 5$$
$$\frac{\cancel{3}x}{\cancel{3}} = \frac{9}{3}$$
$$x = 3.$$

b. (0.5 marks)

A. $y - 8$.

"Less than" indicates subtraction from the variable.

3a. (1 mark)

$1\,cm$ represents $20\,km$, so $3.5\,cm$ represents:

$$\begin{array}{ccc} 1\ cm & : & 20\ km \\ \times 3.5 \downarrow & & \downarrow \times 3.5 \\ 3.5\ cm & : & 70\ km \end{array}$$

$$= 20 \times 3.5$$
$$= 70\,km.$$

b. (1 mark)

$$\text{Average speed} = \frac{\text{distance}}{\text{time}}$$

$$= \frac{330\ km}{3\ hours}$$

$$= 110\ km/h\ .$$

4a. (1 mark)

I.

$p + 7.5q\ .$

II.

$r - 3\ .$

b. (1 mark)

I.

$$x + 9 = 15$$
$$x + 9 - 9 = 15 - 9$$
$$x = 6\ .$$

II.

$$2x = 10$$
$$\frac{2x}{2} = \frac{10}{2}$$
$$x = 5\ .$$

5a. (1.5 marks)

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

We want Time on its own, so multiply by Time to firstly move it to the top :

$$\text{Speed} \times \text{Time} = \frac{\text{Distance}}{\cancel{\text{Time}}} \times \cancel{\text{Time}}$$
$$\text{Speed} \times \text{Time} = \text{Distance}$$

We almost have Time on its own, now divide by speed to remove it form next to Time

$$\frac{\cancel{\text{Speed}} \times \text{Time}}{\cancel{\text{Speed}}} = \frac{\text{Distance}}{\text{Speed}}$$

$$\begin{aligned}
\text{Time} &= \frac{\text{Distance}}{\text{Speed}} \\
&= \frac{1{,}000\,\cancel{km}}{430\,\cancel{km}/h} \\
&\approx 2.326\ h\,. \\
&= 2\,hours + 0.326\,hours \\
&= 2 + 0.326\,\cancel{hours} \times 60\,\frac{minutes}{\cancel{hour}} \\
&= 2\,hours + 19.56\,minutes \\
&\approx 2\,hours \text{ and } 20\,minutes\,.
\end{aligned}$$

b. (1.5 marks)

$$\text{Printer 1: } \frac{10 \text{ pages}}{29 \text{ seconds}} \approx 0.345 \text{ pages/second}$$

$$\begin{aligned}
&= 0.345 \text{ pages/second} \times 60 \text{ seconds/minute} \\
&= 0.345 \frac{\text{pages}}{\cancel{\text{second}}} \times 60 \frac{\cancel{\text{seconds}}}{\text{minute}} \\
&= 0.345 \times 60 \frac{\text{pages}}{\text{minute}} \\
&= 20.7 \text{ pages/minute}\,.
\end{aligned}$$

$$\text{Printer 2: } \frac{12 \text{ pages}}{32 \text{ seconds}} = 0.375 \text{ pages/second}$$

$$\begin{aligned}
&= 0.375 \text{ pages/second} \times 60 \text{ seconds/minute} \\
&= 0.375 \frac{\text{pages}}{\cancel{\text{second}}} \times 60 \frac{\cancel{\text{seconds}}}{\text{minute}} \\
&= 0.375 \times 60 \frac{\text{pages}}{\text{minute}} \\
&= 22.5 \text{ pages/minute}\,.
\end{aligned}$$

The second printer is faster $(0.375$ pages per second$)$ compared to the first printer (0.345) .

6a. (0.5 marks)

Let a be the number of apples Sam started with.

$$\rightarrow a - 4 = 8$$

Solving:

$$a - 4 + 4 = 8 \quad +4$$
$$a = 12 .$$

Sam started with 12 apples .

b. (0.5 marks)

Let c be the number of chocolates in the box.

$$\rightarrow 2c + 6 = 20$$

Solving:

$$2c + 6 - 6 = 20 - 6$$
$$\frac{2c}{2} = \frac{14}{2}$$
$$c = 7 .$$

There are 7 chocolates in the box .

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

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 7 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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