YEAR 7

NSW SYLLABUS

Mathematics

STUDENT COMPANION **NSW**

Pearson | Secondary Teaching Hub

Pearson

Pearson Secondary Teaching Hub Maths 7 NSW

Student Companion

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We pay our respects to Elders, past and present.

Pearson Australia
(a division of Pearson Australia Group Pty Ltd)
459–471 Church Street
Level 1, Building B
Richmond, Victoria 3121
www.pearson.com.au

(a division of Pearson Australia Group Pty Ltd)
First published 2023 by Pearson Australia
2026 2025 2024 2023

10 9 8 7 6 5 4 3 2 1

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Illustrators: DiacriTech and QBS Learning
Proofreader:
Printed in Australia
ISBN 9780655713821
Pearson Australia Group Pty Ltd ABN 40 004 245 943

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How to use this Student Companion

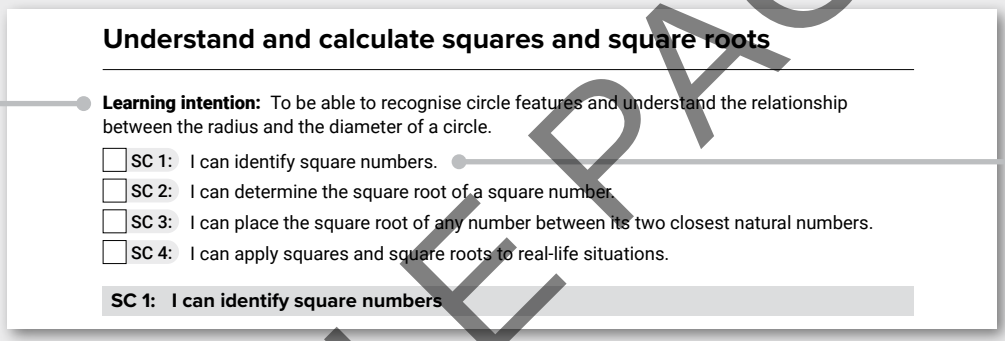
The Student Companion is a complementary resource that offers a print medium for corresponding lessons in Pearson Secondary Teaching Hub. It is designed to support teaching and learning by providing learners with a place to create a portfolio of learning to suit their individual needs, whether you are:

- supporting a blended classroom using the strengths of print and digital
- preparing for exams by creating a study guide or bound reference
- needing a tool to differentiate learning or
- looking for meaningful homework tasks.

Learners can develop their portfolio of learning as part of classroom learning or at home as an additional opportunity to engage and re-engage with the knowledge and skills from the lesson.

This could be done as prior learning in a flipped classroom environment or as an additional revision or homework task.

Learning intention and success criteria



Learning intentions are provided for every lesson. The learning intentions are goals or objectives that align to the corresponding digital lesson. They describe what learners should know, understand or be able to do by the end of the lesson.

Success criteria clarify expectations and describe what success looks like. The success criteria are specific, concrete and measurable so learners can actively engage with and reflect on their evidence of learning within each lesson.

Worked examples

Worked examples provide learners with a step-by-step solution to a problem. The worked examples in the Student Companion correspond to those in the digital lesson and are provided for each skill to:

- scaffold learning
- support skill acquisition
- reduce the cognitive load.

The **worked examples** are an effective tool to demonstrate what success looks like. The 'try yourself' format of the worked examples in the Student Companion support the gradual release of responsibility. Learners can view a completed worked example and a video walkthrough of the worked example in the corresponding digital lesson and then apply the scaffolded steps themselves to solve a unique problem.

SC 3: I can use a factor tree to determine the prime factors of a number.

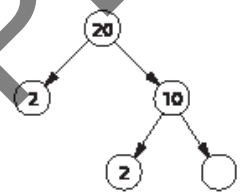
Worked example: Using a factor tree to determine the prime factors of a number.

Use a factor tree to determine the prime factors of 24.

Thinking	Working
Recall any factor pair that does not include 1. Recall a factor pair for any of the non-prime factors that does not include 1. Continue until all factors listed are prime. Answer the question.	

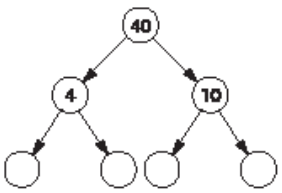
1 Complete the following factor trees to determine the prime factors of the number given.

(a) 30



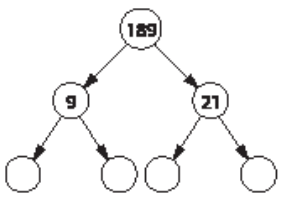
The prime factors are _____

(b) 40



The prime factors are _____

(c) 189



The prime factors are _____

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Practice questions are provided in the student companion so that learners can apply the knowledge and skills obtained in the worked example given. These questions are designed to ensure learners build confidence and demonstrate efficiency. They follow on from the Check your understanding questions beside the corresponding worked example in the digital lesson.

Each lesson in the student companion contains a space for students to reflect on their understanding. The simple and intuitive design of the **lesson reflection tool** allows students to scale their confidence, reflect on their learning and identify areas in which they need support.

Number properties

Understand and calculate squares and square roots

Learning intention: To be able to recognise circle features and understand the relationship between the radius and the diameter of a circle.

- ☐ **SC 1:** I can identify square numbers.
- ☐ **SC 2:** I can determine the square root of a square number.
- ☐ **SC 3:** I can place the square root of any number between its two closest natural numbers.
- ☐ **SC 4:** I can apply squares and square roots to real-life situations.

SC 1: I can identify square numbers

Worked example: Identifying common square numbers

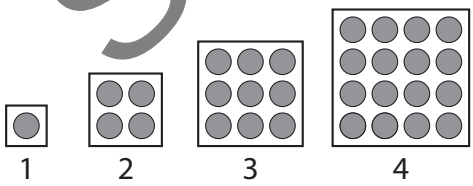
(a) Is 16 a square number?

Thinking	Working
Recall the factors of 16. Can 16 be written as the product of a number multiplied by itself?	
Write the answer.	

(b) Is 8 a square number?

Thinking	Working
Recall the factors of 8. Can 8 be written as the product of a number multiplied by itself?	
Write the answer.	

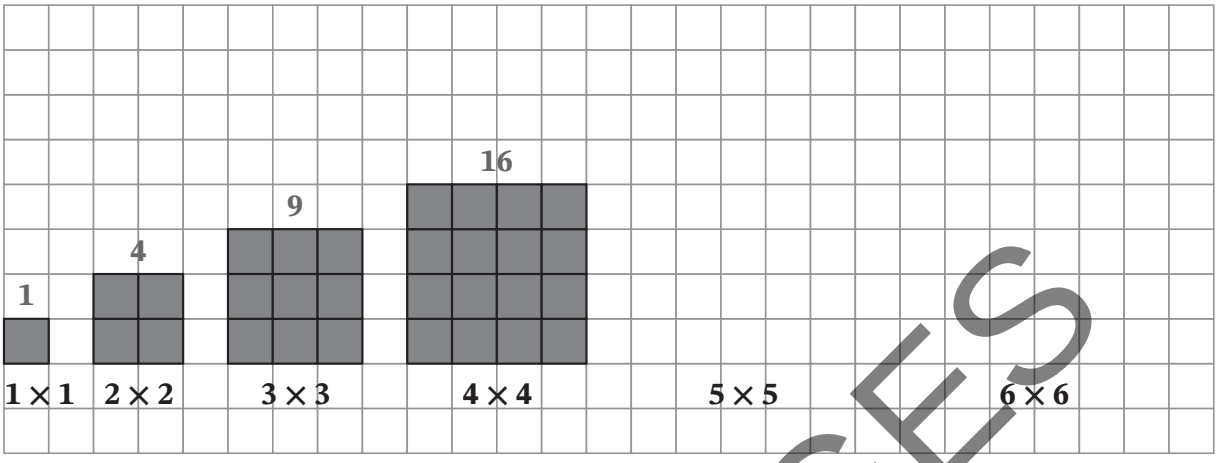
1 Some square numbers are represented by counters in the diagrams below.



(a) The diagrams show the first four square numbers 1, 4, 9 and 16. Explain what these numbers represent.

(b) How many counters would you need to make the fifth square number?

(c) You can also create squares with arrays On the grid below, draw squares with sides 5 units and 6 units.



(d) Determine the area of the squares you drew in part (c).

(e) Explain how you would calculate the value of a square number.

(f) How would you work out the area of a square with side lengths of 8 units?

2 Complete this table of the first 20 square numbers.

$1^2 = 1$	$6^2 =$		
$2^2 = 4$			
$3^2 = 9$			
$4^2 =$			
$5^2 =$			

3 Which of the following numbers are square numbers? Justify your answer.

(a) 12

(b) 36

(c) 50

(d) 144

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SC 2: I can determine the square root of a square number

Worked example: Calculating the square root of a square number

Determine the square root of the square number 36.

Thinking	Working
Determine the number that when multiplied by itself gives the square number.	
Write the answer.	

1 Determine the square root of the following square numbers.

(a) 9 _____

(b) 49 _____

(c) 64 _____

(d) 121 _____

(e) 196 _____

(f) 225 _____

2 Rio says, "As the square root of 4 is 2. Then the square root of 16 is 8".
Explain Rio's mistake.

_____

_____

_____

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SC 3: I can place the square root of any number between its two closest natural numbers

Worked example: Estimating the value of the square root of a number

The square root of 60 is between which two whole numbers?

Thinking	Working
Recall the square numbers above and below 60.	
Write the square root for each number.	
Write the answer.	

1 The square root of 20 is between which two whole numbers?

2 Determine the whole number above and below the square root of:

(a) 12

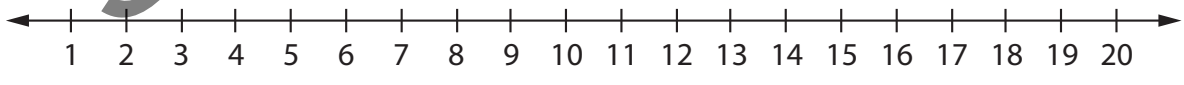
(b) 40

(c) 115

(d) 300

3 Place the following square roots on the number line shown.

(a) $\sqrt{6}$ **(b)** $\sqrt{18}$ **(c)** $\sqrt{77}$ **(d)** $\sqrt{250}$



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SC 4: I can apply squares and square roots to real-life situations

Worked example: Applying squares and square roots

A bathroom fitter will place tiles on a square section of wall. The square measures $2\ \text{m}$ on each side. Each tile is a square measuring $20 \times 20\ \text{cm}$. How many tiles are required?

Thinking	Working
Calculate the number of tiles along one edge of the square.	
Since the section of wall is square, the number of tiles is found by squaring 10.	
Write the answer.	

1 A carpet fitter is laying square carpet tiles in a room. The room has a floor that is a square with sides $5\ \text{m}$. Each floor tile is $50 \times 50\ \text{cm}$. How many carpet tiles are required?

2 A bathroom fitter lays tiles on a square section of floor. The square measures $3\ \text{m}$ on each side. Each tile is a square measuring $20 \times 20\ \text{cm}$. How many tiles are required?

3 A bathroom fitter lays tiles in a square room, measuring $3.9\ \text{m}$ on each side. Each tile is a square measuring $30 \times 30\ \text{cm}$. How many tiles are required?

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Understand and use index notation to represent numbers

Learning intention: To understand and be able to use index notation to represent numbers

- ☐ SC 1: I can correctly use the terms 'base' and 'index'.
- ☐ SC 2: I can express repeated multiplication by using index notation.

SC 1: I can correctly use the terms 'base' and 'index'.

Worked example: Identifying the base and index

Identify the base and index in 5^2.

Thinking	Working
Identify the base. The base is the large number at the bottom.	
Identify the index. The index (or power) is the superscripted number.	

1 Identify the base and index in 7^3.

2 Identify the base and index in:

(a) 3^2

(b) 4^5

(c) x^4

(d) m^n

(e) 7^y

3 You can calculate the value of expressions written in index form.

For example, $2^6 = x$.

Since $2^6 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 64$, $x = 64$.

Calculate the value of x in these equations.

(a) $2^4 = x$

(b) $3^2 = x$

(c) $3^3 = x$

(d) $3^4 = x$

(e) $4^3 = x$

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SC 2: I can express repeated multiplication by using index notation

Worked example: Understanding the link between index and expanded form.

Write the expression $9 \times 9 \times 9 \times 9$ in index form.

Thinking	Working
Identify the base.	
Identify the index by counting the number of times the base occurs in the expression.	
Write the answer.	

1 Write the following in indext form.

(a) $5 \times 5 \times 5 \times 5 \times 5 \times 5$

(b) $5 \times 5 \times 5 \times 5 \times 5$

(c) $5 \times 5 \times 5 \times 5$

(d) $5 \times 5 \times 5$

(e) 5×5

2 Write the following expressions in index form.

(a) $8 \times 8 \times 8 \times 8$

(b) $4 \times 4 \times 4 \times 4$

(c) $20 \times 20 \times 20 \times 20$

(d) $z \times z \times z \times z$

3 When two or more factors are involved, they can be simplified by writing them in index form. For example, $2 \times 2 \times 5 \times 5 \times 5 = 2^2 \times 5^3$. Write the following expressions in index form.

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

(b) $4 \times 4 \times 7 \times 7 \times 7 \times 7$

(c) $3 \times 3 \times 3 \times 3 \times 3 \times 11 \times 11 \times 11$

(d) $3 \times 3 \times 5 \times 5 \times 5 \times 5 \times 7 \times 7 \times 7$

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Represent numbers in prime factor form

Learning intention: To be able to represent numbers in prime factor form

- ☐ SC 1: I can determine the prime factors of a number
- ☐ SC 2: I can use a factor ladder to find determine the prime factors of a number
- ☐ SC 3: I can use a factor tree to determine the prime factors of a number
- ☐ SC 4: I can write a number as a product of its prime factors

SC 1: I can determine the prime factors of a number

Worked example: Determine the prime factors of 24

Determine the prime factors of 24.

Thinking	Working
Write the first factor pair as a product of 1 and itself.	
Try $2, 3, 4, 5, 6$ until there is no difference between the two factors, or the factors start repeating.	
List the factors.	
Highlight the factors that are prime numbers.	
Write the answer.	

1 Determine the prime factors of:

(a) 8

(b) 20

(c) 100

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SC 2: I can use a factor ladder to find determine the prime factors of a number.

Worked example: Using a factor ladder to determine the prime factors of a number.

(a) Determine the prime factors of 18 using a factor ladder.

Thinking	Working
Recall the smallest prime number.	
Divide the number by the smallest prime number until it no longer divides evenly or until the final division gives a result of 1.	
Recall the next prime number.	
Divide the result in the ladder by the next prime number until it no longer divides evenly or until the final division gives a result of 1.	
Answer the question.	

(b) Determine the prime factors of 24 using a factor ladder.

Thinking	Working
Recall the smallest prime number.	
Divide the number by the smallest prime number until it no longer divides evenly or until the final division gives a result of 1.	
Recall the next prime number.	
Divide the result in the ladder by the next prime number until it no longer divides evenly or until the final division gives a result of 1. Try dividing by the next prime number 3.	
Answer the question.	

1 Use a factor ladder to determine the prime factors of:

(a) 8 **(b)** 20 **(c)** 100

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SC 3: I can use a factor tree to determine the prime factors of a number.

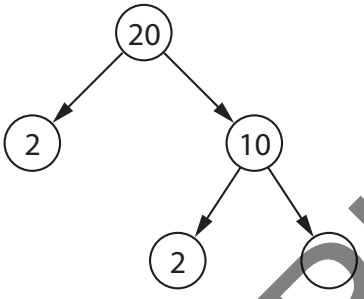
Worked example: Using a factor tree to determine the prime factors of a number.

Use a factor tree to determine the prime factors of 24.

Thinking	Working
Recall any factor pair that does not include 1. Recall a factor pair for any of the non-prime factors that does not include 1. Continue until all factors listed are prime. Answer the question.	

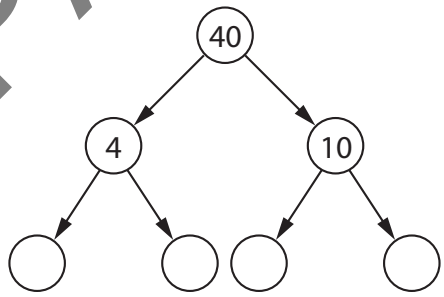
1 Complete the following factor trees to determine the prime factors of the number given.

(a) 30



The prime factors are _____

(b) 40



The prime factors are _____

2 Use a tree diagram to determine the prime factors of

(a) 27

(b) 45

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SC 4: I can write a number as a product of its prime factors

Worked example: Writing the prime factorisation of a number in index form

Write 92 as a product of its prime factors. Express your answer in index form.

Thinking	Working
Use a factor ladder or tree to determine the prime factors of 92.	
Write the prime factors as a product.	
Express your answer in index form.	

1 Express the following numbers as a product of their prime factors, then write them in index form.

(a) 27 _____

(b) 20 _____

(c) 18 _____

(d) 36 _____

(e) 225 _____

2 In expanded form Noah wrote the prime factors of 8 as $2 \times 2 \times 2$. Noah then tried to simplify this by writing it in indext form as $8 = 2 \times 3$. What mistake has Noah made?

_____

_____

3 Answer true or false for each of the statements below.

(a) The factors of 11 are 1 and 11. _____

(b) The prime factors of 11 are 1 and 11. _____

(c) The prime factors of 10 are 2 and 5. _____

(d) 44 written as a product of its prime factors is $2 \times 2 \times 11$. _____

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Understand and identify common factors

Learning intention: To understand and be able to identify common factors

- ☐ SC 1: I can determine the highest common factor (HCF) of a pair of numbers.
- ☐ SC 2: I can determine the lowest common multiple (LCM) of a pair of numbers.
- ☐ SC 3: I can solve problems involving highest common factors and lowest common multiples.

SC 1: I can determine the highest common factor (HCF) of a pair of numbers

Worked example: Finding the highest common factor (HCF)

Determine the highest common factor (HCF) of 36 and 42.

Thinking	Working
List the factors of each number.	
From the lists of factors, identify the factors common to both lists. Use this list to identify the highest common factor (HCF)	
Answer the question.	

1 Determine the highest common factor (HCF) of 16 and 24.

(a) List the factors of 18. _____

(b) List the factors of 24. _____

(c) List the common factors of 16 and 24. _____

(d) Identify the highest common factor (HCF). _____

2 Determine the highest common factor (HCF) of 33 and 63.

(a) List the factors of 33. _____

(b) List the factors of 63. _____

(c) List the common factors of 33 and 63. _____

(d) Identify the highest common factor (HCF). _____

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SC 2: I can determine the lowest common multiple (LCM) of a pair of numbers

Worked example: Finding the lowest common multiple (LCM)

Determine the lowest common multiple of 8 and 10.

Thinking	Working
List the first five multiples for each.	
From the list of multiples, identify the lowest multiple that is common to both lists.	
Answer the question.	

1 Determine the lowest common multiple (LCM) of 12 and 15.

(a) List the first 5 multiples of 12. _____

(b) List the first 5 multiples of 15. _____

(c) Identify the lowest common multiple (LCM). _____

2 Determine the lowest common multiple (LCM) of 4 and 7.

(a) List the first 8 multiples of 4. _____

(b) List the first 8 multiples of 7. _____

(c) Identify the lowest common multiple (LCM). _____

3 Determine the lowest common multiple (LCM) of 6, 9 and 12.

(a) List the first 6 multiples of 6. _____

(b) List the first 4 multiples of 9. _____

(c) List the first 3 multiples of 12. _____

(d) Identify the lowest common multiple (LCM). _____

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SC 3: I can solve problems involving highest common factors and lowest common multiples

Worked example: Solving problems using the lowest common multiple (LCM)

Determine the smallest whole number which when divided by 2, 3, 4 and 9 leaves a remainder of 1 each time.

Thinking	Working
Describe the steps needed to solve the problem.	
Determine the lowest common multiple of 2, 3, 4 and 9.	
Add 1 to the result.	
Check the reasonableness of your answer.	
Answer the question.	

Worked example: Solving problems using the highest common factor (HCF)

An artist has 16 red tiles and 40 blue tiles. The tiles will be laid in rows containing the same number of red tiles and blue tiles, using all the tiles. How many rows will the artist need to create and how many of each tile will be in a row?

Thinking	Working
Describe the steps needed to solve the problem.	
List the factors of each number and identify the highest factor common to both lists. .	
Interpret the highest common factor (HCF).	
Determine the number of plants in each row.	
Write the answer.	

1 Four lights are set to flash at intervals of $5, 7, 10$ and 14 seconds. If they all flash at 10am, when will they next all flash at the same time?

2 Paper straws are sold in boxes of 20 and paper cups in packets of 15. You want to have the same number of straws and cups for a school prom. What is the minimum number of each packet that you need to buy?

3 Three cyclist are practicing by cycling laps around a cross county course. They take 4 minutes, 5 minutes and 6 minutes respectively to complete one lap. They all started from the start line at the same time. How long does it take before they next all cross the starting line at the same time.

Understand and use expanded notation to represent numbers

Learning intention: To understand and be able to use expanded notation to represent numbers

- ☐ SC 1: I can write large powers of ten in both expanded form and index form.
- ☐ SC 2: I can write large numbers in expanded notation.

SC 1: I can write large powers of ten in both expanded form and index form

Worked example: Writing large powers of 10 in expanded notation and index notation

(a) Write the number 1000 in both expanded form and index form.

Thinking	Working
Identify the base number.	
Write the number in expanded form. Expanded form shows the base number multiplied by itself.	
Identify the number of times the base number appears in the product.	
Write the number in index form. The index shows the number of times the base number appears in the product. This is written as a superscript.	
Write the answer.	

(b) Write the number 1000000 in both expanded form and index form.

Thinking	Working
Identify the base number.	
Write the number in expanded form. Expanded form shows the base number multiplied by itself.	
Identify the number of times the base number appears in the product.	
Write the number in index form. The index shows the number of times the base number appears in the product. This is written as a superscript.	
Write the answer.	

1 Write the following in index form with a base of 10.

(a) 10000000 _____

(b) 100000000 _____

(c) 1000000000 _____

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SC 2: I can write large numbers in expanded notation

Worked example: Writing in expanded form using powers of 10

Write 8057 in expanded form using index notation.

Thinking	Working
Write the number in expanded form.	
Rewrite the expanded form by multiplying each digit by a power of 10.	
Write each power of ten in index form. Recall that $1000 = 10^3$, $100 = 10^2$, $10 = 10^1$ and $10 = 10^0$.	
Write the answer.	

1 Place value is shown in the table below. Complete the table with index numbers using 10 as a base.

	Hundreds of thousands	Tens of thousands	Thousands	Hundreds	Tens	Ones
General form	100000					
Index form			10^3		10^1	10^0
Expanded form		$10 \times 10 \times 10 \times 10$				1

2 The number 879 is eight hundreds, seven tens and nine ones and can be written as $(8 \times 100) + (7 \times 10) + (9 \times 1)$ or in expanded form using index notation as $8 \times 10^2 + 7 \times 10^1 + 9 \times 10^0$.

Write the following numbers in expanded form using index notation.

(a) 37 _____

(b) 372 _____

(c) 3702 _____

3 Write these numbers given in expanded notation in general form (as numbers).

(a) $5 \times 10^2 + 3 \times 10^1 + 9 \times 1$ _____

(b) $7 \times 10^2 + 5 \times 1$ _____

(c) $2 \times 10^2 + 3 \times 10^0$ _____

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