TOOL // Grade 7 Number Sense and Numeration

What is it used for?
The assessment and rubric is used to summatively assess student skill development and understanding at the end of the unit.

How do you use it?
After a teaching/learning unit the students independently complete the assessment. The assessment reflects the four categories of achievement outlined in the Ontario Curriculum.

Grade 7

Number Sense and Numeration:

Factors, Multiples, Exponents, Squares & Square Roots, Patterns in Numbers

Teaching points:

- Factors of whole numbers
- Greatest Common Factor of two or more numbers
- Multiples of whole numbers
- Lowest Common Multiple of two or more numbers)
- Squares and square roots (first 16 perfect squares)
- Exponents (focus on squares and cubes 4^2, 5^3)
- Patterns in numbers (growing and shrinking)

Name: _____ Date: _____

Grade 7

Number Sense – Factors, Multiples, Exponents, Squares & Square Roots, Number Patterns

U=	A=	T=	C=

Understanding – These questions are basic questions showing what you know.
Application – These are questions that ask you to apply what you know.
Thinking (problem solving) - These questions are questions that sometimes have more than one answer and the focus is on how you solve these problems. Remember to explain your strategy or your way of thinking. Be sure to show everything that you do as each step counts.
Communication – This is an overall assessment of your communication skills in math. You will be assessed on your ability to effectively communicate your answers based on your explanations, presentation and appropriate use of numbers and diagrams.

Be sure to read the questions carefully and show all steps to your work!

Part A – Understanding

1. What are **prime** and **composite** numbers? Remember to include examples.

2. List the factors of **45**. Which of the factors are multiples of **3**?

3. What are the factors of **16** and **40**? What is the **GCF**? (greatest common factor)

4. What are the first 8 **multiples** of 6 and 9? What is their **LCM**? (lowest common multiple)

5. Write 7^3 in expanded form.

6. What is the **standard form** of?

a) √144 b) 4 to the power of 2 c) the square of 6 d) 5^2

Part B – Application

7. A square has a perimeter of 64m. What is the area of the square?

8. Ben, Freddie, and Julie are competitive gamers. To keep up their skills they each follow a strict practice schedule. Ben practices every **3rd day**, Freddie every **7th day** and Julie every **4th day**. If they all practiced today, **when** will they all practice on the same day again?

Part C – Thinking

9. Complete the table:

Exponent Form	Base	Exponent	Expanded Form	Standard Form
	10	3		
8^2				
				125

Choose your own

10. This is *Pascal's Triangle*.

```
          1
        1   1
      1   2   1
    1   3   3   1
  1   4   6   4   1
1   5  10  10   5   1
```

a) **Describe** 2 patterns that you can find in *Pascal's Triangle*.

i)

ii)

b) What is the **next row** of *Pascal's Triangle*? **Explain** how you know.

11. **Describe** and **extend** each pattern in 2 different ways:

a) 5, 25 ...

i)

ii)

b) 1, 2, 4 …

i)

ii)

12. Use the clues to find the mystery number. ****Show your work**

Clue 1: I am a 2-digit number
Clue 2: I am greater than $\sqrt{256}$, but less than 7^2
Clue 3: I have 21 as a factor
Clue 4: I am a composite number

The number is:_____

Name: ANSWERS Date: _____

Grade 7

Number Sense – Factors, Multiples, Exponents, Squares & Square Roots, Number Patterns

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Be sure to read the questions carefully and show all steps to your work!

Part A – Understanding

1. What are **prime** and **composite** numbers? Remember to include examples.

prime - only 2 factors, 1 and self
→ 2, 3, 7, 19, etc

composite - more than 2 factors
→ 4 (1, 2, 4) 25 (1, 5, 25) 12 (1, 2, 3, 4, 6, 12)

2. List the factors of **45**. Which of the factors are multiples of **3**?

1, 3, 5, 9, 15, 45 - Factors of 45

3, 9, 15, 45 - multiples of 3

3. What are the factors of **16** and **40**? What is the **GCF**? (greatest common factor)

16 - 1, 2, 4, [8], 16

40 - 1, 2, 4, 5, [8], 10, 20, 40

GCF - 8

4. What are the first 8 **multiples** of 6 and 9? What is their **LCM**? (lowest common multiple)

6 - 6, 12, 18, 24, 30, 36, 42, 48

9 - 9, 18, 27, 36, 45, 54, 63, 72

LCM - 18

5. Write 7^3 in <u>expanded</u> form.

7 x 7 x 7

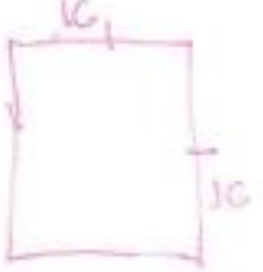
6. What is the **standard form** of?

a) V144 b) 4 to the power of 2 c) the square of 6 d) 5^2

12 4^2 $= 16$ 6^2 $= 36$ 25

<u>Part B – Application</u>

7. A square has a <u>perimeter</u> of 64m. What is the <u>area</u> of the square?



$A = 16^2$

$= 256m^2$

P = 64

S = 64 ÷ 4 = 16

8. Ben, Freddie, and Julie are competitive gamers. To keep up their skills they each follow a strict practice schedule. Ben practices every **3rd day**, Freddie every **7th day** and Julie every **4th day**. If they all practiced <u>today</u>, **when** will they all practice on the <u>same day</u> again?

B - 3, 6, 9, 12, 15, 18, 21, 24 27 30, 33, 36, 39 42, 45, 48
51, 54, 57, 60, 63, 66, 69 72 75 78 81, 84

F - 7, 14, 21, 28, 35, 42 49, 56, 63, 70, 77, 84

J - 4, 8, 12, 16, 20, 24, 28, 32, 36, 40, 44, 48, 52, 56,
60, 64, 68, 72, 76, 80, 84, 88, 92, 96

<u>Part C – Thinking</u>

9. Complete the table:

Exponent Form	Base	Exponent	Expanded Form	Standard Form
10^3	10	3	10x10x10	1000
8^2	8	2	8x8	64
5^3	5	3	5x5x5	125
4^3	4	3	4x4x4	64

10. This is *Pascal's Triangle*.

2^0 —— 1
2^1 —— 1 1
2^2 —— 1 2 1
2^3 — 1 3 3 1
2^4 — 1 4 6 4 1
2^5 - 1 5 10 10 5 1

a) **Describe** 2 patterns that you can find in *Pascal's Triangle*.

i)
① all rows start & end with one
② diagonal columns start at 1 and increase by one
③ the sum of each row starts at one and doubles each time

ii)
④ each row can be expressed as a power of 2 ($2^0, 2^1, 2^2, 2^3$, etc)

b) What is the **next row** of *Pascal's Triangle*? **Explain** how you know.

(5+1) (10+10) (5+1)
1 6 15 20 15 6 1
(10+5) (5+10)

- starts & ends with 1
- sum is $2^6 = 64$

11. **Describe** and **extend** each pattern in 2 different ways:

a) 5, 25 ... for example

i) start at 5, add 20 each time
5, 20, 45, 65, 85...

ii) start at 5, multiply by 5 each time
5, 25, 125, 625...

b) 1, 2, 4 ...

i) start at 1, double each time
1, 2, 4, 8, 16, 32.....

ii) start at 1 add by increasing # each time (+1, +2, +3, +4, etc)
1, 2, 4, 7, 11, 16, 22

12. Use the clues to find the mystery number. ****Show your work**

Clue 1: I am a 2-digit number
Clue 2: I am greater than √256, but less than 7^2
Clue 3: I have 21 as a factor
Clue 4: I am a composite number

$\sqrt{256} = 16$ $7^2 = 49$

21, 42, 63

The number is: 21

or

42

Categories	Level 1	Level 2	Level 3	Level 4
Knowledge and Understanding **facts, terms, procedural skills #2,3,4,5,6** **understanding of concepts #1**	demonstrates limited knowledge of facts, terms, procedural skills by applying them with several major errors demonstrates a limited (1-3) Explanation is unclear or very limited so that understanding is not clear	demonstrates some knowledge of facts, terms, procedural skills by applying them with several minor errors or omissions (4- 6) correct Explanation demonstrates some understanding of prime and composite numbers but is simplistic or incomplete	demonstrates considerable knowledge of facts, terms, procedural skills, by applying them with few minor errors or omissions (7- 9/) correct Explanation demonstrates a general understanding of prime and composite numbers	demonstrates thorough knowledge of facts, terms, procedural skills, by applying them with rarely any errors or omissions (10-11) correct Explanation demonstrates a thorough understanding of prime and composite numbers
Thinking **understands the problem ,makes a plan(chooses a strategy)** **carries out the plan, looks back** **# 9.10.11. 12**	Rarely demonstrates an understanding what the problems are asking chooses a strategy that may be inappropriate rarely carries it through to an accurate solution	For some problems show some understanding of what the problems are asking chooses a strategy and sometimes carries it through to an accurate solution	For most problems demonstrates an understanding what the problems are asking choosing appropriate strategies and usually carrying them through to accurate solutions	Consistently demonstrates understanding what the problems are asking choosing effective strategies and carrying them through to accurate solutions
Communication expresses mathematical ideas visually and in writing using numbers symbols, diagrams and words **(all questions)**	communicates mathematical thinking with limited effectiveness with little evidence of organization, uses conventions, vocabulary, and terminology with limited effectiveness to convey mathematical information	communicates mathematical thinking with some effectiveness with some degree of organization, uses conventions, vocabulary and terminology with some effectiveness to convey basic mathematical information	communicates mathematical thinking with considerable effectiveness with an appropriate degree of organization, clarity, uses conventions, vocabulary, and terminology with considerable effectiveness to convey mathematical information	communicates mathematical thinking effectively with a high degree of organization, clarity uses conventions, vocabulary, and terminology effectively to convey mathematical information
Application **Applies skills and concepts in context** **#7. 8**	Attempts to apply the skills taught in the contexts but has significant difficulty arriving at an accurate solution	Attempts to apply the skills taught in the contexts but has some difficulty arriving at accurate solutions	Demonstrates considerable effectiveness applying the skills taught in the contexts usually arriving at an accurate solution	Is highly effective in applying the skills taught in the contexts to arrive at accurate solutions