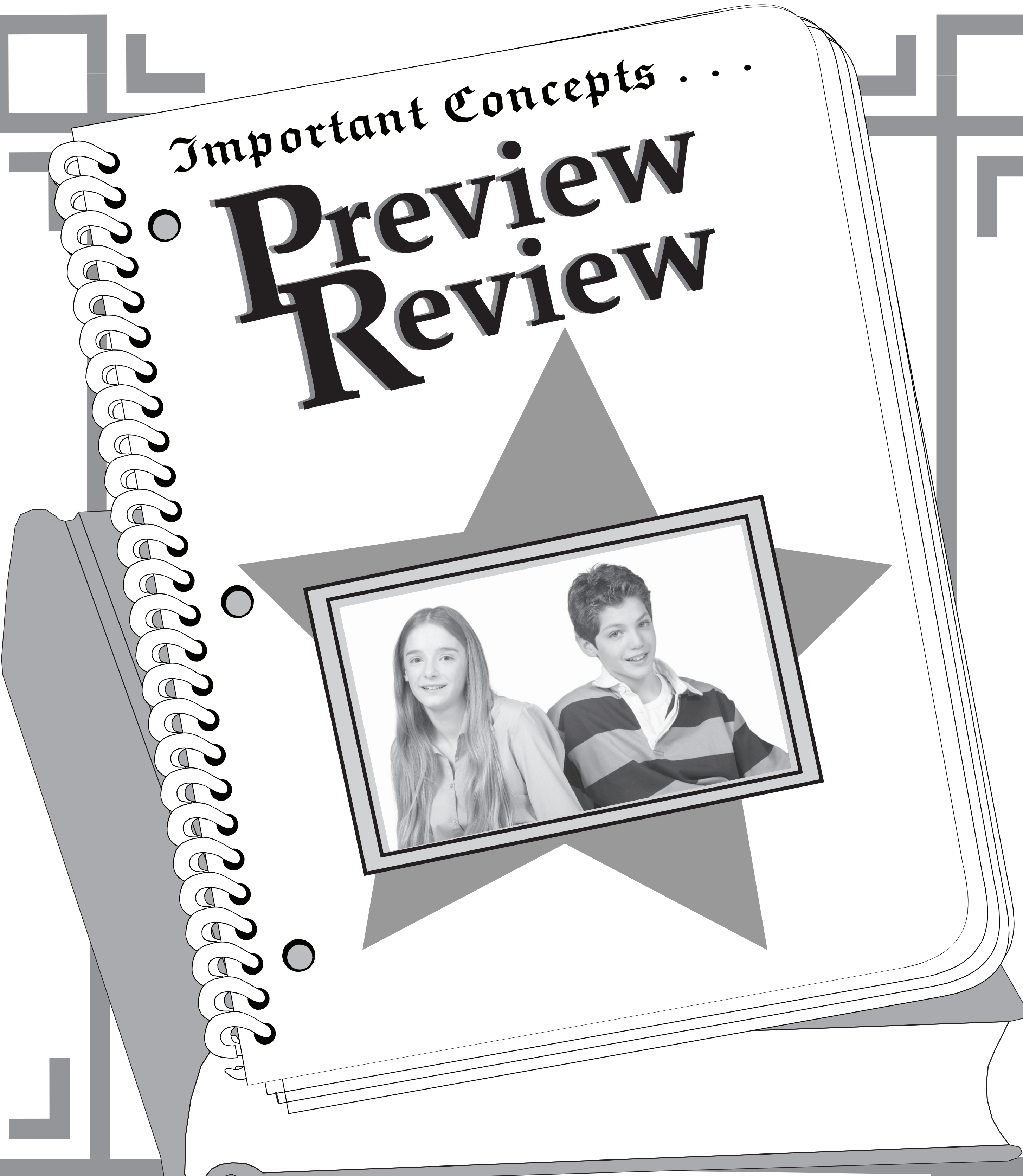

Mathematics Grade 9 TEACHER KEY

W1 - Review

V6-11

Important Concepts of Grade 9 Mathematics

Materials Required

Pencil
Paper
Calculator

No Textbook Required

This is a stand-alone course.

Mathematics Grade 9
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Preview/Review W1 - Review
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Preview/Review Concepts for Grade Nine Mathematics

Teacher Key

W1 – Review

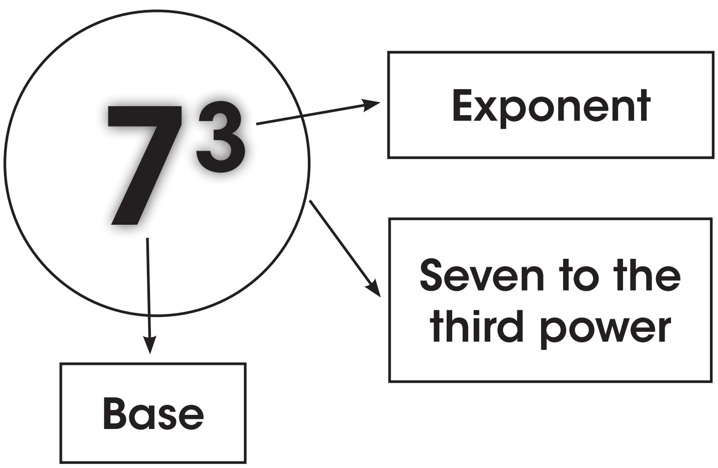
W1 – Review

Materials required:

- Paper, Pencil, and Calculator

Part 1: Powers

Powers have two parts: a base and an exponent.



In this example, the repeated multiplication sentence is:

$7^3 = 7 \times 7 \times 7$

Practice Questions

1. Complete the chart.

Power	Base	Exponent	Repeated Mulitplication	Value
7^4	***7***	***4***	***7 × 7 × 7***	***2401***
$\boldsymbol{3^3}$	***3***	***3***	3 × 3 × 3	***27***
$\boldsymbol{(-5)^6}$	(–5)	6	***–(5) × –(5) × –(5) × –(5)***	***625***
$\boldsymbol{h^4}$	***h***	***4***	–(*h* × *h* × *h* × *h*)	$\boldsymbol{h^4}$
$\boldsymbol{4^3}$	4	***3***	***4 × 4 × 4***	64

2. Explain the following:

a. $(-5)\times(-5)\times(-5)\times(-5) \neq -5^4$

$\boldsymbol{(-5)^4 = 625}$ ***and*** $\boldsymbol{-(5)^4 = -625}$

b. $-3^4 \neq 81$

$\boldsymbol{(-3)^4 = -81}$

Part 2: Laws of Exponents

The **Product Law** can be written as:

$$x^a x^b = x^{a+b}$$

Example

$(5^4)(5^3) = 5^7$

Note: The rules only work when multiplying powers of the same base.

Combining powers with different bases but the same exponent can be written as:

$$x^a y^a = (xy)^a$$

Example

$(4)^3(5)^3 = (4\times5)^3$
$= 20^3$

The **Division Law** can be written as:

$$\frac{x^a}{x^b} = x^a x^{-b} = x^{a-b}$$

Example

$\frac{x^8}{x^6} = x^{8-6} = x^2$

Note: The rule above works only when dividing powers of the same base.

Combining powers with different bases but the same exponent can be written as:

$$\frac{x^a}{y^a} = \left(\frac{x}{y}\right)^a$$

Example

$$\frac{x^5}{y^5} = \left(\frac{x}{y}\right)^5$$

The **Power of a Power Rule** can be written as:

$$\left(x^a\right)^b = x^{ab}$$

Example

Simplify $(-5^3)^2$
$= (-5^3)\,(-5^3)$ or $(-5)^{3\times2}$
$= (-5)^6$

Practice Questions

1. Evaluate each of the following.

a. 3^4

81

b. $(-2)^3$

–8

c. -5^2

–25

d. 10^5

100 000

2. Simplify each of the following.

a. $(d^5)(f^5)$

$\boldsymbol{(df)^5}$

b. $(8^4)(6^4)$

$\boldsymbol{48^4}$

c. $(5^6)(3^6)$

$\boldsymbol{15^6}$

d. $(6^4)(7^4)$

$\boldsymbol{42^4}$

3. Simplify each of the following.

a. $(h^5) \div (k^5)$

$\boldsymbol{\left(\frac{h}{k}\right)^5}$

b. $(3^4) \div (6^4)$

$\boldsymbol{\left(\frac{3}{6}\right)^4}$

4. Simplify the following.

a. $\dfrac{(8^2)(8^5)(8^{-3})}{(8^3)}$

$\left(\dfrac{8^4}{8^3}\right) = 8^1 = 8$

b. $\dfrac{(6^7)(6^2)}{(6^2)}$

$\left(\dfrac{6^9}{6^2}\right) = 6^7$

Part 3: Rational Numbers

- A ***rational number*** is any number that can be written as a ratio of two integers.
- Every ***integer*** is a ***rational number***. Example: $5 = \frac{5}{1}$ and thus 5 is a rational number.
- All ***terminating and repeating decimals*** are ***rational numbers***.
  Example: 0.75, $0.\dot{3}$ or $0.\overline{3}$

Converting Fractions to Decimals

To calculate the decimal equivalent of a fraction, take the numerator and divide it by the denominator of a fraction.

Example

$\frac{1}{4}$ means $1 \mid 4 = 0.25$

Converting Decimals to Fractions

To calculate the fractional equivalent of a decimal, place the decimal over 10, 100, or 1000 . . . etc. Then reduce to lowest terms:

Example

0.25 means $\frac{25}{100}$

Then reduce to lowest terms $\quad 25 \div 25 = 1$
$\quad 100 \div 25 = 4$

Comparing Rational Numbers

To compare fractions, express them as equivalent fractions with a common denominator.

Example

$$-\frac{1}{3} \xrightarrow[\times 6]{\times 6} -\frac{6}{18}$$

Using decimals to compare rational numbers is also possible.

Example

Compare: $-\frac{1}{3}$ and $-\frac{8}{18}$

Convert to decimals: $-0.333\ldots > -0.444\ldots$

Therefore: $-\frac{1}{3}$ is the greater fraction.

Using a number line is a strategy to identify a rational number between two given rational numbers.

Comparing and Ordering Rational Numbers

Step 1: Convert all fractions to decimals to compare.
Step 2: Order the decimals.
Step 3: Use the converted decimals to place the dots on a number line.
Step 4: Put the converted decimals back to fractional form.
Step 5: Use the original numbers given to label the dots on a number line.

Practice Questions

1. Write each decimal as a fraction. Express each answer in reduced form.

a. 0.68

$$\frac{68 \div 4}{100 \div 4} = \frac{17}{25}$$

b. $-0.\overline{6}$

$$-\frac{66 \div 3}{999 \div 3} = -\frac{22}{333}$$

2. Write each fraction as a decimal.

a. $-\frac{8}{18}$

8 ÷ –18 = –0.4444...

b. $2\frac{2}{5}$

5 × 2 = 10 + 2 = 12 ÷ 5 = 2.4

3. Convert each set of numbers to equivalent fractions. Then indicate which one is greater by using > or <.

a. $-\frac{8}{18}$ **<** $-\frac{3}{9}$

$$\frac{8}{18} < \frac{6}{18}$$

b. $\frac{3}{4}$ **>** $\frac{2}{3}$

$$\frac{9}{12} > \frac{8}{12}$$

4. Convert each set of numbers to decimals. Then indicate which one is greater by using > or <.

a. $2\frac{2}{5}$ **>** $2\frac{3}{8}$

2.4 > 2.375

b. $-1\frac{2}{7}$ **>** $-1\frac{3}{8}$

–1.286 > –1.375

5. Order each set from least to greatest and place them on a number line.

$0.9, \frac{1}{5}, -0.\overline{7}, 1\frac{1}{7}, \frac{7}{10}, -\frac{3}{8}$

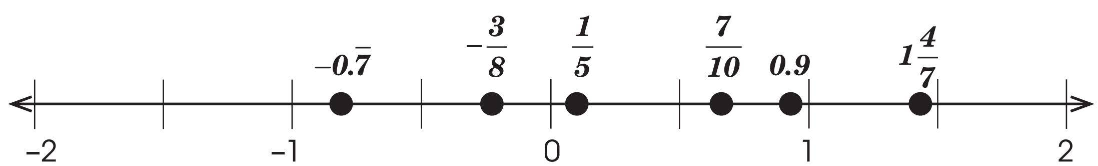
$\boldsymbol{-0.\overline{7} < -\frac{3}{8} < \frac{1}{5} < \frac{7}{10} < 0.9 < 1\frac{4}{7}}$

$\boldsymbol{1 \div 5 = 0.2}$

$\boldsymbol{1\frac{4}{7} = 1.571...}$

$\boldsymbol{7 \div 10 = 0.7}$

$\boldsymbol{-3 \div 8 = -0.375}$



6. Identify a decimal number between each pair of rational numbers.

a. $\frac{21}{30}$ $\frac{95}{98}$

Answers
> 0.7 and < 0.969

b. $-\frac{5}{11}$ $-\frac{2}{7}$

Answers
> –0.454 and < –0.285

7. Identify a fraction between each pair of rational numbers.

a. 0.79 and 0.99

$\boldsymbol{> \frac{79}{100} \text{ and } < \frac{99}{100}}$

b. 0.232 and 0.4

$\boldsymbol{> \frac{232}{1000} \text{ and } < \frac{400}{1000}}$

Part 4: Order of Operations

Adding and Subtracting Integers

- Look for pairs of opposite integers that can cancel each other out.
- Try rearranging the question so the positive and negative integers are together.

Adding and Subtracting Fractions

- First find a common denominator.

Adding and Subtracting Decimals

- Stack up the decimals, then find the sum or difference.

Multiplying and Dividing Fractions

- When multiplying fractions, multiply the numerators first, then multiply the denominators. Convert any mixed numbers to improper fractions.

- When dividing fractions, multiply the first term by the reciprocal of the second term. Convert any mixed numbers to improper fractions.

Order of Operations

- Operations must be completed in a particular order: BEDMAS.

1. Evaluate the following.

a. $-2.3+\left[1.5-(-4.3)\right]\div(-0.4)$ $\boldsymbol{= -7.7}$

b. $\frac{3}{4}+\frac{5}{8}\times\left(-\frac{1}{2}\right)^3$ $\boldsymbol{= \frac{3}{4}+-\frac{5}{64}}$

$\boldsymbol{= \frac{43}{64}}$

c. $3+\left[\frac{5}{8}-\frac{1}{2}\right]^2\div\frac{2}{8}$ $\boldsymbol{= 3+\frac{1}{64}\div\frac{2}{8}}$

$\boldsymbol{= 3+\frac{8}{128}}$

$\boldsymbol{= 3\frac{1}{16}}$

Part 5: Square Roots of Rational Numbers

A square root is the number being multiplied by itself that results in a specific number.

$\sqrt{}$ is the symbol that represents a square root.

Only perfect squares will have square roots that are whole numbers.

Example

What is $\sqrt{9.61}$?

On a calculator, type $\boxed{\sqrt{}}$ $\boxed{9.61}$

Note: Some calculators require the symbol to be entered after: $\boxed{9.61}$ $\boxed{\sqrt{}}$

The screen will show an answer of 2.5709920 . . .

So $\sqrt{9.61} \doteq 2.57$

Practice Questions

1. Determine the square roots of the following numbers using a calculator. Round your answer to the nearest hundredth when necessary.

   a. $\sqrt{4.5} \doteq$ ***2.12***

   b. $\sqrt{18.25} \doteq$ ***4.27***

   c. $\sqrt{\dfrac{36}{81}} = \boldsymbol{\dfrac{2}{3}}$

   d. $\sqrt{\dfrac{49}{100}} = \boldsymbol{\dfrac{7}{10}}$

2. Solve the following.

   a. $\sqrt{900} - 2^4 \times \left(6^2 \div 4\right)^2$

   $\boldsymbol{= 30 - 16 \times (9)^2}$
   $\boldsymbol{= 30 - 16 \times 81}$
   $\boldsymbol{= 30 - 1296}$
   $\boldsymbol{= -1266}$

   b. $\sqrt{m} + 2p$, if $m = 144$ and $p = -2$

   $\boldsymbol{= 12 + 2(-2) = 8}$

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