F.2 Mathematics
Lesson plan (revised)

Topic	Zero and negative integral indices
Target & Class Size	Form 2 students (2C), Local: 29 & Cross-Border Students: 4
Date & Time	12:00-12:30 (7th period), 23rd May
Prior knowledge	Simplifying algebraic expressions with positive integral indices Applying law of indices to simply the algebraic expressions involving positive integral indices
Object of learning	Applying law of indices to simply the algebraic expressions involving any integral indices (positive/ zero / negative)
Critical features	CF1 Identify the definition of zero index and skills for simplification CF2 Identify the definition of negative integral indices and skills for simplification
Learning Difficulties (revised)	• Students are unable to observe the pattern of (a) and (b) in Activity 2 (WS P.2) and could not make correct conclusion on $a^{-n} = \frac{1}{a^n}$ • Students might easily make careless mistakes on the signs when encountering consecutive multiplication and division. (WS P.3 Q2d) $\frac{m^{-5} \times m^2}{m^{-3}} = m^{-5+2-(-3)}$

Pre-lesson

- Students are asked to finish the lesson worksheet P.1-2 the day before. (Distributed on 20/5)
- The preparation time should be within 10 minutes.
- Students are expected to review the simplification by using laws of indices in positive integers.
- Students are expected to identify the definition of zero and negative integral indices in their own preparation.

Rundown

Time	Task
5 min	Identify definition of zero index ➔ Through peer checking of WS P.1 and teacher's clarification 1. (a) $\frac{p}{p} = \frac{p^1}{p^1} = p^{1-1} = p^0$ (b) $\frac{p}{p} = \frac{p^1}{p^1} = 1$ $\therefore p^0 = 1$ 2. (a) $\frac{2}{2} = \frac{2^1}{2^1} = 2^{1-1} = 2^{(\ )}$ (b) $\frac{2}{2} =$ $\therefore 2^0 =$ _____ 3. (a) $\frac{m^3}{m^3} = m^{(\ )} = m^{(\ )}$ (b) $\frac{m^3}{m^3} = \frac{m \times m \times m}{m \times m \times m} =$ $\therefore m^0 =$ _____ 4. (a) $\frac{n^5}{n^5} = n^{(\ )} = n^{(\ )}$ (b) $\frac{n^5}{n^5} = \frac{n \times n \times n \times n \times n}{n \times n \times n \times n \times n} =$ $\therefore n^0 =$ _____

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<table>
<tr><th>Question(s)</th><th>Variant</th><th>Invariant</th><th>Discernment</th></tr>
<tr><td>(a) and (b)</td><td>The way of simplifying (laws of indices VS algebraic notation)</td><td>The values of the algebraic expressions</td><td>Identify two ways of simplification and presentation are identical so that $a^0 = 1$ could be revealed.</td></tr>
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<tr><td>3 min</td><td>Ask students to complete B. Exercise Q1 on WS P.3
➔ Applying zero index in simple questions</td></tr>
<tr><td>5 min</td><td>Identify definition of negative integral indices
➔ Through peer checking of WS P.2 and teacher's clarification
<table>
<tr><td>1. (a) $\frac{a}{a^2} = a^{1-2} = a^{-1}$ (b) $\frac{a}{a^2} = \frac{a}{a \times a} = \frac{a^1}{a \times a_1} = \frac{1}{a}$
$\therefore a^{-1} = \frac{1}{a}$</td></tr>
<tr><td>2. (a) $\frac{2}{2^2} = 2^{1-2} = 2^{(\quad)}$ (b) $\frac{2}{2^2} = \frac{2}{2 \times 2} =$
$\therefore 2^{-1} =$ _____</td></tr>
<tr><td>3. (a) $\frac{a^2}{a^4} = a^{(\quad)} = a^{(\quad)}$ (b) $\frac{a^2}{a^4} = \frac{a \times a}{a \times a \times a \times a} =$
$\therefore a^{-2} =$ _____</td></tr>
<tr><td>4. (a) $\frac{m^2}{m^5} = m^{(\quad)} = m^{(\quad)}$ (b) $\frac{m^2}{m^5} = \frac{m \times m}{m \times m \times m \times m \times m} =$
$\therefore m^{-3} =$ _____</td></tr>
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<tr><td>3 min</td><td>Ask students to complete B. Exercise Q2 on WS P.3
➔ Applying negative integral indices in simple questions</td></tr>
<tr><td>5 min</td><td>Conclusion
➔ $a^0 = 1$
➔ $a^{-n} = \frac{1}{a^n}$
Demonstrate two examples in part C. mixed-type question on WS P.4</td></tr>
<tr><td>5 min</td><td>Ask students to complete 1 – 4.
Assign one groupmate in each group to present the answers on the blackboard.</td></tr>
<tr><td>5 min</td><td>Assessment - Post-test</td></tr>
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