Lesson Plan

Grade 10 Academic Math **Lesson: 3 - 5**

Unit: Analytic Geometry **Topic: Simplifying Radicals**

- *homework check:* **Principles of Mathematics 10 p. 91 # 2 – 6, 8, 10, 13, 14, 18**

- *note:* **Simplifying Radicals**

The steps when simplifying radicals are necessary when working with anything under a square root sign. Taking a square root when the number is a perfect square is easy – but when the number is not a perfect square, we need to simplify. To simplify, we still must know which numbers are perfect squares. For example, the following chart helps when simplifying radicals.

Number	Square
1	1
2	4
3	9
4	16
5	25
6	36
7	49
8	64
9	81
10	100
11	121
12	144

It is important to know the following:

$$\begin{aligned} 10 &= 5 \times 2 \\ &= \sqrt{25} \times \sqrt{4} \\ &= \sqrt{25 \times 4} \\ &= \sqrt{100} \end{aligned}$$

Therefore, $\sqrt{ab} = \sqrt{a} \times \sqrt{b}$ and we use this principle to reduce radicals. Radicals can be written in two forms, an entire radical where everything is under the square root sign or a mixed radical where one number may be in front of the square root sign and only a portion is left under the root sign.

Examples) Simplify each of the following radicals.

$a)\ \sqrt{50} =$
$= \sqrt{25}\sqrt{2}$
$= 5\sqrt{2}$

$b)\ \sqrt{18} =$
$= \sqrt{9}\sqrt{2}$
$= 3\sqrt{2}$

$c)\ \sqrt{54} =$
$= \sqrt{9}\sqrt{6}$
$= 3\sqrt{6}$

Change each of the following to an entire radical.

$a)\ 4\sqrt{2} =$
$= \sqrt{16}\sqrt{2}$
$= \sqrt{32}$

$b)\ 5\sqrt{3} =$
$= \sqrt{25}\sqrt{3}$
$= \sqrt{75}$

$c)\ 10\sqrt{5} =$
$= \sqrt{100}\sqrt{5}$
$= \sqrt{500}$

Complete each operation and simplify.

$a)\ 2\sqrt{3} \times 3\sqrt{3} =$
$= 6\sqrt{9}$
$= 6 \times 3$
$= 18$

$b)\ -2\sqrt{3} \times 4\sqrt{6} =$
$= -8\sqrt{18}$
$= -8\sqrt{9}\sqrt{3}$
$= -24\sqrt{3}$

$c)\ 2\sqrt{12} \times \sqrt{2} =$
$= 2\sqrt{24}$
$= 2\sqrt{4}\sqrt{6}$
$= 4\sqrt{6}$

⌗ ***homework assignment:*** **<u>FM 10</u> p. 21 # 1 – 7**

EXAMPLE 4. Simplify.
(a) $3\sqrt{2} \times 2\sqrt{7}$

SOLUTION:
(a) $3\sqrt{2} \times 2\sqrt{7} = 3 \times 2 \times \sqrt{2} \times \sqrt{7}$
$= 6\sqrt{14}$

(b) $2\sqrt{5} \times 3\sqrt{15}$

(b) $2\sqrt{5} \times 3\sqrt{15} = 6\sqrt{75}$
$= 6 \times \sqrt{25} \times \sqrt{3}$
$= 6 \times 5 \times \sqrt{3}$
$= 30\sqrt{3}$

EXERCISE 1.5

A 1. Evaluate.

(a) $\sqrt{16}$ (b) $\sqrt{49}$ (c) $\sqrt{81}$
(d) $\sqrt{100}$ (e) $\sqrt{121}$ (f) $\sqrt{\frac{4}{9}}$
(g) $\sqrt{\frac{36}{25}}$ (h) $\sqrt{\frac{64}{81}}$ (i) $\sqrt{\frac{36}{49}}$

2. Simplify.

(a) $\sqrt{3} \times \sqrt{2}$ (b) $\sqrt{6} \times \sqrt{11}$
(c) $\sqrt{3} \times \sqrt{5}$ (d) $\sqrt{5} \times \sqrt{7}$
(e) $\sqrt{11} \times \sqrt{7}$ (f) $\sqrt{5} \times \sqrt{6}$
(g) $\sqrt{6} \times \sqrt{7}$ (h) $\sqrt{2} \times \sqrt{11}$
(i) $\sqrt{11} \times \sqrt{13}$ (j) $\sqrt{5} \times \sqrt{17}$

3. Simplify.

(a) $3\sqrt{2} \times 2\sqrt{5}$ (b) $5\sqrt{7} \times \sqrt{3}$
(c) $2\sqrt{5} \times 2\sqrt{3}$ (d) $6\sqrt{5} \times 7\sqrt{2}$
(e) $2\sqrt{5} \times 3\sqrt{6}$ (f) $4\sqrt{7} \times 2\sqrt{5}$
(g) $6\sqrt{2} \times 2\sqrt{5}$ (h) $2\sqrt{2} \times 3\sqrt{3}$
(i) $3\sqrt{2} \times 5\sqrt{3}$ (j) $4\sqrt{3} \times 2\sqrt{7}$

B 4. Change to mixed radicals in simplest form.

(a) $\sqrt{12}$ (b) $\sqrt{18}$ (c) $\sqrt{20}$
(d) $\sqrt{32}$ (e) $\sqrt{45}$ (f) $\sqrt{75}$
(g) $\sqrt{50}$ (h) $\sqrt{1024}$ (i) $\sqrt{72}$
(j) $\sqrt{68}$ (k) $\sqrt{200}$ (l) $\sqrt{24}$

5. Using $\sqrt{2} \doteq 1.414$, $\sqrt{3} \doteq 1.732$, and $\sqrt{5} \doteq 2.236$, approximate the following to the nearest hundredth by first expressing as a mixed radical.

(a) $\sqrt{8}$ (b) $\sqrt{32}$ (c) $\sqrt{24}$
(d) $\sqrt{50}$ (e) $\sqrt{40}$ (f) $\sqrt{27}$

6. Change to entire radicals.

(a) $2\sqrt{3}$ (b) $5\sqrt{2}$ (c) $3\sqrt{5}$
(d) $5\sqrt{3}$ (e) $3\sqrt{11}$ (f) $5\sqrt{10}$
(g) $10\sqrt{3}$ (h) $2\sqrt{7}$ (i) $5\sqrt{8}$
(j) $3\sqrt{14}$ (k) $6\sqrt{7}$ (l) $11\sqrt{2}$

7. Simplify.

(a) $\sqrt{2} \times \sqrt{6}$ (b) $\sqrt{10} \times \sqrt{6}$
(c) $\sqrt{7} \times \sqrt{14}$ (d) $\sqrt{3} \times \sqrt{6}$
(e) $\sqrt{15} \times \sqrt{5}$ (f) $\sqrt{5} \times \sqrt{50}$
(g) $\sqrt{5} \times 2\sqrt{3}$ (h) $5\sqrt{2} \times 3\sqrt{3}$
(i) $2\sqrt{10} \times 5\sqrt{3}$ (j) $5\sqrt{7} \times 2\sqrt{14}$
(k) $5\sqrt{3} \times 2\sqrt{15}$ (l) $3\sqrt{3} \times 2\sqrt{12}$
(m) $\sqrt{6} \times \sqrt{3} \times \sqrt{2}$ (n) $\sqrt{5} \times \sqrt{2} \times \sqrt{15}$
(o) $\sqrt{10} \times \sqrt{15} \times \sqrt{6}$
(p) $3\sqrt{2} \times 2\sqrt{6} \times \sqrt{3}$
(q) $3\sqrt{5} \times 2\sqrt{3} \times 3\sqrt{5}$
(r) $3\sqrt{6} \times 2\sqrt{3} \times 4\sqrt{2}$

MICRO MATH

The following BASIC program will change an entire radical to a mixed radical. The expression under the radical is called the radicand. The radical sign will be printed as RAD(   ).

NEW
```
100 REM CHANGING AN ENTIRE RADICAL
101 REM TO A MIXED RADICAL
110 PRINT "WHAT IS THE RADICAND";
120 INPUT N
130 FOR I = INT(SQR(N)) TO 1 STEP -1
140 IF INT(N/(I*I))<>N/(I*I) THEN 180
150 A=I
160 B=N/(I*I)
170 I=1
180 NEXT I
190 IF A=1 THEN PRINT "NO MIXED
    RADICAL" : GOTO 210
200 PRINT "RAD("; N; ") ="; A;
    "RAD("; B; ")"
210 END
```
RUN