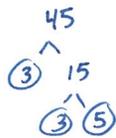Math 20-2

L03 – Worksheet

Part 1 – Mixed and Entire Radicals

Q1: Convert the following entire radicals to mixed radicals.
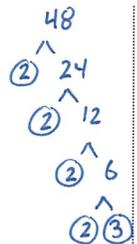
$\sqrt{45}$

$\sqrt{3^2 \cdot 5}$

$3\sqrt{5}$

45
$\diagup\diagdown$
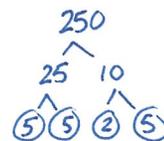③ 15
$\diagup\diagdown$
③ ⑤

$\sqrt{48x^2y^5}$

$\sqrt{2^2 \cdot 2^2 \cdot 3 \cdot x^2 \cdot y^2 \cdot y^2 \cdot y}$

$2 \cdot 2 \cdot x \cdot y \cdot y \sqrt{3y}$

$4xy^2 \sqrt{3y}$

48
$\diagup\diagdown$
② 24
$\diagup\diagdown$
② 12
$\diagup\diagdown$
② 6
$\diagup\diagdown$
②③

$\sqrt[3]{250x^5}$

$\sqrt[3]{2 \cdot 5^3 \cdot x^3 \cdot x \cdot x}$

$5x \sqrt[3]{2 \cdot x \cdot x}$

$5x \sqrt[3]{2x^2}$

250
$\diagup\diagdown$
$25 \quad 10$
$\diagup\diagdown \quad \diagup\diagdown$
⑤⑤ ②⑤

Q2: The entire radical $\sqrt{63x^7}$ simplifies to $ax^b\sqrt{cx^d}$, where **a, b, c,** and **d** are ___, ___, ___, and ___.

*(Record your **four-digit** answer in the Numerical Response boxes below)*

3	3	7	1

$\sqrt{3^2 \cdot 7 \cdot x^2 \cdot x^2 \cdot x^2 \cdot x}$

$3 \cdot x \cdot x \cdot x \sqrt{7x}$

$3x^3 \sqrt{7x}$

$ax^b \sqrt{cx^d}$

63
$\diagup\diagdown$
③ 21
$\diagup\diagdown$
③ ⑦

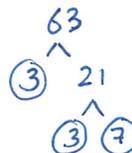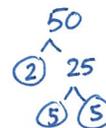**Q3:** The entire radical $\sqrt{50x^5}$ simplifies to $ax^b\sqrt{cx^d}$, where **a, b, c,** and **d** are ___, ___, ___, and ___.

*(Record your **four-digit** answer in the Numerical Response boxes below)*

5	2	2	1

$\sqrt{2 \cdot 5^2 \cdot x^2 \cdot x^2 \cdot x}$

$5xx \sqrt{2x}$

$5x^2 \sqrt{2x}$

$ax^b \sqrt{cx^d}$
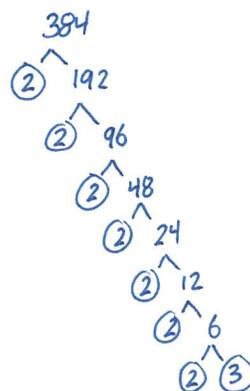
50
$\diagup\diagdown$
② 25
$\diagup\diagdown$
⑤ ⑤

Q4: The entire radical $\sqrt[3]{384x^8}$ simplifies to $ax^b \sqrt[3]{cx^d}$, where **a, b, c,** and **d** are ___, ___, ___, and ___.

*(Record your **four-digit** answer in the Numerical Response boxes below)*

4	2	6	2

$\sqrt[3]{2^3 \cdot 2^3 \cdot 2 \cdot 3 \cdot x^3 \cdot x^3 \cdot x \cdot x}$

$2 \cdot 2 \cdot x \cdot x \sqrt[3]{2 \cdot 3 \cdot x \cdot x}$

$4x^2 \sqrt[3]{6x^2}$

$ax^b \sqrt[3]{cx^d}$

384
$\diagup\diagdown$
② 192
$\diagup\diagdown$
② 96
$\diagup\diagdown$
② 48
$\diagup\diagdown$
② 24
$\diagup\diagdown$
② 12
$\diagup\diagdown$
② 6
$\diagup\diagdown$
② ③

Part 2 – Restrictions

Q5: State the restrictions for each expression.

$\sqrt{x}$	$\sqrt{x+2}$	$\sqrt{x-5}$
$x \geq 0$	$x+2 \geq 0$ $-2 \quad -2$ $x \geq -2$	$x-5 \geq 0$ $+5 \quad +5$ $x \geq 5$

Q6: State the restrictions for each expression.

$\sqrt{2x+3}$	$\sqrt{5-2x}$	$\sqrt{2x-5}$
$2x+3 \geq 0$ $-3 \quad -3$ $2x \geq -3$ $\div 2 \quad \div 2$ $x \geq -\frac{3}{2}$	$5-2x \geq 0$ $-5 \quad -5$ $-2x \geq -5$ $\div(-2) \quad \div(-2)$ $x \leq \frac{5}{2}$	$2x-5 \geq 0$ $+5 \quad +5$ $2x \geq 5$ $\div 2 \quad \div 2$ $x \geq \frac{5}{2}$

Q7: What are the restrictions on the expression $\sqrt{5x-2}$?

   (a.) $x \geq \frac{2}{5}$ b. $x \leq \frac{2}{5}$ c. $x \geq \frac{5}{2}$ d. $x \leq \frac{5}{2}$

$$5x-2 \geq 0$$
$$+2 \quad +2$$
$$5x \geq 2$$
$$\div 5 \quad \div 5$$
$$x \geq \tfrac{2}{5}$$

Q8: What are the restrictions on the expression $\sqrt{4-3x}$?

   a. $x \geq \frac{3}{4}$ b. $x \leq \frac{3}{4}$ c. $x \geq \frac{4}{3}$ (d.) $x \leq \frac{4}{3}$

$$4-3x \geq 0$$
$$-4 \quad -4$$
$$-3x \geq -4$$
$$\div(-3) \quad \div(-3)$$
$$x \leq \tfrac{4}{3}$$

KEY

Part 3 – Adding and Subtracting Radicals

Q9: Simplify the expressions

$\sqrt{20} + \sqrt{45}$

$\sqrt{2^2 \cdot 5} + \sqrt{3^2 \cdot 5}$

$2\sqrt{5} + 3\sqrt{5}$

$5\sqrt{5}$

20: 2, 10 → 2, 5

45: 3, 15 → 3, 5

$\sqrt{32} + \sqrt{98}$

$\sqrt{2^2 \cdot 2^2 \cdot 2} + \sqrt{2 \cdot 7^2}$

$2 \cdot 2 \cdot \sqrt{2} + 7\sqrt{2}$

$4\sqrt{2} + 7\sqrt{2}$

$11\sqrt{2}$

32: 2, 16 → 2, 8 → 2, 4 → 2, 2

98: 2, 49 → 7, 7

Q10: Simplify the expressions

$\sqrt{27} + \sqrt{48} + \sqrt{12}$

$\sqrt{3^2 \cdot 3} + \sqrt{2^2 \cdot 2^2 \cdot 3} + \sqrt{2^2 \cdot 3}$

$3\sqrt{3} + 2 \cdot 2\sqrt{3} + 2\sqrt{3}$

$3\sqrt{3} + 4\sqrt{3} + 2\sqrt{3}$

$9\sqrt{3}$

27: 3, 9 → 3, 3

48: 2, 24 → 2, 12 → 2, 6 → 2, 3

12: 2, 6 → 2, 3

$\sqrt{28} + \sqrt{63} - \sqrt{7}$

$\sqrt{2^2 \cdot 7} + \sqrt{3^2 \cdot 7} - \sqrt{7}$

$2\sqrt{7} + 3\sqrt{7} - 1\sqrt{7}$

$4\sqrt{7}$

28: 2, 14 → 2, 7

63: 3, 21 → 3, 7

Q11: The expression $\sqrt{80} + \sqrt{18} + \sqrt{20} + \sqrt{32}$ simplifies to $a\sqrt{b} + c\sqrt{d}$, where **a, b, c,** and **d** are ___, ___, ___, and ___.

*(Record your **four-digit** answer in the Numerical Response boxes below; Multiple correct answers exist)*

| 7 | 2 | 6 | 5 | or | 6 | 5 | 7 | 2 |

$\sqrt{2^2 \cdot 2^2 \cdot 5} + \sqrt{2 \cdot 3^2} + \sqrt{2^2 \cdot 5} + \sqrt{2^2 \cdot 2^2 \cdot 2}$

$2 \cdot 2\sqrt{5} + 3\sqrt{2} + 2\sqrt{5} + 2 \cdot 2\sqrt{2}$

$4\sqrt{5} + 3\sqrt{2} + 2\sqrt{5} + 4\sqrt{2}$

$7\sqrt{2} + 6\sqrt{5}$

80: 2, 40 → 2, 20 → 2, 10 → 2, 5

18: 2, 9 → 3, 3

20: 2, 10 → 2, 5

32: 2, 16 → 2, 8 → 2, 4 → 2, 2

Q12: The expression $\sqrt{27} + \sqrt{50} - \sqrt{48} + \sqrt{2}$ simplifies to $a\sqrt{b} - c\sqrt{d}$, where **a, b, c,** and **d** are ___, ___, ___, and ___.
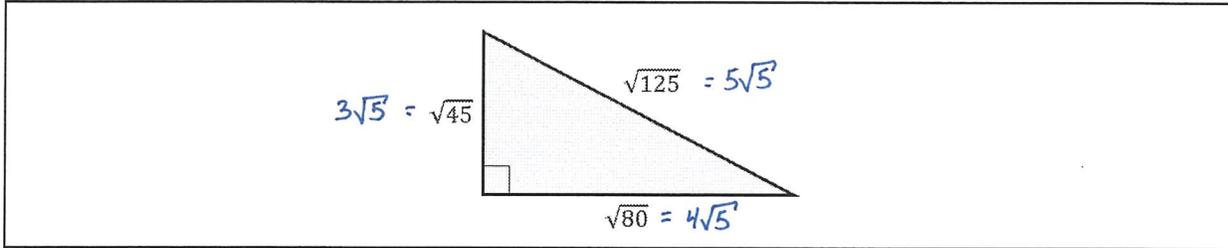
*(Record your **four-digit** answer in the Numerical Response boxes below)*

| 6 | 2 | 1 | 3 |

$\sqrt{3^2 \cdot 3} + \sqrt{2 \cdot 5^2} - \sqrt{2^2 \cdot 2^2 \cdot 3} + \sqrt{2}$

$3\sqrt{3} + 5\sqrt{2} - 2 \cdot 2\sqrt{3} + 1\sqrt{2}$

$3\sqrt{3} + 5\sqrt{2} - 4\sqrt{3} + 1\sqrt{2}$

$6\sqrt{2} - 1\sqrt{3}$

27: 3, 9 → 3, 3

50: 2, 25 → 5, 5

48: 2, 24 → 2, 12 → 2, 6 → 2, 3

⊞ KEY ⊞

Part 4 – Harder Questions

Use the following information to answer Q13:

$3\sqrt{5} = \sqrt{45}$

$\sqrt{125} = 5\sqrt{5}$

$\sqrt{80} = 4\sqrt{5}$

Q13: The perimeter of the shape, as a mixed radical, is $ab\sqrt{c}$, where **a, b,** and **c** are ___, ___, and ___.

*(Record your **three-digit** answer in the Numerical Response boxes below)*

| 1 | 2 | 5 | |

$P = \sqrt{45} + \sqrt{125} + \sqrt{80}$
$= 3\sqrt{5} + 5\sqrt{5} + 4\sqrt{5}$
$= 12\sqrt{5}$

Use the following information to answer Q14:

A toy car is released down a bent ramp, as depicted below.

15 cm

x

10 cm

4 cm

y

6 cm

$a^2 + b^2 = c^2$
$15^2 + 10^2 = x^2$
$225 + 100 = x^2$
$325 = x^2$
$x = \sqrt{325}$
$x = 5\sqrt{13}$

$a^2 + b^2 = c^2$
$4^2 + 6^2 = y^2$
$16 + 36 = y^2$
$52 = y^2$
$y = \sqrt{52}$
$y = 2\sqrt{13}$

$Dist = 5\sqrt{13} + 2\sqrt{13}$
$= 7\sqrt{13}$
$a\sqrt{bc}$

Q14: The total distance travelled by the toy car, from top to bottom, is $a\sqrt{bc}$ centimeters, where **a, b,** and **c** are ___, ___, and ___.

*(Record your **three-digit** answer in the Numerical Response boxes below)*

| 7 | 1 | 3 | |