

Name \_\_\_\_\_ School \_\_\_\_\_

INTERMEDIATE DIVISION

\*Category 3: Radicals

\*CALCULATORS ARE NOT PERMITTED IN THIS CATEGORY

1. (2pts) Simplify:  $\sqrt[4]{x^2} \cdot x^{\frac{1}{2}} \cdot x$

1. \_\_\_\_\_

2. (3pts) Simplify:  $(2\sqrt{5} + \sqrt{7})(5\sqrt{5} - \sqrt{7})$

2. \_\_\_\_\_

3. (5pts) Simplify completely.

3. \_\_\_\_\_

$$\frac{\frac{1}{\sqrt{6}} - \frac{1}{\sqrt{2}}}{2\sqrt{7}}$$

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INTERMEDIATE DIVISION

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1. (2pts)

Simplify:

$$(\sqrt{2} + \sqrt{3})^2 + \sqrt{9} + \sqrt{5}$$

1. \_\_\_\_\_

2. (3pts) Rationalize this fraction

$$\frac{\sqrt[3]{8}}{\sqrt{25}}$$

2. \_\_\_\_\_

3. (5pts) Simplify completely.

$$\frac{\frac{1}{\sqrt{2}} + \frac{1}{\sqrt{3}}}{\sqrt{5}}$$

3. \_\_\_\_\_

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Intermediate Division

Category 3

Radicals

NO CALCULATORS ALLOWED

1. (2pts) Simplify.  $\sqrt[3]{54x^8y^7}$

ANS \_\_\_\_\_

2. (3pts) Rationalize this little beauty.  $\frac{\sqrt{8}}{\sqrt{a-b}}$  where  $a-b \neq 0$ .

ANS \_\_\_\_\_

3. (5pts) Rationalize this big beauty.  $\frac{1}{\sqrt{2}+\sqrt{3}} + \frac{1}{\sqrt{3}+\sqrt{4}} + \frac{1}{\sqrt{4}+\sqrt{5}}$

ANS \_\_\_\_\_

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I-N-T-E-R-M-E-D-I-A-T-E D-I-V-I-S-I-O-N

Category 3. Radicals

CALCULATORS ARE NOT PERMITTED IN THIS CATEGORY

1. (2 Pts.) Simplify.  $(\sqrt{2} + \sqrt{3})^2 + \sqrt{4} + \sqrt{5}$

ANS. \_\_\_\_\_

2. (3 Pts.) Write as 1 rationalized fraction.

$$\frac{1}{\sqrt{2}} + \frac{1}{\sqrt{3}}$$

ANS. \_\_\_\_\_

3. (5 Pts.) Simplify.

$$\frac{\left(\frac{1}{\sqrt{x}} + \sqrt{y}\right)\left(\sqrt{y} - \frac{1}{\sqrt{x}}\right)}{\left(\frac{1}{\sqrt{y}} + \sqrt{x}\right)\left(\sqrt{x} - \frac{1}{\sqrt{y}}\right)}$$

ANS. \_\_\_\_\_

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I-N-T-E-R-M-E-D-I-A-T-E D-I-V-I-S-I-O-N

Category 3. Radicals

CALCULATORS ARE NOT PERMITTED IN THIS CATEGORY

1. (2 Pts.) Simplify.

$$\sqrt{20} \cdot \sqrt{50}$$

ANS. \_\_\_\_\_

2. (3 Pts.) Solve for x.

$$\sqrt{(x+2)^2} = 5$$

ANS. \_\_\_\_\_

3. (5 Pts.) Prove that  
Show each step.  
Be neat.

$$\frac{4 \pm \sqrt{12}}{6} = \frac{2 \pm \sqrt{3}}{3}$$

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I-N-T-E-R-M-E-D-I-A-T-E D-I-V-I-S-I-O-N

Category 3. Radicals

CALCULATORS ARE NOT PERMITTED IN THIS CATEGORY

1. (2 Pts.) Simplify.  $(x+2)^{3b} (x+2)^{-3b}$

ANS. \_\_\_\_\_

2. (3 Pts.) Rationalize this fraction.

$$\frac{-\sqrt{x}}{\sqrt{x} + \sqrt{2x-1}}$$

ANS. \_\_\_\_\_

3. (5 Pts.) Simplify by reducing to a form involving a single radical.

$$\sqrt[3]{4\sqrt{4}\sqrt[3]{4}}$$

ANS. \_\_\_\_\_

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I-N-T-E-R-M-E-D-I-A-T-E D-I-V-I-S-I-O-N

Category 3. Radicals

CALCULATORS MAY NOT BE USED IN THIS CATEGORY

1. (2 Pts.) Simplify.

$$\sqrt{x} \cdot x^{\frac{1}{2}} \cdot \sqrt{x^2} \quad \text{for } x \geq 0$$

ANS. \_\_\_\_\_

2. (3 Pts.) Simplify.

$$3\sqrt{24} + 2\sqrt{54} =$$

ANS. \_\_\_\_\_

3. (3 Pts.) Simplify.

$$\sqrt{(a+b)^2}$$

ANS. \_\_\_\_\_

$$\sqrt{a^2 + 2ab + b^2}$$

ANS. \_\_\_\_\_

$$\sqrt{a^2 + b^2}$$

ANS. \_\_\_\_\_

where a and b are  
any real numbers

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I-N-T-E-R-M-E-D-I-A-T-E D-I-V-I-S-I-O-N

Category 3. Radicals

CALCULATORS MAY NOT BE USED IN THIS CATEGORY

1. (2 Pts.)

where a and b can be any real numbers.

$$\sqrt{(a+b)^2}$$

ANS.  $|a+b|$

2. (3 Pts.) Simplify.

Be sure to rationalize the denominator. x and y are  $\neq 0$ .

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

ANS.  $|x| \cdot \sqrt[4]{\frac{3y}{2x^3y^2}}$

3. (5 Pts.) Simplify.

$$\frac{(3-\sqrt{7})(11+4\sqrt{7})}{5+\sqrt{7}}$$

ANS. \_\_\_\_\_



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INTERMEDIATE DIVISION

Category 3 Radicals

CALCULATORS MAY NOT BE USED IN THIS CATEGORY

1. (2 Pts.) Simplify.  $\sqrt{2} + \sqrt{4} + \sqrt{6} + \sqrt{8} + \sqrt{10} + \sqrt{12} + \sqrt{16} =$

ANS. \_\_\_\_\_

2. (3 Pts.) Solve for x.  $\sqrt{5x+1} - 2 = \sqrt{x+1}$

ANS. \_\_\_\_\_

3. (5 Pts.) Rationalize, simplify, make this look reasonable.

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

ANS. \_\_\_\_\_

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I-N-T-E-R-M-E-D-I-A-T-E D-I-V-I-S-I-O-N

Category 3. Radicals

1. (2 Pts.) Which of the following cannot be simplified?

\_\_\_\_\_ A.  $\sqrt{289}$

\_\_\_\_\_ B.  $\sqrt{289} + \sqrt{1} + \sqrt{0}$

\_\_\_\_\_ C.  $\sqrt{\frac{289}{17}}$

\_\_\_\_\_ D.  $\sqrt{289+17}$

\_\_\_\_\_ E.  $\sqrt{289 \cdot 17}$

2. (3 Pts.) Simplify. (A decimal answer will not be accepted.)

$$\sqrt{2} + \sqrt{4} + \sqrt{8} + \sqrt{16} + \sqrt{32} + \sqrt{64} + \sqrt{128} =$$

ANS. \_\_\_\_\_

3. (5 Pts.) Simplify. (A decimal answer will not be accepted.)

A.  $(\sqrt{2} + 2\sqrt{2})^2 =$

B.  $(2\sqrt{3} + 3\sqrt{2})^2 =$

ANS. (A) \_\_\_\_\_

(B) \_\_\_\_\_

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I-N-T-E-R-M-E-D-I-A-T-E D-I-V-I-S-I-O-N

Category 3. Radicals

1. (2 Pts.) Simplify.  $(\sqrt{3}+2)(\sqrt{3}-2)$

ANS. \_\_\_\_\_

2. (3 Pts.) Simplify each of the following:

a)  $\sqrt[3]{-1000} =$

b)  $\sqrt[4]{625} =$

c)  $\sqrt[4]{405x^5y^3z^6} =$

d)  $\sqrt[3]{-16x^5y^3z^6} =$

3. (5 Pts.) Find A and B.

$$(\sqrt{200} + \sqrt{108})(\sqrt{18} - \sqrt{147}) = A + B\sqrt{6}$$

ANS.  $A =$   
 $B =$

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I-N-T-E-R-M-E-D-I-A-T-E D-I-V-I-S-I-O-N

Category 3. Radicals

1 (2 Pts.) Simplify.

$$\sqrt{12} \sqrt{15} \sqrt{45} =$$

ANS. \_\_\_\_\_

2 (3 Pts.)  $(\sqrt{2} + 2)^2 =$

ANS. \_\_\_\_\_

3. (5 Pts.) Solve for x.  $\sqrt{x} + x = 6$

ANS. \_\_\_\_\_

Name \_\_\_\_\_ No. \_\_\_\_\_ School \_\_\_\_\_

## I-N-T-E-R-M-E-D-I-A-T-E D-I-V-I-S-I-O-N

### Category 3. Radicals

*Rationalize all denominators.*

1. (2 Pts.)

$$\frac{\sqrt[3]{a^2}}{\sqrt[3]{a}}$$

ANS. \_\_\_\_\_

2. (3 Pts.)

$$\frac{\sqrt{a}}{\sqrt{a+b}}$$

ANS. \_\_\_\_\_

3. (5 Pts.)

$$\frac{\sqrt{a} + \sqrt{b}}{\sqrt{a} - \sqrt{b}}$$

ANS. \_\_\_\_\_

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I-N-T-E-R-M-E-D-I-A-T-E D-I-V-I-S-I-O-N

Category 2. Radicals

(Be sure to rationalize all denominators.)

1. (2 Pts.) Simplify and rationalize.

$$\frac{1 + \sqrt{x}}{1 - \sqrt{x}}$$

ANS. \_\_\_\_\_

2. (3 Pts.) Simplify.

$$\sqrt{2}(\sqrt{72} - 10\sqrt{\frac{1}{2}} + \frac{1}{3}\sqrt{162})$$

ANS. \_\_\_\_\_

3. (5 Pts.) Solve for x.

$$\sqrt{3x-4} - \sqrt{x-5} = 1$$

ANS. \_\_\_\_\_

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## I-N-T-E-R-M-E-D-I-A-T-E D-I-V-I-S-I-O-N

Category 3. Radicals

ALL VALUES ARE REAL NUMBERS

1. (2 Pts.) Simplify.

$$\sqrt{(-3)^2}$$

ANS. \_\_\_\_\_

2. (3 Pts.) Simplify.

$$\left(\sqrt{-3}\right)^2$$

ANS. \_\_\_\_\_

2. (5 Pts.) Solve for x when x is any real.

$$\sqrt{x^2}$$

ANS. \_\_\_\_\_

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I-N-T-E-R-M-E-D-I-A-T-E D-I-V-I-S-I-O-N

Category 3. Radicals

(Leave answers in #1 and #2 in simplest radical form.)

1. (2 Pts.)  $\sqrt{2}\sqrt{3}\sqrt{4}\sqrt{5}\sqrt{6}\sqrt{7} =$

ANS. \_\_\_\_\_

2. (3 Pts.)

$$\sqrt{1} + \sqrt{2} + \sqrt{4} + \sqrt{8} + \sqrt{16} + \sqrt{32} + \sqrt{64} + \sqrt{128} + \sqrt{256} =$$

ANS. \_\_\_\_\_

3. (5 Pts.) Find  $x$  correct to the nearest thousandth.

$$\sqrt{x} + \sqrt{2x} = 5$$

ANS. \_\_\_\_\_



NAME \_\_\_\_\_ NO. \_\_\_\_\_ SCHOOL \_\_\_\_\_

I-N-T-E-R-M-E-D-I-A-T-E D-I-V-I-S-I-O-N

Category 3. Irrational Numbers & Radicals

1. (2 Pts.)

$$\sqrt{2+\sqrt{3}} \begin{matrix} > \\ = \\ < \end{matrix} \sqrt{2+3}$$

ANS. \_\_\_\_\_

2. (3 Pts.)

$$\sqrt{2} \cdot \sqrt{3} \begin{matrix} > \\ = \\ < \end{matrix} \sqrt{2 \cdot 3}$$

ANS. \_\_\_\_\_

3. (5 Pts.)

$$\frac{\sqrt{2+\sqrt{3}}}{\sqrt{5}} \begin{matrix} > \\ = \\ < \end{matrix} .2 + \sqrt{.6}$$

ANS. \_\_\_\_\_

Radicals

1. Solve:  $2\sqrt{4x-3} = \sqrt{6x+38}$

2. Solve:  $\sqrt[3]{x^2} = 16$

3. Multiply & simplify (answer with one radical)

$$\sqrt{x} \cdot \sqrt[3]{x} \cdot \sqrt[4]{x}$$

Name \_\_\_\_\_ No. \_\_\_\_\_ School \_\_\_\_\_

I-N-T-E-R-M-E-D-I-A-T-E D-I-V-I-S-I-O-N

Category 2. Radicals

Leave answers in radical form where appropriate.

1. (2 Pts.) Rationalize the denominator

$$\frac{3}{\sqrt{5}}$$

ANS. \_\_\_\_\_

2. (3 Pts.) Simplify

$$\sqrt{11} + \sqrt{121} + \sqrt{1331} + \sqrt{14641} = \text{ANS. } \underline{\hspace{2cm}}$$

3. (5 Pts.) Find correct to the nearest whole number.  
(Sorry no calculators in this category.)

$$\frac{\sqrt{.1}}{\sqrt[3]{.01}} = x$$

- a)  $0 < x < 2$  b)  $2 < x < 4$  c)  $10 < x < 100$  d)  $100 < x < 1000$

A, B, C, D

ANS. \_\_\_\_\_

(Circle correct choice)

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I-N-T-E-R-M-E-D-I-A-T-E D-I-V-I-S-I-O-N

Category 2. Radicals

1. (2 Pts.)  $2 \pm \sqrt{3}$  is approximated by what two rational numbers? (Express answer correct to thousandths.)

ANS. \_\_\_\_\_

2. (3 Pts.)  $\sqrt{3} + \sqrt{9} + \sqrt{27} + \sqrt{81} + \sqrt{243} + \sqrt{729}$   
can be simplified to what irrational number?

ANS. \_\_\_\_\_

3. (5 Pts.) Simplify.

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

for  $x > 0$  ANS. \_\_\_\_\_

Name \_\_\_\_\_ No. \_\_\_\_\_ School \_\_\_\_\_

Category 3  
Radicals

Name: \_\_\_\_\_

2 points

Simplify:

$$\sqrt{2} \cdot \sqrt{4} \cdot \sqrt{8} \cdot \sqrt{16} \cdot \sqrt{32}$$

3 points

Simplify:

a.  $\sqrt[3]{x^3}$

a. \_\_\_\_\_

b.  $\sqrt{x^4}$

b. \_\_\_\_\_

c.  $\sqrt{x} \cdot \sqrt[3]{x} \cdot \sqrt[6]{x}$

c. \_\_\_\_\_

Assume  
 $x > 0$

5 points Solve for x.

$$\sqrt{x-3} + \sqrt{x+3} = 3$$

\_\_\_\_\_

Name: \_\_\_\_\_

## Radicals

2 points

Write the expression symbolically.

- |   |          |
|---|----------|
| a. The square root of $x$ .             | a. _____ |
| b. The cube root of $x$ .               | b. _____ |
| c. The square of the cube root of $x$ . | c. _____ |
| d. The square root of the cube of $x$ . | d. _____ |

3 points

- |  |          |
|--|----------|
| a. Give the radical form of $(2n)^{\frac{2}{3}}$                     | a. _____ |
| b. Give the exponential form of $\sqrt{x^2 + y^2}$                   | b. _____ |
| c. Simplify (assume all variables are positive): $\sqrt{8x^4y^6z^9}$ |          |

5 points

$$\sqrt{x-2} + \sqrt{x+3} = 3$$

Solve for  $x$ .

\_\_\_\_\_

1. Express in simplest radical form

a.  $2\sqrt{45}$

b.  $3\sqrt{300}$

c.  $\frac{1}{4}\sqrt{48}$

d.  $\frac{1}{3}\sqrt{363}$

2. Divide & Simplify - rationalizing denominators if necessary

a.  $\frac{\sqrt{180}}{\sqrt{2}}$

b.  $16\sqrt{125} \div 4\sqrt{5}$

c.  $\frac{2\sqrt{12}}{\sqrt{3}}$

3. Rationalize denominators

a.  $\frac{1}{\sqrt{3}}$

b.  $\frac{\sqrt{2}}{\sqrt{3}}$

c.  $\frac{3+\sqrt{2}}{\sqrt{2}+\sqrt{3}}$

4. Solve:  $5x^2 + 2x + 1 = 0$

# Radicals

1. Which are irrational numbers?

a)  $\sqrt{4} + \sqrt{4}$

e)  $\sqrt[4]{4}$

b)  $\sqrt{4+4}$

f)  $\sqrt{4+\frac{4}{4}}$

c)  $\sqrt{4.4}$

g)  $4.4$

d)  $\sqrt{4-4}$

h)  $4.\bar{4}$

---

2. True or False

a)  $\sqrt[5]{x} \cdot \sqrt[5]{y} = \sqrt[5]{xy}$

b)  $\sqrt[5]{\sqrt[5]{x}} = \sqrt[10]{x}$

c)  $\sqrt[4]{\sqrt[4]{x}} = x^{4^{-2}}$

d)  $\sqrt[6]{a} + \sqrt[6]{b} = \sqrt[6]{a+b} \quad a, b > 0$

e)  $\sqrt[4]{\sqrt[3]{x}} = \sqrt[12]{x}$

f)  $\sqrt[4]{x}$  is irrational

g)  $\sqrt[5]{x}$  is greater than zero.

h)  $\sqrt[6]{x} > 0$  for any  $x$

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3. Solve for  $Q$ :  $i = \pm \sqrt{\frac{1}{ic}} \cdot \sqrt{Q^2 - 9}$