

Ch. 4 - Board PROBLEMS

CHANGE TO SCIENTIFIC NOTATION
CALCULATE TO SIGNIFICANT FIGURES.

① $(265,000)(.00000082)$

② $\frac{3.1 \times 10^{-8}}{4.6 \times 10^{-7}}$

③ $(-16^2)^{-2}$

SIMPLIFY

④ $\frac{x}{y} \left(\frac{x^3}{y^{-1}} + \frac{y^3 x}{x^3} \right)$

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This week, in addition to Chapter 4:

MUST watch Video Ch. 5A and complete at least workbook page 5A-1 BEFORE class next week.

Topic is on Factoring Trinomials.

Ch. 4 - RADICALS (REVIEW FROM GEOMETRY)

ADD & SUBTRACT

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

$$6\sqrt{5} - \sqrt{5} =$$

$$11\sqrt{7} + 4\sqrt{5} - \sqrt{7} =$$

MULTIPLYING/DIVIDING

$$\sqrt{7} \cdot \sqrt{6} =$$

$$2\sqrt{5} \cdot 8\sqrt{3} =$$

$$\frac{\sqrt{21}}{\sqrt{3}} =$$

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

PERFECT
SQUARES

SIMPLIFYING RADICALS

$$\sqrt{12} =$$

$$\sqrt{18} =$$

$$\sqrt{84} =$$

$$17\sqrt{96} =$$

RADICALS CANNOT BE IN THE DENOMINATOR

$$\frac{7}{\sqrt{2}} =$$

$$\frac{3\sqrt{3}}{\sqrt{3}} =$$

$$\frac{4}{\sqrt{8}} =$$

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

$$\frac{2\sqrt{2}}{\sqrt{3}} + \frac{4}{\sqrt{6}} =$$

Lesson 4 Radicals, Basic Operations and Simplifying

Add and Subtract Radicals You can only add or combine two things if they are the same kind. $\sqrt{9}$ is the same as 3, because the square root of 9 is 3. But, $\sqrt{3}$ is not a whole number; it is called a radical. You may add a radical to a radical, or a number to a number, but you can't combine a number and a radical. Just as $2X + 5X = 7X$, $3 + 8 = 11$, and $2X + 5 = 2X + 5$, so $4\sqrt{3} + \sqrt{3} = 5\sqrt{3}$ and $\sqrt{3} + 8 = \sqrt{3} + 8$. You can add $2 + \sqrt{9}$ because you can change the square root of 9 to a whole number (3), then $2 + 3 = 5$.

Example 1 $5\sqrt{2} + 3\sqrt{2} = 8\sqrt{2}$

Example 2 $6\sqrt{5} - \sqrt{5} = 5\sqrt{5}$ Just as X is the same as $1X$, so $\sqrt{5}$ is the same as $1\sqrt{5}$

Example 3 $11\sqrt{5} + 4\sqrt{7} = 11\sqrt{5} + 4\sqrt{7}$ You can't add or combine them if they are not the same kind.

Practice Problems

1) $4\sqrt{3} + 5\sqrt{3} =$

2) $9\sqrt{7} - 3\sqrt{8} =$

3) $11\sqrt{X} + 8\sqrt{X} =$

4) $6\sqrt{5} - \sqrt{5} =$

5) $\sqrt{15} + 4\sqrt{10} =$

6) $8\sqrt{6} - 2\sqrt{6} =$

Multiply and Divide Radicals

When multiplying, multiply numbers times numbers and radicals times radicals. The same holds true for division.

Example 4 $\sqrt{7} \times \sqrt{6} = \sqrt{42}$

Example 5 $2\sqrt{3} \times 4\sqrt{5} = 8\sqrt{15}$

Example 6 $\frac{\sqrt{21}}{\sqrt{3}} = \sqrt{7}$ This is true because $\sqrt{7} \times \sqrt{3} = \sqrt{21}$

Practice Problems

1) $(5\sqrt{6})(2\sqrt{10}) =$

2) $\frac{2\sqrt{30}}{\sqrt{5}} =$

3) $(9\sqrt{2})(4\sqrt{2}) =$

4) $\frac{2\sqrt{28}}{\sqrt{7}} =$

5) $(3\sqrt{5})(6\sqrt{7}) =$

6) $\frac{8\sqrt{12}}{2\sqrt{6}} =$

7) $(7\sqrt{11})(8\sqrt{12}) =$

8) $\frac{9\sqrt{200}}{12\sqrt{2}} =$

Simplifying Radicals We can separate a radical into factors. The key is to choose a factor that is a perfect square, such as 4, 9, 16, 25, etc. These are the only factors that may be transformed into whole numbers instead of being left as radicals. In Example 7, there are other possible factors, but only $\sqrt{4}$ will become a whole number.

Example 7

$$\sqrt{12} = \sqrt{6} \sqrt{2} = \sqrt{12}$$

This hasn't been simplified.

$$\sqrt{12} = \sqrt{4} \times \sqrt{3} = 2\sqrt{3}$$

This has been simplified.

Example 8

$$\sqrt{18} = \sqrt{3} \times \sqrt{6} = \sqrt{18}$$

This hasn't been simplified.

$$\sqrt{18} = \sqrt{9} \times \sqrt{2} = 3\sqrt{2}$$

This has been simplified.

For further proof, estimate your answers by using your calculator. \approx means approximately equal.

$$\sqrt{12} = 2\sqrt{3}$$

$$\sqrt{18} = 3\sqrt{2}$$

$$3.46 \approx 2.00 \times 1.73$$

$$4.24 \approx 3.00 \times 1.414$$

$$3.46 \approx 3.46$$

$$4.24 \approx 4.23$$

Practice Problems

1) $\sqrt{24} =$

2) $\sqrt{50} =$

3) $\sqrt{200} =$

4) $\sqrt{27} =$

5) $2\sqrt{90} =$

6) $3\sqrt{28} =$

7) $10\sqrt{125} =$

8) $4\sqrt{72} =$

Radicals in the Denominator Up to this point, we've been dealing with normal radicals. But, there are radical radicals that live in places they shouldn't, namely in the denominator. Only whole numbers are permitted in the denominator. In the example $7/\sqrt{2}$, we need to multiply $\sqrt{2}$ by something to make it a whole number. The easiest factor to choose is $\sqrt{2}$ itself. But we can't randomly multiply the denominator alone, because it would change the value of the expression. If we multiply the numerator by the same factor, then we are multiplying by $\sqrt{2}/\sqrt{2}$ which is 1. Now the radical is in the numerator, which is acceptable, and the denominator is occupied by a whole number, which is also acceptable.

Example 9

$$\frac{7}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{7\sqrt{2}}{\sqrt{4}} = \frac{7\sqrt{2}}{2}$$

Look this over carefully.

Example 10

$$\frac{3}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}} = \frac{3\sqrt{5}}{\sqrt{25}} = \frac{3\sqrt{5}}{5}$$

Example 11

$$\frac{4}{\sqrt{8}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{4\sqrt{2}}{\sqrt{16}} = \frac{4\sqrt{2}}{4} = \sqrt{2}$$

$$\frac{4}{\sqrt{8}} \times \frac{\sqrt{8}}{\sqrt{8}} = \frac{4\sqrt{8}}{\sqrt{64}} = \frac{4 \times 2\sqrt{2}}{8} = \frac{8\sqrt{2}}{8} = \sqrt{2}$$

You can do this one either way.

Practice Problems

1) $\frac{5}{\sqrt{3}} =$

2) $\frac{7}{\sqrt{11}} =$

3) $\frac{4}{\sqrt{12}} =$

4) $\frac{6\sqrt{5}}{\sqrt{7}} =$

5) $\frac{8\sqrt{2}}{\sqrt{6}} =$

6) $\frac{9\sqrt{7}}{\sqrt{8}} =$

Simplifying Radicals, then finding the common denominator and adding them.

$$\text{Example 12} \quad \frac{3}{\sqrt{2}} + \frac{5}{\sqrt{3}} = \frac{3}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} + \frac{5}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{3\sqrt{2}}{2} + \frac{5\sqrt{3}}{3}$$

$$\frac{3 \times 3\sqrt{2}}{3 \times 2} + \frac{2 \times 5\sqrt{3}}{2 \times 3} = \frac{9\sqrt{2}}{6} + \frac{10\sqrt{3}}{6} = \frac{9\sqrt{2} + 10\sqrt{3}}{6}$$

Practice Problems

1) $\frac{8}{\sqrt{5}} + \frac{3}{\sqrt{6}} =$

2) $\frac{2}{\sqrt{3}} - \frac{9}{\sqrt{7}} =$

LESSON PRACTICE

Add or subtract the radicals.

1. $3\sqrt{2} + 6\sqrt{2} =$

2. $5\sqrt{7} - 2\sqrt{5} =$

3. $6\sqrt{x} - 8\sqrt{x} =$

4. $4\sqrt{3} + 16\sqrt{3} =$

Multiply or divide the radicals.

5. $(2\sqrt{5})(3\sqrt{6}) =$

6. $\frac{10\sqrt{5}}{2\sqrt{5}} =$

7. $(9\sqrt{x})(2\sqrt{y}) =$

8. $\frac{16\sqrt{20}}{8\sqrt{10}} =$

Simplify.

9. $\frac{5}{\sqrt{2}} =$

10. $\frac{4\sqrt{6}}{\sqrt{3}} =$

11. $\frac{\sqrt{12}}{\sqrt{6}} =$

12. $\frac{9\sqrt{27}}{\sqrt{2}} =$

Simplify, and then add or subtract.

13. $\frac{2}{\sqrt{5}} + \frac{4}{\sqrt{6}} =$

14. $-\sqrt{2}(3\sqrt{12} + 2\sqrt{18}) =$

15. $\frac{x}{\sqrt{2}} + \frac{x}{\sqrt{7}} =$

16. $4(2\sqrt{10} - \sqrt{20}) =$

SYSTEMATIC REVIEW

4D

Simplify.

$$1. \quad 4\sqrt{\frac{25}{64}x^2} =$$

$$2. \quad 2\sqrt{10} - 3\sqrt{5} =$$

$$3. \quad (8\sqrt{11})(2\sqrt{11}) =$$

$$4. \quad \sqrt{3}(8\sqrt{10} - 9\sqrt{5}) =$$

$$5. \quad \frac{4\sqrt{48}}{\sqrt{8}} =$$

$$6. \quad \frac{\sqrt{84}}{\sqrt{2}} =$$

$$7. \quad 5\sqrt{80} =$$

$$8. \quad 6\sqrt{125} =$$

$$9. \quad \frac{7}{\sqrt{2}} =$$

$$10. \quad \frac{9}{\sqrt{3}} + \frac{6}{\sqrt{2}} =$$

Solve using scientific notation.

$$11. \quad (58)(.000000037) =$$

$$12. \quad (.0000000046)(82,000,000) =$$

$$13. \quad (.0000096) \div (32) =$$

$$14. \quad \frac{(.0000012)(18)}{(.00000054)} =$$

Combine like terms.

$$15. \quad \frac{9X^2YZ}{YX} + \frac{2XY^{-1}Z^2}{Z^3Y^{-2}} - \frac{6X^{-2}YZ^3}{X^{-3}Z^4} =$$

Solve.

$$16. \frac{1}{8X} - \frac{1}{7X} = 2$$

Simplify.

$$17. (4X^3Y)(3X^{-4})(2X^2) =$$

$$18. 48D^{-7}E^5F^4 \div 16E^{-6}F^3 =$$

Solve for X.

$$19. X + 6 = \frac{4X}{7}$$

$$20. \frac{3X+2}{4} - 5 = \frac{X+8}{2} - 8$$