Review For Students Entering Algebra 2

Salem County
Vocational Technical School District
SCVTS

Dear Student,

You are receiving this summer packet as a review of previously covered math topics needed to be successful in the upcoming math class you will be taking in the 2018-19 school year. The SCVTS Math Department requires that students complete this packet and bring it, with work shown, to school on the first day. Students are requested to use pencil, and show their work in the packet or on lined paper to accompany the packet. The packet will be reviewed, and there will be a test on the material in the packet on the fourth day of the semester. The Math Department recommends that students in Algebra 1 and Geometry have the TI-30XS scientific calculator, and students in Algebra 2 and above have a TI-83 or TI84 graphing calculator.

In addition to the examples shown in the packet, you are encouraged to use the many resources available at the following websites:

https://www.khanacademy.org

http://www.purplemath.com

http://www.mathisfun.com

https://www.desmos.com is a free online graphing calculator also available as a free mobile app for most smart phones.

http://www.youtube.com/user/profrobbob is a YouTube channel featuring video tutorials for a variety of high school level mathematics

Using the search engine on YouTube will also result in plenty of video tutorials that may be useful as well.

Students may turn in the packet early by dropping it off in the main office at CTHS.

Any questions may be directed via email to any of the following teachers in the math department. For incoming freshman please contact Nicole Kopp or Eric Lockwood.

Nicole Kopp	nkopp@scvts.org
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Grading Criteria:

The completion of the packet will be counted as **two homework grades**. If it is not turned in by the first day of school, there will be a 10 point late penalty per day, and will not be accepted after the first week of the semester. The packet will be graded based on the percentage completed. To avoid earning a 0, students should show all their work, and complete at least half of the math packet. As a reminder, homework is counted as 20%, and tests are worth 40% of the marking period grade.

Parent/ Guardian Acknowledgement Statement

I understand that the purpose of the summer packet is for my child to review the topics they have already mastered in previous math classes and therefore will be prepared to take the class they are currently enrolled in.

_____

(Parent/Guardian Signature)

Date

Algebra 1 Skills Needed to be

Successful in Algebra 2

A. Simplifying Polynomial Expressions

Objectives: The student will be able to:

- Apply the appropriate arithmetic operations and algebraic properties needed to simplify an algebraic expression.
- Simplify polynomial expressions using addition and subtraction. • Multiply a monomial and polynomial.

B. Solving Equations

Objectives: The student will be able to:

- Solve multi-step equations.
- Solve a literal equation for a specific variable, and use formulas to solve problems.

C. Rules of Exponents

Objectives: The student will be able to:

- Simplify expressions using the laws of exponents.
- Evaluate powers that have zero or negative exponents.

D. Binomial Multiplication

Objectives: The student will be able to:

- Multiply two binomials

E. Factoring

Objectives: The student will be able to:

- Identify the greatest common factor of the terms of a polynomial expression.
- Express a polynomial as a product of a monomial and a polynomial.
- Find all factors of the quadratic expression $ax^2 + bx + c$ by factoring.

F. Radicals

Objectives: The student will be able to:

- Simplify radical expressions

G. Scatter Plots and Trend Lines

Objectives: The student will be able to:

• Make a scatter plot, find a trend line, and use it to make predictions.

H. Solving Systems of Equations

Objectives: The student will be able to:

• Solve two variable systems algebraically by any method

A. Simplifying Polynomial Expressions

I. Combining Like Terms

- You can add or subtract terms that are considered "like", or terms that have the same variable(s) with the same exponent(s).

Ex. 1: $5x - 7y + 10x + 3y$

$\underline{5x} \underline{- 7y} + \underline{10x} + \underline{3y}$

$15x - 4y$

Ex. 2: $-8h^2 + 10h^3 - 12h^2 - 15h^3$

$\underline{-8h^2} + \underline{10h^3} \underline{- 12h^2} \underline{- 15h^3}$

$-20h^2 - 5h^3$

II. Applying the Distributive Property

- Every term inside the parentheses is multiplied by the term outside of the parentheses.

Ex. 1: $3(9x-4)$

$3\cdot 9x-3\cdot 4$

$27x-12$

Ex. 2: $4x^2(5x^3+6x)$

$4x^2\cdot 5x^3+4x^2\cdot 6x$

$20x^5+24x^3$

III. Combining Like Terms AND the Distributive Property (Problems with a Mix!)

- Sometimes problems will require you to distribute AND combine like terms!!

Ex. 1: $3(4x-2)+13x$

$3\cdot 4x-3\cdot 2+13x$

$12x-6+13x$

$25x-6$

Ex. 2: $3(12x-5)-9(-7+10x)$

$3\cdot 12x-3\cdot 5-9(-7)-9(10x)$

$36x-15+63-90x$

$-54x+48$

PRACTICE SET 1

Simplify.

1. $8x-9y+16x+12y$

2. $14y+22-15y^2+23y$

3. $5n-(3-4n)$

4. $-2(11b-3)$

5. $10q(16x+11)$

6. $-(5x-6)$

7. $3(18z-4w)+2(10z-6w)$

8. $(8c+3)+12(4c-10)$

B. Solving Equations

I. Solving Two-Step Equations

A couple of hints:

1. To solve an equation, UNDO the order of operations and work in the reverse order.
2. REMEMBER! Addition is "undone" by subtraction, and vice versa. Multiplication is "undone" by division, and vice versa.

$$\begin{aligned} Ex.\,1:\ & 4x-2=30 \\ & +2\ \ +2 \\ & 4x=32 \\ & \div 4\ \ \div 4 \\ & x=8 \end{aligned}$$

$$\begin{aligned} Ex.\,2:\ & 87=-11x+21 \\ & -21\qquad -21 \\ & 66=-11x \\ & \div -11\ \ \div -11 \\ & -6=x \end{aligned}$$

II. Solving Multi-step Equations With Variables on Both Sides of the Equal Sign

- When solving equations with variables on both sides of the equal sign, be sure to get all terms with variables on one side and all the terms without variables on the other side.

$$\begin{aligned} Ex.\,3:\ & 8x+4=4x+28 \\ & -4\qquad -4 \\ & 8x=4x+24 \\ & -4x\ \ -4x \\ & 4x=24 \\ & \div 4\ \ \div 4 \\ & x=6 \end{aligned}$$

III. Solving Equations that need to be simplified first

- In some equations, you will need to combine like terms and/or use the distributive property to simplify each side of the equation, and then begin to solve it.

$$\begin{aligned} Ex.\,4:\ & 5(4x-7)=8x+45+2x \\ & 20x-35=10x+45 \\ & -10x\qquad -10x \\ & 10x-35=45 \\ & +35\ \ +35 \\ & 10x=80 \\ & \div 10\ \ \div 10 \\ & x=8 \end{aligned}$$

PRACTICE SET 2

Solve each equation. You must show all work.

1. $5x - 2 = 33$

2. $140 = 4x + 36$

3. $8(3x - 4) = 196$

4. $45x - 720 + 15x = 60$

5. $132 = 4(12x - 9)$

6. $198 = 154 + 7x - 68$

7. $-131 = -5(3x - 8) + 6x$

8. $-7x - 10 = 18 + 3x$

IV. Solving Literal Equations

- A literal equation is an equation that contains more than one variable.
- You can solve a literal equation for one of the variables by getting that variable by itself (isolating the specified variable).

Ex. 1: $3xy = 18$, Solve for x.

$$\frac{3xy}{3y} = \frac{18}{3y}$$

$$x = \frac{6}{y}$$

Ex. 2: $5a - 10b = 20$, Solve for a.

$$+10b = +10b$$

$$5a = 20 + 10b$$

$$\frac{5a}{5} = \frac{20}{5} + \frac{10b}{5}$$

$$a = 4 + 2b$$

PRACTICE SET 3

Solve each equation for the specified variable.

1. $Y + V = W$, for V

2. $9wr = 81$, for w

3. $2d - 3f = 9$, for f

4. $dx + t = 10$, for x

5. $P = (g - 9)180$, for g

6. $4x + y - 5h = 10y + u$, for x

C. Rules of Exponents

Multiplication: Recall $(x^m)(x^n)=x^{(m+n)}$ *Ex:* $(3x^4y^2)(4xy^5)=(3\cdot 4)(x^4\cdot x^1)(y^2\cdot y^5)=12x^5y^7$

Division: Recall $\frac{x^m}{x^n}=x^{(m-n)}$ *Ex:* $\frac{42m^5j^2}{-3m^3j}=\left(\frac{42}{-3}\right)\left(\frac{m^5}{m^3}\right)\left(\frac{j^2}{j^1}\right)=-14m^2j$

Powers: Recall $(x^m)^n=x^{(m\cdot n)}$ *Ex:* $(-2a^3bc^4)^3=(-2)^3(a^3)^3(b^1)^3(c^4)^3=-8a^9b^3c^{12}$

Power of Zero: Recall $x^0=1,\ x\neq 0$ *Ex:* $5x^0y^4=(5)(1)(y^4)=5y^4$

PRACTICE SET 4

Simplify each expression.

1. $(c^5)(c)(c^2)$
2. $\frac{m^{15}}{m^3}$
3. $(k^4)^5$
4. d^0
5. $(p^4q^2)(p^7q^5)$
6. $\frac{45y^3z^{10}}{5y^3z}$
7. $(-t^7)^3$
8. $3f^3g^0$
9. $(4h^5k^3)(15k^2h^3)$
10. $\frac{12a^4b^6}{36ab^2c}$
11. $(3m^2n)^4$
12. $(12x^2y)^0$

D. Binomial Multiplication

I. Reviewing the Distributive Property

The distributive property is used when you want to multiply a single term by an expression.

Ex 1: $8(5x^2 - 9x)$

$8 \cdot 5x^2 + 8 \cdot (-9x)$

$40x^2 - 72x$

II. Multiplying Binomials – the FOIL method

When multiplying two binomials (an expression with <u>two</u> terms), we use the "FOIL" method. The "FOIL" method uses the distributive property <u>twice</u>!

FOIL is the order in which you will multiply your terms.

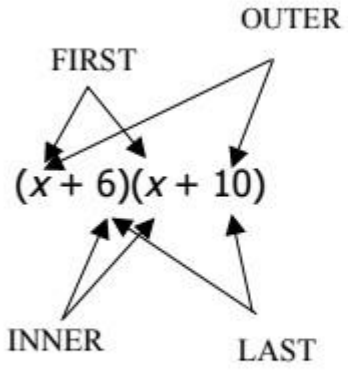
First

Outer

Inner

Last

Ex. 1: $(x + 6)(x + 10)$



First	$x \cdot x$ ------> x^2
Outer	$x \cdot 10$ -----> $10x$
Inner	$6 \cdot x$ ------> $6x$
Last	$6 \cdot 10$ -----> 60

$x^2 + 10x + 6x + 60$

$x^2 + 16x + 60$

(After combining like terms)

Recall: $4^2 = 4 \cdot 4$

$x^2 = x \cdot x$

Ex. $(x+5)^2$

$(x+5)^2 = (x+5)(x+5)$

Now you can use the "FOIL" method to get a simplified expression.

PRACTICE SET 5

Multiply. Write your answer in simplest form.

1. $(x+10)(x-9)$

2. $(x+7)(x-12)$

3. $(x-10)(x-2)$

4. $(x-8)(x+81)$

5. $(2x-1)(4x+3)$

6. $(-2x+10)(-9x+5)$

E. Factoring

I. Using the Greatest Common Factor (GCF) to Factor.

- Always determine whether there is a greatest common factor (GCF) first.

Ex. 1 $3x^4 - 33x^3 + 90x^2$

- In this example the GCF is $3x^2$.
- So when we factor, we have $3x^2(x^2 - 11x + 30)$.
- Now we need to look at the polynomial remaining in the parentheses. Can this trinomial be factored into two binomials? In order to determine this make a list of all of the factors of 30.

30		30	
1	30	-1	-30
2	15	-2	-15
3	10	-3	-10
5	6	-5	-6

Since -5 + -6 = -11 and (-5)(-6) = 30 we should choose -5 and -6 in order to factor the expression.

- The expression factors into $3x^2(x-5)(x-6)$

Note: Not all expressions will have a GCF. If a trinomial expression does not have a GCF, proceed by trying to factor the trinomial into two binomials.

II. Applying the difference of squares: $a^2 - b^2 = (a-b)(a+b)$

Ex. 2 $4x^3 - 100x$

$4x(x^2 - 25)$

$4x(x-5)(x+5)$

Since x^2 and 25 are perfect squares separated by a subtraction sign, you can apply the difference of two squares formula.

PRACTICE SET 6

Factor each expression.

1. $3x^2 + 6x$

2. $4a^2b^2 - 16ab^3 + 8ab^2c$

3. $x^2 - 25$

4. $n^2 + 8n + 15$

5. $g^2 - 9g + 20$

6. $d^2 + 3d - 28$

F. Radicals

To simplify a radical, we need to find the greatest perfect square factor of the number under the radical sign (the radicand) and then take the square root of that number.

Ex. 1: $\sqrt{72}$

$\sqrt{36}\cdot\sqrt{2}$

$6\sqrt{2}$

Ex. 2: $4\sqrt{90}$

$4\cdot\sqrt{9}\cdot\sqrt{10}$

$4\cdot 3\cdot\sqrt{10}$

$12\sqrt{10}$

Ex. 3: $\sqrt{48}$

$\sqrt{16}\sqrt{3}$

$4\sqrt{3}$

OR

Ex. 3: $\sqrt{48}$

$\sqrt{4}\sqrt{12}$

$2\sqrt{12}$ ← This is not simplified completely because 12 is divisible by 4 (another perfect square)

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

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

$4\sqrt{3}$

PRACTICE SET 7

Simplify each radical.

1. $\sqrt{121}$
2. $\sqrt{90}$
3. $\sqrt{175}$
4. $\sqrt{288}$
5. $\sqrt{486}$
6. $2\sqrt{16}$
7. $6\sqrt{500}$

G. Scatter Plots and Trend Lines

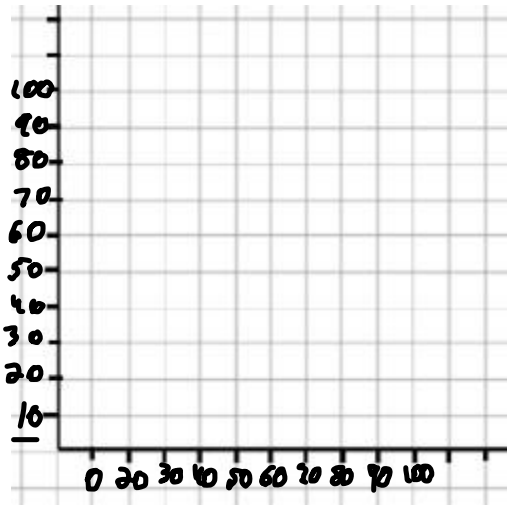
PRACTICE SET 8

1. The following table shows the math and science test scores for a group of ninth graders.

Math Test Scores	60	40	80	40	65	55	100	90	85
Science Test Scores	70	35	90	50	65	40	95	85	90

Let's find out if there is a relationship between a student's math test score and his or her science test score.

a. Create a scatter plot of the data by plotting the points on a graph (treat each pairing of math and science scores as a coordinate).



b. Write an equation for a trend line by picking two points and using them to find the slope and y-intercept of your line (try to create a line that has just about the same amount of points above and below it).

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

Variables
Describe a specific point

$$y = mx + b$$

Slope
Describes the slope of the line

y-intercept
Describes where the line crosses the y-axis

c. Based on your trend line, if a student scored an 82 on his math test, what would you expect his science test score to be? Explain how you determined your answer. Use words, symbols, or both.

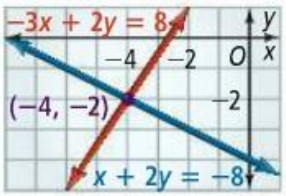
d. Based on your trend line, if a student scored an 53 on his science test, what would you expect his math test score to be? Explain how you determined your answer. Use words, symbols, or both.

H. Solving Systems of Equations

To solve a system of equations, we can use one of three methods: graphing, substitution, and or elimination.

I. Reviewing Solving by Graphing

What is the solution of the system? $\begin{cases} -3x + 2y = 8 \\ x + 2y = -8 \end{cases}$



Method 1 Graph the equations. The point of intersection appears to be $(-4, -2)$.

Check by substituting the values into both equations.

$-3x + 2y = 8$ $\qquad$ $x + 2y = -8$

$-3(-4) + 2(-2) = 8$ ✔ $\qquad$ $-4 + 2(-2) = -8$ ✔

Both equations are true so $(-4, -2)$ is the solution of the system.

II. Reviewing Solving by Substitution

What is the solution of the system of equations? $\begin{cases} 3x + 4y = 12 \\ 2x + y = 10 \end{cases}$

Step 1

Solve one equation for one of the variables.

$2x + y = 10$

$y = -2x + 10$

Step 2

Substitute the expression for y in the other equation. Solve for x.

$3x + 4y = 12$

$3x + 4(-2x + 10) = 12$

$3x - 8x + 40 = 12$

$x = 5.6$

Step 3

Substitute the value for x into one of the original equations. Solve for y.

$2x + y = 10$

$2(5.6) + y = 10$

$11.2 + y = 10$

$y = -1.2$

The solution is $(5.6, -1.2)$.

III. Reviewing Solving by Elimination

What is the solution of the system of equations? $\begin{cases} 4x + 2y = 9 \\ -4x + 3y = 16 \end{cases}$

$4x + 2y = 9$

$-4x + 3y = 16$ — One equation has $4x$ and the other has $-4x$. Add to eliminate the variable x.

$5y = 25$

$y = 5$ Solve for y.

$4x + 2y = 9$ Choose one of the original equations.

$4x + 2(5) = 9$ Substitute for y.

$4x = -1$ Solve for x.

$x = -\frac{1}{4}$

The solution is $\left(-\frac{1}{4}, 5\right)$.

PRACTICE SET 9

Solve each system using any method (by graphing, substitution, or elimination)

1. $\begin{cases} 3x + 5y = 13 \\ 2x + y = 4 \end{cases}$

2. $\begin{cases} 2x - 3y = 6 \\ x + y = -12 \end{cases}$

3. $\begin{cases} 2x + 3y = 7 \\ -2x + 5y = 1 \end{cases}$

4. $\begin{cases} x + 2y = -1 \\ x - y = 8 \end{cases}$

5. $\begin{cases} x - y = -4 \\ 3x + 2y = 7 \end{cases}$

6. $\begin{cases} 3x + 4y = 10 \\ 2x + 3y = 7 \end{cases}$

Coordinate Planes for Problem Set 9 (if needed)