Level *(preGED or GED):*   GED

Content Area *(RLA, Math, Science, Social Studies):*   Math

General Topic: Algebra

Specific Lesson Title: Solving complex linear equations (lesson 16)

Estimated Time: 180 minutes

Anchor(s) & Level(s)	CCR Standards CCRS Levels C & D: Expressions and Equations • Solve and write one-step algebraic expressions. • Solve and write multi-step algebraic expressions, including equations with variables on both sides and equations that have a term to be distributed. • Solve real-life and mathematical problems using numerical and algebraic expressions and equations CCRS Level E: Algebra: Creating Equations • Create equations that describe numbers or relationships. GED Assessment Anchors A.2.a Solve one-variable linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms or equations with coefficients represented by letters. Includes solving routine first-degree equations. A.2.c Write one-variable and multi-variable linear equations to represent context.	*Practice(s)*	MP 1, MP 3, MP 8

SWBAT:

• Solve complex equations, including equations with variables on both sides and/or non-whole-number coefficients and terms

• Solve literal equations for a given variable

Kaplan New GED Test Strategies, Practice, and Review

Steck-Vaughn GED: Test Preparation Student Workbook Mathematical Reasoning

TI-30xs MultiView calculators

Computer and digital projector (optional)

Video lessons and online practice: solving equations with variables on both sides: https://www.khanacademy.org/math/in-eighth-grade-math/linear-equations-one-variable/solving-equations-variable-both-sides/v/why-we-do-the-same-thing-to-both-sides-multi-step-equations

Video lessons and online practice: complex equations: https://www.khanacademy.org/math/in-eighth-grade-math/linear-equations-one-variable/reducing-equations-simpler-form/v/solving-equations-with-the-distributive-property

Multi-step equations (whole numbers) worksheet: http://www.kutasoftware.com/FreeWorksheets/PreAlgWorksheets/Multi-Step%20Equations.pdf

More multi-step equations with whole numbers worksheet: http://www.kutasoftware.com/FreeWorksheets/Alg1Worksheets/Multi-Step%20Equations.pdf

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Multi-step equations with decimals worksheet generator: http://www.math-aids.com/Algebra/Algebra_1/Equations/Multiple_Step_Decimals.html

Equation word problems worksheet generator: http://www.math-aids.com/Algebra/Algebra_1/Equations/Two_Step_Word_Problems.html

CLASSROOM ACTIVITIES OR PROCEDURES *(What specific steps will you follow to execute the lesson? What will you say and do? What will the learners do?)*

Pre-lesson activities (30 minutes)
1) Review homework and answer questions. Discuss problems from exit ticket that students had trouble with.

Lesson (2 hours plus 10 minute break)
2) Solving complex equations

Introduce students to solving more complex equations, including those including fraction or decimal terms and variables on both sides.

Provide ample time for demonstrating strategies (i.e. clearing fractions by multiplying, using calculator to assist with calculation steps, checking work by substituting answer into original problem) and guided practice. Encourage students to explain their thought process in solving the problems.

Suggested resources:

Kaplan p. 351

Steck-Vaughn p.78-81

Video lessons and online practice: solving equations with variables on both sides: https://www.khanacademy.org/math/in-eighth-grade-math/linear-equations-one-variable/solving-equations-variable-both-sides/v/why-we-do-the-same-thing-to-both-sides-multi-step-equations

Video lessons and online practice: complex equations: https://www.khanacademy.org/math/in-eighth-grade-math/linear-equations-one-variable/reducing-equations-simpler-form/v/solving-equations-with-the-distributive-property

Multi-step equations (whole numbers) worksheet: http://www.kutasoftware.com/FreeWorksheets/PreAlgWorksheets/Multi-Step%20Equations.pdf

More multi-step equations with whole numbers worksheet: http://www.kutasoftware.com/FreeWorksheets/Alg1Worksheets/Multi-Step%20Equations.pdf

Multi-step equations with decimals worksheet generator: http://www.math-aids.com/Algebra/Algebra_1/Equations/Multiple_Step_Decimals.html

Equation word problems worksheet generator: http://www.math-aids.com/Algebra/Algebra_1/Equations/Two_Step_Word_Problems.html (these are two-step equations but a good review of equation word problem skills)

3) Literal equations

Demonstrate how algebraic principles can be used to solve for a specific variable in a multi-variable equation. Be sure to use the example of solving a linear equation in standard form i.e. $2x + 4y = 6$ for y as this particular example will become important in subsequent lessons. You may also want to work with students to solve the geometry formulas they have just been working with for a given variable, for example:

Solve $V = lwh$ for h

Solve $C = \pi d$ for π

Solve $A = \frac{1}{2} bh$ for b

Solve $A = \frac{1}{2}h(b_1 + b_2)$ for h or for one of the b terms

Solve $A = \pi r^2$ for r

Solve $V = \pi r^2 h$ for r

Provide time for guided practice. Students are encouraged to explain reasoning and thought process for solving the problems. Suggested resources:

Video lesson and online practice on manipulating formulas to isolate a variable: https://www.khanacademy.org/math/algebra2/modeling-with-algebra/manipulating-formulas/v/example-of-solving-for-a-variable

Literal equations worksheet:

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Closure (20 minutes)
- Ask students to recap vocabulary and concepts learned today.
- Assign homework
- Provide and collect an "exit ticket" with three quick problems reviewing today's work that students must turn in before leaving.

ASSESSMENT ACTIVITIES *(How will you know that the learners have met the objectives for this lesson?)*

- Circulate during guided practice and note areas of understanding and difficulty
- Collect and check exit ticket, go over any that were particularly difficult for most students during pre-lesson at nest session.

HOMEWORK

Finish any guided practice not completed during class.

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