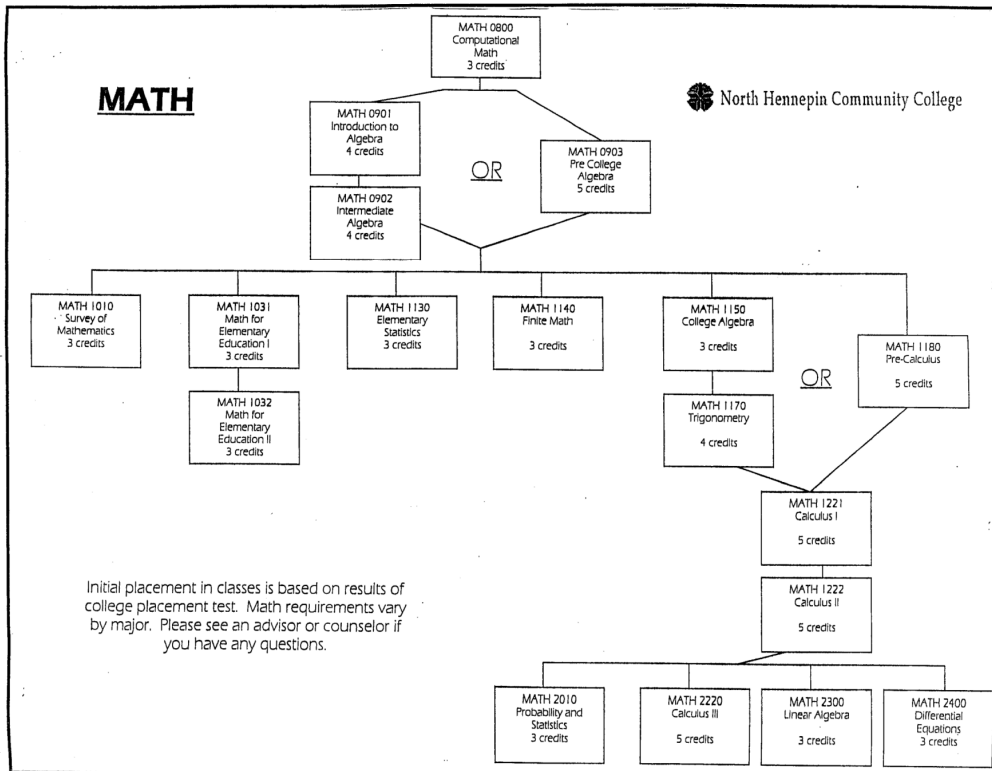


# Introduction to the Practice Exams

The math placement exam determines what math course you will start with at North Hennepin Community College. The placement exam starts with a 12 question elementary algebra test and depending on your score the test may continue into either a college level or an arithmetic test to determine your final placement. You have the option to appeal your first score and retake the exam once. If neither score is what you want, you may retake the exam the next semester but once you enroll in a class, you may no longer take the placement exam.

Look at the following flow chart to see a list of classes and their prerequisites. To move on to the next class you must complete the previous class with a C or better. You can see that your initial placement can make a big impact on the number of courses that you need to take. If you test into a lower class than you are qualified for you will have to spend at least one extra semester to get to the math class that you need.

The following practice tests and answer keys are designed to give you an opportunity to study and review some concepts and skills that will be tested on the elementary algebra and arithmetic portions of the placement exam. The placement exam is a predictive test, so the specific questions asked will change each time the test is taken, but the practice exams cover the main concepts. Good Luck.



# Arithmetic Practice Exam

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This practice exam has a selection of problems similar to those found on the Placement Exam at the Arithmetic Level. The actual exam is 17 questions long. After taking this practice exam, check your answers with the key to see detailed explanations of the skills and steps needed to solve each problem. You may use scratch paper, but not a calculator.

1)  $14 - 5 =$

a) -19

b) 11

c) -9

d) 9

2)  $1\frac{3}{5} \times 4$

a)  $\frac{32}{5}$

b)  $1\frac{12}{5}$

c)  $\frac{23}{5}$

d)  $\frac{32}{20}$

3)  $\frac{9}{20} =$

a) 4.5

b) .18

c) .45

d) .09

4) Subtract the following fractions:  $\frac{4}{3} - \frac{5}{12} =$

a)  $-\frac{1}{9}$

b)  $\frac{11}{12}$

c)  $-\frac{1}{12}$

d)  $\frac{4}{15}$

5) Find the product of  $\frac{3}{8}$  and  $\frac{2}{15}$ .

a)  $\frac{1}{20}$

b)  $\frac{5}{23}$

c)  $\frac{6}{23}$

d)  $\frac{6}{15}$

6) If a pot of soup is  $\frac{2}{3}$  full before lunch and  $\frac{1}{7}$  full after lunch, how much soup was used during lunch?

- a)  $\frac{1}{4}$                       b)  $\frac{1}{21}$                       c)  $\frac{11}{21}$                       d)  $\frac{1}{7}$

7) Which of the following is **not** equivalent to  $2\frac{4}{5}$ ?

- a) 2.8                      b)  $\frac{8}{5}$                       c)  $\frac{14}{5}$                       d)  $1\frac{9}{5}$

8)  $(.35)^2$

- a) .7                      b) .1225                      c) 12.25                      d) 7

9) What percent of 30 is 6?

- a) 2%                      b) 20%                      c) 18%                      d) 5%

10)  $3.2 \div 100 =$

- a) .032                      b) 320                      c) 320                      d) .0032

11)  $5.7 + 3.6 - 1.4 =$

- a) 10.2                      b) 7.3                      c) 7.9                      d) 8.3

12) If a shirt costs \$24.47 and a pair of pants costs \$27.78, what is the cost if you buy both items?

- a) \$52.25                      b) \$51.45                      c) \$41.25                      d) \$52.35

13) 21% of 78,456 is closest to:

- a) 200                              b) 86,000                              c) 160,000                              d) 16,000

14) If 1 car weighs 2 tons and 1 semi weighs 12 tons, what is the ratio of the weight of 5 cars to 2 semis?

- a) 2 : 5                              b) 5 : 2                              c) 5 : 12                              d) 1 : 6

15) If the length of a rectangle is 14 meters, and the width is 5 meters less than the length, what is the perimeter of the rectangle?

- a) 23 meters                      b) 46 meters                      c) 39 meters                      d) 70 meters

# Answer Key for Arithmetic Practice Exam

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Use the following key to check your answers. You can use the suggested websites for more details and explanations for each topic. This practice test covers all of the listed topics for the arithmetic portion of the placement exam, but remember that the actual exam may have a different distribution of topics.

Answers: 1:d 2:a 3:c 4:b 5:a 6:c 7:b 8:b 9:b 10:a 11:c 12:a 13:d 14:c 15:b

1) **Answer: d)** 9 **Skills: Subtracting integers**

When subtracting integers, you want to think of moving on a number line. Starting at positive 14 which lies to the right of zero, to subtract 5, you move to the left five units and you end up at a positive 9.

Helpful Site: <http://www.math.com/school/subject1/lessons/S1U1L11DP.html>

2) **Answer: a)**  $\frac{32}{5}$  **Skills: Mixed Numbers, Multiplying Fractions**

When multiplying or dividing mixed numbers, we need to turn them into improper fractions first. If you multiply the whole number portion by the denominator and add it to the numerator, you will have the improper fraction equivalent.  $1\frac{3}{5} = \frac{1 \times 5 + 3}{5} = \frac{8}{5}$ .

To multiply a fraction by a whole number, put the whole number over 1 and multiply straight across.

$$\frac{8}{5} \times \frac{4}{1} = \frac{8 \times 4}{5 \times 1} = \frac{32}{5}$$

Helpful Site: <http://www.visualfractions.com/MixtoFrCircle.html>

3) **Answer: c)** .45 **Skills: Division**

To find the decimal value of a fraction, divide the numerator by the denominator. You can use long division, or in this case you can notice that if you multiply the top and the bottom by 5, the denominator of the fraction will be 100, which is easily converted into a decimal if you remember that when you divide by 100 you move the decimal in the numerator two places to the left.

$$\frac{9}{20} = \frac{9 \times 5}{20 \times 5} = \frac{45}{100} = .45$$

Helpful Site: [http://www.mathsisfun.com/long\\_division.html](http://www.mathsisfun.com/long_division.html)

4) **Answer: b)**  $\frac{11}{12}$  **Skills: Subtracting fractions**

To subtract (or add) fractions we need to make sure that we have common denominators. We can multiply the numerator and denominator by the same number so that the fractions have the same denominator, then we can subtract the numerators and put it over the common denominator.

$$\frac{4}{3} - \frac{5}{12} = \frac{4 \times 4}{3 \times 4} - \frac{5}{12} = \frac{16}{12} - \frac{5}{12} = \frac{11}{12}$$

Helpful Site:

<http://www.themathpage.com/ARITH/add-fractions-subtract-fractions-1.htm>

- 5) Answer: a)  $\frac{1}{20}$  Skills: Multiplying fractions

To find the product means to multiply, and to multiply we just multiply “straight across”. Make sure to reduce your final answer by cancelling any common factors.

$$\frac{3}{8} \times \frac{2}{15} = \frac{3 \times 2}{8 \times 15} = \frac{\cancel{3} \times \cancel{2}}{\cancel{2} \times 4 \times \cancel{3} \times 5} = \frac{1}{4 \times 5} = \frac{1}{20}$$

Helpful Site: [http://www.mathsisfun.com/fractions\\_multiplication.html](http://www.mathsisfun.com/fractions_multiplication.html)

- 6) Answer: c)  $\frac{11}{21}$  Skills: Fractions

To find the remaining soup we need to subtract the remaining portion,  $\frac{1}{7}$  from the starting portion,  $\frac{2}{3}$ . Remember to create common denominators before subtracting, like problem 4.

$$\frac{2}{3} - \frac{1}{7} = \frac{2 \times 7}{3 \times 7} - \frac{1 \times 3}{7 \times 3} = \frac{14}{21} - \frac{3}{21} = \frac{11}{21}$$

- 7) Answer: b)  $\frac{8}{5}$  Skills: Mixed numbers, Decimals

When we look at the four options, we see first that  $\frac{4}{5} = .8$ , so  $2\frac{4}{5} = 2.8$

Secondly, as an improper fraction,  $2\frac{4}{5} = \frac{2 \times 5 + 4}{5} = \frac{14}{5} \neq \frac{8}{5}$

Finally, if we take one whole number away, and put it with the fractional portion, we would get  $1\frac{1 \times 5 + 4}{5} = 1\frac{9}{5}$ , so b) is the only unequal value.

- 8) Answer: b) .1225 Skills: Multiplying decimals

The exponent (in this case 2) tells you how many times to multiply the base (.35) by itself. To multiply decimals, it is easiest to do this vertically, and to multiply 35 by 35 and add move the decimal four places to the left at the end.

Helpful site: <http://www.themathpage.com/ARITH/multiply-whole-numbers-multiply-decimals.htm>

.35
×.35
-----
175
105
-----
.1225

- 9) Answer: b) 20% Skills: Percentage word problems

To answer this problem we want to set up an equation and solve it. We are looking for the percentage which can be found by thinking of  $\frac{\text{percentage}}{100}$ . In the problem “of” means to multiply, and “is” means equals. Putting this all together “what percentage of 30 is 60” becomes the equation

$$\frac{x}{100} \times 30 = 60$$

Then to get x alone, multiply by 100 and divide by 30.

$$x = \frac{6 \times 100}{30} = \frac{600}{30} = \frac{60}{3} = 20$$

Helpful Site: <http://www.yale.edu/ynhti/curriculum/units/1980/7/80.07.07.x.html>

10) **Answer: a)** .032

**Skills: Dividing decimals**

To divide by 10, 100, 1000, etc, move the decimal point of the numerator to the left the number of zeros. (The opposite works with multiplication by a power of 10; move the decimal to the right)

$$\frac{3.2}{100} = .032$$

Helpful Site: <http://themathpage.com/arith/multiply-by-powers-of-10.htm>

11) **Answer: c)** 7.9

**Skills: Adding/Subtracting decimals**

When adding decimals, make sure to keep everything lined up, and add just like whole numbers. Borrow digits if you need to perform the subtraction

$$\begin{array}{r} 5.7 \\ +3.6 \\ \hline 9.3 \end{array} \quad \begin{array}{r} 9.3 \\ -1.4 \\ \hline 7.9 \end{array} = \begin{array}{r} 8.3 \\ -1.4 \\ \hline 7.9 \end{array}$$

Helpful Site: <http://www.enchantedlearning.com/math/decimals/addingdecimals/>

12) **Answer: a)** \$52.25

**Skills: Adding Money**

This problem is much like number 11 above. Be sure to keep track of the decimal place, and line up the correct values.

Helpful Site:

<http://www.beaconlearningcenter.com/WebLessons/ShowMeTheMoney/default.htm>

13) **Answer: d)** 16,000

**Skills: Approximation**

This is a hard problem to do directly, but since we only need to approximate the answer, we can think of 78,456 as being 80,000 and as 21% as 20%. Then our multiplication problem becomes much easier.

$$80,000 \times 20\% = 80,000 \times .2 = 16,000$$

14) **Answer: c)** 5 : 12

**Skills: Rate/Ratio**

First we need to figure out the weight of 5 cars which is  $5 \times 2 = 10$  tons. The weight of 2 semis is  $2 \times 12 = 24$  tons. When creating ratios, always list the two pieces in order, separated by a colon, and reduce the ratio just like a fraction.

$$10 : 24 = 5 \cdot \cancel{2} : 12 \cdot \cancel{2} = 5 : 12$$

Helpful Site: <http://www.math.com/school/subject1/lessons/S1U2L1GL.html>

15) Answer: b) 46

Skills: Geometry problem

To solve this geometry problem you need to know that the perimeter is the distance around the shape. If the width is 5 less than 14, then the width is 9 meters. Around a rectangle are two lengths and two widths, so the perimeter is  $14 + 14 + 9 + 9 = 46$ .

Helpful Site: <http://www.analyzemath.com/geometry.html>

# Elementary Algebra Practice Exam

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This practice exam has a selection of problems similar to those found on the Placement Exam at the Elementary Algebra Level. The actual exam is 12 questions long. After taking this practice exam, check your answers with the key to see detailed explanations of the skills and steps needed to solve each problem. You may use scratch paper, but not a calculator.

1) Find the sum of  $-4$  and  $-3$ .

a)  $-1$

b)  $-7$

c)  $7$

d)  $12$

2) Find the value of  $5 + 3(2 - 6) \div 2 \cdot 5$ .

a)  $-80$

b)  $17$

c)  $-25$

d)  $3$

3) What is the product of  $-\frac{3}{5}$  and  $\frac{10}{7}$ ?

a)  $-\frac{6}{7}$

b)  $\frac{7}{2}$

c)  $-\frac{13}{12}$

d)  $\frac{50}{21}$

4) Subtract  $\frac{5}{6}$  from  $\frac{7}{4}$ .

a)  $1$

b)  $\frac{1}{12}$

c)  $\frac{11}{12}$

d)  $-\frac{3}{2}$

5) If  $3x = \frac{5}{2}$ , find the value of  $x$ .

a)  $5$

b)  $\frac{6}{5}$

c)  $\frac{15}{2}$

d)  $\frac{5}{6}$

6) Find the value of  $2 + 3|5 - 7|$

a) 10

b) -4

c) 8

d) -10

7) Place the numbers in ascending order (from smallest to largest)  $\left\{\frac{5}{4}, \frac{11}{12}, 1\frac{2}{5}, \frac{5}{6}\right\}$

a)  $\left\{\frac{5}{4}, 1\frac{2}{5}, \frac{11}{12}, \frac{5}{6}\right\}$

b)  $\left\{\frac{5}{6}, \frac{5}{4}, \frac{11}{12}, 1\frac{2}{5}\right\}$

c)  $\left\{\frac{11}{12}, \frac{5}{6}, \frac{5}{4}, 1\frac{2}{5}\right\}$

d)  $\left\{\frac{5}{6}, \frac{11}{12}, \frac{5}{4}, 1\frac{2}{5}\right\}$

8) What is the value of  $3x^2 - 2xy + y^2$  when  $x = -2$  and  $y = 3$ ?

a) 9

b) 33

c) 6

d) 26

9) Simplify  $\frac{x^2 - x - 6}{x^2 - 9}$

a)  $\frac{x+2}{x+3}$

b)  $\frac{x+6}{9}$

c)  $\frac{x-3}{x}$

d)  $\frac{x+6}{x-9}$

10) A rectangular garden is to be made with a perimeter of 54 meters. If the width is five meters less than the length, what are the dimensions of the garden?

a) 24m by 30m

b) 12m by 17m

c) 6m by 9m

d) 11m by 16m

11)  $(2a - 3)(a + 3) =$

a)  $2a^2 - 9$

b)  $2a^2 + 3a - 9$

c)  $5a^3 - 9$

d)  $2a^2 - 9a - 6$

12) Solve the equation:  $x^2 + 3x = 18$

a)  $\{-6, 3\}$

b)  $\{2, -9\}$

c)  $\{4, 3\}$

d)  $\{6, 2\}$

13) Find the sum of  $3x + 2$  and  $4 - x + x^2$

a)  $4x + 6$

b)  $x^2 + 8x$

c)  $x^2 + 2x + 6$

d)  $5x^2 + x + 2$

14) Solve the inequality:  $-3(x - 2) < x - \frac{3}{2}$

a)  $\{x | x < 2\}$

b)  $\left\{x \mid x > \frac{1}{2}\right\}$

c)  $\left\{x \mid x > \frac{15}{8}\right\}$

d)  $\left\{x \mid x < \frac{5}{2}\right\}$

15) Simplify and add the radicals:  $\sqrt{75} + \sqrt{27}$

a)  $8\sqrt{3}$

b)  $\sqrt{102}$

c)  $34\sqrt{3}$

d)  $8\sqrt{6}$

16) Evaluate  $4^{\frac{5}{2}}$

a) 10

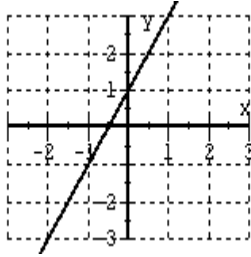
b) 90

c) 16

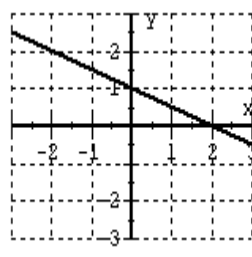
d) 32

17) Which line has a slope of  $\frac{1}{2}$ ?

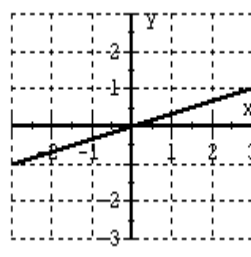
a)



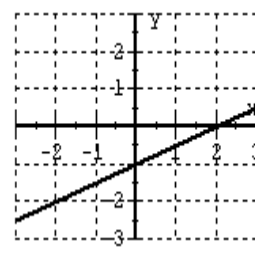
b)



c)



d)



18) Subtract:  $\frac{3x}{y} - \frac{2}{x}$

a)  $\frac{3x^2 - 2y}{xy}$

b)  $\frac{3x - 2}{xy}$

c)  $\frac{3x - 2}{y - x}$

d)  $\frac{x}{y - x}$

19) Two angles are supplementary. If the larger angle is  $20^\circ$  more than three times the smaller, find the measure of each angle.

a)  $85^\circ, 275^\circ$

b)  $40^\circ, 140^\circ$

c)  $15^\circ, 75^\circ$

d)  $60^\circ, 120^\circ$

20) Write the phrase “the difference of a number and twice the square of a number” as a simplified algebraic expression.

a)  $x^4 - 2$

b)  $3x$

c)  $x - 2x^2$

d)  $x^2 - 2x$

# Answer Key for Elementary Algebra Practice Exam

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Answers:        1:b  2:c  3:a  4:c  5:d  6:c  7:d  8:b  9:a  10:d  
                  11:b 12:a 13:c 14:c 15:a 16:d 17:d 18:a 19:b 20:c

1)            b)  $-7$                     **Skills: Adding Integers**

When you add numbers you can visualize a number line with negative numbers to the left and positive numbers to the right. If you start at the location  $-3$  and add  $-4$  to it you move 4 units to the left (since it is negative), so you end up at  $-7$

Helpful site: <http://www.funbrain.com/linejump/index.html>

2)            c)  $-25$                     **Skills: Order of Operations**

When you see a list of operations and parentheses you must perform the operations in the correct order. Always start with any operations inside the parentheses first, and then apply any exponents. (There aren't any in this problem) Next perform multiplication and division as they appear from left to right, and finally addition and subtraction in order from left to right.

$$\begin{array}{ll} 5 + 3(2 - 6) \div 2 \cdot 5 & \text{Subtraction inside Parentheses First} \\ 5 + 3(-4) \div 2 \cdot 5 & \text{Multiplication} \\ 5 + (-12) \div 2 \cdot 5 & \text{Division} \\ 5 + (-6) \cdot 5 & \text{Multiplication} \\ 5 + (-30) & \text{Addition} \\ -25 & \end{array} \left. \vphantom{\begin{array}{l} 5 + 3(2 - 6) \div 2 \cdot 5 \\ 5 + 3(-4) \div 2 \cdot 5 \\ 5 + (-12) \div 2 \cdot 5 \\ 5 + (-6) \cdot 5 \\ 5 + (-30) \\ -25 \end{array}} \right\} \text{In order from left to right}$$

Helpful site: [http://www.mathgoodies.com/lessons/vol7/order\\_operations.html](http://www.mathgoodies.com/lessons/vol7/order_operations.html)

3)            a)  $-\frac{6}{7}$                     **Skills: Multiplying Fractions, Reducing Fractions**

When you multiply fractions, you multiply the numerators (top) together and put your answer over the product of the denominators (bottom). You then need to reduce the fraction by canceling any common factors between the numerator and denominator. Remember that the product of a positive number and a negative number is always negative

$$-\frac{3}{5} \cdot \frac{10}{7} = -\frac{30}{35} = -\frac{5 \cdot 6}{5 \cdot 7} = -\frac{6}{7}$$

Helpful site: <http://www.webmath.com/multfract.html>

4) c)  $\frac{11}{12}$

**Skills: Subtracting Fractions, Finding the Least**

**Common Denominator, translating phrases.**

When the question asks you to subtract  $\frac{5}{6}$  from  $\frac{7}{4}$  it means  $\frac{7}{4} - \frac{5}{6}$ .

You need to know that to subtract (or add) fractions they need to have a common denominator. If you multiply the top and bottom of a fraction by the same value, you don't change the value of the fraction. So to create a common denominator, factor the denominators so you can see what factor(s) each fraction is missing, and add those missing factors. You can then subtract the numerators and put the answer over the common denominator.

$$\frac{7}{2 \cdot 2} - \frac{5}{2 \cdot 3} = \frac{7 \cdot 3}{2 \cdot 2 \cdot 3} - \frac{5 \cdot 2}{2 \cdot 3 \cdot 2} = \frac{21 - 10}{2 \cdot 2 \cdot 3} = \frac{11}{12}$$

5) d)  $\frac{5}{6}$

**Skills: Solving equations/fractions**

With equations we have the option to multiply (or divide) both any non-zero quantity or we can add (or subtract) both sides by the quantity without changing the solutions. This is important since it to rewrite equations in a form that we prefer. The best form is to variable alone as in  $x = \square$ , since then we can easily see the solution. For this problem we can get the x term alone by dividing both sides by 3. To divide the right side by 3, remember that dividing means multiplying by the reciprocal. This gives us the solution.

Helpful site: <http://www.purplemath.com/modules/solvein.htm>

$$\begin{aligned} 3x &= \frac{5}{2} \\ \cancel{3}x &= \frac{5}{2} \div 3 \\ x &= \frac{5}{2} \cdot \frac{1}{3} \\ x &= \frac{5}{6} \end{aligned}$$

sides by same allows us get the solution. sides by 3.

6) c) 8

**Skills: Order of Operations, Absolute Value**

To evaluate this expression, we must first perform the operations of the absolute value symbols (just like parentheses). Remember that absolute value of a number represents the distance from that number to zero so the absolute value is always positive. Make sure that you wait to add and the 3 until after you multiply the 3 because multiplication comes before addition.

$$\begin{aligned} 2 + 3|5 - 7| &= \\ 2 + 3|-2| &= \\ 2 + 3 \cdot 2 &= \\ 2 + 6 &= \\ 8 & \end{aligned}$$

inside the zero so the 2 before

Helpful site: [http://www.mathgoodies.com/lessons/vol7/order\\_operations.html](http://www.mathgoodies.com/lessons/vol7/order_operations.html)

7)      d)  $\left\{\frac{5}{6}, \frac{11}{12}, \frac{5}{4}, 1\frac{1}{3}\right\}$       **Skills: Fractions**

To compare fractions we need to create common denominators. The Least Common Denominator of all the fractions is 12. To convert the mixed number to a fraction multiply the denominator by the whole number and add it to the numerator. The four fractions can then be grouped in the right order.

$$\frac{5 \cdot 2}{6 \cdot 2} = \frac{10}{12} \qquad \frac{11}{12} \qquad \frac{5 \cdot 3}{4 \cdot 3} = \frac{15}{12} \qquad 1\frac{1}{3} = \frac{4 \cdot 4}{3 \cdot 4} = \frac{16}{12}$$

Helpful site: [www.mathsisfun.com/least-common-denominator.html](http://www.mathsisfun.com/least-common-denominator.html)

8)      b) 33      **Skills: Evaluating expressions**

To evaluate an expression we must replace each variable with the given value. Be careful with negative values.

The problem states that  $x = -2$  and  $y = 3$  so:

$$3x^2 - 2xy + y^2 = 3(-2)^2 - 2(-2)(3) + (3)^2 = 3 \cdot 4 + 12 + 9 = 33$$

Helpful site: <http://www.purplemath.com/modules/evaluate.htm>

9)      a)  $\frac{x+2}{x+3}$       **Skills: Factoring quadratics, simplifying rational expressions**

To simplify a rational expression you need to cancel any common factors (products). To see what the common factors are you need to factor the top and the bottom of the fraction. Only then can you see what factors are common and cancel them to get our final answer. Remember that quadratics often factor as the product of two binomials. For more help factoring polynomials see the web sites.

$$\frac{x^2 - x - 6}{x^2 - 9} = \frac{(x-3)(x+2)}{(x-3)(x+3)} = \frac{(x+2)}{(x+3)}$$

Helpful sites: <http://www.purplemath.com/modules/factquad.htm>  
[http://tutorial.math.lamar.edu/Classes/Alg/Factoring.aspx#Pre\\_Fac\\_Ex3\\_a](http://tutorial.math.lamar.edu/Classes/Alg/Factoring.aspx#Pre_Fac_Ex3_a)

10) d) 11m by 16m

**Skills: Word problems, geometry formulas, equation solving**

To solve a word problem we need to translate it into an equation with variables. For this problem, the equation comes from the formula for the perimeter of a rectangle:  $P = 2l + 2w$ . We also know the relationship between the width and the length:  $w = l - 5$ . To solve the problem we substitute the known quantities into the formula and solve the equation

$P = 2l + 2w$	
$(54) = 2l + 2(l - 5)$	Distribute the 2
$54 = 2l + 2l - 10$	Add like terms
$54 = 4l - 10$	Add 10 to each side
$64 = 4l$	Divide both sides by 4
$16 = l$	Substitute into $w = l - 5$
$w = 16 - 5$	
$w = 11$	

Helpful site:

[http://www.algebralab.org/Word/Word.aspx?file=Geometry\\_AreaPerimeterRectangles.xml](http://www.algebralab.org/Word/Word.aspx?file=Geometry_AreaPerimeterRectangles.xml)

11) b)  $2a^2 + 3a - 9$

**Skills: Multiplying polynomials**

When you multiply two binomials together (like this problem) you should remember the FOIL method. This way of making sure that you find all of the products. It for First, Outer, Inner and Last. After you find the four products add any like terms to find the final answer.

$(2a - 3)(a + 3) =$	
F      O      I      L	
$2a \cdot a + 2a \cdot 3 - 3 \cdot a - 3 \cdot 3 =$	
$2a^2 + 6a - 3a - 9 =$	
$2a^2 + 3a - 9$	

is a stands

Helpful Site: <http://rachel5nj.tripod.com/NOTC/foil.html>

12) a)  $\{-6, 3\}$

**Skills: Solving quadratics, factoring**

To solve a quadratic equation we need to get it in standard form  $ax^2 + bx + c = 0$ , so subtract the 18 from both sides. we need to factor the expression. Remember that quadratics usually factor as two binomials and we can check our factoring by multiplying using the FOIL method see that we haven't changed the equation. We can then set factor to zero and then solve to find our two solutions.

$x^2 + 3x = 18$	
$x^2 + 3x - 18 = 0$	
$(x + 6)(x - 3) = 0$	
$x + 6 = 0$	$x - 3 = 0$
$x = -6$	$x = 3$

Next to each

Helpful Site:

<http://www.regentsprep.org/Regents/math/faceq/LFacEq.htm>

13) c)  $x^2 + 2x + 6$

**Skills: Combining like terms**

When you are asked to find the sum, it means to add polynomials, and the most important thing is to remember that can only add terms that have the same variable. These are called terms. We start this problem by grouping all of the like terms together in order;  $x^2$ ,  $x$ , constant. Make sure to keep any negatives with the appropriate term. We then combine the like terms by adding their coefficients.

$3x + 2 + 4 - x + x^2 =$ $x^2 + 3x - x + 2 + 4 =$ $x^2 + 2x + 6$
--

you like

Helpful site: <http://www.themathpage.com/alg/like-terms.htm>

- 14) c)  $\left\{x \mid x > \frac{15}{8}\right\}$  Skills: Solving inequalities

When solving an inequality, we can treat it much like an equation. We can add or subtract quantities from both sides, and we can multiply and divide by a positive number on both sides without changing the answer. One difference between inequalities and equations is if we multiply or divide by a negative number we have to change the direction of the inequality. In this example we subtract and divide both sides to get the variable alone.

$$\begin{array}{rcl}
 -3(x-2) < x - \frac{3}{2} & & -4x < -\frac{3}{2} - 6 \\
 -3x + 6 < x - \frac{3}{2} & & -4x < -\frac{3}{2} - \frac{12}{2} = -\frac{15}{2} \\
 \quad -x \quad -x & & -4x < -\frac{15}{2} \\
 -4x + 6 < -\frac{3}{2} & & \div(-4) \quad \div(-4) \\
 \quad -6 \quad -6 & \square & x > \frac{15}{8}
 \end{array}$$

Helpful site: <http://www.purplemath.com/modules/ineqsolv.htm>

- 15) a)  $8\sqrt{3}$  Skills: Adding and Simplifying Radicals

To add radicals, we must simplify them first. To simplify, the numbers under the radical, then apply the radical to each square like 25 or 9. After they are simplified, we can see terms have the same radical and add them by adding their coefficients.

$\sqrt{75} + \sqrt{27} =$ $\sqrt{25 \cdot 3} + \sqrt{9 \cdot 3} =$ $\sqrt{25} \cdot \sqrt{3} + \sqrt{9} \cdot \sqrt{3} =$ $5\sqrt{3} + 3\sqrt{3} =$ $8\sqrt{3}$
---

factor perfect which

Helpful sites:

<http://www.montgomerycollege.edu/algebra/Adding---Subtracting-Radicals.html>

- 16) d) 32 Skills: Rational Exponents

When evaluating rational exponents, it is often helpful to convert the exponent to a radical. To do this you need to know that the denominator tells you the index of the radical and the numerator tells you the exponent to raise the expression to. It is usually best to evaluate the radical first, and then apply the exponent, but you can do it in either order.

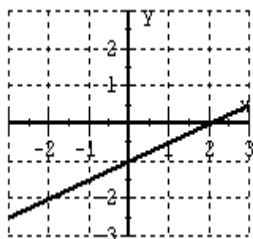
$$4^{5/2} = (\sqrt[2]{4})^5 = (2)^5 = 32$$

Helpful site: <http://www.themathpage.com/alg/rational-exponents.htm>

17)

d)

**Skills: Lines and slopes**



To find the slope of a line, we need to look at the ratio of vertical change to horizontal change between any two points. On this graph the line goes through the point  $(0, -1)$  and  $(2, 0)$  so to find the slope:

$$\text{slope} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{0 - (-1)}{2 - 0} = \frac{1}{2}$$

Helpful Site: [http://www.algebra-lab.net/lessons/lesson.aspx?file=Algebra\\_LinearEqSlopes.xml](http://www.algebra-lab.net/lessons/lesson.aspx?file=Algebra_LinearEqSlopes.xml)

18)

a)  $\frac{3x^2 - 2y}{xy}$

**Skills: Rational Expressions**

To add rational expressions we need a common denominator which in this case is  $xy$ . We create the common denominator by multiplying the top and bottom of each expression by the same quantity, then we add or subtract the numerators.

Helpful Site: <http://www.purplemath.com/modules/rtnladd.htm>

$\frac{3x}{y} - \frac{2}{x} =$ $\frac{3x \cdot x}{y \cdot x} - \frac{2 \cdot y}{x \cdot y} =$ $\frac{3x^2}{xy} - \frac{2y}{xy} =$ $\frac{3x^2 - 2y}{xy}$
--

19)

b)  $40^\circ, 140^\circ$

**Skills: Word Problem, Geometry**

To solve this problem you need to know that supplementary angles add up to 180 degrees. (Complementary angles add up to 90 degrees.) Using this information you can create an

equation that represents the information. If we let  $x$  represent the smaller angle can solve the following equation. Once we know the value of  $x$  we can find the other angle.

$$(x) + (3x + 20) = 180$$

$$4x + 20 = 180$$

$$4x = 160$$

$$x = 40$$

$$3(40) + 20 = 160$$

Helpful Site: Angle information <http://www.mathleague.com/help/geometry/angles.htm>

20) c)  $x - 2x^2$

**Skills: Translating expressions**

To translate a phrase into an expression you have to know which words turn into which symbols. In this problem “difference” means to subtract, “a number” means a variable  $x$ , “twice” means to multiply by 2, and “the square of a number” means  $x^2$ . Put it all together and you have

$$x - 2x^2.$$

Helpful Site: <http://www.studygs.net/mathproblems.htm>