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# Agricultural Algebra: Farmland

## High School Algebra- Area and Percentage

Math



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### Objectives

Students will apply algebraic concepts to solve real-world agricultural algebraic problems. Students will apply math concepts they've learned in class to calculate the area of various farm plots and the yields of crops from those land areas.

### Vocabulary

**Feed Rations**— the daily feed portion prepared from various feeds according to various animals' requirements. It is based on feeding standards and information about the composition and nutritive value of feeds

**Fertilizer**—a substance (such as manure or a special chemical) that is added to soil to help the growth of plants

**Yield**—to produce or provide (something, such as a plant or crop)

### Background

Many times, farmers need to know the overall area of their fields to calculate **fertilizer** rates, and amounts of fertilizer to be applied. Cattle Ranchers in Oklahoma also use math each and every day to calculate **feed rations**, and pasture grazing rates for their fields. Farmers also use math each and every day to ensure their crops are cared for and receive the necessary nutrients to produce a quality **yield**. In this activity, students will apply math concepts they've learned in class to calculate the area of various farm plots and the yields of crops from those land areas.

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# Agricultural Algebra: Farmland

## High School Algebra

Teacher Resources



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### Activity 1: Farmland Worksheets (Math), 1 50 minute class period

#### Materials

#### Math Exercises

Pen or Pencil

Calculator

Agricultural Algebra Farmland Worksheets

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# Agricultural Algebra: Farmland

## High School Algebra

Standards



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### Oklahoma Academic Standards



#### Activity 1: Farmland Worksheets (Math)

- A1.A.1.3** Analyze and solve real-world and mathematical problems involving systems of linear equations with a maximum of two variables by graphing (may include graphing calculator or other appropriate technology), substitution, and elimination. Interpret the solutions in the original context.
- A1.A.3.1** Solve equations involving several variables for one variable in terms of the others.

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# Agricultural Algebra: Farmland



## Activity 1 Worksheet 1: Farmland

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

Class/Hour/Teacher: \_\_\_\_\_

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### Background

Many times, farmers need to know the overall area of their fields to calculate fertilizer rates, and amounts of fertilizer to be applied. Cattle Ranchers in Oklahoma also use math each and every day to calculate feed rations, and pasture grazing rates for their fields. Farmers also use math each and every day to ensure their crops are cared for and receive the necessary nutrients to produce a quality yield. In this activity, you will apply math concepts you've learned in class to calculate the area of various farm plots and the yields of crops from those land areas.

### Problem Set

Using the given dimensions, solve the field problems below.

1. What is the length of one side of one square acre?



<p style="text-align: center;"><b>Given</b></p> <p>There are 43,560 square feet in an acre.</p> <p>There are 640 acres in one section of land.</p> <p>One section of land is equal to one square mile</p>
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2. Farmer Brown has a field that is twice as long on side A as side B. If the overall area of the field is 4.5 acres, what are the dimensions of the field in feet? Sketch the field as well as provide the proper algebraic and geometric equations.

**Agricultural Algebra: Farmland: Activity 1 (Continued)**

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**3. Farmer White owns a parcel of land that consists of 1088 acres. He has 64 fields that he grows crops on. On his land, he uses acres for Beef Cattle (B), Soybeans (S), Wheat (W), Alfalfa (A), Canola (C), Cotton (N), and Legumes (L). If all of the 64 fields are of equal size, what is the percentage of land for each crop?**

C	C	S	S	W	W	A	A
C	C	S	S	W	W	A	A
C	C	S	S	W	W	A	A
N	N	S	S	W	W	A	A
N	N	S	S	W	W	A	A
N	B	W	W	W	W	A	A
B	B	W	W	L	L	L	L
B	B	W	W	L	L	L	L

Beef Cattle (B) = \_\_\_\_\_

Soybeans (S) = \_\_\_\_\_

Wheat (W) = \_\_\_\_\_

Alfalfa (A) = \_\_\_\_\_

Canola (C) = \_\_\_\_\_

Cotton (N) = \_\_\_\_\_

Legumes (L) = \_\_\_\_\_

**4. What is the amount of land used for each crop in the diagram from question 3?, Remember, Farmer White has 1088 acres.**

Beef Cattle (B) = \_\_\_\_\_

Soybeans (S) = \_\_\_\_\_

Wheat (W) = \_\_\_\_\_

**Agricultural Algebra: Farmland: Activity 1 (Continued)**

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Alfalfa (A)= \_\_\_\_\_

Canola (C)= \_\_\_\_\_

Cotton (N) = \_\_\_\_\_

Legumes (L) = \_\_\_\_\_

**Farmer White is happy with the production on his land, but wants to maybe switch out some crops for those that make a little more money. Below is the total amount of profit he made for each of the following crops last year.**

**Beef Cattle (B) = \$42,000**

**Soybeans (S) = \$160,000**

**Wheat (W) = \$176,000**

**Alfalfa (A) = \$215,000**

**Canola (C) = \$100,000**

**Cotton (N) = \$50,000**

**Legumes (L) = \$45,000**

**5. Based upon a per acre profit, which crop(s) are the highest yielding (most \$\$/acre), and which are the least yielding? What recommendations would you give to change practices solely based on profit per acre?**

Beef Cattle (B) = \_\_\_\_\_

Soybeans (S)= \_\_\_\_\_

Wheat (W)= \_\_\_\_\_

Alfalfa (A)= \_\_\_\_\_

Canola (C)= \_\_\_\_\_

Cotton (N) = \_\_\_\_\_

Legumes (L) = \_\_\_\_\_

Recommendations: \_\_\_\_\_

\_\_\_\_\_

# Agricultural Algebra: Farmland



## Activity 1 Worksheet 1: Farmland ANSWERS

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

Class/Hour/Teacher: \_\_\_\_\_

### Background

Many times, farmers need to know the overall area of their fields to calculate fertilizer rates, and amounts of fertilizer to be applied. Cattle Ranchers in Oklahoma also use math each and every day to calculate feed rations, and pasture grazing rates for their fields. Farmers also use math each and every day to ensure their crops are cared for and receive the necessary nutrients to produce a quality yield. In this activity, you will apply math concepts you've learned in class to calculate the area of various farm plots and the yields of crops from those land areas.

### Problem Set

Using the given dimensions, solve the field problems below.

**Given**  
There are 43,560 square feet in an acre.  
  
There are 640 acres in one section of land.  
  
One section of land is equal to one square mile

1. What is the length of one side of one square acre?



The most standard shape for an acre is one furlong by one chain, or 660 feet by 66 feet. To find the linear measurements of other rectangular acres, just divide 43,560 by the number of feet you want on one side. A square-shaped acre would then be about 208.7 by 208.7 feet (because  $208.7 \times 208.7 = \sim 43,560$ ).

2. Farmer Brown has a field that is twice as long on side A as side B. If the overall area of the field is 4.5 acres, what are the dimensions of the field in feet? Sketch the field as well as provide the proper algebraic and geometric equations.

$x = 313.07$

$2x = 626.13$

If  $x$  is equal to 313.07 feet, then the overall dimensions of the field are 313.07 feet by  $2 \times 313.07 = 626.13$  feet

$$4.5 \text{ acres} \times 43560 \text{ ft}^2 = 196020 \text{ ft}^2$$
$$\text{Total area} = \text{length} \times \text{width}$$
$$196020 \text{ ft}^2 = 2x(x)$$
$$196020 = 2x^2$$
$$\frac{196020}{2} = \frac{2x^2}{2}$$
$$98010 = x^2$$
$$\sqrt{98010} = \sqrt{x^2}$$
$$313.07 = x$$

### Agricultural Algebra: Farmland: Activity 1 (ANSWERS Continued)

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3. Farmer White owns a parcel of land that consists of 1088 acres. He has 64 fields that he grows crops on. On his land, he uses acres for Beef Cattle (B), Soybeans (S), Wheat (W), Alfalfa (A), Canola (C), Cotton (N), and Legumes (L). If all of the 64 fields are of equal size, what is the percentage of land for each crop?

C	C	S	S	W	W	A	A
C	C	S	S	W	W	A	A
C	C	S	S	W	W	A	A
N	N	S	S	W	W	A	A
N	N	S	S	W	W	A	A
N	B	W	W	W	W	A	A
B	B	W	W	L	L	L	L
B	B	W	W	L	L	L	L

$$\text{Beef Cattle (B)} = \frac{5 \text{ fields of beef cattle}}{64 \text{ total fields}} = 0.078 = 8\%$$

$$\text{Soybeans (S)} = \frac{10 \text{ fields of soybeans}}{64 \text{ total fields}} = 0.156 = 16\%$$

$$\text{Wheat (W)} = \frac{18 \text{ fields of wheat}}{64 \text{ total fields}} = 0.281 = 28\%$$

$$\text{Alfalfa (A)} = \frac{12 \text{ fields of alfalfa}}{64 \text{ total fields}} = 0.187 = 19\%$$

$$\text{Canola (C)} = \frac{6 \text{ fields of canola}}{64 \text{ total fields}} = 0.093 = 9\%$$

$$\text{Cotton (N)} = \frac{5 \text{ fields of cotton}}{64 \text{ total fields}} = 0.078 = 8\%$$

$$\text{Legumes (L)} = \frac{8 \text{ fields of legumes}}{64 \text{ total fields}} = 0.125 = 12\%$$

4. What is the amount of land used for each crop in the diagram from question 3? Remember, Farmer White has 1088 acres.

$$\text{Beef Cattle (B)} = \frac{5 \text{ fields of beef cattle}}{64 \text{ total fields}} \times 1088 \text{ acres} = 85 \text{ acres}$$

$$\text{Soybeans (S)} = \frac{10 \text{ fields of soybeans}}{64 \text{ total fields}} \times 1088 \text{ acres} = 170 \text{ acres}$$

$$\text{Wheat (W)} = \frac{18 \text{ fields of wheat}}{64 \text{ total fields}} \times 1088 \text{ acres} = 306 \text{ acres}$$



## Agricultural Algebra: Farmland: Activity 1 (Continued)

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$$\text{Alfalfa (A)} = \frac{12 \text{ fields of alfalfa}}{64 \text{ total fields}} \times 1088 \text{ acres} = 204 \text{ acres}$$

$$\text{Canola (C)} = \frac{6 \text{ fields of beef cattle}}{64 \text{ total fields}} \times 1088 \text{ acres} = 102 \text{ acres}$$

$$\text{Cotton (N)} = \frac{5 \text{ fields of cotton}}{64 \text{ total fields}} \times 1088 \text{ acres} = 85 \text{ acres}$$

$$\text{Legumes (L)} = \frac{8 \text{ fields of legumes}}{64 \text{ total fields}} \times 1088 \text{ acres} = 136 \text{ acres}$$

**Farmer White is happy with the production on his land, but wants to maybe switch out some crops for those that make a little more money. Below is the total amount of profit he made for each of the following crops last year.**

**Beef Cattle (B) = \$42,000**

**Soybeans (S) = \$160,000**

**Wheat (W) = \$176,000**

**Alfalfa (A) = \$215,000**

**Canola (C) = \$100,000**

**Cotton (N) = \$50,000**

**Legumes (L) = \$45,000**

**5. Based upon a per acre profit, which crop(s) are the highest yielding (most \$\$/acre), and which are the least yielding? What recommendations would you give to change practices solely based on profit per acre?**

$$\text{Beef Cattle (B)} = \frac{\$42,000}{85 \text{ acres}} = \$494.12 \text{ per acre}$$

$$\text{Soybeans (S)} = \frac{\$160,000}{170 \text{ acres}} = \$941.18 \text{ per acre}$$

$$\text{Wheat (W)} = \frac{\$176,000}{306 \text{ acres}} = \$575.16 \text{ per acre}$$

$$\text{Alfalfa (A)} = \frac{\$215,000}{204 \text{ acres}} = \$1053.92 \text{ per acre}$$

$$\text{Canola (C)} = \frac{\$100,000}{102 \text{ acres}} = \$980.39 \text{ per acre}$$

$$\text{Cotton (N)} = \frac{\$50,000}{85 \text{ acres}} = \$588.24 \text{ per acre}$$

$$\text{Legumes (L)} = \frac{\$45,000}{136 \text{ acres}} = \$330.88 \text{ per acre}$$

Recommendations: Based upon the per acre profit, Farmer White made the most money per acre with his Alfalfa. The least yielding crop was Legumes. He could replace Legumes with Alfalfa and make more money that way.