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Section I

INTRODUCTION

GUIDELINES OR RULES FOR REASONABLE ANSWER

1. One pint weighs approximately one pound.
2. A 4' x 4' x 4' bulk bin of material weighs approximately one ton.
3. Most upright silos have capacities from 50 to 500 tons.
4. Most bunker silos have capacities from 500 to 5,000 tons.
5. The seeding rates for most crops are from 5 to 100 pounds per acre.
6.
7.
8.
9.
10.
11.
12.
13.
14.
15.

2 weeks → 4 to 5 classes

Section II

AREA

INFORMATION SHEET

Area of a triangle = $\frac{bh}{2}$

Area of a circle = πr^2

Circumference of a circle = πd

Volume of a cylinder = $\pi r^2 h$

Volume of a cone = $\frac{h}{3}(\pi r^2)$ or $\frac{\pi}{3} r^2 h$ or $1.047 r^2 h$

Area of a sphere = $4 \pi r^2$

Volume of a sphere = $\frac{4}{3} \pi r^3$ or $4.19 r^3$

Celsius = $\frac{5}{9}$ (F-32)

Fahrenheit = $\frac{9}{5}$ C + 32

1 cu. ft. = .8 bu.

1 bu. = 1.25 cu. ft.

1 cubic foot of silage weighs 40 lbs.

1 gallon = 4 quarts

1 mile = 5,280 feet

1 quart = 2 pints

1 acre = 43,560 square feet

1 cu. ft. = 7.5 gallons

1 cu. ft. of water weighs 62.5 pounds

1 gallon of water weighs 8 1/3 lbs.

One bushel of barley weighs 46 lbs.

One sack of fertilizer weighs 80 pounds

One cubic foot of molasses weighs 90 pounds

1 chain = 66 feet

1 rod = 16.5 feet

APR = $\frac{\text{2 x Number of payments per year x Finance charges}}{\text{Amount borrowed x (Total number of months +1)}}$

27 cu. ft = 1 cu. yd.

1 gallon = 128 fl. oz.

1 gallon = 231 in.^{3}

1 pound = 454 grams

1 ounce = 28.375 grams

1 fluid ounce = 28 ml.

Concrete=150#/ft^3

1 cu ft grain = 32 lbs.

$\pi = 3.14165$

concrete = 150# / ft^3

7.5 gal x 43560 = Acre foot of water (326,700 gallons)

1 bu of barley = 46#

Fuel = 6# / gal.

1 mph = 88'/min.

Area of RT circular cone

$A = \pi \cdot R \cdot L \cdot \pi R^2$

l = slope edge.

Step By Step Procedures

1. Cylindrical Silo:

   $\pi \times r^2 \times h$ = cu. ft. of silage x 40 lbs. of silage $\div$ 2000 = tons of silage

2. Cylindrical Grain Bin:

   $\pi \times r^2 \times h$ = cu. ft. of grain x .8 bu. of grain x bu. wt. = lbs. of grain

   $\div \frac{100}{}$ = cwt. of grain

   $\div \frac{2000}{}$ = tons of grain

3. Cone of grain:

   $1.047 \times r^2 \times h$ = cu. ft. of grain x .8 = bu. of grain x bu. wt. lbs. of grain

   $\div \frac{100}{}$ = cwt. of grain

   $\div \frac{2000}{}$ = tons of grain

4. Cone of fertilizer:

   $1.047 \times r^2 \times h$ = cu. ft. of fertilizer x lbs. per cu. ft. = lbs. of fertilizer $\div$ 2000 tons of fertilizer

5. Drills and Planters:

   Circumference x REVS = length of imaginary field x width of imaginary field =

   $$\frac{\text{sq. ft. in imaginary field}}{} \quad \frac{\text{lbs. material dropped}}{\text{sq. ft. in imaginary field}} \propto \frac{\text{lbs}}{43560}$$

6. Capacity of a cylindrical tank:

   $\pi \times r^2 \times h$ = cu. ft. x 7.5 gallons

7. Weight of a cylindrical water tank:

   $\pi \times r^2 \times h$ = cu. ft. x 62.5 lbs. of water

   lbs. of water + weight of tank = total weight

8. Spheric tank:

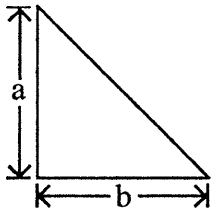
   $4.19 \times r^3$ = cu. ft. x 7.5 gallons/ cu. ft. = gallons

9. Gear problem:

   $$\frac{\text{rpm driver}}{\text{rpm driven}} \propto \frac{1}{} \quad \frac{\text{number teeth driven}}{\text{number teeth driver}}$$

AREA FORMULAS

I. TRIANGLES:

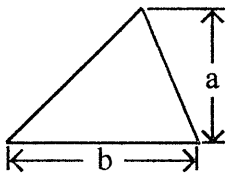


$A = \frac{ab}{2}$

NOTE: The area of any triangle is equal to half of the product of the base and the altitude.

(a) Right-Angled Triangle

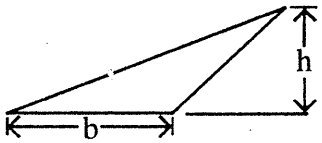
A RIGHT-ANGLED TRIANGLE having a right angle.



$A = \frac{ab}{2}$

(b) Acute-Angled Triangle

An ACUTE-ANGLED TRIANGLE is a triangle in which all of the angles are acute.

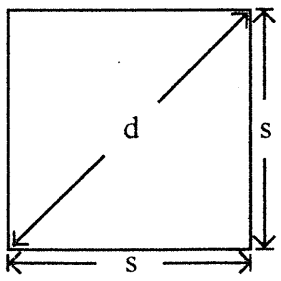


$A = \frac{bh}{2}$

(c) Obtuse-Angled Triangle

An OBTUSE-ANGLED TRIANGLE is a triangle which has one obtuse angle.

II. SQUARE:



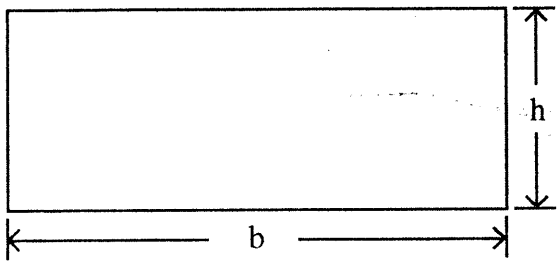
$A = S^2$

or

$A = {}^1/_2 d^2$

A SQUARE is a quadrilateral all whose sides are equal, and all of whose angles are right angles.

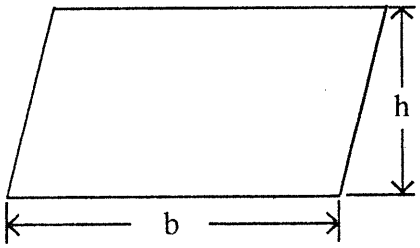
III. RECTANGLE:



$A = bh$

A RECTANGLE is a quadrilateral all of whose angles are right angles.

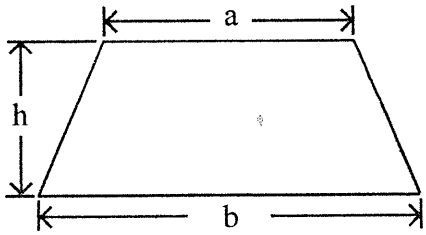
IV. PARALLELOGRAM:



$A = bh$

A PARALLELOGRAM is a four-sided figure whose opposite sides are parallel.

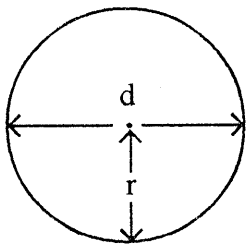
V. TRAPEZOID:



$A = \frac{(a + b)\,h}{2}$

A TRAPEZOID is a quadrilateral which has two of its sides parallel.

VI. CIRCLE:



$A = \pi r^2$

Circumference $= \pi d$

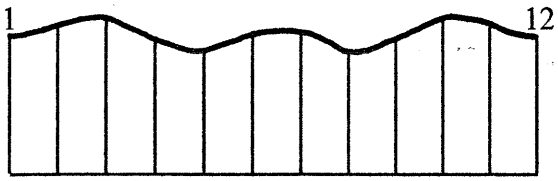
A CIRCLE is a portion of a plane surface, bounded by a closed curved line all points of which are equally distant from a point within called the center. This boundary line is called the CIRCUMFERENCE.

The AREA of the plane surface, enclosed by the circumference.

The RADIUS of a circle is a straight line drawn from the center to the circumference.

The DIAMETER of a circle is a straight line passing through the center of the circle and terminated at both ends by the circumference.

VII. UNEVEN BOUNDARY ON ONE SIDE



$$A = \frac{(1/2h_1 + h_2 + h_3 \text{ -- -- -- -- } 1/2h_{12}) \text{ x length}}{\text{number of parcels}}$$

b b

_____ 1. A field is 922 feet wide and 1,448 feet long. How many acres does it contain?

30.6 AC

Perimeter 4,740'

Formula

A = bh

922
×1448

1,335,056 ÷ 43,560 = 30.648668

_____ 2. How many acres in a field 1,615 feet by 3,969 feet?

147.15 AC

A = bh

1615
×3969

6,409,935 ÷ 43,560 = 147.15785

_____ 3. A piece of property is 416 feet wide and 832 feet long. How many acres does it contain?

7.95 AC

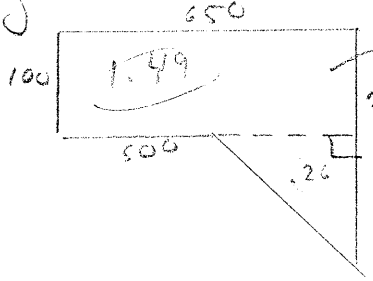
416
×832

346,112 ÷ 43560 = 7.9456382

33.79 4. A field is 700 feet wide and 2,100 feet long. How many acres does it contain?

1,470,000 ÷ 43560 = 33.75

1.49 5. How many acres does this field contain?



A = bh

A = b/2 + 1.75 acres

C.

_____ 7. A circular lawn is 42 feet in diameter. How many square feet does it contain?

1385

$A = \pi r^2$

$r = \frac{1}{2}d$ (21) 441

$r^2 = 21^2$

$\pi = 3.14$

$A = 3.14 \times 21^2$

$A = 3.14 \times 441$

$A = 1,384.74$

_____ 8. What is the circumference of the lawn in Problem 7?

132'

$C = \pi d$

3.14
42
131.88

_____ 9. A circular lawn 36 feet in diameter is to be planted. One pound of seed covers 200 square feet. How many pounds of seed are needed?

1,017 Ft.²

5.09# seed

$A = \pi r^2$

$A = 3.14 \times 18^2$

$A = 1017.36$

$1017 \div 200 = 5.0868$

_____ 10. What is the cirumference of the lawn in Problem 9?

113'

$C = \pi d$

$= 3.14 \times 36$

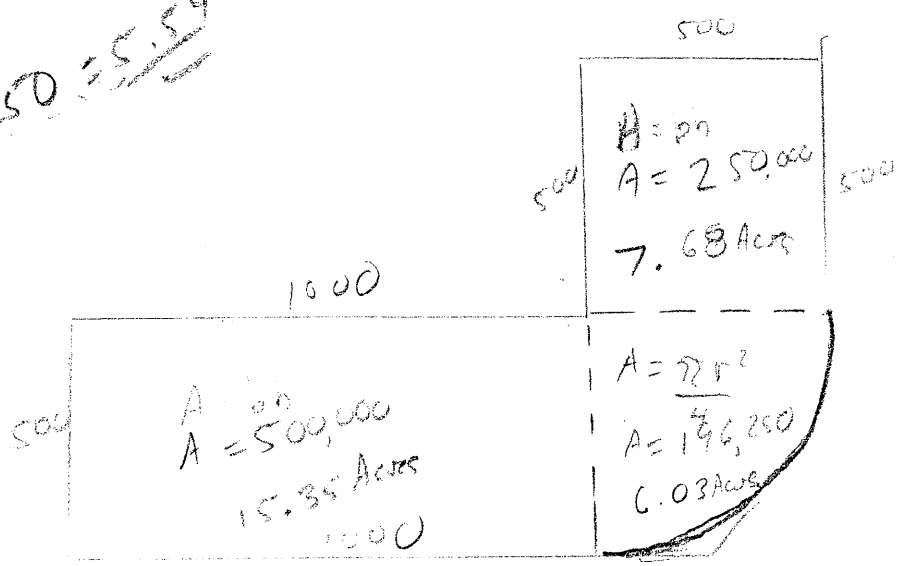
$= 113.04$

_____ 11. How many pounds of lawn seed are needed in problem 7 if one pound covers 250 square feet?

5.54#

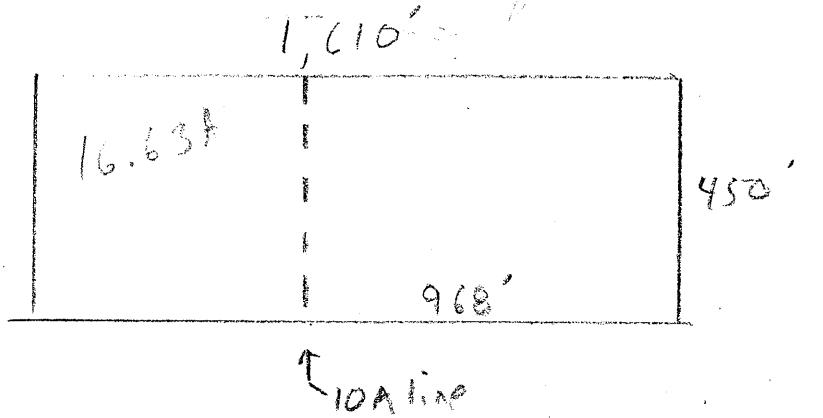
$1385 \div 250 = 5.54$

29.06 Acres 12.



968' 13. A field is 450 feet wide and 1,610 feet long. How far down the field would the 10 acre line be?

43560 sq ft/A



① Acres = $\frac{1610 \times 450}{43{,}560} = \frac{724{,}500}{43{,}560} = 16.632231$

② $\frac{10A}{16.63} = 60\%$

$\frac{1610}{\times .6}$

968, 12986 ft

208.7 14. A square field containing one acre has a side dimension of _____ feet.

$\sqrt{43{,}560} =$

Homework

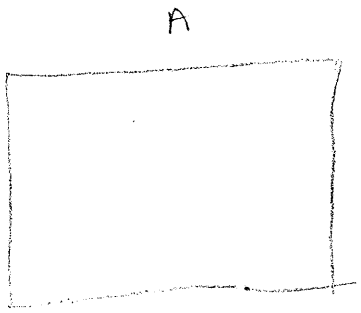
15. How many acres in this field?

16.

17

13) $\begin{array}{r} 1610 \\ \times\ 450 \\ \hline 724{,}500 \\ \hline 43{,}560 \end{array} = \frac{10\text{ac}}{16.63\text{ ac.}} = .60\% \times 1610 = 968\text{ ft.}$

14.



$A = b$

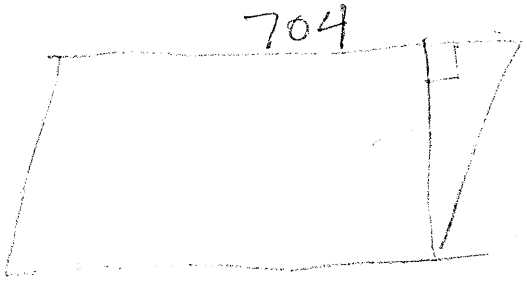
$b \times A = 43560$

$b^2 = 43560$

$b = \sqrt{43560}$

$b = 208.7$

19.

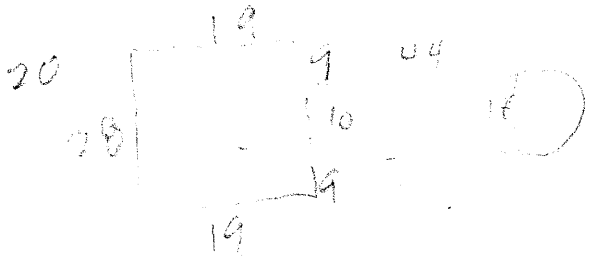


PARALLELOGRAM. 4 sided opposite sides are parallel.

$A = b \cdot h$

$704 \times 274 = \frac{192896}{43560} = 4.428\text{ ac}$

20



532
6.16
1.27.17
1275.17 ft^2

$A = b \cdot h$

$A = 28 \times 19$

$A = 532\text{ ft}^2$

$A = \frac{\pi R^2}{2}$

$A = \frac{3.14 \cdot 9^2}{2}$

$A = 127.17$

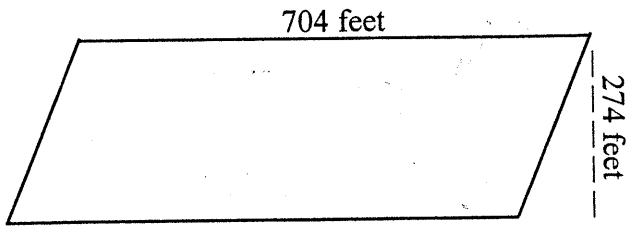
$A = \frac{(a+b)h}{2}$

$A = \frac{(10+18) \cdot 44}{2}$

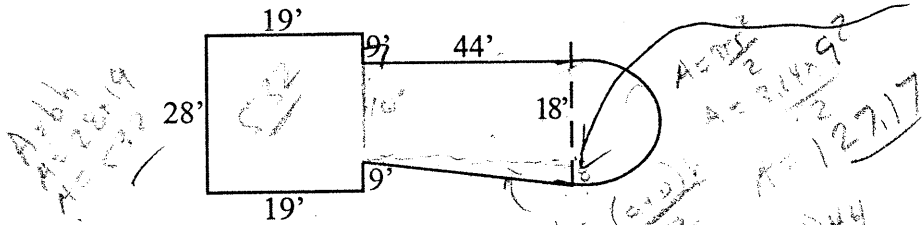
$A = \frac{28 \cdot 44}{2}$

$A = 616\text{ ft}^2$

4,434 19. How many acres in this field? This is a parallelogram.

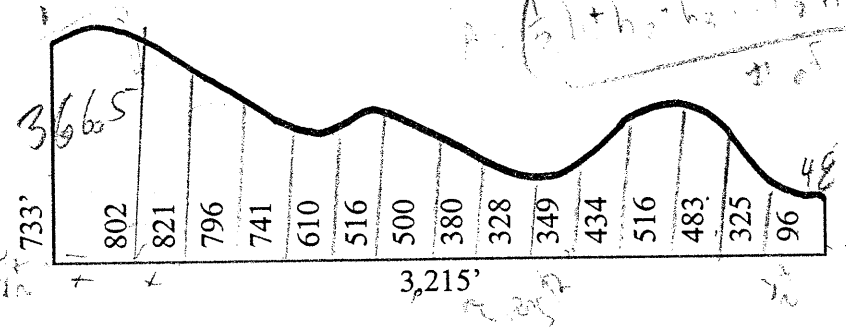


1,275.17 20. How many square feet in this lawn?



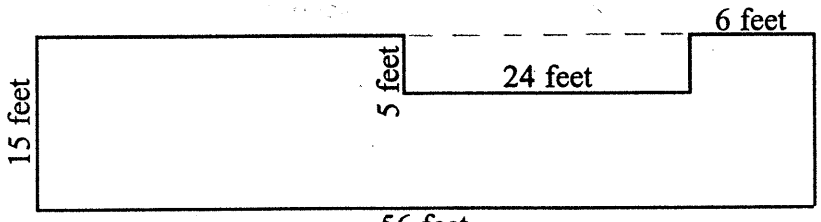
63 21. How many square feet in 7 square yards?

22. How many acres in this field with the creek as a boundary?



12.8 23. A concrete floor is to be painted. One gallon of the paint will cover 250 square feet. The floor is 40 feet wide and 80 feet long. How many gallons of paint are needed?

_____ 24. How many gallons of paint are needed to paint this floor? One gallon of paint covers 400 square feet.



720 ft²
1.8 gal

A = bh
A = 15 × 56
A = 840

A = bh
A = 5 × 24
A = 120

840
- 120
720 ÷ 400
1.8

_____ 25. Six cylindrical silos are 16 feet in diameter and 38 feet tall. How many gallons of paint are needed to paint the sides only? The top and bottom won't be painted. 300ft²/gal.

$\pi d = C$

① 50.24' C × 38' = 1909 ft²
② × 6 ÷ 300 = 38.16 gal
6 silos paint

$A = (\pi d)h \Leftrightarrow 2\pi rd$

_____ 26. A spherical water tank needs painting. It is 20 feet in diameter. How many gallons are needed? 350ft²/gal.

$4\pi r^2 = 4 \times 3.14 \times 100 =$ 1256 ft² / 350 = 3.59 gal

_____ 27. A rancher has 8 cylindrical grain bins that need painting. They are 12 feet in diameter and 14 feet tall. How many gallons of paint are needed to paint the sides only. One gallon of paint will cover 500 square feet. The bins will get two coats.

37.68 C × 14' × 16 ÷ 500 = 16.86 gal

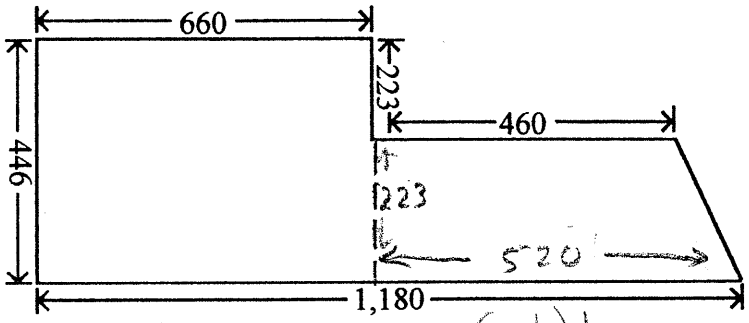
Hwk 1

Due 8-31-99
(30 pts - 5 pts @ answer)

Name Key

Date

9.27 Acres
1. How many acres in this field?

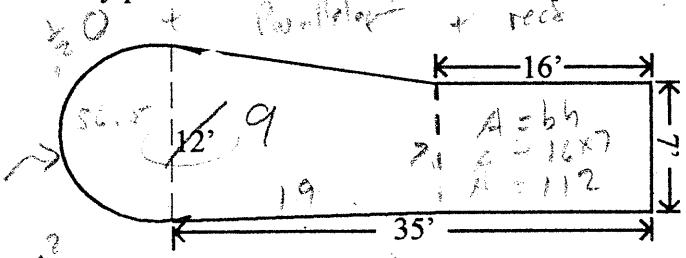


$A = bh$
$A = 660 \times 446$
$A = 294,360 \div 43560$
Acres 6.75

$A = \frac{(a+b)h}{2}$
$A = \frac{(460+520)223}{2}$
$A = 109,270 \div 43,560$
$A = 2,508$

1.47
1.74 ✓

2. How many pounds of seed are needed if one pound covers 200 ft²?



½ O + Rectangle + rect

$A = \frac{\pi r^2}{2}$
$A = \frac{3.14 \times 6^2}{2}$

$A = bh$
$A = 16 \times 7$
$A = 112$

$A = \frac{(a+b)h}{2}$
$A = \frac{(12+7)19}{2}$
$A = 180.5$

56.5
112
180.5
349 ÷ 200 = 1.7

4,356 Trees
3. A grower will plant 36 acres of peaches on 20 x 18 spacings. How many trees are needed?

$\frac{1568160}{4356} = 360$

$36 \times 43560 = 1568160$
$20 \times 18 = 360$ sq ft/tree

1.57 gallons 4. A spherical tanks is 15 feet in diameter. How many gallons of paint are needed if one gallon covers 450 ft²?

$\frac{4\pi r^2}{450} = \frac{4 \times 3.14 \times 7.5^2}{450} = \frac{12,562.56}{450} = \frac{706.5}{450}$

22.72 gallons 5. Four cylindrical grain bins, 50'3" in diameter and 18 feet tall, will be painted. How many gallons of paint are needed if one gallon covers 500 ft²?

$A = (\pi d)h$ $C = \pi d$ $C = 3.14 \times 50.25'$ $C = 157.79$

Total $A = 4 \times C \times 18'$

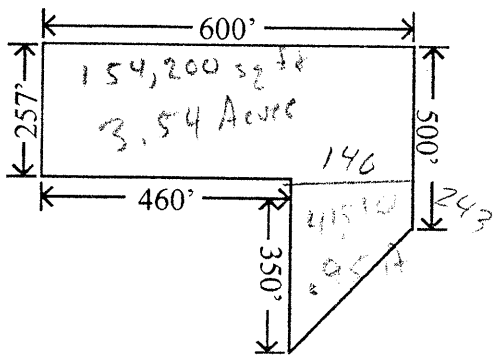
Total $A = 4 \times (157.79 \times 18)$

Total $A = 4 \times 2840.22$

Total $A = 11,360.88$

$\frac{11,360.88}{500} = 22.72$ gallons

4.49 A 6. How many acres in this field?



$A = bh + A = \frac{b \cdot h}{2}$

$= 43,560'$

$A = \frac{(350 + 243)\,140}{2}$

$A = \frac{83020}{2}$

$A = 41510$

Hand 2

Due 9-2-99
40 pts (5 pts @ answer)

Name Key

AREA PROBLEMS

22.42 1. How many acres in a field 682 feet by 1,432 feet?

682 × 1432 = 976624 ÷ 43560

2. A circular lawn is 44 feet in diameter and will be planted at the rate of one pound of seed per 200 square feet. Calculate the following:

1520 ft² πr^2 $3.14 \times 22^2 = 1,519.76$

7.6 pounds of seed 1520 ÷ 200

138 ft circumference πd 3.14×44

1584 3. A field is 550 feet wide and 2,100 feet long. How far down the field would the 20 acre line be?

$\frac{20}{26,575} = .75$

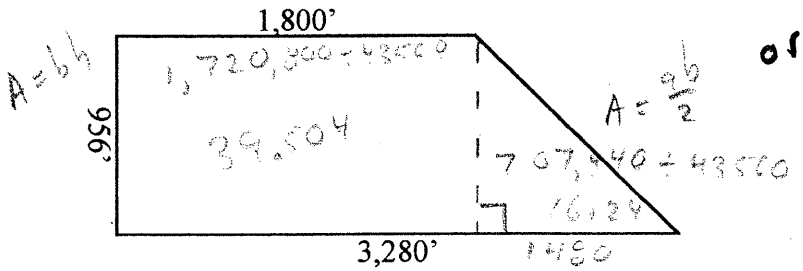
$2100 \times .75 = 1584$

295.16 4. A square field containing two acres has a side dimension of _____ feet.

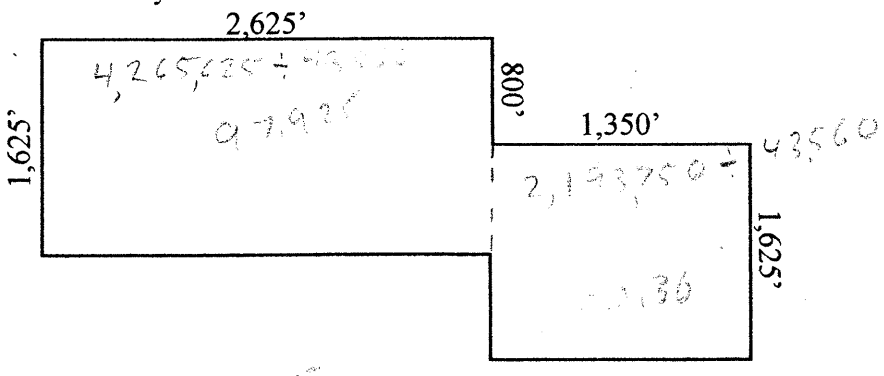
2 × 43560

55.74 5. How many acres in this field?

$A = \frac{(a+b)h}{2}$ or

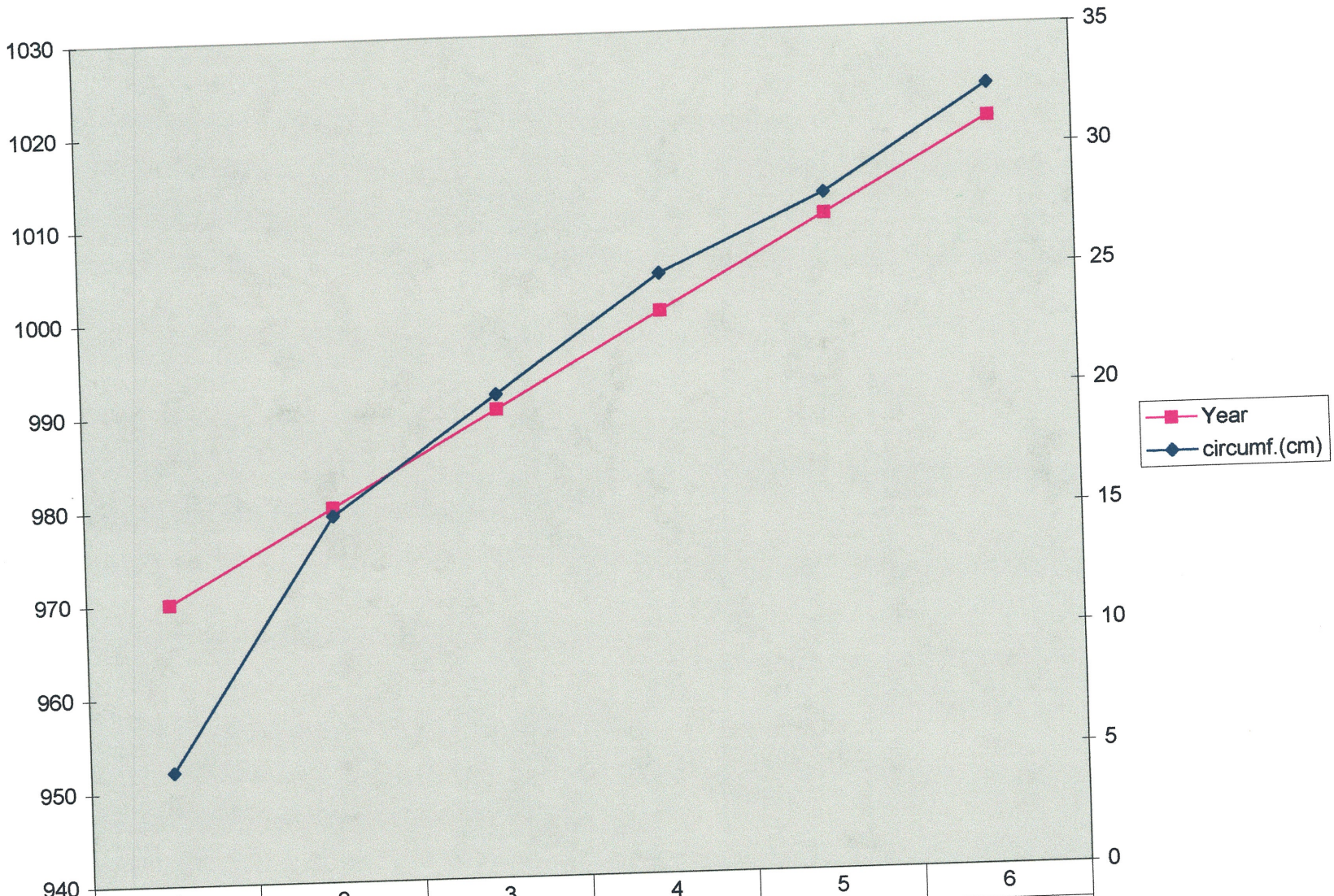


148.29 6. How many acres in this field?



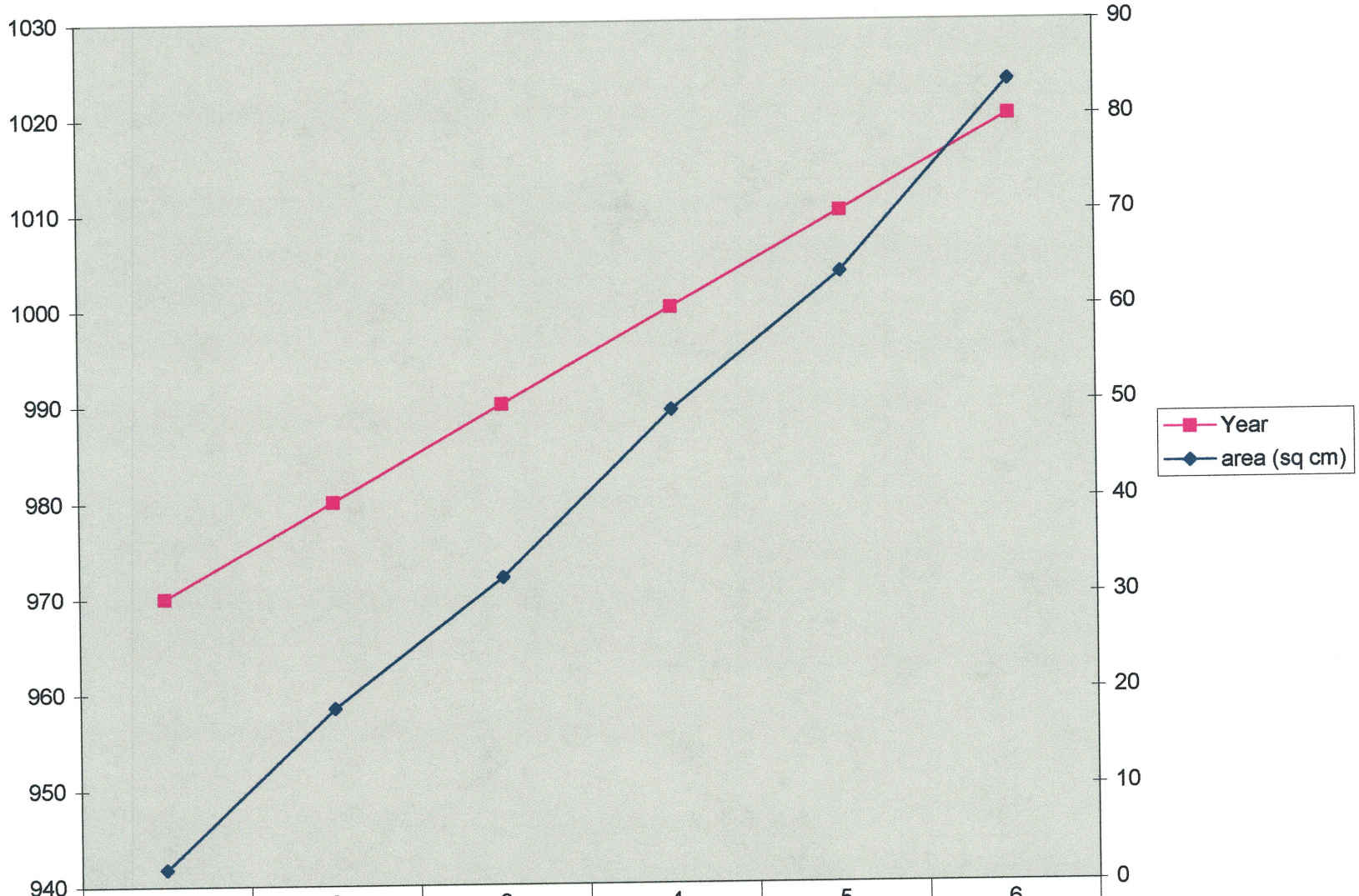
97.925
+50.36
148.29

Chart4



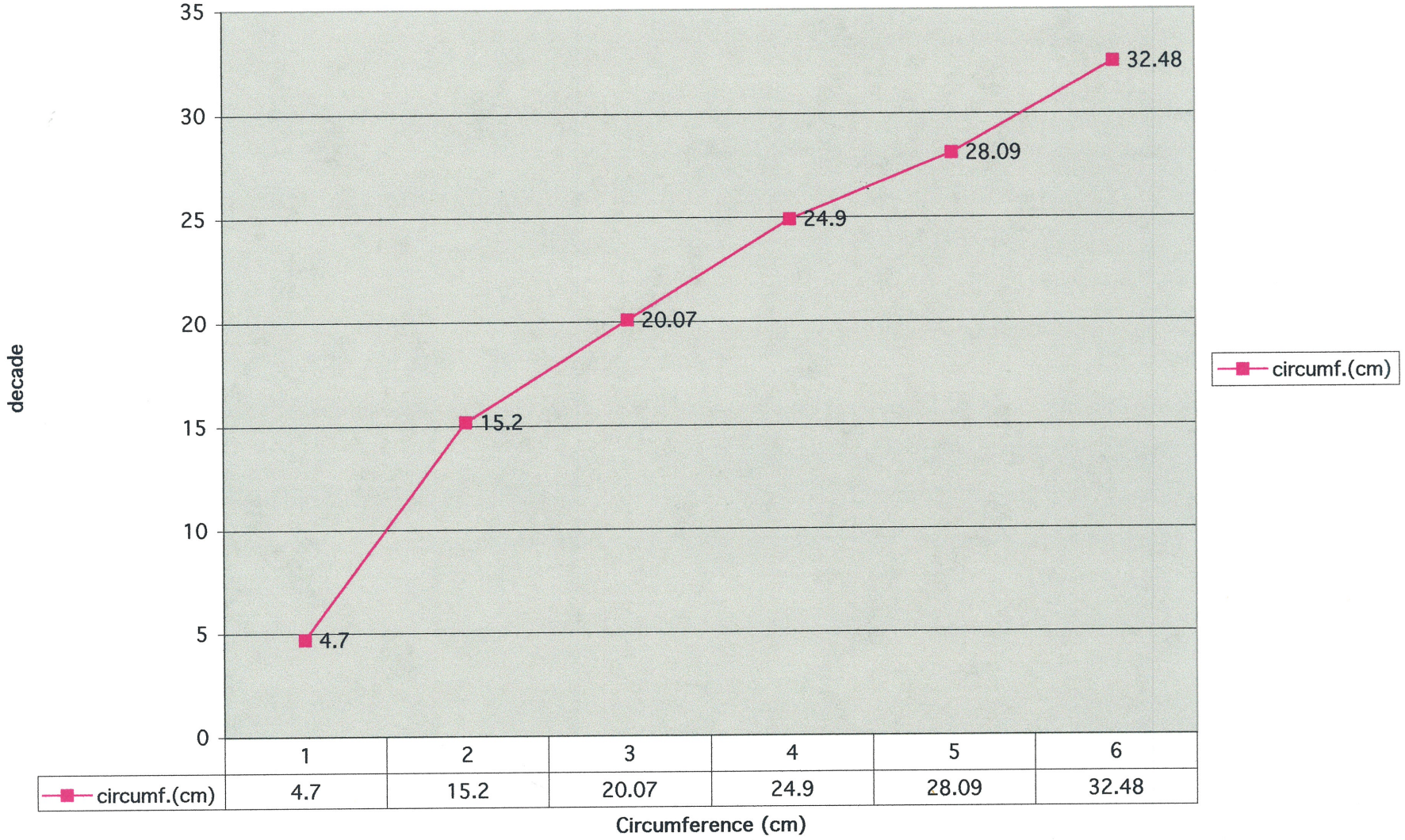
	1	2	3	4	5	6
Year	970	980	990	1000	1010	1020
circumf.(cm)	4.7	15.2	20.07	24.9	28.09	32.48

Chart5



	1	2	3	4	5	6
Year	970	980	990	1000	1010	1020
area (sq cm)	1.77	18.4	31.97	49.27	63.62	83.62

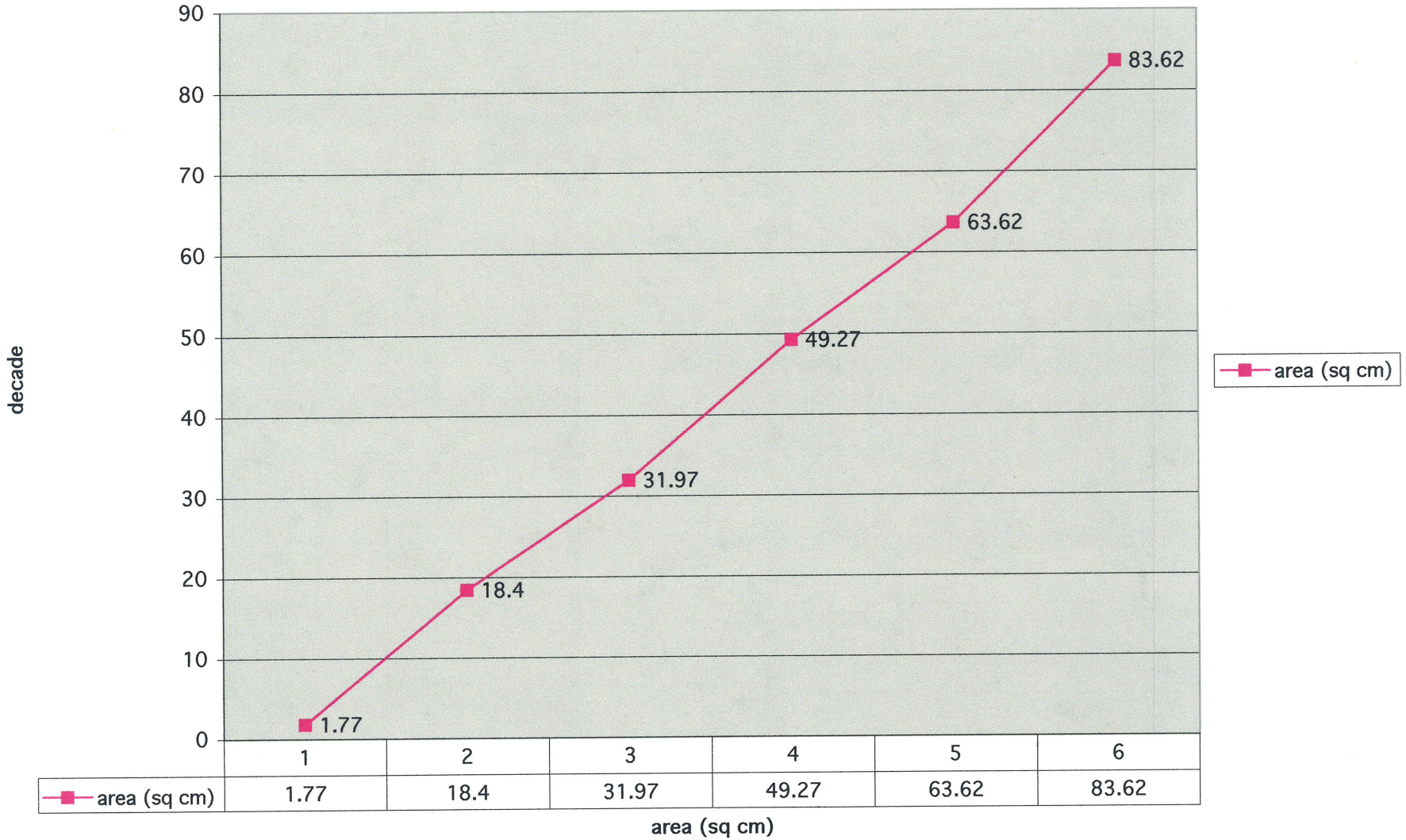
Chaco X-Section circumf.



	1	2	3	4	5	6
circumf.(cm)	4.7	15.2	20.07	24.9	28.09	32.48

Circumference (cm)

Chaco X section area (sq cm)



	1	2	3	4	5	6
area (sq cm)	1.77	18.4	31.97	49.27	63.62	83.62

area (sq cm)

Name: Key

Date: _____

Score: _____ (each question is worth 10 points)

AG 280

Covering Section I-Area

1. 54.28 Ac — A field is 685 feet wide and 3,452 feet long. How many acres does it contain?

2. 196,250 ft² — A circular field is 500 feet across. How many square feet does it contain?
   1,570 ft — What is the circumference of this field?
   785 # — If one pound of seed covers 250 square feet, how many pounds of seed would be required to plant this field?

3. 580.64 ft — A field is 600 feet wide and 1,800 feet long. How far down the field would the 8 acre line be?

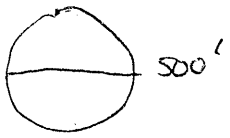
4. .6 gallon or 1 gallon — A spherical water tank needs painting. It is 7 feet in diameter. How many gallons of paint will be needed if one gallon of paint covers 250 square feet?

Check 22.11 gal Key 5.

16.07 gallon or 22.11 gall. if top is included — Four cylindrical silos are 24 feet in diameter and 16 feet tall. How many gallons of paint are needed to paint the sides and the tops of all these silos? One gallon of paint covers 300 square feet.

1 $3,452 \times 685 = 2,364,620$

$\frac{2,364,620}{43560} = 54.28$ AC

2. 

$A = \pi \cdot r^2$

$A = 3.141 (250)^2$

$A = 196,250$

$\frac{196,250}{250} = 785$ #

$C = \pi \cdot D$

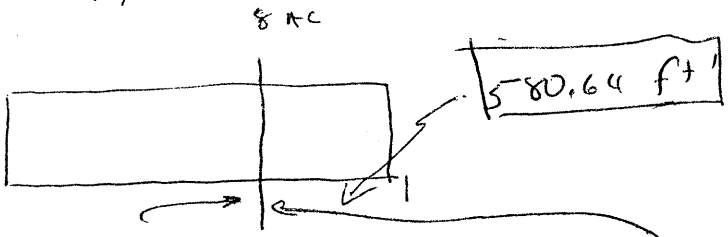
$C = 3.14 \times 500$

3 $L \times A$

$1800 \times 600 = A$

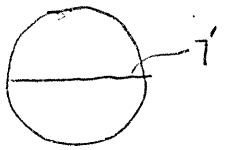
$1,080,000 ft. = A$

$\frac{1,080,000 ft.}{43560} = 24.8$ AC



$\frac{8}{248} = .32 \times 1800 =$

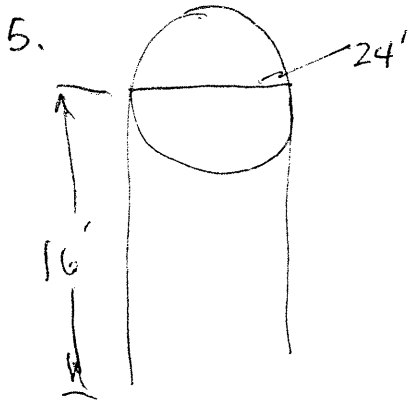
4. $4 \cdot \pi r^2 = A$



$4 \times 3.14 \times (3.5)^2 = A$

$153.86 ft. = A$

$\frac{153.86 ft.}{250 ft/gal} = 6$ gallons or 1 gallon

5. 

$C = \pi \cdot D$

$C = 3.14 \times 24$

75.36

$L \times W = A$

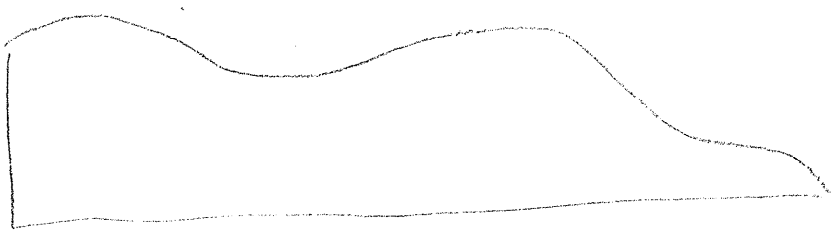
$75.36 \times 16 = A$

$1,205.76 = sq ft$

$4 \times \frac{1,205.76 sq ft}{300} = 16.09$ gallons

4.0192 gallon for 1 silo

22



$$A = \frac{(\frac{1}{2}h_1 + h_2 + h_3 \ldots + h_{12}) \cdot \text{length}}{\#\ \text{parals.}}$$

a) = 30m $\frac{8,015.5}{15} = 534.37 \times \frac{3}{43560} = \frac{3}{215} = \underline{\underline{.4}}$ Ac

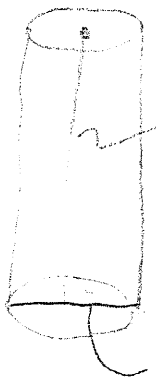
b)

23. $40 \times 80 = \frac{3200\ ft}{250}$

$$\begin{array}{r} 12.8 \text{ gallons} \\ 25 \overline{)\,320.} \\ \underline{25} \\ 70 \\ \underline{50} \\ 200 \\ \underline{200} \end{array}$$

128 gallon

25.



coverage: 300 ft²/gal

$C = \pi \cdot d$

$50.24 = 3.14 \times 16$

$L \times W = A$

$50.24 \times 38 = 1909.12\ ft^2$

$\times 6$

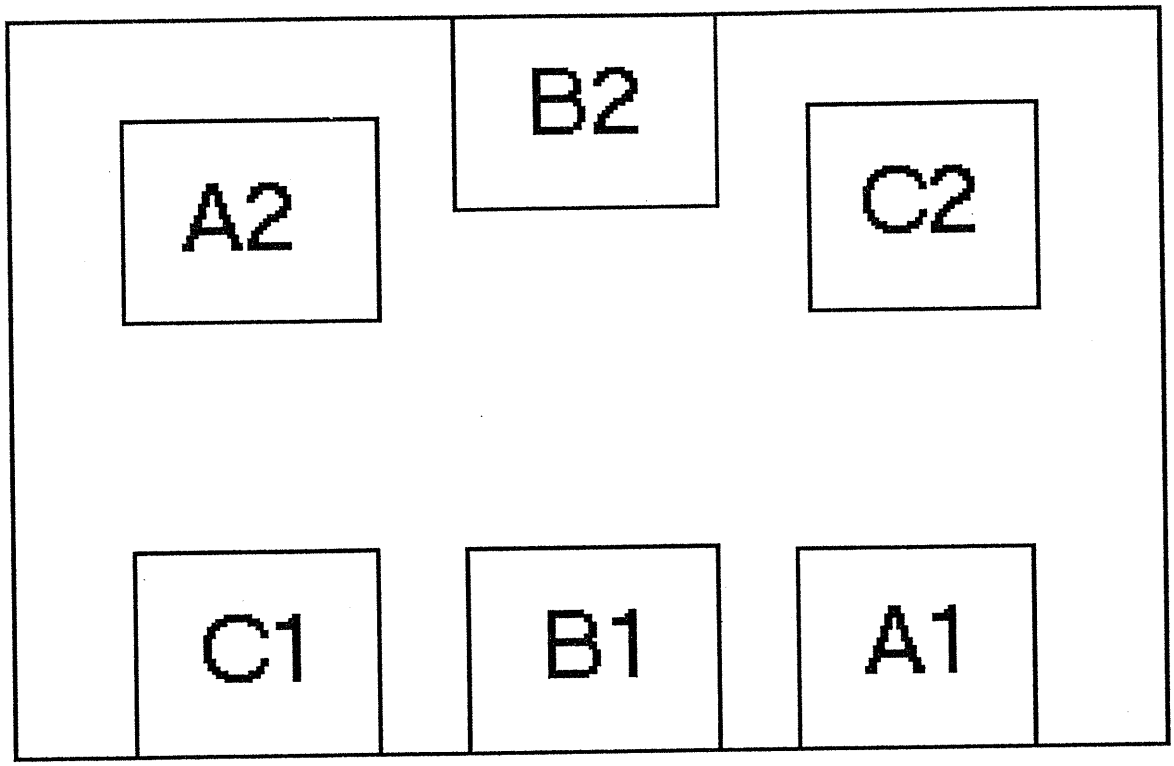
$11,454.72 / 300 = \underline{\underline{38.16 \text{ gallons}}}$

Description	For Education Purposes	For Extension Purposes	Purchasing Information	FIS

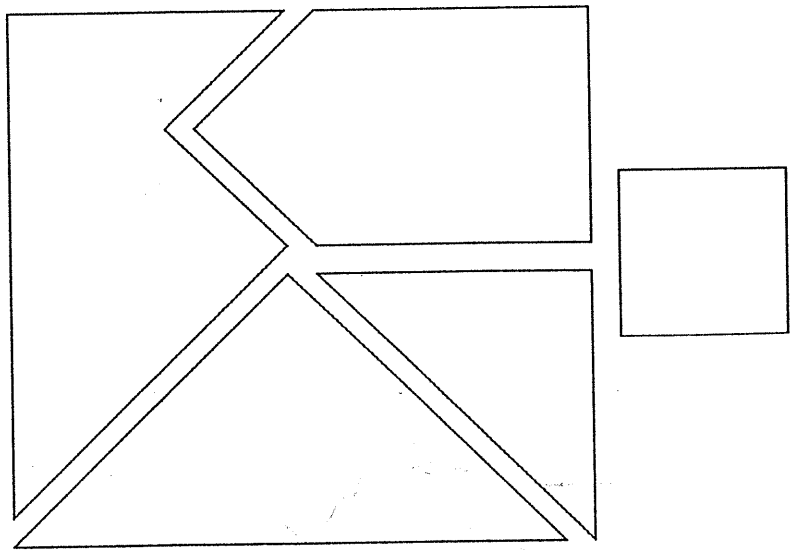
2 weeks → 5 classes w/ exam

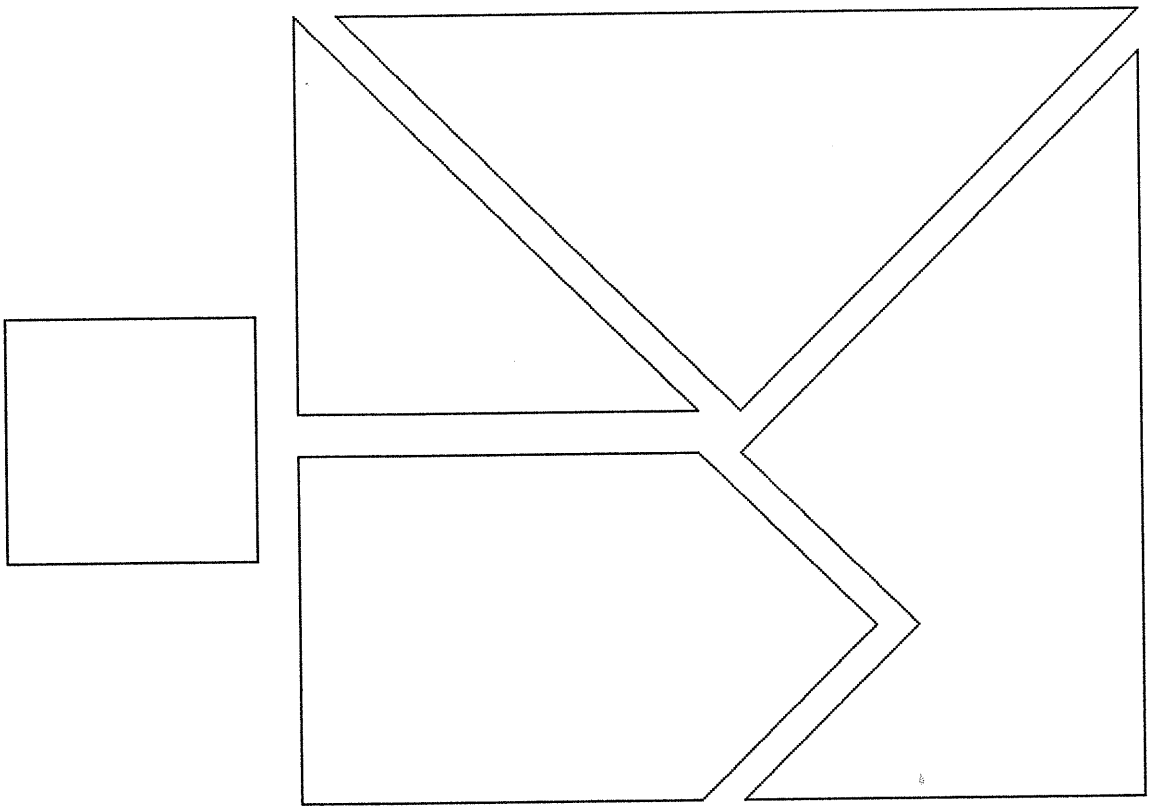
Section III

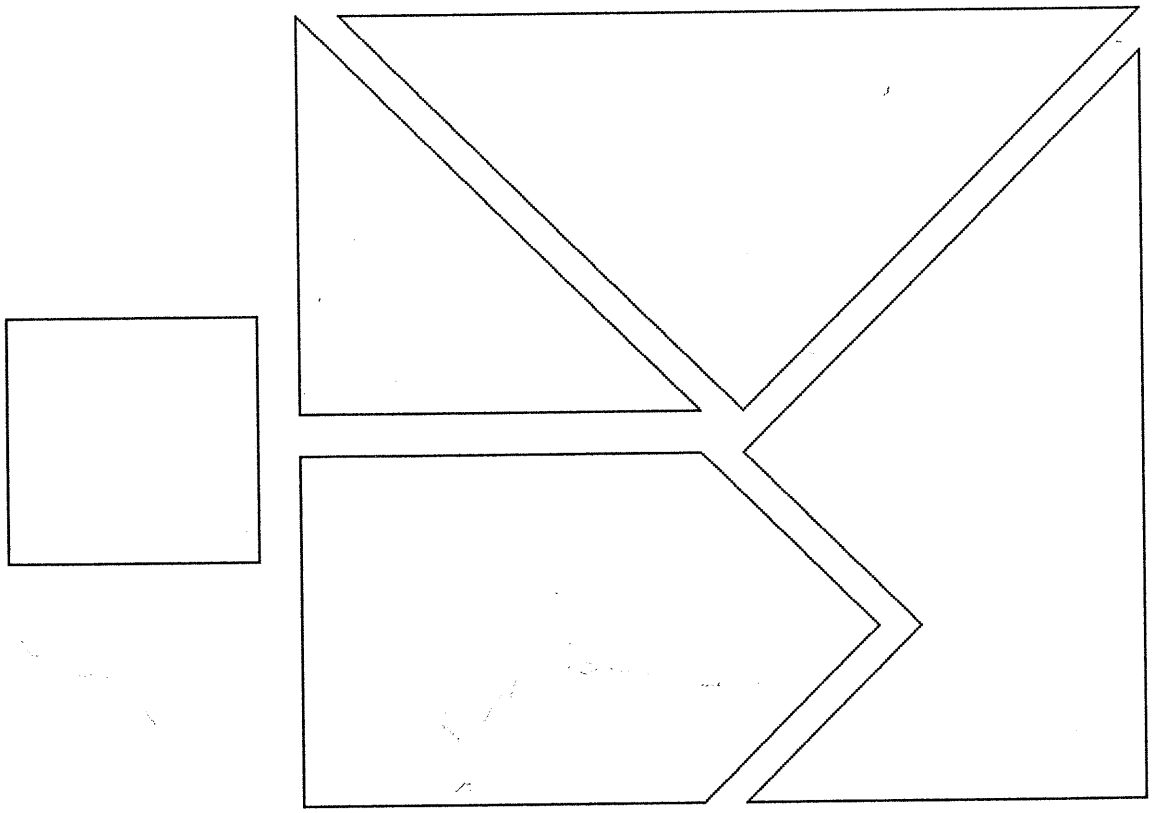
VOLUME

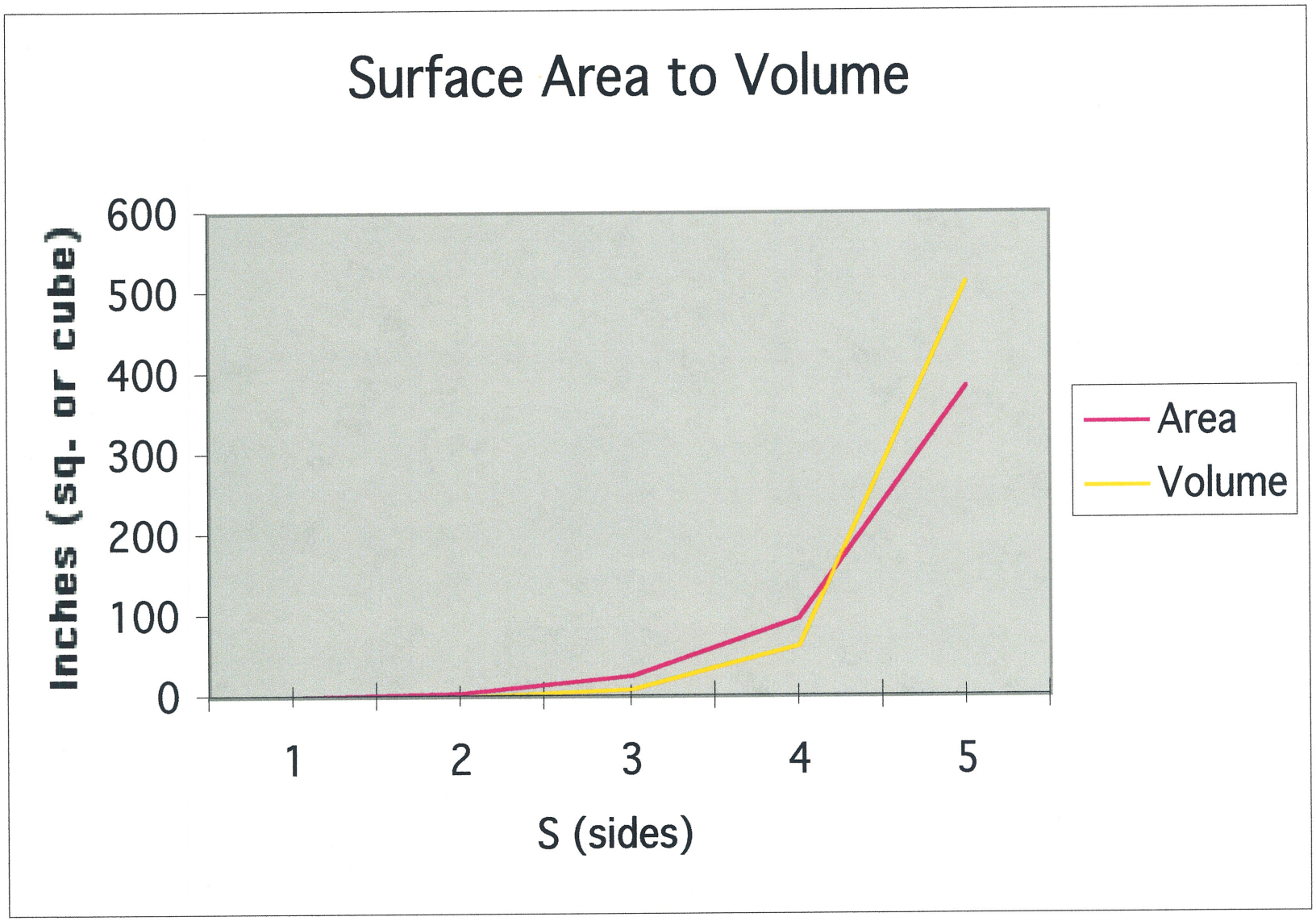


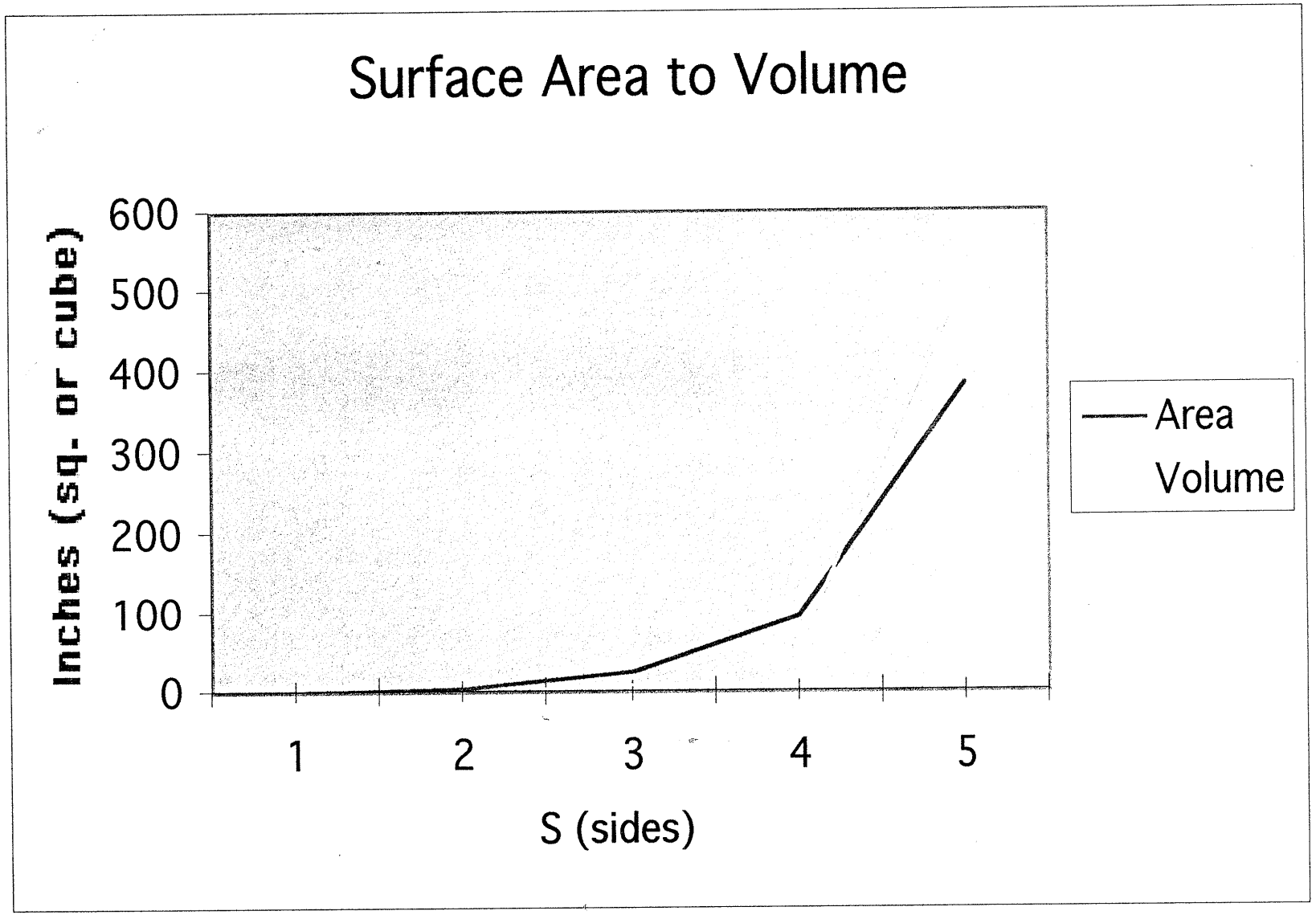
Find a direct path of going from A1 to A2, B1 to B2, and C1 to C2, without crossing lines or touching any border.





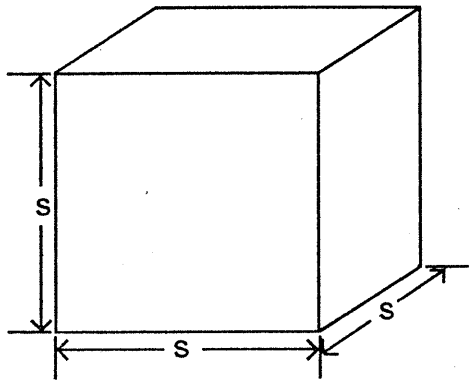



Surface Area to Volume
Inches (sq. or cube)
600
500
400
300
200
100
0
1
2
3
4
5
S (sides)
Area
Volume


Surface Area to Volume
Inches (sq. or cube)
600
500
400
300
200
100
0
1
2
3
4
5
S (sides)
Area
Volume

BASIC FORMULAE FOR MENSURATION OF SOLIDS

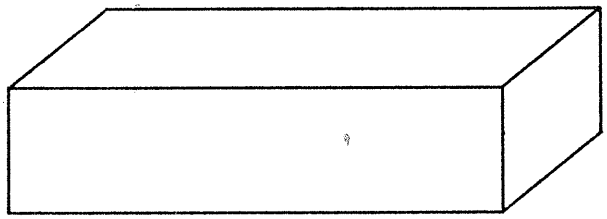
1. CUBE



$V=s^3$

A CUBE is a solid bounded by six squares.

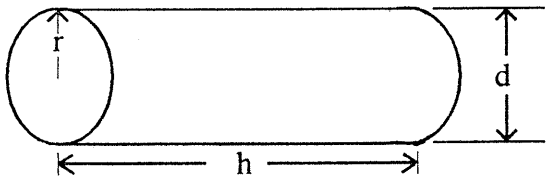
2. RECTANGULAR PARALLELEPIPED



$V = l \times w \times h$

A RECTANGULAR PARALLELEPIPED is one whose bases and faces are all rectangles.

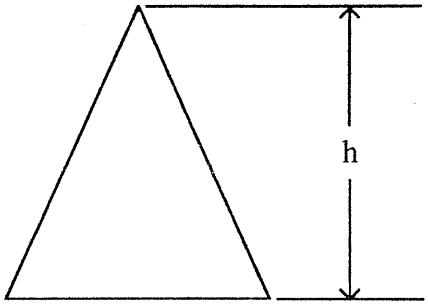
3. CYLINDER



$V=\pi r^2 h$

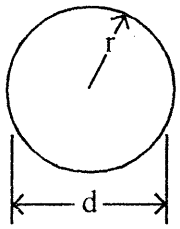
A CYLINDER is a solid bounded by a uniformly curved surface, its ends being equal and parallel circles.

4. CONE



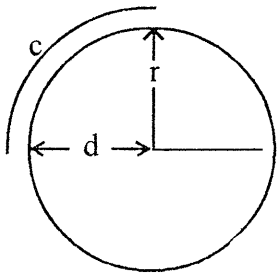
$A = \frac{\pi d^2}{4} = .785\ d^2$

$V = \frac{h}{3}(\pi r^2) = \frac{\pi}{3}\ r^2h = 1.047\ r^2h$



A CONE is a solid whose base is a circle and whose curved lateral surface tapers uniformly to a point, called the vertex.

5. SPHERE



$A = 4\ \pi r^2$

$V = \frac{4}{3}\ \pi r^3 = 4.19\ r^3$

A SPHERE is a solid bounded by a uniformly curved surface, every point of which is equally distant from a point within, called the center.

The RADIUS of a sphere is a straight line joining the center with any point on the surface.

The DIAMETER of a sphere is a straight line passing through the center and terminated at both ends by the bounding surface.

A HEMISPHERE is one of two equal parts into which a sphere may be divided by a plane passing through the center.

KEY

Formulas

$1\ ft^3 = 7.5\ gal$

$A = 4\pi r^2$

$V = 4.19 r^3$

1 2 ft. sphere

$r = 1$

$A = 4\pi(1)^3$

$A = 12.56\ ft^2$

$V = 4.19(1)^3$

$V = 4.119\ ft^3$

31.43 gallons

- RATIO SA : VOL

  12.56 : 4.19

  ~ 3 : 1

2 4 ft sphere

$r = 2$

$A = 12.56 \cdot (2)^2$

$A = 50.24\ ft^2$

- RATIO 50.24 : 33.52

  1.49 : 1

$V = \frac{4}{3}\pi r^3 = 4.19 r^3$

$V = 4.19 \cdot (2)^3$

$V = 33.52\ ft^3$

8x ↑ gallons

251.44 gallons

3 8ft. sphere

$r = 4$

$A = 12.56\ (4)^2$

$A = 200.96\ ft^2$

- RATIO 200.96 : 268.19

  .75 : 1

8x ↑ in gallons

$V = \frac{4}{3}\pi \cdot r^3 = 4.19 r^3$

$V = 4.19 \cdot (4)^3$

$V = 268.19\ ft^3$

2011.43 gallons

Name _____

1. _____ ft. sphere

_____ ft^2
_____ ft^3
_____ gals.

2. _____ ft. sphere

_____ ft^2
_____ ft^3
_____ gals.

3. _____ ft. sphere

_____ ft^2
_____ ft^3
_____ gals.

4. Observations:

1.

2.

3.

4.

5.

Name In Class

15310.08 cu inches

1. A container is 2 ft. 8 inches wide, 3 ft. 4 inches long and 1 foot high. How many cubic inches does it contain?

inches³ in cu³

12×12×12 = 1728

V = l × w × h

V = 2.66 × 3.33 × 1

V = 8.86 cu ft × 1728

V = 15310.08 cu. inches

288 bushels

2. A storage bin is 12 ft. long, 5 ft. wide, and 6 ft. tall. How many bushels of barley will it hold?

(1 cu ft = .8 bushels barley)

V = l × w × h

V = 12 × 5 × 6 cu ft × .8

V = 360 cu ft × .8

14.66 yds

3. A concrete slab is 20 ft. wide, 60 ft. long, and 4 inches thick. How many cubic yards of concrete does it contain?

(27 cu ft / yd) 3×3×3

V = l × w × h

V = 20 × 60 × .33

V = 396 cu ft ÷ 27

152.73 Tons

4. A cylindrical silo is 16 feet in diameter on the inside and 38 feet tall. How many tons of silage does it contain?

Silage 40# / cu. ft.

V = πr²h × 40 ÷ 2000 = tons

V = 7636.48

7636.48 × 40 ÷ 2000 = 152.73 Tons

788.16 cwt.

5. A cylindrical grain bin is 14 feet in diameter and 16 feet tall. What is its capacity in cwt. sacks and tons?

~~152.73 Tons~~

39.41

V = πr²h × .8 × 40

V = 3.14 × 7² × 16

V = 2461.76 cu ft

V × 32/70 ÷ 100 = cwt. sacks

V × 32/70 ÷ 2000 = tons

291.43 gallons

6. A cylindrical fuel tank is 3 feet in diameter and 5½ feet long. How many gallons will it hold?

(1 cu ft = 7.5 gallons)

V = πr²h

V = 3.14 × 1.5² × 5.5 (7.5)

V = 38.86 × 7.5

V = 291.43 gallons

12.56 Tons

7. A water tank is 8 feet in diameter and 8 feet tall. How many tons of water will it hold?

(1 cu. ft H_2O = 62.5

V = πr²h

V = 3.14 × 4² × 8 (62.5#)

V = 401.92 (62.5#)

wt = 25,120 lbs / 2000

Name ____________________

80.65T. 1. A cylindrical silo is 14 feet in diameter OD and 32 feet tall. What is its capacity in tons? The walls are 8 inches thick.

V = πr²×h

3.14

359.2
~~351.62~~ cwt
17.9 ~~17.58~~ T 2. A pile of grain is in a cone shape. It is 15 feet tall at the peak and 49 feet in circumference at the bottom. How many cwt. and tons of grain are there? The barley weighs 47 lbs. per bushel.

49 = πd
d = 15.6'
r = 7.8

V = 1.047 r²h
V = 1.047 × 7.8² × 15
V = 955.5 cu ft × .8 = 764.4 bu. × 46# = 35926.8 ~~35162.4~~ #

35926.8 ~~35162.4~~ / 100 = ~~351.62~~ 359.2 cwt

35926.8 ~~35162.4~~ lbs / 2,000 = 17.9 ~~17.58~~ ton

251.4 ~~251.4~~ gals
2,094.16# 3. A rancher bought a spherical tank at a surplus store. He wants to use the four foot diameter tank for a water tank. How many gallons of water will it hold? How many pounds will it weigh?

V = 4/3 πr³ = 4.19r³ = 4.19 × 2³ = 4.19 × 8 = 33.52

1 cu ft = 7.5 gallons
1 gal = 8.33#

× 7.5 = 251.4 × 8.33 = 2,094.16

_______ 4. A cone of barley is 12 feet tall at the peak and 39 feet in circumference at the base. How many cwt. and tons of grains are there? This barley weighs 44 pounds per bushel.

V = 1.047 × r²h
1.047 (38.56) 12
V = 484.5 cu ft (× .8 bushels)
387.6 bushels (× 44#s)
17054.4# ÷ 100 & 2000

39 = πd
12.42 = d
6.21 = r
170.538 = r²
38.56 = r²

Homework - Thursday 9-9-99 (40pts)

Name Key

15.88 cu. yds. 1. A person is going to buy some concrete for a barn floor. The slab will be 4 inches thick, 20 feet wide and 65 feet long. How many cubic yards of concrete are needed?

$V = l \times w \times h$

$V = 65 \times 20 \times .33$

$V = 429$ cu. ft.

1 cu yd = 27 cu. ft. (3'x3'x3')

$\frac{429 \text{ cu. ft}}{27 \text{ cu. ft}} = 15.88 \text{ cu yds}$

174.2 Tons 2. Some bulk fertilizer is piled in a warehouse in a cone shape. The pile is 27 feet high and 94 feet in circumference at the floor level. The fertilizer weighs 55 pounds per cubic foot. How many tons are in the pile?

1) $C = \pi d$

$94 = 3.14d$

$\frac{94}{3.14} = \frac{3.14d}{3.14}$

$29.94 = d$

$\frac{29.94}{14.97} = r$

2) $V = 1.047 r^2 h$

$V = 1.047 \times 14.97^2 \times 27$

$V = 1.047 \times 224.1 \times 27$

$V = 6,335.1$ cu. ft.

3) $6,335.1 \times 55\#$

$348,430.95$ lbs $\div 2000 = 174.2$ T

4)

38.66 cu yds 3. A concrete slab is to be put into a machine shed. It is to be 6 inches thick, 18 feet wide and 116 feet long. How many cubic yards are needed?

.5

$V = l \times w \times h$

$V = 116 \times 18 \times .5$

$V = 1,044$ cu. ft

1 cu yd = 27 cu. ft

$1044 \div 27 = 38.66$ cu yds

$2,484.44 4. If concrete is delivered for $59.85 per cubic yard, what is the cost of the slab in Problem 3? Include 7.375% sales tax.

38.66

x 59.85

$2,313.80

x .07375 TAX

$170.64

$2,313.80

+170.64

$2,484.44

In class hmwk. 9-7-99 (20 pts)

Name Key

145.5 gallons

5. A spherical fuel tank is 40 inches in diameter. How many gallons of fuel will it hold?

40" = d
20" = r

$V = 4.19r^3 = 4.19 \times 20^3 = 4.19 \times 8000 = 33520$ cu. inches

7.5 gallons = 1 cu ft.

1,728 cu in/cu ft

14 5.5 gallons

19,398 cu. ft

732.5 gallons

6,416.9 lbs w/ tank

6. A rectangular water tank weighs 315 pounds. It is 4½ feet wide, 32 inches tall and 8 feet 2 inches long. What is its capacity in gallons? Total weight in pounds?

$V = l \times w \times h = 4.5 \times 2.66 \times 8.16 = 97.67$ cu. ft.

1 cu ft. = 7.5 gallons = 732.5 gallons

1 gallon = 8.33 lbs = 6,101.9 lbs

+ 315.16 tank

6,416.9 lbs water + tank

In class Thursday

46.5

7. A rancher is going to construct four concrete bases for his grain bins. The round bases are 20 feet in diameter and 12 inches thick. How many cubic yards are needed?

$A = (4)\pi r^2 = 4 \times 3.14 \times 10^2 = 1256$ sq. ft.

$V = A \times h = 1256 \times 1 = 1256$ cu ft $\div 27 = 46.5$ yds

3,928. 175 gal

8. A grower has a steel spheric tank for fuel. It is 10 feet in diameter. How many gallons will it hold?

$V = 4.19r^3 = 4.19 \times 5^2 = 523.75$

7.5 gal = 1 cu ft

523.75 × 7.5

3,928.

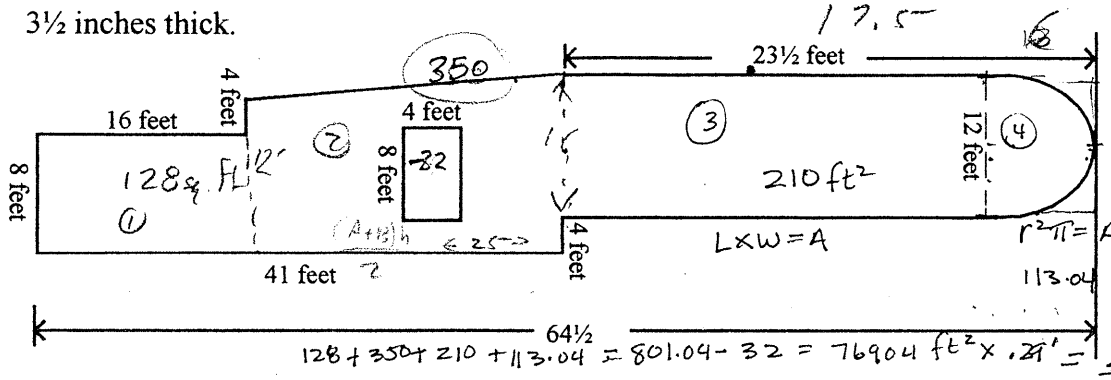
In class 9-8-99 (worked)

Name _____

5 et pd

✓ 9-9

8.26 yd³ 1. Concrete for a patio is to be purchased. How many cubic yards are needed? The slab is 3½ inches thick.



128 + 350 + 210 + 113.04 = 801.04 - 32 = 769.04 ft² x .29' = 223.02 ft³ / 27 = 8.26 yd³

6,301.5 lbs 2. A rancher wants to haul water to some young trees. The tank he wants to put in the back of his pickup is 3 feet 9 inches in diameter and 8 feet 10 inches long. The empty tank weighs 207 pounds. What will be the total weight when the tank is full of water?

45" ÷ 2 = 22.5" 106" long

12 x 12 x 12 = 1728 cubic inches/cu. ft

$V = \pi r^2 h = 3.14 \times 22.5^2 \times 106$

$V = 3.14 \times 506.25 \times 106$

$V = 168500.25$ cu. inches / 1728 = 97.5 cu. ft x 62.5 = 6,094.5 + 207 = 6,301.5

1 cu. ft water = 62.5 lbs

124,189 Tons 3. A silo is 18 feet in diameter and 44 feet tall. It is ⅔ full of silage. How many tons does it contain? The walls are 9 inches thick. 0 - 11

18 - 1.5 - 1.5 = 15 ÷ 2 = 8.25

$V = \pi r^2 h = 3.14 \times 8.25^2 \times 44$

$V = 3.14 \times 68.06 \times 44$

$V = 9,408.28$ cu. ft. x .66 = 6209.46 cu. ft x 40 = 248378. = 200

1 cu. ft silage = 40 lbs

3475.72 lbs 4. A dairyman is building a stand for his molasses tank. He must determine the maximum weight in order to build the stand strong enough. The tank is 30 inches in diameter, 7½ feet long and weighs 164 pounds when empty. How much weight, in pounds, will be on the stand when the tank is full of molasses?

$V = \pi r^2 h = 3.14 \times 1.25^2 \times 7.5$

$V = 3.14 \times 1.5625 \times 7.5$

$V = 36.8$ cu. ft. x 90 = 3311.72 lbs + 164 = 3475.72 lbs

1 cu. ft molasses = 90 lbs

BOARD FEET

one board foot = one piece of lumber - one (1) inch thick, one (1) foot wide and one (1) foot long

one board foot = $\frac{1}{12}$ ft^3 12 board feet = 1 ft^3

$$BF = \frac{\text{number of pieces x inches thick x inches wide x feet long}}{12}$$

Name: Key

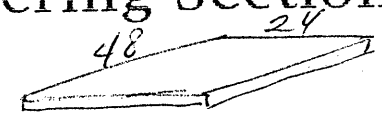
Date: 10/5

Score: 60/60 (each question is worth 10 points)

70% = 42

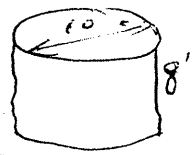
AG 280 Exam

Covering Section II-Volume



576 cu'

1. 21.33 cu yds. A concrete slab is 24 feet wide, 48 feet long, and 6 inches thick. How many cubic yards of concrete does it contain?



2. 4710 gals. A water tank is 10 feet in diameter and 8 feet tall. How many gallons of water will it hold? $V = \pi r^2 h = 62$

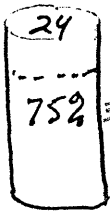
19.62 tons How many tons of water will it hold? 7.5 gal/cu' = 4710 gal

39234.3 lbs ÷ 2000 = 19.62 T

3. 190.76 tons A silo is 24 feet in diameter and 32 feet tall. It is 3/4 full of silage. How many tons does it contain? The walls are 9 inches thick. 24 - 1.5 = 22.5

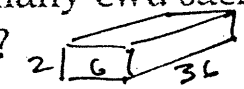
$V = \pi r^2 h$ 9537.75 cu' x 40#/cu' = 381510. ÷ 2000

3/4 full



4. 190.08 cwt. A 2' x 6' x 36' feed tank is full of milo weighing 55 pounds/bushel. How many cwt. sacks does it contain? How many tons?

9.5 tons 19008 ÷ 100 = 190.08 ÷ 2000 = 9.5



432 cu'
x .8
345.6 x 55 = 19

5. 847.8 gals. A rancher bought a 6 foot diameter spherical tank for water storage. How many gallons of water will it hold? How many pounds will it weigh? $V = \frac{4\pi R^3}{3} = \frac{4 \cdot 3.14 \cdot 27}{3} = 113.04$ cu' x 7.5 = 847.8

7062.17 lbs.

6. 986.08 BF (988) How many board feet are in this stack of lumber:

48 - 2" x 8" x 12' (1.33) 5 - 1" x 12" x 12' (1.0)

10 - 4" x 4" x 8' (1.33) 10 - 2" x 4" x 8' (.67)

48 x 12 = 76608 + 10 x 8 = 106.4 + 5 x 12 = 60 + 10 x 8 = 53.6 = 986.08

Name: _____
Date: _____
Score: _____/100 (each question is worth 10 points)

AG 280 Exam

Covering Section II-Volume

1. _____ yds. A concrete slab is 24 feet wide, 48 feet long, and 6 inches thick. How many cubic yards of concrete does it contain?

2. _____ gals. A water tank is 10 feet in diameter and 8 feet tall. How many gallons of water will it hold?
   _____ tons How many tons of water will it hold?

3. _____ tons A silo is 24 feet in diameter and 32 feet tall. It is 3/4 full of silage. How many tons does it contain? The walls are 9 inches thick.

4. _____ cwt. A 2' x 6' x 36' feed tank is full of milo weighing 55 pounds/bushel. How many cwt. sacks does it
   _____ tons contain? How many tons?

5. _____ gals. A rancher bought a 6 foot diameter spherical tank for water storage. How many gallons of
   _____ lbs. water will it hold? How many pounds will it weigh?

6. _____ BF How many board feet are in this stack of lumber:
   48 - 2" x 8" x 12' 5 - 1" x 12" x 12'
   10 - 4" x 4" x 8' 10 - 2" x 4" x 8'

Extra Credit (5 points each):

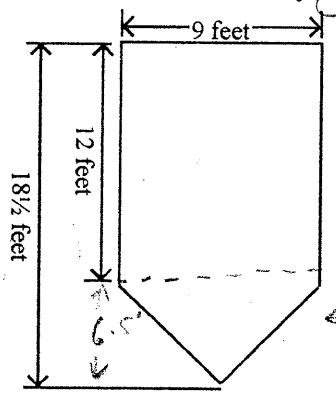
1 gals — A spherical water tank needs painting. It is 8 feet in diameter. How many gallons of paint will be needed if one gallon of paint covers 200 square feet?

57 acres — A field is 2,000 feet wide and 1,243 feet long. How many acres does it contain?

Name _____

425.2 cwt.

_____ 1. A feed tank is full of wheat weighing 59 pounds per bushel. How many cwt. sacks does it contain?



19.8 T

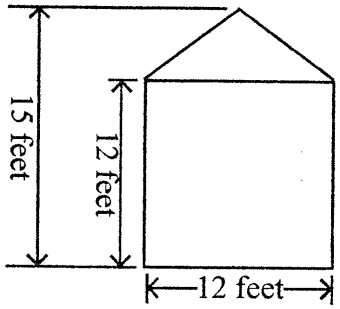
_____ 2. What is the number of tons capacity of milo in the feed tank in Problem 1? This milo weighs 55 pounds per bushel.

4.8

_____ 3. A rectangular fuel can measures 9¼" x 9¼" x 13". How many gallons will it hold?

216.3

_____ 4. A barley grower is going to put up eight storage bins. What is his total storage capacity in tons? Use 46 pound barley. The following is a diagram of one of the bins.



19.65 cu yd

_____ 5. If each of the eight bins in Problem 4 are to be put on 13 foot diameter concrete slabs 6 inches thick, how many cubic yards of concrete are needed?

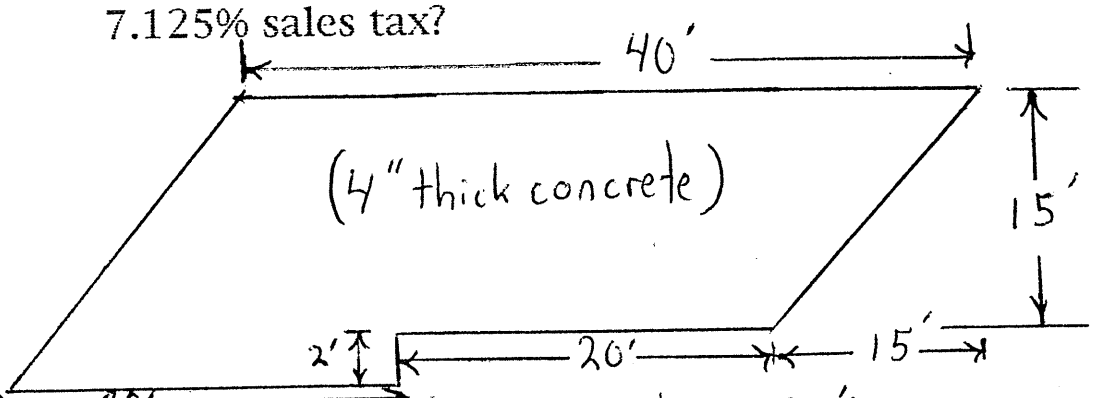
$1257.38

_____ 6. If the concrete in Problem 5 costs $59.60 per cubic yard delivered, what is the cost of the eight slabs? Add 7.375% sales tax.

7. 7.8 yds.

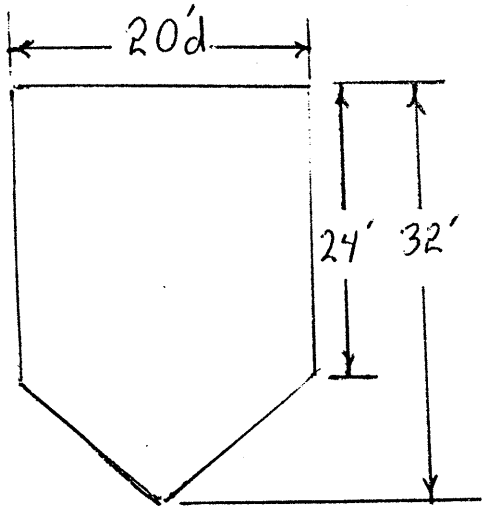
$ 644.85

How many yards of concrete would you have to order to pour a 4" slab in the following shape? How much would it cost at $75.25/yd. with 7.125% sales tax?



8. 6,698.85 Bu.

How many bushels of corn could be stored in a feed tank with the following dimensions?



9. 150 tons

A cone-shaped pile of fertilizer is 16 feet tall and 100.5 feet in circumference. If a cubic foot of fertilizer weighs 70 pounds, how much does the fertilizer in the pile weigh in tons?

10. 941

How many gallons of water can a 5 foot spherical tank hold?

Find Area × Average depth × ~~27.5~~ = cu ft.

(1) $16 \times 8 = A$ $\quad A = L \times w$

$128\ ft^2 = A$

(2) $\frac{(A+b)h}{2} = \frac{(16+12)\cdot 25}{2} = 350\ ft^2 = A$

$L \times w = A$

~~2_b~~ $8 \times 4 = 32\ ft^2$

(3) $17.5 \times 12 = A$ $\quad L \times w = A$

$210\ ft^2 = A$

4. $6^2 \cdot \pi = A$

$36 \cdot \pi = A$

113.04

128
350
210
113.04
801.04
− 32
769.04 ft^2 × .29'

223.02 ft^3 = 8.26 cuyd.

27

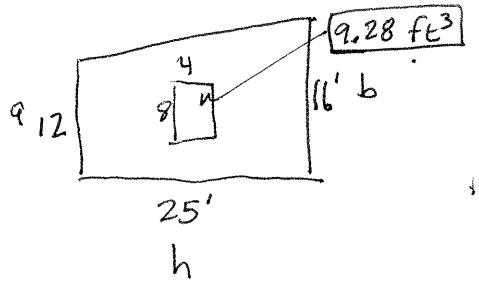
(1) Rectangle $V = L \times w \times h$

$16' \times 8' \times .29' = 37.3\ ft^3 = V$

$3.5'' = .29'$

128 95 2100 210 72 → 1.037

(2)



$25 - 16 = 9$

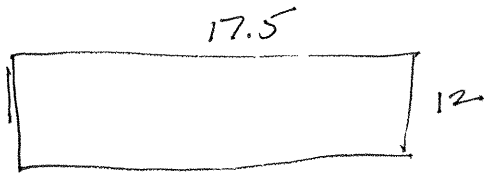
$V = \frac{(a+b)\cdot h}{2} \times .29$

$V = \frac{(12+16)\cdot 25}{2} \times .29$

$V = \frac{28 \cdot 25}{2} \times .29 = 101.5\ ft^3 = V$

4.32

(3)



$23\frac{1}{2} - 6 = 17\frac{1}{2}$

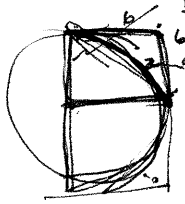
$V = L \times w \times H$

$V = 17.5 \times 12 \times .29$

$V = 60.9\ ft^3$

2.27

(4)



$D = \frac{C}{\pi}$

if $D = 6 \cdot 2$

$\Delta\ r = 6$

$C = \pi \cdot d.$

$C = \frac{37.68\ ft.}{2} = 18.84'$

$V = 12 \times 6 \times .29$

$V = 20.88\ ft^3$

.078

Volume

(1) 37.3

(2) 101.5

(3) 60.9

(4) 20.8

220.5 ft³

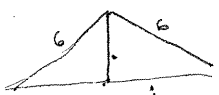
− 9.28 ft

~~22~~

211.22 ft³

27 cuft/yd.

$V = 7.8$ yards



1.037
4.32
2.27
.08

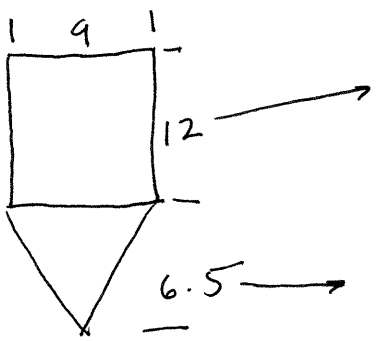
1.04
4.32
2.27
.08

7.71
− .35

7.4

59# / bu. cwt.

1 cu. ft = .8 bushel

1) 

$\pi \times r^2 \times h =$ ~~cuft.~~ cu ft $\times .8$ bu. of grain $\times$ bu. wt = # of grain.

$3.14 \times (4.5)^2 \cdot 12 = 763$ ft^3 $\times .8 \times 59 = 36{,}014.5$# of grain.

610.4 bu

$1.047 \times r^2 \times h = 137.8$ ft^3 $\times .8 \times 59 = 6{,}504.7$# of grain.

110.24 bu

720.6 Bushels

4251.92 cwt. $= \frac{42{,}519.2\text{ \#}}{100}$

2) Tons of milo

milo = 55#/bu.

$$\frac{720.6 \times 55}{2{,}000} = \frac{39{,}633}{2{,}000} = \boxed{19.81 \text{ TON}}$$

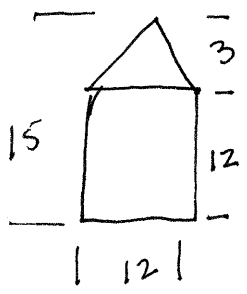
3. ? Gallons

$V = l \times w \times h$

$V = 9.25 \times 9.25 \times 13$

$\text{in}^3 = 1{,}112.31$

$\frac{1{,}112.31}{231} = \boxed{4.8 \text{ gallons}}$ 231 cu in / 1 gallon

4. 

8 bins Capacity in tons

46# barley = 1 bu.

$1.047 \cdot r^2 \cdot h = 113.076$ cu ft.

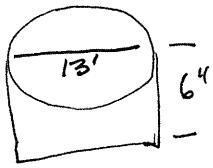
$\pi (6)^2 \cdot h = 1{,}356.48$ cu ft.

1469.56 cu. ft. $\times .8 \times 46 = 54{,}079.7$ # of barley

$\frac{54{,}079.7}{2{,}000}$

27.04 TON / 1 tank $\times 8 = \boxed{216.3}$ TON TOTAL STORAGE

5. 13' dia concrete slabs 6" thick



cu yards of concrete.

$V = \pi r^2 h$

$3.14 (6.5)^2 \cdot .5' = 66.3$ cu. ft.

$66.3 / 27 = 2.456$ cu yd.

2.456×8

total yards 19.65 cu yd.

6. 5.9.60/yd.

19.65
x 59.60
$1,171.02
86.36 sales tax
$1257.38 TOTAL cost of concrete

#8

$V = \pi r^2 h$. cylinder

$V = 1.047 \cdot r^2 \cdot h$. cone

$V = 3.14 (10)^2 \cdot 24$

$V = 7536$ cu ft.

$V = 1.047 \cdot (10)^2 \cdot 8$

$V = 837.6$ cu ft.

Bushels of corn

1 .8 bu / cu ft.

7536
837.6
8473.6 cu ft
.8
6698.88 bushels

9.

$V = 1.047 \cdot r^2 \cdot h$

70# / cu ft

$100.5 = \pi \cdot d$

$\frac{100.5}{3.14} = d$

$32' = d$

$V = 1.047 \cdot (16)^2 \cdot 16$

$V = 1.047 \cdot (256) \cdot 16$

$V = 4288.512 \times 70$

$V = \frac{300195.84}{2000}$

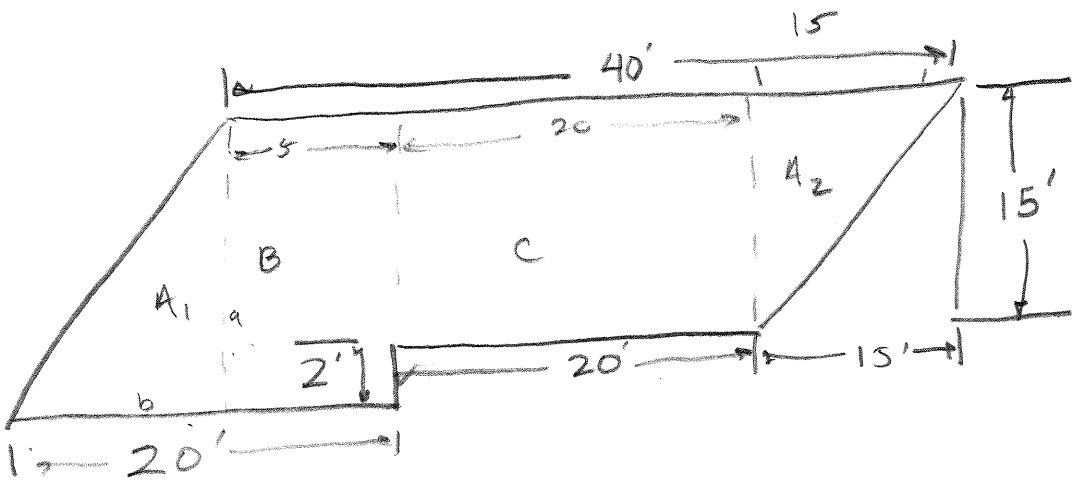
TON = 150.09

100.5'

$C = \pi \cdot d$

(-10)

4" thick
(.1333')



Formulas:

Tri - $A = \frac{Ab}{2}$

Rec. $A = L \times W$

2 cu ft/yd.

A_1	B	C	A_2
$A = \frac{15 \cdot 17}{2}$	$A = 5 \times 17$	$A = 20 \times 15$	$A = \frac{15 \cdot 15}{2}$
$A = 127.5\ ft^2$	$A = 85\ ft^2$	$A = 300\ ft^2$	$A = 112.5$

$127.5 + 85 + 300 + 112.5 = 625 \times .333'$ (thickness) $= 208.3331\ ft^3$

$\frac{208.33}{27} = \boxed{7.72}$ cu yd

7.72
× 75.25
580.63 × 7.125% tax
41.37 tax
$622.00 total

Name _____

1. 2 ft. sphere

$1 ft^3 = 7.5$ gallons

ratio ~ 3:1

12.56 ft^2 A
4.19 ft^3 V
31.43 gals.

2. 4 ft. sphere

~1.5:1

50.24 ft^2
33.52 ft^3
251.44 gals.

3. 8 ft. sphere

$A = 4\pi \cdot r^2$
$V = 4.19 \cdot r^3$

.75:1

200.96 ft^2
268.19 ft^3
2,011.43 gals.

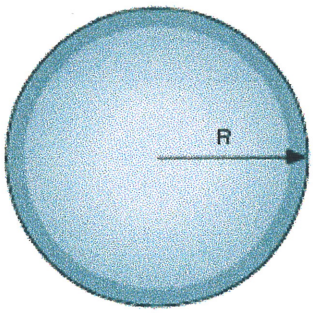
4. Observations:

1. $A = 3V$ when start
2. V approach A & passes it!
3. gallons ~ 8x V
4. As you 2x A you ↑ V by 8
5.

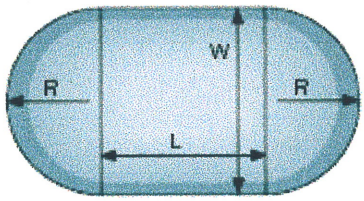
CALCULATING POOL VOLUME

Sunset

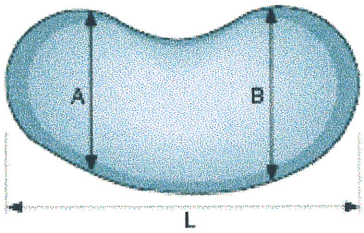
For a variety of decisions you may need to make about your garden pond (such as choosing the correct size pump and filter, the number of fish, or type of fountain), you will need to know its volume, or capacity, in gallons. To find a pool's volume, first calculate its area, which corresponds to the length times the width, then multiply the area by the average depth and a conversion factor (7.5). The trick is finding the "length and width" of a pool with an irregular shape. If you can't find a shape below that approximates your pool, divide the outline into units of simpler shapes, figure the volume of each chunk, and then add them together for the total.



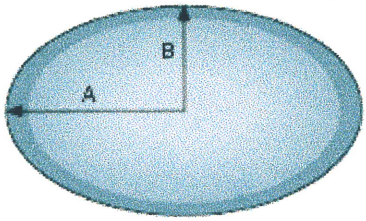
Area = R x R x 3.14
Volume = area x average depth x 7.5



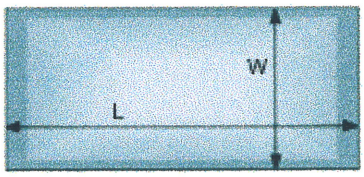
Area = (L x W) + (R x R x 3.14)
Volume = area x average depth x 7.5



Area = (A + B) x L x 0.45 (approx.)
Volume = area x average depth x 7.5



Area = A x B x 3.14
Volume = area x average depth x 7.5



Area = L x W
Volume = area x average depth x 7.5

Intro | Choosing the Site and the Shape | Pool Materials
Installing the Pond | Edgings | A Natural Look | Pond Accessories
Wiring and Electricity | Plants | Fish

Section IV

EQUIPMENT CALIBRATION

Name _____

GRAIN DRILL EXAMPLE

1. 8' grain drill, 75" circumference wheels. To calibrate using 10 revolutions. If ½ lb. of seed is dropped what is the rate per acre?

A. $\frac{75"C}{12} = 6.25'C \times 10 \text{ REVS} = 62.5'l \times 8'w = 500 FT^2$

B. $\frac{.5\#}{500 FT^2} \propto \frac{43.56\#}{43560} \rightarrow 44 \#/AC$

$.5 \cdot 43560 = 21780$

$500 \cdot X = 21780$

$X = \frac{21750}{500}$

① $80'' = 6.67'C \times 20 \text{ REVS} = 133.33'$

$\times 12'w = 1600 \text{ FT}^2$

$$\frac{2.5\#}{1600} \text{ of } \frac{(68\#)}{43560}$$

② $74'' = 6.17'C \times 20 \text{ REVS} = 123.33'$

$\times 10'w = 1233.33 \text{ FT}^2$

$$\frac{3.5\#}{1233} \text{ of } \frac{(124\#)}{43,560}$$

$3 \text{ MPH} \times 10 \text{ HRS} = 30 \text{ MILES}$

$\times 5,280' = 158,400'l$

$\times 10'w = \frac{1,584,000 \text{ FT}^2}{43,560} = \underline{36.36 \text{ AC}}$

Name _____

CALIBRATION

_____ 1. You have a 12' drill with 91 inch circumference wheels. In calibrating it with 20 revolutions, 3¼ lbs. of seed are dropped. What is the seeding rate at this setting?

$91"C = 7.58'C \times 20 \text{ REVS} \times 12'W = 1,820 FT^2$

$\frac{3.25}{1820} \propto \frac{78\#}{43560}$

_____ 2. A 6-row planter has 44 inch circumference wheels and is set at 30" centers. ½ lb. of seed is dropped with 20 revolutions. What is the seeding rate?

$3.67'C \times 20 \text{ REVS} \times 15'W = 1101 FT^2$

$\frac{.5}{1101} \propto \frac{19.8\#}{43560}$

_____ 3. A 16' drill with 88 inch circumference wheels is calibrated with 25 revolutions. This drops 4½ lbs. of seed. What is the seeding rate?

$88"C = 7.33'C \times 25 \text{ REVS} \times 16'W = 2,933 FT^2$

$\frac{4.5}{2,933} \propto \frac{67\#}{43560}$

_____ 4. A 4-row planter is set with 30" centers. The 26 inch circumference wheels are turned 25 times. 3 oz. of seed are dropped. How many pounds per acre is this?

$2.17'C \times 25 \text{ REVS} \times 10'W = 542.5 FT^2$

$\frac{.1875\#}{542.5} \propto \frac{15\#.}{43560}$

Name _____

CALIBRATION

_____ 1. You have a 12' drill with 91 inch circumference wheels. In calibrating it with 20 revolutions, 3¼ lbs. of seed are dropped. What is the seeding rate at this setting?

_____ 2. A 6-row planter has 44 inch circumference wheels and is set at 30" centers. ½ lb. of seed is dropped with 20 revolutions. What is the seeding rate?

_____ 3. A 16' drill with 88 inch circumference wheels is calibrated with 25 revolutions. This drops 4½ lbs. of seed. What is the seeding rate?

_____ 4. A 4-row planter is set with 30" centers. The 26 inch circumference wheels are turned 25 times. 3 oz. of seed are dropped. How many pounds per acre is this?

Name _____

CALIBRATION

81 #/AC 1. A grain drill is 16 feet wide, has 96 inch circumference wheels, calibrated with 20 revolutions, and drops 4¾ pounds of seed. What is its seeding rate per acre?

96" = 8' x 20 REVS x 16'w = 2,560 FT²

$\frac{4.75\#}{2560} \propto \frac{80.8\#}{43560}$

24 #/AC 2. A 12 foot grain drill has 77 inch circumference wheels, calibrated with 30 revolutions and drops 1¼ lbs. of seed. What is the seeding rate at this setting?

77" = 6.42' x 30 REVS x 12'w = 2310 FT²

$\frac{1.25}{2310} \propto \frac{23.6\#}{43560}$

10.4 #/AC 3. A 6-row planter is set on 30 inch centers, has 42 inch circumference wheels, calibrated with 20 revolutions, and drops 4 ounces of seed. How many pounds per acre is it seeding? 42" = 3.5'c x 20 REVS x 15'w = 1,050 FT²

$\frac{.25\#}{1,050} \propto \frac{10.4\#}{43560}$

12.9 #/AC 4. A 4-row planter is set on 30 inch centers, has 38 inch circumference wheels, calibrated with 20 revolutions, and drops 3 ounces of seed. How many pounds per acre is it seeding? 38" = 3.17'c x 20 REVS x 10'w = 633 FT²

$\frac{.1875}{633} \propto \frac{12.9\#}{43560}$

Name _____

CALIBRATION

_____ 1. A grain drill is 16 feet wide, has 96 inch circumference wheels, calibrated with 20 revolutions, and drops 4¾ pounds of seed. What is its seeding rate per acre?

_____ 2. A 12 foot grain drill has 77 inch circumference wheels, calibrated with 30 revolutions and drops 1¼ lbs. of seed. What is the seeding rate at this setting?

_____ 3. A 6-row planter is set on 30 inch centers, has 42 inch circumference wheels, calibrated with 20 revolutions, and drops 4 ounces of seed. How many pounds per acre is it seeding?

_____ 4. A 4-row planter is set on 30 inch centers, has 38 inch circumference wheels, calibrated with 20 revolutions, and drops 3 ounces of seed. How many pounds per acre is it seeding?

(20 points) Thurs. 9-30-99

Name Key

8 x 36 = 24'

45.5 #/AC 1. A 8-row planter is set on 36 inch centers, has 40 inch circumference wheels, calibrated with 20 revolutions, and drops 1 2/3 pounds of seed. How many pounds per acre is it seeding?

40" = 3.33'C x 20 REVS x 24'W = 1598 FT²

$\frac{1.67\#}{1598} \propto \frac{45.5\#}{43560}$

138 #/AC 2. A grain drill is 16 feet wide, has 75 inch circumference wheels, calibrated with 20 revolutions, and drop 6 1/3 lbs. of seed. How many pounds of seed per acre is it seeding?

75" = 6.25'C x 20 REVS x 16'W = 2000 FT²

$\frac{6.33\#}{2000} \propto \frac{138\#}{43560}$

145 #/AC 3. A four row planter is set up for 30 inch centers, has 27 inch circumference wheels, calibrated with 30 revolutions and drops 2 pounds 4 ounces of seed. How many pounds per acre is it seeding?

27" = 2.25'C x 30 REVS x 10'W = 675 FT²

$\frac{2.25}{675} \propto \frac{145.2\#}{43560}$

118 #/AC 4. A grain drill is 16 feet wide, has 66 inch circumference wheels, calibrated with 20 revolutions, and drops 4 3/4 pounds of seed. What is its seeding rate per acre?

66" = 5.5'C x 20 REVS x 16' = 1760 FT²

$\frac{4.75}{1760} \propto \frac{117.6\#}{43560}$

Name _____

_____ 1. A 8-row planter is set on 36 inch centers, has 40 inch circumference wheels, calibrated with 20 revolutions, and drops $1\frac{2}{3}$ pounds of seed. How many pounds per acre is it seeding?

_____ 2. A grain drill is 16 feet wide, has 75 inch circumference wheels, calibrated with 20 revolutions, and drop $6\frac{1}{3}$ lbs. of seed. How many pounds of seed per acre is it seeding?

_____ 3. A four row planter is set up for 30 inch centers, has 27 inch circumference wheels, calibrated with 30 revolutions and drops 2 pounds 4 ounces of seed. How many pounds per acre is it seeding?

_____ 4. A grain drill is 16 feet wide, has 66 inch circumference wheels, calibrated with 20 revolutions, and drops $4\frac{3}{4}$ pounds of seed. What is its seeding rate per acre?

Name_____

PLB 176
Calibration #2

43,560 ft^2 in one acre
5280 ft in one mile
3,786 milliliter in one gallon
128 ounces in one gallon
60 minutes in one hour

You are going to apply Devrinol 50 WP (contains 50% active ingredient) preplant incorporated at the rate of 0.75 lb ai/sprayed acre for weed control in direct seeded tomatoes. Your 200gallon sprayer will apply a 12-inch band of Devrinol 50 WP down the center of the 5-ft bed. For proper soil incorporation of the herbicide you would like the tractor speed at 2 miles per hour. The label states that you apply the recommended rate of Devrinol 50 WP in 20 to 40 gallons of water per sprayed acre.

A. You pick a gallon per sprayed acre rate of spray solution and then determine the needed nozzle output in milliliters per minute.

I choose _____ gallons of spray solution / sprayed acre.

Nozzle output will be _____ milliliters of spray solution per minute.

B. How much Devrinol 50 WP (product) do you add to each tank full of water?

PLB 176
Calibration #2

43,560 ft^2 in one acre
5280 ft in one mile
3,786 milliliter in one gallon
60 minutes in one hour

You are going to apply Devrinol 50 WP (contains 50% active ingredient) preplant incorporated at the rate of 0.75 lb ai/sprayed acre for weed control in direct seeded tomatoes. Your 200gallon sprayer will apply a 12-inch band of Devrinol 50 WP down the center of the 5-ft bed. For proper soil incorporation of the herbicide you would like the tractor speed at 2 miles per hour. The label states that you apply the recommended rate of Devrinol 50 WP in 20 to 40 gallons of water per sprayed acre.

A. You pick a gallon per sprayed acre rate of spray solution and then determine the needed nozzle output in milliliters per minute.

I choose 20 gallons of spray solution / sprayed acre.
Nozzle output will be 302.9 milliliters of spray solution per minute.

12" band / 12 inches/ft = 1ft
2 miles/hour X 5280 ft/mile X 1hour/60 minutes = 176 ft/minute * 1ft = 176 ft^2/ minute.
176 ft^2/ minute divided by 43560 ft^2/ acre = .004 acres/minute
20 gallons/acre X .004 acres/minute = 0.08 gallons/minute X 3786 ml/gallon = 302.9ml / minute.

20 gallons/ acre = 302.9 ml
25 gallons/ acre = 378.6 ml
30 gallons/ acre =454.3 ml,
40 gallons/acre = 605.8 ml

B. How much Devrinol 50 WP (product) do you add to each tank full of water?

0.75 lb ai/acre divided by .50 lb ai/ 1 lb product = 1.5 lb product/ acre
200 gallon/ tank divided by 20 gallons/ acre = 10 acres/ tank * 1.5 lb product/ acre = 15 lb Devrinol/ tank

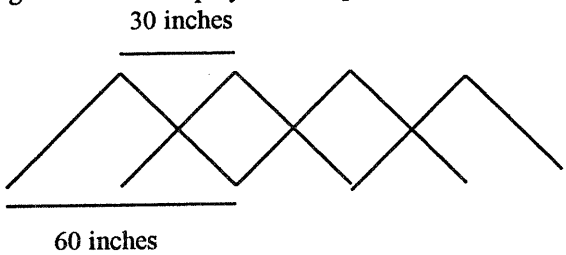
20 gallons/ acre = 15 lb Devrinol/ tank
25 gallon/ acre = 12 lb Devrinol/ tank
30 gallon/ acre = 9.99 lb Devrinol/ tank
40 gallons/ acre = 7.5 lb Devrinol/ tank

Plant Biology 176
Calibration 3
2/21/2001

Name_____

43,560 ft^2 in one acre
5,280 feet in one mine
3,786 milliliters in one gallon
128 ounces in one gallon
60 minutes in one hour

You are going to apply 2,4-D Amine (contains 3.8 lb ae per gallon) at the rate of 0.5 lb ae/ Acre to wheat for broadleaf weed control. Your sprayer has 12 flood nozzles each spraying a 60-inch band but is spaced 30 inches apart to double overlap the spray patterns that will provide optimum coverage along the spray boom. The 100 gallon sprayer is spraying a 30 foot band. Each nozzle output is 57.5 ounces of spray solution per minute and the label recommends that " drift from ground application may be reduced by applying 20 gallons or more spray solution per acre."



You choose gallons per sprayed acre rate and then calculate the proper tractor speed in miles per hour.

a.) I choose _____ gallons per sprayed acre. The tractor speed is _____MPH

b.) How much 2,4-D Amine (product) will you apply per sprayed acre?

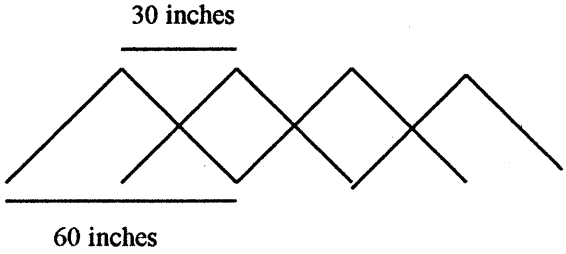
c) How much 2,4-D Amine (product) do you add to each tank full of water?

Plant Biology 176
Calibration #3a key

Name_____

43,560 ft^2 in one acre
5,280 feet in one mine
3,786 milliliters in one gallon
128 ounces in one gallon
60 minutes in one hour

You are going to apply 2,4-D Amine (contains 3.8 lb ae per gallon) at the rate of 0.625 lb ae/ Acre to wheat for broadleaf weed control. Your sprayer has 12 flood nozzles each spraying a 60 inch band but are spaced 30 inches apart to double overlap the spray patterns which will provide optimum coverage along the spray boom. The 150 gallon sprayer is spraying a 30 foot band. Each nozzle output is 38.4 ounces of spray solution per minute and the label recommends that " drift from ground application may be reduced by applying 10 gallons or more spray solution per acre.



You choose a gallons per sprayed acre rate and then calculate the proper tractor speed in miles per hour.

a.) I choose __10__ gallons per sprayed acre. The tractor speed is _____MPH

12 nozzles * 38.4 oz / minute /(128 oz/ gallon) = 3.6 gallons/ minute
(3.6 gallons/ minute)/(10 gallon/Acre)= 0.36 Acres/minute * 43560 ft^2/Acre = 15681.6ft^2/minute
(15681.6ft^2/minute)/ 30 ft (band width) = (522.72 ft/minute)*(60 minutes/hour) /(5280ft/mile)=5.94 MPH
15 gpa = 3.96 mph
20 gpa = 2.97 mph
25 gpa = 2.37 mph

b.) How much 2,4-D Amine (product) will you apply per sprayed acre?

(0.625 lb ai/A)/(3.8 lb ai/gallon) = 0.164 gallon of 2,4-D Amine/acre

c) How much 2,4-D Amine (product) do you add to each tank full of water?

(150 gallon/tank) / (10 gallons/Acre) = 15 Acres/tank * 0.164 gallons / Acre = 2.46 gallons 2,4-D Amine/tank

15 gpa = 1.64 gallon/tank,
20 gpa = 1.23 gallons/ tank,
25 gpa = 0.98 gallons/tank

Plant Biology 176
Calibration #4

Name_____

43,560 ft^2 in one acre
3,786 milliliters in one gallon
128 oz in one gallon
5,280 feet in one mile
60 minutes in one hour.

You are going to apply Roundup Ultra (contains 4 lb active ingredient per gallon) at the rate of 0.325 lb ai/sprayed acre and Princep 90 DF (90 % active ingredient) at the rate of 2.5 lb ai/ sprayed acre to your 500 acre vineyard. The grapes are planted in rows and the rows are 7.5 feet apart. Your 100 gallon sprayer has 1 OC015 nozzle that is delivering 19.5 ounces of spray solution per minute and is spraying a 36 inch band down the vine row. To insure proper coverage the 36 inch spray band is overlapped (sprayed twice once from each side of the vine row).

36 inch X X X X X X X vine row

A. If your sprayer is traveling at the speed of 3.35 miles per hour what is your sprayer output in gallons of spray solution per sprayed acre?

B. How much Roundup Ultra (product) do you add to each tank full of water?

C. How much Princep 90 DF (product) do you add to each tank full of water?

D. How much Roundup Ultra (product) and Princep 90 DF (product) do you need to strip spray your vineyard?

Plant Biology 176 Name_____
Calibration #3 4

43,560 ft^2 in one acre
3,786 milliliters in one gallon
128 oz in one gallon
5,280 feet in one mile
60 minutes in one hour.

You are going to apply Roundup Ultra (contains 4 lb active ingredient per gallon) at the rate of 0.325 lb ai/sprayed acre and Princep 90 DF (90 % active ingredient) at the rate of 2.5 lb ai/ sprayed acre to your 500 acre vineyard. The grapes are planted in rows and the rows are 7.5 feet apart. Your 100 gallon sprayer has 1 OC015 nozzle that is delivering 19.5 ounces of spray solution per minute and is spraying a 36 inch band down the vine row. To insure proper coverage the 36 inch spray band is overlapped (sprayed twice once from each side of the vine row).

36 inch X X X X X X X vine row

A. If your sprayer is traveling at the speed of 3.35 miles per hour what is your sprayer output in gallons of spray solution per sprayed acre?
a) Gallons/ minute. 19.5 oz/ minute + 19.5 oz/ minute = 39 oz/minute divided by 128 oz/gallon = 0.305 gallons/minute

b) Acres/minute. 3.35 miles/hour X 1 hour/60 minutes X 5280 ft / mile = 294.8 ft/minute
294.8 ft/minute X 3 ft = 884.8 ft^2 /minute divided by 43,560 ft^2/acre = .0203 acres/minute
0.305 gallons/minute divided by .0203 acres/minute = 15 gallons/ acre.

B. How much Roundup Ultra (product) do you add to each tank full of water?
0.325 lb ai/acre divided by 4 lb ai/ gallon = .08125 gallons Roundup Ultra/ acre
100 gallon/tank divided by 15 gallons/acre = 6.66 acres/ tank
.08125 gallons/acres X 6.66 acres/tank = .54 gallons of Roundup Ultra/tank

C. How much Princep 90 DF (product) do you add to each tank full of water?
2.5 lb ai/acre divided by .90 lb ai/1 pound Princep = 2.77 pounds Princep /acre
100 gallon/tank divided by 15 gallons/acre = 6.66 acres/ tank
2.77 lb /acre X 6.66 acres/tank = 18.5 lb Princep/ tank

D. How much Roundup Ultra (product) and Princep 90 DF (product) do you need to strip spray your vineyard?
500 acres total x 3 ft sprayed/ 7.5 ft total = 200 acres sprayed
Roundup Ultra 200 acres X .08125 gallons/acre = **16.25 gallons**
Princep 200 acres X 2.77 lb/acre = **554 lb**

CROP PRODUCTION PROBLEMS

Fertilizers

Knowledge is ever-growing and expanding in the field of plant nutrition and fertilizer practices. New and improved methods are being unveiled at a relatively rapid rate. New materials are available to growers and rates of application continually change. Adaptation to these trends relies heavily on practical mathematical skills on the part of the grower, the fertilizer salesman and dealer as well as students of agriculture.

The tables which follow are useful in working out problems relating to fertilizing ingredients in commercial fertilizers.

Nitrogen Content in Some of the Common Nitrogen Fertilizers

Name of Fertilizer	% Nitrogen
Ammonium sulfate	21
Ammonium nitrate	34
Anhydrous ammonia	82
Aqua ammonia	20
Urea	46
Calcium nitrate	16

Phosphoric Acid Content (P_2O_5) in Common Phosphorus Fertilizers

Name of Fertilizer	$\%P_2O_5$
Single superphosphate	20
Triple superphosphate	45

Potash Content (K_2O) in Common Potassium Fertilizers

Name of Fertilizer	$\%(K_2O)$
Potassium sulfate	53
Potassium chloride	62

Fertilizer & Grain Drill Quiz

Key

1. You want to plant 9 acres of oats at 100 pounds per acre. Your grain drill is 12 feet wide with a wheel circumference of 112". After rotating the tire 20 times you collect 3/4 of a pound of seed. At this current setting what would be your **planting rate** (pounds per acre)? If the drill setting is at 12 what **setting** would it have to be to achieve 100#/ acre?

112" = 9.3'

$9.3 \times 20 \times 12 = \frac{2,240 \text{ ft}^2}{43560} = .0514$ of ac.

$\frac{12}{14.58} \propto \frac{X}{100}$

$1200 = 14.58X$

$\frac{82}{1} = X$

$\frac{.75}{2,240} \propto \frac{X}{43560}$ $\quad 32670 = 2240X$

$\frac{32670}{2240} = X = 14.58\#/Ac.$

+15

2. We have a 6-acre field that is scheduled to have alfalfa planted. Our PCA (Pest Control Advisor) says that we need fertilize it at the time of planting at the rate of 200 pounds to the acre (N). We will be using ammonia nitrate, how much of it will we need per acre? How much for the 6 acres?

$\frac{200}{.34} = 588.24\#$ $\times 6 = \frac{3,529.4}{2000} = 1.76$ TON

+15

3. You plan on planting 22 acres of cover crop this winter on ground that you farmed Sudan grass on this summer. You a soil sample done and test it for Nitrogen. (Soil sample results: Nitrogen 7 pounds/ac).

a. How many pounds of Nitrogen/ acre will you apply ? ~~You will need how many pounds of nitrogen/acre?~~

120# of N

+2

120 − 7 = 113# of N

Costs:			
	Urea	$225/Ton	.244
	Aqua	$127/Ton	.317
	NH_3SO_4	$183/Ton	.435
	NH_3NO_3	$ 200/Ton	.29

(the least expensive)

List the cost per lb N on the ~~to~~ the right of each product

225 ÷ 2000 = .1125 ÷ .46 = .24

.06 ÷ .20 = .317

.09 ÷ .21 = .435

.1 ÷ .34 = .29

+8

b. How much fertilizer will you have to buy to cover your field and how much will it cost?

+10

$\frac{113}{.46} = 245.6\#$ of urea/Ac $\quad 22 = 5,404.3$

$\frac{5,404.3}{2000} = 2.7$ tons = $607

180 / .16 = 75 / .82

Name _____

_____ 1. A grower wants to apply 125 lbs. of actual nitrogen per acre to a crop using ammonium sulfate. How many pounds of fertilizer will he apply per acre? (Pounds of active fertilizer desired, in this case nitrogen ÷ analysis of material used = pounds of fertilizer material needed) How many tons are needed for 65 acres?

$\frac{125\#N}{.21} = 595\#AS/AC \times 65AC \div 2000 = 19.3 \text{ TONS}$

_____ 2. A grower wants to apply 80 lbs. of actual nitrogen per acre using anhydrous ammonia. How many pounds of anhydrous ammonia will be applied per acre? How many pounds are needed for 32 acres?

$\frac{80\#N}{.82} = 97.5\#/AC \times 32AC = 3,122\#$

_____ 3. A grower wants to apply 50 lbs. of nitrogen per acre to some grain land using 16-20. How many lbs. will he apply per acre? How many tons are needed for 320 acres?

$\frac{50\#N}{.16} = 312.5\#/AC \times 320AC \div 2000 = 50 \text{ TONS}$

_____ 4. A row crop will be sidedressed with urea at the rate of 40 lbs. of nitrogen per acre. How many pounds of urea will be applied per acre? How many tons are needed for 23 acres?

$\frac{40\#N}{.46} = 87\#U/AC \times 23AC \div 2000 = 1 \text{ TON}$

_____ 5. A 55' x 68' lawn will get an application of one pound of nitrogen per 1000 square feet. How many pounds of ammonium sulfate are necessary?

$55' \times 68' = 3,740 FT^2 = 3.74 M FT^2$

$\times 1\#N/M = 3.74\#N \div .21 = 17.8\#AS$

Name _____

_____ 1. A person has a lawn that measures 24' x 96'. He is going to spray his lawn for lawn moths with chlordane. The directions on the label say to apply 8 oz. of chlordane per 1000 sq. ft. of lawn area and to mix 1 oz. of material in 1 gallon of water. How many oz. of chlordane will be needed for this spraying? How many gallons of water are needed?

_____

_____ 2. A nine-hole golf course covers an area of 41 acres. They are going to spray for lawn moths using chlordane at the same application and dilution rate as in Problem 1. How many gallons of chlordane are needed? How many gallons of water are needed?

_____

_____ 3. An eighteen-hole golf course needs an insecticide spraying. The directions on the label say to apply 5 ounces of the material to each 1000 square feet. If the golf covers 104 acres, how many gallons of the insecticide is needed?

_____ 4. A warehouse needs spraying for ants and spiders. The label on the spray material says to put 6 ounces of material in each gallon of water. If 1100 gallons of water are required to cover the desired area, how many gallons of spray material are required?

Name _____

_____ 1. A person has a lawn that measures 24' x 96'. He is going to spray his lawn for lawn moths with chlordane. The directions on the label say to apply 8 oz. of chlordane per 1000 sq. ft. of lawn area and to mix 1 oz. of material in 1 gallon of water. How many oz. of chlordane will be needed for this spraying? How many gallons of water are needed?

2,304 FT² = 2.3 M FT² x 8oz = 18.4 oz

18.4 GALS

_____ 2. A nine-hole golf course covers an area of 41 acres. They are going to spray for lawn moths using chlordane at the same application and dilution rate as in Problem 1. How many gallons of chlordane are needed? How many gallons of water are needed?

41 AC x 43.56 M FT² = 1,785.96 M FT²

x 8oz = 14,288 oz ÷ 128 = 111.6 GALS

Hmwk.

_____ 3. An eighteen-hole golf course needs an insecticide spraying. The directions on the label say to apply 5 ounces of the material to each 1000 square feet. If the golf covers 104 acres, how many gallons of the insecticide is needed?

104 AC x 43.56 M FT² = 4,530.24 M FT²

x 5oz = 22,651.2 oz ÷ 128 = 177 GALS

_____ 4. A warehouse needs spraying for ants and spiders. The label on the spray material says to put 6 ounces of material in each gallon of water. If 1100 gallons of water are required to cover the desired area, how many gallons of spray material are required?

1100 GALS x 6oz = 6600 oz ÷ 128 oz = 51.56 GALS

Plant Biology 176
Sprayer Calibration Lab

128 oz / gallon
3786 ml / gallon
(1 oz = 29.5 ml)
5280 feet / mile
43,560 ft^2 / Acre
60 minutes / Hour

8002

1. Output of 1 nozzle in ml or oz per minute = 800ml

number of nozzles on sprayer = 7.

$\frac{800}{3786} = .205$

Output of all nozzles in gallons per minute = .205 gallons/minute

$20'' \times 7 = 140''$

$\frac{140''}{12}$

2. Spray width of spray boom (all nozzles) 11.67 ft

88 ft in 10 sec. = 6 mph

3. Speed of sprayer in feet per minute = 528 ft / minute $= 88 \times 6$

Speed in Miles per hour. = 6 MPH

Spray width in feet * Speed in ft per minute = ft^2 / minute ~~11.67 x 528~~

Acres / minute .0202.

~~11.67~~ $\times 528 = \frac{897.6}{43560}$
1.67

20' centers for nozzles

Gallons / minute divided by Acres / minute = Gallons of spray solution / Acre.

Sprayer output = 10.44 Gallons per Acre of spray solution

Name _____

_____ 1. A 3/16" nozzle tip at 50 psi nozzle pressure puts out 9 gpm. If the fire truck tank holds 500 gallons, how long will its water last?

_____ 2. If the above nozzle was changed to 3/8", how long would the water last? Assume the same pressure.

Name _____

_____ 1. A 3/16" nozzle tip at 50 psi nozzle pressure puts out 9 gpm. If the fire truck tank holds 500 gallons, how long will its water last?

$\frac{500 \text{ GALS.}}{9 \text{ GPM}} = 55.5 \text{ MIN}$

πr^2

$3.14 \times \frac{3}{32} \times \frac{3}{32} =$ —

$3.14 \times \frac{3}{16} \times \frac{3}{16} =$ —

1" .785 IN²

2" 3.14 IN²

_____ 2. If the above nozzle was changed to 3/8", how long would the water last? Assume the same pressure.

$2D^2 4 \times$ flow

πr^2

$9 \text{ GPM} \times 4 = 36 \text{ GPM}$

$\frac{55.5 \text{ MIN}}{4} = 13.9 \text{ MIN}$

13.9 MIN

12" D 113.04 in²

6" D 28.26 in²

Hydraulic Ag. 280

PROBLEMS

1. A double-acting cylinder has an inside diameter of 3 inches and a piston rod diameter of 1 inch. The cylinder must exert a force of 5,000 lbs on the extension stroke. What hydraulic pressure is required?

2. The same cylinder is required to pull with a 6,000 lbs force on the retraction stroke. What hydraulic pressure is required?

3. The cylinder in problem 1 is connected to a pump which has a maximum safe operating pressure of 1,000 lbs/sq. inch. What is the maximum force that can be developed by this cylinder on the extension stroke?

4. The pump connected to the cylinder in problem 3 delivers 8 gallons of hydraulic oil per minute. What is the speed of extension of the cylinder? Cylinder Stroke=12".

Name _____

HYDRAULIC PROBLEMS

HYDRAULICS
Useful Formulas

1. Pascal's Law:

   "Pressure at any one point in a static liquid is the same in every direction and exerts an equal force on equal areas, at 90° to that surface".

2. AREA = $3.14 \times R^2$

3. Force = Area X psi

4. Work = Force X Distance(ft.)

5. Power:

$$H.P. = \frac{\text{Force X Dist.}}{33{,}000 \text{ X Min.}}$$

$$H.P. = \frac{\text{Force X Dist.}}{550 \text{ X Sec.}}$$

6. Pump $$H.P. = \frac{\text{GPM X psi}}{1714}$$

7. Cylinder Capacity (gal.) $$= \frac{\text{Vol. (cu")}}{231 \text{ cu"/gal}}$$

8. Cylinder Speed: $$\text{Time (min.)} = \frac{\text{Volume (cu")}}{231 \text{ X GPM}}$$
$$= \frac{\text{Time (Sec.)}}{\text{X 60}}$$

9. Cylinder Force @ Angles other than 90°:

   Force X Sin. $\angle$ = Net Force

10. Leverage: Force X Force Arm = Weight X Wt. Arm

EXAMPLE PROBLEMS

Problem 1

A double-acting cylinder has an inside diameter of 3 inches and a piston rod diameter of 1 inch. The cylinder must exert a force of 5,000 lbs on the extension stroke. What hydraulic pressure is required?

Force = Pressure x Area

Area of a circle = $(\text{Radius})^2 \times 3.14$

$5{,}000 \text{ lb} = \text{Pressure} \times \left(\frac{3 \text{ inches}}{2}\right)^2 \times 3.14 = 5{,}000 \text{ lb} = \text{Pressure} \times 7.06 \text{ sq. in.}$

$\text{Pressure} = 5{,}000 \text{ lb}/7.06 \text{ sq. in.} = 708 \frac{\text{lb}}{\text{sq. in.}}$

Problem 2

The same cylinder is required to pull with a 6,000 lb force on the retraction stroke. What hydraulic pressure is required?

Force = Pressure x Area

Area = Area of Piston - Area of Rod

$\text{Area} = \left(\frac{3 \text{ inches}}{2}\right)^2 \times 3.14 - \left(\frac{1 \text{ inch}}{2}\right)^2 \times 3.14$

Area = 7.06 sq. in. - .785 sq. in. = 6.275 sq. in.

$\text{Pressure} = 6{,}000 \text{ lb}/6.275 \text{ sq. in.} = 957 \frac{\text{lb}}{\text{sq. in.}}$

Problem 3

The cylinder in Problem 1 is connected to a pump which has a maximum safe operating pressure of 1,000 lb/sq. in. What is the maximum force that can be developed by this cylinder on the extension stroke?

Force = Pressure x Area

$\text{Force} = (1{,}000 \text{ lb/sq.in.}) \times \left(\frac{3 \text{ inches}}{2}\right)^2 \times 3.14$

Force = (1,000 lb/sq. in.) x 7.06 sq. in. = 7,060 lb.

Problem 4

The pump connected to the cylinder in Problem 3 delivers 8 gallons of hydraulic oil per minute. What is the speed of extension of the cylinder?

Rate of Piston Travel = Pump Capacity/Piston Area

1 gallon = 231 cu. in.

$$\text{Rate of Piston Travel} = (8 \text{ gallons/min}) \times (231 \text{ cu. in./gallon}) / \left(\frac{3 \text{ inches}}{2}\right)^2 \times 3.14$$

Rate of Piston Travel = (1,850 cu. in./min)/7.06 sq. in. = 262 in./min

Problem 5

If the force on the cylinder in Problem 4 is 7,060 lbs, what horsepower is developed by the cylinder during the expansion stroke?

$$\text{Horsepower} = \frac{\text{Force} \times \text{Speed}}{33{,}000 \text{ ft. lb./min hp}}$$

$$\text{Horsepower} = \frac{(7{,}060 \text{ lbs} \times 262 \text{ in./min}) \times (1 \text{ ft./12 in.})}{33{,}000 \text{ ft lb/min hp}} = 4.67 \text{ hp}$$

Problem 6

If the pump in Problem 5 requires 6 horsepower to drive it when operating the cylinder in Problem 5, what is the efficiency of the pump and connected system?

$$\text{Efficiency} = \frac{\text{Output Power}}{\text{Input Power}}$$

$$\text{Efficiency} = \frac{4.67 \text{ hp}}{6 \text{ hp}} = 77.8\%$$

Problem 7

Can you determine the horsepower output from a hydraulic pump knowing only its rated pressure and rated volume capacity?

Yes. Just imagine that the pump was connected to a cylinder with an area of 1 sq. in.

$$\text{Horsepower} = \frac{\text{Rate of Piston Travel} \times \text{Force}}{33{,}000 \text{ ft. lb./min hp}}$$

Rate of Piston Travel = Capacity/Area = (rated gallons/min) x (1 ft/12 in.)

x (231 cu. in./gallon)/(1 sq. in. area)

Force = Pressure x Area = (rated lb/sq. in.) x (1 sq. in. area)

Horsepower (at rated conditions) =

$$\frac{\text{(rated gallons/min) x (1 ft./12 in.) x 231 cu.in./gallon) x (rated lb/sq.in.) x (1 sq.in. area)}}{\text{(1 sq. in. area) x 33,000 ft. lb/min hp}}$$

$$= \text{Horsepower (at rated conditions)} = \frac{\text{(rated gallons/min) x (rated lb/sq. in.)}}{\text{1714 gpm pai/hp}}$$

Problem 8

A hydraulic pump delivers 22 gallons per minute at 1,500 lb/sq. in. What is the output horsepower of the pump?

$$\text{Horsepower} = \frac{\text{(22 gallons/min) x (1,500 lb/sq. in.)}}{\text{1714 gpm psi/hp}}$$

Problem 9

A hydraulic motor is just like a hydraulic pump except that power input is in the form of high pressure fluid flow and power output is on a turning shaft. What horsepower output could you expect from a hydraulic motor with an efficiency of 70%, if this motor were connected to the flow from the pump in Problem 8?

Power input (high pressure fluid) = 19.25 hp

$$\text{Efficiency} = \frac{\text{Power Output}}{\text{Power Input}}$$

$$70\% = \frac{\text{Power Output}}{\text{19.25 hp}}$$

Power Output (rotating shaft) = 70% x 19.25 hp = 13.48 hp

Problem 10

When a mechanical overload slip clutch continues to slip what happens--the clutch gets hot. When hydraulic oil is forced through a relief valve (essentially a hydraulic slip clutch) what happens--the oil gets hot. If oil at 1,000 lb/sq. in. is forced through a relief value (to zero pressure) at the rate of 4 gallons per minute (a) how much power is lost and (b) how much is that oil heated?

(a) Lost Horsepower = $\frac{(4 \text{ gallons/min}) \times (1{,}000 \text{ lb/sq. in.})}{1714 \text{ gpm psi/hp}}$

Lost Horsepower = 2.33 hp

(b) 1 Horsepower = .746 Kilowatt

Lost Kilowatts = Lost Horsepower x .746 Kilowatt/horsepower = 1.74 Kilowatts

It is, therefore, just like having the oil, which passes through the relief valve, heated by a 1,740 watt electric heater.

1 Kilowatt + 56.8 Btu*/min

Oil weighs about 7.5 lb/gallon

Specific heat of oil is about 0.5

$$\text{Temperature increase} = \frac{\text{Btu}}{(\text{Weight of material}) \times \text{Specific heat}}$$

$$\text{Temperature increase} = \frac{(1.74 \text{ Kilowatts}) \times 56.8 \text{ Btu/min Kilowatt}}{(4 \text{ gallons/min}) \times (7.5 \text{ lb/gallon}) \times 0.5}$$

It can be seen that the time units (min) in the numerator and demoninator cancel with each other so:

$$\text{Temperature increase} = \frac{99 \text{ Btu}}{30 \text{ lbs} \times 0.5} = 6.6 \text{ degrees F.}$$

In general it can be said that for each 1,000 lb/sq. in. pressure drop at the relief valve, that oil which passes through the relief valve is heated an additional 6.6 degrees Fahrenheit each time it passes through this valve.

* 1 Btu (British thermal unit) is the heat required to raise the temperature of 1 lb of water one degree Fahrenheit.

IRRIGATION PROBLEMS

450 gpm = one acre inch per hour
one ft^3/sec = one acre inch per hour

Example #1: Want to apply 4½ inches water to an 80 acre alfalfa field per irrigation with a pump that delivers 1,350 gpm. How long should the pump be run?

1. $\frac{1350 \text{ gpm}}{450 \text{ gpm}}$ = 3 ac. in. per hour pumped

2. Water required - 80 acres x 4.5 inches = 360 acre inches total

3. $\frac{360 \text{ ac in. needed}}{3 \text{ ac in. pumped/hr}}$ = 120 hours

4. $\frac{120 \text{ hours}}{24 \text{ hrs/day}}$ = 5 days needed to deliver 4½" on 80 acres.

Example #2: On an 80 acre field irrigated in 3 days with a pump delivering 1,350 gpm, how much water is being delivered?

1. 3 days x 24 hours = 72 hours of pumping

2. $\frac{1,350 \text{ gpm}}{450 \text{ gpm}}$ = 3 inches per hour x 72 hours = 216 ac. in. applied to 80 acres.

3. $\frac{216 \text{ ac. in.}}{80 \text{ acres}}$ = 2.7 inches applied per acre.

Section V

MONEY AND INTEREST

Name _____

INTEREST PROBLEMS

_____ 1. $2500 deposited for 1 yr. @ 5½% per annum compounded quarterly. Balance?

_____ 2. $7500 deposited for 1 year @ 5½% per annum compounded semiannually. Balance?

_____ 3. $4500 deposited for 1 year 3 months @ 5½% per annum compounded quarterly. Balance?

_____ 4. Interest earned on $11,000 deposited for 9 months @ 5¼% per annum compounded quarterly?

_____ 5. Determine the ending balance for $330 deposited for 1 year @ 5½% interest per annum compounded quarterly?

_____ 6. How much interest will $1200 earn in 9 months @ 5¼% interest compounded quarterly?

Name Key

or divide .055 balance by 4 @ time

INTEREST PROBLEMS

.055 ÷ 4 = .01375

- .01375

#7640.37 1. $2500 deposited for 1 yr. @ 5½% per annum compounded quarterly. Balance?

1	2	3	4
2500.00	2534.38	2569.23	2604.56
34.38	34.85	35.33	35.81
2534.38	2569.23	2604.56	2640.37

#7918.17 2. $7500 deposited for 1 year @ 5½% per annum compounded semiannually. Balance?

1	2
7500.00	7706.25
206.25	211.92
7706.25	7918.17

.055 ÷ 2 = .0275

#4818.01 3. $4500 deposited for 1 year 3 months @ 5½% per annum compounded quarterly. Balance?

.055 × 4/4 = .013753

1	2	3	4	5
4500.00	4561.88	4624.61	4688.20	4752.66
61.88	62.73	63.59	64.46	65.35
4561.88	4624.61	4688.20	4752.66	4818.01

#438.84 4. Interest earned on $11,000 deposited for 9 months @ 5¼% per annum compounded quarterly?

24675 .013125

1	2	3
11,000.00	11,144.38	11,290.65
144.38	146.27	148.19
11,144.38	11,290.65	11,438.84

#438.84

#348.53 5. Determine the ending balance for $330 deposited for 1 year @ 5½% interest per annum compounded quarterly?

1	2	3	4
330.00	334.54	339.14	343.86
4.54	4.60	4.66	4.73
334.54	339.14	343.80	348.53

#47.88 6. How much interest will $1200 earn in 9 months @ 5¼% interest compounded quarterly?

1	2	3
1200.00	1215.75	1231.71
15.75	15.96	16.17
1215.75	1231.71	1247.88

#47.88

$A = p(1+i)^n$ n ~ no. of periods

$i = \frac{\text{no. of times}}{12} \times \frac{\text{interest rate}}{100}$

over

Name KEY

INTEREST PROBLEMS

compounded 1/year or 2 yrs.?

137.63 1. How much interest will $1000 earn in 2 years @ 6½% interest compounded quarterly?

1	2	3	4	5	6	7	8
1000.00	1016.25	1032.76	1049.54	1066.60	1083.93	1101.54	1119.44
16.25	16.51	16.78	17.06	17.33	17.61	17.90	18.19
1016.25	1032.76	1049.54	1066.60	1083.93	1101.54	1119.44	1137.63

$ 32.97 2. How much interest will $1000 earn in 6 months @ 6½% interest compounded monthly?

1	2	3	4	5	6
1000.00	1005.42	1010.87	1016.35	1021.86	1027.40
5.42	5.45	5.48	5.51	5.54	5.57
1005.42	1010.87	1016.35	1021.86	1027.40	1032.97

2242.01 3. $2,200 is deposited in a savings account at 5½% per annum compounded quarterly. What is the balance at the end of nine months?

1	2	3
2200.00	2230.25	2260.92
30.25	30.67	31.09
2230.25	2260.92	2242.01

$ 9124.32 4. $9000 is deposited in a savings account at 5½% per annum compounded monthly. What is the balance at the end of three months?

1	2	3
9000.00	9041.25	9082.69
41.25	41.44	41.63
9041.25	9082.69	9124.32

$ 2557.08 5. What is the balance of a $2,250 deposit for two years at 6½% compounded semi-annually?

1	2	3	4
2250.00	2323.13	2398.63	2476.59
73.13	75.50	77.96	80.49
2323.13	2398.63	2476.59	2557.08

$ 2632.18 6. What is the balance of a $2,250 deposit for two years at 8% compounded semiannually?

1	2	3	4
2250.00	2340.00	2433.60	2530.94
90.00	93.60	97.34	101.24
2340.00	2433.60	2530.94	2632.18

Name _____

AMORTIZED LOANS

1. First deeds of trust
2. Second deeds of trust

Procedure:

1. Interest rate x previous balance = interest/year.
2. Interest/year ÷ 12 months = interest for that month.
3. Payment (-) interest for that month = principal for that month.
4. Previous balance (-) principal for that month = new BALANCE.

1) 60,000 @ 10% over 30 yrs
2) 100,000 @ 12.5% over 15
3) 75,000 @ 9% on 20
4) 200,000 @ 10.5% 30

Name: _____

Date: _____

Score: _____ (each question is worth 10 points)

AG 280 Exam - Covering Section IV-Equipment Calibration

1. _____ lbs/A — You have a 10 foot grain drill with 68 inch circumference wheels. In calibrating it, 30 revolutions distributed 4.75 pounds of seed. What is the seed rate per acre?

2. _____ lbs./A — A 4 row planter has 36 inch circumference wheels and is set at 24 inch centers. Nine onces of seed is dropped with 36 revolutions. What is the seeding rate per acre?

3. _____ lbs. _____ tons — A grower wants to apply 180 pounds actual nitrogen per acre to a crop using calcium nitrate (refer to page 36 for percent nitrogen).How many pounds of fertilizer will she apply per acre? How many tons are needed for 50 acres?

4. _____ lbs. _____ bags — A 98' by 82' lawn will get an application of 2.5 pounds nitrogen per 1000 square feet. How many pounds of a 12-8-6 fertilizer will be needed? How many 50 pound bags will be needed?

5. _____ ozs. _____ gallons — A homeowner has a lawn that measures 62' by 50'. He is going to spray his lawn for rust with a general purpose fungicide, Captan. The directions on the label say to apply 5 oz. of Captan per 1000 square foot of lawn and to mix 2 oz. of material to 10 gallons of water. How many oz. of Capan will be needed for this application? How many gallons of water?

Name EXAMPLE #1

Date _____

AMORTIZED LOAN

Loan Amount $ 75,000 Payment $ 603.47

Interest Rate 9 % Length of Loan 30 YRS

Date	Payment	Interest	Principal	Balance
NOV	603.47	562.50	40.97	74,959.03
DEC	603.47	562.19	41.28	74,917.75
JAN	603.47	561.88	41.59	74,876.16
FEB	3,000.00	561.57	2,438.43	72,437.73
15 YR	760.70	562.50	198.20	

217,249.20 Payback 136,926.00

142,249.20 Total Interest 61,926.00

Name EXAMPLE #2

Date _____

AMORTIZED LOAN

Loan Amount $ 75,000 Payment $ 576.69

Interest Rate 8.5 % Length of Loan 30 YRS

Date	Payment	Interest	Principal	Balance
NOV	576.69	531.25	45.44	74,954.56
DEC	576.69	530.93	45.76	74,908.80
JAN	576.69	530.60	46.09	74,862.71
15 YRS	738.56	531.25	207.31	

207,608.40 Payback 132,940.80

132,608.40 Total Interest 57,940.80

HW#11

Name_____

Date_____

AMORTIZED LOAN

Loan Amount $ 82,000 Payment $ 590.29

Interest Rate 7.8 % Length of Loan 30yrs

82,000

Date	Payment	Interest	Principal	Balance
Nov	590.29	533.00	57.29	81,942.71
Dec	590.29	532.63	57.66	81,885.05
Jan	590.29	532.25	58.04	81,827.01
15 yr	774.20	533.00	241.20	81,758.80

212,504.40 Payback 139,356.00

130,504.40 Total Interest 57,356

Name EXAMPLE #3

Date _____

AMORTIZED LOAN

Loan Amount $ 96,000 Payment $ 798.81

Interest Rate 9.5 % Length of Loan 30 YRS

Date	Payment	Interest	Principal	Balance
NOV	798.81	760.00	38.81	95,961.19
DEC	798.81	759.69	39.12	95,922.07
JAN	798.81	759.38	39.43	95,882.64
20 YRS	894.85	760.00	134.85	

287,571.60 Payback 214,764.00

191,571.60 Total Interest 118,764.00

Name_____

Date_____

AMORTIZED LOAN

Loan Amount $_____ Payment $_____

Interest Rate _____% Length of Loan _____

Date	Payment	Interest	Principal	Balance

_____ Payback

_____ Total Interest