Stage 6 Agriculture

syllabus support

Participant workbook

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NEALS

NEW SOUTH WALES DEPARTMENT OF EDUCATION AND TRAINING

Acknowledgements

The Technology Unit of the Curriculum K–12 Directorate has developed professional learning workshops for secondary Agriculture teachers in NSW public schools to provide practical strategies and resources to support teachers of Stage 6 Agriculture.

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Aims of the workshop

The aims of the workshop are to assist teachers to:

- become familiar with the amended Stage 6 Agriculture syllabus
- develop effective programming using a range of planning tools
- utilise teaching strategies to improve student learning outcomes
- become familiar with the Board of Studies marking guidelines for Stage 6 Agriculture.

NSWIT course registration

The DET is a NSW Institute of Teachers endorsed provider of professional development for the maintenance of accreditation at Professional Competence.

This course is registered with the NSW Institute of Teachers.

NSW IT course code: **151CUK154**

Scope of endorsement – all Elements of the Professional Teaching Standards.

This course addresses the following Professional Teaching Standards:

1.2.1 Apply and use knowledge of the content/discipline(s) through effective, content-rich, teaching activities and programs relevant to the stage.

2.2.3 Apply practical and theoretical knowledge and understanding of the different approaches to learning to enhance student outcomes.

6.2.4 Work productively and openly with colleagues in reviewing teaching strategies and refining professional knowledge and practice.

The completion of this course will contribute **five** hours towards Institute Registered professional development.

Stage 6 Agriculture syllabus support workshop agenda

TIME	SESSION FOCUS
9.00 am	**Welcome and workshop overview**
Session 1 9.10 am	**Syllabus changes** Overview of changes to the syllabus, examination specifications and assessment guidelines.
	Activity 1a – Unit planning Mapping units of work with consideration of seasons, holidays etc
	Activity 1b – Electronic Content Allocation Tool (ECAT) Explore the features, functions and applications of the Electronic Content Allocation Tool.
10.45 am	**MORNING TEA**
Session 2 11.05 am	**Activity 2a – Unpacking technical information** Become familiar with a teaching strategy that can help students to comprehend and respond to an article that uses complex language.
	Activity 2b – Designing a ration Design and explain a ration to meet the nutritional requirements of a selected animal for a particular stage of production.
	Activity 2c – Practical work Become familiar with the practical work requirements of the syllabus.
	Activity 2d – Calculating mean, standard deviation and a simple test of significance Calculate a measure of significance (standard error), and interpret the data from a trial.
1.00 pm	**LUNCH**
Session 3 1.40 pm	**Overview of examination specifications**
	Marking the written paper Gain familiarity with the processes used to mark the written paper.
	Activity 3a – Responding to complex HSC questions Become familiar with a teaching strategy that helps students respond to complex HSC questions.
	Resources to support teaching and learning programs Overview of available resources.
3.20 pm	**Evaluation and Close**

Activity 1a – Unit planning

The purpose of this activity is to map units of work with consideration of:

- seasonal factors
- school calendar dates
- assessment tasks.

1. Using the table on the following pages individually note any significant events such as planting times, livestock availability, show dates or other events which would influence when you might teach a part of the syllabus in the first column.
2. List any school-based constraints such as formal exams in the second column.
3. In the *Unit ideas* column, note when you might teach each section of the course, e.g. when you would study the animal management dot points.
4. Schedule your assessment tasks in the assessment tasks column.

Participant notes:

	Activities on school farm, local resources.	School based dates	Unit ideas	Assessment tasks
Prelim Term 1				
Prelim Term 2				
Prelim Term 3				

	Activities on school farm, local resources.	School based dates	Unit ideas	Assessment tasks
HSC Term 4				
HSC Term 1				
HSC Term 2				
HSC Term 3				

Activity 1b: Electronic Content Allocation Tool

The purpose of this activity is to:

- explore the features, functions and applications of the Electronic Content Allocation Tool (ECAT)
- practice using the tool on a unit of work.

1. Observe the demonstration of the use of ECAT.
2. In groups of two or three, use the Electronic Content Allocation Tool (ECAT) supplied on your USB thumb drive to map syllabus content from the supplied unit of work pages 8–11, *Resource booklet*.

> ECAT is available for download from Curriculum Support's web site **http://www.curriculumsupport.education.nsw.gov.au/secondary/technology/11_12/agriculture/index.htm** along with instructions for its use.

3. Full instructions for use of the ECAT are also found on the following pages.

What ECAT is and does

ECAT is an *Excel* spreadsheet. It can be used as *either*

- a way of checking that your existing course plan (or program) addresses the content (dot points, *learn tos*, *learn abouts*) from the syllabus

or

- a way of ensuring that a course plan in the process of development covers the content in an even way *as it is written*.

This tool cannot produce a unit of work, course plan or program. It cannot think of strategies or activities. It was never intended to do this.

Provides a somewhat less tedious way (compared to doing it manually) to cross check content from the course plan and the syllabus. It makes it obvious if there is content left out. It also makes the user aware if content is often revisited.

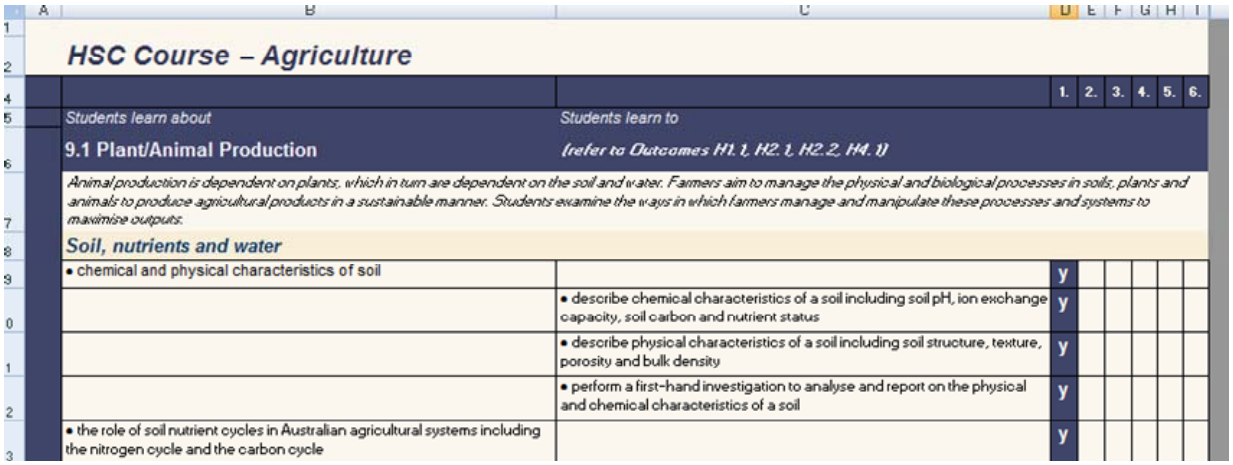
If the course plan or the program is already written, the user would work through the program, entering content in the ECAT. If the plan or program is being developed, the user would work through the ECAT, thinking of strategies and activities.

Instructions

There is an ECAT for the Preliminary course and one for the HSC course. Both spreadsheets work in much the same way. Screen shots are from the HSC course.

Open the file and save it immediately using a different name to be sure you are working with a copy, not the original.

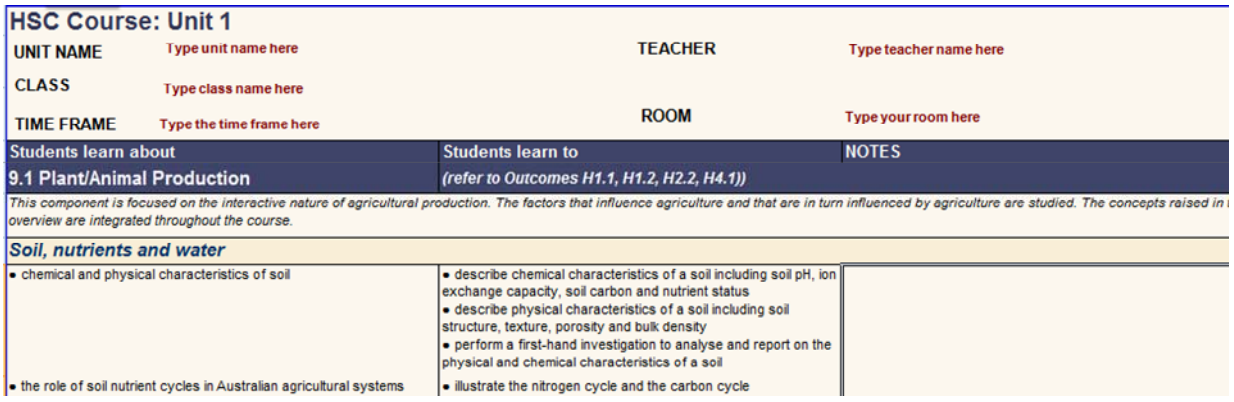
When the document opens, you will see the screen below. As you scroll down you will see that the *learn abouts* and *learn tos* from the entire course are listed. Where you find content in the unit of work that matches with the syllabus, fill in a 'Y' in the row matching the syllabus content and in the column matching the unit.



HSC Course – Agriculture

Students learn about	Students learn to	1.	2.	3.	4.	5.	6.
9.1 Plant/Animal Production	*(refer to Outcomes H1.1, H2.1, H2.2, H4.1)*						
Animal production is dependent on plants, which in turn are dependent on the soil and water. Farmers aim to manage the physical and biological processes in soils, plants and animals to produce agricultural products in a sustainable manner. Students examine the ways in which farmers manage and manipulate these processes and systems to maximise outputs.							
Soil, nutrients and water							
• chemical and physical characteristics of soil		y					
	• describe chemical characteristics of a soil including soil pH, ion exchange capacity, soil carbon and nutrient status	y					
	• describe physical characteristics of a soil including soil structure, texture, porosity and bulk density	y					
	• perform a first-hand investigation to analyse and report on the physical and chemical characteristics of a soil	y					
• the role of soil nutrient cycles in Australian agricultural systems including the nitrogen cycle and the carbon cycle		y					

- In the example above, a 'y' has been entered in five cells. This means that in unit 1, two *learn abouts* have been covered for Soil, nutrients and water and three *learn tos*.
- Now select the unit you want to work on from the bottom bar. Save the spreadsheet.
- Note that content from the syllabus has been copied to this sheet wherever a 'y' was entered on the previous sheet.



HSC Course: Unit 1

UNIT NAME	Type unit name here	TEACHER	Type teacher name here
CLASS	Type class name here		
TIME FRAME	Type the time frame here	ROOM	Type your room here

Students learn about	Students learn to	NOTES
9.1 Plant/Animal Production	*(refer to Outcomes H1.1, H1.2, H2.2, H4.1))*	
This component is focused on the interactive nature of agricultural production. The factors that influence agriculture and that are in turn influenced by agriculture are studied. The concepts raised in overview are integrated throughout the course.		
Soil, nutrients and water		
• chemical and physical characteristics of soil	• describe chemical characteristics of a soil including soil pH, ion exchange capacity, soil carbon and nutrient status • describe physical characteristics of a soil including soil structure, texture, porosity and bulk density • perform a first-hand investigation to analyse and report on the physical and chemical characteristics of a soil	
• the role of soil nutrient cycles in Australian agricultural systems	• illustrate the nitrogen cycle and the carbon cycle	

- Enter the unit name, class, time frame, teacher and room.
- Adjust the height of appropriate cells so that all data can be seen.
- You can enter notes that may be useful to you in the programming process.
- You can also transfer the syllabus content and comments to a teaching and learning sequence by copying and pasting.
- Before you print the document, ensure that the correct print area is set. This may save you accidentally printing pages of empty cells. The simplest way to do this is to adjust the page breaks.
- Check on *Print Preview* to determine which pages you need to print.

Activity 2A: Unpacking technical information

The purpose of this activity is to:

- become familiar with a teaching strategy that can assist students to comprehend and use complex technical information
- enhance knowledge of experimental design.

The *Reciprocal teaching strategy* assists students to construct meaning from text as well as a means of monitoring their reading to ensure they understood what they read. It consists of four stages:

- Predict
- Clarify
- Question
- Summarise.

1. Use the four stages of the reciprocal teaching strategy to analyse the research paper, *Robotic Milking and Its Effect on Fertility and Cell Counts*. You should work in small groups of two or three, just as students would do. Each group should analyse one paragraph, writing answers in the table over the page.
   Predict – what is *Robotic milking and its potential effects?*
2. **Clarify** – use a highlighter and mark the words, terms or phrases that you need to clarify. You should then use your group members to help you with this clarification. Write the outcomes of these clarifications around the highlighted sections or in the *Glossary of terms*.
3. **Question** – ask your group members questions about the text.
4. **Summarise** – write several sentences that summarise the paragraph into the table. Finally you would collect these summaries together to make a complete summarised research article.
5. Use the summarised article to assist you in producing an analysis of the essay.
6. Discuss the use of this strategy and make suggestions about how this strategy can be used.

Stages	Notes
Predict – note the title and attempt to predict what the text is about. This allows you to link new knowledge contained in the text with knowledge you already have.	
Clarify – use a highlighter to mark out words, terms or phrases that are technical or more difficult. Construct a *Glossary of terms* using your group members to help you with this clarification.	
Question – ask your group members questions about the text, identifying information that is most important and relevant.	
Summarise – write 1, 2 or 3 sentences that summarise the paragraph in your own words.	

Glossary of terms

2 x	Cows were milked twice per day.
3 x	Cows were milked three times per day.
Analyse	To examine carefully and in detail so as to identify causes, key factors, possible results, etc.
ANOVA	Analysis of variance, a statistical technique used to determine significant differences.
Arbitrary	Determined without a rule.
Average	A typical value determined by calculation.
Confounding	Confusing.
Estrus	(Oestrus) the animal is on heat, an egg is released from the ovary.
Fertility	The ability to become pregnant.
First service	The first time a cow is inseminated in a season.
Frequency	The number of times something occurs.
Insemination	The process of introducing sperm into the reproductive system of a cow. This can be done by a bull or artificially.
Intermediate	In the middle, a middle value.
Lactation	The period of time a cow produces milk.
Mastitis	A disease, a bacterial infection in the udder.
Mean	A typical value determined by calculation.
Non return rate	The rate of cows pregnant 56 days after artificial insemination.
NR56	Non return rate at 56 days. The rate of cows pregnant 56 days after artificial insemination.
Parturition	Giving birth to a calf.
Postpartum	After giving birth to a calf.
Robot	A machine which can do tasks without human operation.
RM	Robotic milking. Cows milked automatically without the use of human operators.
SCC	Somatic cell count. The number of white blood cells in the milk.
Significant	Observations that are unlikely to occur by chance and therefore indicate a systematic cause.
Somatic cell	White blood cells found in the milk. High rates indicate an infection in the udder.
Student's t test	A statistical technique used to determine significant differences.
Transitory	Occurs for a short period of time.
Yield	The amount of a product produced.

Activity 2b: Designing a ration

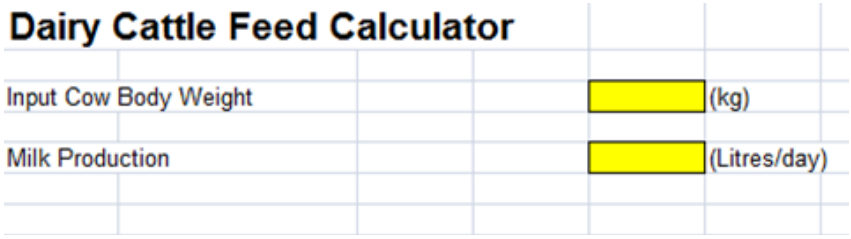
The purpose of this activity is to:

- design and explain a ration to meet the nutritional requirements of a selected animal for a particular stage of production.

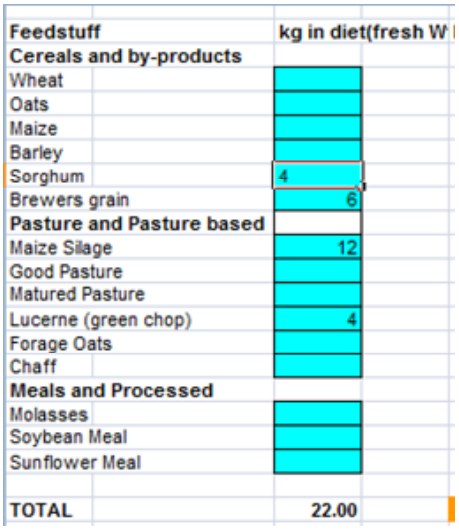
On your USB thumb drive are two Microsoft *Excel* spreadsheets:
- Dairy diet calculator
- Chicken diet calculator.

These are simplified ration calculators which students can use to help to understand the components of a ration and the changing dietary requirements of animals in different production situations. Both of these calculators are also available on *NSW HSC online*. There are a number of similar diet calculators available free online or more advanced ones are available at cost.

1. Open the *Dairy diet calculator* and specify the animal you would like to feed.



2. Add different feedstuffs to supply sufficient protein and energy for your animal.



Feedstuff	kg in diet(fresh W
Cereals and by-products	
Wheat	
Oats	
Maize	
Barley	
Sorghum	4
Brewers grain	6
Pasture and Pasture based	
Maize Silage	12
Good Pasture	
Matured Pasture	
Lucerne (green chop)	4
Forage Oats	
Chaff	
Meals and Processed	
Molasses	
Soybean Meal	
Sunflower Meal	
TOTAL	22.00

3. Compare the energy and protein from the diet you created with the requirements of your specified animal.

Metabolisable energy required		155.3	(MJ/day)
Dietary Protein Required		1390	(g/day)

Molasses		0		0	
Soybean Meal		0		0	
Sunflower Meal		0		0	
TOTAL	26.00	96.58	(MJ)	950	(g)

4. Keep adding feedstuffs to balance the diet for the specified cow.

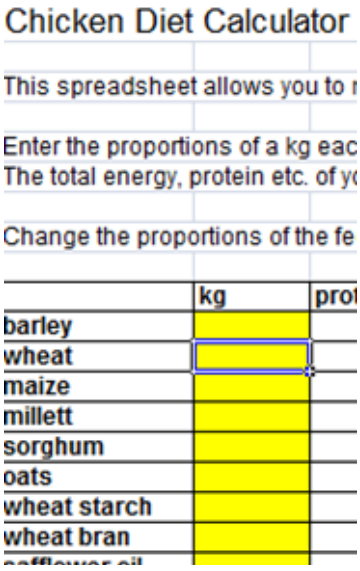
5. You can also evaluate your ration based on its daily cost.

6. The feed values and their costs can be adjusted on the second sheet of the *Excel* file.

7. Try the **Chicken diet calculator** if you would like to balance the diet for more than just energy and protein. This calculator has diet specifications for meat and layer birds.

   In this case you need to add proportions of a kg, and the components need to add up to 1kg.

   You can only input data into the yellow cells.


Chicken Diet Calculator

This spreadsheet allows you to

Enter the proportions of a kg eac
The total energy, protein etc. of y

Change the proportions of the fe

	kg	pro
barley		
wheat		
maize		
millett		
sorghum		
oats		
wheat starch		
wheat bran		

Activity 2c: Practical work

The purpose of this activity is to:

- become familiar with the practical work requirements of the syllabus
- identify mandatory practical activities in the syllabus
- identify dot points which are best covered by practical work and field trials
- be able to calculate statistical information from practical work and field trials.

It is intended that students engage in and reflect upon practical experience relevant to all aspects of the physical, chemical, biological, economic and social sciences embodied within Agriculture Stage 6. Some of this experience will be in the laboratory, some in small plot work and some on commercial farms or other components of the industry. In all cases, students should use these practical experiences to develop design, practical, management, observation, recording, interpretation and communication skills. Practical experiences may also be used to achieve coverage of the content statements not specifically related to skills. The practical experiences should occupy a minimum of 30 per cent of allocated course time.
NSW Board of Studies (2009) *Agriculture Stage 6 Syllabus*, p. 5.

1. Review the Agriculture HSC syllabus to identify the mandatory practical activities. Record these in the table on the following page.
2. Scan the HSC syllabus to identify activities which can be covered by practical work and/or field trials. Record these in the table on the following page.
3. Identify the requirements for experimental design and analysis. Which of the above listed activities are best suited to fulfil this? Highlight these activities.

Mandatory practical activity	Other practical activities

Mandatory practical activity	Other practical activities

Activity 2d: Calculating mean, standard deviation and a simple test of significance

The purpose of this activity is to:

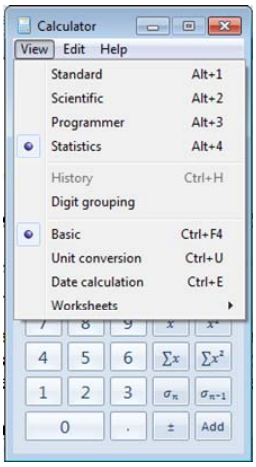
- use two different methods, the *Windows 7* calculator and a Microsoft *Excel* spreadsheet, to calculate a measure of significance (standard error), and interpret the data from a trial.

Method 1: Using the *Windows 7* calculator

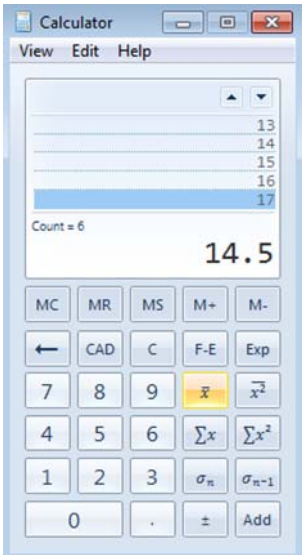
1. Read the *Internal parasite trial*, pages 21-22 *Participant workbook*.

2. Calculate the standard error using the instructions and formula below to determine if there is a significant difference between the means.

3. Put your calculator into **statistical mode** (in the *View* menu).

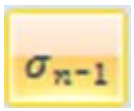


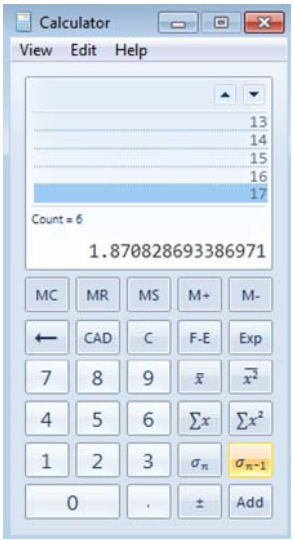
4. Enter each value for one sample population of lambs, then press *Add*.



5. To find the **mean** press the X-bar button.

4. To find the **sample standard deviation (SD)** press the σ_{n-1} button.





5. The number of scores (n) is shown as count =

To calculate standard error, use the following formula

$$Std.Error = \sqrt{\frac{(SD_1)^2}{n_1} + \frac{(SD_2)^2}{n_2} + \frac{(SD_3)^2}{n_3}} +$$

If the difference between the means is more than twice the standard error, we can say the means are significantly different.

Internal Parasite Trial

An experiment was carried out to determine the effect of internal parasites on the growth rate of lambs. When you have read through the aim, method and results of the trial you should complete the questions.

Aim: To determine the effects of no internal parasite control compared with the *Wormkill* recommended control of internal parasites, on the liveweight gains of two groups of Texel cross lambs.

Method: A mob of 20 first cross ewes were used in the experiment. They were all the same age, they all had the same vaccinations, drenches and feed until the start of the experiment. The ewes were all joined in April with the same Texel ram.

1. The ewes were yarded and then alternately drafted into two groups after joining was completed. Those ewes drafted to the right were Group A, while those drafted to the left were Group B.
2. The groups were then put into separate paddocks. Both of these paddocks had not had sheep in them for the last six months. The paddocks were the same size and had similar pasture species growing in them.
3. Group A ewes were treated for internal parasites in accordance with the *Wormkill* program. The ewes lambed in September. The lambs were drenched in December and February with *Seponver* and a broad-spectrum drench. The lambs were weaned onto a low worm pasture in December.
4. Group B ewes were not drenched at all. The ewes lambed in September. The lambs were weaned but not drenched at all. They were weaned onto pasture that had previously had ewes and lambs on it.
5. The pasture types and paddock sizes were the same in both weaning paddocks.
6. At 24 weeks the lambs were weighed. The liveweights are shown in the following table.

Results:

Table: Liveweights of lambs at 24 weeks

Group A (worm control) kg	Group B (no worm control) kg
59	53
54	47
47	48
64	58
50	48
52	49
45	41
58	53
52	51
52	44
$\bar{x}$ **Mean =**	$\bar{x}$ **Mean =**
σ_{n-1} **Standard Deviation =**	σ_{n-1} **Standard Deviation =**

$$Std.Error = \sqrt{\frac{(SD_1)^2}{n_1} + \frac{(SD_2)^2}{n_2} + \frac{(SD_3)^2}{n_3} +}$$

Standard error = _____

What can we say about these two groups of animals?

_____

Method 2: Using a Microsoft *Excel* spreadsheet

1. Read the *Silage maize trial*, page 24 *Participant workbook*.

2. Use the 'Testing significance' *Excel* spreadsheet on the USB thumbdrive to calculate:
   - means
   - standard deviations
   - the standard error.

3. Is there any significant difference between the yields of these three treatments?

Silage maize trial

A Year 12 class set up a field trial to determine the optimum row spacing for silage maize. The row spacing treatments they chose were:

- 65 cm, the standard for their region
- 100 cm, recommended for dry areas
- 35 cm, as close together as they could move through.

Each treatment consisted of four rows and was replicated three times. The treatments were allocated to positions in the paddock randomly. All the plots received the same rainfall, irrigation, fertiliser application and pre emergent herbicide treatment.

When the maize crop reached physiological maturity (approx 120 days from planting) four metres of row was cut from the centre of each treatment and weighed, this was converted to a kg per Ha measurement.

	Row spacing		
	35 cm	**65 cm**	**100 cm**
1	**8821**	**10220**	**10356**
2	**6714**	**11600**	**10223**
3	**6893**	**9820**	**9865**
Mean			
Std Dev			

A significant difference between means is _____

The treatments which are different are _____

Activity 3a: Responding to complex HSC questions

The purpose of this activity is to:

- identify problems students encounter in answering HSC questions
- utilise a strategy to improve student responses to HSC questions.

Resources

You will need to refer to the following resources to work through this activity:

- Agriculture HSC paper (2009): USB thumbrive>NSW BOS materials
- Marking guidelines (2009): *Resource booklet*, pages 18–19.
- Glossary of key words: *Resource booklet*, pages 15–17.
- *HSC Notes from the marking centre* (2009): *Resource booklet*, pages 20–25.

Part 1 – typical problems students encounter in responding to an HSC question

1. Review question 4 in the 2009 Agriculture HSC: USB thumbrive>NSW BOS materials.
2. Review the *Marking guidelines* (what's expected) for this question page 18, *Resource booklet*.
3. What did students get wrong? Read the *HSC Notes from the marking centre*, page 22, *Resource booklet*.

Part 2 – examination practice activity for students

1. Review question 6 in the 2009 Agriculture HSC written paper below. Highlight the key words. What do the key words mean? Refer to the *Glossary of key words*, pages 15–17, *Resource booklet*.

   Question 6 (15 marks)

   (a) Describe the effect of the changing nature of farm ownership on Australian agriculture.

   (b) Discuss strategies available to farmers to manage the risk associated with the changing cost of farm inputs and irregular levels of income.

2. Break down the language, what are the examiners asking for in part (a) and in part (b)?

3. Write a brief plan of your answer (for a class you would then go on to do the full answer).

4. Check the *Marking guidelines* on the *PowerPoint*, how many marks do you think your answer is worth?