WHY DOES A TRUTH TABLE HAVE THESE RESULTS?

Week 15, Lesson 1

1. Warm-up
2. Tautology, Contradiction Implication, & Equivalence
3. ICA
4. IB PROJECT

Tautology/Contradiction/Implication/Equivalence
WHY DOES A TRUTH TABLE HAVE THESE RESULTS?

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Warm Up: Construct a truth table for the following:

$$[\neg(p \wedge q)] \vee q \quad \text{and} \quad [\neg(p \vee q)] \wedge q$$

p	q	$p \wedge q$	$\neg(p \wedge q)$	$[\neg(p \wedge q)] \vee q$	$p \vee q$	$\neg(p \vee q)$	$[\neg(p \vee q)] \wedge q$
T	T	T	F	T	T	F	F
T	F	F	T	T	T	F	F
F	T	F	T	T	T	F	F
F	F	F	T	T	F	T	F

Tautology and Contradiction

Tautology- A compound statement is called a tautology when the entire final column of a truth table is all true

$i.e.\text{-} [\neg(p \wedge q)] \vee q$

Contradiction- A compound statement is called a contradiction when the entire final column of a truth table is all false

$i.e.\text{-} [\neg(p \vee q)] \wedge q$

Implication Truth Table

Argument-   A compound statement includes implication
(if/then) is called an *argument*

$$p \Rightarrow q$$

p is called the *antecedent*
q is called the *consequent*

i.e.- p: you do that again   *q*: I will call your parents

$$p \Rightarrow q :$$

If you do that again **then** I will call your parents

p	q	$p \Rightarrow q$
T	T	T
T	F	F
F	T	T
F	F	T

Equivalence

Equivalence   -The connection of two simple statements using the phrase "if and only if"

i.e.-   *p*: I will go to the park   *q*: John will go to the park

$p \Leftrightarrow q$ "I will go to the park if and only if John will go to the park"

Equivalence Truth Table

p	q	$p \Leftrightarrow q$
T	T	T
T	F	F
F	T	F
F	F	T

        p:

        q:

$p \Leftrightarrow q$ is only true when BOTH statements are true or both statements are false

Summary:

Complete the following truth table:

$$\neg(p \wedge q) \Rightarrow p$$

② p	q	$p \wedge q$ ①	$\neg(p \wedge q)$	⓪ $\neg(p \wedge q) \Rightarrow p$ ②
T	T	T	F	T
T	F	F	T	T
F	T	F	T	F
F	F	F	T	F

Complete the following truth table:

$$(p \vee q) \Leftrightarrow (\neg p \wedge q)$$

$$\neg p \Leftrightarrow q$$

			$\neg p \Leftrightarrow q$

$$p \Leftrightarrow \neg q$$

			$p \Leftrightarrow \neg q$

$$\neg p \Leftrightarrow \neg q$$

				$\neg p \Leftrightarrow \neg q$

How prepare do you feel for your 15 week assessment?

Week 15, Lesson 2

1. Warm-up
2. Notes: Review
3. Study for the Exam

Review

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Warm Up: Given the statements *p, q,* and *r,* translate the compound statement.

p: I drive the speed limit   *q:* I obey traffic signals   *r:* I get a ticket

$$(\neg p \wedge \neg q) \Rightarrow r$$

If I **do not** drive the speed limit **and**
I **do not** obey traffic signals, **then** I get a ticket

Review

1. Three propositions p, q and r are defined as follows:

   p: the water is cold. q: the water is boiling. r: the water is warm

   (a) Write one sentence, in words, for the following logic statement:

   $$(\neg p \wedge \neg q) \Rightarrow r$$

   If the water is not cold and the water is not boiling then the water is warm.

   (b) Write the following sentence as a logic statement using symbols only.

   "The water is cold if it is neither boiling nor warm"

   $$(\neg q \vee \neg r) \Rightarrow p$$

2. Police in a town are investigating the theft of mobile phones one evening from three cafés, "Alan's Diner", "Sarah's Snackbar" and "Pete's Eats". They interviewed two suspects, Matthew and Anna about that evening.

   Let p, q and r be the statements:

   p : I visited Alan's Diner

   q : I visited Sarah's Snackbar

   r : I visited Pete's Eats

   Matthew said: "I visited Pete's Eats and visited Alan's Diner and did not visit Sarah's Snackbar"

   (a) Write down Matthew's statement in symbolic logic form.

   $$r \wedge p \quad \wedge \neg q$$

   What Anna said was lost by the police, but in symbolic form it was

   $$(q \vee r) \Rightarrow \neg p$$

   (b) Write down, in words, what Anna said.

   If I visited Sarah's snackbar or I visited Pete's eats, then I did not visit Alan's Diner.

3. In a particular school, students must choose at least one of three optional subjects: art, psychology or history.

   Consider the following propositions: a: I choose art,

   p: I choose psychology,

   h: I choose history.

   (a) Write, in words, the compound proposition

   $$\neg h \Rightarrow (p \vee a)$$

   If I did not choose history, then I chose psychology or I chose art.

   (b) Complete the truth table for $\neg a \Rightarrow p$

a	p	$\neg a$	$\neg a \Rightarrow p$
T	T	F	T
T	F	F	T
F	T	T	T
F	F	T	F

   (c) State whether $\neg a \Rightarrow p$ is a tautology, a contradiction **or** neither.

Summary:

Review

4. (a) Complete the truth table shown below.

p	q	$p \wedge q$	$p \vee (p \wedge q)$	$(p \vee (p \wedge q)) \Rightarrow p$
T	T	T	T	T
T	F	F	T	T
F	T	F	F	T
F	F	F	F	T

(b) State whether the compound proposition $(p \vee (p \wedge q)) \Rightarrow p$ is a contradiction, a tautology or neither.

Consider the following propositions.

p: Feng finishes his homework

q: Feng goes to the football *match*

(c) Write in symbolic form the following proposition.

If Feng does not go to the football match then Feng finishes his homework.

$$\neg q \Rightarrow p$$

5. Consider the following statements:

h: The hike is difficult   *w*: Bill exercises   *f*: Bill finishes the hike

(a) If Bill exercises, then Bill will finish the hike.

$$w \Rightarrow f$$

(b) If Bill finishes the hike, then the hike is difficult.

$$f \Rightarrow h$$

(c) Bill will not finish the hike if the hike is difficult.

$$h \Rightarrow \neg f$$

(d) Bill will not finish the hike if Bill does not exercise.

$$\neg w \Rightarrow \neg f$$

(e) If the hike is difficult and Bill does not exercise, then Bill will not finish the hike.

$$(h \wedge \neg w) \Rightarrow \neg f$$

6. Consider the two propositions *p* and *q*.

p: The sun is shining   *q*: I will go

Write in words the compound propositions

$p \Rightarrow q$; If the sun is shining, then I will go swimming.

$\neg p \vee q$; The sun is not shining or I will go swimming.

The truth table for these compound propositions is given below.

p	q	$p \Rightarrow q$	$\neg p$	$\neg p \vee q$
T	T	T	F	T
T	F	F	F	F
F	T	T	T	T
F	F	T	T	T

(c) Complete the column for $\neg p$.

(d) State the relationship between the compound propositions $p \Rightarrow q$ and $\neg p \vee q$

Will my 15 week assessment help me improve my overall grade?

Essential Question Essential Question Essential Question Essential Question Essential Question Essential Question Essential Question

Week 15, Lesson 3

1. Test Day
2. 15 Week Assessment
3. Project

15 Week Assessment
Will my 15 week assessment help me improve my overall grade?

00:00 00

Good Luck

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Standard 3.1L & Standard 3.2L & Standard 3.3

How close is your project from being ready to submit?

Essential Question Essential Question Essential Question Essential Question Essential Question Essential Question Essential Question

Week 15, Lesson 4

1. Warm-up
2. Notebook Set-Up
3. Project Day

NB and Project
How close is your project from being ready to submit?

4-7

Warm-up: Fill in the truth table for the following compound statement:

$$[(p \wedge q) \vee \neg q] \Leftrightarrow r$$

p	q	r					
T	T	T					
	T	F					
	F						
	F						
F							

Important Vocabulary

Know

Need to
Know

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Converse, Inverse
& Contrapositive

103

My 2nd Quarter Standards Graph
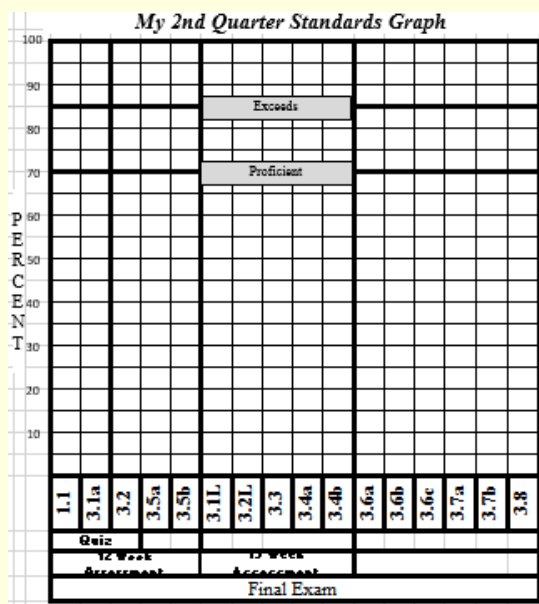
Tape on the same page you have your first quarter grade graph.

Page 8

Title Page: Include a clear title, your name, the date, IB Math Studies, and my name

Introduction: Your introduction should start with a *clear statement of the task*
    -State exactly *what* you are going to do
    -State exactly *why* you are going to do it
    -State exactly *how* you are going to do it

*The "How": Name which mathematical processes you will use *The "Why" are these processes correct?

I. Opening Paragraph:
    A. Statement of task
    B. Why do you care?
    C. Other relevant info to you

II. A detailed plan
    A. How do you plan on gathering information?
    B. How will you organize the information?
    C. Will you make any adjustments?
    D. What will you do with the information?

III. Mathematical Processes
    A. What mathematical processes will you use?
        1. Does this process need to be explained?
        2. Why is this process appropriate?

IV. Closing
    A. What are you expecting to find?
    B. Closing remarks for your project?

Resources

http://ibmathsresources.com/2014/04/01/maths-studies-ia-exploration-topics/

http://ibmathsresources.com/2013/09/03/maths-ia-exploration-topics/

http://cfbportal.schoolwires.net/cms/lib04/TX01001392/Centricity/Domain/2753/
IB_MathStudiesProjectSamples.pdf

http://www.slideshare.net/BillyEgg/ib-math-studies-internal-assessment-final-draft

https://sites.google.com/a/g.coppellisd.com/coppell-ib-math/mathstudies/internal-
assessment/sample-ia-s

http://www.clarkston.k12.mi.us/education/components/scrapbook/default.php?
sectiondetailid=32404

Checklist

IB Math Studies: IA Checklist

The following checklist is based on the rubric that is used to grade your project. To maximize your score, you should be able to check off as many of the following as possible.

A. Introduction
- ☐ Do I have a meaningful title?
- ☐ Do I have a clear statement of task stated explicitly, and does it describe what I am researching/what question I am trying to answer?
- ☐ Do I have a clear description of the plan, describing how my task will be performed (including how I will obtain data and how I will analyze it?)
- ☐ Did I include my own thoughts and predictions of what the answer to my research question will be?
- ☐ Did I give some background information on my topic?
- ☐ Did I discuss why I wanted to research this topic?

B. Information/measurement
- ☐ Is my data relevant to the research question I am trying to answer?
- ☐ Is my data sufficient in quantity?
- ☐ Is my data sufficient in quality (i.e., not too simple)?
- ☐ Is my data from a reputable source?
- ☐ Did I cite the source of my data?
- ☐ Did I include all of the raw data in an appendix?
- ☐ Did I organize the raw data into a form appropriate for analysis (ex., a table)?
- ☐ If necessary, did I group the data in an appropriate way?

C. Mathematical processes
- ☐ Did I include at least *two* "sophisticated" math processes (for example, finding the correlation and line of best fit, AND a Chi-Squared Test, all by hand)?
- ☐ Did I realize that "simple" mathematical processes (such as finding the mean and standard deviation, as well as creating bar charts and pie charts) may be necessary but will not be sufficient to earn a top score in this category?
- ☐ Did I show *all* necessary work and complete all work *by hand*?
- ☐ Are the mathematical processes I used relevant and meaningful for the type of data I collected?
- ☐ Did I double-check my work to make sure that it is accurate?

D. Interpretation of results
- ☐ Did I produce at least two conclusions based on my mathematical processes?
- ☐ Did I discuss how I interpreted the results of my mathematical processes?
- ☐ Are my conclusions and interpretations *consistent* with the mathematical process?
- ☐ Do my conclusions relate back to my original research question?
- ☐ Is my discussion of my interpretations and conclusions "comprehensive"?

Name: _____   Period: _____   Date: _____

E. Validity
- ☐ Did I address the issue of whether or not my mathematical processes were appropriate in this context?
- ☐ Did I discuss why the mathematical processes used are applicable in this context?
- ☐ Did I comment on any limitations to the mathematical processes that I used?
- ☐ Did I comment on the reasonableness of my conclusions/interpretations?
- ☐ Did I include any limitations and/or qualifications relating to my conclusions/interpretations?
- ☐ If I acknowledged that I needed more information/measurements, did I explain why?
- ☐ Did I suggest possible extensions of this project?

F. Structure and communication
- ☐ Is my paper easy to read?
- ☐ Did I include a bibliography/footnotes as appropriate?
- ☐ Is there a logical order and flow to the paper?
- ☐ Is all of my mathematical notation appropriate and correct?
- ☐ Is all of my terminology appropriate and correct?
- ☐ Have I included graphs/charts/tables as necessary?
- ☐ Have I included headings as necessary?
- ☐ Is everything organized neatly?

G. Commitment
- ☐ Did I participate in class discussion on project work?
- ☐ Did I submit each part of the project on time?
- ☐ Did I take initiative to discuss various parts of my project with the teacher and my peers?
- ☐ Did I demonstrate a full understanding of the concepts associated with my project?
- ☐ Did I demonstrate perseverance, even if the work became difficult?
- ☐ Did I show insight?
- ☐ Did I avoid complaining about the project?
- ☐ Did I stay focused and on task while in the computer lab?

IA Project Checklist.doc

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Attachments

IA Project Checklist.doc