

A decorative graphic on the left side of the slide consisting of a network of light blue lines and small circles, resembling a circuit board or a neural network, extending from the top to the bottom of the frame.

# **RANDOMIZED ASSESSMENTS**

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*Randomize:*

- make a set of items ***unpredictable***, unsystematic, or random in ***order or arrangement***

(<https://languages.oup.com/google-dictionary-en>)

- make something random (= so that it happens or is chosen ***by chance***), especially as a way of making a test ***fairer or more accurate***

(<https://dictionary.cambridge.org>)



# REASONS TO RANDOMIZE

- More practice (prework, homework, reviews)
- More interesting (projects, group work, diagnostic)
- Less cheating (preventing and catching)
- Easier edits (versions, makeups, corrections)

## Considerations:

- fairness and consistency
- transparency (tell students)
- adjust by assessment  
(difficulty, purpose, time...)

## Drawbacks:

- System restrictions
- Preparation, testing
- Grading and feedback

# PURPOSE AND TYPE OF ASSESSMENT

Pre-work, practice, reviews:

short questions or long but step-by-step questions; ideally auto-graded; detailed solutions provided

Assignments, small quizzes:

short and long questions; mostly auto-graded; feedback provided shortly

Major tests, projects:

short and long questions; manually graded; feedback provided after the grading period

# PAPER AND COMPUTER ASSIGNMENTS

## Paper assessments:

- Assign by student #, initials
- Versions within class, b/w classes
- Generate questions and answers

## Computer assessments:

- Question pools, shuffling
- Algorithmic questions
- Multiple attempts
- Adjust feedback view settings
- Various types of questions

## Combined assessments:

- Students download random tasks and complete them on paper
- Students attach their papers to online assessments
- Part1 online (calculations, graphs) and part2 on paper (concepts)

Assigned by student #, initials, group #  
+: Easy setup; paper&online; large classes  
-: Planning and control; longer grading  
Example1:

Fill in the last 4 digits of your student number:

| <i>A</i> | <i>B</i> | <i>C</i> | <i>D</i> |
|----------|----------|----------|----------|
|          |          |          |          |

1. The number of blog subscribers after  $x$  days ( $x \geq 0$ ):

$$V(x) = (1Ax^2 - 1B00)e^{-0.0C1x} + 1D000$$

Find the intervals where the function is increasing/decreasing.

Assigned by student #, initials, group #  
+: Easy setup; paper&online; large classes  
-: Planning and control; longer grading

## Example2:

A. Go to

<http://www.climate.weatheroffice.gc.ca/advanceSearch/search.html?Prov=AB&StationID=9999&Year=2011&Month=5&Day=4&timeZone=Atlantic>  
province corresponding to the last digit of your student number:

Student # ends with:

Province

- 1 Alberta
- 2 British Columbia
- 3 Manitoba
- 4 New Brunswick
- 5 Newfoundland
- 6 Ontario
- 7 Nova Scotia
- 8 Nunavut
- 9 Northwest Territories
- 0 Saskatchewan

Search. You will obtain a list of cities from A to Z, continuing on several pages.

Choose a city that starts with the first letter of your name (if there is none, use the second letter). Choose "Daily" data interval, "April", and click "Go". (Note that the



Assigned by student #, initials, group #  
+: Easy setup; paper&online; large classes  
-: Planning and control; longer grading  
Example3:

## Files

This is your version, DO NOT share with other students.

- [StudentData20210121](#)

### Release Conditions

Member of group: group > group1

- [StudentData20210221](#)

### Release Conditions

Member of group: group > group2



# Using Excel to generate questions

+: Paper&online; generate answers; common tech

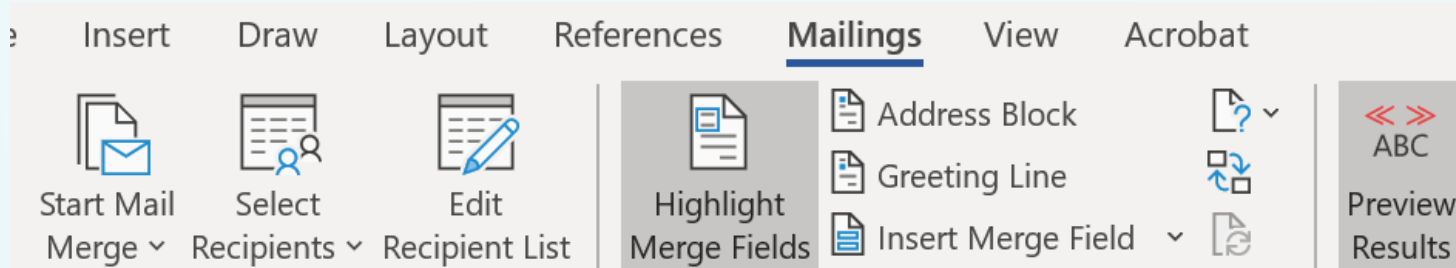
-: Preparation; formatting; grading?

## Example:

|   | A     | B                        | C                               |
|---|-------|--------------------------|---------------------------------|
| 1 | quest |                          | =CHOOSE(RANDBETWEEN(1,10),      |
|   | L     |                          | ="A "&C1&" listed at \$"&B2&"   |
|   |       |                          | is discounted by "&TEXT(B3,     |
|   |       |                          | "0%")&" during a promotion      |
|   |       |                          | event. An additional discount   |
|   |       |                          | of "&TEXT(B4,"0%")&" is         |
|   |       |                          | offered to customers with a     |
|   |       |                          | loyalty card.                   |
|   |       |                          | a) Find the dollar amount of    |
|   |       |                          | the promotion discount.         |
| 2 |       | =RANDBETWEEN(10,60)*10+9 |                                 |
| 3 | d1    | =RANDBETWEEN(21,39)/100  | b) Find the _additional_ dollar |
| 4 | d2    | =RANDBETWEEN(4,15)/100   | amount of the loyalty           |
| 5 | \$D1  | =B2*B3                   | discount.                       |
| 6 | \$D2  | =(B2-B5)*B4              | c) Find the net price if both   |

|   | A         | B            | C  |
|---|-----------|--------------|--|
| 1 | question1 |              | <b>blazer</b>  |
|   | L         | 119          | A blazer listed at \$119 is discounted by 29% during |
|   |           |              | a promotion event. An additional discount of 7% is   |
|   |           |              | offered to customers with a loyalty card.            |
|   |           |              | a) Find the dollar amount of the promotion           |
|   |           |              | discount.  |
|   |           |              | b) Find the _additional_ dollar amount of the        |
|   |           |              | loyalty discount.                                    |
|   |           |              | c) Find the net price if both discounts are applied. |
| 2 |           |              | Round final answers to 2 decimals.                   |
| 3 | d1        | 0.29         | <b>Feedback</b>                                      |
| 4 | d2        | 0.07         | <b>a) N1 = 119(1-0.29) = 84.49; \$D1 = 34.51</b>     |
| 5 | \$D1      | <b>34.51</b> | <b>b) \$D2 = 84.49×0.07 = 5.91</b>                   |
| 6 | \$D2      | <b>5.91</b>  | <b>c) N2 = 84.49-5.91 = 78.58</b>                    |

# Excel + Word



## Mailings tab in Word

«Store» sells a «Product» for \$«A1S».  
The markup on the item is \$«A1M».

## Versions in Excel:

| A1S   | A1M   | Store     | Product      |
|-------|-------|-----------|--------------|
| 59.78 | 18.53 | Walmart   | landscaping  |
| 62.13 | 19.88 | HomeDepot | snow shovel  |
| 64.55 | 21.30 | Lowe's    | garden gnome |

## Paper tests:

Walmart sells a landscaping rake for \$59.78.  
The markup on the item is \$18.53.

HomeDepot sells a snow shovel for \$62.13.  
The markup on the item is \$19.88.

Lowe's sells a garden gnome for \$64.55.  
The markup on the item is \$21.30.

# ALGORITHMIC QUESTIONS

BrightSpace (D2L):

Arithmetic question

Blackboard:

Calculated formula

Moodle and Sakai:

Calculated question

Canvas:

Formula question

Most publishers' systems have them,  
sometimes editable (Pearson MyLab, McGraw Hill Connect).

# BrightSpace (D2L): arithmetic questions

+: Answer&units, with tolerance, auto-graded?

-: Limited functions, only numeric, one answer, feedback

Example:

An invoice for {q} calculators listed at \${L} per calculator has the following terms: {d1}/25, {d2}/50, n/75. The invoice was issued on May {tt}, 2019.

- What amount settled the invoice if the {d2}% discount was applied?
- What was the last date to pay with the {d2}% discount?

Formula \*

$\{q\} * \{L\} * (1 - \{d2\} / 100)$

An invoice for 335 calculators listed at \$43.04 per calculator has the following terms: 6.3/25, 3.1/50, n/75. The invoice was issued on May 24, 2019.

- What amount settled the invoice if the 3.1% discount was applied?
- What was the last date to pay with the 3.1% discount?

➔ 13,971.43 ^(?i)July (0?[147]|10|13|16)\$

Comment: (given as feedback)

Amount = quantity\*L\*(1-d);  
date2=date1+days.

| # | Name                            | Min                             | Max                              | Decimal Places                   | Step                              |
|---|---------------------------------|---------------------------------|----------------------------------|----------------------------------|-----------------------------------|
| 1 | <input type="text" value="q"/>  | <input type="text" value="55"/> | <input type="text" value="995"/> | <input type="text" value="0"/> ▾ | <input type="text" value="10"/>   |
| 2 | <input type="text" value="L"/>  | <input type="text" value="39"/> | <input type="text" value="69"/>  | <input type="text" value="2"/> ▾ | <input type="text" value="0.01"/> |
| 5 | <input type="text" value="tt"/> | <input type="text" value="12"/> | <input type="text" value="29"/>  | <input type="text" value="0"/> ▾ | <input type="text" value="3"/>    |

# Brightspace (D2L): arithmetic questions

If detailed solutions are required,  
without lockdown:  
allow attachments

with lockdown:  
a separate written question

Your Answer:

Answer

units

▼ Add attachments to support your work

Add a File

Record Audio

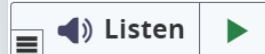
Record Video

Input the final answer with 2 decimals here, and [show your step-by-step solution in the next question box.](#)

Your Answer:

Answer

Question 19 (4 points)



Show the solution of the previous question here.

Paragraph ▼

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# Moodle: calculated questions; calculated multichoice

Around {p}% of students are international at a certain university. Using the binomial distribution, find the probability that out of the next {N} students registered, exactly 3 will be international.

Choice 1

$$\{=\{N\}*\{N\}-1*\{N\}-2\}/6*\text{pow}(\{p\}/100,3)*\text{pow}(1-(\{p\}/100),\{N\}$$

Choice 2

$$\{=\{N\}*\{N\}-1*\{N\}-2\}/12*\text{pow}(\{p\}/100,3)*\text{pow}(1-(\{p\}/100),\{N\}$$

## Choose wildcards dataset properties ?

The wild cards {x..} will be substituted by a numerical value from their dataset

### Mandatory wild cards present in answers

Wild card {N}

will use the same existing private dataset as befo

Wild card {p}

will use the same existing private dataset as befo

Synchronise the data from shared datasets with other questions in a quiz

- ☒ Do not synchronise
- ☐ Synchronise
- ☐ Synchronise and display the shared datasets name as prefix of the question name

Around 23% of students are international at a certain university. Using the binomial distribution, find the probability that out of the next 15 students registered, exactly 3 will be international.

Select one:

- ☐ 0.2886
- ☐ 0.1202
- ☐ 0.4810
- ☐ 0.2405



# Blackboard: calculated formula questions

[https://help.blackboard.com/Learn/Instructor/Ultra/Tests\\_Pools\\_Surveys/Question\\_Types/Calculated\\_Formula\\_Questions](https://help.blackboard.com/Learn/Instructor/Ultra/Tests_Pools_Surveys/Question_Types/Calculated_Formula_Questions)

## Question 2

If a small glass can hold 87 ounces of water and a large glass can hold 19 ounces of water, what's the total ounces in 4 large and 3 small glasses of water?

Add your answer

### Variable ranges

|   | MINIMUM | MAXIMUM | DECIMAL PLACES |
|---|---------|---------|----------------|
| x | 0       | 100     | 0              |
| y | 0       | 100     | 0              |

An instructor creates this question:

If a small glass can hold [x] ounces of water, and a large glass can hold [y] ounces of water, what's the total number of ounces in 4 large and 3 small glasses of water?



# Pearson MyLab: custom algorithmic questions

- ❖ Edit existing or create new questions
  - ❖ Numeric and non-numeric variables
  - ❖ Linked variables, nested variables
  - ❖ Multiple-choice, short answer, multi-short answer, essay
  - ❖ Auto-graded or manually graded
  - ❖ Allows students to type formulas and attach images
  - ❖ Allows working with data sets
- 
- Paid access
  - Only if required in the course

# Pearson MyLab: custom algorithmic questions

Editing  
view:

Explain the meaning of the slope and the y-intercept

~V1

Meaning of the slope in this case [1 mark]

Meaning of the y-intercept in this case [1 mark]

The slope indicates that ...

The y-intercept indicates that ...

Constraint Value (One Constraint per row. Use quotes around text.)

"The profit from selling  $x$  salads is  $P(x) = -80 + 6.5x$  dollars."

"The value of a computer in dollars is  $V(x) = 1,400 - 50x$  after  $x$  months."

"A country's budget in \$billions is  $E(x) = 3.4x + 41$ , where  $x=0$  corresponds to 2000."

"An import fee is  $F(x) = 0.08x$ , where  $x$  is the price of the goods in dollars."

"The volume of a water pipe  $x$  meters long is  $A(x) = 0.11x$  cubic meters."

Student  
view:

Explain the meaning of the slope and the y-intercept of the following function in a **real world context**.

The profit from selling  $x$  salads is  $P(x) = -80 + 6.5x$  dollars.

Meaning of the slope in this case [1 mark]

Meaning of the y-intercept in this case [1 mark]

↶↷

**B***I*U~~S~~ $\mathcal{I}_x$

$\equiv$  $\equiv$  $\equiv$  $\equiv$

$\equiv$  $\equiv$  $\equiv$  $\equiv$

$x_2$  $x^2$

Insert Formula

The slope indicates that ...

# Pearson MyLab: custom algorithmic questions

## Edit existing questions

### Editing view:

Kevin is an auto mechanic. He spends  $\sim\text{tshocks}$  hours when he replaces the shocks on a car and  $\sim\text{tbrakes}$  hours when he replaces the brakes. He works no more than  $\sim\text{hours}$  hours a week. He routinely completes at least  $\sim\text{srep}$  shocks replacements and  $\sim\text{brep}$  brake replacements a week. If he charges  $\sim\text{ishocks}$  for labor replacing shocks and  $\sim\text{ibrakes}$  in labor for replacing brakes, how many jobs of each type should he complete a week to optimize his income?

Let  $x$  be the number of shocks and  $y$  the number of brakes. Write the objective.

- ☒ A. Maximize  $z = \sim\text{ishocks} \cdot x + \sim\text{ibrakes} \cdot y$
- ☐ B. Minimize  $z = \sim\text{ishocks} \cdot x + \sim\text{ibrakes} \cdot y$

Write the constraints.

Total time:  $\sim\text{tshocks} \cdot x + \sim\text{tbrakes} \cdot y \leq \sim\text{hours}$

Shocks routine:  $x \geq \sim\text{srep}$

Brakes routine:  $y \geq \sim\text{brep}$

Other restrictions:

- ☒ A.  $x$  and  $y$  are non-negative and integer
- ☐ B.  $x$  and  $y$  are non-negative
- ☐ C.  $x$  and  $y$  are integers

|                      | Name    | Type    | Format | Constraints    | Link ID | Value |
|----------------------|---------|---------|--------|----------------|---------|-------|
| <a href="#">Edit</a> | hours   | Integer | #      | =[36,42,48,54] |         | 42    |
| <a href="#">Edit</a> | ibrakes | Integer | #      | =[200,250,300] |         | 200   |
| <a href="#">Edit</a> | ishocks | Integer | #      | =[400,450,500] |         | 500   |

### Student view:

Kevin is an auto mechanic. He spends 2 hours when he replaces the shocks on a car and 1 hour when he replaces the brakes. He works no more than 48 hours a week. He routinely completes at least 3 shocks replacements and 2 brake replacements a week. If he charges \$400 for labor replacing shocks and \$250 for labor replacing brakes, how many jobs of each type should he complete a week to optimize his income?

- ☐ A. Minimize  $z =$
- ☐ B. Maximize  $z =$

Write the constraints.

Total time:   $\leq$

Shocks routine:   $\geq$

Brakes routine:   $\geq$

Other restrictions:

- ☐ A.  $x$  and  $y$  are positive integers
- ☐ B.  $x$  and  $y$  are non-negative integers
- ☐ C.  $x$  and  $y$  are integers
- ☐ D.  $x$  and  $y$  are non-negative

Choose the correct answer.

- ☐ A.  $x=18, y=4$
- ☐ B.  $x=20, y=6$
- ☐ C.  $x=18, y=6$
- ☐ D.  $x=20, y=4$

Kevin's optimal weekly income is .



## Summary of ideas:

Decide

Learn

Re-iterate

Have fun!

Link to examples: <https://drive.google.com/drive/folders/1Uon-dtO8feQ2KsB9shQbjWBFrIpLYpb9>

**Thank you for your attention!**

