APPLICATION OF ASSESSMENT IN DECISION SCIENCES: A STUDY ON THE ASSESSMENT OF STUDENTS' MATHEMATICAL ACHIEVEMENT IN VIETNAM HIGH SCHOOLS

Nguyen Huu Hau, Hong Duc University
Bui Anh Tuan, Can Tho University
Tran Thu Giang, Can Tho University
Wing-Keung Wong, Asia University, China Medical University Hospital; The Hang Seng University of Hong Kongity

ABSTRACT

In many areas of society, especially education, from the standpoint of decision science, choosing a good performance evaluation tool is an important process in maintaining and improving quality. In the modern generation, with the opportunities brought about by the digital age, student assessment tools are increasingly diverse, with many new forms and tools, including the use of Google Forms. By inheriting research into Google Forms around the world, the paper presents the student assessment process through Google Forms in combination with IATA software. An empirical study was also conducted to evaluate the results of the model and make necessary recommendations.

Key words: Decision Sciences, Assessment in Teaching Mathematics, Students' Mathematical Achievement, Google Forms, IATA Software.

INTRODUCTION AND LITERATURE REVIEW

In this section, we discuss the effect of IT on education and review the literature of Google Forms tool.

The Effect of IT on Education

It will be known that Information Technology (IT) is one of the great achievements of the current scientific and technological revolution. It penetrates and dominates most fields of science, technology applications in production, education and training, and other socio-political activities. Especially in education and training, IT is used in many subjects. The most obvious effect is the quality of teaching and developing on both theories and practice. Therefore, it is a major topic officially organized by the UNESCO world cultural education organization into an action program at the threshold of the 21st century and anticipating a radical change in education. Thus, IT deeply affects education and training especially in innovation in teaching methods, creating a change of an educational revolution.

Literature Review

From a research perspective, many scientists, for example, Green et al. (1995) and Drosos et al. (2016) have pointed out the characteristics of IT affecting higher education and the interaction of IT and the knowledge management in higher education. Arkorful & Abaidoo (2015)

Citation Information: Hau, N. H., Tuan, B. A., Giang, T. T., & Wong, W-K. (2020). Application of assessment in decision sciences: a study on the assessment of students' mathematical achievement in Vietnam high schools. Journal of Management Information and Decision Sciences, 23(2), 86-111.

and others discussed in details the advantages and disadvantages of e-learning, a teaching method for the digital generation in higher education. In a different and more detailed perspective, Venkatesh et al. (2016) used the IT tools, web 2.0, to study the correlation between lecturers' teaching and students' acquisition in the course process.

From a practical perspective, the impact of IT on social life as well as education has been studied extensively across many countries and continents in the past 20+ years. Antonelli (1998) analyzed the interaction between IT and knowledge-based business processes in Europe through concrete evidence. Dale (2001) carefully analyzed the impact of IT on the US economy in various aspects. Braun (2003) pointed out the impact of IT on the local tourism network in Australia Afari & Khine (2017) pointed out the impact of IT in the industry context 4.0 to students from grades 3 to university students: Robotics exam in UAE. In addition, Kinuthia (2009) has showed the relationship between the development of education and IT elements in Kenya.

The fourth industrial revolution plays an extremely important role in our lives. The teaching of mathematics in high schools also needs to change to meet the current needs. Hau, et al. (2019) presented about teaching Mathematics by practical decision modeling in Vietnam High Schools to serve the fourth industrial revolution. Tuan, et al. (2019b) introduced the STEMTech model which emphasizes Technological factors, to meet the requirements of educational innovation and to serve the fourth industrial revolution. Tuan et al. (2019a) developed formulas for quick calculation of polyhedron volume in spatial geometry to help students in High Schools calculate quickly, accurately and save time to serve the fourth industrial revolution. Trung et al. (2019) studied some models for teaching Mathematics that are suitable for the new context in Vietnam. Peters (2017) presented to Technological unemployment: Educating for the fourth industrial revolution. Readers may refer in Maynard (2015), Prisecaru (2016), Xu et al. (2018), and Hirschi (2018), etc.

Google Forms

Xu et al. (2018) pointed out the many opportunities of the fourth industrial revolution, including improving the quality of life that education is an important and integral part of. Free web 2.0 tools like Facebook, Google, etc. are increasingly playing an essential role in our lives today. More specifically, it will be known that Google Forms is one of web 2.0 tools developed by Google. And the support from this utensil is to help users easily store information collected from surveys and statistical research. With the support of this utensil, we will not need to construct a separate data storage system that is both time consuming and expensive. For simplicity everything can be done on this tool. It has been seen that the use of Google Forms tool in teaching at high schools is very significant and practical in this situation.

Google Forms has also been mentioned in many recent studies, for instance, Valentin et al (2009) presented the problem of using Google Forms to support learning adaptations. It is also used in course evaluation in the United States (Gehringer, 2010). From an educational perspective, Google Forms is also an effective tool in studying students' awareness through the classroom feedback system (Chaiyo & Nokham, 2017). It has been seen that, Google Forms can be found in studies on many continents such as Europe, America, Asia, etc. Therefore, it is very meaningful to apply it in education, especially in the field of assessing student achievement. Readers may refer in Mansor (2012), Djenno et al. (2015), Agrawal et al. (2016), Laskowski (2016), Curts (2017) and Murphy (2018), etc..

Our main goal in this paper is to present to the application of Google forms in the assessment of students' mathematical achievement in Vietnam High Schools. The rest of paper is organized as follows. We review of the Google Forms tool, its components, and how to create Google Forms in Section 2. Experimental study is presented in Section 3. Concluding remarks and inference is provided in the last section.

Citation Information: Hau, N. H., Tuan, B. A., Giang, T. T., & Wong, W-K. (2020). Application of assessment in decision sciences: a study on the assessment of students' mathematical achievement in Vietnam high schools. Journal of Management Information and Decision Sciences, 23(2), 86-111.

THEORY AND RESEARCH METHODOLOGY

In this section, we discuss the theory of Google Forms tool, its components, discuss how to create Google Forms, and discuss the research methodology used in our paper.

Google Forms Tool

With the strong development of the Internet, there are now many cloud storage services launched with outstanding features such as accessing data anytime, anywhere, avoiding the risk of data loss due to hard disk errors, only cost savings for users, easy to update and share, has brought many practical benefits to users. Google Drive online data storage service is one of them. Google Drive is an online storage application that allows you to store and share data such as audio, images, text, videos, etc. on Google servers. This is a place to store personal data that you can access from a web browser or any device with Google Drive installed (such as PC, laptop, smartphone, etc.) the access address is https://drive.google.com, with support for applications such as Google Docs, Google Sheets, Google Slides and Google Forms. In which, Google Forms application is an application that helps create forms to collect information such as surveys, gather lists, register the results of test questions with the following advantages:

- Support many types of questions suitable for each specific content.
- Save time
- Saving only survey fees.
- Visual statistics via charts.
- Provide many templates and themes.

Components in Google Forms

Google Forms allows creating forms with optional content including:

a) Form description: allows you to enter a paragraph describing details of the form as well as instructions for entering information into the form.

b) Content: allows users to create questions with a variety of question types, depending on the content and purpose of each question. Some types of questions are provided in Google Forms, such as:

- Short answer: suitable for short answers, usually entered on one line.
- Paragraph: suitable for longer answers, maybe a paragraph.
- Multiple choice test: choice answers, allowing you to select one choice from multiple options.
- Multiple choice grid, check box grid: multiple choice answers, allowing to select one option from multiple selections (multiple choice).

Create a Google Forms

To create a Google Forms, we need to sign in to your Gmail account. On Gmail or Google.com interface, we will see the window icon in the upper right corner, click on it, it will reveal Google products, find and select Drive. Immediately we will be transferred to the Google Drive interface, where we manage all the files we upload and the files we create in Google Drive.

Because the creation of Google Forms is so simple, in this article, our main goal is to conduct an experimental study of this tool in teaching Mathematics to students in Vietnam High Schools. Therefore, we do not guide in detail how to create this tool. Readers can find detailed instructions for this on the internet. We now discuss to empirical study is conducted Vietnam High Schools.

Citation Information: Hau, N. H., Tuan, B. A., Giang, T. T., & Wong, W-K. (2020). Application of assessment in decision sciences: a study on the assessment of students' mathematical achievement in Vietnam high schools. Journal of Management Information and Decision Sciences, 23(2), 86-111.

Research Methodology

To conduct research on how students are assessed through Google Forms in conjunction with IATA software, we begin with designing an evaluation process as follows (Figure 1):

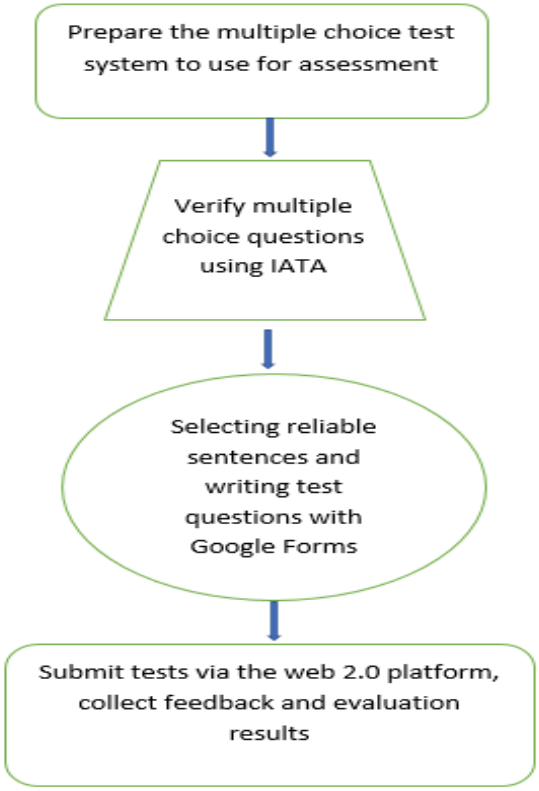


FIGURE 1
ACADEMIC EVALUATION PROCESS USING GOOGLE FORMS IN COMBINATION WITH IATA SOFTWARE

To carry out Step 1 of "Prepare the multiple choice test system to use for assessment", the knowledge chosen to evaluate is the exercises on combinatorics, probabilities, and Newton binomials in Chapter 2 Algebra textbook and Analytics 11 of Vietnam. A test quiz matrix of 25 sentences with six knowledge topics is composed of the following four levels of awareness (Table 1).

Specific questions are compiled according to the matrix of topics presented in the Section 3.2. In order to conduct Step 2 of the study, in order to save time and focus on the main issue, we reuse the findings of Truc (2018) and Luyen (2018). According to Ayala (2009), in order to validate multiple-choice questions, the sample size needs to be at least three times the number of questions (Kiet (2018)). Accordingly, Truc (2018) assessed a 45-minute test of composition and probability with 25 multiple choice questions and sample size of 87 students of class 11A1 and class 11A7 of Bui Huu Nghia High School (Can Tho city, South Vietnam). Similarly, Luyen (2018) also experimented with a test of 25 multiple-choice questions in 45 minutes about Newton's binomial for 82 students of class 11B11 and class 11B10 of Binh Thuy high school (Can Tho city, South Vietnam). Truc and Luyen's research assessed multiple-choice questions using IATA software with three levels of rating according to color symbols before each sentence:

- Questions with no problem.

Citation Information: Hau, N. H., Tuan, B. A., Giang, T. T., & Wong, W-K. (2020). Application of assessment in decision sciences: a study on the assessment of students' mathematical achievement in Vietnam high schools. Journal of Management Information and Decision Sciences, 23(2), 86-111.

Questions to consider.
Questions has problem.

We have selected among 50 assessed questions of Truc and Luyen to choose 25 multiple choice questions with blue rating, consistent with the knowledge topics and the level of awareness according to the topic matrix presented. IATA questionnaire evaluation indicators derived from Truc (2018) and Luyen (2018) are presented in Section 3.3. Step 3 of the study ended with a redesign of the test with 25 well-assessed multiple choice questions with the new version on Google Forms and ready for Step 4 of the study.

TABLE 1
TEST QUIZ MATRIX

Level / Knowledge	Level 1	Level 2	Level 3	Level 4	No of sentences
Binomial expansion	Question 3, 4	Question 7, 8	Question 19	Question 25	6
Find the elements of the term		Question 10, 11	Question 14, 15, 17	Question 24	6
Rules for counting	Question 2	Question 6	Question 18		3
Permutation - Combination	Question 1	Question 12	Question 20, 21		4
Probability		Question 9, 13	Question 16	Question 23	4
Discrete random variables	Question 5			Question 22	2
Number of sentences	5	8	8	4	25

Level 1 are problems that can be solved after a calculation or argument; Level 2 are problems that can be solved after two steps of calculation or argument; Level 3 are problems that can be solved from three or more calculation steps or arguments; Level 4 are problems but cannot be solved by conventional methods, must have a unique, creative approach to find a solution.

In Step 4, we make sample choices to evaluate learning outcomes through Google Forms. To achieve objectivity in research, we conducted a survey of 159 students of grade 11, of 3 high schools in the province of Thanh Hoa (North Vietnam), very far from Can Tho city in the Southern of Vietnam that is Ham Rong High School; Dao Duy Tu High School and Thach Thanh High School. The survey period is 2 months from September to October 2019. Experimental process includes

(1) Send the link of Test making by Google Forms to Facebook groups for students in the experiment;

(2) Using Google Forms to create the questionnaire and send the link "Survey of students' opinions" to students through Gmail.

Finally, we collect feedback and analyze those using statistical tools. The results and discussion are presented in Section 3.4.

EXPERIMENTAL STUDY

Experimental Objective

- Learn the ability to apply IT to the learning of students.
- Surveying needs of studying Mathematics with IT application.
- Evaluating the ability to receive and do papers by Google Forms in teaching Mathematics
- Survey the students' evaluation of the Test in the Combination - Probability chapter.

Citation Information: Hau, N. H., Tuan, B. A., Giang, T. T., & Wong, W-K. (2020). Application of assessment in decision sciences: a study on the assessment of students' mathematical achievement in Vietnam high schools. Journal of Management Information and Decision Sciences, 23(2), 86-111.

- Improve the test with Google Forms where is not reasonable, then store and publish on the form.

Experimental Content

Test

Question 1

A 100m running competition with 5 people with three prizes is the best, second and third. How much is likely to receive prizes from 5 players?

A. 10 abilities **B.** 60 abilities **C.** 120 abilities **D.** 6 abilities

Question 2

Give 2 sets $A=\{1;2;3;4;5\}$ and $B=\{7;8;9\}$. How many numbers have 2 digits $\overline{ab}$ with $a\in A$ and $b\in B$?

A. 8 numbers **B.** 56 numbers **C.** 15 numbers **D.** 28 numbers

Question 3

In the expression $(a+b)^n,(a,b\in\square,n\in\square^*)$. The sum of the exponents of a and b in each term is equal

A. $n+1$ **B.** $2n$ **C.** n **D.** $2n+1$

Question 4

The expression $(a+b)^n$ is given by:

A. $\sum_{k=1}^{n}C_n^k a^{n+k}b^k$ **B.** $\sum_{k=0}^{n}C_n^k a^{n-k}b^k$ **C.** $\sum_{k=1}^{n}C_n^k a^{n-k}b^k$ **D.** $\sum_{k=0}^{n}C_n^k a^{n+k}b^k$

Question 5

Drop a material on a rectangular cover with a length and width of 25m and 10m, respectively. A fixed point A is drawn on the cover as shown. Calculate the probability that a point is 3m to 4m away from point A.

A. $P=0,049$ **B.** $P=0,044$ **C.** $P=0,061$ **D.** $P=0,088$

Question 6

Citation Information: Hau, N. H., Tuan, B. A., Giang, T. T., & Wong, W-K. (2020). Application of assessment in decision sciences: a study on the assessment of students' mathematical achievement in Vietnam high schools. Journal of Management Information and Decision Sciences, 23(2), 86-111.

A farmer has 8 buffaloes. Today he took 2 buffaloes with him to the field but he did not know that 3 of them were sick. Calculate the probability that both buffaloes the farmer chooses are not sick.

A. $P = \frac{5}{14}$ **B.** $P = \frac{5}{28}$ **C.** $P = \frac{11}{28}$ **D.** $P = \frac{3}{28}$

Question 7

The sum of $S = 2^{13}C_{13}^{0} - 2^{12}.3^{1}C_{13}^{1} + 2^{11}.3^{2}C_{13}^{2} - 2^{10}.3^{3}C_{13}^{3} + ... + 3^{13}C_{13}^{13}$ is

A. $(-1)^{13}$ **B.** 5^{13} **C.** $(-5)^{13}$ **D.** 1^{13}

Question 8

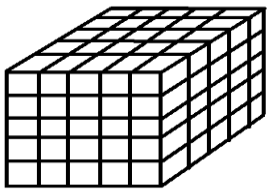
The expression $\left(5 + x^{2}\right)^{12}$ is equal to

A. $5^{12}C_{12}^{0} - 5^{11}xC_{12}^{1} + ... + (-1)x^{24}C_{12}^{12}$ **B.** $5^{12}C_{12}^{0} - 5^{11}x^{2}C_{12}^{1} + ... + \left(-1\right)x^{24}C_{12}^{12}$

C. $5^{12}C_{12}^{0} + 5^{11}x^{2}C_{12}^{1} + ... + x^{24}C_{12}^{12}$ **D.** $5^{12}C_{12}^{0} + 5^{11}xC_{12}^{1} + ... + x^{24}C_{12}^{12}$

Question 9

A cube has all sides painted in color and is divided into 125 equal cubes by the planes parallel to the sides of the cube (as shown). Taking at random 15 small blocks. Calculate the probability of obtaining 6 small blocks of 1 exact same surface.



A. 0.0001 **B.** 0.237 **C.** 0.212 **D.** 0.191

Question 10

In $\left(2a - b\right)^{5}$, $\left(a, b \in \mathbb{R}\right)$ the coefficient of the 3rd term is equal to:

A. 80 **B.** –40 **C.** –80 **D.** 40

Question 11

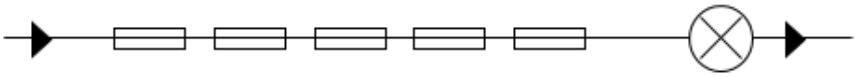
A person walking from the company came to his house when he found out he lost his wallet. He was sure that the wallet had fallen on a road about 100 m in front of the company so he went back to find it. Calculating the probability he finds the wallet knows the distance from home to the company is 1.5 km.

A. $P = \frac{1}{15}$ **B.** $P = \frac{3}{200}$ **C.** $P = \frac{14}{15}$ **D.** $P = \frac{1}{6}$

Citation Information: Hau, N. H., Tuan, B. A., Giang, T. T., & Wong, W-K. (2020). Application of assessment in decision sciences: a study on the assessment of students' mathematical achievement in Vietnam high schools. Journal of Management Information and Decision Sciences, 23(2), 86-111.

Question 12

For the following circuit: With 5 fuses connected in series before a light bulb. How many cases of current cannot reach the light bulb?



We denote: ⊗ light bulb; ▭ fuse.

A. 2500 cases **B**. 5 cases **C**. 31 cases **D**. 325 cases

Question 13

In $(x+2)^{n+6}$, $(x \in \square, n \in \square)$ has 17 terms. What is the value of n equal to?

A. 12 **B**. 10 **C**. 11 **D**. 17

Question 14

Which of the following is not a coefficient of x^8 in the expansion $(1+x)^{10}$?

A. $C_{10}^8 - C_9^8$ **B**. C_{10}^2 **C**. $C_9^7 + C_9^8$ **D**. C_{10}^8

Question 15

In this expression $(1-x)^{12}$, the term containing x^7 has a coefficient of

A. 792 **B**. –495 **C**. 495 **D**. –792

Question 16

In humans, there is a complete b gene that causes complete albinism compared to the normal B color gene. A couple has a heterozygous gene (that is, it has a recessive gene). Calculate the probability that they will have 5 children, then 4 normal and 1 sick child (rounded to the 3rd decimal place).

A. $P = 0,079$ **B.** $P = 0,015$ **C.** $P = 0,395$ **D.** $P = 0,396$

Question 17

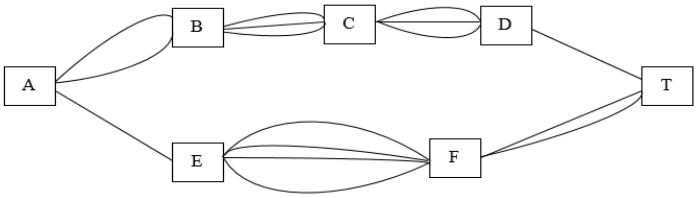
One has $(x-2)^{100} = a_0 + a_1x + a_2x^2 + ... + a_{100}x^{100}$. The coefficient of a_{97} is

A. $-2^3.C_{100}^3$ **B**. $-2^{97}.C_{100}^{97}$ **C**. $2^3.C_{100}^3$ **D**. $2^{97}.C_{100}^{97}$

Question 18

Every day, a goes from position A to field T, which is connected as in the picture. How many roads can a go with and not go through a location twice?

Citation Information: Hau, N. H., Tuan, B. A., Giang, T. T., & Wong, W-K. (2020). Application of assessment in decision sciences: a study on the assessment of students' mathematical achievement in Vietnam high schools. Journal of Management Information and Decision Sciences, 23(2), 86-111.



A. 26 streets **B.** 144 streets **C.** 16 streets **D.** 63 streets

Question 19

Find the positive integer n such that $C_n^0 + 2C_n^1 + 4C_n^2 + ... + 2^n C_n^n = 243$.

A. 5 **B**. 4 **C**. 11 **D.** 12

Question 20

Lan went to the market with her mother to buy a vegetable. The first store sells 5 vegetables, the second store sells 3 vegetables and the third sells 6 vegetables. All three stores sell the same vegetable. Lan and mother have all how to choose?

A. 12 ways **B**. 13 ways **C.** 90 ways **D**. 90 ways

Question 21

The 77th anniversary of the founding of Ho Chi Minh Communist Youth Union (March 26, 1931-26 March, 2008), Hai Phong Department of Education and Training organized a high school football tournament and there were 16 schools registered to participate in kicks in 3 rounds including 4 tables A, B, C, D, each board consists of 4 teams.

Round 1: Each team in the same group meets once and meets all the teams in the table (for example, Group A, the first team must compete with the other 3 teams).

Round 2 (semifinal):

The first in Group A- the first in Group C and the first in Group B- the first in Group C

Round 3 (final):

Third Prize: Two teams lost in the semi-finals. First prize: Two winning teams in the semi-finals.

The tournament is held on consecutive days, 4 matches a day. The question is: the organizers need to borrow the stadium so many days?

A. 3 days **B.** 13 days **C.** 7 days **D.** 4 days

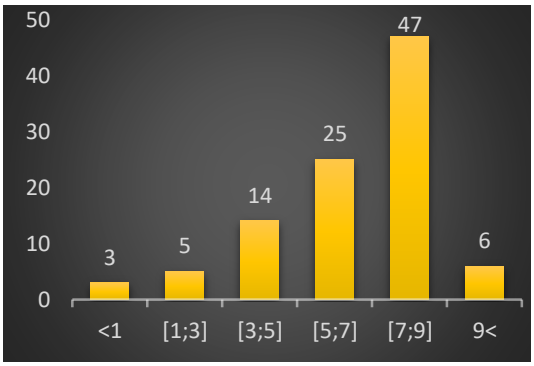
Question 22

The survey of more than 100 students on computer time in a day earned the following chart: Let X be the amount of time spent using a computer (hours).

Calculate $P(5,28 \le X < 9,6)$.

Citation Information: Hau, N. H., Tuan, B. A., Giang, T. T., & Wong, W-K. (2020). Application of assessment in decision sciences: a study on the assessment of students' mathematical achievement in Vietnam high schools. Journal of Management Information and Decision Sciences, 23(2), 86-111.

A. $P(5,28 \le X < 9,6) = 0,72$ **B.** $P(5,28 \le X < 9,6) = 0,94$



C. $P(5,28 \le X < 9,6) = 0,78$ **D.** $P(5,28 \le X < 9,6) = 0,53$

Question 23

The spelling mistake for the 2nd grader on each page is that the random quantity X has a probability distribution table as follows:

X	0	1	2	3	4	5
P	0,3	0,3	0,2	0,01	0,09	0,1

Calculate the probability of at least 3 errors per page.

A. $P = 0,2$ **B.** $P = 0,3$ **C.** $P = 0,81$ **D.** $P = 0,00009$

Question 24

Find the largest coefficient in $(1+x)^n$. Assume the sum of all coefficients is 4096.

A. 0 **B.** 1 **C.** C_{12}^5 **D.** C_{12}^6

Question 25

The sum of $(C_n^0)^2 + (C_n^1)^2 + ... + (C_n^n)^2$ will equal to

A. C_n^{2n} **B.** C_n^n **C.** C_{2n}^{2n} **D.** C_{2n}^n

Answers: 1B, 2C, 3C, 4B, 5C, 6A, 7A, 8C, 9C, 10A, 11B, 12C, 13A, 14A, 15D, 16D, 17A, 18A, 19A, 20A, 21C, 22C, 23A, 24D, 25D.

A priori analysis

Question 1

Because there are 3 prizes in the contest, 3 out of 5 will have prizes. But 3 people will have the order in order. So the number of possible prizes is $A_5^3 = 60$.

Choosing answer B.

Interpretation:

- Misuse of knowledge.

Citation Information: Hau, N. H., Tuan, B. A., Giang, T. T., & Wong, W-K. (2020). Application of assessment in decision sciences: a study on the assessment of students' mathematical achievement in Vietnam high schools. Journal of Management Information and Decision Sciences, 23(2), 86-111.

- Misunderstanding that how much is likely to receive a prize of 3 winners should count as 3! And choose the answer D.
- Another jamming answer.

Question 2

The number with 2 digits is $\overline{ab}$ such that $a \in A$ and $b \in B$. Thus, using multiplication rules $3.5 = 15$ ways.

Selecting answer C.

Explanation:

- Confused between the rules of addition and the rule of multiplication, so choose A.

- Misuse of knowledge. Because the two-digit number should take 2 numbers in all 8 and the number order will be a number, thus $A_8^2 = 56$ numbers. Choosing option B.

- Misuse of knowledge. Because the two-digit number should take 2 numbers in all 8 and unordered will be a number; hence $C_8^2 = 28$ numbers. Selecting answer D.

Question 3

The sum of the exponents of a and b in each term is equal

A. $n + 1$. False, confused with binomial term. **B.** $2n$. Wrong, not part of exponential theory.

C. n. Correct. **D**. $2n + 1$. Wrong, misuse of knowledge.

Question 4

The expression $(a+b)^n$ can be expressed as follows:

A. $\sum_{k=1}^{n} C_k^n a^{n+k} b^k$. False, determine the wrong k and the exponent of the first term.

B. $\sum_{k=0}^{n} C_k^n a^{n-k} b^k$. Correct.

C. $\sum_{k=1}^{n} C_k^n a^{n-k} b^k$. Wrong, determine the wrong k.

D. $\sum_{k=0}^{n} C_k^n a^{n+k} b^k$. Un-correct, determine the exponent of the first term.

Question 5

Citation Information: Hau, N. H., Tuan, B. A., Giang, T. T., & Wong, W-K. (2020). Application of assessment in decision sciences: a study on the assessment of students' mathematical achievement in Vietnam high schools. Journal of Management Information and Decision Sciences, 23(2), 86-111.

As shown in the above figure, the area to be stacked 3 to 4 meters away from A is the yellow area.

One needs to calculate: $S(A,3)=9\pi$ and $S(A,4)=16\pi$.

$S_{\Delta ABC}=2S_{\Delta ABO}=OB.OA=2\sqrt{5}$ and $S_{\Delta ADE}=2S_{\Delta ADO}=OD.OA=4\sqrt{3}$.

$S_{ADE}=\frac{120}{360}.16\pi=\frac{16}{3}\pi$ and $S_{BAC}=\frac{96}{360}.9\pi=\frac{12}{5}\pi$.

The area to find is:

$$S=S_{(A,4)}-S_{(A,3)}-\left(S_{DAE}-S_{\Delta DAE}\right)+\left(S_{BAC}-S_{\Delta ABC}\right)=\frac{61}{15}\pi+4\sqrt{3}-2\sqrt{5}.$$

So the probability to find is: $P=\frac{S}{250}=0,061$.

Choosing C.

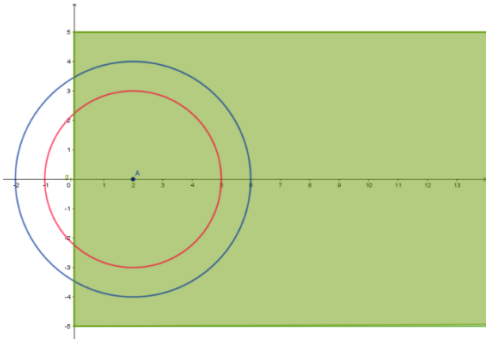
Interpretation:

- When finding the area of an event, there may be errors as follows:

$$S=S_{(A,4)}-S_{(A,3)}-\left(S_{DAE}-S_{\Delta DAE}\right)=\frac{5}{3}\pi+4\sqrt{3}.$$

Thus selecting A.

- With this problem, you can use integrals to solve. When placed in the coordinate system will set as follows:



But make the mistake of writing the circle equation is $(A,3):x^2+y^2=9$ and $(A,4):x^2+y^2=16$.

From there choose the option B.

- Error in finding the area, $S=S_{(A,4)}-S_{(A,3)}=16\pi-9\pi=7\pi$.

Which leads to choose the option D.

Question 6

The number of ways to choose 2 buffaloes out of 8 is $C_8^2=28$.

The number of options for choosing 2 buffaloes from 5 non-infected animals is $C_5^2=10$

.

Citation Information: Hau, N. H., Tuan, B. A., Giang, T. T., & Wong, W-K. (2020). Application of assessment in decision sciences: a study on the assessment of students' mathematical achievement in Vietnam high schools. Journal of Management Information and Decision Sciences, 23(2), 86-111.

So the probability to choose 2 healthy buffalos is $P = \frac{10}{28} = \frac{5}{14}$.

Explanation:
- Calculating the error in choosing among 5 healthy buffaloes is 5 thus choosing B.
- Calculate the number of ways to select 2 from 3 infected animals, so selecting D.
- Misuse of multiplication rules $P = \frac{C_5^2 + C_3^0}{C_8^2} = \frac{11}{28}$ hence choosing C.

Question 7

The sum of $S = 2^{13}C_{13}^0 - 2^{12}.3^1C_{13}^1 + 2^{11}.3^2C_{13}^2 - 2^{10}.3^3C_{13}^3 + ... - 3^{13}C_{13}^{13}$

Solution: Considering $(-2+x)^{13}$

Assume that $x = 3$, one has:

$(2-3)^{13} = (-1)^{13} = 2^{13}C_{13}^0 - 2^{12}.13C_{13}^1 + 2^{11}.3^2C_{13}^2 - 2^{10}.3^3C_{13}^3 + ... + (-3)^{13}C_{13}^{13}$

A. $(-1)^{13}$. Correct. **B.** 5^{13}. Wrong, choosing the wrong x.

C. $(-5)^{13}$. False, wrong formula $(-2-x)^{13}$ and choosing the wrong x.

D. 1^{13}. Un-correct, choosing the wrong x, cho $x = 1$.

Question 8

The expression $(5+x^2)^{12}$ has expansion is

Solution: It will be known that: $(5+x^2)^{12} = 5^{12}C_{12}^1 + 5^{11}x^2C_{12}^2 + ... + x^{24}C_{12}^{12}$

A. $5^{12}C_{12}^1 - 5^{11}xC_{12}^2 + ... + (-1)x^{12}C_{12}^{12}$. The error in formula and exponent of 2nd term.

B. $5^{12}C_{12}^1 - 5^{11}x^2C_{12}^2 + ... + (-1)x^{24}C_{12}^{12}$. The error of formula.

C. $5^{12}C_{12}^1 + 5^{11}x^2C_{12}^2 + ... + x^{24}C_{12}^{12}$. Correct.

D. $5^{12}C_{12}^1 + 5^{11}xC_{12}^2 + ... + x^{12}C_{12}^{12}$. Wrong, The error in the exponent of 2nd term.

Question 9

As shown in the figure, there are 54 small blocks with only one side painted.
Probability to get 15 blocks, there are exactly 6 blocks painted on one side only

$P = \frac{C_{54}^6.C_{71}^9}{C_{125}^{15}} \approx 0,212$. Choosing C.

Interpretation:

- Misunderstandings that the event of 'taking 15 blocks, there are exactly 6 blocks of only one side painted" and the event of 'taking 15 blocks, there is no block of painting only 1 face". Thus, selecting A.

Citation Information: Hau, N. H., Tuan, B. A., Giang, T. T., & Wong, W-K. (2020). Application of assessment in decision sciences: a study on the assessment of students' mathematical achievement in Vietnam high schools. Journal of Management Information and Decision Sciences, 23(2), 86-111.

- Another jamming answer.

Question 10

The expression $(2a-b)^5$, the coefficient of the 3rd term is equal to

Solution: $T_{k+1}=\sum_{k=0}^{n} C_n^{n-k}.(2a)^{n-k}(-b)^k$. The 3rd term, so $k+1=3\Rightarrow k=2$

The coefficient of the 3rd term is equal to $C_5^3.2^3=80$

A. 80. Correct.

B. -40. Wrong, do not understand the problem, the 3rd term should $k = 3$, thus $C_5^2.2^2=40$.

C. -80. False, mistake in calculation $C_5^3.(-1).2^3$.

D. 40. Un-correct, the 3rd term should $k = 3$ and mistake in calculation, hence $C_5^2.(-1).2^2=-40$

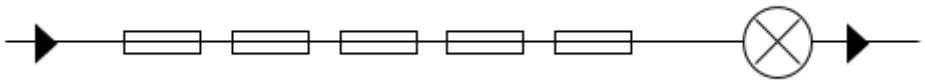
Question 11

Changing, $1,5km=1500m$. The probability to find is $P=\frac{100}{1500}=\frac{1}{15}$.

Selecting A.

Explanation :

- Do not convert quantities into the same unit, so choose B.
- Other jamming answers.



Question 12

According to the knowledge learned in physics we already know that for a given circuit, if you just break a fuse, there will be no electricity to the light bulb. But the possible cases are broken 1, 2, 3, 4 or all 5 fuses. Thus, the number of cases for each situation is as follows:

- Break 1 fuse: 5 cases. - Break 2 fuse: $C_5^2=10$ cases.

- Break 3 fuse: $C_5^3=10$ cases. - Break 4 fuse: $C_5^4=5$ cases. - Break 5 fuse: 1 case.

Thus using one has $5+10+10+5+1=31$ cases.

Choosing C.

Interpretation:

- Calculate the right number of cases for each situation but using the wrong rule of addition and multiplication, choose answer A.
- Considering only one fuse break situation should choose answer B.
- For each situation instead of using a combination, using the set should choose option D.

Question 13

Citation Information: Hau, N. H., Tuan, B. A., Giang, T. T., & Wong, W-K. (2020). Application of assessment in decision sciences: a study on the assessment of students' mathematical achievement in Vietnam high schools. Journal of Management Information and Decision Sciences, 23(2), 86-111.

In the expression $(x+2)^{n+6}$, $(n \in \square)$ has 17 terms. Then n = ?

Solution: It will be known that $(x+2)^{n+6}, (n \in \square)$ then there are $n+7$ terms.

Therefore $n+7=17 \Leftrightarrow n=10$.

A. 12. Wrong. Remember incorrectly the sum of binomial terms $(n+6)-1=17 \Rightarrow n=12$.

B. 10. Correct. **C.** 11. False. Using $n+6=17 \Rightarrow n=11.$

D. 17. Un-correct. Performing n is the sum of the binomial terms $n=17$.

Question 14

Which of the following is NOT the coefficient of x^8 in the expression $(1+x)^{10}$?

Solution: It can be seen that $(1+x)^{10} = \sum_{k=0}^{10} C_{10}^k x^k = \sum_{k=0}^{10} C_{10}^k x^{10-k}$

The coefficient of x^8 then $k=8$, thus $C_{10}^8 = C_{10}^2$.

A. $C_{10}^8 - C_9^8$. Correct. **B.** C_{10}^2. Wrong.

C. $C_9^7 + C_9^8$. False. Executing: $C_n^k = C_{n-k}^k + C_{n-k}^{k-1} \Leftrightarrow C_{10}^8 = C_9^8 + C_9^7$. **D.** C_{10}^8. Un-correct.

Question 15

In the expression $(1-x)^{12}$, the term of x^7 has the coefficient is

Solution: The general term in the above expansion is $T_{k+1} = C_{12}^k.(-1)^{12-k} x^k$

Require problem occurs when $k=7$.Then the coefficient of x^7 is: $-C_{12}^7 = -792$.

A. 792. Wrong, miscalculation.

B. -495. Un-correct, misunderstand the problem k + 1 = 7 + 1 = 8, thus using $-C_{12}^8 = -495$.

C. 495. False, miscalculation $k + 1 = 7 + 1 = 8$, and $C_{12}^8 = 495$.

D. -792. Correct.

Question 16

According to the knowledge we learned with the case of the problem, the offspring of F1 will have three genotypes and the probability of having a normal skin color is $\frac{3}{4}$, the probability of having a child with albinism is $\frac{1}{4}$.

Citation Information: Hau, N. H., Tuan, B. A., Giang, T. T., & Wong, W-K. (2020). Application of assessment in decision sciences: a study on the assessment of students' mathematical achievement in Vietnam high schools. Journal of Management Information and Decision Sciences, 23(2), 86-111.

According to the problem of giving birth to 5 children, there are 4 normal and 1 sick child. So follow the Bernouli formula : $P = C_5^4.\left(\frac{3}{4}\right)^4.\frac{1}{4} \approx 0,396.$

Selecting D.

Explanation :

- Misuse of knowledge. Thus choosing A.
- Wrong knowledge of hybridization. Therefore, it is calculated that the probability to get sick is $\frac{3}{4}$ and not sick is $\frac{1}{4}$. Selecting B.
- Cause of jamming C.

Question 17

In $(x-2)^{100} = a_0 + a_1x + a_2x^2 + ... + a_{100}x^{100}$. The coefficient of a_{97} is

Solution: One has: $f(x) = (x-2)^{100} = C_{100}^0x^{100} - 2C_{100}^1x^{99} + 2^2C_{100}^2x^{98} - ... + 2^{100}C_{100}^{100}$

Thereafter we get: $a_{97} = -2^3.C_{100}^3$

A. $-2^3.C_{100}^3$. Correct. **B.** $-2^{97}.C_{100}^{97}$. Wrong, misunderstand the problem, thus k = 97.

C. $2^3.C_{100}^3$. False, incorrect expansion of sign.

D. $2^{97}.C_{100}^{97}$. Un-correct, identify wrong k and wrong sign of $f(x)$

Question 18

Follow the diagram to go from A to T, An has two options: to go in direction B or direction E.

- Going towards B, following the multiplication rule to go from A to T, An will have 18 roads.
- Going towards E, following the multiplication rule to move from A to T, An will have 8 roads.

Thus, to follow the rules of addition to go from A to T, An will have 26 paths meeting the problem.

Choosing A.

Interpretation:

-Do not know how to combine the rules of multiplication and addition should

-Use only the addition rule. Choose option C.

-Use only multiplication rule. Choose option B.

-It is not clear which rule to use for each case, so choose option D.

Question 19

Find the positive integer n such that: $C_n^0 + 2C_n^1 + 4C_n^2 + ... + 2^nC_n^n = 243$

Solution: It will be known that $(x+1)^n = C_n^0 + xC_n^1 + x^2C_n^2 + ... + x^nC_n^n$

Citation Information: Hau, N. H., Tuan, B. A., Giang, T. T., & Wong, W-K. (2020). Application of assessment in decision sciences: a study on the assessment of students' mathematical achievement in Vietnam high schools. Journal of Management Information and Decision Sciences, 23(2), 86-111.

Performing $x=2$, then one has $3^n = C_n^0 + 2C_n^1 + 2^2 C_n^2 + ... + 2^n C_n^n$ $\Leftrightarrow 3^n = 243 \Leftrightarrow 3^n = 3^5$

A. 5. Correct. **B.** 4. Wrong, determine error $3^{n+1} = 243 \Rightarrow 3^{n+1} = 3^5 \Rightarrow n+1 = 5 \Rightarrow n = 4$

C. 11. False, because $C_n^0 + 2C_n^1 + 2^2 C_n^2 + ... + 2^n C_n^n = 243$ and thus $C_n^1 + 2C_n^2 + ... + 2^{n-1} C_n^n = 121 = 11^2 \Rightarrow n = 11$

D. 12. Un-correct.

Question 20

Each store sells different types of vegetables and Lan and her mother choose only one vegetable, so use the rule of $5+3+6=14$ choices.

Selecting B.

Explanation:

- Misunderstand in the problem. Choosing B.
- Confused between the rules of addition and the rule of multiplication, so we will choose C.
- misunderstand the rule of extension addition, therefore choose D.

Question 21

Round 1 : Each group has 4 teams and each team must compete against the other 3 teams so we have the number of matches for each group $(3.4):2=6$ matches. So 4 groups we have 24 matches in all.

- Round 2 : The first in Group A met the first in Group C and the first in Group B against the first Group D so we have 2 matches.
- Round 3 : One has one match to get the third prize and one match to get the first prize.

So there are 28 matches in total, 4 matches a day.

So the number of days needed is 7 days.

Choosing C.

Interpretation:

- Calculate the number of matches for each group but not multiply by 4. So the total number of matches is only 10. Choose option A.
- Find the error of the match in the first round is 12 matches, thus choose B. If it is wrong to calculate the number of matches for a group in the first round, then choose option D.
- Answer another noise.

Question 22

Based on the survey chart, one has $P(5,28 \le X < 9,6) = \frac{25}{100} + \frac{47}{100} + \frac{6}{100} = 0,78$.

Selecting C.

Explanation:

- Due to a misunderstanding between the sign "$<$" and "$\le$" therefore choose A.
- Students cannot distinguish between probability distribution functions and probability additions. Thus selecting B
- Unable to identify the problem.

Citation Information: Hau, N. H., Tuan, B. A., Giang, T. T., & Wong, W-K. (2020). Application of assessment in decision sciences: a study on the assessment of students' mathematical achievement in Vietnam high schools. Journal of Management Information and Decision Sciences, 23(2), 86-111.

Question 23

Make each page at least 3 errors, that is, 3, 4 or 5 errors per page.
Use the rules for adding the probability we find that $P = 0,2$.
Choosing A.
Interpretation:
- Miscalculation, thus selecting B.
- Misunderstanding the hypothesis should choose option C.
- Using multiplication rule, choose option D.

Question 24

Find the largest coefficient of the expansion $(a+b)^n$. Know that the sum of all factors is 4096.

Solution: It will be known that $C_n^0 + C_n^1 + ... + C_n^n = 2^n$,

Thus $2^n = 4096 = 2^{12} \Leftrightarrow n = 12$

So the largest coefficient is C_{12}^6.

A. C_{12}^7. Un-correct, miscalculation k.

B. 1. False, misunderstand $C_{12}^{12} = 1$.

C. C_{12}^5. Wrong, misuse the knowledge k.

D. C_{12}^6. Correct.

Question 25

The sum of $(C_n^0)^2 + (C_n^1)^2 + ... + (C_n^n)^2$ is equal to

Solution: It will be known that: $(x+1)^n (1+x)^n = (x+1)^{2n}$

The left side of the above formula is: $\left(C_n^0 x^n + C_n^1 x^{n-1} + ... + C_n^n\right)\left(C_n^0 + C_n^1 x + ... + C_n^n x^n\right)$

and the coefficient of x^n in the left side is given by: $\left(C_n^0\right)^2 + \left(C_n^1\right)^2 + \left(C_n^2\right)^2 + ... + \left(C_n^n\right)^2$

The coefficient of x^n in the right side $(x+1)^{2n}$ will equal to C_{2n}^n

Thereafter we get $\left(C_n^0\right)^2 + \left(C_n^1\right)^2 + \left(C_n^2\right)^2 + ... + \left(C_n^n\right)^2 = C_{2n}^n$

A. C_n^{2n}. Un-correct, misunderstand $\left(C_n^0\right)^2 + \left(C_n^1\right)^2 + \left(C_n^2\right)^2 + ... + \left(C_n^n\right)^2 = \left(C_n^n\right)^2 = C_n^{2n}$.

B. C_n^n. Wrong. Misunderstand in the problem $\left(C_n^0\right)^2 + \left(C_n^1\right)^2 + \left(C_n^2\right)^2 + ... + \left(C_n^n\right)^2 = C_n^n$.

C. C_{2n}^{2n}. False. Misuse the knowledge $\left(C_n^0\right)^2 + \left(C_n^1\right)^2 + \left(C_n^2\right)^2 + ... + \left(C_n^n\right)^2 = \left(C_n^n\right)^2 = C_{2n}^{2n}$.

D. C_{2n}^n. Correct.

The result of Test from IATA software

This result is presented in Figure 2.

Citation Information: Hau, N. H., Tuan, B. A., Giang, T. T., & Wong, W-K. (2020). Application of assessment in decision sciences: a study on the assessment of students' mathematical achievement in Vietnam high schools. Journal of Management Information and Decision Sciences, 23(2), 86-111.

Use	O	Name	Discr	PVal	PBis	a	b	c
☑		câu 1	0,58	0,61	0,78	1,69	-0,31	0,00
☑		câu 2	0,69	0,75	0,55	0,87	-1,02	0,00
☑		câu 3	0,82	0,69	0,73	1,40	-0,60	0,00
☑		câu 4	1,00	0,54	0,87	2,93	-0,09	0,00
☑		câu 5	0,91	0,62	0,78	1,85	-0,33	0,00
☑		câu 6	0,55	0,81	0,53	0,89	-1,33	0,00
☑		câu 7	0,64	0,71	0,60	0,96	-0,81	0,00
☑		câu 8	0,83	0,38	0,73	2,53	0,31	0,00
☑		câu 9	0,73	0,68	0,62	1,09	-0,62	0,00
☑		câu 10	0,69	0,56	0,68	1,34	-0,18	0,00
☑		câu 11	0,73	0,73	0,70	1,33	-0,75	0,00
☑		câu 12	0,73	0,67	0,66	1,29	-0,54	0,00
☑		câu 13	0,65	0,60	0,60	1,14	-0,32	0,00
☑		câu 14	0,73	0,75	0,69	1,33	-0,84	0,00
☑		câu 15	0,86	0,62	0,75	1,59	-0,35	0,00
☑		câu 16	0,41	0,75	0,42	0,60	-0,32	0,00
☑		câu 17	0,65	0,60	0,60	1,14	2,18	0,00
☑		câu 18	0,77	0,62	0,65	1,17	-0,39	0,00
☑		câu 19	0,54	0,44	0,36	0,33	0,48	0,00
☑		câu 20	0,54	0,43	0,41	0,50	0,41	0,00
☑		câu 21	0,50	0,35	0,42	0,46	0,90	0,00
☑		câu 22	0,46	0,50	0,33	0,21	0,00	0,00
☑		câu 23	0,46	0,66	0,43	0,78	-0,67	0,00
☑		câu 24	0,54	0,59	0,40	0,37	-0,61	0,00
☑		câu 25	0,37	0,43	0,27	0,17	1,06	0,00

FIGURE 2
EMPIRICAL RESULTS BY IATA SOFTWARE

We have used IATA software with Vietnamese version, in Figure 1, "câu" its mean "question". Theo đó, questions marked in green are ready for use, the yellow questions are in need of further observation, and the red questions are unreliable, so get rid of. The results from Figure 2 show that 25 Test questions can be used, since all are highlighted in green.

Application of Google Forms in Evaluating Academic Results

159 students grade 11, of 3 high schools in the province of Thanh Hoa (North Vietnam) that is Ham Rong High School; Dao Duy Tu High School and Thach Thanh High School participated in the assessment of academic results with Google Forms between September and October 2019. After experiencing the Test, there are 25 questions designed with Google Forms and sent via Facebook, experimental students are sent to a questionnaire to record feedback on how to evaluate their results with Google Forms. This questionnaire was also designed using Google Forms, including 6 questions from A1 to A6.

Question A1

Please indicate the level of use the media in a day (email, internet, etc.)?

☐ Never ☐ Rarely ☐ Sometimes ☐ Often ☐ Always

Citation Information: Hau, N. H., Tuan, B. A., Giang, T. T., & Wong, W-K. (2020). Application of assessment in decision sciences: a study on the assessment of students' mathematical achievement in Vietnam high schools. Journal of Management Information and Decision Sciences, 23(2), 86-111.

Question A2

Which tools do you use to access the internet or search for information and documents to serve learning?

□ Cellular phone □ Ipad □ Computer or laptop □ No tools to use □ Others

Question A3

Do you enjoy learning Mathematics through Google forms?

□ Totally dislike □ Dislike □ No comment □ Like □ Totally like

Question A4

What do you think about the benefit of learning Mathematics through Google forms? Your answer is:

Question A5

What do you think should be improved about learning Mathematics through Google forms? Your answer is:

Question A6

In your opinion, the teacher used Google forms in the evaluation, which proportion is appropriate?

□ 0% □ 25% □ 50% □ 75% □ 100% □ Others

A priori analysis of the survey questionnaire: Survey form is designed with a number of questions on the 5-level Linkert scale, with a number of multiple-choice questions to collect information as quickly as possible.

Question A1

The questionnaire was designed on a 5-level Likert scale to assess how often people use the media. Based on the results, analyze the feasibility of applying IT of students. If students choose: often and always, if they put IT into tests, exercises through Google Forms will be more convenient for students.

Question A2

Design questions with a variety of options to find out which means students can use in learning combined with Google Forms. If the student chooses No tools to use, the student's home study process will be difficult. The majority of students now use mobile phones, laptops, students can study anytime and anywhere through lessons on Google Forms, making it easier to study through these devices easy access. Because this is a multiple-choice question, students can choose so they can choose as many facilities as they can to demonstrate the necessary facilities.

Question A3

Citation Information: Hau, N. H., Tuan, B. A., Giang, T. T., & Wong, W-K. (2020). Application of assessment in decision sciences: a study on the assessment of students' mathematical achievement in Vietnam high schools. Journal of Management Information and Decision Sciences, 23(2), 86-111.

The questionnaire was designed to survey students 'opinions about Google Forms' interest in learning. If students select like or totally like Google Forms will be met with a fast, convenient and favorite standard. If the student chooses to completely dislike or dislike, find out the reason in the following questions.

Question A4

The questionnaire was designed to survey students' opinions about the benefits of Google Forms in taking a test

Question A5

The questionnaire was designed to survey students' opinions on issues that need improvement of Google Forms to prepare multiple-choice questions so that the editors can edit the test using Google Forms to suit the situation of the next level of facilities; student's approach and other objective factors.

Question A6

The questionnaire is designed with multiple options for students to assess the need to use Google Forms in the learning process.

A Posteriori Analysis and Survey Results

Question A1

TABLE 2
SURVEY RESULTS OF QUESTION A1

Level	Never	Rarely	Sometimes	Often	Always
Numbers	1	8	31	90	29
Proportion %	1%	5%	19%	57%	18%
Total	25%			75%	

It can be obseverd from Table 2 that, the level of never, rarely and sometimes are accounted for 25%, and the level of often, always is about 75%. Thus, it can be seen that most students use the media at a high level of use, suggesting that if they apply Google Forms to work, they will not make them too difficult.

Question A2

TABLE 3
SURVEY RESULTS OF QUESTION A2

Media	Cellular phone	Ipad	Computer or laptop	No tools to use	Telephone and laptop
Number	117	6	29	3	4
Proportion %	74%	4%	18%	2%	3%

It has been seen that, there are 117 students (74%) used cellular phones, 6 students (4%) used ipads, 29 students (18%) used computers or laptops, 4 students (3%) used a telephone or laptop, 3 students do not have the means to use. From the above data (Table 3), it proves that students have the means to take multiple choice tests on Google Forms.

Citation Information: Hau, N. H., Tuan, B. A., Giang, T. T., & Wong, W-K. (2020). Application of assessment in decision sciences: a study on the assessment of students' mathematical achievement in Vietnam high schools. Journal of Management Information and Decision Sciences, 23(2), 86-111.

Question A3

TABLE 4
SURVEY RESULTS OF QUESTION A3

Level	Totally dislike	Dislike	No comment	Like	Totally like
Number	2	9	53	83	12
Proportion %	1%	6%	33%	52%	8%

It can observed from Table 4 that, the level of totally dislike and dislike are accounted for 7%, while the level of like and totally like are about 60%. From data proves that Students are interested in Google Forms. An additional note that although the likes and totally likes rates are overwhelming, the no-comment rate accounts for 1/3 of the number of students surveyed. This suggests that more research needs to be done so that the assessment of academic results with Google Forms is more and more accepted in high schools.

Question A4

Through the question, realize that the benefits of Google Forms are most evaluated by students:

Fast and convenient (38%), save paper (15%), easy to edit, have instant results (23%), create excitement, not boring (31%). In addition, it can interact with remote students (19%), easy to store information (22%), encourage the use of information technology in learning, easy management, creating self-awareness in learning (21%) and actively thinking about acquiring knowledge. Stimulating students to explore resources for learning (25%). From the advantages proposed by the experimental team, it can be seen that Google Forms interact quite well with today's teaching and learning process. It also meets the needs of today's young generation, born and raised in the digital age. It demonstrates the potential of this assessment in teaching and learning today.

Question A5

Through the question, realize that most students feel that there are not too many points that need improvement when using Google Forms to take the test. Things to improve in Google Forms specifically are:

+ Need time to integrate into the test

+ Need to improve presentation of answers in addition to the correct answers of the answers need more guidance on solving problems.

Hence it has been seen that Google Forms application to take multiple-choice questions needs more instructions on how to solve Math problems and time to do tests.

It can be seen that the improvements mentioned above are in the internal aspect of the content of Mathematics, that is the appropriate time design and the specific solutions need to be displayed with answers. Technologically, these improvements can be addressed through web 2.0 platforms. These responses are open to future research on Google Forms in the future.

Question A6

Citation Information: Hau, N. H., Tuan, B. A., Giang, T. T., & Wong, W-K. (2020). Application of assessment in decision sciences: a study on the assessment of students' mathematical achievement in Vietnam high schools. Journal of Management Information and Decision Sciences, 23(2), 86-111.

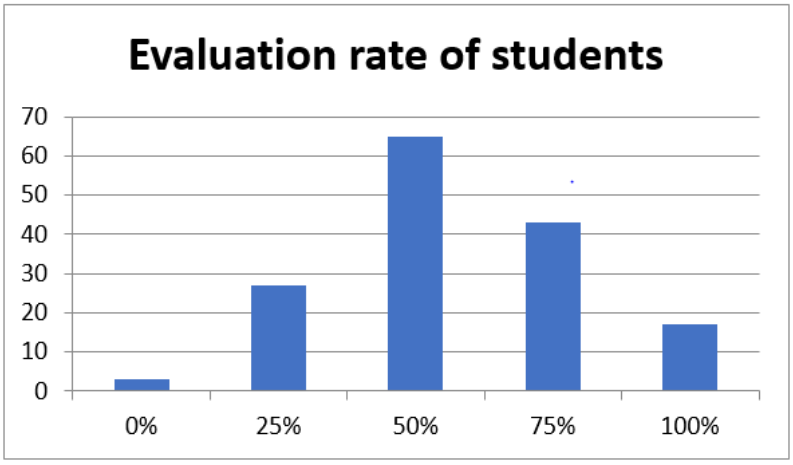


FIGURE 3
THE CHART OF THE USAGE LEVEL OF GOOGLE FORM THAT IS SUITABLE FOR TEACHERS ACCORDING TO STUDENTS' EVALUATION

According to the survey data, there are 129 students (81%) chose the appropriate proportion using Google Forms from 50% to 100%. 27 students (accounting for 17%) chose the appropriate rate using Google Forms as 25%. There were 3 students selected the rate of 0%. As such, most students agree to use Google Forms in taking tests. In general, the highest percentage is concentrated in using Google Forms in 50% of the tests, which may be a harmonious rate in the current context in Vietnam. The figures from Figure 3 also demonstrate the superior trend of Google Forms over traditional paper assessments. At the same time, from here, it paves the way for incorporating technology, especially web 2.0 platforms, in teaching today.

CONCLUDING REMARKS AND INFERENCE

Studies by Xu et al (2018) have shown opportunities and challenges for economies in the face of the fourth industrial revolution, especially developing countries like Vietnam. Education is also not out of the flow of multidimensional impacts in this new age of industry, in which web 2.0 tools like Google Forms become an effective tool for teaching process, especially in high schools.

Google Forms has been demonstrated its usefulness through a series of studies across continents, see, for example, Valentin et al. (2009) in Europe, Gehringer (2010) in Americas, Chaiyo & Nokham (2017) in Asia, etc. Although Google Forms has been studied from many angles, such as in working collaboratively and evaluating results, its specific use in mathematics at high schools is rarely mentioned through the studies cited. The articles also show the versatility of Google Forms but less analyze the effectiveness when used in education, especially at high school level.

The results in this article once again confirm the value of Google Forms in supporting the teaching process, as a web 2.0 tool. It also provides a new approach to Google Forms -- the combination of Google Forms and IATA multiple choice assessment software to apply to the assessment of students' Mathematics performance in high schools. Our study also provides an objective view on the application of Google Forms in the context of a developing country like Vietnam: IATA questionnaire assessments were conducted in the Southern of Vietnam, while Google Forms experiments were conducted in the Northern of Vietnam. The results of the study once again show that it is a good demonstration of the application of Google Forms in many parts of the world, with different conditions and circumstances.

Citation Information: Hau, N. H., Tuan, B. A., Giang, T. T., & Wong, W-K. (2020). Application of assessment in decision sciences: a study on the assessment of students' mathematical achievement in Vietnam high schools. Journal of Management Information and Decision Sciences, 23(2), 86-111.

It can be seen that, in the context of teaching today, it can be said that web 2.0 tools like Google Forms are very useful. It is accessible, free, user friendly, and fast to replicate the model and processes. In the future, when many countries around the world will turn to the evaluation of student learning results on computers, Google Forms will be even more effective. That is easily predictable in modern education.

This paper applies assessment of student's mathematical achievement in Decision Sciences. Extension could include assess other topics in Decision Sciences, for example, Finance (Ly et al. 2019a,b; Batai et al., 2017), capital (Thompson & Wong, 1991, 1996; Wong & Chan, 2004; Lam, et al., 2010, 2012; Guo, et al., 2017; Chang, et al., 2017), Statistics (Mahmoudi et al. 2019, Pho & Nguyen 2018, Pho et al. 2019, Tian et al. 2019, Tuan et al. 2019c), and logistics (Moslehpour et al., 2018; Tien et al., 2019).

ACKNOWLEDGEMENT

The fourth author would like to thank Robert B. Miller and Howard E. Thompson for their continuous guidance and encouragement. This research has been supported by the supports of Vietnam Ministry of Education and Training and Hong Duc University under grant number B2018-HDT-07, Can Tho University, Asia University, China Medical University Hospital, The Hang Seng University of Hong Kong, Research Grants Council (RGC) of Hong Kong (project numbers UGC/IIDS14/P01/17 and 12500915), and Ministry of Science and Technology (MOST, Project Numbers 106-2410-H-468-002 and 107-2410-H-468-002-MY3), Taiwan.

REFERENCES

Afari, E., & Khine, M. S. (2017). Robotics as an educational tool: impact of lego mindstorms. *International Journal of Information and Education Technology*, *7*(6), 437-442.

Agrawal, A., Atiq, M. A., & Maurya, L. S. (2016). A Current Study on the Limitations of Agile Methods in Industry Using Secure Google Forms. *Procedia Computer Science*, *78*, 291-297.

Antonelli, C. (1998). Localized technological change, new information technology and the knowledge-based economy: The European evidence. *Journal of Evolutionary Economics*, *8*(2), 177-198.

Arkorful, V., & Abaidoo, N. (2015). The role of e-learning, advantages and disadvantages of its adoption in higher education. *International Journal of Instructional Technology and Distance Learning*, *12*(1), 29-42.

Batai, A., Chu, A.M.Y., Lv, Z.H., & Wong, W.K. (2017). China's impact on Mongolian Exchange Rate, Journal of Management Information and Decision Sciences, *20*(1), 1-22.

Braun, P. (2003). Regional tourism networks: the nexus between ICT diffusion and change in Australia. Information Technology and Tourism, *6*(4), 231-243.

Chaiyo, Y., Nokham, R. (2017). The effect of Kahoot, Quizizz and Google Forms on the student's perception in the classrooms response system. IEEE: *International Conference on Digital Arts, Media and Technology*, 1-4 March 2017, Chiang Mai, Thailand.

Chang, C. L., McAleer, M., Wong, W. K. (2017). Management Information, Decision Sciences, and Financial Economics: A Connection, *Journal of Management Information and Decision Sciences*, *20*, 1-19.

Curts, E. (2017). Using Google Forms. Google Docs. Google, nd Web, 6.

Dale, W. J. (2001). Information Technology and the U.S. Economy. *American Economic Review*, *91*(1), 1-32.

Djenno, M., Insua, G. M., & Pho, A. (2015). From paper to pixels: using Google Forms for collaboration and assessment. *Library Hi Tech News*, *32*(4), 9-13.

Drosos, D., Chalikias, M., Skordoulis, M., & Mandalenaki, M. (2016). The Role of Information Technology and Knowledge Management in Higher Education. In *Proceedings of 2nd International Conference on Lifelong Education and Leadership for All (ICLEL 2016)*. Liepaja, pp 395-403.

Gehringer, E. F. (2010). Daily Course Evaluation with Google Forms. American Society for Engineering Education: *Proceedings of the 2010 American Society for Engineering Education Annual Conference & Exposition*.

Green, K. C., & Gilbert, S. W. (1995). Great expectations: Content, communications, productivity, and the role of information technology in higher education. Change: *The magazine of higher learning*, *27*(2), 8-18.

Guo, X., McAleer, M., Wong, W. K., Zhu, L. X. (2017). A Bayesian Approach to Excess Volatility, Short-Term Underreaction and Long-term Overreaction during Financial Crises. *North American Journal of Economics and Finance*, *42*, 346-358.

Citation Information: Hau, N. H., Tuan, B. A., Giang, T. T., & Wong, W-K. (2020). Application of assessment in decision sciences: a study on the assessment of students' mathematical achievement in Vietnam high schools. Journal of Management Information and Decision Sciences, 23(2), 86-111.

Hau, N. H., Tuan, B. A., Thao, T. T. T., & Wong, W-K. (2019). Teaching mathematics by practical decision modeling in Vietnam high schools to serve the fourth industrial revolution. *Journal of Management Information and Decision Sciences*, *22*(4), 445-462.

Hirschi, A. (2018). The fourth industrial revolution: Issues and implications for career research and practice. *The career development quarterly*, *66*(3), 192-204.

Kiet, B. A. & Phuong, B. N. (2018). Using IATA software to analyze, evaluate and improve the quality of objective multiple choice questions in the chapter of exponential, exponential, logarithmic functions. Can Tho University Journal of Science, *9C*(54), 81-93.

Kinuthia, W. (2009). Educational development in Kenya and the role of information and communication technology. *International Journal of Education and development using ICT*, *5*(2).

Lam, K., Liu, T. S., Wong, W. K. (2010). A Pseudo-Bayesian Model in Financial Decision Making with Implications to Market Volatility, Under- and Overreaction. *European Journal of Operational Research*, *203*(1), 166-175.

Lam, K., Liu, T. S., Wong, W. K. (2012). A New Pseudo Bayesian Model with Implications to Financial Anomalies and Investors' Behaviors. *Journal of Behavioral Finance*, *13*(2), 93-107.

Laskowski, L. (2016). Google Forms and Sheets for library gate counts. *Journal of Access Services*, *13*(3), 151-158.

Ly, S., Pho, K. H., Ly, S., Wong, W. K. (2019a). Determining Distribution for the Product of Random Variables by Using Copulas. Risks, *7*(1), 23.

Ly, S., Pho, K. H., Ly, S., Wong, W. K. (2019b) Determining Distribution for the Quotients of Dependent and Independent Random Variables by Using Copulas. *Journal of Risk and Financial Management*, *12*, 42.

Luyen, N. T. (2018). *Building multiple-choice questions system on Newton's Binomial in grade 11*. Graduation thesis, Can Tho University, Vietnam.

Mahmoudi, M. R., Heydari, M. H., Avazzadeh, Z., & Pho, K. H. (2019). Goodness of fit test for almost cyclostationary processes. *Digital Signal Processing*, *96*, 102597.

Mansor, A. Z. (2012). Managing student's grades and attendance records using google forms and google spreadsheets. *Procedia-Social and Behavioral Sciences*, *59*, 420-428.

Maynard, A. D. (2015). Navigating the fourth industrial revolution. *Nature nanotechnology*, *10*(12), 1005.

Moslehpour, M., Bilgicli, I., Wong, W.K., Hua-Le, Q.-X. (2018). Meeting the Agricultural Logistics Requirements of Accommodation Enterprises in Sakarya, Turkey. *Journal of Management Information and Decision Sciences*, *21*(1), 1-9.

Murphy, M. P. (2018). "Blending" Docent Learning: Using Google Forms Quizzes to Increase Efficiency in Interpreter Education at Fort Henry. *Journal of Museum Education*, *43*(1), 47-54.

Peters, M. A. (2017). Technological unemployment: Educating for the fourth industrial revolution. *Journal of Self-Governance and Management Economics*, *5*(1), 25-33.

Pho, K. H., Ly, S., Ly, S., & Lukusa, T. M. (2019). Comparison among Akaike Information Criterion, Bayesian Information Criterion and Vuong's test in Model Selection: A Case Study of Violated Speed Regulation in Taiwan. *Journal of Advanced Engineering and Computation*, *3*(1), 293-303.

Prisecaru, P. (2016). Challenges of the fourth industrial revolution. *Knowledge Horizons. Economics*, *8*(1), 57.

Thompson, H. E., Wong, W. K. (1991). On the unavoidability of ``unscientific" judgement in estimating the cost of capital. *Managerial and Decision Economics 12*, 27-42.

Thompson, H. E., Wong, W. K. (1996). Revisiting 'Dividend Yield Plus Growth' and Its Applicability. *Engineering Economist, 41*(2), 123-147.

Tian, Y., Pho, K.H. (2019). A Statistical View to Study the Aphorisms in Nahj al Balaghah. *Digital Scholarship in the Humanities, 34,* (In press).

Tien, D. T., Moslehpour, M., Wong, W. K. (2019). Speculating Environmental Sustainability Strategy for Logistics Service Providers Based on DHL Experiences, *Journal of Management Information and Decision Sciences*, *22*(4), 415-443.

Tuan, B. A., McAleer, M., Dang, N. T. T., & Pho, K. H. (2019a). Developing Formulas for Quick Calculation of Polyhedron Volume in Spatial Geometry: Application to Vietnam. *Journal of Reviews on Global Economics*, *8*, 815-837.

Tuan, B.A., Pho, K.H., Huy, L.M., & Wong, W.K. (2019b). STEMTech model in ASEAN Universities: An empirical research at Can Tho University. *Journal of Management Information and Decision Sciences*, *22*(2), 107-127.

Tuan, B. A., Pudikova, G. N., Mahmoudi, M. R., & Pho, K. H. (2019c). Statistical approaches in literature: Comparing and clustering the alternatives of love in Divan of Hafiz. *Digital Scholarship in the Humanities*, *34*, (In Press).

Truc, D. T (2018). *Develop multiple-choice combination of probability questions in grade 11*. Graduation thesis, Can Tho University, Vietnam.

Citation Information: Hau, N. H., Tuan, B. A., Giang, T. T., & Wong, W-K. (2020). Application of assessment in decision sciences: a study on the assessment of students' mathematical achievement in Vietnam high schools. Journal of Management Information and Decision Sciences, 23(2), 86-111.

Trung, N. T., Thao, T. T. P., & Trung, T. (2019). Realistic mathematics education (RME) and didactical situations in mathematics (DSM) in the context of education reform in Vietnam. *Journal of Physics: Conference Series, 1340*, 1-14.

Valentin, L. D. l. F., Pardo, A. & Kloos, C. D. (2009). Using Third Party Services to Adapt Learning Material: A Case Study with Google Forms. Spinger: *The 2009 European Conference on Technology Enhanced Learning*.

Venkatesh, V., Rabah, J., Fusaro, M., Couture, A., Varela, W., & Alexander, K. (2016). Factors impacting university instructors' and students' perceptions of course effectiveness and technology integration in the age of web 2.0. *McGill Journal of Education/Revue des sciences de l'éducation de McGill*, *51*(1), 533-561.

Wong, W.K., R. Chan (2004). On the estimation of cost of capital and its reliability. *Quantitative Finance, 4*(3), 365-372.

Xu, M., David, J. M., & Kim, S. H. (2018). The fourth industrial revolution: opportunities and challenges. *International journal of financial research*, *9*(2), 90-95.

CORRESPONDING AUTHOR

Bui Anh Tuan

Department of Mathematics Education, Teachers College,
Can Tho University, Vietnam

Email: batuan@ctu.edu.vn

Citation Information: Hau, N. H., Tuan, B. A., Giang, T. T., & Wong, W-K. (2020). Application of assessment in decision sciences: a study on the assessment of students' mathematical achievement in Vietnam high schools. Journal of Management Information and Decision Sciences, 23(2), 86-111.