Facilitating the Generation of Parametric Questions and their export to Moodle

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Frontiers in Education (FIE) Conference, Lincoln, USA, 2021

*Grant #2018/23561–1, São Paulo Research Foundation (FAPESP)

Contents

Motivation - Moodle

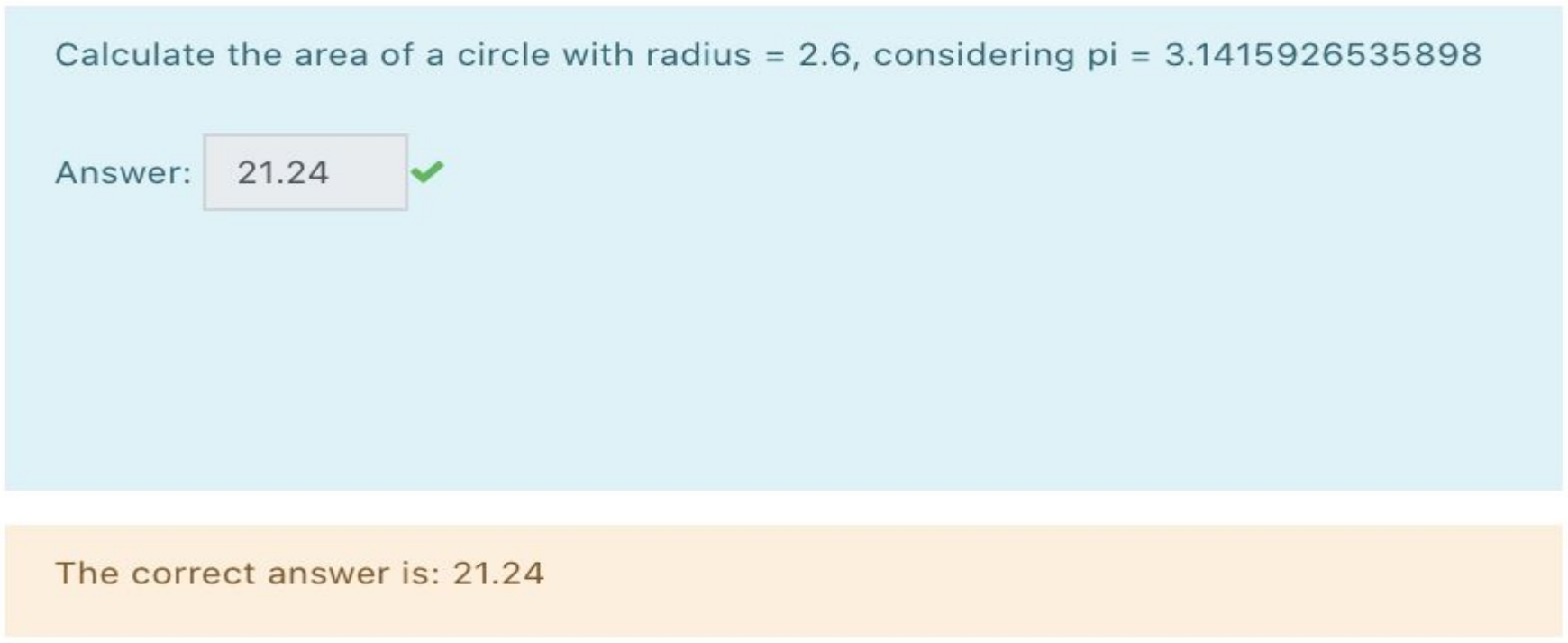
- Calculated Question type

  ⇒ It produces numerous variations of that question, but it must have at least one wildcard, namely a random variable.

- Example: “Calculate the area of a circle with a radius = {radius}, considering pi = {=pi()}”

Motivation - Moodle

Example: “Calculate the area of a circle with a radius = {radius}, considering pi = {=pi()}”



Motivation - Moodle vs MCTest

- Moodle
  - Calculated Question type

    ⇒ Restricts its calculated questions by resorting only to mathematical functions in PHP.
- Solution: Using Adapted MCTest
  - Open source available at GitHub
  - Deployments:

    ⇒ vision.ufabc.edu.br and mctest.ufabc.edu.br
  - Parametric Questions with Latex and Python

Method - MCTest

A Question

Question Update

Create-PDF	Compile-Colab	Save-Json
See this question in PDF format	Copy-Paste the description of question for test in Colab Google	It will save all your questions to a file in json format

Choose Topic: [BCM0505]<5-vector>

Short Description: scalar product

Group: Only one question per group will be sorted for each exam

Description:

Write a program that, given two vectors \(a = [a_1,a_2,...,a_n]\) and \(b = [b_1,b_2,...,b_n]\), both with \(n\) values, perform the following operation, know as scalar product:

$$\sum_{i=1}^n a_ib_i =a_1b_1 +a_2b_2 + \cdots +a_nb_n.$$

Considering the vectors below (size \(n = [[code:n]]\) each), what is the scalar product between them?

[[code:inputs]]

%%{ [[code:correctAnswer]] %%}

```
[[def:
n = np.random.randint(5,9) # choose size between 5 and 8
a = np.random.randint(9, size=n) # create vector with size n, elements between 0 and 9
b = np.random.randint(9, size=n)

inputs = 'a = [' + ','.join([str(i) for i in a]) + ']\n\nb = [' + ','.join([str(i) for i in b]) + ']'
correctAnswer = np.dot(a,b)
]]
```

1. Write a program that, given two vectors a and b, both with n integer values, perform the following operation, k as scalar product:

$$a = [a_1, a_2, \cdots, a_n]$$

$$b = [b_1, b_2, \cdots, b_n]$$

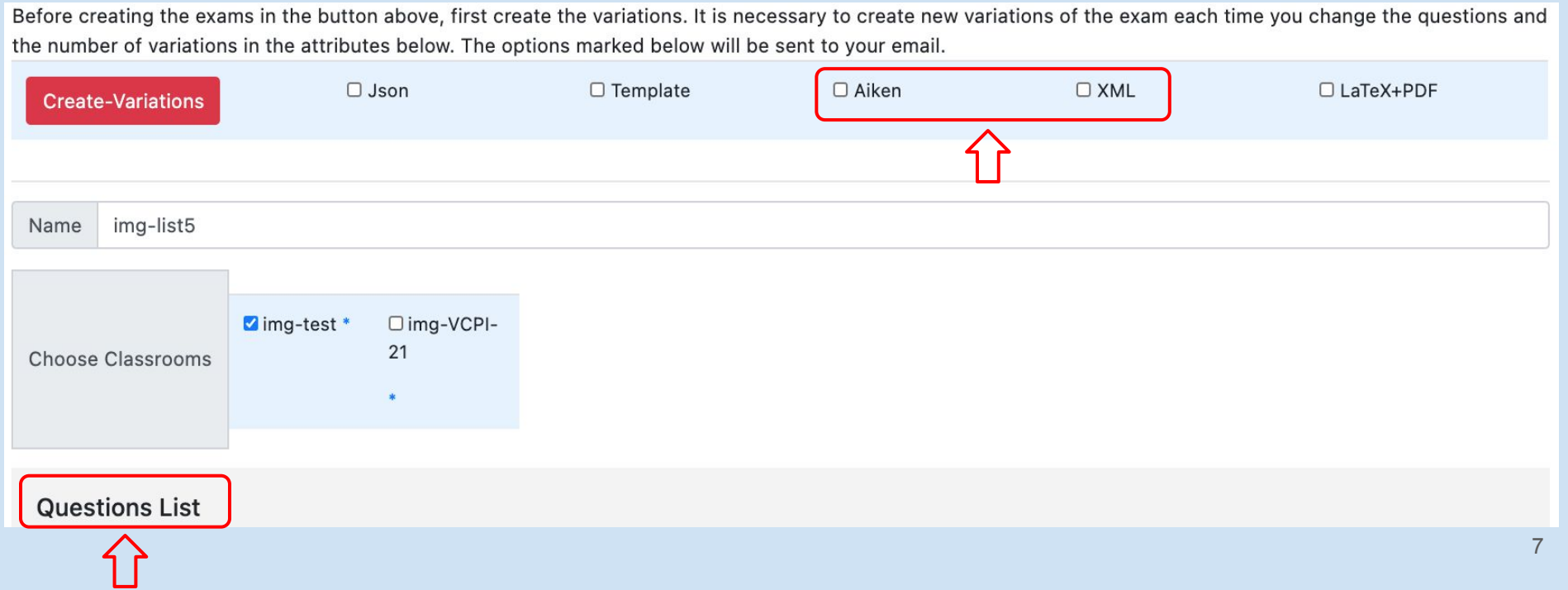
$$a * b = \sum_{i=1}^{n} a_i b_i = a_1 b_1 + a_2 b_2 + \cdots + a_n b_n$$

Considering the vectors below (size n=8 each), what is the scalar product between them?
a = [2, 0, 4, 0, 0, 6, 2, 8]
b = [6, 8, 1, 6, 5, 4, 0, 3]

A.*265 B.*362 C.*163 D.#064

Method - MCTest

- Using Adapted MCTest

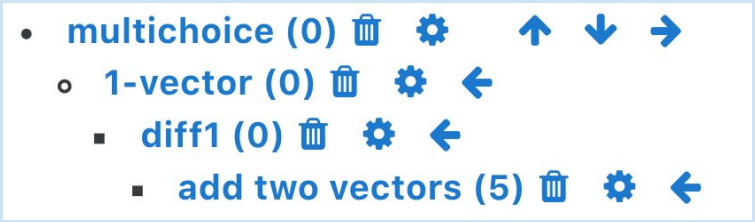


Method - Formats (generated by MCTest and imported by Moodle)

- Aiken format

```
What is the square root of 50 with three
decimals?
A) 7.073
B) 7.072
C) 7.074
D) 7.071
ANSWER: D
```

- XML format
  - Has the advantage of creating categories



Method

The same question drawn in:

MCTest

1. Write a program that, given two vectors $a = [a_1, a_2, ..., a_n]$ and $b = [b_1, b_2, ..., b_n]$, both with n values, perform the following operation, know as scalar product:

$$\sum_{i=1}^{n} a_i b_i = a_1 b_1 + a_2 b_2 + \cdots + a_n b_n.$$

Considering the vectors below (size $n = 7$ each), what is the scalar product between them?

a = [2,7,5,1,6,4,8]

b = [6,3,4,2,8,8,2]

A.*3156 B.*1150 C.#0151 D.*2146

Moodle (with random answers)

Write a program that, given two vectors $a = [a_1, a_2, \ldots, a_n]$ and $b = [b_1, b_2, \ldots, b_n]$, both with n values, perform the following operation, know as scalar product:

$\sum_{i=1}^{n} a_i b_i = a_1 b_1 + a_2 b_2 + \cdots + a_n b_n.$

Considering the vectors below (size $n = 8$ each), what is the scalar product between them?

$a = [2, 7, 5, 1, 6, 4, 8]$

$b = [6, 3, 4, 2, 8, 8, 2]$

Select one:

- a. 156
- b. 146
- c. 151 ✔
- d. 150

The correct answer is: 151

Experiments and Conclusions

- Networks and Communication class in 2020
- 45 students in the morning and 46 in the evening
- They were unified on Moodle & MCTest by their professor, who elaborated quizzes with our method
- He prefers to use the best features of several platforms: Moodle (for static teaching material), YouTube (for dynamic material), Zoom (for live lectures) and MCTest (for class evaluations).

Future Work

- Adding more information about each question through labelling it, specially the ones students have already answered.

- For this purpose we could resort to multi-agent systems, IRT and recommendation systems.

Thanks!

Questions?

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