

## Freeworks

Retours d'expériences sur l'utilisation de WIMS dans l'enseignement

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## WIMS

- randomly generated exercises

The characteristic for which today WIMS still stands out from the other currently available LMS is the built in possibility of extensively using random parameters in the coding of the learning objects and the capability of interacting with softwares of the most different kinds.

These two features combined allow for the creation of complex and engaging exercises. A well designed use of random parameters enable WIMS to provide a *virtually infinite* set of copies of each single activity.

[Cazzola, M., Lemaire, S., and Perrin-Riou, B. (2020). *Wims, a Community of Teachers, Developers and Users. Notices of the Ams*, 67(11):1770 – 1779]

## But...

We believe that problem solving *à la* Polya is a crucial step for a real understanding of mathematics. To gain a *forte* for mathematics, pupils should be led to actively work on a difficult problem and to develop a viable solution for such a problem, given the necessary amount of time.

The use of automated exercises might conflict with this idea. By being given a large amount of similar exercises, students might get the idea that the goal of mathematics is to find the *fastest* strategy to in order to get a computer-approved answer, a strategy that does not always correspond to a real understanding of the subject. This attitude is even stronger if WIMS exercises are used for exams.

[Cazzola, M., Lemaire, S., and Perrin-Riou, B. (2020). *Wims, a Community of Teachers, Developers and Users. Notices of the Ams*, 67(11):1770 – 1779]

## Mathematical knowledge

To know mathematics is not simply to know

*what* is the result of  $2 + 2$ ,

but it is also to know

*why*  $2 + 2 = 4$ .

## Freeworks

Since version 4.19c the module Freework (by Fabrice Guerimand) is available in WIMS, allowing for the construction of open-ended quizzes.

Such module makes it possible to integrate WIMS exercises, text and GeoGebra constructions.

### Types

**Diffusion** teacher can publish a file

**Diffusion et récupération** teacher can publish a file and students can upload files

**Réponse en ligne** flexible combination of the above plus on line answer, WIMS exercises, GeoGebra applet, ...

## Freeworks

Réponse en ligne

Different type of applets are available

### Consigne (teachers' zone)

- text
- GeoGebra
- interactive exercise
- files / a random file

### Answer (students' zone)

- text
- GeoGebra
- file

(current limit: 3+3)

## Examples of use

## OpenWIMS Bicocca

The examples are accessible in an Example Class on the Bicocca OpenWIMS server

<https://openwims.matapp.unimib.it/>



### Highlights

- Freeworks WIMSEDU (anonymous access)

(you can register via qrcode or by clicking on **Freeworks**)



## Diffusion et récupération

Students are proposed a file to download and have to answer by uploading one (1) file

Parametrization by teacher: intro, file size, dates, scoring, visibility

A general solution ("Correction") can be made available



## Réponse en ligne

Hand in file + online texts

Students are proposed some textual questions, a file to download and have to answer both online and by uploading one or more files



## Réponse en ligne

Hand in file + online texts

- Parametrization by teacher: file&text areas sizes, dates, scoring
- Files can be randomized
- A general solution can be made available



## Réponse en ligne

Marking

Marking students' work



## Réponse en ligne

GeoGebra applet

GeoGebra can be used to pose questions



## Réponse en ligne

GeoGebra applet

GeoGebra can be used to pose questions



## Réponse en ligne

GeoGebra applet

GeoGebra can be used as a drawing pad as an aid for standard questions.



## Réponse en ligne

GeoGebra applet

GeoGebra can be used as a drawing pad



## Réponse en ligne

GeoGebra applet

GeoGebra can be used as a drawing pad

**Question 1: Domain**  
Given the real variable function  $f(x) = \frac{x^2 + 1}{x - 1}$  describe its domain and compute the limits at the extremities of the domain.

**Question 2: asymptotes**  
Sketch the asymptotes of a function.

Define when a line is an asymptote for a function and study the possible asymptotes of the function  $f(x) = \frac{x^2 + 1}{x - 1}$ .

$$f(x) = \frac{x^2 + 1}{x - 1}$$

**Question 1: domain**  
Use this space to type your answer to question 1.

**Question 2: asymptotes**  
Use this space to type your answer to question 2.

**Sketch the graph of the function**  
Sketch the graph of the function  $f(x) = \frac{x^2 + 1}{x - 1}$ .



## Réponse en ligne

WIMS exercises

**Sujet**  
**Symmetry of a plane figure**  
Identify your answer.

What do we know about the symmetry group of a rosette?

Solve the WIMS exercise. Afterwards, follow instruction to come back to this page in order to write down a full explanation of the exercise.

Reference: See Par. 16.4 of the textbook.

Solve the exercise and then justify your answer.

Save the WIMS exercise. Once obtained full score, you will be able to come back to this page and write a full explanation of your answer under the required drawing.

**1** Build your own rosette. What can we say about the rosette's symmetry group?

• Détails d'activité sur ce devoir libre

**Zone de réponse**  
Use this space to type your answer.

Instructions to click on the bottom of the page before answering.

• Détails d'activité sur ce devoir libre

**Drawing pad**  
Use this space to draw your answer.

Instructions to click on the bottom of the page before answering.



## Réponse en ligne

WIMS exercise

**Devoir libre 8 - Exercice 1**  
Vous devez obtenir une note minimale de 7.3 à l'exercice avant de rédiger sur feuille les détails de votre résolution.

**Build your own rosette**  
Is it possible to draw a rosette whose symmetry group has 4 elements and contains reflections?  
Your reply: No

Once you've answered the question, provide a full justification for your answer. If the answer is "yes", please also provide an explicit drawing of the rosette with the required characteristics.

**Analyse de votre réponse**  
[1] No: mauvaise réponse, la bonne réponse est: Yes

**Devoir libre 8 - Exercice 1**  
Vous devez obtenir une note minimale de 7.3 à l'exercice avant de rédiger sur feuille les détails de votre résolution.

**Build your own rosette**  
Is it possible to draw a rosette whose symmetry group has 9 elements and contains reflections?  
Your reply: No

Once you've answered the question, provide a full justification for your answer. If the answer is "yes", please also provide an explicit drawing of the rosette with the required characteristics.



## Réponse en ligne

WIMS exercise

**Sujet**  
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Identify your answer.

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| Date      | Hour     | session sheet | exo | Requete | IP       | Status         |
|-----------|----------|---------------|-----|---------|----------|----------------|
| F20230628 | 11:39:43 | PF4F709956    | 8   | 1       | now      | 149.132.103.36 |
| F20230628 | 11:40:26 | PF4F709956    | 8   | 2       | score 0  | 149.132.103.36 |
| F20230628 | 11:41:11 | PF4F709956    | 8   | 1       | return   | 149.132.103.36 |
| F20230628 | 11:41:16 | PF4F709956    | 8   | 1       | score 10 | 149.132.103.36 |



## Students answers

Nell'esercizio proposto non è possibile costruire un rosone diedrale il cui gruppo di simmetria ha esattamente 3 rotazioni e 2 riflessioni, perché il numero di riflessioni e di rotazioni deve essere lo stesso per definizione. Se volessi disegnare un rosone diedrale con 3 rotazioni lo sarei costretto a disegnare un rosone con 3 riflessioni. Analogamente, se volessi disegnare un rosone con 2 riflessioni sarei costretto a disegnare un rosone con 2 rotazioni.

[...] non è possibile che nel gruppo di simmetria ci siano 5 rotazioni e 4 riflessioni, perché comprendendo entrambe le isometrie si tratta di un rosone diedrale ma esse non sono in numero uguale



## Symmetry

Fig. 1

Fig. 2

Diedrale di 8 elementi con riflessioni



## Réponse en ligne

Early consigne

**Taille limite pour le fichier d'un participant**  
Permet de régler la taille limite de la copie de fichiers pour chaque participant.  
0.25Mo (20Mo pour les participants de la classe.)

Capacité de la classe (150 Mo)  
Utilisé: 10%; Réserve: 59%; Libre: 90%.

**Date de remise**  
Date avant laquelle les participants doivent avoir terminé le devoir.  
07/17/2023 à 12:00 AM

**Date du corrigé**  
Date à partir de laquelle le corrigé sera disponible au téléchargement.  
07/21/2023 à 12:01 AM

**Notation**  
Permet d'attribuer une note manuelle à chaque participant.  
 Oui  Non

**L'enseignant peut voir en permanence les devoirs des participants**  
En outre, vous pouvez télécharger les devoirs d'un élève avant la date limite de fin du devoir (éventuellement, il ne sera pas possible de les corriger).

**Les participants peuvent définir le devoir comme terminé avant la date de remise**  
Un participant ne peut plus modifier son devoir une fois qu'il a défini comme terminé sans intervention de l'enseignant.

**Condition pour cacher la séquence aux participants**  
Visible pour tous

**Informations générales**  
Paramétrage du devoir / Liste des devoirs rendus / 1 participant a obtenu son devoir.

Vous pouvez déposer ou modifier votre devoir ci-dessous jusqu'au 16 juillet 2023 à 23h00. Si vous pensez avoir terminé, vous pouvez sauvegarder et remettre votre travail maintenant.

Vous avez décidé de remettre votre travail maintenant. Votre réponse sera sauvegardée dans le dossier de votre devoir. Vérifiez soigneusement vos réponses et cliquez sur le bouton "Remettre" en bas de la page.

Vous envisagez peut-être à tout moment votre devoir.

| Nom de l'étudiant | Devoirs (et date de dépôt) | Note (/10) | Date de correction | Date de remise définitive |
|-------------------|----------------------------|------------|--------------------|---------------------------|
| Du Paris          | 20 Juin 2023 à 11:42       |            |                    | 20230628 11:46:09         |
| Topolino          |                            |            |                    |                           |



Can be useful e.g. for exams.

## Conclusions

### Advantages

- open-ended question nicely integrated with WIMS random exercises
- flexible
- expandable

### Disadvantages

- need of manual marking (help from AI?)
- a bit tricky to set up
- still under development
- less robust than e.g. moodle text assignment (autosave, word count, ...)



## References

- ▶ Cazzola, M., Lemaire, S., and Perrin-Riou, B. (2020). Wims, a Community of Teachers, Developers and Users. *Notices of the Ams*, 67(11):1770 – 1779.
- ▶ Xiao, G. (2001). WIMS: An Interactive Mathematics Server. *Journal of Online Mathematics and its Applications*, 1(1). Retrieved December 9, 2019, from <https://www.maa.org/press/periodicals/loci/joma/wims-an-interactive-mathematics-server>.

