Supporting Criteria-based Marking

Paul Anderson
<dcspaul@ed.ac.uk>

Susan Rhind
<susan.rhind@ed.ac.uk>

Anna Wood
<anna.wood@ed.ac.uk>

Software & Documentation

http://homepages.inf.ed.ac.uk/dcspaul/pmark

Overview

What do we mean by "Criteria-based marking" ?

What is PMark & why do we need it ?

What have we learned ?

How can you try the software ?

Criteria-based marking

Involves ...

Being explicit about the criteria on which the quality of the work will be judged

It is not ..

"**Norm-based**" - i.e. the results for one student do not depend on their past performance, or on the performance of the other students

Under our strict definition, it is not ...

"**Compensatory**" - i.e. students can not succeed by excelling at some parts of the assessment and failing at others (unless this is an explicit intention)

So it is not ...

"**Additive**" - because any summing of numeric values is compensatory

Computing a mark requires ...

"**Criteria**" and "**Decision rules**"

Example criteria

Basic criteria

- Understanding of the problem
- Completion of the project
- Quality of the work
- Quality of the report

Additional criteria

- Knowledge of the literature
- Critical evaluation of previous work
- Critical evaluation of own work
- Justification of the design decisions
- Solution of any conceptual problems
- Amount of work

from the Informatics
Undergraduate project

Example decision rules

0-19 Bad Fail: The project is inadequate on all of the basic criteria.

20-29 Clear Fail: The project is inadequate on more than one of the basic criteria, but not all.

30-39 Marginal Fail: The project is inadequate on one of the basic criteria.

40-49 III: The project is adequate on all of the basic criteria.

50-59 II.2: The project is at least fair on all of the basic criteria and is fair on most of the additional criteria.

60-69 II.1: The project is at least good on all of the basic criteria and is at least fair and sometimes good or excellent on all of the additional criteria.

70-79 Low I: The project is good or excellent on all of the basic and additional criteria; or it almost achieves this by being fair on only one of the additional criteria, and also has elements of the exceptional criteria.

80-89 High I: The project is good or excellent on all of the basic and additional criteria and also has elements of the exceptional criteria.

90-100 Outstanding I: The project is excellent on all of the basic and additional criteria, and has strong elements of the exceptional criteria.

Criteria-based marking & PMark

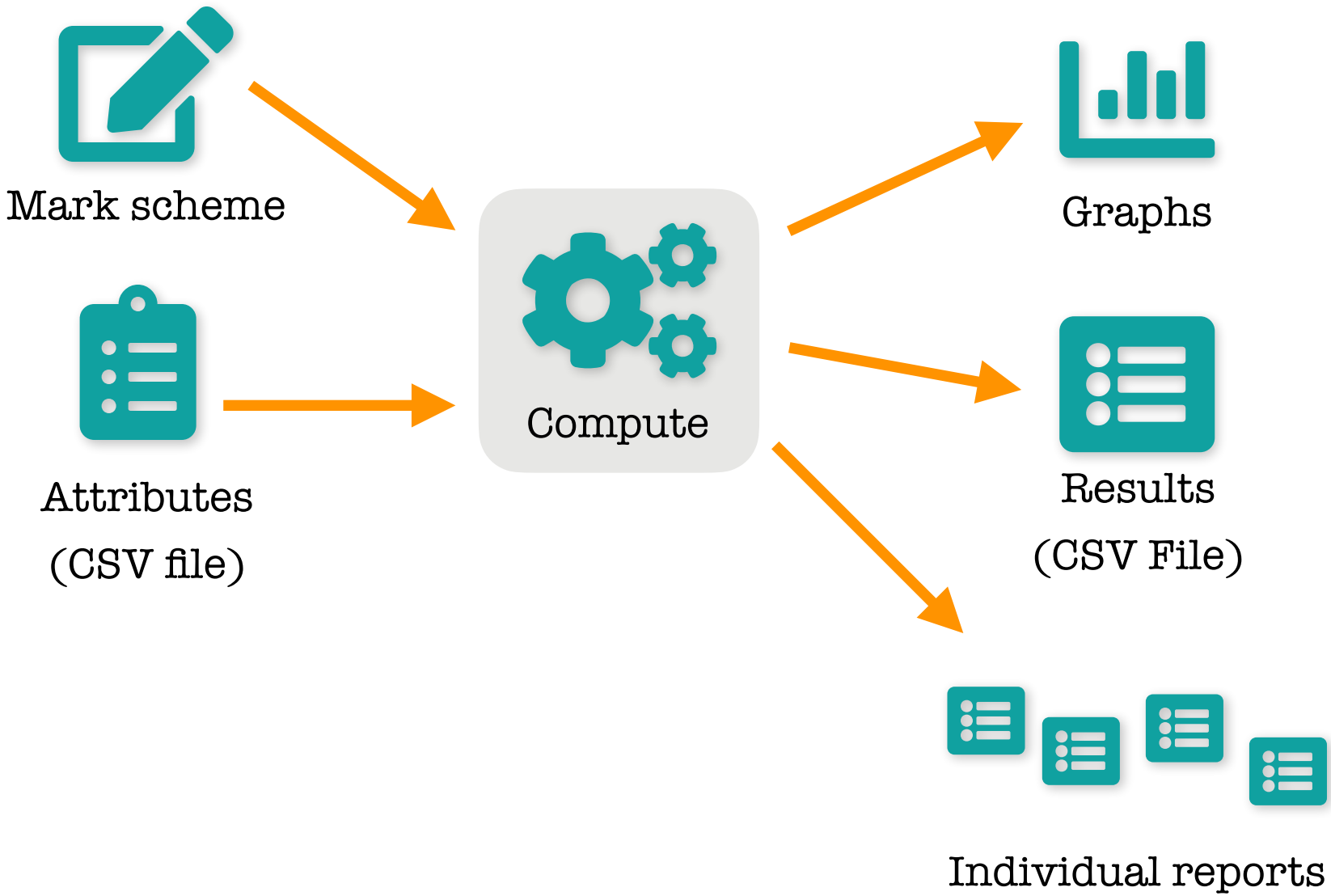
Criteria-based marking

- Forces us to be very clear about the connection between the final mark and the criteria
- It can be difficult to compute a mark manually with many small rules
- Generating a fine-grained numeric mark is usually a manual process

PMark

- Is a tool for computing marks according to a criteria-based "**mark scheme**" with explicit decision rules
- Think of this as the equivalent of a spreadsheet for computing marks from an additive scheme
- PMark allows us to experiment easily with lots of small rules
- It can also interpolate between the grades to automatically calculate a mark on an arbitrary numeric scale (eg. the Common Marking Scheme)
- And it produces explicit reasons for the resulting marks which relate the mark to the criteria (and hence the learning outcomes)

PMark: computing results



PMark

Settings Home

Scheme
ex3

Data
sample1

Result
ex6+sample2

Graph
ex6+sample2...

```
[types]
pass-fail: [fail,pass]
out-of-10: [0..10]
result: [fail,pass,distinction]

[attributes]
ex1: pass-fail
ex2: pass-fail
tutorials: out-of-10

[rules]
pass: tutorials=5
pass: ex1=pass or ex2=pass

distinction: pass
distinction: ex1=pass
         and ex2=pass

[results]
final-grade: result
```

Upload Download
New Delete
Forms Print
Compute Save

PMark

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ex3

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sample2

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ex6+sample2

Graph
ex6+sample2...

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id	ex1	ex2	tutorials	spelling
Leo	fail	pass	2	good
Penelope	fail	fail	7	good
David	pass	pass	4	good
Grace	pass	fail	9	bad
Adam	pass	pass	8	good
Elena	pass	fail	5	bad
Benjamin	fail	pass	2	good
Madison	fail	fail	4	bad
James	pass	fail	4	bad
Emily	pass	fail	9	good
Ryan	pass	pass	7	bad
Björn	pass	fail	6	good

PMark

Settings Home

Scheme
ex3

Data
sample2

Result
ex3+sample2

Graph
ex6+sample2...

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id	final-grade
Leo	fail
Penelope	fail
David	fail
Grace	pass
Adam	distinction
Elena	pass
Benjamin	fail
Madison	fail
James	fail
Emily	pass
Ryan	distinction
Björn	pass

OK scheme 'ex3' computed using 'sample2' data

PMark

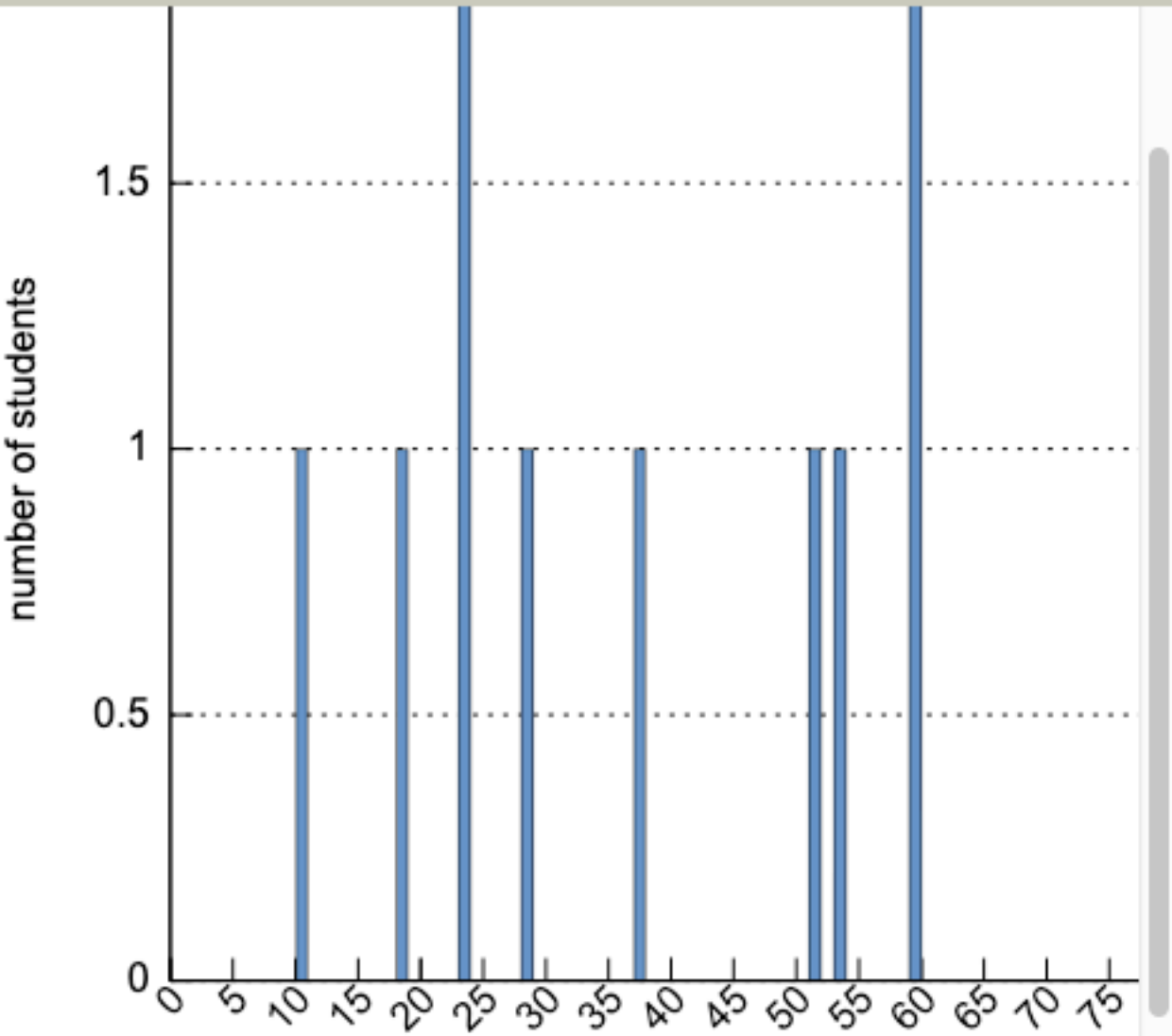
Settings Home

Scheme
ex3

Data
sample2

Result
ex3+sample2

Graph
ex6+sample2...



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Compute Save

OK scheme 'ex3' computed using 'sample2' data

PMark

Settings Home

Scheme
ex6

Data
sample2

Result
ex6+sample2

Graph
ex3+sample2...

Elena : 51

Elena achieved a pass (40) for the final-mark.
Some things that we think might improve the work include:

1. a marginal-fail for ex2 instead of a fail.

Attributes

1. *ex1?* pass
2. *ex2?* fail
3. *tutorials?* 5

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New Delete
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Compute Save

OK scheme 'ex6' computed using 'sample2' data

Some things we have learned (1)

Teachers and students find this very "different"

- There is no "accumulation of credit" and no "weighting"
  - This requires a different "way of thinking" and careful explanation
- Preparing a mark scheme forces the teacher to think about the criteria and how they relate to the learning outcomes - this takes longer
  - But it "pays off" later
- The rules are strictly non-compensatory - so it is easy for a relatively minor criterion to have a disproportionate effect on the result
  - Accommodating this involves being explicit about the required "leniency"
- The "explanations" which PMark generates are very useful in understanding the marks
  - But they need explaining carefully, or manually interpreting if they are to be given directly to the students as feedback
- We give the students the main criteria, but not the details
  - To avoid students "box ticking" without understanding

Some things we have learned (2)

Lots of questions and small ranges are good

- Questions with multiple dimensions should be split into "atomic" questions to avoid different markers balancing them differently
  - "Is it clear & concise?" => "Is it clear?" & "Is it concise?"
- Markers have difficulty distinguishing between values on longer scales
  - Is it "very good" or just "good" ?
- We now prefer a 4-point Lickert scale for most questions:
  - "definitely no", "I don't think so", "I think so", and "definitely yes"
- PMark handles lots of small questions very well
  - This also helps to average out uncertainties
- Even though there may be a lot of questions, this is easier to mark
  - We don't have to ponder whether this is "very good" or just "good"
- PMark can generate very concrete suggestions on what would be necessary in order to achieve a higher grade

Some things we have learned (3)

Explicit, Iterative & Flexible are good ...

- PMark does not restrict the ability to use more holistic criteria - it just forces us to be explicit about them. For example ...
  - "Is there something exceptional about this submission? (explain in comments)"
- Similarly in terms of leniency
  - "A pass requires all of these criteria to be adequate and most of them to be good"
- Being explicit about these ensues that they are applied consistently and transparently
- The mark scheme can be developed iteratively - starting with the main learning objectives and refining this into more detail
  - The effect of this can be explored using a set of dummy attribute values
- Rules can easily be changed retrospectively
  - This allows us to cater for aspects of the assessment which clearly did not function as intended
  - Or to acknowledge good solutions which use an unexpected approach

What next ?

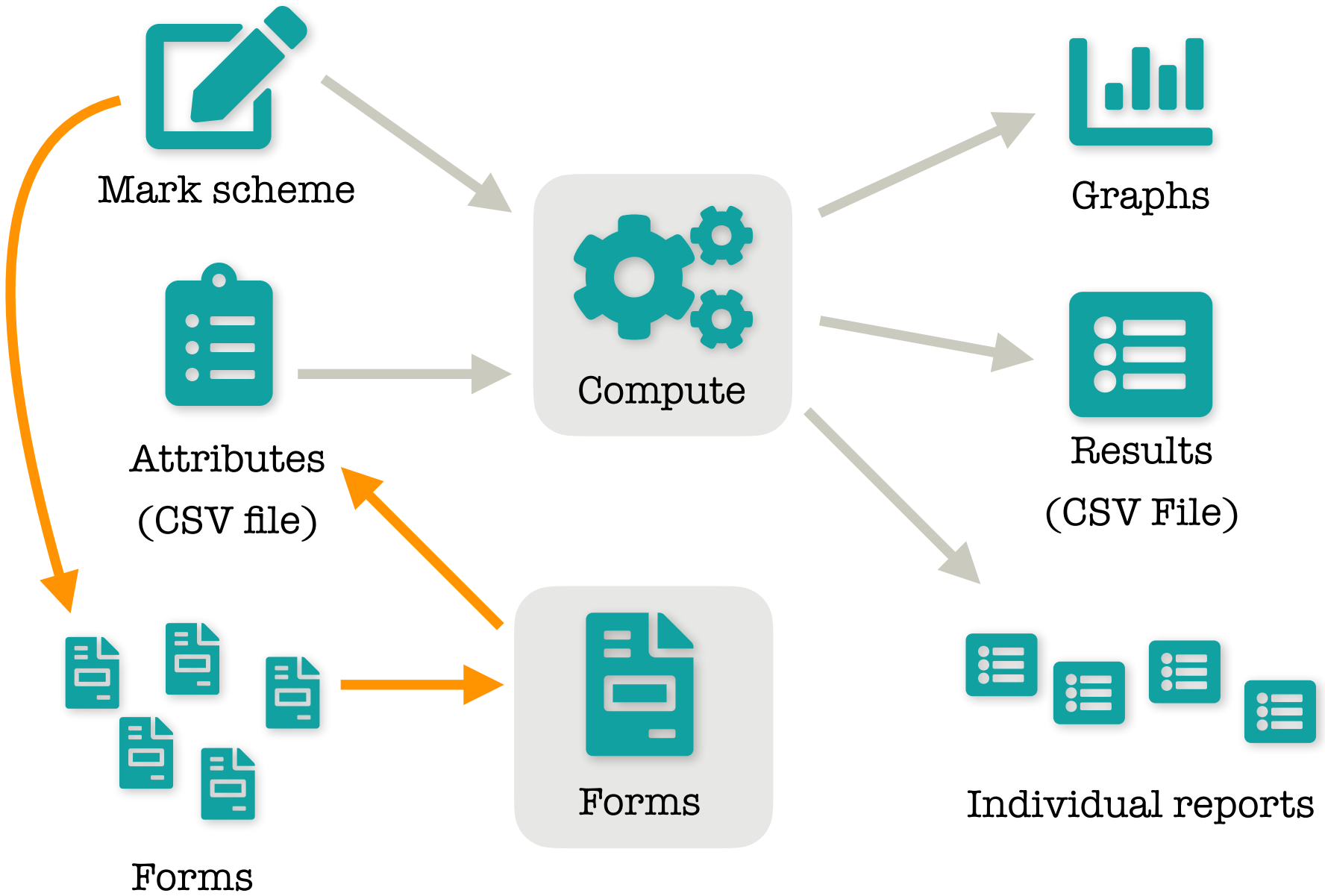
What are we doing now?

- We currently have a small PTAS project evaluating PMark use in Informatics and the Vet School
- We have been developing a web-based version of the software
- We would be happy to talk to anyone who might be interested in trying this out

If you are interested ....

- There is a trial PMark service running in Informatics, which is available to anyone with an EASE account. Feedback on this would be very welcome.
  - It is a "best effort" service, and it is still being developed
  - So please talk to us if you would like to use it for "real" assessments
- Documentation, videos, downloadable software & a link to the service
  - http://homepages.inf.ed.ac.uk/dcspaul/pmark

PMark: forms


Mark scheme
Attributes
(CSV file)
Forms
Compute
Forms
Graphs
Results
(CSV File)
Individual reports

My Form : Benjamin

Settings

Exercises

Did the student pass exercise 1 ?	fail
Did the student pass exercise 2 ?	pass

grade	to achieve this grade ...
pass	complete exercise 2 satisfactorily

Tutorials

How many tutorials did the student attend ?	7

Feedback

A comment here

Show All Hide All

History Print

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OK new form for 'Benjamin'

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