Assessment for learning
Using Moodle quizzes in mathematics

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HESTEM eAssessment Workshop, 22 February 2011
The Open University

- Europe’s leading distance learning organisation
- Part-time students
  - High quality notes
  - (Local) tutors
- 250,000 active students
- 15,000 maths students
MU123: Discovering Mathematics

- 30 point introductory module
- Launched February 2010
- Two presentations a year
- ~1800 students per presentation
MU123: Discovering Mathematics

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- Two presentations a year
- \( \sim 1800 \) students per presentation

**Aims**

- Increase retention over previous incarnation
- Better prepare students for subsequent modules
MU123: Module Design

- Print based
MU123: Module Design

- Print based
- Study guided by VLE (Moodle) calendar
MU123: Module Design

- Print based
- Study guided by VLE (Moodle) calendar
  - screen-casts
MU123: Module Design

- Print based
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  - screen-casts
  - online activities
MU123: Module Design

- Print based
- Study guided by VLE (Moodle) calendar
  - screen-casts
  - online activities
  - quizzes (iCMAs)
Quizzes

- **Practice Quizzes (PQ)**
  - Formative
  - Immediate feedback
  - Three tries per question
  - Worked solutions
  - Can repeat
  - \(\approx 12\) questions per unit

- **iCMAs**
  - Summative
  - Delayed feedback
  - Single attempt
  - 6 questions per unit
  - 12% of module grade

- **Gradebook**

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<th>iCMA</th>
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<td>Unit 14</td>
<td>PQ 14</td>
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</tbody>
</table>

Are you ready for MST121?

(Also 5 Tutor Marked Assignments.)
Questions

• All questions randomised
  ▶ Generated offline, uploaded as Moodle XML
  ▶ Moodle selects random question from “bucket”
  ▶ At least 5 versions of iCMA questions
  ▶ Typically 10 versions of PQ questions
  ▶ Approx 2400 question-variants

• Question types:
  ▶ Numerical
  ▶ Multiple choice (single correct option)
  ▶ OU Multiple response (several correct options)
  ▶ Matching (choose from drop-down menu)
  ▶ Drag and drop
  ▶ OpenMark
  ▶ Short answer
Multiple choice (PQ6, Q1)

Which one of the following points lies on the line \( y = -4x - 3 \)?

Choose one answer.

- \((-2, 8)\)
- \((1/3, -5/3)\)
- \((3, -9)\)
- \((-1/2, -1)\)

3 tries allowed
Which one of the following points lies on the line \( y = -4x - 3 \)?

Choose one:
- \((-2, 8)\)
- \((1/3, -5/3)\)
- \((3, -9)\)
- \((-1/2, -1)\)

Your answer is incorrect.

See Unit 6, Subsection 1.2.
Multiple choice (PQ6, Q1)

Which one of the following points lies on the line $y = -4x - 3$?

Choose one: $(−2, 8)$

Your answer is incorrect.

Which one of the following points lies on the line $y = -4x - 3$?

Choose one answer:

- $(−2, 8)$
- $(1/3, −5/3)$ Your answer is incorrect.
- $(3, −9)$
- $(-1/2, -1)$

Check to see if the coordinates of each point satisfy the equation of the line.

See Unit 6, Subsection 1.2.

Try again
Which one of the following points lies on the line $y = -4x - 3$?

Choose one:

- $(-2, 8)$ Your answer is incorrect.
- $(1/3, -5/3)$
- $(3, -9)$
- $(-1/2, -1)$ Your answer is correct.

A point lies on a line if its coordinates satisfy the equation. To check if a point lies on a line, substitute its $x$-coordinate into the equation of the line. If the resulting value for $y$ is the same as the $y$-coordinate, the point lies on the line. If it is different, the point does not lie on the line.

In this case, the point which lines on the line is $(-1/2, -1)$ since, substituting $-1/2$ for $x$ in the equation of the line gives

$$y = -4x(-1/2) - 3$$

$$= 2 - 3$$

$$= -1$$

which is the same as the $y$-coordinate of the point.

See Unit 6, Subsection 1.2.
What is the gradient of the line joining the points \((-1, -3)\) and \((2, 4)\).
Give your answer correct to 2 significant figures.

Your answer is incorrect. Remember to round your answer to 2 significant figures.

The gradient of the line joining the points \((x_1, y_1)\) and \((x_2, y_2)\) is \(\frac{y_2 - y_1}{x_2 - x_1}\).

See Unit 6, Subsections 2.1 and 2.2.
Matching (PQ6, Q3)

The equation of a straight line is \( y = 1.2x - 3.4 \).

What is the x-intercept of this line?  Choose...

What is the y-intercept of this line?  Choose...

What is the gradient of this line?  Choose...

0.353
-2.833
-0.353
-1.2
1.2
-3.4
3.4
2.833
OU Multiple response (PQ6, Q5)

Which **two** of the following lines have an $x$-intercept of $-5$?

<table>
<thead>
<tr>
<th>Choice</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>$x = -5$</td>
<td>Your answer is correct.</td>
</tr>
<tr>
<td>$y = x - 5$</td>
<td>Your answer is incorrect.</td>
</tr>
<tr>
<td>$y = -5x$</td>
<td></td>
</tr>
<tr>
<td>$y = 0.2x + 1$</td>
<td></td>
</tr>
<tr>
<td>$y = -5$</td>
<td></td>
</tr>
<tr>
<td>$y = -5x + 25$</td>
<td></td>
</tr>
</tbody>
</table>

Your answer has one correct choice.
The two lines with an $x$-intercept of $-5$ are:

- $x = -5$
  This is a vertical line that passes through the point $(-5, 0)$, so its $x$-intercept is $-5$.
- $y = 0.2x + 1$
  The $x$-intercept can be found by solving the equation $y = 0$.

  For this option, when $y = 0$, $0.2x + 1 = 0$.
  Subtracting 1 from both sides gives: $0.2x = -1$
  Multiplying both sides by 5 gives: $x = -5$.

So this equation does indeed have an $x$-intercept of $-5$.

See Unit 6, Subsection 3.3.
Drag the two points at the end of the line segment below, so that the segment lies on the line

\[ y = -2x + 3 \]

You can manipulate the points with the mouse by dragging the circular markers. To manipulate the points with the keyboard, tab to each marker and then use the arrow keys.

Your answer is still incorrect.

You have been asked to draw a straight line with a gradient of -2 which crosses the y-axis at 3 but your line segment has a gradient of -0.36 and the line crosses the y-axis at 2.44.

See Unit 6, Subsection 1.1.
Drag and drop (PQ10, Q8)

Drag the options below into the spaces to complete the following which puts the quadratic expression $x^2 + 18x + 5$ in completed square form.

$x^2 + 18x + 5 = (x + \underline{\phantom{9}})^2 + \underline{\phantom{5}}$

Marks: --/1

3 tries allowed

End test...
Grades (MU123 2010B)
Usage (MU123 2010B)

- 1,561 students
- 22,210 quiz attempts
Practice Quiz repeats

Numbers of students taking multiple attempts at a PQ

Number of attempts at a PQ
Usage over time

Weekly number of icma/pq attempts

Number of attempts started

1400
1200
1000
800
600
400
200
0

ICMA 41
ICMA 42
ICMA 43
ICMA 44
ICMA 45

PQ 01
PQ 02
PQ 03
PQ 04
PQ 05
PQ 06
PQ 07
PQ 08
PQ 09
PQ 10
PQ 11
PQ 12
PQ 13
PQ 14
AYRF
iCMA usage relative to cut-off

Weekly number of icma attempts relative to cut-off date

- ICMA 41
- ICMA 42
- ICMA 43
- ICMA 44
- ICMA 45

Number of attempts started

Week, relative to cut-off date
PQ usage relative to study unit

Weekly number of PQ attempts relative to study week

Number of attempts started

Week, relative to study weeks

-20 -10 0 10 20 30 40 50

PQ 01
PQ 02
PQ 03
PQ 04
PQ 05
PQ 06
PQ 07
PQ 08
PQ 09
PQ 10
PQ 11
PQ 12
PQ 13
PQ 14
Times taken

Times taken for attempts

Number of attempts

ICMA attempts

PQ attempts

0 sec 1 min 10 min 30 min 1 hr 6 hrs 12 hrs 1 day 1 wk 2 wks

0 1000 2000 3000 4000 5000
Problems

• “Give your answer as a number without units”
Problems

• “Give your answer as a number without units”
  ▶ £26
  ▶ 12 children had different favourite treats
  ▶ –1.25
Problems

• “Give your answer as a number without units”
  ▶ £26
  ▶ 12 children had different favourite treats
  ▶ –1.25

• Missing (Unicode) characters

• Students not “Finalising” attempts

• Offender learners
End of Module Survey: 2010B

• The computer-based individual learning activities for this course supported my learning.

  92.2% agree, 0.5% disagree

• Overall, I am satisfied with my study experience.

  99.0% agree, 0.5% disagree
Student Quotes

• The practice quizzes are a great way to build up knowledge.

• It’s a great way to consolidate.

• I already submitted my iCMA 41, I found that the practice quiz helped a lot.

• I like the practice quizzes, you can do lots of them until (hopefully) the lights come on.

• When I’ve finished a Unit I do the Practice Quiz over and over again until I get a really high score.
Student Quotes

- The practise quizzes are great - just wish I could do them when I’m sat under a tree in the forest waiting for my little girl to finish school.

- I don’t enjoy the icma’s at all and always do much better on the tma’s. . . . I just think that they account for such a small percentage of your final mark that they really aren’t worth worrying about.