



Using STACK at the Open University

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The Open University



- Europe's leading distance learning organisation
- Part-time students
 - ▶ Study at home
 - ▶ (Local) tutors
- ~ 170 000 students
- ~ 6000 part-time tutors
- ~ 1000 academic staff

(Data: 2014/15)



The Open University: Mission

Open to:

- people
- places
- methods
- ideas

- No formal entrance requirement
- 40% students have one A-level or less
- Students aged 18 (and less) – 80 (and more!)
- 56% students study while working
- 12% students (~21000) have declared disability



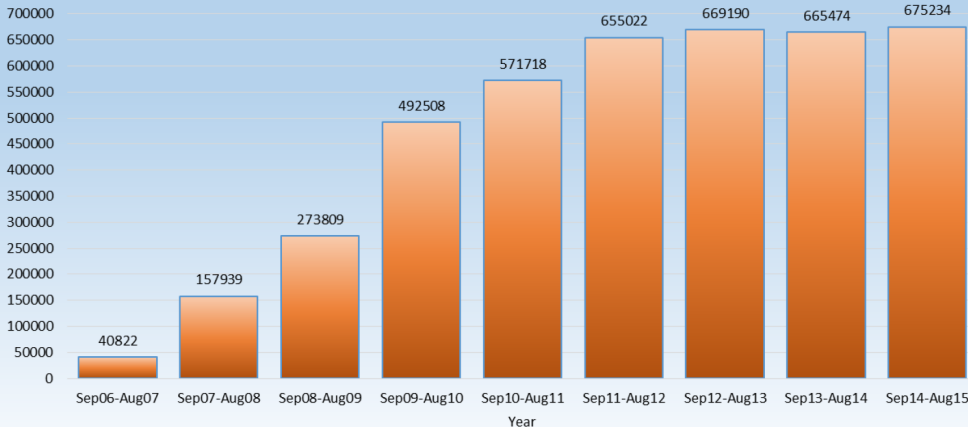
Photograph: Richard Learoyd

(Data: 2014/15)

OU e-assessment usage



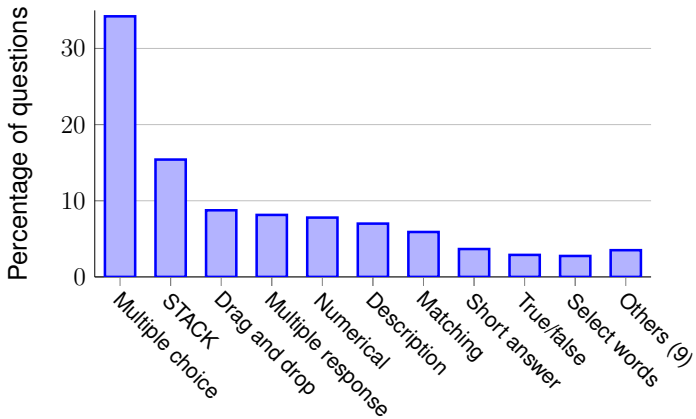
iCMAs served by the OU across all platforms by year





OU Question type usage

Questions answered: 1 Jan 2015 - 1 March 2016



- 6,988,934 questions answered



Why use e-Assessment?

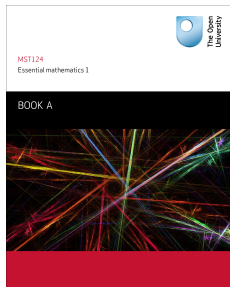
- Enable students to practice mathematics *and get feedback*
 - ▶ Assessment *for* learning
 - ▶ Emphasis on feedback
 - ▶ Multiple attempts
- Deadlines set a pace through the module
- Reduced marking
- Enables written course work to assess other skills
- Randomised questions remove need to reset each year
 - ▶ but requires an initial investment of time



MST124 and MST125

Essential mathematics 1 and 2

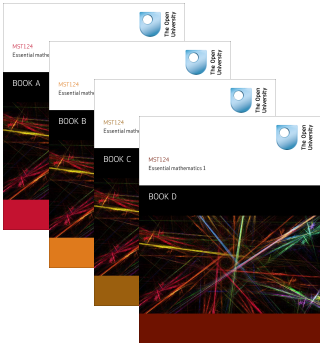
- Two entry level mathematics modules
 - ▶ Can be studied consecutively or simultaneously
 - ▶ Calculus, linear algebra, mechanics
- Each 1/4-year full time study (30 credits)
- Each presented twice per year
 - ▶ February – September
 - ▶ October – May
- MST124: 4000 students annually
- MST125: 1000 students annually





Module presentation style

- Print based, guided by VLE (Moodle) calendar
- Online activities
- Supported by a tutor



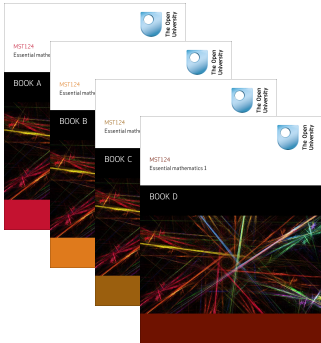
The screenshot shows the Moodle interface for the MST124-14B module. The page is titled "Study planner" and "MST124 Essential mathematics 1". It features a calendar view on the left with dates 19 Apr, 12 to 13 to 26 Apr, 14 to 15 to 16 May, and 16 May. The main content area lists units and activities with checkboxes for completion. The current view is for Unit 6: Differentiation, which is highlighted in blue. The right sidebar contains search, news, and resources sections.

Week	Activity	Progress
19 Apr	Break week	<input type="checkbox"/>
	This week allows you to catch up on your studies if you wish, or to have a break.	<input type="checkbox"/>
12 to 13 to 26 Apr	Book B Unit 6: Differentiation	<input type="checkbox"/>
	In weeks 12 and 13, work through Unit 6.	<input type="checkbox"/>
	Unit 6 4 580 PDF document	<input type="checkbox"/>
	Unit 6 applets	<input type="checkbox"/>
	Tutorial clips for Unit 6	<input type="checkbox"/>
	Exercise Booklet 6 731,000 PDF document	<input type="checkbox"/>
	Unit 6 Practice quiz	<input type="checkbox"/>
	Assignment ICMA 43 (open date 7 May)	<input type="checkbox"/>
14 to 15 to 16 May	Book C Unit 7: Differentiation methods and integration	<input type="checkbox"/>
	In weeks 14 and 15, work through Unit 7.	<input type="checkbox"/>
	You will need to work through part of the Computer algebra guide in Activity 22.	<input type="checkbox"/>
	Unit 7 290 PDF document	<input type="checkbox"/>
	Tutorial clips for Unit 7	<input type="checkbox"/>
	Exercise Booklet 7 57100 PDF document	<input type="checkbox"/>
	Unit 7 Practice quiz	<input type="checkbox"/>
16 May	Book C Unit 8: Integration methods	<input type="checkbox"/>



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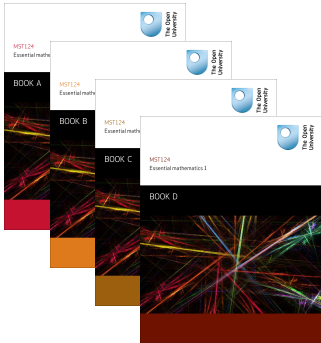


The screenshot shows a Moodle VLE interface for a calculus activity. The main content area displays a graph of the parabola $y = 3 - x^2$ with a histogram of signed areas. The x-axis ranges from -6 to 6, and the y-axis from -8 to 4. The histogram bars are blue, with negative areas below the x-axis and positive areas above. The area between $x = -3$ and $x = 3$ is shaded. Below the graph, there is a text input field for the function $f(x) = 3 - x^2$, a slider for the number of subintervals (set to 6), and a button for "Approximate signed area: -1". The right sidebar contains a search bar, news, and a list of resources for "Integration methods and integration". The footer shows "16 Book C Unit 6: Integration methods".



Module presentation style

- Print based, guided by VLE (Moodle) calendar
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The screenshot shows a Moodle page for 'The Open University'. The main content area displays a calculus problem: 'Find the derivative of $y = \frac{x^2-2}{x^2+1}$ '. The solution is shown in handwritten style, using the chain rule and the quotient rule. The final answer is $\frac{24x(x^2-2)^2}{(x^2+1)^3}$. Below the solution, there is a graph of $y = 3 - x^2$ and a number line for 'Number of subintervals' with points at -3 and 3, and a value of 6.

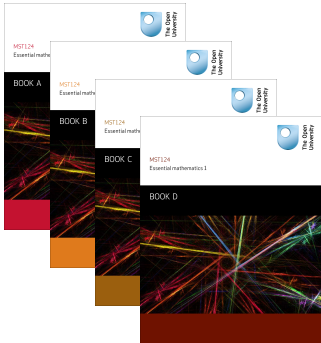
On the right side of the page, there is a search bar and a sidebar with navigation links: 'Progress', 'Search this website', 'News (new)', 'Important erratum for Unit 7', 'Maths & Statistics Programme news (new)', 'MS00 Examination Revision Weekend', 'Resources', 'Study resources', 'Assessment resources', 'Examination', 'Gradebook', 'Computer resources', 'Accessibility', 'Library resources', 'Online tutorials', and 'Recommender'.

At the bottom of the page, the page number '16' and the text 'Book C Unit 6: Integration methods' are visible.



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The screenshot shows a Moodle page for 'The Open University' with a navigation menu (StudentHome, Profile, Study, Community, Help Centre) and a search bar. The main content area displays a calculus problem: 'Find the derivative of $y = \frac{x^2 - 2}{x^2 + 1}$ '. A student has entered the answer $k'(x) = \frac{6x - 3}{x}$. A feedback message states: 'Your answer is incorrect. You appear to have differentiated the two terms and then multiplied the derivatives. This is not how to differentiate a product; you need to use the product rule. See Unit 7 Subsection 2.1. Try again'. The page also includes a sidebar with 'Search this website', 'News (new)', and 'Progress' sections. At the bottom, there is a 'Number of subintervals' slider set to 6, and a footer indicating '16 Book C Unit 6: Integration methods'.



MST124/MST125

Assessment

- 4 Tutor marked assignments
- 4 summative iCMAs
 - ▶ One attempt, delayed feedback
 - ▶ 25% continuous assessment grade
- 12 formative practice quizzes
 - ▶ Immediate feedback, can repeat
 - ▶ Three tries per question, with hints
- Randomised questions using STACK





Typical question style

Question 3

Tries remaining: 3

Marked out of 1.00

 Flag question

Find the integral

$$\int \cos(2x + 3) dx.$$

$$\int \cos(2x + 3) dx =$$

Check

Previous

Next



Typical question style

Question 3

Tries remaining: 3

Marked out of 1.00

Flag question

Find the integral

$$\int \cos(2x + 3) dx.$$

$$\int \cos(2x + 3) dx = \overline{\sin(2x+3)}$$

Your last answer was interpreted as follows:

$$\sin(2x + 3)$$

The variables found in your answer were: $[x]$

Check

Previous

Next



Typical question style

Question 3

Not complete

Marked out of 1.00

 Flag question

Find the integral

$$\int \cos(2x + 3) dx.$$

$$\int \cos(2x + 3) dx = \sin(2x+3)$$

Your last answer was interpreted as follows:

$$\sin(2x + 3)$$

The variables found in your answer were: [x]

Check

Your answer is incorrect.

You have not integrated the function correctly. If you differentiate the indefinite integral you should get back to the original function. However the derivative with respect to x of the expression you entered is $2 \cos(2x + 3)$.

See Unit 8, Subsection 3.3

Try again

Previous

Next



Typical question style

Question 3

Not complete

Marked out of 1.00

Flag question

Find the integral

$$\int \cos(2x + 3) dx.$$

$$\int \cos(2x + 3) dx = \frac{\sin(2x+3)}{2}$$

Your last answer was interpreted as follows:

$$\frac{\sin(2x + 3)}{2}$$

The variables found in your answer were: $[x]$

Check

Your answer is partially correct.

You have correctly integrated the expression but omitted the arbitrary constant.

Recall that if f is a function with antiderivative F and a and b are constants with $a \neq 0$, then

$$\int f(ax + b) dx = \frac{1}{a}F(ax + b) + c.$$

See Unit 8, Subsection 3.3.

Try again



Typical question style

Question 3

Correct

Mark 0.33 out of 1.00

Redo question

Flag question

Find the integral

$$\int \cos(2x + 3) dx.$$

$$\int \cos(2x + 3) dx = \frac{\sin(2x+3)}{2} + p$$

Your last answer was interpreted as follows:

$$\frac{\sin(2x + 3)}{2} + p$$

The variables found in your answer were: $[p, x]$

Check

Your answer is correct.

Recall that if f is a function with antiderivative F and a and b are constants with $a \neq 0$, then

$$\int f(ax + b) dx = \frac{1}{a} F(ax + b) + c.$$

Setting $f(x) = \cos(x)$ and $F(x) = \sin(x)$, gives

$$\int \cos(2x + 3) dx = \frac{\sin(2x + 3)}{2} + c$$



Question 7

Incorrect

Mark 0.00 out of 1.00

Redo question

Flag question

Find the second derivative of the function $y = \sin(x^2 + 1)$.

$$\frac{d^2y}{dx^2} = 2x \cos(x^2 + 1)$$

Your last answer was interpreted as follows:

$$2x \cos(x^2 + 1)$$

The variables found in your answer were: $[x]$

Check

Your answer is incorrect.

To find the first derivative, use the chain rule in the usual way:

$$y = \sin(u); \quad u = x^2 + 1$$

[... lots more working out to fit ...]

Putting this all together and simplifying we get:

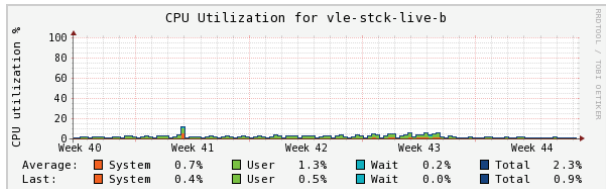
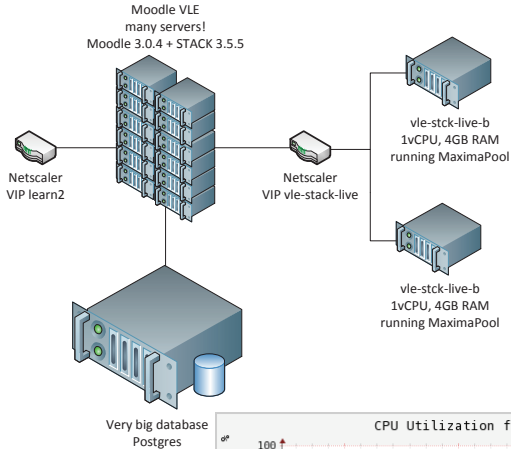
$$\begin{aligned} \frac{d^2y}{dx^2} &= (2x)(-2x \sin(x^2 + 1)) + (\cos(x^2 + 1))(2) \\ &= 2 \cos(x^2 + 1) - 4x^2 \sin(x^2 + 1) \end{aligned}$$

See Unit 7, Subsections 2.1, 2.3 and Unit 6, Subsection 5.1.

Redo question

Module	Number of redos	Practice quizzes	Students
MST210-15J	649	21	500
MST224-15J	335	13	400
M303-15J	871	4	200
MU123-16B	4682	14	1250
MST124-16B	8473	12	850
MST125-16B	3399	12	400
Total	18409		

new in Moodle 2.9



- [Website: MU123-15B \(13\)](#)
- [Website: MST124-15B \(298\)](#)
- [iCMA: ICMA 41 \(10\)](#)
- [iCMA: ICMA 42 \(19\)](#)
- [iCMA: ICMA 43 \(24\)](#)
- [iCMA: ICMA 44 \(24\)](#)
- [Website: MST125-15B \(188\)](#)
- [iCMA: ICMA 41 \(10\)](#)
- [iCMA: ICMA 42 \(15\)](#)
- [iCMA: ICMA 43 \(10\)](#)
- [iCMA: ICMA 44 \(13\)](#)
- [Website: MU123-16B \(13\)](#)
- [Website: MST124-16B \(297\)](#)
- [iCMA: ICMA 41 \(10\)](#)
- [iCMA: ICMA 42 \(22\)](#)
- [iCMA: ICMA 43 \(24\)](#)
- [iCMA: ICMA 44 \(24\)](#)
- [Website: MST125-16B \(188\)](#)
- [iCMA: ICMA 41 \(10\)](#)
- [iCMA: ICMA 42 \(15\)](#)
- [iCMA: ICMA 43 \(10\)](#)
- [iCMA: ICMA 44 \(13\)](#)
- [Website: M303-16J \(65\)](#)
- [iCMA: ICMA 41 \(42\)](#)
- [Website: M823-16J \(34\)](#)
- [Website: MST224-16J \(30\)](#)
- [Website: MU123-16J \(13\)](#)
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- [iCMA: ICMA 41 \(10\)](#)
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Question tests

All tests passed!

Add another test case...

Test case 1 Pass

Input name	Test input	Value entered	Displayed as	Status	Errors
ans1	ans	$-5 \cdot 4^{n-1} / 3 - 1/3$	$-\frac{5 \cdot 4^{n-1}}{3} - \frac{1}{3}$	Score	

PRT name	Score	Expected score	Penalty	Expected penalty	Answer note	Expected answer note	Feedback	Passed?
prt1	1	1	0	0	prt1-1-T ATCASEqual_false. prt1-4-F	prt1-4-F		Pass

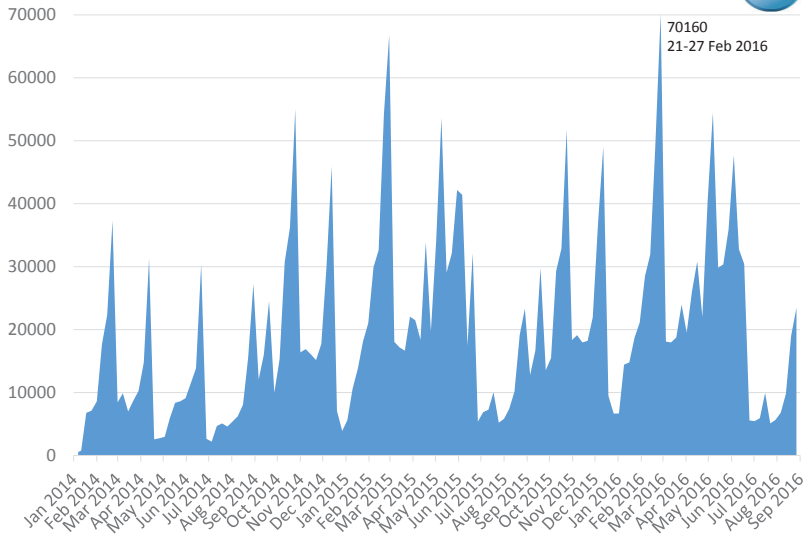
Edit this test case...

Delete this test case...

Test case 2 Pass

Input name	Test input	Value entered	Displayed as	Status	Errors
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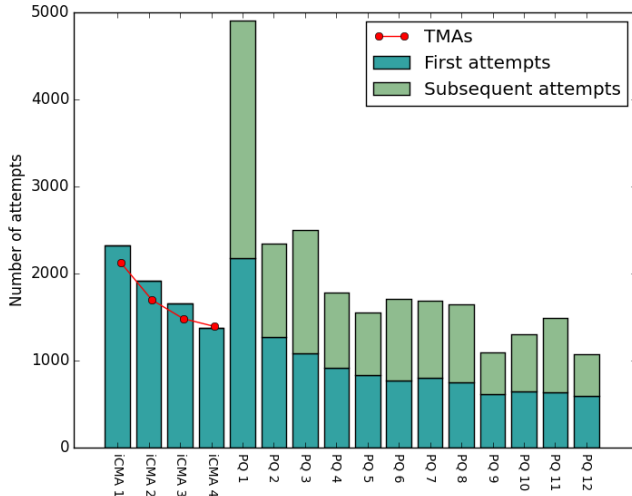
STACK questions interacted with each week





Quiz usage: Attempts

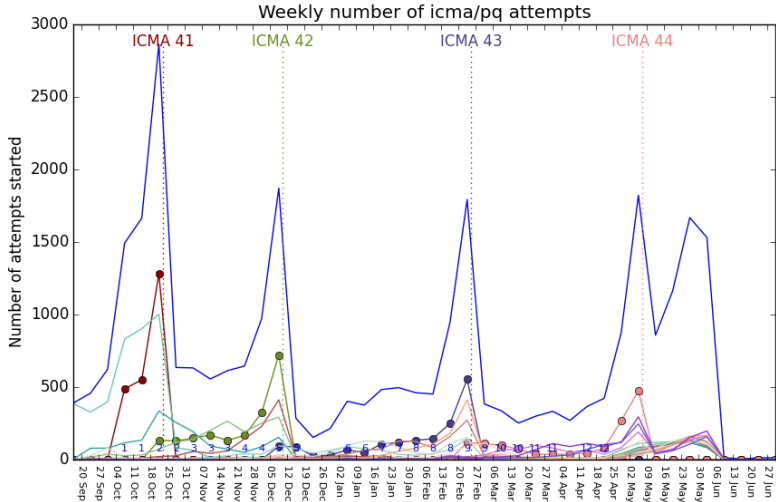
(MST124 2014J)





Quiz usage: Attempts per week

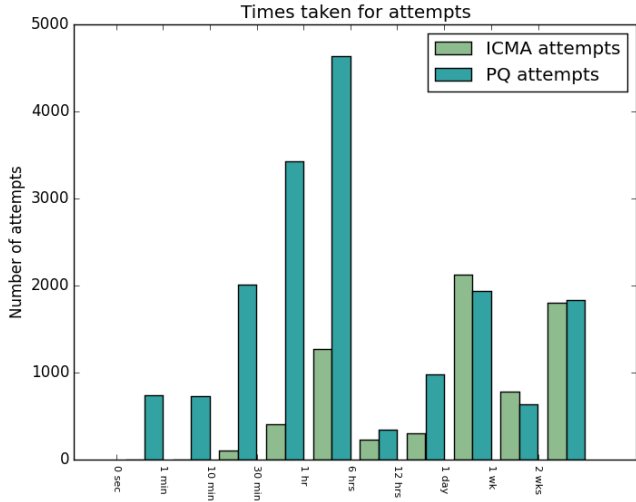
(MST124 2014J)





Quiz usage: Attempt times

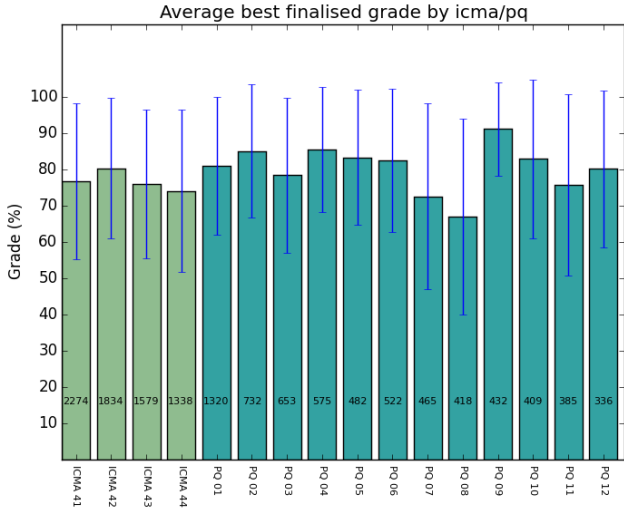
(MST124 2014J)





Quiz usage: Grades

(MST124 2014J)





Teething problems

- Students do not read instructions!
- Answers in terms of X , not x
 - ▶ part marks for incorrect variables
- xy not $x * y$
 - ▶ Automatically insert $*$ assuming single letter variables
- $\text{Sin } x$ not $\sin x$
 - ▶ system improvements
- Loss of confidence in system after experiencing a problem
 - ▶ Questioning why wrong answers are marked wrong
- “A teacher would have known what I meant and given part marks”



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- “Question 2 gave part marks, why doesn't question 3?”



Teething problems

- “My cat submitted the iCMA before I had finished”

Student Quotes





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I found them useful extra practice and a good way
to test your knowledge. (MU123 student)



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(MU123 student)



Student Quotes

I already submitted my iCMA 41, I found that the practice quiz helped a lot. (MU123 student)

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