MONASH University

MAT1830 - Discrete Mathematics for Computer Science - S1 2022

Started on	Saturday, 12 March 2022, 2:05 PM
State	Finished
Completed on	Wednesday, 16 March 2022, 11:55 PM
Time taken	4 days 9 hours
Grade	**10.60** out of 15.00 (**71**%)

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Information

Each answer to a short answer question on this quiz is an integer. Enter your answers as follows.

- Enter all integers as numerals. For example 16, 1, or 0 **BUT NOT** sixteen, 1.0, zero.
- Enter negative integers using the minus character -. For example -12 or -4 **BUT NOT** minus 12 or negative four.
- **Do not** enter anything other than the integer. For example 6 **BUT NOT** z=6.
- **No answer should contain a space**, equals sign, comma, full stop etc.

The quiz is auto-marked. Answers entered incorrectly will be marked wrong. Failure to follow instructions is not grounds for an appeal.

Question **1**

Correct

Mark 0.50 out of 0.50

Does 9 divide 29?

- Yes
- No ✔

Your answer is correct.

The answer is no, because there is no integer k such that $9k = 29$.

The correct answer is: No

Question **2**

Correct

Mark 0.50 out of 0.50

Is $-11 \equiv -26 \pmod{7}$?

- Yes

- No ✔

Your answer is correct.

The answer is no, because $-11-(-26)=15$ and 7 does not divide 15.

The correct answer is: No

Question 3

Correct

Mark 1.00 out of 1.00

What is $\gcd(16,60)$?

Answer: 4 ✔

The correct answer is: 4

Question 4

Incorrect

Mark 0.00 out of 1.00

The smallest positive integer x such that $x \equiv -11 \pmod 5$ is $x =$ 6 ✖ .

The answer is $x=4$. Note that $-11 \equiv 4 \pmod 5$ since $4-(-11)=15=3\times 5$.

Question 5

Correct

Mark 2.00 out of 2.00

Is the following statement true or false? For each positive integer n, either $\gcd(n,35)=1$ or $\gcd(n,35)=5$ or $\gcd(n,35)=35$.

- True
- False ✔

Your answer is correct.

The statement is false. For example, $\gcd(7,35)=7$.

The correct answer is: False

Question 6

Correct

Mark 3.00 out of 3.00

In the following table, fill in the steps of the Euclidean algorithm for calculating $\gcd(324,171)$. Enter your answers so that the third number on each line is equal to the last number on the line above.

$324 = 1 \times 171 + 153$

171 = 1 × 153 + 18

153 = 8 × 18 + 9

18 = 2 × 9 + 0

Now enter $\gcd(324, 171)$: 9

$$324 = 1 \times 171 + 153$$

$$171 = 1 \times 153 + 18$$

$$153 = 8 \times 18 + 9$$

$$18 = 2 \times 9 + 0$$

So $\gcd(324, 171)$ is 9.

Question 7

Partially correct

Mark 3.60 out of 4.00

The following table gives Euclidean algorithm working showing that $\gcd(327, 75) = 3$.

$$327 = 4 \times 75 + 27$$

$$75 = 2 \times 27 + 21$$

$$27 = 1 \times 21 + 6$$

$$21 = 3 \times 6 + 3$$

$$6 = 2 \times 3 + 0$$

Use the extended Euclidean algorithm to complete the following table. Remember to enter negative numbers where appropriate.

3 = 1 × 21 + -3 × 6

3 = -3 × 27 + -4 × 21

3 = 4 × 75 + -11 × 27

3 = -11 × 327 + 48 × 75

Enter an integer z such that $75z \equiv 12 \pmod{327}$ and $0 \leq z \leq 326$: 192

$$3 = 1 \times 21 + -3 \times 6$$

$$3 = -3 \times 27 + 4 \times 21$$

$$3 = 4 \times 75 + -11 \times 27$$

$$3 = -11 \times 327 + 48 \times 75$$

To obtain the first line, we rearrange the second last line of the Euclidean algorithm.

To obtain the second line, we substitute $6 = 27 - 21$ into the first line and rearrange.

To obtain the third line, we substitute $21 = 75 - 2 \times 27$ into the second line and rearrange.

To obtain the last line, we substitute $27 = 327 - 4 \times 75$ into the third line and rearrange.

Multiplying the last line by 4 we see that $12 = -44 \times 327 + 192 \times 75$ and so $192 \times 75 \equiv 12 \pmod{327}$. So one choice for z is 192.

Question **8**

Incorrect

Mark 0.00 out of 3.00

Let x and y be integers such that $x \equiv 4 \pmod{9}$ and $y \equiv 7 \pmod{9}$. Find the integer z such that $93x + 4y^2 \equiv z \pmod{9}$ and $0 \leq z \leq 8$.

Answer: 10 ✖

Because $93 \equiv 3 \pmod{9}$ and $x \equiv 4 \pmod{9}$, we have $93x \equiv 3 \times 4 \equiv 3 \pmod{9}$.
Because $y \equiv 7 \pmod{9}$ we have $y^2 \equiv 49 \equiv 4 \pmod{9}$ and so $4y^2 \equiv 4 \times 4 \equiv 7 \pmod{9}$.
Using these facts,
$93x + 4y^2 \equiv 3 + 7 \equiv 1 \pmod{9}$.
So $z = 1$.

The correct answer is: 1

◄ Exam Discussion

Jump to...

Assignment 1 ►