Number Theory (Core)

Click on a question number to see how your answers were marked and, where available, full solutions.

Question Number	Score
Modular Arithmetic	
Question 1	1 / 1
Question 2	1 / 1
Question 3	1 / 1
Question 4	1 / 1
Euclidean Algorithm	
Question 5	3 / 3
Question 6	3 / 3
Factorisation	
Question 7	4 / 4
Question 8	4 / 4
Base Conversion	
Question 9	1 / 1
Question 10	1 / 1
Question 11	1 / 1
Total	**21 / 21 (100%)**

Congratulations, you passed this quiz with a sufficient score. You may include this attempt as part of your self-assessment evidence.

Make sure that you click on "Print this results summary" and save to pdf, so that everything can be read clearly. Do not navigate away from this page before you have saved your result.

Performance Summary

Exam Name:	Number Theory (Core)
Session ID:	12393679161
Exam Start:	Wed Nov 22 2023 10:51:55
Exam Stop:	Wed Nov 22 2023 11:22:46
Time Spent:	0:30:50

Question 1

Modular Arithmetics

Please solve the following modular operations.

109 (mod 4) = 1 ✔ Expected answer: 1

✔ Your answer is correct. You were awarded **1** mark.

You scored **1** mark for this part.

Score: 1/1 ✔

Question 2

Modular Arithmetics

Please solve the following modular operations.

-180 (mod 5) = 0 ✔ Expected answer: 0

When p is negative, we need to find a number k such that $p + k \times m$ is between 0 and $m - 1$. That number is the modulus.

(Your score will not be affected.)

✔ Your answer is correct. You were awarded **1** mark.

You scored **1** mark for this part.

Score: 1/1 ✔

Question 3

Modular Arithmetics

Please solve the following modular operations.

Modular Arithmetic

Find a number between 60 and 65 which satisfies this equation:

61 ✔ Expected answer: 61 (mod 6) = 1

When p is positive, the result of the modulo operation is the remainder of the deviation of p by m.

(Your score will not be affected.)

✔ Your answer is correct. You were awarded **1** mark.

You scored **1** mark for this part.

Score: 1/1 ✔

Question 4

Modular Arithmetics

Please solve the following modular operations.

Modular Arithmetic

Find a number which satisfies this equation:

478 (mod 12 ✔ Expected answer: 18) = 10

✔ Your answer is correct. You were awarded **1** mark.

You scored **1** mark for this part.

Score: 1/1 ✔

Question 5

Euclidean Algorithm

Apply the Euclidean algorithm to find the greatest common denominator between 2562 and 315. Show the steps.

Part a) Algorithm

Please enter all the steps of the Euclidean algorithm below (please enter the number of steps you need in the "Rows:" box.)

Rows: 3 Columns: 4

2562	8	315	42
315	7	42	21
42	2	21	0

✔

Expected answer:

$$\begin{pmatrix} 2562 & 8 & 315 & 42 \\ 315 & 7 & 42 & 21 \\ 42 & 2 & 21 & 0 \end{pmatrix}$$

✔ You were awarded **1** mark.

You scored **1** mark for this part.

Score: 1/1 ✔

Part b) gcd

gcd(2562,315)=

21 ✔

Expected answer: 21

✔ Your answer is correct. You were awarded **1** mark.

You scored **1** mark for this part.

Score: 1/1 ✔

Part c) LCM

Lowest Common Multiple

Use the information above to calculate the lowest common multiple between 2562 and 315.

lcm(2562,315)=

38430 ✔ Expected answer: 38430

✔ Your answer is correct. You were awarded **1** mark.

You scored **1** mark for this part.

Score: 1/1 ✔

Advice

In order to apply the Euclidean algorithm to find the gcd, you need to apply integer division repeatedly, until the remainder is 0.

Once you know the gcd between two numbers p and q you can find their lcm using the following formula:

$$\operatorname{lcm}(p,q) = \frac{p \times q}{\gcd(p,q)}$$

Question 6

Euclidean Algorithm

Apply the Euclidean algorithm to find the greatest common denominator between 4381 and 481. Show the steps.

Part a) Algorithm

Please enter all the steps of the Euclidean algorithm below (please enter the number of steps you need in the "Rows:" box.)

Rows: 3 Columns: 4

4381	9	481	52
481	9	52	13
52	4	13	0

✔

Expected answer:

4381	9	481	52
481	9	52	13
52	4	13	0

✔ You were awarded **1** mark.

You scored **1** mark for this part.

Score: 1/1 ✔

Part b) gcd

gcd(4381,481)=

13 ✔

Expected answer: 13

✔ Your answer is correct. You were awarded **1** mark.

You scored **1** mark for this part.

Score: 1/1 ✔

Part c) LCM

Lowest Common Multiple

Use the information above to calculate the lowest common multiple between 4381 and 481.

lcm(4381,481)=

162097 ✔ Expected answer: 162097

✔ Your answer is correct. You were awarded **1** mark.

You scored **1** mark for this part.

Score: 1/1 ✔

Advice

In order to apply the Euclidean algorithm to find the gcd, you need to apply integer division repeatedly, until the remainder is 0.

Once you know the gcd between two numbers p and q you can find their lcm using the following formula:

$$\operatorname{lcm}(p,q) = \frac{p \times q}{\gcd(p,q)}$$

Question 7

Factorisation

In this question we will compute the gcd and lcm of two numbers using their prime factorisations.

To enter the prime factorisation of a number, use `*` to denote multiplication and `^` for power. For example, the prime factorisation of 12 would be entered as `3*2^2`.

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p

Enter the prime factorisation (in exponent form) of 528.

3*2^4*11 $3 \times 2^4 \times 11$ ✔

Expected answer: 2^4*3^1*11^1 $2^4 \times 3^1 \times 11^1$

✔ Your answer is numerically correct. You were awarded **1** mark.

You scored **1** mark for this part.

Score: 1/1 ✔

q

Enter the prime factorisation (in exponent form) of 600.

2^3*3*5^2 $2^3 \times 3 \times 5^2$ ✔

Expected answer: 2^3*3^1*5^2 $2^3 \times 3^1 \times 5^2$

✔ Your answer is numerically correct. You were awarded **1** mark.

You scored **1** mark for this part.

Score: 1/1 ✔

c)

Using the information above, enter the gcd and the lcm of 528 and 600.

gcd(528,600) = 24 ✔ Expected answer: 24 .

lcm(528,600) = 13200 ✔ Expected answer: 13200 .

Gap 0

Gap 1

Score: 2/2

Advice

To find the prime factorisation of a number, you can start from finding all the prime numbers below the square root of that number.

Question 8

Factorisation

In this question we will compute the gcd and lcm of two numbers using their prime factorisations.

To enter the prime factorisation of a number, use `*` to denote multiplication and `^` for power. For example, the prime factorisation of 12 would be entered as `3*2^2`.

---

p

Enter the prime factorisation (in exponent form) of 400.

`2^4*5^2` $2^4 \times 5^2$ ✔

Expected answer: `2^4*5^2` $2^4 \times 5^2$

✔ Your answer is numerically correct. You were awarded **1** mark.

You scored **1** mark for this part.

Score: 1/1 ✔

q

Enter the prime factorisation (in exponent form) of 360.

`2^3*3^2*5` $2^3 \times 3^2 \times 5$ ✔

Expected answer: `2^3*3^2*5^1` $2^3 \times 3^2 \times 5^1$

✔ Your answer is numerically correct. You were awarded **1** mark.

You scored **1** mark for this part.

Score: 1/1 ✔

c)

Using the information above, enter the gcd and the lcm of 400 and 360.

gcd(400,360) = 40 ✔ Expected answer: 40 .

lcm(400,360) = 3600 ✔ Expected answer: 3600 .

Gap 0

Gap 1

Score: 2/2

Advice

To find the prime factorisation of a number, you can start from finding all the prime numbers below the square root of that number.

Question 9

Convert 1486 to base 3

1486_{10} = 2001001 ✔ Expected answer: 2001001 3

✔ Your answer is correct. You were awarded **1** mark.

You scored **1** mark for this part.

Score: 1/1 ✔

Advice

To solve this problem you can use one of two methods: either you divide by the powers of 3 continually, or divide by 3 itself. For example:

$$\begin{aligned} 1486 \div 3 &= 495 \quad R1 \\ 495 \div 3 &= 165 \quad R0 \\ 165 \div 3 &= 55 \quad R0 \\ 55 \div 3 &= 18 \quad R1 \\ 18 \div 3 &= 6 \quad R0 \\ 6 \div 3 &= 2 \quad R0 \\ 2 \div 3 &= 0 \quad R2 \end{aligned}$$

Then, using the remainders, we find that $1486_{10} = 2001001_3$.

Question 10

Convert 5664 to base 6

5664_{10} = 42120 ✔ Expected answer: 42120 $_6$

✔ Your answer is correct. You were awarded **1** mark.

You scored **1** mark for this part.

Score: 1/1 ✔

Advice

To solve this problem you can use one of two methods: either you divide by the powers of 6 continually, or divide by 6 itself. For example:

$$\begin{aligned} 5664 \div 6 &= 944 \quad R0 \\ 944 \div 6 &= 157 \quad R2 \\ 157 \div 6 &= 26 \quad R1 \\ 26 \div 6 &= 4 \quad R2 \\ 4 \div 6 &= 0 \quad R4 \end{aligned}$$

Then, using the remainders, we find that $5664_{10} = 42120_6$.

Question 11

Convert 1125 from base 6 to base 10.

1125_6 = 269 ✔ Expected answer: 269 $_{10}$

✔ Your answer is correct. You were awarded **1** mark.

You scored **1** mark for this part.

Score: 1/1 ✔

Advice

To solve this problem you can just multiply each digit by the corresponding powers of 6:

=269

$$1 \cdot 6^3 + 1 \cdot 6^2 + 2 \cdot 6^1 + 5 \cdot 6^0$$

Then, using the remainders, we find that $1125_6 = 269_{10}$.