

QQQ – Further Pure 2 – Chapter 1 – Number Theory (Version 2)

Total Marks: 25

(25 = Platinum, 23 = Gold, 20 = Silver, 17 = Bronze)

1.

(a) Use the Euclidean algorithm to show that 124 and 17 are relatively prime (coprime). **(2)**

(b) Hence solve the equation

$$124x + 17y = 10$$

(3)

(c) Solve the congruence equation

$$124x \equiv 6 \pmod{17}$$

(2)

(Total 7 marks)

Edexcel A2 June 2022 Q4

2.

(i) Making your reasoning clear and using modulo arithmetic, show that

$$214^6 \text{ is divisible by } 8$$

(3)

(ii) The following 7-digit number has four unknown digits

$$\boxed{a} 5 \boxed{b} 8 \boxed{a} \boxed{b} 0$$

Given that the number is divisible by 11

(a) determine the value of the digit a . **(2)**

Given that the number is also divisible by 3

(b) determine the possible values of the digit b . **(3)**

(Total 8 marks)

Edexcel AS June 2023 Q5

3.

(i) A password is to be created from 5 characters using the following criteria

- one capital letter
- 3 distinct single digits
- one of the four symbols @ £ \$ &

Determine how many different passwords can be created if

(a) the characters are in the order of the bullet points above, **(2)**

(b) the characters can be in any order. **(1)**

(ii) Use Fermat's Little Theorem to determine the least positive residue of 4^{50} modulo 13 **(3)**

(iii) Determine the total number of different, positive **odd** numbers, less than 1000, that contain the digit 2 **(4)**

(Total 10 marks)