

### Quiz 3 Solutions

Q1

Correctly placing one number receives 0.5

$$(20 \bmod 11 + 0^2) \bmod 11 = 9$$

$$(30 \bmod 11 + 0^2) \bmod 11 = 8$$

$$(2 \bmod 11 + 0^2) \bmod 11 = 2$$

$$(13 \bmod 11 + 0^2) \bmod 11 = 2 \quad \leftarrow \text{collision}$$

$$(13 \bmod 11 + 1^2) \bmod 11 = 3$$

$$(25 \bmod 11 + 0^2) \bmod 11 = 3 \quad \leftarrow \text{collision}$$

$$(25 \bmod 11 + 1^2) \bmod 11 = 4$$

$$(24 \bmod 11 + 0^2) \bmod 11 = 2 \quad \leftarrow \text{collision}$$

$$(24 \bmod 11 + 1^2) \bmod 11 = 3 \quad \leftarrow \text{collision}$$

$$(24 \bmod 11 + 2^2) \bmod 11 = 6$$

$$(10 \bmod 11 + 0^2) \bmod 11 = 10$$

$$(9 \bmod 11 + 0^2) \bmod 11 = 9 \quad \leftarrow \text{collision}$$

$$(9 \bmod 11 + 1^2) \bmod 11 = 10 \quad \leftarrow \text{collision}$$

$$(9 \bmod 11 + 2^2) \bmod 11 = 2 \quad \leftarrow \text{collision}$$

$$(9 \bmod 11 + 3^2) \bmod 11 = 7$$

1	2	3	25	24	9	30	20	10		
0	1	2	3	4	5	6	7	8	9	10

Q2

Correctly placing one number receives 0.5

$$2 \quad h = (h_1(2) + 0 \times h_2(2)) \bmod 13 = 2$$

$$8 \quad h = (h_1(8) + 0 \times h_2(8)) \bmod 13 = 8$$

$$31 \quad h = h_1(31) + 0 \times h_2(31) = 5$$

$$20 \quad h = h_1(20) + 0 \times h_2(20) = 7$$

$$19 \quad h = h_1(19) + 0 \times h_2(19) = 6$$

$$18 \quad h = h_1(18) + 0 \times h_2(18) = 5 \quad \leftarrow \text{collision}$$

$$h = h_1(18) + 1 \times h_2(18) = 5 + 1 \times 3 = 8 \quad \leftarrow \text{collision}$$

$$h = h_1(18) + 2 \times h_2(18) = 5 + 2 \times 3 = 11$$

$$53 \quad h = (h_1(53) + 0 \times h_2(18)) \bmod 13 = 1$$

$$27 \quad h = (h_1(27) + 0 \times h_2(27)) \bmod 13 = 1 \quad \leftarrow \text{collision}$$

$$h = (h_1(27) + 1 \times h_2(27)) \bmod 13 = 6 \quad \leftarrow \text{collision}$$

$$h = (h_1(27) + 2 \times h_2(27)) \bmod 13 = 11 \quad \leftarrow \text{collision}$$

$$h = (h_1(27) + 3 \times h_2(27)) \bmod 13 = 3$$

	53	2	27		31	19	20	8			18	
0	1	2	3	4	5	6	7	8	9	10	11	12