# Number Play: Thinking Puzzles

Standard difficulty · 20 questions · 40 marks · Time: 36 minutes

Name: _____ Date: _____ Score: ____ / 40

Show your working for Sections B and C. Answers are on the last page — try every question first!

## Section A — Choose the correct answer — 8 × 1 = 8 marks

**1.** A number is divisible by 9 when:

**(a)** it is odd **(b)** its last two digits make a multiple of 9

**(c)** its last digit is 9 **(d)** the sum of its digits is divisible by 9

**2.** A panel has three bulbs. Bulb A glows when the number entered is divisible by 7, bulb B when it is divisible by 10, and bulb C when it is divisible by 11. Which bulbs glow when 166 is entered?

**(a)** A and C **(b)** B and C **(c)** None of them **(d)** A and B

**3.** Using six of the digits 9, 1, 8, 2, 0, 3, 5 once each, what is the largest 6-digit number divisible by 9?

**(a)** 985,320 **(b)** 985,321 **(c)** 985,302 **(d)** 985,311

**4.** What is the remainder when 3,536,984 is divided by 9? (Hint: use the digit sum.)

**(a)** 2 **(b)** 38 **(c)** 8 **(d)** 3

**5.** In 2021, Ananya's age was a multiple of 11. In 2024, it was a multiple of 5. Ananya is under 60. How old was Ananya in 2024?

**(a)** 25 years **(b)** 15 years **(c)** 5 years **(d)** 10 years

**6.** How many numbers from 1 to 125 are divisible by both 4 and 6?

**(a)** 10 **(b)** 11 **(c)** 5 **(d)** 51

**7.** Two different two-digit numbers are both divisible by 11, and neither is a multiple of 22. What is their least possible sum?

**(a)** 44 **(b)** 22 **(c)** 66 **(d)** 33

**8.** Which of these numbers is divisible by 11?

**(a)** 9296 **(b)** 2321 **(c)** 9045 **(d)** 7970

## Section B — Short answer — 8 × 2 = 16 marks

**9.** Why does the digit-sum test work for 9?

**10.** A panel has three bulbs. Bulb A glows when the number entered is divisible by 7, bulb B when it is divisible by 6, and bulb C when it is divisible by 10. Which bulbs glow when 32 is entered? Write the letters, or None.

**11.** Using four of the digits 8, 1, 6, 3, 9 once each, write the largest 4-digit number divisible by 3.

**12.** How many numbers from 1 to 535 are divisible by 11 or by 4 (or both)?

**13.** Which digit goes in the box so that 878□ is divisible by 9?

**14.** 14 × 23 is divided by 11. What is the remainder?

**15.** In 2023, Priya's age was a multiple of 11, and in 2032 a multiple of 6. Priya is under 60. How old was Priya in 2032?

**16.** A row of 23 switches has 5 light switches; the rest are fan switches. The leftmost switch is a light switch, and there are exactly 4 fan switches between any two neighbouring light switches. Which positions, counted from the left, are light switches?

## Section C — Word problems — 4 × 4 = 16 marks

**17.** The numbers 4, 20, 29, 33, 34, 37, 44, 51, 53, 54 are sorted into boxes: multiples of 4 go into Box 1 and multiples of 5 into Box 2; a multiple of both goes into both boxes. How many numbers go into (a) Box 1 (b) Box 2 (c) both boxes (d) neither box?

**18.** A digit is missing from 27□47. (a) Which digits in the box make it divisible by 3? Write them all. (b) Which digit makes it divisible by 9?

**19.** Priya and Vikram choose two different numbers from 5 to 30. The numbers are multiplied and the product is divided by 17. Priya wins if the remainder is more than 14. What is the smallest possible sum of the two numbers for which Priya wins?

**20.** Today is Wednesday. (a) What day of the week will it be 69 days from today? (b) What day will it be 899 days from today?

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# Answer key

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| Q | Answer | Working |
|---|---|---|
| 1 | **(d) the sum of its digits is divisible by 9** | — |
| 2 | **(c) None of them** | 166 ÷ 7 leaves 5; 166 ÷ 10 leaves 6; 166 ÷ 11 leaves 1 |
| 3 | **(a) 985,320** | drop the digit that makes the digit sum a multiple of 9; arrange the rest from largest to smallest |
| 4 | **(a) 2** | digit sum 38; 38 ÷ 9 leaves 2 |
| 5 | **(a) 25 years** | try multiples of 5: only 25 gives 25 − 3 = 22, a multiple of 11 |
| 6 | **(a) 10** | divisible by both means divisible by the LCM 12: 125 ÷ 12 |
| 7 | **(a) 44** | smallest such numbers: 11 and 33 |
| 8 | **(b) 2321** | alternate digit sums of 2321 differ by a multiple of 11 (2321 = 11 × 211) |
| 9 | **Each power of 10 is 1 more than a multiple of 9, so a number and its digit sum leave the same remainder on division by 9.** | — |
| 10 | **None** | 32 ÷ 7 leaves 4; 32 ÷ 6 leaves 2; 32 ÷ 10 leaves 2 |
| 11 | **9861** | choose four digits whose sum is a multiple of 3 and arrange them from largest to smallest |
| 12 | **169** | 48 + 133 − 12 (counted twice: multiples of 44) |
| 13 | **4** | the other digits add up to 23; 23 + 4 = 27 |
| 14 | **3** | 14 × 23 = 322 = 11 × 29 + 3 |
| 15 | **42 years** | multiples of 6; only 42 − 9 = 33 is a multiple of 11 |
| 16 | **1, 6, 11, 16, 21** | start at 1 and jump 5 each time |
| 17 | **(a) 3; (b) 1; (c) 1; (d) 7** | Box 1: 4, 20, 44; Box 2: 20 |
| 18 | **(a) 1, 4, 7; (b) 7** | other digits add up to 20 |
| 19 | **15** | try sums from the smallest up: 5 × 10 = 50 leaves 16 |
| 20 | **(a) Tuesday; (b) Saturday** | 69 = 7 × 9 + 6; 899 = 7 × 128 + 3 |