MENTAL MATHS

Write T for true and F for false statements :

1. The sum of any 2-digit number ab and the number ba by reversing its digits is divisible by 11. T
2. The difference between two 2-digit numbers ab and ba, where $a > b$ is divisible by 4. F
3. If the difference of 93 and 39 is divided by 9, the quotient is 6. T
4. If the sum of three 3-digit numbers xyz, yzx and zxy is divided by 37, the quotient is $(x + y + z)$. F
5. The sum of $ab + bc + ca$ is divisible by 111. F
6. 57291 is divisible by 6. F
7. If the sum of 259, 592 and 925 is divided by 37, the quotient is 48. T
8. If the sum of 483, 834 and 348 is divided by 111, the quotient is 16. F
9. If $24a$ is divisible by 3, where a is a digit. The least value of a is 3. T
10. If $N \div 2$ leaves a remainder 0, then the ones digit of N might be 0, 2, 4, 6 or 8. T

MULTIPLE CHOICE QUESTIONS

Tick (✓) the correct option :

1. If a number is divisible by 10, then, it is also divisible by :
   (a) 2 (b) 5 (c) both 2 and 5 (d) both 2 and 8
2. Largest 3-digit number divisible by 5 is :
   (a) 990 (b) 995 (c) 998 (d) 999
3. A number divisible by 6 is also divisible by :
   (a) 2 only (b) 3 only (c) both 2 and 3 (d) none of these
4. If the number 379* is divisible by 5, then the value of * is :
   (a) 1 (b) 2 (c) 4 (d) 0 or 5
5. If 2 * 3 is divisible by 9, then * can be replaced with :
   (a) 3 (b) 4 (c) 5 (d) 6
6. If 31A5 is divisible by 3, where A is a digit, then the value of A is :
   (a) 1 (b) 4 (c) 2 (d) 3
7. The sum of any 2-digit number *ab* and the number *ba* by reversing its digits, is completely divisible by :
   (a) 11 (b) 9 (c) both 9 and 11 (d) none of these
8. The difference of any 2-digit number *ab* and the number *ba* by reversing its digits, is completely divisible by :
   (a) 11 (b) 9 (c) both 9 and 11 (d) none of these
9. *abc* is a 3-digit number. If the sum (*abc* + *bca* + *cab*) is divided by (*a* + *b* + *c*), the quotient is :
   (a) 37 (b) 3 (c) 111 (d) *abc*
10. If the difference of 782 and 287 is divided by 5, the quotient is :
    (a) 99 (b) 90 (c) 37 (d) 111

VALUE BASED QUESTIONS

Sukant and Priyanka are twins. They study in the same class and play together. They were playing a game. The conversation between them is as below :

Sukant : Think of a 2-digit number, without telling me.

Priyanka : Alright, I have done.

Sukant : Now reverse the digits to get another 2-digit number. Now, get the difference of these two numbers.

Priyanka : OK, I have do

Sukant : Divide the answ ... y 9.

Priyanka : Yes, you are right.

(a) Do you think the number in the last step is always divisible by 9?

(b) Can you explain the trick?

(c) Which qualities do Sukant and Priyanka possess?

4. Solve the cryptograms :

(i)
$$\begin{array}{r} EAT \\ +\,THAT \\ \hline APPLE \end{array}$$

(ii) AA × AA = AHA

(iii)
$$\begin{array}{r} TAKE \\ A \\ +\,CAKE \\ \hline KATE \end{array}$$

(iv) AB × AB = ABB

(v)
$$\begin{array}{r} NINA \\ +\,SING \\ \hline AGAIN \end{array}$$

(vi)
$$\begin{array}{r} TAKE \\ +\,THAT \\ \hline SHEET \end{array}$$

Sol. (i)
$$\begin{array}{r} 819 \\ +\,9219 \\ \hline 10038 \end{array}$$

(ii) 11 × 11 = 121

(iii)
$$\begin{array}{r} 3961 \\ 9 \\ +\,2961 \\ \hline 6931 \end{array}$$

(iv) 10 × 10 = 100

(v)
$$\begin{array}{r} 5051 \\ +\,9054 \\ \hline 14105 \end{array}$$

(vi)
$$\begin{array}{r} 7460 \\ +\,7547 \\ \hline 15007 \end{array}$$

MULTIPLE CHOICE QUESTIONS

...k (✓) the correct option :

$A^B = B^A \Rightarrow 4^2 = 2^4 \Rightarrow 16 = 16.$

(ii) $AB \times AB = CCB$

let $A = 1, B = 5$

$15 \times 15 = 225.$

then $C = 2$

(iii) $A \times B \times BC = 111$

$1 \times 3 \times 37 = 111$

$A = 1, B = 3, C = 7.$

(iv) $A^2 + B^2 + C^2 = D^2.$

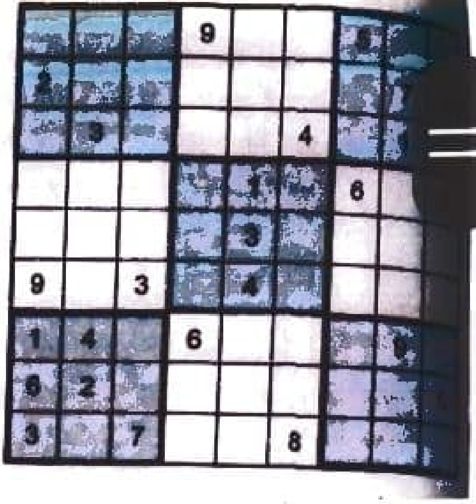
$2^2 + 3^2 + 6^2 = 7^2.$

$4 + 9 + 36 = 49.$

$49 = 49.$

$A = 2, B = 3, C = 6$ and $D = 7.$

2. Fill in the grid so that every horizontal row, every vertical column and every 3 × 3 box contains the digits 1 to 9, without repeating the digits in the same row, column, or box. You cannot change the digits already given.



Sol.

7	6	1	9	2	3	5	4	8
2	9	4	1	8	5	3	7	6
8	3	5	7	6	4	9	1	2
4	8	2	5	1	7	6	3	9
5	7	6	8	3	9	1	2	4
9	1	3	2	4	6	8	5	7
1	4	8	6	5	2	7	9	3
6	2	9	3	7	1	4	8	5
3	5	7	4	9	8	2	6	1

3. Solve : (i) $A^B = B^A$

(ii) $AB \times AB = CCB$

(iii) $A \times B \times BC = AAA$

(iv) $A^2 + B^2 + C^2 = D^2$

Sol. (i) $A = 2, B = 4$

$A^B = B^A \Rightarrow 2^4 = 4^2 \Rightarrow 16 = 16$.

or $A = 4, B = 2$

$A^B = B^A \Rightarrow 4^2 = 2^4 \Rightarrow 16 = 16$,

(ii) $AB \times AB = CCB$

Let $A = 1, B = 5$

EXERCISE 5.2

1. The fractions given below are called continued fractions :

$$\frac{1}{1+1},\quad \frac{1}{1+\frac{1}{1+1}},\quad \frac{1}{1+\frac{1}{1+\frac{1}{1+1}}}$$

(i) Write down the next three terms.

(ii) Evaluate each of the above fractions and give your answer as a fraction in the simplest form.

Sol. (i) $\dfrac{1}{1+\dfrac{1}{1+\dfrac{1}{1+\dfrac{1}{1+1}}}}$, $\dfrac{1}{1+\dfrac{1}{1+\dfrac{1}{1+\dfrac{1}{1+\dfrac{1}{1+1}}}}}$, $\dfrac{1}{1+\dfrac{1}{1+\dfrac{1}{1+\dfrac{1}{1+\dfrac{1}{1+\dfrac{1}{1+1}}}}}}$.

(ii) $\dfrac{1}{1+1} = \dfrac{1}{2}$,

$$\frac{1}{1+\frac{1}{1+1}} = \frac{1}{1+\frac{1}{2}} = \frac{1}{\frac{3}{2}} = \frac{1}{\frac{3}{2}} = \frac{2}{3}.$$

$$\frac{1}{1+\frac{1}{1+\frac{1}{1+1}}} = \frac{1}{1+\frac{1}{1+\frac{1}{2}}} = \frac{1}{1+\frac{1}{\frac{3}{2}}} = \frac{1}{1+\frac{2}{3}}$$

$$= \frac{1}{\frac{5}{3}} = \frac{3}{5}.$$

2. Fill in the grid so that every horizontal row, every vertical column and every 3 × 3 box contains the digits 1 to 9, without repeating the digits in the same row, column, or box. You cannot change the digits already given.

An odd three digit number is divisible by 5 and 11 and sum of its digits is 16. Find the number.

Sol. If a number is divisible by 5 ie. last digit of number will be 5.

Now, sum of three digit number = 16

$$a+b+5 = 16$$

$$a+b = 11 \quad \text{——— (1)}$$

Number is divisible by 11.

$$(a+5)-b = 0$$

$$a-b = -5 \quad \text{——— (2)}$$

from (1) and (2), we get $a = 3$ and $b = 8$

Therefore, three digit number = 385.

16. **Difference of the hundred's digit and unit's digit in a three digit number is 3. Sum of the digits is 15 and the ten's digit is 2. Find the number.**

Sol. let the hundred's digit of a three digit number be a, unit's digit be b.

$$a-b = 3 \quad \text{——— (1)}$$

$$a+b+2 = 15$$

$$a+b = 13 \quad \text{——— (2)}$$

from (1) and (2) we get $a = 8$ and $b = 5$

Therefore, three digit number = 825.

Write the smallest digit to replace * to make the following numbers divisible by 3 :

7*2, 1027*, 876*5.

Sol. Numbers are divisible by 3 : 702, 10272 and 87615.

12. Which of the following numbers are divisible by 12?

806, 3564, 58200, 572.

Sol. Numbers 3564 and 58200 are divisible by 12

Show that a two digit number added to 8 times the number formed by reversing the digits is always divisible by 9. [HOTS]

Sol. Let a two digit number be $(10x+y)$.

number added to 8 times $= 8(10x+y)$

$= 80x+8y$

Reversing the digits $= x+10y$

Required number $= 80x+8y+x+10y$

$= 81x+18y$

$= 9(9x+2y)$.

Thus, number is divisible by 9.

7. Using the digits 3, 4, 8, write all possible numbers which are divisible by (i) 2 (ii) 4 (iii) 8.

Sol. (i) Numbers are divisible by 2 using the digits 3,4 and 8 : 4,8,34,38,48,84,348,384.

(ii) Numbers are divisible by 4 using the digits 3,4 and 8 : 4,8,48,84,348,384.

(iii) Numbers are divisible by 8 using the digits 3,4 and 8 : 8,48,384.

8. Write the missing digits so that the resulting number is divisible by (i) 9 (ii) 11
8 * 25; 403 * 6

Sol. (i) 8325 is divisible by 9.
40356 is divisible by 9.

(ii) 8525 is divisible by 11.
40326 is divisible by 11.

9. Give an example to show that the number divisible by 3 may not be divisible by 9. [HOTS]

Sol. 33 is divisible by 3 may not be divisible by 9.

10. Show by two different examples that a number divisible by 6 will be divisible by 3 also, and a number divisible by 3 may not be divisible by 6. [HOTS]

Sol. Number 54 is divisible by 6 as well as 3 also. And a number 45 is divisible by 3 may not divisible by 6.

11. Write the smallest digit to replace * to [illegible] numbers divisible by 3
7*2, 1027*, 876*5.

Sol. Numbers are divisible by 3 : 702, 1027

5. Which of the following numbers are divisible by (i) 3 (ii) 6 (iii) 9?
9027, 621, 68, 215, 678, 444, 54288, 756

Sol. (i) Numbers are divisible by 3 : 9027, 621, 678, 444, 54288 and 756 (Because sum of the digits is divisible by 3)

(ii) Numbers are divisible by 6 : 678, 444, 54288, 756. (Because a number will be divisible by 6 if it is divisible by 2 and 3 both)

(iii) Numbers are divisible by 9 : 9027, 621, 54288 and 756. (Because sum of the digits is divisible by 9).

6. Which of the following numbers are divisible by (i) 2 (ii) 5 (iii) 10?
250, 485, 392, 780, 546, 1005, 3450, 584

Sol. (i) Numbers are divisible by 2 : 250, 392, 780, 546, 3450 and 584. i.e. one's digit is divisible by 2.

(ii) Numbers are divisible by 5 : 250, 485, 780, 1005 and 3450. i.e. one's digit either 0 or 5.

(iii) Number are divisible by 10 : 250, 780, 3450. i.e. one's digit is 0.

7. Using the digits 3, 4, 8, write all possible numbers which are divisible by (i) 2 (ii)

4. **Without performing actual addition and division, find the quotient when**

(i) the sum of 359, 593 and 935 is divided by (a) 3 (b) 37 (c) 111 (d) 17 (e) 51

(ii) the sum of 174, 741 and 417 is divided by (a) 12 (b) 36 (c) 37 (d) 111 (e) 444

Sol. (i) 359, 593 and 935 are three numbers obtained when the digits 3, 5 and 9 are arranged in the cyclic order.

So, the quotient when the sum of these numbers is divided by :

(a) 3 is $37 \times (3+5+9)$. i.e. 629

(b) 37 is $3(3+5+9) = 51$.

(c) 111 is $(3+5+9)$. i.e 17.

(d) $3+5+9 = 17$ is 111.

(e) $3 \times (3+5+9) = 51$ is 37.

(ii) 174, 741 and 417 ~~is divided by~~ are three numbers obtained when the digits 1, 7 and 4 are arranged in the cyclic order.

So, the quotient when the sum of these numbers is divided by

(a) $1+7+4 = 12$ is 111.

(b) $3 \times (1+7+4) = 36$ is 37.

(c) 37 is $3 \times (1+7+4)$. i.e., 36.

(d) 111 is $(1+7+4)$ i.e. 12.

(e) $37 \times (1+7+4) = 444$ i.e 3

or $\frac{813-318}{8-3} = 99$

(b) If we divide their difference by 99, the quotient is the difference of hundreds and ones digits or $\frac{813-318}{99} = 5$.

(ii) 951 and 159 are the two 3-digit numbers such that one can be obtained by reversing the digits of the other. Thus,

(a) If we divide their difference by the difference of hundreds and ones digits, the quotient is 99.

or $\frac{951-159}{9-1} = 99$

(d) If we divide their difference by 99, the quotient is the difference of hundreds and ones digits.

or $\frac{951-159}{99} = 9-1 = 8$.

(b) If we divide their difference by 11.

or $\frac{951-159}{11} = \frac{792}{11} = 72$

(c) If we divide their difference by 88.

$\frac{951-159}{88} = 9$.

4. Without performing actual addition and division, find the quotient when

Without performing the actual subtraction and division, find the quotient when

(i) the difference of 276 and 672 is divided by (a) 99 (b) 4

(ii) the difference of 813 and 318 is divided by (a) 5 (b) 99

(iii) the difference of 951 and 159 is divided by (a) 8 (b) 11 (c) 88 (d) 99

l. (i) 276 and 672 are the two 3-digit numbers such that one can be obtained by reversing the digits of the other. Thus,

(a) If we divide their difference by 99, the quotient is the difference of hundreds and ones digits. or $\frac{672-276}{99} = 6-2 = 4$.

(b) If we divide their difference by the difference of hundreds and ones digits, the quotient is 99.

or $\frac{672-276}{6-2} = 99$

(ii) 813 and 318 are the two 3-digit numbers such that one can be obtained by reversing the digits of the other. Thus,

(a) If we divide their difference by the the difference of hundreds and ones digits, the quotient is 99.

or $\frac{813-318}{8-3} = 99$

(b) If we divide their difference by 99, the quotient is the difference of hundreds and ones digits or $\frac{813-318}{99} = 5$.

951 and 159 are the 3-digit numbers such that one can be obtained by reversing the digits of the other. Th

or $\frac{75-57}{7-5} = 9$

ii) 93 and 39 are the two numbers, such that one can be obtained by interchanging the digits of the other. Thus,

(a) If we divide their difference by the difference of the digits, we get 9 as the quotient.

or $\frac{93-39}{9-3} = 9$

(b) If we divide their difference by 9, the quotient is the difference of the digits

or $\frac{93-39}{9} = 6$.

iii) 92 and 29 are two numbers, such that one can be obtained by interchanging the digits of the other. Thus,

(a) If we divide their difference by 9, the quotient is the difference of the digits

or $\frac{92-29}{9} = 9-2 = 7$.

(b) If we divide their difference by the difference of the digits, we get 9 as the quotient,

or $\frac{92-29}{9-2} = 9$.

Without performing the actual subtrac[tion and division, ...] the quotient when

(i) the difference of 276 and 672 is divided by (a) 99 (b) 4

(ii) the difference of 813 and 318 is divided by (a) 5 (b) 99

Sum of the digits i.e. $\frac{37+73}{11} = 10.$

(iii) 93 and 39 are the two numbers such that one can be obtained by interchanging the digits of the other.

(a) If we divide their sum by 11, the quotient is the sum of the digits i.e. $\frac{93+39}{11} = 12.$

(b) If we divide by sum of the digits, we get 11 as the quotient or $\frac{93+39}{9+3} = 11.$

2. Without performing the actual subtraction and division, find the quotient when :

(i) the difference of 57 and 75 is divided by (a) 9 (b) 2

(ii) the difference of 39 and 93 is divided by (a) 6 (b) 9

(iii) the difference of 92 and 29 is divided by (a) 9 (b) 7

Sol. (i) 57 and 75 are two numbers, such that one can be obtained by interchanging the digits of the other. Thus,

(a) If we divide their difference by 9, the quotient is the difference of the digits or

$$\frac{75-57}{9} = 7-5 = 2$$

(b) If we divide their difference by the difference of the digits, we get 9 as the quotient or $\frac{75-57}{7-5} = 9$

EXERCISE 5.1

1. Without performing the actual addition and division, find the quotient when :

(i) the sum of 45 and 54 is divided by	(a) 11	(b) 9
(ii) the sum of 37 and 73 is divided by	(a) 10	(b) 11
(iii) the sum of 93 and 39 is divided by	(a) 11	(b) 12

Sol. (i) 45 and 54 are the two numbers such that one can be obtained by interchanging the digits of the other.

(a) If we divide their sum by 11, the quotient is the sum of the digits i.e.

$$\frac{45+54}{11} = 4+5 = 9.$$

(b) If we divide by sum of the digits, we get 11 as the quotient. or $\frac{45+54}{4+5} = 11$.

(ii) 37 and 73 are the two numbers such that one can be obtained by interchanging the digits of the other.

(a) If we divide by sum of the digits, we get 11 as the quotient or $\frac{73+37}{7+3} = 11$.

(b) If we divide their sum by 11, the quotient is the sum of the digits i.e. $\frac{37+73}{11} = 10$.

PLAYING WITH NUMBERS

5

WHAT WE HAVE LEARNT....

1. Can you express 4 as a sum of two odd numbers?
2. Write the largest prime number less than 100.
3. Check the divisibility of the following numbers by : (a) 3 (b) 6 (c) 8 (d) 10

   246, 1342, 2112, 2048, 7548, 29760
4. Write the smallest digit and the greatest digit in the blank space to make the number divisible by 3 :

   (a) 1688 __ (b) __ 80622 (c) 11 __ 691

Sol. 1. Yes. for example, $1+3=4$ and $3+1=4$.
Here, two odd numbers 1 and 3.

2. Largest prime number less than 100 = 97.

3. (a) Numbers are divisible by 3 : 246, 2112, 7548 and 29760.

(b) Numbers are divisible by 6 : 246, 2112, 7548 and 29760.

(c) Numbers are divisible by 8 : 2112, 2048, 29760.

(d) Numbers are divisible by 10 : 29760.

4. (a) Smallest digit = 16881 and greatest digit = 16887

(b) Smallest digit = 080622 and greatest digit = 980622

(c) Smallest digit = 110691 and greatest digit = 119691