

Playing with Numbers

Understanding the Lesson

- Numbers in generalised form.
- Games with numbers.
 - Reversing the digits of two-digit numbers.
 - Reversing the digits of three-digit numbers.
 - Forming three-digit numbers with given three digits.
- Letters for digits.
- Test for divisibility.
 - Divisibility by 10
 - Divisibility by 2 and 5
 - Divisibility by 3 and 9

Conceptual Facts

- Generalised form of a two-digit number if a is ten place digit and b is unit place digit.

$$a \times 10 + b \times 1 = 10a + b$$

- Generalised form of a three-digit number if a is ten place digit and b is unit place digit.

$$a \times 100 + b \times 10 + c \times 1 = 100a + 10b + c$$

- Two-digit original numbers = $10a + b$

Number obtained by reversing the digits = $10b + a$

$$\text{Sum} = 10a + b + 10b + a$$

$$= 11a + 11b = 11(a + b)$$

which is divisible by 11.

$$\text{Difference} = (10a + b) - (10b + a)$$

$$= 10a + b - 10b - a$$

$$= 9a - 9b = 9(a - b)$$

which is divisible by 9.

- Three-digit original number if a is hundred place digit and b is ten place digit and c is unit place digit.

$$= 100a + 10b + c$$

The number obtained by reversing the digits = $100c + 10b + a$

$$\text{Difference} = (100a + 10b + c) - (100c + 10b + a)$$

$$= 100a + 10b + c - 100c - 10b - a$$

$$= 99a - 99c = 99(a - c)$$

which is divisible by 99.

- Divisibility test by 2 – A number is divisible by 2 if its unit place is even.

For example: 24, 48, 56 and 76 etc.

- Divisibility test by 3 – A number is divisible by 3 if the sum of all digits of the given number is also divisible by 3.

For example: $123 = 1 + 2 + 3 = 6 \div 3 = 2$

$$528 = 5 + 2 + 8 = 15 \div 3 = 5$$

$$\begin{array}{r} \therefore \quad B = 12 - 7 = 5 \\ \text{Thus the addition} = \quad \begin{array}{r} 2 \ 5 \\ + 3 \ 7 \\ \hline 6 \ 2 \end{array} \end{array}$$

Q5.
$$\begin{array}{r} A \ B \\ \times 3 \\ \hline C \ A \ B \end{array}$$

Sol. $3 \times B = B \quad \therefore B = 0$
 $3 \times A = CA \quad \therefore 3 \times 5 = 15$
 Thus $A = 5$ and $C = 1$
 Hence $A = 5, B = 0$ and $C = 1$

Q6.
$$\begin{array}{r} A \ B \\ \times 5 \\ \hline C \ A \ B \end{array}$$

Sol. $5 \times B = B \quad \therefore B = 0$ or 5
 $5 \times A = CA \Rightarrow 5 \times 5 = 25$
 Only possible when $B = 0$
 Thus $A = 5$ and $C = 2$
 Hence $A = 5, B = 0$ and $C = 2$

Q7.
$$\begin{array}{r} A \ B \\ \times 6 \\ \hline B \ B \ B \end{array}$$

Sol. $B \times 6 = B$
 $\therefore 6 \times 4 = 24 \rightarrow B = 4$ and 2 is carried to
 $6 \times A = BB$
 $\Rightarrow 6 \times 7 = 42 + 2$ (carried on) = 44
 Thus $B = 7$
 Hence $A = 7$ and $B = 4$

Q8.
$$\begin{array}{r} A \ 1 \\ + 1 \ B \\ \hline + B \ 0 \end{array}$$

$1 + B = 0$
 $1 + 9 = 10 \rightarrow$ unit digit is 0 and 1 is carried to A
 $+ 1 + 1$ (carried on) = $B = 9$
 $\therefore A + 2 = 9 \Rightarrow A = 9 - 2 = 7$
 Hence $A = 7$ and $B = 9$

Q9.
$$\begin{array}{r} 2 \ A \ B \\ + A \ B \ 1 \\ \hline B \ 1 \ 8 \end{array}$$

Sol. $B + 1 = 8 \quad \therefore B = 8 - 1 = 7$
 $A + B =$ a number with unit digit 1
 $\therefore A + B = 11$
 $A + 7 = 11$

$\therefore A = 11 - 7 = 4$ (1 Carried to)
 Now 1 carried on + 2 + A = B
 $3 + A = 7$
 $\therefore A = 7 - 3 = 4$
 Hence $A = 4, B = 7$

Q10.
$$\begin{array}{r} 1 \ 2 \ A \\ + 6 \ A \ B \\ \hline A \ 0 \ 9 \end{array}$$

Sol. $9 = A + B$
 $9 = 1 + 8$ or $2 + 7$ or $3 + 6$ or $4 + 5$
 or $8 + 1$ or $7 + 2$ or $6 + 3$ or $5 + 4$
 or $0 + 9$ or $9 + 0$

Now 0 is required at unit place

$\therefore 2 + A = 10$
 $\Rightarrow A = 10 - 2 = 8$
 $\therefore B = 9 - 8 = 1$
 $\therefore 1 + 6 + 1$ (carried on) = $A = 8$
 Hence $A = 8$ and $B = 1$

TRY THESE (PAGE 257)

(The first one has been done for you)

Q1. If the division $N \div 5$ leaves a remainder of 3, what might be the one's digit of N?

Sol. So the one's digit, when divided by 5, must leave a remainder of 3 the digit must be either 3 or 8

Q2. If the division $N \div 5$ leaves a remainder of 1, what might be the one's digit of N?

Sol. If the one's place of a number is either 0 or 5 then it is divisible by 5

\therefore One's digit might be $0 + 1 = 1$ or $5 + 1 = 6$
 Hence the required digit = 1 or 6

Q3. If the divisions $N \div 5$ leaves a remainder of 4 what might be the one's digit of N?

Sol. If the one's digit of a number is 0 or 5, then it is divisible by 5. So, the one's digit of N might be 4 or 9 with remainder 4.

Hence the required digit is 4 or 9.

TRY THESE (PAGE 257)

(The first one has been done for you)

Q1. If the division $N \div 2$ leaves a remainder of 1, what might be the one's digit of N?

Sol. So N is odd, so its one's digit is odd, therefore, the one's digit must be 1, 3, 5, 7, or 9

Q2. If the division $N \div 2$ leaves no remainder (i.e. zero remainder), what might be the one's digit of N?

Sol. Since remainder is 0 for $N \div 2$

\therefore N must be an even number whose one's digit might be 0, 2, 4, 6 or 8.

Hence, the required digits might be 0, 2, 4, 6, or 8.

Q3. Suppose that the division $N \div 5$ leaves a remainder of 4, and the division $N \div 2$ leaves a remainder of 1. What must be the one's digit of N ?

Sol. If the one's digit of a number is 0 or 5, then it is divisible by 5. So the one's digit of N might be $0 + 4 = 4$ or $5 + 4 = 9$ with remainder 4.

Now for the division $N \div 2$, the one's digit of N might be $= 0 + 1 = 1$, $2 + 1 = 3$, $4 + 1 = 5$, $6 + 1 = 7$ or $8 + 1 = 9$

Since, in both the cases 9 is common

Hence, the required digit is 9.

TRY THESE (PAGE 259)

Q. Check the divisibility of the following numbers by 9.

- | | |
|--------|--------|
| 1. 108 | 2. 616 |
| 3. 294 | 4. 432 |
| 5. 927 | |

Sol. 1. Sum of the digits of $108 = 1 + 0 + 8 = 9$ which is divisible by 9.

Hence 108 is divisible by 9.

2. Sum of the digits of $616 = 6 + 1 + 6 = 13$ which is not divisible by 9.

Hence 616 is not divisible by 9.

3. Sum of the digits of $294 = 2 + 9 + 4 = 15$ which is not divisible by 9.

Hence 294 is not divisible by 9.

4. Sum of digits of $432 = 4 + 3 + 2 = 9$ which is divisible by 9.

Hence 432 is divisible by 9.

5. Sum of the digits of $927 = 9 + 2 + 7 = 18$ which is divisible by 9.

Hence 927 is divisible by 9.

TRY THESE (PAGE 260)

Q. Check the divisibility of the following numbers by 3.

- | | |
|--------|--------|
| 1. 108 | 2. 616 |
| 3. 294 | 4. 432 |
| 5. 927 | |

Sol. 1. Sum of the digits of $108 = 1 + 0 + 8 = 9$ which is divisible by 3.

Hence 108 is divisible by 3.

2. Sum of the digits of $616 = 6 + 1 + 6 = 13$ which is not divisible by 3.

Hence 616 is not divisible by 3.

3. Sum of the digits of $294 = 2 + 9 + 4 = 15$ which is divisible by 3.

Hence 294 is divisible by 3.

4. Sum of the digits of $432 = 4 + 3 + 2 = 9$ which is divisible by 3.

Hence 432 is divisible by 3.

5. Sum of the digits of $927 = 9 + 2 + 7 = 18$ which is divisible by 3.

Hence 927 is divisible by 3.

EXERCISE 16.2

Q1. If $21y5$ is a multiple of 9, where y is a digit, what is the value of y ?

Sol. A number is divisible by 9 if the sum of its digits is also divisible by 9.

$$\therefore \text{Sum of the digits of } 21y5 \\ = 2 + 1 + y + 5 = 8 + y$$

$$\therefore (8 + y) \div 9 = 1$$

$$\Rightarrow \frac{8 + y}{9} = 1 \Rightarrow 8 + y = 9$$

$$\therefore y = 9 - 8 = 1$$

Hence, the required value of $y = 1$.

Q2. If $31z5$ is a multiple of 9, where z is a digit, what is the value of z ?

Sol. A number is a multiple of 9 when the sum of its digits is also divisible by 9.

$$\text{Sum of the digits of } 31z5 \\ = 3 + 1 + z + 5$$

$$\therefore 3 + 1 + z + 5 = 9k \text{ where } k \text{ is an integer.}$$

$$\text{For } k = 1 \quad 3 + 1 + z + 5 = 9$$

$$\therefore z = 9 - 9 = 0$$

$$\text{For } k = 2 \quad 3 + 1 + z + 5 = 18$$

$$\therefore z = 18 - 9 = 9$$

$k = 3$ is not possible because

$$3 + 1 + z + 5 = 27$$

$$\therefore z = 27 - 9 = 18$$

which is not a digit.

Hence the required value of z is 0 or 9

Q3. If $24x$ is a multiple of 3, where x is a digit, what is the value of x ?

Sol. Since $24x$ is a multiple of 3, the sum of digits $6 + x$ is a multiple of 3; so $6 + x$ is one of these numbers; 0, 3, 6, 12, 15, 18,

$$\therefore 6 + x = 3k \text{ where } k \text{ is any integer.}$$

For $k = 0$, $6 + x = 3 \times 0$
 $\Rightarrow 6 + x = 0$
 $\therefore x = -6$. Not possible

For $k = 1$, $6 + x = 3 \times 1$
 $\Rightarrow 6 + x = 3$
 $\therefore x = 3 - 6$
 $= -3$ Not possible

For $k = 2$, $6 + x = 3 \times 2$
 $\Rightarrow 6 + x = 6$
 $\therefore x = 6 - 6 = 0$
 $2 + 4 + 0 = 6$ multiple of 3

For $k = 3$, $6 + x = 3 \times 3$
 $\Rightarrow x = 9 - 6 = 3$
 $\therefore 2 + 4 + 3 = 9$ multiple of 3

For $k = 4$, $6 + x = 3 \times 4$
 $\Rightarrow 6 + x = 12$
 $\therefore x = 12 - 6 = 6$
 $\therefore 2 + 4 + 6 = 12$ which is multiple of 3

For $k = 5$, $6 + x = 3 \times 5$
 $\Rightarrow x = 15 - 6 = 9$
 $\therefore 2 + 4 + 9 = 15$ which is multiple of 3

For $k = 6$, $6 + x = 3 \times 6$

$\Rightarrow x = 18 - 6$
 $= 12$ not possible as x is digit

Hence the required values of x are 0, 3, 6 or 9.

Q4. If $31z5$ is a multiple of 3, where z is a digit, what might be the value of z ?

Sol. A number is a multiple of 3 if the sum of its digits is divisible by 3.
 $\therefore 3 + 1 + z + 5 = 3k$ where k is an integer
 $9 + z = 3k$
 $\therefore z = 3k - 9$

Here, $k = 0, 1, 2$ is not possible as z is a digit of the number.

For $k = 3$, $z = 3 \times 3 - 9 = 9 - 9 = 0$
 $\therefore 9 + 0 = 9$ multiple of 3

For $k = 4$, $z = 3 \times 4 - 9 = 12 - 9 = 3$
 $\therefore 9 + 3 = 12$ multiple of 3

For $k = 5$, $z = 3 \times 5 - 9 = 15 - 9 = 6$
 $\therefore 9 + 6 = 15$ multiple of 3

For $k = 6$, $z = 3 \times 6 - 9 = 18 - 9 = 9$
 $\therefore 9 + 9 = 18$ multiple of 3

For $k = 7$, $z = 3 \times 7 - 9 = 21 - 9 = 12$ Not possible as z is a digit

Hence, the required values of z are 0, 3, 6 and 9.

Learning More Q & A

I. VERY SHORT ANSWER (VSA) QUESTIONS

Q1. Write the following numbers in generalised form.

- (a) ab (b) 85
 (c) 132 (d) 1000

Sol. (a) $ab = 10 \times a + 1 \times b = 10a + b$
 (b) $85 = 10 \times 8 + 1 \times 5 = 10 \times 8 + 5$
 (c) $132 = 100 \times 1 + 10 \times 3 + 1 \times 2$
 $= 100 \times 1 + 10 \times 3 + 2$
 (b) $1000 = 1000 \times 1$

Q2. Write the following in usual form.

- (a) $3 \times 100 + 0 \times 10 + 6$
 (b) $5 \times 1000 + 3 \times 100 + 2 \times 10 + 1$

Sol. (a) $3 \times 100 + 0 \times 10 + 6$
 $= 300 + 0 + 6 = 306$
 (b) $5 \times 1000 + 3 \times 100 + 2 \times 10 + 1$
 $= 5000 + 300 + 20 + 1 = 5321$

Q3. Which of the following numbers are divisible by 3?

- (i) 106 (ii) 726
 (iii) 915 (iv) 1008

Sol. (i) Sum of the digits of $106 = 1 + 0 + 6 = 7$ which is not divisible by 3.
 Hence 106 is not divisible by 3.

(ii) Sum of the digits of $726 = 7 + 2 + 6 = 15$ which is divisible by 3.
 Hence 726 is divisible by 3.

(iii) Sum of the digits of $915 = 9 + 1 + 5 = 15$ which is divisible by 3.
 Hence 915 is divisible by 3.

(iv) Sum of the digits of $1008 = 1 + 0 + 0 + 8 = 9$ which is divisible by 3.
 Hence 1008 is divisible by 3.

Q4. Prove that the sum of the given numbers and the numbers obtained by reversing their digits is divisible by 11.

- (a) 89 (b) ab
 (c) 69 (d) 54

Sol. (a) Given number = 89
 Number obtained by reversing the order of digits = 98
 Sum = $89 + 98 = 187 \div 11 = 17$
 Hence, the required number is 11.

(b) Given number = $ab = 10a + b$
 Number obtained by reversing the digits = $10b + a$
 \therefore Sum = $(10a + b) + (10b + a)$
 $= 10a + b + 10b + a$
 $= 11a + 11b = 11(a + b) \div 11$
 $= a + b$

(c) Given number = 69
 Number obtained by reversing the digits = 96
 Sum = $69 + 96 = 165 \div 11 = 15$
 Hence, the required number is 11.

(d) Given number = 54
 Number obtained by reversing the digits = 45
 Sum = $54 + 45 = 99 \div 11 = 9$
 Hence, the required number is 11.

Q5. Prove that the difference of the given numbers and the numbers obtained by reversing their digits is divisible by 9.

- (i) 59 (ii) xy
 (iii) xyz (iv) 203

Sol. (i) Given number = 59
 Number obtained by reversing the digits = 95
 Difference = $95 - 59 = 36 \div 9 = 4$
 Hence, the required number is 9.

(ii) Given number = $xy = 10x + y$
 Number obtained by reversing the digits = $10y + x$
 \therefore Difference = $(10x + y) - (10y + x)$
 $= 10x + y - 10y - x$
 $= 9x - 9y$
 $= 9(x - y) \div 9 = x - y$

Hence, the required number is 9.

(iii) Given number = $xyz = 100x + 10y + z$
 Number obtained by reversing the digits = $100z + 10y + x$
 \therefore Difference
 $= (100x + 10y + z) - (100z + 10y + x)$
 $= 100x + 10y + z - 100z - 10y - x$
 $= 99x - 99z$
 $= 99(x - z)$

$$99(x - z) \div 9 = 11(x - z)$$

Hence, the required number is 9.

(iv) Given number = 203
 Number obtained by reversing the digits = 302
 \therefore Difference = $302 - 203 = 99 \div 9 = 11$
 Hence, the required number is 9.

Q6. If a, b, c are three digits of a three-digit number, prove that $abc + cab + bca$ is a multiple of 37.

Sol. We have $abc + cab + bca$

$$abc = 100a + 10b + c$$

$$cab = 100c + 10a + b$$

$$bca = 100b + 10c + a$$

Adding $abc + cab + bca$

$$= 111a + 111b + 111c$$

$$= 111(a + b + c)$$

$$= 37 \times 3(a + b + c)$$

which is a multiple of 37.

Hence proved.

II. SHORT ANSWER (SA) QUESTIONS

Q7. Complete the magic square given below so that the sum of the numbers in each row or in each column or along each diagonal is 15.

8	1	A
B	5	C
D	E	F

(i) $A = 15 - (8 + 1) = 15 - 9 = 6$

(ii) $F = 15 - (8 + 5) = 15 - 13 = 2$

(iii) $C = 15 - (A + F) = 15 - (6 + 2)$
 $= 15 - 8 = 7$

(iv) $E = 15 - (1 + 5) = 15 - 6 = 9$

(v) $D = 15 - (E + F) = 15 - (9 + 2)$
 $= 15 - 11 = 4$

(vi) $B = 15 - (8 + 4) = 15 - 12 = 3$

Hence the required square is

8	1	6
3	5	7
4	9	2

Q8. Find the values of P and Q from the given addition problem

$$\begin{array}{r} 3 \quad P \quad 4 \quad 3 \\ + 4 \quad 2 \quad 7 \quad Q \\ \hline 7 \quad 9 \quad 1 \quad 7 \end{array}$$

Sol. Here, $3 + Q = 7 \therefore Q = 7 - 3 = 4$

Now taking second column, we get

$$4 + 7 = 11 \text{ i.e. } 1 \text{ is carried over to third column}$$

$$\therefore 1 + P + 2 = 9$$

$$3 + P = 9$$

$$\therefore P = 9 - 3 = 6$$

Hence the value of $P = 6$ and $Q = 4$

Q9. Find the values of p, q and r in the following multiplication problem.

$$\begin{array}{r} 3 \ p \ 4 \\ \times \ q \ 6 \\ \hline 2 \ 1 \ 2 \ 4 \\ 1 \ 0 \ 6 \ r \ \times \\ \hline 1 \ 2 \ 7 \ 4 \ 4 \end{array}$$

Sol. $6 \times 4 = 24$, Here 2 is carried over second column

$$6 \times p + 2 - 3 \times 10 = 2$$

$$[21 - 3 \times 6 = 3]$$

$$6p - 30 = 0 \Rightarrow p = 5$$

Now the multiplication problem becomes,

$$\begin{array}{r} 3 \ 5 \ 4 \\ \times \ q \ 6 \\ \hline 2 \ 1 \ 2 \ 4 \\ 1 \ 0 \ 6 \ r \ \times \\ \hline 1 \ 2 \ 7 \ 4 \ 4 \end{array}$$

Here $2 + r = 4$

$$\therefore r = 2$$

$$q \times 354 = 1062$$

$$\Rightarrow q = \frac{1062}{354} = 3$$

Hence $p = 5, q = 3$ and $r = 2$

Q10. Observe the following patterns:

$$1 \times 9 - 1 = 8$$

$$21 \times 9 - 1 = 188$$

$$321 \times 9 - 1 = 2888$$

$$4321 \times 9 - 1 = 38888$$

Find the value of $87654321 \times 9 - 1$

Sol. From the pattern, we observe that there are as many eights in the result as the first digit from the right which is to be multiplied by 9 and reduced by 1.

$$\therefore 87654321 \times 9 - 1 = 788888888$$

HIGH ORDER THINKING SKILLS (HOTS) QUESTIONS

Q11. Complete the cross number puzzle with the given column.

a		b		c	d	
		e	f			
g	h					i
j		k			l	
	m				n	o
p				q		
r				s		

Horizontal row	Vertical row
(a) $0.7 \times 8 \times 90$	(a) 64% of 9200
(c) $94.9 - 2.1$	(b) 0.6×75
(e) 80% of 6600	(c) $1079.2 - 90.2$
(g) 0.5×168	(d) 0.4×50
(i) 0% of 125	(f) $512 + 1722$
(j) $10^4 - 1037$	(h) 896×7
(m) $550 - 26$	(l) $(0.36 \times 10^4) + 192$
(n) 100% of 79	(o) $10^2 \times 9$
(q) $360 + 30$	(p) $(3 \times 10^1) + (3 \times 10)$
(r) $8.34 - 5.22$	(q) 70% of 50
(s) $8 \times 5 \times 13$	

Sol.	Horizontal row	Vertical row
	(a) $0.7 \times 8 \times 90 = 504$	(a) 64% of 9200 = 5888
	(c) $94.9 - 2.1 = 92.8$	(b) $0.6 \times 75 = 45$
	(e) 80% of 6600 = 5280	(c) $1079.2 - 90.2 = 989$
	(g) $0.5 \times 168 = 84$	(d) $0.4 \times 50 = 20$
	(i) 0% of 125 = 0	(f) $512 + 1722 = 2234$
	(j) $10^4 - 1037 = 8963$	(h) $896 \times 7 = 6272$
	(m) $550 - 26 = 524$	(l) $(0.36 \times 10^4) + 192 = 3792$
	(n) 100% of 79 = 79	(o) $10^2 \times 9 = 900$
	(q) $360 + 30 = 390$	(p) $(3 \times 10^1) + (3 \times 10^0) = 33$
	(r) $8.34 - 5.22 = 3.12$	(q) 70% of 50 = 35
	(s) $8 \times 5 \times 13 = 520$	

Hence the complete square is

5	0	4		9	2	8
8		5	2	8	0	
8	4		2	9		0
8	9	6	3		3	
	5	2	4		7	9
3		7		3	9	0
3	1	2		5	2	0

Q12. The product of two 2-digit numbers is 1431. The product of their tens digits is 10 and the product of their units digits is 21. Find the numbers.

Sol. Let the required two 2-digit numbers be $10a + b$ and $10p + q$ as per the condition, we have

$$a \times p = 10 \text{ and } b \times q = 21$$

$$\therefore a = 2 \text{ and } p = 5 \text{ or } a = 5 \text{ and } p = 2$$

Similarly $b \times q = 21$

$$\therefore b = 3 \text{ and } q = 7 \text{ or } b = 7 \text{ and } q = 3$$

$$\therefore 10p + q = 57 \text{ or } 10p + q = 53$$

$$\text{and } 10a + b = 23 \text{ or } 10a + b = 27$$

Since the units digit of product 1431 is 1.

\therefore Numbers are 57 and 23 or 53 and 27.

Now $57 \times 23 = 1311$ and $53 \times 27 = 1431$ which is given.

Hence, the required numbers are 53 and 27.

Test Yourself

I. VERY SHORT ANSWER (VSA) QUESTIONS

Q1. Write the following numbers in generalised form.

(a) 137 (b) 125 (c) 370

Q2. Write the following in usual form.

(a) $10a + b$ (b) $100x + 10y + z$

(c) $8 \times 100 + 7$

Q3. Find the values of the English alphabets in the following:

$\begin{array}{r} (a) \quad 8 \ 5 \\ + \ 4 \ A \\ \hline B \ C \ 3 \end{array}$	$\begin{array}{r} (b) \quad B \ 6 \\ + \ 8 \ A \\ \hline C \ A \ 2 \end{array}$
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$\begin{array}{r} (c) \quad A \ B \\ - \ B \ 7 \\ \hline 4 \ 5 \end{array}$	$\begin{array}{r} (d) \quad 8 \ A \ B \ C \\ + \ A \ B \ C \ 5 \\ \hline D \ 4 \ 8 \ 8 \end{array}$
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(NCERT Exemplar)

Q4. When x is divided by 2, the remainder is 1. What can be the ones digit of x ?

Q5. Check the divisibility of the following numbers by 3.

(i) 64779 (ii) 854 (iii) 325695

Q6. If $715x$ is a multiple of 3, find the greatest value of x .

Q7. If $578x4$ is divisible by 3, find the least value of x .

Q8. Find the value of A in the following addition.

$\begin{array}{r} (a) \quad 3 \ 1 \ A \\ + \ 2 \ A \ 4 \\ \hline 5 \ 5 \ 8 \end{array}$	$\begin{array}{r} (b) \quad 4 \ 0 \ 2 \\ + \ 4 \ A \ 6 \\ \hline A \ A \ A \end{array}$
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Q9. Which of the following numbers are divisible by 9?

(a) 6358 (b) 666675

Q10. A number N when divided by 5 leaves a remainder 3. What are the possible values of ones digit of N?

II. SHORT ANSWER (SA) QUESTIONS

Q11. A number x when divided by 2 and 5 leaves remainder 1 and 4 respectively. What are the possible values of x ?

Q12. Write the number which is divisible by 2 and 9.

Q13. Find the value of k where $31kz$ is divisible by 6. (NCERT Exemplar)

Q14. Replace the letters by the numerals to make correct worked examples.

(i)

$$\begin{array}{r} 1 \ A \ 3 \ B \ 5 \\ - \quad 5 \ C \ 7 \ D \\ \hline 6 \ 6 \ 6 \ 6 \end{array}$$

(ii)

$$\begin{array}{r} A \ 6 \ B \ 4 \ C \\ + \ 1 \ 7 \ 2 \ 5 \ 5 \\ \hline 9 \ D \ 0 \ E \ 8 \end{array}$$

Q15. Replace the letters by the numerals in the following.

(a)

$$\begin{array}{r} 1 \ A \ 7 \\ \times \ 3 \ 1 \ 2 \\ \hline B \ 5 \ C \\ D \ 2 \ E \ 0 \\ 3 \ F \ G \ 0 \ 0 \\ \hline 3 \ H \ K \ 2 \ 4 \end{array}$$

$$\begin{array}{r}
 \text{(b)} \quad \begin{array}{c} \text{A B C} \\ \hline 34 \overline{) 9996} \\ \text{D 8 0 0} \\ \hline 3 1 \text{ E 0} \\ \text{F 0 G 0} \\ \hline 1 3 \text{ H} \\ \text{L J K} \\ \hline 0 \end{array}
 \end{array}$$

Q16. A asks B to think of a 4-digit number and then to subtract from it each of the number's digits. For

example, if B chooses 5901 and then takes away 5, 9, 0, 1 the resultant number will be 5886. Now ask B to give the digit of the new number leaving out any one of the 4 digits. Suppose B tells the numbers 886, A can astonish B by telling the missing digit? Explain how.

Q17. Find the values of the letters in each of the following: *(NCERT Exemplar)*

$$\begin{array}{r}
 \text{(i)} \quad \begin{array}{r} \text{P Q} \\ \times 6 \\ \hline \text{Q Q Q} \end{array}
 \end{array}$$

$$\begin{array}{r}
 \text{(ii)} \quad \begin{array}{r} 2 \text{ L M} \\ \text{L M 1} \\ \hline \text{M 1 8} \end{array}
 \end{array}$$

ANSWERS

1. (a) $1 \times 100 + 3 \times 10 + 7$
 (b) $1 \times 100 + 2 \times 10 + 5$
 (c) $3 \times 100 + 7 \times 10$

2. (a) ab (b) xyz (c) 807

3. (a) $A = 8, B = 1, C = 3$

(b) $A = 6, B = 7, C = 1$

(c) $A = 7, B = 2$

(d) $A = 7, B = 2, C = 3, D = 1$

4. 1, 3, 5, 7 or 9 5. (i) and (iii)

6. 8 7. 0

8. (a) 4 (b) 8

9. (b) 10. 3 or 8

11. 9 12. 36540

13. k is either 0 or 3, 6, 9

14. (i) $A = 2, B = 4, C = 6, D = 9$

(ii) $A = 7, B = 8, C = 3, D = 4, E = 9$

15. (a) $A = 2, B = 2, C = 4, D = 1, E = 7, F = 8, G = 1, H = 9, K = 6$

(b) $A = 2, B = 9, C = 4, D = 6, E = 9, G = 6, F = 3, H = 6, K = 6, J = 3$ and $L = 1$

16. 5.

17. (i) $P = 7, Q = 4$ (ii) $M = 7, L = 4$

Internal Assessment

Q1. Fill in the blanks:

- (a) 2007 is divisible by
- (b) If $732x$ is a multiple of 3, then $x = \dots\dots\dots$
- (c) If $72x1$ is a multiple of 9, then $x = \dots\dots\dots$
- (d) If $1234x \div 3$ leaves a remainder 1, then least value of $x = \dots\dots\dots$
- (e) If $875A$ is multiple of 5, then $A = \dots\dots\dots$

Q2. Construct a magic square of 3×3 with magic sum 27.

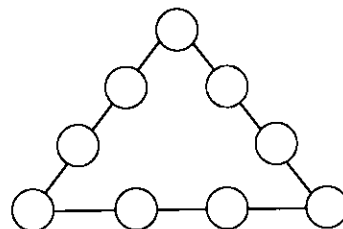
Q3. Check the divisibility of 567321 by 3 and 9.

Q4. Find the value of the letters in each of the following.

$$\begin{array}{r}
 \text{(a)} \quad \begin{array}{r} m \ n \\ \times 6 \\ \hline n \ n \ n \end{array}
 \end{array}$$

$$\begin{array}{r}
 \text{(b)} \quad \begin{array}{r} 3 \ 6 \ a \\ - 1 \ b \ 7 \\ \hline 1 \ 7 \ 6 \end{array}
 \end{array}$$

Q5. Use the digit 1–9 in only one of the circles so that the sum along each side of the triangle is 21.



III. MULTIPLE CHOICE QUESTIONS (MCQs)

Q6. If $ab \overline{) 252} \overline{) ba}$ thus the value of a and b are

$$\begin{array}{r}
 24 \\ \hline 12 \\ \hline 12 \\ \hline 0 \end{array}$$

- (i) 1, 2 (ii) 2, 3
 (iii) 1, 3 (iv) None of these

Q7. The sum of a two-digit number and the number obtained by reversing the digits is divisible by

- (i) 91 (ii) 11
 (iii) 21 (iv) None of these

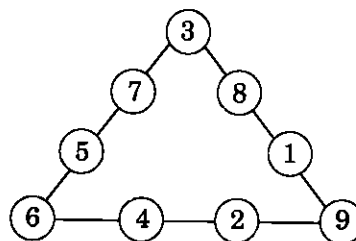
- Q8.** The difference of a two-digit number and the number obtained by reversing the digits is divisible by
 (i) 9 (ii) 11
 (iii) 21 (iv) None of these
- Q9.** If a , b and c are three digits then the value of $abc + cab + bca$ is divisible by
 (i) 37 (ii) 9
 (iii) 11 (iv) 73
- Q10.** If three-digit number $24x$ is divisible by 9, then the value of x is
 (i) 6 (ii) 5
 (iii) 3 (iv) None of these
- Q11.** If $5A + B3 = 65$, then the value of A and B is
 (i) $A = 2, B = 3$ (ii) $A = 3, B = 2$
 (iii) $A = 2, B = 1$ (iv) $A = 1, B = 2$
 (NCERT Exemplar)

- Q12.** If $A3 + 8B = 150$, then the value of $A + B$ is
 (i) 13 (ii) 12
 (iii) 17 (iv) 15
 (NCERT Exemplar)
- Q13.** If $5A \times A = 399$, then the value of A is
 (i) 3 (ii) 6
 (iii) 7 (iv) 9
 (NCERT Exemplar)
- Q14.** If $6A \times B = A8B$, then the value of $A - B$ is
 (i) -2 (ii) 2
 (iii) -3 (iv) 3
 (NCERT Exemplar)
- Q15.** Which of the following numbers is divisible by 99?
 (i) 913462 (ii) 114345
 (iii) 135792 (iv) 3572406
 (NCERT Exemplar)

ANSWERS

1. (a) 3 or 9 (b) 0 (c) 8
 (d) 3 (e) 0 or 5
- 2.
- | | | |
|----|----|----|
| 6 | 11 | 10 |
| 13 | 9 | 5 |
| 8 | 7 | 12 |
3. Divisible by 3
4. (a) $m = 7, n = 4$ (b) $a = 3, b = 8$

5.



6. (i) 7. (ii) 8. (i)
 9. (i) 10. (iii) 11. (iii)
 12. (i) 13. (iii) 14. (i) 15. (ii)

◆ Yearly Assessment

SET-1

Time: 3 hour

M.M.: 80

General Instructions

- All questions are compulsory. However internal choice is given.
- Section A consists of 4 questions carrying 1 mark each.
- Section B consists of 5 questions carrying 2 marks each.
- Section C consists of 10 questions carrying 3 marks each.
- Section D consists of 9 questions carrying 4 marks each.

SECTION-A

1. Find: $\sqrt{64 \times 625}$
2. Find $12\frac{1}{2}\%$ of ₹ 600
3. Using factorisation, find the cube root of 512.
4. In which quadrant, the following points lie.
 - (i) P(-3, 4)
 - (ii) (-4, -5)

SECTION-B

5. State which of these triplets form Pythagorean triplets:
 - (i) 4, 5, 6
 - (ii) 12, 13, 25
 - (iii) 7, 24, 25
6. Evaluate: $\sqrt{\frac{625}{729}}$
7. Find the volume of a cube whose surface area is 150 cm^2 .
8. Find SP when MP = ₹ 550 and discount = 10%.
9. Find the value of $(81x^2 + 16y^2 - 72xy)$ when $x = \frac{2}{3}$ and $y = \frac{3}{4}$.

SECTION-C

10. What is the value of $\sqrt{63 \times 28}$?
11. Find the cube root of 1.331.
12. Multiply $(p^2 + 2q)$ by $(p^3 - 2pq + q^2)$ and find the value of the product of $p = 1$ and $q = -1$.

OR

Resolve into factor: $a^4 - 16b^2$.

13. Solve for x : $\frac{2x - 3}{x + 7} = \frac{3}{4}$
14. A shopkeeper offers 10% discount on all his goods. During festival season, he announced a further discount of 15%. Find the selling price of an item marked at ₹ 1250.
15. Calculate the interest on ₹ 20,000 for 3 years at 5% p.a., when the interest is compounded annually.
16. Which of the following groups of angle form a quadrilateral?
 - (a) $95^\circ, 115^\circ, 60^\circ, 90^\circ$
 - (b) $45^\circ, 75^\circ, 110^\circ, 70^\circ$
 - (c) $125^\circ, 180^\circ, 25^\circ, 40^\circ$
17. Two adjacent angles of a parallelogram are $(3x - 4)^\circ$ and $(3x + 10)^\circ$. Find the measures of these angles of the parallelogram.

18. Construct a quadrilateral BULK, given that $BU = 5$ cm, $UL = 4$ cm, $m\angle U = 60^\circ$, $m\angle B = 90^\circ$ and $m\angle L = 135^\circ$.

OR

Construct a rhombus PQRS whose diagonals PR and QS are 6 cm and 5 cm respectively.

19. The surface area of a cuboid is 3328 sq m. If its dimensions are in the ratio 4 : 3 : 2, find its volume.

SECTION-D

20. The volume of a cube is 512 cu. cm, find its surface area.
21. The expenditure of a family on various heads is given in the following table:

Head	Rent	Education	Food	Clothing	Miscellaneous	Total
Expenditure (in ₹)	8000	4000	6000	2000	4000	24000

Represent the above data by a pie graph.

22. Number 1 to 10 are written on separate slips (one number on one slip), kept in a box and mixed well. One slip is drawn from the box without looking into it. What is the probability of:

- (a) getting a number 6
 (b) getting a number less than 6
 (c) getting a number greater than 6
 (d) getting a 1-digit number

23. Simplify: $(1.5x - 4y)(1.5x + 4y + 3) - 4.5 + 12y$

24. Divide: $x^3 + 6x^2 + 11x + 6$ by $x + 2$

25. Factorise the following:

(i) $5y^2 - 20y - 8z + 2yz$

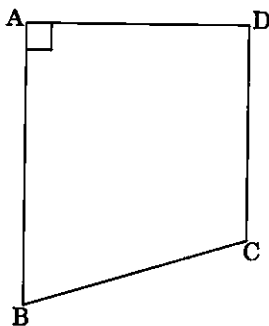
(ii) $(m + 3n)^2 + 4m + 12n$

26. Solve the following equations:

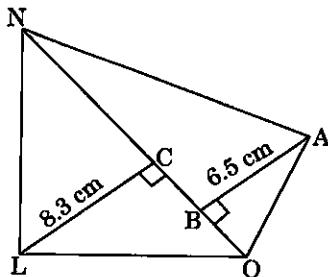
(i) $\frac{3x}{4} - \frac{2x+5}{3} = \frac{5}{2}$

(ii) $\frac{3x-2}{4} - \frac{2x+3}{3} + x = \frac{2}{3}$

27. In the given figure, ABCD is a trapezium in which $AB \parallel CD$. If $m\angle BCD = 120^\circ$ and $DA \perp AB$, find $m\angle ADC$ and $m\angle ABC$.



28. Find the area of a quadrilateral $\angle OAN$ in which diagonal $ON = 23.7$ cm and offsets on it are 6.5 cm and 8.3 cm.



◆ Yearly Assessment

SET-2

Time: 3 hour

M.M.: 80

General Instructions: Same as paper-1**SECTION-A**

1. What per cent of 20 is 40?
2. Solve for x : $6x - 5 = 4x + 7$
3. How many number of edges are in a square pyramid?
4. A cow is sold for ₹ 10240. If its cost price is ₹ 10000 then find the gain %.

SECTION-B

5. What per cent of 108 km/h is 15 m/s?
6. Multiply: $-6x^2(3 - 2x^5)$
7. Two numbers are in ratio 7 : 5. If they differ by 16, what are the numbers?
8. A polyhedron has 40 faces and 60 edges. How many vertices does it have?
9. The volume of a cube is 1728 cm^3 , find its surface area.

SECTION-C

10. The area of a trapezium shaped field is 480 m^2 , the distance between two parallel sides is 15 m and one of the parallel sides is 20 m. Find the length of the other side.
11. A road roller takes 750 complete revolutions to move once over to level a road. Find the area of the road if the diameter of a road roller is 84 cm and length is 1 m.
12. A cuboid is of dimensions 60 cm \times 54 cm \times 30 cm. How many small cubes with side 6 cm can be placed in the given cuboid?
13. An electric pole 14 m high, casts a shadow of 10 metres. Find the height of a tree that casts a shadow of 15 metres under similar an conditions.

OR

There are 100 students in a hostel. Food provision for them is for 20 days. How long will these provisions last, if 25 more students join the group?

14. Factorise: $49x^2 - y^2 + 14y - 49$.
15. Plot the following points on the graph and verify if they lie on a line.
A(2, 3), B(5, 3), C(5, 5) and D(2, 5)
16. Marks scored by A are 25% more than that of B. By what per cent are B's marks less than that of A?
17. Evaluate: $\frac{1.23 \times 1.23 - 0.73 \times 0.73}{1.23 + 0.73}$
18. The perimeter of each face of a cube is 20 cm, find its volume.
19. A number is increased by 25% and then reduced by 25%. Find the net increase or decrease per cent.

SECTION-D

20. The total surface area of a cylinder is 6512 cm^2 and the circumference of its base is 88 cm . Find the volume of the cylinder.
21. The angles of a triangle are $3x^\circ$, $(2x + 20)^\circ$ and $(5x - 40)^\circ$. Find the angles. Hence show that the triangle is an equilateral triangle.
22. Construct a quadrilateral PQRS in which $PQ = 4.5 \text{ cm}$, $QR = 3.9 \text{ cm}$, $RS = 4.6 \text{ cm}$, $SP = 3 \text{ cm}$ and $\angle Q = 75^\circ$.
23. If $x + \frac{1}{x} = 8$, find the value of $x^4 + \frac{1}{x^4}$.
24. Divide: $6x^5 - x^4 + 4x^3 - 5x^2 - x - 15$ by $2x^2 - x + 3$ and find the remainder.
25. A merchant lost 8% by selling an ipad for ₹ 12880 . What price should he sell it in order to gain 8% ?
26. A rectangular tin foil of a size 22 cm by 16 cm is wrapped to form a cylinder of height 16 cm . Find the volume of the cylinder.
27. The monthly sale of computers by a shopkeeper is shown in the following table:

Months	No. of computers sold
July	12
Aug	18
Sept	28
Oct	42
Nov	44

Draw a pie-chart to represent the above data.

28. If $\sqrt{2304} = 48$ and $\sqrt{1764} = 42$, then find the value of $\frac{\sqrt{0.2304} + \sqrt{0.1764}}{\sqrt{0.2304} - \sqrt{0.1764}}$.