

1. Number System

A system in which we deal with different types of number is termed as 'number system'. Numbers (Numerals), which are the symbolical representation in mathematical language are the base of Mathematics. In Hindu-Arabic system, ten digits (0, 1, 2, 3, 4, 5, 6, 7, 8, 9) are used to represent any number.

Numeration Systems

Numeration means expressing a number in words. We express numbers in two ways. *These two systems of numeration are*

1. Indian system
2. International system

Indian/Hindu-Arabic System

Periods	Crore		Lakhs		Thousands		Units		
Values	Ten Crore 10,00,00,000	Crore 1,00,00,000	Ten Lakh 10,00,000	Lakh 1,00,000	Ten Thousand 10,000	Thousand 1,000	Hundred 100	Ten 10	One 1
Numeral	4	3	2	5	2	3	7	1	6

To read the number name, we normally read number alongwith periods except in the case of digits in the ones period. The above numeral is written as 43, 25, 23, 716. It is read as forty three crore twenty five lakh twenty three thousand seven hundred sixteen.

International System

Periods	Million			Thousands			Units		
Values	Hundred Million 100,000,000	Ten Million 10,000,000	Million 1,000,000	Hundred Thousand 100,000	Ten Thousand 10,000	Thousand 1,000	Hundred 100	Ten 10	One 1
Numeral	4	3	2	5	2	3	7	1	6

It is most commonly used system in the world. In this system given numeral is written as 432, 523, 716. It is read as four hundred thirty two million five hundred twenty three thousand seven hundred sixteen.

Example 1 Write in words : 95,876

- (a) Ninety five thousand eight hundred sixty seven
- (b) Ninety five thousand eight hundred seventy six
- (c) Nine thousand five hundred eighty seven six
- (d) Ninety five thousand seven hundred eighty six

Sol. (b) The numeral is written as 95,876. It is read as ninety five thousand eight hundred seventy six.

Example 2 Write in figures . Seventy thousand three hundred sixty four.

- (a) 70364
- (b) 73064
- (c) 73046
- (d) 70346

Sol. (a) It is written as 70364.

Types of Numbers

Natural Numbers Numbers 1, 2, 3, 4, 5, ... etc, which are used for counting are called natural numbers.

☑ The number zero (0) is not a natural number.

Whole Numbers All natural numbers together with 0 (zero) are called whole numbers. Thus, 0, 1, 2, 3, 4, ..., etc., are whole numbers.

☑ 0 is the smallest whole number.

Prime Numbers A number greater than 1 which cannot be divided by any other number except 1 and itself, is called a prime number, e.g. 2, 3, 5, 7, 11, 13, 17 etc.

☑ 2 is the least prime number.

Composite Numbers A positive integer that has atleast one divisor other than 1 and itself is called a composite number, e.g. 4, 6, 8, 9 are all composite numbers.

- ☑ (i) 1 is neither prime nor composite.
- (ii) 4 is the smallest composite number.

Even Numbers Those numbers which are divisible by 2 are known as even numbers, e.g. 2, 4, 6, 8, 10 etc.

☑ 2 is the smallest even number.

Odd Numbers Numbers which are not divisible by 2 are called odd numbers e.g. 1, 3, 5, 7, 9, 11, 13 etc.

☑ 1 is the smallest odd number.

1. Write in words (International System) :

243, 183, 017

- (a) Two hundred forty three million one hundred eighty three thousand seventeen
- (b) Two hundred forty million thirty one hundred eighty thousand seventeen
- (c) Two hundred forty three million one hundred eighty three thousand seventy one
- (d) Twenty five hundred thirty one million eighty three thousand seventeen

2. Write the numeral (International System)

: Two hundred twenty five million five hundred thousand seven hundred eighty three.

- (a) 225, 570, 783
- (b) 225, 500, 783
- (c) 225, 583, 000
- (d) 200, 225, 783

3. Write in the numeral : Three crore fifty one lakh two thousand sixty one.

- (a) 3, 51, 02, 061
- (b) 3, 52, 02, 061
- (c) 3, 51, 20, 061
- (d) 3, 51, 02, 016

4. How many prime numbers between 1 and 15?

- (a) 5
- (b) 8
- (c) 7
- (d) 6

5. The sum of all even numbers below 10 is
(a) 20 (b) 10
(c) 19 (d) 24

6. Which one of the following statements is true?

- (a) All even numbers are composite numbers
- (b) All odd numbers are prime numbers
- (c) There are infinite prime numbers
- (d) A prime number can be written as the product of more than two natural number

7. Which of the following numbers is divisible by 3?

- (a) 687 (b) 340 (c) 712 (d) 551

8. 7386032 is divisible by

- (a) 3 (b) 4 (c) 9 (d) 11

9. Which one of the following numbers is divisible by 9?

- (a) 7532458 (b) 6812348
- (c) 6234588 (d) 4701828

10. On dividing a number by 9, the quotient is 12 and remainder is 7. Find the number.

- (a) 116 (b) 115
- (c) 120 (d) 125

2. Fractions and Decimals

Fraction

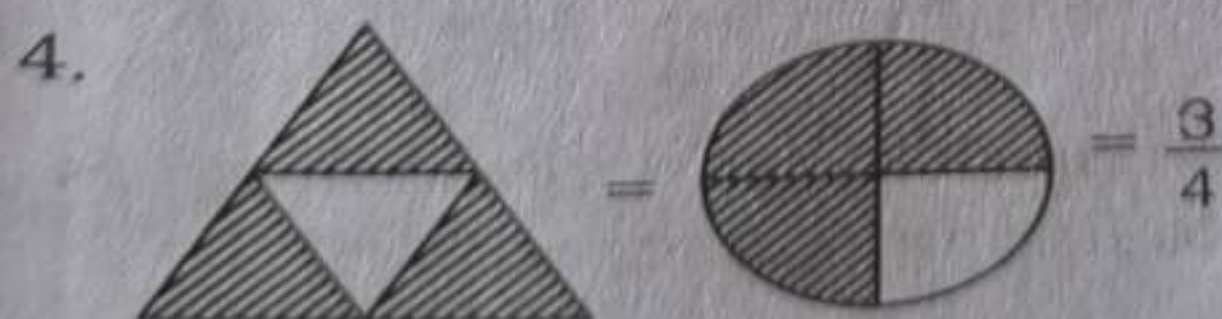
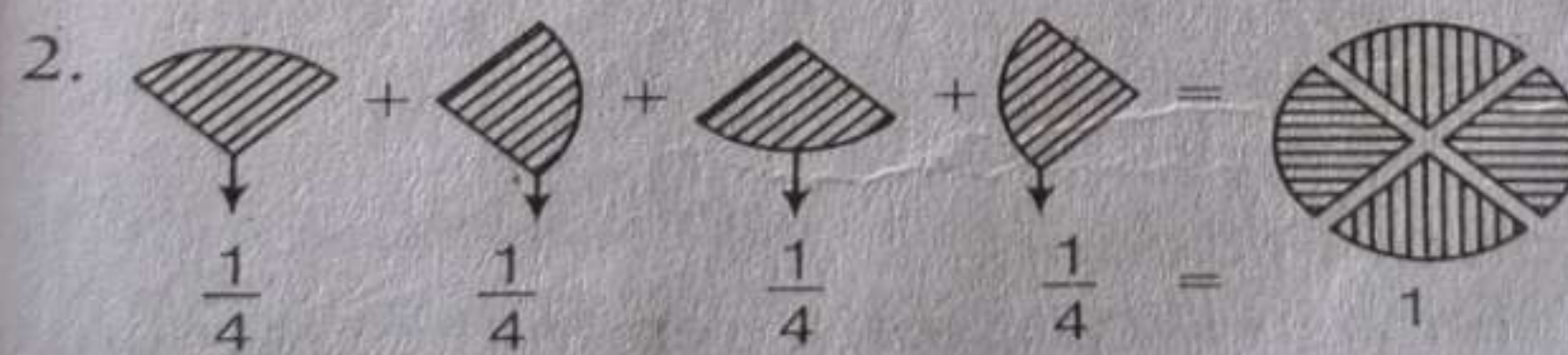
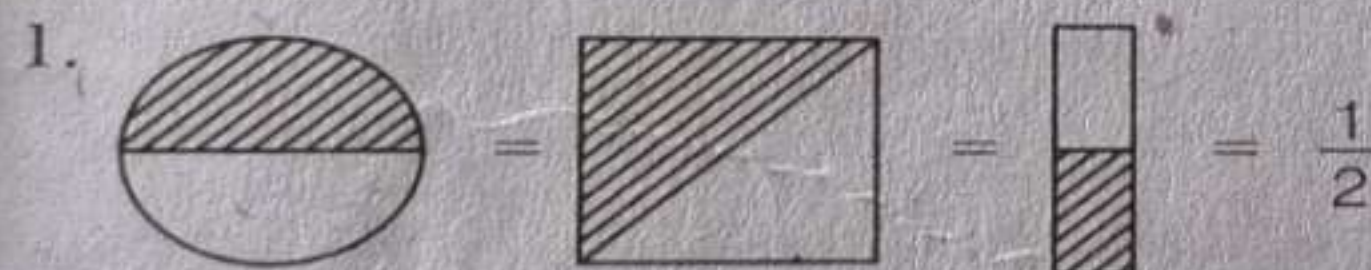
The number of the form $\frac{a}{b}$, where a and b are natural numbers are known as fraction.

e.g. $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}$

Here, a is called numerator and b is called denominator.

A fraction may also be defined as the quotient, obtained on dividing the numerator by denominator.

Some figures are given below to understand the fraction in better way.



Types of Fraction

Proper Fraction

In a fraction when numerator is less than the denominator, it is called as proper fraction, e.g. $\frac{4}{7}$ is a proper fraction.

Improper Fraction

In a fraction when numerator is greater than the denominator, it is called as improper fraction, e.g. $\frac{7}{4}$ is an improper fraction.

Mixed Fraction

A fraction with a whole number part and a fractional part is called as mixed fraction, e.g. $4\frac{2}{3}$ is a mixed fraction.

✓ Every mixed fraction can be expressed as improper fraction and *vice-versa*.

e.g. $3\frac{4}{7} = \frac{3 \times 7 + 4}{7} = \frac{25}{7}$

Decimal Fraction

This type of fractions, is a fraction whose denominator is 10 or a power of 10.

e.g. $\frac{7}{10}, \frac{9}{100}, \frac{3}{1000}$ etc.

1. Change $\frac{75}{100}$ into decimal fraction.
(a) 0.075 (b) 0.75 (c) 0.0075 (d) 7.5

2. Convert 0.4776 into the fraction.

- (a) $\frac{43}{90}$ (b) $\frac{4776}{10000}$
(c) $\frac{4776}{1000}$ (d) $\frac{4776}{100}$

3. $4 + 4.44 + 44.4 = ?$

- (a) 52.08 (b) 50.48
(c) 52.84 (d) 5.284

4. $1 + 0 + \frac{9}{10} + \frac{3}{100} = ?$

- (a) 1.93 (b) 1.093
(c) 1.903 (d) 1.0093

5. Arrange the fraction $\frac{21}{42}, \frac{14}{42}, \frac{30}{42}$ in

desending order

- (a) $\frac{14}{42} < \frac{30}{42} < \frac{21}{42}$ (b) $\frac{30}{42} < \frac{21}{42} < \frac{14}{42}$
(c) $\frac{30}{42} > \frac{21}{42} > \frac{14}{42}$ (d) $\frac{21}{42} > \frac{14}{42} > \frac{30}{42}$

6. Divide the $1.2875 \div 25$.

- (a) 0.515 (b) 0.0515
(c) 0.00515 (d) 5.15

7. Find the sum of $\frac{3}{10} + \frac{5}{100} + \frac{8}{1000}$ in

decimal form.

- (a) 0.853 (b) 3.58
(c) 8.35 (d) 0.358

8. Simplify the expression $\frac{5}{2} + \frac{3}{4}$

- (a) $\frac{13}{4}$ (b) $\frac{15}{4}$
(c) $\frac{14}{3}$ (d) $\frac{17}{4}$

3. PERCENTAGE

Practice Exercise

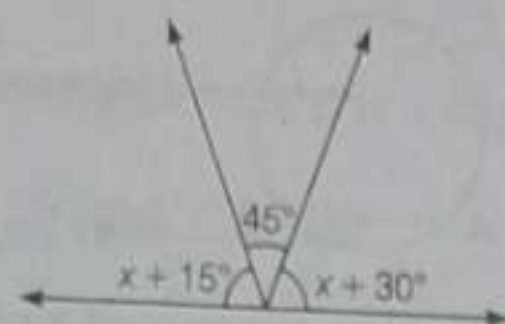
- What is the percentage form of 0.4?
(a) 50% (b) 40% (c) 0.4% (d) 0.04%
- What is the fraction form of $22\frac{1}{2}\%$?
(a) $\frac{9}{40}$ (b) $\frac{40}{9}$ (c) $\frac{16}{9}$ (d) $\frac{45}{2}$
- Find the value of $\frac{7}{2}\%$ of 80.
(a) $\frac{12}{5}$ (b) 15 (c) $\frac{14}{5}$ (d) $\frac{13}{4}$
- Find 125% of 64.
(a) 70 (b) 50 (c) 60 (d) 80
- 36 is what per cent of 144?
(a) 25% (b) 28% (c) 30% (d) 20%
- What per cent of 80 is 16?
(a) 23% (b) 20%
(c) 30% (d) 40%
- If 23% of A is 46, then find A .
(a) 300 (b) 400
(c) 200 (d) 150
- Simplify 35% of $x = \frac{3}{4}$ of $48 + 62$.
(a) 280 (b) 250
(c) 260 (d) 275
- Simplify $5\frac{1}{2}$ of 240 = 150% of x .
(a) 625 (b) 600
(c) 800 (d) 880
- In school there are 1200 students. If the percentage of boys in a school is 60%, then find the number of girls.
(a) 500 (b) 480
(c) 280 (d) 300

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5. Angles

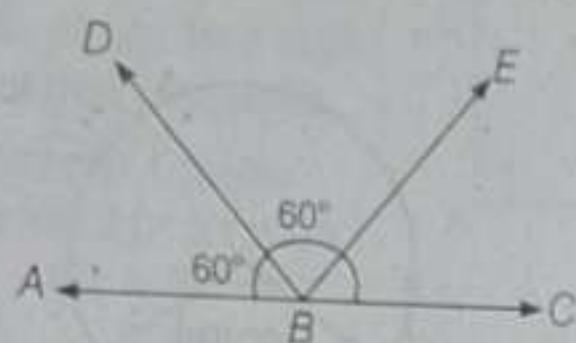
Practice Exercise

1. Find x from the figure.



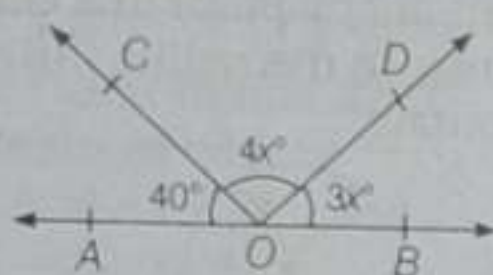
- (a) 45° (b) 60°
(c) 30° (d) 90°

2. From the figure, find $\angle CBE$.



- (a) 60° (b) 45° (c) 20° (d) 30°

3. In the given figure, AOB is straight line. If $\angle AOC = 40^\circ$, $\angle COD = 4x^\circ$ and $\angle BOD = 3x^\circ$, then $\angle COD$ is equal to



- (a) 80° (b) 100° (c) 120° (d) 140°

4. Difference between two complementary angles is 10° . Calculate the values of both angles.

- (a) $45^\circ, 45^\circ$ (b) $40^\circ, 50^\circ$ (c) $50^\circ, 60^\circ$ (d) $100^\circ, 10^\circ$

5. Difference between two supplementary angles is 20° . Find one angle.

- (a) 60° (b) 90° (c) 80° (d) 40°

6. Complementary angle of an angle is five times of it. Find the angle.

- (a) 45° (b) 15°
(c) 35° (d) 22°

7. Find the angle which is equal to its complementary angle.

- (a) 90° (b) 45° (c) 30° (d) 60°

8. Find the angle which is equal to its supplementary angle.

- (a) 180° (b) 45° (c) 90° (d) 60°

9. If two angles of a triangle are 60° and 50° , respectively. Find the third angle.

- (a) 90° (b) 80° (c) 70° (d) 60°

10. An angle of a right angled triangle is 45° . Find the third angle.

- (a) 45° (b) 90° (c) 135° (d) 60°

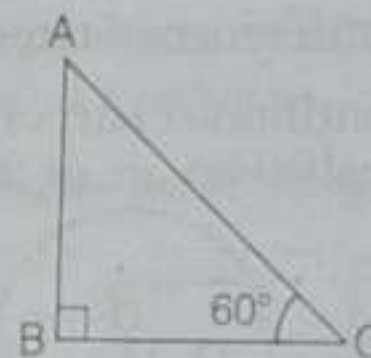
11. In a $\triangle ABC$. If $\angle A + \angle B = 75^\circ$ and $\angle B + \angle C = 150^\circ$. Find $\angle B$.

- (a) 30° (b) 60° (c) 50° (d) 45°

12. The angles of a triangle are in the ratio of 1 : 1 : 4. Find the three angles.

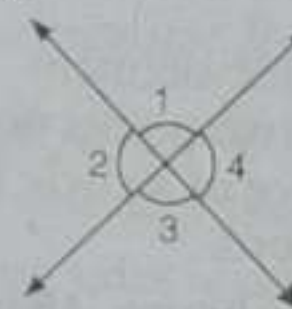
- (a) $30^\circ, 30^\circ, 120^\circ$ (b) $40^\circ, 30^\circ, 110^\circ$
(c) $130^\circ, 30^\circ, 20^\circ$ (d) $150^\circ, 15^\circ, 15^\circ$

13. From the figure, find $\angle A$.



- (a) 15° (b) 45°
(c) 30° (d) 90°

14. If $\angle 1 = 135^\circ$, $\angle 4 = 45^\circ$. Then, find $\angle 2$ and $\angle 3$, respectively.



- (a) $145^\circ, 35^\circ$ (b) $130^\circ, 50^\circ$
(c) $140^\circ, 40^\circ$ (d) $45^\circ, 135^\circ$

15. The angles of a triangle are in the ratio of 2 : 3 : 5. Find the angles.

- (a) $45^\circ, 90^\circ, 45^\circ$ (b) $90^\circ, 45^\circ, 45^\circ$
(c) $30^\circ, 96^\circ, 54^\circ$ (d) $36^\circ, 54^\circ, 90^\circ$

16. If two adjacent angles of a rhombus are in the ratio of 2 : 3, then find the measures of all angles.

- (a) $72^\circ, 108^\circ, 72^\circ, 108^\circ$
(b) $72^\circ, 108^\circ, 70^\circ, 110^\circ$
(c) $80^\circ, 100^\circ, 80^\circ, 100^\circ$
(d) None of the above

6. Measurements



Practice Exercise

1. 107 cm is equivalent to
(a) 10.7 m (b) 1.07 m
(c) 0.107 m (d) 1070 m
2. 1 km is equivalent to
(a) 1000 mm (b) 100000 mm
(c) 10000 mm (d) 1000000 mm
3. If a bag weighs 0.78 kg, then find the weight of bag in gram.
(a) 780 gm (b) 777 gm
(c) 781 gm (d) 790 gm
4. 4 L is equal to
(a) 4000 mL (b) 400 mL
(c) 40000 mL (d) 400000 mL
5. The weight of a basket is 3 kg 550 gm.
What is its weight in gram?
(a) 3549 gm (b) 3550 gm
(c) 3556 gm (d) 3554 gm
6. What time is 3 h 40 min before 2 : 30 pm?
(a) 11 : 00 am (b) 10 : 50 am
(c) 11 : 30 am (d) 11 : 55 am

Intelligence Topics

1. Number Analogy

2. Number Analogy

In this type of analogy, numbers are given in a pair or group. The candidate has to find the relationship between the numbers or group of numbers. Then, he has to complete the incomplete pair by choosing the correct number from the given alternatives.

The relationship in number analogy can be of following types

- Even and odd numbers
- Multiplication and division of numbers
- Addition and subtraction of numbers
- Square roots of numbers

Example 2 Complete the second pair by choosing the appropriate alternative.

$$2 : 4 :: 3 : ?$$

(a) 20

(b) 21

(c) 24

(d) 9

Sol. (d) Second number is the square of first number.

i.e. $2^2 = 2 \times 2 = 4$ and $3^2 = 3 \times 3 = \boxed{9}$

Directions (Q. Nos. 11-14) *In each of the following questions, choose the number which will replace the question mark(?)*.

11. $1, 2, 4, 7 : 3, 4, 6, 9 :: ? : 2, 3, 5, 8$

(a) 0, 1, 3, 6

(b) 2, 4, 5, 8

(c) 1, 3, 4, 7

(d) 3, 5, 6, 8

12. $63 : 21 :: 27 : ?$

(a) 6

(b) 9

(c) 1

(d) 3

13. $100 : 121 :: 144 : ?$

(a) 160

(b) 93

(c) 169

(d) 426

14. $5 : 125 :: 6 : ?$

(a) 225

(b) 216

(c) 400

(d) 30

2. Number Series

1. Number Series

In this type of questions, we are given a sequence of numbers including one or more missing numbers. This series follows a pattern. Keeping this pattern in mind, we have to find the missing terms.

The pattern can be based on addition/subtraction of numbers, multiplication/division of numbers, square/cube of numbers etc.

Directions (Example 1-3) *Choose the correct alternative from the given ones that will complete the series.*

Example 1 5, 6, 9, 14, 21, ?

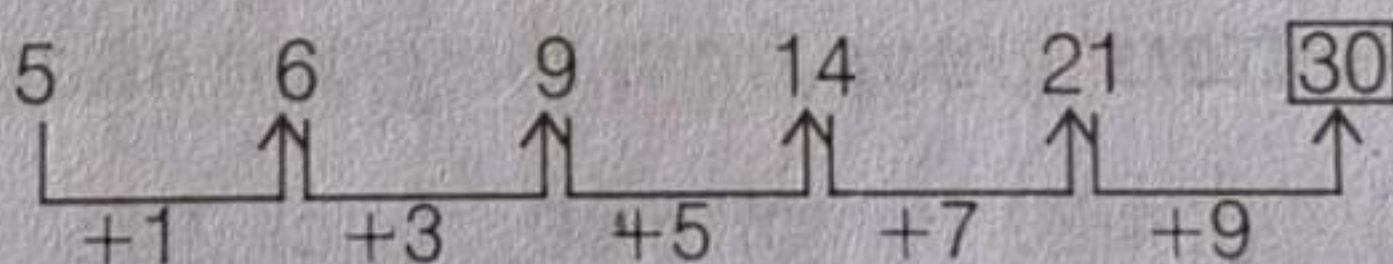
(a) 26

(b) 28

(c) 30

(d) 34

Sol. (c)



This sequence consists pattern of addition of consecutive odd numbers. To the previous one.

Example 2 1, 3, 9, 27, 81, ?

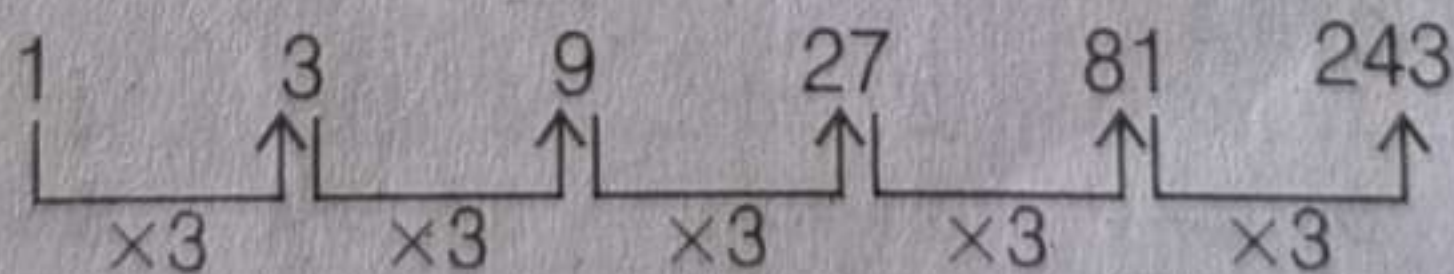
(a) 216

(b) 220

(c) 243

(d) 250

Sol. (c)



Next number of this series is multiplication of 3 with previous one.

Directions (Q. Nos. 1-11) *In each of the following questions, a number series is given with one of the terms missing. Choose the correct alternative that will continue the same pattern and replace the question mark (?) in the given series.*

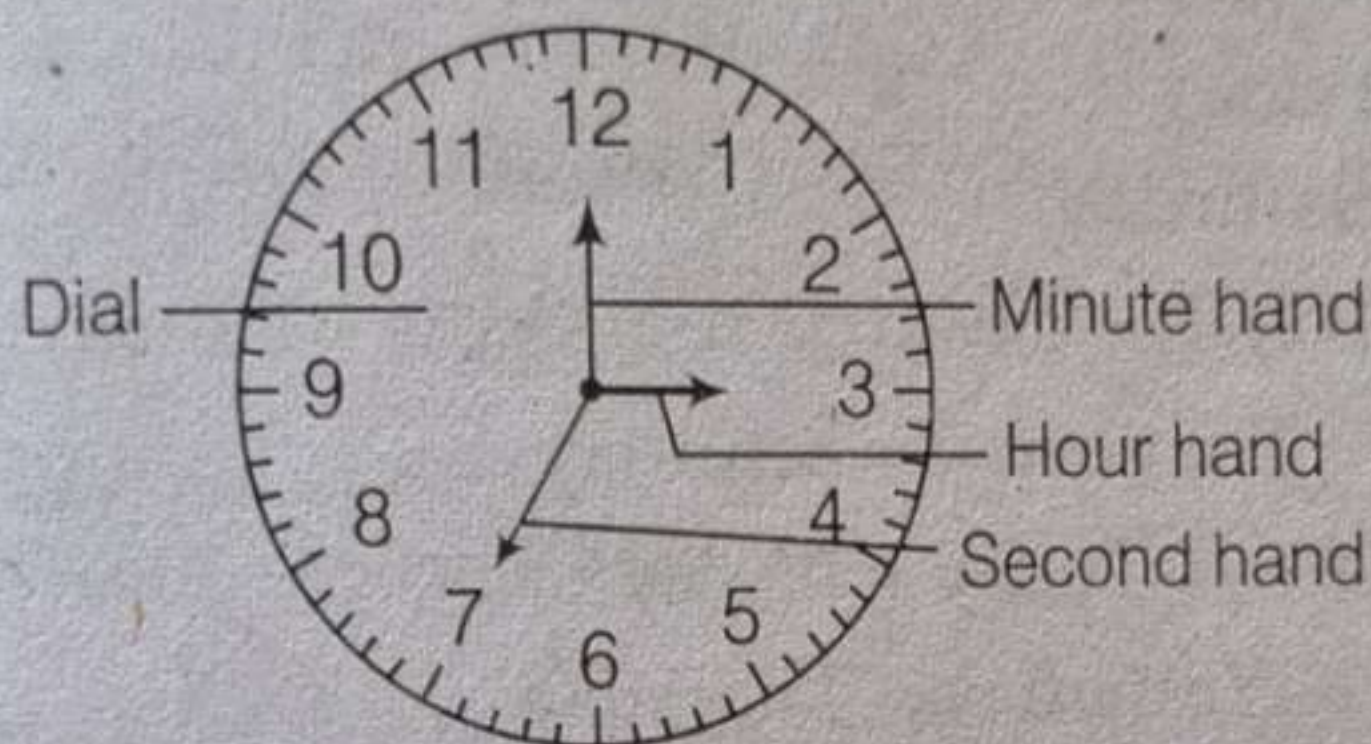
1. 2, 22, 222, 2222, ?
(a) 11222 (b) 22233
(c) 23255 (d) 22222
2. 3, 7, 13, 21, ?
(a) 31 (b) 28 (c) 30 (d) 36
3. 100, 50, 52, 26, 28, ?
(a) 18 (b) 16 (c) 15 (d) 14
4. 4, 9, 20, 43, ?
(a) 80 (b) 90 (c) 75 (d) 85
5. 42, 21, 34, 17, 26, ?
(a) 13 (b) 15 (c) 14 (d) 10
6. 8, 7, 16, 21, 32, 63, ?
(a) 65 (b) 64 (c) 62 (d) 60
7. 18, 25, 22, 20, 26, 15, ?
(a) 32 (b) 30 (c) 25 (d) 28
8. 68, 67, 64, 59, ?
(a) 52 (b) 53 (c) 54 (d) 56
9. 97, 90, 76, 55, ?
(a) 28 (b) 27 (c) 26 (d) 25
10. 11, 15, 38, 126, ?
(a) 520 (b) 500 (c) 400 (d) 380

3. Clock and Calendar

Clock

A clock is a circular/square shaped instrument used to view/measure time in hours, minutes and seconds.

There are mainly four important parts of a clock—dial, hour hand, minute hand and second hand.



Clock

60 seconds = 1 minute

60 min = 1 hour

30 min = Half of an hour

15 min = Quarter of an hour

Important Points

- Both hands of a clock occurs at right angle twice in one hour, 22 times in 12 h and 44 times in 24 h.
- Both hands of a clock occurs in a straight line or are opposite once in one hour, 11 times in 12 h and 22 times in 24 h.
- The hands of a clock coincide once in an hour, 11 times in 12h and 22 times in 24h.

Example 1 The priest told the devotes, "The bell rings at regular intervals of 45 min. The last bell was rung 5 min ago. The next bell is

due to be rung at 7 : 45 am''. At what time did the priest give the information to the devotees?

- (a) 6 : 55 am (b) 7 : 00 am
(c) 7 : 05 am (d) 7 : 40 am

Sol. (c) Time of ringing of last bell

$$= (7 : 45 - 0 : 45) = 7 : 00 \text{ am.}$$

But it happened 5 min before the priest gave the information to the devotees.

$\therefore$ Time of giving information

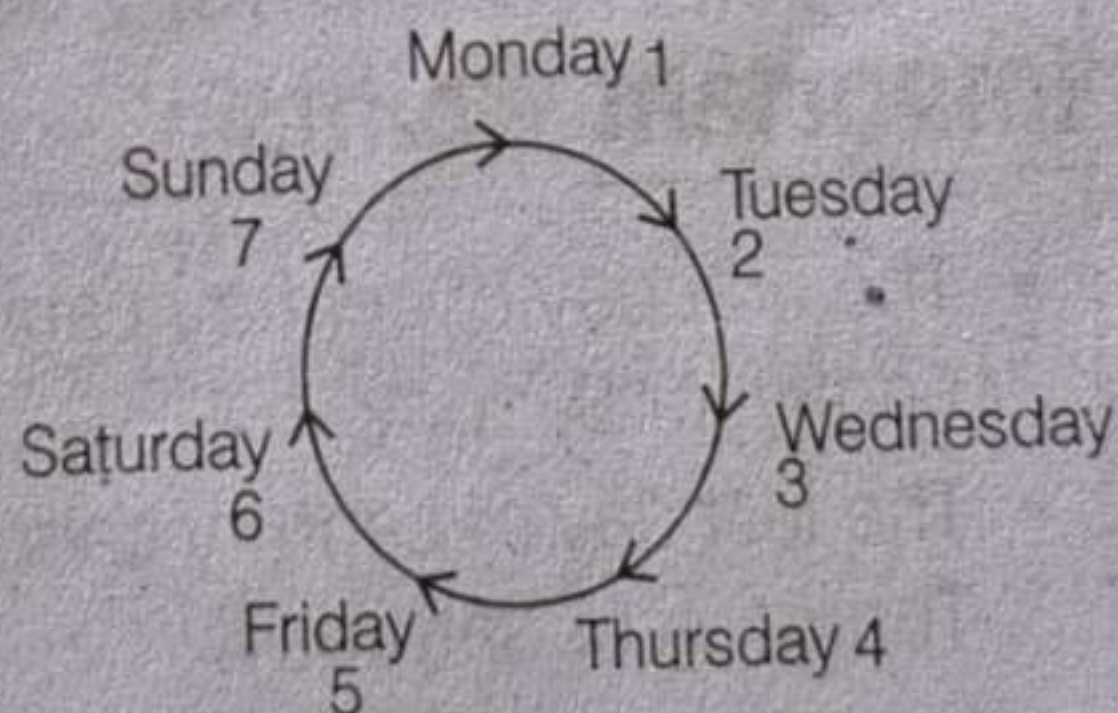
$$= 7 : 00 + 0 : 05 = 7 : 05 \text{ am}$$

Calendar

The record of all the days of the year is given in the calendar. It shows the months, weeks and days in the year.

Days

There are seven days in a week. A week starts with Monday and ends at Sunday. The same cycle goes on and on.



Months of the Year

We know that, there are 12 months in a year.

January, March, May, July, August, October and December have 31 days each. April, June, September and November have 30 days each, February has 28 days in an ordinary year and 29 days in a leap year.

Century

A period of 100 years is called a century. Thus, each one of the years 1100, 1800, 2000, 2100 is a century.

Ordinary Year

An ordinary year is a year which has 365 days (52 weeks +1 day). Such years are not divisible by 4. e.g. 2001, 2002, 2003, 2005, etc.

Ordinary years in the form of century are not exactly divisible by 400.

e.g. 100, 200, 500, etc.

In any two consecutive ordinary years, date of the next year will be one day ahead of the same date of previous year. e.g. If 2nd March, 2010 is Tuesday, then 2nd March, 2011 will be Wednesday.

Leap Year

A leap year is a year which has 366 days (52 weeks +2 days). Such years are exactly divisible by 4. e.g. 2004, 2008, 2012, etc.

Leap year in the form of a century are exactly divisible by 400. e.g. 400, 1200, etc.

If a leap year comes immediately after ordinary year, date of the next year will be two days ahead of the same date of previous year (from March to December) and one day ahead of the same date of previous year (in January and February) e.g. If 24th February 2015 is Monday, then 24th February, 2016 is Tuesday and if 16th March, 2015 is Wednesday, then 16th March, 2016 is Friday.

Important Points

- The first day of century cannot be Wednesday, Friday or Sunday.
- The last day of century cannot be Tuesday, Thursday or Saturday.

Example 2 Which of the following is not a leap year?

(a) 2000 (b) 2600 (c) 1600 (d) 1996

Sol. (b) The century year divisible by 400 is a leap year. So, 2000 and 1600 are leap years. Also, 1996 is a leap year. Only 2600 is not a leap year.

Example 3 Sameer remembers that his brother's birthday is after 15th but before 18th of February whereas his sister Kanika remembers that her brother's birthday is after 16th but before 19th of February. On which day in February is Sameer's brother's birthday?

- (a) 15th February
- (b) 18th February
- (c) 17th February
- (d) None of the above

Sol. (c) As per Sameer, birthday is on 16th or 17th February.

As per Kanika, birthday is on 17th or 18th February.

17th February is common in both the groups.

Clearly, the correct date is 17th February.

Example 4 If the day after tomorrow is a Sunday, what was it day before yesterday?

- (a) Wednesday
- (b) Thursday
- (c) Friday
- (d) Saturday

Sol. (a) The day after tomorrow = Sunday.

∴ Tomorrow = Saturday

∴ Today = Friday

∴ Yesterday = Thursday

So, the day before yesterday = Wednesday.

Example 5 If 1st January, 2001 was Monday, then what day of the week was it on 31st December, 2001?

- (a) Wednesday
- (b) Friday
- (c) Monday
- (d) Saturday

Sol. (c) Year 2001 was an ordinary year and in an ordinary year 1st day is same as last day* (remember)

i.e. Day on 1st January is same as day on 31st December.

As, given that, 1st January = Monday

Hence, 31st December = Monday

4. Coding Direction

2. Number Coding

In this type, we deal with the questions in which the numerical code values are assigned to a word or alphabets according to predefined pattern. Candidates are required to identify the numerical pattern of coding, so that the given word can be transformed in same coding.

Example 4 If DELHI is coded as 73541 and CALCUTTA as 82589662, then how can CALICUT be coded?

- (a) 5279431 (b) 5978013
(c) 8251896 (d) 8543691

Sol. (c) As,

D	E	L	H	I
↓	↓	↓	↓	↓
7	3	5	4	1

and

C	A	L	C	U	T	T	A
↓	↓	↓	↓	↓	↓	↓	↓
8	2	5	8	9	6	6	2

Similarly,

C	A	L	I	C	U	T
↓	↓	↓	↓	↓	↓	↓
8	2	5	1	8	9	6

Example 5 If MAN is coded as 13-1-14, then how, will you code TIME?

- (a) 20-9-13-5 (b) 19-9-18-5
(c) 19-18-5-6 (d) 20-8-13-5

Sol. (a) Here, the postional value of letters in English alphabet are given.

As,

M	A	N
↓	↓	↓
13	1	14

Similarly,

T	I	M	E
↓	↓	↓	↓
20	9	13	5

Example 2 In a certain code, SOBER is written as RNADQ. How LOTUS can be written in that code?

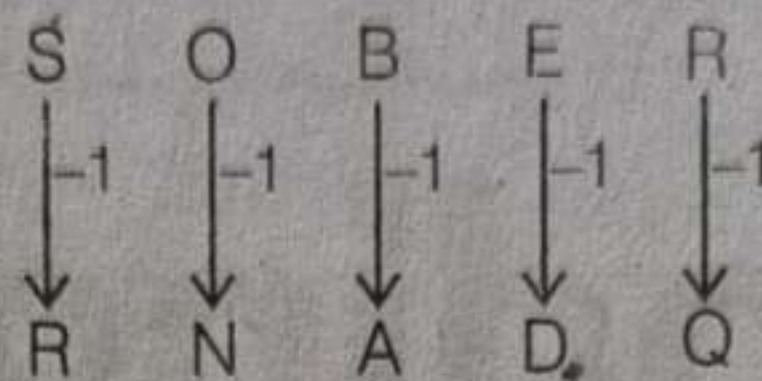
(a) KNSTR

(b) MPUWT

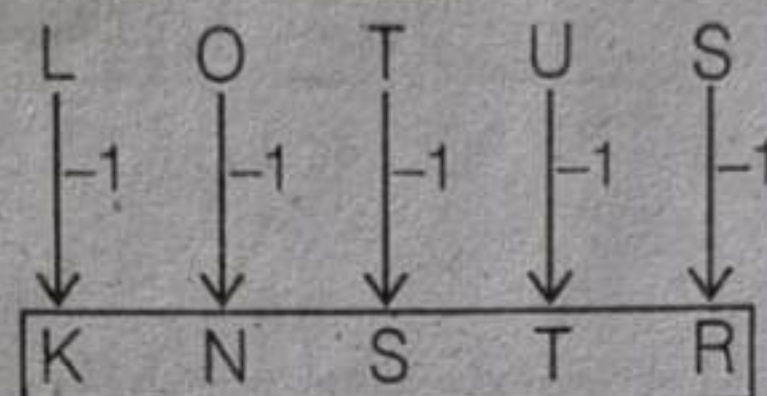
(c) KMSTR

(d) LMRST

Sol. (a) As,



Similarly,



Example 3 In a certain code, ROAD is written as URDG. How is SWAN written in that code?

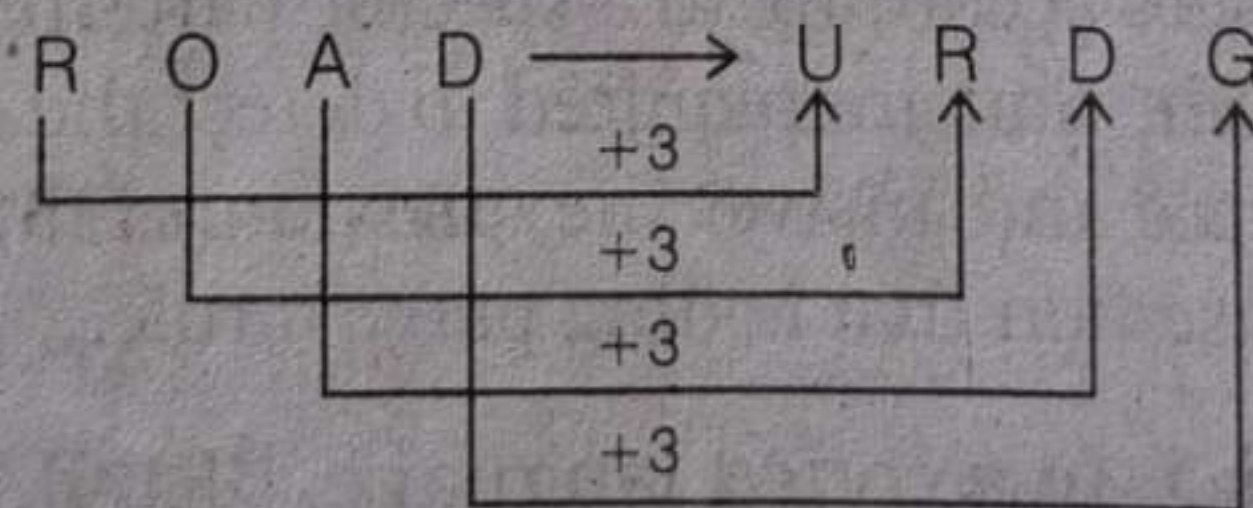
(a) VXDQ

(b) VZDQ

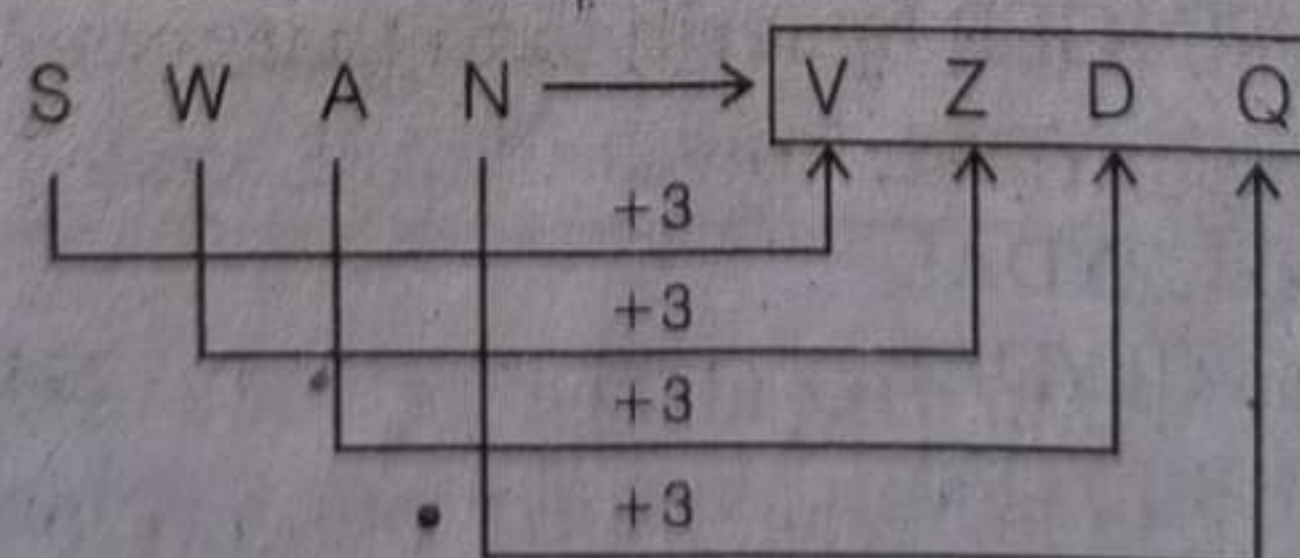
(c) VZCP

(d) UXDQ

Sol. (a) As,



Similarly,



Coding-Decoding can be divided into following two types.

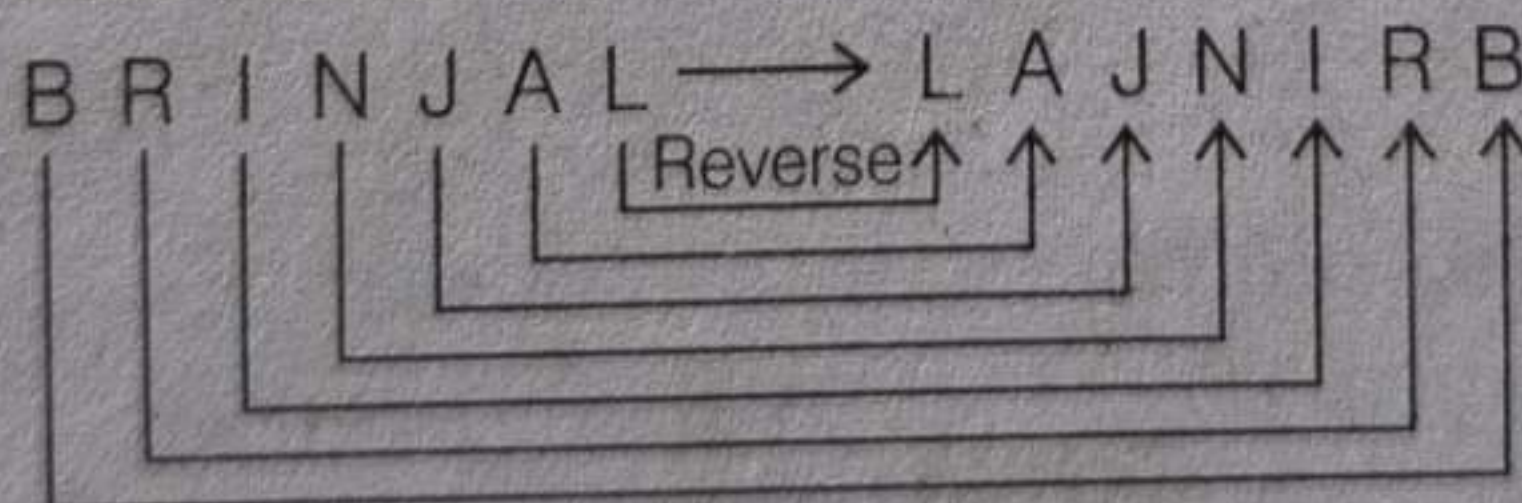
1. Letter Coding

In this type of coding, we deal with questions, in which the letters of a word are replaced by certain other letters according to a specific pattern/rule to form a code. You are required to detect the coding pattern/rule and answer the question(s) that are asked, based on that coding pattern/rule.

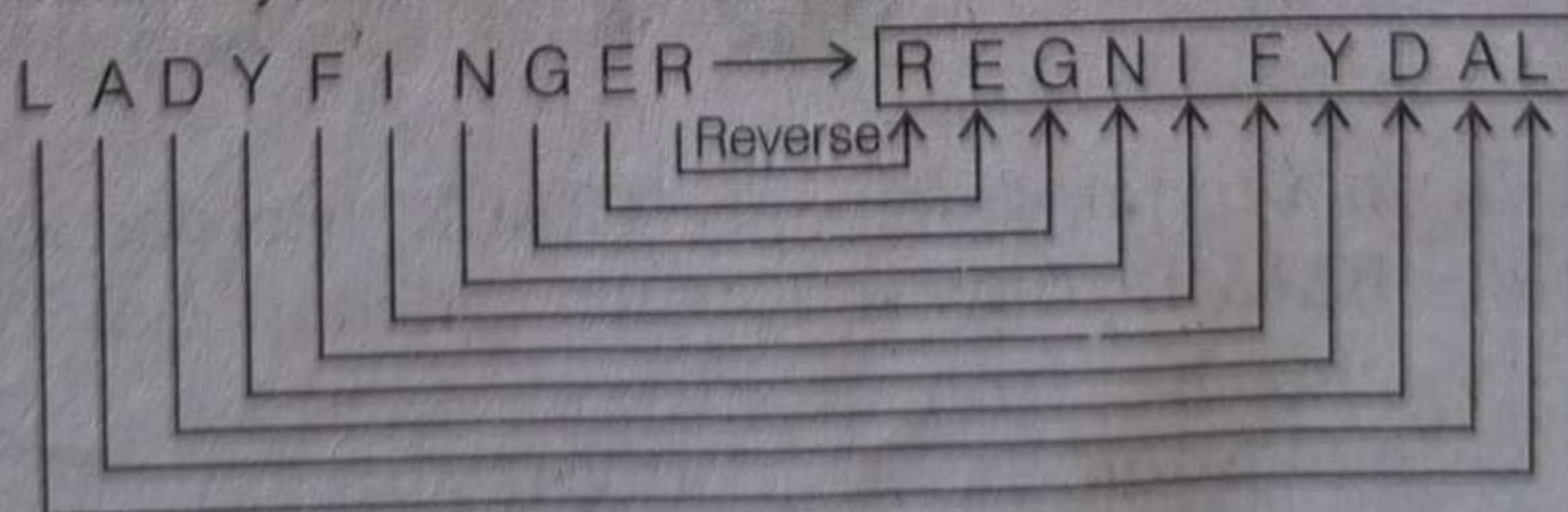
Example 1 In a coded language, BRINJAL is written as LAJNIRB. How will LADYFINGER be written in that code?

- (a) RNEGIFYDAL
- (b) RINEGFYDAL
- (c) REGNIFYDAL
- (d) RGENIFYDAL

Sol. (c) As,



Similarly,



Coding means to hide the meaning of any message and decoding means to understand the actual meaning of that message.

In questions based on coding-decoding, a word (basic word) is coded in a particular way and the candidates are asked to code other word in the same way.

To solve the questions based on coding-decoding, first of all it is necessary to remember the positions of all the letters in English alphabetical order.

Order of the English Alphabet

Forward order position	1	2	3	4	5	6	7	8	9	10	11	12	13
------------------------	---	---	---	---	---	---	---	---	---	----	----	----	----

Letters	A	B	C	D	E	F	G	H	I	J	K	L	M
---------	---	---	---	---	---	---	---	---	---	---	---	---	---

Forward order position	14	15	16	17	18	19	20	21	22	23	24	25	26
------------------------	----	----	----	----	----	----	----	----	----	----	----	----	----

Letters	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
---------	---	---	---	---	---	---	---	---	---	---	---	---	---

☑ By using EJOTY and CFILORUX formulae, we can easily remember the position of letters of English alphabet.

3	6	9	12	15	18	21	24
↓	↓	↓	↓	↓	↓	↓	↓
C	F	I	L	O	R	U	X

(sounds like a medicine name)

5	10	15	20	25
↓	↓	↓	↓	↓
E	J	O	T	Y

(sounds like a girl's name Joti)

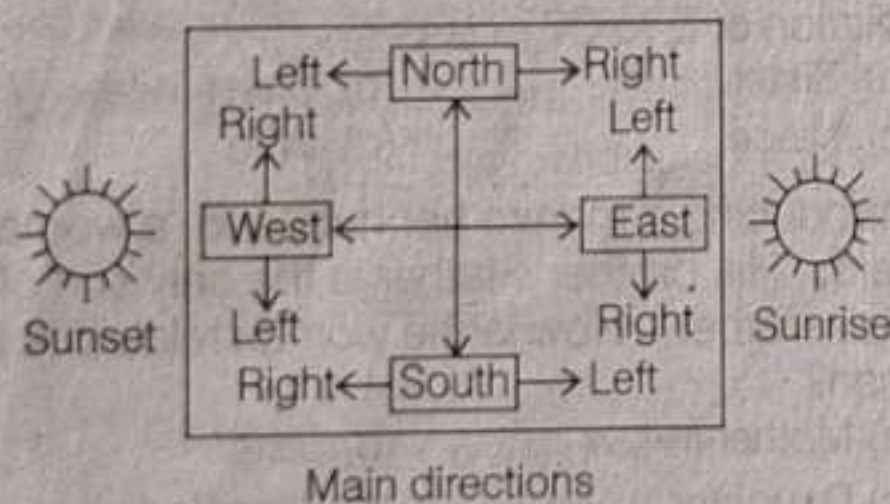
5. Direction Sense Test

Direction is the general position of one thing with respect to another thing and displacement is the distance between the starting point and final point.

In this chapter, we deal with the questions in which a successive follow-up of directions is given and the candidate is required to determine the final direction or the distance between two points.

Main Directions

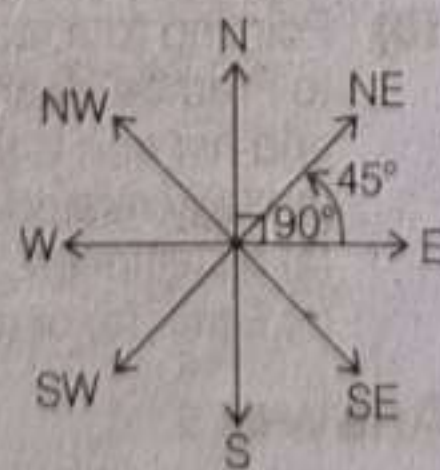
There are four main directions viz. East, West, North and South as shown in the figure given below



Abbreviations for these directions are E (East), W (West), N (North) and S (South).

Cardinal Directions

A direction between two adjacent main directions is called cardinal direction or subdirection, i.e. NE (North-East), NW (North-West), SE (South-East) and SW (South-West).



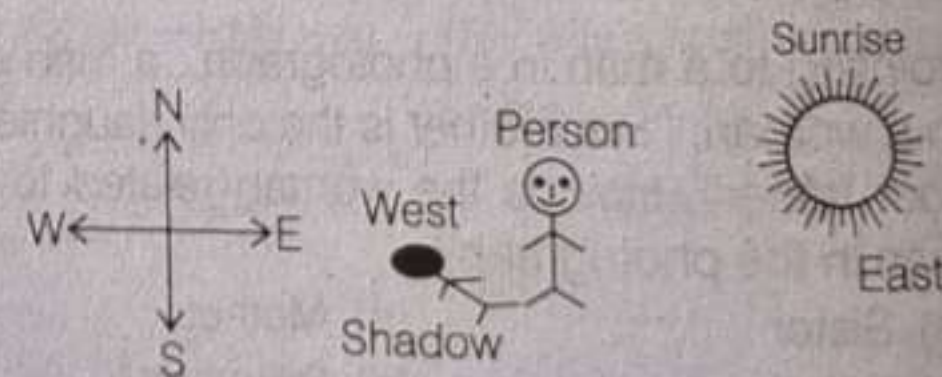
Students are advised to use adjacent diagram for the purpose of sensing directions.

Angle formed between two main directions is 90° and angle formed between a cardinal direction and main direction is 45° .

Concept of Shadow

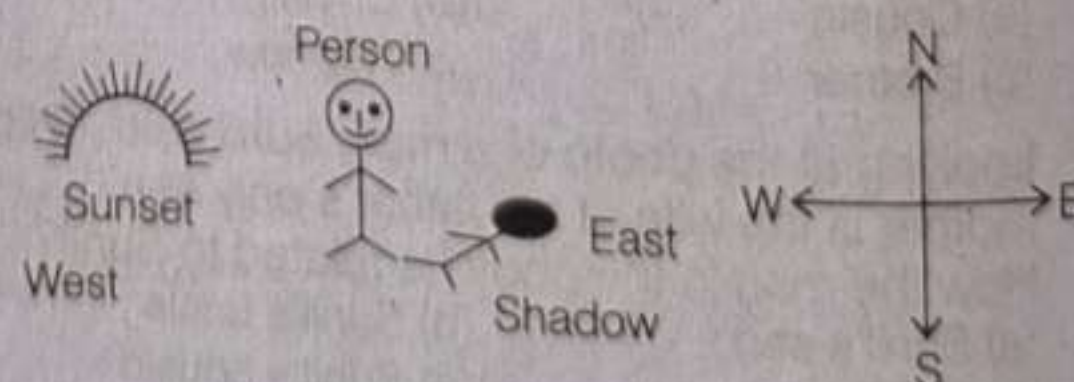
Shadow at the Time of Sunrise

In the morning, Sun rises in the East and the shadow of any person or object falls in the West.



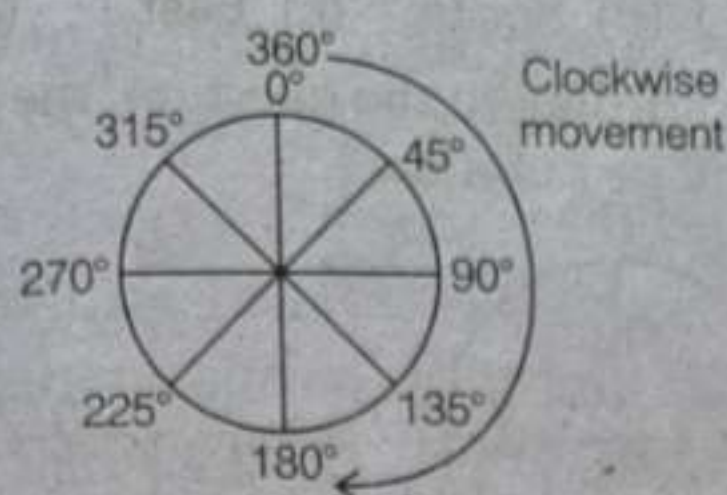
Shadow at the Time of Sunset

In the evening the Sun sets in the West and the shadow of a person or an object falls in the East.

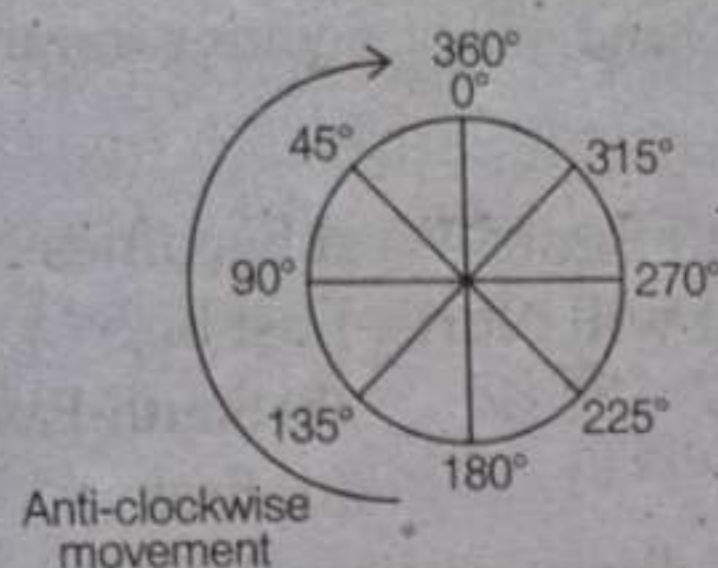


Angle of Movement

- (i) Movement in the direction of clock is called the clockwise (CW) movement.



- (ii) Movement opposite to the direction of clock is called anti-clockwise (ACW) movement.

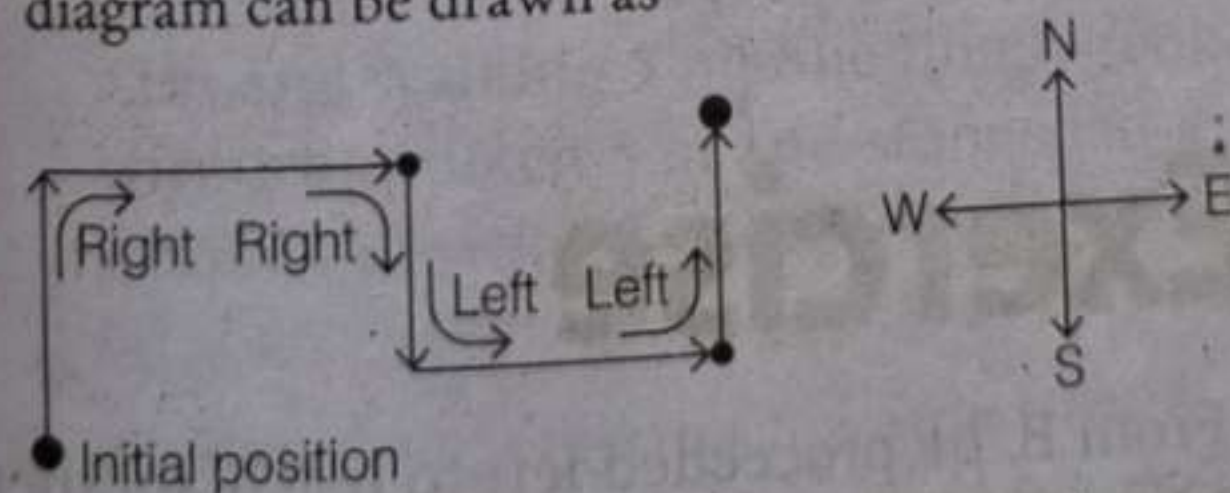


Example 1 Vandana is going Northwards.

She turns right, moves some distance and again turns to her right. After moving some distance, she turns to her left, goes forward and again turns to her left. In which direction now is Vandana going?

- (a) North (b) South-West
(c) South (d) West

Sol. (a) According to the question, the direction diagram can be drawn as

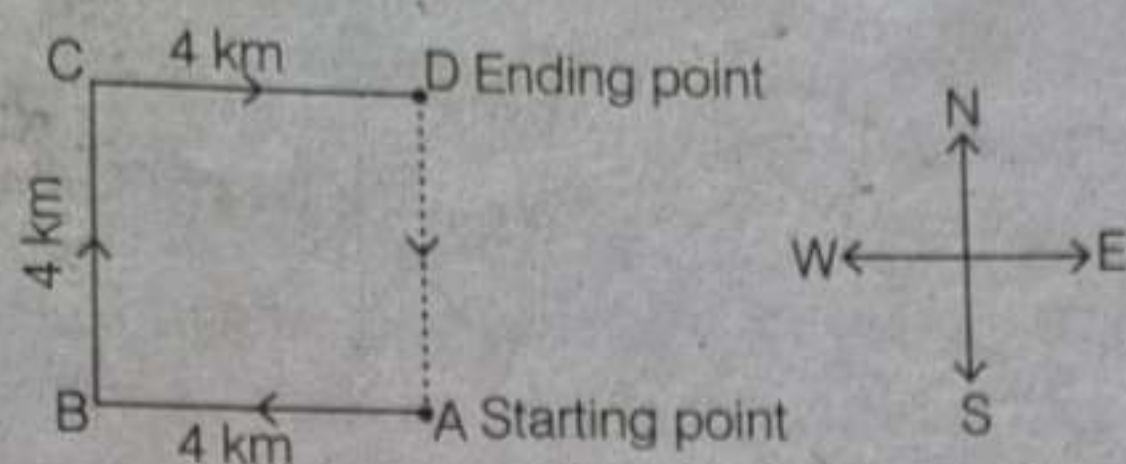


Clearly, Vandana is going towards North.

Example 2 After starting from a point, a man walks 4 km towards West, then turning to his right he moves 4 km. After this, he again turns right and moves 4 km. Which choice given below indicates the correct direction in which he is from his starting point?

- (a) North (b) East
(c) South (d) West

Sol. (a) The direction diagram of a man is as given below

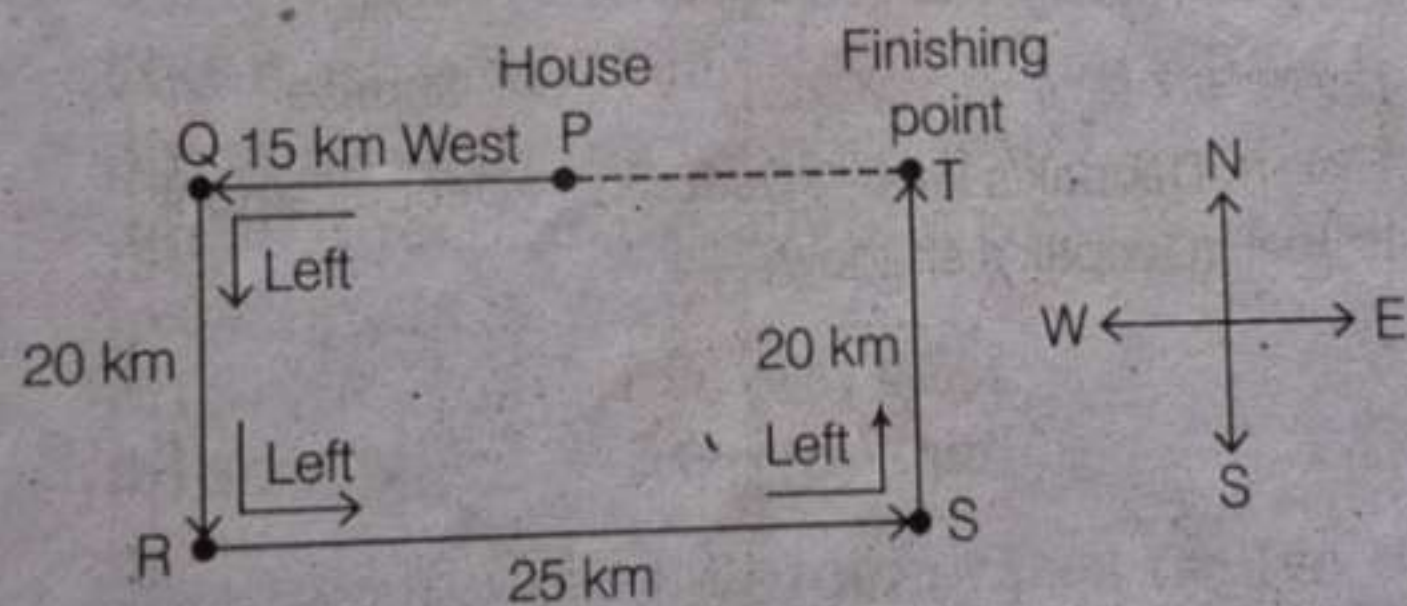


Let A be the starting and D be the ending point of man. It is clear from the diagram that, he is in North direction from his starting point.

Example 3 Laxman went 15 km to the West from house, then turned left and walked 20 km. He, then turned East and walked 25 km and finally turning left covered 20 km. How far is he now from his house?

- (a) 15 km (b) 20 km
(c) 25 km (d) 10 km

Sol. (d) According to the question, the direction diagram will be as follows



$$PQ = 15 \text{ km}$$

$$QR = TS = 20 \text{ km}$$

$$RS = 25 \text{ km}$$

$\therefore$ Required distance,

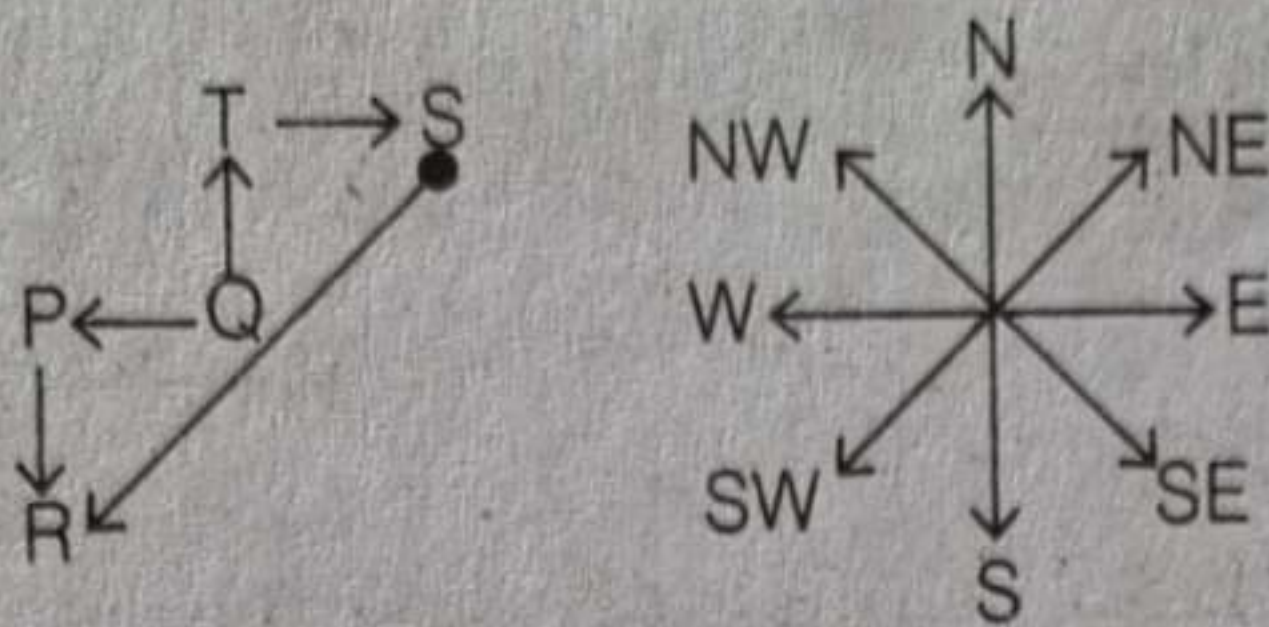
$$PT = QT - QP = RS - QP \quad [\because RS = QT]$$

$$= 25 - 15 = 10 \text{ km}$$

Example 4 Five villages P, Q, R, S and T situated close to each other. P is to the West of Q, R is to the South of P, T is to the North of Q and S is to the East of T. Then, in which direction is R with respect to S?

- (a) North-West
(b) South-East
(c) South-West
(d) Data inadequate

Sol. (c) According to the given information, locations of the five villages can be represented as

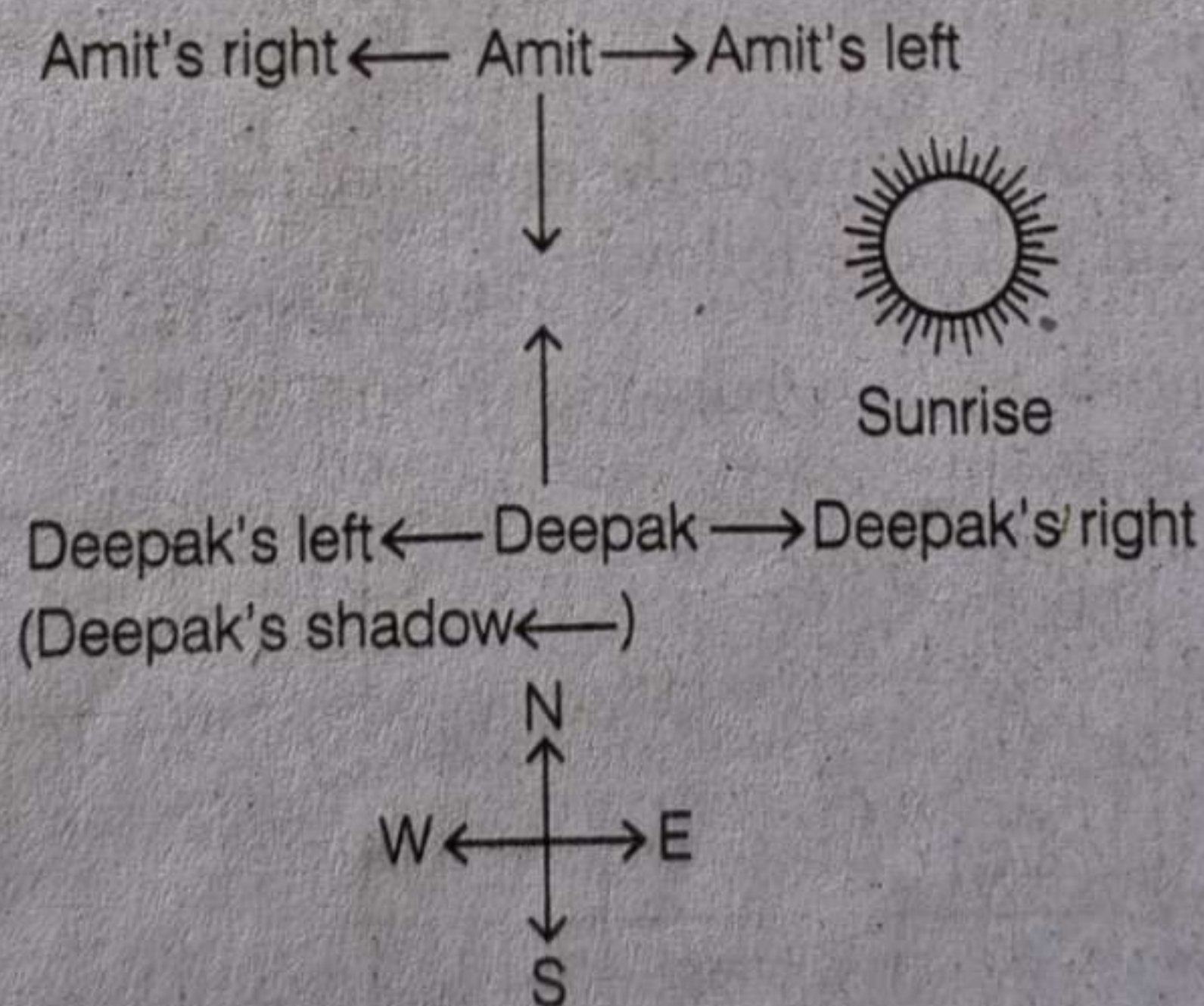


Clearly, R lies to the South-West of S.

Example 5 At sunrise, Amit and Deepak are having a conversation standing in front of each other. The shadow of Deepak is formed towards the right hand of Amit. What direction is Deepak facing?

- (a) North-East (b) South
(c) East (d) North

Sol. (d) According to the question, the direction diagram is drawn as



Clearly, Deepak is facing North.

