

# Answers

(1) A) XXII

## Step 1

We should remember following basic rules to form Roman numerals:

- a. Repetition
    - i. Repetition of a Roman numeral means addition.
    - ii. Only I, X, C and M can be repeated.
    - iii. V, L and D can never be repeated.
    - iv. No numeral can be repeated more than three times.
  - b. Addition and Subtraction of numerals
    - i. A smaller numeral written to the right of a larger numeral is always added to the larger numeral.
    - ii. A smaller numeral written to the left of a larger numeral is always subtracted from the larger numeral.
    - iii. V, L and D are never subtracted.
    - iv. I can be subtracted from V and X.
    - v. X can be subtracted from L and C.
    - vi. When a smaller numeral is placed between two larger numerals, then it is always subtracted from the larger numeral immediately following it.
    - vii. Only a single symbol can be subtracted from another single symbol. Subtraction can not be done with groups of symbols.
    - viii. A symbol can not be subtracted from another one that is more than 10 times greater than it.
- For example:
- We can not write IL to convey  $50 - 1 = 49$  because L (50) is 50 times I (1).
  - We can not write LM to convey  $1000 - 50 = 950$  because M (1000) is 20 times L (50).

## Step 2

Based on the above rules, we may break the given number into easy repeating and non-repeating units of Roman numerals as  $10 + 10 + 2$ .

## Step 3

The roman numeral for 10 is X and 2 is II, and since we know that to add two Roman numerals, we write the smaller numeral to the right of the larger numeral. So 22 is XXII.

### Step 1

We should remember following basic rules to form Roman numerals:

- a. Repetition
  - i. Repetition of a Roman numeral means addition.
  - ii. Only I, X, C and M can be repeated.
  - iii. V, L and D can never be repeated.
  - iv. No numeral can be repeated more than three times.
- b. Addition and Subtraction of numerals
  - i. A smaller numeral written to the right of a larger numeral is always added to the larger numeral.
  - ii. A smaller numeral written to the left of a larger numeral is always subtracted from the larger numeral.
  - iii. V, L and D are never subtracted.
  - iv. I can be subtracted from V and X.
  - v. X can be subtracted from L and C.
  - vi. When a smaller numeral is placed between two larger numerals, then it is always subtracted from the larger numeral immediately following it.
  - vii. Only a single symbol can be subtracted from another single symbol. Subtraction can not be done with groups of symbols.
  - viii. A symbol can not be subtracted from another one that is more than 10 times greater than it.

For example:

- We can not write IL to convey  $50 - 1 = 49$  because L (50) is 50 times I (1).
- We can not write LM to convey  $1000 - 50 = 950$  because M (1000) is 20 times L (50).

### Step 2

Based on the above rules, we may break the given number into easy repeating and non-repeating units of Roman numerals as  $10 + 1$ .

### Step 3

The roman numeral for 10 is X and 1 is I, and since we know that to add two Roman numerals, we write the smaller numeral to the right of the larger numeral. So 11 is XI.

### Step 1

We should remember following basic rules to form Roman numerals:

- a. Repetition
  - i. Repetition of a Roman numeral means addition.
  - ii. Only I, X, C and M can be repeated.
  - iii. V, L and D can never be repeated.
  - iv. No numeral can be repeated more than three times.
- b. Addition and Subtraction of numerals
  - i. A smaller numeral written to the right of a larger numeral is always added to the larger numeral.
  - ii. A smaller numeral written to the left of a larger numeral is always subtracted from the larger numeral.
  - iii. V, L and D are never subtracted.
  - iv. I can be subtracted from V and X.
  - v. X can be subtracted from L and C.
  - vi. When a smaller numeral is placed between two larger numerals, then it is always subtracted from the larger numeral immediately following it.
  - vii. Only a single symbol can be subtracted from another single symbol. Subtraction can not be done with groups of symbols.
  - viii. A symbol can not be subtracted from another one that is more than 10 times greater than it.

For example:

- We can not write IL to convey  $50 - 1 = 49$  because L (50) is 50 times I (1).
- We can not write LM to convey  $1000 - 50 = 950$  because M (1000) is 20 times L (50).

### Step 2

Based on the above rules, we may break the given number into easy repeating and non-repeating units of Roman numerals as  $10 + 10 + 3$ .

### Step 3

The roman numeral for 10 is X and 3 is III, and since we know that to add two Roman numerals, we write the smaller numeral to the right of the larger numeral. So 23 is XXIII.

## D) XXXIX

### Step 1

We should remember following basic rules to form Roman numerals:

- a. Repetition
    - i. Repetition of a Roman numeral means addition.
    - ii. Only I, X, C and M can be repeated.
    - iii. V, L and D can never be repeated.
    - iv. No numeral can be repeated more than three times.
  - b. Addition and Subtraction of numerals
    - i. A smaller numeral written to the right of a larger numeral is always added to the larger numeral.
    - ii. A smaller numeral written to the left of a larger numeral is always subtracted from the larger numeral.
    - iii. V, L and D are never subtracted.
    - iv. I can be subtracted from V and X.
    - v. X can be subtracted from L and C.
    - vi. When a smaller numeral is placed between two larger numerals, then it is always subtracted from the larger numeral immediately following it.
    - vii. Only a single symbol can be subtracted from another single symbol. Subtraction can not be done with groups of symbols.
    - viii. A symbol can not be subtracted from another one that is more than 10 times greater than it.
- For example:
- We can not write IL to convey  $50 - 1 = 49$  because L (50) is 50 times I (1).
  - We can not write LM to convey  $1000 - 50 = 950$  because M (1000) is 20 times L (50).

### Step 2

Based on the above rules, we may break the given number into easy repeating and non-repeating units of Roman numerals as  $10 + 10 + 10 + 9$ .

### Step 3

The roman numeral for 10 is X and 9 is IX, and since we know that to add two Roman numerals, we write the smaller numeral to the right of the larger numeral. So 39 is XXXIX.

## E) XXXVI

### Step 1

We should remember following basic rules to form Roman numerals:

- a. Repetition
    - i. Repetition of a Roman numeral means addition.
    - ii. Only I, X, C and M can be repeated.
    - iii. V, L and D can never be repeated.
    - iv. No numeral can be repeated more than three times.
  - b. Addition and Subtraction of numerals
    - i. A smaller numeral written to the right of a larger numeral is always added to the larger numeral.
    - ii. A smaller numeral written to the left of a larger numeral is always subtracted from the larger numeral.
    - iii. V, L and D are never subtracted.
    - iv. I can be subtracted from V and X.
    - v. X can be subtracted from L and C.
    - vi. When a smaller numeral is placed between two larger numerals, then it is always subtracted from the larger numeral immediately following it.
    - vii. Only a single symbol can be subtracted from another single symbol. Subtraction can not be done with groups of symbols.
    - viii. A symbol can not be subtracted from another one that is more than 10 times greater than it.
- For example:
- We can not write IL to convey  $50 - 1 = 49$  because L (50) is 50 times I (1).
  - We can not write LM to convey  $1000 - 50 = 950$  because M (1000) is 20 times L (50).

### Step 2

Based on the above rules, we may break the given number into easy repeating and non-repeating units of Roman numerals as  $10 + 10 + 10 + 6$ .

### Step 3

The roman numeral for 10 is X and 6 is VI, and since we know that to add two Roman numerals, we write the smaller numeral to the right of the larger numeral. So 36 is XXXVI.

### Step 1

We should remember following basic rules to form Roman numerals:

- a. Repetition
    - i. Repetition of a Roman numeral means addition.
    - ii. Only I, X, C and M can be repeated.
    - iii. V, L and D can never be repeated.
    - iv. No numeral can be repeated more than three times.
  - b. Addition and Subtraction of numerals
    - i. A smaller numeral written to the right of a larger numeral is always added to the larger numeral.
    - ii. A smaller numeral written to the left of a larger numeral is always subtracted from the larger numeral.
    - iii. V, L and D are never subtracted.
    - iv. I can be subtracted from V and X.
    - v. X can be subtracted from L and C.
    - vi. When a smaller numeral is placed between two larger numerals, then it is always subtracted from the larger numeral immediately following it.
    - vii. Only a single symbol can be subtracted from another single symbol. Subtraction can not be done with groups of symbols.
    - viii. A symbol can not be subtracted from another one that is more than 10 times greater than it.
- For example:
- We can not write IL to convey  $50 - 1 = 49$  because L (50) is 50 times I (1).
  - We can not write LM to convey  $1000 - 50 = 950$  because M (1000) is 20 times L (50).

### Step 2

Based on the above rules, we may break the given number into easy repeating and non-repeating units of Roman numerals as  $10 + 10 + 10 + 4$ .

### Step 3

The roman numeral for 10 is X and 4 is IV, and since we know that to add two Roman numerals, we write the smaller numeral to the right of the larger numeral. So 34 is XXXIV.

(2) **XLIV** (44)

**Step 1**

Let us first convert the roman numerals to numbers:

$$XXX = 30$$

$$XIV = 14$$

**Step 2**

Let us now add the numbers 30 and 14.

$$\Rightarrow 30 + 14 = 44$$

**Step 3**

Let us convert the number 44 back to roman numeral ,i.e., XLIV.

**Step 4**

Thus, the sum of the roman numerals XXX and XIV is **XLIV**.

(3) CCC meters

**Step 1**

There are XV workers, or  $XV = 15$  workers.

**Step 2**

Each worker can paint V meters of fence, or 5 meters of fence in one hour.

**Step 3**

In a period of 4 hours, the total meters of fence that can be painted by 15 workers will be  $15 \times 5 \times 4 = 300$  meters.

**Step 4**

300 can be written in the Roman form as CCC. Hence, the workers can paint a total of **CCC** meters over a period of 4 hours.

(4) XXIX

**Step 1**

The difference in their ages is  $38 - 9 = 29$  years.

**Step 2**

Now, we know that 29 can be written in Roman form as **XXIX**.

(5) LIV

**Step 1**

Trying to add Roman numerals directly can get tough. So let us first convert the given numerals to the Hindu-Arabic form: XXIII = 23, XIX = 19, and XII = 12.

**Step 2**

The sum of 23, 19, and 12 is 54.

**Step 3**

We find that the Roman numeral for 54 is LIV. Hence, we may conclude that the sum of XXIII, XIX, and XII is LIV.

(6) MMCCXXV

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### Step 1

We know that the number of days in the month of January is 31. Now let us write 31 in Roman numerals.

### Step 2

We should remember following basic rules to form Roman numerals:

#### a. Repetition

- i. Repetition of a Roman numeral means addition.
- ii. Only I, X, C and M can be repeated.
- iii. V, L and D can never be repeated.
- iv. No numeral can be repeated more than three times.

#### b. Addition and Subtraction of numerals

- i. A smaller numeral written to the right of a larger numeral is always added to the larger numeral.
- ii. A smaller numeral written to the left of a larger numeral is always subtracted from the larger numeral.
- iii. V, L and D are never subtracted.
- iv. I can be subtracted from V and X.
- v. X can be subtracted from L and C.
- vi. When a smaller numeral is placed between two larger numerals, then it is always subtracted from the larger numeral immediately following it.
- vii. Only a single symbol can be subtracted from another single symbol. Subtraction can not be done with groups of symbols.
- viii. A symbol can not be subtracted from another one that is more than 10 times greater than it.

For example:

- We can not write IL to convey  $50 - 1 = 49$  because L (50) is 50 times I (1).
- We can not write LM to convey  $1000 - 50 = 950$  because M (1000) is 20 times L (50).

### Step 3

Based on the above rules, we may break the given number into easy repeating and non-repeating units of Roman numerals as  $10 + 10 + 10 + 1$ .

### Step 4

The roman numeral for 10 is X and 1 is I, and since we know that to add two Roman numerals, we write the smaller numeral to the right of the larger numeral. So 31 is XXXI.

### Step 1

We know that 10 and 6 in roman numerals can be written as X and VI respectively. But since there is no method to multiply Roman numbers directly, let us multiply the given natural numbers and convert their product to Roman numerals.

### Step 2

The product of 10 and 6 is 60. Now let us write 60 in Roman numerals.

### Step 3

We should remember following basic rules to form Roman numerals:

a. Repetition

- i. Repetition of a Roman numeral means addition.
- ii. Only I, X, C and M can be repeated.
- iii. V, L and D can never be repeated.
- iv. No numeral can be repeated more than three times.

b. Addition and Subtraction of numerals

- i. A smaller numeral written to the right of a larger numeral is always added to the larger numeral.
- ii. A smaller numeral written to the left of a larger numeral is always subtracted from the larger numeral.
- iii. V, L and D are never subtracted.
- iv. I can be subtracted from V and X.
- v. X can be subtracted from L and C.
- vi. When a smaller numeral is placed between two larger numerals , then it is always subtracted from the larger numeral immediately following it.
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- viii. A symbol can not be subtracted from another one that is more than 10 times greater than it.

For example:

- We can not write IL to convey  $50 - 1 = 49$  because L (50 ) is 50 times I (1).
- We can not write LM to convey  $1000 - 50 = 950$  because M (1000) is 20 times L (50).

### Step 4

Since there is no direct Roman numeral for 60, and that any Roman numeral cannot be repeated more than three times, another possible way to 60 is  $50 + 10$ .

### Step 5

The roman numeral for 50 is L and 10 is X, and since we know that to add two Roman numerals, we write the smaller numeral to the right of the larger numeral. So 60 is LX.

(9) LXXV seconds

**Step 1**

First let us convert the given Roman numerals into number forms.

**Step 2**

Vadim runs 100 meters in XV seconds, or  $XV = 15$  seconds.

**Step 3**

Karolina runs the second leg in XIX seconds, or  $XIX = 19$  seconds.

**Step 4**

Sofia runs the third leg in XXI seconds, or  $XXI = 21$  seconds.

**Step 5**

Adrian runs the final leg in XX seconds, or  $XX = 20$  seconds.

**Step 6**

The total time taken by them is  $15 + 19 + 21 + 20 = 75$  seconds.

**Step 7**

The above sum of 75 seconds can be written in Roman form as **LXXV seconds**.

(10) d. XXXI

**Step 1**

We know that the number of days in the month of March is 31. Now let us write 31 in Roman numerals.

**Step 2**

We should remember following basic rules to form Roman numerals:

a. Repetition

- i. Repetition of a Roman numeral means addition.
- ii. Only I, X, C and M can be repeated.
- iii. V, L and D can never be repeated.
- iv. No numeral can be repeated more than three times.

b. Addition and Subtraction of numerals

- i. A smaller numeral written to the right of a larger numeral is always added to the larger numeral.
- ii. A smaller numeral written to the left of a larger numeral is always subtracted from the larger numeral.
- iii. V, L and D are never subtracted.
- iv. I can be subtracted from V and X.
- v. X can be subtracted from L and C.
- vi. When a smaller numeral is placed between two larger numerals, then it is always subtracted from the larger numeral immediately following it.
- vii. Only a single symbol can be subtracted from another single symbol. Subtraction can not be done with groups of symbols.
- viii. A symbol can not be subtracted from another one that is more than 10 times greater than it.

For example:

- We can not write IL to convey  $50 - 1 = 49$  because L (50) is 50 times I (1).
- We can not write LM to convey  $1000 - 50 = 950$  because M (1000) is 20 times L (50).

**Step 3**

Based on the above rules, we may break the given number into easy repeating and non-repeating units of Roman numerals as  $10 + 10 + 10 + 1$ .

**Step 4**

The roman numeral for 10 is X and 1 is I, and since we know that to add two Roman numerals, we write the smaller numeral to the right of the larger numeral. So 31 is XXXI.

(11) **b.** XVIII = 19

**Step 1**

In Roman Number system, we know that **XL** is equal to 40, **VI** is equal to 6, and **XXI** is equal to 21. But **XVIII** is equal to 18.

**Step 2**

Thus, option **b.** is not correct.

(12) c. XXVI

### Step 1

We know that India's Republic Day is celebrated on 26 of January. We are basically being asked to convert 26 into Roman numeral. Now let us write 26 in Roman numerals.

### Step 2

We should remember following basic rules to form Roman numerals:

a. Repetition

- i. Repetition of a Roman numeral means addition.
- ii. Only I, X, C and M can be repeated.
- iii. V, L and D can never be repeated.
- iv. No numeral can be repeated more than three times.

b. Addition and Subtraction of numerals

- i. A smaller numeral written to the right of a larger numeral is always added to the larger numeral.
- ii. A smaller numeral written to the left of a larger numeral is always subtracted from the larger numeral.
- iii. V, L and D are never subtracted.
- iv. I can be subtracted from V and X.
- v. X can be subtracted from L and C.
- vi. When a smaller numeral is placed between two larger numerals, then it is always subtracted from the larger numeral immediately following it.
- vii. Only a single symbol can be subtracted from another single symbol. Subtraction can not be done with groups of symbols.
- viii. A symbol can not be subtracted from another one that is more than 10 times greater than it.

For example:

- We can not write IL to convey  $50 - 1 = 49$  because L (50) is 50 times I (1).
- We can not write LM to convey  $1000 - 50 = 950$  because M (1000) is 20 times L (50).

### Step 3

Based on the above rules, we may break the given number into easy repeating and non-repeating units of Roman numerals as  $10 + 10 + 6$ .

### Step 4

The roman numeral for 10 is X and 6 is VI, and since we know that to add two Roman numerals, we write the smaller numeral to the right of the larger numeral. So 26 is XXVI.

(13) A) 32

B) 5

C) 24

D) 4

E) 31

F) 17

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**Step 1**

We know that 7 and 6 in roman numerals can be written as VII and VI respectively. But since there is no method to multiply Roman numbers directly, let us multiply the given natural numbers and convert their product to Roman numerals.

**Step 2**

The product of 7 and 6 is 42. Now let us write 42 in Roman numerals.

**Step 3**

We should remember following basic rules to form Roman numerals:

- a. Repetition
  - i. Repetition of a Roman numeral means addition.
  - ii. Only I, X, C and M can be repeated.
  - iii. V, L and D can never be repeated.
  - iv. No numeral can be repeated more than three times.
- b. Addition and Subtraction of numerals
  - i. A smaller numeral written to the right of a larger numeral is always added to the larger numeral.
  - ii. A smaller numeral written to the left of a larger numeral is always subtracted from the larger numeral.
  - iii. V, L and D are never subtracted.
  - iv. I can be subtracted from V and X.
  - v. X can be subtracted from L and C.
  - vi. When a smaller numeral is placed between two larger numerals, then it is always subtracted from the larger numeral immediately following it.
  - vii. Only a single symbol can be subtracted from another single symbol. Subtraction can not be done with groups of symbols.
  - viii. A symbol can not be subtracted from another one that is more than 10 times greater than it.

For example:

- We can not write IL to convey  $50 - 1 = 49$  because L (50) is 50 times I (1).
- We can not write LM to convey  $1000 - 50 = 950$  because M (1000) is 20 times L (50).

**Step 4**

Based on the above rules, we may break the given number into easy repeating and non-repeating units of Roman numerals as  $50 - 10 + 2$ .

**Step 5**

The roman numeral for 50 is L, 10 is X and 2 is II, and since we know that to add two Roman numerals, we write the smaller numeral to the right of the larger numeral and to subtract two roman numerals, we write the smaller numeral to the left of the larger numeral. So 42 is XLII.

**B)** 46

**C)** 59

**D)** 88

**E)** 69

**F)** 84

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