

NCERT Class 11 Mathematics Chapter 2 – Relations and Functions Exercise 2.3 Solutions

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1. Which of the following relations are functions? Give reasons. If it is a function, determine its domain and range.

(i) $\{(2,1), (5,1), (8,1), (11,1), (14,1), (17,1)\}$

As every first element in the ordered pairs $(2,1), (5,1), (8,1), (11,1), (14,1), (17,1)$ is mapped uniquely to other numbers that's why relation $\{(2,1), (5,1), (8,1), (11,1), (14,1), (17,1)\}$ is a Function.

Domain = Set of first components of the ordered pairs

Domain = $\{2, 5, 8, 11, 14, 17\}$

Range = Set of second components of the ordered pairs

Range = $\{1\}$

(ii) $\{(2,1), (4,2), (6,3), (8,4), (10,5), (12,6), (14,7)\}$

As every first element in the ordered pairs $(2,1), (4,2), (6,3), (8,4), (10,5), (12,6), (14,7)$ is mapped uniquely to other numbers that's why relation $\{(2,1), (4,2), (6,3), (8,4), (10,5), (12,6), (14,7)\}$ is a

Function.

Domain = Set of first components of the ordered pairs

Domain = {2, 4, 6, 8, 10, 12, 14}

Range = Set of second components of the ordered pairs

Range = {1, 2, 3, 4, 5, 6, 7}

(iii) {(1,3), (1,5), (2,5)}

As element 1 is mapped to both of 3, 5 thus {(1,3), (1,5), (2,5)} is not a Function.

So as its not a function hence it does not have a domain or range.

2. Find the domain and range of the following real functions:

(i) $f(x) = -x$

Domain of $f(x) = -x$ is whole set of Real Numbers \mathbb{R}

Range of $f(x) = -x$ is $(-\infty, 0]$

(ii) $f(x) = \text{Square Root of } 9 - x^2$

Domain of $f(x) = \text{Square Root of } 9 - x^2$ is $[-3, 3]$

Range of $f(x) = \text{Square Root of } 9 - x^2$ is $[0, 3]$

3. A function f is defined by $f(x) = 2x - 5$

Write down the values of

(i) $f(0)$

$$f(0) = 2 \times 0 - 5 = 0 - 5 = -5$$

$$f(0) = -5$$

(ii) $f(7)$

$$f(7) = 2 \times 7 - 5 = 14 - 5 = 9$$

$$f(7) = 9$$

(iii) $f(-3)$

$$f(-3) = 2 \times (-3) - 5 = -6 - 5 = -11$$

$$f(-3) = -11$$

4. The function 't' which maps temperature in degree Celsius into temperature in degree Fahrenheit is defined by $t(C) = 9C/5 + 32$

Find

(i) $t(0)$

$$t(0) = 2 \times 0/5 + 32 = 0 + 32 = 32$$

$$t(0) = 32$$

(ii) $t(28)$

$$t(28) = 2 \times 28/5 + 32 = 56/5 + 32 = 11.2 + 32 = 43.2$$

(iii) $t(-10)$

$$t(-10) = 2 \times (-10)/5 + 32 = 2 \times -2 + 32 = -4 + 32 = 28$$

$$t(-10) = 28$$

(iv) The value of C, when $t(C) = 212$

As per question

$$t(C) = 9C/5 + 32$$

Replacing $t(C) = 212$

$$212 = 9C/5 + 32$$

$$212 - 32 = 9C/5$$

$$18 = 9C/5$$

$$18 \times 5 = 9C$$

$$(18 \times 5)/9 = C$$

$$2 \times 5 = C$$

$$C = 10$$

Thus if $t(C) = 212$ then value of $C = 10$

5. Find the range of each of the following functions.

(i) $f(x) = 2 - 3x$, $x \in \mathbf{R}$, $x > 0$

Let $f(x) = y = 2 - 3x$ where $x \in \mathbf{R}$ and $x > 0$

$$y = 2 - 3x$$

$$3x = 2 - y$$

$$x = (2 - y)/3$$

As per question its given that $x > 0$

Then

$$(2 - y)/3 > 0$$

$$2 - y > 0$$

$$-y > -2$$

Multiplying both sides of above in-equation by -1

$$-1 \times -y > -1 \times -2$$

$$y < 2$$

Thus range of $f(x) = 2 - 3x$, $x \in \mathbb{R}$, $x > 0$ is $y < 2$

(ii) $f(x) = x^2 + 2$, x is a real number

Let $f(x) = y = x^2 + 2$ where x is a real number

$$y = x^2 + 2$$

$$y - 2 = x^2$$

$$x = \pm \text{Square Root of } (y - 2)$$

Because x is a Real Number

$$y - 2 \geq 0$$

$$\Rightarrow y \geq 2$$

Thus Range of $f(x) = x^2 + 2$, x is a real number is $[2, \infty)$

(iii) $f(x) = x$, x is a real number

Let $f(x) = x$ where $x \in \mathbb{R}$

Hence Range of $f(x) = x$ will also be \mathbb{R}
