

Relations and Functions: math test solutions, Grade 9 – download the PDF

Test solutions with the detailed point scale. Add up your points and spot what to review.

Suggested time: 45 minutes. Out of 20 points. Calculator allowed only when the problem says so.

1 Relations

/ 4 pts

- a. Domain $\{0, 1, 2, 5\}$; range $\{-3, 4, 6\}$. (1 pt)
- b. Yes: every input appears once. (1 pt)
- c. The inputs **0** and **2**. (1 pt)
- d. For example replace $(5, -3)$ by $(0, -3)$: the input **0** then has the outputs **6** and **-3**. (1 pt)

2 Function notation

/ 4 pts

- a. $f(3) = -6 + 9 = 3$. (1 pt)
- b. $f(-4) = 8 + 9 = 17$. (1 pt)
- c. $-2x + 9 = 1$, $-2x = -8$, $x = 4$. (1 pt)
- d. $-2x + 9 = -5$, $-2x = -14$, $x = 7$. (1 pt)

3 Reading a graph

/ 4 pts

- a. $h(2) = -4 + 8 = 4$, the top of the curve. (1 pt)
- b. $h(x) = 0$ at $x = 0$ and $x = 4$. (1 pt)
- c. $h(1) = 3$ and $h(3) = -9 + 12 = 3$, so $x = 1$ and $x = 3$. (1 pt)
- d. The highest value is 4. The ends give $h(-1) = -5$ and $h(5) = -5$, the lowest values. The range is $-5 \leq y \leq 4$. (1 pt)

4 Table and rule

/ 3 pts

- a. Domain $\{0, 2, 4, 6\}$; range $\{1, 7, 13, 19\}$. (1 pt)
- b. When x goes up by 2, $f(x)$ goes up by 6: the slope is 3, and $f(0) = 1$. So $f(x) = 3x + 1$. (1 pt)
- c. $f(15) = 45 + 1 = 46$. (1 pt)

5 Arithmetic sequence

/ 3 pts

- a. $d = 8 - 11 = -3$, and $a_n = 11 - 3(n - 1) = 14 - 3n$. (1 pt)
- b. $a_9 = 14 - 27 = -13$. (1 pt)
- c. $14 - 3n < 0$ gives $n > 4.67$, so $n = 5$ and $a_5 = -1$ (while $a_4 = 2$). (1 pt)

6

Gym membership

/ 2 pts

- a. $C(m) = 12m + 25$; $C(8) = 96 + 25 = 121$ dollars. (1 pt)
- b. $12m + 25 \leq 200$ gives $m \leq 14.58$, so **14 months**. Check: $C(14) = 193$ and $C(15) = 205$. (1 pt)

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