## Quantitative Skills \& Reasoning - Math 1001

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## Functions

A function is a rule or correspondence that assigns to each element of a set (called the domain) exactly one element of a second set (called the range).

A function may be defined by a set of ordered pairs, a diagram, a table, a graph, an equation, or a verbal description.

The set of all first elements of the function, or the inputs, is called the domain. The variable representing elements in the domain is called the independent variable.

The range is the set of all second elements of the function, or the outputs. The dependent variable is the variable representing elements in the range.

## INPUT x Domain



## Must Pass Vertical Line Test



If a nonvertical line passes through the points $P\left(x_{1}, y_{1}\right)$ and $Q\left(x_{2}, y_{2}\right)$,
Its slope is found using the formula

$$
m=\frac{y_{2}-y_{1}}{x_{2}-x_{1}}
$$

The equation of the line with slope $m$ and passing through a known point $\left(x_{1}, y_{1}\right)$ is $y-y_{1}=m\left(x-x_{1}\right)$

Find the equation for the linear function that passes through the points $(-4,-6)$ and $(8,3)$. Answers must use whole numbers and/or fractions, not decimals.

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$$
y=\frac{3}{4} x-3
$$

In Exercises 11-20, find the slope-intercept form of the line which passes through the given points.
11. $P(0,0), Q(-3,5)$
13. $P(5,0), Q(0,-8)$
15. $P(-1,5), Q(7,5)$
17. $P\left(\frac{1}{2}, \frac{3}{4}\right), Q\left(\frac{5}{2},-\frac{7}{4}\right)$
19. $P(\sqrt{2},-\sqrt{2}), Q(-\sqrt{2}, \sqrt{2})$
12. $P(-1,-2), Q(3,-2)$
14. $P(3,-5), Q(7,4)$
16. $P(4,-8), Q(5,-8)$
18. $P\left(\frac{2}{3}, \frac{7}{2}\right), Q\left(-\frac{1}{3}, \frac{3}{2}\right)$
20. $P(-\sqrt{3},-1), Q(\sqrt{3}, 1)$
17. $y=-\frac{5}{4} x+\frac{11}{8}$
18. $y=2 x+\frac{13}{6}$

A salesperson is paid $\$ 200$ per week plus $5 \%$ commission on her weekly sales of $x$ dollars. Find a linear function that represents her total weekly pay, $W$ (in dollars) in terms of $x$. What must her weekly sales be in order for her to earn $\$ 475.00$ for the week?

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32. $W(x)=200+.05 x, x \geq 0$ She must make $\$ 5500$ in weekly sales.

An on-demand publisher charges $\$ 22.50$ to print a 600 page book and $\$ 15.50$ to print a 400 page book. Find a linear function which models the cost of a book $C$ as a function of the number of pages $p$. Interpret the slope of the linear function and find and interpret $C(0)$.

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33. $C(p)=0.035 p+1.5$ The slope 0.035 means it costs 3.5 ¢ per page. $C(0)=1.5$ means there is a fixed, or start-up, cost of $\$ 1.50$ to make each book.

The amount of radiation in a 1 kg sample of Plutonium loses $33 \%$ of its radioactivity every 500 years.
The function is a) linear b) Exponential decay (decrease) c)neither

The population of a town ( 10,000 in 2018 ) is decreasing by 100 people per year.
The function is
a) linear
b) Exponential decay (decrease)
c) neither

Write an equation for $\mathrm{P}(\mathrm{t})$ where t is the years past 2018

A rock is thrown upward from the top of a 112-foot high cliff overlooking the ocean at a speed of 96 feet per second. The rock's height above ocean can be modeled by the equation
$H(t)=-16 t^{2}+96 t+112$.
a. When does the rock reach the maximum height?
b. What is the maximum height of the rock?
c. When does the rock hit the ocean?

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f(x)=-x^{2}+4 x+3
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$2+\sqrt{7}, \quad 2-\sqrt{7}$

Flu in a very bad year increased at the rate of $50 \%$ per month. In the first month, there were 100 cases. How many cases after 6 months?

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$\$ 1,636,654$

