

Building Functions from Real Situations

Grade 9 – Algebra 1 math · Worksheet · Standards: F-BF.A.1a, F-BF.A.1b, F-BF.B.4a, F-LE.A.1b

Name: _____ Date: _____ Class: _____

These 20 problems train standards F-BF.A.1, F-BF.B.4a and F-LE.A.1b. The first problems write explicit and recursive rules and spot constant rates. Later problems add, subtract and multiply functions and find inverses of linear functions.

The last six problems model profit, savings, taxi fares and a leaking tank.

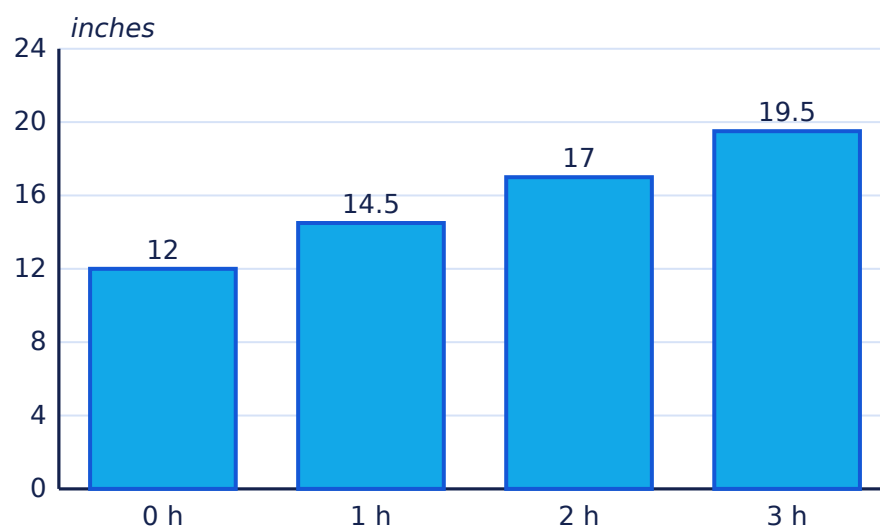
Standards: F-BF.A.1a, F-BF.A.1b, F-BF.B.4a, F-LE.A.1b · **Level:** Grade 9 Algebra 1

Problem 1 Gym Membership Rule (easy)

A gym charges a \$30 sign-up fee and \$18 per month. Write a function $M(t)$ for the total cost after t months and find $M(6)$.

Problem 2 Rising Pool Level (easy)

A pool has 12 inches of water, and the depth rises 2.5 inches every hour. Write a recursive rule and an explicit rule for the depth D after n hours, and find $D(3)$.



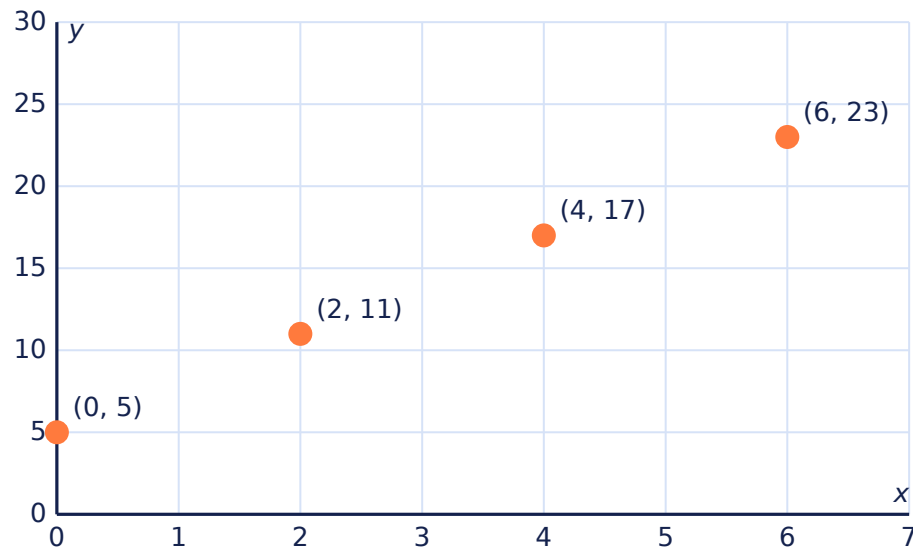
Pool depth each hour.

Problem 3 Steps to a Taxi Fare (easy)

To find a fare, multiply the miles by \$2.75 and then add \$4. Write the rule as a function $C(m)$ and find the fare for 8 miles.

Problem 4 Constant Rate in a Table (easy)

The points $(0, 5)$, $(2, 11)$, $(4, 17)$ and $(6, 23)$ come from a table. Show that the rate of change is constant per unit and write the function.



The points of the table.

Problem 5 Add Two Functions (easy)

Let $f(x) = 5x - 3$ and $g(x) = x^2 + 4$. Find $(f + g)(x)$ and $(f + g)(3)$.

Problem 6 Subtract Two Functions (easy)

Use $f(x) = 5x - 3$ and $g(x) = x^2 + 4$ again. Find $(f - g)(x)$ and $(f - g)(3)$.

Problem 7 Multiply Two Functions (medium)

Let $f(x) = x + 7$ and $g(x) = 2x - 5$. Find $(f \cdot g)(x)$ and $(f \cdot g)(2)$.

Problem 8 Profit from Revenue and Cost (medium)

A school store sells x hoodies. Revenue is $R(x) = 14x$ and cost is $C(x) = 210 + 6x$. Write the profit $P(x)$, find the profit for 40 hoodies and find the least whole number of hoodies that gives a profit.

Problem 9 Inverse of a Linear Function (medium)

Find the inverse of $f(x) = 4x - 7$ and check it at $x = 2$.

Problem 10 Inverse with a Negative Slope (medium)

Undo the rule $f(x) = -2x + 10$ by writing its inverse function.

Problem 11 Solve $f(x) = c$ (medium)

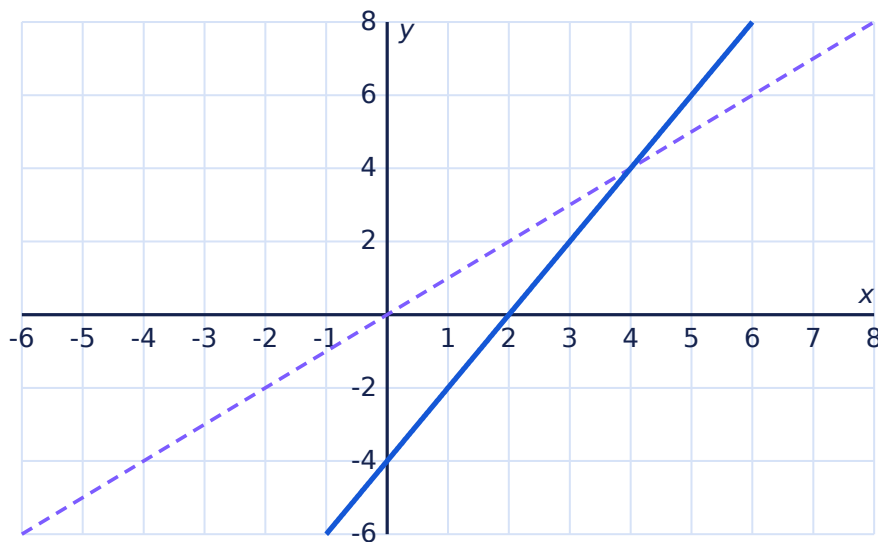
For $f(x) = 5x + 12$, find the input x for which $f(x) = 47$.

Problem 12 Convert Temperatures (medium)

The Fahrenheit temperature is $F = \frac{9}{5}C + 32$. Write C as a function of F , then convert 77°F and 14°F to Celsius.

Problem 13 Reflect a Graph (medium)

The graph shows $f(x) = 2x - 4$ and the dashed line $y = x$. Two points of f are $(0, -4)$ and $(2, 0)$. Give the matching points of f^{-1} and write its equation.



The line f and the mirror line $y = x$.

Problem 14 Area and Perimeter Rules (medium)

A rectangle has length $3x + 2$ and width $x + 5$. Write functions for its area $A(x)$ and perimeter $P(x)$.

Problem 15 Savings Plan, Recursive to Explicit (hard)

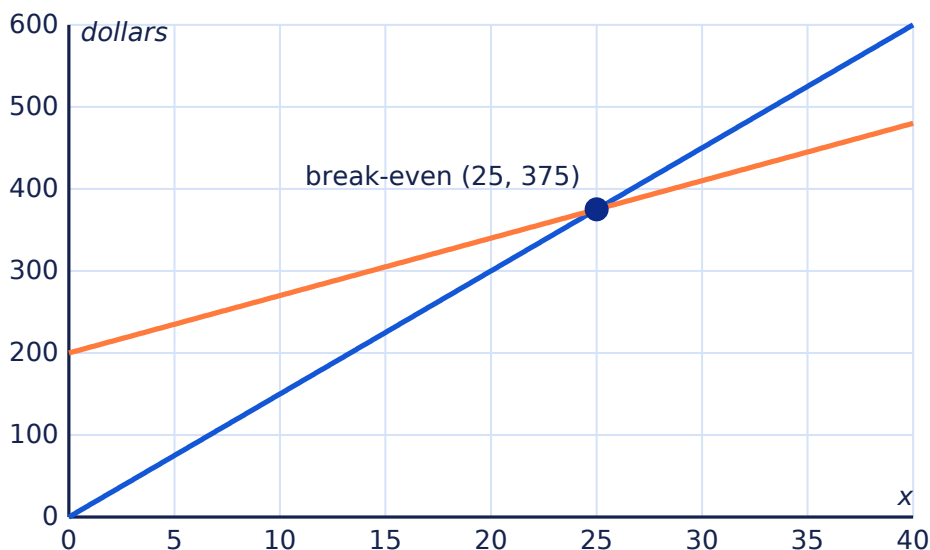
A savings account follows $S(0) = 250$ and $S(n) = S(n - 1) + 45$, where n counts months. Write the explicit rule and find the first month when the balance reaches at least \$1,000.

Problem 16 Unequal Steps, Same Rate (hard)

A table lists $x = 1, 3, 6, 10$ with $y = 14, 22, 34, 50$. Show that y changes at a constant rate per unit interval even though the x -steps are not equal, and write the function.

Problem 17 Break-Even Point (hard)

A club makes and sells x keychains. Revenue is $R(x) = 15x$ and cost is $C(x) = 200 + 7x$. The graph shows both. Write the profit function, find the break-even number of keychains and the profit for 40.



Revenue and cost meet at the break-even point.

Problem 18 Inverse in Context (hard)

A taxi fare is $C(m) = 2.75m + 4$ dollars for m miles. Write a function that gives the miles for a given fare, and use it to find the miles for fares of \$26 and \$15.

Problem 19 Discount Then Shipping (hard)

An online store takes 15% off the item price p and then adds \$8 shipping. Write the total $T(p)$, find its inverse, and use it to find the item price when the total is \$110.

Problem 20 Fill and Leak (hard)

A tank holds 20 gallons. A pump adds water at 8 gallons per hour while a leak removes 3 gallons per hour. Let $f(t) = 20 + 8t$ be the volume with the pump alone and $g(t) = 3t$ the volume lost. Find $V(t) = f(t) - g(t)$ and the time when the tank holds 100 gallons.