Quiz 1. *True/False*: $9/3 + 2(3^2 + 10) - 8 + 4 \cdot 3 = 45$

Solution. The statement is *false*. To see this, we can simply follow the order of operations—using PEMDAS as a guide:

$$9/3 + 2(3^2 + 10) - 8 + 4 \cdot 3 \overset{?}{=} 55$$
$$9/3 + 2(9 + 10) - 8 + 4 \cdot 3 \overset{?}{=} 55$$
$$9/3 + 2(19) - 8 + 4 \cdot 3 \overset{?}{=} 55$$
$$3 + 2(19) - 8 + 4 \cdot 3 \overset{?}{=} 55$$
$$3 + 38 - 8 + 4 \cdot 3 \overset{?}{=} 55$$
$$3 + 38 - 8 + 12 \overset{?}{=} 55$$
$$41 - 8 + 12 \overset{?}{=} 55$$
$$33 + 12 \overset{?}{=} 55$$
$$45 \neq 55$$

Quiz 2. *True/False*: $\gcd(2^3 \cdot 3 \cdot 5, 2 \cdot 3^2 \cdot 7) = 2^3 \cdot 3^2 \cdot 5 \cdot 7$.

Solution. The statement is *false*. Remember given a prime factorization of the numbers, we find the gcd by choosing the *smallest* powers of each prime that appears in the factorizations. So we should have $\gcd(2^3 \cdot 3 \cdot 5, 2 \cdot 3^2 \cdot 7) = 2 \cdot 3$. Instead, the largest power of each prime that appears in the factorizations was chosen which is how we compute the lcm. Therefore, we have $\text{lcm}(2^3 \cdot 3 \cdot 5, 2 \cdot 3^2 \cdot 7) = 2^3 \cdot 3^2 \cdot 5 \cdot 7$.

Quiz 3. *True/False*: $\dfrac{\frac{3}{10}}{\frac{12}{5}} = \dfrac{1}{8}$

Solution. The statement is *true*. Note that division by a nonzero number is the same as multiplying by its reciprocal. So we have

$$\frac{\frac{3}{10}}{\frac{12}{5}} = \frac{3}{10} \cdot \frac{5}{12} = \frac{\cancel{3}^1}{\cancel{10}^2} \cdot \frac{\cancel{5}^1}{\cancel{12}^4} = \frac{1}{8}$$

One can also rewrite the problem as...

$$\frac{\frac{3}{10}}{\frac{12}{5}} = \frac{3}{10} \div \frac{12}{5}$$

But then to divide, we multiply by the reciprocal and proceed as in the solution above.

Quiz 4. *True/False*: The number $0.\overline{19}$ is rational.

Solution. The statement is *true*. Any real number with a decimal expansion that either terminates or repeats is a rational and hence can be expressed as a/b, where a and b are integers and $b \neq 0$. Moreover, every rational number, i.e. the a/b's, have a decimal expansion that either terminates or repeats. We can even find a rational expression for $0.\overline{19}$:

$$
\begin{array}{rcc}
100r & = & 19.191919191919\ldots \\
- \quad r & = & 0.191919191919\ldots \\
\hline
99r & = & 19
\end{array}
$$

But then $r = 0.\overline{19} = \dfrac{19}{99}$.

Quiz 5. *True/False*: $\sqrt[3]{2^8 \cdot 3^3 \cdot 5^1 \cdot 7^5} = 2^2 \cdot 3^1 \cdot 7\sqrt[3]{2^2 \cdot 5^1 \cdot 7^2}$

Solution. The statement is *true*. There are two ways to think about this. First, we should write out the numbers and group them into threes and pull out/leave the terms appropriately:

$$\sqrt[3]{2^8 \cdot 3^3 \cdot 5^1 \cdot 7^5} = \sqrt[3]{\underline{2 \cdot 2 \cdot 2} \cdot \underline{2 \cdot 2 \cdot 2} \cdot 2 \cdot 2 \cdot \underline{3 \cdot 3 \cdot 3} \cdot 5 \cdot \underline{7 \cdot 7 \cdot 7} \cdot 7 \cdot 7} = 2^2 \cdot 3^1 \cdot 7\sqrt[3]{2^2 \cdot 5 \cdot 7^2}$$

Alternatively, we can use division. We know that $8/3$ is 2 with remainder 2, $3/3$ is 1 with remainder 0, $1/3$ is 0 with remainder 1, and $5/3$ is 1 with remainder 2. So we can pull out two 3's with 2 remaining, one 3 with 0 remaining, no 5's with 1 remaining, and two 7's with 2 remaining, which gives:

$$\sqrt[3]{2^8 \cdot 3^3 \cdot 5^1 \cdot 7^5} = 2^2 \cdot 3^1 \cdot 7\sqrt[3]{2^2 \cdot 5^1 \cdot 7^2}$$

Quiz 6. *True/False*: 57 increased by 127% is $57(1.27)$.

Solution. The statement is *false*. To find 127% of 57, we would multiply 57 by the percent written as a decimal. This would be $57(1.27)$. However, to increase or decrease a number by a percentage, we compute the number $\#(1\pm\%)$, where we add if we are increasing, subtract if we are decreasing, $\#$ is the number, and % is the percentage written as a decimal. So to increase 57 by 127%, we need to compute $57(1 + 1.27) = 57(2.27)$.

Quiz 7. *True/False*: If $f(x) = x + 1$ and $g(x) = x^2$, then $(f \circ g)(2) = 9$.

Solution. The statement is *false*. Recall that $(f \circ g)(2) = f(g(2))$. First, we compute $g(2)$. We have $g(2) = 2^2 = 4$. Then we have $f(g(2)) = f(4)$ and we compute $f(4)$: $f(4) = 4 + 1 = 5$.

Quiz 8. *True/False*: The point $(1, 3)$ is on the graph of $f(x) = 2x - 5$.

Solution. The statement is *false*. We have the point $(x, y) = (1, 3)$. If this point is on the graph of $f(x)$, then these x and y satisfy the equation for $f(x)$. We can check this:

$$f(x) = 2x - 5$$
$$3 = 2(2) - 5$$
$$3 = 4 - 5$$
$$3 \neq -1$$

Therefore, the point $(1, 3)$ is not on the graph of $f(x)$. Alternatively, if $x = 1$, then the corresponding point on the graph of $f(x)$ would have y-value $f(1) = 2(1) - 5 = 2 - 5 = -3$. Then the point $(1, -3)$ is on the graph of $f(x)$. But then $(1, 3)$ is not on the graph of $f(x)$.

Quiz 9. *True/False*: If $f^{-1}(3) = 9$, then $f(3) = 9$.

Solution. The statement is *false*. Recall that $f^{-1}(y) = x$ if and only if $f(x) = y$; that is, f^{-1} asks the question, 'what do I plug into f to get this number.' So if $f^{-1}(3) = 9$, this means we should be able to plug in 9 into $f(x)$ and obtain 3, i.e. $f(9) = 3$. But then $f(3) = 9$ is not necessarily true.

Quiz 10. *True/False*: To find the x-intercept, you find $f(0)$.

Solution. The statement is *false*. Recall that an x-intercept is where a function intersects the x-axis. But then the y-value must be zero. But then because $y = f(x)$, we have $f(x) = 0$. Whereas if we wanted to find a y-intercept, we would recall that along the x-axis, $x = 0$ so that we would need to find $f(0)$. So finding x-intercepts involves solving $f(x) = 0$, whereas finding y-intercepts involves evaluating $f(0)$.

Quiz 11. *True/False*: The lines $y = \frac{2}{3}x + 5$ and $3x + 2y = -6$ are perpendicular.

Solution. The statement is *true*. The line $y = \frac{2}{3}x + 5$ has slope $m = \frac{2}{3}$. Solving for y in the second line, we have $y = -3 - \frac{3}{2}x$. This line has slope $m = -\frac{3}{2}$. The negative reciprocal of $\frac{2}{3}$ is $-\frac{3}{2}$. Therefore, the lines are perpendicular.

Quiz 12. All lines perpendicular to $y = 4$ are of the form $x = \#$.

Solution. The statement is *true*. The line $y = 4$ is horizontal. For a line to be perpendicular to a horizontal line, the line must be vertical. But all vertical lines are of the form $x = \#$.

Quiz 13. *True/False*: Any line with slope 0 must be of the form $y = \#$.

Solution. The statement is *true*. All vertical lines 'look like' $y = mx + b$ for some m, b. If the slope is 0, then $m = 0$. But then $y = \#$.

Quiz 14. *True/False*: All functions have inverses.

Solution. The statement is *false*. All constant functions, i.e. $f(x) = \#$, do not have inverses. Constant functions are functions—every input has exactly one output (even if they all happen to be the same). However, you cannot 'tell' what x gave you $\#$. Alternatively, $f(x) = \#$ fails the horizontal line test. [Recall that a function has an inverse if and only if it passes the horizontal line test.]