Quiz 1. *True/False*: The number 1 is prime.

Solution. The statement is *false*. A prime number is an integer greater than 1 that can only be factored as the product of one and itself. So for example, the integer 11 is prime because we can only factor 11 as $11 = 1 \cdot 11$. However, the integer 12 is not prime because we can write $12 = 2 \cdot 6$, neither of which are 1 or 12.

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 $\mathrm{lcm}(2^3 \cdot 3 \cdot 5, 2 \cdot 3^2 \cdot 7) = 2^3 \cdot 3^2 \cdot 5 \cdot 7$.

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

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 4. *True/False*: 68 increased by 119% is $68(1.19)$.

Solution. The statement is *false*. To find 119% of 68, we would multiply 68 by the percent written as a decimal. This would be $68(1.19)$. 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 68 by 119%, we need to compute $68(1 + 1.19) = 68(2.19)$.

Quiz 5. *True/False*: If $f(x) = 3x + 5$ and $g(x) = 1 - 2x$, then $(f \circ g)(1) = 8$.

Solution. The statement is *false*. Recall that $(f \circ g)(1) = f(g(1))$. First, we compute $g(1)$: $g(1) = 1 - 2(1) = 1 - 2 = -1$. Then we need to compute $f(g(1)) = f(-1)$. We have $f(-1) = 3(-1) + 5 = -3 + 5 = 2$.

Quiz 6. *True/False*: The point $(1, -3)$ is on the graph of $f(x) = x - 3$.

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:

$$\begin{aligned} f(x) &= x - 3 \\ -3 &= 1 - 3 \\ -3 &\neq -2 \end{aligned}$$

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 $f(1) = 1 - 3 = -2$. Then the point $(1, -2)$ is on the graph of $f(x)$. But then $(1, -3)$ is not on the graph of $f(x)$.

Quiz 7. *True/False*: The graph of the solutions to $2x - 6y = 9$.

Solution. The statement is *true*. The graph of the set of solutions to an equation of the form $Ax + By = C$ is a line. Here we have $A = 2$, $B = -6$, and $C = 9$. Notice also we can solve for y:

$$\begin{aligned} 2x - 6y &= 9 \\ -6y &= -2x + 9 \\ y &= \frac{-2}{-6}\,x + \frac{9}{-6} \\ y &= \frac{1}{3}\,x - \frac{3}{2} \end{aligned}$$

The function $f(x) = \frac{1}{3}x - \frac{3}{2}$ is a linear function, whose graph must be a line.

Quiz 8. *True/False*: The line through $(-1, 5)$ with slope 3 is $y = 3x + 8$.

Solution. The statement is *true*. We know that the line contains the $(-1, 5)$ and has slope 3, i.e. $m = 3$. Then we have

$$\begin{aligned} y &= mx + b \\ y &= 3x + b \\ 5 &= 3(-1) + b \\ 5 &= -3 + b \\ b &= 8 \end{aligned}$$

Therefore, the equation of the line is $y = 3x + 8$.

Quiz 9. *True/False*: A function cannot have two y-intercepts.

Solution. The statement is *true*. If a function had two y-intercepts, then there would be two points on the graph of the function on the y-axis. But then the function would fail the vertical line test—which is impossible because it is a function.

Quiz 10. *True/False*: 47 increased by 16% is $47(0.16)$.

Solution. The statement is *false*. There are two ways to do this: first, we can use the percent increase/decrease formula; that is, if we want to increase/decrease a number by a percentage, we use the formula $\#(1 \pm \%)$, where $\#$ is the number, $\%$ is the percentage written as a decimal, and we choose $+$ if we are increasing the number and $-$ if we are decreasing the number. So in our case, we have $47(1+0.16) = 47(1.16)$. The other method is to find the amount of increase/decrease and then add/subtract this to our original number, respectively. We want to find 16% of 47, which is $47(0.16)$. Then we increase, i.e. add, this to our original number, so we have $47 + 47(0.16) = 47(1 + 0.16) = 47(1.16)$.

Quiz 11. *True/False*: The vertex of the quadratic function $y = (x + 2)^2 - 3$ is the point $(2, -3)$.

Solution. The statement is *false*. The x-coordinate of the vertex is the x-value that makes the square term zero. In this case, $x = -2$ would make $(x+2)^2$ zero. Then we would be left with $y = -3$, which is the y-coordinate of the vertex. Therefore, the vertex is $(-2, -3)$. Alternatively, the 'proper' vertex form of a quadratic function is $y = A(x - B) + C$. The vertex is (B, C). Writing the 'proper' vertex form of the quadratic function $y = (x+2)^2 - 3$, we have $y = (x- \ -2)^2 + (-3)$. Therefore, the vertex form is $(-2, -3)$. Finally, one could expand this out: $y = (x+2)^2 - 3 = (x^2+4x+4) - 3 = x^2+4x+1$. The x-coordinate of the vertex is $x = \frac{-b}{2a} = \frac{-4}{2(1)} = -2$. Then the y-coordinate of the vertex is $y(-2) = (-2)^2 + 4(-2) + 1 = 4 - 8 + 1 = -3$. Therefore, the vertex is $(-2, -3)$.

Quiz 12. *True/False*: $x^2 - 4x - 5 = (x + 1)(x - 5)$

Solution. The statement is *true*. One way of seeing this would be to expand $(x + 1)(x - 5)$,

$$(x + 1)(x - 5) = x^2 - 5x + x - 5 = x^2 - 4x - 5.$$

Alternatively, we can factor the polynomial $x^2 - 4x - 5$. First, we find the factors of 5, which are only $1, 5$. Because the 5 is negative, the factors must have opposite signs.

$$\begin{aligned} 1, -5&: \ -4 \\ -1, 5&: \quad\ 4 \end{aligned}$$

We want these signed factors to add to -4. Therefore, we want 'factors' $1, -5$. Therefore,

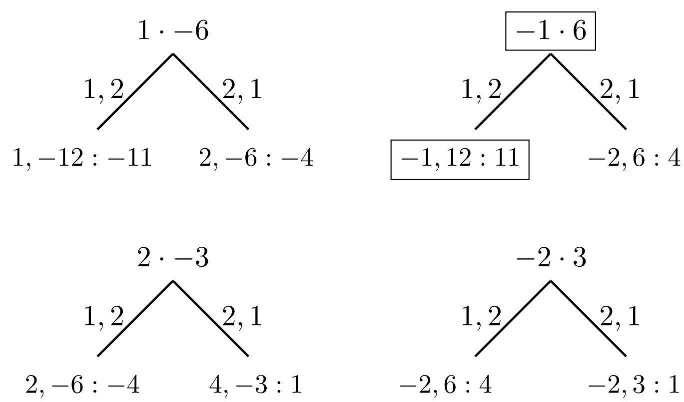
$$x^2 - 4x - 5 = (x + 1)(x - 5)$$

Quiz 13. *True/False*: $2x^2 + 11x - 6 = (2x - 1)(x + 6)$

Solution. The statement is *true*. There are two approaches: first, we can simply expand the right side and show that this is equal to the left side,

$$(2x - 1)(x + 6) = 2x^2 + 12x - x - 6 = 2x^2 + 11x - 6$$

Alternatively, we can factor the polynomial on the left side and show that it is the same as the given factorization of the right side,



Therefore,

$$2x^2 + 11x - 6 = (2x - 1)(x + 6)$$

Quiz 14. *True/False*: The vertical asymptotes of $f(x) = \dfrac{(x-1)(x+3)}{(x-1)(x+5)}$ are $x = 1$ and $x = -5$.

Solution. The statement is *false*. We first find the domain. The domain of a rational function is where the denominator is not 0. The denominator is 0 if $(x - 1)(x + 5) = 0$. But then $x - 1 = 0$, i.e. $x = 1$, or $x + 5 = 0$, i.e. $x = -5$. Therefore, the domain is all real numbers such that $x \neq -5, 1$. We can then cancel any common factors in the numerator and denominator. Then

$$\frac{(x-1)(x+3)}{(x-1)(x+5)} = \frac{\cancel{(x-1)}(x+3)}{\cancel{(x-1)}(x+5)} = \frac{x+3}{x+5}$$

The vertical asymptotes are then the values where the denominator vanishes in this reduced function. But then $x + 5 = 0$, i.e. $x = -5$. Therefore, the only vertical asymptote is $x = -5$.

Quiz 15. *True/False*: To add $\dfrac{5}{x+1}$ and $\dfrac{x}{(x+1)^2}$, one would use the common denominator of $x+1$.

Solution. The statement is *false*. The common denominator should be the least common multiple of the two denominators. The first expression has a single factor of $x + 1$, whereas the second expression has two factors of $x + 1$. Therefore, the least common denominator would be $(x + 1)^2$.

Quiz 16. *True/False*: There is no function with domain all reals and a vertical asymptote at $x = 1$.

Solution. The statement is *true*. Any x-value which corresponds to a vertical asymptote cannot be in the domain of the function. So if $x = 1$ were a vertical asymptote, then $x = 1$ is not in the domain for the function. But then the domain cannot be all real numbers.