

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

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

**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:

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

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:

$$f(x) = x - 3$$

$$-3 = 1 - 3$$

$$-3 \neq -2$$

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  $y$ :

$$2x - 6y = 9$$

$$-6y = -2x + 9$$

$$y = \frac{-2}{-6}x + \frac{9}{-6}$$

$$y = \frac{1}{3}x - \frac{3}{2}$$

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

$$y = mx + b$$

$$y = 3x + b$$

$$5 = 3(-1) + b$$

$$5 = -3 + b$$

$$b = 8$$

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  $y = A(x - B)^2 + C$ . 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.

$$\begin{array}{ll} 1, -5: & -4 \\ -1, 5: & 4 \end{array}$$

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

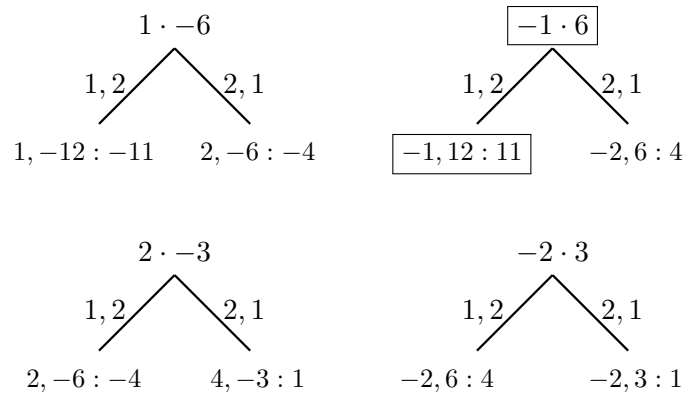
$$x^2 - 4x - 5 = (x + 1)(x - 5)$$

**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,

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