Workout 8

\$100.40	\$711.28
\$201.20	\$814.53
\$302.40	\$918.19
\$404.02	\$1022.26
\$506.03	\$1126.75n
\$608.45	\$1231.66

231. At the start of every month, Marte adds \$100 to the account. Then at the end of every month, the bank posts 0.4% interest on the balance. We can get the correct monthly balances if we repeatedly add 100 and then multiply the new sum by 1.004. The sequence of balances is shown here, assuming the bank rounds the interest amount to the nearest cent. At the end of one year, Marte will have **\$1231.66** in her account.

232. The horizontal distance between the two points is $4 - (-4) = 8$ units. The vertical distance is $2 - (-5) = 7$ units. These are the legs of a right triangle, so the distance, d, between the points can be found using the Pythagorean Theorem as follows: $d = \sqrt{8^2 + 7^2} = \sqrt{64 + 49} = \sqrt{113}$. Since $10^2 = 100$ and $11^2 = 121$, the value of $\sqrt{113}$ must be between 10 and 11. The desired sum is $10 + 11 =$ **21**.

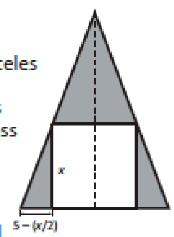
233. The decimal value of 8/81 is $0.\overline{098765432}$. If we were to write out 2007 digits, we would have 223 complete sets of the nine digits in the pattern. The 2012th digit must be the fifth digit in the pattern, which is 6.

234. Tito wants to pay 20% of the bill as a tip and he has to pay 6% of the bill in taxes, so he will pay an extra 26% of the bill. We can get the total amount he will pay by multiplying the bill by 1.26, which is $1.26 \times \$19.50 =$ **\$24.57**.

235. In the game of Krypto, there are $3 \times 10 = 30$ cards from 1 to 10, $2 \times 7 = 14$ cards from 11 to 17 and $1 \times 8 = 8$ cards from 18 to 25. That's $30 + 14 + 8 = 52$ cards in all. Since there are 30 cards containing a number from 1 to 10, the probability that the first card selected at random is 10 or less is 30/52. Then the probability that the second randomly selected card will be 10 or less is 29/51, and so forth. So the probability that five cards selected randomly are 10 or less is $(30/52) \times (29/51) \times (28/50) \times (27/49) \times (26/48) \approx$ **0.055**.

236. Subtracting $2\sqrt{x}$ from each side yields $3\sqrt{x} - 30 = 54$. Then we can add 30 to each side to get $3\sqrt{x} = 84$. Once we divide each side by 3, we are left with $\sqrt{x} = 28$. If we square each side of the equation, we see that $x =$ **784**.

237. Since the ratio of the dimensions of the rectangular prism is 1:2:3 and the shortest edge is 2 ft, the dimensions must be 2 ft, 4 ft and 6 ft. The longest distance between any two vertices in the prism is the space diagonal, which can be the hypotenuse of a right triangle whose short leg has length 4 ft. The long leg is the diagonal of a 2-by-6 rectangle and has a length of $\sqrt{6^2 + 2^2} = \sqrt{40}$. That means the space diagonal has length $\sqrt{[\sqrt{40}]^2 + 4^2} = \sqrt{40 + 16} = \sqrt{56} =$ **7.48** ft.



238. If we "drop a perpendicular" from the vertex angle of the triangle, it will intersect the base at its midpoint, dividing the isosceles triangle into two congruent right triangles. Each of these two triangles is a 5-12-13 right triangle. The area of the entire isosceles triangle is $(1/2) \times 10 \times 12 = 60$ cm². Let's say that the side length of the square is x units. Then the small right triangle on the left is similar to the 5-12-13 triangle and has leg lengths of x and $5 - x/2$. We can set up the following proportion: $(5 - x/2)/x = 5/12$. Cross multiplying yields the equation $60 - 6x = 5x$. So $60 = 11x$, and $x = 60/11$. Thus, the area of the square is $(60/11)^2 = 3600/121$ cm². Subtracting this area from the area of the entire triangle, we get $60 - 3600/121 = 7260/121 - 3600/121 = 3660/121 =$ **30.25** cm².

239. If we multiply both sides of the equation by $x + 1$, we get $x^2 + ax + 6 = x^2 + (b + 1)x + b$. For these two expressions to be equal, we must have $b = 6$ and $a = b + 1 = 6 + 1 = 7$. The value of $6a - 7b$ is $6 \times 7 - 7 \times 6 = 42 - 42 =$ **0**.

240. Initially the ladder forms a 45-45-90 right triangle. The ladder is the hypotenuse with length 6 ft, and the floor and wall are the two congruent legs of the right triangle. Using properties of 45-45-90 triangles, we see that the top of the ladder rests against the wall at a distance of $6/\sqrt{2} = 3\sqrt{2}$ ft above the floor. This is also the distance from the base of the ladder to the wall. When this distance is decreased by 2/3, the new distance from the base of the ladder to the wall is $3\sqrt{2}/3 = \sqrt{2}$. Using the Pythagorean Theorem, we see that the top of the ladder now rests $\sqrt{6^2 - (\sqrt{2})^2} = \sqrt{36 - 2} = \sqrt{34}$ ft from the floor. Thus, the top of the ladder has moved farther up the wall a distance of $\sqrt{34} - 3\sqrt{2} =$ **1.59** ft.