Workout 1

171. _____ If three fair coins are simultaneously flipped, what is the probability that exactly two heads will be showing? Express your answer as a fraction in simplest form.

172. _____ m/s^2 An Euler Airline flight is getting ready to take off. Gary McDonald, the pilot, starts from rest at the edge of the runway. He needs to accelerate to a speed of 300 km/h in 30 seconds. Acceleration is defined as the change in speed per unit time. What is Gary's average acceleration, in meters per second per second, which is equivalent to meters per second squared, during takeoff? Express your answer as a decimal to the nearest tenth.

173. _____ pounds An object's weight on a planet is directly proportional to the mass of that planet and inversely proportional to the square of the radius of the planet. Jupiter is 318 times as massive as Earth and has a radius 11 times as large as that of Earth. If Gordon weighs 100 pounds on Earth, how many pounds would he weigh on Jupiter? Express your answer to the nearest whole number.

174. _____ million dollars The 1998 film *Armageddon* had a production budget of $140 million. The domestic box office gross was about $200 million, and the international box office gross was about $350 million. The studio considers a film a financial success if the worldwide (domestic plus international) gross is at least double the sum of the production budget and the advertising budget. In millions of dollars, what was the greatest advertising budget the film could have had to be considered a financial success? Express your answer to the nearest whole number.

175. _____ days What is the mean number of days per month among all months in the year 2018? Express your answer as a decimal to the nearest tenth.

176. _____ If $A = x^2 - 2x + 6$ and $B = \frac{5x^2 - 1}{x + 3}$, what is $A + B$ if $x = -2$?

177. _____ cm What is the height of a cone with a volume of 1187.5 cm^3 and a base of diameter 18 cm? Express your answer to the nearest whole number.

178. _____ degrees What is the degree measure of each interior angle of a regular decagon?

179. $ _____ Elliott's stock portfolio was valued at $5000 on January 1. Its value decreased by 20% during January but then increased by 25% during February. What was the value of his stock portfolio at the end of February?

180. _____ hours How many hours are in the decade from January 1, 2011, through December 31, 2020?

Workout 2

181. _____ inches If a television screen with a length-to-height ratio of 16:9 has an area of 576 in^2, what is its perimeter?.

182. _____ miles Alex Zhu bikes between home and school every day. He uses the same route to go to and from school, but it takes him 20 minutes to bike to school and only 15 minutes to bike back. If his average biking pace for the whole round-trip is 7 minutes per mile, how many miles long is the trip from home to school? Express your answer as a decimal to the nearest tenth.

183. _____ m/s Bruce and Lawson are playing ice hockey. Bruce shoots the puck at the goal 40 meters directly in front of him at a speed of 50 m/s. If Lawson is standing exactly 30 meters to the left of Bruce, what is the minimum speed at which he must skate, to reach the goal when the puck does? Express your answer as a decimal to the nearest tenth.

184. $ _____ In 2015 the average two-adult family in a particular town paid $619 per month for groceries, excluding sales tax. If groceries in this town were subject to a 9% sales tax, how much sales tax was paid by the average two-adult family in one month?

185. $ _____ Linda makes 6 cakes per hour. Sara makes 4 cakes per hour. If Linda gets paid $11 less than Sara for each cake, how much in dollars should Sara be paid for each cake for Linda and Sara to earn the same amount each hour?

186. _____ yards In a golf long-drive competition, Jason Zuback hits his first five drives 394, 401, 387, 414 and 421 yards, respectively. How long must he hit his sixth drive to ensure that the mean of his six drives is at least 400 yards?

187. _____ km A pilot flying due east is forced to make a detour from her original route to avoid turbulent weather. The pilot turns 30 degrees north of east. After traveling some distance, she turns and rejoins her original route and is 1000 km away from where she took the detour. The turn back to her original route put her at a 45 degree angle to that route. How much farther did the pilot travel due to her detour? Express your answer to the nearest whole kilometer.

188. _____ What is 12% of $\frac{3}{4}$ of 1.8? Express your answer to the nearest thousandth.

189. _____ ways In how many different ways can four people be seated around a circular table so that no one ever has the same two neighbors more than once?

190. _____ fluid ounces A cylindrical container holds 20 fluid ounces. It has a radius of 3 inches and a height of 12 inches. How many fluid ounces will a similar container with a radius of 4.5 inches hold? Express your answer as a decimal to the nearest tenth.

Workout 3

191. _____ seats The number of seats per row in an auditorium increases from the front to the back. The first row has 15 seats, the second row has 2 more seats than the first row, the third row has 3 more seats than the second row, the fourth row has 2 more seats than the third row, the fifth row has 3 more seats than the fourth row. This pattern continues, with successive rows alternating between 2 more seats and then 3 more seats than the previous row. How many seats are in the auditorium if there are 30 rows total?

192. _____ degrees Three interior angles of a pentagon measure 110, 120 and 130 degrees, respectively. Of the two remaining interior angles, one is three times the measure of the other. What is the measure of the pentagon's smallest interior angle?

193. _____ Hisham Dimashkieh chooses four distinct positive integers a, b, c and d, each less than or equal to 10. He chooses the numbers so that a is prime, b is composite, c is a perfect square and d is a perfect cube. What is the greatest possible sum of the four numbers?

194. _____ If p, q and r are prime numbers such that $pq + r = 73$, what is the least possible value of $p + q + r$?

195. _____ % If Bella runs 40% as fast as Thomas and 35% as fast as Tam, what percent faster than Thomas is Tam? Express your answer to the nearest percent.

196. _____ % The probability that it will rain today is 50%. The probability that it will rain tomorrow is 40%. Assuming today and tomorrow's precipitation outcomes are independent from one another, what is the percent probability that it will rain on at least one of the two days? Express your answer as a whole number.

197. _____ ft^2 What is the area of a 60 degree sector of a circle with radius 30 feet? Express your answer in terms of π.

198. _____ kg One year, the U.S. government printed $700 million worth of paper money every day, for 365 days. Half of the total value came from $1 bills. If a new $1 bill weighs exactly 1 gram, what was the weight, in kilograms, of all the $1 bills printed that year?

199. _____ trees The number of bushels of apples, $B(n)$, that can be harvested from an acre of land is a function of n, the number of trees planted per acre, where $B(n) = 2025n - n^3$. How many trees planted per acre will produce the greatest harvest? Express your answer as a whole number.

200. _____ Three days ago, there were p cupcakes on the counter. Two days ago, exactly 20% of the cupcakes were eaten. Today, there are 30% fewer cupcakes than yesterday and half as many as there were three days ago. If a whole number of cupcakes were eaten every day, what is the least possible value of p?

Workout 4

201. _____ The sum of the digits of a two-digit integer is 12. The integer is equal to 15 times its units digit. What is the integer?

202. _____ If $\frac{x^2+8x+15}{x+5} = 4.01$, then what is the value of x? Express your answer as a decimal to the nearest hundredth.

203. _____ units^2 A triangle has three vertices given by coordinates (2, 2), (2, −6) and (−5, −9). What is the area of the triangle?

204. _____ In a regular octagon, the diagonals have three possible lengths —"short," "medium," and "long." What is the ratio of the length of the medium diagonal to the long diagonal? Express your answer as a decimal to the nearest thousandth.

205. _____ % Not realizing that an 18% tip had already been added to the cost of a meal, Emalee added another 15% to the total bill. Given that there is no sales tax, what percent tip did Emalee actually pay? Express your answer as a percent to the nearest tenth.

206. _____ Penner has a deck of 40 cards composed of four suits (red, blue, green, and yellow) and cards numbered 1 through 10 in each suit. Tell secretly chooses a card. Penner then chooses the following 4 cards from the deck: Red-2, Blue-3, Green-5 and Yellow-7. For each card Penner chooses, Tell says "yes" if his secret card is of the same color or shares a common factor greater than 1 with Penner's card. Otherwise Tell says "no." Tell says "no," "yes," "no," and "yes," respectively, in response to Penner's cards. With this information, what is the best possible probability Penner has of guessing Tell's secret card? Express your answer as a common fraction.

207. _____ Henry Flannigan chooses a two-digit positive integer at random. What is the probability that the two digits have an absolute difference greater than 1? Express your answer as a common fraction.

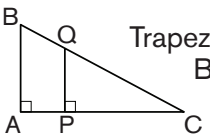
208. _____ mi^3 Ngorongoro Crater is shaped approximately like a cylinder that is 10 miles across and 2000 feet deep. How many cubic miles of water would it take to fill the crater? Express your answer to the nearest whole number.

209. _____ Mady distributes w candies evenly among 20 bags. The next day, she discovers 5 more empty bags and decides to redistribute the w candies evenly into all of the bags. On the third day, Mady finds 1 more bag and redistributes the w candies evenly again. There are 2 fewer candies on the third day in each of the bags than there were in the bags on the second day. What is the value of w?

210. _____ If $f(x) = ax^2 + bx + c$, with $f(0) = 4$, $f(2) = 2$ and $f(4) - f(3) = 4$, what is the value of $f(1)$?

Workout 5

211. _____ units^2



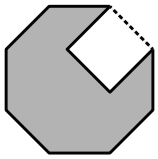
Trapezoid APQB lies inside of right triangle ABC, as shown. If AP = 30, BQ = 34 and AB = 60, what is the area of triangle ABC?

212. _____ There are five two-digit positive integers arranged in decreasing order. Each digit is unique. What is the absolute difference between the greatest possible range and the least possible range of such a set of integers?

213. _____ ways Six different donuts are lined up in a box. Six different cookies are lined up in another box. Mackenzie wants to alternate the donuts and cookies in one big long box. How many ways are there to arrange them?

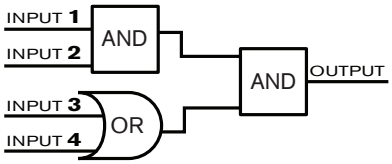
214. _____ workers For a certain crew of workers, it takes the nth worker exactly n hours to complete a certain job alone. What is the least number of workers needed to complete an identical job in under 20 minutes by working together?

215. _____ cm^2



A regular octagon has a perimeter of 64 cm. A square with one side along an edge of the octagon has been cut out of the octagon, as shown. What is the remaining area of the octagon? Express your answer in simplest radical form.

216. _____ inputs The function machine shown here consists of three logic functions. A Boolean is a member of the set {0, 1}. For each function, the inputs are on the left and the output is on the right. The output of each function is a Boolean. The input of each function is a pair of Booleans. For the AND function, the output is 1 if and only if both inputs are 1. For the OR function, the output is 0 if and only if both inputs are 0. Among the 16 distinct sets of inputs that can be applied on the far left, how many will produce a 1 as the final output on the far right?



217. $ _____ Joe, Bob and Randell split a restaurant bill that totaled $80 before the tip. The group tipped 25%, Joe paid twice as much as Bob, and Randell paid the same amount as Joe. How much did Bob pay?

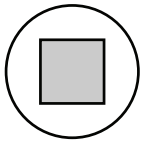
218. _____ pairs How many pairs of positive integers a and b exist such that $a^2 - b^2 = 144$?

219. _____ cm^3 A rectangular box measures 5 mm × 10 mm × 1 m. What is the volume of the box in cubic centimeters?

220. _____ A college has been trying to decrease the number of cars on campus and increase the number of bicycles. The price of a parking permit was tripled, and the number of cars on campus decreased 30%. Student tuition was decreased, and the number of bicycles on campus increased by 20%, producing a car to bicycle ratio of 1:3. What was the ratio of cars to bicycles before the changes occurred? Express your answer as a common fraction.

Workout 6

221. _____ in^2 The gasket shown consists of a circular disk with a square removed. The square and the disk have the same center. If each corner of the square is exactly 1 inch away from the boundary of the disk, and the midpoint of each side of the square is exactly 2 inches away from the boundary of the disk, what is the area of the top face of the gasket? Express your answer as a decimal to the nearest tenth.

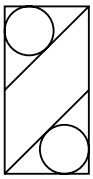


222. _____ % Jeffrey Pribble needs to buy 6 pairs of socks. The Sock Shop is running a limited time promotion: buy 3 pairs of socks and get 3 pairs at half off the regular price. What percent savings does Jeffrey get with the promotion compared to the regular price without the promotion?

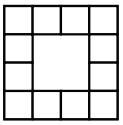
223. _____ What is the greatest possible absolute difference between the median and mean of a list of 10 positive integers that are at most 20? Express your answer as a decimal to the nearest tenth.

224. _____ tourists The tour from Ajim to the Mos Eisley Cantina can take at most 36 tourists. The price for the tour is $520 per person until at least 15 people have signed up. After that, the price for each person, including the first 15, drops $5 per additional tourist. If the total amount the tourists paid was $12,740, how many tourists signed up?

225. _____ inches A rectangle has a width of 1 inch and a height 2 inches. There are two lines drawn, each connecting a vertex to the midpoint of the opposite side, and circles are inscribed in the triangles created, as shown. How far apart are the centers of the circles? Express your answer as a decimal to the nearest hundredth.



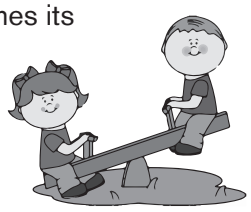
226. _____ rect-angles



How many rectangles of any size are in the figure shown?

227. _____ Let S be the set of all integers N such that both N and the number formed by reversing the digits of N are three-digit perfect squares. What is the sum of the integers in S?

228. _____ feet A seesaw is in balance when the weight on one side of the fulcrum times its distance from the fulcrum is equal to the weight on the other side of the fulcrum times its distance from the fulcrum. Shandra weighs 96 pounds. Her little sister weighs 72 pounds. The seesaw at their playground has a beam with seats 14 feet apart. The position of the fulcrum can be adjusted as required. If each girl sits in her seat, how far should the fulcrum be from Shandra's seat to achieve perfect balance with her sister?



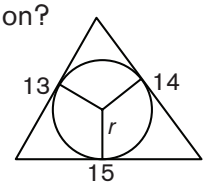
229. _____ Jennie Weiner has p pennies, n nickels, d dimes and q quarters with a total value of $1.08. If the numbers p, n, d and q are distinct and positive, and the greatest common divisor of each pair of these numbers is 1, what is the least possible value of $p + n + d + q$?

230. _____ ft^2 What is the total surface area of a right square pyramid with a height of 12 feet and a base with side length 10 feet?

Workout 7

231. $\_\_\_\_\_$ Rahul Ilangovan can arrange his dad's collection of quarters as a rectangular array with 10 equal rows, 12 equal rows or 18 equal rows, using all the quarters in each arrangement. What is the least possible monetary value in dollars of the quarter collection?

232. _____ units What is the radius of the largest circle that can be inscribed in an acute triangle with sides 13, 14 and 15 units?



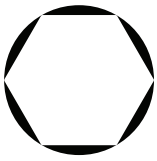
233. _____ Francisco is born at 1:00 a.m. on a Tuesday and gets married exactly 2^{18} hours later. On what day of the week does Francisco get married?

234. _____ Erica drew a 4 of hearts out of a standard 52-card deck, without replacement. If she draws a second card from the deck, what is the probability that her two cards will show consecutive numbers? Express your answer as a common fraction.

235. _____ A set S contains some, but not all, of the positive integers from 3 to 7. Some statements describing S are given below. The statement numbered n is true if the number n is in S and false if n is not in S. What is the product of the numbers that are in S?

3. The sum of the numbers in S is odd.
4. The sum of the numbers in S is less than 15.
5. S contains exactly one composite number.
6. S contains exactly one prime number.
7. The product of the numbers in S is odd.

236. _____ m^2 The figure shows a regular hexagon of side length 12 meters inscribed in a circle. What is the total area of the shaded regions between the hexagon and the circle? Express your answer to the nearest whole number.



237. _____ Kendra starts at a positive integer k and counts up by 4s until she hits exactly 200. Mason starts at a positive integer m and counts up by 6s until he hits exactly 200. If it takes Kendra half as many steps to reach 200 as it takes Mason, what is the greatest possible value of $k - m$?

238. _____ The graph of the line $3x - 4y = 13$ is translated 2018 units to the right. What is the y-intercept of the translated line? Express your answer as a decimal to the nearest hundredth.

239. $\_\_\_\_\_$ Ron works five days a week selling wallets in a booth at the mall. He earns a salary of \$215 per week plus 15% of his weekly sales. If he earned \$383.75 this week, what was the amount of his average daily sales for the week?

240. _____ inches A regular hexagon is inscribed in a circle. If the area of the hexagon is $216\sqrt{3}$ in^2, what is the circumference of the circle? Express your answer in terms of π.

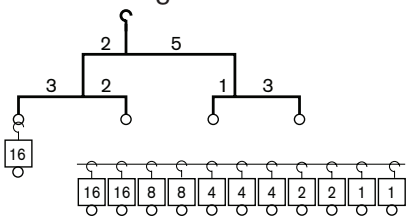
Workout 8

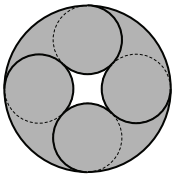
241. _____ Suppose that $A \,\&\, B = k \times A^m \times B^n$, where k, m and n are constants. Suppose that $5 \,\&\, 3 = 18$, $10 \,\&\, 3 = 72$ and $5 \,\&\, 6 = 36$. What is the value of $10 \,\&\, 6$?

242. _____ combinations How many different combinations of pennies, nickels, dimes and quarters are possible in the cup holder of Terry's car if he counts 15 coins total?

243. _____ in^3 If the average length of the edges of a right rectangular prism is 13 inches, and the dimensions of the prism are distinct integers in geometric progression, what is the sum of the volumes of the distinct prisms that meet these criteria?

244. _____ weights In the mobile shown, a beam is *in balance* when the length l_L of the left arm of the beam times the total weight w_L hanging below the left arm of the beam is equal to the length l_R of the right arm of the beam times the total weight w_R hanging below the right arm of the beam. Every beam must be in balance for the mobile to be in balance. Decorative weights are available only in powers of 2. Multiple weights can be hung in a vertical chain, one below another. If the existing weight in the figure is not removed, what is the minimum number of weights that must be added to bring the mobile shown into balance?



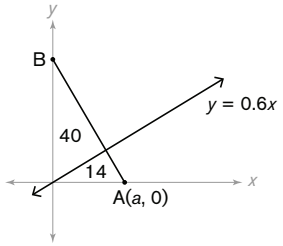
245. _____ %  Four non-overlapping congruent circles are inscribed in a larger circle. Each small circle is shaded. Each region between two adjacent small circles and the enclosing large circle is also shaded. What percent of the figure is not shaded? Express your answer as a decimal to the nearest tenth of a percent.

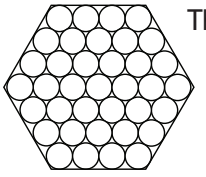
246. _____ Maxine secretly chooses a positive integer between 1 and 2018, inclusive. Martin wants to identify her number with a series of guesses. Each time Martin makes a guess, Maxine tells him whether his number is correct, too high or too low. With an appropriate strategy, Martin can always identify Maxine's number after at most n guesses. What is the least value of n for which Martin can correctly guess Maxine's number?

247. _____ novels Ms. Ault's reading list has novels by only three authors: Mark Twain, Ernest Hemingway and John Steinbeck. For a summer reading assignment, Austen Mazenko must pick one of the authors and read two of that author's novels on the list. If there are exactly 100 ways for Austen to pick two novels that satisfy this requirement, what is the greatest possible total number of novels on the reading list?

248. _____ What is the sum of all prime numbers p less than 60 such that there exists a right triangle whose side lengths are all integers and whose hypotenuse has length p?

249. _____ A line segment AB from the positive x-axis to the positive y-axis cuts off a triangle of area 54 square units in the first quadrant of the coordinate plane. The line $y = 0.6x$ divides this triangle into two triangles of areas 40 $units^2$ and 14 $units^2$. If the point A has coordinates $(a, 0)$, what is the value of a? Express your answer in simplest radical form.



250. _____ %  The Solar Sunflower is made up of super-efficient circular solar panels within a hexagonal frame. Using a two-dimensional diagram of the Solar Sunflower, as shown, with a hexagonal frame with side length 10 meters, what percent of the hexagon is covered in solar discs? Express your answer to the nearest whole number.