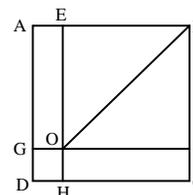


UBC Grade 6–7 Workshop Problems, 2009–2010

1. A playing field is three times as long as it is wide. Its length is 111 m. What is the perimeter of the field?
2. Lyle is a passionate snowboarder. He rushes out and buys a season's pass for Grouse Mountain for \$350. A day pass costs \$40 and a night pass costs \$30. During a 12-week season, Lyle goes snowboarding every other Friday night and every third Saturday afternoon. Should Lyle have bought the season's pass?
3. Gus the guinea pig can eat dandelions at a constant rate without ever getting full. He is let loose in the 15 ft x 15 ft backyard, where there is an average of 10 dandelions per square foot. Gus gobbles dandelions at the rate of 50 per hour. How long will it take for Gus to eat half the dandelions in the yard?
4. A student is doing a math test that has 10 questions. Question 1 is worth 1 mark, Question 2 is worth 2 marks, and so on. A student knows he got Questions 1 to 5 perfectly. He thinks he got half the total available marks for questions 6 to 8 but no marks for Question 9. How many marks does he need on Question 10 to pass the test (i.e. get at least half of the total available marks)? Note that half marks are possible on each question.
5. Every morning, Amy brushes her teeth, gets dressed, has breakfast, and then leaves for school. It takes her half as long to brush her teeth as to get dressed, and half as long to get dressed as to eat breakfast. Amy gets up at 7:40 a.m. and leaves for school at 8:00 a.m. Is she brushing her teeth for at least 3 minutes like her dentist told her to do?
6. A couple has a giant candy jar initially containing 72 candies. The husband eats 2 candies every day and the wife eats 1 candy every other day. The wife does not eat a candy on the day the jar is opened. On some days, Grandma visits, and she eats 1 candy every time she visits. The husband has eaten his 2 candies today and his wife has eaten her 7th candy since the jar was opened. There are 30 candies remaining. How many times has Grandma visited since the jar was opened?
7. Suppose ABCD, EBFO, and DGOH are squares and BO is a diagonal of EBFO, as in the picture. If the area of the triangle BOF is 8 and the area of the square DGOH is 4, find the area of the square ABCD.



8. Tony is cooking pasta for himself and his three guests, Joe, Angela, and Lisa. Joe eats 120 grams of pasta, Angela eats $\frac{4}{5}$ the amount Joe eats, and Lisa eats $\frac{3}{4}$ of what Angela eats. If Tony eats $\frac{3}{8}$ the total of what his three guests eat, how many grams of pasta does he need to cook?
9. When we write a whole number followed by “!”, we mean that number times all the whole numbers less than it. So for example $2! = 2 \times 1 = 2$ and $5! = 5 \times 4 \times 3 \times 2 \times 1 = 120$. Without using a calculator, determine the value of $13!/11!$.
10. The school wants to remodel the boys' washroom. The Grade 7 math class decides to use two different types of tiles for the floor, all of which are 2 ft by 2 ft, but one is red and other is blue. The red tiles will be used to create a one-tile border around the perimeter of the washroom and the blue tiles will fill in the rest. The washroom is 20 ft by 30 ft. How many of each type of tile should the school order?

11. Jim and Sarah have a rectangular pool and want to build a fence around it. The dimensions of the pool are 7 m by 4 m. Along the 7-m sides, the fence will be 3 m from the edge of the pool. Along the 4-m sides, the fence will be 5 m from the pool's edge. How much larger will the perimeter of the fence be than that of the pool? Does your answer depend on the actual dimensions of the pool?
12. Natasha and six of her friends go out for dinner, and sit around a large circular table at the restaurant. They decide to order a single combo meal that they will all share. They count down numbers, going around the table, to decide who will order. Natasha will say the first number, the person on her right says the number that is one smaller, etc. The person who says the number "1" will order. What is the smallest number larger than 100 that Natasha should say in order to be the one who eventually orders?
13. The combination for Min's school locker is composed of 3 numbers. The first number has 1 digit and the 2nd and 3rd have 2 digits. Min remembers that the 1st number is a multiple of 3, the 2nd number is 5 times the first number, and the sum of all the numbers is 58. How many combinations will Min have to try in order to be sure to be able to open her locker?
14. Dan bought a Wii console for \$310.00 as well as 5 games for \$40 each. He charges \$15/week to rent the console with 1 game and \$20/week for the console with all 5 games. His friends rent for him every week, but alternate between the two rental methods. After how many weeks will Dan recover the cost of the console and games? Does the answer depend on whether the first rental is for \$15 or \$20?
15. One day John goes to Rollercoaster World. He brings \$41 and only wants to go on two rides: The Mega Coaster and the Easy Slide. The coaster costs \$5 per ride, while the slide costs just \$1 per ride. John wants to go on the coaster more times than on the slide, but still go on as many total rides as possible. How many times should John ride the Mega Coaster?
16. A 5-digit number ends in 67 and the 2nd digit is 2, and the sum of the first 2 digits equals the sum of the middle 3 digits. Also, the digits of this number are all different. What is the 5-digit number?
17. Margaret wants to join the basketball team and decides to practice free throws for 7 days. Each day she makes 2 more shots than the day before, and in total she makes 77 shots. How many shots did Margaret make on the first day?
18. A police officer works on rotation. He works four day shifts, four evening shifts, and then rests for two days. Today is Sunday and he is working an evening shift. His wife's birthday is the following Sunday, and they are planning a celebration in the evening. What are the chances that he will be available to celebrate his wife's birthday?

SOLUTIONS

Note: These concise solutions are meant for workshop leaders and teachers. Presentations to Grade 6/7 students should include additional detail and motivation. The solutions outlined here are considered appropriate for school students at this level; alternate solutions are often possible.

1. Answer: 296. The width is $\frac{1}{3}$ of 111, namely 37. So, the perimeter is $2 \times (111 + 37) = 296$.
2. Answer: no. Suppose Lyle had instead bought day or night passes. Then he would have spent $4 \times \$40 + 6 \times \$30 = \$340$, less than the cost of the season's pass.
3. Answer: $22 \frac{1}{2}$ hours. There are a total of $15 \times 15 \times 10 = 2250$ dandelions, which will take $2250/50 = 45$ hours to eat. Now divide by 2.
4. Answer: 2. The student got $1 + 2 + 3 + 4 + 5 = 15$ marks on the first 5 questions and $(6 + 7 + 8)/2 = 10 \frac{1}{2}$ marks on questions 6 through 8, so $25 \frac{1}{2}$ marks so far. The total number of marks available is $1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9 + 10 = 55$, so he needs a total of $55/2 = 27 \frac{1}{2}$ marks. So, he needs 2 marks on Question 10.
5. Answer: no. Suppose Amy had brushed her teeth for exactly 3 minutes. Then she would have spent a total of $3 + 6 + 12 = 21 > 20$ minutes between getting up and leaving for school. So, she spent < 3 minutes brushing her teeth.
6. Answer: 7 times. Today is the 14th day that candies are being eaten. The husband has eaten 28 candies so he and his wife have eaten 35. A total of 42 candies have been eaten, so Grandma has visited 7 times.
7. Answer: 36. The area of the square EBFO is $2 \times 8 = 16$ so its sides have length 4. The square DGOH has side length 2. So, ABCD has side length 6.
8. Answer: 396 grams. Angela eats $120 \times \frac{4}{5} = 96$ grams of pasta and Lisa eats $96 \times \frac{3}{4} = 72$ grams. So, the guests eat a total of $120 + 96 + 72 = 288$ grams and Tony eats $\frac{3}{8}$ of this amount, which is 108 grams. The overall total is 396 grams.
9. Answer: 156. Cancel the factors 1, 2, 3, ..., 11 to get 13×12 .
10. Answer: 46 red, 104 blue. The washroom measures 10×15 tiles, so there are a total of 150 tiles, and there are $8 \times 13 = 104$ blue ones.
11. Answers: 32 m, no. The side of the fence that is along the 7-m sides of the pool is $2 \times 5 = 10$ m longer than the 4-m side, and the other side of the fence is $2 \times 3 = 6$ m longer than the pool's 7-m side. So, the total additional perimeter is $2 \times (10 + 6)$. The "7" and "4" are irrelevant to the difference.
12. Answer: 106. Natasha should say the smallest number that is greater than 100 and leaves a remainder of 1 when divided by 7; this number is 106.
13. Answer: 2. The first number could be 3, 6, or 9, which would make the second number respectively 15, 30, or 45. The last case is not possible since the third number, being two digits, is at least 10 and $9 + 45 + 10 > 58$. The first two cases do work.
14. Answers: 29 weeks if first rental is \$20, 30 weeks if it is \$15. Dan's total outlay was \$510. In two consecutive weeks he will earn \$35 in rental fees. Since $14 \times \$35 = \490 , Dan will recover his outlay in 29 weeks if the first rental is for \$20 and 30 weeks if the first rental is for \$15.
15. Answer: 7 times. The optimal strategy is for John to ride the coaster once more than the slide. Since $41 = 6 \times (5 + 1) + 5$, this strategy can be realized by riding the coaster 7 times and the slide 6 times.
16. Answer: 92367. Write the number as $a2c67$, where a and c are the 1st and 3rd digits. Then a must be 6 greater than c , so that the sum of the first two digits equals that of the middle three. The distinctness of the digits yields just one possibility.
17. Answer: 5. Margaret's shot total is 7 times the number of shots she scored on the middle day. So, that number is 11. Count backward to discover that she got 5 shots on the first day.
18. Answer: chances are 3 in 4. If the officer's first evening shift is this evening, then in seven days he will be on his second day shift, so he can attend the wife's birthday. If it is the second evening shift then in seven days he will be on his third day shift and is still okay, and similarly if it is the third evening shift. The only problem is if the officer is on his fourth evening shift this evening, in which case he will be on his first evening shift in seven days. The chances of that unfortunate event are 1 in 4.