UBC Grade 8/9 Problems 1999

1. I have a lot of 1 dollar coins, a lot of 2 dollar coins, and nothing else. In how many different ways can I give change for a 10 dollar bill?

2. Altogether, a mother and her two identical twin babies weigh 75 kilograms. The mother weighs 8 times as much as either one of the babies. How much does the mother weigh?

3. A $4 \times 4 \times 4$ block of wood is painted red all over, and then is cut into sixty-four $1 \times 1 \times 1$ cubes. How many of these small cubes have
(a) exactly 3 red faces?
(b) exactly 2 red faces?
(c) exactly 1 red face?

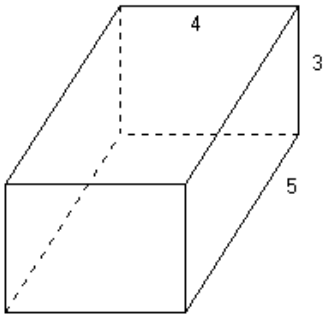
4. Two families go camping together. Family A consists of 3 adults and 2 children. Family B has two adults and 1 child. They agree to split food costs in proportion to family size, counting each child as half an adult. If total food costs were \$130, how much should family A pay?

5. A kitchen has two electronic timers. One of them, after it is turned on, beeps every five minutes until it is shut off. The other is similar, but beeps every nine minutes. Use these timers to time a three-minute egg.

6. At a movie theatre, 3 bags of popcorn and 2 drinks cost \$12.00, while 2 bags of popcorn and 3 drinks cost \$12.50. How much does 1 bag of popcorn cost? (There are no special "combination" deals.)

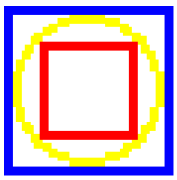
7. Male bees have only one parent (a mother, of course), while female bees have two parents, one of each sex. A female bee (Bea) is working out her family tree. How many female ancestors does Bea have who are exactly seven generations back from her?

8. A box that measures 3 feet by 4 feet by 5 feet is suspended in the air. A spider starts at one corner, and wants to crawl along the edges, visiting each of the other corners exactly once and ending up where it began.
(a) Find a way of doing this.
(b) Find a way which makes the distance crawled as small as possible.



9. One Canadian dollar buys 20.37 Taiwan dollars, and one Taiwan dollar buys 3.724 Japanese yen. A Canadian coming home from Taiwan had a stopover in Tokyo, and bought a video game system that cost 16,000 yen. She paid for it with five Taiwan 1000 dollar bills, and asked for the change in Canadian dollars. How much change should she get?

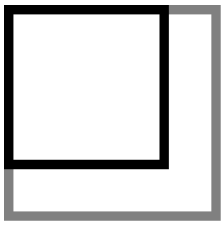
10. In the picture the outer square is 20 cm by 20 cm. Find the area of the inner square.



11. There are 20 chairs around a circular banquet table. Twenty people choose chairs at random (one person to a chair) and sit down. What is the probability that Agnes and Brian are seated next to each other? Hint: Agnes is very hungry and sits down first.

12. How many of the numbers from 1 to 400 are *not* divisible by 5?

13. Each side of a square is increased by 20%. By what percentage does the area of the square increase?



14. A 600 pound pumpkin was entered in a contest. When it arrived, it was 99% water. The pumpkin sat for days in the hot sun, lost some weight (water only), and is now 98.5% water. How much does it weigh?

15. Jo got a job with a starting salary of \$1 a day. Each day, Jo's salary went up by a dollar, so Jo made \$2 on day 2, \$3 on day 3, and so on. Jo worked every day of a 365 day year. How much did Jo earn that year? Hint: Jo's friend Mo started at \$365 a day, and every day Mo's salary went *down* by a dollar. How much did Jo and Mo earn together on the first day? On the second?

16. A tub has a flat bottom with area $5000\,\text{cm}^2$, and vertical sides. There is water in the tub to a depth of 20 cm.
(a) A concrete cube with sides 25 cm is placed on the floor of the tub. How much does the water level rise?
(b) A second identical cube is placed on the floor of the tub. How much further does the water level rise now?