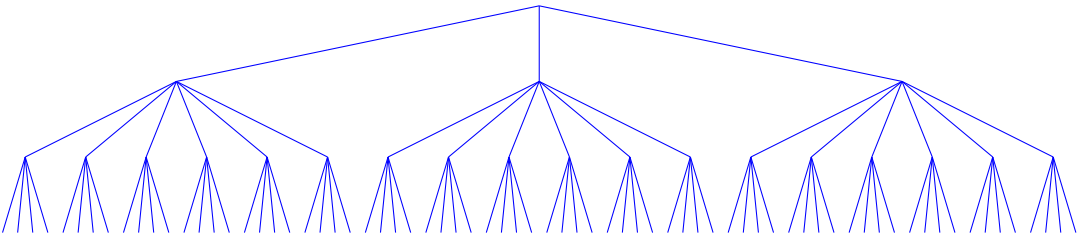# Assignment 1
Show all your work

Name: _____

Number: _____

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Score: ___/10

Problem 1: Draw a tree diagram to help you count the number of different ice cream cones (made of one cone, one scoop of ice cream, and one topping), given that there are three kinds of cones, six different flavours of ice cream, and four kinds of toppings.

Score: /3

Problem 2: Discover the following number trick.

    a. Choose a number (any number). x

    b. Add 5. $x + 5$

    c. Double the result. $2(x + 5)$

    d. Subtract 4. $2(x + 5) - 4$

    e. Divide by 2. $\frac{2(x+5)-4}{2}$

    f. Subtract the number first thought of. $\frac{2(x+5)-4}{2} - x$

What is your answer? Prove that the number trick yields the same answer everytime regardless of the number chosen in Step a.

$$\frac{2(x+5)-4}{2} - x = \frac{2x+10-4}{2} - x = \frac{2x+6}{2} - x = (x+3) - x = 3$$

Score: /3

Problem 3: Anjali's family was invited to a friend's party. Suppose there were 6 families in total: 12 parents and 14 ($= 1 + 2 + 2 + 3 + 3 + 3$) children. If all the adults shook hands with one another except with their spouses and all the children shook hands except with their siblings, how many handshakes took place?

Adults' handshakes: $\frac{12 \times 10}{2} = 60$.
Children's handshakes: $\frac{1 \times 13 + 2 \times 2 \times 12 + 3 \times 3 \times 11}{2} = 80$.
Total $60 + 80 = 140$ handshakes.
Alternatively: All the adults could shake hands in $\frac{12 \times 11}{2} = 66$ ways. But the 6 handshakes between spouces do not happen, so only $66 - 6 = 60$ handshakes between adults.
Similarly, the children could shake hands in $\frac{14 \times 13}{2} = 91$ ways. Within each of the 2 families with two kids, the siblings could shake hands in $\frac{2 \times 1}{2} = 1$ way. That's $2 \times 1 = 2$ handshakes that do not happen. Similarly, with in each of the 3 families with three kids, the siblings could shake hands in $\frac{3 \times 2}{2} = 3$ ways. That's $3 \times 3 = 9$ handshakes that do not happen. So there is only $91 - 2 - 9 = 80$ handsshakes between children.
Again, a total of $60 + 80 = 140$ handshakes.

Score: /4