Quiz 2 MAT 118, Spring 2003

**PRINT your Name:** Solution

**circle your section**
2 Tues 11:20
3 Thur 12:50
4 Tues 5:30

1. The participants in a meeting are trying to decide what breakfast snack to have along with the coffee and tea at the morning break. After bickering for some time, they decide to use approval voting. The votes fall as follows:

   - Three people approve of bagels, fruit, and muffins.
   - Two people approve of bagels and donuts.
   - Four people approve of donuts only.
   - Two people approve of bagels and muffins.
   - One person approves of Captain Crunch cereal.

   Which snack should they offer, according to the approval voting method?

   bagels fruit donuts muffins Captain Crunch

   **Solution:** The group choice should be bagels.

   There are 7 people who approve of bagels, 3 people for fruit, 5 people for muffins, 6 people for donuts, and one for Captain Crunch. Since the most people approve of bagels, that is the winner.

2. If $5^{2t} - 4 = 100$, then

   $$t = \pm\sqrt{\frac{104}{5}} \qquad t = \sqrt{\frac{104}{\log 5}} \qquad \underline{t = \frac{\log 104}{2\log 5}} \qquad t = \frac{2\log 104}{\log 5} \qquad t = \frac{1}{2}\log 20 + 4$$

   **Solution:** To solve this equation, we first want to get the $5^{2t}$ by itself, so add 4 to both sides. This gives

   $$5^{2t} = 104$$

   Now take the $\log$ of both sides, and simplify:

   $$\begin{aligned} \log(5^{2t}) &= \log 104 \\ 2t\log(5) &= \log 104 \end{aligned}$$

   Now divide both sides by $2\log 5$ to get $t$:

   $$t = \frac{\log 104}{2\log 5}$$

3. I borrowed \$1000 for 9 months, agreeing to pay simple interest at a rate of 4% per year. If I borrowed the money on January 1, 2003, what is the total amount of money I need to pay on September 1, 2003?

   **Solution:** First, notice that I messed up the problem, somehow thinking that from January 1 to September 1 is 9 months, while it is only 8 months. So, I'll give the solution twice (and full credit if you used either 9 or 8 months).

   Note that the rate is 4% per year, but the time period is in months. That means we have to remember to convert months to years, and that 4% is the same as 0.04. Since the amount of interest is given as principal×rate×time, we have

$$\begin{aligned} \text{interest} &= (\$1000) \times \left(\frac{0.04}{\text{year}}\right) \times (9 \text{ months }) \times \left(\frac{1 \text{ year}}{12 \text{ months}}\right) \\ &= \$40 \times \tfrac{9}{12} \\ &= \$30 \end{aligned}$$

   Since I have to pay back the original principal plus the interest, I must pay \$1000 + \$30, or a total of \$1030.

   Now, if the time period is 8 months instead of 9 as above, we have

$$\begin{aligned} \text{interest} &= (\$1000) \times \left(\frac{0.04}{\text{year}}\right) \times (8 \text{ months }) \times \left(\frac{1 \text{ year}}{12 \text{ months}}\right) \\ &= \$40 \times \tfrac{8}{12} \\ &= \$26.66 \end{aligned}$$

   Since I have to pay back the original principal plus the interest, I must pay \$1000 + \$26.66, or a total of \$1026.66.