MATH 1030-004, Exam 1 **Spring 2014**

Name: **SOLUTION**

SHOW YOUR WORK!

1. **(16 pts)** In a recent survey people were asked if they took a vacation in the Summer, Winter, or Fall in the past year. The results were the following: 73 took a vacation in the Summer, 51 took a vacation in the Winter, 27 took a vacation in the Fall, and 2 had taken no vacation. Also, 10 had taken vacations at all three times, 13 had taken both a Summer and a Winter vacation, but not the Fall, 18 had taken only a Winter vacation, and 5 had taken both a Summer and Fall but not a Winter vacation.

   Using S for Summer, W for Winter, and F for Fall, construct a 3-set Venn diagram, and answer the following questions.

   (a) How many people had been surveyed?

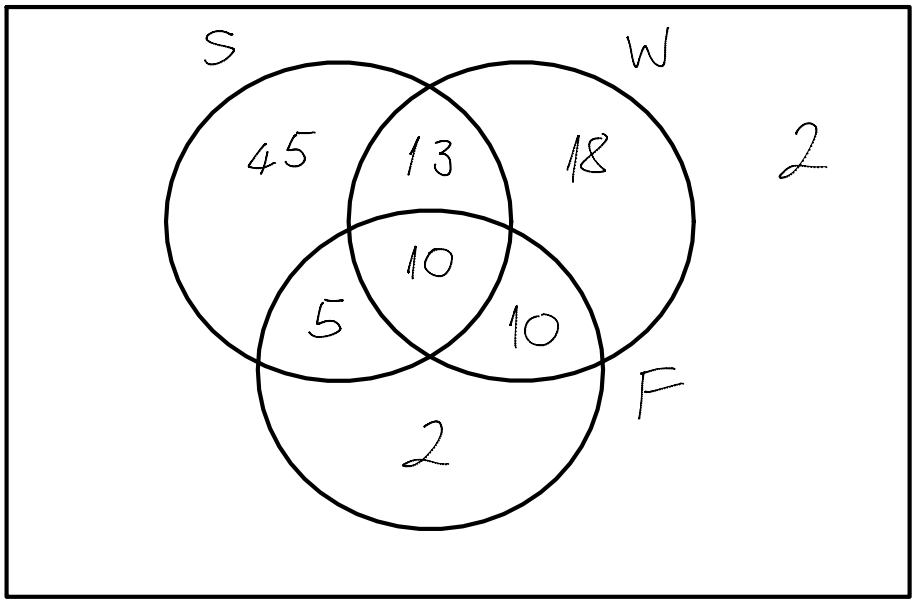
   $73+2+2+10+18=105$

   (b) How many people had taken Summer vacation only?

   $73-(13+10+5)=45$

   (c) How many people had taken Fall vacation only?

   $27-(5+10+10)=2$



2. **(12 pts)** John earns 150% more than Sam. How many times larger is John's income than Sam's?

$$(150+100)\% = 250\% = 2.5.$$

3. **(12 pts)** How much money will you have in 30 years if you invest \$10,000 now at an APR of 4.75%, assuming

   (a) that you earn simple interest.

$$A = \$10{,}000 + 0.0475 \cdot \$10{,}000 \cdot 30 = \$24{,}250.$$

   (b) interest is compounded quarterly.

$$A = \$10{,}000\left(1+\frac{0.0475}{4}\right)^{4\cdot 30} = \$41{,}231.$$

   (c) What is the APY, if we assume the interest is compounded quarterly?

$$APY = \left(1+\frac{0.0475}{4}\right)^{4} - 1 = 0.0484 = 4.84\%$$

4. **(12 pts)** If you sleep an average of 7 hours per day, how many hours do you spend sleeping in 5 years? How many weeks is this?

$$\frac{7\,\text{hr}}{1\,\text{day}} \cdot \frac{365\,\text{days}}{1\,\text{year}} \cdot 5\,\text{years} = 12{,}775\,\text{hr}$$

$$12{,}775\,\text{hr} \cdot \frac{1\,\text{day}}{24\,\text{hr}} \cdot \frac{1\,\text{week}}{7\,\text{days}} = 76\,\text{weeks}.$$

5. **(12 pts)** The average cost of a house in Salt Lake City increased from \$176,000 in 2010 to \$201,500 in 2014. Find the absolute and relative change. (Express the relative change in %.)

$$\text{absolute change} = \$201{,}500 - \$176{,}000 = \$25{,}500.$$

$$\text{relative change} = \frac{\$25{,}500}{\$176{,}000} = 0.145 = 14.5\%$$

6. **(12 pts)** You want to build a \$70,000 college fund in 16 years by making regular, weekly deposits. Assuming an *APR* of 4%, and assuming weekly compoundings, calculate how much you should deposit every week. *(1 year = 52 weeks.)*

$$\$7 \cdot 10^4 = PMT \frac{\left(1 + \frac{0.04}{52}\right)^{52 \cdot 16} - 1}{\left(\frac{0.04}{52}\right)}$$

$$\$7 \cdot 10^4 = PMT \cdot 1{,}164.82$$

$$PMT = \frac{\$7 \cdot 10^4}{1{,}164.82} = \$60.10.$$

(b.) How much of the financial value comes from actual deposits, and how much from interest?

$$\text{Total deposits} = \$60.10 \cdot 52 \cdot 16 = \$50{,}003.20$$

$$\text{In interest} = \$70{,}000 - \$50{,}003.20 = \$19{,}996.80.$$

7. **(12 pts)** If the natural gas costs 0.70 British Pounds per liter, how much does it cost in dollars per gallon? *(1 gallon = 4 quarts, 1 liter = 1.057 quarts, 1 British Pound = $1.65.)*

$$\frac{0.70\,£}{1\,L}\cdot\frac{1\,L}{1.057\,q}\cdot\frac{4\,q}{1\,gal}\cdot\frac{\$1.65}{1\,£}=\$4.37/gal$$

8. **(12 pts)** There are approximately 135 million births worldwide in a year. Express this quantity in births per second.

$$\frac{1.35\cdot10^{8}\,births}{1\,year}\cdot\frac{1\,year}{365\,days}\cdot\frac{1\,day}{24\,hr}\cdot\frac{1\,hr}{60\,min}\cdot\frac{1\,min}{60\,s}=4.28\,\frac{births}{s}.$$