

Write your answers in the Blue Book. Print your names & write the number of students taking this test in the upper right corner of the Blue Book. Put this test & the Blue Book in the provided envelope.

1. (10 points) What is the speed of a racecar in MPH (miles per hour) if it can go 100 yards in one second? Hint: 1 mile=5280 feet.

Solution: The speed of the racecar is

$$100 \frac{\text{yards}}{\text{second}} = 100 \frac{\text{yards}}{\text{second}} \cdot \frac{1 \text{ mile}}{1760 \text{ yards}} \cdot \frac{3600 \text{ second}}{1 \text{ hour}} = 204.54 \frac{\text{miles}}{\text{hour}}$$

2. (10 points) Find the fraction (in lowest terms) a/b with $2/7 \leq a/b \leq 5/12$ which has the smallest denominator.

Solution: $2/7 = 24/84$ and $5/12 = 35/84$ Note $28/84 = 1/3$ is such a fraction.

3. (10 points) A book has 300 pages numbered 1, 2, 3, and so on. How many times does the digit 1 appear in the page numbers?

Solution: : For the pages between 1 and 9 one number 1 is needed. For the pages from 10 to 19 eleven numbers 1 is needed. For the pages between 20 and 99 we need another 8 numbers 1's. (21, 31, ..., 91) Therefore for the first 99 pages we use 20 numbers 1's. The same is true for the pages between 200 and 300. For the pages between 100 and 199 we need 20 numbers 1's for the last two digits and another 100 numbers 1's for the first digits. The total number of number 1's needed is $20+20+20+100=160$.

4. (10 points) The sum of two numbers is 180, the difference between them is 80. What are the numbers?

Solution: If you add the sum and the difference of two numbers, you get twice the greater number. In this case the greater number is $(180+80)/2 = 130$. The smaller number is $180-130=50$. (Check it: $130+50=180$ and $130-50=80$)

5. (10 points) Rachel, Ian and Terri each brought a pie to math class on March 14. Rachel's blueberry pie has a area of 50.2 square inches, Ian's pecan pie has a circumference of 28.3 inches and Terri's key lime pie has a diameter of 10 inches.
- (a) About how many pieces can be cut if each piece of pie is wedge shaped with a 4 inch arc?
- (b) Why did the students bring pie to math class on March 14?

Solution:

- (a) We will compute the circumference of each pie. Rachel's pie has circumference $= 2\pi\sqrt{50.2/\pi} = 25.10$ in Ian's pie has circumference $= 28.3$ in & Terry's pie has circumference $= 2\pi \times 10 = 31.4$ in . The sum of the circumferences is about 84.8 inches. So we have $84.8/4$ or 21 pieces of pie.
- (b) March 14= $3/14$ or Π -day.