Math 206 - Test 1

September 22, 2010

Name key

Score _____

Show all work to receive full credit (even on multiple-choice problems). Supply explanations when necessary.

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1. (6 points) Solve each of the following. Use the unit rate approach for one, the scale factor approach for one, and standard cross multiplication for one. Say which is which, and when you use cross multiplication, say whether you are using the between or within strategy.

   (a) David can read 40 pages in 46 minutes. How long will it take him to read 160 pages?

SCALE FACTOR APPROACH: 160 PAGES ARE 4 TIMES 40 PAGES

$46 \text{ min} \times 4 = \boxed{184 \text{ min}}$

   (b) If 4 peaches cost \$1.20, how much will 11 peaches cost?

UNIT RATE APPROACH: $\frac{\$1.20}{4} = 0.30 \Rightarrow$ EACH PEACH COST \$0.30

11 PEACHES COST $11 \times \$0.30 = \boxed{\$3.30}$

   (c) A Boeing 747 jet is 230 ft long and has a wingspan of 195 ft. If a scale model of the jet is 40 cm long, what is the model's wingspan?

LENGTH TO WINGSPAN RATIO IS CONSTANT

BETWEEN STRATEGY

$\frac{230}{195} = \frac{40}{x} \Rightarrow \boxed{x \approx 33.91 \text{ cm}}$

2. (1 point) If $P(B) = 0.4$, what are the odds in favor of B?

$P(B) = \frac{4}{10} \Rightarrow$ ODDS ARE $\boxed{\frac{4}{6}}$

3. (4 points) Consider the following numbers:

$$0.2733333\ldots,\quad 0,\quad -\frac{8}{17},\quad 5,\quad -10,\quad 5.623233233323333\ldots,\quad 5.\overline{13},\quad \sqrt{2},\quad -3$$

(a) Which of the numbers are whole numbers?

0, 5

(b) Which of the numbers are integers?

0, 5, -10, -3

(c) Which of the numbers are rational?

$0.2\overline{73}$, 0, $-\frac{8}{17}$, 5, -10, $5.\overline{13}$, -3

(d) Which of the numbers are irrational?

5.623233233323333 ... , $\sqrt{2}$

4. (3 points) Four letters are selected one at a time, without replacement, from the word MISSISSIPPI. What is the probability of selecting the letters SIMP in that order?

$\frac{4}{11}$ S $\frac{4}{10}$ I $\frac{1}{9}$ M $\frac{2}{8}$ P

PROB IS $\frac{4}{11} \times \frac{4}{10} \times \frac{1}{9} \times \frac{2}{8}$

$= \frac{32}{7920} = \frac{2}{495}$

5. (4 points) Without using your calculator or doing division, write each fraction as a terminating decimal.

(a) $\frac{17}{32} = \frac{17}{2^5} \cdot \frac{5^5}{5^5} = \frac{(17)(3125)}{10^5} = \frac{53,125}{10^5} =$ 0.53125

625
5
3125

3125
17
21875
3125
53125

(b) $\frac{9}{1500} = \frac{3}{500} \cdot \frac{2}{2} = \frac{6}{1000} =$ 0.006

6. (3 points) At Rattlesnake School the teacher-student ratio is 1:30. If the school has 1200 students, how many additional teachers must be hired to reduce the ratio to 1:20?

$\frac{\text{TEACHER}}{\text{STUDENT}} = \frac{1}{30} = \frac{X}{1200} \Rightarrow X = 40 \rightarrow$ 40 CURRENT TEACHERS

$\frac{\text{TEACHER}}{\text{STUDENT}} = \frac{1}{20} = \frac{Y}{1200} \Rightarrow Y = 60 \rightarrow$ 60 TEACHERS NEEDED

20 ADDITIONAL TEACHERS

7. (3 points) Write $0.\overline{18}$ as a fraction in lowest terms.

$F = 0.181818\ldots$

$100F = 18.181818\ldots$

$100F = 18.181818\ldots$

$F = 0.181818\ldots$

$99F = 18 \Rightarrow F = \frac{18}{99} = \frac{2}{11}$

8. (2 points) The odds in favor of the event A are 8/5. What is $P(\overline{A})$?

ODDS AGAINST A ARE $\frac{5}{8}$

$\Rightarrow P(\overline{A}) = \frac{5}{13}$

9. (2 points) Edgar was interested in answering the following question:

   If a PSC student is chosen at random, what is the probability that the student is a female?

To answer his question, Edgar counted 50 students as they passed through the doors, and 31 were females.

(a) Edgar assigned the probability a value of 31/50. Is this a theoretical or experimental probability?

THIS IS EXPERIMENTAL.

HE ACTUALLY DID THE EXPERIMENT!

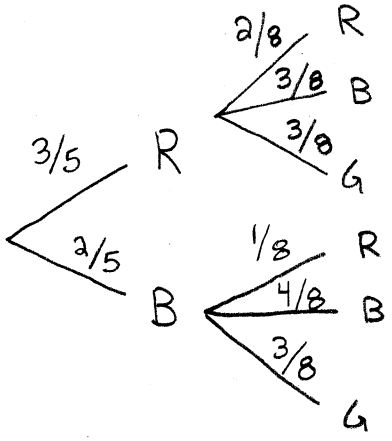
(b) What would Edgar need to do to assign the other type of probability?

HE MUST COUNT THE TOTAL # OF STUDENTS AND TOTAL # OF FEMALES.

PROB IS $\frac{\#\text{ OF FEMALE STUDENTS}}{\#\text{ OF STUDENTS}}$

10. Box 1 contains 3 red marbles and 2 blue marbles. Box 2 contains 1 red marble, 3 blue marbles, and 3 green marbles. A marble is selected at random from Box 1 and placed into Box 2. Then a marble is selected from Box 2.

(a) (3 points) Sketch the complete tree diagram for this experiment. Include the probabilities of each path.



$P(\{RR\}) = \frac{6}{40}$

$P(\{RB\}) = \frac{9}{40}$

$P(\{RG\}) = \frac{9}{40}$

$P(\{BR\}) = \frac{2}{40}$

$P(\{BB\}) = \frac{8}{40}$

$P(\{BG\}) = \frac{6}{40}$

(b) (1 point) What is the probability that a blue marble is selected from Box 2?

$$P(\{RB, BB\}) = \frac{9}{40} + \frac{8}{40} = \boxed{\frac{17}{40}}$$

(c) (1 point) Use your probability from part (b) to determine the probability that a non-blue marble is selected from Box 2.

$$1 - \frac{17}{40} = \boxed{\frac{23}{40}}$$

(d) (2 points) What is the probability of selecting a red marble from Box 1 or a green marble from Box 2?

$$P(\{RR, RB, RG, BG\}) = \frac{3}{5} + \frac{6}{40} = \frac{30}{40} = \boxed{\frac{3}{4}}$$

11. (3 points) John and Sally run a landscaping business. John can mow 3 yards in 2 hours, while Sally can mow 4 yards in 3 hours. Working together, how long will it take them to mow 5 yards?

JOHN: $\frac{3 \text{ yds}}{2 \text{ hrs}} = \frac{3/2 \text{ yd}}{1 \text{ hr}}$

SALLY: $\frac{4 \text{ yds}}{3 \text{ hrs}} = \frac{4/3 \text{ yd}}{1 \text{ hr}}$

$\Rightarrow$ TOGETHER: $\frac{\frac{3}{2} + \frac{4}{3} \text{ yds}}{1 \text{ hr}} = \frac{\frac{17}{6} \text{ yds}}{1 \text{ hr}} = \frac{17 \text{ yds}}{6 \text{ hrs}}$

$\frac{17 \text{ yds}}{6 \text{ hr}} = \frac{5 \text{ yds}}{X \text{ hr}} \Rightarrow X = \frac{30}{17} \text{ hrs} \approx 1.76 \text{ hrs}$

12. (3 points) Consider the fraction 55/89.

(a) Does the decimal form of the fraction repeat or terminate? Explain.

$\frac{55}{89}$ IS IN LOWEST TERMS AND 89 IS PRIME. IT REPEATS BECAUSE THE DENOM HAS PRIME FACTORS OTHER THAN 2's AND 5's

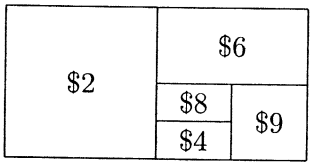
(b) Use your calculator to compute the fraction's the decimal form. Round your result to the nearest ten-thousandth.

$0.617977753... \approx \boxed{0.6180}$

(c) Looking at your calculator's display, are you surprised that the decimal form has not yet terminated or repeated? Explain.

NO, I AM NOT SURPRISED, THE REPETEND MAY HAVE UP TO 88 DIGITS.

13. (2 points) A dart lands at random on the board shown below. The thrower wins the amount of money associated with the dart's location. What is the probability that the thrower wins more than \$5? Briefly explain your reasoning.



$P(\$6) = \frac{1}{4}$

$P(\$9) = \frac{1}{8}$

$P(\$8) = \frac{1}{16}$

$\Rightarrow \frac{1}{4} + \frac{1}{8} + \frac{1}{16} = \boxed{\frac{7}{16}}$

14. (3 points) Suppose A, B, and C are events such that $P(A) = 0.35$, $P(B) = 0.70$, and $P(C) = 0.65$.

(a) Are A and B mutually exclusive? Explain your reasoning.

No, IF THEY WERE THEN $P(A \cup B) = P(A) + P(B)$
$= 0.35 + 0.70 = 1.05$
↑ NOT A PROB!

(b) What is $P(\overline{C})$?

$1 - 0.65 =$ **0.35**

(c) What is $P(A \cap B)$ if $P(A \cup B) = 0.85$?

$P(A \cap B) = P(A) + P(B) - P(A \cup B)$
$= 0.35 + 0.70 - 0.85 =$ **0.2**

15. (4 points) Consider the experiment of rolling a fair, six-sided die.

(a) Give an example of two mutually exclusive events.

$\{1, 5\}$ AND $\{2, 3, 6\}$

(b) Give an example of an event A such that the odds in favor of A are 4:2.

$\{1, 2, 3, 4\}$

(c) What is the event of rolling an even number?

$\{2, 4, 6\}$

(d) Give an example of an event D such that $P(D) = 1$.

$D = \{1, 2, 3, 4, 5, 6\}$