Answers for sample test I

Monday Sept 29, 2003

Math 142 Fall 2003 ____ NAME: Key

Test I 100pts

Chapters 10 and 11 Seat: ____

Show all your work! Partial credit is based on work shown!

6pts (2pts each) P.425

1. What kind of graph (a **bar graph**, a **circle graph, or** a **line graph**) would be **best suited** for each of the following situations:

   a. You want to show turkey production for the three major turkey producing states. Bar graph

   b. You want to show the proportion of a middle-school's student population that are 6th graders, 7th graders and 8th graders. circle graph

   c. You want to show the monthly sales for a business over the last two years to determine any trends. line graph

-2 if switched answers for a & c

2pts

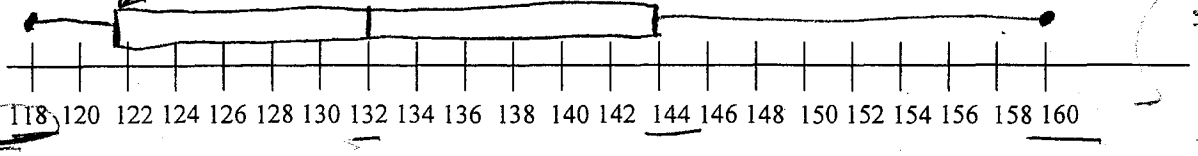
2. If a portion of a circle graph is to represent 25%, what will be the measure of the corresponding central angle? 90° (← 25% of 360°)

21pts

3. For the following heights of children, in centimeters,
   118, 120, 121, 122, 128, 128, 132, 134, 140, 142, 146, 155, 160
   find the: a. mode 128 1pt b. mean = $\frac{1746}{13} \approx 134.3$ c. median = 132 2pts

   d. lower quartile and upper quartile -2pts if 122 & 142 ⇒ 121.5 2pts 144 2pts (Also be able to calculate the fence to determine if there are outliers 2pts)

   e. construct a box and whisker plot, using the scale below.



5pts, one for each of 5 #'s plotted

   f. Make a stem and leaf plot for the heights. 4pts

Stem	Leaves
11	8
12	01288
13	24
14	026
15	5
16	0

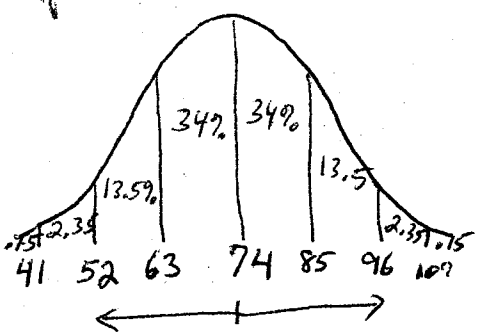
8pts

   g. Which gives a better analysis of the data, the box and whisker plot or the stem and leaf plot? box + whisker Explain: 3pts Variety of reasons are possible. Is shows quartiles, median & range Visualization of 5 data pts.

   Note! -2pts if said stem + leaf with a reason. Stem & leaf plot shows visualization of distribution but is not an analysis of data.

4. A county mathematics test for all third-graders had a normal distribution with a mean of 74 and a standard deviation of 11.

   a. Show a sketch of a normal distribution with the mean score and other scores, represented by the standard deviations, labeled. 4pts



   b. What percentage of the third-graders scored between 52 and 96? 2pts 95%

   c. At what percentile is a student who scored 63? 2pts 16th

37pts

Be flexible about answers here.

5. Describe two ways you could change a bar graph that would distort the overall impression of the graph but still use the original data. (Also explain how this change distorts the impression given.)

see 10.3 colayer 57-9

① Could change vertical scale by leaving out beginning part (or not label axis) This emphasizes the changes at the top of the bars. (makes it difficult to determine values)

② Could switch axes. This would make a decreasing trend appear to be increasing.

(could have) 3D bars – Are harder to read – harder to line up top of bar with vertical axis.

Pictorial embellishment can distract reader or make graph harder to read.

8pts

6. True / false questions. If false, correct the statement or explain why it is false. (1pt for the correction)

$6 \cdot 6 \cdot 2 = 36 \cdot 2 = 72$

False a. If you toss two dice and then flip a coin, there are ~~38~~ possible outcomes.

True b. The words tab and bat are the same combination of letters.

true c. A z-score is the number of standard deviations away from the mean in a normal distribution.

False d. The experimental probability and theoretical probability of an event are usually ~~the same~~ not.

(Theoretical is the "ideal" outcome – calculate from possible outcomes
Experimental is the actual outcome when an experiment is done
These are approximately equal for a large # of repeated experiments.) (could explain or just say not)

4pts.

7. Suppose that the odds of a certain bill's passing through a state senate are 7 to 5,

a. what are the odds of the bill's not passing? 5:7

b. what is the probability that the bill will pass? $\frac{7}{12}$

6pts

8. Suppose an insurance company has broken down yearly automobile claims for drivers from age 16 through 21, as shown in the table below. How much should the company charge as its average premium in order to break even on its cost for claims?

Amount of claim (nearest $2000)	Probability
0	0.70
$ 2000	0.15
$ 4000	0.10
$ 6000	0.03
$ 8000	0.01
$10000	0.01

Expected value $= v_1 p_1 + v_2 p_2 + \dots + v_6 p_6$

$E = \$0(.70) + 2000(.15) + 4000(.10) + 6000(.03) + 8000(.01) + 10000(.01)$

$E = \$0 + \$300 + \$400 + \$180 + \$80 + 100$

$E = \$1060$

note $\frac{30000}{6} = 5000$ not correct since not equally likely

4pts

9. Jennifer stated that it is best to do a simulation whenever an experiment is very complex or requires a large number of trials. Do you agree? Yes Explain: –2pts if said no, calculate theoretical prob

see p. 484 p. 516

(If experiment is complex the theoretical probability may be hard (or impossible) to calculate, so instead you can do a simulation to calculate an experimental probability

or

(With a large # of trials it is easier to simulate the situation, especially using a computer, rather than carry out the original experiment.

or

(May possibly save time + money with a simulation.

26pts

11 balls

10. A bag contains 1 red balls, 6 blue balls, and 4 white balls. One ball is drawn at random and then a second ball is drawn without replacing the first ball.

a. On the back of the previous page, draw a **probability tree diagram** to illustrate this and **list all the different possible outcomes.** 10pts

b. Find the following probabilities: 9pts

Note: this work may be on the page with their tree diagram

P (one red ball and one white ball)

$$P(RW \text{ or } WR) = \left(\frac{1}{11}\cdot\frac{4}{10}\right) + \left(\frac{4}{11}\cdot\frac{1}{10}\right) = \frac{4}{110} + \frac{4}{110} = \boxed{\frac{8}{110}} \text{ or } \frac{4}{55}$$

P (both balls are white)

$$P(WW) = \frac{4}{11}\cdot\frac{3}{10} = \boxed{\frac{12}{110}} \text{ or } \frac{6}{55}$$

-1pt if 4 mult.

P (two balls of the same color)

$$P(WW \text{ or } BB) = \left(\frac{4}{11}\cdot\frac{3}{10}\right) + \left(\frac{6}{11}\cdot\frac{5}{10}\right) = \frac{12}{110} + \frac{30}{110} = \boxed{\frac{42}{110}} \text{ or } \frac{21}{55}$$

6pts (2pts each)

11. Show how the Fundamental Counting Principle can be used to solve this problem:
Telephone numbers consist of ten digits; the area code followed by 7 digits.

a. How many different telephone numbers can there be that have the area code 910?
(Assume the first digit cannot be a 0 or a 1.)

$$\underbrace{1\cdot1\cdot1}_{\text{(area code)}} \cdot 8\cdot10\cdot10\cdot10\cdot10\cdot10\cdot10 = 8\cdot10^6 \text{ or } 8{,}000{,}000$$

b. How many of these phone numbers would begin with 962, following the area code 910?

$$\underbrace{1\cdot1\cdot1}_{910}\cdot\underbrace{1\cdot1\cdot1}_{962}\cdot10\cdot10\cdot10\cdot10 = 10^4 = 10{,}000$$

c. What is the probability of getting one of these phone numbers that begin 910-962-____?

$$\frac{10000}{8000000} = \frac{1}{800}$$ Convert to ratio of possible to actual

6pts (3pts each)

12. If a team of six players must be chosen from 5 boys and 4 girls, how many teams can be made if

a. there are no restrictions?

$${}_9C_6 = \frac{9!}{3!6!} \quad \frac{9\cdot8\cdot7\cdot6\cdot5\cdot4}{6!} = 84$$

-1pt if $_9P_6 = 60480$

b. there must be 3 boys and 3 girls?

$$\frac{5\cdot4\cdot3}{3!}\cdot\frac{4\cdot3\cdot2}{3!} = 10\cdot4 = 40$$

or ${}_5C_3 \cdot {}_4C_3 \Rightarrow$ -1pt if $_5P_3 \cdot {}_4P_3 = 1440$

6pts

13. Suppose that there are 12 first-class seats on an airplane. How many different ways are there to seat

a. 12 passengers?

$$12! = 479{,}001{,}600$$

$${}_{12}P_{12} = \frac{12!}{0!} = \frac{12!}{1}$$

b. 7 passengers?

$$12\cdot11\cdot10\cdot9\cdot8\cdot7\cdot6 = 3991680$$

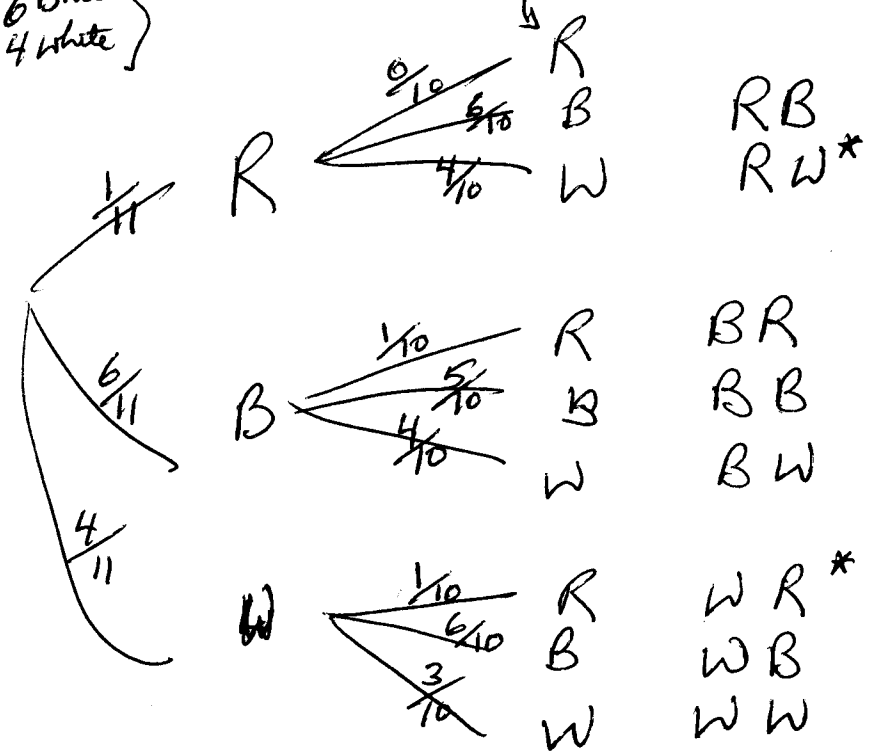
37pts

$${}_{12}P_7 = \frac{12!}{5!} \Rightarrow$$ -2 if $7! = 5040$

-1pt if $_{12}C_7 = 792$

1 Red
6 Blue
4 White
} 11 balls

could omit this one since probability is zero



RB
RW*
BR
BB
BW
WR*
WB
WW

$P(WW) = \frac{4}{11} \cdot \frac{3}{10} = \frac{12}{110}$ or $\frac{6}{55}$