

Math 206 - 1st Final Exam

May 4, 2011

Name key

Score _____

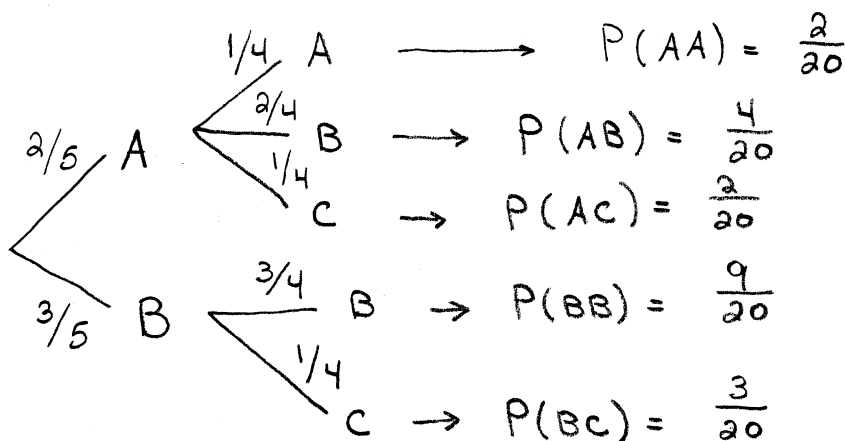
Show all work. Supply explanations where necessary. Use only a compass and a straightedge for constructions. For each construction, the steps you follow must be apparent.

1. (5 points) A letter is selected at random from the first box and placed into the second box. Then a letter is selected from the second box.

A A B B B

B B C

- (a) Sketch the probability tree associated with this two-stage experiment and find the probability of each outcome.



- (b) Are the probabilities above theoretical or experimental? Explain your reasoning.

THEORETICAL. NO EXPERIMENTS HAVE BEEN DONE.

THE PROBABILITIES WERE ASSIGNED BY ASSUMING RANDOMNESS AND EACH LETTER BEING EQUALLY LIKELY.

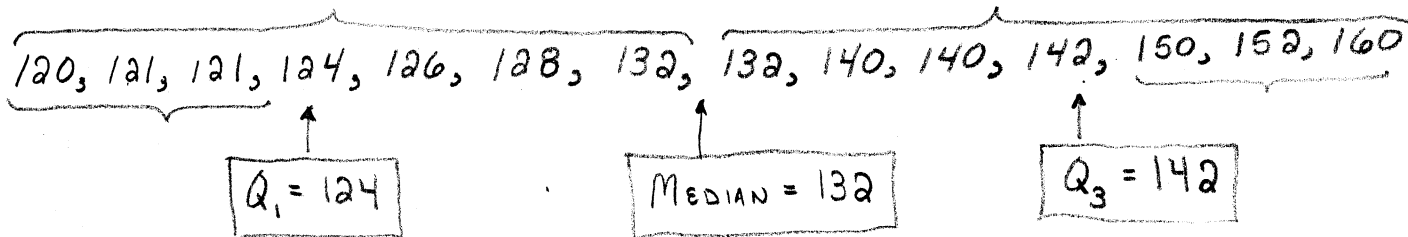
2. (3 points) Ms. Ridder teaches two algebra classes. Section 1 has 17 students, and their mean score on the recent test was 72.5. Section 2 has 24 students, and their mean score was 68.25. Find the mean score of the combined classes.

$$\frac{17 \cdot 72.5 + 24 \cdot 68.25}{41} = \frac{2870.5}{41}$$

$$\approx \boxed{70.01}$$

3. (6 points) The numbers shown below are the heights (in centimeters) of the children in Mr. Strand's class. Compute the median, quartiles, IQR, and outlier cut-offs. Then construct the corresponding box plot. (Use the attached graph paper for the box plot.)

~~121, 120, 121, 128, 124, 126, 160,~~
~~132, 140, 140, 152, 150, 142, 132~~



$IQR = 142 - 124 = 18$

$1.5 \times IQR = 27$

$Q_1 - 27 = 97$

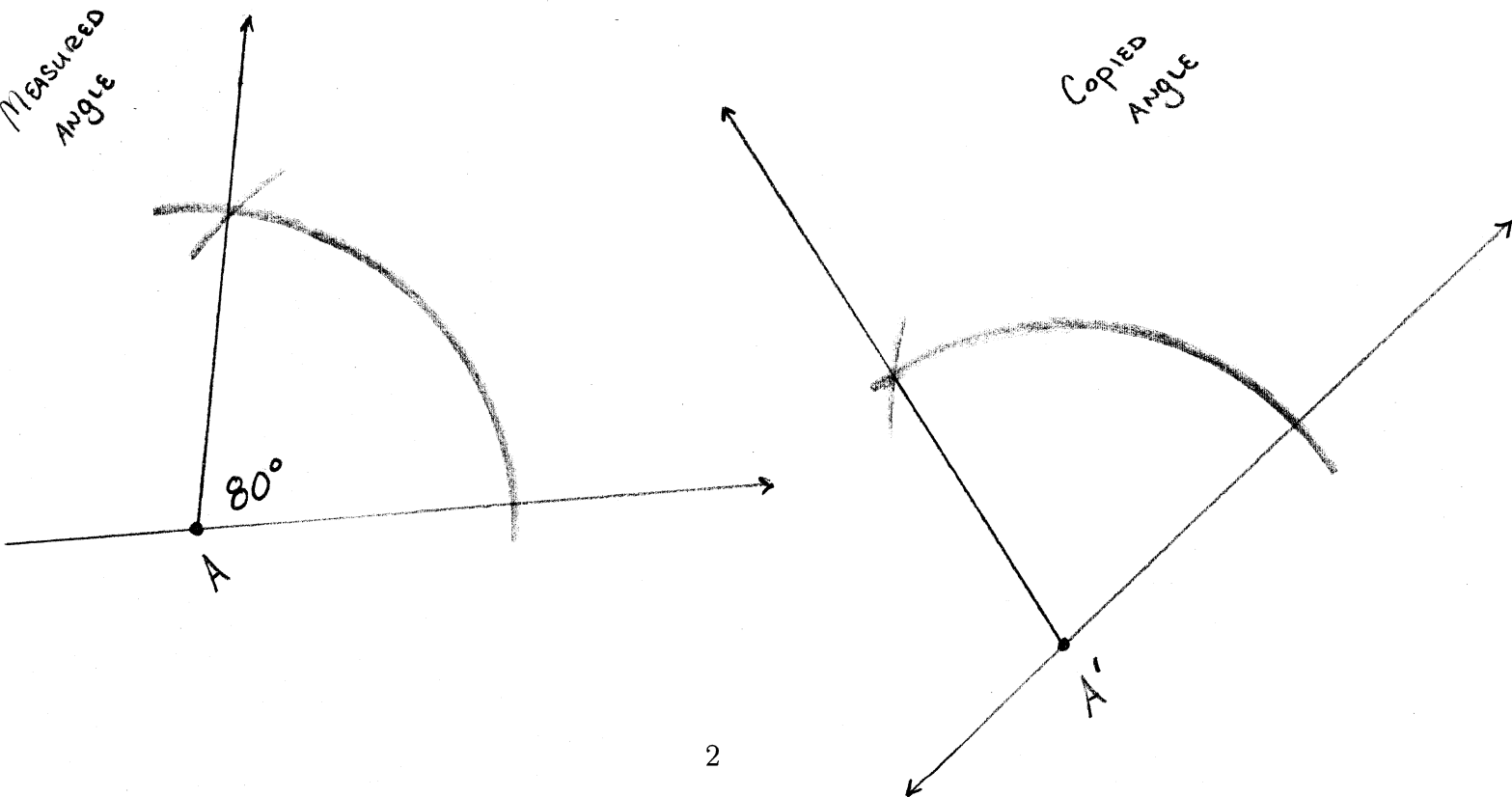
$Q_3 + 27 = 169$

There are no outliers in this data set.

Outliers are below 97 or above 169.

See graph paper for box plot.

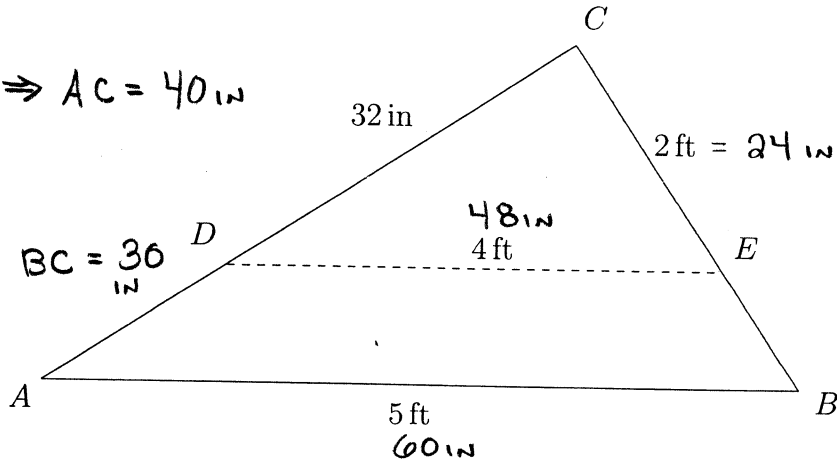
4. (5 points) Use your protractor to construct an angle that measures 80° . Then use only a compass and straightedge to copy that angle to a new location.



5. Consider the triangle shown below.

$$\frac{48}{60} = \frac{32}{AC} \Rightarrow AC = 40 \text{ in}$$

$$\frac{48}{60} = \frac{24}{BC} \Rightarrow BC = 30 \text{ in}$$



(a) (3 points) Find the perimeter of $\triangle ABC$. Write your answer in feet.

$$40 \text{ in} + 60 \text{ in} + 30 \text{ in} = 130 \text{ in}$$

$$\frac{130 \text{ in}}{1} \cdot \frac{1 \text{ FT}}{12 \text{ in}} = \boxed{10.8\bar{3} \text{ FT}}$$

(b) (2.5 points) Convert the perimeter to miles.

$$\frac{10.8\bar{3} \text{ FT}}{1} \cdot \frac{1 \text{ mile}}{5280 \text{ FT}} \approx \boxed{0.00205 \text{ mi}}$$

(c) (2.5 points) Convert the perimeter to meters.

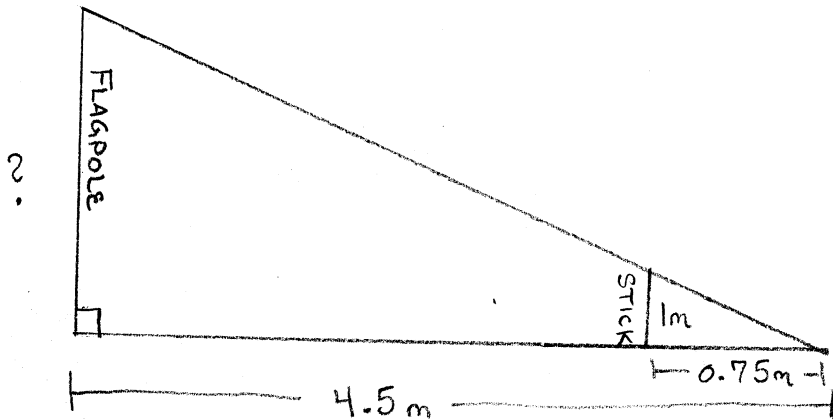
$$\frac{130 \text{ in}}{1} \cdot \frac{2.54 \text{ cm}}{1 \text{ in}} \cdot \frac{1 \text{ m}}{100 \text{ cm}} = \boxed{3.302 \text{ m}}$$

6. (3 points) What is the name of a polygon with 7 sides? What is the measure of each interior angle of a regular 7-sided polygon?

HEPTAGON.

$$\frac{(7-2)(180^\circ)}{7} \approx \boxed{128.57^\circ}$$

7. (3 points) On a sunny day a flagpole casts a 4.5-m shadow. At the same time, a meter stick cast a 0.75-m shadow. Use similar triangles to find the height of the flagpole.

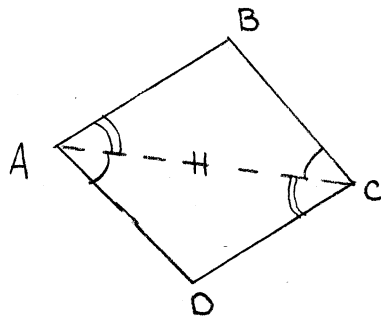


$$\frac{1\text{m}}{0.75\text{m}} = \frac{?}{4.5\text{m}}$$

$$? = 6\text{m}$$

8. (4 points) What is a rhombus? Use a ruler to roughly sketch a rhombus. (It doesn't have to be perfect!) Then draw one of the diagonals. Give a convincing argument that the diagonal divides the rhombus into two congruent triangles.

A RHOMBUS IS A PARALLELOGRAM WITH TWO ADJACENT SIDES CONGRUENT.



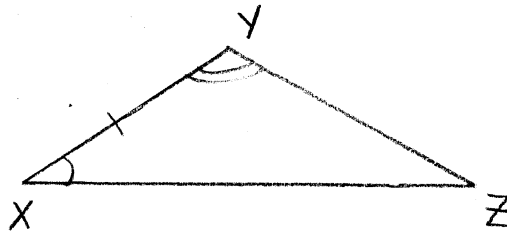
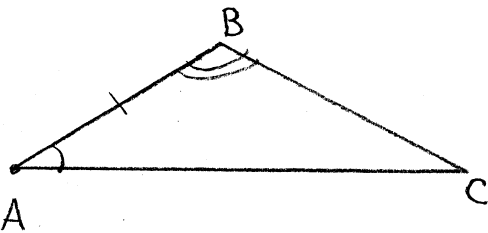
① \overleftrightarrow{AC} IS A TRANS OF PARALLEL LINES
 \overleftrightarrow{AD} AND $\overleftrightarrow{BC} \Rightarrow \angle CAD \cong \angle ACB$
 (ALT INT \angle 'S)

② SIMILARLY, $\angle CAB \cong \angle ACD$

③ $\overline{AC} \cong \overline{AC}$ DUH!

④ $\triangle BAC \cong \triangle DAC$ BY ASA

9. (4 points) Sketch two obtuse triangles that appear to be congruent. Label them $\triangle ABC$ and $\triangle XYZ$. Indicate what must be true if the triangles are congruent by the ASA property.



TO BE CONGRUENT BY ASA, TWO ANGLES
 AND THE INCLUDED SIDE MUST BE CONGRUENT
 4 (SUCH AS MARKED).

10. (5 points) Suppose A , B , and C are events of an experiment with sample space S . Further suppose that

$$P(A) = \frac{3}{8}, \quad P(B) = \frac{5}{8}, \quad P(C) = \frac{1}{2}.$$

- (a) Find the odds against A .

ODDS IN FAVOR ARE $\frac{3}{5} \Rightarrow$ ODDS AGAINST ARE $\boxed{\frac{5}{3}}$

- (b) Find $P(A \cup C)$ if $P(A \cap C) = 0.25$

$$P(A \cup C) = P(A) + P(C) - P(A \cap C) = \frac{3}{8} + \frac{1}{2} - 0.25 = \boxed{\frac{5}{8} = 0.625}$$

- (c) Find $P(\bar{B})$.

$$1 - \frac{5}{8} = \boxed{\frac{3}{8}}$$

- (d) Find the odds in favor of B .

$$\boxed{\frac{5}{3}}$$

- (e) Is it possible that B and C are mutually exclusive? Explain.

No, BECAUSE $\frac{5}{8} + \frac{1}{2} > 1$

11. (4 points) The prices of a certain stock throughout the day are shown below.

9am — \$3.50, 11am — \$5.00, 12noon — \$6.25, 2pm — \$6.50, 3pm — \$4.00

What type of graph would be best for displaying this data? Sketch the corresponding graph on the attached graph paper.

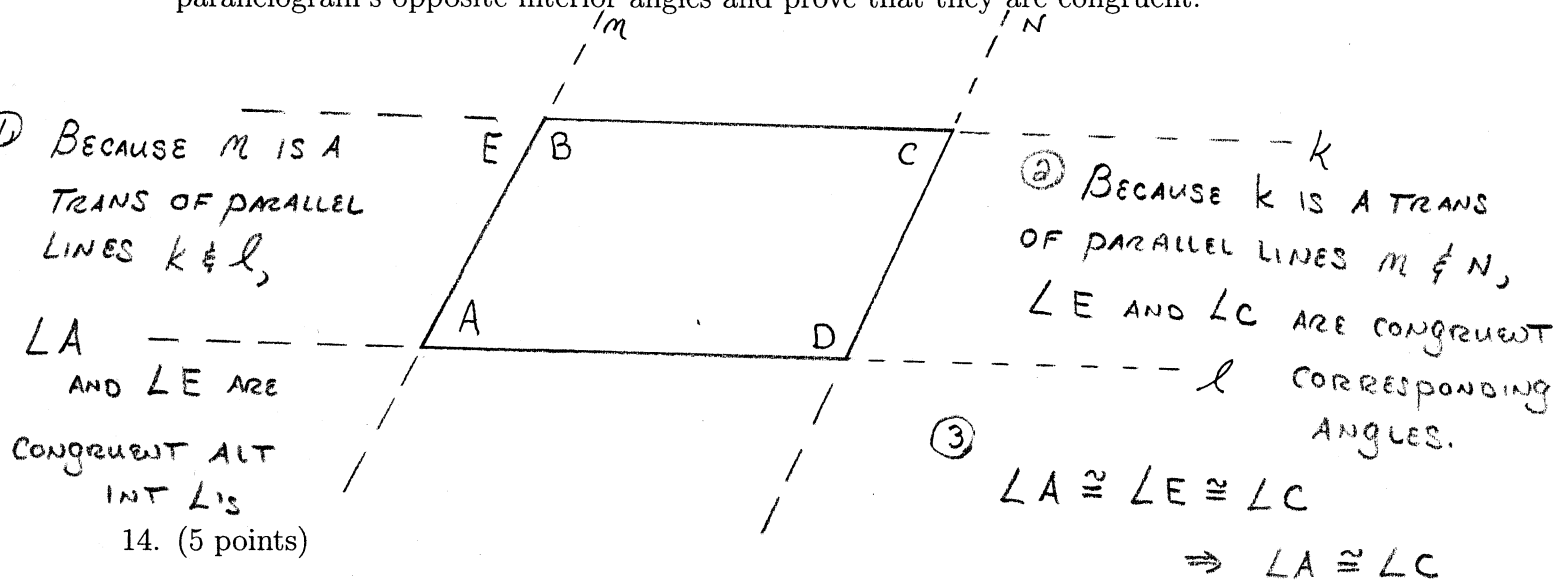
LINE GRAPHS ARE BEST FOR SHOWING TRENDS
OVER TIME. (SEE GRAPH PAPER.)

12. (3 points) An experiment consists of selecting a letter at random from the word SPEED. List the elements of a possible sample space, and give an event with probability $\frac{4}{5}$.

$$\text{SAMPLE SPACE} = \{S, P, E, D\}$$

$$\text{EVENT} = \{S, P, E\}$$

13. (5 points) Use a ruler to roughly sketch a parallelogram. (It doesn't have to be perfect!) Extend each side to form two pairs of parallel lines. Now choose any pair of the parallelogram's opposite interior angles and prove that they are congruent.



14. (5 points)

- (a) How many distinct points are needed to uniquely define a line?

2 points

- (b) How many distinct, non-collinear points are needed to uniquely define a plane?

3 points

- (c) What does CPCTC stand for?

CORRESPONDING PARTS OF CONGRUENT TRIANGLES ARE CONGRUENT

- (d) What does it mean for a 2D figure to be simple?

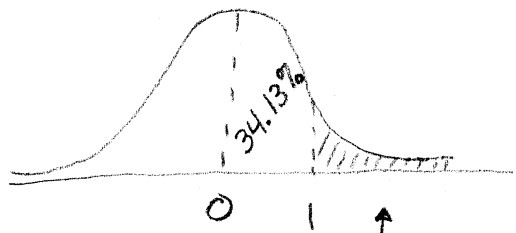
IT DOES NOT CROSS ITSELF

- (e) What are skew lines?

LINES THAT DO NOT LIE IN THE SAME PLANE.

15. (4 points) Biologists studying Australia's Long-Nosed Bandicoot have found that adult males have a mean weight of 6.73 lbs with a standard deviation of 0.47 lbs. Assuming bandicoot weights are normally distributed, about what percent of adult male bandicoots weigh more than 7.2 lbs?

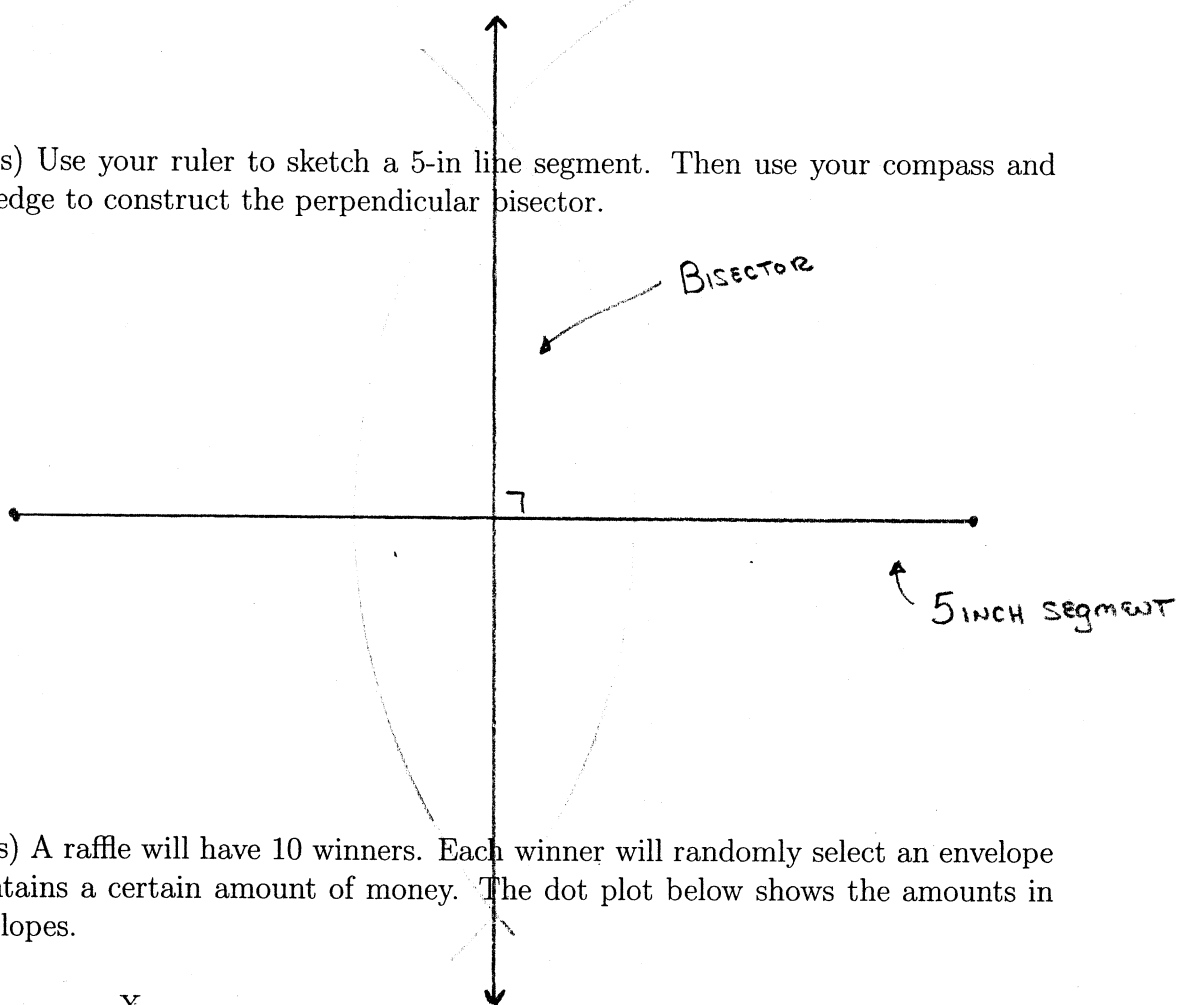
$$z = \frac{7.2 - 6.73}{0.47} = 1$$



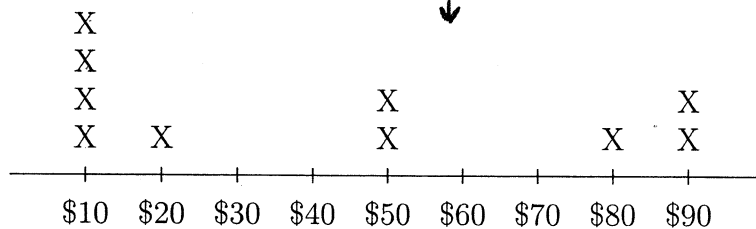
50% - 34.13%

= 15.87%

16. (4 points) Use your ruler to sketch a 5-in line segment. Then use your compass and straightedge to construct the perpendicular bisector.



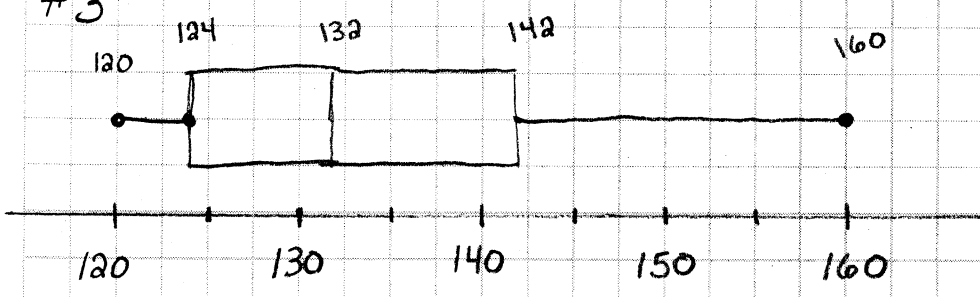
17. (4 points) A raffle will have 10 winners. Each winner will randomly select an envelope that contains a certain amount of money. The dot plot below shows the amounts in the envelopes.



How much should the first winner expect to win? (Compute the expected value.)

$$\begin{aligned}
 E &= \frac{4}{10} (\$10) + \frac{1}{10} (\$20) + \frac{2}{10} (\$50) + \frac{1}{10} (\$80) \\
 &\quad + \frac{2}{10} (\$90) \\
 &= \frac{40 + 20 + 100 + 80 + 180}{10} \\
 &= \frac{420}{10} = \boxed{\$42}
 \end{aligned}$$

#3



#11

