Statistics Unit 1 test: Exploring one-variable data

Name _____ Date _____ Period _____

13 questions, 54 points

1. A post office weighs 10 parcels and sorts them into classes: light (under 2 kg), medium (2 kg up to 5 kg) and heavy (5 kg and over). The clerk writes down only the classes: 4 light, 5 medium and 1 heavy. (3 points)

(a) Explain why the total mass of the 10 parcels must be more than 15 kg.

(b) Could the mean mass of the parcels be 1.2 kg? Could it be 4 kg? Explain each answer.

2. Naomi recorded how long she spent sketching on 12 days, to the nearest 5 minutes:

30, 45, 20, 55, 15, 30, 40, 25, 50, 30, 35, 20

(a) Make a frequency table with bins 10 minutes wide from 10 to 60, using this course's rule: a value on an edge goes in the bar to its right. (b) Her brother Daniel uses the other rule: a value on an edge goes in the bar to its left, so "10 to 20" holds 15 and 20. Make his table with the same bins. (c) Which bar is tallest in each table? Explain what this shows about the edge rule. (3 points)

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3. The 12 students in Arjun's gym class each threw a softball once. The distances, in meters, were 18, 25, 31, 22, 27, 35, 20, 29, 24, 33, 26, 40.
(4 points)

(a) Find the mean and the median.

(b) Find the five-number summary.

(c) Find the IQR. How many throws are longer than Q_1 and shorter than Q_3, and what fraction of the class is that?

4. On the same test, Class A had mean 72 points with standard deviation 5 points, and Class B had mean 78 points with standard deviation 12 points.
(4 points)

(a) Compare the two classes in two sentences.

(b) Jasmine in Class A scored 84 and Andre in Class B scored 90. Who did better relative to their own class? Show the counts of standard deviations.

(c) Andre says, "Class B's standard deviation is bigger, so the lowest score in Class B must be lower than the lowest score in Class A." Explain why the standard deviations cannot show this.

5. Leah measured 11 pea pods, in centimeters, and sorted the lengths: 5, 6, 7, 7, 8, 8, 9, 9, 9, 10, 16.
(4 points)

(a) Find Q_1, Q_3, the IQR and the two fences, and name any outliers.

(b) Leah's partner writes every length in millimeters (1 cm = 10 mm). Without sorting the new list, give Q_1, Q_3, the IQR and the fences in millimeters, and say whether the same pods are outliers.

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6. Isaac asked 15 classmates how many whole hours each one spent playing video games last week: 2, 0, 3, 5, 4, 1, 3, 6, 2, 4, 3, 16, 5, 2, 3. (5 points)

(a) Find the median, the quartiles, and the mean to the nearest tenth of an hour.

(b) Test for outliers, and name any gap.

(c) Write a description that answers "How much time did Isaac's classmates spend playing video games last week?"

(d) If the 16 were left out, about how much would the mean change, and how much would the median change? What does that show about the pair of measures you chose?

7. In gym class, each of 11 students did as many sit-ups as possible in one minute. The counts were 43, 39, 46, 10, 41, 45, 40, 47, 43, 42, 44. The student who did 10 got a cramp and stopped early. (5 points)

(a) Use the 1.5 IQR rule to decide whether 10 is an outlier. Show the quartiles and the fences.

(b) Find the mean and the median of all 11 counts, and of the 10 counts left without the 10.

(c) The gym teacher wants one number for how many sit-ups a student in this class usually does. Which center should she report, and why?

8. A toll booth handles about 3000 cars a day. One day a worker counts the people in 20 cars chosen at random. (4 points)

people x	**1**	**2**	**3**	**4**
cars f	8	6	4	2

(a) Find the median, the quartiles and the IQR of the 20 counts.

(b) Find the standard deviation that fits this question, to two decimal places.

(c) The worker types the 20 counts into a spreadsheet and uses STDEV.P. What does it show, and why is it not the one wanted?

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9. The distances that one model of electric scooter travels on a full charge are modeled by $N(40, 3)$, in kilometers. Use the empirical rule: for a normal model, about 68%, 95% and 99.7% of values lie within one, two and three standard deviations of the mean. (4 points)

(a) Find the z-scores of distances of 34 km and 43 km.

(b) Estimate the share of scooters that either travel less than 34 km or travel more than 43 km on a full charge.

(c) The maker wants to advertise a range that only about 0.15% of its scooters fall short of. What range should it advertise?

(d) A new battery keeps the standard deviation at 3 km but moves the mean, so that only about 2.5% of scooters travel less than 38 km. Find the new mean.

10. Before a typing course, the typing speeds of a large group of students are modeled by $N(40, 8)$, in words per minute. Suppose the course turns every speed x into $1.1x + 5$. (4 points)

(a) Give the model for the speeds after the course.

(b) Where are the inflection points of the new curve?

(c) What speed before the course turns into 66.6 words per minute after it? How many standard deviations above the mean is it before the course, and how many is 66.6 after it?

(d) Before the course, the model gives a share of about 0.023 of students typing faster than 56 words per minute. What share does the new model give faster than 66.6 words per minute, and what share slower than 31.4 words per minute? Explain.

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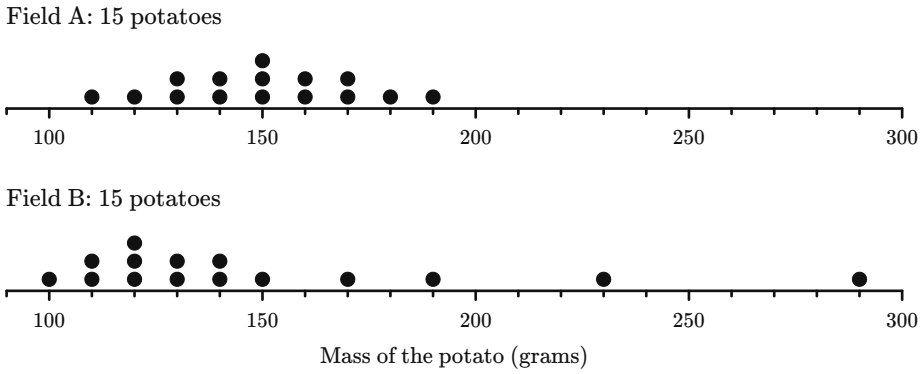
11. The times taken to put together a flat-pack desk are modeled by $N(52, 8)$, in minutes. Use the standard normal table or a calculator's normal function, and give shares to four decimal places. (4 points)

(a) What share of people take more than 64 minutes?

(b) A furniture store sells 1,200 of these desks in a year, and each buyer puts one together. Find the share of buyers who take between 48 and 64 minutes, and about how many of the 1,200 buyers the model expects to take that long. Round the count to the nearest whole buyer.

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12. Mateo dug random samples of 15 potatoes from each of two large fields and weighed each one, to the nearest 10 grams. The dot plots show the masses.



Field A: 110, 120, 130, 130, 140, 140, 150, 150, 150, 160, 160, 170, 170, 180, 190

Field B: 100, 110, 110, 120, 120, 120, 130, 130, 140, 140, 150, 170, 190, 230, 290 (5 points)

(a) Describe the shape of each distribution.

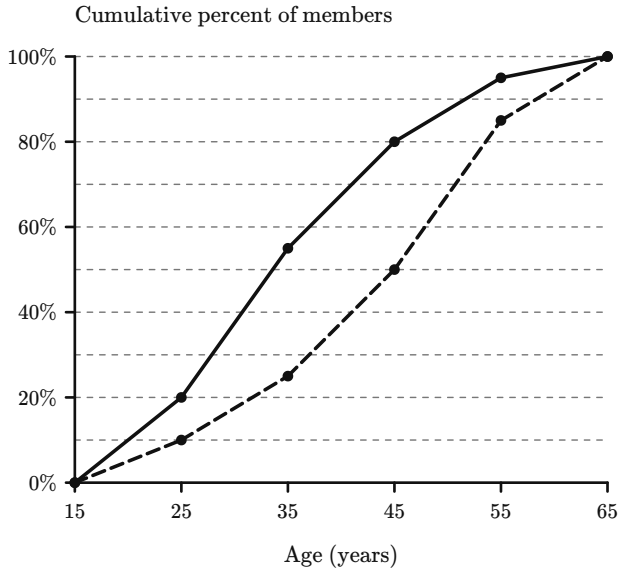
(b) Use the 1.5 IQR rule to decide whether either of Field B's two heaviest potatoes is an outlier.

(c) Find the mean and the median of each field. Which pair should be compared, and what does the comparison say?

(d) Do the samples give good reason to think the potatoes in Field A tend to be heavier? Explain by comparing the shift with the spread.

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13. The graph shows the cumulative relative frequency of the ages of the members of two community choirs: Choir A has 60 members and Choir B has 80. Each plotted point lies on a faint line or halfway between two.
(5 points)



Solid line: Choir A. Dashed line: Choir B.

(a) Estimate the median age in each choir, to the nearest tenth of a year.

(b) Estimate the interquartile range of the ages in each choir, to the nearest tenth of a year.

(c) How many members of each choir are 55 or older?

(d) Compare the two age distributions in context, using the graph.

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