Answers

	FORM A	FORM B
1	A	B
2	D	C
3	A	D
4	E	B
5	B	D
6	A	E
7	C	A
8	D	B
9	B	C
10	B	A
11	E	A
12	C	D
13	B	C
14	C	D
15	D	E

MATH 10 EXAM 1 Ch. 1, 2, 3
WINTER 2019

See following pages for some of the work/explanations for multiple choice and for complete solutions to written (free response) questions

This page is followed by
Form A (purple)
and then by
Form B (blue)

Both Versions
Both Classes
} are in this file

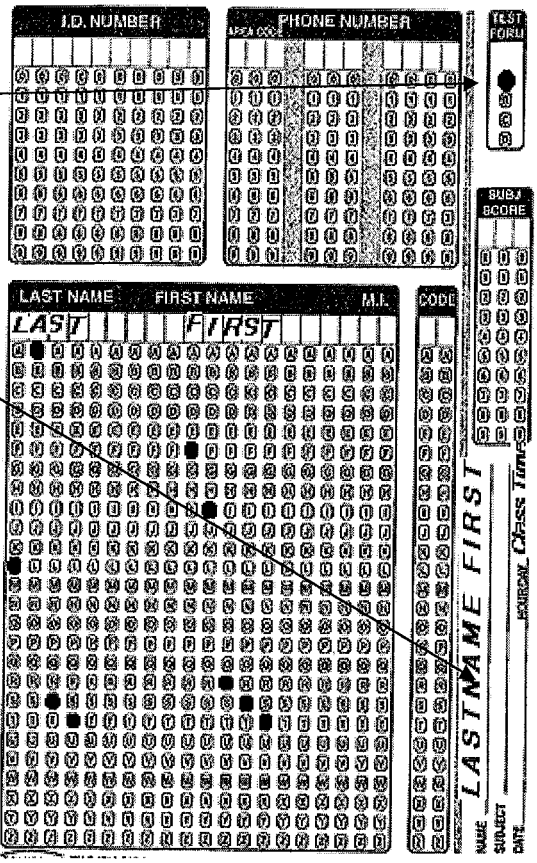
PURPLE

Winter 2019 FORM A Name Last: Form A **First:** KEY

Exam 1: Chapters 1,2,3 **Circle Class Time: 11:30 12:30**

DIRECTIONS:

- **Print your NAME and CIRCLE YOUR CLASS TIME on THIS EXAM paper.**
- **Completely fill in the letter bubble for FORM A on your PARSCORE**
- **Print your NAME and Class time on your PARSCORE.**
- **Completely fill in the letter bubbles under YOUR NAME on your PARSCORE.**
  (ID and phone number are NOT needed)



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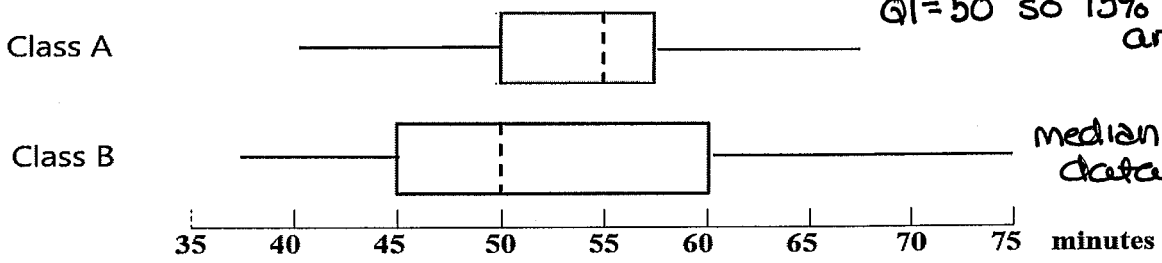
  Each multiple choice question is worth 5 points and has exactly ONE BEST answer.
  .
- **There are 6 written response questions. Answer the written response questions on this exam paper** (not on the parscore).
  Show work. These written questions are worth a total of 28 points; points for each question are shown.
- **You may write on this exam. There is no scratch paper allowed.**
- **You must turn in your page of notes with this exam.**
- **Put the PARSCORE and PAGE of NOTES INSIDE your EXAM to turn it in.**
  Before you start packing up your things, turn in your EXAM and SCANTRON. Then go back to your desk to pack up your materials. When your exam is returned, you will get back all materials you turned in. When your exam is returned, you will get back all your materials.

A TOTAL OF 103 points out of 100 is possible on this exam

FAILURE TO FOLLOW ANY OF THESE INSTRUCTIONS ON THIS EXAM WILL COST YOU 3 POINTS!

1. The boxplots represent the times, in minutes, needed for students in two statistics classes to complete a lab worksheet. Both classes have the same total number of students

Q1 = 50 so 75% of data values are ≥ 50



median = 50 so 50% of data values are ≥ 50

Which class had more students who took 50 minutes or longer to complete the assignment?

A. Class A B. Class B C. Both the same

D. Not enough information given to determine

Questions 2 - 5 refer to the following:

The table below shows information for a sample of 150 jobs at Jim's Auto Repair Shop. It classifies the jobs by type of work done and type of vehicle.

Type of Work Done	Type of Vehicle			
	Cars (C)	Trucks (T)	SUVs (S)	TOTAL
Routine Maintenance (M)	19	12	22	**53**
Repair out of Warranty (R)	15	12	18	**45**
Warranty Repair (W)	9	6	11	**26**
Accident Repair (A)	7	10	9	**26**
TOTAL	**50**	**40**	**60**	**150**

Suppose that one job was randomly selected from 150 jobs in the table.

2. Find the probability that the job was warranty repair (W) **and** the vehicle was a truck (T).

A. 70/150 B. 6/40 C. 11/26 D. 6/150 E. 66/150

3. Find the probability that the job was warranty repair (W) **or** the vehicle was an SUV (S).

Use $P(W \text{ or } S) = P(W) + P(S) - P(W \text{ and } S)$ Addition Rule

A. 75/150 B. 86/150 C. 11/26 D. 11/60 E. 11/150

$\frac{26}{150} + \frac{60}{150} - \frac{11}{150}$

4. Find the probability that job was a truck (T) **given that** it was an accident repair (A)

A. 10/150 B. 10/40 C. 56/140 D. 26/40 E. 10/26

$P(A|T)$ $P(T|A)$

5. The events "SUV", "Repair out of warranty" (S , R) are

A. Mutually Exclusive only
B. Independent only
C. Both Mutually Exclusive and Independent
D. Neither Mutually Exclusive nor Independent

$P(R) = \frac{45}{150} = .3$ $P(R|S) = \frac{18}{60} = .3$

$P(R) = P(R|S)$ INDEPENDENT

$P(R \text{ and } S) = \frac{18}{150} \neq 0$ NOT MUTUALLY EXCLUSIVE

Questions 6 – 9 refer to the following:
An egg packaging plant is evaluating the effectiveness of its egg cartons in preventing egg breakage. They want to know how many eggs are broken in a carton of a dozen eggs.

The quality control manager selects a sample of egg cartons to inspect to see how many eggs are broken in a carton of eggs.

6. The plant has 10 egg packaging machines. The quality control manager gets the sample by randomly selecting 2 out of the 10 packing machines and then inspecting every carton of eggs packed by those two machines. The sampling method is

(A. cluster) B. stratified C. simple random D. systematic

7. The number of broken eggs in a carton is:

A. qualitative B. quantitative continuous (C. quantitative discrete) D. categorical

8. The PARAMETER is

A. the total number of eggs in the sample
B. the total number of eggs in the population
C. the average number of broken eggs for the cartons of eggs that are inspected. statistic
(D.) the average number of broken eggs for all cartons of eggs packed at the factory parameter

9. The VARIABLE of interest in this study is

A. the total number of eggs packed in a day
(B.) the number of broken eggs in a carton of eggs variable
C. the average number of broken eggs for the cartons of eggs in the sample. statistic
D. the average number of broken eggs for all cartons of eggs packed at the factory parameter

10. Below are the results of the first exam for three students in three algebra different classes.

Student	Score		Class Average Grade	Class Standard Deviation
Reena	84	Class R	77	9
Sofia	83	Class S	77	6
Tracy	91	Class T	85	8

Which student had the **BEST** exam performance when compared relative to the other students in her own class? Sofia has largest z-score

A. Reena (B. Sofia) C. Tracy D. Both Sofia and Reena

$z = \frac{84-77}{9} = \frac{7}{9}$ $z = \frac{83-77}{6} = \frac{6}{6} = 1$ $z = \frac{91-85}{8} = \frac{6}{8}$

11. At a company, 38% of employees are under age 35, and 62% are age 35 or over.
57% of all employees contribute to retirement savings accounts.
But, of the employees who are under age 35, only 25% contribute to a retirement savings account.

Find the probability that an employee is under age 35 and contributes to a retirement savings account.

A. 0.2166 B. 0.2500 C. 0.1550 D. 0.7000 (E. 0.0950)

Event U = under age 35
R = contributes to retirement savings

$P(U) = .38$
$P(R) = .57$
$P(R|U) = .25$

$P(R \text{ and } U) = P(R|U)\,P(U)$
$= .25(.38) = .095$

12. Rydez Bikeshare Company is studying bike usage by people who rent its bikes.
For a sample of riders, they collect data from their records about the distance a user travels on a bike rental, and the number of days per month a rider rents a Rydez bike.
They select the sample by downloading the GPS records of the bike rental for every 10th bike rental during the time the study is conducted. The sampling method is

A. cluster B. stratified C. systematic D. simple random

Questions 13 – 18 refer to the following:

The table shows the speeds in miles per hour for a sample of 25 vehicles on River Expressway

Score (L1)	Frequency (L2)	Relative Frequency	Cumulative Relative Frequency
52	1	0.04	0.04
55	2	0.08	0.12
60	2	0.08	0.20
65	4	0.16	0.36
67	8	0.32	0.68
69	6	0.24	0.92
74	2	0.08	1

1 varstats L1, L2
or
1 varstats
Xlist: L1
freq: L2

13. Find the mean and standard deviation for this sample data:

A mean = 65.6 standard deviation = 5.29
B. mean = 65.6 standard deviation = 5.40 ← its a sample; need s for the standard deviation
C. mean = 63.14 standard deviation = 7.86
D. mean = 63.14 standard deviation = 7.28
E. mean = 3.57 standard deviation = 2.57

14. Which would be the most appropriate measure of center of this data, and why?

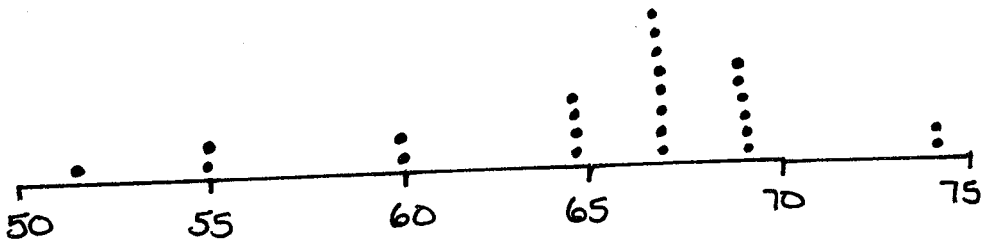
A. Mean because the data are skew.
B. Mean because the data are not skew
C. Median because the data are skew.
D. Median because the data are not skew.
E. Standard Deviation

Data are skewed to the left, so the MEDIAN is more appropriate as measure of center. If you can't tell by looking that its skewed to the left, try making a quick dotplot (see below)

15. What percent of the vehicles had speeds of **at least 65** miles per hour?

A. 16% B. 20% C. 64% D. 80% E. 36%

$\frac{4+8+6+2}{25} = \frac{20}{25} = .80$ OR $1 - .2 = .80$



ANWER THE REST OF THE QUESTIONS BY WRITING WORK AND ANSWERS ON THIS EXAM PAPER.

DO *NOT* ANSWER THE REST OF THESE QUESTIONS ON THE PARSCORE FORM

Questions 13 – 18 refer to the following (information repeated from questions 13 – 15 on previous page)

The table shows the speeds in miles per hour for a sample of 25 vehicles on River Expressway

Speed (L1)	Frequency (L2)	Relative Frequency	Cumulative Relative Frequency
52	1	0.04	0.04
55	2	0.08	0.12
60	2	0.08	0.20
65	4	0.16	0.36
67	8	0.32	0.68
69	6	0.24	0.92
74	2	0.08	1

same data as previous page. Use the same 1 variable statistics

1 varstats L1, L2

16 [*6 points*] Identify all data values that are outliers. If there are no outliers, state that there are NONE.
You must show work *using the appropriate test for identifying outliers to justify your conclusion.*
No correct work = no credit, even if the conclusion is correct.. SHOW WORK.

Q1 = 65 Q3 = 69

IQR = Q3 − Q1 = 69 − 65 = 4

Fences Q1 − 1.5 IQR = 65 − 1.5 * 4 = 59

Q3 + 1.5 IQR = 69 + 1.5 * 4 = 75

The three data values of 52, 55, and 55 are outliers. They are "outside" the fences.

17. [*4 points*] Calculate the two values that are 2 standard deviations below and above the mean.
Round to 1 decimal (tenths)

$\bar{x} - 2s = 65.6 - 2(5.40) = 54.8$

$\bar{x} + 2s = 65.6 + 2(5.40) = 76.4$

18. [*7 points*] Find the 40th percentile and write the two sentences that interpret the meaning of the 40th percentile in the context of this problem.

The 40th percentile is a speed of 67 miles per hour.

Interpretations:

40% of the vehicles had speeds of 67 mph or less
at most 67 mph

60% of the vehicles had speeds of 67 mph or more
at least 67 mph

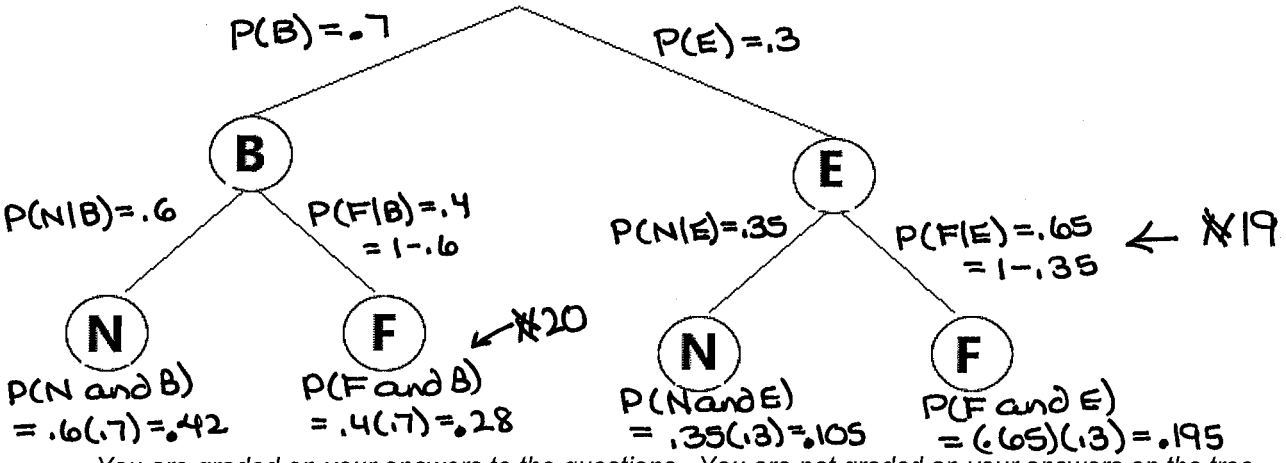
Go to the next page for questions 19-21

Questions 19 - 21 refer to the following: [11 points]:

BigOnlineBookstore.com sells print books and ebooks through its website.
70% of the books sold are print books. 30% of books sold are ebooks.
Of the print books sold, 60% are non-fiction and the rest are fiction
Of the ebooks sold, 35% are non-fiction and the rest are fiction

Events: B = Print Book E = ebook N = Non-fiction F = Fiction

Use a probability tree to find the answers to the following questions..



You are graded on your answers to the questions. You are not graded on your answers on the tree, but completing the tree will be helpful to answer the questions.

Suppose we randomly select one book sold on this site. Round answers to 3 decimal places, as needed.

19. [*3 points*] Find the probability that a book is a fiction book, given that it is an ebook.

$P(F|E) = 1 - P(N|E) = 1 - .35 = .65$

20. [*4 points*] Find the probability that a book is a fiction book and a print book

$P(F \text{ and } B) = .4(.7) = .28$

Multiplying along the path through B and F

21. [*4 points*] Find the probability that a book is a non-fiction book

$P(N) = P(N \text{ and } B) + P(N \text{ and } E)$

$= (.6)(.7) + (.35)(.3)$

$= .42 + .105$

$= .525$

BLUE

Winter 2019 FORM B Name Last: FORM B **First:** KEY

Exam 1: Chapters 1,2,3 **Circle Class Time: 11:30 12:30**

DIRECTIONS:

- **Print your NAME and CIRCLE YOUR CLASS TIME on THIS EXAM paper.**
- **Completely fill in the letter bubble for FORM B on your PARSCORE**
- **Print your NAME and Class time on your PARSCORE.**
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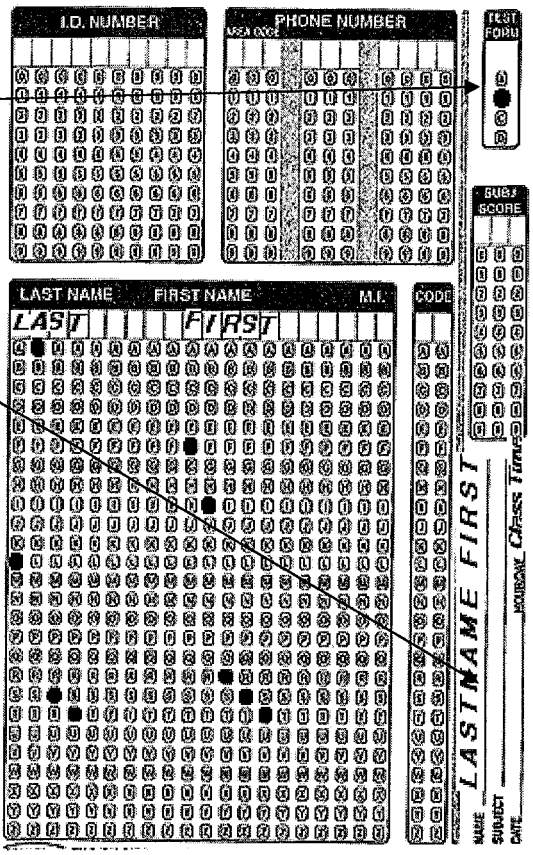
  (ID and phone number are NOT needed)



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Which student had the **BEST** exam performance when compared relative to the other students in her own class? Sofia has the largest z-score

A. Reena (B. Sofia) C. Tracy D. Both Sofia and Reena

$z = \frac{84-77}{9} = \frac{7}{9}$ $z = \frac{83-77}{6} = \frac{6}{6} = 1$ $z = \frac{91-85}{8} = \frac{6}{8}$

2. Rydez Bikeshare Company is studying bike usage by people who rent its bikes.
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3. At a company, 38% of employees are under age 35, and 62% are age 35 or over.
57% of all employees contribute to retirement savings accounts.
But, of the employees who are under age 35, only 25% contribute to a retirement savings account.

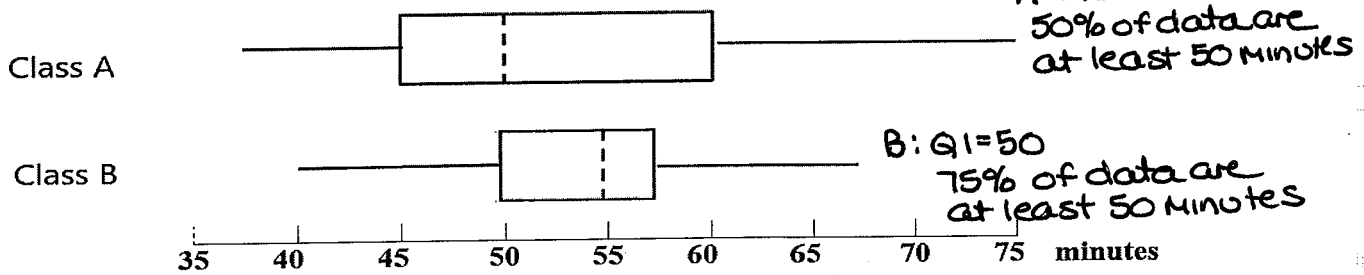
Find the probability that an employee is under age 35 and contributes to a retirement savings account.

A. 0.7000 B. 0.2500 C. 0.2166 (D. 0.0950) E. 0.1550

U = under age 35
R = contributes to retirement savings
P(U) = .38
P(R) = .57
P(R|U) = .25

$P(R \text{ and } U) = P(R|U)P(U)$
$= (.25)(.38)$
$= .095$

4. The boxplots represent the times, in minutes, needed for students in two statistics classes to complete a lab worksheet. Both classes have the same total number of students



A: Median = 50
50% of data are at least 50 minutes

B: Q1 = 50
75% of data are at least 50 minutes

Which class had more students who took 50 minutes or longer to complete the assignment?

A. Class A (B. Class B) C. Both the same

D. Not enough information given to determine

Questions 5 - 8 refer to the following:

The table below shows information for a sample of 150 jobs at Jim's Auto Repair Shop.
It classifies the jobs by type of work done and type of vehicle.

Type of Work Done	Type of Vehicle			
	Cars (C)	Trucks (T)	SUVs (S)	TOTAL
Routine Maintenance (M)	19	12	22	**53**
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Warranty Repair(W)	9	6	11	**26**
Accident Repair(A)	7	10	9	**26**
TOTAL	**50**	**40**	**60**	**150**

Suppose that one job was randomly selected from 150 jobs in the table.

5. Find the probability that the job was warranty repair (W) **and** the vehicle was a truck (T).

A. 70/150 B. 6/40 C. 11/26 D. 6/150 E. 66/150

6. Find the probability that job was a truck (T) **given that** it was an accident repair (A)

A. 10/150 B. 10/40 C. 56/140 D. 26/40 E. 10/26

P(A|T) P(T|A)

7. Find the probability that the job was warranty repair (W) **or** the vehicle was an SUV (S).

Use addition rule $P(W \text{ OR } S) = P(W) + P(S) - P(W \text{ and } S)$

A. 75/150 B. 86/150 C. 11/26 D. 11/60 E. 11/150

$\frac{26}{150} + \frac{60}{150} - \frac{11}{150}$

8. The events "SUV", "Repair out of warranty" (S,R) are

A. Mutually Exclusive only
B. Independent only
C. Both Mutually Exclusive and Independent
D. Neither Mutually Exclusive nor Independent

$P(R|S) = \frac{18}{60} = .3$ $P(R) = \frac{45}{150} = .3$ } Independent

$P(R|S) = P(R)$

$P(R \text{ and } S) = \frac{18}{150} \neq 0$ so NOT Mutually exclusive

Questions 9 – 12 refer to the following:

An egg packaging plant is evaluating the effectiveness of its egg cartons in preventing egg breakage.
They want to know how many eggs are broken in a carton of a dozen eggs.
The quality control manager selects a sample of egg cartons to inspect to see how many eggs are broken in a carton of eggs.

9. The number of broken eggs in a carton is:

A. qualitative B. quantitative continuous C. quantitative discrete D. categorical

10. The plant has 10 egg packaging machines. The quality control manager gets the sample by randomly selecting 2 out of the 10 packing machines and then inspecting every carton of eggs packed by those two machines. The sampling method is

A. cluster B. stratified C. simple random D. systematic

Questions 9 – 12 refer to the following (information repeated from previous page):

An egg packaging plant is evaluating the effectiveness of its egg cartons in preventing egg breakage. They want to know how many eggs are broken in a carton of a dozen eggs.
The quality control manager selects a sample of egg cartons to inspect to see how many eggs are broken in a carton of eggs.

11. The VARIABLE of interest in this study is

A. the number of broken eggs in a carton of eggs variable
B. the total number of eggs packed in a day
C. the average number of broken eggs for the cartons of eggs in the sample. statistic
D. the average number of broken eggs for all cartons of eggs packed at the factory parameter

12. The PARAMETER is

A. the total number of eggs in the sample
B. the total number of eggs in the population
C. the average number of broken eggs for the cartons of eggs that are inspected. statistic
D. the average number of broken eggs for all cartons of eggs packed at the factory parameter

Questions 13 – 18 refer to the following:

The table shows the speeds in miles per hour for a sample of 25 vehicles on Lake Highway

L1 Speed	L2 Frequency	Relative Frequency	Cumulative Relative Frequency
49	1	0.04	0.04
52	2	0.08	0.12
57	2	0.08	0.20
62	4	0.16	0.36
64	8	0.32	0.68
66	6	0.24	0.92
71	2	0.08	1

1 Varstats L1, L2
or
1 Varstats
Xlist: L1
freq: L2

13. What percent of the vehicles had speeds of **at least 62** miles per hour?

A. 20% B. 64% C. 80% D. 36% E. 16%

$\frac{4+8+6+2}{25} = \frac{20}{25} = .8$ or $1-.2=.8$

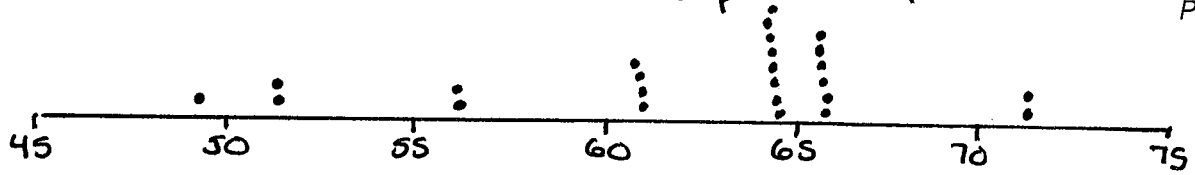
14. Find the mean and standard deviation for this sample data:

A. mean = 60.14 standard deviation = 7.86
B. mean = 60.14 standard deviation = 7.28
C. mean = 62.6 standard deviation = 5.29
D. mean = 62.6 standard deviation = 5.40 ← use s because its a sample
E. mean = 3.57 standard deviation = 2.57

15. Which would be the most appropriate measure of center of this data, and why?

A. Standard Deviation
B. Mean because the data are not skew.
C. Mean because the data are skew.
D. Median because the data are not skew.
E. Median because the data are skew.

Data are skewed to the left so the MEDIAN is the most appropriate measure of center.
If you can't tell data are skew from looking at the table, make a quick dotplot to see the shape



ANSWER THE REST OF THE QUESTIONS BY WRITING WORK AND ANSWERS ON THIS EXAM PAPER.

DO *NOT* ANSWER THE REST OF THESE QUESTIONS ON THE PARSCORE FORM

Questions 13 – 18 refer to the following (information repeated from questions 13 – 15 on previous page)

The table shows the speeds in miles per hour for a sample of 25 vehicles on Lake Highway

same data as previous page use same 1varstats L1, L2

Speed (L1)	Frequency (L2)	Relative Frequency	Cumulative Relative Frequency
49	1	0.04	0.04
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66	6	0.24	0.92
71	2	0.08	1

16. [*4 points*] Calculate the two values that are 2 standard deviations below and above the mean.
Round to 1 decimal (tenths)

$\bar{x} - 2s = 62.6 - 2(5.4) = 51.8$

$\bar{x} + 2s = 62.6 + 2(5.4) = 73.4$

17. [*7 points*] Find the 40th percentile and write the two sentences that interpret the meaning of the 40th percentile in the context of this problem.

The 40th percentile is a speed of 64 miles per hour.

Interpretations:

40% of vehicles had speeds of 64 mph or less
(at most 64 mph)

60% of vehicles had speeds of 64 mph or more
(at least 64 mph)

18 [*6 points*] Identify all data values that are outliers. If there are no outliers, state that there are NONE.
You must show work *using the appropriate test for identifying outliers to justify your conclusion.*
No correct work = no credit, even if the conclusion is correct.. SHOW WORK.

$Q1 = 62 \quad Q3 = 66$

$IQR = Q3 - Q1 = 66 - 62 = 4$

Lower Fence $= Q1 - 1.5 * IQR = 62 - 1.5(4) = 56$

Upper Fence $= Q3 + 1.5 * IQR = 66 + 1.5(4) = 72$

The three data values of 49, 52, and 52 are outliers. They are "outside" the fences.

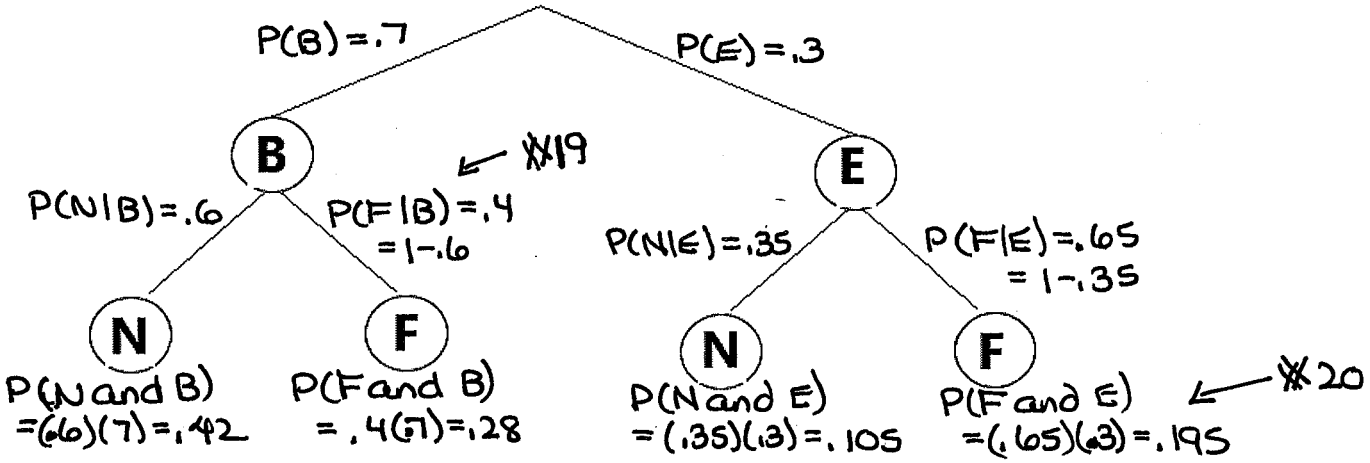
Go to the next page for questions 19-21

ANSWER QUESTIONS 19-21 BY WRITING WORK AND ANSWERS ON THIS EXAM PAPER.

Questions 19 - 21 refer to the following [11 points]:
BigOnlineBookstore.com sells print books and ebooks through its website.
70% of the books sold are print books. 30% of books sold are ebooks.
Of the print books sold, 60% are non-fiction and the rest are fiction
Of the ebooks sold, 35% are non-fiction and the rest are fiction

Events: B = Print Book E = ebook N = Non-fiction F = Fiction

Use a probability tree to find the answers to the questions



You are graded on your answers to the questions. You are not graded on your answers on the tree, but completing the tree will be helpful to answer the questions.

Suppose we randomly select one book sold on this site. Round answers to 3 decimal places, as needed.

19. [3 *points*] Find the probability that a book is a fiction book, given that it is a print book.

$P(F|B) = 1 - P(N|B) = 1 - .6 = .4$

20. [4 *points*] Find the probability that a book is a fiction book and an ebook

$P(F \text{ and } E) = (.65)(.3) = .195$

Multiplying along the path through E and F

21. [4 *points*] Find the probability that a book is a non-fiction book

$P(N) = P(N \text{ and } B) + P(N \text{ and } E)$

$= (.6)(.7) + (.35)(.3)$

$= .42 + .105$

$= .525$