

STAT 254 – Test 1

February 8, 2018

Name: _____

Instructor: Patricia Wrean

Total: 30 points

1. (3 points) For Pat's statistics unit in Stat 254, she handed out small boxes of paperclips and asked students to count the number of paperclips in each box.
 - (a) What is the experimental unit? _____
 - (b) Name the variable being measured. _____
 - (c) For your answer to part (b), is it
 - (i) qualitative
 - (ii) quantitative and discrete
 - (iii) quantitative and continuous

2. (5 points) A small warehouse employs a supervisor at \$1200 a week, an inventory manager at \$700 per week, six stock workers at \$400 per week, and four drivers at \$500 a week.
 - (a) Find the mean and median wage.

 - (b) How many employees make more than the mean wage?

 - (c) Which measure of centre best describes a typical wage at this company? Explain briefly.

3. (2 points) A set of data has a mean of 75 and a standard deviation of 5. What does Tchebysheff's theorem say about the proportion of measurements that fall between 70 and 80?
- (a) It could be zero.
 - (b) At least 75% of the measurements will lie between 70 and 80.
 - (c) Exactly 75% of the measurements will lie between 70 and 80.
 - (d) Approximately 75% of the measurements will lie between 70 and 80.

After looking at the distribution, you know that this is a more-or-less symmetric, mound-shaped distribution. What can you say about the proportion of measurements that fall between 70 and 80?

- (a) It could be zero.
 - (b) At least 68% of the measurements will lie between 70 and 80.
 - (c) Exactly 68% of the measurements will lie between 70 and 80.
 - (d) Approximately 68% of the measurements will lie between 70 and 80.
4. (3 points) A smoke-detector system uses two devices, A and B . If smoke is present, the probability that it will be detected by device A is 0.95; by device B , 0.98; and by both devices, 0.94.
- (a) Calculate the probability that if smoke is present, the smoke will not be detected.

- (b) Calculate the probability that device A detects the smoke but B does not.

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5. (2 points) Consider events A and B , with $P(A) = 0.4$ and $P(B) = 0.8$.
- (a) Can A and B be mutually exclusive? Explain briefly.
- (b) Can A and B be complements (i.e. is it possible that $A = \overline{B}$)? Explain briefly.
6. (4 points) Your engineering company is considering competing for a certain contract. The cost of competing for this contract is \$25 000. You estimate that your bid has a 45% probability of success, which will mean a profit of \$150 000.
- (a) Calculate the expected earnings.
- (b) Your company does not like to bid on risky projects in which the standard deviation of the earnings is more than \$60 000. Should your firm bid on this contract? Explain your reasoning.

7. (6 points) A researcher for BC Ferries randomly selects a sample of sailings from the Vancouver - Victoria route and records whether the sailing departed on time or not and whether it was full. The results are displayed below.

	on time	late
full	12	3
not full	76	9

In your answers below, show enough work that I can see which method you are using.

- (a) What's the probability that a random sailing was full?
- (b) What's the probability that a random full sailing was late?
- (c) Are the events "full sailing" and "late departure" independent? Explain briefly, being sure to state the values of the probabilities you are comparing. (Points will only be given if your explanation is valid.)

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8. (5 points) Let x equal the number of flaws per square meter in a bolt of cloth made in textile manufacturing.
- (a) What is the name of the probability distribution that would best describe x ? Explain briefly.
- (b) If the probability that there are no flaws in a square meter of cloth is equal to 16.5%, calculate the mean and standard deviation of x .