Answer sheet - to be handed in

MATH10282 Introduction to Statistics
Class Test, 16th April 2018
Time allowed: 40 minutes

University approved calculators permitted.

This is the class test for Introduction to Statistics. It counts for 10% of the module mark. Answer **all** questions. The total number of marks on the paper is 20.

For each question, mark **one** of the possible answer boxes with an 'X'.

You may wish to use the paper provided for rough work.

Full name:

Student ID:

Tutorial group: ☐ Mon 10am ☐ Tue 3pm ☐ Thu 9am ☐ Thu 2pm

Q	***Mark one answer per question with an 'X'***						
1.	(a) ☐	(b) ☐	(c) ☐	(d) ☐	(e) ☐	[1]	[ ]
2.	(a) ☐	(b) ☐	(c) ☐	(d) ☐	(e) ☐	[3]	[ ]
3.	(a) ☐	(b) ☐	(c) ☐	(d) ☐	(e) ☐	[2]	[ ]
4.	(a) ☐	(b) ☐	(c) ☐	(d) ☐	(e) ☐	[1]	[ ]
5.	(a) ☐	(b) ☐	(c) ☐	(d) ☐	(e) ☐	[3]	[ ]
6.	(a) ☐	(b) ☐	(c) ☐	(d) ☐	(e) ☐	[2]	[ ]
7.	(a) ☐	(b) ☐	(c) ☐	(d) ☐	(e) ☐	[2]	[ ]
8.	(a) ☐	(b) ☐	(c) ☐	(d) ☐	(e) ☐	[2]	[ ]
9.	(a) ☐	(b) ☐	(c) ☐	(d) ☐		[2]	[ ]
10.	(a) ☐	(b) ☐	(c) ☐	(d) ☐		[2]	[ ]

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Question sheet - do not hand in

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Class Test, 16th April 2018

1. Consider the following data:

   3.83, 5.63, 6.29, 6.31, 6.63, 8.99

   To 2 d.p., what is the sample mean?

   (a) 6.28 (b) 6.30 (c) 7.57 (d) 30.19 (e) 34.49

   [1 mark]

2. Consider the following data, which is the same as in Question 1:

   3.83, 5.63, 6.29, 6.31, 6.63, 8.99

   To 2 d.p., what is the sample variance?

   (a) 2.32 (b) 2.78 (c) 5.01 (d) 10.67 (e) 35.18

   [3 marks]

3. Consider the following data, which is the same as in Question 1:

   3.83, 5.63, 6.29, 6.31, 6.63, 8.99

   To 2 d.p., what is $\hat{Q}(0.33)$? Calculate your answer using the formula given in lectures for the Type 6 sample quantile.

   (a) 1.98 (b) 2.31 (c) 5.59 (d) 5.63 (e) 5.77

   [2 marks]

4. Suppose that $X_1, \ldots, X_{10}$ denote an independent random sample of size $n = 10$ from a $N(12, 7^2)$ distribution. What is the sampling distribution of $\bar{X}$?

   (a) $N(1.2, 4.9)$ (b) $N(12, 4.9)$ (c) $N(120, 70)$ (d) $N(12, 0.7)$ (e) $N(120, 490)$

   [1 mark]

5. Suppose that $X_1, \ldots, X_{10}$ denote an independent random sample of size $n = 10$ from a $N(12, 7^2)$ distribution. To 3 d.p., what is the probability that $\bar{X} \leq 13$?

Hint: you may use the following table of values for the standard normal c.d.f., $\Phi(z)$.

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
1.2	0.885	0.887	0.889	0.891	0.893	0.894	0.896	0.898	0.900	0.901
1.3	0.903	0.905	0.907	0.908	0.910	0.911	0.913	0.915	0.916	0.918
1.4	0.919	0.921	0.922	0.924	0.925	0.926	0.928	0.929	0.931	0.932
1.5	0.933	0.934	0.936	0.937	0.938	0.939	0.941	0.942	0.943	0.944

(a) 0.897 (b) 0.901 (c) 0.906 (d) 0.911 (e) 0.925

[3 marks]

6. Suppose that $X_1, \ldots, X_{13}$ denote an independent random sample of size $n = 13$ from a $N(10, 4^2)$ distribution. Let S^2 denote the sample variance. Which of the following statements is true?

(a) $0.75\, S^2 \sim \chi^2(12)$ (b) $\frac{4}{3S^2} \sim \chi^2(12)$ (c) $\frac{1.23}{S^2} \sim \chi^2(13)$

(d) $0.81\, S^2 \sim \chi^2(13)$ (e) $S^2 \sim \chi^2(12)$

[2 marks]

7. Suppose that $X_1, \ldots, X_{13}$ denote an independent random sample of size $n = 13$ from a $N(10, 4^2)$ distribution. To 3 d.p., what is the probability that $S \leq 6.143$?

Hint: You may use the following table, which lists some important quantiles of the $\chi^2(\nu)$ distribution, i.e. the value q such that $P(Y \leq q) = p$, where $Y \sim \chi^2(\nu)$.

	p				
ν	0.950	0.975	0.990	0.995	0.999
12	21.026	23.337	26.217	28.300	32.909
13	22.362	24.736	27.688	29.819	34.528

(a) 0.950 (b) 0.975 (c) 0.990 (d) 0.995 (e) 0.999

[2 marks]

8. Suppose that $X_1, \ldots, X_n \sim \mathrm{N}(\mu, \sigma^2)$ independently with $n \geq 5$. Consider the following estimators of μ.

   Click to place a cross ($\times$) next to each estimator which is unbiased for μ.

   (a) $\hat{\mu}_1 = \bar{X}$ (b) $\hat{\mu}_2 = \frac{1}{4}X_1 + \frac{3}{4}X_2$ (c) $\hat{\mu}_3 = \frac{1}{2}X_2 + \frac{1}{8}X_4$ (d) $\hat{\mu}_4 = \frac{3}{8}X_3 + \frac{2}{8}X_5$

   [2 marks]

9. Suppose that $X_1, \ldots, X_n \sim \mathrm{N}(\mu, \sigma^2)$ independently with $n \geq 5$. Consider the following estimators of μ, which are the same as in Question 8.

   Click to place a cross ($\times$) next to each estimator which has variance $\frac{5\sigma^2}{8}$.

   (a) $\hat{\mu}_1 = \bar{X}$ (b) $\hat{\mu}_2 = \frac{1}{4}X_1 + \frac{3}{4}X_2$ (c) $\hat{\mu}_3 = \frac{1}{2}X_2 + \frac{1}{8}X_4$ (d) $\hat{\mu}_4 = \frac{3}{8}X_3 + \frac{2}{8}X_5$

   [2 marks]

10. Suppose that $X_1, \ldots, X_n \sim N(\mu, 3)$ independently, with μ unknown, and that a data set is obtained with $n = 10$ and $\bar{x} = 17.2$. Which of the following is a 95% confidence interval for μ?

    (a) (16.13, 18.27) (b) (16.30, 18.10) (c) (16.71, 17.69)
    (d) (16.92, 17.48) (e) (15.64, 18.76)

    [2 marks]

[END OF CLASS TEST]