MATH10282 Introduction to Statistics
Class Test, 28th April 2016
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 <u>one</u> answer per question with an 'X'*

1.   (a) ☐   (b) ☐   (c) ☐   (d) ☐   (e) ☐   [1]   [   ]

2.   (a) ☐   (b) ☐   (c) ☐   (d) ☐   (e) ☐   [2]   [   ]

3.   (a) ☐   (b) ☐   (c) ☐   (d) ☐   (e) ☐   [2]   [   ]

4.   (a) ☐   (b) ☐   (c) ☐   (d) ☐   (e) ☐   [3]   [   ]

5.   (a) ☐   (b) ☐   (c) ☐   (d) ☐   [1]   [   ]

6.   (a) ☐   (b) ☐   (c) ☐   (d) ☐   [1]   [   ]

7.   (a) ☐   (b) ☐   (c) ☐   (d) ☐   (e) ☐   [1]   [   ]

8.   (a) ☐   (b) ☐   (c) ☐   (d) ☐   (e) ☐   [3]   [   ]

9.   (a) ☐   (b) ☐   (c) ☐   (d) ☐   (e) ☐   [1]   [   ]

10. (a) ☐   (b) ☐   (c) ☐   (d) ☐   (e) ☐   [3]   [   ]

11. (a) ☐   (b) ☐   (c) ☐   (d) ☐   [1]   [   ]

12. (a) ☐   (b) ☐   (c) ☐   (d) ☐   [1]   [   ]

Total   [   ]

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1. Consider the following data:

    0.01, 2.53, 2.64, 3.22, 3.73, 3.80, 4.30, 4.71, 4.85

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

    (a) 3.72   (b) 3.73   (c) 3.74   (d) 3.75   (e) 3.76

    [1 mark]

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

    0.01, 2.53, 2.64, 3.22, 3.73, 3.80, 4.30, 4.71, 4.85

   To 3 d.p., what is the sample lower quartile?

   Use the main method discussed in lectures to calculate the 'Type 6' lower quartile. Do not use R.

    (a) 2.584   (b) 2.585   (c) 2.586   (d) 2.587   (e) 2.588

    [2 marks]

3. Consider the following data set:

    2.93, 6.21, 7.99, 10.81, 11.06, 12.35, 14.34, 14.58, 14.83, 15.84

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

    (a) 11.05   (b) 11.06   (c) 11.07   (d) 11.08   (e) 11.09

    [2 marks]

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

    2.93, 6.21, 7.99, 10.81, 11.06, 12.35, 14.34, 14.58, 14.83, 15.84

   To 2 d.p., what is the sample standard deviation?

    (a) 4.21   (b) 4.22   (c) 4.23   (d) 4.24   (e) 4.25

    [3 marks]

5. Study the box plot below.
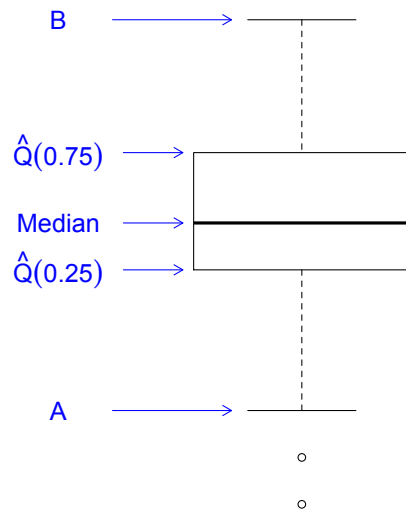
Which of the following statements about the box plot is true?

(i) A corresponds to the sample minimum

(ii) B corresponds to the sample maximum

(a) Both (i) and (ii),   (b) Only (i),   (c) Only (ii),   (d) Neither

[1 mark]

6. Students from two universities were asked to sit the same exam. The box plot below shows the distribution of marks from the two groups. Study the box plot and answer the question overleaf.

Which of the following can be concluded from the figure above?

  i The lowest mark in University A is smaller than the lowest mark in University B
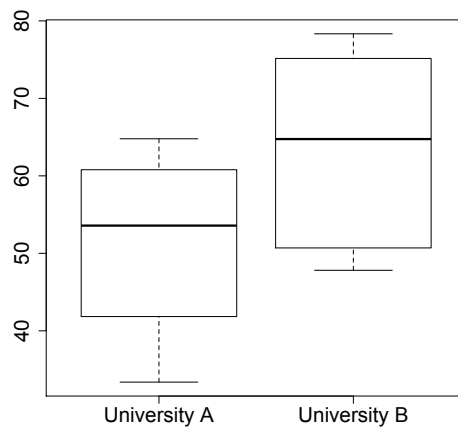
  ii The highest mark in University A is greater than the lowest mark in University B

  iii The median mark in University A is greater than the lower quartile in University B

(a) All of the above   (b) Only (iii)   (c) None of the above   (d) Only (i) and (ii)

[1 mark]

7. Suppose that $X_1, \ldots, X_{10}$ denote a random sample of size $n = 10$ from a $N(10, 5^2)$ distribution. What is the sampling distribution of $\bar{X}$?

(a) $N(1, 2.5)$ (b) $N(10, 2.5)$ (c) $N(100, 50)$ (d) $N(10, 0.5)$ (e) $N(100, 250)$

[1 mark]

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

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) 0.913   (c) 0.916   (d) 0.929   (e) 0.941

[3 marks]

9. Suppose that $X_1, \ldots, X_{10}$ denote a random sample of size $n = 10$ from a $N(10, 5^2)$ distribution. Which of the following statements is true?

(a) $0.36\, S^2 \sim \chi^2(9)$ (b) $\frac{2.78}{S^2} \sim \chi^2(9)$ (c) $\frac{2.5}{S^2} \sim \chi^2(10)$

(d) $0.4\, S^2 \sim \chi^2(10)$ (e) $S^2 \sim \chi^2(9)$

[1 mark]

10. Suppose that $X_1, \ldots, X_{10}$ denote a random sample of size $n = 10$ from a $N(10, 5^2)$ distribution. To 3 d.p., what is the probability that $S \leq 7.269$?

   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
9	16.919	19.023	21.666	23.589	27.877
10	18.307	20.483	23.209	25.188	29.588

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

   [3 marks]

11. Which of the following is true of an unbiased estimator?

   (a) it is equal to the true value of the parameter

   (b) its variance is small

   (c) it is representative

   (d) its mean is equal to the true value of the parameter

   [1 mark]

12. Before the experiment, which of the following is true of a 95% confidence interval?

   (a) it will always contain the true value of the parameter

   (b) the confidence interval will be wide

   (c) it will contain the true value of the parameter with 95% probability

   (d) the confidence interval will be symmetric

   [1 mark]

[END OF CLASS TEST]