



DESK No.

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FAMILY NAME: \_\_\_\_\_

GIVEN NAMES: \_\_\_\_\_

SIGNATURE: \_\_\_\_\_

STUDENT NUMBER:

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**SEMESTER 2, 2018 EXAMINATIONS****CITS4009****Introduction to Data Science**Physics, Mathematics & Computing  
EMSThis paper contains: **8** Pages (including title page)Time Allowed: **0:45** hours**INSTRUCTIONS:**

This test consists of 20 multiple-choice questions.

Each question has four answer choices.

Read each question carefully, and select only ONE best answer.

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Q1. In data science, which one of the following statements is \*NOT\* valid.

- a) Hypothesis generation requires looking at data and apply subject-area knowledge.
- b) A data science project is an iterative process.
- c) Hypothesis confirmation is also known as data exploration.
- d) Models are often used for exploration.

Q2. Which type of R collections is created after the following statement?

```
a <- c(1,2,3)
```

- a) A vector.
- b) A matrix.
- c) A list.
- d) An array.

Q3. Given a list of values, **x**, what does the following function do?

```
secret <- function(x) {  
  s <- sort(x)  
  index <- floor(length(x)/2) + 1  
  return(c(index, s[index]))  
}
```

- a) Return a list of indices and corresponding sorted values of **x**.
- b) The index and the value of median.
- c) The indices and the value of lower and upper quartile.
- d) A list of indices for lower quartile, median and upper quartile.

Q4. Given the following geom specifications, which are suitable for visualising a continuous variable (x) against a categorical one (y)?

- 1) `geom_histogram(mapping = aes(x = x, color=y))`
- 2) `geom_histogram(mapping = aes(x = x), color=y)`
- 3) `geom_boxplot(mapping = aes(x = x, y = y))`
- 4) `geom_boxplot(mapping = aes(x = y, y = x))`

- a) 1) and 3)
- b) 1) and 4)
- c) 2) and 3)
- d) 2) and 4)

本题应该选b，因为boxplot的x轴应该是分类变量，y轴才是连续变量

The following questions Q5-Q12 are related to this data frame.

```
marks <- c(80,60,34,56,70,56,65,95)
name <- c("John", "Emma", "Peter", "Dave", "Jane", "Rob", "Chris", "Emily")
gender <- c("M", "F", "M", "M", "F", "M", "M", "F")
unit <- c("CITS4009", "CITS1401", "CITS1401", "CITS4009", "CITS4009", "CITS4009", "CITS1401", "CITS1401")
df <- data.frame(name=name, gender=gender, unit=unit, marks=marks)
```

For ease of interpretation, the data frame can be viewed as a table below.

	name	gender	unit	marks
1	John	M	CITS4009	80
2	Emma	F	CITS1401	60
3	Peter	M	CITS1401	34
4	Dave	M	CITS4009	56
5	Jane	F	CITS4009	70
6	Rob	M	CITS4009	56
7	Chris	M	CITS1401	65
8	Emily	F	CITS1401	95

Q5. Which one of the following code is equivalent to the statement below?

```
a <- subset(df, gender=="M" & marks < 50, select="name")
```

此题应该选a。由于subset只取出子集，a选项1代表第1列，可以；b选项name要双引号；cd选项最终显示出来一堆NA和""

a) ~~a <- df[gender=="M" & marks < 50, 1]~~

b) a <- df[df\$gender=="M" & df\$marks < 50, name]

name要双引号?

c) ~~a <- ifelse(df\$gender=="M" & df\$marks < 50, df\$name, NA)~~

d) a <- ifelse(df\$gender=="M" & df\$marks < 50, df\$name, "")

Q6. Which of the following plots will \*NOT\* help compare the number of male and female students in the two classes?

~~a) A hexbin plot~~

b) A tile plot

c) A side-by-side bar chart

d) Bar charts of gender faceted by unit code

选a，因为六边形图需要两个连续变量才能构图，而tile热力图和条形图均能用于离散变量

Q7. The boxplot stats give the following values, which one of the following statements is ~~true~~ <sup>false</sup>?

```
> boxplot.stats(df$marks)
$`stats`
[1] 34.0 56.0 62.5 75.0 95.0
```

a) 95.0 is the maximum value of marks.

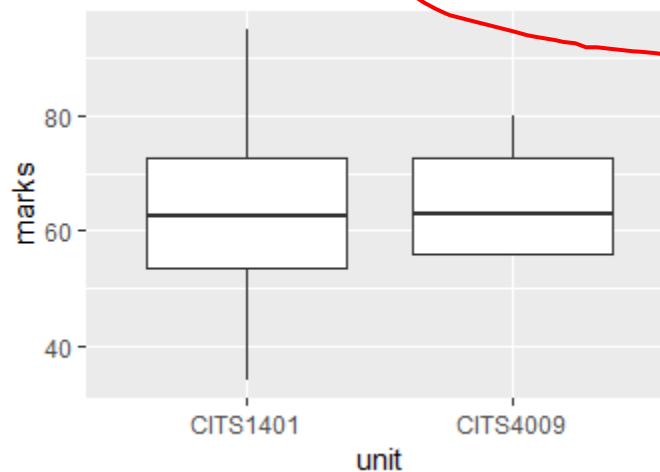
b) 34.0 is the minimum value of marks.

c) 75% percent of the students have marks lower than 75.0.

~~d) The average of all students is 62.5.~~

Q8. Which one of the following will produce the boxplots in the figure below?

- 1) `ggplot(df) + geom_boxplot(mapping=aes(x=unit, y=marks))`
- 2) `boxplot(df[df$unit=="CITS1401",]$marks, df[df$unit=="CITS4009",]$marks)`



表示所有等于CITS1401的行  
取出marks那一列

- a) Only 1).
- b) Only 2).
- ☒ c) Both 1) and 2).
- d) None of them.

Q9. Given the above boxplot, which observation is the \*LEAST\* sensible?

- a) The two class have roughly the same median marks.
- b) The distributions of marks in the two classes are similar.
- c) Both units have no outlier marks.
- ☒ d) CITS4009 have higher average because of no failed students.

c选项是对的，因为没有人分数超过100或者负数的，不算异常值；d选项是错的，不一定没挂科，也不一定平均分就更高(1401有好几个高分的)

Q10. Which of the following code will insert a new column to the data frame to record a logical pass or fail status.

pass : Factor w/ 2 levels "FALSE","TRUE": 2 2 1 2 2 2 2 2

- a) `df$pass <- as.factor(df$marks > 50)`
- b) `df$pass <- ifelse(df$marks > 50, "TRUE", "FALSE")`
- ☒ c) `df <- within(df, {pass=NA; pass=marks>50})`
- d) All of the above.

字符类

logi类

Q11. What does the code below do?

```
df[order(df$unit, -df$marks),]
```

- a) It won't work because you cannot have the negative sign before a column name.
- b) It won't work because it has an extra comma after the order function.
- c) It sorts the data according to unit in ascending order, but remove the marks column.
- ☒ d) It sorts the data first according to unit in ascending order, then marks in descending order.

Q12. Which one is the output of the following statement?

```
aggregate(df$marks, list(df$unit), mean)
```

```
1) Group.1      x  
   1 CITS1401 63.5  
   2 CITS4009 65.5
```

```
2) Group.1      x  
   1 CITS4009 65.5  
   2 CITS1401 63.5  
   3 CITS1401 63.5  
   4 CITS4009 65.5  
   5 CITS4009 65.5  
   6 CITS4009 65.5  
   7 CITS1401 63.5  
   8 CITS1401 63.5
```

```
3) Group.1 mean  
   1 CITS1401 63.5  
   2 CITS4009 65.5
```

- ☒ a) 1)
- b) 2)
- c) 3)
- d) None of the above

Q13. When can we use `na.omit()` to remove missing data?

- ☒ a) Only when the NAs are for roughly from the same data points and are of a small proportion of the dataset.
- b) Only when the NAs are concentrated for certain variables, and are of a small proportion of the dataset.
- c) When the missing data are a result of sensor errors.
- d) When the data are missing systematically.

Q14. When should we consider the use of `average` to impute missing data?

- a) When the data are missing systematically.
- b) When the missing data are of integer type.
- ☒ c) When the missing data are concentrated on certain rows and possibly due to sensor errors.
- d) When the missing data are concentrated on certain columns.

Q15. Taking the `income` variable of the `custdata` used in the lectures for example, it is highly skewed towards one side in a density plot. Which would *\*NOT\** be a sensible transformation?

- a) Use domain knowledge to set a threshold for outlier removal.
- b) Use the stats returned from `boxplot.stats()` for outlier removal.
- c) Apply `log10` transformation.
- ☒ d) Use z-normalisation to turn it into values between -1 and 1.

Q16. In R, what is the default reference date used for internal date storage?

- a) 1900-01-01
- ☒ b) 1970-01-01
- c) There is no set reference date, it should be specified using the `date()` function.
- d) This depends on the operating system you use.

Q17. Given the following code, what is the likely value of `dob_num`?

```
dob <- as.Date("1956-10-12")
dob_num <- as.double(dob)
```

- ☒ a) -4829
- b) 4829
- c) "1956-10-12"
- d) None of the above

Q18. How do you work out the age of this person on today?

```
dob <- as.Date("1956-10-12")
1) as.double((Sys.Date()-dob))/365
2) as.double(difftime(Sys.Date(), dob, units="days"))/365
```

- a) 1) only
- b) 2) only
- ☒ c) Both of them
- d) None of them

The following two questions are related to the two data frames depicted in the following tables:

surname	nationality	deceased
Tukey	US	yes
Venables	Australia	no
Tierney	US	no
Winton	UK	no

*Data Frame: authors*

name	title	other.author
Tukey	Exploratory Data Analysis	NA
Venables	Modern Applied Statistics	Ripley
Tierney	LISP-STAT	NA
Ripley	Spatial Statistics	NA
Ripley	Stochastic Simulation	NA
McNeil	Interactive Data Analysis	NA
R Core	An Introduction to R	Venables & Smith

*Data Frame: books*

Q19. Given the above data frame, `authors` and `books`, where the key columns are `surname` and `name` respectively. What is the number of columns in the new data frame after mutable joins?

- a) 5
- b) 6
- c) 3
- d) None of the above

Q20. Given the above data frame, `authors` and `books`, where the key columns are `surname` and `name` respectively. What is the number of records in the new data frame after **full join**?

- a) 3
- b) 4
- c) 7
- d) 8

全部算上，一个不落