2021 ASSESSMENT MATERIALS

AS

MATHS

Statistics

Total number of marks: 40

11 A survey is undertaken to find out the most popular political party in London.

The first 1100 available people from London are surveyed.

Identify the name of this type of sampling.

Circle your answer.

[1 mark]

simple random | opportunity | stratified | quota

13 The table below shows the probability distribution for a discrete random variable X.

x	0	1	2	3	4 or more
$\mathbf{P}(X = x)$	0.35	0.25	k	0.14	0.1

Find the value of k.

Circle your answer.

[1 mark]

0.14 | 0.16 | 0.18 | 1

12 Manny is studying the price and number of pages of a random sample of books.

He calculates the value of the product moment correlation coefficient between the price and number of pages in each book as 1.05

Which of the following best describes the value 1.05?

Tick (✓) **one** box.

[1 mark]

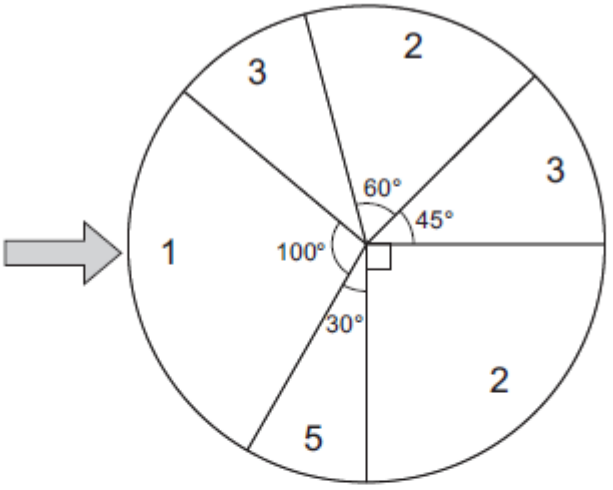
definitely correct ☐

probably correct ☐

probably incorrect ☐

definitely incorrect ☑

17 A game consists of spinning a circular wheel divided into numbered sectors as shown below.



On each spin the score, X, is the value shown in the sector that the arrow points to when the spinner stops.

The probability of the arrow pointing at a sector is proportional to the angle subtended at the centre by that sector.

17 (a) Show that $P(X = 1) = \frac{5}{18}$. $P(X=1) = \frac{100}{360} = \frac{5}{18}$ **[1 mark]**

17 (b) Complete the probability distribution for X in the table below.

x	1	2	3	5
$P(X = x)$	$\frac{5}{18}$	$\frac{5}{12}$	$\frac{2}{9}$	$\frac{1}{12}$

[2 marks]

16 Kevin is the Principal of a college.

He wishes to investigate types of transport used by students to travel to college.

There are 3200 students in the college and Kevin decides to survey 60 of them.

Describe how he could obtain a simple random sample of size 60 from the 3200 students.

[4 marks]

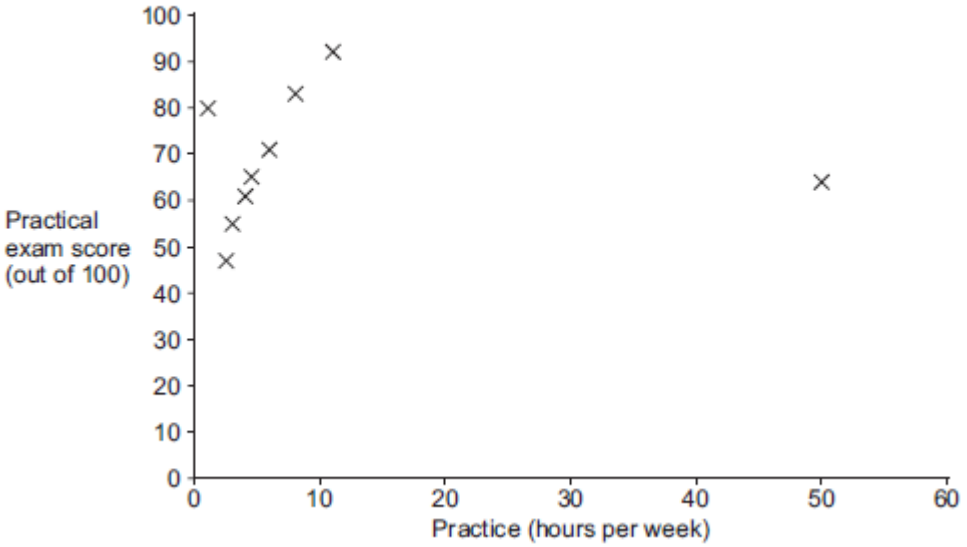
Assign each student a random number from 1 to 3200 and generate a random number from 1 to 3200 using a random number generator. Continue until 60 different numbers have been generated and select the students with those numbers.

18 Jennie is a piano teacher who teaches nine pupils.

She records how many hours per week they practice the piano along with their most recent practical exam score.

Student	Practice (hours per week)	Practical exam score (out of 100)
Donovan	50	64
Vazquez	6	71
Higgins	3	55
Begum	2.5	47
Collins	1	80
Coldbridge	4	61
Nedbalek	4.5	65
Carter	8	83
White	11	92

She plots a scatter diagram of this data, as shown below.



18 (a) Identify two possible outliers by name, giving a possible explanation for the position on the scatter diagram of each outlier.

[4 marks]

First outlier Collins

Possible reason Naturally a very good piano player so doesn't do much practice

Second outlier Donovan

Possible reason Data entry error has been made.

18 (b) Jennie discards the two outliers.

18 (b) (i) Describe the correlation shown by the scatter diagram for the remaining points. **[1 mark]**

Positive

18 (b) (ii) Interpret this correlation in the context of the question. **[1 mark]**

The more hours you practice the better practical score you get.

14 A probability distribution is given by

$$P(X = x) = c(4 - x), \text{ for } x = 0, 1, 2, 3$$

where c is a constant.

14 (a) Show that $c = \frac{1}{10}$ **[2 marks]**

$\Sigma P(X=x)=1$ so $4c+3c+2c+c=1$

$10c=1 \Rightarrow c=\frac{1}{10}$

14 (b) Calculate $P(X \geq 1)$ **[2 marks]**

$P(X\geq 1)=3c+2c+c=6c=\frac{6}{10}$

15 Nicola, a darts player, is practising hitting the bullseye. She knows from previous experience that she has a probability of 0.3 of hitting the bullseye with each dart.

Nicola throws eight practice darts.

15 (a) Using a binomial distribution, calculate the probability that she will hit the bullseye three or more times. **[2 marks]**

$X \sim B(8, 0.3)$. $P(X \geq 3) = 1 - P(X \leq 2)$

$= 1 - 0.5517.. = 0.448$

15 (b) Nicola throws eight practice darts on three different occasions. Calculate the probability that she will hit the bullseye three or more times on all three occasions. **[2 marks]**

$X \sim B(3, 0.448)$. $P(X=3)=0.0901$

15 (c) State two assumptions that are necessary for the distribution you have used in part **(a)** to be valid. **[2 marks]**

The probability of hitting the bullseye each time is independent and the probability of hitting a bullseye is fixed.

18 (a) Bag A contains 7 blue discs, 4 red discs and 1 yellow disc.

Two discs are drawn at random from bag A **without replacement**.

Find the probability that exactly **one** of the discs is blue. **[2 marks]**

$P(1 \text{ blue only}) = P(1st = \text{blue and } 2nd \neq \text{blue}) + P(1st = \text{red and } 2nd = \text{blue}) + P(1st = \text{yellow and } 2nd = \text{blue})$

$= \left(\frac{7}{12} \times \left(1 - \frac{6}{11}\right)\right) + \left(\frac{4}{12} \times \frac{7}{11}\right) + \left(\frac{1}{12} \times \frac{7}{11}\right)$

$= \frac{35}{66}$

18 (b) Bag A contains 7 blue discs, 4 red discs and 1 yellow disc.

Bag B contains 3 blue discs and 6 red discs.

A disc is drawn at random from Bag A and placed in Bag B.

A disc is then drawn at random from Bag B.

Find the probability that the disc drawn from Bag B is red.

[3 marks]

$$P = \left(\frac{8}{12} \times \frac{6}{10}\right) + \left(\frac{4}{12} \times \frac{7}{10}\right)$$
$$= \frac{19}{30}$$

16 Andrea is the manager of a company which makes mobile phone chargers.

In the past, she had found that 12% of all chargers are faulty.

16 (a) Andrea decides to move the manufacture of chargers to a different factory.

Andrea tests 60 of the new chargers and finds that 4 chargers are faulty.

Investigate, at the 10% level of significance, whether the proportion of faulty chargers has reduced.

[7 marks]

$H_0: p = 0.12$ and $H_1: p < 0.12$ where p is the proportion of faulty chargers.
$X \sim B(60, 0.12)$.
$P(X \leq 4) = 0.1388$. As 0.1388 is greater than 0.1, this result is not significant so insufficient evidence to reject H_0, which would suggest the proportion of faulty chargers hasn't reduced.

16 (b) State, **in context**, two assumptions that are necessary for the distribution that you have used in part **(a)** to be valid.

[2 marks]

The probability of each charger being faulty is independent and the probability of a charger being faulty is fixed.