

STATISTICS

1. Classify each of the following as either a *discrete* (D) or a *continuous* (C) variable.

D or C

(i) The number of cars in a car park.

(ii) The reaction time of a driver.

(iii) The age, in years, of a school pupil.

2. The mean of a set of numbers is 14 and the standard deviation is 5.

(a) A new set of numbers is created by adding 4 to each number in the original set.

(i) What will be the *mean* of the new set of numbers?

(ii) What will be the *standard deviation* of the new set of numbers?

(b) A new set of numbers is created by multiplying each of the numbers in the original set by 3.

(i) What will be the *mean* of this new set of numbers?

(ii) What will be the *standard deviation* of this new set of numbers?

3. The number of telephone calls made per day by a teacher was recorded for 7 days.
The data collected is listed below.

5, 4, 6, 7, 10, 3, 7

(a) What is the *mode*?

(b) What is the *median*?

(c) Calculate the *range*.

(d) Calculate the *inter-quartile range*.

(e) Calculate the *mean*.

4. The lengths of the telephone calls made from a phone during one month are summarised in the table below.

<i>Call Length (t, mins)</i>	$0 < t \leq 2$	$2 < t \leq 4$	$4 < t \leq 6$	$6 < t \leq 8$	$8 < t \leq 10$
<i>Frequency</i>	5	11	13	3	9

Estimate the *median* length of the phone calls.

Median $\approx$ mins

5. Calculate the *standard deviation* of this set of numbers.

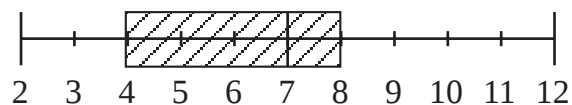
1, 3, 4, 8, 9

Standard deviation =

6. A histogram is to be drawn for the data on waiting times given in the table below.
Complete the blank spaces in the table.

<i>Waiting Time (t, mins)</i>	$0 < t \leq 5$	$5 < t \leq 10$	$10 < t \leq 20$	$20 < t \leq 40$	$40 < t \leq 90$
<i>Frequency</i>	6	9	4	2	1
<i>Frequency Density</i>					

7. The diagram shows a box and whisker plot which has been drawn using a data sample.



Are these statements *true* or *false*?

T or F

- (i) The *median* of the sample is 7.

- (ii) The *inter-quartile range* of the sample is 4.

- (iii) The *mean* of the sample *can* be found from the diagram.

- (iv) The *mode cannot* be found from the diagram.

8. The probability of obtaining a 2 when a dice is rolled is $\frac{1}{6}$.

A 2 is obtained and the dice is rolled again.

What is the probability of now obtaining a 2 ?

$p =$

9. You toss a coin 5 times.

What is the probability that you obtain

- (a) 0 heads $p =$
- (b) 1 head $p =$
- (c) more than one head ? $p =$

10. Hannah buys a box of 10 light bulbs in a discount store.
The probability that a bulb does not work is 0.1.

- (a) Calculate the probability that *all* the bulbs work. $p =$
- (b) Calculate the probability that *exactly one* of the bulbs does *not* work. $p =$
- (c) Calculate the probability that *at least 8* of the bulbs work. $p =$

11. The people in a room are classified according to their age and gender. The results are listed in the table below.

		<i>Age</i>	
		<i>Under 21</i>	<i>21 and Over</i>
<i>Gender</i>	<i>Male</i>	5	5
	<i>Female</i>	7	3

A person is selected at random from those in the room.

A denotes the event that the person chosen is *21 or older*.

B denotes the event that the person chosen is *male*.

A' denotes the event *not A*, and B' denotes the event *not B*.

Calculate the following probabilities.

(a) $p(A)$ =

(b) $p(B')$ =

(c) $p(A \cap B)$ =

(d) $p(A \cup B)$ =

(e) $p(A | B)$ =

(f) $p(B' | A)$ =

12. When Ben and Jake play table tennis, the probability that Jake wins is $\frac{1}{4}$.

They play 8 games of table tennis. X is the number of games that Jake wins.

(a) What is the *mean* of X ? $Mean =$

(b) What is the *variance* of X ? $Variance =$

13. The number of text messages arriving at a mobile phone each hour follows a Poisson distribution with mean 4.

Find the probability that, in one hour,

(a) *no* text messages arrive $p =$

(b) *one* text message arrives $p =$

(c) *two or more* text messages arrive. $p =$

14. A random variable X follows a Poisson distribution with mean 10.
What is the *variance* of X ?

$Variance =$

15. Would you expect these variables to have a normal distribution?

✓ *or* ✗

A The heights of 6-year-old children.

☐

B The score when a fair dice is rolled.

☐

C The scores of children in an IQ test.

☐

D The number of heads that you get when you toss a coin.

☐

16. A random variable, Z , is normally distributed with mean 0 and standard deviation 1.

Calculate the probabilities that:

(a) $Z > 1$

$p =$

(b) $Z > 2$

$p =$

(c) $Z < 2$

$p =$

17. The ages of the members of a sports club are randomly distributed with mean 36 and standard deviation 6.

Calculate the probability that a member chosen at random is

(a) over 39

$p =$

(b) under 45

$p =$

(c) aged between 28.8 and 44.4.

$p =$

18. The birds in a flock have masses that are normally distributed with mean 300 grams and standard deviation 80 grams.

- (a) What mass will be exceeded by 10% of the birds? grams
- (b) What mass will be exceeded by 20% of the birds? grams
- (c) What mass will be exceeded by 90% of the birds? grams

Give your answer to the nearest gram.

19. On a large shingle beach there are pebbles which have masses that are normally distributed with mean 70 and standard deviation 45.

Samples made up of 25 pebbles are to be taken from the beach.

- (a) Which of these statements is correct?
- A The sample means will have a Poisson distribution.
- B The sample means will have a Binomial distribution.
- C The sample means will have a Normal distribution.

Statement is correct

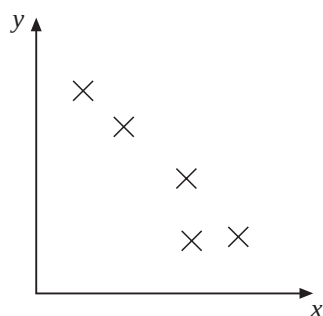
- (b) What will be the *mean* of the distribution of the sample means?

Mean $\approx$

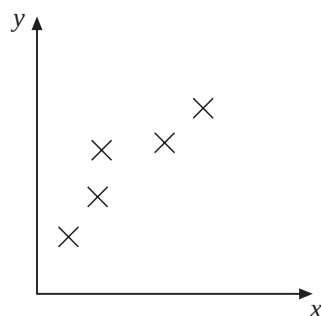
- (c) What will be the *standard deviation* of the distribution of the sample means?

Standard deviation $\approx$

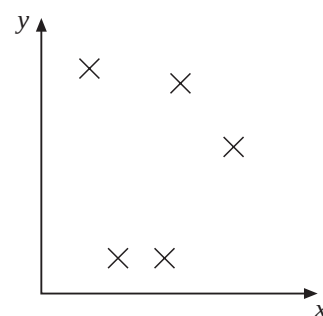
20. Consider the three scatter plots shown below.



Graph A



Graph B



Graph C

(a) Which graph shows a *positive* correlation?

Graph

(b) Which graph shows a *negative* correlation?

Graph

(c) Which graph shows *no* correlation?

Graph

21. Calculate the product moment correlation coefficient for the data in this table.

X	1	2	3	4
Y	2	5	2	8

Answer

22. A discrete random variable, X , has the probability shown in the table below.

x	0	1	2
$p(X = x)$	0.5	0.3	0.2

- (a) Calculate the *mean* of X .
(b) Calculate the *variance* of X .

Mean =

Variance =

23. A continuous random variable, X , has probability density function

$$f(x) = \begin{cases} kx & 0 < x < 2 \\ 0 & \text{otherwise} \end{cases}$$

Find k .

$$k = \boxed{}$$

24. A continuous random variable, X , has probability density function

$$f(x) = \begin{cases} 0.02x & 0 < x < 10 \\ 0 & \text{otherwise} \end{cases}$$

Find the mean of X .

$$\text{Mean of } x = \boxed{}$$

25. A sample of fish is taken from a lake. It is known that the lengths of the fish in the lake are normally distributed with standard deviation 8 cm.

The lengths of the fish in the sample are

35 cm, 47 cm, 50 cm, 60 cm

Calculate a 95% confidence interval for the mean length of the fish in the lake.

95% confidence interval : (,)