BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 14B

1

Test each of the following sample correlation coefficients for positive correlation at 5% significance, where n is the sample size.

a) $r = 0.4, n = 15$

b) $r = 0.3, n = 100$

c) $r = 0.3, n = 15$

d) $r = 0.4, n = 9$

e) $r = -0.5, n = 15$

f) $r = -0.3, n = 30$

g) $r = 0.25, n = 100$

h) $r = 0.6, n = 10$

TAP FOR ANSWERS

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2

a) Information for 20 students is used to investigate the hypothesis that there is a correlation between IQ and results in a maths test
   i. Write down the null and alternative hypothesis for this investigation
   ii. Data are collected and the p-value for the correlation coefficient is 0.00218. What is the conclusion of the hypothesis test at the 5% significance level

b) The average speed of cars is measured at six different checkpoints at varying distances from a junction. There is a belief that, in general , cars get faster as they are further from the junction.
   a) Write down the null and alternative hypothesis for this investigation
   b) The p-value of the observed data is found to be 0.084. Test the data at the 5% significance level.

TAP FOR ANSWERS

3

$x \sim (8, p)$, If $P(X = 5) = P(X = 6)$. Find the value of p

TAP FOR ANSWERS

4

A stone is dropped from the top of a tower. One second later another stone is thrown vertically downwards from the same point with a velocity of 14 m s^{-1}. If they hit the ground together, find the height of the tower.

TAP FOR ANSWERS

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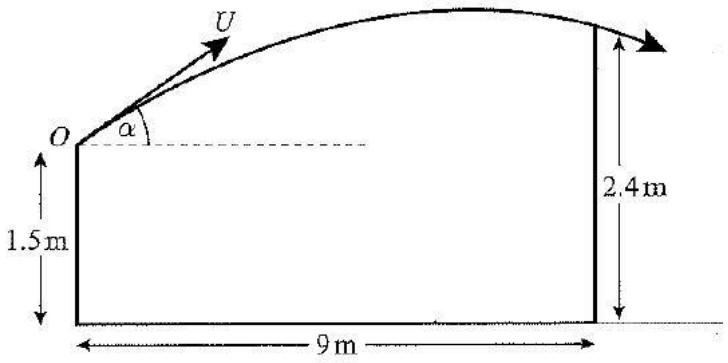
5

A girl playing volleyball on horizontal ground hits the ball towards the net 9 m away from a point 1.5 m above the ground. The ball moves in a vertical plane which is perpendicular to the net. The ball just passes over the top of the net, which is 2.4 m above the ground, as shown in the diagram.



The ball is modelled as a particle projected with initial speed U m s^{-1} from point O, 1.5 m above the ground at an angle α to the horizontal.

By writing down expressions for the horizontal and vertical distances from O to the ball, t seconds after it was hit, show that when the ball passes over the net

$$0.9 = 9\tan\alpha - \frac{81g}{2U^2\cos^2\alpha}$$

Given that $\alpha = 30°$

Find the speed of the ball as it passes over the net.

TAP FOR ANSWERS

6

A ship S is moving with constant velocity $(3\mathbf{i} + 3\mathbf{j})$ km h^{-1}. At time $t = 0$, the position vector of S is $(-4\mathbf{i} + 2\mathbf{j})$ km.

(a) Find the position vector of S at time t hours.

A ship T is moving with constant velocity $(-2\mathbf{i} + n\mathbf{j})$ km h^{-1}. At time $t = 0$, the position vector of T is $(6\mathbf{i} + \mathbf{j})$ km. The two ships meet at the point P.

(b) Find the value of n.

(c) Find the distance OP.

TAP FOR ANSWERS

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7

It is known that in the UK, 63% of households own at least one car. Grace, who lives in the big city, believes that in his neighbourhood car ownership is lower than this. She uses a hypothesis test, based on the binomial distributions, to confirm this.

a) State suitable null and alternative hypothesis for his test

Grace surveys a random sample of 50 households in her neighbourhood and finds that 29 of them own a least one car

b) Use this date to test Grace's hypothesis at the 10% significance level. State your conclusion clearly

TAP FOR ANSWERS

8

a) A car starts from rest and moves in a straight line. Its acceleration, $a\ ms^{-2}$, is given by $a(t) = 0.12t^2 - 1.44t + 4.32$
   i. Find the equations for the car's velocity and its displacement from the starting point
   ii. Find the velocity and the displacement at the point when the acceleration is zero

b) A particle moves in a straight line. Its displacement from the point P is x metres and its acceleration is $a = (1 - 0.6t)ms^{-1}$. The particle is initially 25 m from P and moving away form P with velocity 7.5 ms^{-1}.
   i. Find an expression for the velocity in terms of t
   ii. Find the particle's displacement from P after 10 seconds
   iii. Find the particle's displacement from P at the time when its acceleration is $-2\ ms^{-2}$

TAP FOR ANSWERS

BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 14B

9

A particle moves in a straight line with acceleration $a = (2 - 6t)ms^{-2}$, where the time is measure in seconds. When $t = 2$ its velocity is $-8\, ms^{-1}$. Find the average velocity of the particle between $t = 5$ and $t = 8$

TAP FOR ANSWERS

10

The moment magnitude scale is used by seismologists to express the sizes of earthquakes. The scale is calculated using the formula

$$M = \frac{2}{3}\log_{10}(S) - 10.7$$

Where S is the seismic moment in dyne cm.

(a) Find the magnitude of an earthquake with a seismic moment of 2.24×10^{22} dyne cm.

(b) Find the seismic moment of an earthquake with
(i) Magnitude 6
(ii) Magnitude 7

(c) Using your answers to part b or otherwise, show that an earthquake of magnitude 7 is approximately 32 times as powerful as an earthquake of magnitude 6.

TAP FOR ANSWERS

BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 14B

11

A zoologist is studying the growth of a population of fish in a lake. He thinks that the size of the population can be modelled by the equation $N = Ae^{kt}$ where N is the number of fish and t is the number of months since the fish were first introduced into the lake.

a) The zoologist collected some data and wants to plot them on the graph in order to check whether his proposed model is suitable. Assuming his model is correct, prove which of the following graphs will produce approximately a straight line.

A N against $\log t$ B $\log N$ against t C $\log N$ against $\log t$

You may assume that the proposed model is correct.

b) Initially, 150 fish are introduced into the lake. Write down the value of A

c) After 10 months there are 780 fish in the lake. Find the value of k

d) Comment on the suitability of this model for predicting the number of fish in the long term

TAP FOR ANSWERS

12

The probability that Amy leaves her umbrella in any shop she visits is $\frac{1}{5}$. After visiting two shops in succession, she finds she has left her umbrella in one of them. What is the probability that she left her umbrella in the second shop.

TAP FOR ANSWERS

13

a) Expand $\left(e+\frac{2}{e}\right)^5$

b) Simplify $\left(e+\frac{2}{e}\right)^5+\left(e-\frac{2}{e}\right)^5$

TAP FOR ANSWERS

14

Prove that $n^3 - n$ is always a multiple of 6 for $n \geq 2$

TAP FOR ANSWERS

15

The tables below are an extract from the Large Data Set. It shows the data collected in Camborne

a) When was this data collected

b) Clean the data and subsequently find the modal value for every column.

c) What is the difference between “tr” and 0?

TAP FOR ANSWERS

BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 14B

15

Date	Daily Mean Temperature (0900-0900) (°C)	Daily Total Rainfall (0900-0900) (mm)	Daily Total Sunshine (0000-2400) (hrs)	Daily Mean Windspeed (0000-2400) (kn)	Daily Mean Windspeed (0000-2400) (Beaufort conversion)	Daily Maximum Gust (0000-2400) (kn)
01-05-87	10.7	3.1	n/a	n/a	n/a	n/a
02-05-87	8.9	0.1	n/a	n/a	n/a	n/a
03-05-87	8.1	0	n/a	n/a	n/a	n/a
04-05-87	8.2	0	n/a	n/a	n/a	n/a
05-05-87	9.8	0	n/a	n/a	n/a	n/a
06-05-87	9.3	0	n/a	n/a	n/a	n/a
07-05-87	10.9	0	n/a	n/a	n/a	n/a
08-05-87	10.5	tr	n/a	n/a	n/a	n/a
09-05-87	10.9	0	n/a	n/a	n/a	n/a
10-05-87	9.9	0	n/a	n/a	n/a	n/a
11-05-87	8.8	6	n/a	n/a	n/a	n/a
12-05-87	10.2	tr	n/a	n/a	n/a	n/a
13-05-87	9.2	2.2	n/a	n/a	n/a	n/a
14-05-87	10.2	tr	5.9	16	Moderate	35
15-05-87	9.6	0	12.3	13	Moderate	27

TAP FOR ANSWERS

BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 14B

15

Date	Daily Maximum Relative Humidity %	Daily Mean Total Cloud (oktas)	Daily Mean Visibility (Dm)	Daily Mean Pressure (hPa)	Daily Mean Wind Direction (o)	Cardinal Direction	Daily Max Gust Corresponding Direction (o)	Cardinal Direction
01-05-87	100	7	2000	1018	360	N	20	NNE
02-05-87	91	3	3200	1020	320	NW	330	NNW
03-05-87	77	5	3600	1029	350	N	350	N
04-05-87	83	5	4100	1036	350	N	350	N
05-05-87	86	5	2700	1036	10	N	10	N
06-05-87	100	1	1000	1033	330	NNW	340	NNW
07-05-87	100	3	600	1031	350	N	350	N
08-05-87	89	1	2400	1025	110	ESE	110	ESE
09-05-87	95	3	900	1017	360	N	NA	#N/A
10-05-87	79	4	4100	1018	10	N	10	N
11-05-87	95	7	2500	1017	270	W	260	W
12-05-87	97	5	2400	1009	310	NW	310	NW
13-05-87	77	4	4600	1016	340	NNW	340	NNW
14-05-87	95	7	3100	1008	290	WNW	270	W
15-05-87	77	4	4500	1012	10	N	10	N

TAP FOR ANSWERS

16

https://www.madasmaths.com/archive/iygb_practice_papers/c2_practice_papers/c2_p.pdf

TAP FOR ANSWERS

BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 14B

1 - Answers

(a) Significant evidence
(b) Significant evidence
(c) No Significant evidence
(d) No Significant evidence
(e) No Significant evidence
(f) No Significant evidence
(g) Significant evidence
(h) Significant evidence

TAP TO RETURN

2 - Answers

(a) a

i. $H_0: \rho = 0; H_1: \rho \neq 0$

ii. Reject H_0

(b) b

i. $H_0: \rho = 0; H_1: \rho > 0$

ii. Do not reject H_0

TAP TO RETURN

3 - Answers

$$p = \frac{2}{3}$$

TAP TO RETURN

4 - Answers

23 m

TAP TO RETURN

5 - Answers

(a) R(→): $x = 9 = U\cos\alpha \times t$, so $t = \frac{9}{U\cos\alpha}$

R(↑): $y = U\sin\alpha \times t - \frac{1}{2}gt^2$

Substitute for $t \Rightarrow y = U\sin\alpha\left(\frac{9}{U\cos\alpha}\right) - \frac{1}{2}g\left(\frac{9}{U\cos\alpha}\right)^2$

Use $\tan\alpha = \frac{\sin\alpha}{\cos\alpha}$ and $y = 0.9$. Rearrange to give $0.9 = 9\tan\alpha - \frac{81g}{2U^2\cos^2\alpha}$.

(b) 10.27 m s^{-1}

TAP TO RETURN

6 - Answers

(a) $(-4 + 3t)\mathrm{i} + (2 + 3t)\mathrm{j}$

(b) 3.5

(c) 8.25 km

TAP TO RETURN

7 - Answers

a) $H_0: p = 0.63, H_1: p < 0.63$

b) Cannot reject H_0, no evidence of lower car ownership in David's neighbourhood

TAP TO RETURN

8 - Answers

(a) G

i. $v = 0.04t^3 - 0.72t^2 + 4.32t, \mathrm{x} = 0.01\mathrm{t}^4 - 0.24\mathrm{t}^3 + 2.16\mathrm{t}^2$

ii. $v = 8.64\, ms^{-1}, x = 38.9\, m$

(b) F

i. $v = 7.5 + t - 0.3t^2$

ii. $x = 50\, m$

iii. $x = 62.5\, m$

TAP TO RETURN

9 - Answers

$(a) -116\ ms^{-1}$

TAP TO RETURN

10 - Answers

(a) 4.2

(b) (i) 1.12×10^{25} dyne cm
(ii) 3.55×10^{26} dyne cm

(c) Divide (b)(ii) by (b)(i)

TAP TO RETURN

11 - Answers

(a) B

(b) $A = 150$

(c) $k = 0.165$

(d) Not suitable, as it predicts indefinite growth

TAP TO RETURN

BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 14B

12 - Answers

$\frac{4}{9}$

TAP TO RETURN

13 - Answers

(a) $e^5 + 10e^3 + 40e + \frac{80}{e} + \frac{80}{e^3} + \frac{32}{e^5}$

(b) $2e^5 + 80e + \frac{160}{e^3}$

TAP TO RETURN

14 - Answers

Proof

TAP TO RETURN

BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 14B

15 - Answers

a) May 1987

b)

Daily Mean Temperature (0900-0900) (°C)	Daily Total Rainfall (0900-0900) (mm)	Daily Total Sunshine (0000-2400) (hrs)	Daily Mean Windspeed (0000-2400) (kn)	Daily Mean Windspeed (0000-2400) (Beaufort conversion)	Daily Maximum Gust (0000-2400) (kn)		
10.9	0	5.9 and 12.3	13 and 16	Moderate	27 and 35		

Daily Maximum Relative Humidity %	Daily Mean Total Cloud (oktas)	Daily Mean Visibility (Dm)	Daily Mean Pressure (hPa)	Daily Mean Wind Direction (o)	Cardinal Direction	Daily Max Gust Corresponding Direction (o)	Cardinal Direction
100	5	4100	1017 and 1018	350	N	350	N

TAP TO RETURN

BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 14B

16 - Answers

https://www.madasmaths.com/archive/iygb_practice_papers/c2_practice_papers/c2_p_solutions.pdf

TAP TO RETURN