

BHASVIC MαTHS

A1 DOUBLES ASSIGNMENT 13B

1

Of the articles from a certain production line, 10% are defective. If a sample of 25 articles is taken, find the expected number of defective articles and the standard deviation. Explain what these mean in words in the context of the question.

TAP FOR ANSWERS

BHASVIC MαTHS

A1 DOUBLES ASSIGNMENT 13B

2

Find the exact value(s) of x which satisfy the equations:

(a) $\ln(6x + 1) = 1$

(b) $e^{3x-1} = 2$

(c) $e^{2x} = e^x + 12$

(d) $e^{2x} \times e^{x+1} = 28$

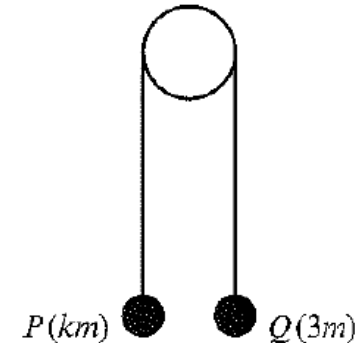
TAP FOR ANSWERS

BHASVIC MαTHS

A1 DOUBLES ASSIGNMENT 13B

3

Two particles A and B have masses m kg and 3 kg respectively, where $m > 3$. The particles are connected by a light inextensible string which passes over a smooth, fixed pulley. Initially A is 2.5 m above horizontal ground. The particles are released from rest with the string taut and the hanging parts of the string vertical, as shown in the figure. After A has been descending for 1.25 s, it strikes the ground. Particle A reaches the ground before B has reached the pulley.



- Show that the acceleration of B as it ascends is 3.2 m s^{-2} .
- Find the tension in the string as A descends.
- Show that $m = \frac{65}{11}$.
- State how you have used the information that the string is inextensible.

When A strikes the ground it does not rebound and the string becomes slack. Particle B then moves freely under gravity, without reaching the pulley, until the string becomes taut again.

- Find the time between the instant when A strikes the ground and the instant when the string becomes taut again.

TAP FOR ANSWERS

BHASVIC MαTHS

A1 DOUBLES ASSIGNMENT 13B

4

A parcel of mass 8 kg rests on a smooth slope, and is connected by a light inextensible string which passes over a smooth pulley to a mass of 2kg, which hangs freely. The system is in equilibrium. Find the angle of the slope.

TAP FOR ANSWERS

BHASVIC MATHS

A1 DOUBLES ASSIGNMENT 13B

5

A projectile is launched from a point on a horizontal plane with initial speed u m s⁻¹ at an angle of elevation α . The particle moves freely under gravity until it strikes the plane. The range of the projectile is R m.

- (a) Show that the time of flight of the particle is $\frac{2u \sin \alpha}{g}$ seconds
- (b) Show that $R = \frac{u^2 \sin 2\alpha}{g}$.
- (c) Deduce that, for a fixed u , the greatest possible range is when $\alpha = 45^\circ$
- (d) Given that $R = \frac{2u^2}{5g}$, find the two possible values of the angle of elevation at which the projectile could have been launched.

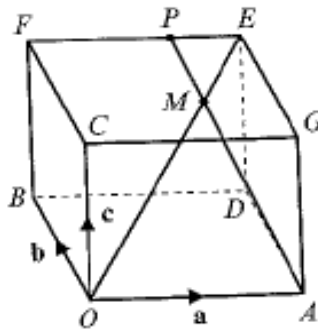
TAP FOR ANSWERS

BHASVIC MATHS

A1 DOUBLES ASSIGNMENT 13B

6

The diagram shows a cuboid whose vertices are O, A, B, C, D, E, F and G . \mathbf{a} , \mathbf{b} , and \mathbf{c} are the position vectors of the vertices A, B , and C respectively. The point M lies on OE such that $OM : ME = 3 : 1$. The straight line AP passes through point M . Given that $AM : MP = 3 : 1$, prove that P lies on the line EF and find the ratio $FP : PE$.



TAP FOR ANSWERS

BHASVIC MαTHS

A1 DOUBLES ASSIGNMENT 13B

7

Write as a single logarithm, then simplify your answer.

(a) $\log_2 40 - \log_2 5$

(b) $\log_6 4 + \log_6 9$

(c) $2 \log_{12} 3 + 4 \log_{12} 2$

(d) $\log_8 25 + \log_8 10 - 3 \log_8 5$

(e) $2 \log_{10} 2 - (\log_{10} 5 + \log_{10} 8)$

TAP FOR ANSWERS

BHASVIC MATHS

A1 DOUBLES ASSIGNMENT 13B

8

(i)

In the following relationships, $\log x$ is plotted against $\log y$ to give a straight line graph. State the value of the gradient and y intercept in each case:

(a) $y = 3x^7$ (b) $y = \frac{1}{4}x^3$ (c) $y = 2x^{\frac{1}{2}}$

In the following relationships, x is plotted against $\log y$ to give a straight line graph. State the value of the gradient and y intercept in each case:

(d) $y = 3(7^x)$ (e) $y = \frac{1}{4}(3^x)$ (f)
 $y = 2\left(\frac{1}{2}\right)^x$

TAP FOR ANSWERS

BHASVIC MATHS
A1 DOUBLES ASSIGNMENT 5B

8 - continued

(ii) $\log x$ is plotted against $\log y$ and gives a straight line graph with the gradient and $\log y$ -axis intercept below. State the relationship between y and x only:

(a) $grad = \frac{1}{9}, intercept \log 3$

(b) $grad = 7, intercept \log\left(\frac{1}{4}\right)$

(c) $grad = -2, intercept 2\log 4$

x is plotted against $\log y$ and gives a straight line graph with the gradient and $\log y$ -axis intercept below.

State the relationship between y and x :

(d) $grad = \log 5, intercept \log 4$

(e) $grad = \log 3, intercept \log 2$

(f) $grad = 2, intercept -\log 10$

BHASVIC MαTHS

A1 DOUBLES ASSIGNMENT 13B

9

- (a) State the four conditions for a binomial distribution to be an appropriate model
- (b) For each experiment described below state, with a reason, whether a binomial distribution is appropriate:

Experiment 1. A bag contains black, white and red marbles which are selected at random, one at a time with replacement. The colour of each marble is noted.

Experiment 2. This experiment is a repeat of the first, except that the bag contains black and white marbles only.

Experiment 3. This experiment is a repeat of the other two except that the marbles are not replaced after selection.

TAP FOR ANSWERS

BHASVIC MαTHS

A1 DOUBLES ASSIGNMENT 13B

10

- (a) Expand $(1 - 2x)^9$ in ascending powers of x up to and including the term in x^3
- (b) Use the expansion to find an approximation to $(0.98)^9$ correct to 4 decimal places.

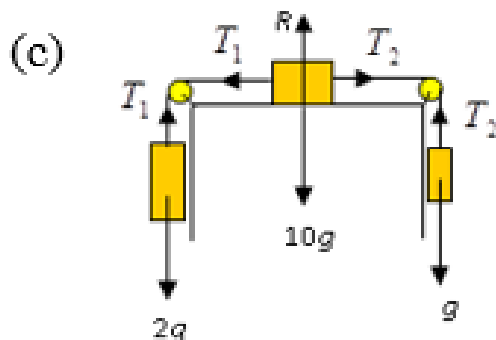
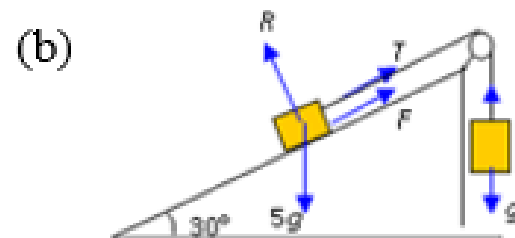
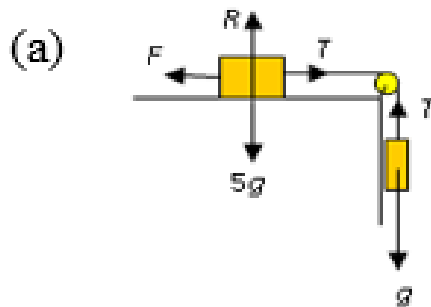
TAP FOR ANSWERS

BHASVIC MATHS

A1 DOUBLES ASSIGNMENT 13B

11

In the cases illustrated below, strings pass over small light pulleys. Contact between the blocks and the surfaces is rough. The blocks are at rest and the strings taut. By resolving forces in appropriate directions form equations to find the tension in the string and the frictional force exerted by each surface on the block with which it is in contact.



Add F (friction) to the diagram in the correct direction.

TAP FOR ANSWERS

BHASVIC MαTHS

A1 DOUBLES ASSIGNMENT 13B

12

A bag contains 6 red and 3 blue counters. A counter is chosen at random, its colour noted and then it is replaced. This is done three times. The number of red counters seen is denoted by X .

Write out the probability distribution for X .

TAP FOR ANSWERS

BHASVIC MαTHS

A1 DOUBLES ASSIGNMENT 13B

13

Find the first 4 terms of the binomial expansion for the following:

(a) $\left(2 - \frac{x}{2}\right)^3$

(b) $\left(\frac{1}{x} + x^2\right)^3$

(c) $(a - b)^3(a + b)^3$ (look carefully and save time!)

TAP FOR ANSWERS

BHASVIC MαTHS

A1 DOUBLES ASSIGNMENT 13B

14

- a) Expand $(1 + y)^3$.
- b) By replacing y with $(-3y)$ in the above expansion, find the expansion of $(1 - 3y)^3$ in ascending powers of y .

TAP FOR ANSWERS

BHASVIC MαTHS

A1 DOUBLES ASSIGNMENT 13B

15

The table shows data from the large data set on the daily mean air temperature and the daily mean pressure during May and June 2015 in Beijing.

Temperature °C	17.5	18.5	18.0	24.6	22.2	23.1	27.3
Pressure (hPa)	1010	1011	1012	997	1009	998	1002

Test at the 2.5% level of significance the claim that there is negative correlation between the daily mean air temperature and the daily mean pressure. State your hypotheses clearly.

TAP FOR ANSWERS

BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 13B

16

Complete this old spec paper

https://www.madasmaths.com/archive/iygb_practice_papers/c2_practice_papers/c2_o.pdf

TAP TO RETURN

BHAVIC MATHS
A1 DOUBLES ASSIGNMENT 13B

1 - Answers

2.5, 1.5

TAP TO RETURN

BHASVIC MαTHS

A1 DOUBLES ASSIGNMENT 13B

2 - Answers

(a) $\frac{1}{6}(e - 1)$

(b) $\frac{1}{3}(\ln 2 + 1)$

(c) $2 \ln 2$

(d) $\frac{1}{3}(\ln 28 - 1)$

BHASVIC MαTHS

A1 DOUBLES ASSIGNMENT 13B

3 - Answers

(a) $s = ut + \frac{1}{2}at^2$ so $2.5 = 0 + \frac{1}{2} \times a \times 1.25^2, a = 3.2 \text{ ms}^{-2}$

(b) 39 N

(c) For A, $R(\downarrow): mg - T = ma$

$$T = m(9.8 - 3.2), T = 6.6m$$

Substituting for $T: 39 = 6.6m$

$$m = \frac{65}{11}$$

(d) Same tension in string either side of the pulley.

(e) $\frac{40}{49} \text{ s}$

TAP TO RETURN

BHAVIC MATHS
A1 DOUBLES ASSIGNMENT 13B

4 - Answers

14.5°

TAP TO RETURN

BHAVIC MATHS
A1 DOUBLES ASSIGNMENT 13B

5 - Answers

12° and 78° (nearest degree)

TAP TO RETURN

BHASVIC MαTHS

A1 DOUBLES ASSIGNMENT 13B

6 - Answers

Show that $\overrightarrow{FP} = \frac{2}{3}\mathbf{a}$ (multiple methods possible)

Show that $\overrightarrow{PE} = \frac{1}{3}\mathbf{a}$ (multiple methods possible)

Therefore FP and PE are parallel, so P lies on FE

$FP:PE = 2 : 1$

TAP TO RETURN

BHASVIC MαTHS

A1 DOUBLES ASSIGNMENT 13B

7 - Answers

(a) $\log_2 8 = 3$

(b) $\log_6 36 = 2$

(c) $\log_{12} 144 = 2$

(d) $\log_8 2 = \frac{1}{3}$

(e) $\log_{10} \frac{1}{10} = -1$

TAP TO RETURN

BHASVIC MαTHS

A1 DOUBLES ASSIGNMENT 13B

8 - Answers

(i)

(a) grad = 7, intercept = $\log 3$

(b) (b) grad = 3, intercept = $\log\left(\frac{1}{4}\right)$

(c) grad = $\frac{1}{2}$, intercept = $\log 2$

(d) grad = $\log 7$, intercept = $\log 3$

(e) grad = $\log 3$, intercept = $\log\left(\frac{1}{4}\right)$

(f) grad = $\log\left(\frac{1}{2}\right)$, intercept = $\log 2$

(ii)

(a) $y = 3(x)^{\frac{1}{9}}$

(b) $y = \frac{1}{4}(x)^7$

(c) $y = 16(x)^{-2}$

(d) $y = 4(5^x)$

(e) $y = 2(3^x)$

(f) $y = 10^{2x-1}$ or $y = \frac{1}{10}(10^{2x})$ or $y = 10(10^x)$

TAP TO RETURN

BHASVIC MαTHS

A1 DOUBLES ASSIGNMENT 13B

9 - Answers

Check your notes

TAP TO RETURN

BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 13B

10 - Answers

- (a) $1 - 18x + 144x^2 - 672x^3$
(b) 0.8337

TAP TO RETURN

BHASVIC MαTHS

A1 DOUBLES ASSIGNMENT 13B

11 - Answers

- (a) $T=9.8\text{N}$, $F=9.8\text{N}$
- (b) $T=9.8\text{N}$, $F=14.7\text{N}$
- (c) $T_2=9.8\text{N}$, $T_1=19.6\text{N}$, $F=9.8\text{N}$

TAP TO RETURN

BHASVIC MαTHS

A1 DOUBLES ASSIGNMENT 13B

12 - Answers

x	0	1	2	3
$P(X = x)$	$\frac{1}{27}$	$\frac{6}{27}$	$\frac{12}{27}$	$\frac{8}{27}$

TAP TO RETURN

BHASVIC MATHS

A1 DOUBLES ASSIGNMENT 13B

13 - Answers

$$(a) 8 - 6x + \frac{3x^2}{2} - \frac{x^3}{8}$$

$$(b) \frac{1}{x^3} + 3 + 3x^2 + x^6$$

$$(c) (a^2 - b^2)^3 = a^6 - 3a^4b^2 + 3a^2b^4 - b^6$$

TAP TO RETURN

BHASVIC MαTHS

A1 DOUBLES ASSIGNMENT 13B

14 - Answers

a) $1 + 3y + 3y^2 + y^3;$

b) $1 - 9y + 27y^2 - 27y^3$

TAP TO RETURN

BHASVIC MαTHS

A1 DOUBLES ASSIGNMENT 13B

15 - Answers

$r = -0.793$ (3 s. f.), $H_0: \rho = 0$, $H_1: \rho < 0$, critical value -0.7545 .
Reject H_0 . There is evidence that temperature and pressure are negatively correlated.

TAP TO RETURN

BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 13B

16 - Answers

https://www.madasmaths.com/archive/iygb_practice_papers/c2_practice_papers/c2_o_solutions.pdf

TAP TO RETURN