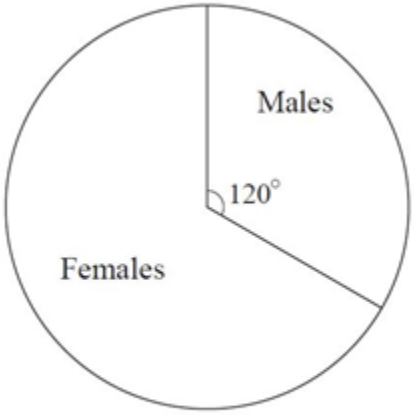
BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 5B

1

The numbers of males and females in Year 12 at a school are illustrated in the pie chart. The number of males in Year 12 is 128.

(a) Find the number of females in Year 12.

(b) On a corresponding pie chart for Year 13, the angle of the sector representing males is 150°
Explain why this does not necessarily mean that the number of males in Year 13 is more than 128.



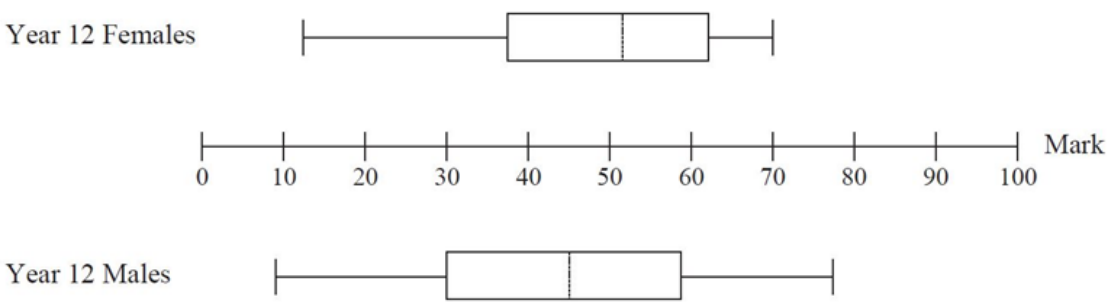
Year 12

TAP FOR ANSWERS

BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 5B

1

All the Year 12 students took a General Studies examination. The results are illustrated in the box-and-whisker plots.



(c) One student said "The Year 12 pie chart shows that there are more females than males, but the box-and-whisker plots show that there are more males than females." Comment on this statement.

(d) Give two comparisons between the overall performance of the females and the males in the General Studies examination.

(e) Give one advantage and one disadvantage of using box-and-whisker plots rather than histograms to display the results.

TAP FOR ANSWERS

1

(f) The mean mark for 102 of the male students was 51. The mean mark for the remaining 26 male students was 59. Calculate the mean mark for all 128 male students.

TAP FOR ANSWERS

BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 5B

2

The events A and B are such that $P(A) = \frac{5}{16}, P(B) = \frac{1}{2}$ and $P(A|B) = \frac{1}{4}$

Find

(a) $P(A \cap B)$

(b) $P(B'|A)$

(c) $P(A' \cup B)$

(d) Determine, with a reason, whether or not the events A and B are independent.

TAP FOR ANSWERS

3

The events A and B are such that $P(A) = 0.2$, and $P(A \cup B) = 0.6$
Find

(a) $P(A' \cap B')$

(b) $P(A' \cap B)$

Given also that events A and B are independent, find
(c) $P(B)$

(d) $P(A' \cup B')$

TAP FOR ANSWERS

BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 5B

4

(i) Sketch the following curves, stating the equations of asymptotes and axis intercepts

(a) $y = 3^x$ (b) $y = 3^{-x}$ (c) $y = \left(\frac{1}{3}\right)^x$

(d) $y = 3^{x+1}$ (e) $y = \log_3 x$ (f) $y = \log_3(x-2)$

(ii) Solve these equations, giving your answers to 2 d.p.:

(a) $(0.3)^{2x-1} = 10$ (b) $3^{x+1} = 2$ (c) $7^{-x} = 2$

(d) $\log 5 + \log x = 7$ (e) $4^{2x} - 4^{x+1} + 3 = 0$

(f) $\log_5(x^2 - 4) - \log_5 2x = 0$

(g) $\log_5(3x + 95) = 2 + \log_5(x + 3)$

TAP FOR ANSWERS

BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 5B

5

(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 log$y$ 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 log$y$ 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 MαTHS
A1 DOUBLES ASSIGNMENT 5B

5

(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) $grad = \frac{1}{9}, intercept\ log3$ (b) $grad = 7, intercept \log\left(\frac{1}{4}\right)$

(c) $grad = -2, intercept\ 2log4$

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) $grad = log5, intercept\ log4$ (e) $grad = log3, intercept\ log2$

(f) $grad = 2, intercept - log10$

TAP FOR ANSWERS

BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 5B

6

(a) £350 is initially paid into a bank account that pays 3% per year interest. No further money is deposited or withdrawn. Create a model to show the amount of money in the account after t years and use it to calculate how many whole years it will be before there is more than £1,000 in the account.

(b) Scientists are monitoring the population of curly-toed spiders at a secret location. It appears to be dropping at a rate of 25% per year. When the population has dropped below 200, the species will be in danger of extinction.

At the moment the population is 2000. Use logarithms and solve an inequality to find the year in which the spiders will be in danger of extinction.

TAP FOR ANSWERS

BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 5B

7

A small ball is projected vertically upwards from ground level with speed u m s^{-1}. The ball takes 4 s to return to ground level.

(a) Draw a velocity-time graph to represent the motion of the ball during the first 4 s.

(b) The maximum height of the ball above the ground during the first 4 s is 19.6 m. Find the value of u.

c) Why is the ball described as 'small'?

TAP FOR ANSWERS

8

A set of data values, x, is shown below:
52, 73, 31, 73, 38, 80, 17, 24

a) Code the data using the coding $y = \frac{x-3}{7}$

a) Calculate the mean of the coded data values

a) Use your answer to (b) to calculate the mean of the original data.

TAP FOR ANSWERS

9

A girl runs a 400 m race in a time of 84 s. In a model of this race, it is assumed that, starting from rest, she moves with constant acceleration for 4 s, reaching a speed of 5 m s^{-1}. She maintains this speed for 60 s and then moves with constant deceleration for 20 s, crossing the finishing line with a speed of V m s^{-1}.

(a) Sketch a speed-time graph for the motion of the girl during the whole race.

(b) Find the distance run by the girl in the first 64 s of the race.

(c) Find the value of V.

(d) Find the deceleration of the girl in the final 20 s of her race.

TAP FOR ANSWERS

10

A racing car modelled as a particle starts from rest at the point A and moves in a straight line with constant acceleration for 30 s until it reaches point C. The speed of the car at C is 75 m s^{-1}.

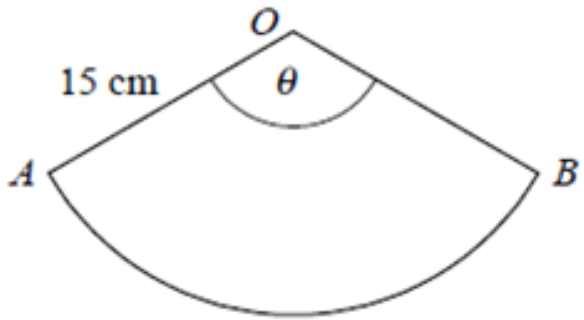
(a) Calculate the acceleration of the car.

(b) If B is a point between A and C such that AB = 245 m, calculate the distance BC.

TAP FOR ANSWERS

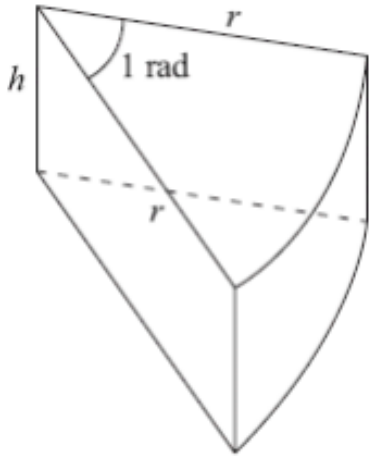
11

The diagram shows sector OAB of a circle, centre O, radius 15 cm
Given that $\angle AOB=\theta$ radians and that the length of the arc AB is 32.1 cm,
(a) find the value of θ
(b) find the area of sector OAB.



TAP FOR ANSWERS

12



The diagram above shows a closed box used by a shop for packing pieces of cake. The box is a right prism of height h cm. The cross section is a sector of a circle. The sector has radius r cm and angle 1 radian.

The volume of the box is 300 cm^3.

(a) Show that the surface area of the box, S cm^2, is given by

$$S = r^2 + \frac{1800}{r}$$

(5)

TAP FOR ANSWERS

b) Use calculus to find the value of r for which S is stationary.

c) Prove that this value of r gives a minimum value of S.

d) Find, to the nearest cm^2, this minimum value of S.

TAP FOR ANSWERS

13

Over a long period of time I have worked out the probability that my train is late on a Sunday is 0.3.

Draw a tree diagram to show the possible outcomes for my next 2 journeys on a Sunday.

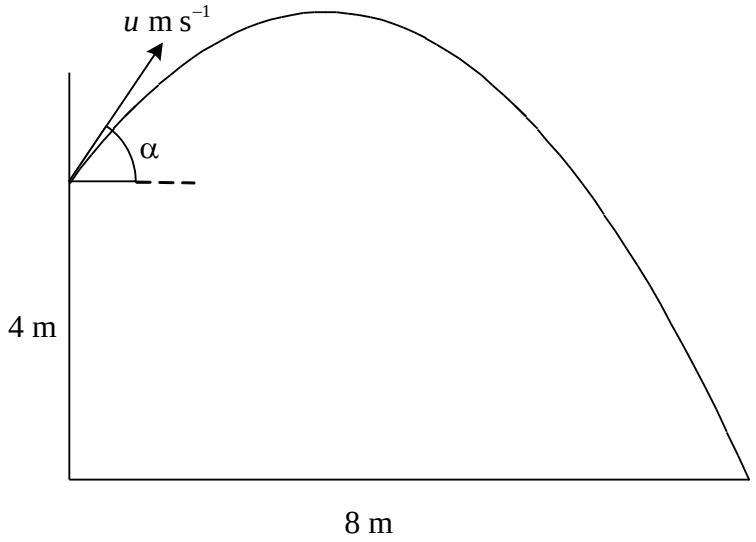
From the tree diagram calculate the probability that:

(a) both journeys are on time.

(b) only one journey is on time.

TAP FOR ANSWERS

14



A ball is thrown from a point 4 m above horizontal ground. The ball is projected at an angle α above the horizontal, where $\tan\alpha = \frac{3}{4}$. The ball hits the ground at a point which is a horizontal distance 8 m from its point of projection, as shown.

The initial speed of the ball is u m s $^{-1}$ and the time of flight is T seconds.

TAP FOR ANSWERS

14

(a) Prove that $uT = 10$.

(b) Find the value of u.

As the ball hits the ground, its direction of motion makes an angle $\emptyset$ with the horizontal.

(c) Find $\tan \emptyset$.

TAP FOR ANSWERS

15

Copy and complete this table

Attribute	Units	Discrete or Continuous?	Min	Max	Qualitative or Quantitative	Possible values
Daily Mean Temperature						
Daily Total Rainfall						
Daily Total Sunshine						
Daily Maximum Relative Humidity						
Daily Mean Windspeed						
Daily Maximum Gust						

TAP FOR ANSWERS

And this bit!

Attribute	Units	Discrete or Continuous?	Min	Max	Qualitative or Quantitative	Possible values
Daily Mean Wind Direction						
Cardinal Wind Direction						
Daily Maximum Gust Direction						
Cardinal Gust Direction						
Cloud Cover						
Visibility						

TAP FOR ANSWERS

BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 5B

1 - Answers

(a) 256

(f) $\bar{x} = 52.6$

TAP TO RETURN

BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 5B

2 – Answers

(a) $\frac{1}{8}$

(b) $\frac{3}{5}$

(c) $\frac{13}{16}$

TAP TO RETURN

3 - Answers

(a) 0.4

(b) 0.4

(c) 0.5

(d) 0.9

TAP TO RETURN

4 - Answers

(i) Use desmos!

(ii) (a) -0.46 (b) -0.37 (c) -0.36 (d) 2,000,000

(e) $x = 0, x = 0.79$ (f) 3.24 (g) $x = 0.91$

TAP TO RETURN

BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 5B

5 - Answers

(i) (a) grad = 7, intercept = log3 (b) grad = 3, intercept = $\log\left(\frac{1}{4}\right)$

(c) grad = ½ , intercept = log2 (d) grad = log7, intercept = log3

(e) grad = log3, intercept = $\log\left(\frac{1}{4}\right)$ (f) grad = $\log\left(\frac{1}{2}\right)$, intercept = log2

(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

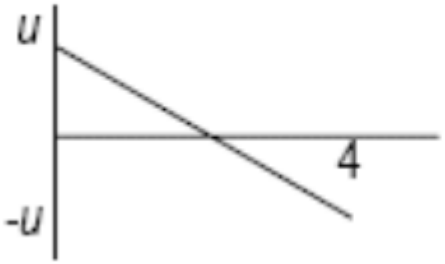
6 - Answers

(a) 36
(b) 8^{th} year

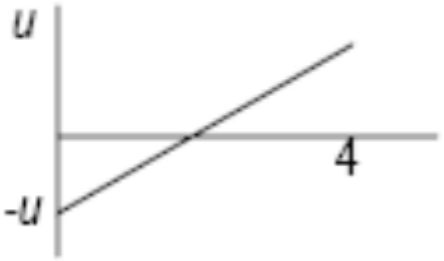
TAP TO RETURN

7 - Answers

(a)



or



(b) $19.6 = \frac{1}{2} \times 2 \times u$

$u = 19.6$

c) The dimensions of the ball are negligible so mass is concentrated at a single point and rotational forces and air resistance can be ignored

TAP TO RETURN

BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 5B

8 - Answers

a) 7, 10, 4, 10, 5, 11, 2, 3

b) 6.5

c) 48.5

TAP TO RETURN

9 - Answers

(b) 310m

(c) $4ms^{-1}$

(d) $0.05ms^{-2}$

TAP TO RETURN

10 - Answers

(a) $a = 2.5\text{ms}^{-2}$

(b) BC = 880m

TAP TO RETURN

11 - Answers

(a) 2.14

(b) 240.75 cm^2

TAP TO RETURN

12 - Answers

b) 9.7

c) $\frac{d^2S}{dr^2} > 0$

d) 280cm² (3s.f.)

TAP TO RETURN

13 - Answers

(a) 0.49

(b) 0.42

TAP TO RETURN

14 - Answers

(b) 7

(c) 7/4

TAP TO RETURN

BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 5B

15 - Answers

Attribute	Units	Discrete or Continuous?	Min	Max	Qualitative or Quantitative	Possible values
Daily Mean Temperature	°C	Discrete	n/a	n/a	Quantitative	Integers + tenths
Daily Total Rainfall	millimetres	Discrete	0	n/a	Quantitative	Integers + tenths
Daily Total Sunshine	Hours	Discrete	0	24*	Quantitative	Integers + tenths
Daily Maximum Relative Humidity	Percentage	Discrete	0	100	Quantitative	Integers
Daily Mean Windspeed	Knots	Discrete	0	n/a	Quantitative	Integers
Daily Maximum Gust	Knots	Discrete	0	n/a	Quantitative	Integers

*You may not agree with this but bear in mind that the midnight sun occurs in places North of the Arctic Circle and South of the Antarctic Circle in the summer months. However, none of these places fall into this category. For more detail look at the Wikipedia entry for "Midnight Sun"

TAP TO RETURN

BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 5B

15 - Answers

Attribute	Units	Discrete or Continuous?	Min	Max	Qualitative or Quantitative	Possible values
Daily Mean Wind Direction	Degrees	Discrete	0	360	Quantitative	Multiples of 10
Cardinal Wind Direction	Points of compass	Discrete	n/a	n/a	Qualitative	N, NNE, NE, ENE, E, ESE, SE SSE, S, SSW, SW, WSW, W, WNW, NW NNW
Daily Maximum Gust Direction	Degrees	Discrete	0	360	Quantitative	Multiples of 10
Cardinal Gust Direction	Points of compass	Discrete	n/a	n/a	Qualitative	N, NNE, NE, ENE, E, ESE, SE SSE, S, SSW, SW, WSW, W, WNW, NW NNW
Cloud Cover	Oktas	Discrete	0	8	Quantitative	Integers
Visibility	Decametres	Discrete	0	n/a	Quantitative	Multiples of 100

TAP TO RETURN