BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 1B

1

Convert the below into the form $ax^m + bx^n$:

(a) $\frac{1+5x}{4x}$

(b) $\frac{3x-4\sqrt{x}}{x^3}$

(c) $\frac{\sqrt[4]{16x^3}-\sqrt[3]{27x^3}}{2x^2}$

(d) $\frac{4-5x}{3x^2}$

(e) $\frac{\sqrt{4x^3}-1-2x}{\sqrt[3]{x}}$

(f) $\frac{4x+\sqrt{81x^2}}{9\sqrt{x}}$

TAP FOR ANSWERS

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2

A dairy farm records the milk yield, in litres, for each of its herd of 40 pedigree friesian cows. For on particular day the yields were as follows:

key 2|1 means 21 litres																	
0	1	5	7														
1	1	2	2	3	5	9											
2	3	3	3	4	5	5	5	6	6	9							
3	2	3	3	4	4	4	5	5	5	6	6	7	7	9	9	9	9
4	0	1	1	9													

Reminder – the median is the middle value. To find the median you find the $\frac{n}{2}$ *th value. If* $\frac{n}{2}$ *is a whole number (integer) you go half way between that value and the next one in the list. If* $\frac{n}{2}$ *is a decimal, you round up and take that value.*

(a) Find the lower quartile(Q_1), median (Q_2), and the upper quartile (Q_3) of this data then calculate the interquartile range (IQR = $Q_3 - Q_1$)

TAP FOR ANSWERS

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2

key 2|1 means 21 litres																	
0	1	5	7														
1	1	2	2	3	5	9											
2	3	3	3	4	5	5	5	6	6	9							
3	2	3	3	4	4	4	5	5	5	6	6	7	7	9	9	9	9
4	0	1	1	9													

An **outlier** is any value less than $Q_1 - \frac{3}{2}(Q_3 - Q_1)$ or more than $Q_3 + \frac{3}{2}(Q_3 - Q_1)$.

(b) Check for outliers, showing your working

(c) Draw a box plot to represent the data in the stem & leaf diagram

TAP FOR ANSWERS

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3

At a children's party each child was blindfolded and asked to pin a tail on a cardboard donkey. The distance, in cm. of the pin from the correct position was measured and the results are recorded below.

17, 15, 5, 9, 13, 42, 8, 24, 34, 38, 29, 6

Find the mean and the standard deviation for this set of numbers. Give your answers to 2 decimal places where appropriate.

TAP FOR ANSWERS

4

The table below summarises the weights, to the nearest Kilogram, of a random sample of forty Highland cattle. Estimate the mean and the standard deviation of the weights for this distribution, giving your answers to 2 decimal places.

Weight (kg)	Frequency
400-449	4
450-499	7
500-549	6
550-599	13
600-649	9
650-699	1

TAP FOR ANSWERS

5

Use google to find the following definitions, and make sure you know them on the day that your assignment is due (as well as writing them out as part of this assignment). Approximately one sentence per definition.

Define the following:
Population
Sample
Census
Simple random sampling
Opportunity sampling
Stratified sampling
Systematic sampling
Quota sampling

TAP FOR ANSWERS

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A1 DOUBLES ASSIGNMENT 1B

6

Convert these to the form ax^n or $ax^n + bx^m$:

(a) $(64x^{10})^{\frac{1}{2}}$

(b) $\frac{5x^3-2x^2}{x^5}$

(c) $(125x^{12})^{\frac{1}{3}}$

(d) $\frac{x+4x^3}{x^3}$

(e) $\frac{2x+x^2}{x^4}$

(f) $\left(\frac{4}{9}x^4\right)^{\frac{3}{2}}$

(g) $\frac{9x^2-15x^5}{3x^3}$

(h) $\frac{5x+3x^2}{15x^3}$

TAP FOR ANSWERS

7

A fertiliser company uses a model to determine how the amount of fertiliser used, f kilograms per hectare, affects the grain yield g, measured in tonnes per hectare.

$$g = 6 + 0.03f - 0.00006f^2$$

(a) According to the model, how much grain would each field yield without any fertiliser?

(b) One farmer currently uses 20kg of fertiliser per hectare. How much more fertiliser would he need to use to increase his grain yield by 1 tonne per hectare?

TAP FOR ANSWERS

8

A swimmer dives into a pool. Her position, p m, underwater can be modelled in relation to her horizontal distance, x m, from the point she entered the water as a quadratic equation $p = \frac{1}{2}x^2 - 3x$.

The position of the bottom of the pool can be modelled by the linear equation $p = 0.3x - 6$.

Determine whether this model predicts that the swimmer will touch the bottom of the pool.

TAP FOR ANSWERS

9

The function f is defined as $f(x) = 2^{2x} - 20(2^x) + 64, x \in \mathbb{R}$.

(a) Write f(x) in the form $(2^x - a)(2^x - b)$, where a and b are real constants.

(b) Hence find the two roots of f(x).

TAP FOR ANSWERS

10

A car starts from rest and accelerates uniformly for 15 seconds until it reaches a speed of $12ms^{-1}$. It then maintains this speed for 40 seconds before decelerating uniformly to rest in 30 seconds.

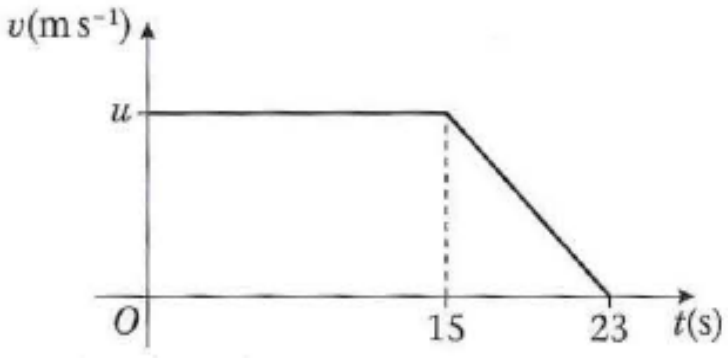
Draw a speed-time graph to model this motion and calculate the total distance travelled by the car (**you will need to use the fact that the distance travelled equals area under a speed-time graph**).

TAP FOR ANSWERS

11

The diagram is a speed-time graph representing the motion of a cyclist along a straight road. At time $t = 0$ s, the cyclist is moving with speed u m s^{-1}. The speed is maintained until time $t = 15$ s, when she slows down with constant deceleration, coming to rest when $t = 23$ s. The total distance she travels in 23 s is 152 m.

Find the value of u.



TAP FOR ANSWERS

This is a suvat table. Only model a situation with a suvat table if acceleration is **constant**

s	
u	
v	
a	
t	

s = displacement in metres, u = initial velocity in metres per second,
v = final velocity in metres per second, a = acceleration in metres per second2,
t = time in seconds

The *suvat* table can also be drawn horizontally:

s	*u*	*v*	*a*	*t*

TAP FOR ANSWERS

The five *suvat* equations are given below. Each equation contains only 4 out of the 5 variables.

$$s = vt - \frac{1}{2}at^2 \qquad v = u + at \qquad s = \left(\frac{u+v}{2}\right)t$$

$$s = ut + \frac{1}{2}at^2 \qquad v^2 = u^2 + 2as$$

Write out (many times) and <u>memorise</u> the *suvat* equations.

For each of the situations on the next page, make and complete a *suvat* table. Put a question mark in the box for whichever piece of information is required by the question, and a cross for the variable you're not interested in. **Make sure you've used displacement not distance, and make sure you're consistently using the same direction (up or down, or left or right) as the 'positive' direction.**

TAP FOR ANSWERS

For each situation, select an equation from the 5 listed on the previous page. The easiest way to do this is to see what information is missing from your table (neither given nor required by the question) and choose the equation with this variable missing.

Write down the equation, substitute in the values from your *suvat* table and then rearrange to find the required information**. Don't forget units on your final answer!**

<u>In all mechanics questions, you need to round your final answer to 2 or 3 significant figures at the end.</u>

(a) A particle moves in a straight line. When $t = 0$ its velocity is 3 m s^{-1}. When $t = 4$ its velocity is 12 m s^{-1}. Find its acceleration, assumed to be constant.

TAP FOR ANSWERS

(b) A car is approaching traffic lights at 15 m s^{-1} when the driver applies the brake and comes to a stop in 45 m. Find the deceleration, assumed constant, and the time taken to stop.

(c) A particle has constant acceleration 6 m s^{-2} whilst travelling in a straight line between points *A* and *B*. It passes *A* at 2 m s^{-1} and *B* at 5 m s^{-1}. Calculate the distance *AB*.

(d) A person on the top of a tower of height 45m holds their arm over the side of the building and **drops** a stone vertically downwards. The stone takes 3.03s to reach the ground. Use this information to prove that the value of acceleration due to gravity is 9.8 to 2 significant figures.

TAP FOR ANSWERS

13

A particle is projected vertically upwards with speed 24.5m s $^{-1}$. Find the total time for which it is 21 m or more above its point of projection.

TAP FOR ANSWERS

14

Last year Eleanor played 10 rounds of gold. Her scored were as follows:
80, 67, 67, 74, 66, 65, 79, 71, 66, 64.

(a) Calculate the mean of these scores and show that the standard deviation is 5.56 correct to 3 significant figures.

(b) Find the median and interquartile range of the scores

This year, Eleanor also played 10 rounds of golf. The standard deviation of her scores was 4.23 correct to 3 significant figures, and the interquartile range was the same as last year.

(c) Give a possible reason why the standard deviation of her scores was lower than last year although her interquartile range was unchanged.

In golf, smaller scores mean a better standard of play than larger scores. Ken suggests that since the standard deviation was smaller this year, Eleanor's overall standard has improved.

(d) Explain why Ken is wrong.

(e) State what the smaller standard deviation does show about Eleanor's play.

TAP FOR ANSWERS

15

Look at the table showing the mean temperature in Heathrow and Beijing for the first week of May 2015.
Find the mean and standard deviation of the temperature in each place.
What conclusions can you draw?

	Heathrow	Beijing
1-May-15	9.8	17.5
2-May-15	11.0	20.0
3-May-15	14.7	19.2
4-May-15	15.0	18.5
5-May-15	14.3	21.1
6-May-15	11.5	17.1
7-May-15	13.1	18.8

TAP FOR ANSWERS

BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 1B

1 - Answers

(a) $\frac{1}{4}x^{-1} + \frac{5}{4}$

(b) $3x^{-2} - 4x^{-\frac{5}{2}}$

(c) $x^{-\frac{5}{4}} - \frac{3}{2}x^{-1}$

(d) $\frac{4}{3}x^{-2} - \frac{5}{3}x^{-1}$

(e) $2x^{\frac{7}{6}} - x^{-\frac{1}{3}} - 2x^{\frac{2}{3}}$

(f) $\frac{13}{9}x^{\frac{1}{2}}$

TAP TO RETURN

2 - Answers

(a)Q_1=23, Q_2=32.5, Q_3=36.5. IQR = 13.5 show all working.
(b)One outlier below = 1, none above.
(c)Make sure your box plot has a labelled scale

TAP TO RETURN

3 - Answers

$\overline{x} = 20$

$\sigma = 12.48$

TAP TO RETURN

4 - Answers

$\overline{x} \approx 548.25$

$\sigma \approx 67.07$

TAP TO RETURN

5 - Answers

Use Google to look these definitions up!

TAP TO RETURN

6 - Answers

(a) $8x^5$

(b) $5x^{-2} - 2x^{-3}$

(c) $5x^4$

(d) $x^{-2} + 4$

(e) $2x^{-3} + x^{-2}$

(f) $\frac{8}{27}x^6$

(g) $3x^{-1} - 5x^2$

(h) $\frac{1}{3}x^{-2} + \frac{1}{5}x^{-1}$

TAP TO RETURN

7 - Answers

(a) 6 tonnes

(b) 39.6 kilograms per hectare

TAP TO RETURN

8 - Answers

The diver does not reach the bottom of the pool.

TAP TO RETURN

9 - Answers

(a) $f(x) = (2^x - 16)(2^x - 4)$

(b) 4 and 2

TAP TO RETURN

10 - Answers

750m

TAP TO RETURN

11 - Answers

$u = 8$

TAP TO RETURN

12 - Answers

(a) 2.25 ms^{-2}

(b) $a = 2.5$ ms^{-2}, $t = 6$

(c) 1.75m

TAP TO RETURN

13 - Answers

2.8 seconds

TAP TO RETURN

14 - Answers

(a) $\bar{x} = 69.9$, median = 67, IQR = 8

(c) IQR does not include extreme scores, whereas standard deviation (SD) does. Therefore, if her play has fewer extreme scores this year (she is more consistent), then the IQR will remain unchanged but the SD will be reduced.

(d) SD measures the average difference of her scores from the mean. A reduction in SD could mean that either i) her lowest scores have improved (her game has improved) OR ii) her highest score have gotten worse (her game has worsened).

(e) Her play is more consistent (scores are closer to the mean score/fewer extreme scores).

TAP TO RETURN

15 - Answers

Heathrow: mean=12.7, s.d.=1.88

Beijing: mean = 18.9, s.d.=1.28

Beijing hotter. Heathrow more variable.

TAP TO RETURN