

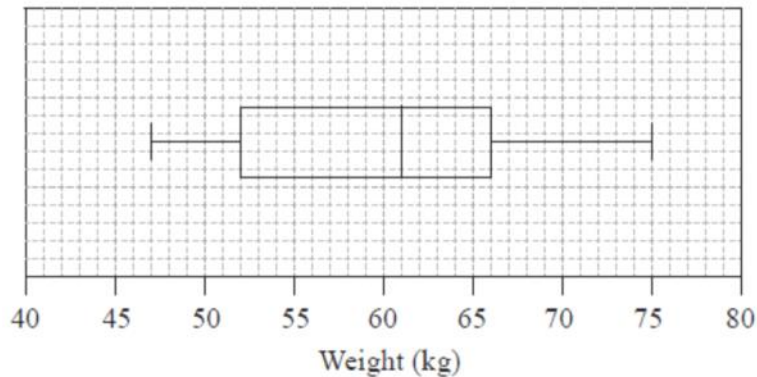
# Year End Review

June 16, 2018 11:36 AM

## MATH STUDIES 11 YEAR END REVIEW

name: \_\_\_\_\_/91

1. The weights in kg, of 80 adult males, were collected and are summarized in the box and whisker plot shown below.



- (a) Write down the median weight of the males.

61 kg

(1)

- (b) Calculate the interquartile range.

$$66 - 52 = 14$$

(2)

- (c) Estimate the number of males who weigh between 61 kg and 66 kg.

$$0.25 \times 80 = 20$$

(1)

- (d) Estimate the mean weight of the lightest 40 males.

$$\frac{47 + 52}{2} = 49.5$$

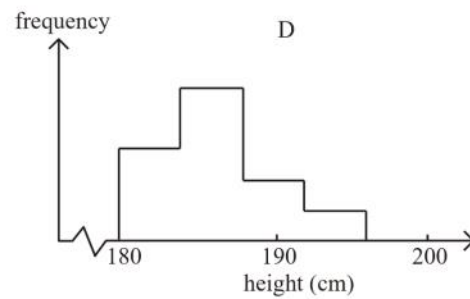
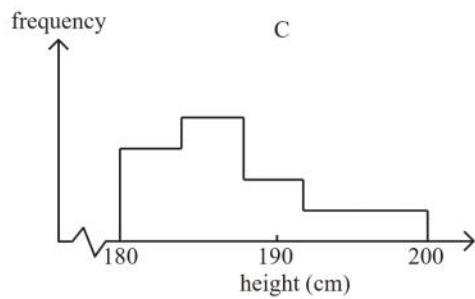
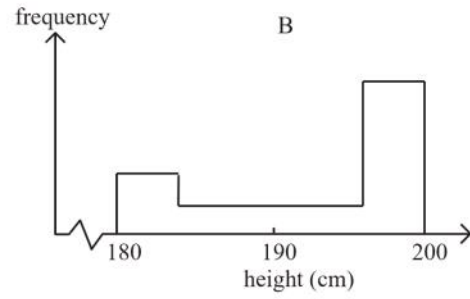
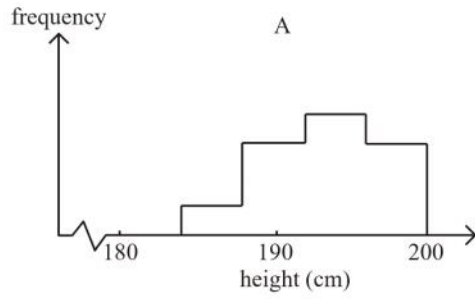
$$\frac{52 + 61}{2} = 56.5$$

← midpoint of quartile

(Total 6 marks)

$$\frac{49.5 \times 20 + 56.5 \times 20}{40} = 53 \text{ kg}$$

2. The heights in cm of the members of 4 volleyball teams A, B, C and D were taken and represented in the frequency histograms given below.



The mean  $\bar{x}$  and standard deviation  $\sigma$  of each team are shown in the following table.

	I	II	III	IV
$\bar{x}$	194	189	188	195
$\sigma$	6.50	4.91	3.90	3.74

Match each pair of  $\bar{x}$  and  $\sigma$  (I, II, III, or IV) to the correct team (A, B, C or D).

$\bar{x}$ and $\sigma$	Team
I	B
II	C
III	D
IV	A

(Total 6 marks)

2. The mass of packets of a breakfast cereal is normally distributed with a mean of 750 g and standard deviation of 25 g.

normal cdf (LB, RB,  $\mu$ ,  $\sigma$ )

(a) Find the probability that a packet chosen at random has mass

(i) less than 740 g;

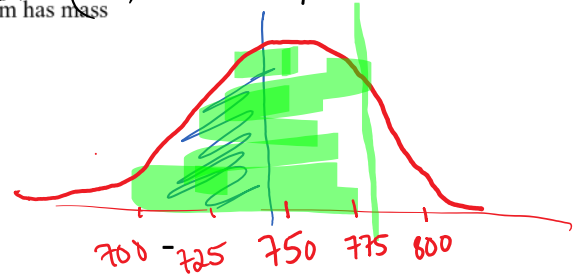
34.5%

(ii) at least 780 g;

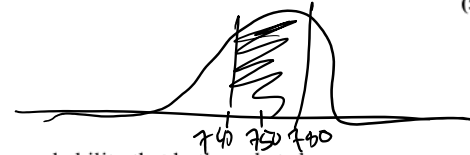
57.9%

(iii) between 740 g and 780 g.

54%



(5)



(b) Two packets are chosen at random. What is the probability that both packets have a mass which is less than 740 g?

this goes beyond what we've studied so far; (2)

$$.345 \times .345 = 0.119 \text{ or } 11.9\%$$

(c) The mass of 70% of the packets is more than  $x$  grams. Find the value of  $x$ .

$$\text{invnorm}(.7) \approx 0.524$$

$$0.524 \times 25 = 13.11$$

$$750 + 13.11 = 763.11 \quad \text{(Total 9 marks)}$$

3. Let  $f(x) = x^2 - 6x + 8$ .

(a) Factorise  $x^2 - 6x + 8$ .

$$(x-2)(x-4)$$

(2)

(b) Hence, or otherwise, solve the equation  $x^2 - 6x + 8 = 0$ .

$$x=2; x=4$$

(2)

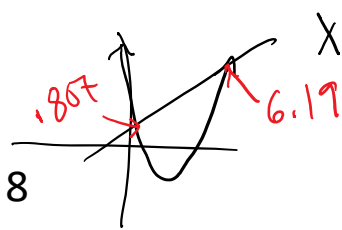
Let  $g(x) = x + 3$ .

(c) Write down the solutions to the equation  $f(x) = g(x)$ .

(2)

(Total 6 marks)

means you can solve however you like.



$$x^2 - 6x + 8 = x + 3$$

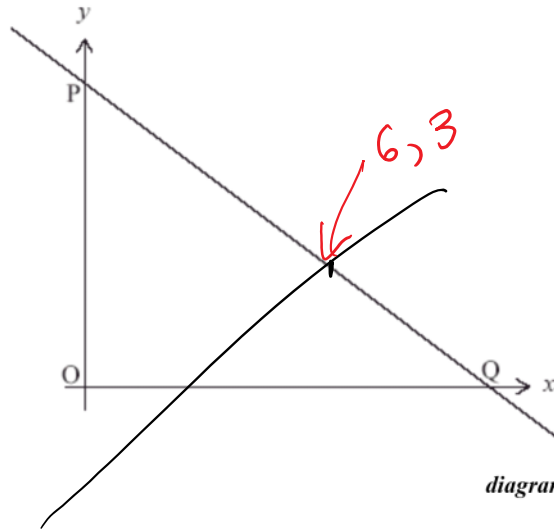
$$x = 6.19$$

$$x = 0.807$$

\* don't include the y-values / marks are deducted.

or use quadratic formula.

4. The diagram below shows the line PQ, whose equation is  $x + 2y = 12$ . The line intercepts the axes at P and Q respectively.



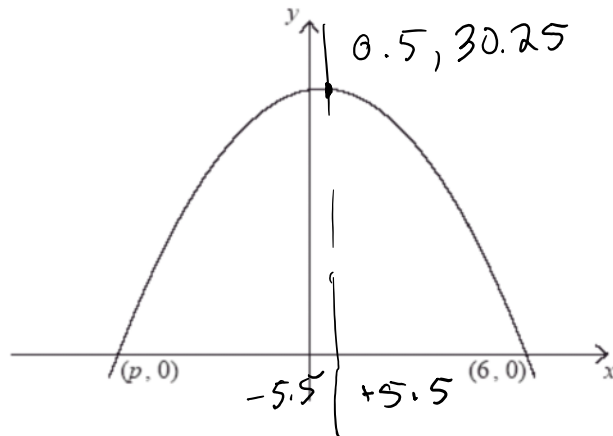
- (a) Find the coordinates of P and of Q.

Handwritten work for part (a):  
 $y$  int  $x=0$   
 $P: (0, 6)$   
 $2y = 12$   
 $y = 6$   
 $Q: x=12$   
 $(12, 0)$  (3)

- (b) A second line with equation  $x - y = 3$  intersects the line PQ at the point A. Find the coordinates of A.

Handwritten work for part (b):  
 graph or  
 $x = 3 + y$  substitute  
 $3 + y + 2y = 12$   
 $3y = 9$   
 $y = 3$   
 $x - 3 = 3$   
 $x = 6$   
 (Total 6 marks) (3)

5. The diagram below shows the graph of a quadratic function. The graph passes through the points  $(6, 0)$  and  $(p, 0)$ . The maximum point has coordinates  $(0.5, 30.25)$ .



- (a) Calculate the value of  $p$ .

Handwritten work for part (a):  
 $p = 0.5 - 5.5$

- (a) Calculate the value of  $p$ .

$$p = 0.5 - 5.5$$
$$= -5$$

(2)

- (b) Given that the quadratic function has an equation  $y = x^2 + bx + c$  where  $b, c \in \mathbb{Z}$ , find  $b$  and  $c$ .

$b = -1$   
 $c = 30$

$$y = (x+5)(x-6)$$
$$= x^2 - 6x + 5x - 30$$
$$= x^2 - x - 30$$

(Total 6 marks)

*change signs  $-x^2 + x + 30$*

*nasty!*

6. The function  $Q(t) = 0.003t^2 - 0.625t + 25$  represents the amount of energy in a battery after  $t$  minutes of use.

- (a) State the amount of energy held by the battery immediately before it was used.  $Q(0) = 25$

- (b) Calculate the amount of energy available after 20 minutes.  $Q(20) = 13.7$

- (c) Given that  $Q(10) = 19.05$ , find the average amount of energy produced per minute for the interval  $10 \leq t \leq 20$ .

$$19.05 - 13.7 = 5.35$$

- (d) Calculate the number of minutes it takes for the energy to reach zero.

*54.0*  
*or 53.99 53 is wrong!*

(Total 6 marks)

7. A manufacturer in England makes 16 000 garden statues. 12 % are defective and cannot be sold.

- (a) Find the number of statues that are non-defective.

$$.88 \times 16000 = \underline{14080}$$

(2)

The manufacturer sells each non-defective statue for 5.25 British pounds (GBP) to an American company. The exchange rate from GBP to US dollars (USD) is 1 GBP = 1.6407 USD.

- (b) Calculate the amount in USD paid by the American company for all the non-defective statues. Give your answer correct to **two decimal places**.

$$14080 \times 5.25 \text{ GBP} \times \frac{1.6407 \text{ USD}}{\text{GBP}} = \underline{121280.54 \text{ USD}}$$

(2)

The American company sells one of the statues to an Australian customer for 12 USD. The exchange rate from Australian dollars (AUD) to USD is 1 AUD = 0.8739 USD.


- (c) Calculate the amount that the Australian customer pays, in AUD, for this statue. Give your answer correct to **two decimal places**.

$$12 \times \frac{1 \text{ AUD}}{0.8739 \text{ USD}} = 13.73 \text{ AUD}$$

(Total 6 marks)

jiu

8. The following diagram shows a rectangle with sides of length  $9.5 \times 10^2$  m and  $1.6 \times 10^3$  m.

$$9.5 \times 10^2 \text{ m}$$


8. The following diagram shows a rectangle with sides of length  $9.5 \times 10^2$  m and  $1.6 \times 10^3$  m.



diagram not to scale

- (a) Write down the area of the rectangle in the form  $a \times 10^k$ , where  $1 \leq a < 10$ ,  $k \in \mathbb{Z}$ . (3)

$$1.52 \times 10^6 \text{ m}^2$$

Helen's estimate of the area of the rectangle is  $1\,600\,000 \text{ m}^2$ .

- (b) Find the percentage error in Helen's estimate. (3)

$$\frac{1\,600\,000 - 1\,520\,000}{1\,520\,000} \times 100\% = 5.26\%$$

(Total 6 marks) the or -ve of

9. Jenny has a circular cylinder with a lid. The cylinder has height 39 cm and diameter 65 mm.

- (a) Calculate the volume of the cylinder in  $\text{cm}^3$ . Give your answer correct to **two** decimal places. (3)

$$1294.14 \text{ cm}^3$$

The cylinder is used for storing tennis balls.  
Each ball has a **radius** of 3.25 cm.

- (b) Calculate how many balls Jenny can fit in the cylinder if it is filled to the top. (1)

$$39/6.5 = 6$$

- (c) (i) Jenny fills the cylinder with the number of balls found in part (b) and puts the lid on. Calculate the volume of air inside the cylinder in the spaces between the tennis balls.  $431 \text{ cm}^3$

- (ii) Convert your answer to (c) (i) into cubic metres. (4)

$$431 \text{ cm}^3 \times \frac{1 \text{ m}^3}{100^3 \text{ cm}^3} = 0.000431 \text{ m}^3$$

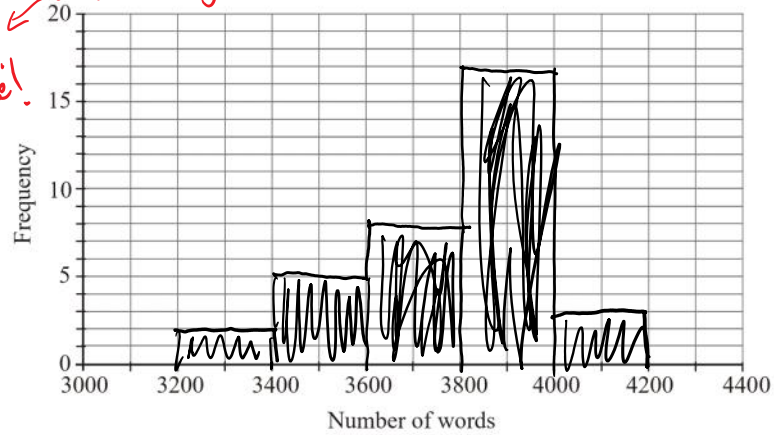
(Total 8 marks)  $\text{or } 4.31 \times 10^{-4} \text{ m}^3$

10. The table below shows the number of words in the extended essays of an IB class.

Number of words	$3200 \leq w < 3400$	$3400 \leq w < 3600$	$3600 \leq w < 3800$	$3800 \leq w < 4000$	$4000 \leq w < 4200$
Frequency	2	5	8	17	3

(a) Draw a histogram on the grid below for the data in this table.

Use a ruler!  
Be precise!  
Worth a mark!!



(3)

(b) Write down the modal group.  $3800 \leq w < 4000$

(1)

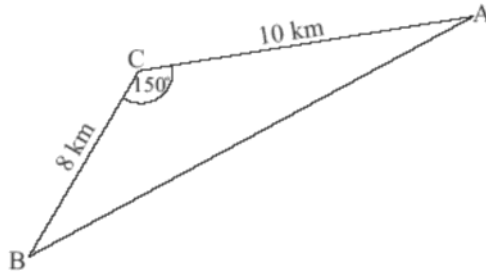
The maximum word count is 4000 words.

(c) Write down the probability that a student chosen at random is on or over the word count.

$$\frac{3}{35} = 0.857 \text{ or } 8.57\%$$

(2)  
(Total 6 marks)

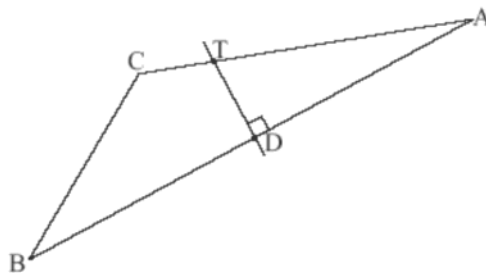
11. In the diagram below A, B and C represent three villages and the line segments AB, BC and CA represent the roads joining them. The lengths of AC and CB are 10 km and 8 km respectively and the size of the angle between them is  $150^\circ$ .



*diagram not to scale*

- (a) Find the length of the road AB. *Cosine law : 17.4 Km* (3)
- (b) Find the size of the angle CAB. *13.3°* (3)

Village D is halfway between A and B. A new road perpendicular to AB and passing through D is built. Let T be the point where this road cuts AC. This information is shown in the diagram below.



*diagram not to scale*

- (c) Write down the distance from A to D. *AD = 8.7 Km* (1)



- (d) *give all the steps!* Show that the distance from D to T is 2.06 km correct to three significant figures. (2)
- $$DT = \tan(13.29\dots^\circ) \times 8.697\dots = 2.0550$$
- $$= 2.06$$

A bus starts and ends its journey at A taking the route AD to DT to TA.

- (e) Find the total distance for this journey. *19.7 km* (3)

The average speed of the bus while it is moving on the road is  $70 \text{ km h}^{-1}$ .  
The bus stops for 5 minutes at each of D and T.

- (f) Estimate the time taken by the bus to complete its journey. Give your answer correct to the nearest minute. (4)
- 26.9*  
*= 27 minutes* (Total 16 marks)

12. Give all answers in this question to the nearest whole currency unit.

In January 2008 Larry had 90 000 USD to invest for his retirement in January 2011.

He invested 40 000 USD in US government bonds which paid 4 % per annum **simple interest**.

- (a) Calculate the value of Larry's investment in government bonds in January 2011. (3)
- Oops - I didn't teach this yet...*
- $$40\,000 \times 0.04 \times 3 + 40\,000 = 48\,000 \text{ USD}$$

Larry changed this investment into South African rand (ZAR) at an exchange rate of 1 USD = 18.624 ZAR.

- (b) Calculate the amount that Larry received in ZAR from the exchange. (2)
- 834355 ZAR*

He changed the remaining 50 000 USD to South African rand (ZAR) in January 2008. The exchange rate between USD and ZAR was 1 USD = 10.608 ZAR. There was 2.5 % commission charged on the exchange.

- (c) Calculate the value, **in USD**, of the commission Larry paid. (2)
- 1250 USD*

- (d) Show that the amount that Larry had to invest is 517 000 ZAR, correct to the nearest thousand ZAR. (3)
- ...*

(Total 10 marks)