



Mission Heights Junior College

Subject: Mathematics 2019

Time: 2 hours

Name: _____ **Class:** _____

xxx Whanau

Instructions:

Time allowed for this examination is TWO hours.

You should attempt all the required questions in this examination. You are allowed to use a calculator.

Start writing when you are instructed to do so. You have 5 minutes of reading time before you start writing.

Use the space provided after each question to write all your answers with **the working shown very clearly**. If you need extra writing sheets then ask your teacher. Round your answers to 2 dp where applicable. Use only black or blue pen to write the paper. Use pencil only to draw the graph and diagrams.

Check that this booklet has pages 1-22 in the correct order and a separate planning sheet.

YOU MUST HAND THIS BOOKLET TO THE TEACHER AT THE END OF THE TEST.

Working Towards	Achieved	Merit	Excellence

Sections

Section	WT	AT	ABOVE	BEYOND
A: Number	You have attempted to solve problems involving integers, decimals and fractions	You have solved problems involving integers, decimals and fractions	You have solved number problems involving few steps	You have solved number problems in context involving several steps
B: Algebra and graphs	You have attempted to carry out simple algebraic manipulations and solved simple equations	You have carried out simple algebraic manipulations and solved simple equations	You have carried out complex algebraic manipulations and solved linear equations and graphs	You have applied algebraic skills to solve problems
C: Trigonometry	You have attempted to use trigonometry to solve mathematical problems	You have used trigonometry to solve mathematical problems	You have used trigonometry to solve mathematical problems with reasoning	You have used trigonometry to solve problems in context with justification
D: Statistics	You have attempted to answer questions relating to graphs and performed basic statistical calculations	You have answered questions relating to graphs and performed basic statistical calculations	You have Commented on aspects of statistical graphs	You are able to Interpret graphs and reports.

Section A: Number

Show ALL working.

QUESTION ONE

The questions in this section relate to Faafoi family. The families weekly income is **\$1200**.

(a) The family spends 37% of their income on mortgage repayments. Calculate the value of the weekly mortgage repayments.

(AT)

(b) \$300 is budgeted for food each week. What percentage of the income is this?

(AT)

(c) Each week the family saves \$50. What fraction of the income does the family save?

(AT)

(d) The family have an unlimited broadband plan. This costs $\frac{1}{50}$ of their income each week. Calculate the monthly cost of the broadband plan (Use 4 weeks in a month).

(AA)

(e) The monthly charge for having rubbish collected has increased by 6%. It now costs \$23.32. Calculate the old monthly charge of having rubbish collected.

(AA)

QUESTION TWO

The family use gas for heating their hot water. The amount of gas used each day, measured in kg has been monitored over the last week.

(a) List these amounts in order from smallest to largest.

0.23, 0.16, 0.211, 0.305, 0.098, 0.106, 0.203

(AT)

(b) Write the total amount of gas used last week correct to 2 significant figures.

(AT)

(c) The family have been investigating using solar panels to power their home. When Mr Faafoi googled Solar panels on the internet, he got 24 300 000 results.

Write 24 300 000 in standard form.

(AT)

QUESTION THREE

Below is part of the families' last electricity bill.

		Actual reading	
Previous activity	Charges	Credits	
Previous balance			\$236.99
Incoming Payment (13 Mar 19)		\$173.85	
Prompt Payment Discount		\$63.14	
Balance outstanding			\$0.00
Summary of Current activity	Charges	Credits	
Fixed daily charges	\$31.29		
Variable charges	\$211.44		
GST	\$36.41		
Total current charges			\$279.14
Total amount due			\$279.14
Save \$61.41 with your prompt payment discount if paid by 23 Apr 2019			\$217.73 (includes \$28.40 of GST on current charges)

(a) The bill shows a total amount due of \$279.14, with a prompt payment discount of \$61.41. Calculate the percentage of the prompt payment discount.

(AT)

(b) The current total charges is \$279.14 and the previous total charge was \$236.99. Calculate the percentage change in the electricity cost. (AA)

(c) The electricity usage is broken into a daily fixed charge and a variable charge in the ratio of 1:3. From the total of \$217.73; calculate the amount of the variable charge. (AA)

QUESTION FOUR

(a) $\frac{2}{9} - \frac{1}{2} =$ (AT)

(b) $\frac{1}{9} \div \frac{2}{5} =$ (AT)

(c) $\frac{3}{5}$ of 60 = (AT)

(d) $2\frac{3}{5} + (\frac{1}{2})^2$ (AT)

QUESTION FIVE

The Fafoi family wishes to purchase a spa pool and install this on the patio of their house. (TAAB)



**SPA POOL 5 SEATER PREMIUM
35 JET**

PRE-ORDER NOW, NEW STOCK ARRIVING 1 JUN

★★★★★ 1 review

NOW ONLY
\$6,999

PRICE GUARANTEE Seen a lower price? [Ask us to beat it](#)

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No door to door delivery options.

Delivery to [Dunedin Depot](#) \$219 2-5 days.

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They have decided on the pool in the picture above.

The pool cost \$6 999 plus \$219 deliver fee.

It will cost \$320 plus GST (15%) to get an electrician to install a special plug for the pool.



A cover for the pool costs \$479.00. However, Mrs Fafoi has negotiated a 20% discount.

The family have been given approval for a \$6999 loan from the bank to pay for the pool. The loan has an interest rate of 5.45%. The loan and interest need to be repaid by the end of 12 months.

The family have saved \$1000 to cover the cost of delivery, installation and the cover. They can spare $\frac{1}{10}$ of their weekly income to repay the loan.

Can the Fafoi family afford to buy the spa pool?

You must show working and state what you are calculating at each step.

(TAAB)

Simplify the following expressions

(a) $3y + 5y - y =$ (AT)

(b) $4z + 6w - 2z + 7w =$ (AT)

(c) $3q^3 \times 6q^7 \times 9q =$ (AT)

(d) $n \times n \times n \times n =$ (AT)

(e) $\frac{24w^{10}}{8w} =$ (AT)

(f) $(2k^4)^7 =$ (AA)

(g) $\frac{-3p^6 4p^7}{8p^5} =$ (AA)

(h) $\frac{5x}{8} - \frac{4x}{9} =$

(AA)

QUESTION TWO

The formula for the volume of a cylinder is:

$V = \pi r^2 h$ v = volume r = radius h = height

(a) Calculate the volume of a sphere with a radius of 5 cm and height of 9 cm. (AT)

(b) Rearrange the formula to make r the subject. (AA)

QUESTION THREE

Solve the following equations

(a) $\frac{x}{10} = 4$ (AT)

(b) $5x - 3 = 47$ (AT)

(c) $\frac{w}{6} + 3 = 20$ (AA)

(d) $5x + 6 = 2x - 10$ (AA)

(e) $6(y - 4) = 2y + 20$ (AA)

(f) $(x - 8)(x + 7) = 0$ (AA)

(g) $x^2 + 7x + 12 = 0$ (AA)

(b) The gardener worked for 6.5 hours. How much did the family need to pay? (AA)

(c) The gardener charged the next door neighbours \$185 How many hours did he work for the neighbours? (TAAB)

QUESTION SIX

Expand and simplify the following expressions:

(a) $x(x + 9)$ (AT)

(c) $(x + 3)(x + 4)$ (AA)

(d) $(x - 7)^2$ (AA)

QUESTION SEVEN

Factorise the following expressions:

(a) $4w + 20$ (AT)

(b) $25y^5 - 30y^7$ (AT)

(c) $6x^6y^2 + 20x^3y^9$ (AA)

(d) $x^2 + 13x + 36$ (AA)

(e) $2x^2 + 18x + 40$ (TAAB)

QUESTION EIGHT

The cover for the spa pool is a rectangular shape. The longer side is 50 cm longer than the shorter side. The perimeter of the cover is 900 cm.

Write an equation for the perimeter of the cover **and** use the equation to find the dimensions of the spa pool cover. (AA)

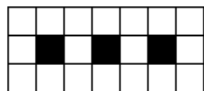
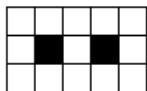
QUESTION NINE

Give the next two terms in each of these patterns:

- (a) 2, 4, 8, 16, _____, _____ (AT)
- (b) 1, 4, 7, 10, _____, _____ (AT)
- (c) 1, 4, 9, _____, _____ (AT)
- (d) 1, 1, 2, 3, 5, 8, 13 _____, _____ (AT)
- (e) 1, 6, 31, 156, _____, _____ (AT)

QUESTION TEN

Mr Faafoi is pathing the area around the outside of the spa pool. He is using light and dark paving stones. The relationship between the number of light and dark stones can be seen in the images below



MHJC

13

2019

(a) Fill in the table below:

(AT)

Dark stone(D)	Light stone (L)
1	8
2	13
3	18
4	
5	

(b) Write a rule linking the number of dark stones and the number of light stones.

(AA)

L = _____

(c) If Mr Faafoi needs to use 24 dark stones, how many light stones will he need to use?

(AA)

QUESTION TWELVE

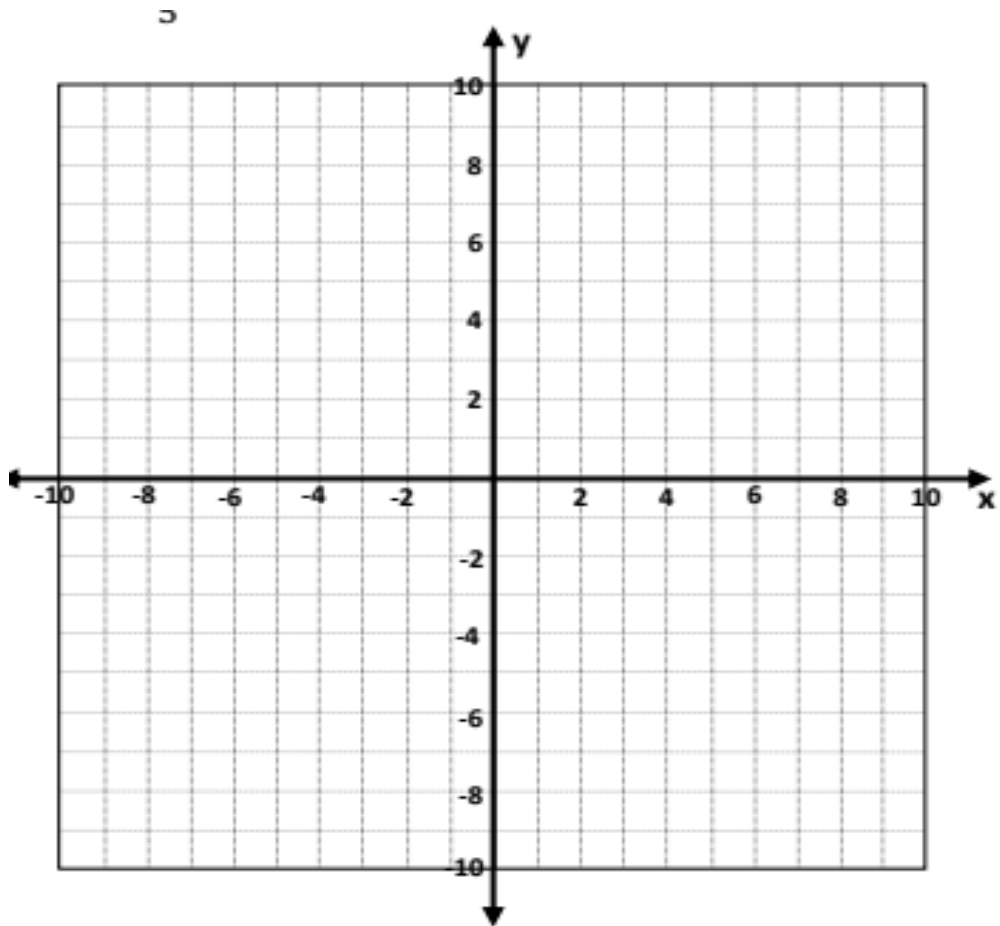
Plot the following straight lines on the axes below. Remember to label each line.

(a) $y = -2x + 1$

(AA)

(b) $y = \frac{3}{5}x + 1$

(TAAB)



This is the working out space for making graphs.

Section C: Trigonometry

QUESTION ONE

Calculate the values of x to 1 decimal place.

(a) $3^2 + 8^2 = x^2$

(AT)

(b) $x^2 + 2.3^2 = 5.4^2$

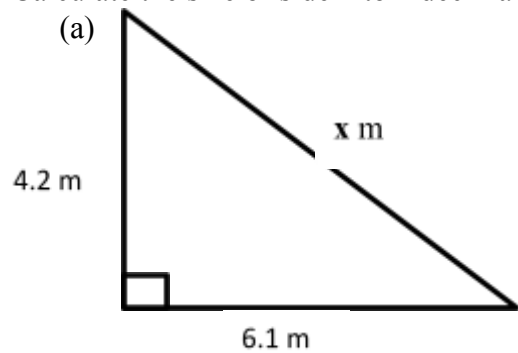
(AT)

(c) $x = 3.5 \sin 50^\circ$

(AT)

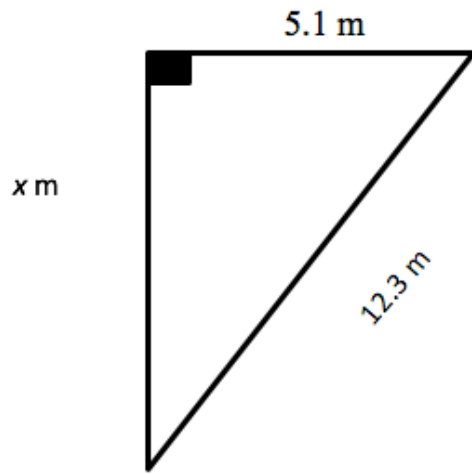
QUESTION TWO

Calculate the size of side x to 1 decimal place.



(AT)

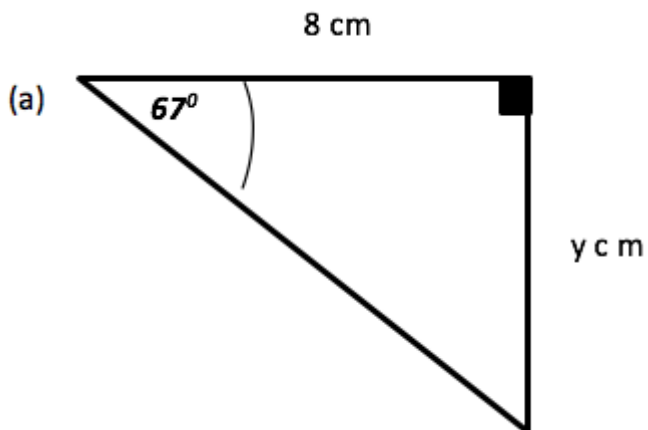
(b)



(AT)

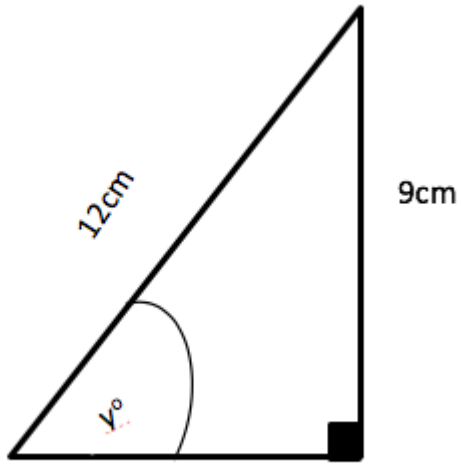
QUESTION THREE

Calculate the size of y to 1 decimal place



(AA)

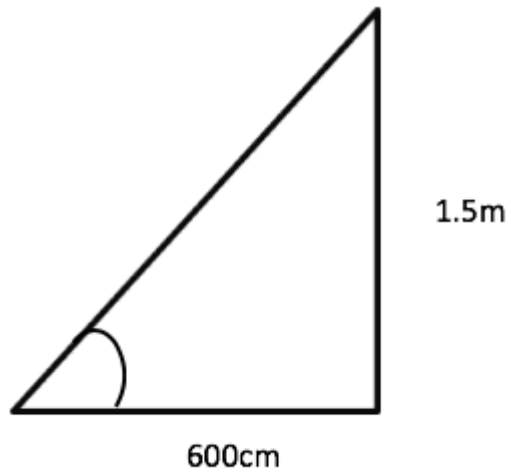
(b)



(AA)

QUESTION FOUR

Mr Faafoi is going to construct a handrail on the steps up to the front door. The height of the steps is 1.5m and the depth 600cm.



(a) Calculate the minimum length the handrail should be.

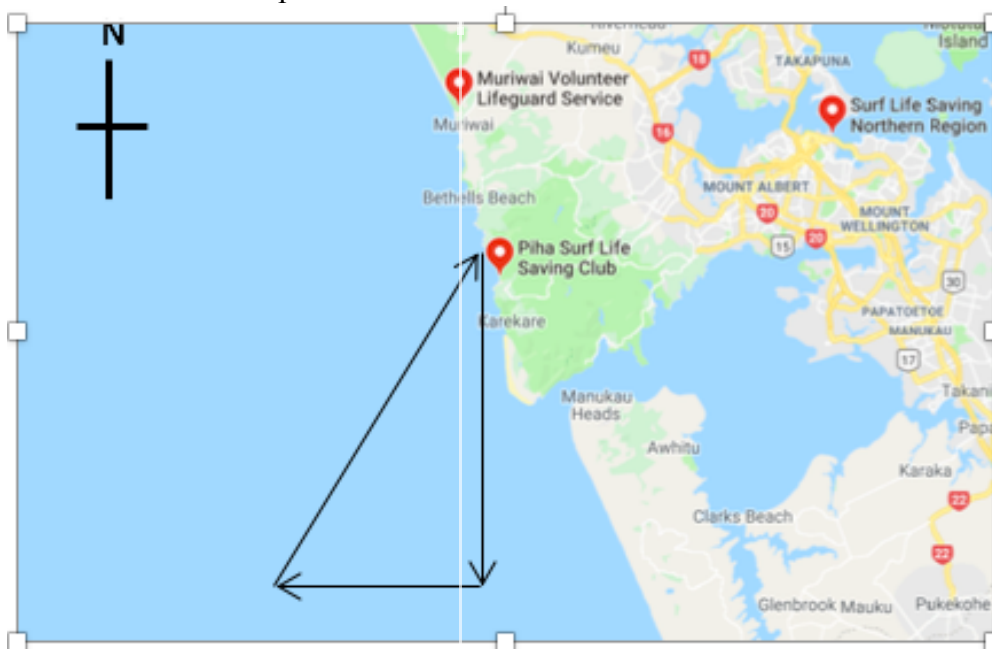
(AA)

(b) Calculate the angle of elevation of the stairs.

(AA)

QUESTION FIVE

A search and Rescue boat is on a training trip. The Boat starts at the Piha Surf Life club and travels 25km, then turns west and travels 13 Km, and finally turns back and travels back to the Piha Surf Life Club. The arrows show the path of the boat.



(a) Calculate the angle the boat needs to turn to travel back to the club house.

(AA)

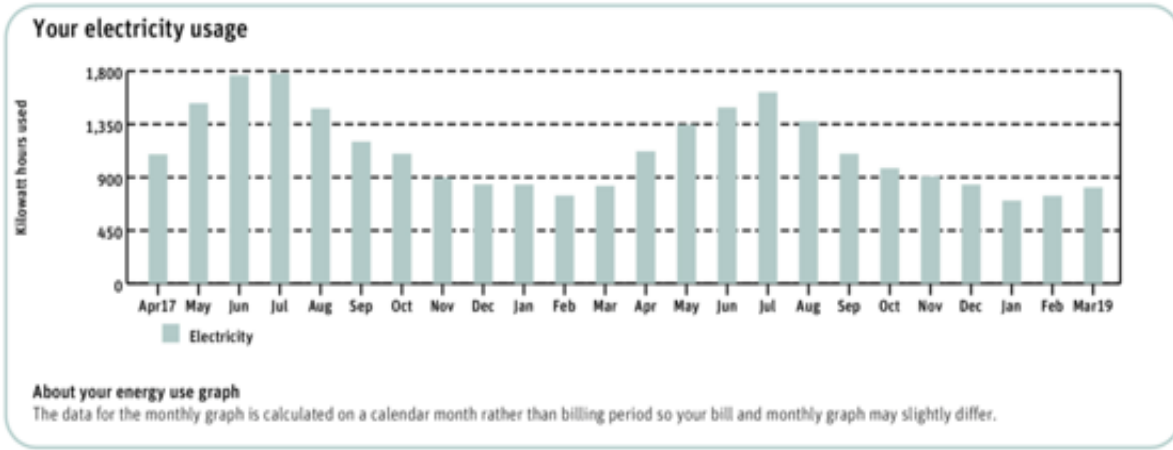
(b) Calculate the bearing the boat needs to travel back to the boathouse.

(TAAB)

Section D: Statistics

QUESTION ONE

The graph below shows the Faafoi families monthly electricity usage from April 2017 to March 2019



(a) Describe the family’s electricity usage.

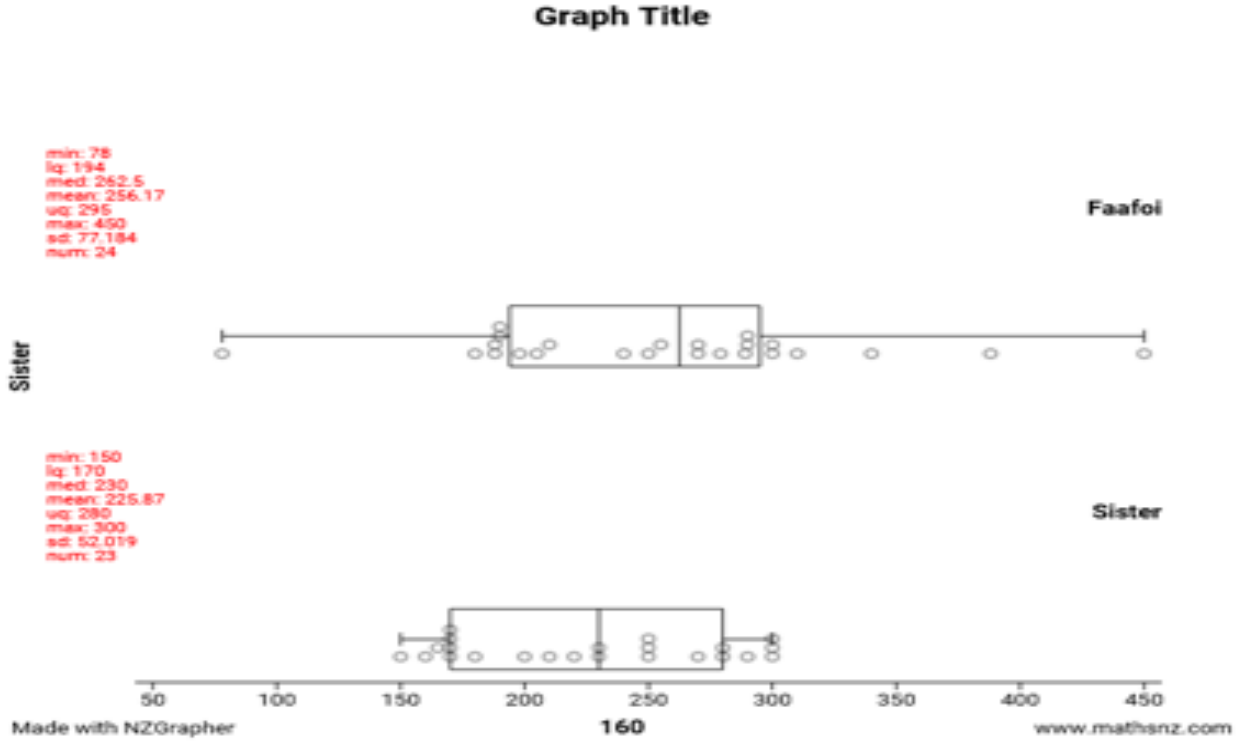
(AT)

(b) Make a prediction the electricity usage for November 2019.

(AT)

QUESTION TWO

The Faafoi family is considering changing electricity providers. They are comparing their electricity costs for the past 10 years to Mrs Faafoi’s sister’s family, which is also a family of four. Below is the comparative box and whisker plot of both families’ monthly electricity costs over the past 2 years.



(a) By referring to the box and whisker graphs, dot plots and summary statistics, discuss how the electricity usage of the two families compares? (TAAB)

(b) Mr Faafoi is concerned that his family is using more electricity than they should be. How do the graphs above support or not support his concern? (AA)

QUESTION THREE

The family's electricity usage in November for the past ten years is listed below.

900, 850, 780, 920, 950, 875, 866, 810, 898, 900

Calculate the following statistics

(a) Mean: _____ (AT)

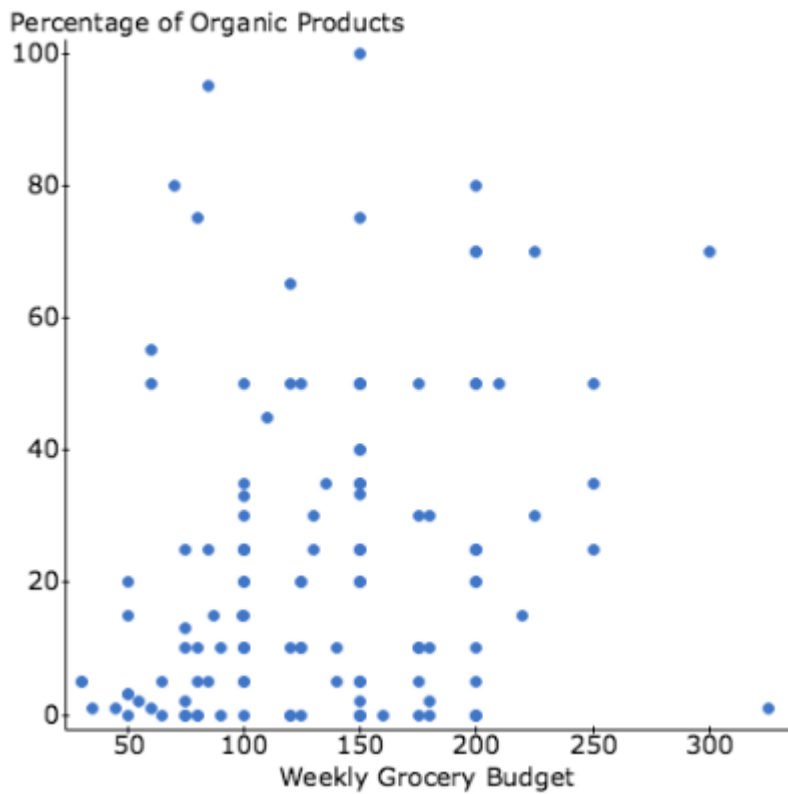
(b) Median: _____ (AT)

(c) Mode: _____ (AT)

(d) Range: _____ (AT)

QUESTION FOUR

Grandma Faafoi likes to eat organic food. The graph below shows how her weekly groceries spending and the percentage of her shop that was organic food.



Grandad Faafoi says that organic food is expensive. Does the graph support Grandad’s opinion? You must give a reason for your answer and refer to the graph. (AA)
