MB
KC
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BS
GS

Name: _____

Class: 11MTS___

Teacher: _____

CHERRYBROOK TECHNOLOGY HIGH SCHOOL

2018

YEAR 11

AP2 EXAMINATION

MATHEMATICS STANDARD

Time allowed - 2 HOURS
(Plus 5 minutes reading time)

DIRECTIONS TO CANDIDATES:

- Attempt all questions. Marks are indicated to the right of each question.
- Section I: Multiple Choice answers to go on the Multiple Choice Answer sheet.
- Section II: All questions are to be answered in the space provided.
- All necessary working should be shown in every question. Full marks may not be awarded for careless or badly arranged work.
- NESA approved calculators may be used.
- A formula sheet has been provided.

Section I

20 marks
Attempt Questions 1-20
Allow about 30 minutes for this section

Use the multiple choice answer sheet for Questions 1-20

1. Iron Man works part time to save the world, earning \$17.50 per hour, except on Saturdays when he earns double time.

How much will he earn in a week where he works 18 hours Monday to Friday and 8 hours on a Saturday?

(A) \$455
(B) \$595
(C) \$770
(D) \$910

2. Spiderman wanted to become an Avenger, so he wrote a book about '*How to be a Hero'*.
He earns \$1.50 for every book sold. The retail price is \$28.95.
What percentage of the retail price is the royalty?

(A) $\frac{1.50}{28.95} \times 100$
(B) $\frac{1.50}{27.45} \times 100$
(C) $\frac{1.50}{100} \times 28.95$
(D) $\frac{27.45}{28.95} \times 100$

3. Groot needs a break from saving the universe, so he decided to take a holiday to Bora Bora.
He currently earns \$855 per week. When he takes his 4 weeks annual leave, he is paid an additional loading of $17\frac{1}{2}\%$.
What will be his total pay when he takes his leave?

(A) \$598.50
(B) \$3420
(C) \$4000.50
(D) \$4018.50

4. Under special circumstances, the Government supplements a person's income with allowances. The following table shows the maximum payment per fortnight for some of these circumstances.

If you are	Maximum payment per fortnight
Single with no children, 18 years and over and living at home	$265.00
Single with no children 18 years and over and required to live away from home	$402.70
Single with children	$527.50

These allowances are reduced by an amount depending on any income a person receives from employment that exceeds set limits. The following table shows these reductions.

	Income limits per fortnight	Reduction
Job seeker	$62 – $250 Above $250	50 cents in the dollar 60 cents in the dollar
Students and Australian apprentices	$236 – $316 Above $316	50 cents in the dollar 60 cents in the dollar

Thor is 19 years old, has no children and lives at home. He works as an apprentice for a demolition company and is paid an income of $300 per fortnight from his employer.

Use the above tables to calculate the allowance which Thor receives each fortnight.

(A) $265.00

(B) $533.00

(C) $233.00

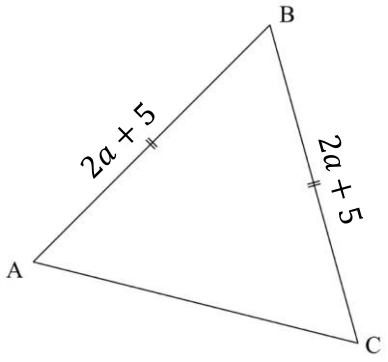
(D) $115.00



5. If $d = \sqrt{\frac{h}{5}}$, what is the value of d, correct to one decimal place, when $h = 38$?

(A) 2.7
(B) 1.3
(C) 2.8
(D) 1.2

6. The perimeter of the triangle ABC below is $5a + 4$. Which of the following is a correct algebraic expression for the length AC.



(A) $4a + 10$
(B) $a - 6$
(C) $a + 4$
(D) $9a + 14$

7. In order for Doctor Strange to master the skill of magic, he needs to successfully answer a math question. If $y = 3\sqrt{x} - 2$, which of the following correctly changes the equation?

(A) $x = \left(\frac{y+2}{3}\right)^2$
(B) $x = \sqrt{\frac{y+2}{3}}$
(C) $x = \frac{(y+2)^2}{3}$
(D) $x = \frac{y-2}{9}$



8. If $g = -4$, what is the value of $2g^3 - 3g^2$?

(A) -500
(B) -368
(C) -176
(D) -80

9. Logan's daughter is sick and the only medicine available in their house is prescribed for adults. Logan used the Fried's rule to determine the appropriate dosage for his daughter.

The Fried's rule is given by the formula:

$$D = \frac{m \times A}{150}$$

If m is the adult dosage and A is the child's age in months, what is the correct dosage needed to be given for Logan's daughter who is currently aged 1½ years old and the adult dose is 15 mL.

(A) 0.15 mL
(B) 0.15 L
(C) 1.8 mL
(D) 1.8 L

10. Gamora weighs 54 kg on Earth and consumed 4 standard drinks at a party in the first hour. She was convinced that her blood alcohol level was zero. Calculate her blood alcohol content using the formula below to prove that she is wrong:

$$BAC_{\text{Female}} = \frac{10N - 7.5H}{5.5M}$$

(A) 0.050
(B) 0.067
(C) 0.089
(D) 0.109

11. Thanos can only read numbers in scientific notation. You want to let him know that the surface area of the Earth's moon is approximately 38 000 000 square kilometres.

Express this measurement in scientific notation (standard notation):

(A) 3.8×10^6
(B) 3.8×10^7
(C) 38×10^6
(D) 38×10^7

12. Superman is tired from flying so he decides to drive his car. He is driving at 70 km per hour (km/h) when he sees a cyclist fall from their bike. His reaction time is 1.8 seconds and his braking distance is 32 metres.

What is his stopping distance?

(Note: Stopping distance = Reaction distance + Braking distance)

(A) 32.0 metres
(B) 40.0 metres
(C) 67.0 metres
(D) 89.4 metres

13. Express 0.000 004 560 78 correct to two significant figures.

(A) 0.0
(B) 0.1
(C) 0.000 0045
(D) 0.000 0046

14. Eric Banner constructed the following stem-and-leaf plot to show the time, in hours, between transformations into The Hulk. One of the times (*) is missing.

Stem	Leaf
0	3 3 6
1	2 * 5 8 8 8
2	1 1 2 8
3	0 2

What is a possible value for the missing time (*)?

(A) 13
(B) 4
(C) 25
(D) 16



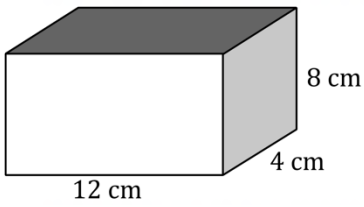
15. The table below shows the student population for X-Men High School.

Year	No. of students
7	235
8	255
9	235
10	205
11	195
12	180
Total students	**1305**

If a stratified random sample of 60 students were chosen to represent the school, how many Year 8's should be included?

(A) 255
(B) 11.7
(C) 12
(D) 20

16. A tissue box is to be made out of gold plastic, but you need to know how much material you will need. What is the surface area of the rectangular prism below?



Not to scale

(A) 176 cm^2
(B) 304 cm^2
(C) 352 cm^2
(D) 3846 cm^2

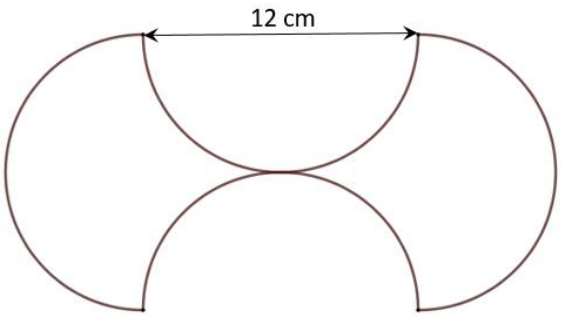
17. What is the volume of a sphere with a diameter of 14 cm? (Answer to 2 decimal places)
(A) 1436.75 cm^3
(B) 1436.76 cm^3
(C) 1149.04 cm^3
(D) 11494.04 cm^3

18. Aquaman has a pet stingray who lives in a cubic water tank.
The tank has a side length of 9 m.
What is the capacity of the tank (in litres)?

(A) 729 000 000 L
(B) 729 000 L
(C) 729 L
(D) 729 000 000 000 L

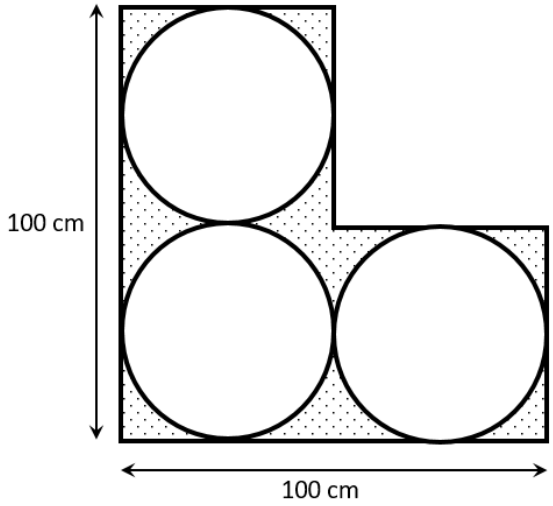


19. Four semicircular arcs of diameter 12 cm are joined to form the composite shape shown below.



What is the area (in cm^2) of the shape formed from the arcs?
(A) 108 cm^2
(B) 144 cm^2
(C) 226.2 cm^2
(D) 257.1 cm^2

20. You are commissioned to create a contemporary artwork for the President of United States. Your artwork consists of three circular discs of equal radius placed on top of an "L" shaped canvas. The discs just touch the edges of the canvas as shown in the diagram below.



What is the area of the canvas not covered by the discs? Answer to the nearest cm^2.

(A) 353 cm^2
(B) 2146 cm^2
(C) 4110 cm^2
(D) 1610 cm^2

End of Section I

Section II **60 marks**

Allow 1 hour and 30 minutes for this section.

Answer each question on the space provided in the booklet

Your responses should include relevant mathematical reasoning and/or calculations.

Question 21 (12 marks)

a) The Black Panther is regularly challenged by a rival for his leadership position, but he wins every time. The following data shows how many wins per month he has achieved over the last year.

17	5	19	10	17	24	8	15	20	22	13	12

i) Use your calculator to determine find the **mode, mean** and **standard deviation**. Round your answers to 1 decimal place. **3**

ii) The Black Panther has decided to retire after one more month. How many wins does he need to have during this month in order to raise his overall average to 17 wins? **2**

b) After the Black Panther retires, his country Wakanda comes under attack. Someone has been stealing bottles of the precious *Vibranium*. The following is a record of how many bottles of *Vibranium* have been stolen over the last 9 days.

19	20	15	14	31	17	20	16	22

i) Determine the **median** for the data above. **1**

Question 21 continues on the next page

ii) Calculate the interquartile range, showing all necessary working out. **2**

iii) Is 31 an outlier for this set of data? Justify your answer with calculations. **2**

c) The smallest of 5 numbers in a data set is zero. The range of the set is 10 and the median exceeds the mode by 3. **2**

Write down a possible data set satisfying these facts.

End of Question 21

Question 22 (12 marks)

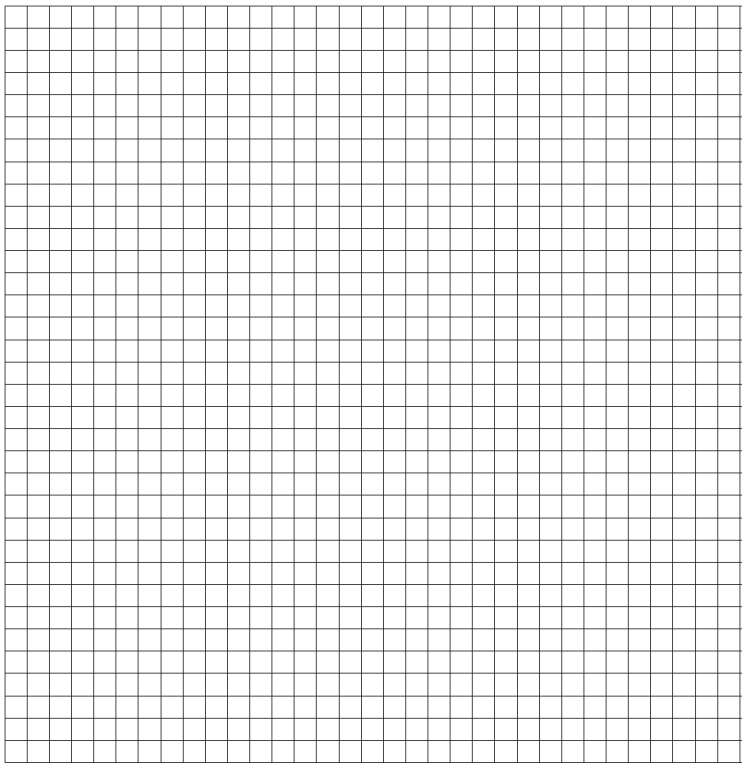
a) Jake Peralta is a traffic control officer outside of Brooklyn Tech High. He recorded the numbers of cars passing through an intersection from Monday to Friday in the table below.

Day	Frequency	Cumulative frequency	Cumulative percent
Monday	25	25	50
Tuesday		35	70
Wednesday	8		86
Thursday	5	48	
Friday	2	50	100

i) However, Jake accidentally spilt correction liquid on three of the numbers. He needs your help to retrieve these numbers. **1**

Fill in the missing numbers on the table above.

ii) In the space given below, draw a Pareto Chart from the above table. **3**



100%= _____

10%=_____

Question 22 continues on the next page

b) Ms Rosa Diaz is a PE teacher at Brooklyn Tech High. She records the pulse rates (beats per minute) of the students in her class before and after exercise.

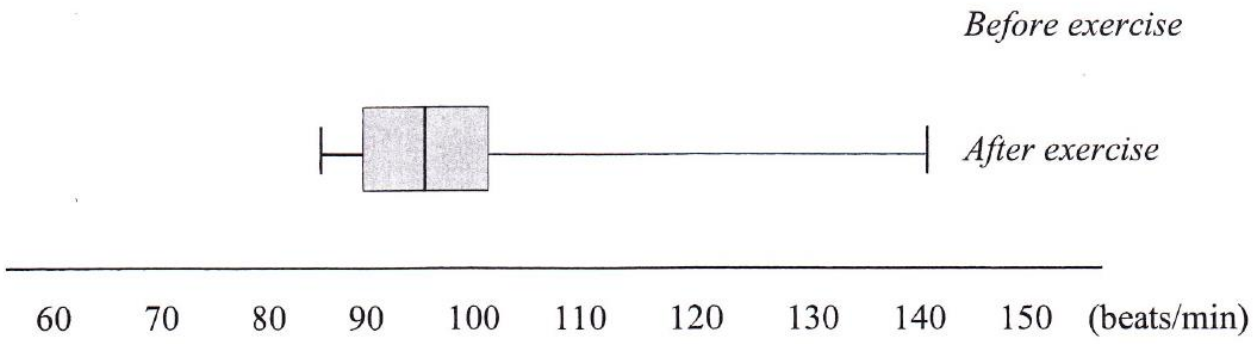
The pulse rates *before exercise* are shown in the table below:

65	89	75	68	91	82	87	78
71	67	94	75	85	93	69	91

i) Prepare a five number summary based on the *before exercise* data given above. **2**

ii) The box-and-whisker plot below shows the after exercise data for the students. **1**

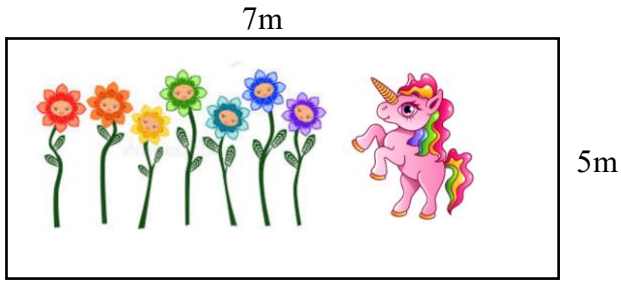
Construct an accurate box-and-whisker plot for the *before exercise* data on the same scale.



iii) Compare and contrast the distribution of the data. **2**

Question 22 continues on the next page

c) Gina Linetti built a rectangular garden for Captain Raymond Holt. The sides of the rectangle were measured and found to be 7m by 5m, correct to the nearest metre.



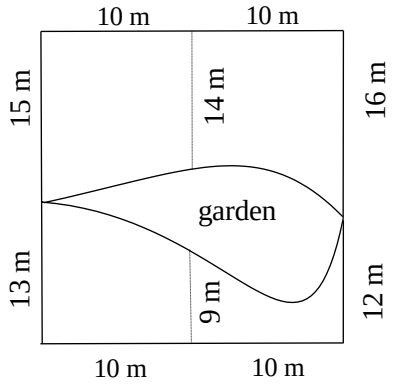
i) Within what range of values will the actual length and width of the rectangular garden lie? **2**

ii) Calculate the smallest possible area of the rectangular garden. **1**

End of Question 22

Question 23 (12 marks)

a) Amy Santiago saw Gina's motives as a competition to impress Captain Holt. She creatively designed a unique garden plan and decided to implement this into Holt's backyard. The diagram below represents the shape of the garden inside the rectangular block of land.



NOT TO SCALE

i) What is the area of the rectangular block of land? **1**

ii) Use two applications of the Trapezoidal Rule to find the approximate area of the garden. Answer correct to one decimal place. **3**

Question 23 continues on the next page

b) i) Terry's wife is pregnant and is always hungry. She only wants to eat *Ham and Cheese Toasties*. **1**

Terry uses a 1.2 kilowatt per hour toaster for a total of 12 hours to make food for his wife.

The bill is charged to Jake's credit card at a rate of 27.15 cents per kilowatt.

What is the cost of using the toaster?

ii) Terry's wife now craves Krispy Kreme doughnuts. **2**

Each doughnut contains a total of 2.8 grams of fat.

If 1 gram of fat = 37 kJ and 1 calorie = 4.184 kJ, what is the total number of calories in each doughnut? (Round your answer to the nearest whole number)

c) Solve the equation $2y - 3 = 17$ **1**

Question 23 continues on the next page

d) The tax payable on taxable income for the financial year ended 30 June 2019 is set out as follow

Taxable Income	Tax on this income
0 – $18,200	Nil
$18,201 – $37,000	19c for each $1 over $18,200
$37,001 – $90,000	$3,572 plus 32.5c for each $1 over $37,000
$90,001 – $180,000	$20,797 plus 37c for each $1 over $90,000
$180,001 and over	$54,097 plus 45c for each $1 over $180,000

i) Captain America lives in Australia and has to pay tax.

Calculate the amount of tax payable by Captain America if his gross income in the year was $190 690 and he has allowable deductions of $1460. **2**

ii) Hence, calculate his net income if he also has to pay 12% of his gross income to superannuation and $32.50 p.a. for union fees. **2**

End of Question 23

Question 24 (12 marks)

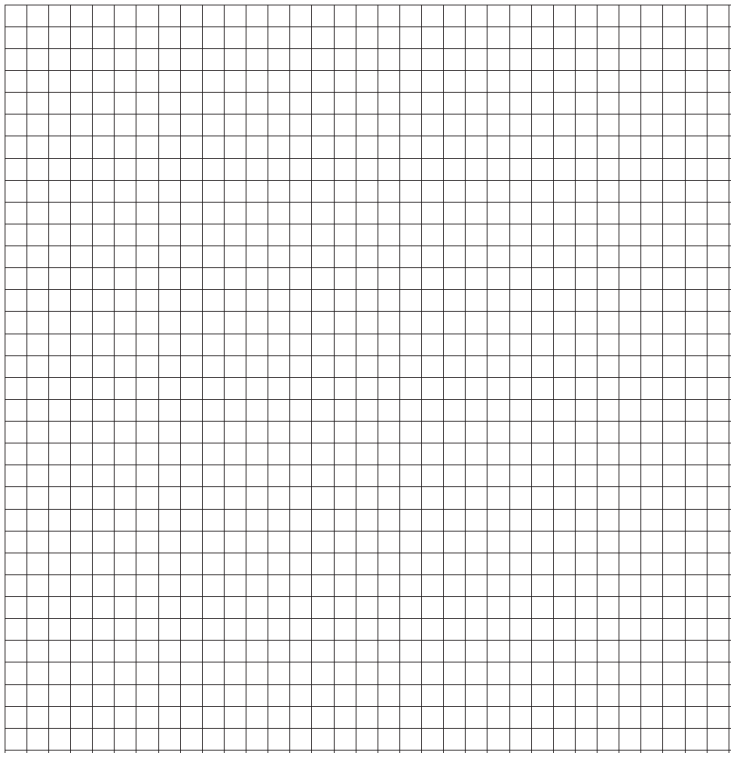
a) Deadpool's IQ score (I) is directly proportional to the number of hours (n) that he sleeps. After 9 hours of sleep, his IQ score is 140.

i) Write a linear equation to describe this situation **2**

ii) Use your equation to complete the table of values below: **1**

n	0	2	4	6	8	10
I						

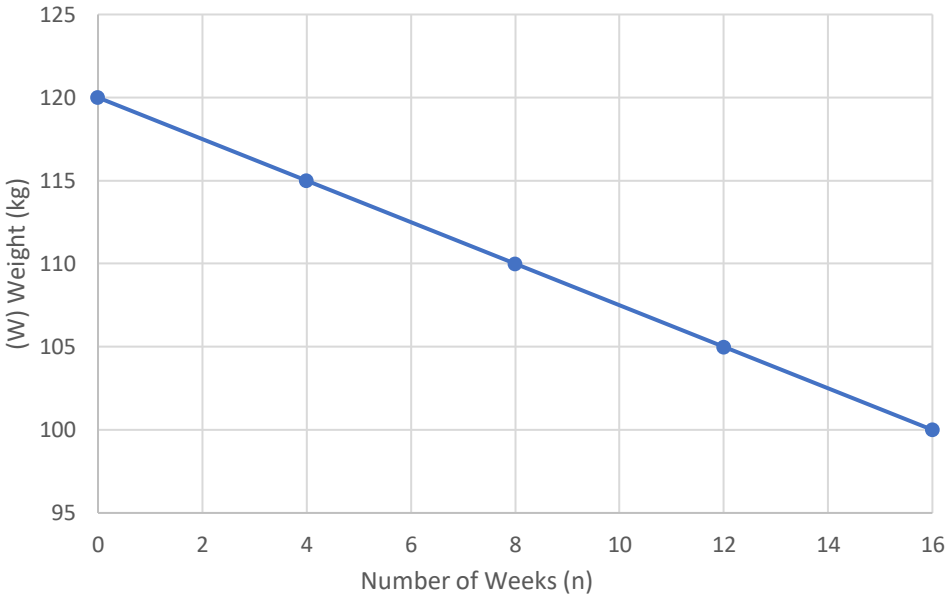
(iii) Use your table of values to graph the data on the grid provided below. **2**



Question 24 continues on the next page

b) Solve $\frac{4k-4}{5} = 1 - k$ **2**

c) Edward Cullen is following a diet and exercise program to lose weight. He has tracked his progress using the straight-line graph shown below.



i) State the y-intercept and gradient of the line graph. **2**

ii) What is the equation of the graph? **1**

Question 24 continues on the next page

iii) If Edward's weight loss continues in this linear fashion, what will his weight be when he reaches week 20? **1**

iv) What is one limitation of using a linear model to predict Edward's weight loss over a longer period of time? **1**

End of Question 24

Question 25 (12 marks)

a) Your group of friends decided to fly from Sydney to Brisbane to meet Wonder Woman.
As the travel organiser, you visited the Jetstar website and found the following daily flight schedule.

Flight no.	Sydney	Brisbane
TH503	0905	1030
TH511	0935	1100
TH038	1005	1130
TH114	1040	1210
TH514	1105	1230
TH051	1135	1300

i) When does flight TH511 leave Sydney and how long is the journey? **2**

ii) Your group needs to be at Sydney airport 50 minutes before a flight takes off. When would you all need to be at the airport to catch the TH038 flight? **1**

iii) To meet Wonder Woman, you need to be at the hotel in Brisbane by 12:30 pm. **2**
It takes 30 minutes to drive from the airport to the hotel, what is the latest flight your group can catch from Sydney?
Justify this time to your friends by using mathematical calculations.

Question 25 continues on the next page

b) The Flash decides to visit his friend Batman. He travels in his jet from his home at $A(34°N, 118°E)$ to the Bat-Cave at B. **1**

If The Flash travels $89°$ south and $80°$ west, what are the coordinates of the Bat-Cave (B)?

c) The Joker lives in Auckland $(42°S, 145°E)$ and his partner Harley Quinn lives in Buenos Aires $(42°S, 109°W)$.

Auckland is 13 hours ahead of UTC while Buenos Aires is 3 hours behind of UTC.

i) Calculate the difference in latitude between Auckland and Buenos Aires. **1**

ii) Harley wishes to call the Joker. It is 2 pm in Buenos Aires on Wednesday. **2**

By determining the time difference between the two locations, calculate the time and day when the Joker will receive the call? Show all necessary working out.

iii) Harley flies from Buenos Aires to Auckland leaving at 23:00 on a Friday (Buenos Aires time). The flight takes 12 hours. **3**

Determine the day and time when Harley will arrive in Auckland. (Give your answer in 12-hour Auckland time). Show all necessary working out.

END OF EXAMINATION

Student Name: _____

Year 11 Mathematics Standard Section I - Answer Sheet

Select the alternative A, B, C or D that best answers the question.

Fill in the response oval completely.

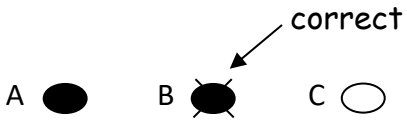
Sample: 2 + 4 = (A) 2 (B) 6 (C) 8 (D) 9

A ○ B ● C ○ D ○

- If you think you have made a mistake, put a cross through the incorrect answer and fill in the new answer.

A ● B ⊗ C ○ D ○

- If you change your mind and have crossed out what you consider to be the correct answer, then indicate the correct answer by writing the word correct and drawing an arrow as follows.



MC	/20
Q21	/12
Q22	/12
Q23	/12
Q24	/12
Q25	/12
Total	**/80**

1.	A ○	B ○	C ○	D ○	11.	A ○	B ○	C ○	D ○
2.	A ○	B ○	C ○	D ○	12.	A ○	B ○	C ○	D ○
3.	A ○	B ○	C ○	D ○	13.	A ○	B ○	C ○	D ○
4.	A ○	B ○	C ○	D ○	14.	A ○	B ○	C ○	D ○
5.	A ○	B ○	C ○	D ○	15.	A ○	B ○	C ○	D ○
6.	A ○	B ○	C ○	D ○	16.	A ○	B ○	C ○	D ○
7.	A ○	B ○	C ○	D ○	17.	A ○	B ○	C ○	D ○
8.	A ○	B ○	C ○	D ○	18.	A ○	B ○	C ○	D ○
9.	A ○	B ○	C ○	D ○	19.	A ○	B ○	C ○	D ○
10.	A ○	B ○	C ○	D ○	20.	A ○	B ○	C ○	D ○

Solutions (student copy)

Student Name: _____

Year 11 Mathematics Standard Section I - Answer Sheet

Select the alternative A, B, C or D that best answers the question.
Fill in the response oval completely.

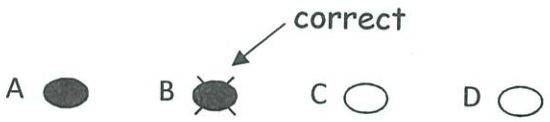
Sample: 2 + 4 = (A) 2 (B) 6 (C) 8 (D) 9

A ○ B ● C ○ D ○

- If you think you have made a mistake, put a cross through the incorrect answer and fill in the new answer.

A ● B ⊗ C ○ D ○

- If you change your mind and have crossed out what you consider to be the correct answer, then indicate the correct answer by writing the word correct and drawing an arrow as follows.



1.	A ○	B ●	C ○	D ○		11.	A ○	B ●	C ○	D ○
2.	A ●	B ○	C ○	D ○		12.	A ○	B ○	C ●	D ○
3.	A ○	B ○	C ○	D ●		13.	A ○	B ○	C ○	D ●
4.	A ○	B ○	C ●	D ○		14.	A ○	B ●	C ○	D ○
5.	A ○	B ○	C ●	D ○		15.	A ○	B ○	C ●	D ○
6.	A ○	B ●	C ○	D ○		16.	A ○	B ○	C ●	D ○
7.	A ●	B ○	C ○	D ○		17.	A ○	B ●	C ○	D ○
8.	A ○	B ○	C ●	D ○		18.	A ○	B ●	C ○	D ○
9.	A ○	B ○	C ●	D ○		19.	A ○	B ●	C ○	D ○
10.	A ○	B ○	C ○	D ●		20.	A ○	B ○	C ○	D ●

MC	/20
Q21	/12
Q22	/12
Q23	/12
Q24	/12
Q25	/12
Total	**/80**

Section II

Allow 1 hour and 30 minutes for this section. **60 marks**

Answer each question on the space provided in the booklet

Your responses should include relevant mathematical reasoning and/or calculations.

Question 21 (12 marks)

a) The Black Panther is regularly challenged by a rival for his leadership position, but he wins every time. The following data shows how many wins per month he has achieved over the last year.

17	5	19	10	17	24	8.	15	20	22	13	12

i) Use your calculator to determine find the **mode, mean** and **standard deviation**. Round your answers to 1 decimal place. 3

$\bar{x} = 15.17 \approx 15.2$

mode = 17

S.D = 5.5

ii) The Black Panther has decided to retire after one more month. How many wins does he need to have during this month in order to raise his overall average to 17 wins? 2

Total 13 months

$\frac{x}{13} = 17$

$x = 221$

Total of 12 months = 182

Diff = 221 − 182

= 39

(OR) (based on part i)

Sum old = 15.2 × 12

= 182.4

Sum New = 17 × 13

= 221

More wins = 221 − 182.4

= 38.6

b) After the Black Panther retires, his country Wakanda comes under attack. Someone has been stealing bottles of the precious *Vibranium*. The following is a record of how many bottles of *Vibranium* have been stolen over the last 9 days.

19	20	15	14	31	17	20	16	22

14 15 16 17 19 20 20 22

Q1 = 15.5 Q3 = 20.5

3.1

i) Determine the **median** for the data above. 1

19.

Question 21 continues on the next page

ii) Calculate the interquartile range, showing all necessary working out. **2**

$IQR = Q_3 - Q_1$
$= 21 - 15.5$
$= 5.5$

iii) Is 31 an outlier for this set of data? Justify your answer with calculations. **2**

$Fence = 1.5 \times IQR$
$= 1.5 \times 5.5$
$= 8.25$

$\therefore$ 31 is an outlier

$Q_3 + 8.25$
$= 21 + 8.25$
$= 29.25$

c) The smallest of 5 numbers in a data set is zero. The range of the set is 10 and the median exceeds the mode by 3. **2**

Write down a possible data set satisfying these facts.

0, 0, 3, 7, 10

multiple answers.

End of Question 21

Question 22 (12 marks)

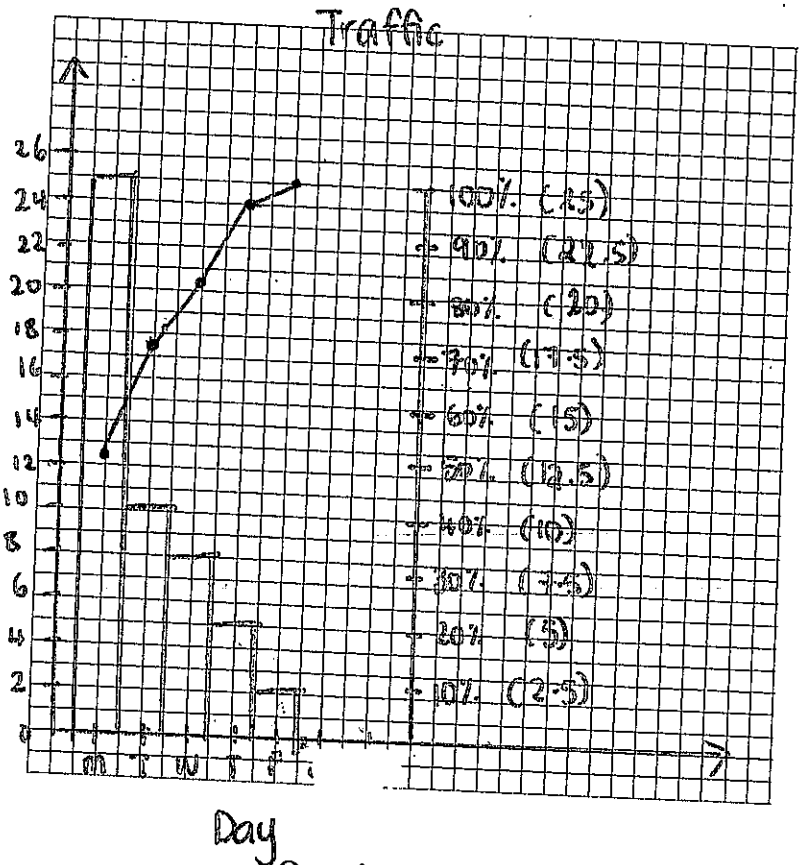
a) Jake Peralta is a traffic control officer outside of Brooklyn Tech High. He recorded the numbers of cars passing through an intersection from Monday to Friday in the table below.

Day	Frequency	Cumulative frequency	Cumulative percent
Monday	25	25	50
Tuesday	10	35	70
Wednesday	8	43	86
Thursday	5	48	96
Friday	2	50	100

i) However, Jake accidentally spilt correction liquid on three of the numbers. He needs your help to retrieve these numbers. **1**

Fill in the missing numbers on the table above.

ii) In the space given below, draw a Pareto Chart from the above table. **3**



100%= 25

10%= 2.5

Question 22 continues on the next page

b) Ms Rosa Diaz is a PE teacher at Brooklyn Tech High. She records the pulse rates (beats per minute) of the students in her class before and after exercise.

The pulse rates *before exercise* are shown in the table below:

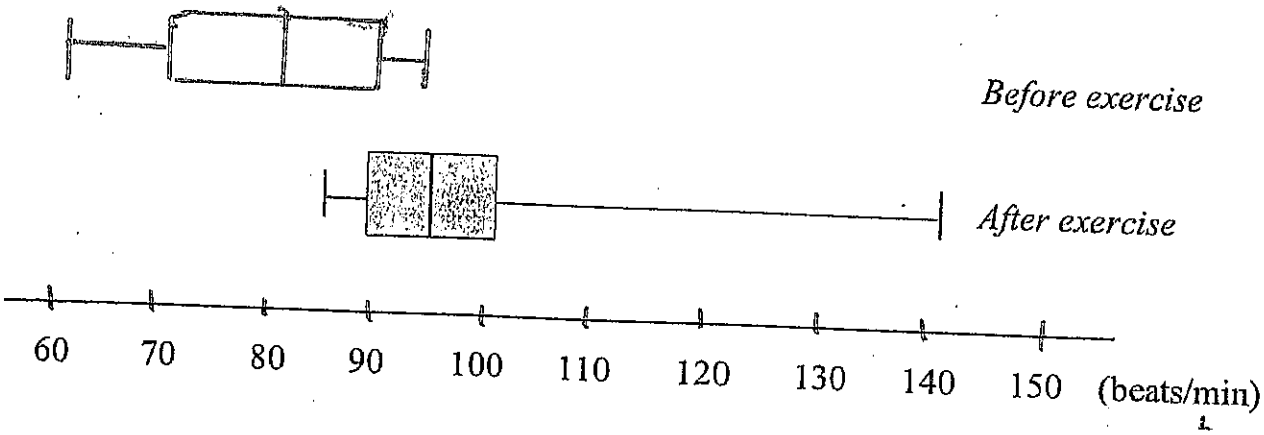
65	89	75	68	91	82	87	78
71	67	94	75	85	93	69	91

65, 67, 68, 69, 71, 75, 78, 78, 82, 85, 87, 89, 91, 91, 93, 94

i) Prepare a five number summary based on the *before exercise* data given above. 2

Min = 65
Max = 94
Q_1 = 70
Q_3 = 90

ii) The box-and-whisker plot below shows the after exercise data for the students. 1
Construct an accurate box-and-whisker plot for the *before exercise* data on the same scale.



iii) Compare and contrast the distribution of the data. 2

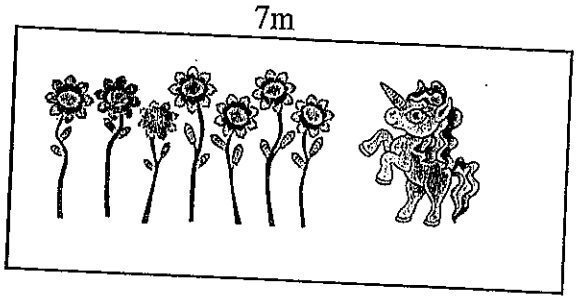
Before:
- Symmetrical data.
- lower med
- Larger IQR, less consis.
- clustered between 60-100

After: positively skewed
- Higher med
- Lower IQR, more consistent
- Larger Range 80-140
- Higher range

Range = 94 - 65 = 29
IQR = 90 - 70 = 20
- Lower range

Question 22 continues on the next page

c) Gina Linetti built a rectangular garden for Captain Raymond Holt. The sides of the rectangle were measured and found to be 7m by 5m, correct to the nearest metre.



i) Within what range of values will the actual length and width of the rectangular garden lie? **2**

Limit : $\frac{1}{2} \times 1m$

$= 0.5m$

Length : $6.5m$ to $7.5m$

Width : $4.5m$ to $5.5m$

ii) Calculate the smallest possible area of the rectangular garden. **1**

$A = L \times W$

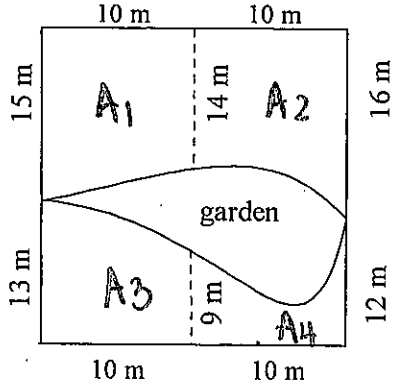
$= 6.5 \times 4.5$

$= 29.25m^2$

End of Question 22

Question 23 (12 marks)

a) Amy Santiago saw Gina's motives as a competition to impress Captain Holt. She creatively designed a unique garden plan and decided to implement this into Holt's backyard. The diagram below represents the shape of the garden inside the rectangular block of land.



NOT TO SCALE

i) What is the area of the rectangular block of land? **1**

$A = 20 \times 28$

$= 560m^2$

ii) Use two applications of the Trapezoidal Rule to find the approximate area of the garden. Answer correct to one decimal place. **3**

$A_1 = \frac{10}{2}(15+14)$

$= 145$

$A_2 = \frac{10}{2}(14+16)$

$= 150$

$A_3 = \frac{10}{2}(13+9)$

$= 110$

$A_4 = \frac{10}{2}(9+12)$

$= 105$

Total $= 510m^2$

Garden $= 560 - 510$

$= 50m^2$

Question 23 continues on the next page

b) i) Terry's wife is pregnant and is always hungry. She only wants to eat *Ham and Cheese Toasties.* **1**

Terry uses a 1.2 kilowatt per hour toaster for a total of 12 hours to make food for his wife.

The bill is charged to Jake's credit card at a rate of 27.15 cents per kilowatt.

What is the cost of using the toaster?

$1.2 \times 12 = 14.4$ kW

$14.4 \times 27.15¢ = 3.9096$

$\approx \$3.91$

ii) Terry's wife now craves Krispy Kreme doughnuts. **2**

Each doughnut contains a total of 2.8 grams of fat.

If 1 gram of fat = 37 kJ and 1 calorie = 4.184 kJ, what is the total number of calories in each doughnut? (Round your answer to the nearest whole number)

$2.8g = 37 \times 2.8$

$= 103.6$ kJ

$103.6 \div 4.184 = 24.76$ cal

≈ 25 cal

c) Solve the equation $2y - 3 = 17 + 3$ **1**

$\frac{2y}{2} = \frac{20}{2}$

$y = 10$

Question 23 continues on the next page

d) The tax payable on taxable income for the financial year ended 30 June 2019 is set out as follow

Taxable Income	Tax on this income
0 – $18,200	Nil
$18,201 – $37,000	19c for each $1 over $18,200
$37,001 – $90,000	$3,572 plus 32.5c for each $1 over $37,000
$90,001 – $180,000	$20,797 plus 37c for each $1 over $90,000
$180,001 and over	$54,097 plus 45c for each $1 over $180,000

i) Captain America lives in Australia and has to pay tax.

Calculate the amount of tax payable by Captain America if his gross income in the year was $190 690 and he has allowable deductions of $1460. **2**

Tax Income = 190 690 - 1460
= $189230

Excess = 189230 - 180 000 = $9230

Tax = 0.45 x 9230 = $4153.50

Total tax = 54097 + 4153.50 = $58250.50

ii) Hence, calculate his net income if he also has to pay 12% of his gross income to superannuation and $32.50 p.a. for union fees. **2**

Super = 12% x 190 690 = $22882.80

Deductions = 32.50 + 22882.80 + 58250.50 (tax)
= $81 165.80

Net = Gross - Ded
= 190 690 - 81 165.80 - 1460 (allowable ded)
= $108 064.20

End of Question 23

Question 24 (12 marks)

a) Deadpool's IQ score (I) is directly proportional to the number of hours (n) that he sleeps. After 9 hours of sleep, his IQ score is 140.

i) Write a linear equation to describe this situation 2

$I = kn$ $\longrightarrow$ $\therefore I = \frac{140}{9}n$

$n = 9,\ I = 140$

$140 = k \times 9$

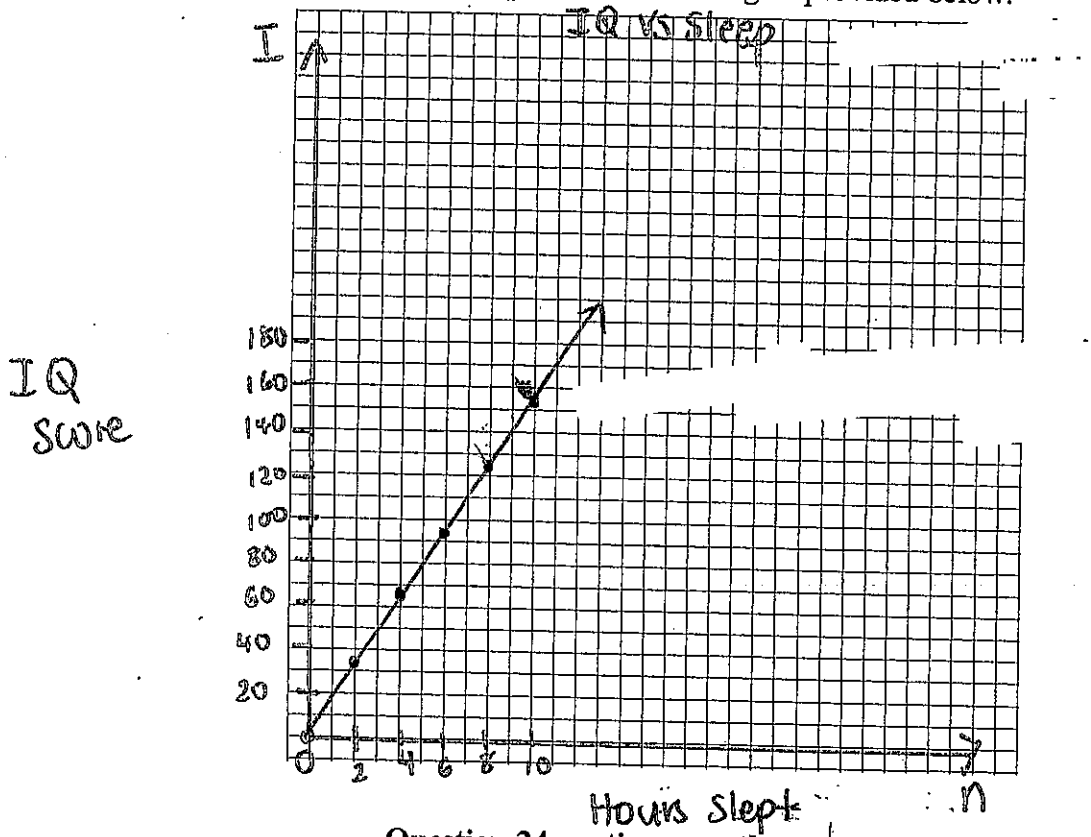
$k = \frac{140}{9}$ or 15.6 (1.d.p) $(15.\dot{5})$

ii) Use your equation to complete the table of values below: 1

n	0	2	4	6	8	10
I	0	31.1	62.2	93.3	124.4	155.6

0 31 62 93 124 155 OR

(iii) Use your table of values to graph the data on the grid provided below. 2



Question 24 continues on the next page

b) Solve $\frac{4k-4}{5} = 1-k$ 2

$4k - 4 = 5(1 - k)$

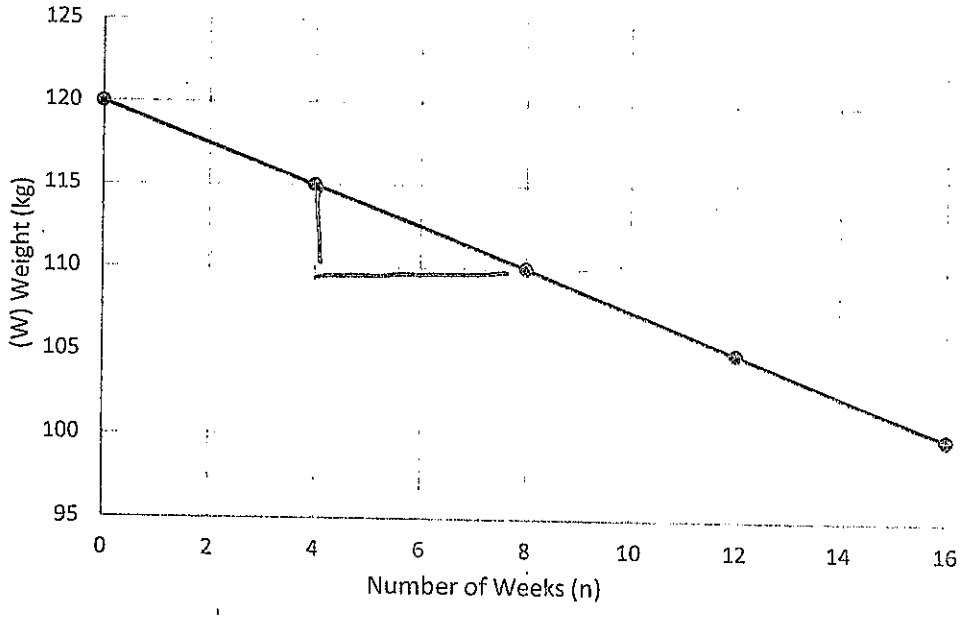
$4k - 4 = 5 - 5k$

$k = 1$

$4k + 5k = 5 + 4$

$\frac{9k}{9} = \frac{9}{9}$

c) Edward Cullen is following a diet and exercise program to lose weight. He has tracked his progress using the straight-line graph shown below.



i) State the y-intercept and gradient of the line graph. 2

y int = 120 kg

$m = \frac{rise}{run} = -\frac{5}{4}$

ii) What is the equation of the graph? 1

$y = mx + b$

$y = -\frac{5}{4}x + 120$

$W = -\frac{5}{4}n + 120$

Question 24 continues on the next page

iii) If Edward's weight loss continues in this linear fashion, what will his weight be when he reaches week 20? **1**

$y = \frac{-5}{4}x + 120$

When $x = 20$

$y = \frac{-5}{4}(20) + 120$

$= 95kg$

iv) What is one limitation of using a linear model to predict Edward's weight loss over a longer period of time? **1**

$y = \frac{-5}{4}x + 120$

$0 = \frac{-5}{4}x + 120$

$0 = -5x + 480$

$\frac{5x}{5} = \frac{480}{5}$

$x = 96$

Diet + exercise must be consistent, other factors contribute e.g. lifestyle timetable consumption of food

End of Question 24

∴ After 96 weeks, he dies.

After 96 weeks
Edward will weigh zero kg.
Too much weight loss after certain no. of weeks.

Question 25 (12 marks)

a) Your group of friends decided to fly from Sydney to Brisbane to meet Wonder Woman. As the travel organiser, you visited the Jetstar website and found the following daily flight schedule.

Flight no.	Sydney	Brisbane
TH503	0905	1030
TH511	0935	1100
TH038	1005	1130
TH114	1040	1210
TH514	1105	1230
TH051	1135	1300

i) When does flight TH511 leave Sydney and how long is the journey? **2**

0935 or 09:35 am

0935 → 1100 = 1hr 25 mins

ii) Your group needs to be at Sydney airport 50 minutes before a flight takes off. When would you all need to be at the airport to catch the TH038 flight? **1**

10:05 am - 50 mins = 9:15 am

= 0915.

iii) To meet Wonder Woman, you need to be at the hotel in Brisbane by 12:30 pm. It takes 30 minutes to drive from the airport to the hotel, what is the latest flight your group can catch from Sydney? **2**

Justify this time to your friends by using mathematical calculations.

12:30 pm - 30 mins = 12:00 pm

Arrive Brisbane = 11:30 am

Leave Sydney = 10:05 am

Catch the TH038 at 10:05 am

Question 25 continues on the next page

b) The Flash decides to visit his friend Batman. He travels in his jet from his home at $A(34°N, 118°E)$ to the Bat-Cave at B. 1

If The Flash travels 89° south and 80° west, what are the coordinates of the Bat-Cave (B)?

$34°N - 89° = -55° \Rightarrow 55°S$

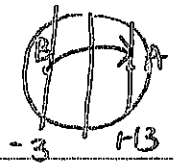
$118°E - 80 = 38°E$

$\therefore B(55°S, 38°E)$

c) The Joker lives in Auckland $(42°S, 145°E)$ and his partner Harley Quinn lives in Buenos Aires $(42°S, 109°W)$.

Auckland is 13 hours ahead of UTC while Buenos Aires is 3 hours behind of UTC.

i) Calculate the difference in ~~latitude~~ between Auckland and Buenos Aires. 1



$0°$

ii) Harley wishes to call the Joker. It is 2 pm in Buenos Aires on Wednesday. 2

By determining the time difference between the two locations, calculate the time and day when the Joker will receive the call? Show all necessary working out.

Time diff = 16 hours.

2pm + 16 hrs = $30° - 24$

= 6am Thursday.

iii) Harley flies from Buenos Aires to Auckland leaving at 23:00 on a Friday (Buenos Aires time). The flight takes 12 hours. 3

Determine the day and time when Harley will arrive in Auckland. (Give your answer in 12-hour Auckland time). Show all necessary working out.

11:00pm + 12 hrs + 16 hours = $51° - 24 - 24$

= Sunday 3am.

END OF EXAMINATION