

# NEWINGTON COLLEGE



2014

## Assessment 2 (HSC mini)

### Year 12 Mathematics General 2

#### General Instructions:

- Date of task - Monday 31<sup>st</sup> March (Wk 10B)
- Reading time - 5 mins
- Working time - 120 mins
- Weighting - 30%
- Board-approved calculators may be used.
- A formulae sheet is provided at the back of the paper.
- Attempt all questions.
- Show all relevant mathematical reasoning and/or calculations.

Total marks - 70

#### Section I (20 marks)

- Answer questions 1 to 20 on the multiple choice answer sheet provided at the end of this paper.
- Allow about 30 minutes for this section.

#### Section II (60 marks)

- Answer questions 21 to 25 on the writing paper provided.
- **Start each question in a new booklet.**
- Each page must show the candidate's computer number.

#### Outcomes to be assessed:

- MG2H1** uses mathematics and statistics to evaluate and construct arguments in a range of familiar and unfamiliar contexts.
- MG2H4** analyses two-dimensional and three-dimensional models to solve practical problems, including those involving spheres and non-right-angled triangles.
- MG2H7** answers questions requiring statistical processes, including the use of the normal distribution, and the correlation of bivariate data.
- MG2H8** solves problems involving counting techniques, multistage events and expectation

**Section I****20 marks****Attempt Questions 1-20****Allow about 30 minutes for this section.**

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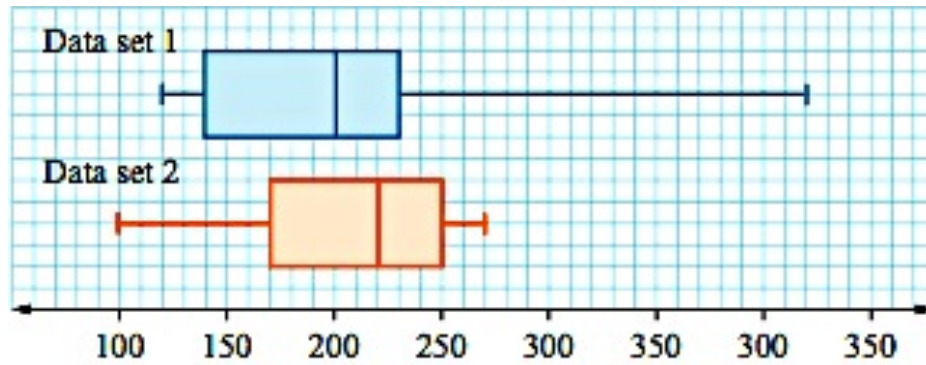
1. Six students were tested on their understanding of trigonometry. The marks were:

|    |    |    |    |    |    |
|----|----|----|----|----|----|
| 47 | 53 | 32 | 45 | 68 | 31 |
|----|----|----|----|----|----|

After a refresher course there were tested again. Each student's marks increased by exactly 10. Compared with the first set of marks, the second set had:

- A) A larger mean and smaller standard deviation  
B) A larger mean and larger standard deviation  
C) The same mean and larger standard deviation  
D) A larger mean and same standard deviation
2. The mean in the heights of a set of students is 155 cm and the standard deviation is 11.2 cm. A person is chosen at random from this group. Between which two values will the height of the student be if the z score is between -3 and 3?
- A) 132.6 cm and 177.4 cm  
B) 121.4 cm and 188.6 cm  
C) 155 cm and 177.4 cm  
D) 155 cm and 188.6 cm
3. In a science test a class of 24 boys had a mean of 56 and a class of 16 girls had a mean of 66. What is the combined mean of the two scores?
- A) 56  
B) 60  
C) 61  
D) 62
4. The interquartile range of the following scores is:  
5, 5, 6, 6, 7, 7, 7, 7, 8, 8, 8, 9, 9, 10
- A) 2  
B) 5  
C) 7.5  
D) 10

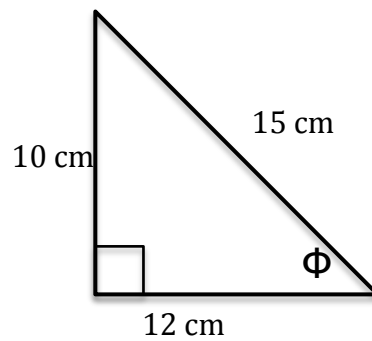
5. Consider the following data set.



Which of the following data is true

- A) The range is smaller in Data Set 1
- B) The IQR is the same in both Data Sets
- C) The median is smaller in Data Set 1
- D) Data Set 1 has the lowest score

6. In the following triangle  $\tan \Phi =$



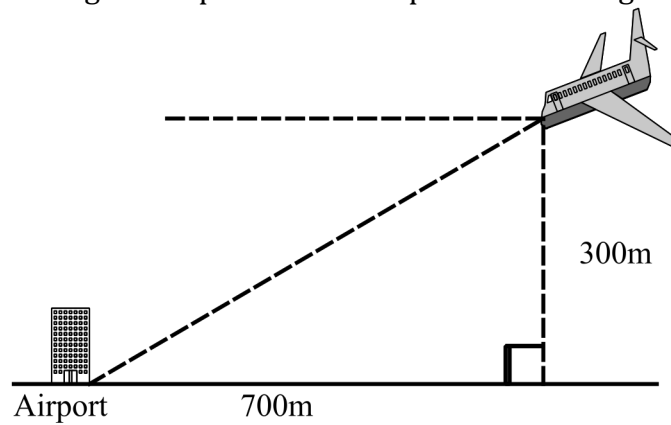
- A)  $\frac{10}{15}$
- B)  $\frac{12}{15}$
- C)  $\frac{10}{12}$
- D)  $\frac{12}{10}$

7. Which measure of central tendency is the best one to represent the following data:

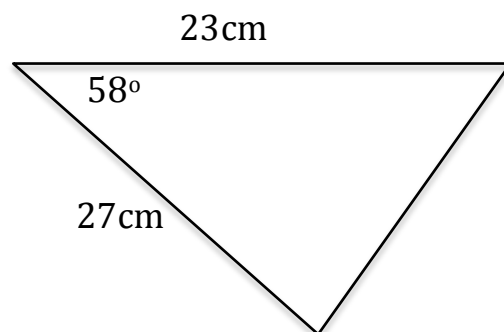
4, 5, 5, 6, 6, 6, 7, 8, 9, 9, 9, 15

- A) Mode
- B) Median
- C) Range
- D) Mean

8. What is the angle of depression of the plane in the diagram below?



- A)  $0.007^\circ$
  - B)  $0.04^\circ$
  - C)  $66.8^\circ$
  - D)  $23.2^\circ$
9. Find the area of the following triangle



- A)  $263.32 \text{ cm}^2$
- B)  $164.54 \text{ cm}^2$
- C)  $526.64 \text{ cm}^2$
- D)  $310.5 \text{ cm}^2$

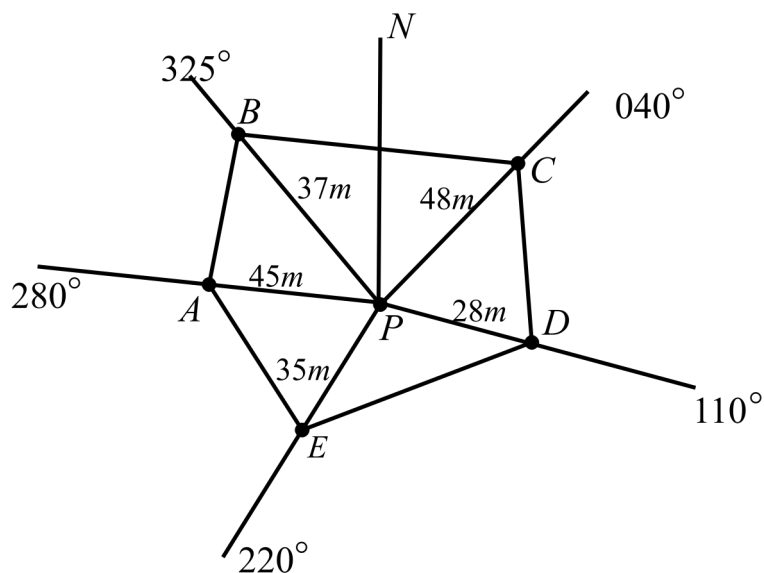
10. The information below is for 2 tests a student completed.

|                    | Test 1 | Test 2 |
|--------------------|--------|--------|
| Mean               | 55     | 60     |
| Standard Deviation | 7      | 10     |

Fred gets a raw mark of 50 in test 2. His z-score is:

- A) 1
- B) -2
- C) 0
- D) -1

11. Find the size of the angle CPD

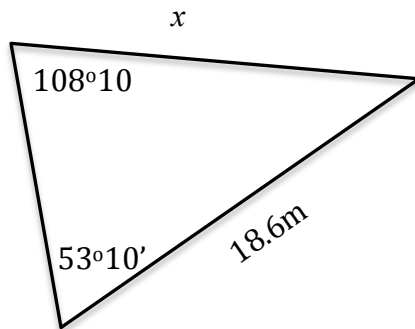


- A)  $40^\circ$
- B)  $110^\circ$
- C)  $70^\circ$
- D)  $48^\circ$

12. In how many ways can Vinnie, Sally, Paul, Henry and Katie stand in a row?

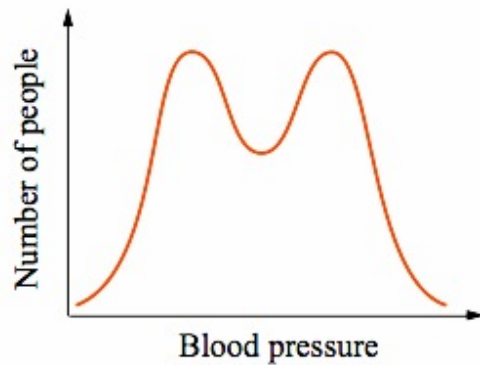
- A) 5
- B) 25
- C) 75
- D) 120

13. Find the value of  $x$  in the triangle below:



- A) 35.76 cm  
B) 15.67 cm  
C) 22.08 cm  
D) 9.67 cm
14. How many ways can 4 entrees, 3 mains and 2 desserts be ordered?
- A) 24  
B) 9  
C) 288  
D) 12
15. The letters of the word PERMUTATION are used to form a four-letter word. Letters are replaced after they have been used. How many different outcomes are possible?
- A)  $4 \times 3 \times 2 \times 1$   
B)  $11 \times 10 \times 9 \times 8$   
C)  $11 \times 11 \times 11 \times 11$   
D)  $\frac{11 \times 10 \times 9 \times 8}{4 \times 3 \times 2 \times 1}$
16. Calculate the expected number of times a dice should land on a number greater than 4 if it is rolled 300 times.
- A) 100  
B) 200  
C) 300  
D) 2

17. Which description best describes the graph:

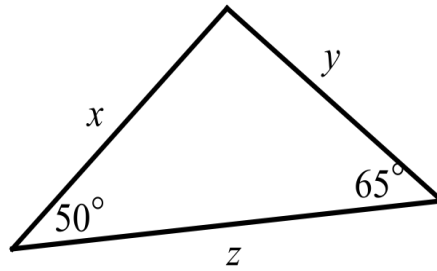


- A) Smooth, symmetrical, U-shaped
- B) Smooth, symmetrical bi-modal
- C) Smooth, bi-modal, positively skewed
- D) Uniform distribution, no mode

18. There are 14 horses in a race. What is the probability of choosing the first and second places?

- A)  $\frac{3}{14}$
- B)  $\frac{1}{91}$
- C)  $\frac{1}{182}$
- D)  $\frac{2}{14}$

19. The area of this triangle is



- A)  $\frac{1}{2} zy \sin 50^\circ$
- B)  $\frac{1}{2} zx \sin 65^\circ$
- C)  $\frac{1}{2} xy \sin 50^\circ$
- D)  $\frac{1}{2} xy \sin 65^\circ$
20. A data set of nine scores has a median of 7. The scores 6, 6, 12, 17 are added to this data set.  
What is the median of the data set now?
- A) 6
- B) 7
- C) 8
- D) 9

**End of Section I**



**Section II****60 marks**

Attempt Questions 21-25.

Show all working where necessary.

Allow about 1 hour and 30 minutes for this section.

**Question 21** (12 Marks) – Use a SEPARATE writing booklet.

i) Below is a stem and leaf plot:

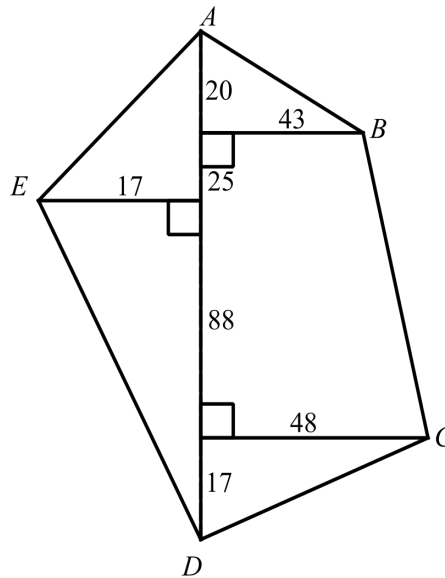
| Stem | Leaf          |
|------|---------------|
| 0    | 5             |
| 1    | 3 7           |
| 2    | 2 2 4 6       |
| 3    | 0 1 1 5 8 8 9 |
| 4    | 2 3 3 6       |
| 5    | 1 5           |
| 6    | 4             |

- a) Calculate the median,  $Q_L$ ,  $Q_U$  and IQR. (2)
- b) Using the formulas:  $Q_L - 1.5 \times IQR$ ,  $Q_U + 1.5 \times IQR$  calculate the values of the outliers for the data (2)
- c) Are 64 and 5 outliers? Explain your answer (2)
- ii) The numbers 4, 7, and 8 are placed in a bag. The numbers are drawn at random and not replaced to form a 3 digit number.
- a) How many different ways can the numbers be ordered? (1)
- b) List the possible sample space (2)
- c) What is the probability of getting an even number? (1)
- d) What is the probability of getting the number 874? (1)
- e) What is the probability that the 7 is first? (1)

**End of Question 21**

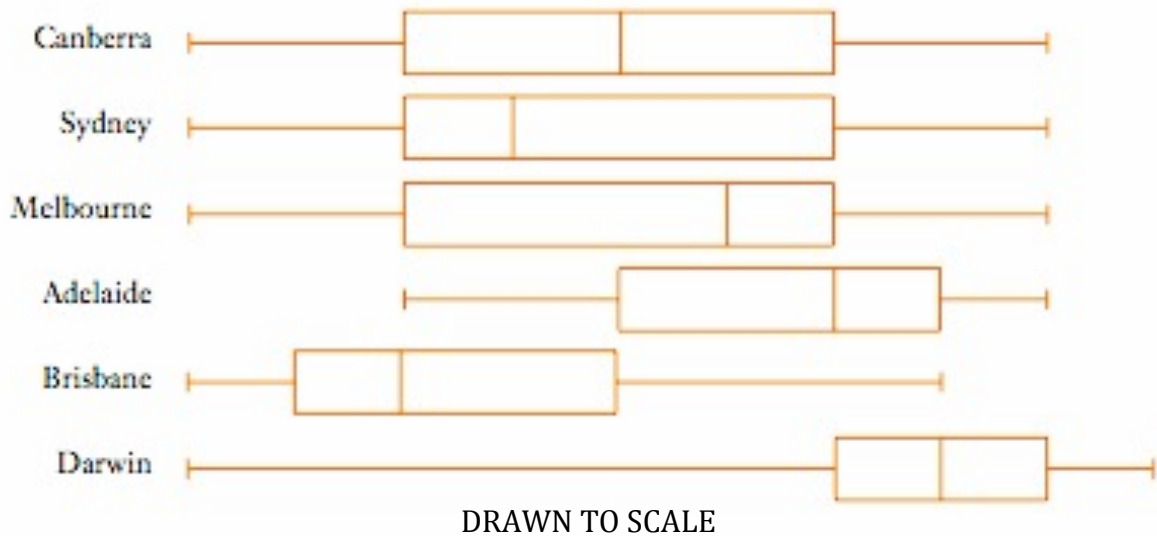
**Question 22** (11 Marks) – Use a SEPARATE writing booklet.

- i) Edward scored 70 in an English test. The test mean was 60 and the standard deviation was 4.
- a) What was Edward's z-score? (1)
- b) This test is being rescaled to a mean of 65 and a standard deviation of 10 without changing the z-scores. What will Edward's new mark be? (1)
- ii) Calculate the area of ABCD in the field drawn below: (3)



**Question 22 continues on the next page**

- iii) The box and whisker plots below show the distribution of petrol prices in six Australian capital cities.

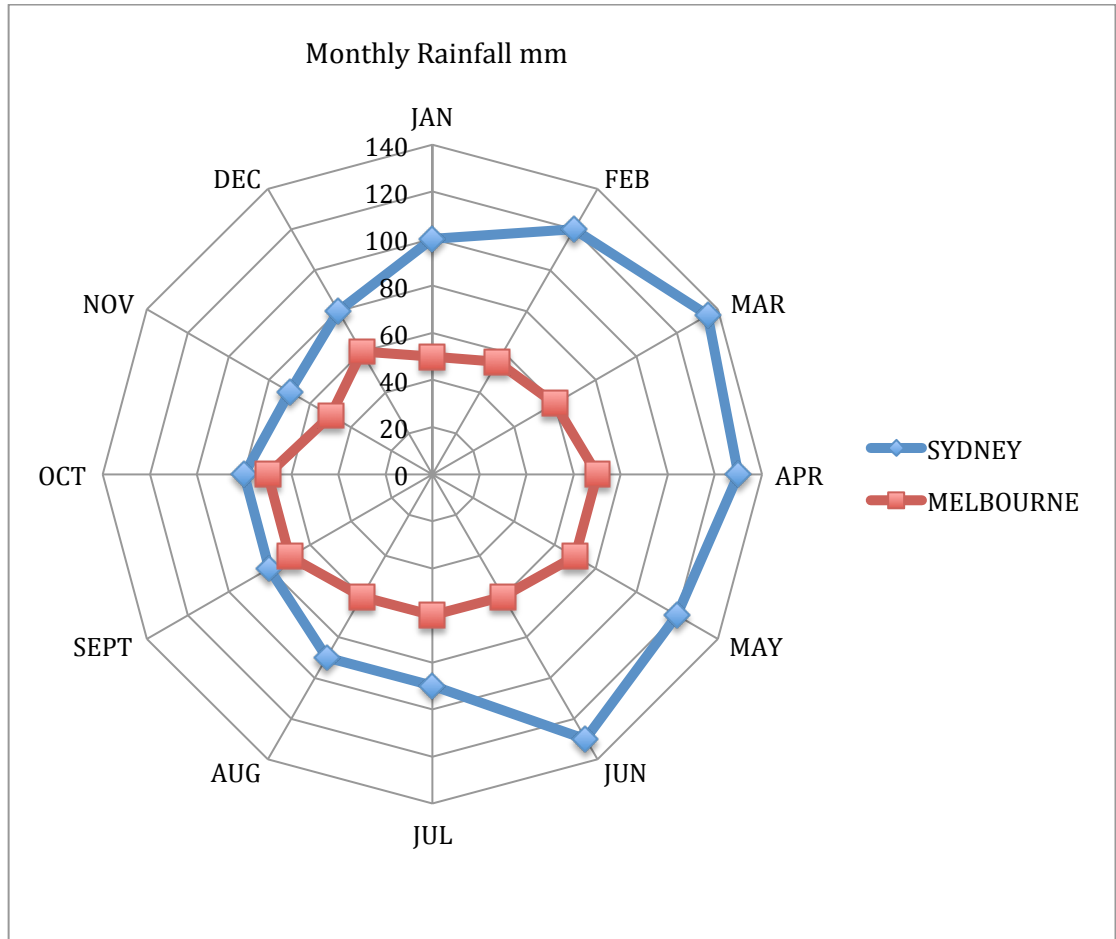


- a) Which city has the greatest range of prices? (1)
- b) Which city has the lowest median price? (1)
- c) Comment on at least two features of the distribution of the graphs of Darwin and Brisbane, examining shape, skewness and measures of location and spread (2)
- d) Which city would you rather pay for petrol in out of Canberra, Sydney and Melbourne? Give reasons for your answer. (2)

**End of Question 22**

**Question 23** (14 Marks) – Use a SEPARATE writing booklet.

- i) The following graph shows the average rainfall for Sydney and Melbourne



- a) Which month has the lowest rainfall in Sydney? (1)
- b) Which month(s) has the highest rainfall in Melbourne? (1)
- c) What is the difference in the rainfall in the month of May? (1)

**Question 23 continues on the next page**

- ii) Paige plays a game by selecting one of 4 aces. The rules of the game are as follows:
- Paige wins \$40 by selecting a red card
  - Paige has no result by selecting a club
  - Paige loses \$100 by selecting a spade
- She plays the game 160 times and replaces the card after each game.
- a) How many times would she expect to win \$40? (1)
- b) How many times would she expect to lose \$100? (1)
- c) What is the financial expectation of the game? (2)
- d) Should Paige play? Give reasons for your answer. (2)
- iii) In Lotto, six numbers are chosen from 1 to 45. Last week, Lotto sold 22 Million entries with a first draw prize of \$3 million.
- a) What is the probability of winning a first prize with a single entry? (2)
- b) How much money did Lotto make if every entry cost \$2.40? (1)
- c) How many first prize winners should Lotto expect? (1)
- d) What would be each prize winners share? (1)

**End of Question 23**

**Question 24** (11 Marks) – Use a SEPARATE writing booklet.

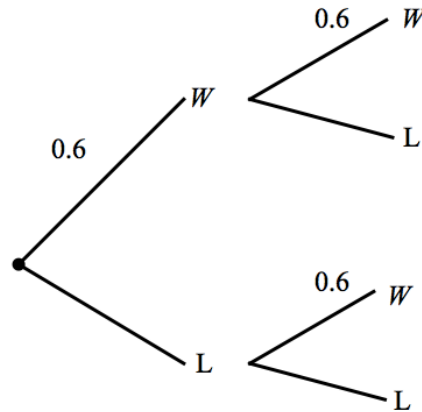
- i) The triangle ABC has an area of  $243\text{m}^2$ . BC has a length of 30.1m and an angle C is  $50^\circ 13'$ . What is the length of AC in metres correct to 1 decimal place? (1)
- ii) The mean of a set of 5 scores is 27.2. A new score of 29 is added. What is the new mean? (2)
- iii) The systolic blood pressure of 20 people is listed below.
- |     |     |     |     |     |     |     |     |    |    |
|-----|-----|-----|-----|-----|-----|-----|-----|----|----|
| 200 | 156 | 178 | 140 | 120 | 100 | 80  | 95  | 98 | 88 |
| 130 | 142 | 128 | 102 | 83  | 110 | 153 | 111 | 99 | 98 |
- a) What is the interquartile range of the data? (1)
- b) What is the standard deviation? (1)
- c) The mean of the above data is 111. Fred says that this data is a good average of the general population. Do you think he is correct? Why? (2)
- iv) A chocolate manufacturer makes 500g blocks. The standard deviation of the weight of the blocks is 5g.
- a) Between what values of weight will the acceptable blocks lie if 95% of the blocks are considered acceptable? (2)
- b) Sally says that she regularly gets a block that weighs 487g. Is Sally telling the truth? Give reasons for your answer. (2)

**End of Question 24**

**Question 25** (11 Marks) – Use a SEPARATE writing booklet.

i) Bilal has a 0.6 chance of winning a set of tennis against Mickael.

a) Copy and complete the following tree diagram into your booklet. (2)



b) What is the probability of Bilal having 2 wins? (1)

c) What is the probability that Bilal has at least one loss? (1)

ii) Nathan sells a diet plan with a money back guarantee if the customer does not lose 9kg in the first 3 months. The weight loss after 3 months is normally distributed with a mean loss of 13.2 kg and a standard deviation of 1.4 kg.

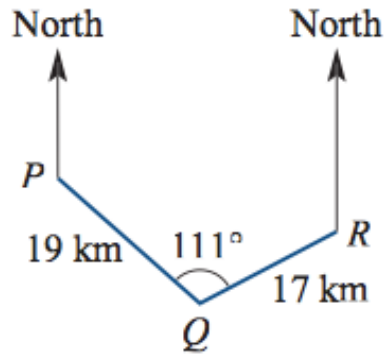
a) What is the z-score corresponding to a weight loss of 9kg? (1)

b) What percentage of customers will not reach the 9kg in three months? (1)

c) Nathan has sold 2000 diet plans. How many refunds are expected? (1)

**Question 25 continues on the next page**

- iii) The diagram below shows information about the locations of towns P, Q and R. Amber takes 2 hours and 30 minutes to walk directly from Town P to Town Q.



- a) What is Ambers walking speed correct to the nearest km/h? (1)
- b) What is the distance from P to R correct to the nearest kilometre? (2)
- c) How long would it take Amber to walk from P to R? Answer to the nearest minute. (2)

**END OF PAPER**



**Student Number :**

|  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|
|  |  |  |  |  |  |  |  |  |
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**SECTION I – Multiple Choice Answer Sheet**

*Instructions – 1. Tear off this page and write your student number in box above.  
2. Colour in the circle corresponding to your correct answer.*

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

## Appendix - Marking and mapping grid

| Outcome | Data<br>(MG2H1) | Trig<br>(MG2H4) | Normal<br>Dist<br>(MG2H7) | Probability<br>(MG2H8) |
|---------|-----------------|-----------------|---------------------------|------------------------|
| Q1      |                 |                 | /1                        |                        |
| Q2      |                 |                 | /1                        |                        |
| Q3      | /1              |                 |                           |                        |
| Q4      | /1              |                 |                           |                        |
| Q5      | /1              |                 |                           |                        |
| Q6      |                 | /1              |                           |                        |
| Q7      | /1              |                 |                           |                        |
| Q8      |                 | /1              |                           |                        |
| Q9      |                 | /1              |                           |                        |
| Q10     |                 |                 | /1                        |                        |
| Q11     |                 | /1              |                           |                        |
| Q12     |                 |                 |                           | /1                     |
| Q13     |                 | /1              |                           |                        |
| Q14     |                 |                 |                           | /1                     |
| Q15     |                 |                 |                           | /1                     |
| Q16     |                 |                 |                           | /1                     |
| Q17     |                 |                 | /1                        |                        |
| Q18     |                 |                 |                           | /1                     |
| Q19     |                 | /1              |                           |                        |
| Q20     | /1              |                 |                           |                        |
| Q21     | i(6)            |                 |                           | ii(6)                  |
| Q22     | iii(6)          | ii(3)           | i(2)                      |                        |
| Q23     | i(3)            |                 |                           | ii(6), iii(5)          |
| Q24     | ii(2), iii(4)   | i(1)            | iv(4)                     |                        |
| Q25     |                 | iii(4)          | ii(3)                     | i(4)                   |
| Total   | /26             | /14             | /13                       | /26                    |

|         |     |
|---------|-----|
| Overall | /80 |
| Comment |     |