Carlingford High School

YEAR 12
STANDARD MATHEMATICS
TERM 4 Assessment Task 1
2019

Student number:.....

- Time allowed: 50 minutes
- Answer all questions in this question booklet. Circle the correct responses to the Multiple Choice Questions on the question sheet.
- Approved calculators may be used.
- All necessary working should be shown in every question. Marks may be deducted for careless or badly arranged work.
- A reference sheet is provided

Question/outcomes	Section A	Section B	Section C	Total
Working with time	/14			/14
Trigonometry		/16		/16
Summary Statistics			/17	/17
	/14	/16	/17	/47

Section A: Working with time (14 marks)

Marks

1. Violet works on her homework from 3:45 p.m. until 5:08 p.m. each weekday. How much time does Violet spend doing her homework over the week?

   A. 1 h 23 min B. 5 h 15 min C. 6 h 55 min D. 9 h 01 min

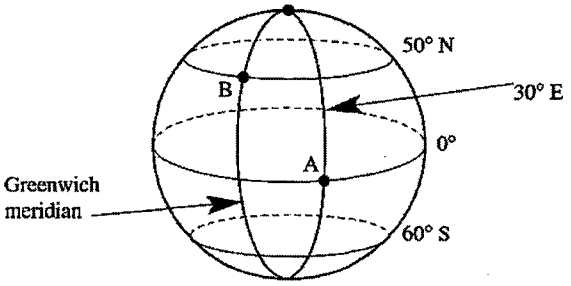
2. The school bus takes 49 minutes to get from Joseph's house to the school. If school starts at 8:30 a.m., what is the latest time Joseph can catch the bus to get to school on time?

   A. 7:19 am B. 7:41 am C. 7:51 am D. 9:19 am

3. Ballarat is 2° south and 6° west of Batemans Bay $(35°S, 150°E)$. What are the coordinates of Ballarat?

   A. $(33°S, 144°E)$ B. $(37°S, 156°E)$ C. $(33°S, 156°E)$ D. $(37°S, 144°E)$

4. A diagram of Earth's surface is shown



   i) What are the coordinates of point A? 1

   .....

   ii) What is the latitude of point B? 1

   .....

5. A movie runs for 212 minutes

   i) Convert this time to hours and minutes. 1

   .....

   .....

   ii) What is the finishing time of the movie if the movie starts at 14:35? 2
   Answer in 24-hour time.

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6. Jason makes a note of the time zones of the three cities that he will be staying in while travelling as a part of an international student delegation.

Country	City	Time zone
Australia	Sydney	UTC+10:00
Austria	Vienna	UTC+1:00
USA	Washington	UTC–5:00

Before leaving from Sydney airport, Jason rings the delegates in Washington. He rings at 2:30 p.m. on Friday 20th September. Ignoring daylight saving times, what time and day will his call come through in Washington? 2

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7. Jack, in Sydney, wants to phone his mother in Perth. Sydney is located in UTC (+10) and Perth is in UTC (+8). Daylight saving time is operating in Sydney. When should Jack ring to reach his mother at 6: 00 p.m. in Perth? 2

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8. Part of the Manly to Darling Harbour fast ferry timetable is shown below.

Darling Harbour	Pyrmont Bay	North Sydney	Circular Quay	Manly Wharf 3	Manly Wharf 2	North Sydney	Pyrmont Bay	Darling Harbour
-	-	-	-	6:55	-	7:15	7:28	7:35
-	-	-	-	7:25	-	7:45	7:59	8:02
-	-	-	-	7:55	-	8:17	8:32	8:39
7:35	-	-	-	8:15	-	8:33	8:45	8:53
8:05	-	-	-	8:45	-	9:05	9:19	9:25
16:40	16:47	17:00	17:10	-	17:29	-	-	-
17:15	17:22	17:35	-	17:55	-	-	-	18:25
17:45	17:52	18:05	-	18:25	-	-	-	19:00
18:15	18:22	18:35	-	18:55	-	-	-	19:30
18:35	18:42	18:55	-	19:15	-	-	-	19:45
19:05	19:11	19:24	19:29	-	19:49	-	-	-

i) How long does it take to travel on the 7: 35 ferry from Darling Harbour to Manly? 1

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ii) What is the latest time to catch a ferry from Pyrmont Bay and get to Manly by 18: 45? 1

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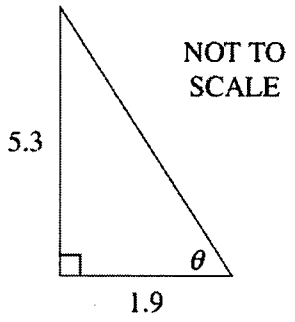
Section B: Trigonometry (16 marks) **Marks**

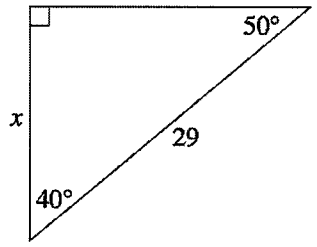
1. The diagram below shows a right-angled triangle.



What is the value of θ, to the nearest minute?

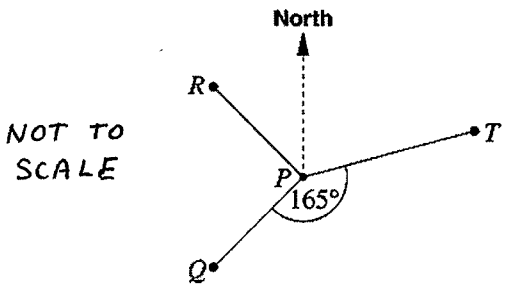
A. $70°16'$ B. $70°17'$ C. $70°27'$ D. $70°28'$

2. Which expression could be used to calculate the value of x in the triangle below?



A. $29 \times \cos 40°$ B. $29 \times \cos 50°$ C. $\frac{\cos 40°}{29}$ D. $\frac{\cos 50°}{29}$

3. The diagram below shows the position of Q, R and T relative to P.



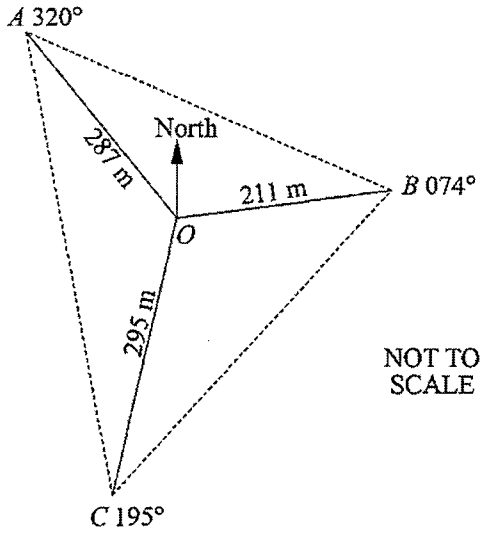
In the diagram,

- Q is south-west of P
- R is north-west of P
- $\angle QPT$ is $165°$

What is the bearing of T from P?

A. $060°$ B. $075°$ C. $105°$ D. $120°$

4. A radial compass survey of a sports centre is shown in the diagram below.



i) Show that the size of angle AOB is $114°$. 1

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ii) If the size of angle AOC is $125°$, calculate the length of the boundary AC, correct to three significant figures. 3

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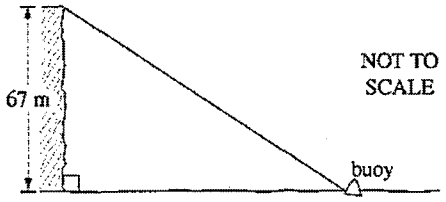
5. From the top of a cliff 67 metres above sea level, the angle of depression of a buoy is $42°$. 2



How far is the buoy from the base of the cliff, to the nearest metre?

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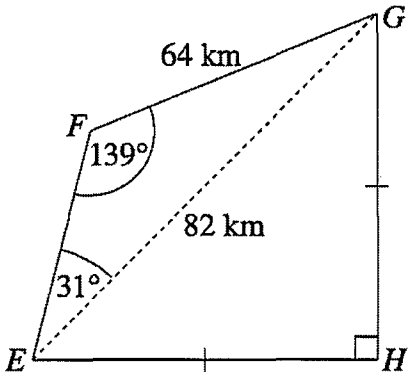
6. Raj cycles around a course. The course starts at E, passes through F, G and H and finishes at E. The distances EH and GH are equal.



NOT TO SCALE

i) Show that the length of EH is 57.98 km, correct to two decimal place? 2

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ii) What is the length of EF, to one decimal place? 2

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iii) Calculate the area of the course $EFGH$. Answer correct to one decimal place. 3

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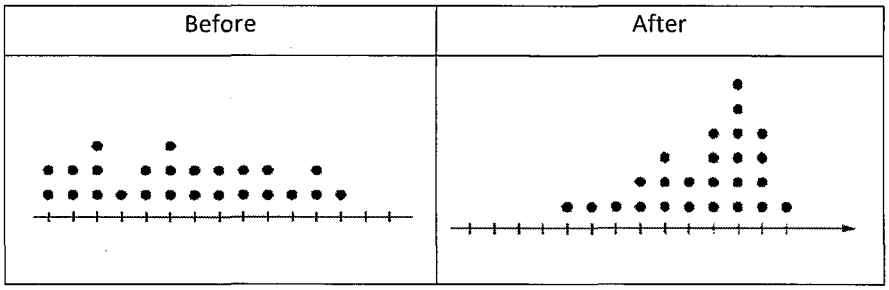
Section C: Data (17 marks)

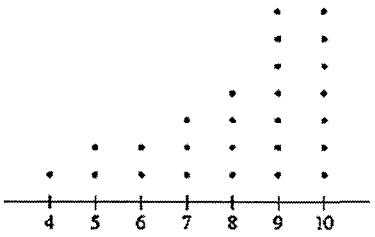
1. The dot plots below are drawn on the same scale. They show the class scores in tests taken before and after a unit of work was completed.



Which statement about the change in scores is correct?

A. The mean increased and the standard deviation decreased.
B. The mean increased and the standard deviation increased.
C. The mean decreased and the standard deviation decreased.
D. The mean decreased and the standard deviation increased.

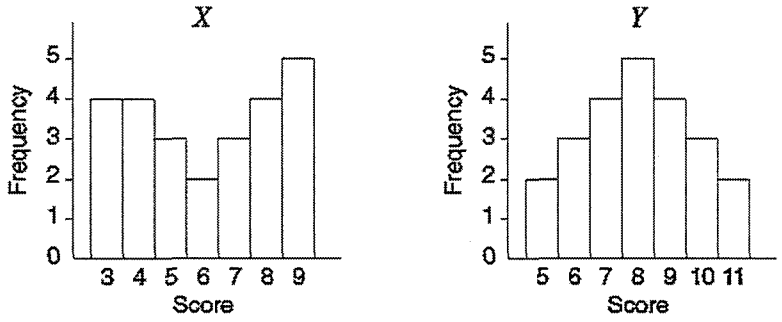
2. A set of data is displayed in this dot plot.



Which of the following best describes this set of data?

A. Symmetrical
B. Positively skewed
C. Negatively skewed
D. Normally distributed

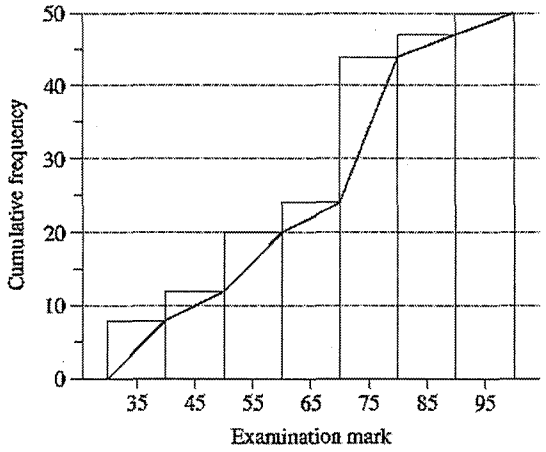
3. The sets of data, *X* and *Y*, are displayed in the histograms.



Which of these statements is true?

A. X has a larger mode and *Y* has a larger range.
B. X has a larger mode and the ranges are the same.
C. The modes are the same and *Y* has a larger range.
D. The modes are the same and the ranges are the same.

4. A set of examination results is displayed in a cumulative frequency histogram and polygon (ogive).



Sam knows that his examination mark is in the 4th decile. Which of the following could have been Sam's examination mark?

A. 37 B. 57 C. 67 D. 77

5. A soccer referee wrote down the number of goals scored in 9 different games during the season. 2

1, 3, 3, 3, 5, 5, 8, 9, *N*

The last number (*N*) has been omitted. The range of the data is 11.
What is the five-number summary for this data set?

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ii) Is the score of 1 an outlier for this set of data? Justify your answer with calculations. 2

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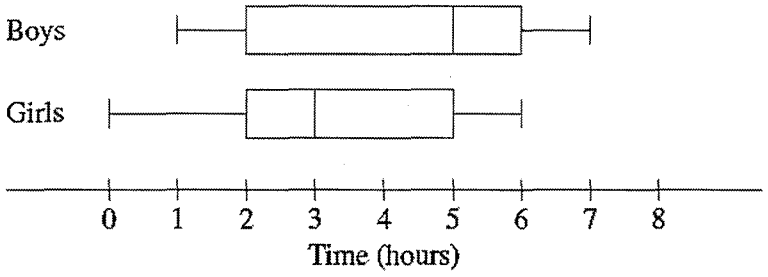
6. In a school, boys and girls were surveyed about the time they usually spend on the internet over a weekend. These results were displayed in box-and-whisker plots, as shown below.



i) Find the interquartile range for boys. 1

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ii) What percentage of girls usually spend 5 or less hours on the internet over a weekend? 1

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iii) Compare and contrast the two data sets by commenting on the measures of the location and spread. 3

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7. A shop sells two brands of DVDs, Starlight and Starbright. Both brands sell for the same price. The shop decides to discontinue one of the brands. The sales of each brand in the 10 week period before one of the brands is discontinued is recorded, and shown in the ordered back – to-back stem and leaf plot below.

Starlight		Starbright
4 3 3	1	8 9
8 6 5	2	1 6 6
4 2	3	1 3 3 4
1	4	0
5	5	

i) Complete the table below. 3

	Mean	Median	Standard Deviation
Starlight		27	
Starbright	28.1		6.9

ii) Which brand should be discontinued? Justify your answer. 1

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End of Paper

NSW Education Standards Authority

2019 HIGHER SCHOOL CERTIFICATE EXAMINATION

Mathematics Standard 1
Mathematics Standard 2

REFERENCE SHEET

Measurement

Limits of accuracy

Absolute error = $\frac{1}{2} \times$ precision

Upper bound = measurement + absolute error

Lower bound = measurement – absolute error

Length

$$l = \frac{\theta}{360} \times 2\pi r$$

Area

$$A = \frac{\theta}{360} \times \pi r^2$$

$$A = \frac{h}{2}(a + b)$$

$$A \approx \frac{h}{2}(d_f + d_l)$$

Surface area

$$A = 2\pi r^2 + 2\pi rh$$

$$A = 4\pi r^2$$

Volume

$$V = \frac{1}{3}Ah$$

$$V = \frac{4}{3}\pi r^3$$

Trigonometry

$$\sin A = \frac{\text{opp}}{\text{hyp}}, \quad \cos A = \frac{\text{adj}}{\text{hyp}}, \quad \tan A = \frac{\text{opp}}{\text{adj}}$$

$$A = \frac{1}{2}ab\sin C$$

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$c^2 = a^2 + b^2 - 2ab\cos C$$

$$\cos C = \frac{a^2 + b^2 - c^2}{2ab}$$

Financial Mathematics

$$FV = PV(1 + r)^n$$

Straight-line method of depreciation

$$S = V_0 - Dn$$

Declining-balance method of depreciation

$$S = V_0(1 - r)^n$$

Statistical Analysis

An outlier is a score

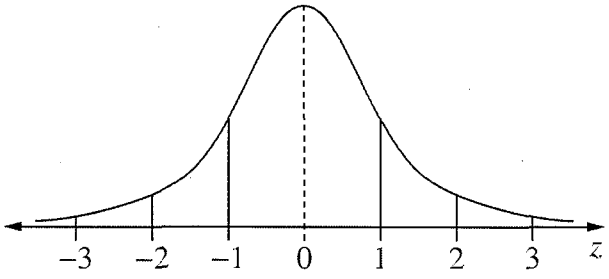
less than $Q_1 - 1.5 \times IQR$

or

more than $Q_3 + 1.5 \times IQR$

$$z = \frac{x - \bar{x}}{s}$$

Normal distribution



- approximately 68% of scores have z-scores between –1 and 1
- approximately 95% of scores have z-scores between –2 and 2
- approximately 99.7% of scores have z-scores between –3 and 3

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Carlingford High School

YEAR 12
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TERM 4 Assessment Task 1
2019

Student number: Solutions

- Time allowed: 50 minutes
- Answer all questions in this question booklet. Circle the correct responses to the Multiple Choice Questions on the question sheet.
- Approved calculators may be used.
- All necessary working should be shown in every question. Marks may be deducted for careless or badly arranged work.
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Question/outcomes	Section A	Section B	Section C	Total
Working with time	/14			/14
Trigonometry		/16		/16
Summary Statistics			/17	/17
	/14	/16	/17	/47

Section A: Working with time (14 marks)

Marks

1. Violet works on her homework from 3:45 p.m. until 5:08 p.m. each weekday. How much time does Violet spend doing her homework over the week?

   A. 1 h 23 min B. 5 h 15 min C. 6 h 55 min D. 9 h 01 min

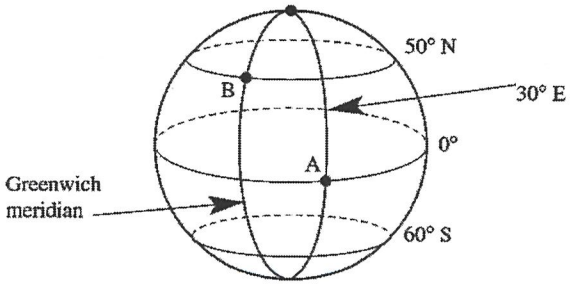
2. The school bus takes 49 minutes to get from Joseph's house to the school. If school starts at 8:30 a.m., what is the latest time Joseph can catch the bus to get to school on time?

   A. 7:19 am B. 7:41 am C. 7:51 am D. 9:19 am

3. Ballarat is 2° south and 6° west of Batemans Bay $(35°S, 150°E)$. What are the coordinates of Ballarat?

   A. $(33°S, 144°E)$ B. $(37°S, 156°E)$ C. $(33°S, 156°E)$ D. $(37°S, 144°E)$

4. A diagram of Earth's surface is shown



   i) What are the coordinates of point A? 1

   (0°, 30° E)

   ii) What is the latitude of point B? 1

   50° N do not accept (50°N, 0°)

5. A movie runs for 212 minutes

   i) Convert this time to hours and minutes. 1

   3 hours 32 mins

   ii) What is the finishing time of the movie if the movie starts at 14:35? 2
   Answer in 24-hour time.

   14:35 + 3h 32 mins

   = 1807

   ① 6:07 pm

6. Jason makes a note of the time zones of the three cities that he will be staying in while travelling as a part of an international student delegation.

Country	City	Time zone
Australia	Sydney	UTC+10:00
Austria	Vienna	UTC+1:00
USA	Washington	UTC–5:00

Before leaving from Sydney airport, Jason rings the delegates in Washington. He rings at 2:30 p.m. on Friday 20th September. Ignoring daylight saving times, what time and day will his call come through in Washington? 2

15 hours difference

2:30 pm → 2:30 am Fri (12 h)

11:30 pm Thurs (3 h)

∴ 11:30 pm Thursday 19th Sept

(1) (1)

7. Jack, in Sydney, wants to phone his mother in Perth. Sydney is located in UTC (+10) and Perth is in UTC (+8). Daylight saving time is operating in Sydney. When should Jack ring to reach his mother at 6:00 p.m. in Perth? 2

2 hours difference

P S

6 pm 8 pm + 1 daylight saving.

∴ 9 pm (1) for 8 pm

8. Part of the Manly to Darling Harbour fast ferry timetable is shown below.

Darling Harbour	Pyrmont Bay	North Sydney	Circular Quay	Manly Wharf 3	Manly Wharf 2	North Sydney	Pyrmont Bay	Darling Harbour
-	-	-	-	6:55	-	7:15	7:28	7:35
-	-	-	-	7:25	-	7:45	7:59	8:02
-	-	-	-	7:55	-	8:17	8:32	8:39
7:35	-	-	-	8:15	-	8:33	8:45	8:53
8:05	-	-	-	8:45	-	9:05	9:19	9:25
16:40	16:47	17:00	17:10	-	17:29	-	-	-
17:15	17:22	17:35	-	17:55	-	-	-	18:25
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19:05	19:11	19:24	19:29	-	19:49	-	-	-

i) How long does it take to travel on the 7: 35 ferry from Darling Harbour to Manly? 1

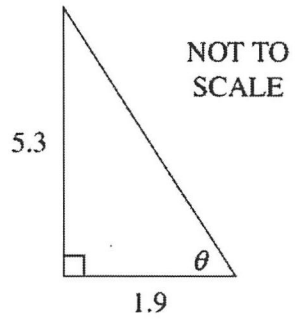
40 mins must have minutes

ii) What is the latest time to catch a ferry from Pyrmont Bay and get to Manly by 18: 45? 1

17:52

Section B: Trigonometry (16 marks) **Marks**

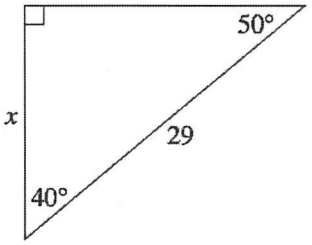
1. The diagram below shows a right-angled triangle.



What is the value of θ, to the nearest minute?

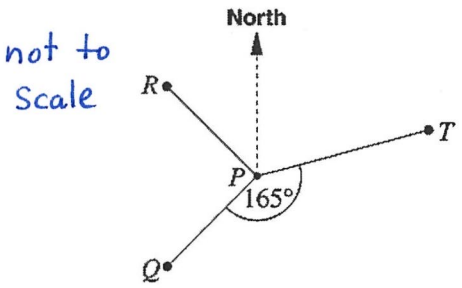
A. $70°16'$ B. $70°17'$ C. $70°27'$ D. $70°28'$

2. Which expression could be used to calculate the value of x in the triangle below?



A. $29 \times \cos 40°$ B. $29 \times \cos 50°$ C. $\frac{\cos 40°}{29}$ D. $\frac{\cos 50°}{29}$

3. The diagram below shows the position of Q, R and T relative to P.



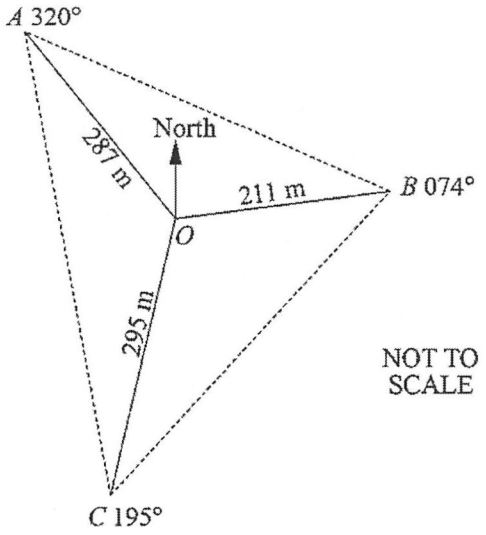
In the diagram,

- Q is south-west of P
- R is north-west of P
- $\angle QPT$ is $165°$

What is the bearing of T from P?

A. $060°$ B. $075°$ C. $105°$ D. $120°$

4. A radial compass survey of a sports centre is shown in the diagram below.



i) Show that the size of angle AOB is 114°. 1

$(360 - 320) + 74$

$= 114°$

ii) If the size of angle AOC is 125°, calculate the length of the boundary AC, correct to three significant figures. 3

① $AC^2 = 287^2 + 295^2 - 2 \times 287 \times 295 \times \cos 125°$

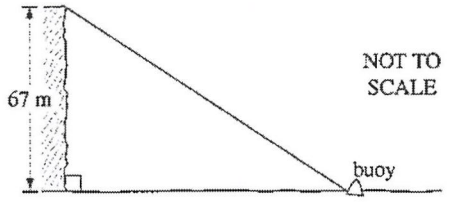
$= 266517.698$

$AC = \sqrt{266517.698}$

$= 516.253\ldots$ ①

$= 516\text{m}$ ①

5. From the top of a cliff 67 metres above sea level, the angle of depression of a buoy is 42°. 2



How far is the buoy from the base of the cliff, to the nearest metre?

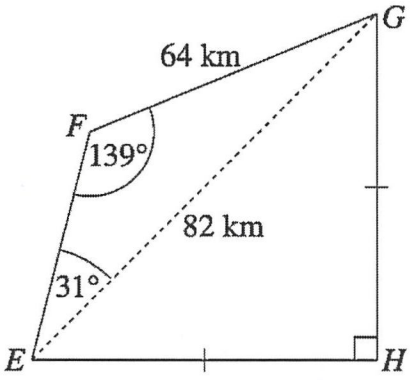
$\tan 42° = \frac{67}{x}$ ①

$x = \frac{67}{\tan 42°}$

$x = 74.411\ldots$ } either ①

$x = 74\text{m}$

6. Raj cycles around a course. The course starts at E, passes through F, G and H and finishes at E. The distances EH and GH are equal.



NOT TO SCALE

i) Show that the length of EH is 57.98 km, correct to two decimal place? 2

$2x^2 = 82^2$ (1)

$x^2 = 3362$ (1)

$x = 57.982...$

$x = 57.98$ km

ii) What is the length of EF, to one decimal place? 2

$\frac{EF}{\sin 10^\circ} = \frac{82}{\sin 139^\circ}$

1 mark for 10°

$EF = 21.704$ } either (1)

$= 21.7$ km

iii) Calculate the area of the course $EFGH$. Answer correct to one decimal place. 3

Area $EFG = \frac{1}{2} \times 82 \times 64 \times \sin 10^\circ$

$= 455.652...$ (1)

Area $GEH = \frac{1}{2} \times 57.98 \times 57.98$

$= 1680.8402$ (1)

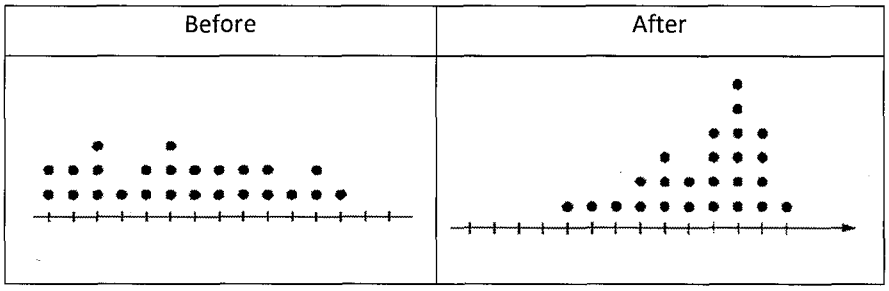
total area $= 455.652... + 1680.8402$

$= 2136.4922$ } either (1)

$= 2136.5$ km^2

Section C: Data (17 marks)

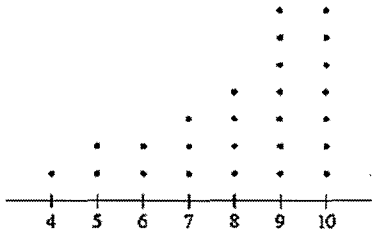
1. The dot plots below are drawn on the same scale. They show the class scores in tests taken before and after a unit of work was completed.



Which statement about the change in scores is correct?

A. The mean increased and the standard deviation decreased.
B. The mean increased and the standard deviation increased.
C. The mean decreased and the standard deviation decreased.
D. The mean decreased and the standard deviation increased.

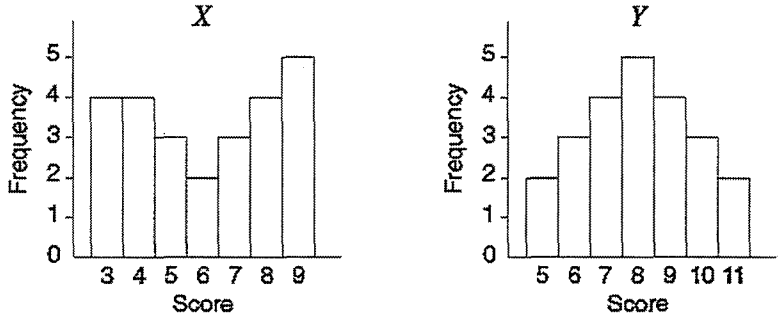
2. A set of data is displayed in this dot plot.



Which of the following best describes this set of data?

A. Symmetrical
B. Positively skewed
C. Negatively skewed
D. Normally distributed

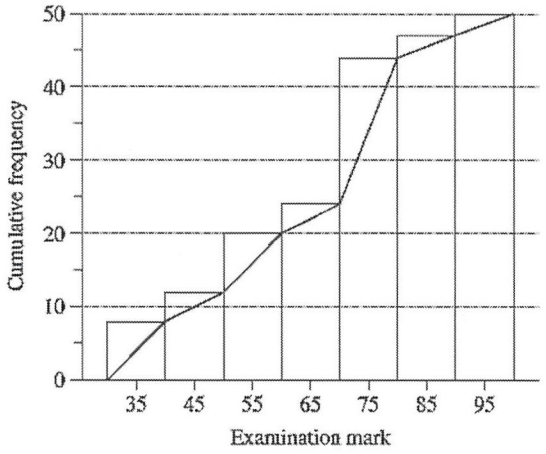
3. The sets of data, *X* and *Y*, are displayed in the histograms.



Which of these statements is true?

A. X has a larger mode and *Y* has a larger range.
B. X has a larger mode and the ranges are the same.
C. The modes are the same and *Y* has a larger range.
D. The modes are the same and the ranges are the same.

4. A set of examination results is displayed in a cumulative frequency histogram and polygon (ogive).



Sam knows that his examination mark is in the 4th decile. Which of the following could have been Sam's examination mark?

A. 37 (B.) 57 C. 67 D. 77

5. A soccer referee wrote down the number of goals scored in 9 different games during the season. 2

1, 3, 3, 3, 5, 5, 8, 9, *N*

The last number (*N*) has been omitted. The range of the data is 11.
What is the five-number summary for this data set?

1 3 5 8.5 12

-1 each mistake

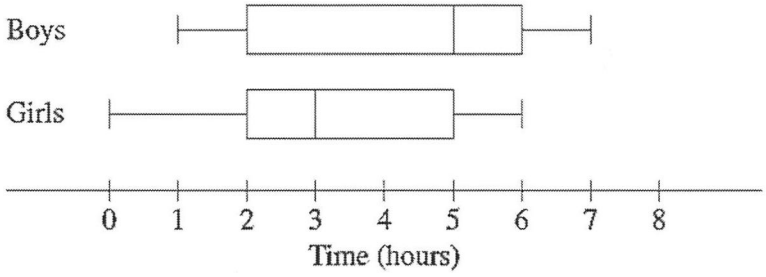
ii) Is the score of 1 an outlier for this set of data? Justify your answer with calculations. 2

IQR = 8.5 - 3
= 5.5

Lower Limit = 3 - 1.5 × 5.5
= -5.25 (1) must have justification

∴ 1 > -5.25 not an outlier.

6. In a school, boys and girls were surveyed about the time they usually spend on the internet over a weekend. These results were displayed in box-and-whisker plots, as shown below.



i) Find the interquartile range for boys. 1

$6 - 2 = 4$

ii) What percentage of girls usually spend 5 or less hours on the internet over a weekend? 1

75 %

iii) Compare and contrast the two data sets by commenting on the measures of the location and spread. 3

- The median for boys is higher than the girls. (1)
- The range of the boys is higher than the girls (1)
- The IQR for the boys is higher than the girls

either.

- Girls are more consistent.

- "Boys" is negatively skewed and "Girls" is positively skewed. (1)

7. A shop sells two brands of DVDs, Starlight and Starbright. Both brands sell for the same price. The shop decides to discontinue one of the brands. The sales of each brand in the 10 week period before one of the brands is discontinued is recorded, and shown in the ordered back – to-back stem and leaf plot below.

Starlight		Starbright
4 3 3	1	8 9
8 6 5	2	1 6 6
4 2	3	1 3 3 4
1	4	0
5	5	

i) Complete the table below. 3

	Mean	Median	Standard Deviation
Starlight	28.1	27	12.7
Starbright	28.1	27	6.9

ii) Which brand should be discontinued? Justify your answer. 1

The Starlight brand should be discontinued as the SD is larger, which means it is less consistent.

End of Paper