TRINITY GRAMMAR SCHOOL

Mathematics Department

2013

HALF YEARLY EXAMINATION
HSC ASSESSMENT TASK 3

Year 12

General

Mathematics

General Instructions

- Reading time – 5 minutes
- Working time – 2½ hours
- Write using black or blue pen
  Black pen is preferred
- Board-approved calculators may
  be used
- A formula sheet is provided
- Show all necessary working in
  Questions 26 – 30
- Write your Board of Studies Student
  Number **and** Class Teacher on the
  answer sheet **and** writing booklet(s) **or**
  sheet(s) submitted
- **WEIGHTING:** 30%

Total marks – 100

(**Section I**) Pages 2 – 6

25 marks

- Attempt Questions 1 – 25
- Allow about 30 minutes for this section

(**Section II**) Pages 7 – 16

75 marks

- Attempt Questions 26 – 30
- Allow about 2 hours for this section

Section I 25 marks

- Circle the correct response on the answer sheet provided
- Each question is worth 1 mark

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1 Calculate the simple interest earned on $ 2 000 if invested for 3 years at 12% pa.

(A) $ 2 720   (B) $ 800   (C) $ 2 800   (D) $ 720

2 A television is advertised for $ 1 100 cash or on terms at 20% deposit and $40 per month for 2 years. If buying on terms, how much more will the television cost than if bought for cash?

(A) $ 1 180   (B) $ 80   (C) $ 220   (D) $ 960

3 Andrew is charged 0.04% compound interest per day on his credit card purchase of $ 1 200. Find the amount of interest owing after 30 days.

(A) $ 14.48   (B) $ 4.80   (C) $ 14.40   (D) $ 12.00

4 Simplify: $3(2x - 1) - 2(x + 1)$

(A) $4x - 1$ (B) $4x - 5$ (C) $4x$ (D) $4x + 5$

5 A number is decreased by 4, then this amount is doubled. The result is 80. Which equation best represents this information?

(A) $2(x - 4) = 80$ (B) $4 - 2x = 80$ (C) $2x - 4 = 80$ (D) $2(4 - x) = 80$

6 The length of a rectangle is 5cm more than its width. The width is w cm. What is the area of the rectangle?

(A) $5w\ cm^2$ (B) $(w^2 + 5)cm^2$ (C) $(w^2 + 5w)cm^2$ (D) $(5w + 10)cm^2$

7   Simplify: $\dfrac{24x^2y^8}{12x^6y^2} =$

(A) $\dfrac{2y^6}{x^4}$ (B) $2x^3y^4$ (C) $\dfrac{2y^4}{x^3}$ (D) $2x^4y^6$

8   Solve: $2x - 1 = x + 3$

(A) $x = 2$ (B) $x = -4$ (C) $x = 4$ (D) $x = -2$

9   Given $E = mc^2$, find c if $m = 0.05$ and $E = 4.5 \times 10^{15}$.

(A) 1.5×10^7 (B) 3.0×10^8 (C) 1.0×10^{15} (D) 2.0×10^{16}

10   Find the length of the longest piece when 50cm of timber is cut in the ratio 1:2:7.

(A) 35cm   (B) 10cm   (C) 36cm   (D) 7cm

11   Jim's car uses 8 litres of petrol to travel 100km. Petrol costs 69 cents per litre. How far can he drive using $ 20 worth of petrol?

(A) 276km   (B) 232km   (C) 431km   (D) 362km

12   A real estate agent sells a house for $ 500 000. From the selling price he earns $ 10 000 for his services. Which term is used to describe the money he earns?
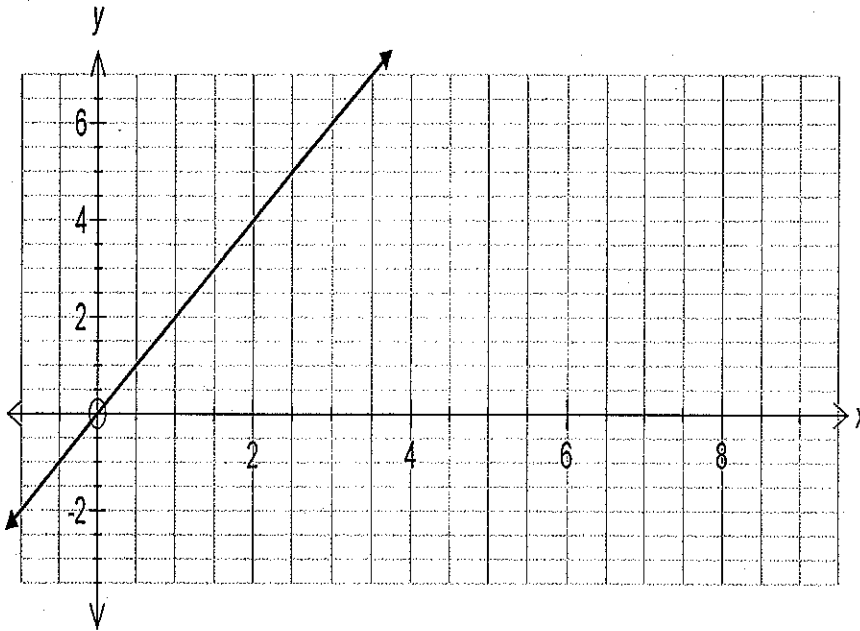
(A) Income tax   (B) Royalty   (C) Commission   (D) Superannuation

13 Stella drew the graph below.

What is the gradient of the line?

(A) 1   (B) 2   (C) −   (D) -2

14 Use the set of scores 1, 1, 1, 2, 2, 3, 3, 3, 3, 4, 5, 5, 6, to **answer Questions 14, 15 and 16.**

What is the range of the scores?

(A) 6   (B) 5   (C) 4   (D) 3

15 What is the mode of the scores?

(A) 2   (B) 1   (C) 5   (D) 3

16 What is the mean of the scores?

(A) 3.5   (B) 3   (C) 2.5   (D) 2

17 Two dice are rolled. What is the probability that one of the dice shows a six?

(A) $\frac{5}{36}$ (B) $\frac{11}{36}$ (C) $\frac{5}{18}$ (D) $\frac{1}{6}$

18   Bob purchased a camera for $ 990 while on holidays in Australia. The price included

10% GST. When he left Australia he received a refund of the GST. What was Bob's refund?

(A) $ 90   (B) $ 99   (C) $ 891   (D) $ 900

19   Which equation represents the relationship between x and y in this table?

x	0	1	2	3
y	5	3	1	-1

(A) $y = \frac{1}{2}x + 5$ (B) $y = -x + 2$ (C) $y = 5x - 2$ (D) $y = -2x + 5$

20   Max is planning to roll a standard six-sided die 120 times. How many times would he expect
to roll a 2?

(A) 10   (B) 20   (C) 30   (D) 60

21   The mean of a set of 5 scores is 62. What is the new mean of the set of scores after a score
of 50 is added?

(A) 40   (B) 50   (C) 60   (D) 62
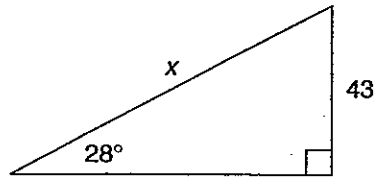

22   What is the bearing of A from B?

N

A ⟩150°   NOT TO
                 SCALE

•B
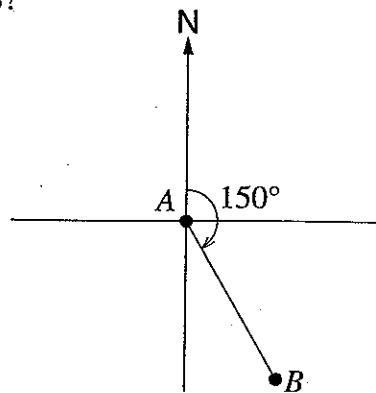
(A) 030°   (B) 150°   (C) 210°   (D) 330°

23 What is 0.000 024mm expressed in scientific notation?

(A) $24 \times 10^{-6}mm$ (B) $2.4 \times 10^{-5}mm$ (C) $2.4 \times 10^{4}mm$ (D) $2.4 \times 10^{6}mm$

24 Calculate the value of x to one decimal place.

(A) 38.0 (B) 20.2 (C) 48.7 (D) 91.6

25 How many square centimetres are in 0.0085 square metres?

(A) 0.85 (B) 8.5 (C) 85 (D) 8 500

End of Section I

Section II   75 marks

- Begin each question in a new writing booklet or on a new answer sheet
- Each question is worth 15 marks

Question 26   (15 marks)

a)   Jeff has two packets of jelly beans. Each packet contains one black, and five yellow jelly beans. Jeff takes one jelly bean from each packet without looking. What is the probability that both of the jelly beans are black?   **2**

b)   Andrew has 4 different English books and 1 Maths book. He wishes to arrange these books on a shelf. In how many ways can the books be arranged?   **1**

c)   A committee of three people is to be chosen at random from a group of eight people. How many different committees can be formed?   **1**

d)   For a three-day long weekend (Saturday to Monday), the probability of rain on any of these days is 0.4.

i) Copy **and** complete the tree diagram for the long weekend in your answer booklet.   **1**
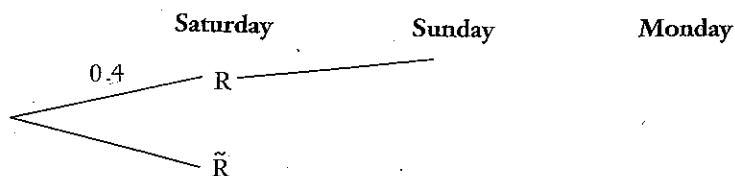
ii) Calculate the probability that over the long weekend there is exactly one rainy day.   **2**

iii) Calculate the probability that over the long weekend there is at least one rainy day.   **2**

e) John rolls a pair of dice in a game of chance that costs $ 1 per roll. The table lists the financial outcome for each event.

EVENT	FINANCIAL OUTCOME
Double	Win $ 2
Sum of 7	Win $ 3
Odd sum (except 7)	Win $ 1 (money back)
Even sum (except a double)	Lose $ 2

i) Calculate the financial expectation for this game.   2

ii) On average, will he make a profit or loss? Give a reason for your answer.   1

f)   Solve: $\dfrac{3x+1}{2} - \dfrac{x}{3} = 1$ 3

Question 27 commences on next page.

Question 27 **(15 marks)**   **Begin a NEW answer booklet or answer sheet**

a)   Sandra borrowed $ 13 500 at 15%pa flat interest for a second hand car to be repaid in fortnightly instalments over 3 years.

    i)   Calculate the simple interest charged over 3 years.   **2**

    ii)   How much will the car cost altogether?   **1**

    iii)   How much is each fortnightly instalment?   **1**

b)   The table below is used to calculate monthly loan repayments on reducing balance loans.

Monthly repayments per $ 1000 borrowed

Interest rate (% p.a.)			Term (years)		
	5	**10**	**15**	**20**	**25**
5	$ 18.87	$ 10.61	$ 7.91	$ 6.60	$ 5.85
5.5	$ 19.10	$ 10.85	$ 8.17	$ 6.88	$ 6.14
6	$ 19.33	$ 11.10	$ 8.44	$ 7.16	$ 6.44
6.5	$ 19.57	$ 11.35	$ 8.71	$ 7.46	$ 6.75

Andy borrowed $ 250 000 at 6.5%pa for 25 years.

    i)   What is his monthly loan repayment?   **1**

    ii)   What total amount does he repay?   **1**

    iii)   How much interest does he pay?   **1**

c)   Expand and simplify: $2x - 3 - (x - 3)$ **2**

d) Calculate $\sqrt{(3.7 \times 10^{-1})^3}$ correct to **two decimal places.** 2

e) If $D = \dfrac{yA}{y+12}$, evaluate A if $D = 15$ and $y = 2$. 2

f) For the equation $3x - 2y + 1 = 0$, state the gradient **and** y-intercept. 2

Question 28 commences on the next page.

Question 28   (15 marks)   **Begin a NEW answer booklet or answer sheet**

a)   A car travelled 20m in 2 seconds. What is its speed in km/hr?   **2**

b)   A surveyor made this notebook entry to sketch a building block, with measurements shown in metres.

```
                    C
                    30
            D 10 |  25
                    10 | 15 B
                    0
                    A
```
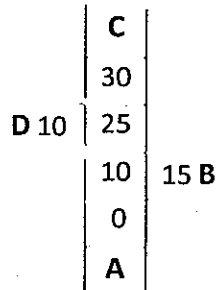
   i)   Draw a diagram of the building block showing all measurements.   **2**

   ii)   Calculate the area of the block.   **2**

   iii)   A fence is to be constructed along BC. If fencing costs $ 30 per metre, calculate the cost to fence BC.   **2**

c)   Calculate the volume of a hemisphere which has a diameter of 10cm.

       (Answer to 2 decimal places)   **2**

d) Calculate the area of the sector to 2 decimal places.   **2**

8 cm   70°   8 cm
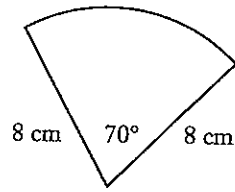
e) For the cylinder below, calculate:

12 cm

|← 24 cm →|
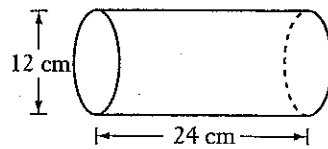
i) The surface area to 2 decimal places.   **2**

ii) The volume to 2 decimal places.   **1**

Question 29 commences on the next page.

Question 29 (15 marks)   Begin a NEW answer booklet or answer sheet

a)   Barry wishes to survey his school population. He obtains a school roll and surveys every 10th student. What is this method of sampling best known as?   **1**

b)   The number of goals scored in a soccer game would be referred to as numerical data. But more specifically it can be best classified as what type of data?   **1**

c)   For the data in the table below, calculate the mean to 1 decimal place.   **1**

Score (x)	Frequency (f)
1	2
2	4
3	7
4	3

d)   The scores below represent quiz results for a Maths class of 12 students on a Pre-test and on a Post-test.

Pre-test: 0, 1, 5, 7, 8, 10, 10, 11, 11, 13, 15, 20

Post-test: 10, 11, 12, 12, 16, 19, 21, 25, 27, 29, 29, 30

   i)   **In your writing booklet** display the data in a back-to-back stem-and-leaf plot, using the stem given.   **2**

Pre-test	Stem	Post-test
	0	
	1	
	2	
	3	

   ii)   Between the pre-test and post-test the teacher altered their teaching style. Is the teacher justified in thinking that their new style improved the performance of the students on the post-test? Comment on the location, spread and shape of the display to justify your answer.   **3**

e) Copy the number line into your writing booklet.
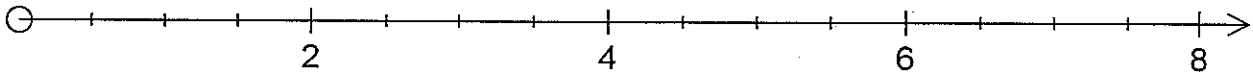
For the set of scores below calculate the five-figure summary then use them to construct on the number line the box-and-whisker plot.

1, 6, 4, 3, 2, 5, 6, 5, 7, 4, 4   **4**

f) A group of people were surveyed on their smoking habits. Using the two-way table:

	Male	Female
Smoker	50	60
Non-smoker	80	30

i) How many female smokers were there?   **1**

ii) What percentage of non-smokers were male?   **1**

g) Which measure of location is mostly affected by an outlier?   **1**

Question 30 commences on the next page.

Question 30   (15 marks)   Begin a NEW answer booklet or answer sheet

a)   A boat is 420m from the base of a cliff. The angle of depression of the boat from the top of
     the cliff is 28°. Find the height of the cliff to the nearest metre.   **3**

b)   A canoeist paddles 3 kilometres west, then 3 kilometres south. Calculate the canoeist's true
     bearing from its original position.   **2**

c)   The radial survey of a tract of land is shown below.

J (351°)

63 m

NOT TO
SCALE

52 m

(255°) M

O   40 m   K (090°)

61 m

L (172°)
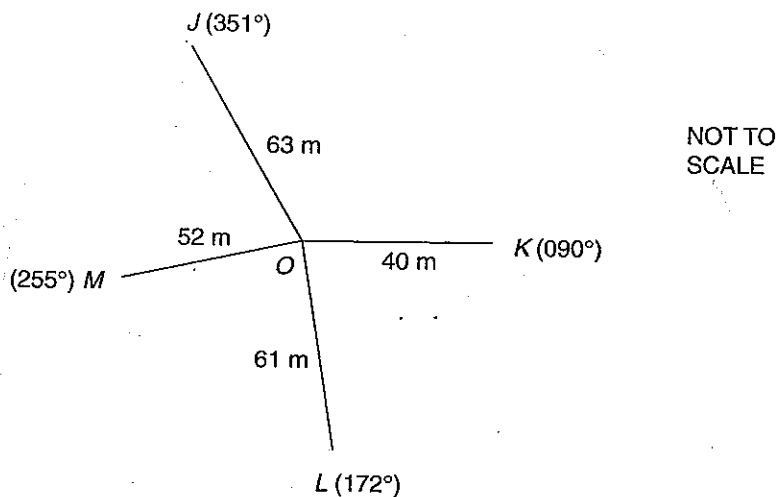
   i)   Find the size of angle JOK.   **1**

   ii)   Find the area of triangle JOK to the nearest square metre.   **1**

   iii) Find the length of JK to the nearest metre.   **2**

Question 30 continues on the next page.

d) Calculate the shaded area to 2 decimal places in the diagram below. **3**
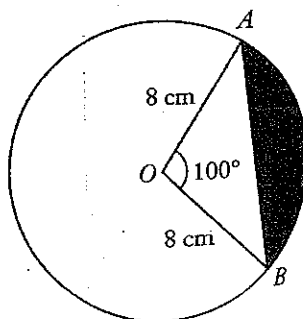
e) Anthea observes a tower at an angle of elevation of $11°$. Walking 80m towards the tower, she found that the angle of elevation increased to $36°$. Find the height of the tower to the nearest metre. **3**

End of Section II

End of Examination

Solutions

TRINITY GRAMMAR SCHOOL
2013, Year 12 General Mathematics
Half Yearly Examination, HSC Assessment Task 3
SECTION I
ANSWER SHEET

Name: ....   Class Teacher: ....

Be sure to write your answers for Section I on this answer sheet. After you have selected an answer, **CIRCLE** the correct answer. To change an answer, erase your previous mark completely, and then record your new answer. Mark only one answer for each question.

Q1.	A	B	C	**(D)**						
Q2.	A	**(B)**	C	D		**Q14.**	A	**(B)**	C	D
Q3.	**(A)**	B	C	D		**Q15.**	A	B	C	**(D)**
Q4.	A	**(B)**	C	D		**Q16.**	A	**(B)**	C	D
Q5.	**(A)**	B	C	D		**Q17.**	A	B	**(C)**	D
Q6.	A	B	**(C)**	D		**Q18.**	**(A)**	B	C	D
Q7.	**(A)**	B	C	D		**Q19.**	A	B	C	**(D)**
Q8.	A	B	**(C)**	D		**Q20.**	A	**(B)**	C	D
Q9.	A	**(B)**	C	D		**Q21.**	A	B	**(C)**	D
Q10.	**(A)**	B	C	D		**Q22.**	A	B	C	**(D)**
Q11.	A	B	C	**(D)**		**Q23.**	A	**(B)**	C	D
Q12.	A	B	**(C)**	D		**Q24.**	A	B	C	**(D)**
Q13.	A	**(B)**	C	D		**Q25.**	A	B	**(C)**	D

(26) a) $P(BB) = \frac{1}{6} \times \frac{1}{6}$ — ① for one block

$= \frac{1}{36}$ — ① for answer

b) $5! = 120$ — ①

c) $\frac{8 \times 7 \times 6}{3 \times 2 \times 1} = {^8C_3} = 56$ — ①

d) i)

— ① for correct prob's
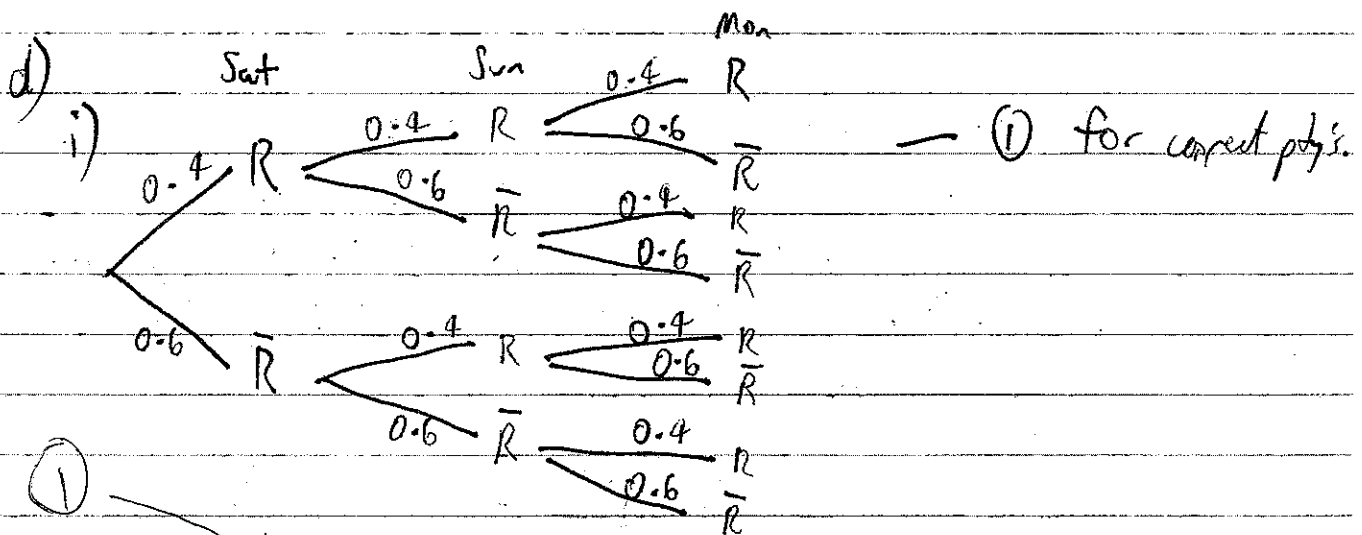
ii) $(0.4 \times 0.6 \times 0.6) \times 3 = 0.432$ — ①

iii) $1 - 0.6^3 = 0.784$ — ①   ①

e) i) $F \cdot E = \left(\frac{1}{6} \times 2\right) + \left(\frac{6}{36} \times 3\right) + \left(\frac{12}{36} \times 1\right) - \left(\frac{12}{36} \times 2\right)$ — ①

$= \frac{1}{3} + \frac{1}{2} + \frac{1}{3} - \frac{2}{3}$

$= 50¢$ — ①

ii) Loss — it costs $1 — ① must have a reason
to play ∴ lose 50¢.

f) $x^6\left(\dfrac{3x+1}{2}\right) - {}^{x}6\left(\dfrac{x}{3}\right) = 1^{x \cdot 6}$ ——①

$3(3x+1) - 2x = 6$

$9x+3 - 2x = 6$ ——①

$7x = 3$

$x = \dfrac{3}{7}$ ——①

$\diagup 5$

27

a) i) $SI = 13500 \times 0.15 \times 3$ — ①

$= \$6075$ — ①

ii) total cost $= 13500 + 6075$

$= \$19575$ — ①

iii) instalment $= 19575 \div 78$

$= \$250.96$ — ①

b) i) monthly repay $= 6.75 \times 250$

$= \$1687.50$ p month — ①

ii) total repay $= 1687.50 \times 25 \times 12$

$= \$506,250$ — ①

iii) Int $= 506250 - 250000$

$= \$256,250$ — ①

c) $\quad 2x - 3 - (x - 3)$

$= 2x - 3 - x + 3$ — ①

$= x$ — ①

d) $\sqrt{(3.7 \times 10^{-1})^3} = 0.2250622... \quad — \text{①}$

$= 0.23 \quad — \text{①}$

* rounding Q.
must have 0.23 for
2 marks.

e) $D = \dfrac{yA}{y+12}$

$15 = \dfrac{2A}{2+12} \quad — \text{①}$

$210 = 2A$

$A = 105 \quad — \text{①}$

f) $3x - 2y + 1 = 0$

$2y = 3x + 1$

$y = \dfrac{3}{2}x + \dfrac{1}{2}$

$\therefore m = \dfrac{3}{2} \quad — \text{①}$

$b = \dfrac{1}{2} \quad — \text{①}$

15

(28)

a) $20 m/2 sec = 0.02 km/2 sec$
    $ = 0.01 km/sec$ ×3600 } — ①

    $= 36 km/hr$ — ①

b) i)
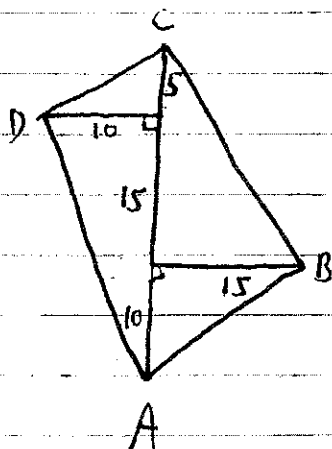
① for correct measurements
① for labelling and correct slope.

ii) Area $= \left(\frac{1}{2} \times 30 \times 10\right) + \left(\frac{1}{2} \times 30 \times 15\right)$ — ①

    $= 150 + 225$

    $= 375 m^2$ — ①

iii) $BC = \sqrt{15^2 + 20^2}$

    $BC = 25$ — ④

    $\therefore cost = 25 \times \$30$

    $= \$750$ — ①

c) $V = \frac{4}{3} \times \pi \times 5^3 \times \frac{1}{2}$ — ①

    $= 261.799...$

    $= 261.80 cm^3$ — ①

d)

$$A = \frac{70}{360} \times \pi \times 8^2 \quad — \text{①}$$

$$= 39.095..$$
$$= 39.10 \text{ cm}^2 \quad — \text{①}$$

e) i) $S.A = 2\pi r^2 + 2\pi r h$

$$= 2 \times \pi \times 6^2 + 2 \times \pi \times 6 \times 24 \quad — \text{①}$$

$$= 72\pi + 288\pi$$

$$= 1130.97335..$$
$$= 1130.97 \text{ cm}^2 \quad \Big] — \text{①}$$

ii) $V = \pi \times 6^2 \times 24$

$$= 2714.33605..$$
$$= 2714.34 \text{ cm}^3 \quad \Big] — \text{①}$$

/5

(29) a) Systematic — ①

b) Discrete — ①

c)

x	f	fx
1	2	2
2	4	8
3	7	21
4	3	12
	16	43

$$\bar{x} = \frac{43}{16} = 2.6875 \left.\begin{array}{c} \\ \\ \end{array}\right] — ①$$
$$\doteqdot 2.7$$

d) i)

Pre-test	Stem	Post-test
8 7 5 1 0	0	
5 3 1 1 0 0	1	0 1 2 2 6 9
0	2	1 5 7 9 9
	3	0

must be ordered
only penalise once

① →

← ①

ii) — both sets are positive skewed ⎤
     — spread is similar in both ⎦ — ①

     — location has increased in Post test — ①
       (higher mean)

     ∴ Yes he is justified — ①

e)   1, 2, 3, 4, 4, 4, 5, 5, 6, 6, 7

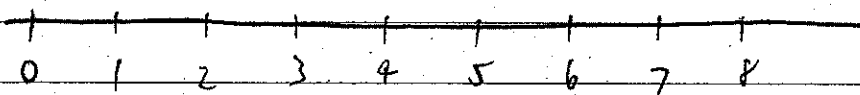min = 1
$Q_1 = 3$
$Q_2 = 4$
$Q_3 = 6$
Max = 7

② for five figure summary
② for box and whisker
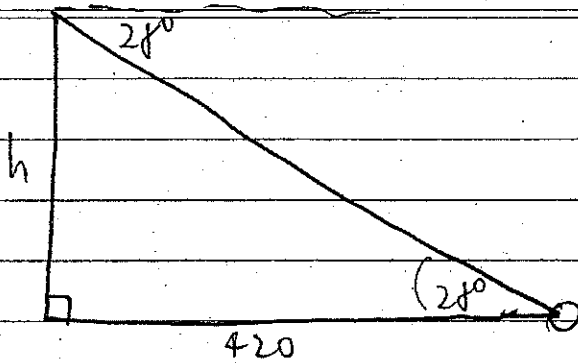(lose one mark for each mistake)

f) i)   60   —   ①

ii) $\dfrac{80}{110} \times 100\% = 72.727\%$ ⎤—①
                     $\doteqdot 73\%$

g)   mean   —   ①

15

30 **a)**

— ① for diagram

$$\tan 28° = \frac{h}{420} \qquad — ①$$

$$h = 420 \times \tan 28°$$

$$= 223.31796.. \left. \right\}— ①$$
$$= 223\text{m}$$

b)

$$\tan \theta = \frac{3}{3} \qquad ①$$

$$\theta = 45° \qquad ①$$
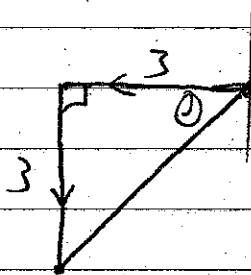
∴ bearing is $225°$ T $(or \; S45°W)$

c) i) $99°$ — ①

ii) $A = \frac{1}{2} \times 63 \times 40 \times \sin 99$

$$= 1244.487.. \left. \right\}— ①$$
$$= 1244 \text{m}^2$$

iii) $JK^2 = 63^2 + 40^2 - 2 \times 63 \times 40 \times \cos 99°$ — ①

$$= 6357.4297..$$

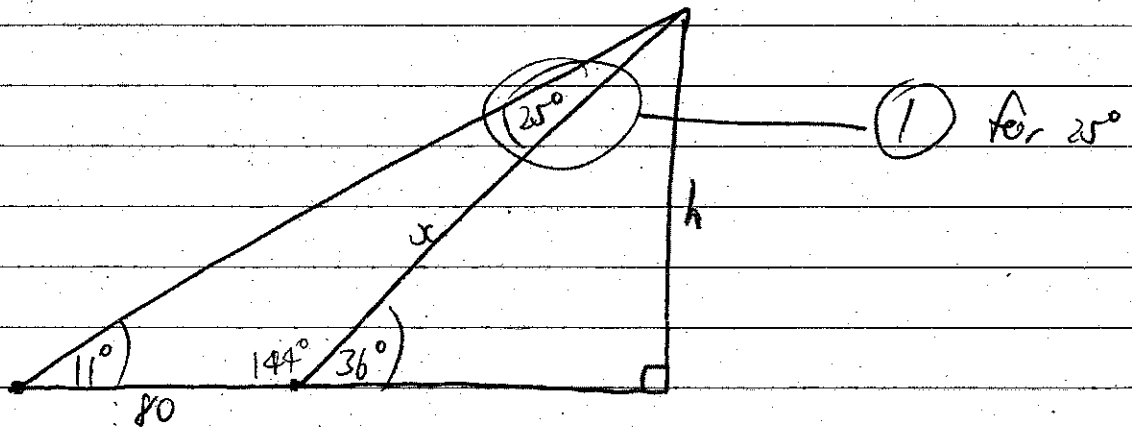$$∴ JK = 79.73 \text{m} \doteqdot 80\text{m} \qquad — ①$$

d) $S.A = \left(\dfrac{100}{360} \times \pi \times 8^2\right) - \left(\dfrac{1}{2} \times 8 \times 8 \times \sin 100°\right)$ ①

        ①

$= 55.850536 \quad - \quad 31.5138..$

$= 24.34156$

$= 24.34 \text{ cm}$] —— ①

e)

     ① for 25°

$\dfrac{x}{\sin 11°} = \dfrac{80}{\sin 25°}$

$x = \dfrac{80}{\sin 25} \times \sin 11°$ ①

$= 36.11940$

$\sin 36° = \dfrac{h}{x}$

$\therefore h = 36.1194 \times \sin 36°$ ①

$= 21.2304$]

$= 21 \text{ m}$

/15