Name : ____________________ (   )

Class : ________

Section A

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Cedar Girls' Secondary School
End-of-Year Examination
2006

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Subject	:	**Mathematics**
Paper	:	**4017 (Section A)**
Level	:	**Secondary Three**
Duration	:	**1 hour 15 minutes**
Date	:	**3 October 2006**

INSTRUCTIONS TO CANDIDATES

1. All questions in Section A must be attempted.
2. Answers to Section A are to be written in the SPACES provided in the question booklet.
3. The use of calculators is not allowed in the computation of answers in Section A. All calculators must be placed on the floor.
4. Working must be shown clearly in ink.
5. Omission of essential working will result in loss of marks.
6. **Section A will be collected after 1 hour 15 minutes. You can begin to work on Section B before the end of 1 hour 15 minutes provided that the calculator is not used.**

Additional Materials:

1. Nil

....

This section consists of 10 printed pages

Answer **all** questions.
Calculators must not be used in this section.

1 Simplify

(a) $1\frac{3}{4}+\left(\frac{25}{16}\right)^{\frac{1}{2}}\div\left(\frac{2}{5}\right)^{-1}$,

(b) $\frac{ab^{-1}}{3c}\div\left(\frac{2a}{3c}\right)^{2}$.

Answer : (a) .....[1]

(b) .....[1]

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2 Make p the subject of $p+q=\frac{3pq+r}{2p+q}$.

Answer : .....[2]

3 **(a)** Factorise $x^6 - 3x^3 + 2$.

(b) Solve $\frac{1}{2(m-1)} + \frac{3}{(m+1)} = 1$.

Answer : (a) .....[1]

(b) .....[2]

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4 Using as much of the information given below as is necessary, evaluate

(a) $\sqrt{12500}$,

(b) $\sqrt{0.5}$.

$[\sqrt{12.5} = 3.54,\ \sqrt{125} = 11.2.]$

Answer : (a) .....[1]

(b) .....[1]

5 **(a)** Solve the inequality $-4t+7 \leq 5 \leq 3t+4$

(b) Given x and y are integers such that $-5 \leq x \leq 2$ and $-1 \leq y \leq 4$, find

(i) the greatest possible integer value of $\frac{x^2}{y}$,

(ii) the least possible integer value of $(x-y)(x+y)$.

Answer : (a) .....[2]

(b)(i) .....[2]

(ii) .....[2]

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6 A regular polygon has n sides. The size of each interior angle is 5 times the size of each exterior angle.

(a) Calculate the value of each exterior angle.

(b) State the value of n.

Answer : (a) .....[1]

(b) .....[1]

7 **(a)** The variables a and b are such that a is directly proportional to b^2. It is known that $a = 8$ for a particular value of b. Find the value of a when this value of b is doubled.

(b) **(i)** Given that y is inversely proportional to $(x-1)^2$, $x > 1$ and that $y = 8$ when $x = 6$, find the value of x when $y = 2$.

(ii) Sketch the graph that shows the relationship of y and x in the diagram below.

[1]

Answer : (a) .....[2]

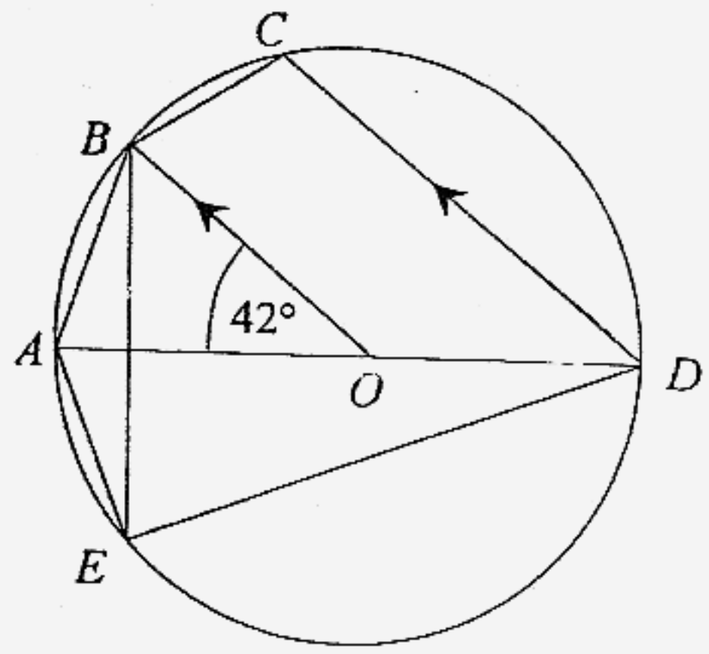
(b)(i) .....[2]

8 In the diagram below, A, B, C, D and E are points on the circle with centre at O.
AD is a diameter of the circle, and BO and CD are parallel lines.
Given that $\angle AOB = 42°$, find

(a) $\angle ABO$,

(b) $\angle AEB$,

(c) $\angle BCD$.



Answer : (a) .....[1]

(b) .....[1]

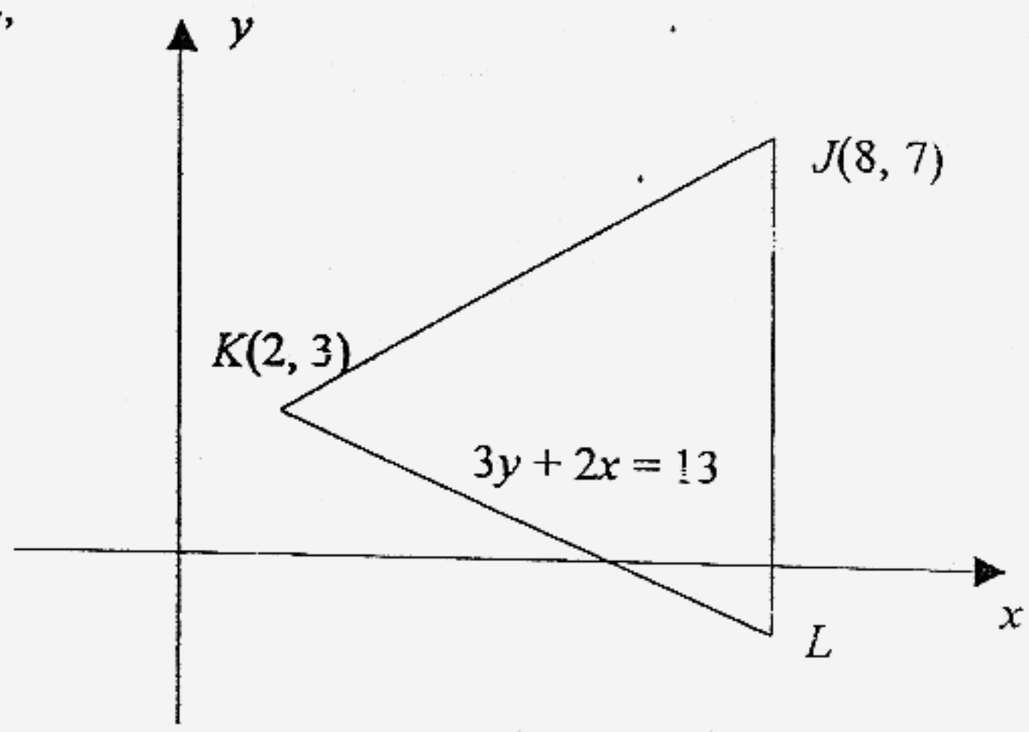
(c) .....[2]

9 In the diagram, J is the point (8, 7) and K is the point (2, 3). Given that JL is parallel to the y-axis and the equation of the line KL is $3y + 2x = 13$, find

(a) the equation of the line KJ,

(b) the coordinates of the point L,

(c) the area of ΔJKL.



Answer : (a) .....[2]

(b) .....[1]

(c) .....[2]

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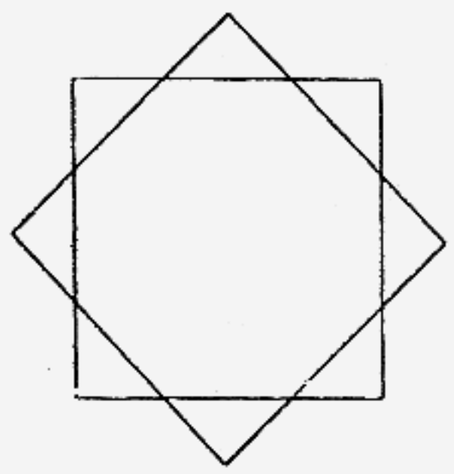
10 The figure below is made up of two identical squares overlapping each other.

State

(a) the number of lines of symmetry,

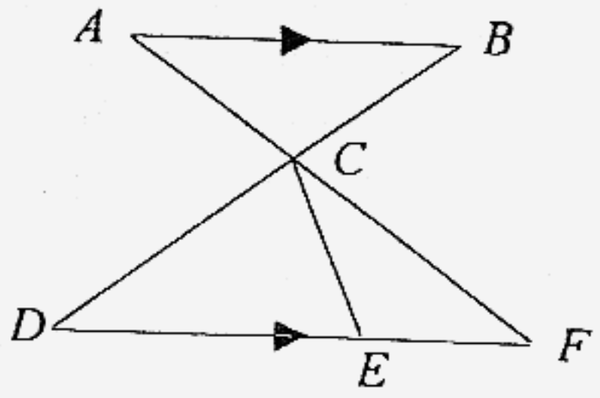
(b) the order of rotational symmetry.



Answer : (a) .....[1]

(b) .....[1]

11 In the diagram, AB is parallel to DF and E is a point on DF such that $DE : EF : AB = 3 : 1 : 2$. The area of ΔCDE is 15 cm^2.



(a) Show that ΔABC is similar to ΔFDC.

(b) Calculate the value of

(i) $\dfrac{\text{area of } \Delta FDC}{\text{area of } \Delta ABC}$,

(ii) area of ΔCEF.

Answer: (a).....

.....

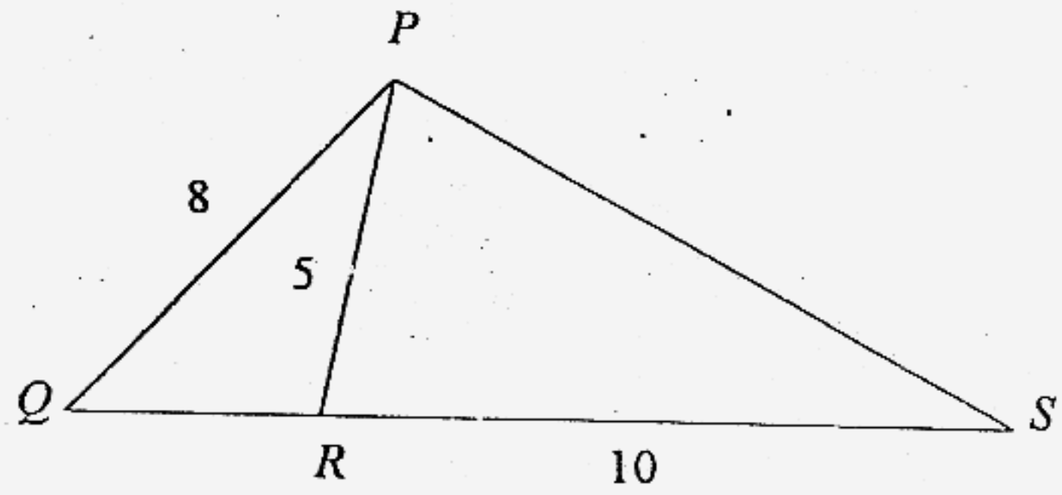
.....[1]

Answer : (b)(i) .....[1]

(ii) .....[2]

12 In the diagram below, QRS is straight line, $PQ = 8$ cm, $PR = 5$ cm, $RS = 10$ cm and $\sin \angle PRS = \frac{4}{5}$. Find

(a) area of ΔPRS,
(b) $\cos \angle PRQ$,
(c) $\sin \angle PQS$.



Answer : (a) .....[1]

(b) .....[2]

(c) .....[1]

13 The table below shows the number of goals scored in each match in a particular football league.

No. of goals scored	1	2	3	4	5	6
Frequency	7	6	x	2	3	1

(a) Write down the largest possible value of x given that the mode is 1.
(b) Write down the largest possible value of x given that the median is 2.
(c) If $x = 1$, calculate the mean.

Answer : (a) .....[1]

(b) .....[1]

(c) .....[2]

14 240 students are divided into three groups according to the amount of pocket money they received per week.

Group I: Those who received less than \$5.
Group II: Those who received at least \$5 but less than \$15.
Group III: Those who received at least \$15 but less than \$20.

	Group I	Group II	Group III
Pocket money (\$)	$0 \le p < 5$	$5 \le p < 15$	$15 \le p < 20$
No. of students	60	100	80

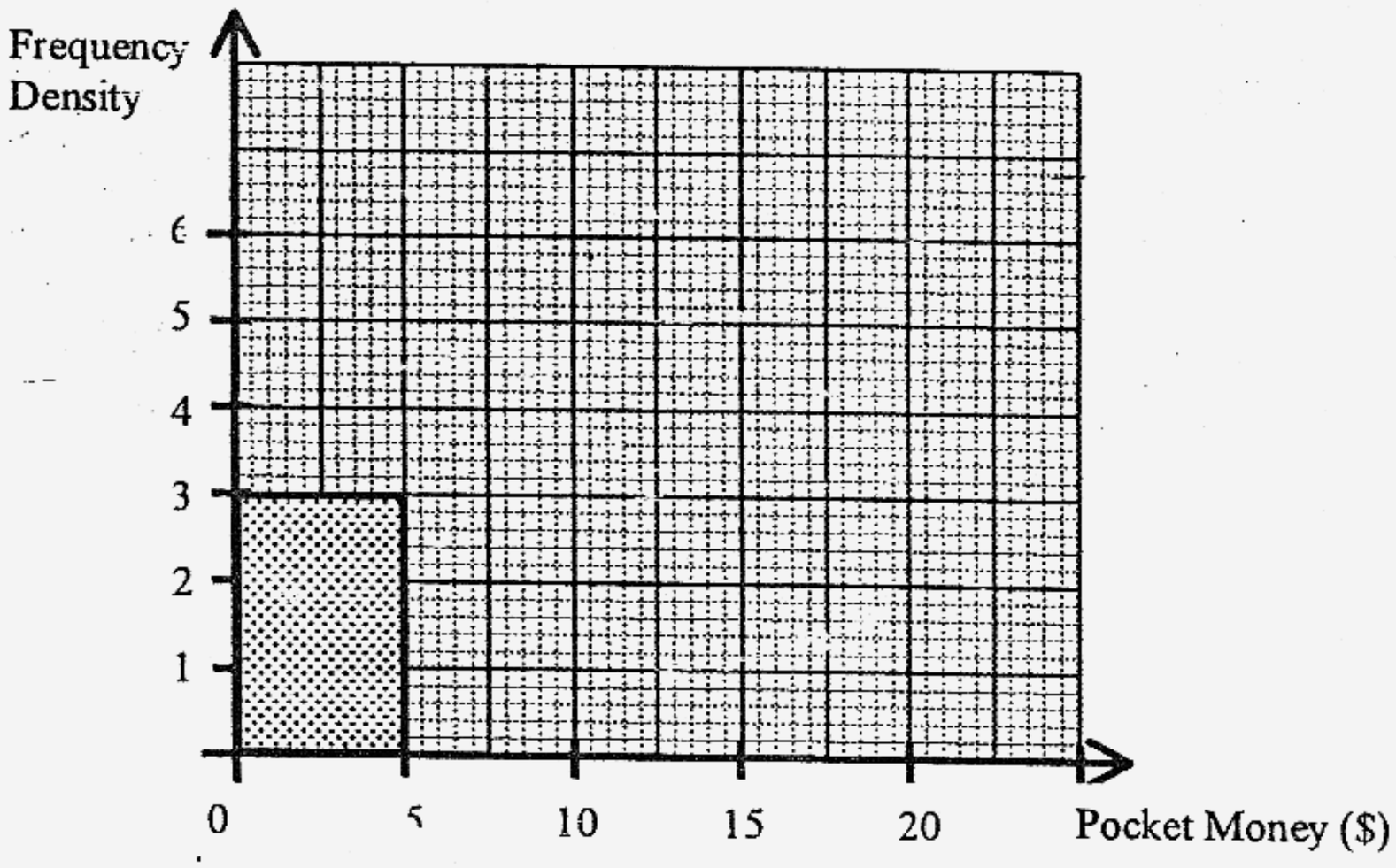
(a) **(i)** State the modal class.

(ii) Calculate the mean amount of pocket money received per week.

Answer : (a)(i) .....[1]

(ii) .....[2]

(b) Use the information given above to complete the histogram.



[2]

End of Section A

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Cedar Girls' Secondary School
End-of-Year Examination
2006

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Subject	:	**Mathematics**
Paper	:	**4017 (Sections B and C)**
Level	:	**Secondary Three**
Duration	:	**1 hour 15 minutes**
Date	:	**3 October 2006**

INSTRUCTIONS TO CANDIDATES

1. Answer **ALL** questions in **Section B**, and **ONE** question in **Section C**.
2. Answers to both Sections B and C are to be written in the writing paper provided.
3. Calculators can be used in the computation of answers in Sections B and C.
4. The number of marks is given in brackets [ ] at the end of each question or part question.
5. Working must be shown clearly in ink.
6. Omission of essential working will result in loss of marks.
   If the degree of accuracy is not specified in the question, and if the answer is not exact, the answer should be given to three significant figures.
   Answers in degrees should be given to one decimal place.
   For π, use either your calculator value or 3.142, unless the question requires the answer in terms of π.

Additional Materials:

1. 6 sheets of writing paper
2. 1 sheet of graph paper

This section consists of 8 printed pages

Section B [40 marks]
Answer **all** questions in this section.

15 **(a)** The product of two consecutive positive integers is 155 more than their sum.

(i) By taking the smaller integer to be x, use the above information to form an equation, in terms of x, and show that it simplifies to

$$x^2 - x - 156 = 0.$$ [2]

(ii) Factorise $x^2 - x - 156$. [2]

(iii) Hence, find the two positive integers that satisfy the equation in **(i)**. [2]

(b) Given that $x^2 + \frac{36}{x^2} = 13$, find the value of $(x + \frac{6}{x})^2$. [3]

16 The equation of a straight line is $3x + 4y + 12 = 0$. The line cuts the x-axis at point A and the y-axis at point B.

Find

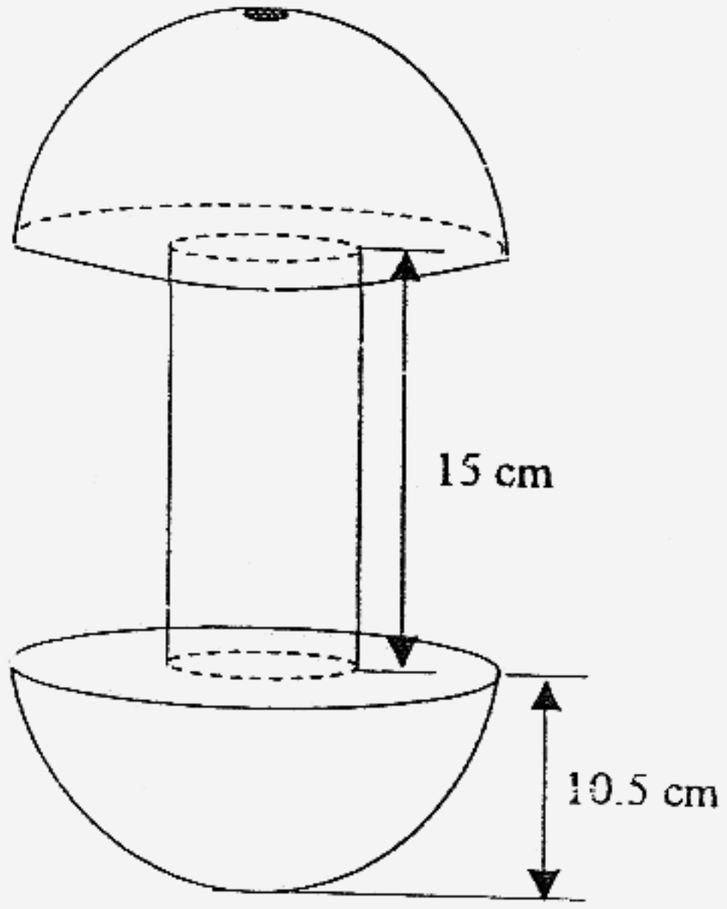
(a) the coordinates of A and B, [2]

(b) the area of ΔABP where P is $(0, 3)$, [2]

(c) the coordinates of Q such that $APQB$ is a rhombus, [2]

(d) the equation of the straight line which is parallel to AP and passes through T where $AT = 3TB$. [2]

17 The diagram below shows a container that is being manufactured by Poka-Pola as the packaging for its new drink, Pokoo. It is made up of two identical hemispheres and a right cylinder. The radii of the hemispheres are 10.5 cm each and the cylinder has a radius of 3.5 cm and a length of 15 cm.

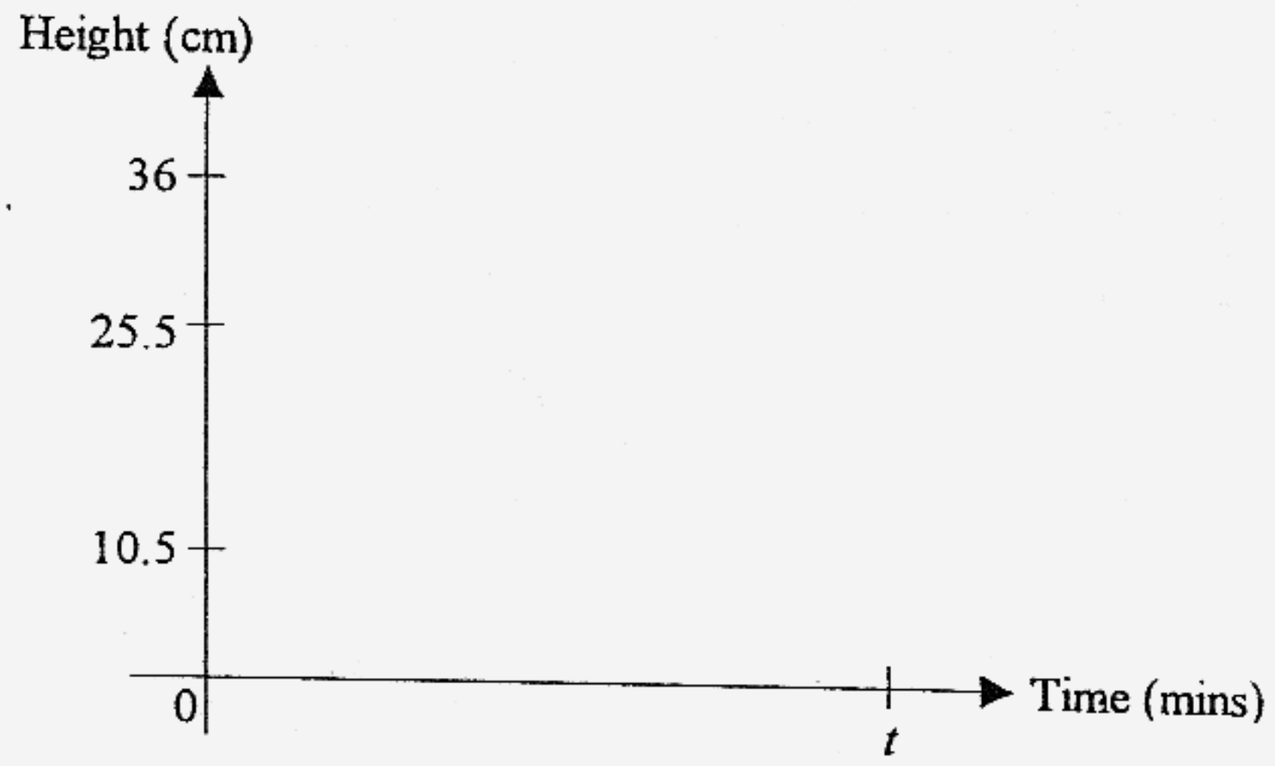


Find

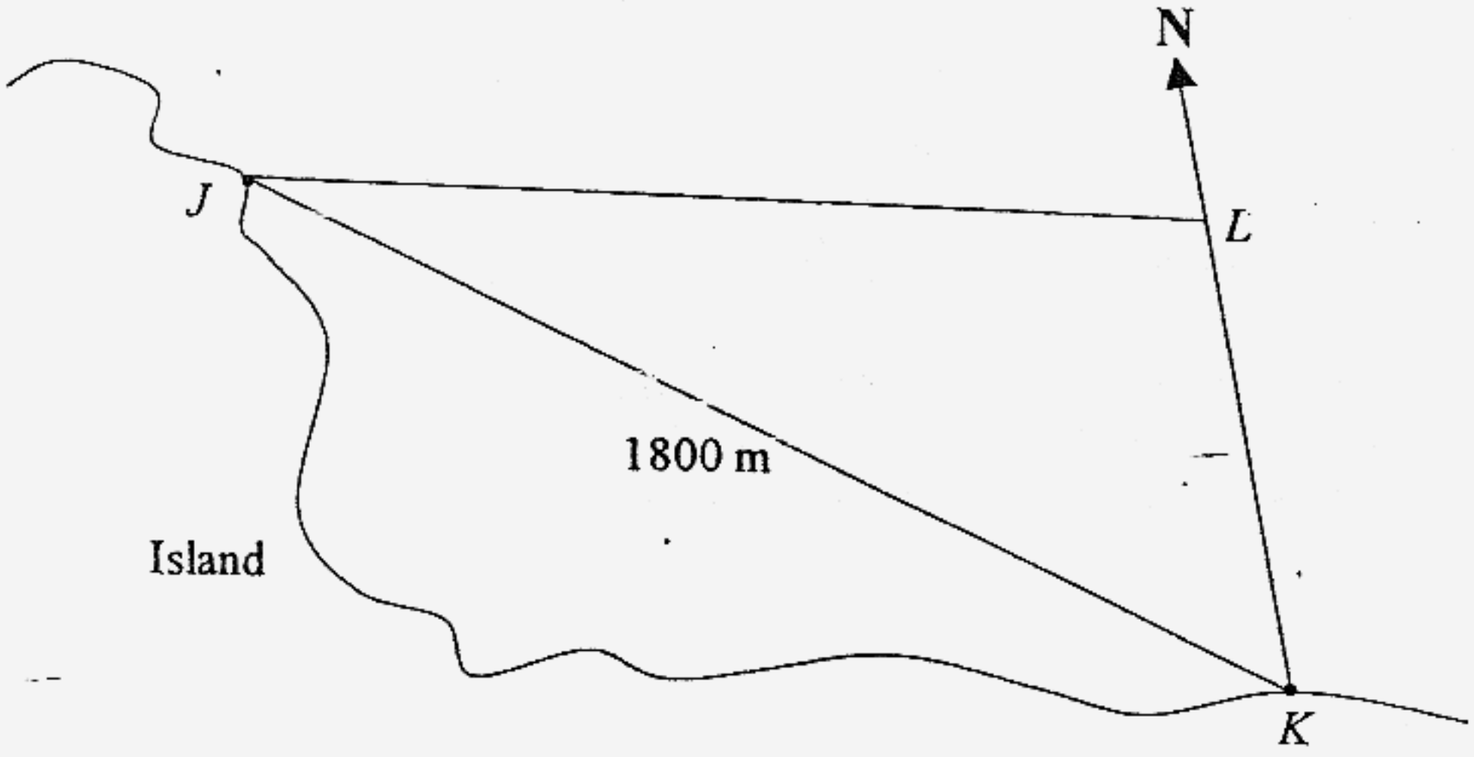
(a) the volume of the container, [2]

(b) the total surface area of the container. [3]

(c) During the manufacturing process, it is observed that the new container takes a time of t minutes to be completely filled with the drink. Copy the axes given below and on it sketch a graph to show how the height of the drink varies with time. [3]



18 The diagram shows part of the coast of a small island. Point J represents the location of Kampong Jae, point K represents the location of Kabu Village and point L represents the location of a lighthouse. It is given that $JK = 1800$ m, $\angle LJK = 26°$ and $\angle JKL = 57°$.



(a) Find the bearing of L from J. [1]

(b) Calculate the distance LJ. [2]

(c) At 0800, a sampan left J for L and it travelled along route JL at an average speed of 4.1 km/h. Find, the time, to the nearest minute when it arrived at L. [2]

(d) The lighthouse at L stands vertically and is 420 m in height. If the sampan had travelled along route JK instead, find the greatest angle of elevation of the top of the lighthouse from the sampan. [2]

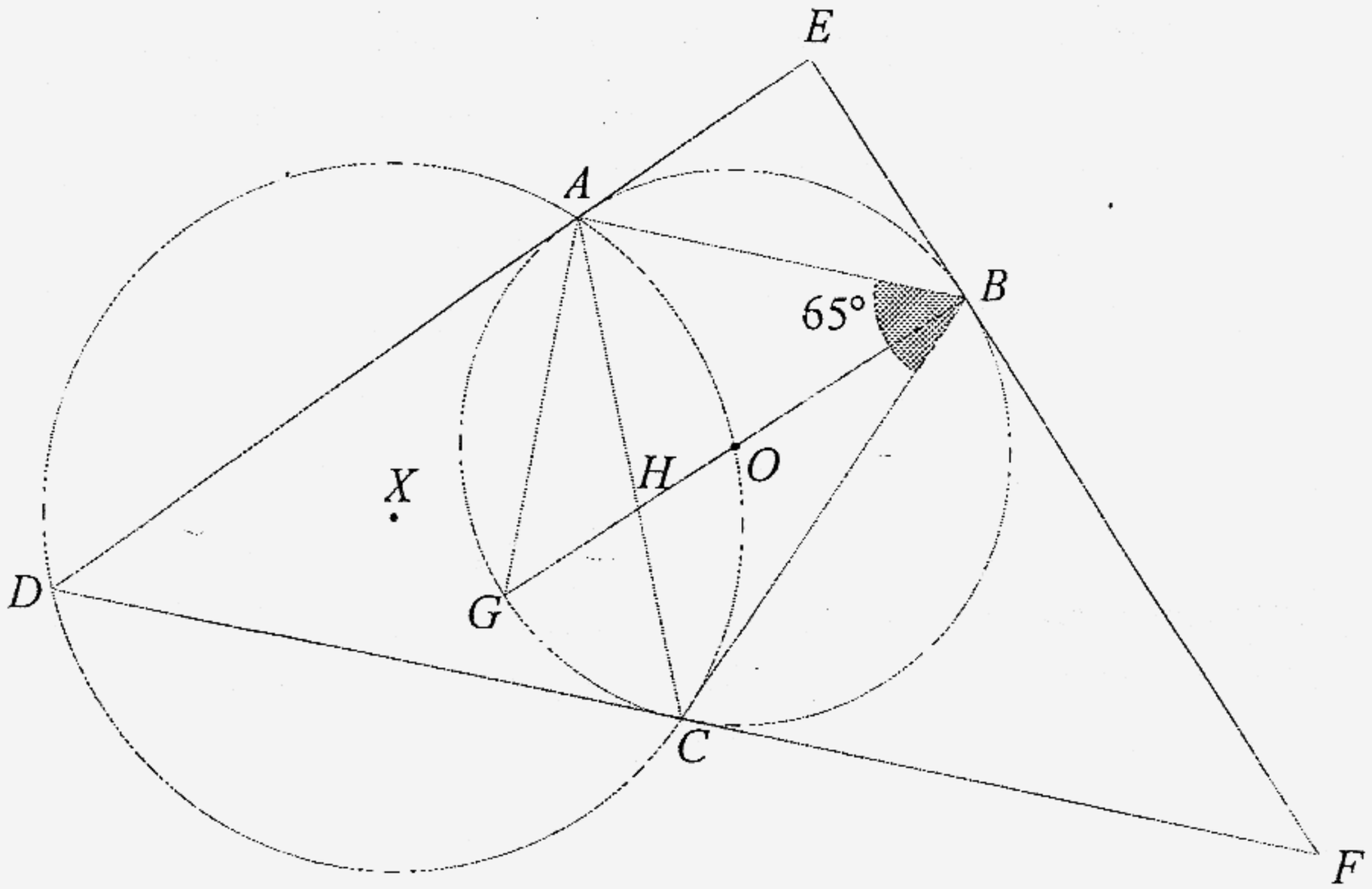
19 In the diagram, the circle ACD passes through the centre O of circle ABC. DE, EF and DF are tangents to the circle ABC at points A, B and C respectively. Given that AB is parallel to DF, $AC = BC$ and $\angle ABC = 65°$, find

(a) $\angle ADC$, [2]

(b) $\angle ACX$, [2]

(c) $\angle AGB$, [2]

(d) $\angle AHB$. [2]



End of Section B

Section C [10 marks]
Answer **one** question.

20 Answer the whole of this question on a sheet of graph paper.

The variables x and y are related by the equation $y = 5 + 6x^2 - x^3$. Some corresponding values of x and y are given in the following table.

x	−1	0	1	2	3	3.5	4	4.5	5	6
y		5	10	21		35.6			30	5

(a) Copy and complete the table of values. [1]

(b) Using a scale of 2 cm to represent 1 unit on the horizontal x-axis and 2 cm to represent 5 units on the vertical y-axis, draw the graph of $y = 5 + 6x^2 - x^3$ for $-1 \le x \le 6$. [3]

(c) By drawing a tangent, find the gradient of the graph at $x = 3.5$. [2]

(d) Showing your method clearly, use your graph to find the values of x in the range $-1 \le x \le 6$ for which

$$x^2(5 - x) = 6 - x^2.$$ [2]

(e) Using your graph and another appropriate graph on the same axes, find the values of x in the range $-1 \le x \le 6$ for which

$$10 + 12x^2 - 2x^3 \le 10(x + 1).$$ [2]

21 Answer the whole of this question on a sheet of graph paper.

A survey was done to find out the amount of time 400 Cedarians spent blogging each week.

No. of hours	$0 < t \le 2$	$2 < t \le 4$	$4 < t \le 6$	$6 < t \le 8$	$8 < t \le 10$	$10 < t \le 12$
Number of students	30	55	125	170	10	10

(a) Copy and complete the following cumulative frequency table. [1]

No. of hours	$t \le 2$	$t \le 4$	$t \le 6$	$t \le 8$	$t \le 10$	$t \le 12$
Number of students	30					400

(b) Using a horizontal scale of 2 cm to represent 2 hours and a vertical scale of 4 cm to represent 100 students, draw a smooth cumulative frequency curve to illustrate this information. [3]

(c) Use your graph to estimate

(i) the median time spent, [1]

(ii) the interquartile range. [1]

(d) The following information shows the profile of 400 student bloggers from Selffar Girl's Secondary School.

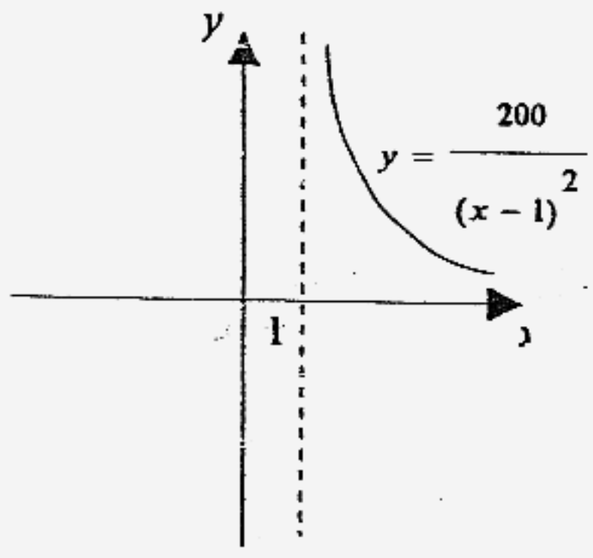
10 students spent ≤ 2 hours blogging each week.
None of the students blogged more than 12 hours a week.
The median number of hours is 7 hours.
The upper quartile is 8 hours.
The interquartile range is 2.6 hours.

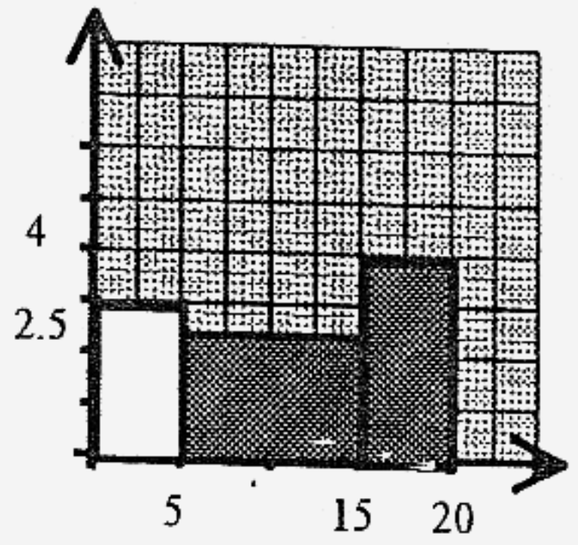
On the same axes, use this information to draw a smooth cumulative frequency curve for Selffar Girl's Secondary School. [2]

(e) Use your graphs to determine the difference in the number of students from the two schools who spent more than 7.5 hours blogging each week. [2]

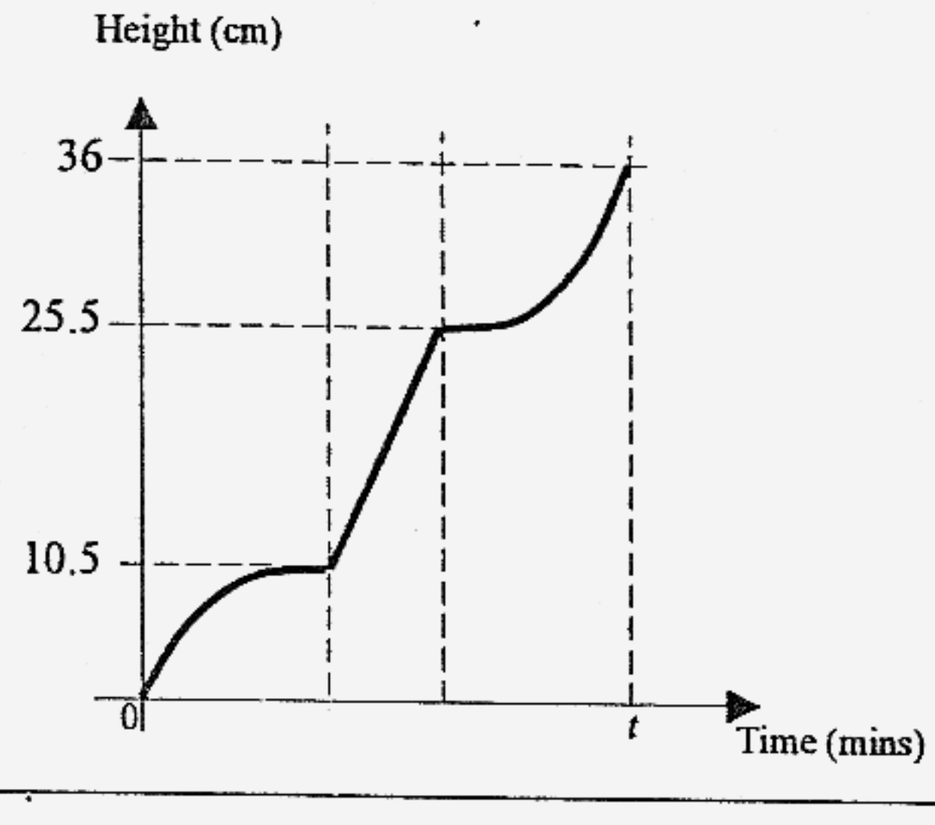
End of Section C

CEDAR GIRLS' SECONDARY EYE 2006
SECONDARY 3 MATHEMATICS ANSWER KEY

Section A	
Question	Answer
1a	$2\frac{1}{4}$
1b	$\frac{bc}{12a}$
2	$p = \pm\sqrt{\frac{r-q^2}{2}}$
3a	$(x^3-1)(x^3-2)$
3b	$m = \frac{1}{2},\ 3$
4a	112
4b	0.708
5a	$t \geq \frac{1}{2}$
5b(i)	Greatest = 25
5b(ii)	Least = -16
6a	30°
6b	$n = 12$
7a	$a = 32$
7b(i)	$x = 11$
7b(ii)	
8a	69° (*base ∠s of iso.Δ*)
8b	21°

Section A	
Question	Answer
8c	111° (*opp. ∠s of a cyclic quad*)
9a	$3y = 2x + 5$
9b	$(8,\ -1)$
9c	24 units^2
10a	8
10b	8
11a	$\angle ABC = \angle FDC$ (*alt.∠s*), $\angle BAC = \angle DFC$ (*alt.∠s*), & $\angle ACB = \angle FCD$ (*vert. opp.∠s*) By (AAA)
11b(i)	4
11b(ii)	5 cm^2
12a	20 cm^2
12b	$-\frac{3}{5}$
12c	$\frac{1}{2}$
13a	6
13b	6
13c	2.55
14a(i)	$15 \leq p < 20$
14a(ii)	\$10.625
14b	

CEDAR GIRLS' SECONDARY EYE 2006
SECONDARY 3 MATHEMATICS ANSWER KEY

Section B	
Question	Answer
15(a)(i)	$x\ (x+1) = x + (x+1) + 155$ . . $x^2 - x - 156 = 0$ (shown)
15(a)(ii)	$(x-13)(x+12)$
15(a)(iii)	$x = 13$ or -12 (rejected) Two integers are 13 and 14
15(b)	25
16(a)	$A\ (-4, 0)$ $B\ (0, -3)$
16(b)	12 units^2
16(c)	$Q\ (4, 0)$
16(d)	When $T\ (-1, -\frac{9}{4})$, equation of line is $y = \frac{3}{4}x - \frac{3}{2}$. When $T\ (2, -\frac{9}{2})$, equation of line is $y = \frac{3}{4}x - 6$.
17(a)	5430 cm^3
17(b)	2330 cm^2
17c	

Section B	
Question	Answer
18a	097°
18b	$LJ = 1520$ m
18c	$t = 22$ mins sampan arrived at L at 0822.
18d	32.2°
19a	50° (*base ∠s of iso.Δ*)
19b	40° (*base ∠s of iso.Δ*)
19c	50° (*∠s in same segment*)
19d	75° (*ext. ∠ = sum* int. *opp. ∠s*)
Section C	
20a	12, 32, 37, 35.4
20c	Gradient = 5.25 (± 1.0)
20d	Draw $y = 11$ $x = -0.95$, 1.15 or 5.85
20e	Draw $y = 5(x + 1)$ $0 \le x \le 1$ or $5 \le x \le 6$ (Both required)
21a	85, 210, 380, 390, 400
21ci	Median time spent is 5.95 h (± 0.5)
21cii	Interquartile range = 2.2 (± 0.5)
21e	Difference in no. of students is 110.