NAME: _____

THE SCOTS COLLEGE

YEAR 12 GENERAL MATHEMATICS
JULY 2010

TRIAL HIGHER SCHOOL CERTIFICATE EXAMINATION

GENERAL INSTRUCTIONS

- Working time - 2½ hours
- Reading time - 5 minutes
- Write using blue or black pen
- Use Multiple Choice Answer Sheet provided for Questions 1 – 22
- Use a Separate Booklet for Questions 23 – 28.
- Use graph sheet provided for Question 25(a) and 28(a)
- Board-approved calculators may be used
- All necessary working should be shown for every question.
- A separate Formula Sheet is provided

TOTAL MARKS (100)

SECTION I

22 MARKS

- Attempt Questions 1 - 22
- Allow about 30 minutes for this section

SECTION II

78 MARKS

- Attempt all of Questions 23 - 28
- Allow about 2 hours for this section

STUDENTS ARE ADVISED THAT THIS IS A TRIAL EXAMINATION ONLY AND CANNOT IN ANY WAY GUARANTEE THE CONTENT OR THE FORMAT OF THE HIGHER SCHOOL CERTIFICATE EXAMINATION.

SECTION I

TOTAL MARKS - 22

- Attempt Questions 1-22
- Allow approximately 30 minutes for this section
- Use the Multiple Choice Answer Sheet.
- Select the alternative A, B, C or D that best answers the question. Fill in the response oval completely.

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1. 0.0017534 written correct to 2 significant figures is:

A. 0.0017
B. 0.0018
C. 0.001
D. 0.002

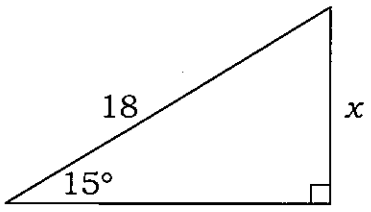
2. The manager of the Hockeyroos asked each player their age as of their last birthday. Which of the following best describes the type of data collected?

A. Continuous
B. Categorical
C. Stratified
D. Discrete

3. Simplify $2(x-1)-9(2x+5)$

A. $-16x-47$
B. $-16x+43$
C. $-16x+47$
D. $-16x-43$

4. From the diagram below, which of the statements is true?



A. $x = 18\cos 15^\circ$

B. $x = 18\sin 15^\circ$

C. $x = \frac{18}{\cos 15^\circ}$

D. $x = \frac{18}{\sin 18^\circ}$

5. If $M = qr^2$, find M when $q = 2.3 \times 10^{-16}$ and $r = 3 \times 10^{8}$.

A. 2.07×10^{11}

B. 2.07×10^{1}

C. 6.9×10^{24}

D. 2.07×10^{-1}

6. John has 100 football cards, of which there are 50 NSW players, 40 Queensland players and 10 from Victoria. He takes out all the Victorian players and asks Tim to choose a card at random from the remaining cards. What is the probability that Tim chooses a Queensland player?

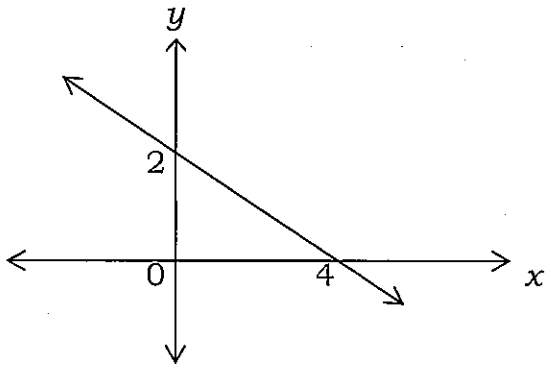
A. $\frac{1}{2}$

B. $\frac{2}{5}$

C. $\frac{4}{5}$

D. $\frac{4}{9}$

7. The equation of the line shown in the diagram is:



NOT TO SCALE

A. $y = -2x + 2$

B. $y = 2x + 2$

C. $y = -\frac{1}{2}x + 2$

D. $y = \frac{1}{2}x + 2$

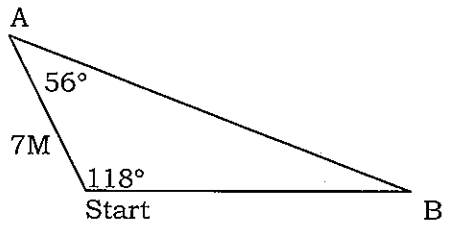
8. A ship travels a distance of 480 nautical miles in 18 hours. What is its average speed in kilometres per hours? (1M = 1.852km).

A. 26.7
B. 49.4
C. 98.8
D. 52

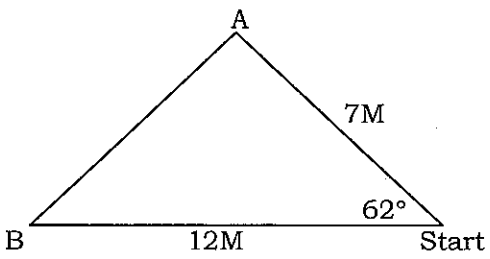
9. Which diagram **best** represents the information in the following problem?

Two boats leave from the same starting point off Bondi Beach. Boat A travels on a bearing of 056°T for 7M while boat B travels 12M in the direction 118°T.

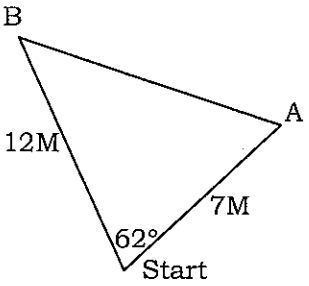
A.



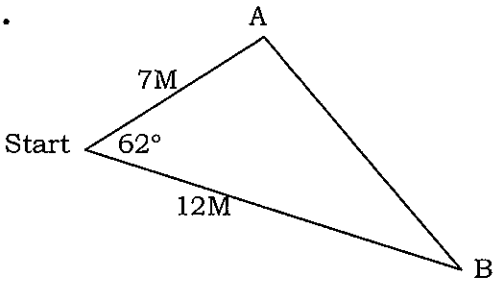
B.



C.



D.



10. The point that is 20° North of (15°S, 20°W) is:

A. (35°N, 20°W)
B. (10°S, 35°W)
C. (35°S, 5°W)
D. (5°N, 20°W)

11. A score of 12 is added to the table. Which measure will change?

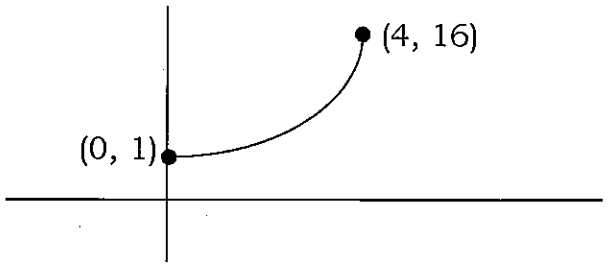
SCORE	FREQUENCY
10	5
11	4
12	1
13	6
14	4

A. Median
B. Range
C. Mode
D. Mean

12. The solution of the equation $3x - 6 = 5x + 2$ is:

A. $x = -1$
B. $x = -2$
C. $x = -4$
D. $x = 1$

13. Which equation best represents the portion of the graph below?



A. $y = x^2$

B. $y = 2^x$

C. $y = \frac{1}{x}$

D. $y = x^2 + 1$

14. In the HSC trial examinations, the mean for General Mathematics was 60 and the standard deviation was 8. Aaron achieved a mark of 72. His z-score for this examination was equivalent to:

A. +0.5

B. +1.0

C. +1.5

D. –0.5

15. At a restaurant in Rose Bay they have 5 options for entrées, 8 options for main courses and 4 options for dessert. How many combinations are possible when ordering an entrée, main and dessert?

A. 17

B. 40

C. 132

D. 160

16. The following frequency table shows Taj's scores from a surfing competition.

SCORE	FREQUENCY
6	2
7	3
8	5
9	2
10	1

Which expression gives Taj's mean score?

A. $\frac{12+21+40+18+10}{13}$

B. $\frac{12+21+40+18+10}{5}$

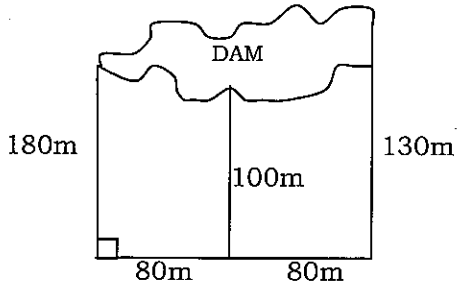
C. $\frac{6+7+8+9+10}{13}$

D. $\frac{6+7+8+9+10}{5}$

17. The volume of a sphere of radius 5cm is closest to:

A. $314cm^3$
B. $524cm^3$
C. $1257cm^3$
D. $4189cm^3$

18. A farm is bordered by three straight sides and a dam as shown.

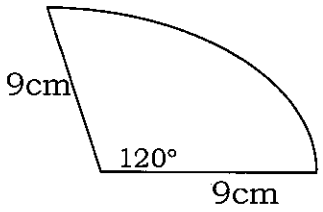


NOT TO SCALE

Which expression for the area of this farm in square metres, would be obtained from one application of Simpson's Rule?

A. $\frac{80}{3}(180 + 100 + 130)$
B. $\frac{160}{3}(180 + 400 + 130)$
C. $\frac{160}{3}(180 + 100 + 130)$
D. $\frac{80}{3}(180 + 400 + 130)$

19. This is a sketch of a sector of a circle.



Calculate the area of this sector (correct to one decimal place).

A. $84.8cm^2$
B. $36.8cm^2$
C. $18.8cm^2$
D. $9.4cm^2$

20. Harper buys an ipod for $574.20, including 10% GST. What is the value of the GST component?

A. $57.42
B. $52.20
C. $5.74
D. $10.00

21. The surface area of a closed cylinder is given by the formula $A = 2\pi r^2 + 2\pi rh$. The formula with h as the subject is:

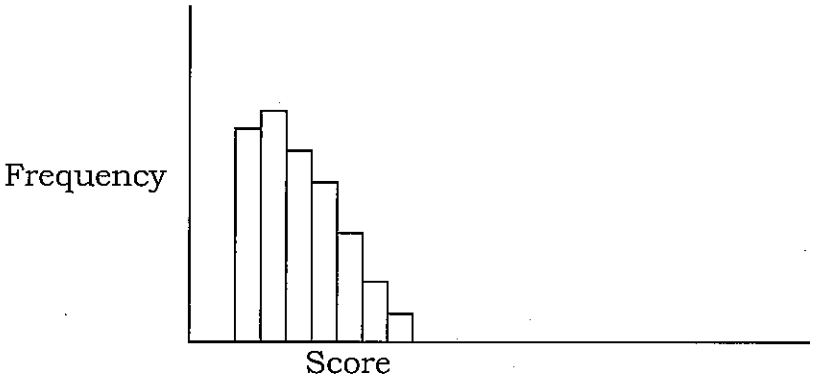
A. $h = \frac{A}{2\pi r} - 2\pi r^2$

B. $h = \frac{2\pi r - A}{2\pi r^2}$

C. $h = \frac{A - 2\pi r^2}{2\pi r}$

D. $\frac{A + 2\pi r^2}{2\pi r}$

22. Which description best describes the data shown below:



A. Negatively skewed
B. Symmetrical
C. Inversely proportional
D. Positively skewed

END OF MULTIPLE CHOICE SECTION

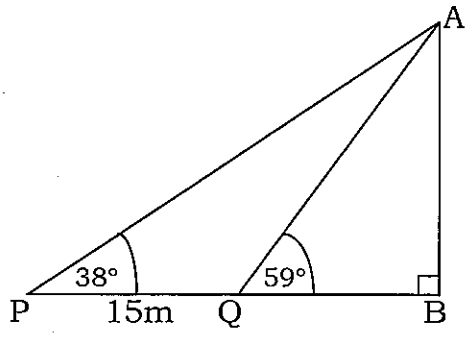
SECTION II

TOTAL MARKS – 78

- Attempt Questions 23-28
- Allow about 2 hours for this section
- Answer each question in a **SEPARATE** Writing Booklet
- Show all working

Question 23 **[13 marks]** **START A NEW BOOKLET** **MARKS**

a. When Tony looks up from position P, the angle of elevation to the top of his house A is 38°. Tony travels 15m from P to Q and notices the angle of elevation to the top of his house is now 59°.



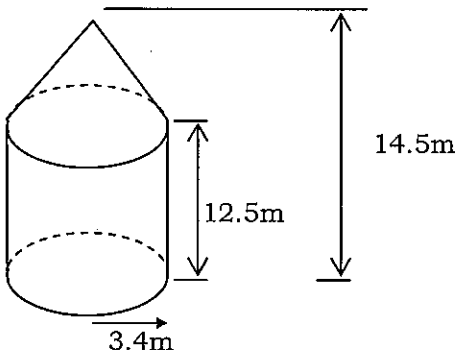
NOT TO SCALE

(i) Find the size of angle PAQ. **1**

(ii) Using the sine rule, find the length of AQ to the nearest metre. **2**

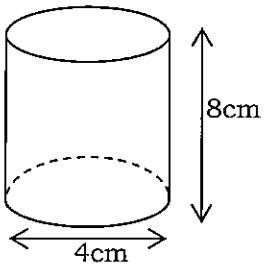
(iii) Once Tony reaches Q, how much further does he need to walk to reach the base of his house A? (Answer to the nearest metre.) **2**

b. Water is stored in a water tank the shape of a cylinder with a cone on top as shown in the diagram. The radius of the cylinder is 3.4m. The height of the cylinder is 12.5m and the height of the cone is 2m.



(i) Calculate the water tank's capacity in litres. Assume the entire tank is filled with water. **3**

(ii) The water from the water tank is bottled in small cylindrical containers as shown below. **3**

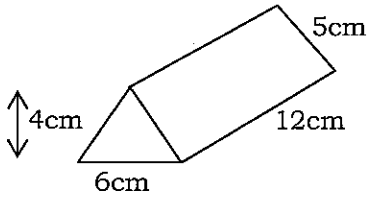


What number of water containers can be filled from a full water tank?

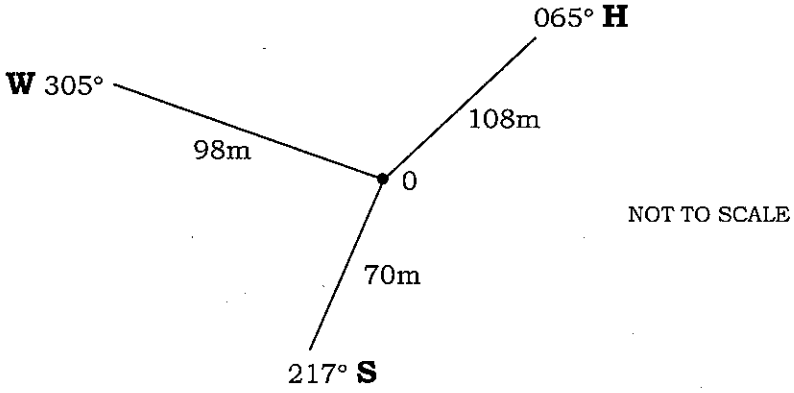
c. Solve $\frac{x+1}{2} - 5 = -1$ **2**

Question 24 **[13 marks]** **START A NEW BOOKLET**

a. Find the surface area of the triangular prism below. **2**



b. A compass radial survey of a small farm is recorded as a notebook entry below:



Points W, S and H represent a well, a shed and a house respectively.

(i) Find the size of the angle between the well and the house, angle W0H. **1**

(ii) Use the cosine rule to calculate the distance between the well and the house, WH. **2**

c. The Socceroos leave Perth (32°S, 120°E) by plane on an 8-hour flight to Cape Town (33°S, 15°E) at 4.00pm on Monday.

(i) What is the time difference between Perth and Cape Town? **1**

(ii) What time is it in Cape Town when the plane leaves Perth? **1**

(iii) If the return flight leaves Cape Town at 8.00am (local time) on Friday when does it arrive in Perth? **1**

d. Data from the Super 14 Rugby competition is shown below. The table compares the points scored from the Waratahs and the Brumbies during the competition.

	Waratahs	Brumbies
Mean	24	16
Median	22	15
Standard deviation	8	4
Upper quartile	32	24
Lower quartile	12	10
Highest score	52	40
Lowest score	7	5

(i) Draw a box-and-whisker plot for each of the team's results to show this information. **3**

(ii) Comment on the consistency of performance for each team. Use statistical terms to support your answer. **2**

Question 25 [13 marks] **START A NEW BOOKLET** **MARKS**

a. Spark plugs are used in petrol motors. To produce a spark, there must be a small gap, d mm, in the top of the spark plug.

The efficiency rating, E, of a 'Power Plus' spark plug can be determined using the formula $E = 360d(1-d)$, where d is the gap in millimetres.

(i) **Copy and complete this table of values for E into your answer booklet.** **2**

d	0	0.2	0.5	0.7	1
E	0	57.6		75.6	

(ii) On the graph paper provided at the end of this exam, sketch the graph of the efficiency rating of the 'Power Plus' spark plug from the table of values. Join the points with a curve of best fit. **3**

Remove the graph paper at the end of this exam and include it in your answer booklet.

(iii) Which of the variables, d or E, is the dependent variable? **1**

(iv) What size gap produces the highest efficiency rating. **1**

(v) The spark plug efficiency needs to be 65 or greater for optimal performance. Use your graph to estimate the range of spark plug gaps needed to produce optimal motor performance. **1**

(vi) What happens if the gap is larger than 1mm? **1**

b. Carlos is saving up to buy a $5000 electric guitar that he thinks he will be able to afford in 2 years' time. He is going to save equal monthly amounts and put them into a bank account that earns 1% per month, with interest compounding monthly.

(i) How many contributions will Carlos make? **1**

(ii) How much does he need to save each month to afford the electric guitar? **3**

Question 26 [13 marks] **START A NEW BOOKLET** MARKS

a. The stopping distance of a car is proportional to the square of the car's speed. A car travelling at 60km/h has a stopping distance of 40m. If the stopping distance is 80m, what is the car's speed? **2**

b. Calculate the distance in nautical miles between the points A(5°N, 50°E) and B (5°S, 50°E), given that 1° on a great circle is 60 nautical miles. **2**

c. A sphere has a volume $115m^3$.

(i) What is its radius? Answer to the nearest centimetre. **2**

(ii) Calculate its surface area. Answer to 2dp. **1**

d. Phillip purchased an IPAD computer for work purposes on 1 November for $1000. Calculate the amount that he can claim as a tax deduction in the same financial year ending 30 June, by using the straight-line depreciation rate of 25%pa. **2**

e. The following Home Loan Table shows Bernard's home loan repayments over a 6 month period.

HOME LOAN TABLE

Amount = $80 000			This table assumes the same number of days in each month, that is: Interest = rate/12 × principal	
Annual interest rate = 10%				
Monthly repayment *(R)* = $800				
N	Principal *(P)*	Interest *(I)*	*P + I*	*P + I – R*
1	$80 000.00	$666.67	$80 666.67	$79 866.67
2	$79 866.67	$665.56	$80 532.23	$79 732.23
3	$79 732.23	**B**	**C**	$79 596.67
4	$79 596.67	$663.31	$80 259.98	$79 459.98
5	$79 459.98	$662.17	$80 122.15	$79 322.15
6	$79 322.15	$661.02	$79 983.17	$79 183.17

(i) How much had Bernard paid off the loan at the end of 6 months? **1**

(ii) How much had Bernard reduced the loan by at the end of the second month? **1**

(iii) Find the values of **B** and **C** marked in the table. **2**

Question 27 [13 marks] **START A NEW BOOKLET** MARKS

a. Mr Bean gave his class a test on measurement. The class marks on the test had a mean of 65% and a standard deviation of 10. Mr Bean scaled the results to a mean of 80% and a standard deviation of 5.

Michael, a student in the class, received a mark of 55% in the original test before scaling.

(i) Calculate the z-score for Michael's mark. **2**

(ii) Calculate Michael's mark after the results have been scaled, keeping his z-score the same. **1**

(iii) In a second test, Michael scored 60%, with the mean being 70% and the standard deviation 5. Did Michael perform better in the first or second test? Justify your answer. **2**

b. A car number plate has three letters (chosen from a to z) followed by three digits (chosen from 0–9).

(i) How many possible number plates are there? **2**

(ii) How many number plates have three letters followed by three zeroes? **2**

c. Fifty tickets are sold in a raffle. There are 2 prizes. Maurice buys four tickets.

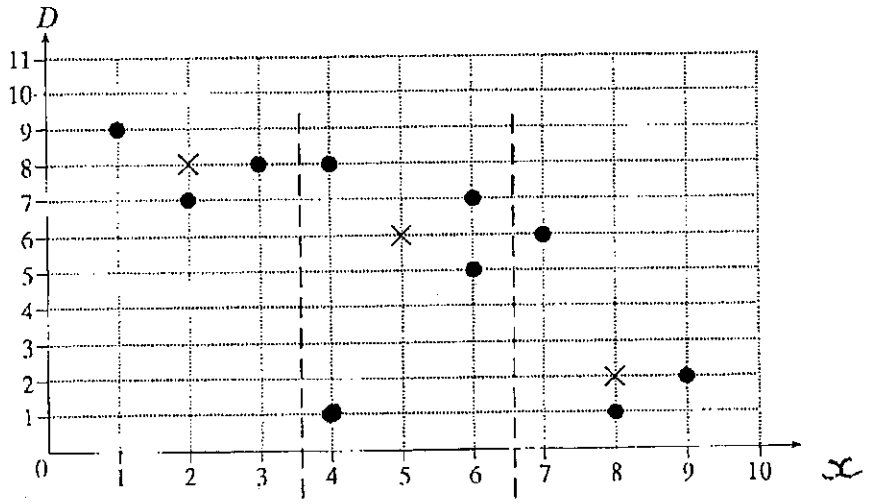
(i) What is the probability Maurice wins both prizes? **2**

(ii) What is the probability Maurice wins one prize only? **2**

Question 28 [13 marks] **START A NEW BOOKLET** MARKS

a. When Ali was constructing a median regression line to represent the data he obtained from his science project, he showed each data point as a dot (•) on a graph. Then he divided his data into three sections and marked the median summary point in each section with a cross (x).

This diagram shows Ali's scatter plot.



(i) Explain why (8,2) is the median summary point in the right-hand column. **2**

(ii) **On the graph at the end of the exam**, use your ruler to show the position of the median regression line on Ali's graph. **2**

(iii) What is the equation of the median regression line? **2**

(iv) Ali thought he had probably made an error with one of his data points. Which point in Ali's data is probably wrong? What D value (on the vertical axis) does the median regression line give for this value of x? **2**

b. Raul's parents decided when he was born they would investigate investment options so he could have a sum of money on his 18th birthday. They were deciding between:

Option1: Investing \$200 per month at 6%pa interest compounded monthly for 18 years.

Option 2: Investing a lump sum of \$20,000 at 6%pa interest compounding monthly for 18 years.

Investigate both options and explain to Raul's parents (supporting your answer with calculations), which option they should choose and why. **5**

End of examination

NAME: _____

MULTIPLE CHOICE ANSWER SHEET

For each question, choose the most correct answer and indicate your choice by shading in the appropriate space on the grid below.

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