

Name: ..... ( )

Class: .....

1. A varies inversely as  $(2B - 1)$  and  $A = 25$  when  $B = 3$ . Find

- (a) an equation relating A and B,
- (b) the value of A when  $B = 0.25$ .

Answer: (a) \_\_\_\_\_ [2]

(b) \_\_\_\_\_ [1]

2. 20 men who work for 8 hours a day can build a tunnel in 25 days. If 4 men do not turn up for work, how many hours must the remaining workers work per day to build the tunnel on time?  
Assume that the rate of work done by each worker is constant.

Answer: \_\_\_\_\_ h [2]

3. The distance between Town A and Town B is 2.5 km. It is represented by 4 cm on the map.

(a) Express this scale in the form 1 : n.

(b) Find the area of a farm that is represented by  $32 \text{ cm}^2$  on this map.

Answer: (a) \_\_\_\_\_ [2]

(b) \_\_\_\_\_  $\text{km}^2$  [2]

4. Simplify the expression  $(2x + 9)^2 - (x - 9)^2 - 54x$ .

Answer: \_\_\_\_\_ [2]

5. Factorise  $14x - 7y + 2xy - y^2$ .

Answer: \_\_\_\_\_ [2]

Name: ..... ( )

Class: .....

6. Solve the following equation

(a)  $(2 - d)(4d - 5) = 0$ ,

(b)  $p^2 = 12p + 13$ .

Answer: (a) \_\_\_\_\_ [2]

(b) \_\_\_\_\_ [2]

7. (a) Express  $\frac{3p+5}{10} - \frac{3-p}{2}$  as a single fraction in its simplest form.

(b) Given that  $H = \frac{a-6n}{m-n}$ , express  $n$  in terms of  $a$ ,  $m$  and  $H$ .

Answer: (a) \_\_\_\_\_ [2]

(b)  $n =$  \_\_\_\_\_ [2]

8. If the sum of squares of three consecutive even numbers is 1460, find the smallest number.

Answer: \_\_\_\_\_ [3]

9. Solve the following simultaneous equations

$$x - 3y = 30,$$

$$\frac{x}{5} + y = -2.$$

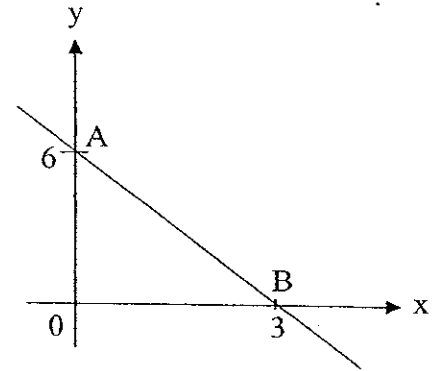
Answer:  $x =$  \_\_\_\_\_,  $y =$  \_\_\_\_\_ [3]

Name: ..... ( )

Class:.....

10. A straight line intersects the y-axis at A and the x-axis at B.

- (a) What are the coordinates of the y-intercept of the line, AB?
- (b) Find the gradient of the line AB.
- (b) Hence, write down the equation of the line AB.



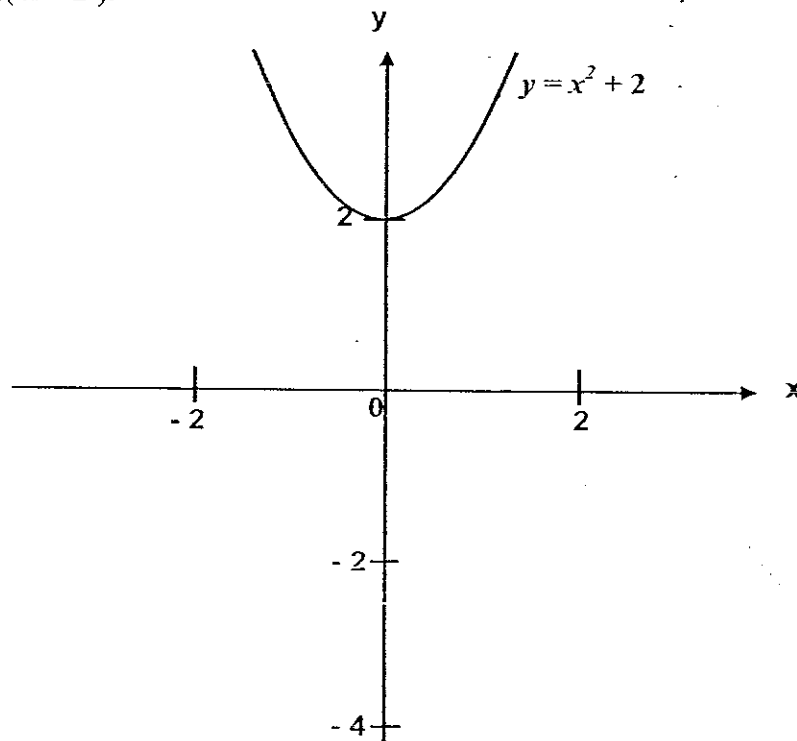
Answer: (a) ..... [1]

(b) ..... [1]

(c) ..... [1]

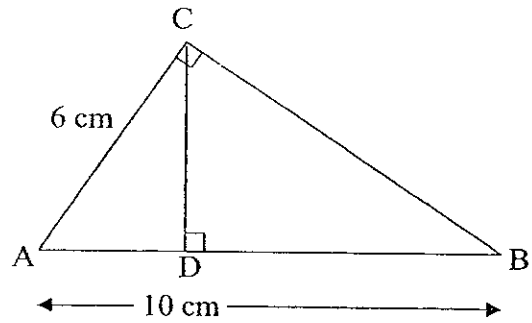
11. The graph of  $y = x^2 + 2$  is shown below. On the same axes, sketch the following graphs:

- (a)  $y = x^2$ , [1]
- (b)  $y = (x - 2)(x + 2)$ . [2]



12. The diagram shows two similar triangles,  $\triangle ABC$  and  $\triangle CBD$ , where  $AC = 6$  cm,  $AB = 10$  cm.

- (a) Show that  $BC = 8$  cm.
- (b) Find  $CD$ .
- (c) Find the ratio of  $\frac{BD}{BC}$ .



Answer : (a) \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_ [1]

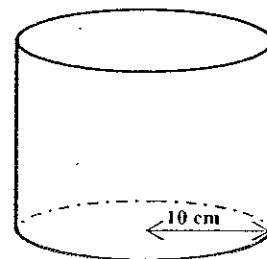
(b) \_\_\_\_\_ cm [2]

(c) \_\_\_\_\_ [2]

13. A solid cylinder has a base radius of 10 cm and a volume of  $2512$  cm<sup>3</sup>.

Using  $\pi = 3.14$ , find

- (a) the height,
- (b) the total surface area of the cylinder.



Answer: (a) \_\_\_\_\_ cm [2]

(b) \_\_\_\_\_ cm<sup>2</sup> [2]

Name: ..... ( )

Class: .....

14. The number of siblings that students in a class have is shown in the table below.

Number of siblings	0	1	2	3	4	5
Number of students	4	17	$x$	10	2	1

There are 42 students in the class. Find

- (a) the value of  $x$ ,
- (b) the mean number of siblings (correct to 1 decimal place) that the students have,
- (c) the probability that a class representative has 3 siblings, if he or she is picked at random.

Answer: (a) \_\_\_\_\_ [1]  
 (b) \_\_\_\_\_ [2]  
 (c) \_\_\_\_\_ [1]

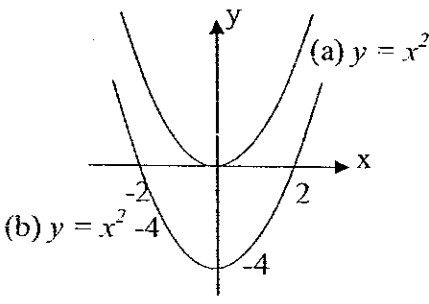
15. Given that  $\xi = \{x : x \text{ is an integer, } 1 \leq x \leq 8\}$ ,

$$A = \{x : x \text{ is an integer, } 4x \geq 9\},$$

$$B = \{x : x \text{ is an integer, } x \text{ is odd}\}.$$

- (a) List the elements in  $A$ .
- (b) Find
  - (i)  $n(B)$ ,
  - (ii)  $n(A \cap B)$ .

Answer: (a) \_\_\_\_\_ [2]  
 (b) (i) \_\_\_\_\_ [1]  
 (ii) \_\_\_\_\_ [1]

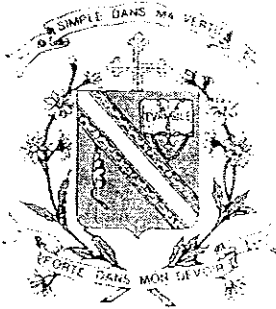
Answers		Marks
1	(a) $k=125, A=\frac{125}{2B-1}$ (b) $A=-250$	3
2	10 h	2
3	(a) 1: 62 500, (a) 12.5	2,2
4	$3x^2$	2
5	$(2x-y)(7+y)$	2
6	(a) $d=2, d=1.25$ (b) $(p-13)(p+1)=0, p=13$ or $-1$	2,2
7	(a) $\frac{4p-5}{5}$ (b) $n=\frac{Hm-a}{H-6}$	2,2
8	$3y^2 + 8 = 1460, x = 22,$ smallest number is 20	3
9	$x = 15, y = -5$	3
10	(a) (0,6) (b) -2 (c) $y = -2x + 6$	1,1,1
11	Sketch 	1,2
12	(a) Use Pythagoras theorem (b) 4.8 cm (c) $\frac{4}{5}$	1,2,2
13	(a) $h = 8$ (b) 1130.2	2,2
14	(a) $x = 8$ (b) 1.8 (c) $\frac{10}{42} = \frac{5}{21}$	1,2,1
15	(a) {3, 4, 5, 6, 7, 8} (b) 4 (c) 3	2,1,2

Name : \_\_\_\_\_

Class

Registration  
Number

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**CHIJ KATONG CONVENT**  
**END-OF-YEAR EXAMINATION 2007**  
**MATHEMATICS**  
**PAPER 2**

**SECONDARY TWO (EXPRESS)**

Duration: 1 hour 30 minutes

Classes: Sec 2.3, 2.4, 2.5, 2.6

Additional materials:  
Writing paper  
Graph paper (1 sheet)

**INSTRUCTIONS TO CANDIDATES**

Write your name, class and registration number in the spaces at the top of this page and any separate answer paper used.

Answer **all** questions.

Write your answers on the separate answer paper provided.

Omission of essential working will result in loss of marks.

**ELECTRONIC CALCULATORS MAY BE USED IN THIS PAPER.**

**INFORMATION FOR CANDIDATES**

The number of marks is given in brackets [ ] at the end of each question or part question.

You should not spend too much time on any one question.

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.

The total mark for this paper is 50.

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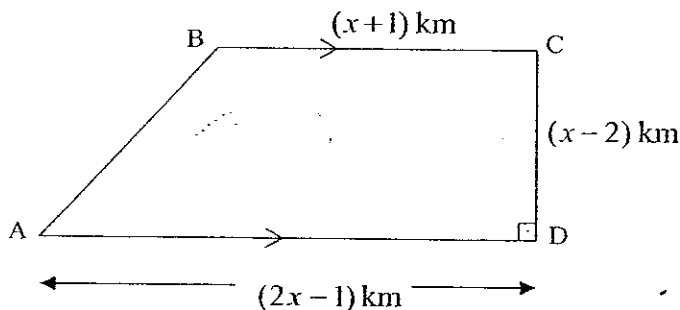
This question paper consists of 5 printed pages (including this cover page).

[Turn over

Answer all questions.

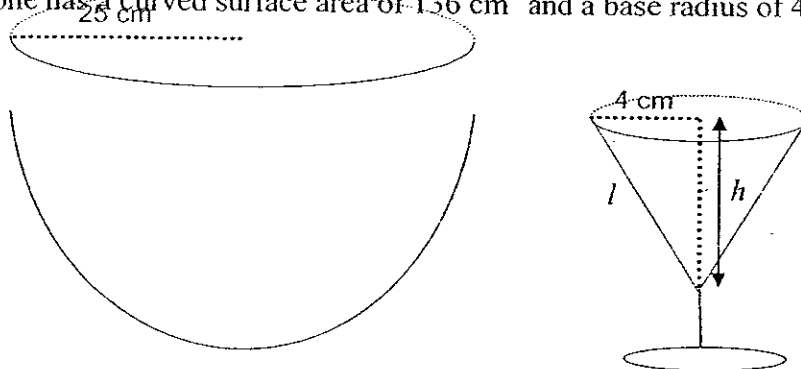
1. ABCD is a field in the shape of a trapezium in which AD is parallel to BC and  $\angle ADC = 90^\circ$ .

$AD = (2x - 1)$  km,  $BC = (x + 1)$  km,  $CD = (x - 2)$  km.



- (a) Given that the area of the trapezium is  $36 \text{ km}^2$ , form an equation in  $x$  and show that it reduces to  $x^2 - 2x - 24 = 0$   
[2]
- (b) Solve the equation  $x^2 - 2x - 24 = 0$ .  
[2]
- (c) A man runs diagonally across the field from A to C in a straight line at a speed of 7.8 km/h. Find the time taken for him to complete the run.  
[4]

2. A large bowl with the shape of a hemisphere has an inner radius of 25 cm. In a party, this bowl is used to contain fruit juice. Glasses in the shape of a cone were used for filling the juice. The cone has a curved surface area of  $136 \text{ cm}^2$  and a base radius of 4 cm.



Taking  $\pi = 3.142$ ,

- (a) calculate the volume of fruit juice in the bowl given that the bowl was filled to the brim, giving your answer correct to 2 decimal places.  
[2]
- (b) calculate the  
(i) slant height  $l$ ,  
[2]

(ii) vertical height  $h$   
 [2]  
 of the glass.

(c) find the number of glasses that can be filled from the bowl of fruit juice and round off your answer to the nearest whole number.  
 [3]

3. (a) Given that  $(p + q)^2 = 50$  and  $pq = 8$ , find the value of  $p^2 + q^2$ .  
 [2]

(b) Simplify  $\frac{(x - 2y)^2}{3xy - 6y^2}$ .  
 [2]

(c) Solve the equation  $\frac{1}{x-1} + \frac{2}{1-x^2} + \frac{3}{x+1} = 1$   
 [3]

4. A group of 40 pupils were asked to estimate a time interval of 1 minute without the use of any time measuring device. The results, in seconds, are recorded as follows:

28	73	72	61	46	50	62	59
59	78	81	83	58	32	40	43
53	57	65	49	62	65	70	48
60	29	39	46	57	80	67	65
64	58	59	63	67	52	43	71

(a) Represent the data by an ordered stem and leaf diagram.  
 [2]

(b) Hence find the median time of the distribution.  
 [2]

(c) A pupil whose estimation falls within the range of 57 s to 63 s is considered to be a good estimator of time. Find the percentage of this group of pupils who are good estimators of time.  
 [2]

(d) A pupil is chosen at random. Find the probability that he or she is **not** a good estimator of time.  
 [1]

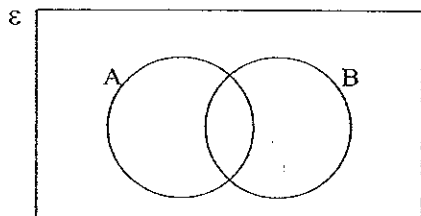
5. Twenty cards are numbered 1 to 20.

(a) Let  $M$  be the event that the number on the card selected is a multiple of 3. List all possible outcomes of this event.

[1]

- (b) Find  
 (i)  $P(M)$ , [1]  
 (ii)  $P(M')$ . [1]

6. In each of the following cases, copy the given diagram and shade the required region.



- (a)  $A' \cap B'$ ,  
 [1]

- (b)  $(A \cap B)'$ .  
 [1]

7. John is  $2x$  years old. His younger sister, Janet, is  $y$  years old.

- (a) The sum of their ages is 20 years. Form an equation connecting  $x$  and  $y$ .  
 [1]
- (b) The difference between their ages is 4 years. Form another equation connecting  $x$  and  $y$ .  
 [1]
- (c) Solve the simultaneous equations and hence find the ages of John and Janet.  
 [3]

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

The depth of water,  $y$  m, at the entrance of a harbour  $x$  hours after noon is given by  $y = -x^2 + 3x + 4$  where  $0 \leq x \leq 4$ . Some corresponding values of  $y$  and  $x$  are given in the following table.

$x$ (hours after 12 00)	0	0.5	1	1.5	2	2.5	3	3.5	4
$y$ (m)	4	5.25	6	$a$	6	5.25	4	2.25	$b$

- (a) Calculate the values of  $a$  and  $b$ . [2]
- (b) Using a scale of 4 cm to 1 unit on the  $x$ -axis and a scale of 2 cm to 1 unit on the  $y$ -axis, plot the points given in the table and join them with a smooth curve.  
 [3]
- (c) Use your graph to find  
 (i) the depth of water at the harbour entrance at 14 45,  
 [1]

- [1]      (ii)    the time when the harbour entrance is dry,
- [1]      (iii)   the maximum depth of water at the entrance,
- [1]      (ii)    the time when the depth of the water at the entrance is maximum.

**-End of paper-**

**Mark Scheme for Sec 2E EOY Paper 2**

1. a) Area of trapezium =  $36 \text{ km}^2$

$$\frac{1}{2} \times (x+1+2x-1) \times (x-2) = 36 \quad \text{[M1]}$$

$$\frac{1}{2} \times (3x) \times (x-2) = 36$$

$$3x(x-2) = 72$$

$$3x^2 - 6x - 72 = 0$$

$$x^2 - 2x - 24 = 0 \text{ (shown)} \quad \text{[A1]}$$

b)

$$x^2 - 2x - 24 = 0$$

$$(x-6)(x+4) = 0 \quad \text{[M1]}$$

$$x = 6 \text{ or } x = -4 \text{ (N.A.)} \quad \text{[A1]}$$

c)  $CD = 4 \text{ km}$  and  $AD = 11 \text{ km}$  [M1]

$$AC^2 = 4^2 + 11^2$$

$$AC = 11.7047 \text{ km} \quad \text{[M1]}$$

Time taken = Distance / Speed

$$= 11.7047 / 7.8 \quad \text{[M1]}$$

$$\approx 1.50 \text{ h} \quad \text{[A1]}$$

2. a) Volume of juice

$$= \frac{1}{2} \times \frac{4}{3} \pi r^3$$

$$= \frac{2}{3} \times 3.142 \times 25^3 \quad \text{[M1]}$$

$$\approx 32729.17 \text{ cm}^3 \quad \text{[A1]}$$

b)

(i)

Curved S.A. of cone = 136

$$\pi r l = 136$$

$$l = \frac{136}{3.142 \times 4} \quad [\text{M1}]$$

$$l = 10.82$$

$$l \approx 10.8 \text{ cm} \quad [\text{A1}]$$

(ii)  $10.82^2 = 4^2 + h^2$

$$h^2 = 10.82^2 - 4^2 \quad [\text{M1}]$$

$$h = 10.05$$

$$h \approx 10.1 \text{ cm} \quad [\text{A1}]$$

c)

Volume of cone glass

$$\frac{1}{3} \pi r^2 h$$

$$= \frac{1}{3} \times 3.142 \times 4^2 \times 10.05 \quad [\text{M1}]$$

$$= 168.41 \text{ cm}^3 \quad [\text{M1}]$$

Number of glasses that can be filled

$$= \frac{\text{Volume of juice}}{\text{Volume of cone glass}}$$

$$= \frac{32729.167}{168.41}$$

$$\approx 194 \quad [\text{A1}]$$

3. a)  $(p + q)^2 = 50$

$$p^2 + 2pq + q^2 = 50$$

$$p^2 + 2(8) + q^2 = 50 \quad [\text{M1}]$$

$$p^2 + q^2 = 50 - 16$$

$$p^2 + q^2 = 34 \quad [\text{A1}]$$

b)

$$\begin{aligned} & \frac{(x-2y)^2}{3xy-6y^2} \\ &= \frac{(x-2y)^2}{3y(x-2y)} \quad \text{[M1]} \\ &= \frac{x-2y}{3y} \quad \text{[A1]} \end{aligned}$$

c)

$$\begin{aligned} & \frac{1}{x-1} + \frac{2}{1-x^2} + \frac{3}{x+1} = 1 \\ & \frac{1}{x-1} + \frac{2}{(1-x)(1+x)} + \frac{3}{x+1} = 1 \\ & \frac{-1}{1-x} + \frac{2}{(1-x)(1+x)} + \frac{3}{x+1} = 1 \\ & \frac{-1(1+x)}{(1-x)(1+x)} + \frac{2}{(1-x)(1+x)} + \frac{3(1-x)}{(1-x)(x+1)} = 1 \quad \text{[M1]} \\ & \frac{-1(1+x) + 2 + 3(1-x)}{(1-x)(1+x)} = 1 \\ & \frac{-1-x+2+3-3x}{(1-x)(1+x)} = 1 \\ & \frac{4-4x}{(1-x)(1+x)} = 1 \quad \text{[M1]} \\ & \frac{4(1-x)}{(1-x)(1+x)} = 1 \\ & \frac{4}{1+x} = 1 \\ & 4 = 1+x \\ & x = 3 \quad \text{[A1]} \end{aligned}$$

4. a) Stem | Leaf

2        8 9

3        2 9

4        0 3 3 6 6 8 9

[B2]

5        0 2 3 7 7 8 8 9 9 9

6        0 1 2 2 3 4 5 5 5 7 7

7        0 1 2 3 8

8        0 1 3

Key: 2|8 means 28 seconds

b) Median terms: 20<sup>th</sup> and 21<sup>st</sup> [M1]

Median time = 59 sec [A1]

c) % of good estimators =  $(12/40) \times 100\%$  [M1]

= 30% [A1]

d) P( not a good estimator)

$$= \frac{28}{40}$$

$$= \frac{7}{10} \quad \text{[B1]}$$

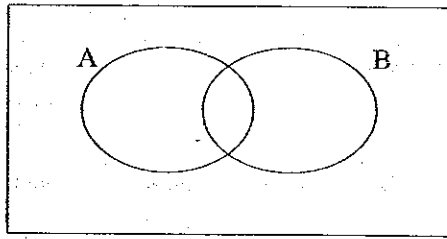
5. a)  $M = \{3, 6, 9, 12, 15, 18\}$  [B1]

b) P(M)        c)  $P(M') = \frac{7}{10}$  [B1]

$$= \frac{6}{20}$$

$$= \frac{3}{10} \quad \text{[B1]}$$

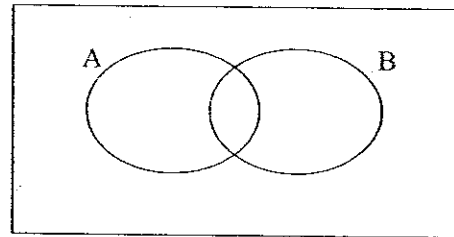
6. a)



$$A' \cap B'$$

[B1]

b)



$$(A \cap B)'$$

[B1]

7. a)  $2x + y = 20$  [B1]

b)  $2x - y = 4$  [B1]

c)  $2x + y = 20$  ----- (1)

$2x - y = 4$  ----- (2)

(1) + (2):  $4x = 24$

$$x = 6$$

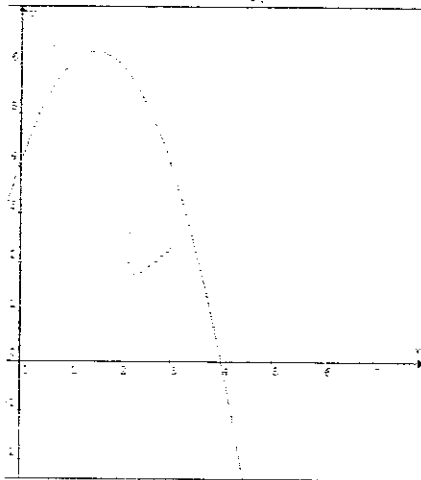
[M2]

$$y = 8$$

Therefore, John's age is 12 years and Janet's age is 8 years. [A1]

8. a)  $a = 6.25$  and  $b = 0$  [B2]

b)



Plot points [M2], Smooth curve [A1]

c)

(i) 2 h 45 min = 2.75 h

From the graph, when  $x = 2.75$ ,  $y = 4.68$  m [B1]

(ii) When  $y = 0$ ,  $x = 4$ . Time = 1600 or 4 pm [B1]

(iii) Maximum depth = 6.25 m [B1]

(iv) Time at which maximum depth occurs = 1330 or 1:30 pm [B1]