



CATHOLIC HIGH SCHOOL

FINAL TERM EXAMINATION 2006

Subject : Mathematics

Paper : 1

Level : Secondary 3

Date : 10 October 2006

Marks : 40

Time : 1030-1130

Name : _____ ()

Class : Secondary 3 - _____

FOR EXAMINER'S USE

/ 40

INSTRUCTIONS TO CANDIDATES :

Answer *all* questions.

Write your answers in the spaces provided on the question paper.

If working is needed for any question, show it in the space below that question.

Omission of essential working will result in loss of marks.

**NEITHER ELECTRONIC CALCULATOR NOR MATHEMATICAL TABLES
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.

The total marks for this paper is 40.

This question paper consists of 7 printed pages.

**NEITHER ELECTRONIC CALCULATOR NOR MATHEMATICAL TABLES
MAY BE USED IN THIS PAPER.**

- 1 (a) Simplify $3ab^2 \times (9a^4b^{-2})^{\frac{1}{2}}$
(b) Evaluate $2^0 \times \left(\frac{7}{4}\right)^{-1} \div \frac{1}{7}$

Answer : (a) [2]

(b) [2]

- 2 The plan of a school is drawn to a scale of 1:500.
- (a) The actual length of the inner lane of the running track is 200 m. Calculate the length of the inner lane of the running track in the plan, giving your answer in centimetres.
- (b) The area of the garden is represented by an area of 24 cm^2 on the plan. Calculate the actual area of the garden, giving your answers in square metres.

Answer: (a) cm [1]

(b) m^2 [2]

- 3(a) Given that $x^2 - 6xy + 9y^2 = 0$, find the value of y/x
- (b) Factorise $15ax + 21bx - 14by - 10ay$ completely.

Answer : (a) [2]

(b) [2]

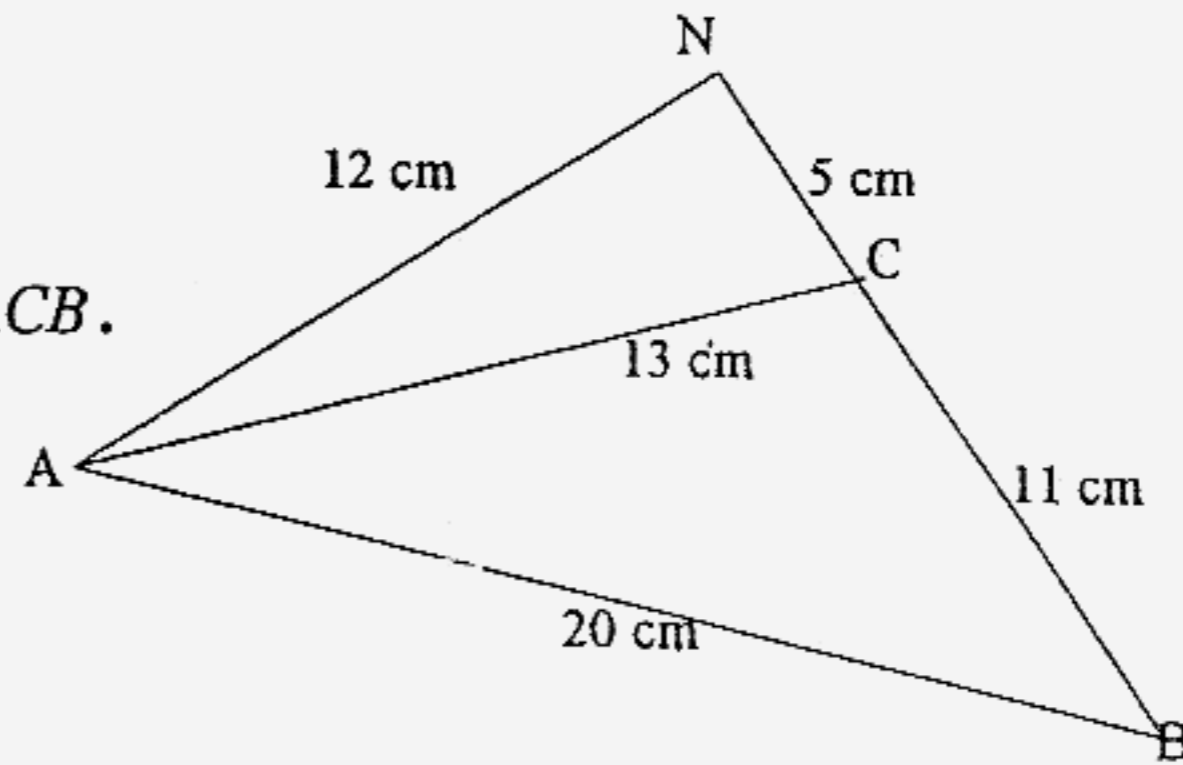
4. ABC is a triangle in which AC = 13 cm, BC = 11 cm and AB = 20 cm. N is a point on BC produced, where CN = 5 cm and AN = 12 cm.

(a) Explain why $\angle ANB$ is a right angle.

(b) Expressing your answers as fractions, find

(i) $\tan \angle ABN$

(ii) $\cos \angle ACB$.



Answer :: (a) [1]

(b i) [1]

(b ii) [1]

5. The line $3x - 4y = 12$ cuts the x-axis at A and the y-axis at B.

(a) Find the gradient of the line.

(b) Find the coordinates of A and B.

(c) Find the length of the line segment AB.

(d) If the x-axis is the line of symmetry of the triangle ABC, state the coordinates of C.

Answer : (a) [1]

(b) [2]

(c) units [1]

(d) [1]

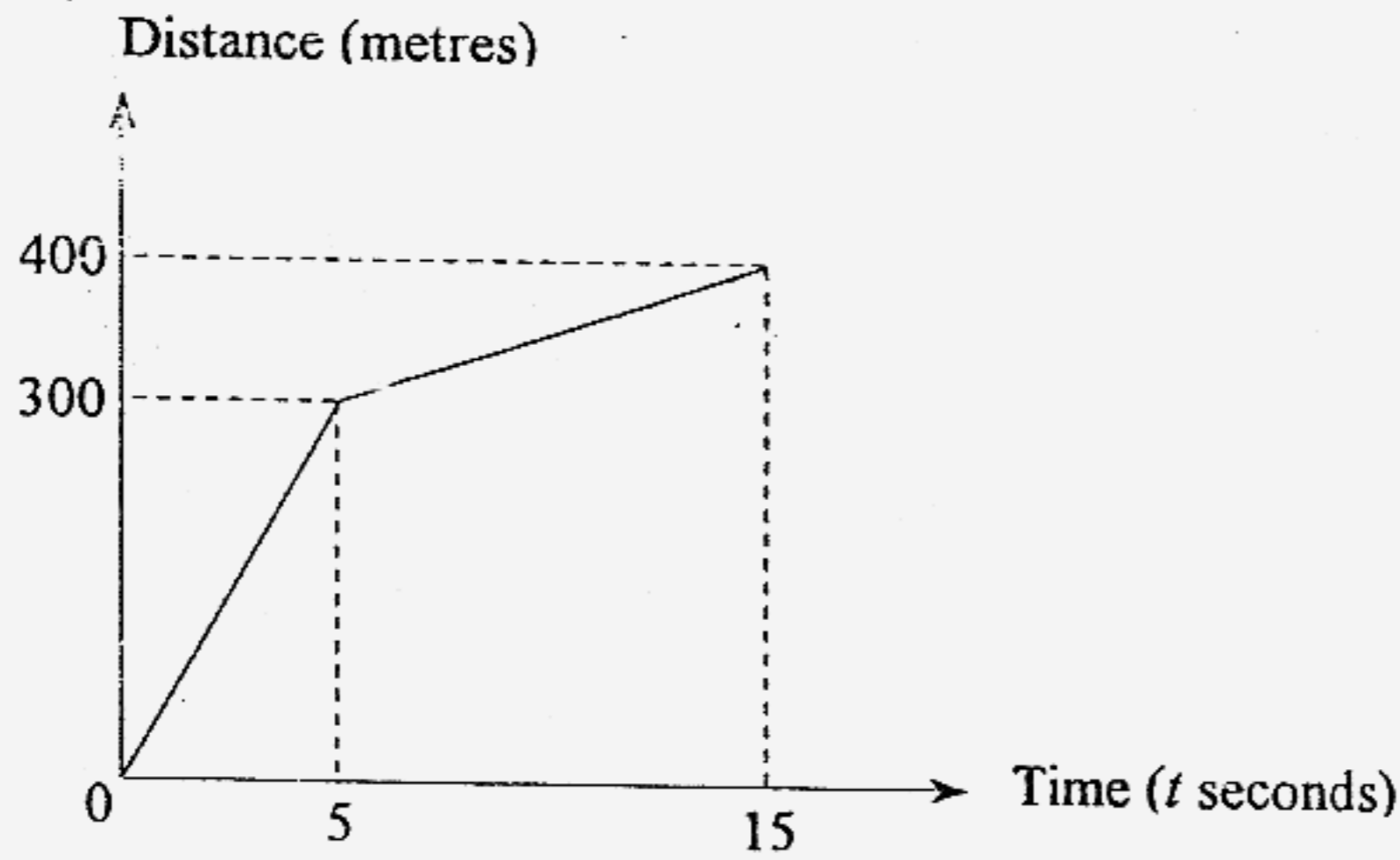
- 6(a) Given that $4 \leq x \leq 8$ and $-3 \leq y \leq 2$, state
i) the least possible value of xy ,
ii) the greatest possible value of $4x - y^2$
(b) Find the smallest integer k such that $-3k < 20$

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

-
- 7 It is given that y varies inversely as x^2 . Given that $y = 3$ when $x = 4$,
(a) express y in terms of x ,
(b) find the value of y when $x = 0.5$.

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

8. The diagram shows the distance-time graph of a moving object.



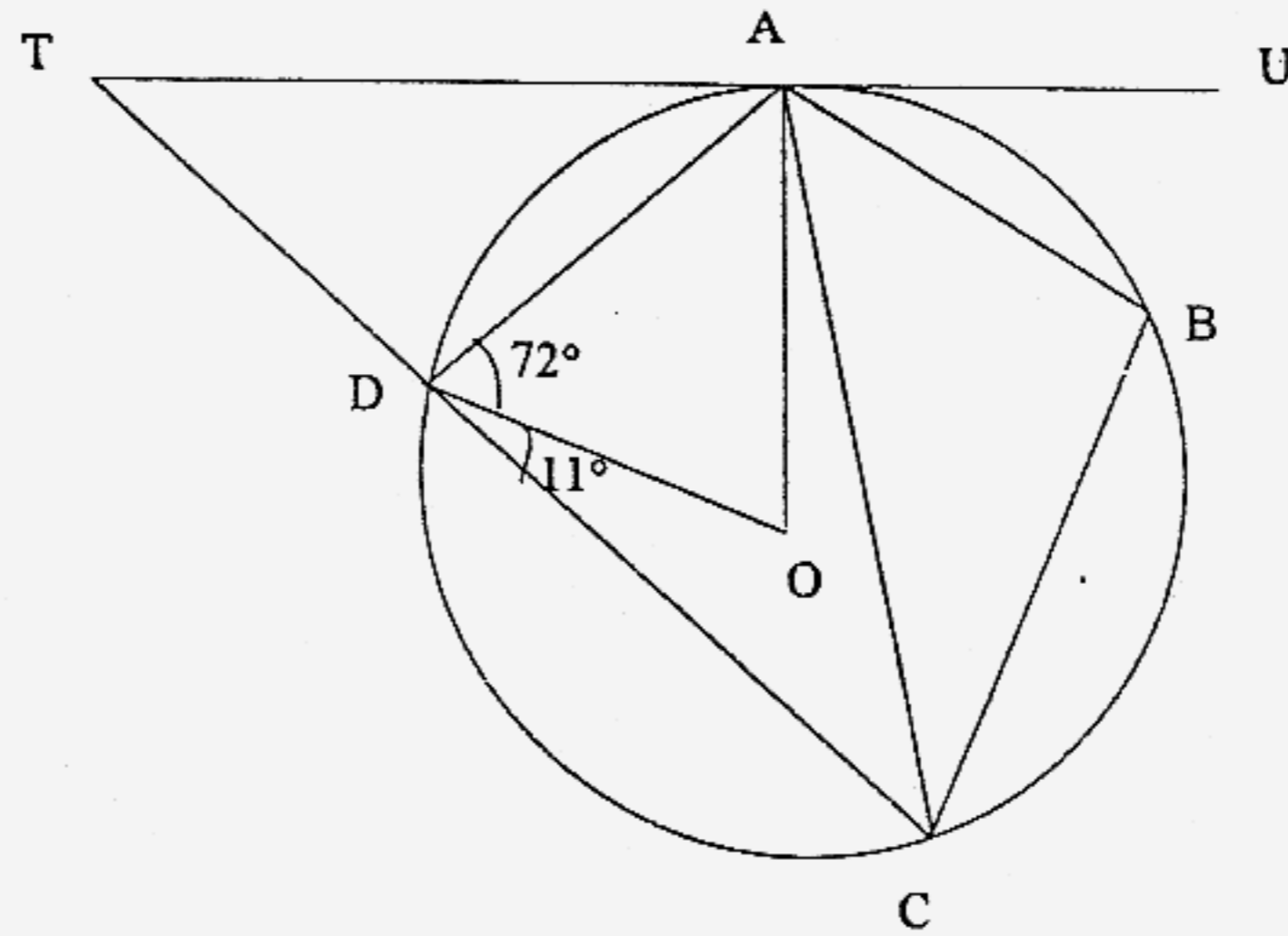
Calculate

- (a) the speed of the object when $t = 9$,
- (b) the acceleration of the object when $t = 3$,
- (c) the average speed of the object for the first 13 seconds.

Answer : (a) m/s [1]
(b) m/s^2 [1]
(c) m/s [2]

9 In the diagram, O is the centre of the circle. ABCD is a quadrilateral whose vertices lie on the circumference of the circle. CDT is a straight line and TAU is a tangent to the circle at point A. Given that $\angle ODA = 72^\circ$ and $\angle CDO = 11^\circ$. Find

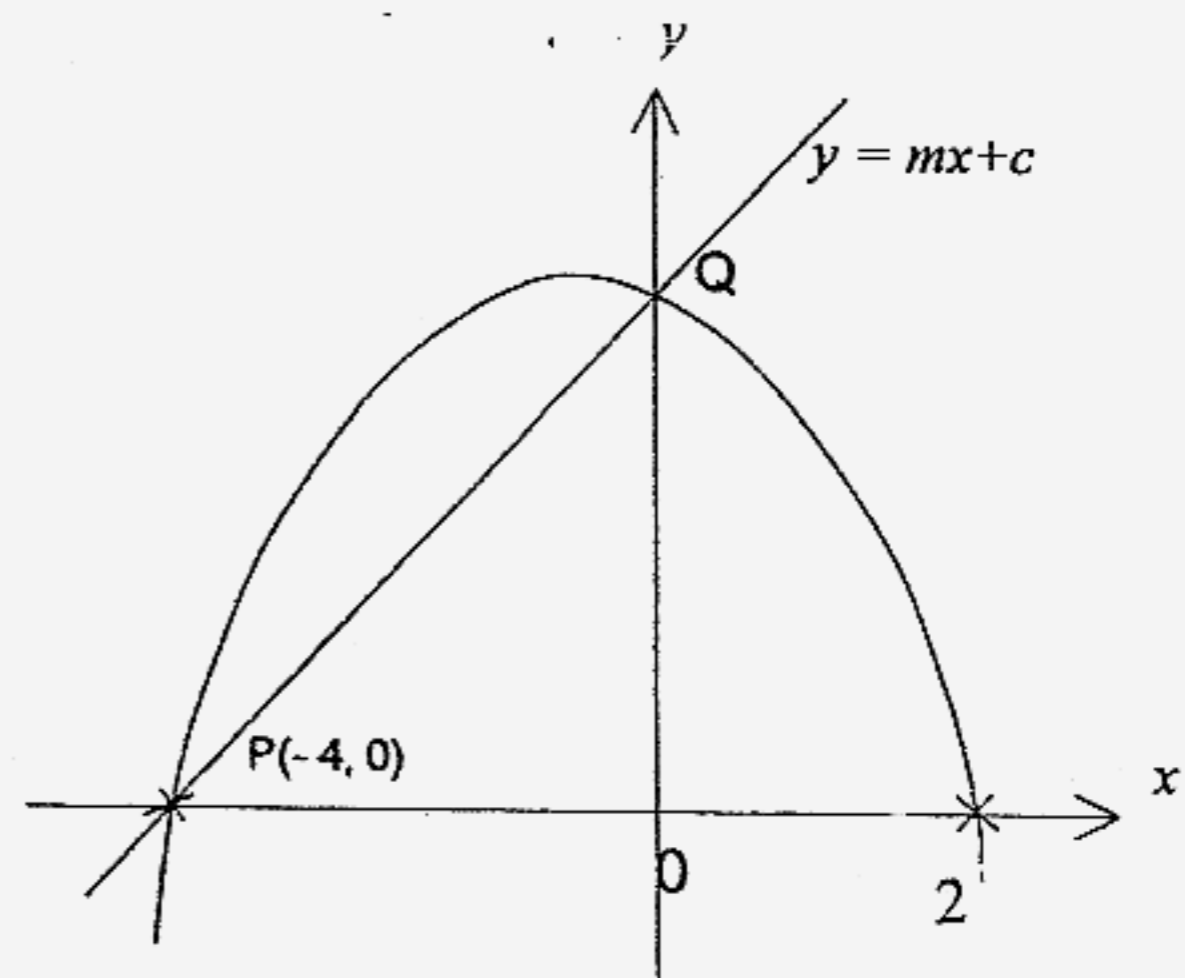
- (a) $\angle CBA$
- (b) $\angle AOD$
- (c) $\angle DCA$
- (d) $\angle ATD$
- (e) $\angle CAO$



- Answer : (a) [1]
 (b)..... [1]
 (c)..... [1]
 (d)..... [1]
 (e)..... [1]

10 The diagram shows a quadratic curve and a straight line $y = mx + c$. They meet at the points, P and Q, on the x-axis and y-axis respectively.

- (a) Find the equation of the quadratic curve.
- (b) Find the values of m and c .



- Answer (a) [1]
 (b) $m =$ $c =$ [2]

11 The table shows the distribution of marks obtained by a group of boys in a Science quiz.

| | | | | | | | |
|-----------|----|---|---|---|-----|---|---|
| Marks | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| Frequency | 10 | 2 | 7 | 3 | m | 3 | 8 |

- Find the
- (a) least possible value of m if 4 is the mode,
 - (b) value of m if the mean is 3,
 - (c) range of values of m if the median is 3.

Answer (a) $m =$ [1]

(b) $m =$ [1]

(c) [1]

END OF PAPER 1



CATHOLIC HIGH SCHOOL

FINAL TERM EXAMINATION 2006

Subject: Mathematics D

Paper: 2

Level: Secondary 3

Date: 10/10/06

Marks: 50

Time: 11 40-12 55

INSTRUCTIONS:

Answer all questions.

Number all questions clearly.

Show all of your working on the same page as the rest of the answer.

Omission of essential working will result in loss of marks.

INFORMATION FOR CANDIDATES:

Intended marks for questions or parts are given in brackets [].

The total marks for this paper is 50.

You are expected to use an electronic calculator to evaluate explicit numerical expressions.

If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures.

Give answers in degrees to one decimal place.

This question paper consists of 5 pages, including this cover page

Section A: 38 Marks (Answer all questions)

1. (a) Given that $y = \sqrt{\frac{2a-4}{3-4a}}$, express a in terms of y . [2]

(b) Solve the equation $(3x-2)(x+2) = 1$ [2]

(c) Solve the inequality $\frac{1}{3}(x+7) < \frac{1}{6}(x+24) < x$ and list the integers which satisfy the above inequality [3]

2. Mr Tan drives from Singapore to Kuala Lumpur, a distance of 186 km apart.

(a) If his average speed was x km/h, write down in terms of x , an expression for the time taken, in hours, for the whole journey. [1]

(b) On his return journey, his average speed for the first 150 km was x km/h, and the remaining journey, at $(x-10)$ km/h. Write down an expression in terms of x , for the time taken in hours, for the return journey. [2]

(c) If the return journey took 25 minutes longer, form an equation in x and show that it reduces to $x^2 - 10x - 864 = 0$. [3]

(d) Solve the equation $x^2 - 10x - 864 = 0$, giving both your answers correct to 2 decimal places. [3]

(e) Calculate, correct to the nearest minutes, the total time taken by Mr Tan for both journeys. [2]

3. Construct a quadrilateral ABCD such that $AB = 14$ cm, $BC = 12$ cm, $\angle ABC = 45^\circ$, $\angle BAD = 90^\circ$ and $\angle BCD = 130^\circ$. Measure the length of CD. [3]

(a) On your diagram, inside the quadrilateral,

(i) draw the locus of points W which are 8 cm from A. [1]

(ii) draw the locus of points X such that area of $\triangle ABX = 21$ cm² [1]

(iii) draw the locus of points Y which are equidistant from AD and CD. [1]

(iv) draw the locus of points Z which are equidistant from B and C. [1]

(b) F is a point inside the quadrilateral such that

(i) $AF \leq 8$ cm

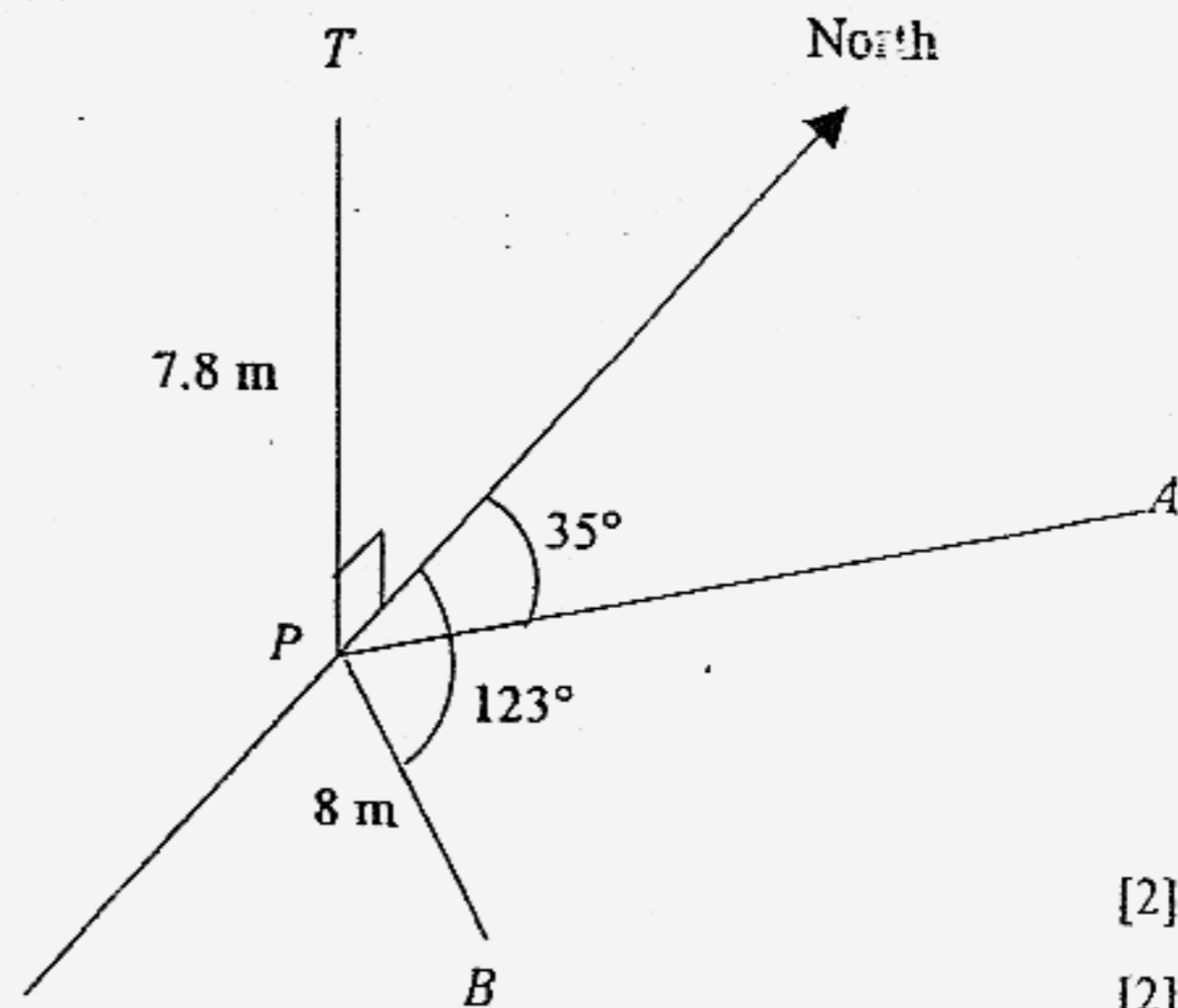
(ii) area of $\triangle ABF \leq 21$ cm²

(iii) it is nearer to CD than to AD

(iv) $CF \leq BF$

Indicate clearly, by shading, the region of your diagram in which F must lie. [2]

- 4 Two students Amy and Bob are sitting at the positions A and B on the bearings of 035° and 123° from a stand P respectively. Bob is 8 m away from P . A vertical flag pole, PT , stands at P is of height 7.8 m . The angles of elevation of the top of the flag pole T from Amy is 26° .



- (a) Calculate
- (i) the distance PA , [2]
 - (ii) the distance AB , [2]
 - (iii) the bearing of Amy from Bob, [3]
 - (iv) how far is Bob due west of Amy. [2]
- (b) Amy walks from A towards B until she reaches a point R , where the angle of elevation of T from R is the greatest. Calculate the distance travelled by Amy. [2]

Section B [12 marks]

Answer **ONE** question in this section.

5 (i)

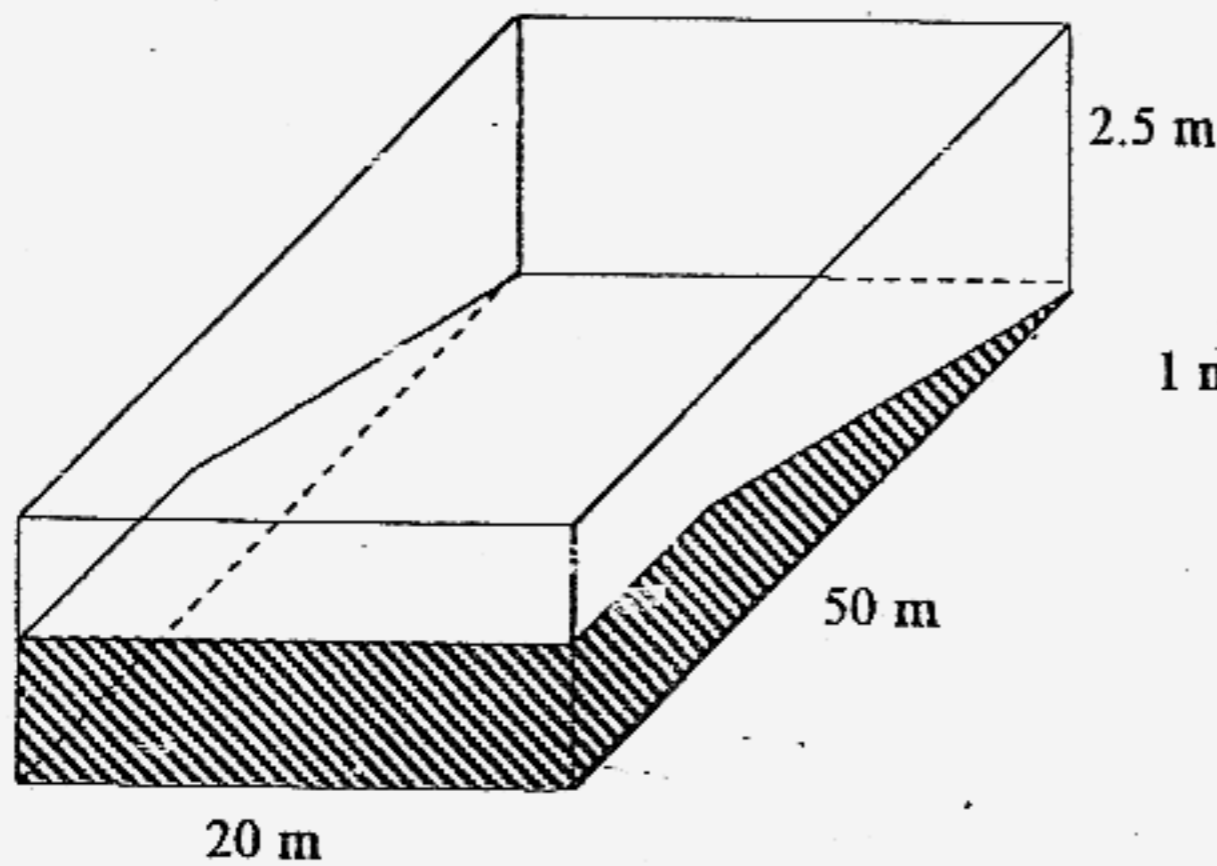


Diagram 1

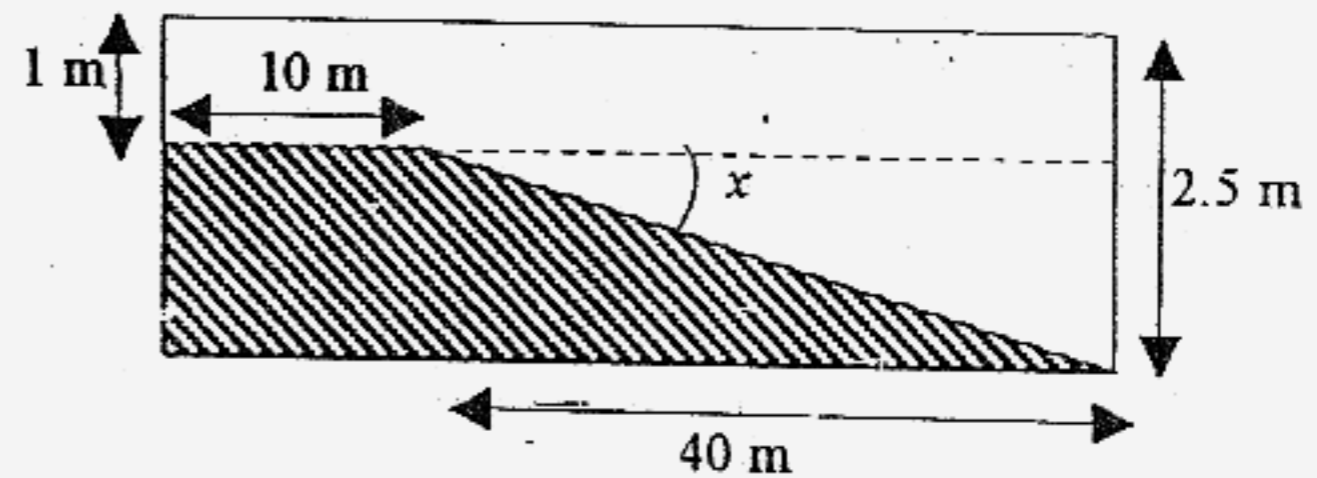


Diagram 2

Diagram 1 shows a swimming pool and Diagram 2 shows the longitudinal section of the swimming pool. The length and breadth of the swimming pool are 50 m and 20 m respectively. The depth is 1 m for a length of 10 m . After that the depth increases gradually until it becomes 2.5 m .

- (a) Find the angle marked x . [1]
- (b) Calculate the volume of water needed to fill the pool completely. [2]
- (c) The pool is cleaned once a week. Water is drained from it at a rate of $V\text{ m}^3\text{ s}^{-1}$.
If it takes 2 hours to drain the pool dry, find the value of V . [1]
- (d) If the pool is filled with just 1000 m^3 of water, find the depth of water in the pool at the deepest end. [2]

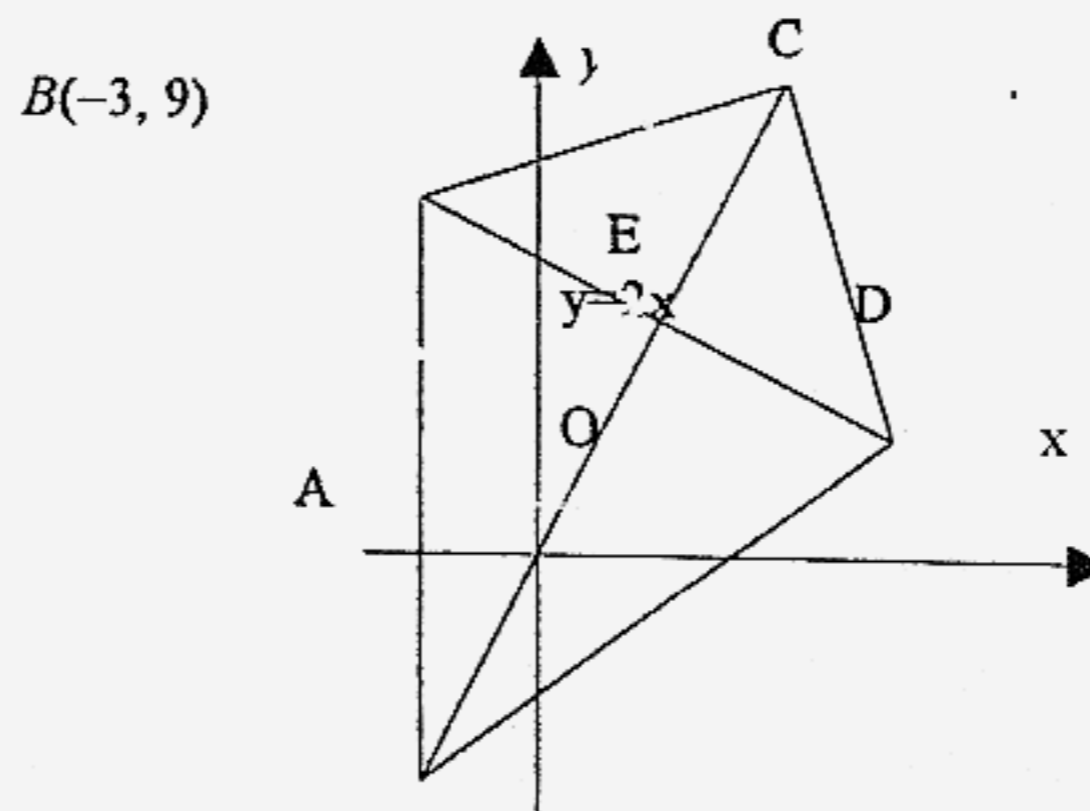
(ii) The figure shows a kite $ABCD$ with one side AB parallel to the y -axis and its two diagonals intersect at E . Given that B is $(-3, 9)$ and the equation of the diagonal AC is $y = 2x$,

(a) state the coordinates of the point A ,

[2]

(b) find the equation of diagonal BD and hence write down the coordinates of D and E .

[4]



6. ANSWER THIS QUESTION ON GRAPH PAPER.

A printing company makes a profit of y thousand Singapore dollars from x thousand books where $y = 4x - x^2 - 1$.

Corresponding values of y and x are given in the table below.

| | | | | | | | | |
|-----|----|------|---|-----|---|------|---|-----|
| x | 0 | 0.5 | 1 | 1.5 | 2 | 2.5 | 3 | 3.5 |
| y | -1 | 0.75 | 2 | a | 3 | 2.75 | 2 | b |

(a) Calculate the value of a and of b .

[1]

(b) Using a scale of 4 cm to represent 1 unit on each axes, draw the graph of $y = 4x - x^2 - 1$ for $0 \leq x \leq 3.5$.

[3]

(c) Use your graph to find

(i) the number of books the company should print in order to obtain the maximum profit,

[1]

(ii) the minimum number of books that should be printed in order to cover the cost of production,

[1]

(iii) the range of values of x for which the profit is more than S\$2450.

[2]

(d) By drawing a suitable straight line on the same axes, find the solutions for $2x^2 - 7x + 4 = 0$.

[2]

(e) From the graphs, find the value of x for which the gradient of the

tangent is equal to $\frac{1}{2}$.

[2]

Answer key to Paper 1

- 1 (a) $9a^2b$ (b) 4
 2 (a) 40 cm (b) 600 m^2
 3 (a) $\frac{1}{3}$ (b) $(3x - 2y)(5a + 7b)$
 4 (a) By Pythagoras Theorem (must show working)
 5 (a) $\frac{3}{4}$ (b) A(4,0), B (0, -3)
 (c) 5 units (d) (0, 3)
 6 (a) (i) -24 (ii) 32
 (b) -6
 7 (a) $y = \frac{48}{x^2}$ (b) 192
 8 (a) 10 m/s (b) 0 m/s^2
 (c) $29\frac{3}{13}$
 9 (a) 97° (b) 36° (c) 18°
 (d) 65° (e) 7°
 10 (a) $-(x+4)(x-2)$ (b) $m=2$ $c=8$
 11 (a) $m=11$ (b) $m=11$ (c) $6 \leq m \leq 10$

Paper 2

- 1 (a) $a = \frac{3y^2 + 4}{2(1 + 2y^2)}$ (b) $x = 0.847$ or -1.18 (c) 5,6,7,8,9
 2 (a) $\text{time} = \frac{186}{x}$ h (b) $\frac{150}{x} + \frac{36}{x-10}$ (d) 34.86, -24.86 (e) 11 h 5 min
 3 $CD = 5.6 \pm 0.1 \text{ cm}$
 4 (a) (i) PA = 16.0 m (b) AB = 17.6m (iii) Bearing of A from B is 008° (iv) 14.2 m
 5 (i)(a) $x = 2.1^\circ$ (b) 16000 m^0 (c) $800 \text{ m}^3/\text{s}$ (d) 1.9 m
 (ii) (a) A = (-3, -6) (b) Equation of BD : $y = -\frac{1}{2}x + \frac{15}{2}$ E=(3,6), D=(9,3)
 6 (a) $a = 2.75$ $b = 0.75$ (c) (i) 3000 books (ii) $0.25 \times 1000 = 250$ books
 (iii) $1.25 < x < 2.7$ (d) $y = \frac{1}{2}x + 1$ $x = 0.7$ or 2.8 (e) $x = 1.75$