SYDNEY BOYS HIGH SCHOOL

YEAR 11 2 UNIT MATHEMATICS

YEARLY EXAMINATION

September 16, 1994

Time allowed: 2 Hours Examiner: T.A. Donnellan

Instructions:

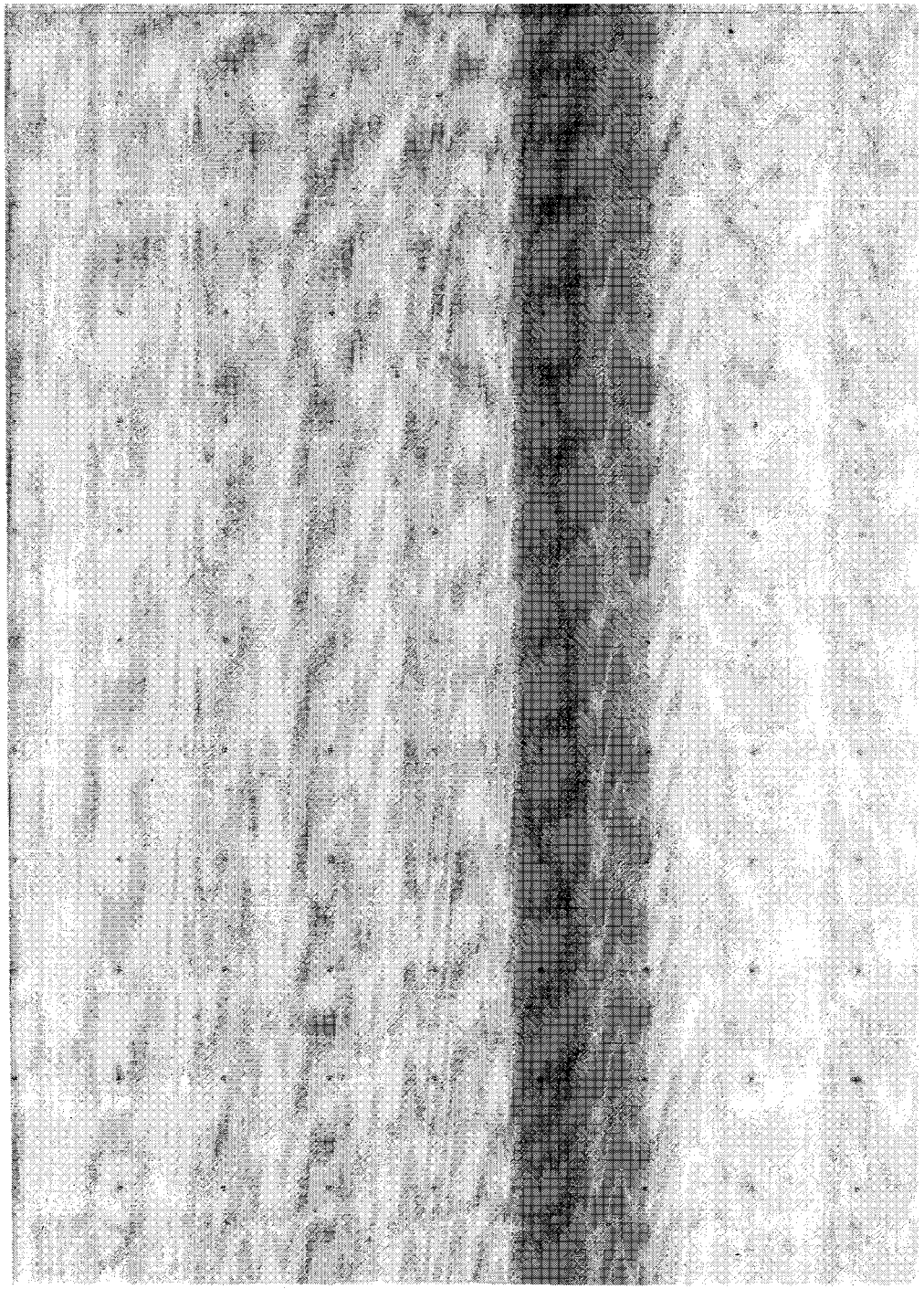
* Answer all the questions
* **All working should be shown**
* Silent non-programmable calculators may be used
* All questions carry the same number of marks
* Hand your work in in 4 parts:

  Part A - Questions 1,2

  Part B - Questions 3,4

  Part C - Questions 5,6

  Part D - Questions 7,8



Question 1

(a) Calculate $\frac{147.5 \text{ -- } 12.92}{\sqrt{84.58}}$ correct to 2 decimal places.

(b) Find the exact value of
$\sqrt{45} + \sqrt{80} - \sqrt{20}$

(c) Factorise fully
(i) $7x^2 + 28$

(ii) $5x^3 + 40$

(d) Express $\frac{5}{\sqrt{7} - 2}$ with a rational denominator

(e) Solve for x
(i) $x - 3(2 - x) = 0$

(ii) $\frac{x}{3} - \frac{2x + 1}{4} = 5$

Question 2 (Start a new page)

(a) If $E = \frac{m}{2}(v^2 - u^2)$
find the value of E when $m = 4$, $v = 10$, $u = 7$

(b) Factorise
$3x^2 + 8x - 16$

(c) Express in scientific notation
$(1.26 \times 10) \div (7 \times 10^2)$

(d) Solve for x
$|x - 2| = 1$

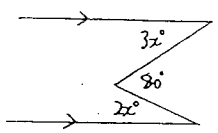
(e) Find $\sqrt[3]{800}$ to 3 sig. figs.

(f) Find all the solutions of
(i) $(x + 2)^2 = 25$

(ii) $\frac{1}{x - 1} + \frac{1}{2x - 1} = 0$

Question 3 (Start a new page)

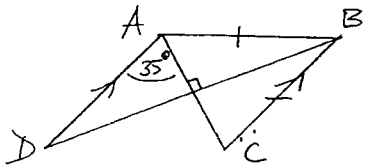
(a)



Not to scale

Find x

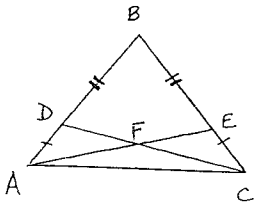
(b) This figure is not drawn to scale:



(i) Calculate $\angle$ ABC

(ii) Show that AB = AD

(c)



Not to scale

(i) Use congruent triangles to prove that AE = CD

(ii) Prove that AF = CF

(d) Express $0.3\dot{1}\dot{7}$ in the form $\frac{m}{n}$, where m and n are integers.

Question 4 (Start a new page)

(a) Given the points Q (4,4) and T (-2, 1)

(i) Find the midpoint and gradient of QT.

(ii) Find the equation of the line QT in general form.

(iii) Find the equation of the line through P(2,-3) perpendicular to the line QT.

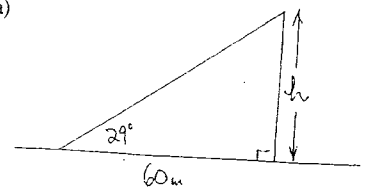
(iv) Find exactly the distance of P from QT.

(v) Find the area of the circle with QT as diameter. (leave this as a multiple of π)

(b) It has been suggested that there exists a regular polygon with an interior angle equal to 125°. Is this possible? Support your answer with reasoning.

Question 5 (Start a new page)

(a)



Not to scale.

A minister wishes to find, to the nearest metre, the height of his church tower. When he is 60cm from the base of the tower, he notices the top at an angle of elevation of 29°.

(i) Calculate the height of the tower to the nearest metre.

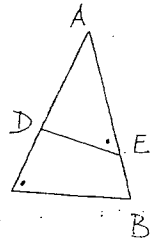
(ii) If he moves 15m nearer the tower, what will the angle of elevation of the top now be, to the nearest degree?

(b) A ship sails from a port P 40 nautical miles on a bearing of 135°T, it then turns to a heading (bearing) of 340°T, and goes 75 nautical miles, reaching the point B.

(i) Find the distance from B to P, to the nearest nautical mile.

(ii) Find the bearing of P from B.

(c)



Not to scale

$\angle AED = \angle ACB$

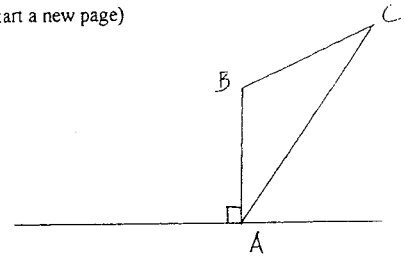
AB = 8; AC = 10; AD = 6

(i) Find AE

(ii) Find the ratio Area CDEB: Area ΔABC

Question 6 (Start a new page)

(a)



AB is a vertical rod 4m long and AC is inclined at 52° to the horizontal. BC makes an angle of 35° to the horizontal.

(i) Draw a diagram and on it mark the sizes of all the angles of ΔABC.

(ii) Calculate, correct to the nearest centimetre, the length of AC.

(b) Consider the function $y = \frac{|x|}{x}$

(i) What is the range of this function?

(ii) What is its domain?

(iii) Draw a sketch of the function with $-3 \leq x \leq 3$

(c) Sketch the graph of $y = 2x^2 + x - 10$ for the $-3 \leq x \leq 3$, and hence or otherwise solve : $2x^2 + x - 10 > 0$