

SYDNEY BOYS HIGH SCHOOL



HALF-YEARLY EXAMINATION

YEAR 11

MAY 2003

MATHEMATICS

Time allowed - Ninety Minutes

Examiner: R. Boros

DIRECTIONS TO CANDIDATES

- All questions may be attempted.
- Questions are not of equal value.
- All necessary working should be shown in every question. Full marks may not be awarded for careless or badly arranged work.
- Approved calculators may be used.
- Start each question in a new writing booklet.
- If required, additional paper may be obtained from the examination supervisor upon request.

Question 1 (18 marks) Start work in a new booklet

Marks

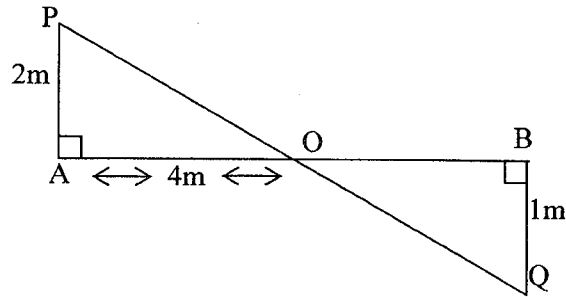
- (a) Simplify $\sqrt{32} + \sqrt{98} - \sqrt{50}$ leaving your answer in exact form. 2
- (b) $\left(\frac{8}{27}\right)^{\frac{1}{3}} \times \left(\frac{4}{9}\right)^{\frac{1}{2}}$ 2
- (c) Simplify $\frac{8x^2}{9x^4} \times \frac{5x}{10x^2}$ 1
- (d) Factorise $4x^2 + 16x - 9$ 2
- (e) Solve for x , $\frac{3x-2}{5} = \frac{x}{4} + 3$ 2
- (f) Show that $\frac{1}{3-\sqrt{2}} + \frac{1}{3+\sqrt{2}}$ is rational 2
- (g) Solve the inequality and graph the solution to it on a number line
 $9 - 2x > 14$ 2
- (h) Solve the equation $|x+1| = 5 - 3x$ 3
- (i) Show that $0.\dot{2}\dot{7}$ is a rational number 2

Question 2 (15 marks) Start work in a new booklet

- (a) Write down the value of $\sin \theta$ if $\tan \theta = \frac{5}{12}$ and $\cos \theta < 0$ 2

- (b) If $\sin \theta^\circ = \frac{2}{3}$, find the exact value of 3
- (i) $\operatorname{cosec} \theta^\circ$
 - (ii) $\sin(180 - \theta)^\circ$
 - (iii) $\sin(-\theta)^\circ$
- (c) Express as trigonometric ratios of θ° only. 3
- (i) $\cos(180 + \theta)^\circ$
 - (ii) $\tan(-\theta)^\circ$
 - (iii) $\sec(90 - \theta)^\circ$
- (d) Prove that $\frac{1}{\sin \theta \cos \theta} - \tan \theta = \cot \theta$ 3
- (e) From O, two cyclists ride along straight roads which branch out at an angle of 70° . Their speeds are 10 km/h and 15 km/h respectively. Find their distance apart after 2 hours (correct to 2 decimal places). 2
- (f) A boy 1.5 m tall, casts a shadow of length 2 m. At the same time, what should be the length of the shadow cast by a tree of height 9 m? 2

Question 3 (14 marks) Start work in a new booklet.

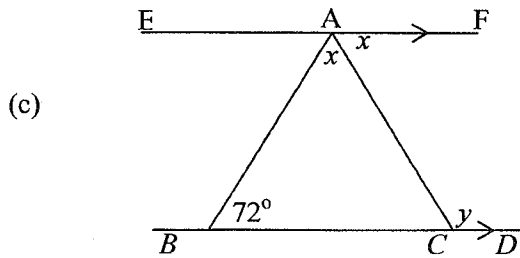


In $\triangle PAO$, $AP = 2m$, $AO = 4m$, $\hat{PAO} = 90^\circ$

In $\triangle QBO$, $BQ = 1m$, $\hat{QBO} = 90^\circ$

PQ and AB intersect at O

- (i) Prove $\triangle PAO \parallel \triangle QBO$ 2
 - (ii) Find the length of BO 1
 - (iii) Find the length of PQ 3
- (b) From P , the bearing of a point Q , 30km away is $114^\circ T$. From Q the bearing of a point R , 20km away is $230^\circ T$. By drawing a diagram of the above information, find the distance from P to R (to 2 decimal places) and also the bearing of R from P . 5



$EF \parallel BD$

$\hat{BAC} = \hat{FAC} = x$

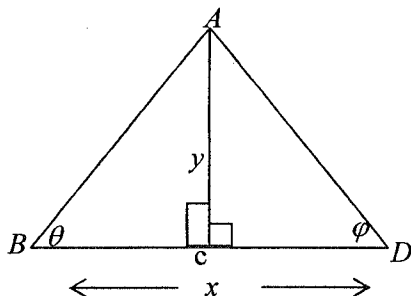
$\hat{ACD} = y$

Find the values of x and y
(Give reasons) 3

Question 4 (18 marks) Start work in a new booklet

- (a) The lines $2x + 3y = -19$ and $5x - y = 12$ intersect at P . Find the coordinate of P 2
- (b) Show that $(6, -4)$, $(5, -1)$ and $(2, 8)$ are collinear 3
- (c) Find the equation of the line which has an x intercept of 3 and a y intercept of -2 . Write your answer in the gradient - intercept form. 2
- (d) Find the equation of the perpendicular bisector of AB where $A(6, -9)$ and $B(-3, 9)$ Write your answer in the general form. 3
- (e) Which of the two points $P(7, -3)$ and $Q(-2, 0)$ are the closest to the line $3x + 4y + 2 = 0$. Are the two points on the same side of the line or on opposite sides? 3
- (f) Factorise completely $16 - m^4$ 2

(g)



Prove that

$$\frac{y = x \sin \theta \sin \phi}{\sin(\theta + \phi)}$$

Question 5 (17 marks) Start work in a new booklet

- (a) Write the following expressions in the form of a complete square sign plus or minus a constant
- (i) $x^2 + 4x$ 1
- (ii) $x^2 - 6x + 11$ 1

(b) If $A = \frac{27}{64}$, $B = \frac{125}{128}$, $C = \frac{25}{81}$ 3

Find the value of $\frac{A^3 C^2}{B^2}$ in simplest rational form

(c) Solve the following equations, leaving your answers in surd form if necessary

(i) $x + \frac{1}{x} = 2$ 2

(ii) $x(x-3) = 9$ 3

(d) Graph the solution set to $|2x+1| \leq 3$ 2

(e) Solve the simultaneous equations 3

$$2a - 7b + 3c = 7$$

$$a + 3b + 2c = -4$$

$$4a + 5b - c = 9$$

(f) Fully factorise $8x^3 + 27y^3$ 2

end of paper