

SYDNEY BOYS' HIGH SCHOOL

MOORE PARK, SURRY HILLS



HALF-YEARLY EXAMINATION May 2002

MATHEMATICS

Time allowed — Ninety Minutes
Examiner: A.M. Gainford

DIRECTIONS TO CANDIDATES

- ALL questions may be attempted.
- 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 Section on a new page. Section A (Q1, Q2, Q3, Q4), Section B (Q5, Q6, Q7, Q8), Section C (Q9, Q10, Q11).
- If required, additional paper may be obtained from the Examination Supervisor upon request.

Section A

Marks
6

Question 1

- (a) Evaluate $\frac{\pi+2}{\pi-2}$ correct to one decimal place.
- (b) Simplify $a(1-b) - b(1-a)$.
- (c) Write $\frac{\sqrt{6}}{\sqrt{3}-\sqrt{2}}$ in the form $a\sqrt{2} + b\sqrt{3}$.

Question 2

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- (a) Express $0.\overline{18}$ as a common fraction in lowest terms.
- (b) Prove that no regular polygon has an internal angle of 132° .
- (c) Solve for x : $(x+4)^2 = 9$.

Question 3

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- (a) Simplify $\left(\frac{4}{3}\right)^{\frac{5}{2}} \times 2^{-3} \times \sqrt{\frac{27}{64}}$
- (b) Express $\frac{\sqrt{3}+1}{\sqrt{3}}$ with rational denominator.
- (c) By expressing it in its simplest form, show that $\frac{1}{\sqrt{7}-2} - \frac{1}{\sqrt{7}+2}$ is rational.

Question 4

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Factorise completely:

- (a) $4ab^2 - 6ab$
- (b) $4m^2 - 9$
- (c) $x^2 - 2x - 15$

Section B

Question 5

The value of a computer system is depreciating at a rate of 30% each year. Its current value is \$3500.

- (a) What will be its value in one year's time?
- (b) What was its value one year ago?
- (c) Express the total two year loss as a percentage of the current value.

Question 6

For the points $A(1, 6)$ and $B(3, 8)$:

- (a) Find the coordinates of M , the midpoint of AB .
- (b) Find the equation of the line through M , perpendicular to AB .
- (c) Write the equation of the line AB .

Question 7

Graph on separate number lines the solutions to the following:

- (a) $2x + 3 < 5x + 9$
- (b) $-1 \leq x < 2$
- (c) $|x - 2| \leq 3$

Question 8

- (a) Show that the lines $y = 2x - 1$ and $2x - y + 3 = 0$ are parallel.
- (b) Find the perpendicular (shortest) distance between the two lines in Part (a).
- (c) By completing the square on x , or otherwise, find the minimum value of the quadratic expression $x^2 + 8x + 9$.

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Section C

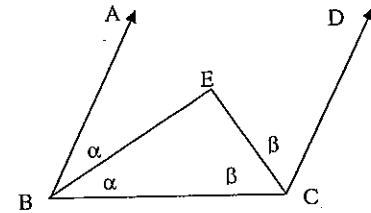
Question 9

Factorise completely:

- (a) $12x^2 + 5x - 3$
- (b) $2xy + 6x - y - 3$
- (c) $a^3 - 8$

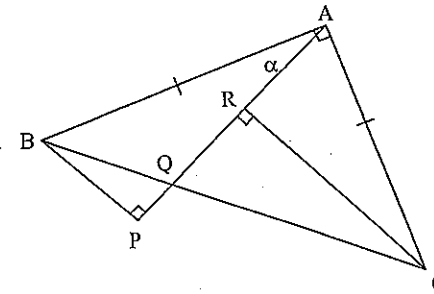
Question 10

- (a) Given that $AB \parallel CD$ and angles are as marked, find the measure of $\angle BEC$. (Give reasons)



- (b) Find the equation of the line with gradient -1 , which passes through the intersection of the lines $2x - 5y + 19 = 0$ and $2x + 3y - 5 = 0$.

Question 11



In the figure $AB = AC$, $\angle BAC = \angle BPA = \angle CRA = 90^\circ$; $\angle BAP = \alpha$.
Prove that:

- (a) $\angle ACR = \alpha$.
- (b) Triangles ABP and CAR are congruent.
- (c) Triangles BPQ and CRQ are similar.
- (d) $\frac{PQ}{QR} = \frac{RA}{AP}$.

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