

# 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****6**

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

**Question 3****6**

- (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****6**

Factorise completely:

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

## Section B

### Question 5

6

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

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

6

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

6

- (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  $x^2 + 8x + 9$ .

**Section C**

**Question 9**

6

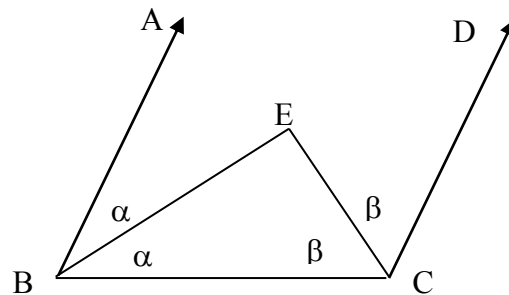
Factorise completely:

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

**Question 10**

6

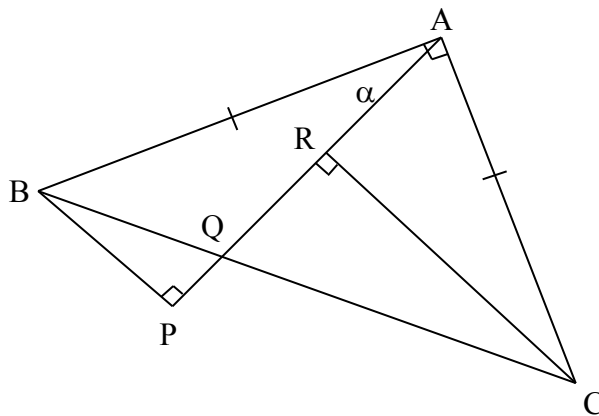
- (a) Given that  $AB \parallel CD$  and angles are as marked, find the measure of  $\angle BEC$ . (Give reasons)



- (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**

8



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)  $\frac{PQ}{QR} = \frac{RA}{AP}$ .