SYDNEY GIRLS HIGH SCHOOL

# MATHEMATICS

YEAR 10

HALF-YEARLY EXAMINATION

2006

**Time Allowed: 75 minutes**

INSTRUCTIONS:

- There are FIVE (5) Questions of equal value.
- Attempt all questions.
- Show all necessary working. Marks may be deducted for badly arranged work or incomplete working.
- Start each Part on a new page.
- Write on one side of paper only.
- Diagrams are NOT to scale.
- Board-approved calculators may be used.
- Write your name and Maths class clearly at the top of each question and clearly number each question.



## QUESTION 1 (20 Marks)

MARKS

1. Solve the following:

(a) $(x-2)(x+5)=0$ 1

(b) $a^2-64=0$ 1

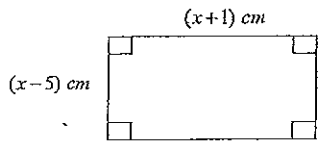
(c) $y^2+y-20=0$ 2

(d) $2x^2+7x+6=0$ 2

(e) $(m+5)^2=7$ (leave your answer in surd form) 2

(f) $x^2+7=15-6x$ (answer to 2 decimal places) 3

2. If the area of the rectangle drawn below is $27cm^2$:




(a) find the value of $x$. 3

(b) find the length of the rectangle. 1

3. A right-angled triangle is drawn so that the hypotenuse is twice the length of the shortest side, and the other side is 1cm longer than the shortest side. Draw a diagram and then form an algebraic equation to represent the information given. (Let $x$ = the shortest side). Solve the equation and find the length of the hypotenuse to 2 decimal places. 5

## QUESTION 2 (20 Marks)

MARKS

1. Jenny places $620 in a term deposit account. If the bank pays her 5.2% p.a. simple interest for 6 months, how much interest does Jenny receive at the end of 6 months? 3

2. Catherine buys a new car valued at $24 500 but decided to buy it on terms. She pays a $5000 deposit and then pays $700 monthly instalments over three years. 3
   (a) How much has Catherine paid for the car?
   (b) What is the amount of interest she paid on the car?

3. If Selina paid $2350 in interest over two years on a loan of $29 000, what was the rate per annum of simple interest charged? 4

4. $35 000 is invested and earns compound interest at a rate of 5.4% p.a. Find the interest earned after two years if it compounded monthly. 4

5. A new plasma TV depreciates by 25% per year. If it costs $1900 new, what will the TV be worth in five years? 3

6. A yacht now worth $120 000 has been depreciating at a rate of 8% p.a. for the last five years. What was its value five years ago? 3



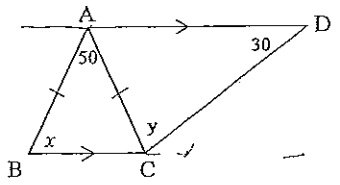
## QUESTION 3 (20 Marks)

MARKS

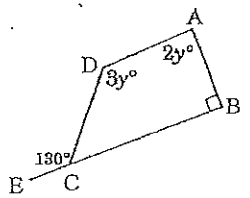
1. When comparing the properties of a rectangle and a rhombus, state one way in which the diagonals are different for both quadrilaterals. 1

2. Determine the value of the pronumeral(s) in each of the following. Give reasons for your answers. 5

(a)




(b) 4

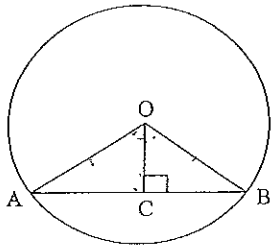


## QUESTION 3 continued

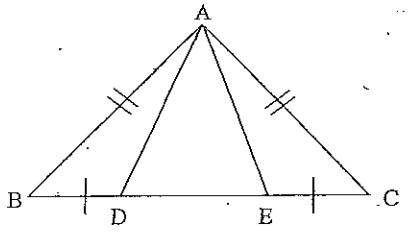
MARKS

3. Prove $\triangle$s AOC and BOC are congruent. 4

Note: O is the centre of the circle and OC is drawn perpendicular to AB.




4. $\triangle$ABC is an isosceles triangle. $AB = AC$ and $BD = CE$.




(a) Prove $\triangle$s ABD and ACE are congruent. 4

(b) Hence show that $\triangle$ADE is isosceles. 2



## QUESTION 4 (20 Marks)

MARKS

1. A traffic light shows red for 1 minute 20 seconds, amber for 20 seconds and green for 1 minute. At any given time, what is the probability that the light is: 8

(a) amber?
(b) not red?
(c) amber or red?
(d) green or blue?

2. Four cards, [one black (B), one red (R), one yellow (Y), one green (G)], are placed in a bag. Two cards are chosen at random without replacing the cards.

(a) Construct a tree diagram and list all the possible pairs chosen. 3
(b) What is the probability of getting a black card? 1
(c) What is the probability of getting a red and a blue card? 1

3. The following data of blood pressure readings was collected for a number of children.

| Blood Pressure | Frequency (f) |
|---|---|
| 115-119 | 0 |
| 120-124 | 2 |
| 125-129 | 9 |
| 130-134 | 6 |
| 135-139 | 2 |
| 140-145 | 0 |

If a child is selected at random, find the probability that the child has blood pressure: 2
(a) less than 125
(b) between 130-139.

4. There are 80 employees in a certain large supermarket. 35 are check-out operators, 20 are shelf stackers. Of the employees, 11 work as both check-out operator and shelf stacker.

(a) Draw a Venn diagram to display this information. 3
(b) If an employee is chosen at random, what is the probability that the employee:
(i) is a check-out operator but not a shelf stacker? 1
(ii) is neither a check-out operator nor a shelf stacker? 1

## QUESTION 5 (20 Marks)

MARKS

1. For the parabola $y = x^2 + 4x - 5$, find the following information:

   (a) the y-intercept 1
   (b) the x-intercepts 2
   (c) the vertex. 3
   (d) Hence or otherwise, sketch the parabola showing all relevant features. 2

2. Find the equation of the parabola with x-intercepts of (-2,0) and (4,0) and y-intercept of (0,-16). 3

3. Sketch the following on separate graphs, showing all relevant features 6

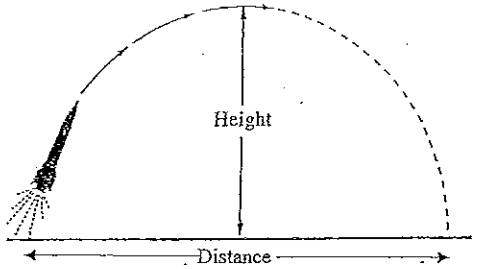
   (a) $y = 3^x$

   (b) $xy = 5$

   (c) $x^2 + y^2 = 9$

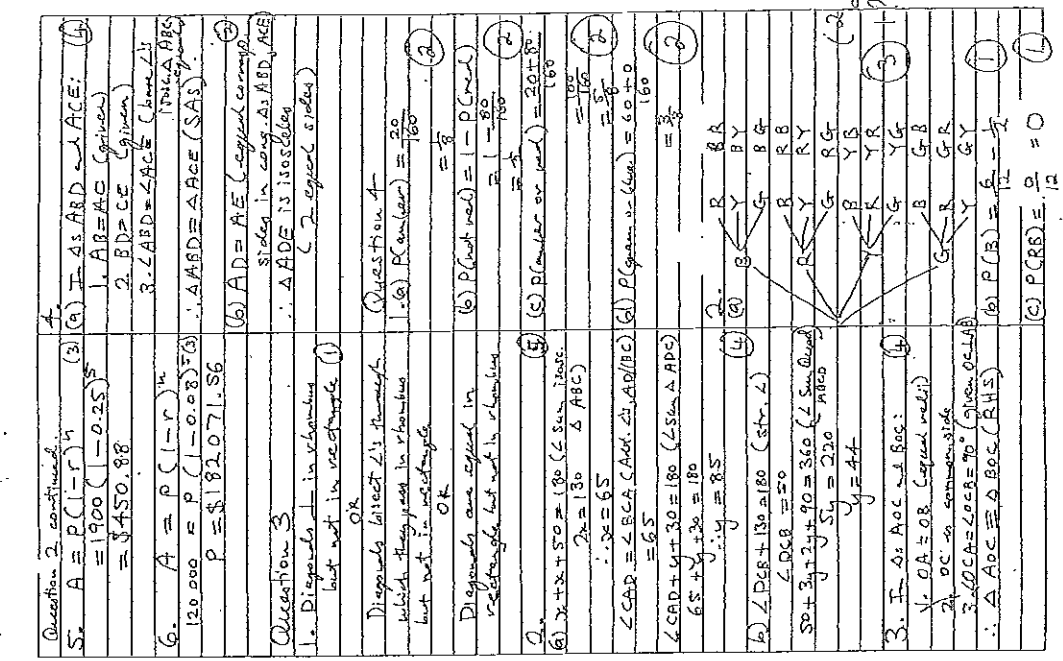
4. A rocket fired from Earth travels in a parabolic path represented by the equation $y = -\frac{x^2}{20} + 3x$, where $y$ is the vertical height in kilometres above the Earth's surface and $x$ is the horizontal distance travelled in kilometres.

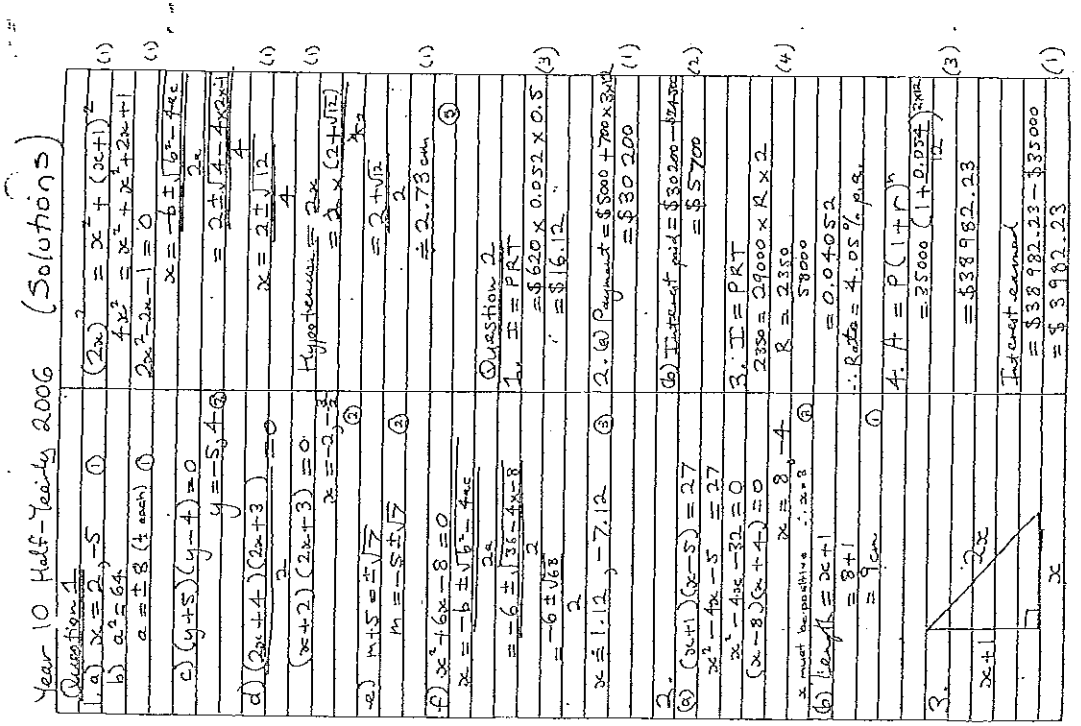
   Find the maximum height that the rocket reaches. 3




End of Paper





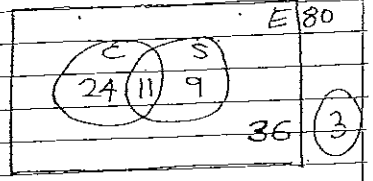


3. (a) $P(<125) = \frac{2}{19}$ (1)

(b) $P(\text{between } 130\text{–}139) = \frac{8}{19}$ (1)

4.

(a)




(3)

(b) $P(C \text{ but not } S) = \frac{24}{80}$

$= \frac{3}{10}$ (1)

(c) $P(\text{not } C \text{ or } S) = \frac{36}{80}$

$= \frac{9}{20}$ (1)

Question 5

1 $y = x^2 + 4x - 5$

(a) Let $x = 0$

$y$ intercept $= -5$ (1)

(b) Let $y = 0$

$0 = (x+5)(x-1)$ (2)

$x = -5$ and $1$ ($x$ intercepts)

(c) Axis of sym $x = \frac{-b}{2a}$

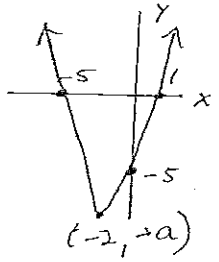
$x = \frac{-4}{2} = -2$

Sub into $y = x^2 + 4x - 5$

$y = 4 - 8 - 5 = -9$

$\therefore$ Vertex $= (-2, -9)$ (3)

(d)




(2)

2 $y = k(x - x_1)(x - x_2)$

$y = k(x+2)(x-4)$

Substitute $(0, -16)$

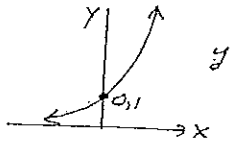
$-16 = k(2)(-4)$

$\therefore k = 2$

$y = 2(x+2)(x-4)$

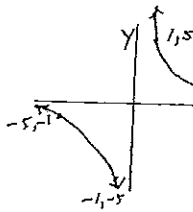
$\therefore y = 2x^2 - 4x - 16$ (3)

3 (a)



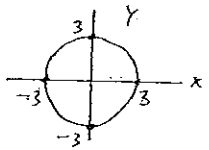

$y = 3^x$ (2)

(b)




$xy = 5$ (2)

(c)




$x^2 + y^2 = 9$ (4)

4 $y = -\frac{1}{20}x^2 + 3x$

Axis of sym $x = \frac{-b}{2a}$

$x = \frac{-3}{(2 \times \frac{-1}{20})} = 30$

$y = -\frac{1}{20} \times 30^2 + 3 \times 30$

$= 45$ (3)

$\therefore$ Max height $= 45$ km