



SYDNEY BOYS HIGH SCHOOL
MOORE PARK, SURRY HILLS

Year 9

Yearly Examination 2009

Advanced Mathematics

General Instructions

- Working time – 90 minutes
- Write using black or blue pen.
- Approved calculators may be used.
- All necessary working **MUST** be shown in every question if full marks are to be awarded.
- If more space is required, clearly write the number of the **QUESTION** on one of the back pages and answer it there. Indicate that you have done so.
- Clearly indicate your class by placing an X, next to your class

- All answers should be presented in simplest exact form, unless otherwise directed.
- Marks may not be awarded for untidy or badly arranged work.

Examiner: *A.M.Gainford*

NAME:

Class	Teacher	
9 A	Mr Kourtesis	
9 B	Ms Nesbitt	
9 C	Ms Ward	
9 D	Ms Roessler	
9 E	Mr McQuillan	
9 F	Mr Boros	
9 G	Mr Hespe	

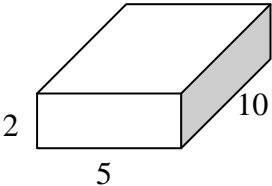
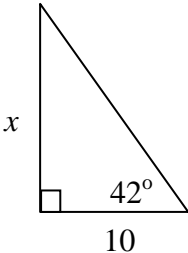
Question	Mark
1	/18
2	/18
3	/18
4	/18
5	/18
6	/18
7	/18
Total	/126

Question 1. (18 marks)

		Answers
(a)	Find, correct to 4 decimal places:	(i)
[2]	(i) $\sin 46^\circ 22'$ (ii) $\tan 84^\circ 12'$	(ii)
(b)	Express 0.0064045 in scientific notation, correct to four significant figures.	
[1]		
(c)	Arrange this set of numbers in order, smallest to largest:	
[2]	$\left\{ \frac{11}{7}, \frac{\pi}{2}, \sqrt{3}, (0.66667)^{-1} \right\}$	
(d)	In each case find the acute angle θ correct to the nearest minute:	(i)
[2]	(i) $\cos \theta = 0.9$ (ii) $\tan \theta = 2.5$	(ii)
(e)	Express $\sqrt{45} - \sqrt{20}$ as a simple surd.	
[2]		
(f)	Simplify the following expression:	
[2]	$\frac{6(xy^2)^4}{(3x^3y)^2}$	
(g)	Express in simplest surd form	
	(i) $2\sqrt{75} - 3\sqrt{48}$	(i)
	(ii) $\frac{6\sqrt{2} \times \sqrt{6}}{4\sqrt{3}}$	(ii)
[2]		
(h)	Expand and simplify $(3x - 2) - 2(x + 2)$.	
[2]		
(i)	At a Sydney Swans match in Sydney there were five men to every two women. If 31 514 fans attended, how many men were there?	
[1]		

		Answers
(j)	Solve for x : $4(x+2) - 3(x-1) = 23$	
[2]		

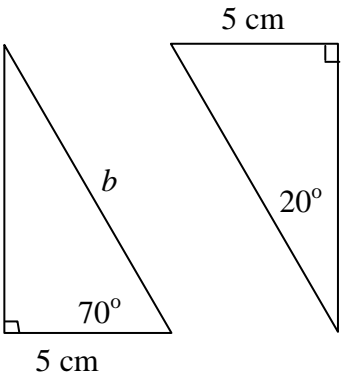
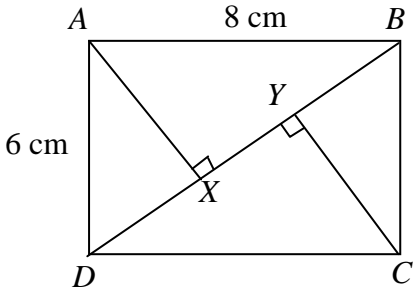
Question 2. (18 marks)

(a)	A letter is chosen at random from the word <i>KATOOMBA</i> . What is the probability that the letter is: (i) A (ii) a consonant (iii) Z	(i) (ii) (iii)
[3]		
(b)	Factorise completely: (i) $9ab^2 - 6a^2b$ (ii) $4y^2 - 36$	(i) (ii)
[3]		
(c)	Find the volume and surface area of the closed rectangular prism, where measurements are in centimetres.	Volume = SA =
[4]		
(d)	Factorise (i) $x^2 - 6x + 8$ (ii) $8x^2 + 18x - 5$	(i) (ii)
[4]		
(e)	Find x , correct to 3 decimal places.	
[2]		

		Answers
(f)	A certain quad scull races at 18 km/hr.	
	(i) How far will it go in 2 minutes?	(i)
	(ii) How long, to the nearest second, will it take to race 1100 m?	(ii)
[2]		

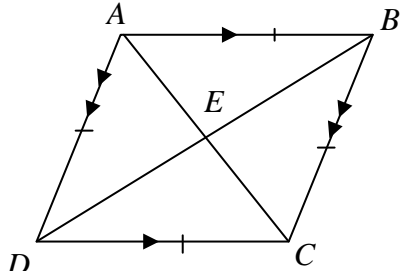
Question 3 (18 Marks)

(a)	Two ordinary dice (6 faces) are rolled, and the uppermost faces noted.	(i)
	(i) Use a grid or table to show all possible outcomes.	
	(ii) What is the probability of a double?	(ii)
	(iii) What is the probability that the sum is 7 or 11?	(iii)
[4]		
(b)	Consider the line with equation $2x - 5y + 10 = 0$	
	(i) State the gradient of the line.	(i)
	(ii) State the y-intercept of the line.	(ii)
	(iii) State the x-intercept of the line.	(iii)
[3]		

		Answers
(c)	 <p>(i) State which test you would use to show that these two triangles are congruent.</p> <p>(ii) Find the value of the pronumeral, correct to 2 decimal places.</p>	(i) (ii)
[3]		
(d)	<p>$ABCD$ is a rectangle with sides 6 cm and 8 cm. AX and CY are drawn perpendicular to BD.</p> <p>Find the length of XY.</p> 	
[3]		
(e)	<p>A card is drawn at random from a regular pack of 52 playing cards.</p> <p>State the probability that it is:</p> <p>(i) Red (ii) a spade (iii) a king</p> <p>(iv) a red ace (v) either a seven or a black queen</p>	(i) (ii) (iii) (iv) (v)
[5]		

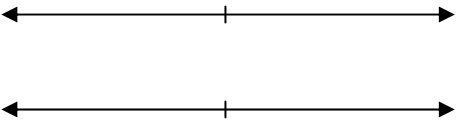
Question 4 (18 Marks)

		Answers
(a)	<p>Use the diagram to answer the following:</p> <p>(i) Find the gradient of HD.</p> <p>(ii) Find the gradient of FH.</p> <p>(iii) Find the gradient of HM.</p> <p>(iv) Find the length of AK (as a surd).</p> <p>(v) Find the mid point of LF.</p> <p>(vi). Write the equation of the line FH.</p>	<p>(i)</p> <p>(ii)</p> <p>(iii)</p> <p>(iv)</p> <p>(v)</p> <p>(vi)</p>
[6]		
(b)	Anita is five times as old as her son Bill. In fifteen years time Anita will only be twice as old as Bill. Find their present ages.	
[2]		
(c)	Factorise the following expression completely:	
	$x^2 - y^2 + 5x - 5y$	
[2]		

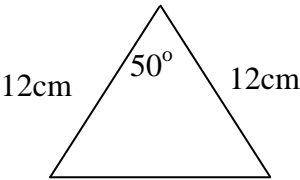
		Answers
(d)	<p>The diagram below is a rhombus.</p>  <p>(i) Prove that the diagonals bisect the angles at the vertices.</p> <p>(ii) Hence, show that the diagonals are perpendicular.</p> <p>Give clear reasons for each step.</p>	<p>(i)</p> <p>(ii)</p>
[5]		
(e)	<p>Solve</p> $\frac{2a+3}{2} - \frac{a-2}{3} = \frac{a-1}{4}$	
[2]		
(e)	<p>Make x the subject of the formula $y = \frac{x+1}{x-1}$.</p>	
[1]		

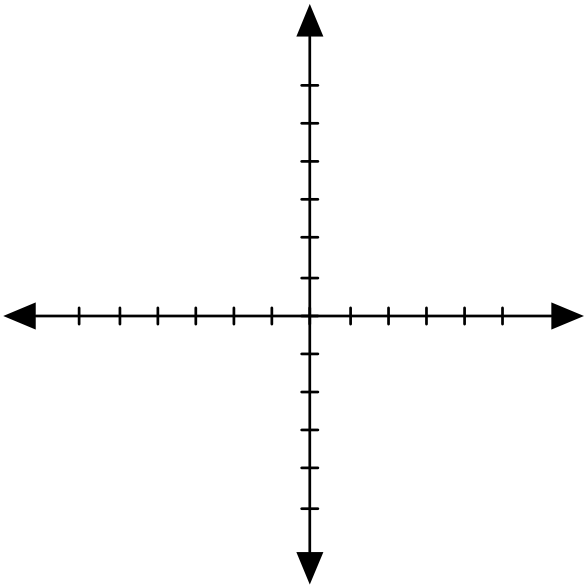
Question 5 (18 Marks)

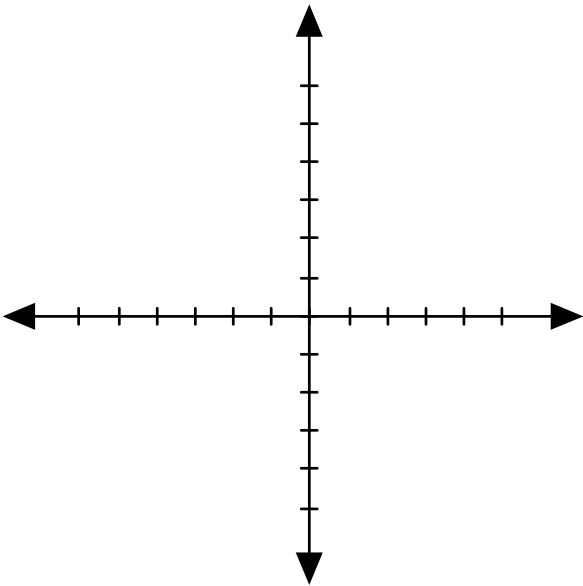
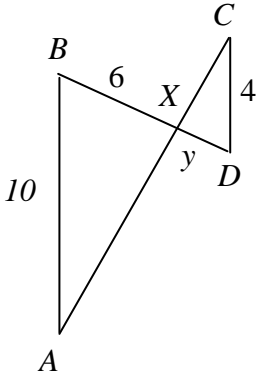
		Answers
(a)	<p>Simplify, and express with rational denominator:</p> $\frac{1}{\sqrt{5}-\sqrt{3}} - \frac{1}{\sqrt{7}+\sqrt{5}}$	
[2]		
(b)	<p>The Venn diagram shows the papers (Herald, Tele, Mx) read by a class of 30 boys. A boy is chosen at random. State the probability that:</p> <p>(i) He reads the Herald</p> <p>(ii) He reads the Tele and Mx, but not the Herald</p> <p>(iii) He reads exactly two papers</p> <p>(iv) He reads no paper</p>	<p>(i)</p> <p>(ii)</p> <p>(iii)</p> <p>(iv)</p>
[4]		
(c)	<p>A canoeist paddles due west for 1.5 km, then turns due south and covers a further 800 m. How far (to the nearest metre) and in what direction (true bearing, nearest degree) must she travel to return directly to her starting point?</p>	<p>Distance</p> <p>Bearing</p>
[2]		
(d)	<p>Calculate the area of a right-angled triangle with hypotenuse 8 cm, and an angle of 50°, correct to 2 decimal places.</p>	
[2]		
(e)	<p>Solve this set of equations simultaneously:</p> $\begin{cases} 3x - y = 11 \\ x + y = 1 \end{cases}$	<p>$x =$</p> <p>$y =$</p>
[2]		
(f)	<p>From a lighthouse 70 m above sea level a ship is sighted 1.2 km out to sea. What is the angle of depression from the lighthouse to the ship? (Answer to the nearest minute.)</p>	
[2]		

		Answers
(g)	Simplify $\frac{x^2+2x-8}{x^2+8x+16}$.	
[2]		
(h)	Sketch the solution set of the inequations on separate number lines. (i) $2x - 3 < 5$ (ii) $-2(3 - 2x) \leq 4$	
[2]		

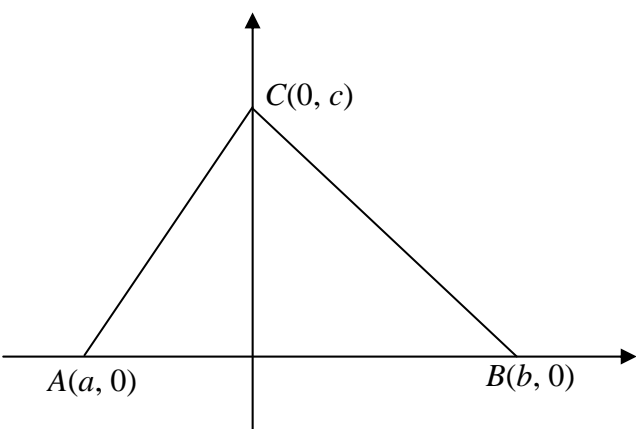
Question 6 (18 Marks)

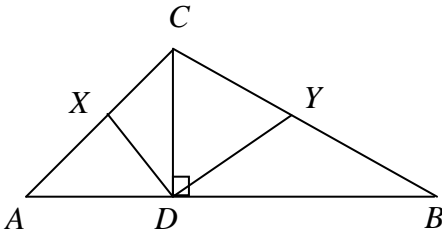
(a)	The bases of two ladders are the same distance from the base of a vertical wall. The longer ladder is 15 m long, and makes an angle of 58° with the ground. If the shorter ladder is 12.6 m long, what angle does it make with the ground? (Nearest degree)	
[2]		
(b)	Find the general form equations of the lines: (i) Parallel to the line $3x + 4y - 2 = 0$ and passing through the point $(-3, 4)$. (ii) Perpendicular to the line $3x + y = 4$ and with x -intercept at -3 .	(i) (ii)
[4]		
(c)	By the use of an appropriate construction, calculate the area of this triangle, correct to one decimal place.	
		
[2]		

		Answers
(d)	A British 50 pence piece is based on a regular heptagon (7 sides). Find the size of the internal angles.	
[1]		
(e)	On the number plane below sketch the lines $3x - 2y = 6$ and $y = -\frac{1}{2}x + 3$.	
		
[2]		
(f)	Use either the elimination method or the substitution method to solve the following system of simultaneous equations:	
	$\begin{cases} 7x + 3y - 4 = 0 \\ 5x + 2y - 3 = 0 \end{cases}$	
[2]		

		Answers
(g)	<p>Sketch on the number plane the region where the inequalities $x - y \leq 2$ and $3x + y \geq 3$ hold simultaneously.</p> 	
[2]		
(h)		<p>(i) Given that $AB \parallel CD$, prove that $\triangle ABX \sim \triangle CDX$ (giving reasons).</p> <p>(ii) Hence find the value of y. (Measurements are in centimeters).</p>
[3]		

Question 7 (18 Marks)

		Answers
(a)	<div></div> <p>The diagram represents any triangle. An altitude of a triangle passes through a vertex and is perpendicular to the opposite side, produced if necessary.</p> <div><div><div>(i) Sketch the altitudes BM (M lies on AC) and AN (N lies on BC).</div><div>(ii) Write down the gradients of BM and AN.</div><div>(iii) State the equations of the lines BM and AN.</div><div>(iv) Find the co-ordinates of the point of intersection of the altitudes BM and AN.</div></div><div><div>[10] (v) What geometric result is proved by the above?</div></div></div>	<div><div>(ii)</div><div>(iii)</div><div>(iv)</div><div>(v)</div></div>

		Answers
(b)	<p>The figure is a cube of side 6 cm.</p> <p>(i) Find the length of the body diagonal CE. (Correct to 2 d.p.)</p> <p>(ii) Find the angle CEG to the nearest minute.</p>	<p>(i)</p> <p>(ii)</p>
[4]		
(c)	 <p>ABC is any triangle, CD is an altitude, and X and Y are the midpoints of AC and BC respectively.</p> <p>Prove $DXCY$ is a kite.</p>	
[4]		

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Use this space if you wish to **REWRITE** any answers

Clearly *indicate* the **QUESTION** number.

Question	

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