



SYDNEY BOYS HIGH SCHOOL
MOORE PARK, SURRY HILLS

Year 9

Yearly Examination 2012

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.
- Marks may not be awarded for untidy or badly arranged work.
- All answers should be given in simplest exact form unless specified otherwise.
- If more space is required, clearly write the number of the QUESTION on the back page and answer it there. Indicate that you have done so.
- Clearly indicate your class by placing an X, next to your class.

Examiner: A. Fuller

NAME: _____

Class	Teacher	
9 A	Mr Boros	
9 B	Ms Ward	
9 C	Mr Elliott	
9 D	Ms Nesbitt	
9 E	Mr Hespe	
9 F	Ms Chen/Ms Evans	
9 G	Mr Gainford	

Question	Mark
1	/16
2	/16
3	/16
4	/16
5	/16
6	/15
7	/15
Total	/110

Question One (16 marks)

(a) Express 0.00703 in scientific notation.

(b) Simplify the following:

(i) $\frac{2 \times a}{a + a + a}$

(ii) $\frac{a \times a \times a}{2 \times a}$

(iii) $\sqrt{7} \times \sqrt{7}$

(iv) -5^2

(v) $3\sqrt{3} \times 2\sqrt{6}$

(c) State the number of significant figures in the following:

(i) 4080

(ii) 0.0090

(iii) 10000 (to nearest hundred)

- (d) Write $8 \cdot 15 \times 10^4$ as a basic numeral.
- (e) Simplify the following ratios:
- (i) $24 : 36 : 16$
- (ii) $36 r^2 : 9 r^2$
- (f) Write $23^\circ 47' 20''$ in degrees correct to 2 decimal places.
- (g) What is the complementary angle of 75° ?
- (h) Describe the complementary event of rolling an even number from a standard die.
- (i) Evaluate $\sin 42^\circ$ correct to 2 decimal places.

Question Two (16 marks)

(a) Find the acute angle α to the nearest degree if $\tan \alpha = \sqrt{2}$.

(b) Expand and simplify the following:

(i) $\sqrt{2}(3 + \sqrt{5}) - \sqrt{2}$

(ii) $(2x^2)^3$

(iii) $(3 + x^2)(3 - x^2)$

(iv) $(2\sqrt{5} - 3)^2$

(c) (i) Find the gradient of the line $3x - 2y = 12$.

(ii) Hence, find the gradient of a line which is perpendicular to $3x - 2y = 12$.

(d) Write an algebraic expression for “the square of p less than m ”.

(e) Determine the linear relationship for the table of values.

x	1	2	3	4
y	4	1	-2	-5

(f) If $a = -2$ and $b = -4$, evaluate the following:

(i) ab^2

(ii) $(1 - a)(1 - b)$

(g) Factorise the following:

(i) $6b - 3b^2$

(ii) $1 - 4x^2$

(iii) $x^2 - 4x - 12$

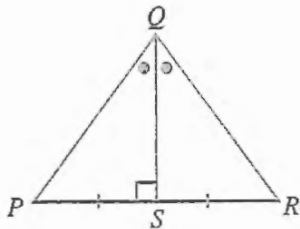
(iv) $x^2y - xy^2 - 2x + 2y$

Question Three (16 marks)

(a) (i) Express $0.\dot{8}\dot{1}$ in simplest fractional form.

(ii) Given that $0.\dot{4} = \frac{4}{9}$ express $0.\dot{4} \div 0.\dot{8}\dot{1}$ in simplest decimal form.

(b) Which congruent tests can be used to prove $\triangle PQS \equiv \triangle RQS$ without further working?



(c) Solve the following equations for x :

(i) $1 - 2x = 7$

(ii) $\frac{x}{6} - \frac{5}{3} = 1$

(iii) $(x - 1)^2 = x^2 - 1$

(iv) $ax + by = cxy$

(d) An integer is selected at random from the integers 2 to 9 inclusive.

What is the probability that the integer is:

(i) divisible by 3

(ii) less than 5

(iii) divisible by 3 or less than 5

(e) Convert the following:

(i) 275 *m* to *km*

(ii) 0.6 *m*² to *cm*²

(iii) 24 *kg/h* to *g/s*.

(f) Find the value of *x* correct to two decimal places if $x^{2/3} = 10$.

Question Four (16 marks)

(a) Rationalise the denominator of the following:

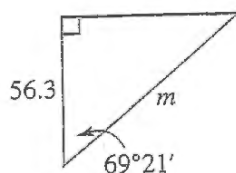
(i) $\frac{2}{3\sqrt{5}}$

(ii) $\frac{2-\sqrt{5}}{3+\sqrt{5}}$

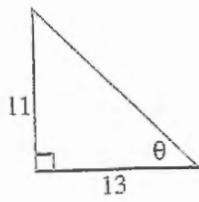
(b) Calculate the curved surface area of a cylinder which has a height of 5 cm and a volume of $250\pi \text{ cm}^3$.

(c) Solve $\frac{1-2x}{5} < -3$ and graph the solution on the number line.

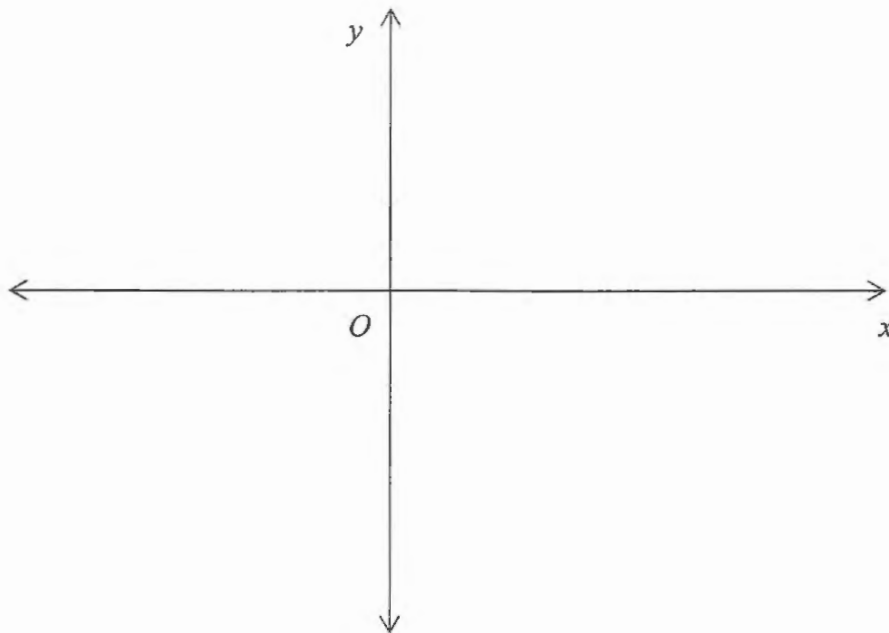
(d) Find the value of m correct to one decimal place.



- (e) Find the size of angle θ to the nearest minute.



- (f) Shade the region satisfying both the inequalities $y < 2$ and $3x + y \geq 3$ on the number plane.



- (g) If the bearing of A from B is 162° . What is the bearing from A to B ?

- (h) Evaluate $1 - 2 + 3 - 4 + 5 - 6 + \dots - 498 + 499 - 500 + 501$

Question Five (15 marks)

(a) Write the following in the form a^n :

(i) $a^{1/2} \times a^{1/3}$

(ii) $\sqrt[3]{\sqrt{a}}$.

(b) A sum of money is divided among Allan, Barry and Carol. Allan receives \$1 plus one-third of what is left. Barry then receives \$6 plus one-third of what remains. Carol receives the rest, which amounts to \$40. How much did Barry receive?

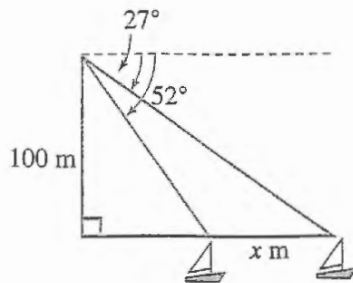
(c) In a 2 kilometre race Andrew can beat Bill by 200 metres and Bill can beat Craig by 100 metres. By what distance can Andrew beat Craig?

(d) An integer is defined to be upright if the sum of the first two digits equals its third digit. For example 156 is an upright integer since $1 + 5 = 6$.

How many positive three digit integers are upright?

- (e) From the top of a cliff 100 m above sea level, the angles of depression of two boats at sea which appear in the same line of sight are 27° and 52° respectively.

Calculate the distance between the boats, correct to the nearest metre.



- (f) Factorise the following:

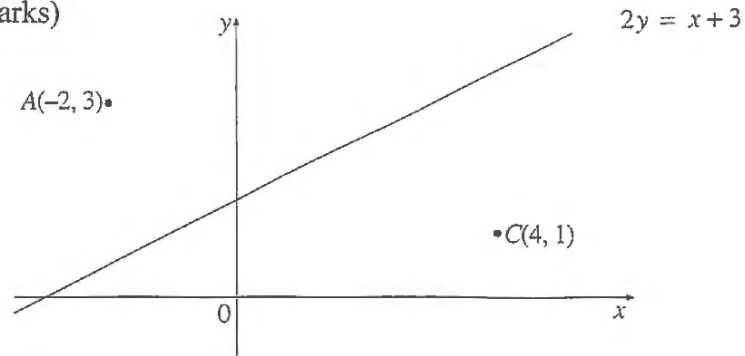
(i) $6x^2 - 7x - 3$

(ii) $x^2 + 2xy + y^2 - 4$

- (g) Find the exact value of $\tan \theta$ where θ is acute and $\cos \theta = \frac{1}{\sqrt{3}}$.

Question Six (15 marks)

(a)



- (i) Find the coordinates of M , the midpoint of AC .
- (ii) Prove that M lies on the line $2y = x + 3$.
- (iii) Lines through A and C , parallel to the y -axis, meet the line $2y = x + 3$ at B and D respectively. Prove Δ 's ABM and CDM are congruent.
- (iv) Prove $ABCD$ is a parallelogram

(b) If $4^x = A$. Write the following in terms of A :

(i) 4^{x+2}

(ii) 4^{-x}

(iii) 8^x

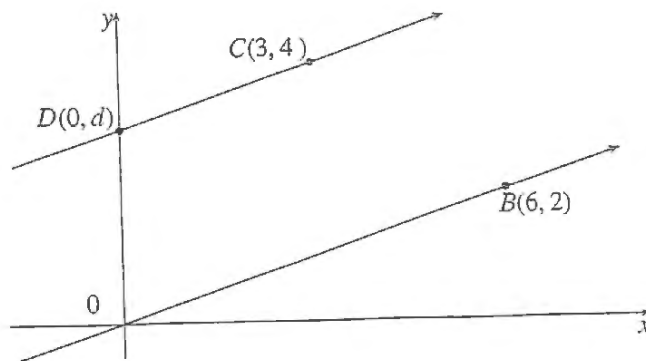
(c) Simplify $\frac{1}{1-\frac{a}{b}} + \frac{1}{1-\frac{b}{a}}$.

(d) (i) Find the obtuse angle between the hour and minute hands of a clock when the time is a quarter to two.

(ii) When is the next time that the angle between the hour and minute hands of a clock are the same as that found in part (i)?

Question Seven (15 marks)

(a)



- (i) What is the gradient of OB ?

- (ii) Find the value of d if CD and OB are parallel.

- (iii) Find the area of $\triangle OCD$.

- (iv) Calculate the distance CD .

- (v) Using your results from (iii) and (iv), calculate the distance between the parallel lines CD and OB .

(c) $PQRS$ is a parallelogram. PQ is produced to T so that $QT=QR$ and PS is produced to U so that $SU=PS$. It is now discovered that T, R and U are collinear.

(i) Draw a neat sketch showing the above information.

(ii) Prove that $PQRS$ is a rhombus.

End of Exam