Name _____

Teacher _____

SYDNEY TECHNICAL HIGH SCHOOL

YEAR 9 TERM 2 COMMON TEST 2009

ADVANCED MATHEMATICS

Time Allowed : 70 minutes

INSTRUCTIONS:

- **You have 10 minutes to complete the Non Calculator section**
- **Approved calculators may be used after this time.**
- **All the non calculator questions are worth 1 mark. Write answers in the column provided.**
- **Working can be shown in Section 2 questions.**
- **Marks may be deducted for careless or poorly arranged work.**

Non calculator	Number	Algebra I	Algebra II	Probability	Geometry
/11	/10	/11	/11	/11	/16

Total
/70

Number

a) Which number, when divided by 1.2, gives an answer of 0.3?

b) Calculate $(9.6 \times 10^4) \div (6.3 \times 10^{-2})$.
Write your answer using 3 significant figures.

c) If 15% of a quantity is 3.6 kg, find the whole amount.

d) A car has an average fuel consumption of 8.4 L/100 km. How far will it travel on 60 litres?

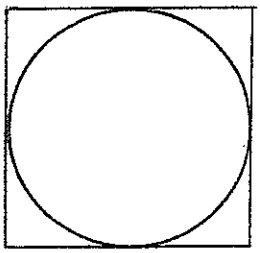
e) Express $0.\dot{3}\dot{4}$ as a simple fraction

f) Four numbers A, B, C, D are said to be "in proportion" when A : B = C : D.
Find D if 3, 4, 5, D are in proportion.

g) Convert 9 km/h to m/s

h) If \$1 U.S. = \$1.45 AUS and \$1 AUS = 25 Yuan, how many Yuan do you get for \$50 U.S?

i)



The circle touches all four sides of the square.

What percentage of the square's area is occupied by the circle? Give your answer correct to 1 decimal place. (2 marks)

a) Write a simplified algebraic expression for:

i) 4 less than x.

ii) the speed of a car if it takes y hours to travel m kilometres.

iii) the perimeter of a rectangle that is $4x$ metres long and $(x-3)$ metres wide.

i)

ii)

iii)

b) Which expression represents "x percent of y"?

A. $\frac{x}{100}$ B. $\frac{x}{100y}$ C. $\frac{xy}{100}$ D. $\frac{100y}{x}$ E. $\frac{100x}{y}$

c) If $a = -3, b = 4, c = \frac{1}{2}$ evaluate:

i) $a + 2b$

ii) $2b^2 - a$

iii) $\frac{b}{c} + \frac{c}{b}$

i)

ii)

iii)

d) Expand and simplify:

i) $4x(x + 3) + 2x$

ii) $(x + 3)(x + 5)$

iii) $(3x + 4)^2$

i)

ii)

iii)

e) Express $\frac{m}{3} + \frac{m}{4}$ as a single fraction.

Algebra II

a) Express each as simplified single fractions:

i) $\frac{8}{5x} + 3$

ii) $\frac{8x}{5a} \times \frac{a^2}{4x}$

iii) $\frac{8}{5x} \times \frac{3}{7x} \div \frac{2}{x}$

iv) $\frac{4x}{3} - \frac{x-2}{6}$

b) Find the values of A, B, C if :

$4x^2 - 12xy + A = (B - C)^2$

A =

B =

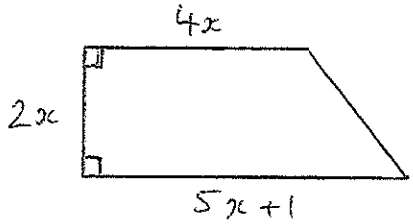
C =

c) Expand and fully simplify: (2 marks)

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

d) Find an expression for the area of this shape.

Simplify your answer. (2 marks)



Probability **Answers Only**

a) Which of these probabilities means that an event is unlikely to occur?

A. $\frac{1}{5}$ B. $\frac{1}{2}$ C. 0.6 D. 0.9 E. Unable to determine

b) A bag contains twice as many red balls as white balls. One ball is chosen at random.

What is the probability that it is white?

A. $\frac{1}{3}$ B. $\frac{1}{2}$ C. $\frac{2}{3}$ D. cannot be determined

c) The probability of some event occurring is $\frac{4}{5}$. What is the probability of the complementary event?

d) From a pack of 52 playing cards, a card is chosen at random.

What is the probability that it is:

i) the Ace of Hearts? i)

ii) a 6 or 7 ? ii)

iii) not a Jack ? iii)

e) When a coin is tossed, we say that the probability of Heads is $\frac{1}{2}$. However, when the experiment is conducted ten times, you may obtain seven Heads, or two or nine!

Briefly explain what the "$\frac{1}{2}$" means.

f) In a family of 3 children, there are eight possible groupings. Four of these are: BBB, BBG, BGB, GBB (where B = Boy , G = Girl)

Write the remaining 4 possible groupings. _____

---

g) In a family with 3 children, what is the probability that:

i) all three are the same sex? _____

ii) there are exactly 2 girls?_____

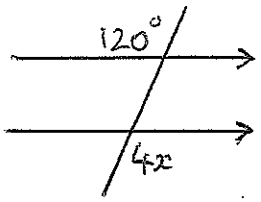
---

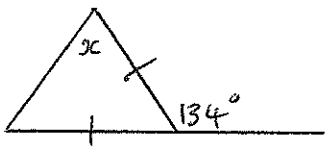
h) There are 4 different pairs of socks in a drawer but all 8 are mixed up. Two socks are picked out without looking.

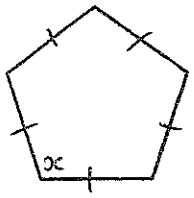
What is the probability that the second sock matches the first?_____

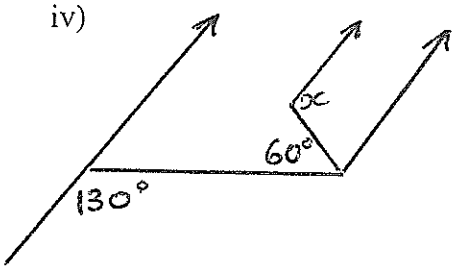
Geometry

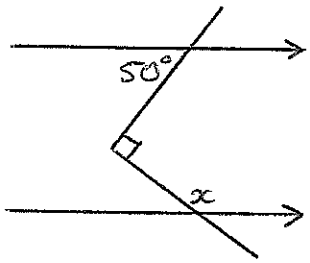
a) Find the value of x in degrees (reasons are not necessary).

i) 

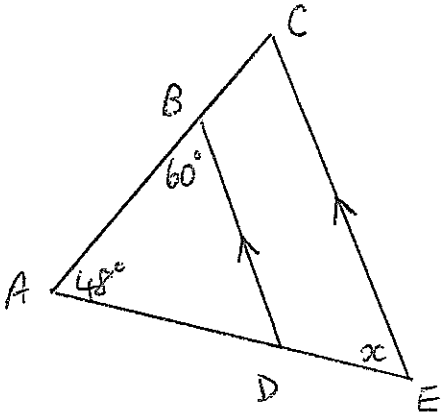
ii) 

iii) 

iv) 

v) 

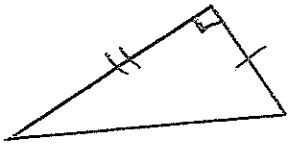
b) Find the value of x, giving full reasons. (2 marks)

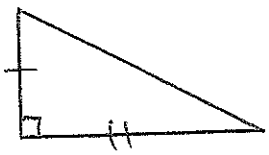


c) A dodecagon is a 12 sided polygon. What is the sum of its interior angles?

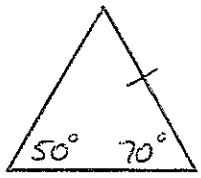
d) Name two quadrilaterals that have their diagonals intersecting at right angles?

e) Which congruence test is applicable to this pair of congruent triangles?

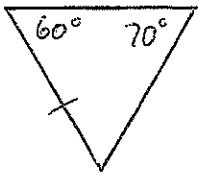




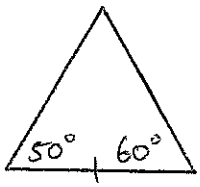
f) Which two of these triangles are congruent?



A



B



C

Not to Scale

_____

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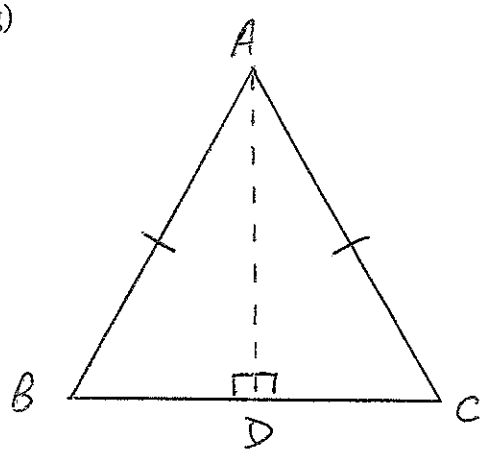
g)



Set out a proof for congruent triangles and prove that the base angles of this isosceles triangle are equal. (4 marks)

_____

_____

_____

_____

_____

_____

_____

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h) Which is the correct definition of a rectangle?

A. A quadrilateral with opposite sides equal.

B. A parallelogram with a pair of adjacent sides equal

C. A parallelogram with diagonals bisecting each other

D. A parallelogram with a right angle.

_____

End of Test

Non Calculator NAME: _____ **Answers Only**

a) Which <u>two</u> of these numbers are the rational numbers: $\sqrt{2}$, $\frac{3}{4}$, π, $0.\dot{6}$?	
b) Which number is halfway between 6.32 and 6.33 ?	
c) Express 3 as a percentage of 20.	
d) Simplify $1\frac{1}{2} : 1\frac{1}{3}$	
e) Round off 6.8752 correct to i) 2 decimal places ii) 2 significant figures	i) ii)
f) Express 734,900 in scientific notation.	
g) Write 2.6×10^{-3} as an ordinary numeral.	
h) A number with three decimal places is rounded off to give 7 (nearest whole number). What is the largest number possible that it could have originally been?	7. □□□
i) Metals D, E, F are mixed to make a new alloy. It is known that D : E = 2 : 1 and E : F = 4 : 5. What is D : E : F ?	
j) In a certain school, all students must study a language and/or play a sport. In a particular Year 9 class of thirty students, seventeen study Spanish, twenty-three play tennis and some do both. How many students in this class <u>only</u> study Spanish?	

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Non calculator	Number	Algebra I	Algebra II	Probability	Geometry
/11	/10	/11	/11	/11	/16

Total
/70

Number

a) Which number, when divided by 1.2, gives an answer of 0.3?

0.36

b) Calculate $(9.6 \times 10^4) \div (6.3 \times 10^{-2})$.
Write your answer using 3 significant figures.

152000

c) If 15% of a quantity is 3.6 kg, find the whole amount.

24 kg

d) A car has an average fuel consumption of 8.4 L/100 km. How far will it travel on 60 litres?

$\doteq$ 714 km

e) Express $0.\dot{3}\dot{4}$ as a simple fraction

34/99

f) Four numbers A, B, C, D are said to be "in proportion" when A : B = C : D.
Find D if 3, 4, 5, D are in proportion.

$3/4 = 5/D$

$3D = 20$

$D = 6\frac{2}{3}$

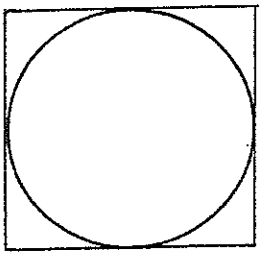
g) Convert 9 km/h to m/s

$\frac{9000\text{m}}{3600\text{s}} = 2.5\text{ m/s}$

h) If \$1 U.S. = \$1.45 AUS and \$1 AUS = 25 Yuan, how many Yuan do you get for \$50 U.S?

1812.5 Yuan

i)



The circle touches all four sides of the square.

What percentage of the square's area is occupied by the circle? Give your answer correct to 1 decimal place. (2 marks)

$\frac{\pi r^2}{4r^2} = \frac{\pi}{4} \times 100\%$

$\doteq 78.5\%$

a) Write a simplified algebraic expression for:

i) 4 less than x .

ii) the speed of a car if it takes y hours to travel m kilometres .

iii) the perimeter of a rectangle that is $4x$ metres long and $(x\text{-}3)$ metres wide .

i) $x - 4$

ii) $\frac{m}{y}$ km/h

iii) $10x - 6$

---

b) Which expression represents "x percent of y"?

A. $\frac{x}{100}$ B. $\frac{x}{100y}$ C. $\frac{xy}{100}$ D. $\frac{100y}{x}$ E. $\frac{100x}{y}$

C

---

c) If $a = -3, b = 4, c = \frac{1}{2}$ evaluate:

i) $a + 2b$

ii) $2b^2 - a$

iii) $\frac{b}{c} + \frac{c}{b}$

i) 5

ii) 35

iii) $8\frac{1}{8}$ or 8.125

---

d) Expand and simplify:

i) $4x(x + 3) + 2x$

ii) $(x + 3)(x + 5)$

iii) $(3x + 4)^2$

i) $4x^2 + 14x$

ii) $x^2 + 8x + 15$

iii) $9x^2 + 24x + 16$

---

e) Express $\frac{m}{3} + \frac{m}{4}$ as a single fraction .

$\frac{7m}{12}$

Algebra II

a) Express each as simplified single fractions:

i) $\frac{8}{5x} + 3$ $\frac{8}{5x} + \frac{15x}{5x}$

$= \frac{8+15x}{5x}$

ii) $\frac{8x}{5a} \times \frac{a^2}{4x}$ $\frac{2a}{5}$

iii) $\frac{8}{5x} \times \frac{3}{7x} \div \frac{2}{x}$

$\frac{24}{35x^2} \times \frac{x}{2}$

$= \frac{12}{35x}$

iv) $\frac{4x}{3} - \frac{x-2}{6}$

$\frac{8x}{6} - \frac{x-2}{6} = \frac{7x+2}{6}$

b) Find the values of A, B, C if :

$4x^2 - 12xy + A = (B - C)^2$

A = $9y^2$

B = $2x$

C = $3y$

c) Expand and fully simplify: (2 marks)

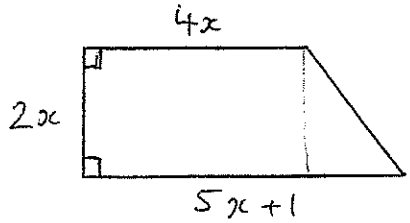
$(x-y)^2 - 2(x+3y)(x-3y)$ $= x^2 - 2xy + y^2 - 2(x^2 - 9y^2)$

$= x^2 - 2xy + y^2 - 2x^2 + 18y^2$

$= -x^2 - 2xy + 19y^2$

d) Find an expression for the area of this shape.

Simplify your answer. (2 marks)



$A = 8x^2 + \frac{1}{2} \times 2x \times (x+1)$

$= 8x^2 + x^2 + x$

$= 9x^2 + x.$

or use $A = \frac{1}{2} \times 2x \times (4x + 5x + 1)$

Probability **Answers Only**

a) Which of these probabilities means that an event is unlikely to occur?

A. $\frac{1}{5}$ B. $\frac{1}{2}$ C. 0.6 D. 0.9 E. Unable to determine

A

b) A bag contains twice as many red balls as white balls. One ball is chosen at random.

What is the probability that it is white?

A. $\frac{1}{3}$ B. $\frac{1}{2}$ C. $\frac{2}{3}$ D. cannot be determined

A

c) The probability of some event occurring is $\frac{4}{5}$. What is the probability of the complementary event?

$\frac{1}{5}$

d) From a pack of 52 playing cards, a card is chosen at random.

What is the probability that it is:

i) the Ace of Hearts?

i) $\frac{1}{52}$

ii) a 6 or 7 ?

ii) $\frac{8}{52} = \frac{2}{13}$

iii) not a Jack ?

iii) $\frac{48}{52} = \frac{12}{13}$

e) When a coin is tossed, we say that the probability of Heads is $\frac{1}{2}$. However, when the experiment is conducted ten times, you may obtain seven Heads, or two or nine!

Briefly explain what the "$\frac{1}{2}$" means.

For a very large number of tosses, half of them should be Heads

f) In a family of 3 children, there are eight possible groupings. Four of these are: BBB, BBG, BGB, GBB
(where B = Boy , G = Girl)
Write the remaining 4 possible groupings. BGG, GBG, GGB, GGG.

---

g) In a family with 3 children, what is the probability that:

i) all three are the same sex? 2/8 = 1/4

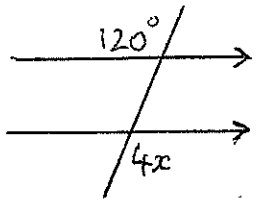
ii) there are exactly 2 girls? 3/8.

---

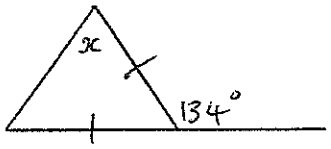
h) There are 4 different pairs of socks in a drawer but all 8 are mixed up. Two socks are picked out without looking.
What is the probability that the second sock matches the first? 1/7.

Geometry

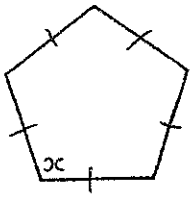
a) Find the value of x in degrees (reasons are not necessary).

i) 

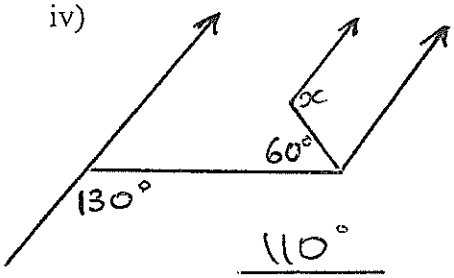
30°

ii) 

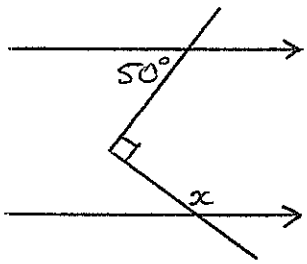
67°

iii) 

108°

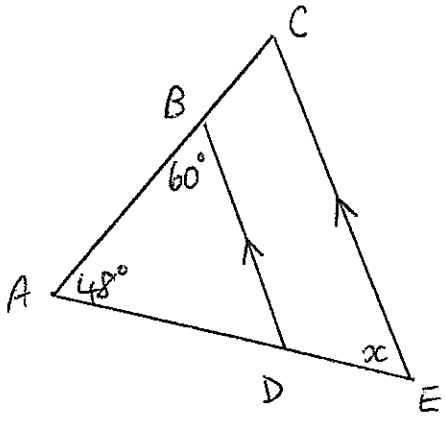
iv) 

110°

v) 

140°

b) Find the value of x, giving full reasons. (2 marks)



$\angle ADB$ = 72° (angle sum of $\triangle ABD$)

$\therefore x = 72°$ (corresponding angles equal, parallel lines)

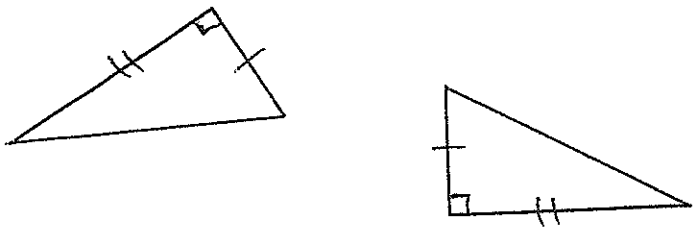
c) A dodecagon is a 12 sided polygon. What is the sum of its interior angles?

$(12-2) \times 180° = 1800°$

d) Name two quadrilaterals that have their diagonals intersecting at right angles?

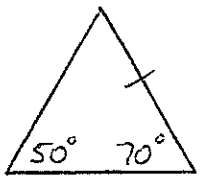
(any two) square, rhombus, kite

e) Which congruence test is applicable to this pair of congruent triangles?

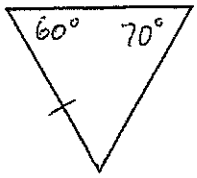


SAS

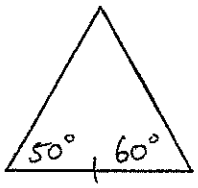
f) Which two of these triangles are congruent?



A



B



C

Not to Scale

B and C

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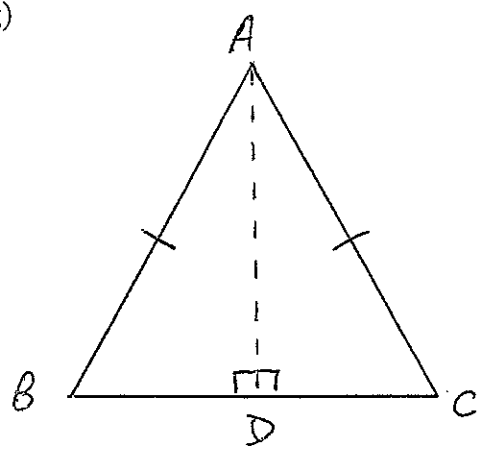
g)



Set out a proof for congruent triangles and prove that the base angles of this isosceles triangle are equal. (4 marks)

$AB = AC$ (given)

$\angle ADB = \angle ADC = 90°$ (given)

AD is common

$\therefore \triangle ABD \equiv \triangle CBD$ (RHS)

$\therefore \angle B = \angle C$ (corresponding angles of congruent triangles).

---

h) Which is the correct definition of a rectangle?

A. A quadrilateral with opposite sides equal.

B. A parallelogram with a pair of adjacent sides equal

C. A parallelogram with diagonals bisecting each other

D. A parallelogram with a right angle.

D

End of Test

Non Calculator NAME: ANSWERS Answers Only

a) Which <u>two</u> of these numbers are the rational numbers: $\sqrt{2}, \frac{3}{4}, \pi, 0.\dot{6}$?	$\frac{3}{4}$, $0.\dot{6}$
b) Which number is halfway between 6.32 and 6.33 ?	6.325
c) Express 3 as a percentage of 20.	15%
d) Simplify $1\frac{1}{2} : 1\frac{1}{3}$	9 : 8
e) Round off 6.8752 correct to i) 2 decimal places ii) 2 significant figures	i) 6.88 ii) 6.9
f) Express 734,900 in scientific notation.	7.349×10^5
g) Write 2.6×10^{-3} as an ordinary numeral.	0.0026
h) A number with three decimal places is rounded off to give 7 (nearest whole number). What is the largest number possible that it could have originally been?	7.499
i) Metals D, E, F are mixed to make a new alloy. It is known that D : E = 2 : 1 and E : F = 4 : 5. What is D : E : F ?	8 : 4 : 5
j) In a certain school, all students must study a language and/or play a sport. In a particular Year 9 class of thirty students, seventeen study Spanish, twenty-three play tennis and some do both. How many students in this class <u>only</u> study Spanish?	7