Name: _____

Teacher: _____

SYDNEY TECHNICAL HIGH SCHOOL

YEAR 10 COMMON TEST

TERM 2, MAY 2012

MATHEMATICS

Time Allowed: 75 Minutes

Directions to candidates

- Attempt all questions and show all required working.
- PART A – Non Calculator – 15 minutes (answer sheet provided)
- PARTS B, C, D, E and F – allow 60 minutes (answers in spaces provided).
- Approximate marks are shown alongside each question.

PART A	PART B	PART C	PART D	PART E	PART F
Non-Calculator	Simultaneous Equations	Consumer Arithmetic	Trigonometry	Quadratic Equations	Graphs Co-ord Geometry
15	/10	/14	/13	/14	/11
				TOTAL	77

PART B: SIMULTANEOUS EQUATIONS

Total Marks: /10

		Marks
1.	Solve the following simultaneous equations for x *and* y $2x - y = 11$ $x - y = 3$	2
2.	Solve the following simultaneous equations for x *and* y $2x - y = 3$ $x = y - 4$	2
3.	Show algebraically, the following 3 lines are <u>concurrent</u> (ie pass through the same point) $x + y = 1$ $x - 2y = 2$ and $2x - y = 3$	3
4.	A purse contains 34 coins. All coins are either 10 cent or 5 cent. The total value of the coins is \$2.85. Let x be the number of 10 cent coins. Let y be the number of 5 cent coins. i) Form 2 simultaneous equations in terms of x *and* y. ii) Solve these to find the number of 10 cent and 5 cent coins.	1 2

PART C: CONSUMER ARITHMETIC

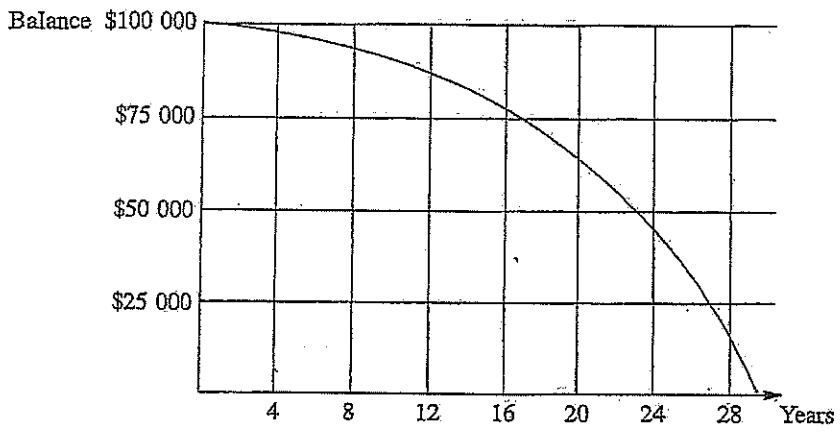
Total Marks: /14

		Marks
1.	Haydn earns $428 per week and has to pay a Medicare levy of 1.5% only on earnings in excess of $14 200pa. What must he pay as his levy at the end of the financial year?	2
2.	Parker Read Estate earns commission of 3% on the first $50 000, $2\frac{1}{2}$% on the next $150 000 and $1\frac{1}{4}$% on the balance of all real estate sales. a) What is its commission on the sale of a house for $275 000? b) What does the owner receive?	2
3.	If Tanya is asked to work on Thursday nights or weekends she is paid overtime rates at time and a half. If she works 10 hours at normal rate of $15.80 per hour, 3 hours on Thursday night and 4 hours on Sunday, what will her pay be?	2
4.	Find the amount to which an investment of $2000 will grow if invested at 6%pa for 3 years compounded monthly.	2
5.	The Taxation Department agrees to allow Joe Smith to depreciate (decrease) the value of his truck by 17% each year for taxations purposes. When new it was worth $22 000. By how much has it depreciated after 2 years?	2

6.	The two graphs below show the effects of more frequent repayments on a loan of $100 000 at 9.25%pa.	4

A.

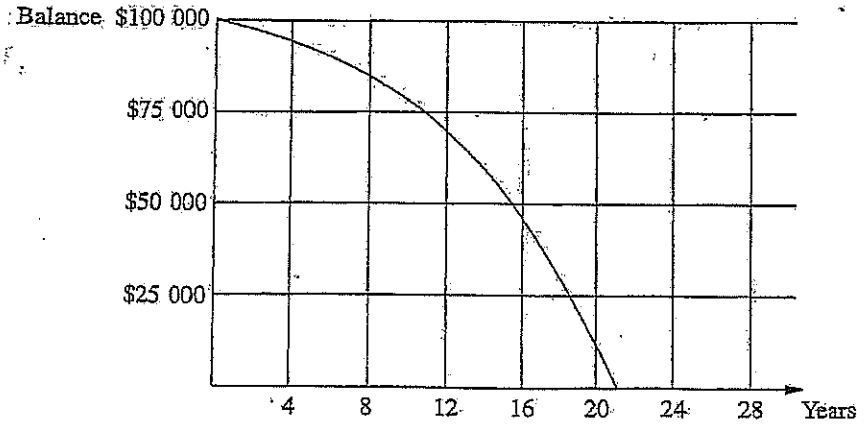
Loan information for monthly repayments for 30 years



Amount financed: $100 000
Current variable rate: 9.25% p.a.
Repayment: $822 per month

B.

Loan information for fortnightly repayment for 21 years 6 months



Amount financed: $100 000
Current variable rate: 9.25% p.a.
Repayment: $411 per fortnight (assume 2 fortnights per month)

a) Calculate the total repayments made for each loan:

Loan A: _____ Loan B: _____

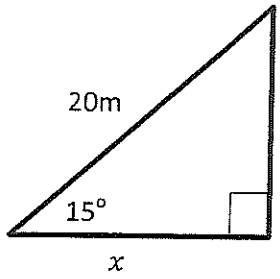
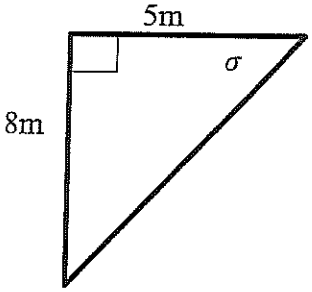
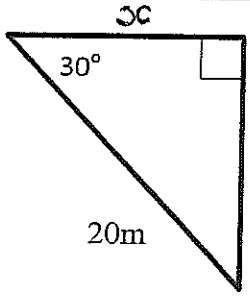
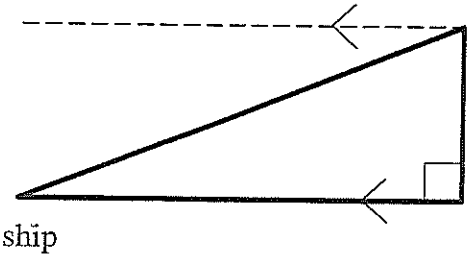
b) Write 2 benefits of paying off the loan fortnightly rather than monthly.

i): _____

ii): _____

PART D: TRIGONOMETRY

Total Marks: /13

		Marks
1.	If $sin\ \sigma = \frac{1}{3}$ find the exact value of $tan\ \sigma$.	1
2.	 Find x correct to 2 decimal places.	2
3.	 Find σ correct to nearest degree.	2
4.	 Find the exact value of x	2
5.	The top of a lighthouse is 40m above sea level. The base of the lighthouse is at sea level. The angle of depression of a ship at sea is 25° as seen from the top of the lighthouse. i) Indicate on the diagram below the angle of depression.  lighthouse ship	1

	ii) How far is the ship from the base of the lighthouse (to nearest m) ?	2
6.	A ship travels 60km on a bearing of N54°E. i) Draw a suitable diagram to show this information.	1
	ii) Hence find how far the ship is then north of its starting point? (To nearest km.)	2

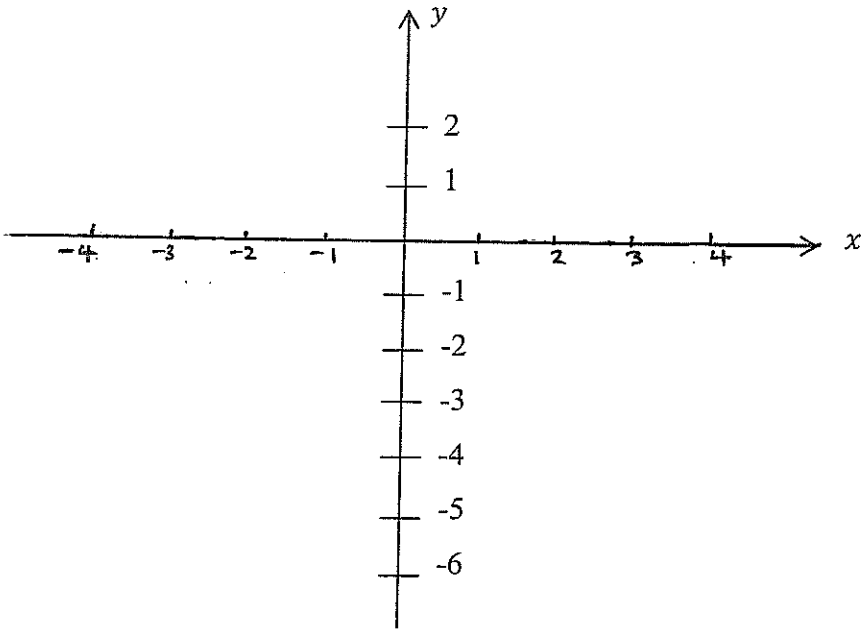
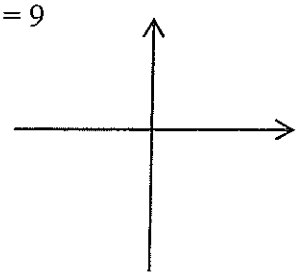
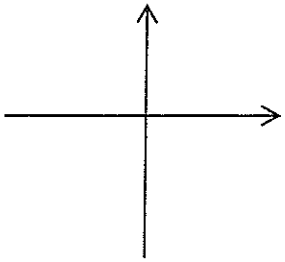
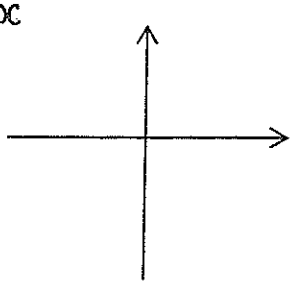
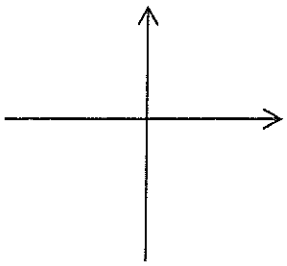
PART E: QUADRATIC EQUATIONS

Total Marks: /14

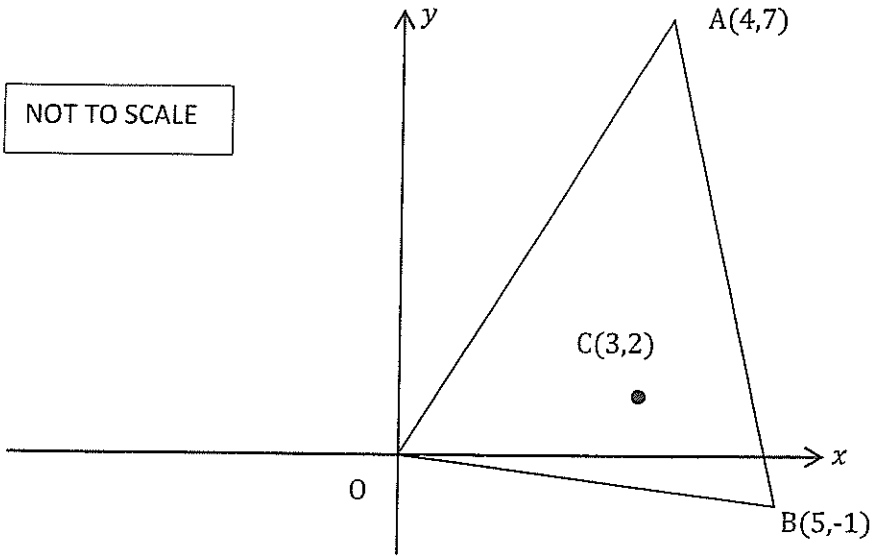
		Marks
1.	Solve: a) $4x^2 - 25 = 0$	1
	b) $2t^2 - 3t + 1 = 0$	2
	c) $3(x-1)^2 = 12$	2
2.	Solve, $x^2 - 2x - 1 = 0$, by completing the square. Leave your answer in surd form.	2
3.	Solve, $3x^2 - 2x - 4 = 0$ and write your answer(s) correct to 2 decimal places.	2
4.	Explain why $3x^2 + 7x + 5 = 0$ has no real solutions.	1
5.	Solve $\frac{2}{3x+4} = \frac{2x-1}{5}$	2
6.	The sum of a number, x, and its reciprocal is $2\frac{1}{6}$. Form a quadratic equation in terms of x. Hence, find all possible values for x.	2

PART F: CO-ORD GEOMETRY/GRAPHS

Total Marks: /11

		Marks
1.	For the parabola $y = (x - 1)(x + 3)$ find i) the x intercepts _____ ii) the y intercepts _____ iii) the vertex _____ iv) hence sketch the parabola showing all the above information 	4
2.	Make a neat sketch of the following curves. Indicate if the curve cuts either the x or y axes and find these points. a) $x^2 + y^2 = 9$  b) $xy = 1$  c) $y = 2^{-x}$  d) $y = x^2 - 4$ 	4

3.



The diagram shows A(4,7) B(5,-1) and C(3,2).

i) What are the co-ordinates of the mid-point of AB? 1

ii) Find the equation of OC. 1

iii) Show that OC bisects AB. 1

Name: _____

Teacher: _____

SYDNEY TECHNICAL HIGH SCHOOL

YEAR 10 COMMON TEST

TERM 2, MAY 2012

MATHEMATICS

PART A: Non-Calculator

TIME ALLOWED: 15 Minutes

INSTRUCTIONS: Remove this front page and place answers in spaces provided.

Q1: _____ Q5: _____ Q10: _____

Q2: _____ Q6: _____ Q11: _____

Q3: _____ Q7: _____ Q12: _____

Q4 i) _____ Q8: _____ Q13: _____

Q4 ii) _____ Q9: _____ Q14: _____

Name Teacher

1. A letter is chosen from the word ALGEBRA at random. What is the probability that the letter chosen is A ?

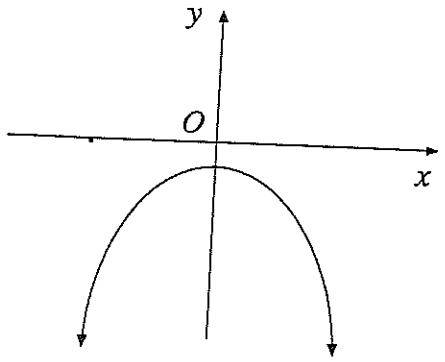
2. For an item originally priced at $\$P$, its value $\$A$, after n years of depreciation at $r\%$ p.a. is given by

(A) $A=-P\left(1+\frac{r}{100}\right)^n$

(B) $A=-P\left(\frac{1+r}{100}\right)^n$

(C) $A=P\left(1-\frac{r}{100}\right)^n$

(D) $A=P\left(\frac{1-r}{100}\right)^n$

3. 

The parabola shown could have the equation

(A) $y=-x^2-3$

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

(C) $y=x^2-3$

(D) $y=x^2+3$

4

i) How many 2 digit numbers can be formed from the digits 1,2,3,4, and 5 if repetition is not allowed.

ii) What is the probability that a number chosen at random from the 2 digit numbers above, is greater than 40 ?

5

Solve for x: $2x^2 - 5x - 1 = 0$.

(A) $x = \frac{5 \pm \sqrt{17}}{4}$ (B) $x = \frac{-5 \pm \sqrt{17}}{4}$ (C) $x = \frac{5 \pm \sqrt{33}}{4}$ (D) $x = \frac{-5 \pm \sqrt{33}}{4}$

6

Magazines	\$4 each
Comics	\$3 each

Sarah bought x magazines and y comics at the above prices.

She bought nine more magazines than comics, and spent \$120 altogether.

Which pair of simultaneous equations could be solved to find how many of each she bought?

(A) $\left.\begin{aligned} 4x + 3y &= 120 \\ x - y &= 9 \end{aligned}\right\}$

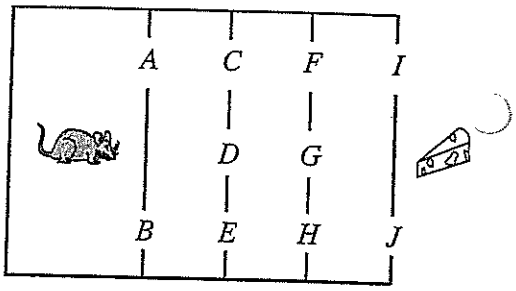
(B) $\left.\begin{aligned} 4x + 3y &= 120 \\ y - x &= 9 \end{aligned}\right\}$

(C) $\left.\begin{aligned} \frac{x}{4} + \frac{y}{3} &= 120 \\ x - y &= 9 \end{aligned}\right\}$

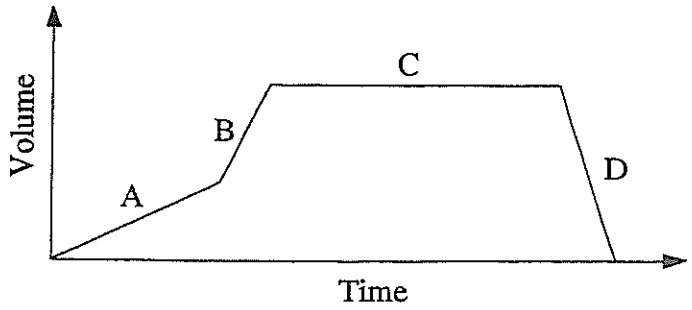
(D) $\left.\begin{aligned} \frac{x}{4} + \frac{y}{3} &= 120 \\ y - x &= 9 \end{aligned}\right\}$

7

How many choices has the rat in moving through the 4 walls to get to the cheese?



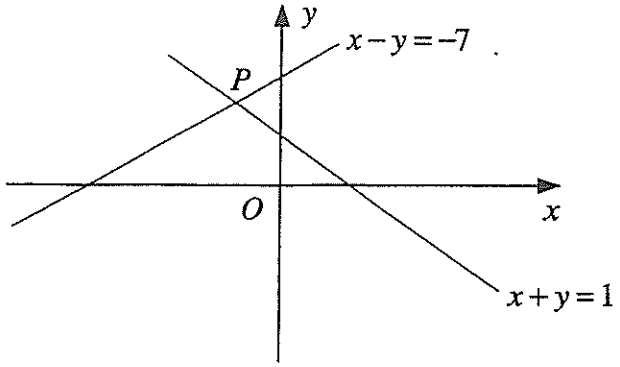
8



The graph shows the volume of water in a tank at any given time.

Which section of the graph shows the time when the volume is INCREASING most rapidly?

9

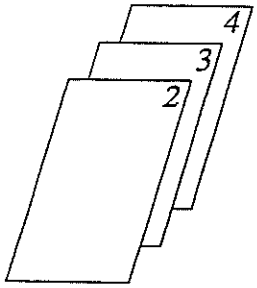


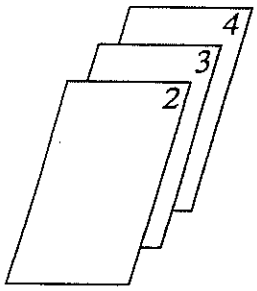
NOT TO SCALE

Which of the following are the coordinates of P?

(A) $(-4, 3)$ (B) $(-3, -4)$ (C) $(-3, 4)$ (D) $(-2, 3)$

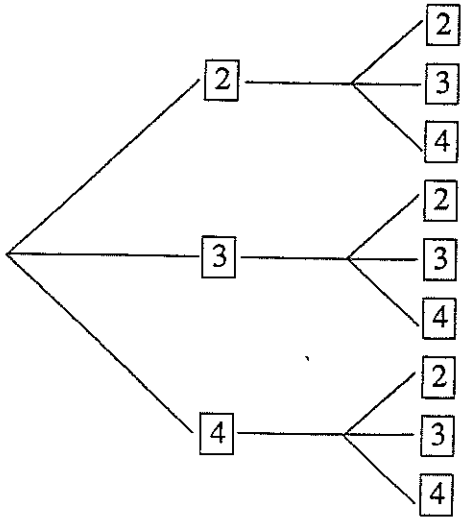
10





A card is chosen at random from each of the above piles.

The tree diagram below shows the possible outcomes.



If the numbers on the two cards chosen are added together, what is the probability that the total is even?

11

If $(3x + P)^2 = 9x^2 - Mx + 16$ (where M is positive),

then

(A) $P = -4$ and $M = 12$

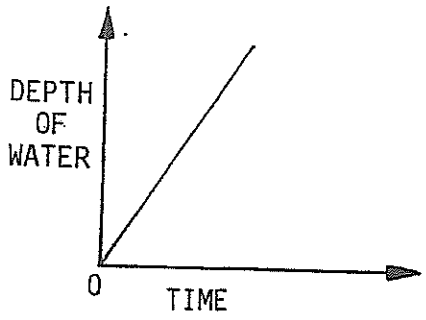
(B) $P = -4$ and $M = 24$

(C) $P = 4$ and $M = 12$

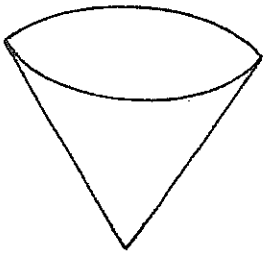
(D) $P = 4$ and $M = 24$

12

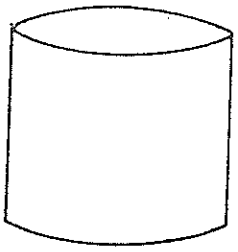
Water was poured into a container at a constant rate.
The graph shows the depth of water in the container as it was being filled.
Which of the following containers could have been used ?



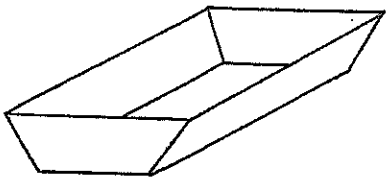
A.



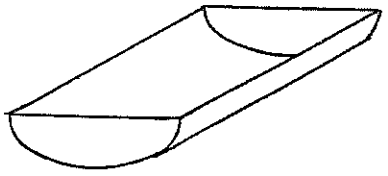
B.



C.



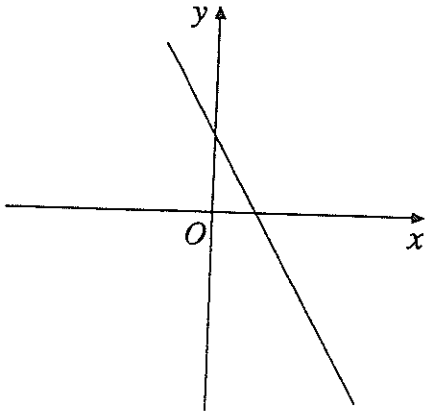
D.



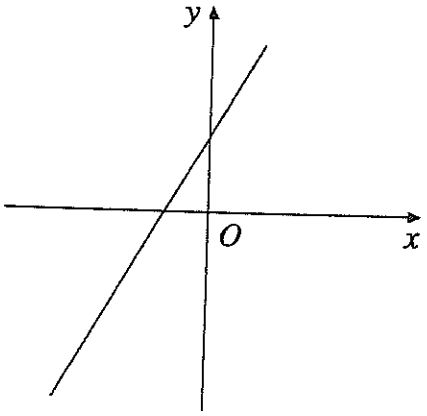
13

Which line could have the equation $y = -2x + 4$?

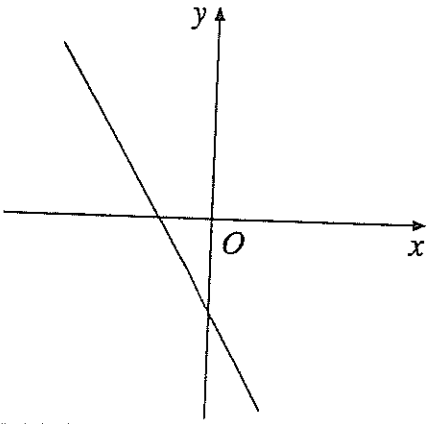
(A)



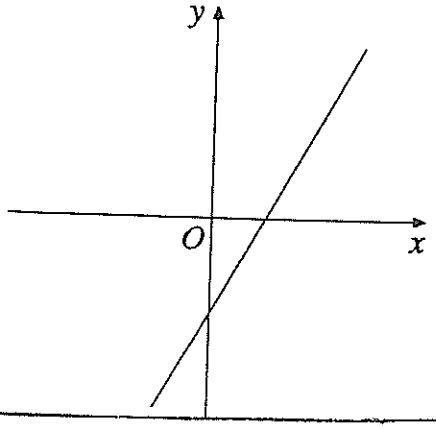
(B)



(C)



(D)



14

A bag contains 3 pink and 4 green marbles. Two marbles are selected at random from the bag. Find the probability that both the marbles are pink.

Name: SOLUTIONS

Teacher: _____

SYDNEY TECHNICAL HIGH SCHOOL

YEAR 10 COMMON TEST

TERM 2, MAY 2012

MATHEMATICS

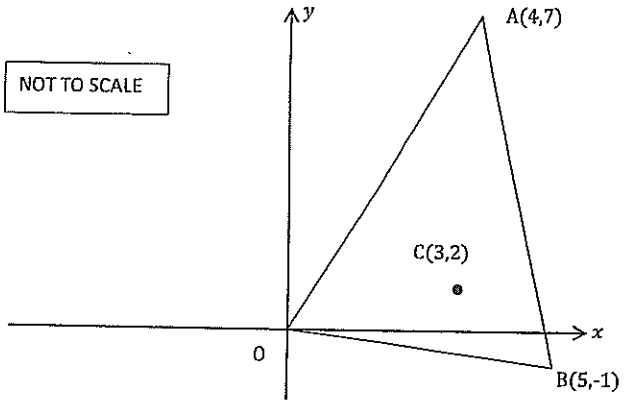
PART A: Non-Calculator

TIME ALLOWED: 15 Minutes

INSTRUCTIONS: Remove this front page and place answers in spaces provided.

Q1: $\frac{2}{7}$	Q5: C	Q10: $\frac{5}{9}$
Q2: C	Q6: A	Q11: B
Q3: A	Q7: 36	Q12: B
Q4 i) 20	Q8: B	Q13: A
Q4 ii) $\frac{2}{5}$	Q9: C	Q14 $\frac{1}{7}$

3.



The diagram shows A(4,7) B(5,-1) and C(3,2).

i) What are the co-ordinates of the mid-point of AB? 1

midpt $\left(\frac{9}{2}, 3\right)$

ii) Find the equation of OC. 1

$y = \frac{2}{3}x$

iii) Show that OC bisects AB. 1

sub mid pt to get true solution

PART E: QUADRATIC EQUATIONS

Total Marks: /14

		Marks
1.	Solve: a) $4x^2 - 25 = 0$ $x = \pm \frac{5}{2}$	1
	b) $2t^2 - 3t + 1 = 0$ $(2t-1)(t-1)=0$ $t = 1/2, 1$	2
	c) $3(x-1)^2 = 12$ $(x-1)^2 = 4$ $x-1 = \pm 2$ $\therefore x = 3, -1$	2
2.	Solve, $x^2 - 2x - 1 = 0$, by completing the square. Leave your answer in surd form. $x^2 - 2x = 1$ $x^2 - 2x + 1 = 2$ $(x-1)^2 = 2$ $x-1 = \pm\sqrt{2}$ $x = 1 \pm \sqrt{2}$	2
3.	Solve, $3x^2 - 2x - 4 = 0$ and write your answer(s) correct to 2 decimal places. $x = \frac{2 \pm \sqrt{52}}{6}$ $x = 1.54, -0.87$	2
4.	Explain why $3x^2 + 7x + 5 = 0$ has no real solutions. $x = \frac{-7 \pm \sqrt{-11}}{6}$ -ve under $\sqrt{}$ $\therefore$ no real sol.	1
5.	Solve $\frac{2}{3x+4} = \frac{2x-1}{5}$ $10 = (2x-1)(3x+4)$ $10 = 6x^2 + 5x - 4$ $0 = 6x^2 + 5x - 14$ $(6x-7)(x+2)=0$ $x = \frac{7}{6}, -2$	2
6.	The sum of a number, x, and its reciprocal is $2\frac{1}{6}$. Form a quadratic equation in terms of x. Hence, find all possible values for x. $x + \frac{1}{x} = \frac{13}{6}$ $6x^2 + 6 = 13x$ $6x^2 - 13x - 6 = 0$ $(3x-2)(2x-3)=0$ $x = \frac{2}{3}, \frac{3}{2}$	2

$3x \times -2$
$2x \times 3$

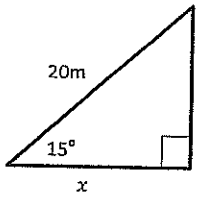
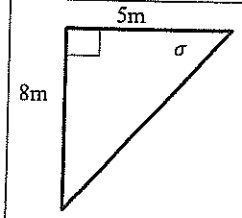
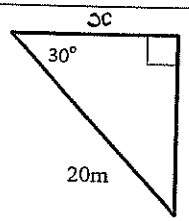
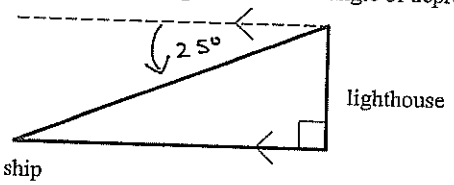
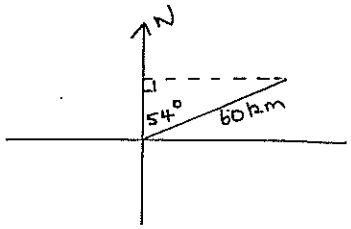
PART F: CO-ORD GEOMETRY/GRAPHS

Total Marks: /11

		Marks
1.	For the parabola $y = (x-1)(x+3)$ find i) the x intercepts $x = 1, -3$ ii) the y intercepts $y = -3$ iii) the vertex $(-1, -4)$ iv) hence sketch the parabola showing all the above information	4
2.	Make a neat sketch of the following curves. Indicate if the curve cuts either the x or y axes and find these points. a) $x^2 + y^2 = 9$ b) $xy = 1$ c) $y = 2^{-x}$ d) $y = x^2 - 4$	4

PART D: TRIGONOMETRY

Total Marks: /13

		Marks
1.	If $\sin\sigma = \frac{1}{3}$ find the exact value of $\tan\sigma$. $\tan\theta = \frac{1}{\sqrt{8}}$	1
2.	 Find x correct to 2 decimal places. $\cos 15^\circ = \frac{x}{20}$ $x = 19.32$ m	2
3.	 Find σ correct to nearest degree. $\tan\theta = \frac{8}{5}$ $\theta = 58^\circ$	2
4.	 Find the exact value of x $\cos 30^\circ = \frac{x}{20}$ $x = 10\sqrt{3}$	2
5.	The top of a lighthouse is 40m above sea level. The base of the lighthouse is at sea level. The angle of depression of a ship at sea is 25° as seen from the top of the lighthouse. i) Indicate on the diagram below the angle of depression. 	1
	ii) How far is the ship from the base of the lighthouse (to nearest m) $\tan 25^\circ = \frac{40}{x}$ $\therefore x = 86$m	2
6.	A ship travels 60km on a bearing of N54°E. i) Draw a suitable diagram to show this information. 	1
	ii) Hence find how far the ship is then north of its starting point? (To nearest km.) $\cos 54^\circ = \frac{x}{60}$ $x = 35$km	2

PART C: CONSUMER ARITHMETIC

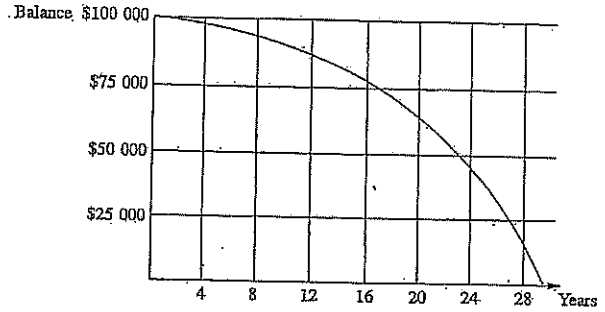
Total Marks: /14

		Marks
1.	Haydn earns $428 per week and has to pay a Medicare levy of 1.5% only on earnings in excess of $14 200pa. What must he pay as his levy at the end of the financial year? $120.84	2
2.	Parker Read Estate earns commission of 3% on the first $50 000, $2\frac{1}{2}$% on the next $150 000 and $1\frac{1}{4}$% on the balance of all real estate sales. a) What is its commission on the sale of a house for $275 000? $6187.50 b) What does the owner receive? $268,812.50	2
3.	If Tanya is asked to work on Thursday nights or weekends she is paid overtime rates at time and a half. If she works 10 hours at normal rate of $15.80 per hour, 3 hours on Thursday night and 4 hours on Sunday, what will her pay be? $323.90	2
4.	Find the amount to which an investment of $2000 will grow if invested at 6%pa for 3 years compounded monthly. $2393.36 (ignore any rounding off)	2
5.	The Taxation Department agrees to allow Joe Smith to depreciate (decrease) the value of his truck by 17% each year for taxations purposes. When new it was worth $22 000. By how much has it depreciated after 2 years? $6844.20	2

(ignore any rounding off)

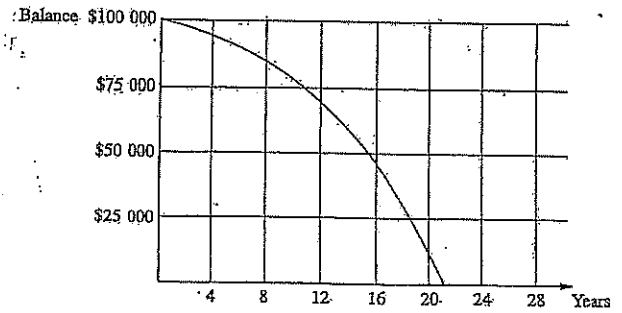
6.	The two graphs below show the effects of more frequent repayments on a loan of $100 000 at 9.25%pa.	4

A.



Amount financed: $100 000
Current variable rate: 9.25% p.a.
Repayment: $822 per month

B.



Amount financed: $100 000
Current variable rate: 9.25% p.a.
Repayment: $411 per fortnight (assume 2 fortnights per month)

a) Calculate the total repayments made for each loan: $212076 ($411 x 24 x 21.5)
Loan A: $295,920 Loan B: or $229749 ($411 x 26 x 21.5)

b) Write 2 benefits of paying off the loan fortnightly rather than monthly.
i): pay less interest
ii): pay loan off quicker

Name: Solutions

Teacher: _____

SYDNEY TECHNICAL HIGH SCHOOL

YEAR 10 COMMON TEST

TERM 2, MAY 2012

MATHEMATICS

Time Allowed: 75 Minutes

Directions to candidates

- Attempt all questions and show all required working.
- PART A – Non Calculator – 15 minutes (answer sheet provided)
- PARTS B, C, D, E and F – allow 60 minutes (answers in spaces provided).
- Approximate marks are shown alongside each question.

PART A	PART B	PART C	PART D	PART E	PART F
Non-Calculator	Simultaneous Equations	Consumer Arithmetic	Trigonometry	Quadratic Equations	Graphs Co-ord Geometry
15	/10	/14	/13	/14	/11
				TOTAL	77

PART B: SIMULTANEOUS EQUATIONS

Total Marks: /10

		Marks
1.	Solve the following simultaneous equations for x and y $2x-y=11$ $x-y=3$ $x=8$ $y=5$	2
2.	Solve the following simultaneous equations for x and y $2x-y=3$ $x=y-4$ $x=7$ $y=11$	2
3.	Show algebraically, the following 3 lines are concurrent (ie pass through the same point) $x+y=1$ $x-2y=2$ and $2x-y=3$ $x=\frac{4}{3}$ $y=-\frac{1}{3}$ — (2) show but subst (1)	3
4.	A purse contains 34 coins. All coins are either 10 cent or 5 cent. The total value of the coins is \$2.85. Let x be the number of 10 cent coins. Let y be the number of 5 cent coins. i) Form 2 simultaneous equations in terms of x and y. $x+y=34$ $10x+5y=285$ } must have both	1
	ii) Solve these to find the number of 10 cent and 5 cent coins. 23 10cent coins 11 5cent coins no marks if guess and check	2