

Name:

Maths Class:

SYDNEY TECHNICAL HIGH SCHOOL



YEAR 9 ASSESSMENT

Mathematics

October 2015

TIME ALLOWED: 75 minutes

Instructions:

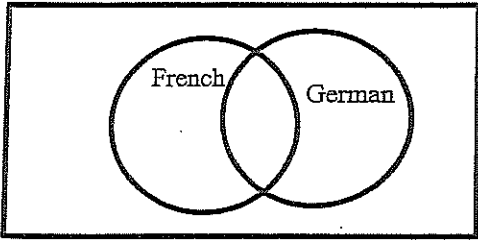
- Write your name and class at the top of this page,
- Calculators may be used in all parts of this examination.
- All necessary working must be shown.
- Marks may not be awarded for careless or badly arranged work.
- All questions are NOT of equal value. Marks are indicated on each question

(MARKERS' USE ONLY)

TOPIC			QUESTION 5		TOPIC TOTAL
Revision topics	QUESTION 1	/14	(a)	/4	/18
Equations and Inequalities	QUESTION 2	/15	(b)	/3	/18
Trigonometry	QUESTION 3	/14	(c)	/4	/18
Factors	QUESTION 4	/14	(d)	/4	/18
				TOTAL	/72


Write your answers to all questions in the space provided at right.

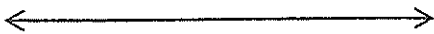
QUESTION 1: REVISION TOPICS (14 marks)

Working and Answer		
1	(a)	Fully simplify $\sqrt{75}$
1	(b)	Expand and simplify $3 - (5 - x)$
1	(c)	Write $\frac{1}{\sqrt{2}}$ in the form 2^x
2	(d)	<p>The Venn diagram below represents a Year 9 class of 30 pupils all of whom do either French or German as an elective. 15 students study French, while 25 do German.</p>  <p>By filling in the Venn Diagram, answer these questions:</p> <p>(i) How many pupils studied both languages?</p> <p>(ii) How many students studied <u>only</u> German?</p>
1	(e)	Simplify $\frac{\sqrt{6}}{\sqrt{2}}$
1	(f)	Rationalise the denominator of $\frac{10}{\sqrt{5}}$ and simplify
1	(g)	Simplify $\sqrt{a^4b^2}$

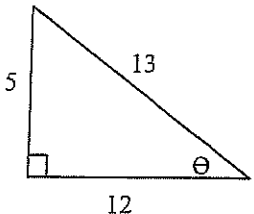
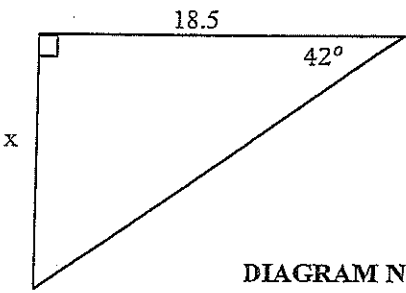
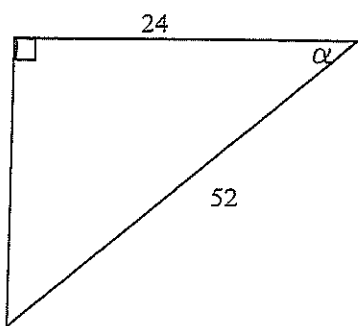
1	(h)	Expand and simplify $(\sqrt{5} - 1)(\sqrt{5} + 1)$	
1	(i)	Expand and simplify: $(4x + 2)^2$	
1	(j)	Solve for x: $5^{x+3} = 5$	
1	(k)	<p>Fran buys a ticket in a raffle of 10 000 tickets. It is number 23. Later, her husband, Jack, buys one as well, but gets ticket 4578. Jack gloats to his wife that he has a much better chance of winning because there are more 4-digit tickets which could come out than 2-digit ones.</p> <p><i>Does Jack have a better chance? Yes or No</i></p>	<p>YES / NO (circle one answer)</p>
1	(l)	Expand and simplify: $(2x - 1)(3x - 4)$	
1	(m)	<p>A card is drawn from a normal 52 card deck which has been shuffled. Its value is noted, and it is returned to the pack.</p> <p>The pack is shuffled and another card is drawn.</p> <p>What is the probability that it is the same card?</p>	

QUESTION 2: EQUATIONS (15 marks)

1	(a)	Solve $3(x - 4) = 5$	Working and Answer
2	(b)	Solve for y , and plot the solution on the number plane provided. $2 - y < 3$	Working and Answer 
1	(c)	Solve $\sqrt{3x + 1} = 4$	Working and Answer
1	(d)	Solve $x(x - 4) = x^2 - 12$	Working and Answer
2	(e)	Solve: $\frac{x+4}{6} = \frac{1}{3}$	Working and Answer
2	(f)	Solve for x : $\frac{2y + 1}{4} = \frac{3y - 4}{3}$	Working and Answer

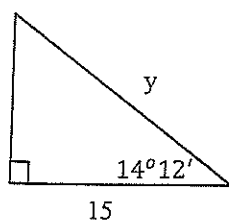
2	(g) Solve the following inequality, and plot the solution on the number line provided. $\frac{5x}{2} - 4 \geq 4x - 7$	Working and Answer 
2	(h) Make s the subject of the formula $v^2 = u^2 + 2as$	Working and Answer
2	(i) Solve the following for x : $\frac{1}{x} + \frac{1}{2x} = \frac{4}{5}$	Working and Answer

QUESTION 3: TRIGONOMETRY (14 marks)

1	<p>(a) In the diagram below find the <u>exact</u> value of $\sin\theta$</p>  <p style="text-align: center;">DIAGRAM NOT TO SCALE</p>	Working and Answer
1	<p>(b) Find, to the <u>nearest minute</u>, the value of α if $\cos\alpha = 0.8$</p>	Working and Answer
1	<p>(c) Find the value of $\cos 58^{\circ}7'$ to 3 decimal places</p>	Working and Answer
2	<p>(d) Find the value of x to 1 decimal place.</p>  <p style="text-align: center;">DIAGRAM NOT TO SCALE</p>	Working and Answer
2	<p>(e) Find the value of α in the following diagram correct to the nearest minute:</p>  <p style="text-align: center;">DIAGRAM NOT TO SCALE</p>	Working and Answer

2

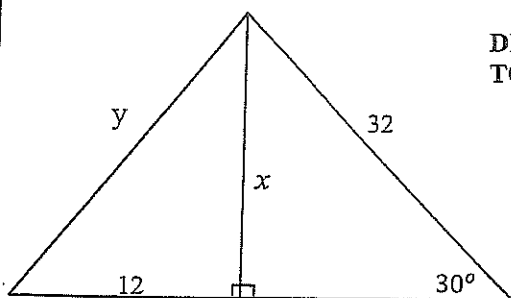
(e)

Find the value of y to 1 decimal place:DIAGRAM NOT
TO SCALE

Working and Answer

2

(g)

DIAGRAM NOT
TO SCALE

Working and Answers

(i)

(i) Find the value of x

(ii)

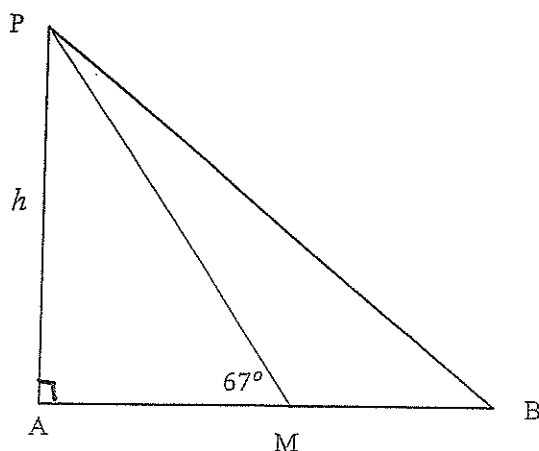
(ii) Find the exact value of y

3

(h)

Peter walks from the base of a vertical wall AP, of height h metres. After walking 40 m to M, he takes a reading to the top of the wall, and finds that the angle of elevation to the top is 67° . He then walks x metres further and retakes the angle of elevation to the top and now finds it is 45° .

Put the information into the diagram below, and find the value of x correct to 1 decimal place.



Working and Answer

QUESTION 4: FACTORS (14 marks)

	(a) Fully factorise:	Working and Answer
1	(i) $3p^2 - 6py$	(i)
1	(ii) $y^2 - 3y - 40$	(ii)
1	(iii) $3x^2 - 6x + 5ax - 10a$	(iii)
1	(iv) $25 - x^2$	(iv)
1	(v) $6x^2 + 13x + 5$	(v)

Question 4 continues overleaf.....)

Working and Answer

2	(b) Simplify:	(i)
	(i) $\frac{8x^2+16x}{3x+6}$	
2	(ii) $\frac{x+5}{3} + \frac{2x}{5}$	(ii)
1	(iii) $\frac{x-2}{2-x}$	(iii)
2	(iv) $\frac{x^2-9}{2x-6}$	(iv)
2	(v) $\frac{3}{x-4} - \frac{2}{x+5}$	(v)

QUESTION 5: (14 marks)

1	(a)	(i)	<p>There are 4 blank cards, each with one of the numbers 2, 4, 5 and 6 written on it.</p> <p>The cards are shuffled and then placed (number up) on a table from left to right to form a 4-digit number.</p> <p>What is the chance that the number formed is greater than 6 000 ?</p>
3		(ii)	<p>You are given that $(2\sqrt{3} - 1)(\sqrt{3} + 5) = x + \sqrt{y}$</p> <p>Find the values of x and y</p>

MARK FOR 5(a)

/4

3

(b)

John's son, Adam, was born on John's 29th birthday.

On the occasion of John's next birthday, he will then be twice as old as Adam.

How old is John NOW?

Letting Adam's present age be x , set out your working below, to find John's present age.

Marks are awarded in this part for full and organised setting out.

SOLUTION:

Let Adam's present age be x years.

MARK FOR 5(b)

/3

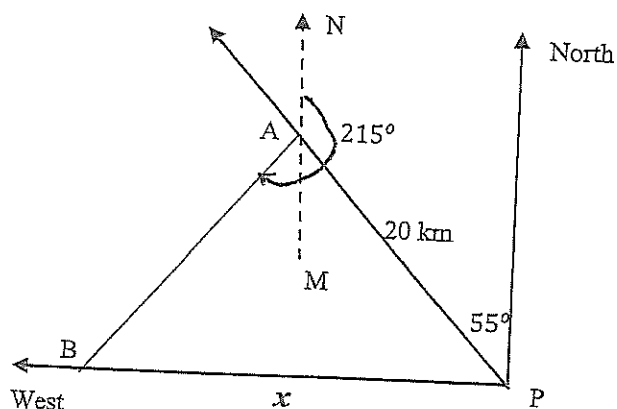
3

(c)

Two ships A and B sail from a port P.

Ship A sails on a bearing of 305° while ship B sails due West.

When A has travelled 20 km, it takes a bearing on Ship B and finds it is 215° , as in the diagram below.



- (i) Giving a reason, explain why the angle PAB is 90°
- (ii) Find the size of the angle APB
- (iii) How far is ship B from the port P at this time?
(Give your answer to the nearest 0.1 km)

MARK FOR 5(c)

2	(d)	(i)	Completely factorise $x^2 - y^2 + 3x - 3y$
2		(ii)	Simplify $\frac{1}{x^2-4} + \frac{1}{x^2-x-2}$

MARK FOR 5(d)

/4

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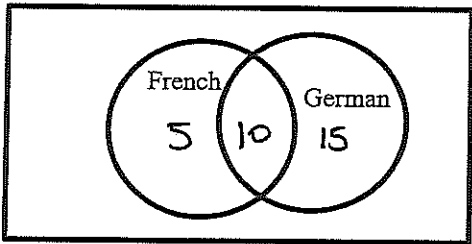
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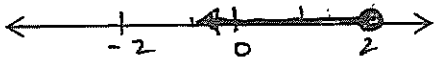
QUESTION 1: REVISION TOPICS (14 marks)

		Working and Answer
1	(a) Fully simplify $\sqrt{75}$	$5\sqrt{3}$
1	(b) Expand and simplify $3 - (5 - x)$	$3 - 5 + x$ $= x - 2$
1	(c) Write $\frac{1}{\sqrt{2}}$ in the form 2^x	$2^{-1/2}$
2	(d) The Venn diagram below represents a Year 9 class of 30 pupils all of whom do either French or German as an elective. 15 students study French, while 25 do German. <div style="text-align: center;">  </div> <p>By filling in the Venn Diagram, answer these questions:</p> <p>(i) How many pupils studied both languages?</p> <p>(ii) How many students studied <u>only</u> German?</p>	(i) Both languages = 10 (ii) Only German = 15
1	(e) Simplify $\frac{\sqrt{6}}{\sqrt{2}}$	$\sqrt{3}$
1	(f) Rationalise the denominator of $\frac{10}{\sqrt{5}}$ and simplify	$\frac{10\sqrt{5}}{5} = 2\sqrt{5}$
1	(g) Simplify $\sqrt{a^4b^2}$	a^2b

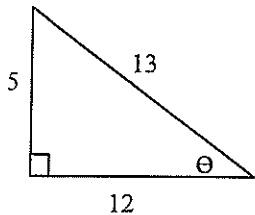
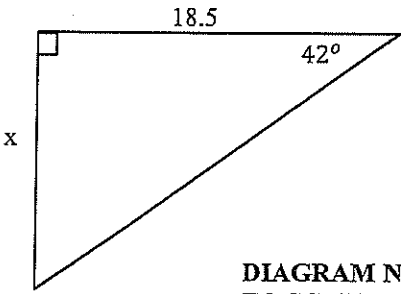
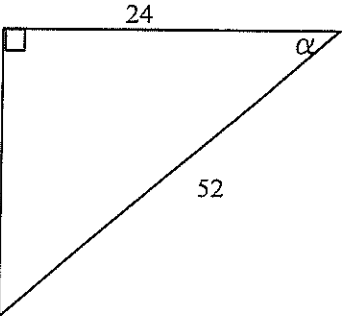
1	(h)	Expand and simplify $(\sqrt{5} - 1)(\sqrt{5} + 1)$	$5 - 1$ $= 4$
1	(i)	Expand and simplify: $(4x + 2)^2$	$16x^2 + 16x + 4$
1	(j)	Solve for x: ✱ $5^{x+3} = 5$	$x = -2$
1	(k)	Fran buys a ticket in a raffle of 10 000 tickets. It is number 23. Later, her husband, Jack, buys one as well, but gets ticket 4578. Jack gloats to his wife that he has a much better chance of winning because there are more 4-digit tickets which could come out than 2-digit ones. Does Jack have a better chance? Yes or No	YES / NO (circle one answer)
1	(l)	Expand and simplify: $(2x - 1)(3x - 4)$	$6x^2 - 11x + 4$
1	(m)	A card is drawn from a normal 52 card deck which has been shuffled. Its value is noted, and it is returned to the pack. The pack is shuffled and another card is drawn. What is the probability that it is the same card?	$\frac{1}{52}$

QUESTION 2: EQUATIONS (15 marks)

1	(a)	Solve $3(x-4) = 5$	Working and Answer $3x - 12 = 5$ $3x = 17$ $x = 17/3$
2	(b)	Solve for y , and plot the solution on the number plane provided. $2 - y < 3$	Working and Answer $-y < 1$ $y > -1$ 
1	(c)	Solve $\sqrt{3x+1} = 4$	Working and Answer $3x+1 = 16$ $3x = 15$ $x = 5$
1	(d)	Solve $x(x-4) = x^2 - 12$	Working and Answer $x^2 - 4x = x^2 - 12$ $-4x = -12$ $x = 3$
2	(e)	Solve: $\frac{x+4}{6} = \frac{1}{3}$	Working and Answer $3x+12 = 6$ $3x = -6$ $x = -2$
2	(f)	Solve for x : $\frac{2y+1}{4} = \frac{3y-4}{3}$	Working and Answer $6y+3 = 12y-16$ $19 = 6y$ $y = 19/6$

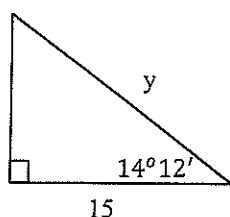
2	<p>(g) Solve the following inequality, and plot the solution on the number line provided.</p> $\frac{5x}{2} - 4 \geq 4x - 7$	<p>Working and Answer</p> $5x - 8 \geq 8x - 14$ $6 \geq 3x$ $x \leq 2$ 
2	<p>(h) Make s the subject of the formula</p> $v^2 = u^2 + 2as$	<p>Working and Answer</p> $2as = v^2 - u^2$ $s = \frac{v^2 - u^2}{2a}$
2	<p>(i) Solve the following for x:</p> $\frac{1}{x} + \frac{1}{2x} = \frac{4}{5}$	<p>Working and Answer</p> $2 + 1 = \frac{8x}{5}$ $8x = 15$ $x = \frac{15}{8}$

QUESTION 3: TRIGONOMETRY (14 marks)

1	<p>(a) In the diagram below find the <u>exact</u> value of $\sin \theta$</p>  <p>DIAGRAM NOT TO SCALE</p>	<p>Working and Answer</p> $\sin \theta = \frac{5}{13}$
1	<p>(b) Find, to the <u>nearest minute</u>, the value of α if $\cos \alpha = 0.8$</p>	<p>Working and Answer</p> $36^{\circ} 52'$
1	<p>(c) Find the value of $\cos 58^{\circ} 7'$ to 3 decimal places</p>	<p>Working and Answer</p> 0.528
2	<p>(d) Find the value of x to 1 decimal place.</p>  <p>DIAGRAM NOT TO SCALE</p>	<p>Working and Answer</p> $\frac{x}{18.5} = \tan 42^{\circ}$ $x = 16.657$ ≈ 16.7
2	<p>(e) Find the value of α in the following diagram correct to the nearest minute:</p>  <p>DIAGRAM NOT TO SCALE</p>	<p>Working and Answer</p> $62^{\circ} 31'$

2

(e)

Find the value of y to 1 decimal place:DIAGRAM NOT
TO SCALE

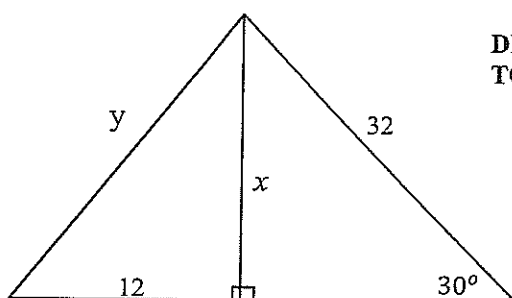
Working and Answer

$$\frac{15}{y} = \cos 14^{\circ}12'$$

$$y = 15.5$$

2

(g)

DIAGRAM NOT
TO SCALE(i) Find the value of x (ii) Find the exact value of y

Working and Answers

(i)

$$\frac{x}{32} = \sin 30^{\circ}$$

$$x = 16$$

(ii)

$$\begin{aligned} y^2 &= x^2 + 12^2 \\ &= 16^2 + 12^2 \\ &= 400 \end{aligned}$$

$$y = 20$$

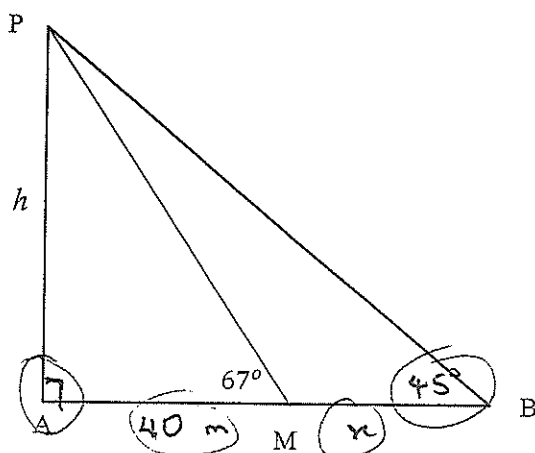
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(h)

Peter walks from the base of a vertical wall AP, of height h metres. After walking 40 m to M, he takes a reading to the top of the wall, and finds that the angle of elevation to the top is 67° . He then walks x metres further and retakes the angle of elevation to the top and now finds it is 45° .

*

Put the information into the diagram below, and find the value of x correct to 1 decimal place.



Working and Answer

$$\frac{h}{40} = \tan 67^{\circ}$$

$$\therefore h = 40 \tan 67^{\circ} = 94.23$$

$$\therefore x + 40 = 94.23$$

$$x = 54.23$$

QUESTION 4: FACTORS (14 marks)

		Working and Answer
	(a) Fully factorise:	
1	(i) $3p^2 - 6py$	(i) $3p(p - 2y)$
1	(ii) $y^2 - 3y - 40$	(ii) $(y - 8)(y + 5)$
1	(iii) $3x^2 - 6x + 5ax - 10a$	(iii) $3x(x - 2) + 5a(x - 2)$ $= (x - 2)(3x + 5a)$
1	(iv) $25 - x^2$	(iv) $(5 - x)(5 + x)$
1	(v) $6x^2 + 13x + 5$	(v) $(3x + 5)(2x + 1)$

Question 4 continues overleaf.....)

QUESTION 5: (14 marks)

1	(a)	(i)	<p>There are 4 blank cards, each with one of the numbers 2, 4, 5 and 6 written on it.</p> <p>The cards are shuffled and then placed (number up) on a table from left to right to form a 4-digit number.</p> <p>What is the chance that the number formed is greater than 6 000 ?</p> $\frac{1}{4}$
3		(ii)	<p>You are given that $(2\sqrt{3} - 1)(\sqrt{3} + 5) = x + \sqrt{y}$</p> <p>Find the values of x and y</p> $6 + 10\sqrt{3} - \sqrt{3} - 5 = x + \sqrt{y}$ $1 + 9\sqrt{3} = x + \sqrt{y} \quad \leftarrow \textcircled{1}$ $\begin{array}{l} \textcircled{1} \downarrow \\ x = 1 \end{array} \qquad \begin{array}{l} \downarrow \textcircled{2} \\ y = 243 \end{array}$

MARK FOR 5(a)

/4

3

(b)

John's son, Adam, was born on John's 29th birthday.
 On the occasion of John's next birthday, he will then be twice as old as Adam.
 How old is John NOW?

Letting Adam's present age be x , set out your working below, to find John's present age.

Marks are awarded in this part for full and organised setting out.

SOLUTION:

Let Adam's present age be x years.

\therefore John is $29 + x$ years old.

Next birthday,

John will be $30 + x$ y/old

Adam " " $x + 1$ " "

$$\text{and } 30 + x = 2(x + 1)$$

$$28 = x$$

\therefore Adam is now 28

and John is 57

MARK FOR 5(b)

/3

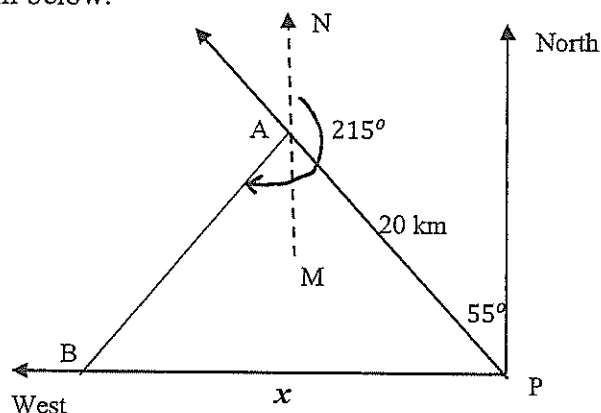
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(c)

Two ships A and B sail from a port P.

Ship A sails on a bearing of 305° while ship B sails due West.

When A has travelled 20 km, it takes a bearing on Ship B and finds it is 215° , as in the diagram below.



- (i) Giving a reason, explain why the angle PAB is 90°

$$\begin{aligned}\angle BAm &= 35^\circ \\ \therefore \angle MAP &= 55^\circ \text{ (alternate angles)} \\ \therefore \angle BAP &= 90^\circ\end{aligned}$$

- (ii) Find the size of the angle APB

$$\angle APB = 35^\circ$$

- (iii) How far is ship B from the port P at this time?
(Give your answer to the nearest 0.1 km)

$$\begin{aligned}\frac{20}{x} &= \cos 35^\circ \\ x &= \frac{20}{\cos 35^\circ} \\ &= 24.415\end{aligned}$$

\therefore B is approx 24.4 km from P

MARK FOR 5(c)

2	(d)	(i)	Completely factorise	$x^2 - y^2 + 3x - 3y$ $(x-y)(x+y) + 3(x-y)$ $= (x-y)[x+y+3]$ $= (x-y)(x+y+3)$
2		(ii)	Simplify	$\frac{1}{x^2-4} + \frac{1}{x^2-x-2} = \frac{1}{(x-2)(x+2)} + \frac{1}{(x-2)(x+1)}$ $= \frac{x+1 + x+2}{(x-2)(x+2)(x+1)}$ $= \frac{2x+3}{(x-2)(x+2)(x+1)}$

MARK FOR 5(d)

/4
