Delegate Booklet
Course Title:

International GCSE Mathematics
4MA1 and 4MB1

Welcome to Pearson
Module 2

About this event

Course Title: Welcome to Pearson International GCSE Mathematics: 4MA1 and 4MB1

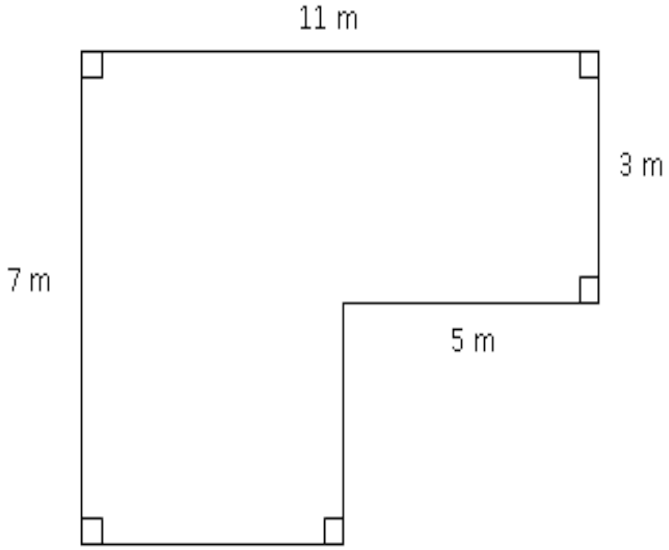
Aims and Objectives of the event

Course description:
This face-to-face event is designed for teachers who are new to delivering the International GCSE Mathematics A and B specifications. This event will give you an understanding of the content of the qualification and how to cover it, an understanding of the mark schemes and practice applying them using exemplar student work, as well as access to the range of Pearson support available to teachers.

In this training, delegates will: -

- identify how the qualifications are devised
- review the content of the qualification
- explore how to plan the course and/or lessons
- understand the assessment of the qualification and how to prepare students
- identify the support available from Pearson
- network and share ideas with other teachers.

Activity 1 – A 'real world' problem solving question



The diagram shows the floor plan of a room in Kate's house.

Kate is going to cover the floor with tiles. She is going to buy some packs of tiles.

The tiles in each pack of tiles cover 2 m² of floor and can be purchased in whole packs only. Each pack of tiles costs £24.80

Work out how much it will cost Kate to buy the packs of tiles she needs.

- Which parts of the content (specification parts) are being addressed in this question?
- What steps does a candidate need to take to solve this problem?
- How would you teach your students to tackle this type of question?

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Activity 2 - A 'mathematical' problem solving question

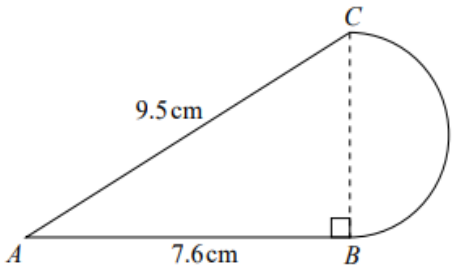

Diagram **NOT** accurately drawn

The diagram shows a shape made from triangle ABC and a semicircle with diameter BC.
Triangle ABC is right-angled at B.

$AB = 7.6$ cm and $AC = 9.5$ cm.

Calculate the area of the shape.
Give your answer correct to 3 significant figures.

- Which parts of the content (specification parts) are being addressed in this question?
- What makes this a problem-solving question?

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Activity 3 – Using a mark scheme

26 (a) Use the factor theorem to show that $(2x + 3)$ is a factor of $2x^3 - 3x^2 - 17x - 12$

(b) Hence, factorise completely $2x^3 - 3x^2 - 17x - 12$

- Answer the above question and use the mark scheme to mark your own work.

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Mark scheme

Question	Working	Answer	Mark	AO	Sub-total	Total
25(a)	$90+28t-3t^2$ (2 terms correct)	(cao)	M1 A1	1.4 1.4	2	
25(b)	'$90+28t-3t^2$' $=0$ (oe)		M1	1.4		
	$\frac{+28\pm\sqrt{(-28)^2-4\times(3)\times(-90)}}{2\times3}$ (Solving 3 term quadratic)		M1 DEP	1.3		
	$\sqrt{1864}$, 43.17	awrt 11.9	B1 A1	1.3 1.4	4	**6**
26(a)	$2\times(-1.5)^3-3\times(-1.5)^2-17\times(-1.5)-12$ (substitute)		M1	1.3		
		$=0$	A1		2	
26(b)	x^2-3x		M1			
		x^2-3x-4	A1			
	$(x-4)(x+1)$ (solving trinomial quadratic)		M1 INDEP			
		$(2x+3)(x-4)(x+1)$	A1		4	**6**

Activity 4 - Marking exercise 1
Question 5 Paper 1F

5 There are 12 481 people at a concert.
8906 of these people are adults.
The rest of the people are children.

$\frac{3}{5}$ of the children are boys.

Work out the number of girls at the concert.

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Mark scheme

5		$\frac{3}{5}$ × (12481 – 8906) (=2145) **or** $1 - \frac{3}{5}(=\frac{2}{5})$ **and** 12481 – 8906 (=3575)		4	M2 If not M2 then award M1 for either 12481 – 8906 (=3575) **or** $1 - \frac{3}{5}(=\frac{2}{5})$
		3575 – "2145" **or** $\frac{2}{5}$ × "3575"			M1 dep
			1430		A1
					Total 4 marks

Response 1

5 There are 12 481 people at a concert.
8906 of these people are adults.
The rest of the people are children.

$\frac{3}{5}$ of the children are boys.

Work out the number of girls at the concert.

12481 people − 8906 = 3575 children

$\frac{3}{5}$ of 3575 = 2145

12481 − 2145 = 10336 girls

10336

(Total for Question 5 is 4 marks)

Response 2

5 There are 12 481 people at a concert.
8906 of these people are adults.
The rest of the people are children.

$\frac{3}{5}$ of the children are boys.

Work out the number of girls at the concert.

3575

2145

(Total for Question 5 is 4 marks)

Question 20 Paper 2H June 2019

20 The equation of the line **L** is $y = 9 - x$
The equation of the curve **C** is $x^2 - 3xy + 2y^2 = 0$

L and **C** intersect at two points.

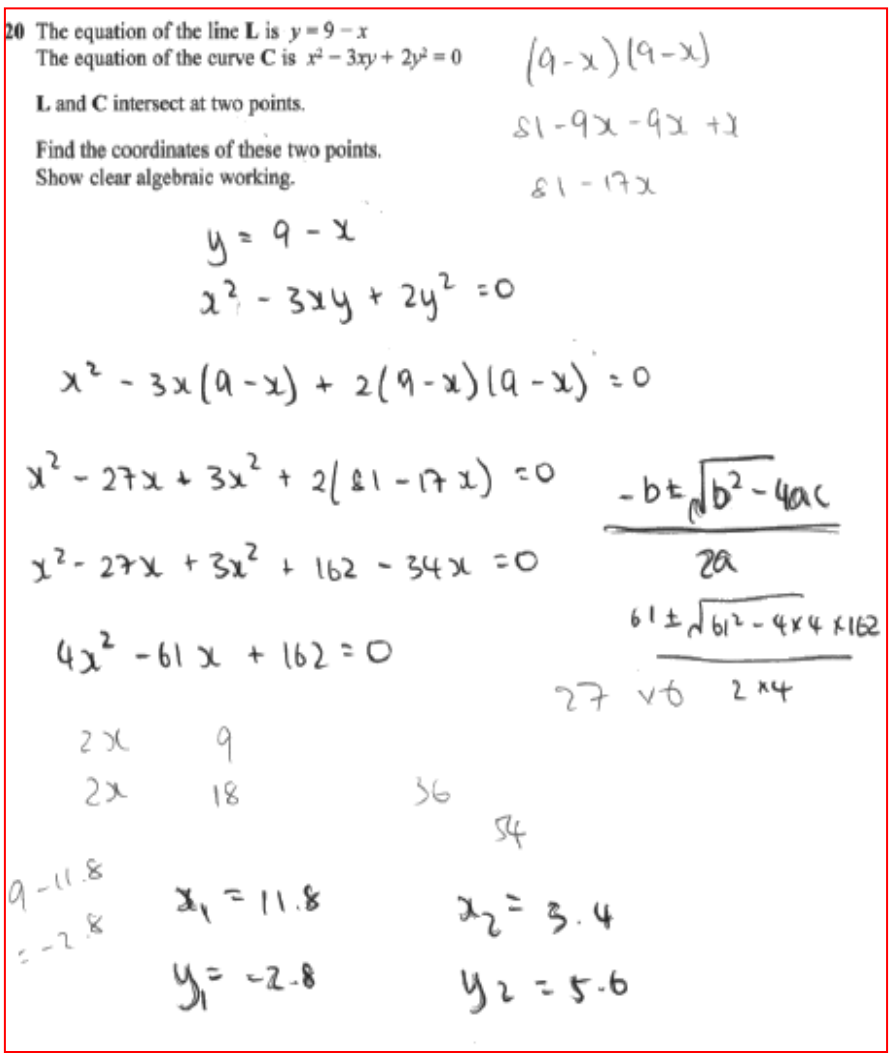
Find the coordinates of these two points.
Show clear algebraic working.

Mark scheme

20		$x^2 - 3x(9 - x) + 2(9 - x)^2$ (= 0)	$(9 - y)^2 - 3y(9 - y) + 2y^2$ (= 0)			M1 substitution of linear equation into quadratic
		e.g. $6x^2 - 63x + 162$ (= 0) **or** $2x^2 - 21x + 54$ (= 0) allow $2x^2 - 21x = -54$ oe	e.g. $6y^2 - 45y + 81$ (= 0) **or** $2y^2 - 15y + 27$ (= 0) allow $2y^2 - 15y = -27$ oe			A1 (dep on M1) writing the correct quadratic expression in form $ax^2 + bx + c$ (= 0) allow $ax^2 + bx = c$
		e.g. $(2x - 9)(x - 6)$ (= 0) $x = \frac{-(-21) \pm \sqrt{(-21)^2 - 4\times2\times54}}{2\times2}$ e.g. $2\left(\left(x - \frac{21}{4}\right)^2 - \left(\frac{21}{4}\right)^2\right) = -54$	e.g. $(2y - 9)(y - 3)$ (= 0) $y = \frac{-(-15) \pm \sqrt{(-15)^2 - 4\times2\times27}}{2\times2}$ e.g. $2\left(\left(x - \frac{15}{4}\right)^2 - \left(\frac{15}{4}\right)^2\right) = -27$			M1 (dep on M1) for a complete method to solve their 3-term quadratic equation (allow one sign error and some simplification – allow as far as $\frac{21 \pm \sqrt{441 - 432}}{4}$)
		$x = 4.5$ and $x = 6$	$y = 4.5$ and $y = 3$			A1 (dep on M1) both x-values **or** both y-values
				(4.5, 4.5) and (6, 3)	5	A1 (dep on M1) oe Must be paired correctly
						Total 5 marks

20 **Alt**		$(x - y)(x - 2y)$ (= 0)				M1 for a method to factorise **C**
		$(x - (9 - x))(x - 2(9 - x))$ (= 0)	$(9 - y - y)(9 - y - 2y)$ (= 0)			A1 (dep M1) substitution of **L** into their factorised **C**
		$(2x - 9)(3x - 18)$ (= 0) oe	$(9 - 2y)(9 - 3y)$ (= 0) oe			M1 (dep on M1)
		$x = 4.5$ and $x = 6$	$y = 4.5$ and $y = 3$			A1 (dep on M1) both x-values **or** both y-values
				(4.5, 4.5) and (6, 3)	5	A1 (dep on M1) oe Must be paired correctly
						Total 5 marks

Response 1



20 The equation of the line **L** is $y = 9 - x$
The equation of the curve **C** is $x^2 - 3xy + 2y^2 = 0$

L and **C** intersect at two points.

Find the coordinates of these two points.
Show clear algebraic working.

$(9-x)(9-x)$

$81 - 9x - 9x + x$

$81 - 17x$

$y = 9 - x$

$x^2 - 3xy + 2y^2 = 0$

$x^2 - 3x(9-x) + 2(9-x)(9-x) = 0$

$x^2 - 27x + 3x^2 + 2(81 - 17x) = 0$

$x^2 - 27x + 3x^2 + 162 - 34x = 0$

$4x^2 - 61x + 162 = 0$

$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$\frac{61 \pm \sqrt{61^2 - 4 \times 4 \times 162}}{2 \times 4}$

27 vb

$2x \quad 9$

$2x \quad 18$

36

54

$9 - 11.8$
$= -2.8$

$x_1 = 11.8$

$y_1 = -2.8$

$x_2 = 3.4$

$y_2 = 5.6$

Response 2

20 The equation of the line **L** is $y = 9 - x$
The equation of the curve **C** is $x^2 - 3xy + 2y^2 = 0$

L and **C** intersect at two points.

Find the coordinates of these two points.
Show clear algebraic working.

$x^2 - 3x(9-x) + 2(9-x)(9-x) = 0$

$x^2 - 27x + 3x^2 + 2(81 - 9x - 9x + x^2) = 0$

$x^2 - 27x + 3x^2 + 162 - 36x + 2x^2 = 0$

$6x^2 - 63x + 162 = 0$

$6x^2 - 36x - 27x + 162 = 0$

$6x(x-6) - 27(x-6) = 0$

$(6x-27)(x-6) = 0$

$x = -4.5$ or 6

$9 - 4.5 = 13.5$

$(-4.5, 13.5)$

$9 - 6 = 3$

$(6, 3)$

Activity 5 – Marking task 2

Question 9 June 2019 4MB1 Paper 2

9

$$\mathbf{p} = \begin{pmatrix} 2x-1 \\ y \end{pmatrix} \qquad \mathbf{q} = \begin{pmatrix} y+3 \\ -y \end{pmatrix}$$

The vectors $\mathbf{p}$ and $\mathbf{q}$ are such that $|\mathbf{p}| = \sqrt{98}$ and $\mathbf{p} + \mathbf{q} = \begin{pmatrix} 7 \\ 0 \end{pmatrix}$

(a) Show that $x^2 - 3x - 9 = 0$

(5)

Given that $x > 0$

(b) (i) find the exact value of x,

(2)

(ii) show that $y = 2 - 3\sqrt{5}$

(2)

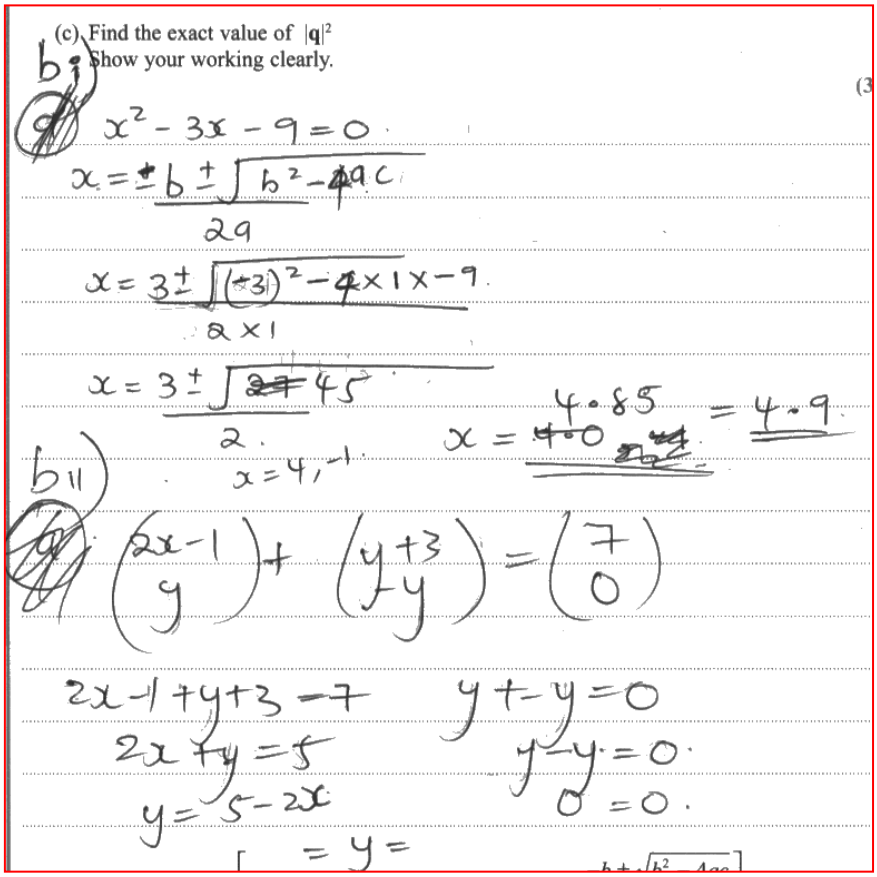
(c) Find the exact value of $|\mathbf{q}|^2$
Show your working clearly.

(3)

Mark scheme

Question		Working	Answer	Mark	Notes
9	(a)	$\sqrt{(2x-1)^2+y^2}=\sqrt{98}$		5	M1 Correct use of modulus to form any correct equation
		$(2x-1)+(y+3)=7$			M1 oe e.g. $2x+y=5$
		$(2x-1)^2+(5-2x)^2=98$ oe			M1 dep. on both previous M marks. Remove square-roots and substitute to gain an equation in terms of x only. May be seen in expanded form. Eg. $-4x^2+4x+97=25+4x^2-20x$ For this and next M mark allow a maximum of 1 sign or numerical error.
		$8x^2-24x-72=0$			M1 dep. previous mark. Expand and attempt to form 3 term quadratic For this and previous M mark allow a maximum of 1 sign or numerical error.
			$x^2-3x-9=0$		A1 As answer given sufficient working must be shown. No incorrect work can be seen.
	(b)(i)	$x=\dfrac{-(-3)\pm\sqrt{(-3)^2-4(1)(-9)}}{2(1)}$ or $\left(x-\frac{3}{2}\right)^2-\frac{9}{4}-9=0$		2	M1 Solving quadratic using formula or completing square
			$x=\dfrac{3+3\sqrt{5}}{2}$		A1 Accept other equivalent exact forms eg $\frac{3+\sqrt{45}}{2}$ Do not accept ± for the final answer, they must indicate positive solution. Do not isw answer given as a decimal.
	(b)(ii)	$y=5-2\left(\dfrac{3+3\sqrt{5}}{2}\right)$		2	M1 Substitute their x which must be an expression involving surds into linear equation to find y If using equation for y^2 must obtain $y^2=98-49-12\sqrt{5}$ or simpler to gain this mark.
			$y=2-3\sqrt{5}$		A1 As answer given sufficient working must be shown Allow $y^2=49-12\sqrt{5}$ from modulus equation and expansion of $(2-3\sqrt{5})^2=49-12\sqrt{5}$ along with an appropriate comment. Do not isw answer given as a decimal.
	(c)	$(\lvert\mathbf{q}\rvert^2=)$ $(2-3\sqrt{5}+3)^2+\left(-(2-3\sqrt{5})\right)^2$		3	M1 Attempt $\lvert\mathbf{q}\rvert^2=q_1^2+q_2^2$ - allow in terms of y or x Eg. $(y+3)^2+y^2$ or $(8-2x)^2+(5-2x)^2$ Allow an expression for $\lvert\mathbf{q}\rvert$
		$=25-30\sqrt{5}+45+45-12\sqrt{5}+4$			M1 dep expand brackets must involve surds. Allow square root of this.
			$119-42\sqrt{5}$ or $7(17-6\sqrt{5})$		A1 cao Do not isw answer given as a decimal.
					Total 12 marks

Response 1



(c) Find the exact value of $|q|^2$
Show your working clearly.

(3

b i)

$x^2 - 3x - 9 = 0$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$x = \frac{3 \pm \sqrt{(-3)^2 - 4 \times 1 \times -9}}{2 \times 1}$

$x = \frac{3 \pm \sqrt{45}}{2}$

$x = 4, -1$

$x = \frac{4.85}{4.0} = 4.9$

b ii)

$\begin{pmatrix} 2x-1 \\ y \end{pmatrix} + \begin{pmatrix} y+3 \\ -y \end{pmatrix} = \begin{pmatrix} 7 \\ 0 \end{pmatrix}$

$2x - 1 + y + 3 = 7$

$2x + y = 5$

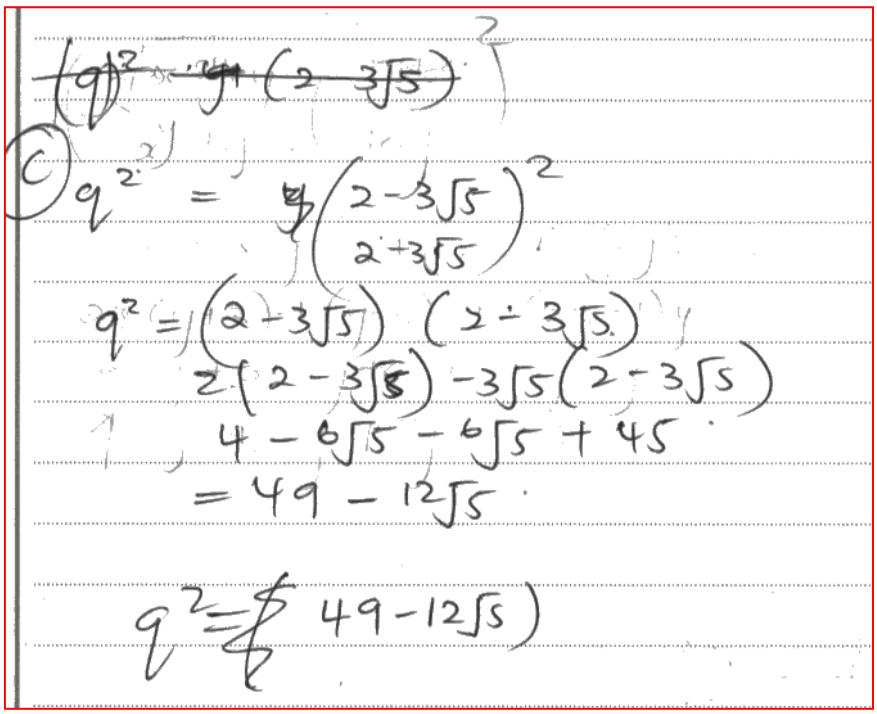
$y = 5 - 2x$

$y + -y = 0$

$y - y = 0$

$0 = 0$

$= y =$



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

c) $q^2 = \left(\frac{2 - 3\sqrt{5}}{2 + 3\sqrt{5}}\right)^2$

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

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

$4 - 6\sqrt{5} - 6\sqrt{5} + 45$

$= 49 - 12\sqrt{5}$

$q^2 = (49 - 12\sqrt{5})$

Response 2

a. $\begin{pmatrix} 2x-1 \\ y \end{pmatrix} + \begin{pmatrix} y+3 \\ -y \end{pmatrix} = \begin{pmatrix} 7 \\ 0 \end{pmatrix}$

$2x - 1 + y + 3 = 7$

$2x + y + 2 = 7$

$2x + y + 2 - 7 = 0$

$2x + y - 5 = 0$

$y = 5 - 2x$

$|p| = \sqrt{(2x-1)^2 + (y)^2}$

$\sqrt{98} = \sqrt{(2x-1)^2 + y^2}$

$\sqrt{98} = \sqrt{(2x-1)^2 + (5-2x)^2}$

$\sqrt{98} = \sqrt{4x^2 - 4x + 1 + 25 - 20x + 4x^2}$

$\sqrt{98} = \sqrt{8x^2 - 24x + 26}$

$8x^2 - 24x + 26 = (\sqrt{98})^2$

$8x^2 - 24x + 26 = 98$

$8x^2 - 24x + 26 - 98 = 0$

$8x^2 - 24x - 72 = 0$

$8(x^2 - 3x - 9) = 0$

$x^2 - 3x - 9 = 0$

b. (i) $x^2 - 3x - 9 = 0$

~~$P = -9 \quad S = -3$~~

~~$-3 + 3 \quad -3 + 3$~~

~~$(x-3)(x+3)$~~

~~$x =$~~ $a = 1 \quad b = -3 \quad c = -9$

$$x = \frac{3 \sqrt{(-3)^2 - (4 \times 1 \times -9)}}{2 \times 1}$$

$$x = \frac{3 + \sqrt{45}}{2} \quad \text{or} \quad x = \frac{3 - \sqrt{45}}{2}$$

Ans: $x = \frac{3 + \sqrt{45}}{2}$

(ii) $y = 5 - 2x$

$$y = 5 - 2\left(\frac{3 + \sqrt{45}}{2}\right)$$

$y = 5 - 3 \mp \sqrt{45}$

$y = 2 \mp \sqrt{5 \times 3 \times 3}$

$y = 2 \mp 3\sqrt{5}$

c. $|q|^2 = (y+3)^2 + (y)^2$

$|q|^2 = y^2 + 6y + 9 + y^2$

$|q|^2 = 2y^2 + 6y + 9$

$|q|^2 = 2((2 \mp 3\sqrt{5})(2 \mp 3\sqrt{5})) + 6(2 \mp 3\sqrt{5}) + 9$

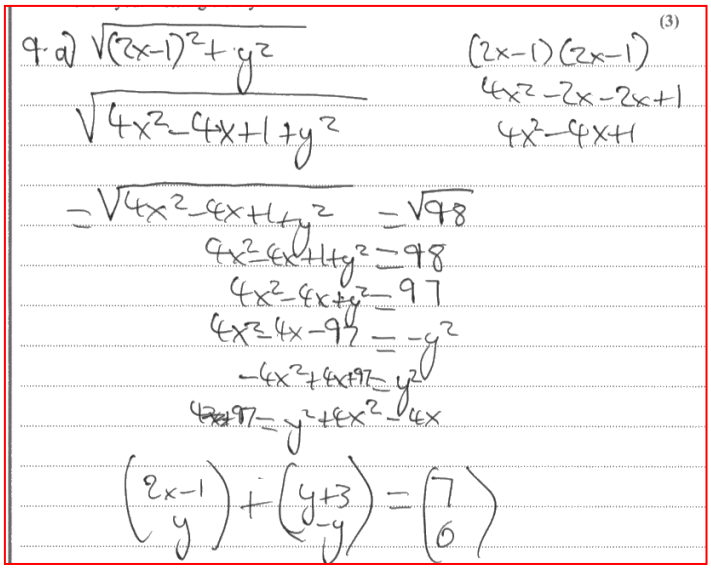
$|q|^2 = 2(4 - 6\sqrt{5} - 6\sqrt{5} + 45) + 12 - 18\sqrt{5} + 9$

$|q|^2 = 8 - 24\sqrt{5} + 90 + 12 - 18\sqrt{5} + 9$

$|q|^2 = 119 - 24\sqrt{5} - 18\sqrt{5}$

$|q|^2 = 119 - 42\sqrt{5}$

Response 3



9. a) $\sqrt{(2x-1)^2+y^2}$ (3)

$\sqrt{4x^2-4x+1+y^2}$

$(2x-1)(2x-1)$

$4x^2-2x-2x+1$

$4x^2-4x+1$

$-\sqrt{4x^2-4x+1+y^2} = \sqrt{98}$

$4x^2-4x+1+y^2 = 98$

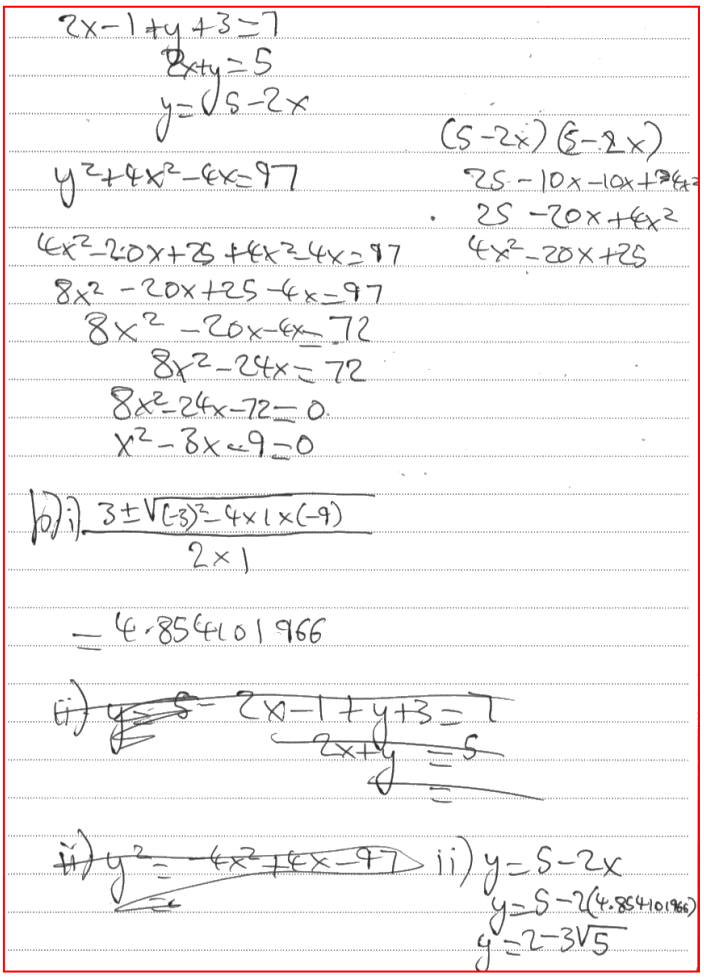
$4x^2-4x+y^2 = 97$

$4x^2-4x-97 = -y^2$

$-4x^2+4x+97 = y^2$

$97 = y^2+4x^2-4x$

$\begin{pmatrix} 2x-1 \\ y \end{pmatrix} + \begin{pmatrix} y+3 \\ -y \end{pmatrix} = \begin{pmatrix} 7 \\ 6 \end{pmatrix}$



$2x-1+y+3=7$

$2x+y=5$

$y=5-2x$

$y^2+4x^2-4x=97$

$(5-2x)(5-2x)$

$25-10x-10x+4x^2$

$25-20x+4x^2$

$4x^2-20x+25$

$4x^2-20x+25+4x^2-4x=97$

$8x^2-20x+25-4x=97$

$8x^2-20x-4x=72$

$8x^2-24x=72$

$8x^2-24x-72=0$

$x^2-3x-9=0$

b) i) $\frac{3\pm\sqrt{(-3)^2-4\times1\times(-9)}}{2\times1}$

$= 4.854101966$

ii) ~~$y=5-2x$~~ $2x-1+y+3=7$

~~$2x+y=5$~~

ii) ~~$y^2=4x^2+4x-97$~~ ii) $y=5-2x$

$y=5-2(4.854101966)$

$y=-2-3\sqrt{5}$

c) $q = \begin{pmatrix} y+3 \\ -y \end{pmatrix}$

$= \begin{pmatrix} (2-3\sqrt{5})+3 \\ -(2-3\sqrt{5}) \end{pmatrix}$

$= \begin{pmatrix} 5-3\sqrt{5} \\ -2+3\sqrt{5} \end{pmatrix}$

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

$= (5.008507257)^2$

$= 25.08514495$

Things to do:

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Things to avoid

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Your ideas:

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