

16 Solve the simultaneous equations

$$\begin{aligned} 3xy - y^2 &= 8 \\ x - 2y &= 1 \end{aligned}$$

Show clear algebraic working.

$$\hookrightarrow x = 1 + 2y$$

$$3xy - y^2 = 8$$

$$3(1+2y)y - y^2 = 8$$

$$3y(1+2y) - y^2 = 8$$

$$3y + 6y^2 - y^2 = 8$$

$$3y + 5y^2 = 8$$

$$5y^2 + 3y - 8 = 0$$

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

$$\frac{-3 \pm \sqrt{(3)^2 - 4(5)(-8)}}{2(5)}$$

$$y = 1$$

$$y = -1.6$$

$$x = 1 + 2y$$

$$x = 1 + 2(1)$$

$$x = 1 + 2(-1.6)$$

$$x = 3$$

$$x = -2.2$$

$$x = 3 \quad y = 1$$

and

$$\begin{aligned} x &= -2.2 \\ y &= -1.6 \end{aligned}$$

(Total for Question 16 is 5 marks)



17 Solve the simultaneous equations

$$x - 6y = 5$$

$$xy - 2y^2 = 6$$

$$x = 5 + 6y$$

Show clear algebraic working.

$$xy - 2y^2 = 6$$

$$(5 + 6y)y - 2y^2 = 6$$

$$y(5 + 6y) - 2y^2 = 6$$

$$5y + 6y^2 - 2y^2 = 6$$

$$5y + 4y^2 = 6$$

$$4y^2 + 5y - 6 = 0$$

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

$$\frac{-5 \pm \sqrt{(5)^2 - 4(4)(-6)}}{2(4)}$$

$$y = 0.75$$

$$y = -2$$

$$x = 5 + 6y$$

$$x = 5 + 6(0.75)$$

$$x = 9.5$$

$$x = 5 + 6(-2)$$

$$x = -7$$

$$x = 9.5$$

$$y = 0.75$$

and

$$x = -7$$

$$y = -2$$

(Total for Question 17 is 5 marks)



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18 Solve the simultaneous equations

$$2x^2 + 3y^2 = 14$$

$$x = 2y - 3$$

$$\begin{aligned} x^2 &= (2y-3)(2y-3) \\ &= 4y^2 - 6y - 6y + 9 \\ &= 4y^2 - 12y + 9 \end{aligned}$$

Show clear algebraic working.

$$2x^2 + 3y^2 = 14$$

$$2(4y^2 - 12y + 9) + 3y^2 = 14$$

$$8y^2 - 24y + 18 + 3y^2 = 14$$

$$11y^2 - 24y + 18 = 14$$

$$11y^2 - 24y + 4 = 0$$

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

$$\frac{-(-24) \pm \sqrt{(-24)^2 - 4(11)(4)}}{2(11)}$$

$$y = 2$$

$$y = \frac{2}{11}$$

$$x = 2y - 3$$

$$\begin{aligned} x &= 2(2) - 3 \\ &= 1 \end{aligned}$$

$$\begin{aligned} x &= 2\left(\frac{2}{11}\right) - 3 \\ x &= \frac{-29}{11} \end{aligned}$$

$$\begin{aligned} x &= 1 \\ y &= 2 \end{aligned}$$

and

$$\begin{aligned} x &= \frac{-29}{11} \\ y &= \frac{2}{11} \end{aligned}$$

(Total for Question 18 is 5 marks)

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19 Solve the simultaneous equations

$$\begin{aligned} y &= 3 - 2x \\ x^2 + y^2 &= 18 \end{aligned}$$

$$\begin{aligned} y^2 &= (3 - 2x)(3 - 2x) \\ &= 9 - 6x - 6x + 4x^2 \\ y^2 &= 4x^2 - 12x + 9 \end{aligned}$$

Show clear algebraic working.

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

$$x^2 + (4x^2 - 12x + 9) = 18$$

$$5x^2 - 12x + 9 = 18$$

$$5x^2 - 12x - 9 = 0$$

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

$$\frac{-(-12) \pm \sqrt{(-12)^2 - 4(5)(-9)}}{2(5)}$$

$$x = 3$$

$$x = -0.6$$

$$y = 3 - 2x$$

$$y = 3 - 2(3)$$

$$y = 3 - 2(-0.6)$$

$$y = -3$$

$$y = 4.2$$

$$x = 3$$

$$x = -0.6$$

$$y = -3$$

$$y = 4.2$$

(Total for Question 19 is 5 marks)

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19 Solve the simultaneous equations

$$\begin{aligned} 3x^2 + y^2 - xy &= 5 \\ y &= 2x - 3 \end{aligned}$$

$$\begin{aligned} y^2 &= (2x-3)(2x-3) \\ &= 4x^2 - 6x - 6x + 9 \\ y^2 &= 4x^2 - 12x + 9 \end{aligned}$$

Show clear algebraic working.

$$3x^2 + y^2 - xy = 5$$

$$3x^2 + (4x^2 - 12x + 9) - x(2x - 3) = 5$$

$$7x^2 - 12x + 9 - 2x^2 + 3x = 5$$

$$5x^2 - 9x + 9 = 5$$

$$5x^2 - 9x + 4 = 0$$

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

$$\frac{-(-9) \pm \sqrt{(-9)^2 - 4(5)(4)}}{2(5)}$$

$$x = 1$$

$$x = 0.8$$

$$y = 2x - 3$$

$$y = 2(1) - 3$$

$$y = 2(0.8) - 3$$

$$y = -1$$

$$y = -1.4$$

$$x = 1$$

$$x = 0.8$$

$$y = -1$$

$$y = -1.4$$

(Total for Question 19 is 5 marks)



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19 Solve the simultaneous equations

$$\begin{aligned} x^2 - 9y - x &= 2y^2 - 12 \\ x + 2y - 1 &= 0 \end{aligned}$$

$$\begin{aligned} x + 2y - 1 &= 0 \\ x &= 1 - 2y \\ x^2 &= (1 - 2y)(1 - 2y) \\ x^2 &= 1 - 2y - 2y + 4y^2 \\ x^2 &= 1 - 4y + 4y^2 \end{aligned}$$

Show clear algebraic working.

$$\begin{aligned} x^2 - 9y - x &= 2y^2 - 12 \\ (1 - 4y + 4y^2) - 9y - (1 - 2y) &= 2y^2 - 12 \\ 1 - 4y + 4y^2 - 9y - 1 + 2y &= 2y^2 - 12 \\ 4y^2 - 11y &= 2y^2 - 12 \\ 2y^2 - 11y + 12 &= 0 \end{aligned}$$

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

$$\frac{-11 \pm \sqrt{(-11)^2 - 4(2)(12)}}{2a}$$

$$y = 4$$

$$y = 1.5$$

$$x = 1 - 2y$$

$$x = 1 - 2(4)$$

$$x = 1 - 2(1.5)$$

$$x = -7$$

$$x = -2$$

$$\begin{aligned} x &= -7 \\ y &= 4 \end{aligned}$$

and

$$\begin{aligned} x &= -2 \\ y &= 1.5 \end{aligned}$$

(Total for Question 19 is 5 marks)



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20 Solve the simultaneous equations

$$\begin{aligned} y &= 7 - 2x \\ x^2 + y^2 &= 34 \end{aligned} \quad \rightarrow \quad \begin{aligned} y^2 &= (7 - 2x)(7 - 2x) \\ &= 49 - 14x - 14x + 4x^2 \\ y^2 &= 49 - 28x + 4x^2 \end{aligned}$$

Show clear algebraic working.

$$x^2 + y^2 = 34$$

$$x^2 + (49 - 28x + 4x^2) = 34$$

$$5x^2 - 28x + 49 = 34$$

$$5x^2 - 28x + 15 = 0$$

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

$$\frac{-(-28) \pm \sqrt{(-28)^2 - 4(5)(15)}}{2(5)}$$

$$x = 5$$

$$x = 0.6$$

$$y = 7 - 2x$$

$$\begin{aligned} y &= 7 - 2(5) \\ y &= -3 \end{aligned}$$

$$\begin{aligned} y &= 7 - 2(0.6) \\ &= 5.8 \end{aligned}$$

$$\begin{aligned} x &= 5 \\ y &= -3 \end{aligned}$$

and

$$\begin{aligned} x &= 0.6 \\ y &= 5.8 \end{aligned}$$

(Total for Question 20 is 5 marks)



P 7 2 4 4 3 A 0 1 9 2 8

21 Solve the simultaneous equations

$$\begin{aligned} 2x^2 + 3y^2 &= 11 \\ x &= 3y - 1 \end{aligned}$$

$$\begin{aligned} x^2 &= (3y-1)(3y-1) \\ &= 9y^2 - 3y - 3y + 1 \\ x^2 &= 9y^2 - 6y + 1 \end{aligned}$$

Show clear algebraic working.

$$2x^2 + 3y^2 = 11$$

$$2(9y^2 - 6y + 1) + 3y^2 = 11$$

$$18y^2 - 12y + 2 + 3y^2 = 11$$

$$21y^2 - 12y + 2 = 11$$

$$21y^2 - 12y - 9 = 0$$

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

$$\frac{-(-12) \pm \sqrt{(-12)^2 - 4(21)(-9)}}{2(21)}$$

$$y = 1$$

$$y = \frac{-3}{7}$$

$$x = 3y - 1$$

$$x = 3(1) - 1$$

$$x = 2$$

$$x = 3\left(\frac{-3}{7}\right) - 1$$

$$= \frac{-16}{7}$$

$$x = 2$$

$$y = 1$$

and

$$x = \frac{-16}{7}$$

$$y = \frac{-3}{7}$$

(Total for Question 21 is 5 marks)

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P 7 2 8 2 8 A 0 2 1 2 8

21 Solve the simultaneous equations

$$\begin{aligned} x - 2y &= 3 \\ x^2 - y^2 + 2x &= 10 \end{aligned}$$

$$\begin{aligned} x &= 3 + 2y \\ x^2 &= (3 + 2y)(3 + 2y) \\ &= 9 + 6y + 6y + 4y^2 \\ x^2 &= 9 + 12y + 4y^2 \end{aligned}$$

Show clear algebraic working.

$$(9 + 12y + 4y^2) - y^2 + 2(3 + 2y) = 10$$

$$9 + 12y + 4y^2 - y^2 + 6 + 4y = 10$$

$$3y^2 + 16y + 15 = 10$$

$$3y^2 + 16y + 5 = 0$$

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

$$\frac{-16 \pm \sqrt{(16)^2 - 4(3)(5)}}{2(3)}$$

$$y = \frac{-1}{3}$$

$$y = -5$$

$$x = 3 + 2y$$

$$x = 3 + 2\left(\frac{-1}{3}\right)$$

$$x = 3 + 2(-5)$$

$$x = \frac{7}{3}$$

$$x = -7$$

$$x = \frac{7}{3}$$

$$x = -7$$

$$y = \frac{-1}{3}$$

$$y = -5$$

(Total for Question 21 is 5 marks)



22 Solve the simultaneous equations

$$x^2 + y^2 + y = 3$$

$$x + 2 = y$$

$$\begin{aligned} y^2 &= (x+2)(x+2) \\ &= x^2 + 2x + 2x + 4 \\ y^2 &= x^2 + 4x + 4 \end{aligned}$$

Show clear algebraic working.

$$x^2 + y^2 + y = 3$$

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

$$x^2 + x^2 + 4x + 4 + x + 2 = 3$$

$$2x^2 + 5x + 6 = 3$$

$$2x^2 + 5x + 3 = 0$$

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

$$\frac{-5 \pm \sqrt{(5)^2 - 4(2)(3)}}{2(2)}$$

$$x = 1$$

$$x = -1.5$$

$$y = x + 2$$

$$y = (1) + 2$$

$$y = (-1.5) + 2$$

$$y = 3$$

$$y = 0.5$$

$$x = 1$$

$$x = -1.5$$

$$y = 3$$

$$y = 0.5$$

(Total for Question 22 is 5 marks)



22 Solve the simultaneous equations

$$\begin{aligned} x^2 + y^2 &= y + 11 \\ y &= 3x - 1 \end{aligned}$$

$$\begin{aligned} y^2 &= (3x-1)(3x-1) \\ &= 9x^2 - 3x - 3x + 1 \\ y^2 &= 9x^2 - 6x + 1 \end{aligned}$$

Show clear algebraic working.

$$\begin{aligned} x^2 + y^2 &= y + 11 \\ x^2 + (9x^2 - 6x + 1) &= (3x - 1) + 11 \\ 10x^2 - 6x + 1 &= 3x + 10 \\ 10x^2 - 9x - 9 &= 0 \end{aligned}$$

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

$$\frac{-(-9) \pm \sqrt{(-9)^2 - 4(10)(-9)}}{2(10)}$$

$$x = 1.5 \qquad x = -0.6$$

$$y = 3x - 1$$

$$\begin{aligned} y &= 3(1.5) - 1 \\ &= 3.5 \end{aligned}$$

$$\begin{aligned} y &= 3(-0.6) - 1 \\ &= -2.8 \end{aligned}$$

$$\begin{aligned} x &= 1.5 \\ y &= 3.5 \end{aligned}$$

$$\begin{aligned} x &= -0.6 \\ y &= -2.8 \end{aligned}$$

(Total for Question 22 is 5 marks)

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22 Solve the simultaneous equations

$$2x^2 + 3y^2 = 5$$

$$y = 2x + 1$$

$$\begin{aligned} y^2 &= (2x+1)(2x+1) \\ &= 4x^2 + 2x + 2x + 1 \\ y^2 &= 4x^2 + 4x + 1 \end{aligned}$$

Show clear algebraic working.

$$2x^2 + 3y^2 = 5$$

$$2x^2 + 3(4x^2 + 4x + 1) = 5$$

$$2x^2 + 12x^2 + 12x + 3 = 5$$

$$14x^2 + 12x + 3 = 5$$

$$14x^2 + 12x - 2 = 0$$

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

$$\frac{-12 \pm \sqrt{(12)^2 - 4(14)(-2)}}{2(14)}$$

$$x = 1$$

$$x = -\frac{1}{7}$$

$$y = 2x + 1$$

$$y = 2(1) + 1$$

$$y = 2\left(-\frac{1}{7}\right) + 1$$

$$y = 3$$

$$y = \frac{5}{7}$$

$$x = 1$$

and

$$x = -\frac{1}{7}$$

$$y = 3$$

$$y = \frac{5}{7}$$

(Total for Question 22 is 5 marks)



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22 Solve the simultaneous equations

$$\begin{aligned} 2y^2 + x^2 &= -6x + 42 \\ 2x + y &= -3 \end{aligned}$$

$$\begin{aligned} &\rightarrow 2x + y = -3 \\ &\quad y = -2x - 3 \\ &y^2 = (-2x - 3)(-2x - 3) \\ &\quad = 4x^2 + 6x + 6x + 9 \\ &y^2 = 4x^2 + 12x + 9 \end{aligned}$$

Show clear algebraic working.

$$\begin{aligned} 2y^2 + x^2 &= -6x + 42 \\ 2(4x^2 + 12x + 9) + x^2 &= -6x + 42 \\ 8x^2 + 24x + 18 + x^2 &= -6x + 42 \\ 9x^2 + 24x + 18 &= -6x + 42 \\ 9x^2 + 30x - 24 &= 0 \end{aligned}$$

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

$$\frac{-30 \pm \sqrt{(30)^2 - 4(9)(-24)}}{2(9)}$$

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

$$x = -4$$

$$y = -2x - 3$$

$$y = -2\left(\frac{2}{3}\right) - 3$$

$$y = -2(-4) - 3$$

$$y = \frac{-13}{3}$$

$$y = 5$$

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

$$x = -4$$

$$y = \frac{-13}{3}$$

$$y = 5$$

(Total for Question 22 is 5 marks)



P 7 2 4 4 4 A 0 2 3 3 2