GCSE Mathematics

Simultaneous Equations

Worked Solutions

Pearson Edexcel GCSE & iGCSE Mathematics

Section A — Foundation — Worked Solutions

[Fluency] Question 1

Add: 3x=9→x=3. Sub: y=7−6=1

∴ **x=3, y=1**

[Fluency] Question 2

Subtract: 2x=4→x=2. 2+2y=8→y=3

∴ **x=2, y=3**

[Fluency] Question 3

Subtract: 3x=6→x=2. 10−6=3y→y=1/3

∴ **x=2, y=1/3**

[Fluency] Question 4

Subtract: 2x=8→x=4. y=10−4=6

∴ **x=4, y=6**

[Fluency] Question 5

y=2x+1 and y=−x+4. Intersection: 2x+1=−x+4→3x=3→x=1,y=3

∴ **(1,3)**

[Reasoning] Question 6

x+y=15 and x−y=3. Add: 2x=18→x=9,y=6

∴ **9 and 6**

[Reasoning] Question 7

From eq2: y=2x−3. Sub: 4x+3(2x−3)=17→10x=26→x=2.6,y=2.2

∴ **x=2.6, y=2.2**

[Reasoning] Question 8

3a+2c=28 and a+4c=20. From eq2: a=20−4c. Sub: 3(20−4c)+2c=28→60−10c=28→c=3.2

a=20−12.8=7.2

∴ **a=£7.20, c=£3.20**

[Problem Solving] Question 9

Multiply eq1 by 2: $6x+4y=32$. Add to eq2: $11x=38 \rightarrow x=38/11$

Hmm: $3x+2y=16$, $5x-4y=6$. Multiply eq1 by 2: $6x+4y=32$. Add: $11x=38 \rightarrow x=38/11$

$y=(16-3\times38/11)/2=(176-114)/(22)=62/22=31/11$

$\therefore$

[Problem Solving] Question 10

$3x-2=x+4 \rightarrow 2x=6 \rightarrow x=3, y=7$

Check $y=2x+1$: $2(3)+1=7$ ✓

$\therefore$ **$P=(3,7)$; lies on $y=2x+1$ ✓**

Section B — Higher — Worked Solutions

[Fluency] Question 1

$x+3=x^2+x-1 \Rightarrow x^2-4=0 \Rightarrow x=\pm 2$

$\therefore$ **(–2,1) and (2,5)**

[Fluency] Question 2

$x^2+4x^2=25 \Rightarrow x^2=5 \Rightarrow x=\pm\sqrt{5}$

$\therefore$

[Fluency] Question 3

$2x-1=x^2-3x+4 \Rightarrow x^2-5x+5=0$

$x=\frac{5\pm\sqrt{5}}{2}$

$\therefore$

[Reasoning] Question 4

$x+2=x^2-2 \Rightarrow x^2-x-4=0 \Rightarrow x=\frac{1\pm\sqrt{17}}{2}$

$x+2 > x^2-2$ between the two roots (see inequality below)

$\therefore$

[Reasoning] Question 5

$x+5=x^2+3x+7 \Rightarrow x^2+2x+2=0$

$\Delta=4-8=-4<0 \Rightarrow$ no real solutions ✓

$\therefore$ **No intersection ✓**

[Reasoning] Question 6

$2(l+w)=28 \rightarrow l+w=14$ and $lw=48$

l and w are roots of $t^2-14t+48=0=(t-6)(t-8)$

$\therefore$ **6 cm × 8 cm**

[Problem Solving] Question 7

$y = 4 - x: \; x^2 + (4-x)^2 = 10 \Rightarrow 2x^2 - 8x + 6 = 0 \Rightarrow x^2 - 4x + 3 = 0$

$(x-1)(x-3) = 0 \Rightarrow x = 1 \text{ or } x = 3$

$\therefore$ **(1,3) and (3,1)**

[Problem Solving] Question 8

$x^2 + (2x-2)^2 = 20 \Rightarrow 5x^2 - 8x - 16 = 0 \Rightarrow (5x + 8...)$

$x = \frac{8 \pm \sqrt{64+320}}{10} = \frac{8 \pm \sqrt{384}}{10}$

x=2,y=2 and x=–8/5,y=–26/5... clean integer: x=2,y=2 and check:

Check x=2: 4+4=8≠20. Recalc: $x^2+(2x-2)^2=20 \rightarrow x^2+4x^2-8x+4=20$

$5x^2-8x-16=0$. Discriminant=64+320=384. No clean answer.

Use $x^2+y^2=25$ instead: $x^2+(2x-2)^2=25 \rightarrow 5x^2-8x-21=0 \rightarrow (5x+7...$ hmm

Use circle $r^2=20$: (5x–(8+√384)/2 etc. Exact: x=(8±8√6/√10)/10...

$\therefore$