DAILY PRACTICE ★ ★ ★ ★ π to 4 d.p. ★ ★

Q1. $(3m - 1)(2m - 1)$

$6m^2 - 3m - 2m + 1$

$6m^2 - 5m + 1$

Q2. State the gradient of the line
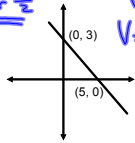$3x - 2y + 4 = 0$ $y = mx + c$

$3x + 4 = 2y$

$y = 1.5x + 2$ $m = 1.5$ or $\frac{3}{2}$

Q3. What is the equation
of this line? $y = mx + c$

(0, 3)

(5, 0)
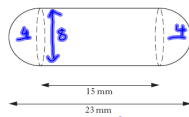
$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{0 - 3}{5 - 0} = -\frac{3}{5}$ $c = 3$

$y = -\frac{3}{5}x + 3$

Q4. What is the volume of this
shape?

4 | 8 | 4

15 mm

23 mm

$V = \pi r^2 h + \frac{4}{3}\pi r^3$

$V = (\pi \times 4^2 \times 15) + (\frac{4}{3} \times \pi \times 4^3)$

$V = 1022.06 mm^3$

(2 d.p.)

Today we will be learning about simultaneous
equations.

Simultaneous Equations

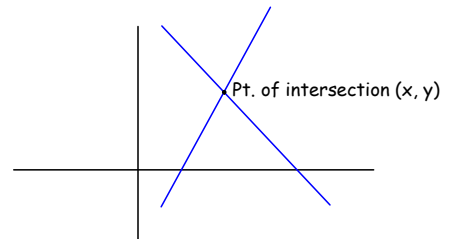Simultaneous equations are used to to find 2 unknowns.

They can be solved using three methods:

- Graphically
- Elimination
- Substitution

✱ Need to be able to rearrange formula. ✱

Solving Simultaneous Equations Graphically

Sketch each equation. The point of intersection is the solution (i.e.
where the x and the y are the same for both equations).

Pt. of intersection (x, y)

Solving Simultaneous Equations Graphically

Examples:

1. State the point of intersection of the lines x + 2y = 5 and x – 2y = 1

$x + 2y = 5$

x	0	5	1
y	2.5	0	2

(0, 2.5) (5, 0) (1, 2)

$1 + 2y = 5$
$2y = 4$
$\div 2 \quad \div 2$
$y = 2$

$x - 2y = 1$

x	0	1	3
y	$-\frac{1}{2}$	0	1

(0, $-\frac{1}{2}$) (1, 0) (3, 1)

$3 - 2y = 1$
$-2y = -2$
$y = 1$

(3, 1)

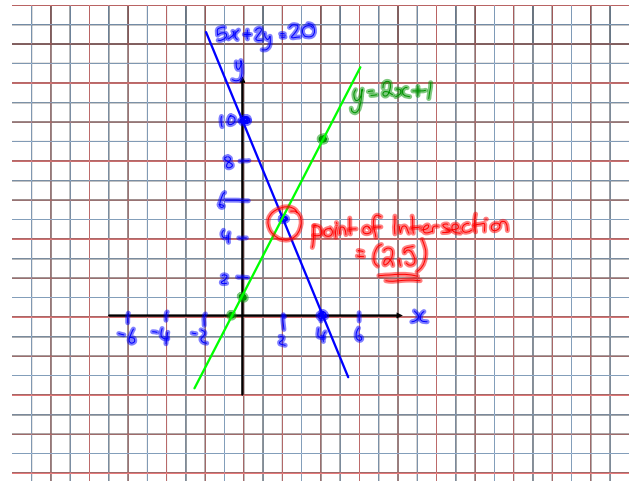**1.** Simplify $\frac{n^5 \times 10n}{2n^2}$.

$= \frac{10n^6}{2n^2} = 5n^4$

2. Express $\frac{7}{x+5} - \frac{3}{x}$ $x \neq -5, \ x \neq 0$ as a single fraction in its simplest form.

$\frac{7x}{x(x+5)} - \frac{3(x+5)}{x(x+5)}$

$\frac{4x - 15}{x(x+5)}$

Today we will be continuing to learn how to solve simultaneous equations graphically.

Solving Simultaneous Equations Graphically

Examples:

2. Solve the pair of simultaneous equations $5x + 2y = 20$ and $y = 2x + 1$

$5x + 2y = 20$

x	0	4	2
y	10	0	5

$5(0) + 2y = 20$ $5x + 2(0) = 20$ $5(2) + 2y = 20$
$2y = 20$ $5x = 20$ $10 + 2y = 20$
$y = 10$ $x = 4$ $2y = 10$
$(0, 10)$ $(4, 0)$ $y = 5$
                            $(2, 5)$

$y = 2x + 1$

x	0	$-\frac{1}{2}$	4
y	1	0	9

$y = 2(0) + 1$ $0 = 2x + 1$ $y = 2(4) + 1$
$y = 1$ $-1 = 2x$ $y = 9$
$(0, 1)$ $-\frac{1}{2} = x$ $(4, 9)$
          $(-\frac{1}{2}, 0)$

Solving Simultaneous Equations Graphically

Solve the following by sketching and stating the point of intersection:

(a)	$3y - x = 9$	(b)	$2x - 3y = 6$	(c)	$x + 2y = 10$
	$x + y = 11$		$x + 2y = 10$		$2x + y = 8$
(d)	$x - 2y = -2$	(e)	$x - y = 7$	(f)	$3x + 2y = 6$
	$2x - y = 2$		$3x - 2y = 24$		$x - 2y = 10$
(g)	$2y - x = 8$	(h)	$x + y = 2$	(i)	$x - 2y = 3$
	$3y + x = 17$		$2x - y = 4$		$x + y = 0$

From Pegasys

Daily Practice   16.3.2016

Q1. Multiply out and simplify $(3x - 2)(x^2 - 5x + 7)$

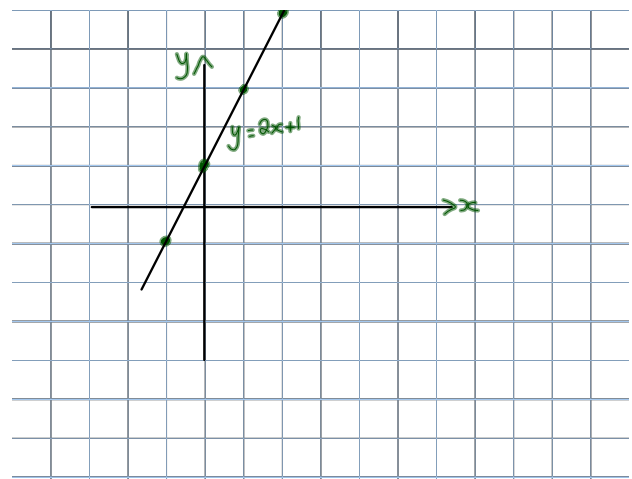$3x^3 - 15x^2 + 21x - 2x^2$
         $+ 10x - 14$
$3x^3 - 17x^2 + 3x - 14$

Q2. Factorise $x^2 - 12x + 20$

$(x - 2)(x - 10)$

Q3. Draw the line $y = 2x + 1$

x	0	$-\frac{1}{2}$	4
y	1	0	9

Today we will be continuing to practise
solving simultaneous equations graphically.

page 163   Q2-5
Select your own questions.

Point of
Intersection = (2,5)
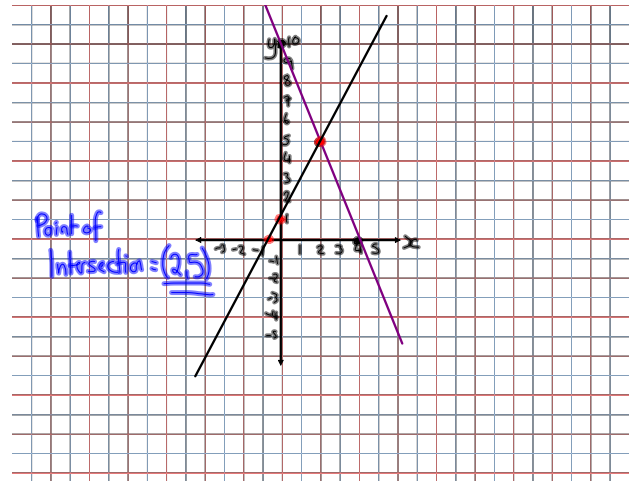
Today we will be continuing to learn how to solve
simultaneous equations.

Solving Simultaneous Equations by Elimination

We can solve a pair of simultaneous equations by adding or
subtracting the equations and eliminating one of the variables.

E.g. $x + 2y = 7$ or $3x - 4y = -2$

             $x - 8y = -13$ $5x + 4y = 23$

Then solve for the other variable and substitute it back into either
equation to find the variable you have eliminated.

Solving Simultaneous Equations by Elimination

Examples: Solve the following

(a) $x + y = 7$
      $x - 8y = -29$

$9y = 36$
$y = 4$

$x + y = 7$
$x + 4 = 7$
$x = 3$

(b) $3x - 4y = 1$
      $5x + 4y = 23$

$8x = 24$
$x = 3$

$3x - 4y = 1$
$3(3) - 4y = 1$
$9 - 4y = 1$
$-4y = -8$
$y = 2$

Solving Simultaneous Equations by Elimination

Solve the following pairs of simultaneous equations: Pegasys

(a)	$2x + y = 15$	(b)	$3x + 2y = 32$	(c)	$5x + 3y = 26$
	$x - y = 6$		$x - 2y = 8$		$2x - 3y = 2$
(d)	$3x + y = 9$	(e)	$4x + y = 11$	(f)	$7x + 2y = 36$
	$x + y = 5$		$2x + y = 5$		$2x + 2y = 16$

Daily Practice   21.3.2016

Q1. Calculate the original value of a car that is now worth £4550 after depreciating by 15%

$85\% = 4550$
$1\% = 4550 \div 85 = 53.53$
$100\% = £5352.94$

Q2. Calculate the radius of a sphere with a volume of 1650cm³

$V = \frac{4}{3}\pi r^3$ $1650 = \frac{4}{3}\pi r^3$ $r^3 = \frac{1650}{\frac{4}{3}\pi}$ $r^3 = 393.9$
$r = \sqrt[3]{393.9}$
$r = 7.3cm$

Q3. (i) Rearrange the line $3x - 2y + 4 = 0$ so that it is in the form $y = mx + c$.

$2y = 3x + 4$
$y = 1.5x + 2$

(ii) State the gradient and y - intercept of this line.

$m = 1.5$ $c = 2$

Today we will be learning to solve simultaneous equations by elimination.

Solving Simultaneous Equations by Elimination   21.3.16

Sometimes you need to multiply one or both of the equations by a number first, to ensure that one of the variables can cancel.

Examples: Solve

(a) ① $2x + 3y = 9$
② $x + 4y = 7$ (×2)

① $2x + 3y = 9$
② $2x + 8y = 14$
$-5y = -5$
$y = 1$

Sub into ②
$x + 4y = 7$
$x + 4(1) = 7$
$x = 3$

(b) $3x + 4y = 5$ (×2)
$-2x + 5y = 12$ (×3)

① $6x + 8y = 10$
② $-6x + 15y = 36$
$23y = 46$
$y = 2$

$3x + 4y = 5$
$3x + 4(2) = 5$
$3x + 8 = 5$
$3x = -3$
$x = -1$

Page 165 Q3 (b) (g) (h)

Pg. 166 Q7 (c) (e)

Q9

$3y + 2x = 4$
$5y + 3x = 15$

$3y + 2x = 4$
$6y + 5x = 8$

$3y + 2x = 4$
$3y + 5x = 12$

$2x + 3y = 7$ (×5) $10x + 15y = 35$
$5x - 6y = 8$ (×2) $10x - 12y = 16$

Daily Practice   22.3.2016

Q1. Calculate the original size of a box of cereal that now weighs 725grams with 25% extra free

$125 = 725$
$1 = 5.8$
$100 = 580$

Q2. Write with a rational denominator $\frac{3}{\sqrt{6}}$ $\frac{3\sqrt{6}}{6}$ $\frac{\sqrt{6}}{2}$

Q3. Evaluate 500 x 7000.184 and write your answer in scientific notation and rounded to 2 s.f.

3.500092×10^6
$\rightarrow 3.5 \times 10^6$

Q4. Simplify $3x^2(x^{0.5} - x^{-3})$
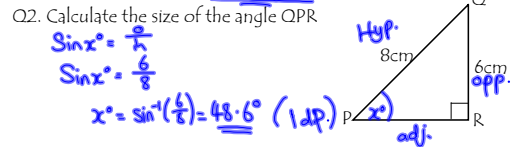
$3x^{2.5} - 3x^{-1}$

Q5. 20% of £40 - £3.86

$20\% = 8$
$£8 - £3.86$
$= £4.14$

Today we will be continuing to learn how to solve simultaneous equations.

Daily Practice   23.3.2016

Q1. Multiply out and simplify $(2x - 4)(3x^2 + 6x - 7)$

$$6x^3 + 12x^2 - 14x - 12x^2 - 24x + 28$$
$$6x^3 - 38x + 28$$

Q2. Calculate the size of the angle QPR

$$\sin x° = \frac{o}{h}$$
$$\sin x° = \frac{6}{8}$$
$$x° = \sin^{-1}\left(\frac{6}{8}\right) = 48 \cdot 6° \ (1dp.)$$

Hyp.   8cm   6cm   opp.   adj.

Q3. State the equation of the line joining (2, 3) and (4, –5). Express your answer in the form y = mx + c

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-5 - 3}{4 - 2} = \frac{-8}{2} = -4$$

$$y = mx + c$$
$$3 = -4(2) + c$$
$$3 = -8 + c$$
$$c = 11$$

$$y = -4x + 11$$

Today we will be continuing to practise simultaneous equations.

Simultaneous Equations: Solving by Substitution   23·3·16

To solve by substitution, get one variable in terms of the other. e.g. y in terms of x and then substitute into the other equation.

Examples:

(i) 3x + y = 18   ①

    x = y – 2   ②

sub. ② into ①

$$3(y-2) + y = 18$$
$$3y - 6 + y = 18$$
$$4y - 6 = 18$$
$$4y = 24$$
$$y = 6$$

$$x = y - 2$$
$$x = 6 - 2$$
$$x = 4$$

Simultaneous Equations

Solving by substitution

(ii) 2x – 5y = –12   ①

    x – y = –3   ②

Rearranging ②
$$x - y = -3$$
$$x = -3 + y$$

Sub. ② into ①
$$2(-3+y) - 5y = -12$$
$$-6 + 2y - 5y = -12$$
$$-6 - 3y = -12$$
$$-3y = -6$$
$$y = 2$$

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

Simultaneous Equations

Solving by substitution

Questions:

Q1. y - 2x = 3 and 3y - 2x = 17

$$y = 2x + 3$$

Q2. y - 4x = 8 and y + 7x - 30 = 0

Q3. 2x - y = -1 and 3x - y = 2

Q4. a = 2b and a = -b + 1

Q5. k = 2n + 1 and

    k + n + 1 = 11

Q6. y = 4x and 2x - 3y = 20

Questions:

Solve by substitution -

Q1. y - 2x = 3 and 3y - 2x = 17

$y = 3 + 2x$

$3(3 + 2x) - 2x = 17$ $y = 3 + 2(2)$

$9 + 6x - 2x = 17$ $y = 7$

$4x = 8$

$x = 2$

Q2. y - 4x - 3 = 5 and y + 7x - 30 = 0

$y = 4x + 8$

$4x + 8 + 7x - 30 = 0$ $y = 4(2) + 8$

$11x - 22 = 0$ $y = 16$

$11x = 22$

$x = 2$

Q3. 2x - y = -1 and 3x - y = 2

$y = 2x + 1$

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

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

$x = 3$

Questions:

Solve by substitution:

Q1. y – 3x = 1 and y = x + 7

Q2. y – 2x = 3 and 3y – 2x = 17

Q3. y – 4x – 3 = 5 and y + 7x – 30 = 0

Q4. 2x – y = –1 and 3x – y = 2

Solve each of the systems of equations below using the method of substitution.

a. $y = x$ and $3x - y = 10$ b. $y = x$ and $5x - y = 4$
c. $y = 2x$ and $5x + y = 14$ d. $y = 2x$ and $2x + 3y = 24$
e. $y = 3x + 1$ and $y = x + 7$ f. $y = 5x - 4$ and $y = 2x + 11$
g. $2y = 5x - 12$ and $2y = x + 4$ h. $3y = 7x + 5$ and $3y = 10x - 7$

Daily Practice   21.3.2016

Q1. Noel bought a painting for £3500 and sold it for £4800.
Calculate the profit as a percentage

Q2. Rearrange the line 2y - 3x = 4 so that it is in the form

y = mx + c and state the gradient and y - intercept

Q3. State where the line 7y - x = 14 cuts the x and y axes

DAILY PRACTICE   11.4.2016

1.
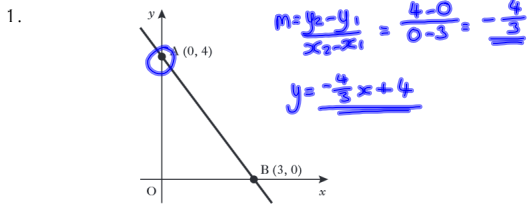
Find the equation of the straight line AB.

$m = \dfrac{y_2 - y_1}{x_2 - x_1} = \dfrac{4-0}{0-3} = -\dfrac{4}{3}$

$y = -\dfrac{4}{3}x + 4$

2. Simplify $\dfrac{(x+4)^2}{x^2 - x - 20}$.

$\dfrac{(x+4)(x+4)}{(x-5)(x+4)}$

$= \dfrac{x+4}{x-5}$

3. Multiply out the brackets and collect like terms.

$(x+2)(x-5) - 9x$

$x^2 - 5x + 2x - 10 - 9x$

$x^2 - 12x - 10$

TODAY WE WILL BE SOVING WORDED SIMULTANEOUS EQUATIONS.

HOMEWORK ONLINE DUE 19.4.16

Worded Simultaneous Equations

Examples:

1. Robyn sold 30 tickets for a concert.
She sold x tickets for £3 each, and y tickets for £4.50 each.
She collected £123 in total.

a. Write down two equations connecting x and y.

$x + y = 30$
$3x + 4.5y = 123$

b. Solve these simultaneous equations to find the amounts of the two different types of tickets sold.

$x + y = 30$ (×3) $3x + 3y = 90$
$3x + 4.5y = 123$ $\ominus$ $3x + 4.5y = 123$

$x + y = 30$ $-1.5y = -33$
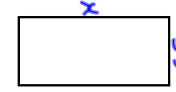$x + 22 = 30$ $y = 22$
$x = 8$

Robyn sold 8 tickets at £3 each and 22 tickets at £4.50 each.

Worded Simultaneous Equations

Examples:

2. A rectangular park is x metres long and y metres broad. The difference between the length and the breadth is 50m and the perimeter of the park is 200m. Calculate its length and breadth.

$x - y = 50$
$x + y = 100$

$2x = 150$
$x = 75$ metres
Length = 75 metres

$x - y = 50$
$75 - y = 50$
$y = 25$ metres
Breadth = 25 metres

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Page 168
Qa.4,6
8

Daily Practice   12.4.16

Q1. Multiply out and simplify $(x-4)(2x^2 + 7x - 8)$

$2x^3 + 7x^2 - 8x - 8x^2 - 28x + 32$

$2x^3 - x^2 - 36x + 32$

Q2. Write with a rational denominator $\dfrac{2}{\sqrt{3}}$ $\times\dfrac{\sqrt{3}}{\sqrt{3}} = \dfrac{2\sqrt{3}}{3}$

Q3. Evaluate $144^{\frac{3}{2}}$ $= \left(\sqrt{144}\right)^3 = 12^3 = 1728$

Q4. Simplify $k^{\frac{3}{2}}(k^{\frac{1}{2}} + k^2)$

$k^2 + k^{\frac{7}{2}}$

Q5. $\dfrac{7x+3}{2} = 12$

×2   ×2
$7x + 3 = 24$
-3 -3
$7x = 21$
$x = 3$

Today we will be continuing to practise worded simultaneous equations.

Daily Practice   13.4.2016

Q1. Mutliply out and simplify $(x - 3)^2 + 2x$

$$x^2 - 6x + 9 + 2x$$
$$x^2 - 4x + 9$$

Q2. Write $x^2 + 6x - 4$ in completed square form $(x+a)^2 + b$

$$(x+3)^2 - 13 \quad \longrightarrow \quad (x+3)^2$$
$$x^2 + 3x + 3x + 9$$
$$x^2 + 6x + 9$$

Q3. Factorise $9x^2 - 64$

$$(3x + 8)(3x - 8)$$

Q4. Write as a single fraction

$$\frac{3}{n} + \frac{2}{n^2} = \frac{3n}{n^2} + \frac{2}{n^2}$$
$$= \frac{3n + 2}{n^2}$$

Q5. Write as a single fraction

$$\frac{a}{b} \div \frac{3a}{4b}$$
$$\frac{a}{b} \times \frac{4b}{3a} = \frac{4ab}{3ab}$$
$$= \frac{4}{3}$$

Today we will be practising mixed questions on simultaneous equations.

Homework due Tuesday

Daily Practice   15.4.2016

Q1. Multiply out and simplify $2(x + 3)^2$

$$2(x^2 + 6x + 9)$$
$$2x^2 + 12x + 18$$

Q2. Write $x^2 - 6x + 2$ in completed square form i.e. $(x + p)^2 + q$

$$(x - 3)^2 - 7$$

Q3. Write 6 700 000 in scientific notation

$$6.7 \times 10^6$$

Q4. Simplify $\sqrt{20} - \sqrt{5} + \sqrt{500}$

$$\sqrt{4}\sqrt{5} - \sqrt{5} + \sqrt{100}\sqrt{5}$$
$$2\sqrt{5} - \sqrt{5} + 10\sqrt{5} = 11\sqrt{5}$$

Q5. Simplify $6k^2(2k - k^{-3})$

$$12k^3 - 6k^{-1}$$
$$= 12k^3 - \frac{6}{k}$$

Today we will be continuing our group task on simultaneous equations.

Homework due Tuesday.

Today we will be marking the homework and completing a check-up on simultaneous equations.

(a)   a + 2b = 3
       -a + 3b = 2   ⊕

$$5b = 5$$
$$b = 1 \checkmark$$

$$a + 2(1) = 3$$
$$a + 2 = 3$$
$$a = 1 \checkmark$$

②

(b) $4n - 3m = 7$
   $n + 3m = -2$

$5n = 5$

$\underline{n = 1}$ ✓

$4n - 3m = 7$
$4(1) - 3m = 7$ ②
$4 - 3m = 7$
$-3m = 3$
$\underline{m = -1}$ ✓

✓ (c) $2a + 6b = 16$
     $5a + 6b = 22$

$-3a = -6$
$\underline{a = 2}$ ✓

(7 marks)

$2a + 6b = 16$
$4 + 6b = 16$
$6b = 12$
$\underline{b = 2}$ ✓   ③

Q2. (a) $4x + 5y = 6$ $(\times 7)$ $28x + 35y = 42$ ✓
      $7x - y = 30$ $(\times 4)$ $28x - 4y = 120$ ✓
                               $39y = -78$
                               $y = -2$ ✓

$4x + 5(-2) = 6$
$4x - 10 = 6$
$4x = 16$
$\underline{x = 4}$ ✓   ③

(b) $6h - 3k = 9$ $(\times 3)$ $18h - 9k = 27$ ✓
    $3h - 5k = 1$ $(\times 6)$ $18h - 30k = 6$ ✓
                             $21k = 21$
                             $\underline{k = 1}$ ✓

$3h - 5(1) = 1$
$3h = 6$
$\underline{h = 2}$ ✓   ③

(c) $5t + 4k = 6$ $(\times 2)$ $10t + 8k = 12$ ✓
    $2t + k = 3$ $(\times 5)$ $10t + 5k = 15$ ✓
                            $3k = -3$
                            $\underline{k = -1}$ ✓   (10 marks)
                                                    9

$2t + (-1) = 3$
$2t = 4$
$\underline{t = 2}$ ✓   ③

Q3. The sky slope in Aviemore has a daily charge for the use of its facilities. They also have a charge each time the lift to the higher slope is used.

Martin stayed 2 days and used the lift 5 times. His bill was £15.
Jenna stayed 3 days and used the lift 7 times. Her bill was £22.

(a)   Write down 2 equations in x and y (2 marks)

① $2x + 5y = 15$,   ① $3x + 7y = 22$ ✓

(b)   Solve the equations to find -

   (i) The Daily charge   (ii) The charge for the use of the lift.

$2x + 5y = 15$ $(\times 7)$ $14x + 35y = 105$ ✓
$3x + 7y = 22$ $(\times 5)$ $15x + 35y = 110$ ✓
                          $-x = -5$
                          $x = 5$ ✓   (4 marks)

$2x + 5y = 15$
$2(5) + 5y = 15$
$10 + 5y = 15$
$5y = 5$
$\underline{y = 1}$ ✓

1 day charge = £5
Use of lift = £1   ✓

④

Q4. Rearrange the following and solve

$x = 2y + 9$
$x + 5y + 5 = 0$ (5 marks)

$$x - 2y = 9 \quad (\times 5) \qquad 5x - 10y = 45 \checkmark$$
$$x + 5y = -5 \quad (\times 2) \qquad \underline{2x + 10y = -10} \checkmark$$
$$ 7x = 35$$
$$ \underline{x = 5} \checkmark$$

$$x - 2y = 9$$
$$5 - 2y = 9 \qquad\qquad\qquad \text{Total} = 25$$
$$-2y = 4$$
③$$ \underline{y = -2} \checkmark$$

$$2y + 9 + 5y + 5 = 0$$
$$7y + 14 = 0$$
$$7y = -14$$
$$y = -2$$