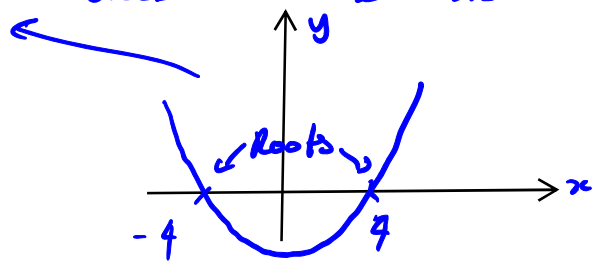


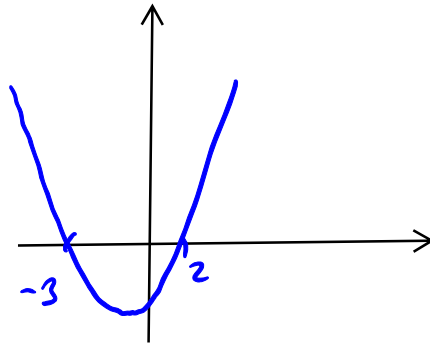
9.1 Q6 (b) $x^2 - 16 = 0$ roots are point at which the graph crosses the x-axis.
 $(x-4)(x+4) = 0$
 $x = 4$ $x = -4$ Roots.



(c) $4 - y^2 = 0$
 $(2-y)(2+y) = 0 \Rightarrow y = 2$ or $y = -2$

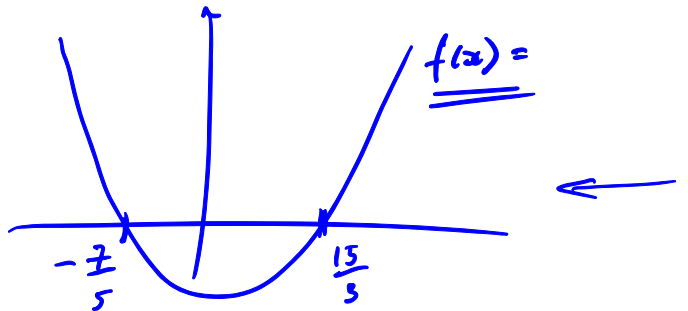
7 (a) $x^2 + x - 6 = 0$
 $x = -3$ or $x = 2$

(b) $x^2 + x - 6 = 0$
 $(x+3)(x-2) = 0$



what are the roots of $f(x)$
 $f(x) = 0$

$x = -\frac{7}{5}$ or $\frac{15}{3}$



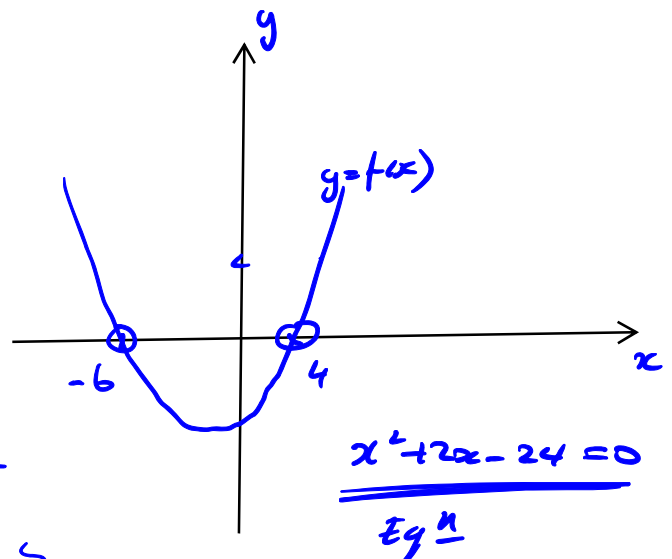
8 (c) Solve $x^2 + 8 = 6x \therefore x = 2, x = 4$

(g) $x = 4$ $x = -6$

$f(x) = (x+6)(x-4) = x^2 + 2x - 24$

$f(x) = (2x+12)(x-4) = 2x^2 + 4x - 48$
 $(x+6)(2x-8)$

$f(x) = (5x+30)(x-4) = 5x^2 + 10x - 120$
 $(x+6)(5x-20)$



$x^2 + 2x - 24 = 0$

Egⁿ

$y = x^2 + 2x - 24$
 $f(x) = x^2 + 2x - 24$

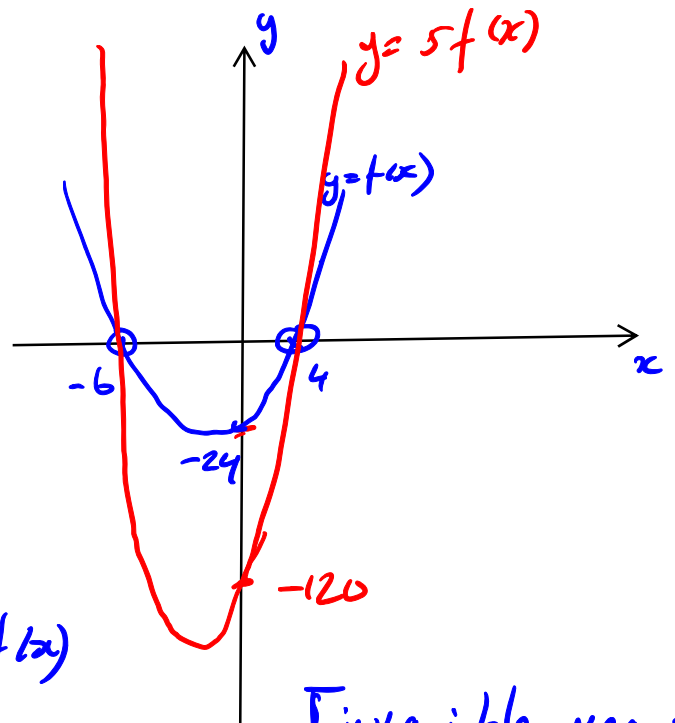
Roots $(x+6)(5x-20) = 0$
 $x+6=0$ $5x-20=0$

$$\underline{x = -6} \quad \underline{x = 4}$$

$$f(x) \rightarrow 5f(x)$$

this transformation is
a stretch in the
y-direction

The points $x = -6$, $x = 4$
are invariable under
the transformation $f(x) \rightarrow 5f(x)$



[invariable means
unchanged]

9.2 solving quadratic equations 2.

(1) (b) $x^2 + 5x + 4 = 0$
 $x = -1$ or $x = -4$

(c) $(2x+2)(x-4)$
 $2x^2 - 6x - 8$

(5) $x(x+1) = 30$
 $x^2 + x - 30 = 0$
 $(x+6)(x-5) = 0$
 $x = -6$ or $x = 5$

$x > 0$ since the width of a
rectangle can not be negative.

$\therefore \underline{x = 5}$

(6) ... $a = 2$ small rug $2m \times 2m$.

Q8 (b) $2x^2 + 3x - 5$
 $(2x+5)(x-1)$

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

Q9 (b) $(2x-9)(3x+12) = 0$
 $2x-9=0$ or $3x+12=0$
 $x = \frac{9}{2}$ or $x = -4$

(d) $(4b-3)(3b-8) = 0$
 $b = \frac{3}{4}$ or $b = \frac{8}{3}$

10 (b) $3x^2 + 5x - 12 = 0$
 $(3x-4)(x+3) = 0$
 $3x-4=0$ or $x+3=0$
 $x = \frac{4}{3}$ or $x = -3$

(d) $6x^2 + 9x - 15 = 0$
 $2x^2 + 3x - 5 = 0$
 \vdots
 $x = -\frac{5}{2}$ or $x = 1$

$$Q11) \textcircled{a} (2x+4)(2x+5) - 4x5 = 10$$

$$\textcircled{b} 4x^2 + 8x + 10x + 20 - 20 = 10$$

$$4x^2 + 18x - 10 = 0$$

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

$$(2x-1)(x+5) = 0$$

$$\underline{x = \frac{1}{2}} \text{ or } \underline{x = -5}$$

$$Q13) \textcircled{e} 3x^2 + 9x + 5$$

$$a=3, b=9, c=5$$

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

$$x = \frac{-9 \pm \sqrt{9^2 - 4(3)(5)}}{2(3)}$$

$$x = \frac{-9 \pm \sqrt{81 - 60}}{6}$$

$$x = \frac{-9 \pm \sqrt{21}}{6}$$

$$\underline{x = \frac{-3}{2} \pm \frac{\sqrt{21}}{6}}$$

$$\textcircled{c} x^2 + 2x - 2 = 0$$

$$a=1, b=2, c=-2$$

$$\therefore \underline{x = -1 \pm \sqrt{3}}$$

$$(14) \textcircled{d} 2x^2 + 3x - 8 = 0$$

$$a=2, b=3, c=-8$$

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

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

$$x = \frac{-3 \pm \sqrt{9 + 64}}{4}$$

$$x = \frac{-3 \pm \sqrt{73}}{4}$$

$$x = 1.386, -2.886$$

$$\underline{x = 1.39, -2.89}$$

2dp

$$\textcircled{d} x^2 + 2x - 6 = 0$$

$$a=1, b=2, c=-6$$

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

$$x = \frac{-2 \pm \sqrt{2^2 - 4(1)(-6)}}{2(1)}$$

$$x = \frac{-2 \pm \sqrt{4 + 24}}{2}$$

$$x = \frac{-2 \pm \sqrt{28}}{2}$$

$$x = \frac{-2 \pm 2\sqrt{7}}{2}$$

$$x = \frac{-2}{2} \pm \frac{2\sqrt{7}}{2}$$

$$\underline{x = -1 \pm \sqrt{7}}$$

$$\textcircled{b} 2x^2 - 5x - 6 = 0$$

$$x = \frac{5 \pm \sqrt{73}}{4}$$

$$x = 3.39 \text{ or } x = -0.89 \text{ 2dp.}$$

$$(15) 2x^2 - 7x - 15 = 0$$

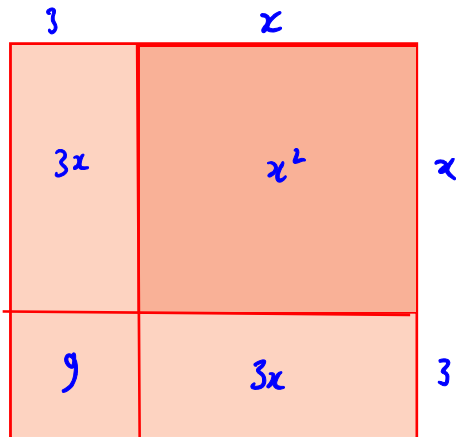
$$(a) (2x \quad)(x \quad) = 0$$

$$a=2, b=-7, c=-15$$

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

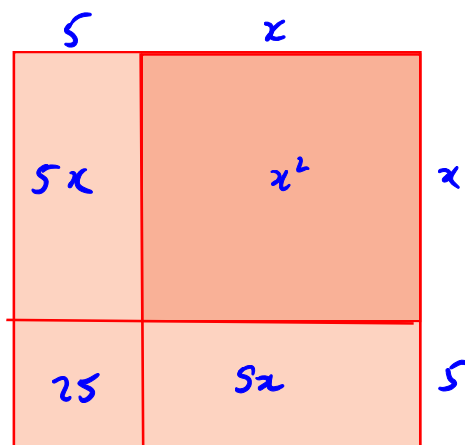
9-3 Completing the Square

Perfect Square

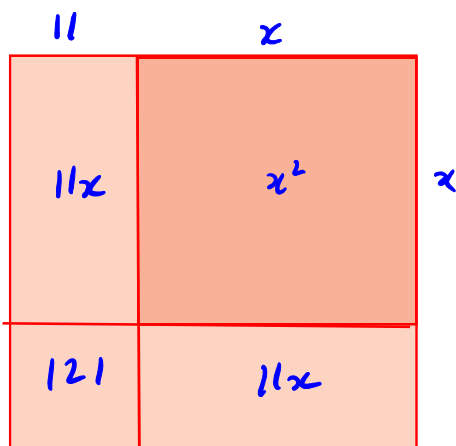


$$(x+3)^2 = x^2 + 3x + 3x + 9$$

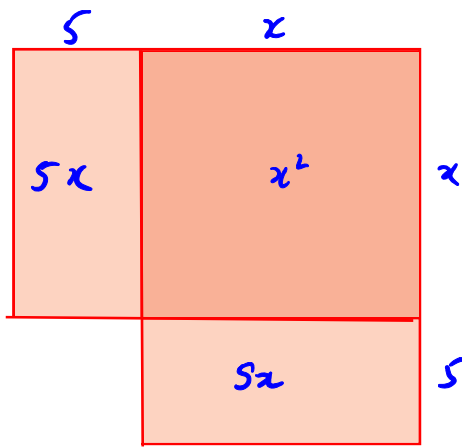
$$= x^2 + 6x + 9$$



$$(x+5)^2 = x^2 + 10x + 25$$



$$(x+11)^2 = x^2 + 22x + 121$$



$$(x+5)^2 = x^2 + 10x + 25$$

$$x^2 + 10x = \underline{(x+5)^2 - 25}$$

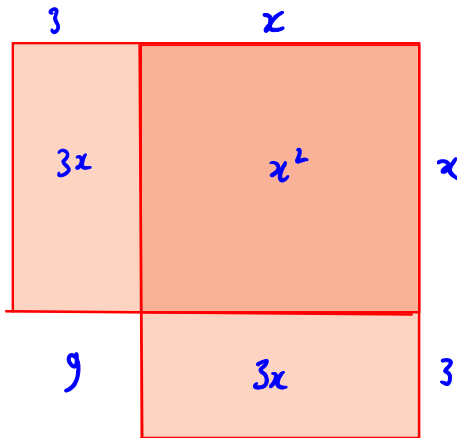
this process is known as completing the square.

$$x^2 + 10x + 7 = (x+5)^2 - 25 + 7$$

$$x^2 + 10x + 7 = \underline{\underline{(x+5)^2 - 18}}$$

$$x^2 + 10x + 21$$

$$(x+5)^2 - 25 + 21 = \underline{\underline{(x+5)^2 - 4}}$$



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

$$= x^2 + 6x + 9$$

$$x^2 + 6x - 7 = (x+3)^2 - 9 - 7$$

$$= \underline{\underline{(x+3)^2 - 16}}$$

$$x^2 + 6x + 21 = (x+3)^2 - 9 + 21$$

$$= \underline{\underline{(x+3)^2 + 12}}$$

$$x^2 - 6x + 21 = (x-3)^2 - 9 + 21$$

$$\uparrow$$

$$= \underline{\underline{(x-3)^2 + 12}}$$

Notes about Hwb

$$\textcircled{1} \begin{array}{c} 4 \\ b \end{array}$$

$$\textcircled{1} \underline{\underline{4 > 2}}$$

$$\textcircled{2} \underline{\underline{d \ e}}$$

$$-4 \leq -4$$

$$-6 \leq -4$$

9.2

$$(c) \quad \boxed{x^2 - x - 6 = 0}$$

$$x^2 - x - 6$$

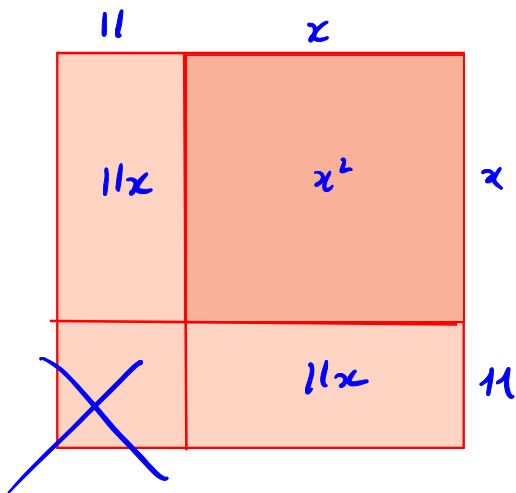
$$\underline{\quad\quad\quad} \quad \underline{\quad\quad\quad}$$

$$x = 3 \quad x = -2$$

⋮

9.3 Completing the square continued

21/06/20



$$(x+11)^2 = x^2 + 22x + 121$$

$$x^2 + 22x = (x+11)^2 - 121$$

$$x^2 + 22x + 17 = (x+11)^2 - 121 + 17$$

$$= \underline{\underline{(x+11)^2 - 104}}$$

Q1

(c) $(2x+3)^2 = (2x+3)(2x+3) = 4x^2 + 6x + 6x + 9$
 $= \underline{\underline{4x^2 + 12x + 9}}$

(e) $(x+1)^2 + 7 = (x+1)(x+1) + 7$
 $= x^2 + x + x + 1 + 7$
 $= \underline{\underline{x^2 + 2x + 8}}$

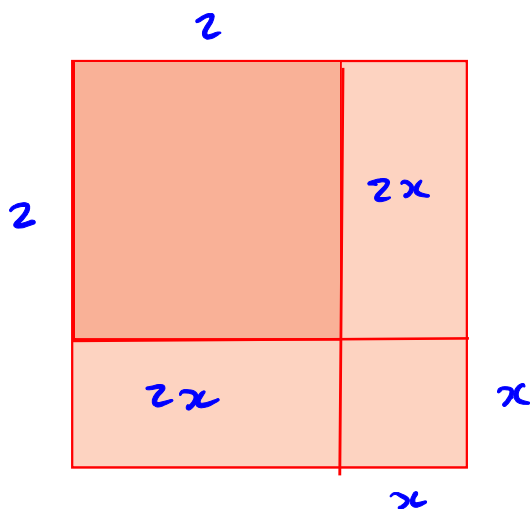
Q2) (c) $\sqrt{48} = \sqrt{16 \cdot 3} = 4\sqrt{3}$

(d) $\sqrt{90} = \sqrt{9 \cdot 10} = 3\sqrt{10}$

Q3) (c) $x-7 = \pm\sqrt{5}$

$x = \underline{\underline{7 \pm \sqrt{5}}}$

Q4)



Area of Square

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

perfect square.

Q5) (a) $x^2 + 4x + 5 = (x+2)^2 - 4 + 5$
 $= \underline{\underline{(x+2)^2 + 1}}$

(b) $x^2 + 4x + 6 = (x+2)^2 - 4 + 6$
 $= (x+2)^2 + 2$

(c) $x^2 + 4x - 1 = (x+2)^2 - 4 - 1$
 $= (x+2)^2 - 5$

7 form $(x+p)^2 + q$

$$\textcircled{d} x^2 + 6x + 11 = (x+3)^2 - 9 + 11 \\ = \underline{\underline{(x+3)^2 + 2}}$$

$$\textcircled{c} x^2 + 12x =$$

$$\textcircled{e} x^2 - 4x + 6 =$$

$$9(b) x^2 + 2x - 5 = 0$$

$$(x+1)^2 - 2 - 5 = 0$$

$$(x+1)^2 - 7 = 0$$

$$(x+1)^2 = 7$$

$$x+1 = \pm\sqrt{7}$$

$$\underline{\underline{x = -1 \pm \sqrt{7}}}$$

$$\textcircled{a} x^2 + 6x + 7 = 0$$

$$(x+3)^2 - 9 + 7 = 0$$

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

$$x+3 = \pm\sqrt{2}$$

$$\underline{\underline{x = -3 \pm \sqrt{2}}}$$

$$\textcircled{11} \textcircled{d} 4x^2 + 12x - 7$$

$$4(x^2 + 3x) - 7$$

$$4\left[(x + \frac{3}{2})^2 - \frac{9}{4}\right] - 7$$

$$4(x + \frac{3}{2})^2 - 9 - 7$$

$$\underline{\underline{4(x + \frac{3}{2})^2 - 16}}$$

$$\textcircled{c} 5x^2 + 10x + 25$$

$$5[x^2 + 2x] + 25$$

$$5[(x+1)^2 - 1] + 25$$

$$5(x+1)^2 - 5 + 25$$

$$\underline{\underline{5(x+1)^2 + 20}}$$

$$\textcircled{b} 3x^2 - 6x + 5$$

$$3(x-1)^2 + 2$$

$$\textcircled{a} 2x^2 + 12x + 2$$

$$\textcircled{12} \textcircled{b} 3x^2 + 12x - 3 = 0$$

$$x^2 + 4x - 1 = 0$$

$$(x+2)^2 - 4 - 1 = 0$$

$$(x+2)^2 - 5 = 0$$

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

$$\underline{\underline{x = -2 \pm \sqrt{5}}}$$

$$\textcircled{a} 2x^2 - 12x + 2 = 0$$

$$\underline{\underline{x = 3 \pm 2\sqrt{2}}}$$

$$(14) (d) \quad 5x^2 - 15x - 4 = 0$$

$$5 \left[x^2 - 3x \right] - 4 = 0$$

$$5 \left[\left(x - \frac{3}{2} \right)^2 - \frac{9}{4} \right] - 4 = 0$$

$$5 \left(x - \frac{3}{2} \right)^2 - \frac{45}{4} - 4 = 0$$

$$5 \left(x - \frac{3}{2} \right)^2 - \frac{61}{4} = 0$$

$$5 \left(x - \frac{3}{2} \right)^2 = \frac{61}{4}$$

$$\left(x - \frac{3}{2} \right)^2 = \frac{61}{20}$$

$$x = \frac{3}{2} \pm \frac{\sqrt{61}}{\sqrt{20}}$$

$$x = \frac{3}{2} \pm \frac{\sqrt{61}}{2\sqrt{5}}$$

$$x = \frac{3}{2} \pm \frac{\sqrt{305}}{10}$$

$$(b) \quad 6x^2 - 3x - 2 = 0$$

$$x^2 - \frac{1}{2}x - \frac{1}{3} = 0$$

$$\left(x - \frac{1}{4} \right)^2 - \frac{1}{16} - \frac{1}{3} = 0$$

$$\left(x - \frac{1}{4} \right)^2 - \frac{3}{48} - \frac{16}{48} = 0$$

$$\left(x - \frac{1}{4} \right)^2 - \frac{19}{48} = 0$$

$$\left(x - \frac{1}{4} \right)^2 = \frac{19}{48}$$

$$x = \frac{1}{4} \pm \frac{\sqrt{19}}{\sqrt{48}}$$

$$x = \frac{1}{4} \pm \frac{\sqrt{19}}{4\sqrt{3}}$$

$$x = \frac{1}{4} \pm \frac{\sqrt{57}}{12}$$

$$x = \underline{0.88}, \quad x = \underline{-0.88}$$

$$(e) \quad 4x^2 + 6x - 5 = 0$$

$$x^2 + \frac{3}{2}x - \frac{5}{4} = 0$$

$$\left(x + \frac{3}{4} \right)^2 - \frac{9}{16} - \frac{5}{4} = 0$$

$$\left(x + \frac{3}{4} \right)^2 - \frac{29}{16} = 0$$

$$x + \frac{3}{4} = \pm \frac{\sqrt{29}}{4}$$

$$x = \underline{\underline{\frac{-3 \pm \sqrt{29}}{4}}}$$

$$(c) \quad 3x^2 + 6x - 10 = 0$$

$$x^2 + 2x - \frac{10}{3} = 0$$

9.4 Solving simple simultaneous equations

$$\begin{aligned} \text{Q4 (f)} \quad y &= x+3 & \text{--- (1)} \\ x+3y &= 17 & \text{--- (2)} \end{aligned}$$

sub (1) into (2)

$$x + 3(x+3) = 17$$

$$x + 3x + 9 = 17$$

$$4x = 8$$

$$\underline{x = 2}$$

$$\text{when } x=2 \quad y=5$$

$$\underline{(2, 5)}$$

$$\begin{aligned} \text{(g)} \quad y-3x &= 0 \Rightarrow y=3x \\ 2x+2y &= 24 & \text{--- (2)} \end{aligned}$$

$$2x + 2(3x) = 24$$

$$2x + 6x = 24$$

$$8x = 24$$

$$\underline{x = 3}$$

$$\text{when } x=3 \quad y=3(3)=9$$

$$\underline{(3, 9)}$$

$$\begin{aligned} \text{(d)} \quad y &= 4x & \text{--- (1)} \\ 3x+2y &= 11 & \text{--- (2)} \end{aligned}$$

$$\begin{aligned} \text{(h)} \quad 2x-y &= 0 \Rightarrow y=2x & \text{--- (1)} \\ 5x+4y &= 26 & \text{--- (2)} \end{aligned}$$

(6) Lamb chops £x
Sausages ky

$$\text{Jake: } 2x + 2y = 7 & \text{--- (1)}$$

$$\text{Jamie: } 3x + 4y = 11 & \text{--- (2)}$$

$$\text{(1) } \times 2 \quad 4x + 4y = 14 & \text{--- (3)}$$

$$\text{(3) - (2)} \quad \underline{x = 3}$$

lamb chop cost £3.

$$2(3) + 2y = 7$$

$$2y = 1$$

$$\underline{y = \frac{1}{2} = 50p.}$$

Sausage cost 50p.

$$\begin{aligned} \text{(7)} \quad \text{(b)} \quad 5x+y &= 15 & \text{--- (1)} \\ 2x+y &= 3 & \text{--- (2)} \end{aligned}$$

$$\text{(1) - (2)} \Rightarrow 3x = 12$$

$$\underline{x = 4}$$

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

$$y = 3 - 8$$

$$\underline{y = -5}$$

$$\underline{(4, -5)}$$

$$\text{(c)} \quad 4x - 3y = 10 & \text{--- (1)}$$

$$5x - 3y = 14 & \text{--- (2)}$$

$$10) (d) \quad 3y - 2x = -7 \quad \text{--- ①}$$

$$5y - x = 7 \quad \text{--- ②}$$

$$\text{②} \times 2 \quad 10y - 2x = 14 \quad \text{--- ③}$$

$$\text{③} - \text{①} \quad 7y = 21$$

$$\underline{y = 3}$$

Sub $y=3$ into ①

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

$$9 - 2x = -7$$

$$2x = 16$$

$$\underline{x = 8}$$

$$\underline{(8, 3)}$$

$$(c) \quad 5x + 3y = 21$$

$$3x + y = 11$$

$$\underline{x = 3 \quad y = 2}$$

9.6 Solving linear and quadratic simultaneous Eqⁿs

05/07/20

$$(4) (b) \quad 2x - y = 7 \quad \text{--- ①}$$

$$x^2 - 15 = y \quad \text{--- ②}$$

$$\text{Sub ② into ①} \quad 2x - (x^2 - 15) = 7$$

$$2x - x^2 + 15 = 7$$

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

$$(x - 4)(x + 2) = 0$$

$$\underline{x = 4} \quad \underline{x = -2}$$

sub into ①

$$x = 4, \quad 2x - y = 7$$

$$2(4) - y = 7$$

$$8 - y = 7$$

$$y = 1$$

$$\underline{(4, 1)}$$

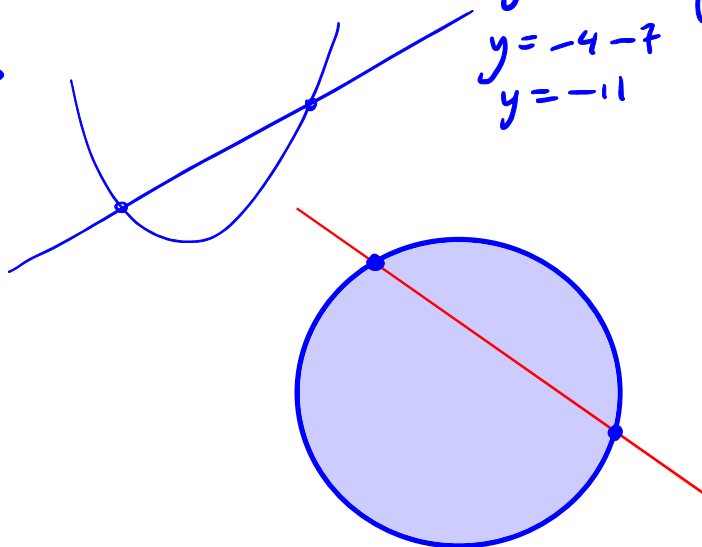
$$\underline{x = -2}$$

$$2(-2) - y = 7$$

$$y = -4 - 7$$

$$y = -11$$

$$(-2, -11)$$



$$(e) \quad x^2 + y^2 = 4 \quad \text{--- ①}$$

$$3x + 5 = y \quad \text{--- ②}$$

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

$$x^2 + 9x^2 + 30x + 25 - 4 = 0$$

$$10x^2 + 30x + 21 = 0$$

$$10(x^2 + 3x) + 21 = 0$$

$$10\left[\left(x + \frac{3}{2}\right)^2 - \frac{9}{4}\right] + 21 = 0$$

$$10\left(x + \frac{3}{2}\right)^2 - \frac{45}{2} + 21 = 0$$

$$10\left(x + \frac{3}{2}\right)^2 - \frac{45}{2} + \frac{42}{2} = 0$$

$$10\left(x + \frac{3}{2}\right)^2 = \frac{3}{2}$$

$$\left(x + \frac{3}{2}\right)^2 = \frac{3}{20}$$

$$x + \frac{3}{2} = \frac{\pm\sqrt{3}}{\sqrt{20}}$$

$$x = \frac{-3 \pm \sqrt{3}}{2 \cdot 2\sqrt{5}}$$

$$x = \frac{-3 \pm \sqrt{15}}{10}$$

$$x = \frac{-15 \pm \sqrt{15}}{10}$$

$$x = -1.11, \quad x = -1.89$$

Sub into (2)

$$y = 3(-1.11) + 5 = 1.66$$

$$y = 3(-1.89) + 5 = -0.66$$

$$(-1.11, 1.66), \quad (-1.89, -0.66)$$

$$4(d) \quad y = 5x - 3 \quad \text{--- (1)}$$

$$y = 3x^2 + 6x - 7 \quad \text{--- (2)}$$

$$5x - 3 = 3x^2 + 6x - 7$$

$$3x^2 + x - 4 = 0$$

$$(3x + 4)(x - 1) = 0$$

$$x = -\frac{4}{3} \quad \text{or} \quad x = 1$$

$$\text{when } x = 1 \Rightarrow y = 5(1) - 3 = 2 \quad (1, 2)$$

$$\text{when } x = -\frac{4}{3} \quad y = 5\left(-\frac{4}{3}\right) - 3$$

$$y = -\frac{20}{3} - 3 = -\frac{29}{3}$$

$$\left(-\frac{4}{3}, -\frac{29}{3}\right)$$

$$\underline{\underline{(-1.33, -9.67)}}$$

$$Q7) \quad (d) \quad y = 3x^2 - 4x - 2$$

$$y = 2x - 3$$

$$3x^2 - 4x - 2 = 2x - 3$$

$$3x^2 - 6x + 1 = 0$$

$$3(x^2 - 2x) + 1 = 0$$

$$3[(x-1)^2 - 1] + 1 = 0$$

$$3(x-1)^2 - 3 + 1 = 0$$

$$3(x-1)^2 - 2 = 0$$

$$(x-1)^2 = \frac{2}{3}$$

$$x-1 = \frac{\pm\sqrt{2}}{\sqrt{3}}$$

$$x = 1 \pm \frac{\sqrt{6}}{3}$$

$$x = \frac{3 \pm \sqrt{6}}{3}$$

$$y = 2x - 3$$

$$x = \frac{3 \pm \sqrt{6}}{3}$$

$$y = 2\left(\frac{3 \pm \sqrt{6}}{3}\right) - 3$$

$$y = \frac{6 \pm 2\sqrt{6} - 9}{3}$$

$$y = \frac{-3 \pm 2\sqrt{6}}{3}$$

$$x = \frac{3 \pm \sqrt{6}}{3}$$

$$\text{and } y = \frac{-3 \pm 2\sqrt{6}}{3}$$

$$x = 1.82$$

$$y = 0.63$$

$$x = 0.18$$

$$y = -2.63$$

7(b) $2dp$

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

$$y = 2 - x$$

$$4x^2 - x - 6 = 2 - x$$

$$4x^2 = 8$$

$$x^2 = 2$$

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

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7(e) $y = 2x - 1$ — (1)

$y^2 = 4x + 13$ — (2)

$$(2x-1)^2 = 4x+13$$

$$4x^2 - 4x + 1 = 4x + 13$$

$$4x^2 - 8x - 12 = 0$$

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

$$(x+1)(x-3) = 0$$

$$x = -1 \quad \text{or} \quad x = 3$$

$$x = -1 \Rightarrow y = 2(-1) - 1 = -3$$

$$x = 3 \Rightarrow y = 2(3) - 1 = 5$$

$$\underline{(-1, -3)} \quad \underline{(3, 5)}$$

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

$$y = 2 - x$$

$$y = 2 - (\pm\sqrt{2})$$

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

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

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

$$x = 1.41$$

$$y = 0.59$$

$$x = -1.41$$

$$y = 3.41$$

12/07/20

7(f) $3y = x + 6$ — (1)

$y^2 = 2x + 7$ — (2)

$$(1) \Rightarrow \underline{x = 3y - 6}$$

$$y^2 = 2(3y - 6) + 7$$

$$y^2 = 6y - 12 + 7$$

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

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

$$(y-5)(y-1) = 0$$

$$y = 5, y = 1$$

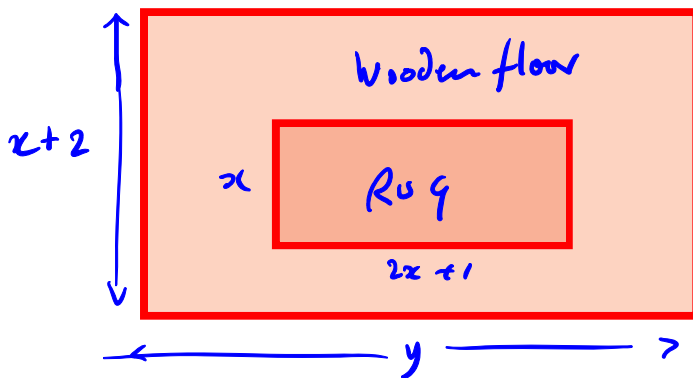
$$y = 1 \Rightarrow x = 3(1) - 6 = -3$$

$$\underline{(-3, 1)}$$

$$y = 5 \Rightarrow x = 3(5) - 6 = 9$$

$$\underline{(9, 5)}$$

8



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

$$y = 2x + 3$$

(b) Area of rug = $x(2x+1) = 3$

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

(c) $(2x+3)(x-1) = 0$

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

$$\underline{x = 1}$$

$x > 0$
since length
must be > 0

$$\underline{\underline{x = 1m}}$$

$$\therefore y = 2(1) + 3 = \underline{\underline{5m}}$$

$$\textcircled{11} \quad \begin{aligned} x^2 + y^2 &= 4 & \text{--- (1)} \\ y &= 2x - 1 & \text{--- (2)} \end{aligned}$$

Sub (2) into (1)

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

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

$$5x^2 - 4x - 3 = 0$$

$$x^2 - \frac{4}{5}x - \frac{3}{5} = 0$$

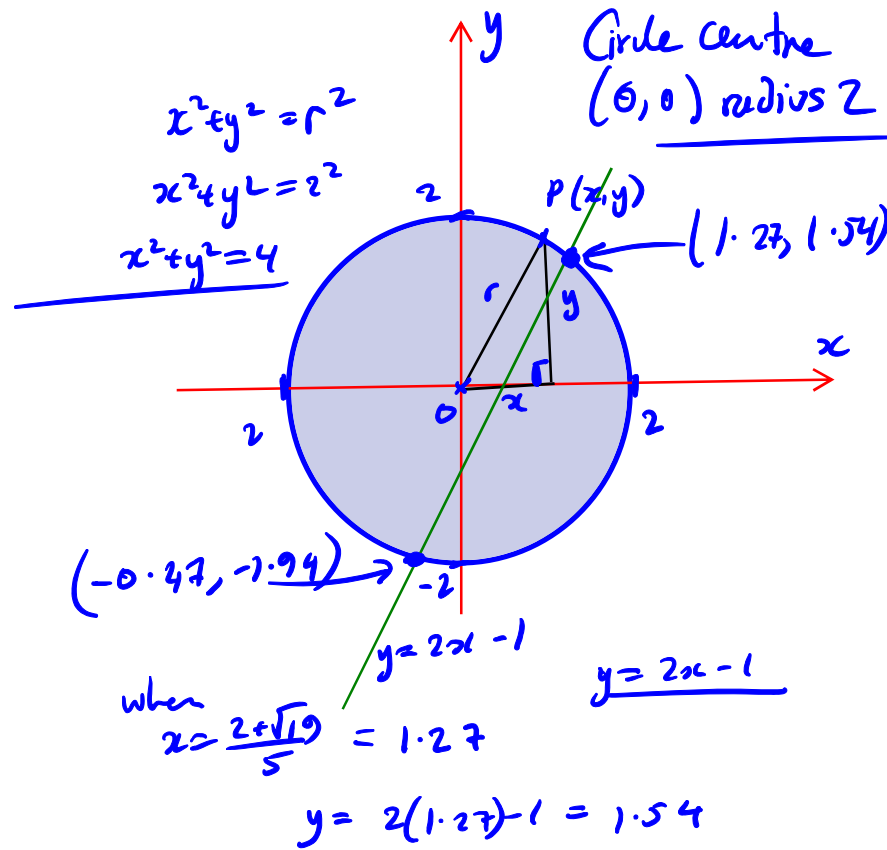
$$\left(x - \frac{2}{5}\right)^2 - \frac{4}{25} - \frac{3}{5} = 0$$

$$\left(x - \frac{2}{5}\right)^2 - \frac{4}{25} - \frac{15}{25} = 0$$

$$\left(x - \frac{2}{5}\right)^2 = \frac{19}{25}$$

$$x - \frac{2}{5} = \pm \frac{\sqrt{19}}{5}$$

$$x = \frac{2 \pm \sqrt{19}}{5}$$



$$x = \frac{2 - \sqrt{19}}{5} = -0.472$$

$$y = 2(-0.472) - 1 = -1.94$$

Coordinates of points of intersection

$$\underline{(1.27, 1.54) \quad (-0.472, -1.94)}$$

$$\textcircled{12} \quad \text{(c) } x^2 + y^2 = 50 \text{ --- (1) } \rightarrow \text{ circle radius } \sqrt{50} = 5\sqrt{2}$$

$$y = 3 + 2x \text{ --- (2)}$$

Sub (2) into (1)

$$x^2 + (3 + 2x)^2 = 50$$

$$x^2 + 9 + 12x + 4x^2 = 50$$

$$5x^2 + 12x - 41 = 0$$

$$x^2 + \frac{12}{5}x - \frac{41}{5} = 0$$

$$\left(x + \frac{6}{5}\right)^2 - \frac{36}{25} - \frac{41}{5} = 0$$

$$\left(x + \frac{6}{5}\right)^2 - \frac{36}{25} - \frac{205}{25} = 0$$

$$\left(x + \frac{6}{5}\right)^2 = \frac{241}{25}$$

$$x + \frac{6}{5} = \pm \frac{\sqrt{241}}{5} \Rightarrow x = \frac{-6 \pm \sqrt{241}}{5}$$

$$x = 1.90, \quad x = -4.30$$

$$y = 3 + 2(1.9), \quad y = 3 + 2(-4.30)$$

$$y = 6.81, \quad y = -5.61$$

Coordinates of points of intersection

$$\underline{(1.90, 6.81) \quad (-4.30, -5.61)}$$

9.7 Solving linear inequalities

$$\begin{aligned} \text{Q1 (d)} \quad 9 - 5x &= 21 + x \\ (+5x) \quad 9 &= 21 + 6x \end{aligned}$$

$$-12 = 6x$$

$$\underline{x = -2}$$

Cloud; -2, 0, 3, 5, 10, 12

$$\text{Q2 (b)} \quad x < 4; \quad -2, 0, 3$$

$$\text{(d)} \quad -2 \leq x < 4; \quad -2, 0, 3.$$

$$\text{Q3 (f)} \quad 0 < x \leq 4; \quad 1, 2, 3, 4$$

$$\text{(g)} \quad 3 > x \geq -3; \quad -3, -2, -1, 0, \dots, 3.$$

$$\text{Q4 (c)} \quad x < 2 \quad \text{(d)} \quad x > -1, \quad \text{(e)} \quad 1 < x \leq 5 \quad \text{(f)} \quad -4 \leq x < 2$$

Q7 (b) $\{x : x \leq -2\}$ means the set of all x values such that x is less than or equal to -2 .

$$\text{(d)} \quad \{x : x \leq 0\}$$

$$\text{(e)} \quad \{x : x > -1\}$$

$$\text{Q11 (b)} \quad 2(x-1) < 5x+7$$

$$2x-2 < 5x+7$$

$$-2 < 3x+7$$

$$-9 < 3x$$

$$3x > -9$$

$$x > -3$$

$\{x : x > -3\}$ set notation.

$$\text{(d)} \quad 3(4-2x) < 2(2x-3)$$

$$\{x : x > 1.8\}$$

$$\text{(12) (d)} \quad -1 < \frac{3x-1}{4} \leq 2$$

$$-4 < 3x-1 \leq 8$$

$$-3 < 3x \leq 9$$

$$\underline{-1 < x \leq 3}$$

$$\text{(c)} \quad -2 \leq \frac{2x}{3} \leq 6$$

$$-6 \leq 2x \leq 18$$

$$\underline{-3 \leq x \leq 9}$$

(15) (a) $-2 > 4(1-x) \geq -8$
 $-\frac{1}{2} > 1-x \geq -2$
 $-\frac{3}{2} > -x \geq -3$
 $\frac{3}{2} < x \leq 3$

$7 > 5$
 $\underline{\underline{-7 < -5}}$

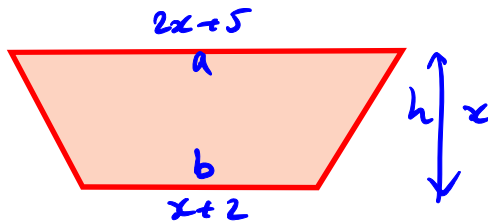
Set Notation -
 $\underline{\underline{\{x : \frac{3}{2} < x \leq 3\}}}}$

(c) $-3 < 2x+1 \leq 9$
 $-4 < 2x \leq 8$
 $-2 < x \leq 4$

$\underline{\underline{\{x : -2 < x \leq 4\}}}$

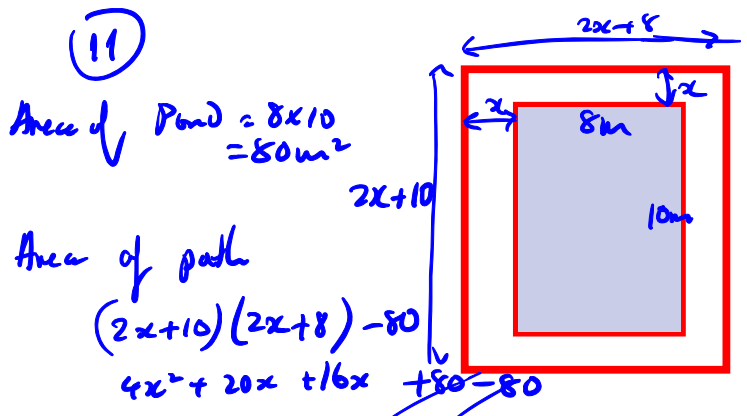
9 extend (p301)

12/07/20



$A = \frac{1}{2}(a+b)h = 20$
 $\frac{1}{2}(2x+5+x+2)x = 20$
 $x(3x+7) = 40$
 $3x^2 + 7x - 40 = 0$
 $(x+5)(3x-8) = 0$
 $x = -5$ or $x = \frac{8}{3}$
 $h > 0 \therefore x = \frac{8}{3} \text{ m}$

(10) $s = 20 - 4t$
 $5 < s < 15$
 $5 < 20 - 4t < 15$
 $-15 < -4t < -5$
 $\frac{15}{4} > t > \frac{5}{4}$
 $3.75 > t > 1.25 \text{ seconds.}$



$4x^2 + 36x$
 $4x^2 + 36x = 80 \div 4 \quad 80$
 $4x^2 + 36x = 80$
 $x^2 + 9x - 16 = 0$
 $(x + \frac{9}{2})^2 - \frac{81}{4} - 16 = 0$
 $(x + \frac{9}{2})^2 - \frac{145}{4} = 0$
 $x + \frac{9}{2} = \pm \sqrt{\frac{145}{4}}$

$x = \frac{-9 \pm \sqrt{145}}{2}$
 $\underline{\underline{x = 1.52 \text{ m}}}$