

pg 254

- 1 a) $b^2 - 4ac = 49 - 4(1)(4) = 33 \therefore 2 \text{ roots}$
 b) $9 - 4(1)(-2) = 17 \quad 2 \text{ roots}$
 c) $81 - 4(1)(6) = 57 \quad 2 \text{ roots}$
 d) $4 - 4(1)(1) = 0 \quad 1 \text{ root}$
 e) $9 - 4(7)(2) = -47 \quad \text{no roots}$
 f) $144 - 4(4)(9) = 0 \quad 1 \text{ root}$

- 2 a) $4 - 4(1)(-14) = 60 \quad 2 \text{ roots}$
 b) 48.0036 $\quad 2 \text{ roots}$
 c) $9 - 4(\frac{1}{4})(9) = 0 \quad 1 \text{ root}$
 d) $4 - 4(-1)(-1) = 0 \quad 1 \text{ root}$
 e) $1 - 4(\frac{1}{2})(\frac{5}{2}) = -4 \quad \text{no roots}$
 f) $25 - 4(-6)(-1) = 1 \quad 2 \text{ roots}$

3 a) $x = \frac{-24 \pm \sqrt{576 - 4(7)(9)}}{14}$

$x = \frac{-24 \pm \sqrt{324}}{14}$

$x = \frac{-24 \pm 18}{14}$

$x = \frac{-6}{14}, \frac{-42}{14}$

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

c) $x = \frac{-16 \pm \sqrt{256 - 4(-5)(-2)}}{-10}$

$x = \frac{-16 \pm \sqrt{216}}{-10}$

$x = \frac{-16 \pm 2\sqrt{54}}{-10}$

$x = \frac{8 \pm \sqrt{54}}{5}$

$x = 3.07 \quad x = 0.13$

* this is 4c

b) $x = \frac{12 \pm \sqrt{144 - 4(4)(-9)}}{8}$

$x = \frac{12}{8}$

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

c) $3q^2 + 5q - 1 = 0$

$q = \frac{-5 \pm \sqrt{25 - 4(3)(-1)}}{6}$

$q = \frac{-5 \pm \sqrt{37}}{6}$

d) $2m^2 + 4m - 7 = 0$

$m = \frac{-4 \pm \sqrt{16 - 4(2)(-7)}}{4}$

$= \frac{-4 \pm \sqrt{72}}{4}$

$x = \frac{-4 \pm 6\sqrt{2}}{4}$

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

pg 254

$$3e) 2j^2 - 7j + 4 = 0$$

$$j = \frac{7 \pm \sqrt{49 - 4(2)(4)}}{4}$$

$$= \frac{7 \pm \sqrt{17}}{4}$$

$$f) 16g^2 + 24g + 9 = 0$$

$$g = \frac{-24 \pm \sqrt{576 - 4(16)(9)}}{32}$$

$$g = \frac{-24}{32} \quad g = \frac{-3}{4}$$

$$4a) 3z^2 + 14z + 5 = 0$$

$$z = \frac{-14 \pm \sqrt{14^2 - 4(3)(5)}}{6}$$

$$z = \frac{-14 \pm \sqrt{136}}{6}$$

$$z = -0.39 \quad z = -4.28$$

$$b) 4c^2 - 7c - 1 = 0$$

$$c = \frac{7 \pm \sqrt{49 - 4(4)(-1)}}{8}$$

$$c = \frac{7 \pm \sqrt{65}}{8}$$

$$c = 1.88 \quad c = -0.13$$

c) on previous page

$$d) 8b^2 + 12b + 1 = 0$$

$$b = \frac{-12 \pm \sqrt{144 - 4(8)(1)}}{16}$$

$$b = \frac{-12 \pm \sqrt{112}}{16}$$

$$b = -0.09 \quad b = -1.41$$

$$e) 10w^2 - 45w - 7 = 0$$

$$w = \frac{45 \pm \sqrt{45^2 - 4(10)(-7)}}{20}$$

$$w = \frac{45 \pm \sqrt{2305}}{20}$$

$$w = 4.65 \quad w = -0.15$$

$$f) -6k^2 + 17k + 5 = 0$$

$$k = \frac{-17 \pm \sqrt{289 - 4(-6)(5)}}{-12}$$

$$k = \frac{-17 \pm \sqrt{409}}{-12}$$

$$k = -0.27 \quad k = 3.10$$

$$5a) 3x^2 + 6x + 1 = 0$$

$$x = \frac{-6 \pm \sqrt{36 - 4(3)(1)}}{6}$$

$$x = \frac{-6 \pm \sqrt{24}}{6}$$

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

$$x = \frac{-3 \pm \sqrt{6}}{3} \quad (\text{exact})$$

$$x = -0.18 \quad x = -1.82$$

pg 254

5b)

$$h^2 + \frac{1}{6}h - \frac{1}{2} = 0$$

$$6h^2 + h - 3 = 0$$

$$h = \frac{-1 \pm \sqrt{1 - 4(6)(-3)}}{12}$$

$$h = \frac{-1 \pm \sqrt{73}}{12} \quad (\text{exact})$$

$$h = 0.63 \quad h = -0.80$$

5c) $0.2m^2 + 0.3m - 0.1 = 0$

$$2m^2 + 3m - 1 = 0$$

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

$$m = \frac{-3 \pm \sqrt{17}}{4} \quad (\text{exact})$$

$$m = 0.28 \quad m = -1.78$$

5d) $4y^2 - 12y + 7 = 0$

$$y = \frac{12 \pm \sqrt{144 - 4(4)(7)}}{8}$$

$$y = \frac{12 \pm \sqrt{32}}{8}$$

$$y = \frac{12 \pm 4\sqrt{2}}{8}$$

$$y = \frac{3 \pm \sqrt{2}}{2} \quad (\text{exact})$$

$$y = 2.21 \quad y = 0.79$$

5e) $\frac{7}{2}x^2 - \frac{x}{2} - 1 = 0$

$$7x^2 - x - 2 = 0$$

$$x = \frac{1 \pm \sqrt{1 - 4(7)(-2)}}{14}$$

$$x = \frac{1 \pm \sqrt{57}}{14} \quad (\text{exact})$$

$$x = 0.61 \quad x = -0.47$$

5f) $2z^2 - 6z + 1 = 0$

$$z = \frac{6 \pm \sqrt{36 - 4(2)(1)}}{4}$$

$$z = \frac{6 \pm \sqrt{28}}{4}$$

$$z = \frac{6 \pm 2\sqrt{7}}{4}$$

$$z = \frac{3 \pm \sqrt{7}}{2} \quad (\text{exact})$$

$$z = 2.82 \quad z = 0.18$$

6 - depends on setup

$(x+2)^2 = 14$ wouldn't use quad formula

standard form $ax^2 + bx + c = 0$... probably quad formula

pg 254

$$7a) n^2 + 2n - 2 = 0$$

$$n^2 + 2n = 2$$

$$n^2 + 2n + 1 = 3$$

$$(n+1)^2 = 3$$

$$n+1 = \pm\sqrt{3}$$

$$n = -1 \pm \sqrt{3}$$

$$b) y^2 - 6y + 9 = 0$$

$$(y-3)(y-3) = 0$$

$$y-3 = 0$$

$$y = 3$$

$$c) -2u^2 = -16$$

$$u^2 = 8$$

$$u = \pm\sqrt{8}$$

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

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

$$3x^2 - 2x = 6$$

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

$$x = \frac{2 \pm \sqrt{4 - 4(3)(-6)}}{6}$$

$$e) x^2 - 4x + 8 = 0$$

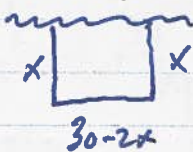
$$b^2 - 4ac = -16 \therefore \text{no solution}$$

$$x = \frac{2 \pm \sqrt{76}}{6}$$

$$x = \frac{2 \pm 2\sqrt{19}}{6}$$

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

#8



$$A = x(30-2x)$$

$$100 = -2x^2 + 30x$$

$$2x^2 - 30x + 100 = 0$$

$$x^2 - 15x + 50 = 0$$

$$(x-5)(x-10) = 0$$

$$x = 5$$

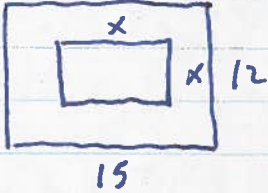
$$x = 10$$

5m deep 20m long

10m deep 10m long

Pg 255

9.



Mural Area

$$0.75(12 \times 15) = (15 - 2x)(12 - 2x)$$

$$135 = 4x^2 - 54x + 180$$

$$0 = 4x^2 - 54x + 45$$

$$x = \frac{54 \pm \sqrt{2196}}{8}$$

$$x = 0.89, x = 12.6$$

(not possible)

$$\therefore 0.89m$$

$$10. \frac{1}{2}x^2 - x = 11$$

$$x^2 - 2x = 22$$

$$x^2 - 2x + 1 = 22 + 1$$

$$(x - 1)^2 = 23$$

$$x - 1 = \pm \sqrt{23}$$

$$x = 1 \pm \sqrt{23}$$

$$x = 5.80 \quad x = -3.80$$

$$11. h = -0.4(d - 2.5)^2 + 2.5$$

$$\text{base, } h = 0 \quad 0 = -0.4(d - 2.5)^2 + 2.5$$

$$-2.5 = -0.4(d - 2.5)^2$$

$$6.25 = (d - 2.5)^2$$

$$\pm 2.5 = d - 2.5$$

$$2.5 \pm 2.5 = d$$

$$d = 0 \quad d = 5 \quad \therefore \text{width } 5m$$

$$12 \text{ a) base } (30 - 2x)(12 - 2x) = 208$$

$$\text{b) } 4x^2 - 84x + 360 = 208$$

$$4x^2 - 84x + 152 = 0$$

$$x^2 - 21x + 38 = 0$$

$$(x - 19)(x - 2) = 0$$

$$x = 19$$

$$x = 2$$

(not possible)

2 inches

$$\text{c) } 26 \text{ cm} \times 8 \text{ cm} \times 2 \text{ cm}$$

L W H

13. a) $0.0067v^2 + 0.15v = 42$
 $0.0067v^2 + 0.15v - 42 = 0$

$$v = \frac{-0.15 \pm \sqrt{.15^2 - 4(.0067)(-4)}}{2(.0067)}$$

$v = 68.8$ and negative (discard)

b) sub 75 for 42 95.2 km/h
 c) sub 135 131.2 km/h

14. a) 4.2 million

b) $8 = 0.3t^2 + 0.1t + 4.2$

$0 = 0.3t^2 + 0.1t - 3.8$

or $0 = 3t^2 + t - 38$

$$t = \frac{-1 \pm \sqrt{1 - 4(3)(-38)}}{6}$$

$t = 3.4$ yrs (discard negative)

15 old R = sales \times price

90×275 $x = \$15$ decrease

new R = $(90 + 5x)(275 - 15x)$

$19600 = -75x^2 + 25x + 24750$

$0 = -75x^2 + 25x + 5150$

$0 = -3x^2 + x + 206$

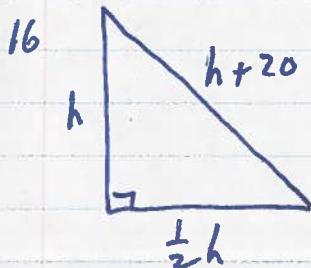
$$x = \frac{-1 \pm \sqrt{1 - 4(-3)(206)}}{-6}$$

$x = -8.1, 8.45$

\downarrow
 B decreases

\therefore price \$155

sales 130 jackets.



$$h^2 + \left(\frac{1}{2}h\right)^2 = (h + 20)^2$$

$$h^2 + \frac{1}{4}h^2 = h^2 + 40h + 400$$

$$\frac{1}{4}h^2 - 40h - 400 = 0$$

$$h^2 - 160h - 1600 = 0$$

$$h = \frac{160 \pm \sqrt{160^2 - 4(1)(-1600)}}{2}$$

~~$h = -9.4$~~

$h = 169.4$ m

17. $2x^2 + bx - 24 = 0$ -8 is a root $\therefore (-8, 0)$

$$2(-8)^2 + b(-8) - 24 = 0$$

$$128 - 8b - 24 = 0$$

$$-8b = -104$$

$$b = 13$$

$$2x^2 + 13x - 24 = 0$$

$$(x+8)(2x-3) = 0$$

$$\begin{array}{l} \uparrow \\ -8 \text{ is a root} \end{array} \quad \downarrow \quad 2x = +3$$

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

18 Surface area (including top + bottom)

$$A = 2\pi rh + 2\pi r^2$$

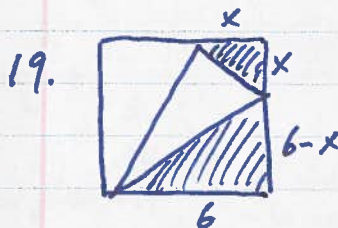
$$100 = 2\pi r(5) + 2\pi r^2$$

$$0 = 2\pi r^2 + 10\pi r - 100$$

$$r = \frac{-10\pi \pm \sqrt{(10\pi)^2 - 4(2\pi)(-100)}}{4\pi}$$

$$r = \frac{-10\pi \pm \sqrt{100\pi^2 + 800\pi}}{4\pi}$$

$$r = 2.2 \text{ cm} \quad (\text{discard negative})$$



Areas equal

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

$$x^2 = 36 - 6x$$

$$x^2 + 6x = 36$$

$$x^2 + 6x + 9 = 45$$

$$(x+3)^2 = 45$$

$$x+3 = \pm\sqrt{45} \quad x = -3 + \sqrt{45} \quad x = -3 + 3\sqrt{5} \text{ m}$$

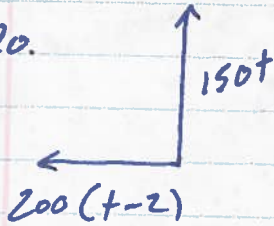
b) square - 3 triangles

$$36 - 3(-3 + 3\sqrt{5})$$

$$36 + 9 - 9\sqrt{5}$$

$$45 - 9\sqrt{5} \text{ m}^2$$

20.



$$(150t)^2 + (200t - 400)^2 = 600^2$$

$$22500t^2 + 40000t^2 - 160000t + 160000 = 360000$$

$$62500t^2 - 160000t - 200000 = 0$$

$$25t^2 - 64t - 80 = 0$$

 $\rightarrow \div 2500$

$$t = \frac{64 \pm \sqrt{(-64)^2 - 4(25)(-80)}}{2(25)}$$

So

$$t = 3.48 \text{ and negative (discard)}$$

3.5 hours.