

YEAR 10 Advanced - Quadratic Equation Test

QUESTION 1

Solve for x:

(leave any non rational answers in surd form)

(a) $6x - x^2 = 0$

(b) $(x - 3)^2 = 16$

(c) $x^3 = 9x$

(d) $3x^2 - 24x = 60$

(e) $5x^2 - 8x + 2 = 0$

(f) $\frac{10}{x} + 1 = x - 2$

- (b) A watch making company with manufacturing plants in Australia and Japan can produce 1000 watches per day. If it costs \$45 to produce a watch in Australia and \$30 in Japan, how many watches can be made in each country to have an average cost of \$34.50 per watch?
- (c) The height of a ball above the ground, thrown vertically upwards is given by:
 $h = 30t - 5t^2$
- (i) Find the time, t, elapsed before the ball reaches a height of 40 metres
- (ii) Find how long before the ball falls back to the ground.
- (iii) Find the maximum height

QUESTION 2

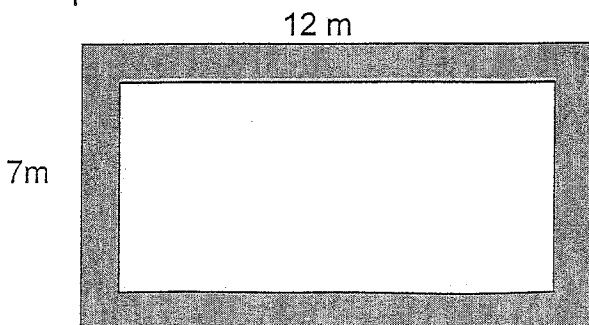
Solve the following by using the "completing the square" method.

(a) $x^2 - 10x = -7$

(b) $2x^2 - 10x + 5 = 0$

QUESTION 3

- (a) A rectangular garden 12m x 7m is surrounded by a path of uniform width. Find the width of the path to the nearest cm (ie 2 d.p.) if the area of the path is 24m^2 .



QUESTION 4

- a) Find the value of k which would give only one solution.
 $2kx^2 + 15x + 20 = 0$
- b) Find the values of k for which $x^2 + 6x + k = 0$ has no solutions.
- c) Write down the quadratic equation whose roots are $\frac{2}{3}$, & $-1\frac{3}{4}$. Your answer should be in general form with no fractions

QUESTION 5

- (a) If $a^4 - a^2b^2 + ab^2 - a^3 = 0$ find the values of a that will satisfy this equation
- (b) By substituting $x^2 + x = v$, find all the solutions to the equation
 $(x^2 + x)^2 - 8(x^2 + x) + 12 = 0$

ANSWERS YR10 - Quads Test.

- Q1. (a) $x=0$ or $x=6$
 (b) $x=7$ or $x=-1$
 (c) $x=3, -3, 0$
 (d) $x=10$ or $x=-2$
 (e) $x = \frac{4+\sqrt{6}}{5}$ or $x = \frac{4-\sqrt{6}}{5}$
 (f) $x=5$ or $x=-2$

Q2.

- (a) $x^2 - 10x + 25 = -7 + 25$
 $(x-5)^2 = 18$
 $x = 5 \pm 3\sqrt{2}$
- (b) $2(x^2 - 5x + \frac{25}{4}) = -5 + \frac{25}{2}$
 $2(x - \frac{5}{2})^2 = \frac{15}{2}$
 $x - \frac{5}{2} = \pm \sqrt{\frac{15}{4}}$
 $x = \frac{5}{2} \pm \frac{\sqrt{15}}{2}$

Q3

- (a) Let width = x
 \therefore Area of path is :-
 $A = 12 \times 7 - (7-2x)(12-2x)$
 $= 84 - \{84 - 38x + 4x^2\}$
 $\therefore 24 = 38x - 4x^2 \quad (\div 2)$
 $\therefore x = \frac{19 \pm \sqrt{265}}{4} = 8.82 \text{ m}^2$
- (b) Let x = no. made in Aust.
 $1000 - x$ = No. made in Japan.
 Aver. Cost = $\frac{45x + (1000-x) \times 30}{1000}$
 $\therefore 34.5 = \frac{15x + 30000}{1000}$
 $\therefore x = 300$ (Aust) $y = 700$ (Japan)
- (c) Solve $40 = 30t - 5t^2 \rightarrow t = 2$ ($t=4$)
 (ii) Solve $0 = 30t - 5t^2 \rightarrow t = 6$ ($t=0$)
 (iii) $h = ?$ when $t = 3 \rightarrow h = 45 \text{ m.}$

Q4

- (a) One solution $\Rightarrow \Delta = 0$
 $\Delta = 225 - 160k = 0$ when $k = \frac{45}{32}$
- (b) No solutions $\Rightarrow \Delta < 0$
 $\Delta = 36 - 4k < 0 \rightarrow k > 9$
- (c) roots are $\frac{2}{3}$ & $-\frac{7}{4}$ then
 factors are $(x - \frac{2}{3}) (x + \frac{7}{4})$
 \therefore quadratic eqnⁿ is:
 $(3x-2)(4x+7) = 0$
 $\therefore 12x^2 + 13x - 14 = 0$

Q5.

- (a) $a^2(a^2 - b^2) + a(b^2 - a^2) = 0$
 $\Rightarrow (a^2 - b^2)(a^2 - a) = 0$
 $\Rightarrow (a-b)(a+b)a(a-1) = 0$
 $\therefore a = 0$ or $a = 1$ or ...
 $a = b$ or $a = -b$
- (b) $(v-6)(v-2) = 0$
 $\therefore v = 2$ or $v = 6$
 $\therefore x^2 + x = 2 \quad x^2 + x = 6$
 $(x+2)(x-1) = 0 \quad (x+3)(x-2) = 0$
 $\therefore x = -2, 1, -3, \text{ or } 2.$