Lesson 6

Conic Sections
GCSE and Preparatory A-Level Mathematics

6.1 Sweating The Q Formula

Last lesson you used the Q formula.
From memory, write it down.

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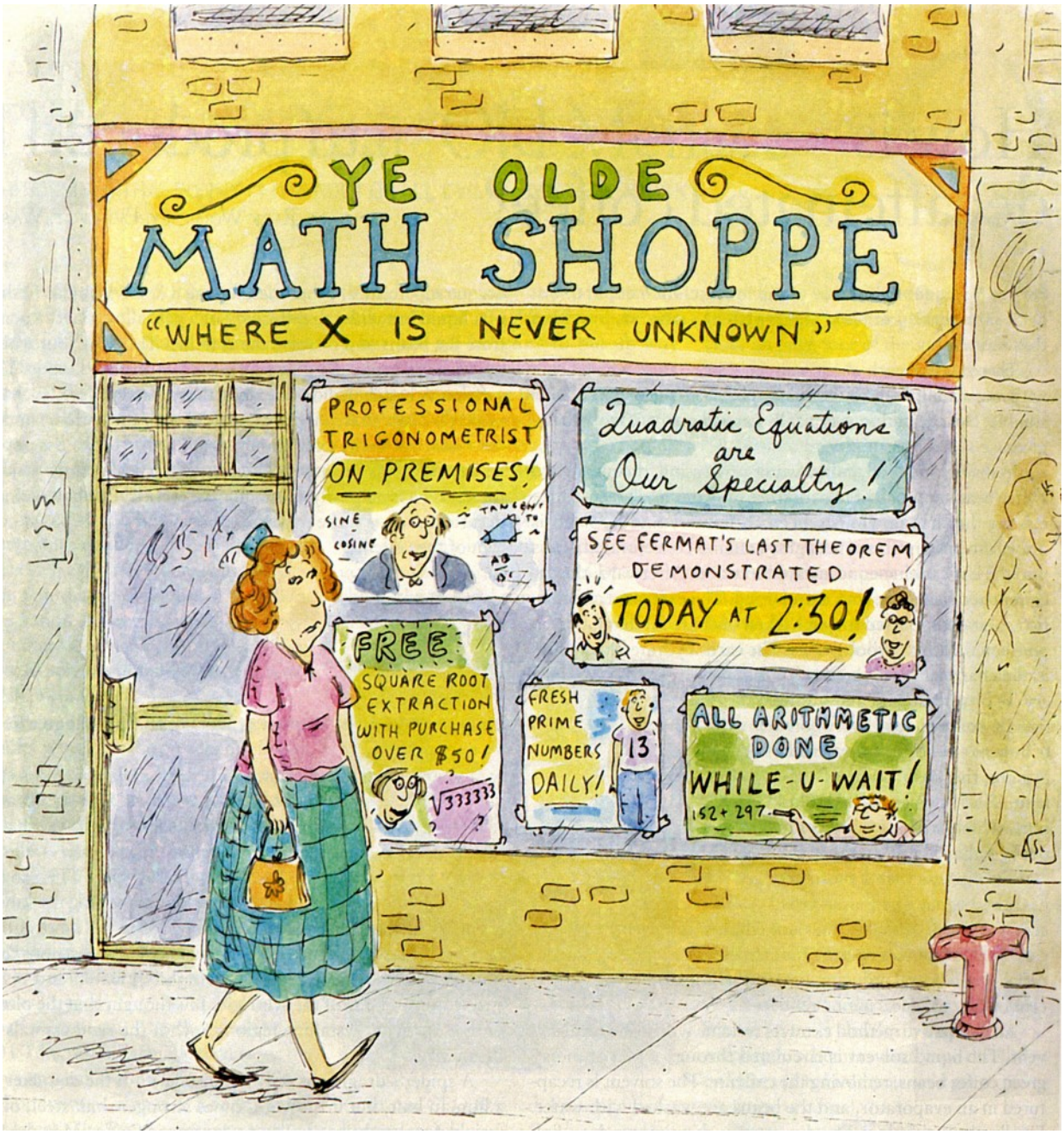


6.2 An Example Where $a \neq 1$

Question

Show how to use the Q formula to solve the equation,

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

Answer

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

with $a = 3$, $b = 6$ and $c = 2$ gives

$$x = \frac{-6 \pm \sqrt{6^2 - 4 \times 3 \times 2}}{2 \times 3}$$

$$= \frac{-6 \pm \sqrt{36 - 24}}{6}$$

$$= \frac{-6 \pm \sqrt{12}}{6}$$

$$= \frac{-6}{6} \pm \frac{\sqrt{4 \times 3}}{6}$$

$$= -1 \pm \frac{2\sqrt{3}}{6}$$

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

Notes

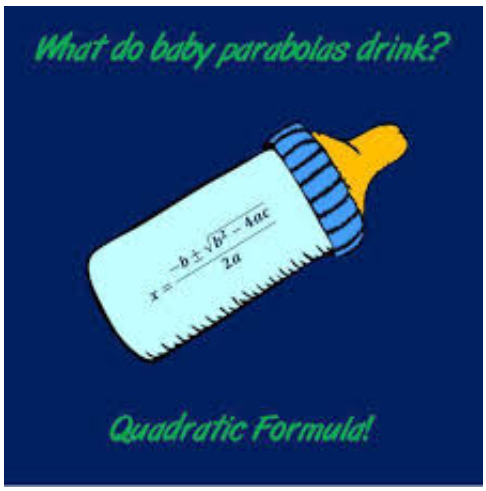
(i) You should begin by writing down the Q formula

(ii) Write down the value of a, of b and of c

(iii) You must show the numbers substituted into the formula.
Mark schemes give zero marks for the whole question if you don't do this.

(iv) Questions often require the exact answer. i.e. With square roots left in.

(v) Or they may ask for the answer to a specified number of significant figures.



6.3 Exercise

Question 1

Show how to use the Q formula to solve the quadratic equation,

$$2x^2 + 8x + 5 = 0$$

and hence that $x = -2 \pm \frac{\sqrt{6}}{2}$ are the two solutions.

Question 2

Show how to use the Q formula to solve the quadratic equation,

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

and hence that $x = -\frac{1}{3} \pm \frac{\sqrt{13}}{3}$ are the two solutions.

Question 3

GCSE Examination Question from May 2018, Paper 1H, Q11(b)

Solve $3x^2 + 6x - 5 = 0$

Show your working clearly.

Give your solutions correct to 3 significant figures.

[3 marks]

Question 4

GCSE Examination Question from June 2011, Paper 4H, Q21(b)

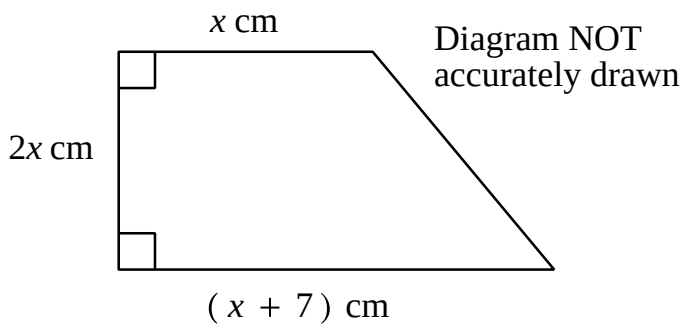
Solve $x^2 + 90x - 1200 = 0$

Give the value of x correct to 3 significant figures.

[3 marks]

Question 5

GCSE Examination Question from January 2015, 4H, Q17



The diagram shows a trapezium.
The trapezium has an area of 17 cm^2

(a) Show that $2x^2 + 7x - 17 = 0$

[3 marks]

(b) Work out the value of x
Give your answer correct to 3 significant figures,
Show your working clearly.

[3 marks]