Q1

The Babylonian's seemed to have solved quadratic equations roughly 3600 years ago, or about 1600BC.

McMillan R D; (1984); *Babylonian Quadratics*; The Mathematics Teacher; 77(1):63-65; https://doi.org/10.5951/MT.77.1.0063

Q2

The wages, days worked, and days to build canals for irrigation and transportation were all reasons for the development of the quadratic equations.

Robertson E F and O'Connor J J; (2000); An overview of Babylonian mathematics; Accessed 16 March 2024

Q3

$x^2 + px = q$, or $x^2 + px - q = 0$

a) $x^2 + 2x = 10; q > 5$

b) $x = \sqrt{(\frac{p}{2})^2 + q} - \frac{p}{2}$

c) $x = \frac{-p \pm \sqrt{p^2 - 4aq}}{2a}$

d) $\sqrt{\frac{2}{3}^2 + 10} - \frac{2}{2} = \sqrt{\frac{94}{9}} - 1 = 2.2317$

e) $x = \frac{-2 \pm \sqrt{2^2 - 4(1)(-10)}}{2(1)}$
-> $\frac{-2 \pm \sqrt{4+40}}{2} = \frac{-2 \pm \sqrt{44}}{2}$
$x^+ = \frac{-2+\sqrt{44}}{2} = 2.316$
$x^- = \frac{-2-\sqrt{44}}{2} = -4.316$

f) The Babylonian solution gave a decent approximation of the quadratic formula solution, being off by approximately 0.085. The Babylonian solution did not include the a value that the quadratic does, but that did not have an effect in the equation anyway.
Interestingly enough, we subtract $\frac{b}{2}$ from the $\sqrt{}$ and they do too. A big difference is the lack of the $\pm$ symbol, meaning they would never arrive at two solutions given the one equation like we do. We also divide the majority of the equation by $2a$ while they do not, instead placing variables inside fractions. In addition, the divisions are calculated before the square root. A last note is that there is an exponent within the square root function in the Babylonian whereas none are present in the quadratic formula.

g) They may not have known any other way to solve the quadratic, or if they did, their method is relatively precise for the work that they would need in ancient times and therefore not need another method of calculation. Furthermore, their method involves large amounts of seemingly excess calculations to arrive at the approximation, so perhaps they could not find another way in amongst all the equation clutter.

Q4

Solve $2x^2+3x-10$ using the Babylonian method.

$2x^2+3x-10$ into $u^2+bu=ac$
-> $x^2+3x-10+10=2\times 10$
-> $x^2+3x=2(10)$
-> $x^2+3x=20$

$x=\sqrt{(\frac{p}{2})^2+q}-\frac{p}{2}$

$x=\sqrt{(\frac{3}{2})^2+20}-\frac{3}{2}$
-> $x=\frac{\sqrt{89}}{2}-\frac{3}{2}=3.2169$