F Michaelmas Trial Practice 2

1. Calculate $\dfrac{0.00014}{0.0000007}$. $\boxed{200}$

2. By rounding every component of the calculation to 1 significant figure, estimate the value of $\dfrac{4.967 + \sqrt{125.345}}{0.16754}$. $\boxed{75}$

3. Solve the simultaneous equations $\begin{matrix} ax + y = 1 \\ x - y = b \end{matrix}$, giving your answers as single fractions.

$\boxed{(x, y) = \left(\frac{b+1}{a+1}, \frac{1-ab}{a+1}\right)}$

4. Expand and simplify fully:

   (a) $(4x - y)^3$. $\boxed{64x^3 - 48x^2y + 12xy^2 - y^3}$

   (b) $(x - 3)^2 - (x - 2)(x + 3)$. $\boxed{15 - 7x}$

   (c) $\left(2x - \dfrac{2}{x}\right)\left(x + \dfrac{1}{2x}\right)$. $\boxed{2x^2 - 1 - \frac{1}{x^2}}$

5. Solve for x:

   (a) $\dfrac{4 - ax}{bx - 3} = k$. $\boxed{x = \frac{4+3k}{a+bk}}$

   (b) $x - 2 = \dfrac{3 - 2x}{3} - \dfrac{2x - 3}{4}$. $\boxed{x = \frac{45}{26}}$

   (c) $5^x = \dfrac{25^{2x-3}}{125^{3x-1}}$. $\boxed{x = -\frac{1}{2}}$

   (d) $2 \times \dfrac{4^{ax}}{8^{x-1}} = 2^{1-bx}$. $\boxed{x = \frac{3}{3-b-2a}}$

6. Solve the following inequalities:

   (a) $\frac{x-3}{-2} + 7 < 2(x - 3)$. $\boxed{x > \frac{29}{5}}$

   (b) $-7 < 2x + 5 \leqslant 13$. $\boxed{-6 < x \leqslant 4}$

   (c) $\dfrac{2x - 3}{4} < \dfrac{x}{-5} + 1 \leqslant \dfrac{7x - 3}{2}$. $\boxed{\frac{25}{37} \leqslant x < \frac{5}{2}}$

7. Simplify fully:

   (a) $\dfrac{a^2 \times a^{-5}}{a^{-20}}$. $\boxed{a^{17}}$

   (b) $\dfrac{(3xy^3)^2 \times (2x^4y^{-11})^3}{(6x^{-1}y^{-2})^2}$. $\boxed{\frac{2x^{16}}{y^{23}}}$

   (c) $\dfrac{10x - 5}{7 - 14x}$. $\boxed{-\frac{5}{7}}$

8. A dog eats $\frac{3}{7}$ of a can of dog food every day. How long does it take the dog to eat 39 cans? $\boxed{91 \text{ days}}$

9. There are an equal number of orange and green fish in a tank. Two of the green fish die and are removed. $\frac{8}{17}$ are now green. How many fish were there in the tank to begin with?

$\boxed{36 \text{ fish}}$

10. Draw a Venn diagram with three sets A, B and C overlapping in the usual way. Shade the region $(A' \cap B) \cup (B \cap C')$.

11. Prove that the opposite angles in a cyclic quadrilateral sum to $180°$.

12. The angles in a pentagon are $x°$, $2x°$, $(x + 10)°$, $160°$ and $90°$. Find the largest angle in the pentagon.

$\boxed{160°}$

13. If a fishermen can catch b fish in c days, how long does it take b fishermen to catch c fish?

$\boxed{\frac{ac^2}{b^2}}$