① (a) $6a^2b - 15ab^2$

(b) $12p^2 - 18p - 10p + 15$

$12p^2 - 28p + 15$

(c) $x^3 - 7x^2 + 9x + 5x^2 - 35x + 45$

$x^3 - 2x^2 - 26x + 45$

② $V(cylinder) = \pi r^2 h$

$= \pi \times 7.5^2 \times 30$

$= 5301.44$

$V(cone) = \frac{1}{3}\pi r^2 h$

$= \frac{1}{3} \times \pi \times 7.5^2 \times 30$

$= 1767.15$

$V(Glass) = 5301.44 - 1767.15$

$= 3534.29 \ cm^3$

③ (a) $6ac(2a + 3b)$

(b) $(7x + 2y)(7x - 2y)$

(c) $(8p + 5)(2p - 3)$

④ $Angle = \frac{Area}{\pi r^2} \times 360$

$= \frac{96}{\pi \times 10^2} \times 360$

$= 110°$

⑤ (a) $\dfrac{(2a+11)(2a-11)}{(2a-11)(a+4)}$

$\dfrac{2a+11}{a+4}$

(b) $\dfrac{3x}{2a^2} \times \dfrac{a}{6x}$

$\dfrac{{}^{1}\cancel{3}\cancel{a}x}{{}_{4}\cancel{12}a^2\cancel{x}}$

$\dfrac{1}{4a}$

⑥ $x^{\frac{18}{2}} + 3^{\frac{1}{2}} x^{6/2}$

$x^9 + \sqrt{3}\,x^3$

⑧ $(x+3)^2 - 9 + 10$

$(x+3)^2 + 1$

⑨ $3.2 \times 10^7 \times 24 \times 300$

$= 2.304 \times 10^{11}$ km

⑩ $\dfrac{7}{\sqrt{2}} \times \dfrac{\sqrt{2}}{\sqrt{2}}$

$\dfrac{7\sqrt{2}}{2}$

⑦ $P = \dfrac{4}{5x^2} + \dfrac{4}{5x^2} + \dfrac{2}{3x} + \dfrac{2}{3x}$

$= \dfrac{8}{5x^2} + \dfrac{4}{3x}$

$= \dfrac{24x}{15x^3} + \dfrac{20x^2}{15x^3}$

$= \dfrac{20x^2 + 24x}{15x^3}$

$= \dfrac{20x + 24}{15x^2}$

① (a) $3(x^2 + 4x - 21)$ (b) $(3c + 2)(c - 3)$

$3(x - 3)(x + 7)$

② Area $= \frac{230}{360} \times \pi \times 24^2 = 1156.11 \text{ cm}^2$

③ (a) $24x - 30 + 6x + 9$ (b) $2x^3 - 10x^2 - 4x^2 + 8$

$= 30x - 21$ $= 2x^3 - 14x^2 + 8$

④ V(cylinder) $= \pi r^2 h$ V(sphere) $= \frac{4}{3} \pi r^3$

$= \pi \times 15^2 \times 55$ $= \frac{4}{3} \times \pi \times 15^3$

$= 38877.21$ $= 14137.17$

V(Hemisphere) $= \frac{1}{2} \times 14137.17$

$= 7068.59$

V(Bin) $= 38\,877.21 + 7068.59$

$= 49\,945.8$

$= 49.9458 \text{ L}$

$= 50 \text{ L (nearest litre)}$

⑤ $\dfrac{(x - 4)(x + 1)}{(1 + x)(1 - x)}$ ⑥ $6\sqrt{2} - \sqrt{25}\sqrt{2} + \sqrt{3}$

$= 6\sqrt{2} - 5\sqrt{2} + \sqrt{3}$

$= \dfrac{x - 4}{1 - x}$ $= \sqrt{2} + \sqrt{3}$

$\boxed{7}$ $\quad \dfrac{a}{3x} \times \dfrac{x^2}{5}$

$\dfrac{ax^2}{15x}$

$\dfrac{ax}{15}$

$\boxed{8}$ $\quad \dfrac{12x^{\frac{11}{2}}}{2x^{-2}}$

$6x^{\frac{15}{2}}$

$\begin{array}{|c|}
\hline
4 + \frac{3}{2} \\
= \frac{8}{2} + \frac{3}{2} \\
= \frac{11}{2} \\
\hline
\frac{11}{2} - (-2) \\
\frac{11}{2} + 2 \\
\frac{11}{2} + \frac{4}{2} \\
\frac{15}{2} \\
\hline
\end{array}$

$\boxed{9}$ $\quad P = 2(l + b)$

$= 2\left(\dfrac{1}{x^2} + \dfrac{5x}{4}\right)$

$= 2\left(\dfrac{4}{4x^2} + \dfrac{5x^3}{4x^2}\right)$

$= 2\left(\dfrac{4 + 5x^3}{4x^2}\right)$

$= \dfrac{8 + 10x^3}{4x^2}$

$\boxed{10}$ $\quad \left(x + \dfrac{7}{2}\right)^2 - \dfrac{49}{4} + 12$

$\left(x + \dfrac{7}{2}\right)^2 - \dfrac{49}{4} + \dfrac{48}{4}$

$\left(x + \dfrac{7}{2}\right)^2 - \dfrac{1}{4}$

$\underline{\underline{OR}}$ - - - - - - - - - - -

$(x + 3.5)^2 - 12.25 + 12$

$(x + 3.5)^2 - 0.25$

$\boxed{11}$ $\quad 5.39 \times 10^{13} \div 31$

$= 1.738709677 \times 10^{12}$

$= 1.74 \times 10^{12} \quad (3\ sf)$

$\boxed{12}$ $\quad = \dfrac{6}{2 - \sqrt{3}} \times \dfrac{2 + \sqrt{3}}{2 + \sqrt{3}}$

$= \dfrac{12 + 6\sqrt{3}}{(2 - \sqrt{3})(2 + \sqrt{3})}$

$= \dfrac{12 + 6\sqrt{3}}{4 + 2\sqrt{3} - 2\sqrt{3} - 3}$

$= \dfrac{12 + 6\sqrt{3}}{1}$

$= 12 + 6\sqrt{3}$

① $5\frac{2}{3} \times \frac{9}{x}$

$\frac{17}{3} \times \frac{9}{x}^{3}$

$\frac{51}{x}$

② (a) $pc + 2p^2c^4$

(b) $3y^2 + 6y - y - 2$

$3y^2 + 5y - 2$

(c) $2x^3 - 2x^2 + 2x - 3x^2 + 3x - 3$

$2x^3 - 5x^2 + 5x - 3$

③ (a) $x^2 = 18^2 - 16^2$

$= 68$

$x = \sqrt{68}$

$= 8.246211\ldots$

$= 8.25$ cm (3 sf)

(b) $A = \frac{220}{360} \times \pi \times 8.25^2$

$= 130.67$ cm^2

$A = \frac{1}{2}bh$

$= \frac{1}{2} \times 16 \times 8.25$

$= 66$ cm^2

Total A $= 196.67$ cm^2

④ (a) $(p - 4)(p + 7)$ (b) $h(h^2 - 4e^2)$ (c) $(3x - 4)(x - 3)$

$h(h + 2e)(h - 2e)$

⑤ V(cone) $= \frac{1}{3}\pi r^2 h$

$= \frac{1}{3} \times \pi \times 3^2 \times 7$

$= 65.97$

V(sphere) $= \frac{4}{3}\pi r^3$

$= \frac{4}{3} \times \pi \times 3^3$

$= 113.10$

V(Hemisphere) $= 113.10 \div 2$

$= 56.55$

Total V $= 65.97 + 56.55$

$= 122.52 = 122.5$ cm^3 (1 dp)

⑥ ⓐ $\dfrac{2(a^2-4)}{(a-2)(a-6)}$

$\dfrac{2(a+2)\cancel{(a-2)}}{\cancel{(a-2)}(a-6)}$

$\dfrac{2(a+2)}{a-6}$

ⓑ $\dfrac{2x}{y^2} \times \dfrac{y^3}{4x}$

$\dfrac{2x\,y^3}{4x\,y^2}$

$\dfrac{y}{2}$

⑦ $A = l \times b$

$2(\sqrt{6}+\sqrt{3}) = l \times \sqrt{6}$

$2\sqrt{6} + 2\sqrt{3} = l \times \sqrt{6}$

$\dfrac{2\sqrt{6}+2\sqrt{3}}{\sqrt{6}} = l$

$\dfrac{2\sqrt{6}}{\sqrt{6}} + \dfrac{2\sqrt{3}}{\sqrt{6}} = l$

$2 + \dfrac{2\sqrt{3}}{\sqrt{2}\sqrt{3}} = l$

$2 + \dfrac{2}{\sqrt{2}} = l$

$2 + \dfrac{2\sqrt{2}}{2} = l$

$2 + \sqrt{2} = l$

$l = 2 + \sqrt{2}$

⑧ $x^{4/2} \times 4^{\frac{1}{2}} x^{\frac{1}{2}}$

$x^2 \times \sqrt{4}\, x^{\frac{1}{2}}$

$x^2 \times 2x^{\frac{1}{2}}$

$2x^{5/2}$

$2+\frac{1}{2}$

$\frac{4}{2}+\frac{1}{2}$

$\frac{5}{2}$

⑨ $\left(x-\dfrac{3}{2}\right)^2 - \dfrac{9}{4} + 1$

$\left(x-\dfrac{3}{2}\right)^2 - \dfrac{5}{4}$

OR $(x-1.5)^2 - 1.25$

⑩ $5.34 \times 10^{24} \times 30$

$= 1.602 \times 10^{26}$

$= 1.60 \times 10^{26}$ (3 sf)

⑪ $\dfrac{2}{3+\sqrt{7}} \times \dfrac{3-\sqrt{7}}{3-\sqrt{7}}$

$\dfrac{6-2\sqrt{7}}{(3+\sqrt{7})(3-\sqrt{7})}$

$\dfrac{6-2\sqrt{7}}{9-3\sqrt{7}+3\sqrt{7}-7} = \dfrac{6-2\sqrt{7}}{2}$

$= \underline{\underline{3-\sqrt{7}}}$