Exercise 6A

1. (a) $\dfrac{\cancel{4}\,\cancel{x^4}}{\cancel{12}\,\cancel{x^5}\,y} = \dfrac{1}{3xy}$

(b) $\dfrac{\cancel{16}\,\cancel{a^3}\,\cancel{b^4}}{\cancel{24}\,\cancel{a^5}\,\cancel{b^2}} = \dfrac{2b^2}{3a^2}$

(c) $\dfrac{\cancel{23}\,\cancel{q^3}\,\cancel{r}}{\cancel{69}\,\cancel{q}\,\cancel{r^3}\,s} = \dfrac{q^2}{3r^2 s}$

(d) $\dfrac{\cancel{3}\,\cancel{m}\,\cancel{n^2}\,\cancel{p^3}}{\cancel{18}\,\cancel{m^3}\,\cancel{n}\,\cancel{p^6}} = \dfrac{n}{6m^2 p^3}$

(e) $\dfrac{\cancel{15}\,\cancel{a}\,\cancel{c^3}}{\cancel{75}\,\cancel{a^2}\,b^4\,\cancel{c}} = \dfrac{c^2}{5ab^4}$

(f) $\dfrac{\cancel{16}\,\cancel{x}\,\cancel{y^3}\,\cancel{z}}{\cancel{64}\,\cancel{x^2}\,\cancel{y^4}\,\cancel{z^3}} = \dfrac{1}{4xyz^2}$

2. (a) $\dfrac{xy + 3y}{4x + 12} = \dfrac{y\,\cancel{(x + 3)}}{4\,\cancel{(x + 3)}}$

$= \dfrac{y}{4}$

(b) $\dfrac{8a + 4b}{bc + 2ac} = \dfrac{4(2a + b)}{c(b + 2a)}$

$= \dfrac{4\,\cancel{(2a + b)}}{c\,\cancel{(2a + b)}}$

$= \dfrac{4}{c}$

(c) $\dfrac{a^2 + 2ab}{6a} = \dfrac{\cancel{a}(a + 2b)}{6\cancel{a}}$

$= \dfrac{a + 2b}{6}$

(d) $\dfrac{c^2}{c^2 - cd} = \dfrac{\cancel{c^2}}{\cancel{c}(c - d)}$

$= \dfrac{c}{c - d}$

(e) $\dfrac{(m - n)^2}{m^2 - mn} = \dfrac{\cancel{(m - n)^2}}{m\,\cancel{(m - n)}}$

$= \dfrac{m - n}{m}$

Q#2

(f) $\frac{5pq}{15p-10pq} = \frac{\cancel{5}\,\cancel{p}\,q}{\cancel{5}\,\cancel{p}(3-2q)}$

$= \frac{q}{3-2q}$

3. (a) $\frac{2a+b}{4a^2-b^2} = \frac{\cancel{2a+b}}{\cancel{(2a+b)}(2a-b)}$

$= \frac{1}{2a-b}$

(b) $\frac{c^2+2cd-15d^2}{4c^2+20cd} = \frac{(c-3d)\cancel{(c+5d)}}{4c\cancel{(c+5d)}}$

$= \frac{c-3d}{4c}$

(c) $\frac{3a-6}{a^2+a-6} = \frac{3\cancel{(a-2)}}{\cancel{(a-2)}(a+3)}$

$= \frac{3}{a+3}$

(d) $\frac{x^2+6x-7}{x^2-x} = \frac{\cancel{(x-1)}(x+7)}{x\cancel{(x-1)}}$

$= \frac{x+7}{x}$

(e) $\frac{k^2-9}{k^2-7k+12} = \frac{(k+3)\cancel{(k-3)}}{\cancel{(k-3)}(k-4)}$

$= \frac{k+3}{k-4}$

(f) $\frac{mk+8k}{m^2+4m-32} = \frac{k\cancel{(m+8)}}{(m-4)\cancel{(m+8)}}$

$= \frac{k}{m-4}$

4. (a) $\frac{15a^2}{8ab^3c} \times \frac{4c}{5ab} = \frac{{}^{3}\cancel{60}\,\cancel{a^2}\,\cancel{c}}{{}_{2}\cancel{40}\,\cancel{a^2}\,b^4\,\cancel{c}}$

$= \frac{3}{2b^4}$

(b) $\frac{3(c+d)}{c-d} \times \frac{2c-2d}{8c+8d} = \frac{3\cancel{(c+d)}}{\cancel{c-d}} \times \frac{\cancel{2}\cancel{(c-d)}}{\underset{4}{\cancel{8}}\cancel{(c+d)}}$

$= \frac{3}{4}$

(c) $\frac{a-2b}{16} \div \frac{4a-8b}{24} = \frac{a-2b}{16} \times \frac{24}{4a-8b}$

$= \frac{a-2b}{16} \times \frac{24}{4(a-2b)}$

$= \frac{{}^{3}\cancel{24}\,\cancel{(a-2b)}}{{}_{8}\cancel{64}\,\cancel{(a-2b)}}$

$= \frac{3}{8}$

(d) $\frac{8c^3}{6(c+d)} \div \frac{2c^2}{3c+3d} = \frac{8c^3}{6(c+d)} \times \frac{3c+3d}{2c^2}$

$= \frac{8c^3}{6(c+d)} \times \frac{3(c+d)}{2c^2}$

$= \frac{{}^{2}\cancel{24}\,\overset{c}{\cancel{c^3}}\,\cancel{(c+d)}}{\cancel{12}\,\cancel{c^2}\,\cancel{(c+d)}}$

$= 2c$

5. **(a)** $$\frac{\cancel{9}\,\cancel{x}\,\cancel{(a-b)^2}}{\underset{3}{\cancel{27}}\,\underset{x^2}{\cancel{x^3}}\,\underset{(a-b)}{\cancel{(a-b)^3}}} = \frac{1}{3x^2(a-b)}$$

(b) $$\frac{7\,\overset{a}{\cancel{a^3}}\,\overset{(a-3b)^2}{\cancel{(a-3b)^4}}}{\underset{3}{\cancel{21}}\,\cancel{a^2}\,b\,\cancel{(a-3b)^2}} = \frac{a(a-3b)^2}{3b}$$

(c) $$\frac{8ab^3(2a+3b)^2}{32a^2b(3b+2a)} = \frac{\cancel{8}\,\cancel{a}\,\overset{b^2}{\cancel{b^3}}\,\overset{(2a+3b)}{\cancel{(2a+3b)^2}}}{{}_4\cancel{32}\,\underset{a}{\cancel{a^2}}\,\cancel{b}\,\cancel{(2a+3b)}}$$

$$= \frac{b^2(2a+3b)}{4a}$$

(d) $$\frac{8an^3(b+c)}{96a^2n(c+b)^2} = \frac{\cancel{8}\,\cancel{a}\,\overset{n^2}{\cancel{n^3}}\,\cancel{(b+c)}}{{}_{12}\cancel{96}\,\underset{a}{\cancel{a^2}}\,\cancel{n}\,\underset{(b+c)}{\cancel{(b+c)^2}}}$$

$$= \frac{n^2}{12a(b+c)}$$

(e) $$\frac{y^2-2y-15}{y^2-3y-10} = \frac{\cancel{(y-5)}(y+3)}{\cancel{(y-5)}(y+2)}$$

$$= \frac{y+3}{y+2}$$

(f) $$\frac{8-2m-m^2}{2m^2-3m-2} = \frac{-(m^2+2m-8)}{2m^2-3m-2}$$

$$= \frac{-\cancel{(m-2)}(m+4)}{(2m+1)\cancel{(m-2)}}$$

$$= \frac{-(m+4)}{2m+1}$$

$$= \frac{-m-4}{2m+1}$$

(g) $$\frac{9x^2-y^2}{y^2-2xy-3x^2} = \frac{(3x+y)(3x-y)}{(y-3x)(y+x)}$$

$$= \frac{-(y+3x)\cancel{(y-3x)}}{\cancel{(y-3x)}(y+x)}$$

$$= \frac{-(y+3x)}{y+x}$$

(h) $$\frac{3x^2+5xy-2y^2}{4x^2+7xy-2y^2} = \frac{(3x-y)\cancel{(x+2y)}}{(4x-y)\cancel{(x+2y)}}$$

$$= \frac{3x-y}{4x-y}$$

(i) $$\frac{b^2-a^2}{2a^2+ab-3b^2} = \frac{(b+a)(b-a)}{(2a+3b)(a-b)}$$

$$= \frac{-(a+b)\cancel{(a-b)}}{(2a+3b)\cancel{(a-b)}}$$

$$= \frac{-(a+b)}{2a+3b}$$

$$= \frac{-a-b}{2a+3b}$$

(j) $$\frac{y^2-6y-7}{2y^2-17y+21} = \frac{(y+1)\cancel{(y-7)}}{(2y-3)\cancel{(y-7)}}$$

$$= \frac{y+1}{2y-3}$$

Q#5 **(k)** $\frac{3x-3y}{ax-ay-x+y} = \frac{3(x-y)}{a(x-y)-(x-y)}$

$= \frac{3\,\cancel{(x-y)}}{\cancel{(x-y)}\,(a-1)}$

$= \frac{3}{a-1}$

(l) $\frac{a^2-ab-ac+bc}{a^2+ab-ac-bc} = \frac{a(a-b)-c(a-b)}{a(a+b)-c(a+b)}$

$= \frac{(a-b)\,\cancel{(a-c)}}{(a+b)\,\cancel{(a-c)}}$

$= \frac{a-b}{a+b}$

(m) $\frac{a^2+am-an-mn}{a^2+am+an+mn} = \frac{a(a+m)-n(a+m)}{a(a+m)+n(a+m)}$

$= \frac{\cancel{(a+m)}\,(a-n)}{\cancel{(a+m)}\,(a+n)}$

$= \frac{a-n}{a+n}$

6. **(a)** $\frac{5a}{9b} \times \frac{ac^2}{2b} \times \frac{c^3}{8b^4} = \frac{5a^2c^5}{144b^6}$

(b) $\frac{6df}{9f^3} \times \frac{3f}{16d^2} \div \frac{8d^3f^2}{27d} = \frac{6df}{9f^3} \times \frac{3f}{16d^2} \times \frac{27d}{8d^3f^2}$

$= \frac{\overset{27}{\cancel{486}}\ \cancel{d^2}\ \cancel{f^2}}{\underset{64}{\cancel{1152}}\ \underset{d^3}{\cancel{d^5}}\ \underset{f^3}{\cancel{f^5}}}$

$= \frac{27}{64d^3f^3}$

(c) $2y \div \frac{4y}{5xy} \times \frac{64xy}{100x^3y^4} = 2y \times \frac{5xy}{4y} \times \frac{64xy}{100x^3y^4}$

$= \frac{\overset{8}{\cancel{640}}\ \cancel{x^2}\ \cancel{y^2}}{\underset{5}{\cancel{400}}\ \underset{x}{\cancel{x^3}}\ \underset{y^2}{\cancel{y^5}}}$

$= \frac{8}{5xy^2}$

(d) $\frac{3ps}{4pqr} \div \frac{3pq^2}{12p^3q} \times \frac{14s^3}{7qr} = \frac{3ps}{4pqr} \times \frac{12p^3q}{3pq^2} \times \frac{14s^3}{7qr}$

$= \frac{\overset{6}{\cancel{504}}\ \overset{p^2}{\cancel{p^4}}\ \cancel{q}\ s^4}{\cancel{84}\ \cancel{p^2}\ \underset{q^2}{\cancel{q^3}}\ r^2}$

$= \frac{6p^2s^4}{q^2r^2}$

Q#6

(e) $\frac{3w-7}{5w^3} \div \frac{21-9w}{27w} = \frac{3w-7}{5w^3} \times \frac{27w}{21-9w}$

$= \frac{3w-7}{5w^3} \times \frac{27w}{-3(3w-7)}$

$= \frac{\overset{9}{\cancel{27}}\, \cancel{w}\, \cancel{(3w-7)}}{\underset{-5}{\cancel{-15}}\, \underset{w^2}{\cancel{w^3}}\, \cancel{(3w-7)}}$

$= -\frac{9}{5w^2}$

(f) $\frac{6x^2y}{16y-8x} \times \frac{12x-24y}{4xy^2} = \frac{6x^2y}{8(2y-x)} \times \frac{12(x-2y)}{4xy^2}$

$= \frac{6x^2y}{-8(x-2y)} \times \frac{12(x-2y)}{4xy^2}$

$= \frac{\overset{9}{\cancel{72}}\, \overset{x}{\cancel{x^2}}\, \cancel{y}\, \cancel{(x-2y)}}{\underset{-4}{\cancel{-32}}\, \cancel{x}\, \underset{y}{\cancel{y^2}}\, \cancel{(x-2y)}}$

$= -\frac{9x}{4y}$

(g) $\frac{h^2-h-6}{h^2-9} \times \frac{h^2}{h^2+2h} = \frac{\cancel{(h-3)}\, \cancel{(h+2)}}{(h+3)\, \cancel{(h-3)}} \times \frac{\overset{h}{\cancel{h^2}}}{\cancel{h}\, \cancel{(h+2)}}$

$= \frac{h}{h+3}$

(h) $\frac{c^2-d^2}{c^2-2cd+d^2} \div \frac{1}{cd+d^2} = \frac{c^2-d^2}{c^2-2cd+d^2} \times cd+d^2$

$= \frac{(c+d)\, \cancel{(c-d)}}{\underset{(c-d)}{\cancel{(c-d)^2}}} \times d(c+d)$

$= \frac{d(c+d)^2}{c-d}$

(i) $\frac{m^2-4}{m^2-3m+2} \div \frac{m}{m-1} = \frac{m^2-4}{m^2-3m+2} \times \frac{m-1}{m}$

$= \frac{(m+2)\, \cancel{(m-2)}}{\cancel{(m-1)}\, \cancel{(m-2)}} \times \frac{\cancel{m-1}}{m}$

$= \frac{m+2}{m}$

(j) $\frac{z^2}{z^2-4} \div \frac{3z-z^2}{z^2-5z+6} = \frac{z^2}{z^2-4} \times \frac{z^2-5z+6}{3z-z^2}$

$= \frac{\overset{z}{\cancel{z^2}}}{(z+2)\, \cancel{(z-2)}} \times \frac{\cancel{(z-2)}\, \cancel{(z-3)}}{{}_{-1}\cancel{z}\, \cancel{(z-3)}}$

$= -\frac{z}{z+2}$

(k) $a^2-4b^2 \div \frac{a^2+2ab}{ab} = a^2-4b^2 \times \frac{ab}{a^2+2ab}$

$= \cancel{(a+2b)}(a-2b) \times \frac{\cancel{a}b}{\cancel{a}\, \cancel{(a+2b)}}$

$= b(a-2b)$

(l) $\frac{y^2-4y+4}{2-6y} \times \frac{2y+4}{3y^2-12} = \frac{(y-2)^2}{2(1-3y)} \times \frac{2(y+2)}{3(y^2-4)}$

$= \frac{\overset{(y-2)}{\cancel{(y-2)^2}}}{\cancel{2}(1-3y)} \times \frac{\cancel{2}\, \cancel{(y+2)}}{3\, \cancel{(y+2)}\, \cancel{(y-2)}}$

$= \frac{y-2}{3(1-3y)}$

7. $\frac{x^2+y^2-z^2+2xy}{x^2-y^2-z^2-2yz} = \frac{(x^2+2xy+y^2)-z^2}{x^2-(y^2+2yz+z^2)}$

$= \frac{(x+y)^2-z^2}{x^2-(y+z)^2}$

$= \frac{[(x+y)+z][(x+y)-z]}{[x+(y+z)][x-(y+z)]}$

$= \frac{\cancel{(x+y+z)}\,(x+y-z)}{\cancel{(x+y+z)}\,(x-y-z)}$

$= \frac{x+y-z}{x-y-z}$