**19** Write as a single fraction in its simplest form.

**(a)** $\frac{5a}{6} \times \frac{3b}{a}$

$\frac{5a}{2\cancel{6}} \times \frac{\overset{1}{\cancel{3}b}}{\cancel{a}} = \frac{5b}{2}$

$\frac{5b}{2}$ [2]

**10** Simplify.

$\frac{p}{2q} \times \frac{4pq}{t}$

$\frac{p}{\overset{1}{\cancel{2}}\cancel{q}} \times \frac{\overset{2}{\cancel{4}}\cancel{pq}}{t} = \frac{2p^2}{t}$

$\frac{2p^2}{t}$ [2]

**3** Simplify fully.

$\frac{5x}{12} \times \frac{4}{15x}$

$\frac{5\cancel{x}}{3\cancel{12}} \times \frac{\overset{1}{\cancel{4}}}{15\cancel{x}} = \frac{5}{45}$

$= \frac{1}{9}$

$\frac{1}{9}$ [2]

**(b)** Simplify $\frac{a}{x} \div \frac{b}{2y}$.

Give your answer as a single fraction.

$\frac{a}{x} \times \frac{2y}{b} = \frac{2ay}{bx}$

$\frac{2ay}{bx}$ [1]

**15** Simplify.

$\frac{x-4}{x^2-16}$

$$\frac{x-4}{(x+4)(x-4)} \quad \begin{matrix} \div(x-4) \\ \div(x-4) \end{matrix}$$

$$= \frac{1}{x+4}$$

$\frac{1}{x+4}$ [2]

**(b)** Simplify.

$\frac{x-5}{x^2-25}$

$$\frac{x-5}{(x+5)(x-5)} \quad \begin{matrix} \div(x-5) \\ \div(x-5) \end{matrix}$$

$$= \frac{1}{x+5}$$

$\frac{1}{x+5}$ [2]

**23** Simplify.

$\frac{2x^2+10x}{x^2-25}$

$$\frac{2x(x+5)}{(x+5)(x-5)} \quad \begin{matrix} \div(x+5) \\ \div(x+5) \end{matrix}$$

$$= \frac{2x}{x-5}$$

$\frac{2x}{x-5}$ [3]

**19** Simplify.

$\frac{7x-x^2}{49-x^2}$

$$\frac{x(7-x)}{(7+x)(7-x)}$$

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

$\frac{x}{7+x}$ [3]

**22** Simplify.

$\frac{5x-x^2}{25-x^2}$

$$\frac{x(5-x)}{(5+x)(5-x)}$$

$$= \frac{x}{5+x}$$

$\frac{x}{5+x}$ [3]

**16** Simplify $\frac{x^2y-3xy}{x^2-2x-3}$.

$$\frac{xy(x-3)}{(x-3)(x+1)}$$

$$= \frac{xy}{x+1}$$

$\frac{xy}{x+1}$ [3]

**22** Simplify.

$\frac{x^2-5x}{2x^2-50}$

$\frac{x(x-5)}{2(x^2-25)}$

$= \frac{x(x-5)}{2(x+5)(x-5)}$

$= \frac{x}{2(x+5)}$

$\frac{x}{2(x+5)}$ ..... [4]

**21** Simplify.

$\frac{5p^2-20p}{2p^2-32}$ $\frac{5p(p-4)}{2(p^2-16)}$

$= \frac{5p(p-4)}{2(p+4)(p-4)}$

$= \frac{5p}{2(p+4)}$

$\frac{5p}{2(p+4)}$ ..... [3]

**20** Write as a single fraction in its simplest form.

**(a)** $\frac{10x^2-60x}{x^2-x-30}$ $\frac{10x(x-6)}{(x-6)(x+5)}$

$= \frac{10x}{x+5}$

$\frac{10x}{x+5}$ ..... [3]

**7** **(a)** Simplify.

$\frac{x^2-25}{x^2-x-20}$ $\frac{(x+5)(x-5)}{(x-5)(x+4)}$

$= \frac{x+5}{x+4}$

$\frac{x+5}{x+4}$ ..... [3]

**24** Simplify.

$$\frac{x^2-25}{x^2-17x+60}$$

$$\frac{(x+5)(x-5)}{(x-12)(x-5)}$$

$$= \frac{x+5}{x-12}$$

$\frac{x+5}{x-12}$ [4]

**18** Simplify.

$$\frac{w^2-9}{2w^2+5w-3}$$

$2w^2+5w-3$

$ac = -6$

two numbers: $6, -1$

$2w^2+6w-w-3$

$2w(w+3)-1(w-3)$

$(2w-1)(w+3)$

$$\frac{(w+3)(w-3)}{(2w-1)(w+3)}$$

$$= \frac{w-3}{2w-1}$$

$\frac{w-3}{2w-1}$ [4]

**23** Simplify.

$$\frac{5x^2-19x+12}{x^2-9}$$

$5x^2 - 19x + 12$

$ac = 60$

two numbers: $-15, -4$

$5x^2 - 15x - 4x + 12$

$5x(x-3) - 4(x-3)$

$(5x-4)(x-3)$

$$\frac{(5x-4)(x-3)}{(x+3)(x-3)}$$

$$= \frac{5x+4}{x+3}$$

$\frac{5x+4}{x+3}$ ..... [4]

**21** Simplify.

$$\frac{2x^2+5x-12}{4x^2-9}$$

$2x^2 + 5x - 12$

$ac = -24$

two numbers: $8, -3$

$2x^2 + 8x - 3x - 12$

$2x(x+4) - 3(x+4)$

$(2x-3)(x+4)$

$$\frac{(2x-3)(x+4)}{(2x+3)(2x-3)}$$

$$= \frac{x+4}{2x+3}$$

$\frac{x+4}{2x+3}$ ..... [4]

**22** Simplify.

$$\frac{2x^2-5x-12}{3x^2-12x}$$

$2x^2 - 5x - 12$

$ac = -24$

two numbers: $-8, 3$

$2x^2 - 8x + 3x - 12$

$2x(x-4) + 3(x-4)$

$(2x+3)(x-4)$

$$\frac{(2x+3)(x-4)}{3x(x-4)}$$

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

$\frac{2x+3}{3x}$ ..... [4]

**(b)** Write as a single fraction in its simplest form.

$$\frac{4}{2x-3} \div \frac{2x^2+14x}{2x^2+11x-21}$$

$2x^2 + 11x - 21$

$ac = -42$

two numbers: $14, -3$

$\rightarrow 2x^2 + 14x - 3x - 21$

$2x(x+7) - 3(x+7)$

$(2x-3)(x+7)$

$$\frac{4}{2x-3} \div \frac{2x(x+7)}{(2x-3)(x+7)}$$

$$= \frac{4}{2x-3} \div \frac{2x}{2x-3}$$

$$= \frac{4}{2x-3} \times \frac{2x-3}{2x}$$

$$= \frac{4}{2x}$$

$$= \frac{2}{x}$$

$\frac{2}{x}$ ..... [4]

**(b) (i)** Factorise.

$x^2 - 9$

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

$(x+3)(x-3)$ [1]

**(ii)** Simplify.

$$\frac{x^2-9}{2xy-6y+5x-15}$$

$2xy - 6y + 5x - 15$

$2y(x-3) + 5(x-3)$

$(2y+5)(x-3)$

$$\frac{(x+3)(x-3)}{(2y+5)(x-3)}$$

$$\frac{x+3}{2y+5}$$ [3]

**11** Simplify.

$$\frac{ax^2+5ax+bx+5b}{x^2-25}$$

$ax^2 + 5ax + bx + 5b$

$ax(x+5) + b(x+5)$

$(ax+b)(x+5)$

$$\frac{(ax+b)(x+5)}{(x+5)(x-5)}$$

$$\frac{ax+b}{x-5}$$ [3]

**24** Simplify.

$$\frac{ax-2a-x+2}{a^2-1}$$

$ax - 2a - x + 2$

$a(x-2) - 1(x-2)$

$(a-1)(x-2)$

$$\frac{(a-1)(x-2)}{(a-1)(a+1)}$$

$$\frac{x-2}{a+1}$$

..... [4]

**23** Simplify.

$$\frac{3xy+36y-5x-60}{2x^2-288}$$

$3xy + 36y - 5x - 60$

$3y(x+12) - 5(x+12)$

$(3y-5)(x+12)$

$$\frac{(3y-5)(x+12)}{2(x^2-144)}$$

$$= \frac{(3y-5)(x+12)}{2(x-12)(x+12)}$$

$$\frac{3y-5}{2(x-12)}$$

..... [4]

**17** Simplify.

$$\frac{3x-6y-ax+2ay}{x^3-2x^2y}$$

$3x - 6y - ax + 2ay$

$3(x-2y) - a(x-2y)$

$(3-a)(x-2y)$

$$\frac{(3-a)(x-2y)}{x^2(x-2y)}$$

$$= \frac{3-a}{x^2}$$

$\frac{3-a}{x^2}$ [4]

**26** Simplify.

$$\frac{ux-2u-x+2}{u^2-1}$$

$ux - 2u - x + 2$

$u(x-2) - 1(x-2)$

$(u-1)(x-2)$

$$\frac{(u-1)(x-2)}{(u-1)(u+1)}$$

$$= \frac{x-2}{u+1}$$

$\frac{x-2}{u+1}$ [4]

**15** Simplify.

$$\frac{3-a}{3p-6t-ap+2at}$$

$3p - 6t - ap + 2at$

$3(p - 2t) - a(p - 2t)$

$(3 - a)(p - 2t)$

$$\frac{3-a}{(3-a)(p-2t)}$$

$$= \frac{1}{p-2t}$$

$\frac{1}{p-2t}$ [3]

**(d)** Simplify. $\frac{2x-1-4ax+2a}{2x^2-x}$

$2x - 1 - 4ax + 2a$

$1(2x - 1) - 2a(2x - 1)$

$(1 - 2a)(2x - 1)$

$$\frac{(1-2a)(2x-1)}{x(2x-1)}$$

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

$\frac{1-2a}{x}$ [4]

25 Simplify.

$$\frac{2x^2+x-15}{ax+3a-2bx-6b}$$

$2x^2 + x - 15$

$ac = -30$

two numbers: $6, -5$

$\rightarrow 2x^2 + 6x - 5x - 15$

$2x(x+3) - 5(x+3)$

$(2x-5)(x+3)$

$ax + 3a - 2bx - 6b$

$a(x+3) - 2b(x+3)$

$(a-2b)(x+3)$

$\rightarrow \frac{(2x-5)(x+3)}{(a-2b)(x+3)}$

$= \frac{2x-5}{a-2b}$

$\frac{2x-5}{a-2b}$ [5]

(b) $\frac{6x^2+x-12}{6ax-8a-3x+4}$

$6x^2 + x - 12$

$ac = -72$

two numbers: $9, -8$

$\rightarrow 6x^2 + 9x - 8x - 12$

$3x(2x+3) - 4(2x+3)$

$(3x-4)(2x+3)$

$6ax - 8a - 3x + 4$

$2a(3x-4) - 1(3x-4)$

$(2a-1)(3x-4)$

$\rightarrow \frac{(3x-4)(2x+3)}{(2a-1)(3x-4)}$

$= \frac{2x+3}{2a-1}$

$\frac{2x+3}{2a-1}$ [5]