

## Algebra Skills Required for Entry to a Level Two Course in Mathematics

This is a list of Level One skills you will be required to demonstrate if you are to gain entry to the Level Two Achievement Standard Course in Year 12. To demonstrate that you have gained these skills you will be required to attend school and sit an Algebra test. If you can demonstrate mastery of 4 out of the 6 Achieved skills and 4 out of 6 of the Merit skills then this will count as satisfying the "Merit in Algebra" criterion for entry to the Year 12 course.

Level of Achievement	Skill	Example
Achieved	<a href="#">Simplify expressions involving indices</a>	Simplify $\frac{12x^6}{8x^3}$
	<a href="#">Simplify expressions involving brackets</a>	Expand and simplify $4(x + 2y) - 3(x - 2y)$
	<a href="#">Expand a pair of brackets</a>	Expand and simplify $(2x - 3)(x + 4)$
	<a href="#">Factorise a quadratic expression</a>	Factorise $x^2 - 3x - 10$
	<a href="#">Solve a linear equation</a>	Solve $\frac{2x + 3}{5} = 7$
	<a href="#">Solve a factorised quadratic equation</a>	Solve $(3x - 1)(x + 2) = 0$
Achieved with Merit	<a href="#">Factorise, then solve, a quadratic equation</a>	Solve, by factorising, $x^2 + 10x - 200 = 0$
	<a href="#">Rearrange, then solve, a quadratic equation</a>	Solve: $x^2 - 3x = 2x + 24$
	<a href="#">Solve simultaneous linear equations</a>	Solve this pair of equations: $4x + 5y = 400$ $x = y + 10$
	<a href="#">Rearrange a formula</a>	Rearrange the formula $A = \frac{1}{2}(a + b)h$ to make $a$ the subject of the formula
	<a href="#">Simplify a fractional algebraic expression</a>	Simplify $\frac{x^2 - 4}{x + 2}$
	<a href="#">Add or subtract algebraic fractions</a>	Simplify $\frac{2x}{3} + \frac{x}{4}$

Worked examples, practice questions, and practice assessments with answers are provided in the following pages.

## Achieved Skill 1      Simplify expressions involving indices

Example 1a: Simplify  $\frac{12x^6}{8x^3}$

Method: "Cancel" the fraction part.  
You can use the fraction key on your calculator to do this.  
Or just divide both 12 and 8 by 4, giving the fraction  $\frac{3}{2}$ .  
Now subtract the powers, so  $6 - 3 = 3$ .

Answer:  $\frac{3x^3}{2}$

Example 1b: Simplify  $8x^3 \times 5x^9$

Method: Multiply the numbers. So  $8 \times 5 = 40$   
Now add the powers, so  $3 + 9 = 12$ .

Answer:  $40x^{12}$

Example 1c: Simplify  $(5x^3y)^2$

Method: Work out  $5^2$ . This is 25.  
Now multiply the powers. So  $(x^3)^2$  becomes  $x^6$   
And  $(x^3y)^2$  becomes  $x^6y^2$

Answer:  $25x^6y^2$

## Achieved Skill 1      Practice questions

Simplify these:

1  $5x^{20} \times 20x^5$

2  $(4a^5b^3)^2$

3  $\frac{5x^{10}}{10x^5}$

4  $8p^3 \times 4p^9$

5  $a \times 2a^5 \times 3a^2$

6  $\frac{8x^8}{16x}$

7  $(5m^2n^4)^3$

8  $12x^3 \times 12x^6$

9  $(5d^{10})^2$

10  $\frac{25x^5}{5x}$

11  $6d^5 \times 3d^2$

12  $\frac{3a^2}{6a}$

13  $\frac{9x^{21}}{15x^7}$

14  $(8d^4e^5)^2$

## Achieved Skill 2      Simplify expressions involving brackets

Example 2a:      Expand and simplify  $4(x + 2y) - 3(x - 2y)$

Method:          Multiply each term inside the bracket by the number that is outside.  
Remember  $- \times - = +$ . Then gather like terms

$$\begin{aligned} & 4(x + 2y) - 3(x - 2y) \\ & = 4x + 8y - 3x + 6y \end{aligned}$$

Answer:          =  $x + 14y$

Example 2b:      Expand and simplify  $4(x - 7) - (3x - 4)$

Method:          If there is just a  $-$  sign in front, make it into  $-1$

$$\begin{aligned} & 4(x - 7) - 1(3x - 4) \\ & = 4x - 28 - 3x + 4 \end{aligned}$$

Answer:          =  $x - 24$

## Achieved Skill 2      Practice questions

Simplify these:

1       $5(x - 3) + 2(x - 4)$

2       $3(2x - 1) - 2(x - 3)$

3       $6x - 3 + 4(x - 7)$

4       $-3 + 8(x - 3)$

5       $x(x - 3) + 4x + 5$

6       $-3(x - 1) + 5(2x - 4)$

7       $-(x + 4) - 3(x - 2)$

8       $4(x + 1) - (x - 6)$

9       $-2(3 - 2x) - 4(x - 3)$

10      $x(x - 3) + x(x - 4)$

11      $7(x - 2y) - 2(5x - 4y)$

12      $3(4y - x) - (2x + 9y)$

13      $14 - 3(2x - 7) - 5x$

14      $-7(4 - 5x) - (3 + 2x)$

### Achieved Skill 3      Expand a pair of brackets

Example 3a:      Expand and simplify  $(2x - 3)(x + 4)$

Method:          Multiply each term inside the second bracket first by the  $2x$  and then by the  $-3$ . Remember  $- \times + = -$ . Then gather like terms.

$$\begin{array}{l} \text{Diagram showing the expansion of } (2x - 3)(x + 4) \text{ with arrows indicating the multiplication of terms.} \\ (2x - 3)(x + 4) \\ = 2x^2 + 8x - 3x - 12 \end{array}$$

Answer:          =  $2x^2 + 5x - 12$

Example 3b:      Expand and simplify  $(x - 5)(3x - 4)$

Method:          Multiply each term inside the second bracket first by the  $x$  and then by the  $-5$ . Remember  $- \times - = +$ .

$$\begin{array}{l} \text{Diagram showing the expansion of } (x - 5)(3x - 4) \text{ with arrows indicating the multiplication of terms.} \\ (x - 5)(3x - 4) \\ = 3x^2 - 4x - 15x + 20 \end{array}$$

Answer:          =  $3x^2 - 19x + 20$

### Achieved Skill 3      Practice questions

Expand the bracket and then simplify:

1       $(x - 3)(x - 4)$

2       $(2x - 1)(x - 3)$

3       $(6x - 3)(x + 7)$

4       $(x - 5)(2x - 3)$

5       $(x - 3)(4x + 5)$

6       $(x + 1)(2x - 7)$

7       $(3x + 4)(2x - 1)$

8       $(4x + 1)(x - 6)$

9       $(3x - 2)(x - 3)$

10      $(2x - 5)(3x - 4)$

11      $(3x - 2)(5x + 4)$

12      $(4y - 3)(2y + 7)$

13      $(2x - 1)(5 - 2x)$

14      $(4 - 5x)(3 + 2x)$

### Achieved Skill 4 Factorise a quadratic expression

Example 4a: Factorise  $x^2 - 3x - 10$

Method: Draw a pair of "skeleton" brackets, then put  $x$  at the start of each bracket.  
Write down pairs of numbers that *multiply* to give  $-10$ .  
Choose the pair of numbers that also *add together* to give  $-3$ .  
Put these numbers into the brackets.  
Check that you get  $x^2 - 3x - 10$  if you expand the brackets.

$$\begin{array}{r}
 x^2 - 3x - 10 \\
 = (x \quad \quad)(x \quad \quad) \\
 \text{Answer: } = (x - 5)(x + 2)
 \end{array}
 \begin{array}{r}
 +10 \quad -1 \\
 -10 \quad +1 \\
 +5 \quad -2 \\
 -5 \quad +2
 \end{array}$$

Example 4b: Factorise  $x^2 - 8x + 15$

Method: Draw a pair of "skeleton" brackets, and put  $x$  at the start of each bracket.  
Find the pair of numbers that *multiply* to give  $+15$   
and *add together* to give  $-8$ . Put these numbers into the brackets.  
Check that you get  $x^2 - 8x + 15$  if you expand the brackets.

$$\begin{array}{r}
 x^2 - 8x + 15 \\
 = (x \quad \quad)(x \quad \quad) \\
 \text{Answer: } = (x - 5)(x - 3)
 \end{array}
 \begin{array}{r}
 +15 \quad +1 \\
 -15 \quad -1 \\
 +5 \quad +3 \\
 -5 \quad -3
 \end{array}$$

Example 4c: Factorise  $x^2 - 25$  (This type is called the *difference of two squares*)

Method: Draw a pair of "skeleton" brackets, and put  $x$  at the start of each bracket.  
Our pair of numbers must *multiply* to give  $-25$  and *add together* to give zero  
(there is no  $x$  term).  
The numbers are  $+5$  and  $-5$   
Check that you get  $x^2 - 25$  if you expand the brackets.

$$\begin{array}{r}
 x^2 - 25 \\
 \text{Answer: } = (x + 5)(x - 5)
 \end{array}$$

### Achieved Skill 4 Practice questions

Factorise:

1  $x^2 - 3x - 18$

2  $x^2 + x - 20$

3  $x^2 - 13x + 30$

4  $x^2 - 8x + 12$

5  $x^2 + 3x - 10$

6  $x^2 + 5x - 24$

7  $x^2 - 10x + 24$

8  $x^2 - 4x - 5$

9  $x^2 - 16$

10  $x^2 - 5x - 14$

11  $x^2 - 4$

12  $x^2 + 4x - 21$

13  $x^2 + 11x + 30$

14  $x^2 - 81$

15  $x^2 - x - 12$

**Achieved Skill 5****Solve a linear equation**

Example 5a:  $5 \times \frac{2x+3}{5} = 7 \times 5$

Method:

$$\begin{array}{rcl} 2x + 3 & = & 35 \\ -3 & -3 & \\ \hline 2x & = & 32 \\ \div 2 & \div 2 & \\ \hline x & = & 16 \end{array}$$

Example 5b:  $7x - 8 = 5x - 22$

Method:

$$\begin{array}{rcl} 7x - 8 & = & 5x - 22 \\ -5x & -5x & \\ \hline 2x - 8 & = & -22 \\ +8 & +8 & \\ \hline 2x & = & -14 \\ \div 2 & \div 2 & \\ \hline x & = & -7 \end{array}$$

**Achieved Skill 5****Practice questions**

Solve these equations:

1  $12x + 32 = 7x - 6$

2  $5(3 - 2x) = 35$

3  $\frac{5x}{3} - 14 = 1$

4  $\frac{5x+14}{6} = 4$

5  $22 + 6x = 64 - x$

6  $7x - 3(x - 6) = 2$

7  $\frac{5x}{8} + 9 = 4$

8  $13 - x = 17 + 2x$

9  $4(x + 5) - 17 = x$

10  $\frac{7x}{5} = \frac{1}{2}$

11  $\frac{3-2x}{4} = 13$

12  $2.4x + 5.4 = 4.2x + 18$

13  $\frac{3}{4}(2x - 3) = 15$

14  $\frac{2x}{9} - 1 = 11$

**Achieved Skill 6      Solve a factorised quadratic equation**

Example 6a:      Solve:  $(3x - 1)(x + 2) = 0$

Method:          Let each bracket equal zero. This gives two equations, so there are two solutions.

$$3x - 1 = 0 \quad \text{or} \quad x + 2 = 0$$

Answer:           $x = \frac{1}{3}$  or  $x = -2$

Example 6b:      Solve:  $3x(3x + 4) = 0$

Method:          Let each part equal zero. Again there are two solutions.

$$3x = 0 \quad \text{or} \quad 3x + 4 = 0$$

Answer:           $x = 0$  or  $x = -\frac{4}{3}$

**Achieved Skill 6      Practice questions**

Solve these equations:

1       $(x + 5)(x - 4) = 0$

2       $(2x - 1)(x + 3) = 0$

3       $(6x - 1)(x + 7) = 0$

4       $(x - 5)(2x - 3) = 0$

5       $(x - 3)(4x + 5) = 0$

6       $(x + 1)(2x + 7) = 0$

7       $3x(2x - 1) = 0$

8       $4x(x - 6) = 0$

9       $(3x - 2)(x + 3) = 0$

10      $2x(3x - 4) = 0$

11      $(5x - 1)(x + 4) = 0$

12      $(4x + 1)(x - 7) = 0$

13      $5x(2x - 1) = 0$

14      $-5x(3 + 2x) = 0$

**Merit Skill 1     Factorise and solve a quadratic equation**

Example 1a:     Solve:  $x^2 + 10x - 200 = 0$

Method:             $(x + 20)(x - 10) = 0$

Answer:             $x = -20$  or  $x = 10$

Example 1b:     Solve:  $2x^2 - 50 = 0$

Method:             $2(x^2 - 25) = 0$   
 $2(x + 5)(x - 5) = 0$

Answer:             $x = -5$  or  $x = 5$

**Merit Skill 1             Practice questions**

Solve these equations:

1         $x^2 - 15x + 50 = 0$

2         $x^2 - 2x - 80 = 0$

3         $3x^2 - 48 = 0$

4         $x^2 - 10x - 200 = 0$

5         $x^2 + 4x - 60 = 0$

6         $x^2 - 35x + 300 = 0$

7         $x^2 - 25x + 100 = 0$

8         $x^2 - 8x - 20 = 0$

9         $x^2 + 16x - 80 = 0$

10        $x^2 + 25x - 150 = 0$

11        $x^2 - 7x + 12 = 0$

12        $2x^2 - 98 = 0$

13        $4x^2 - 36 = 0$

14        $x^2 - 13x + 40 = 0$

15        $x^2 + 40x + 300 = 0$

16        $x^2 - 40x + 400 = 0$

17        $x^2 - x - 42 = 0$

18        $x^2 - 16x + 64 = 0$

19        $x^2 + 20x + 100 = 0$

20        $x^2 + 5x - 150 = 0$

21        $6x^2 - 24 = 0$

22        $x^2 - 15x + 36 = 0$

23        $x^2 - 14x + 40 = 0$

24        $x^2 + 10x - 1200 = 0$



**Merit Skill 2    Rearrange, then solve a quadratic equation**

Example 2a:    Solve:  $x^2 - 3x = 2x + 24$

Method:         $x^2 - 5x - 24 = 0$   
                      $(x - 8)(x + 3) = 0$

Answer:         $x = 8$    or    $x = -3$

Example 2b:    Solve:  $x^2 = 24 - 10x$

Method:         $x^2 + 10x - 24 = 0$   
                      $(x + 12)(x - 2) = 0$

Answer:         $x = -12$    or    $x = 2$

Example 2c:    Solve:  $x^2 = 3(x + 6)$

Method:         $x^2 = 3x + 18$   
                      $x^2 - 3x - 18 = 0$   
                      $(x - 6)(x + 3) = 0$

Answer:         $x = 6$    or    $x = -3$

**Merit Skill 2        Practice questions**

Solve these equations:

1         $x^2 - 13x = 30$

2         $x^2 = 9x - 20$

3         $x^2 = 9(x + 4)$

4         $x^2 + 3x = 40$

5         $x^2 + 8x = 9x + 56$

6         $(x + 3)^2 = 25$

7         $x^2 = 10x - 21$

8         $x^2 + 10 = 7x$

9         $x^2 = 30 - x$

10        $x^2 = 10(3x - 20)$

11        $(x + 6)(x + 2) = 21$

12        $x^2 + 3x - 26 = 14x$

13        $x^2 + 60 = 16x$

14        $x^2 = 5(3x - 10)$

15        $(x + 3)(x - 2) = 6$

16        $x^2 = 25(x - 6)$

**Merit Skill 3 Solve simultaneous linear equations**

Example 3a: Solve:  $4x + 5y = 400$   
 $x = y + 10$

Method: Substitute  $y + 10$  in place of  $x$  in the first equation

$$4(y + 10) + 5y = 400$$

$$4y + 40 + 5y = 400$$

$$9y = 360$$

$$y = 40$$

Now substitute this into the second equation to find out what  $x$  is.

Answer:  $y = 40$  and  $x = 40 + 10 = 50$

Example 3b: Solve:  $40x - 10y = 280$   
 $3y = 4x + 12$

Method: Rearrange the second equation so that it "matches" the first one.

$$40x - 10y = 280$$

$$-4x + 3y = 12$$

Divide the first equation by 10 (or multiply the second equation by 10)

$$4x - y = 28$$

$$-4x + 3y = 12$$

Add the equations to eliminate the  $x$  variable

$$2y = 40$$

$$y = 20$$

Substitute  $y = 20$  into one of the original equations, and solve for  $x$ .

$$40x - 10 \times 20 = 280$$

$$x = 12$$

Answer:  $x = 12$  and  $y = 20$

The equations have to be arranged this way if you are using a graphics calculator.

**Merit Skill 3 Practice questions**

Solve these pairs of simultaneous equations:

1  $5y + 2x = 75$   
 $y = x - 13$

2  $2x - 8y = 4$   
 $x = 2y + 10$

3  $2x - 8y = 6$   
 $5y = x + 1$

4  $2y - x = 2$   
 $3y = x + 6$

5  $3x + 2y = 119$   
 $y = x - 23$

6  $7x - 10y = 159$   
 $y = x - 30$

7  $7x - y = 11$   
 $5x = 2y - 59$

8  $3x + 4y = 122$   
 $x = y + 1$

9  $4x - y = 3$   
 $x + 18 = y$

10  $2x - 6y = 30$   
 $3x = 8y + 90$

**Merit Skill 4    Rearrange a formula**

Example 4a:    Make  $a$  the subject of the formula  $A = \frac{1}{2}(a + b)h$

Method:         $\frac{1}{2}(a + b)h = A$

$$(a + b)h = 2A$$

$$a + b = \frac{2A}{h}$$

Answer:         $a = \frac{2A}{h} - b$

Example 4b:    Make  $a$  the subject of the formula  $v = u + at$

Method:         $u + at = v$

$$at = v - u$$

Answer:         $a = \frac{v - u}{t}$

**Merit Skill 4        Practice questions**

- 1        The formula for the perimeter of a rectangle is  $P = 2l + 2b$ .  
Rearrange the formula to make  $b$  the subject.
- 2        Make  $n$  the subject of the formula  $S = 180(n - 2)$ .
- 3        Make  $h$  the subject of the formula  $A = \frac{1}{2}bh$ .
- 4        The formula for the distance around a running track is  $D = 2l + \pi w$ .  
Rearrange the formula to make  $w$  the subject.
- 5        The formula for the area of a square with an equilateral triangle on one of its sides is  $A = 1.433x^2$ . Rearrange the formula to make  $x$  the subject.
- 6        The formula for the volume of a cylinder is  $V = \pi r^2 h$ .  
Rearrange the formula to make (i)  $h$  (ii)  $r$  the subject.
- 7        Make  $d$  the subject of the formula  $A = \frac{\pi d^2}{4}$ .
- 8        Make  $v$  the subject of the formula  $E = \frac{1}{2}mv^2$ .
- 9        Make  $d$  the subject of the formula  $T = a + (n - 1)d$ .
- 10      The equation of a straight line is  $2x + 3y = 12$ .  
Rearrange the equation to make  $y$  the subject.

**Merit Skill 5 Simplify a fractional algebraic expression**

Example 5a: Simplify:  $\frac{x^2 - 4}{x + 2}$

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

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

Factorise top, or bottom, or both. Then cancel.

Answer:  $= x - 2$

Example 5b: Simplify:  $\frac{2x^2 + 6x}{3x + 9}$

Method: 
$$= \frac{2x(x + 3)}{3(x + 3)}$$

$$= \frac{2x\cancel{(x + 3)}}{3\cancel{(x + 3)}}$$

Answer:  $= \frac{2x}{3}$

**Merit Skill 5 Practice questions**

Simplify:

1  $\frac{4x + 12}{x + 3}$

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

3  $\frac{x^2 - 9}{x - 3}$

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

5  $\frac{x^2 + 5x + 4}{x + 4}$

6  $\frac{3p^2q^3 - 15p^2q^2}{3pq^2}$

7  $\frac{3x^2 - 3x}{x - 1}$

8  $\frac{6x^2 + 12xy}{3x + 6y}$

9  $\frac{x - 1}{x^2 - 1}$

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

11  $\frac{x^2 + 3x + 2}{x + 2}$

12  $\frac{2x^2 + 8x}{x + 4}$

13  $\frac{x^2 + 4x + 4}{x + 2}$

14  $\frac{2x - 6}{x^2 - 3x}$

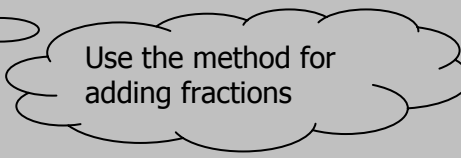
**Merit Skill 6 Add or subtract algebraic fractions**

Example 6a: Simplify:  $\frac{2x}{3} + \frac{x}{4}$

Method:  $= \frac{4 \times 2x + 3 \times x}{12}$

$$= \frac{8x + 3x}{12}$$

Answer:  $= \frac{11x}{12}$



Use the method for adding fractions

Example 6b: Simplify:  $\frac{x}{3} - \frac{5x}{24}$

Method:  $= \frac{8x}{24} - \frac{5x}{24}$

$$= \frac{3x}{24}$$

Answer:  $= \frac{x}{8}$

**Merit Skill 6 Practice questions**

Simplify:

1  $\frac{2x}{5} + \frac{3x}{10}$

2  $\frac{m}{4} + \frac{3m}{5}$

3  $\frac{x}{5} - \frac{x}{6}$

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

5  $\frac{2a}{9} + a$

6  $\frac{6x}{7} + \frac{7x}{6}$

7  $\frac{k}{8} + \frac{5k}{12}$

8  $\frac{x}{2} - \frac{5x}{12}$

9  $2p - \frac{7p}{5}$

10  $\frac{3z}{4} + \frac{3z}{16}$

11  $\frac{2x}{9} + \frac{4x}{3}$

12  $\frac{x}{5} - \frac{x}{15}$

13  $\frac{7d}{10} - \frac{2d}{5}$

14  $\frac{3x}{5} - \frac{9x}{25}$

## Practice Assessment One

1 Simplify  $(3a^4b)^2$

2 Simplify  $-4(x - 2y) + 2(2x + y)$

3 Expand and simplify  $(2y - 3)(y + 4)$

4 Factorise  $x^2 - 3x - 28$

5 Solve:  $\frac{3x + 2}{4} = 5$

6 Solve:  $4x(3x - 1) = 0$

7 Solve:  $x^2 - 7x - 30 = 0$

8 Solve:  $x^2 + 6x = 3x + 10$

9 Solve these simultaneous equations:

$$5a + 2b = 30$$

$$a + 1 = b$$

10 Make  $h$  the subject of the formula

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

11 Simplify  $\frac{2a^3b + 2ab^3}{a^2 + b^2}$

12 Simplify  $\frac{5x}{2} - \frac{x}{5}$

## Practice Assessment Two

1 Simplify  $\frac{8a^3}{2a}$

2 Simplify  $8(p - 2q) - 2(3p + q)$

3 Expand and simplify  $(x - 2)(3x - 4)$

4 Factorise  $x^2 - 6x + 8$

5 Solve:  $\frac{3x}{8} = \frac{1}{4}$

6 Solve:  $(x + 7)(3x - 2) = 0$

7 Solve:  $x^2 + 9x + 18 = 0$

8 Solve:  $(x + 2)(x + 4) = 15$

9 Solve these simultaneous equations:

$$2x - 3y = 8$$

$$y = 23 - 3x$$

10 Make  $r$  the subject of the formula

$$A = 4\pi r^2$$

11 Simplify  $\frac{x^2 - 16}{2x + 8}$

12 Simplify  $\frac{2m}{3} + \frac{m}{4}$

**Practice Assessment Three**

1 Simplify  $3a^2 \times 4a^5$

2 Simplify  $5(3a + 6) - (4a - 9)$

3 Expand and simplify  $(3d - 2)(d - 5)$

4 Factorise  $x^2 + x - 12$

5 Solve:  $7x - 3 = 4 - 5x$

6 Solve:  $(x - 3)(2x + 1) = 0$

7 Solve:  $2x^2 - 50 = 0$

8 Solve:  $x^2 = 4(x + 3)$

9 Solve these simultaneous equations:

$$3x + 4y = 43$$

$$x = 2y - 9$$

10 Make  $t$  the subject of the formula

$$C = k + 2nt$$

11 Simplify  $\frac{x^2 + 5x + 4}{x + 1}$

12 Simplify  $\frac{9x}{4} - \frac{x}{2}$



**Answers      Achieved Skill 1      Simplify expressions involving indices**

1	$100x^{25}$	8	$144x^9$
2	$16a^{10}b^6$	9	$25d^{20}$
3	$\frac{x^5}{2}$	10	$5x^4$
4	$32p^{12}$	11	$18d^7$
5	$6a^8$	12	$\frac{a}{2}$
6	$\frac{x^7}{2}$	13	$\frac{3x^{14}}{5}$
7	$125m^6n^{12}$	14	$64d^8e^{10}$

**Answers      Achieved Skill 2      Simplify expressions involving brackets**

1	$5(x-3) + 2(x-4)$ $= 5x - 15 + 2x - 8$ $= 7x - 23$	8	$4(x+1) - (x-6)$ $= 4x + 4 - x + 6$ $= 3x + 10$
2	$3(2x-1) - 2(x-3)$ $= 6x - 3 - 2x + 6$ $= 4x + 3$	9	$-2(3-2x) - 4(x-3)$ $= -6 + 4x - 4x + 12$ $= 6$
3	$6x - 3 + 4(x-7)$ $= 6x - 3 + 4x - 28$ $= 10x - 31$	10	$x(x-3) + x(x-4)$ $= x^2 - 3x + x^2 - 4x$ $= 2x^2 - 7x$
4	$-3 + 8(x-3)$ $= -3 + 8x - 24$ $= 8x - 27$	11	$7(x-2y) - 2(5x-4y)$ $= 7x - 14y - 10x + 8y$ $= -3x - 6y$
5	$x(x-3) + 4x + 5$ $= x^2 - 3x + 4x + 5$ $= x^2 + x + 5$	12	$3(4y-x) - (2x+9y)$ $= 12y - 3x - 2x - 9y$ $= 3y - 5x$
6	$-3(x-1) + 5(2x-4)$ $= -3x + 3 + 10x - 20$ $= 7x - 17$	13	$14 - 3(2x-7) - 5x$ $= 14 - 6x + 21 - 5x$ $= -11x + 35$
7	$-(x+4) - 3(x-2)$ $= -x - 4 - 3x + 6$ $= -4x + 2$	14	$-7(4-5x) - (3+2x)$ $= -28 + 35x - 3 - 2x$ $= 33x - 31$

**Answers      Achieved Skill 3      Expand a pair of brackets**

$$\begin{aligned} 1 \quad & (x-3)(x-4) \\ & = x^2 - 3x - 4x + 12 \\ & = x^2 - 7x + 12 \end{aligned}$$

$$\begin{aligned} 2 \quad & (2x-1)(x-3) \\ & = 2x^2 - 6x - x + 3 \\ & = x^2 - 7x + 3 \end{aligned}$$

$$\begin{aligned} 3 \quad & (6x-3)(x+7) \\ & = 6x^2 + 42x - 3x - 21 \\ & = 6x^2 + 39x - 21 \end{aligned}$$

$$\begin{aligned} 4 \quad & (x-5)(2x-3) \\ & = 2x^2 - 3x - 10x + 15 \\ & = 2x^2 - 13x + 15 \end{aligned}$$

$$\begin{aligned} 5 \quad & (x-3)(4x+5) \\ & = 4x^2 + 5x - 12x - 15 \\ & = 4x^2 - 7x - 15 \end{aligned}$$

$$\begin{aligned} 6 \quad & (x+1)(2x-7) \\ & = 2x^2 - 7x + 2x - 7 \\ & = 2x^2 - 5x - 7 \end{aligned}$$

$$\begin{aligned} 7 \quad & (3x+4)(2x-1) \\ & = 6x^2 - 3x + 8x - 4 \\ & = 6x^2 + 5x - 4 \end{aligned}$$

$$\begin{aligned} 8 \quad & (4x+1)(x-6) \\ & = 4x^2 - 24x + x - 6 \\ & = 4x^2 - 23x - 6 \end{aligned}$$

$$\begin{aligned} 9 \quad & (3x-2)(x-3) \\ & = 3x^2 - 9x - 2x + 6 \\ & = 3x^2 - 11x + 6 \end{aligned}$$

$$\begin{aligned} 10 \quad & (2x-5)(3x-4) \\ & = 6x^2 - 8x - 15x + 20 \\ & = 6x^2 - 23x + 20 \end{aligned}$$

$$\begin{aligned} 11 \quad & (3x-2)(5x+4) \\ & = 15x^2 + 12x - 10x - 8 \\ & = 15x^2 + 2x - 8 \end{aligned}$$

$$\begin{aligned} 12 \quad & (4y-3)(2y+7) \\ & = 8y^2 + 28y - 6y - 21 \\ & = 8y^2 + 22y - 21 \end{aligned}$$

$$\begin{aligned} 13 \quad & (2x-1)(5-2x) \\ & = 10x - 4x^2 - 5 + 2x \\ & = -4x^2 + 12x - 5 \end{aligned}$$

$$\begin{aligned} 14 \quad & (4-5x)(3+2x) \\ & = 12 + 8x - 15x - 10x^2 \\ & = -10x^2 - 7x + 12 \end{aligned}$$

**Answers      Achieved Skill 4      Factorise a quadratic expression**

$$\begin{aligned} 1 \quad & x^2 - 3x - 18 \\ & = (x-6)(x+3) \end{aligned}$$

$$\begin{aligned} 2 \quad & x^2 + x - 20 \\ & = (x+5)(x-4) \end{aligned}$$

$$\begin{aligned} 3 \quad & x^2 - 13x + 30 \\ & = (x-10)(x-3) \end{aligned}$$

$$\begin{aligned} 4 \quad & x^2 - 8x + 12 \\ & = (x-6)(x-2) \end{aligned}$$

$$\begin{aligned} 5 \quad & x^2 + 3x - 10 \\ & = (x+5)(x-2) \end{aligned}$$

$$\begin{aligned} 6 \quad & x^2 + 5x - 24 \\ & = (x+8)(x-3) \end{aligned}$$

$$\begin{aligned} 7 \quad & x^2 - 10x + 24 \\ & = (x-6)(x-4) \end{aligned}$$

$$\begin{aligned} 8 \quad & x^2 - 4x - 5 \\ & = (x-5)(x+1) \end{aligned}$$

$$\begin{aligned} 9 \quad & x^2 - 16 \\ & = (x+4)(x-4) \end{aligned}$$

$$\begin{aligned} 10 \quad & x^2 - 5x - 14 \\ & = (x-7)(x+2) \end{aligned}$$

$$\begin{aligned} 11 \quad & x^2 - 4 \\ & = (x+2)(x-2) \end{aligned}$$

$$\begin{aligned} 12 \quad & x^2 + 4x - 21 \\ & = (x+7)(x-3) \end{aligned}$$

$$\begin{aligned} 13 \quad & x^2 + 11x + 30 \\ & = (x+6)(x+5) \end{aligned}$$

$$\begin{aligned} 14 \quad & x^2 - 81 \\ & = (x+9)(x-9) \end{aligned}$$

$$\begin{aligned} 15 \quad & x^2 - x - 12 \\ & = (x-4)(x+3) \end{aligned}$$

**Answers      Achieved Skill 5      Solve a linear equation**

$$1 \quad \begin{aligned} 12x + 32 &= 7x - 6 \\ 5x &= -38 \\ x &= -\frac{38}{5} \end{aligned}$$

$$2 \quad \begin{aligned} 5(3 - 2x) &= 35 \\ 15 - 10x &= 35 \\ -10x &= 20 \\ x &= -2 \end{aligned}$$

$$3 \quad \begin{aligned} \frac{5x}{3} - 14 &= 1 \\ \frac{5x}{3} &= 15 \\ x &= \frac{15 \times 3}{5} \\ x &= 9 \end{aligned}$$

$$4 \quad \begin{aligned} \frac{5x + 14}{6} &= 4 \\ 5x + 14 &= 24 \\ 5x &= 10 \\ x &= 2 \end{aligned}$$

$$5 \quad \begin{aligned} 22 + 6x &= 64 - x \\ 7x &= 42 \\ x &= 6 \end{aligned}$$

$$6 \quad \begin{aligned} 7x - 3(x - 6) &= 2 \\ 7x - 3x + 18 &= 2 \\ 4x &= -16 \\ x &= -4 \end{aligned}$$

$$7 \quad \begin{aligned} \frac{5x}{8} + 9 &= 4 \\ \frac{5x}{8} &= -5 \\ x &= \frac{-5 \times 8}{5} \\ x &= -8 \end{aligned}$$

$$8 \quad \begin{aligned} 13 - x &= 17 + 2x \\ -3x &= 4 \\ x &= -\frac{4}{3} \end{aligned}$$

$$9 \quad \begin{aligned} 4(x + 5) - 17 &= x \\ 4x + 20 - 17 &= x \\ 3x &= -3 \\ x &= -1 \end{aligned}$$

$$10 \quad \begin{aligned} \frac{7x}{5} &= \frac{1}{2} \\ x &= \frac{1 \times 5}{2 \times 7} \\ x &= \frac{5}{14} \end{aligned}$$

$$11 \quad \begin{aligned} \frac{3 - 2x}{4} &= 13 \\ 3 - 2x &= 52 \\ -2x &= 49 \\ x &= -\frac{49}{2} \end{aligned}$$

$$12 \quad \begin{aligned} 2.4x + 5.4 &= 4.2x + 18 \\ -1.8x &= 12.6 \\ x &= \frac{12.6}{-1.8} \\ x &= -7 \end{aligned}$$

$$13 \quad \begin{aligned} \frac{3}{4}(2x - 3) &= 15 \\ 6x - 9 &= 60 \\ 6x &= 69 \\ x &= 11\frac{1}{2} \end{aligned}$$

$$14 \quad \begin{aligned} \frac{2x}{9} - 1 &= 11 \\ \frac{2x}{9} &= 12 \\ x &= \frac{12 \times 9}{2} \\ x &= 54 \end{aligned}$$

**Answers      Achieved Skill 6      Solve a factorised quadratic equation**

$$1 \quad x = -5 \text{ or } x = 4$$

$$2 \quad x = \frac{1}{2} \text{ or } x = -3$$

$$3 \quad x = \frac{1}{6} \text{ or } x = -7$$

$$4 \quad x = 5 \text{ or } x = \frac{3}{2}$$

$$5 \quad x = 3 \text{ or } x = \frac{-5}{4}$$

$$6 \quad x = -1 \text{ or } x = \frac{-7}{2}$$

$$7 \quad x = 0 \text{ or } x = \frac{1}{2}$$

$$8 \quad x = 0 \text{ or } x = 6$$

$$9 \quad x = \frac{2}{3} \text{ or } x = -3$$

$$10 \quad x = 0 \text{ or } x = \frac{4}{3}$$

$$11 \quad x = \frac{1}{5} \text{ or } x = -4$$

$$12 \quad x = \frac{-1}{4} \text{ or } x = 7$$

$$13 \quad x = 0 \text{ or } x = \frac{1}{2}$$

$$14 \quad x = 0 \text{ or } x = \frac{-3}{2}$$

**Answers Merit Skill 1****Factorise and solve a quadratic equation**

1  $x^2 - 15x + 50 = 0$   
 $(x - 10)(x - 5) = 0$   
 $x = 10$  or  $x = 5$

2  $x^2 - 2x - 80 = 0$   
 $(x - 10)(x + 8) = 0$   
 $x = 10$  or  $x = -8$

3  $3x^2 - 48 = 0$   
 $3(x^2 - 16) = 0$   
 $3(x + 4)(x - 4) = 0$   
 $x = -4$  or  $x = 4$

4  $x^2 - 10x - 200 = 0$   
 $(x - 20)(x + 10) = 0$   
 $x = 20$  or  $x = -10$

5  $x^2 + 4x - 60 = 0$   
 $(x + 10)(x - 6) = 0$   
 $x = -10$  or  $x = 6$

6  $x^2 - 35x + 300 = 0$   
 $(x - 20)(x - 15) = 0$   
 $x = 20$  or  $x = 15$

7  $x^2 - 25x + 100 = 0$   
 $(x - 20)(x - 5) = 0$   
 $x = 20$  or  $x = 5$

8  $x^2 - 8x - 20 = 0$   
 $(x - 10)(x + 2) = 0$   
 $x = 10$  or  $x = -2$

9  $x^2 + 16x - 80 = 0$   
 $(x + 20)(x - 4) = 0$   
 $x = -20$  or  $x = 4$

10  $x^2 + 25x - 150 = 0$   
 $(x + 30)(x - 5) = 0$   
 $x = -30$  or  $x = 5$

11  $x^2 - 7x + 12 = 0$   
 $(x - 4)(x - 3) = 0$   
 $x = 4$  or  $x = 3$

12  $2x^2 - 98 = 0$   
 $2(x^2 - 49) = 0$   
 $3(x + 7)(x - 7) = 0$   
 $x = -7$  or  $x = 7$

13  $4x^2 - 36 = 0$   
 $4(x^2 - 9) = 0$   
 $4(x + 3)(x - 3) = 0$   
 $x = -3$  or  $x = 3$

14  $x^2 - 13x + 40 = 0$   
 $(x - 8)(x - 5) = 0$   
 $x = 8$  or  $x = 5$

15  $x^2 + 40x + 300 = 0$   
 $(x + 30)(x + 10) = 0$   
 $x = -30$  or  $x = -10$

16  $x^2 - 40x + 400 = 0$   
 $(x - 20)(x - 20) = 0$   
 $x = 20$  (twice)

17  $x^2 - x - 42 = 0$   
 $(x - 7)(x + 6) = 0$   
 $x = 7$  or  $x = -6$

18  $x^2 - 16x + 64 = 0$   
 $(x - 8)(x - 8) = 0$   
 $x = 8$  (twice)

19  $x^2 + 20x + 100 = 0$   
 $(x + 10)(x + 10) = 0$   
 $x = -10$  (twice)

20  $x^2 + 5x - 150 = 0$   
 $(x + 15)(x - 10) = 0$   
 $x = -15$  or  $x = 10$

21  $6x^2 - 24 = 0$   
 $6(x^2 - 4) = 0$   
 $4(x + 2)(x - 2) = 0$   
 $x = -2$  or  $x = 2$

22  $x^2 - 15x + 36 = 0$   
 $(x - 12)(x - 3) = 0$   
 $x = 12$  or  $x = 3$

23  $x^2 - 14x + 40 = 0$   
 $(x - 10)(x - 4) = 0$   
 $x = 10$  or  $x = 4$

24  $x^2 + 10x - 1200 = 0$   
 $(x + 40)(x - 30) = 0$   
 $x = -40$  or  $x = 30$

**Answers Merit Skill 2****Rearrange, then solve, a quadratic equation**

$$1 \quad x^2 - 13x = 30$$

$$x^2 - 13x - 30 = 0$$

$$(x - 15)(x + 2) = 0$$

$$x = 15 \text{ or } x = -2$$

$$2 \quad x^2 = 9x - 20$$

$$x^2 - 9x + 20 = 0$$

$$(x - 5)(x - 4) = 0$$

$$x = 5 \text{ or } x = 4$$

$$3 \quad x^2 = 9(x + 4)$$

$$x^2 = 9x + 36$$

$$x^2 - 9x - 36 = 0$$

$$(x - 12)(x + 3) = 0$$

$$x = 12 \text{ or } x = -3$$

$$4 \quad x^2 + 3x = 40$$

$$x^2 + 3x - 40 = 0$$

$$(x + 8)(x - 5) = 0$$

$$x = -8 \text{ or } x = 5$$

$$5 \quad x^2 + 8x = 9x + 56$$

$$x^2 - x - 56 = 0$$

$$(x - 8)(x + 7) = 0$$

$$x = 8 \text{ or } x = -7$$

$$6 \quad (x + 3)^2 = 25$$

$$x^2 + 6x + 9 = 25$$

$$x^2 + 6x - 16 = 0$$

$$(x + 8)(x - 2) = 0$$

$$x = -8 \text{ or } x = 2$$

$$7 \quad x^2 = 10x - 21$$

$$x^2 - 10x + 21 = 0$$

$$(x - 7)(x - 3) = 0$$

$$x = 7 \text{ or } x = 3$$

$$8 \quad x^2 + 10 = 7x$$

$$x^2 - 7x + 10 = 0$$

$$(x - 5)(x - 2) = 0$$

$$x = 5 \text{ or } x = 2$$

$$9 \quad x^2 = 30 - x$$

$$x^2 + x - 30 = 0$$

$$(x - 6)(x + 5) = 0$$

$$x = 6 \text{ or } x = -5$$

$$10 \quad x^2 = 10(3x - 20)$$

$$x^2 = 30x - 200$$

$$x^2 - 30x + 200 = 0$$

$$(x - 20)(x + 10) = 0$$

$$x = 20 \text{ or } x = -10$$

$$11 \quad (x + 6)(x + 2) = 21$$

$$x^2 + 8x + 12 = 21$$

$$x^2 + 8x - 9 = 0$$

$$(x + 9)(x - 1) = 0$$

$$x = -9 \text{ or } x = 1$$

$$12 \quad x^2 + 3x - 26 = 14x$$

$$x^2 - 11x - 26 = 0$$

$$(x - 13)(x + 2) = 0$$

$$x = 13 \text{ or } x = -2$$

$$13 \quad x^2 + 60 = 16x$$

$$x^2 - 16x + 60 = 0$$

$$(x - 10)(x - 6) = 0$$

$$x = 10 \text{ or } x = 6$$

$$14 \quad x^2 = 5(3x - 10)$$

$$x^2 = 15x - 50$$

$$x^2 - 15x + 50 = 0$$

$$(x - 10)(x - 5) = 0$$

$$x = 10 \text{ or } x = 5$$

$$15 \quad (x + 3)(x - 2) = 6$$

$$x^2 + x - 6 = 6$$

$$x^2 + x - 12 = 0$$

$$(x + 4)(x - 3) = 0$$

$$x = -4 \text{ or } x = 3$$

$$16 \quad x^2 = 25(x - 6)$$

$$x^2 = 25x - 150$$

$$x^2 - 25x + 150 = 0$$

$$(x - 15)(x - 10) = 0$$

$$x = 15 \text{ or } x = 10$$

**Answers      Merit Skill 3      Solve simultaneous linear equations**

$$\begin{aligned}
 1 \quad & 5y + 2x = 75 \\
 & y = x - 13 \\
 & 5(x - 13) + 2x = 75 \\
 & 5x - 65 + 2x = 75 \\
 & 7x = 140 \\
 & x = 20 \text{ and } y = 20 - 13 = 7
 \end{aligned}$$

$$\begin{aligned}
 2 \quad & 2x - 8y = 4 \\
 & x = 2y + 10 \\
 & 2(2y + 10) - 8y = 4 \\
 & 4y + 20 - 8y = 4 \\
 & -4y = -16 \\
 & y = 4 \text{ and } x = 2 \times 4 + 10 = 18
 \end{aligned}$$

$$\begin{aligned}
 3 \quad & 2x - 8y = 6 \\
 & 5y = x + 1 \\
 & x = 5y - 1 \\
 & 2(5y - 1) - 8y = 6 \\
 & 10y - 2 - 8y = 6 \\
 & 2y = 8 \\
 & y = 4 \text{ and } x = 5 \times 4 - 1 = 19
 \end{aligned}$$

$$\begin{aligned}
 4 \quad & 2y - x = 2 \\
 & 3y = x + 6 \\
 & 2y - x = 2 \\
 & \underline{3y - x = 6} \quad \text{Rearrange eqn 2, then subtract} \\
 & -y = -4 \\
 & y = 4 \quad \text{Now substitute into eqn 2} \\
 & 3 \times 4 = x + 6 \\
 & x = 6
 \end{aligned}$$

$$\begin{aligned}
 5 \quad & 3x + 2y = 119 \\
 & y = x - 23 \\
 & 3x + 2(x - 23) = 119 \\
 & 3x + 2x - 46 = 119 \\
 & 5x = 165 \\
 & x = 33 \text{ and } y = 33 - 23 = 10
 \end{aligned}$$

$$\begin{aligned}
 6 \quad & 7x - 10y = 159 \\
 & y = x - 30 \\
 & 7x - 10(x - 30) = 159 \\
 & 7x - 10x + 300 = 159 \\
 & -3x = -141 \\
 & x = 47 \text{ and } y = 47 - 30 = 17
 \end{aligned}$$

$$\begin{aligned}
 7 \quad & 7x - y = 11 \\
 & 5x = 2y - 59 \\
 & 7x - y = 11 \\
 & 5x - 2y = -59 \quad \text{Rearrange eqn 2} \\
 & 14x - 2y = 22 \quad \text{Double eqn 1, then subtract} \\
 & \underline{5x - 2y = -59}
 \end{aligned}$$

$$\begin{aligned}
 & 9x = 81 \\
 & x = 9 \quad \text{Now substitute into eqn 1} \\
 & 63 - y = 11 \\
 & y = 63 - 11 = 52
 \end{aligned}$$

$$\begin{aligned}
 8 \quad & 3x + 4y = 122 \\
 & x = y + 1 \\
 & 3(y + 1) + 4y = 122 \\
 & 3y + 3 + 4y = 122 \\
 & 7y = 119 \\
 & y = 17 \text{ and } x = 17 + 1 = 18
 \end{aligned}$$

$$\begin{aligned}
 9 \quad & 4x - y = 3 \\
 & x + 18 = y \\
 & 4x - (x + 18) = 3 \\
 & 4x - x - 18 = 3 \\
 & 3x = 21 \\
 & x = 7 \text{ and } y = 7 + 18 = 25
 \end{aligned}$$

$$\begin{aligned}
 10 \quad & 2x - 6y = 30 \\
 & 3x = 8y + 90 \\
 & 2x - 6y = 30 \\
 & 3x - 8y = 90 \quad \text{Rearrange equation 2} \\
 & 6x - 18y = 90 \quad \text{Multiply eqn 1 by 3} \\
 & \underline{6x - 16y = 180} \quad \text{Multiply eqn 2 by 2} \\
 & -2y = -90 \quad \text{Subtracting equations} \\
 & y = 45 \quad \text{Now substitute into eqn 2} \\
 & 3x = 8 \times 45 + 90 \\
 & 3x = 450 \\
 & x = 150
 \end{aligned}$$

**Answers Merit Skill 4****Rearrange a formula**

$$1 \quad P = 2l + 2b$$

$$2l + 2b = P$$

$$2b = P - 2l$$

$$b = \frac{P - 2l}{2}$$

$$2 \quad S = 180(n - 2)$$

$$180(n - 2) = S$$

$$180n - 360 = S$$

$$180n = S + 360$$

$$n = \frac{S + 360}{180}$$

or you can do this:

$$n - 2 = \frac{S}{180}$$

$$n = \frac{S}{180} + 2$$

$$3 \quad A = \frac{1}{2}bh$$

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

$$bh = 2A$$

$$h = \frac{2A}{b}$$

$$4 \quad D = 2l + \pi w$$

$$2l + \pi w = D$$

$$\pi w = D - 2l$$

$$w = \frac{D - 2l}{\pi}$$

$$5 \quad A = 1.433x^2$$

$$1.433x^2 = A$$

$$x^2 = \frac{A}{1.433}$$

$$x = \sqrt{\frac{A}{1.433}}$$

$$6 \quad V = \pi r^2 h$$

$$\pi r^2 h = V$$

$$h = \frac{V}{\pi r^2}$$

$$\pi r^2 h = V$$

$$r^2 = \frac{V}{\pi h}$$

$$r = \sqrt{\frac{V}{\pi h}}$$

$$7 \quad A = \frac{\pi d^2}{4}$$

$$\frac{\pi d^2}{4} = A$$

$$d^2 = \frac{4A}{\pi}$$

$$d = \sqrt{\frac{4A}{\pi}}$$

$$8 \quad E = \frac{1}{2}mv^2$$

$$\frac{1}{2}mv^2 = E$$

$$mv^2 = 2E$$

$$v^2 = \frac{2E}{m}$$

$$v = \sqrt{\frac{2E}{m}}$$

$$9 \quad T = a + (n - 1)d$$

$$a + (n - 1)d = T$$

$$(n - 1)d = T - a$$

$$d = \frac{T - a}{n - 1}$$

$$10 \quad 2x + 3y = 12$$

$$3y = 12 - 2x$$

$$y = \frac{12 - 2x}{3}$$

**Answers Merit Skill 5****Simplify a fractional algebraic expression**

$$\begin{aligned} 1 \quad & \frac{4x+12}{x+3} \\ &= \frac{4(x+3)}{x+3} \\ &= 4 \end{aligned}$$

$$\begin{aligned} 2 \quad & \frac{x^3+2x^2}{x+2} \\ &= \frac{x^2(x+2)}{x+2} \\ &= x^2 \end{aligned}$$

$$\begin{aligned} 3 \quad & \frac{x^2-9}{x-3} \\ &= \frac{(x+3)(x-3)}{x-3} \\ &= x+3 \end{aligned}$$

$$\begin{aligned} 4 \quad & \frac{x^2+x-2}{x+2} \\ &= \frac{(x+2)(x-1)}{x+2} \\ &= x-1 \end{aligned}$$

$$\begin{aligned} 5 \quad & \frac{x^2+5x+4}{x+4} \\ &= \frac{(x+4)(x+1)}{x+4} \\ &= x+1 \end{aligned}$$

$$\begin{aligned} 6 \quad & \frac{3p^2q^3-15p^2q^2}{3pq^2} \\ &= \frac{3p^2q^2(q-5)}{3pq^2} \\ &= p(q-5) \end{aligned}$$

$$\begin{aligned} 7 \quad & \frac{3x^2-3x}{x-1} \\ &= \frac{3x(x-1)}{x-1} \\ &= 3x \end{aligned}$$

$$\begin{aligned} 8 \quad & \frac{6x^2+12xy}{3x+6y} \\ &= \frac{6x(x+2y)}{3(x+2y)} \\ &= 2x \end{aligned}$$

$$\begin{aligned} 9 \quad & \frac{x-1}{x^2-1} \\ &= \frac{x-1}{(x+1)(x-1)} \\ &= \frac{1}{x+1} \end{aligned}$$

$$\begin{aligned} 10 \quad & \frac{x^2+x-12}{x+4} \\ &= \frac{(x+4)(x-3)}{x+4} \\ &= x-3 \end{aligned}$$

$$\begin{aligned} 11 \quad & \frac{x^2+3x+2}{x+2} \\ &= \frac{(x+2)(x+1)}{x+2} \\ &= x+1 \end{aligned}$$

$$\begin{aligned} 12 \quad & \frac{2x^2+8x}{x+4} \\ &= \frac{2x(x+4)}{x+4} \\ &= 2x \end{aligned}$$

$$\begin{aligned} 13 \quad & \frac{x^2+4x+4}{x+2} \\ &= \frac{(x+2)(x+2)}{x+2} \\ &= x+2 \end{aligned}$$

$$\begin{aligned} 14 \quad & \frac{2x-6}{x^2-3x} \\ &= \frac{2(x-3)}{x(x-3)} \\ &= \frac{2}{x} \end{aligned}$$



**Answers Merit Skill 6****Add or subtract algebraic fractions**

$$\begin{aligned} 1 \quad & \frac{2x}{5} + \frac{3x}{10} \\ &= \frac{4x}{10} + \frac{3x}{10} \\ &= \frac{7x}{10} \end{aligned}$$

$$\begin{aligned} 2 \quad & \frac{m}{4} + \frac{3m}{5} \\ &= \frac{5m + 12m}{20} \\ &= \frac{17m}{20} \end{aligned}$$

$$\begin{aligned} 3 \quad & \frac{x}{5} - \frac{x}{6} \\ &= \frac{6x - 5x}{30} \\ &= \frac{x}{30} \end{aligned}$$

$$\begin{aligned} 4 \quad & \frac{2x}{3} - \frac{x}{4} \\ &= \frac{8x - 3x}{12} \\ &= \frac{5x}{12} \end{aligned}$$

$$\begin{aligned} 5 \quad & \frac{2a}{9} + \frac{a}{1} \\ &= \frac{2a + 9a}{9} \\ &= \frac{11a}{9} \end{aligned}$$

$$\begin{aligned} 6 \quad & \frac{6x}{7} + \frac{7x}{6} \\ &= \frac{36x + 49x}{42} \\ &= \frac{85x}{42} \end{aligned}$$

$$\begin{aligned} 7 \quad & \frac{k}{8} + \frac{5k}{12} \\ &= \frac{12k + 40k}{96} \\ &= \frac{52k}{96} \\ &= \frac{13k}{24} \end{aligned}$$

$$\begin{aligned} 8 \quad & \frac{x}{2} - \frac{5x}{12} \\ &= \frac{12x - 10x}{24} \\ &= \frac{2x}{24} \\ &= \frac{x}{12} \end{aligned}$$

$$\begin{aligned} 9 \quad & \frac{2p}{1} - \frac{7p}{5} \\ &= \frac{10p - 7p}{5} \\ &= \frac{3p}{5} \end{aligned}$$

$$\begin{aligned} 10 \quad & \frac{3z}{4} + \frac{3z}{16} \\ &= \frac{12z}{16} + \frac{3z}{16} \\ &= \frac{15z}{16} \end{aligned}$$

$$\begin{aligned} 11 \quad & \frac{2x}{9} + \frac{4x}{3} \\ &= \frac{2x}{9} + \frac{12x}{9} \\ &= \frac{14x}{9} \end{aligned}$$

$$\begin{aligned} 12 \quad & \frac{x}{5} - \frac{x}{15} \\ &= \frac{3x}{15} - \frac{x}{15} \\ &= \frac{2x}{15} \end{aligned}$$

$$\begin{aligned} 13 \quad & \frac{7d}{10} - \frac{2d}{5} \\ &= \frac{7d}{10} - \frac{4d}{10} \\ &= \frac{3d}{10} \end{aligned}$$

$$\begin{aligned} 14 \quad & \frac{3x}{5} - \frac{9x}{25} \\ &= \frac{15x}{25} - \frac{9x}{25} \\ &= \frac{6x}{25} \end{aligned}$$

## Practice Assessment Answers

## Assessment One

- 1  $9a^8b^2$
- 2  $10y$
- 3  $2y^2 + 5y - 12$
- 4  $(x - 7)(x + 4)$
- 5  $x = 6$
- 6  $x = 0$  or  $x = \frac{1}{3}$
- 7  $x = 10$  or  $x = -3$
- 8  $x = -5$  or  $x = 2$
- 9  $a = 4$  and  $b = 5$
- 10  $h = \frac{3V}{\pi r^2}$
- 11  $2ab$
- 12  $\frac{23x}{10}$

## Assessment Two

- 1  $4a^2$
- 2  $2p - 18q$
- 3  $3x^2 - 10x + 8$
- 4  $(x - 4)(x - 2)$
- 5  $x = \frac{2}{3}$
- 6  $x = -7$  or  $x = \frac{2}{3}$
- 7  $x = -6$  or  $x = -3$
- 8  $x = -7$  or  $x = 1$
- 9  $x = 7$  and  $y = 2$
- 10  $r = \sqrt{\frac{A}{4\pi}}$
- 11  $\frac{x - 4}{2}$
- 12  $\frac{11m}{12}$

## Assessment Three

- 1  $12a^7$
- 2  $11a + 39$
- 3  $3d^2 - 17d + 10$
- 4  $(x + 4)(x - 3)$
- 5  $x = \frac{7}{12}$
- 6  $x = 3$  or  $x = -\frac{1}{2}$
- 7  $x = -5$  or  $x = 5$
- 8  $x = 6$  or  $x = -2$
- 9  $x = 5$  and  $y = 7$
- 10  $t = \frac{C - k}{2n}$
- 11  $x + 4$
- 12  $\frac{7x}{4}$