

1 (a) Simplify  $n^0$

(1)

(b) Simplify  $(3x^2y^5)^3$

(2)

(c) Factorise fully  $2e^2 - 18$

(2)

(d) Make  $r$  the subject of  $m = \sqrt{\frac{6a + r}{5r}}$

(4)

---

(Total for Question 1 is 9 marks)

**2** (a) Expand and simplify  $(x + 4)(x - 2)(x + 1)$

.....  
(3)

(b) Express  $x^2 - 10x + 40$  in the form  $(x + a)^2 + b$ , where  $a$  and  $b$  are integers.

.....  
(2)

**(Total for Question 2 is 5 marks)**

3 (a) Simplify  $(64p^9q^{12})^{\frac{2}{3}}$

---

(2)

(b) Write as a single fraction  $\frac{2}{3x} + \frac{4}{5x} - \frac{9}{10x}$

Give your answer in its simplest form.

---

(2)

- (c) Expand and simplify  $4x(x - 5)(2x + 3)$   
Show your working clearly.

.....  
(3)

---

**(Total for Question 3 is 7 marks)**

---

4 Simplify fully  $\left(\frac{9t^4w^9}{18t^6w^{10}}\right)^{-2}$

---

(Total for Question 4 is 3 marks)

5 Expand and simplify  $4x(3x + 1)(2x - 3)$   
Show your working clearly.

---

(Total for Question 5 is 3 marks)

6 (a) Expand and simplify  $5x(x + 2)(3x - 4)$

.....  
(3)

(b) Simplify completely  $\left(\frac{16w^8}{y^{20}}\right)^{-\frac{3}{4}}$

.....  
(3)

---

(Total for Question 6 is 6 marks)

7 (a) Simplify fully  $(8e^{15})^{\frac{2}{3}}$

.....  
(2)

(b) Express  $\left(\frac{y}{2}\right)^{-4}$  in the form  $ay^n$  where  $a$  and  $n$  are integers.

.....  
(2)

(c) Solve  $\frac{4x-2}{3} - \frac{5-3x}{4} = 6$

Show clear algebraic working.

$x =$  .....  
(4)

---

**(Total for Question 7 is 8 marks)**

8 (a) Expand and simplify  $(2x - 1)(x + 3)(x - 5)$

.....  
(3)

(b) Solve  $3x^2 + 6x - 5 = 0$   
Show your working clearly.  
Give your solutions correct to 3 significant figures.

.....  
(3)

---

**(Total for Question 8 is 6 marks)**



9 (a) Expand and simplify  $(3x - 1)(x + 2)(3x + 1)$

.....  
(3)

(b) Simplify fully  $\left(\frac{2x^5}{8xy^2}\right)^{-2}$

.....  
(3)

---

(Total for Question 9 is 6 marks)

- 10** (a) Expand and simplify  $(5 - x)(2x + 3)(x + 4)$   
Show your working clearly.

.....  
(3)

- (b) Make  $c$  the subject of  $g = \frac{c + 3}{4 + c} - 7$

.....  
(4)

---

(Total for Question 10 is 7 marks)

**11** Expand and simplify  $(4x + 1)(x - 3)(5x + 6)$

.....  
**(Total for Question 11 is 3 marks)**

---

**12** (a) Express  $\frac{4}{x-2} - \frac{3}{x+1}$  as a single fraction.

Give your answer in its simplest form.

.....  
(3)

(b) Expand and simplify  $2x(x-5)(x-3)$

.....  
(3)

**(Total for Question 12 is 6 marks)**

---

- 13** (a) Expand and simplify  $(x + 2)(2x + 3)(x - 7)$   
Show your working clearly.

.....  
(3)

- (b) Make  $m$  the subject of  $p^2 = \frac{x + m}{2m - y}$

.....  
(3)

---

**(Total for Question 13 is 6 marks)**

**14** (a) Simplify  $(3x^2y^5)^4$

(2)

(b) Expand and simplify  $4n(n - 3)(n + 5)$

(2)

(c) Factorise  $4c^2 - 9d^2$

(1)

(d) Simplify fully  $\frac{x^2 - 7x + 12}{4x - x^2}$

(3)

**(Total for Question 14 is 8 marks)**

**15** (a) Expand and simplify  $n(n - 4)(3n + 5)$

.....  
(2)

(b) Express

$$\frac{3}{x} + \frac{x+2}{2x} + \frac{1}{4}$$

as a single fraction in its simplest form.

.....  
(3)

---

**(Total for Question 15 is 5 marks)**

**16** (a) Simplify fully  $\left(\frac{256x^{20}}{y^8}\right)^{-\frac{1}{4}}$

.....  
(2)

(b) Express  $\frac{1}{9x^2 - 25} - \frac{1}{6x + 10}$  as a single fraction in its simplest form.

.....  
(3)

(Total for Question 16 is 5 marks)



17 (a) Simplify fully  $(x^{12}y^8)^{\frac{3}{4}}$

.....  
(2)

Given that  $3^n = \frac{3^x}{9^y}$

(b) find an expression for  $n$  in terms of  $x$  and  $y$ .

$n =$  .....  
(2)

---

(Total for Question 17 is 4 marks)

18 (a) Simplify  $(2e^2 f^3)^3$

.....  
(2)

(b) Expand and simplify  $(3x - 4y)(x + 3y)$

.....  
(2)

$\frac{\sqrt{a} \times a}{a^{-2}}$  can be written in the form  $a^k$

(c) Find the value of  $k$ .

$k =$  .....  
(2)

(d) Simplify  $\frac{2^n - 1}{4^n - 1}$

.....  
(2)

(Total for Question 18 is 8 marks)

19 (a) Simplify  $(16e^{10}f^6)^{\frac{1}{2}}$

.....  
(2)

(b) Write  $\frac{2x+1}{4} + \frac{x-2}{3}$  as a single fraction in its simplest form.

.....  
(3)

Given that  $4^{k+3} = 16 \times 2^k$

(c) find the value of  $k$ .  
Show your working clearly.

$k =$  .....  
(4)

(Total for Question 19 is 9 marks)

20 (a) Simplify  $8^2 \times \sqrt[3]{4^6}$

Give your answer in the form  $2^a$  where  $a$  is an integer.

Show each stage of your working clearly.

.....  
(3)

Given that  $n^{\left(-\frac{4}{5}\right)} = \left(\frac{1}{2}\right)^4$  where  $n > 0$

(b) find the value of  $n$ .

$n =$  .....

(4)

(Total for Question 20 is 7 marks)

**21** (a) Show that  $(6 + 2\sqrt{12})^2 = 12(7 + 4\sqrt{3})$

Show each stage of your working.

(3)

(b) Simplify fully  $\left(\frac{27a^{12}}{t^{15}}\right)^{-\frac{2}{3}}$

(3)

---

(Total for Question 21 is 6 marks)

---

**22** Solve  $\frac{1}{2x-1} + \frac{3}{x-1} = 1$

Give your answer in the form  $\frac{p \pm \sqrt{q}}{2}$  where  $p$  and  $q$  are integers.

.....  
(Total for Question 22 is 4 marks)

**23**

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

Give your answer in the form  $a \pm b\sqrt{2}$  where  $a$  and  $b$  are fractions.

.....  

---

**(Total for Question 23 is 5 marks)**

24 Solve  $\frac{1}{x+4} + \frac{3}{2-2x} = 1$

.....  
(Total for Question 24 is 4 marks)



25 (a) (i) Write  $x^2 - 8x + 3$  in the form  $(x - a)^2 - b$  where  $a$  and  $b$  are integers.

.....  
(2)

(ii) Hence, write down the coordinates of the turning point on the graph of  $y = x^2 - 8x + 3$

(..... , .....)  
(1)

(b) Solve  $7x^2 + 8x - 5 = 0$   
Give your solutions correct to 3 significant figures.

.....  
(3)

Alex has to find the solutions of the quadratic equation  $3k^2 + 10k - 8 = 0$   
Here is his working and answer.

$$(3k - 2)(k + 4) = 0$$

$$k = 2 \text{ or } k = -4$$

(c) What mistake has Alex made?

.....  
.....  
.....  
(1)

(Total for Question 25 is 7 marks)