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 $m = \sqrt{\dfrac{6a + r}{5r}}$

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

.....

(Total for Question 3 is 3 marks)

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

.....

(Total for Question 4 is 3 marks)

5 (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 5 is 6 marks)

6 (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 6 is 6 marks)

7 (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 7 is 6 marks)

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

(3)

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

(4)

(Total for Question 8 is 7 marks)

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

(Total for Question 9 is 3 marks)

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

(3)

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

(3)

(Total for Question 10 is 6 marks)

11 (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 $\dfrac{x^2 - 7x + 12}{4x - x^2}$

(3)

(Total for Question 11 is 8 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) Simplify $(2e^2 f^3)^3$

.....

(2)

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

.....

(2)

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

(c) Find the value of k.

$k =$ .....

(2)

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

.....

(2)

(Total for Question 13 is 8 marks)

14 (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 14 is 9 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 $3^{n} = \dfrac{3^{x}}{9^{y}}$

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

$n =$ .....

(2)

(Total for Question 17 is 4 marks)

18 (a) Simplify 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 18 is 8 marks)

19 (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 19 is 7 marks)

20 (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)

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

Show each stage of your working.

(3)

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

(3)

(Total for Question 19 is 6 marks)

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

.....

(3)

(Total for Question 20 is 7 marks)

22 Simplify fully $\dfrac{6x^3 + 13x^2 - 5x}{4x^2 - 25}$

.....

(Total for Question 22 is 3 marks)

23 (a) Rationalise the denominator of $\dfrac{a+\sqrt{4b}}{a-\sqrt{4b}}$ where a is an integer and b is a prime number.

Simplify your answer.

(3)

(b) Given that $\left(\sqrt{\dfrac{y}{x}}\right)^{-5} = \dfrac{x^m}{y^m}$ where $x \neq y$

find the value of m.

$m =$

(1)

(Total for Question 23 is 4 marks)

24

(a) Simplify fully $\dfrac{10x^2 + 23x + 12}{4x^2 - 9}$

.....

(3)

$2^{2y} \times 2^{3y+2} = \dfrac{8^{5y}}{4^n}$

(b) Find an expression for n in terms of y.
Show clear algebraic working and simplify your expression.

.....

(4)

(Total for Question 24 is 7 marks)

25

$$\frac{18 \times \left(\sqrt{27}\right)^{4n+6}}{6 \times 9^{2n+8}} = 3^x$$

Express x in terms of n
Show your working clearly and simplify your expression.

$x =$ .....

(Total for Question 25 is 3 marks)

26 Express each of a, b and c in terms of q so that

$$q + 12x - qx^2$$

can be written as $a - b(x - c)^2$

$a =$ .....

$b =$ .....

$c =$ .....

(Total for Question 26 is 4 marks)

27 $a = \dfrac{14}{3x - 7}$ $\quad x = \dfrac{7}{4y - 3}$

Express a in the form $\dfrac{py + q}{ry + s}$ where p, q, r and s are integers.

Give your answer in its simplest form.

$a =$ .....

(Total for Question 27 is 3 marks)

28 Express $\left(\frac{20}{x^2 - 36} - \frac{2}{x - 6}\right) \times \frac{1}{4 - x}$ as a single fraction in its simplest form.

.....

(Total for Question 28 is 3 marks)

29

Given that $M = \dfrac{18^{4n} \times 2^{3(n^2-6n)} \times 3^{2(1-4n)}}{12^2}$

find the values of n for which $M = 2$

.....

(Total for Question 29 is 5 marks)

30 Express

$$\frac{1}{3x-2} \times \frac{9x^2-4}{3x^2-13x-10} - \frac{7}{x-1}$$

as a single fraction in its simplest form.

.....

(Total for Question 30 is 5 marks)