5.1 Powers of prime numbers

So far the laws of indices have only been applied to numbers with a base that is a prime number. They apply equally well when the base is composite.

For example : $8^6 \times 8^4 = 8^{10}$

Sometimes a question will ask that the answer be written in the form, a^m, where a is a prime number in which case there is extra work to do.

For example : $8^6 \times 8^4 = 8^{10} = (2^3)^{10} = 2^{30}$

5.2 'Together' Questions
Write each answer in the prime index form, p^m, where p is a prime number.

(a) 4^4

(b) 8^5

(c) $16^{\frac{1}{2}}$

(d) $4^3 \times 2^3$

(e) 8×4

(f) $\dfrac{2^{12}}{4^3}$

(g) $2^5 \times \sqrt{16}$

(h) 25^4

(i) $\dfrac{5^9}{25^2}$

5.3 Exercise

Question 1

Complete the following table,

Number	rewritten as a power of 2
2	2^1
4	2^2
8	
16	
32	
64	
128	

For each of the following, rewrite in prime index form, p^m, where p is a prime number.

(a) 4^6

(b) 8^7

(c) $64^{\frac{1}{2}}$

(d) $32^3 \times 2^3$

(e) 128×4

(f) $\dfrac{2^{25}}{4^3}$

(g) $64^5 \times \sqrt{16}$

(h) $128^4 \times 32^7$

(i) $\dfrac{16^9}{64^2}$

Question 2

Complete the following table,

Number	rewritten as a power of 3
3	3^1
	3^2
	3^3
243	
729	
2187	

For each of the following, rewrite in prime index form, p^m, where p is a prime number.

(a) 9^7

(b) 81^7

(c) $81^{\frac{1}{2}}$

(d) $243^4 \times 3^4$

(e) 2187×729

(f) $\dfrac{3^{18}}{9^3}$

(g) $81^7 \times \sqrt{9}$

(h) $27^9 \times 9^7$

(i) $\dfrac{27^9}{2187}$

Question 3

Complete the following table,

Number	rewritten as a power of 5
5	5^1
	5^2
	5^3
625	
3125	
15625	
78125	

For each of the following, rewrite in prime index form, p^m, where p is a prime number.

(a) 3125^7

(b) $\left(25^3\right)^7$

(c) $625^{\frac{1}{2}}$

(d) $125^{13} \times 5^3$

(e) 3125×78125

(f) $\dfrac{25^8}{15625}$

(g) $625 \times \sqrt{625}$

(h) $25^{19} \times 625^7$

(i) $\dfrac{78125^2}{25^3}$

Question 4

Complete the following table,

Number	rewritten as a power of 7
7	7^1
	7^2
	7^3
2401	
16807	
117649	
823543	

For each of the following, rewrite in prime index form, p^m, where p is a prime number.

(a) 117649^5

(b) $\left(2401^{10}\right)^7$

(c) $117649^{\frac{1}{2}}$

(d) $343^{11} \times 49^{13}$

(e) 823543×49

(f) $\dfrac{2401^8}{823543^2}$

(g) $7^8 \times \sqrt{117649}$

(h) $\left(343^4\right)^5 \times 16807^7$

(i) $\dfrac{823543^{20}}{343^5}$