(b) $\left(x^{\frac{1}{a-b}}\right)^{\frac{1}{a-c}} \cdot \left(x^{\frac{1}{b-c}}\right)^{\frac{1}{b-a}} \cdot \left(x^{\frac{1}{c-a}}\right)^{\frac{1}{c-b}} = 1$

(c) $\frac{x^{a(b-c)}}{x^{b(a-c)}} \div \left(\frac{x^b}{x^a}\right)^c = 1$

(d) $\frac{\left(x^{a+b}\right)^2\left(x^{b+c}\right)^2\left(x^{c+a}\right)^2}{\left(x^a x^b x^c\right)^4} = 1$

16. If x is a positive real number and exponents are rational numbers, simplify $\left(\frac{x^b}{x^c}\right)^{b+c-a} \cdot \left(\frac{x^c}{x^a}\right)^{c+a-b} \cdot \left(\frac{x^a}{x^b}\right)^{a+b-c}$.

17. If $\frac{9^n \times 3^2 \times \left(x^{-n/2}\right)^{-2} - (27)^n}{3^{3m} \times 2^3} = \frac{1}{27}$, prove that m - n = 1.

18. Write the following in ascending order of magnitude. $\sqrt[6]{6}, \sqrt[3]{7}, \sqrt[4]{8}$.

2. Polynomials

EXERCISE 2A

1. Which of the following expressions are polynomials? In case of a polynomial, write its degree.
   (a) $x^5 - 2x^3 + x + \sqrt{3}$ (b) $y^3 + \sqrt{3}y$
   (c) $t^2 - \frac{2}{5}t + \sqrt{5}$ (d) $x^{100} - 1$
   (e) $\frac{1}{\sqrt{2}}x^2 - \sqrt{2}x + 2$ (f) $x^{-2} + 2x^{-1} + 3$
   (g) 1 (h) $\frac{-3}{5}$
   (i) $\frac{x^2}{2} - \frac{2}{x^2}$ (j) $\sqrt[3]{2}x^2 - 8$
   (k) $\frac{1}{2x^2}$ (l) $\frac{1}{\sqrt{5}}x^{1/2} + 1$
   (m) $\frac{3}{5}x^2 - \frac{7}{3}x + 9$ (n) $x^4 - x^{3/2} + x - 3$
   (o) $2x^3 + 3x^2 + \sqrt{x} - 1$
2. Identify constant, linear, quadratic, cubic and quartic polynomials from the following.
   (a) -7 + x (b) 6y (c) $-z^3$
   (d) $1 - y - y^3$ (e) $x - x^3 + x^4$ (f) $1 + x + x^2$
   (g) $-6x^2$ (h) -13 (i) -p
3. Write
   (a) the coefficient of x^3 in $x + 3x^2 - 5x^3 + x^4$.
   (b) the coefficient of x in $\sqrt{3} - 2\sqrt{2}x + 6x^2$.
   (c) the coefficient of x^2 in 2x - 3 + x^3.
   (d) the coefficient of x in $\frac{3}{8}$x^2 - $\frac{2}{7}$x + $\frac{1}{6}$.
   (e) the constant term in $\frac{\pi}{2}x + 7x - \frac{2}{5}\pi$
4. Determine the degree of each of the following polynomials.
   (a) $\frac{4x - 5x^2 + 6x^3}{2x}$ (b) $y^2(y - y^3)$
   (c) $(3x - 2)(2x^3 + 3x^2)$ (d) $-\frac{1}{2} + 3$
   (e) -8 (f) $x^{-2}(x^4 + x^2)$
5. (a) Give an example of a monomial of degree 5.
   (b) Give an example of a binomial of degree 8.
   (c) Given an example of a trinomial of degree 4.
   (d) Give an example of a monomial of degree 0.
6. Rewrite each of the following polynomials in standard form.
   (a) $x - 2x^2 + 8 + 5x^3$ (b) $\frac{2}{3} + 4y^2 - 3y + 2y^3$
   (c) $6x^3 + 2x - x^5 - 3x^2$ (d) $2 + t - 3t^3 + t^4 - t^2$

EXERCISE 2B

1. If $p(x) = 5 - 4x + 2x^2$, find
   (a) p(0), (b) p(3), (c) p(-2)
2. If $p(y) = 4 + 3y - y^2 + 5y^3$, find
   (a) p(0), (b) p(2), (c) p(-1)
3. If $f(t) = 4t^2 - 3t + 6$, find
   (a) f(0), (b) f(4), (c) f(-5)
4. If $p(x) = x^3 - 3x^2 + 2x$, find p(0), p(1), p(2). What do you conclude?
5. If $p(x) = x^3 + x^2 - 9x - 9$, find p(0), p(3), p(-3) and p(-1). What do you conclude about the zeros of p(x)? Is 0 a zero of p(x)?
6. Verify that
   (a) 4 is a zero of the polynomial, p(x) = x - 4.
   (b) –3 is a zero of the polynomial, q(x) = x + 3.
   (c) $\frac{2}{5}$ is a zero of the polynomial, f(x) = 2 - 5x.
   (d) $\frac{-1}{2}$ is a zero of the polynomial, g(y) = 2y + 1.
7. Verify that
   (a) 1 and 2 are the zeros of the polynomial, p(x) = $x^2 - 3x + 2$.
   (b) 2 and –3 are the zeros of the polynomial, q(x) = $x^2 + x - 6$.
   (c) 0 and 3 are the zeros of the polynomial, r (x) = $x^2 - 3x$.
8. Find the zero of the polynomial:
   (a) p(x) = x - 5 (b) q(x) = x + 4 (c) r(x) = 2x + 5
   (d) f(x) = 3x + 1 (e) g(x) = 5 - 4x (f) h(x) = 6x - 2
   (g) p(x) = ax, a ≠ 0 (h) q(x) = 4x
9. If 2 and 0 are the zeros of the polynomial $f(x) = 2x^3 - 5x^2 + ax + b$ then find the values of a and b.

EXERCISE 2C

1. By actual division, find the quotient and the remainder when $(x^4 + 1)$ is divided by (x - 1). Verify that remainder = f(1).
2. Verify the division algorithm for the polynomials $p(x) = 2x^4 - 6x^3 + 2x^2 - x + 2$ and g(x) = x + 2.

Using the remainder theorem, find the remainder, when p(x) is divided by g(x), where

3. $p(x) = x^3 - 6x^2 + 9x + 3$, g(x) = x - 1.
4. $p(x) = 2x^3 - 7x^2 + 9x - 13$, g(x) = x - 3.
5. $p(x) = 3x^4 - 6x^2 - 8x - 2$, g(x) = x - 2.
6. $p(x) = 2x^3 - 9x^2 + x + 15$, g(x) = 2x - 3.
7. $p(x) = x^3 - 2x^2 - 8x - 1$, g(x) = x + 1.
8. $p(x) = 2x^3 + x^2 - 15x - 12$, g(x) = x + 2.

1. Number Systems

EXERCISE 1A

1. Is zero a rational number? Justify.
2. Represent each of the following rational numbers on the number line:
   (a) $\frac{5}{7}$ (b) $\frac{8}{3}$ (c) $-\frac{23}{6}$ (d) 1.3 (e) -2.4
3. Find a rational number between
   (a) $\frac{3}{8}$ and $\frac{2}{5}$ (b) 1.3 and 1.4 (c) -1 and $\frac{1}{2}$
   (d) $-\frac{3}{4}$ and $-\frac{2}{5}$ (e) $\frac{1}{9}$ and $\frac{2}{9}$
4. Find three rational numbers lying between $\frac{3}{5}$ and $\frac{7}{8}$. How many rational numbers can be determined between these two numbers?
5. Find four rational numbers between $\frac{3}{7}$ and $\frac{5}{7}$.
6. Find six rational numbers between 2 and 3.
7. Find five rational numbers between $\frac{3}{5}$ and $\frac{2}{3}$.
8. Insert 16 rational numbers between 2.1 and 2.2.
9. State whether the following statements are true or false. Give reasons for your answer.
   (a) Every natural number is a whole number.
   (b) Every whole number is a natural number.
   (c) Every integer is a whole number.
   (d) Every integer is a rational number.
   (e) Every rational number is an integer.
   (f) Every rational number is a whole number.

EXERCISE 1B

1. Without actual division, find which of the following rational numbers are terminating decimals.
   (a) $\frac{13}{80}$ (b) $\frac{7}{24}$ (c) $\frac{5}{12}$ (d) $\frac{31}{375}$ (e) $\frac{16}{125}$
2. Write each of the following in decimal form and say what kind of decimal expansion each has.
   (a) $\frac{5}{8}$ (b) $\frac{7}{25}$ (c) $\frac{3}{11}$ (d) $\frac{5}{13}$
   (e) $\frac{11}{24}$ (f) $\frac{261}{400}$ (g) $\frac{231}{625}$ (h) $2\frac{5}{12}$
3. Express each of the following decimals in the form $\frac{p}{q}$, where p, q are integers and q ≠ 0.
   (a) $0.\overline{2}$ (b) $0.\overline{53}$ (c) $2.\overline{93}$ (d) $18.\overline{48}$
   (e) $0.\overline{235}$ (f) $0.00\overline{32}$ (g) $1.3\overline{23}$ (h) $0.3\overline{178}$
   (i) $32.12\overline{35}$ (j) $0.40\overline{7}$
4. Express $2.\overline{36} + 0.\overline{23}$ as a fraction in simplest form.
5. Express in the form of $\frac{p}{q}$: $0.\overline{38} + 1.\overline{27}$

EXERCISE 1C

1. What are irrational numbers? How do they differ from rational numbers? Give examples.
2. Classify the following numbers as rational or irrational. Give reasons to support your answer.
   (a) $\sqrt{\frac{3}{81}}$ (b) $\sqrt{361}$ (c) $\sqrt{21}$ (d) $\sqrt{1.44}$
   (e) $\frac{2}{3}\sqrt{6}$ (f) 4.1276 (g) $\frac{22}{7}$
   (h) 1.232332333... (i) 3.040040004...
   (j) 2.356565656... (k) 6.834834...
3. Let x be a rational number and y be an irrational number. Is x + y necessarily an irrational number? Give an example in support of your answer.
4. Let a be a rational number and b be an irrational number. Is ab necessarily an irrational number? Justify your answer with an example.
5. Is the product of two irrationals always irrational? Justify your answer.
6. Give an example of two irrational numbers whose
   (a) difference is an irrational number.
   (b) difference is a rational number.
   (c) sum is an irrational number.
   (d) sum is a rational number.
   (e) product is an irrational number.
   (f) product is a rational number.
   (g) quotient is an irrational number.
   (h) quotient is a rational number.
7. Examine whether the following numbers are rational or irrational.
   (a) $3 + \sqrt{3}$ (b) $\sqrt{7} - 2$ (c) $\sqrt[3]{5} \times \sqrt[3]{25}$
   (d) $\sqrt{7} \times \sqrt{343}$ (e) $\sqrt{\frac{13}{117}}$ (f) $\sqrt{8} \times \sqrt{2}$
8. Insert a rational and an irrational number between 2 and 2.5.
9. How many irrational numbers lie between $\sqrt{2}$ and $\sqrt{3}$? Find any three irrational numbers lying between $\sqrt{2}$ and $\sqrt{3}$.
10. Find two rational and two irrrational numbers between 0.5 and 0.55.
11. Find three different irrational numbers between the rational numbers $\frac{5}{7}$ and $\frac{9}{11}$.
12. Find two rational numbers of the form $\frac{p}{q}$ between the numbers 0.2121121112... and 0.2020020002... .
13. Find two irrational numbers between 0.16 and 0.17.
14. State, in each case, whether the given statement is true or false.
   (a) The sum of two rational numbers is rational.
   (b) The sum of two irrational numbers is irrational.
   (c) The product of two rational numbers is rational.

(d) The product of two irrational numbers is irrational. 5. The sum of a rational number and an irrational number is irrational. 6. The product of a nonzero rational number and an irrational number is a rational number. 7. Every real number is rational. 8. Every real number is either rational or irrational. 9. π is irrational and $\frac{22}{7}$ is rational.

EXERCISE 1D

1. Add
   (a) $(2\sqrt{3}-5\sqrt{2}), (\sqrt{2}+2\sqrt{2})$
   (b) $(2\sqrt{2}+5\sqrt{3}-7\sqrt{5}), (3\sqrt{3}-\sqrt{2}+\sqrt{5})$
   (c) $(\frac{2}{3}\sqrt{7}-\frac{1}{2}\sqrt{2}+6\sqrt{11})$, $(\frac{1}{3}\sqrt{7}+\frac{3}{2}\sqrt{2}-\sqrt{11})$
2. Multiply
   (a) $3\sqrt{5}$ by $2\sqrt{5}$ (b) $6\sqrt{15}$ by $4\sqrt{3}$
   (c) $2\sqrt{6}$ by $3\sqrt{3}$ (d) $3\sqrt{8}$ by $3\sqrt{2}$
   (e) $\sqrt{10}$ by $\sqrt{40}$ (f) $3\sqrt{28}$ by $2\sqrt{7}$
3. Divide
   (a) $16\sqrt{6}$ by $4\sqrt{2}$ (b) $12\sqrt{15}$ by $4\sqrt{3}$
   (c) $18\sqrt{21}$ by $6\sqrt{7}$
4. Simplify
   (a) $(3-\sqrt{11})(3+\sqrt{11})$
   (b) $(-3+\sqrt{5})(-3-\sqrt{5})$
   (c) $(3-\sqrt{3})^2$
   (d) $(\sqrt{5}-\sqrt{3})^2$
   (e) $(5+\sqrt{7})(2+\sqrt{5})$
   (f) $(\sqrt{5}-\sqrt{2})(\sqrt{2}-\sqrt{3})$
5. Simplify $(3+\sqrt{3})(2+\sqrt{2})^2$
6. Examine whether the following numbers are rational or irrational:
   (a) $(5-\sqrt{5})(5-\sqrt{5})$ (b) $(\sqrt{3}+2)^2$
   (c) $\frac{2\sqrt{13}}{3\sqrt{52}-4\sqrt{117}}$ (d) $\sqrt{8}$ + $4\sqrt{32}$ - $6\sqrt{2}$
7. On her birthday Reema distributed chocolates in an orphanage. The total number of chocolates she distributed is given by (5 + $\sqrt{11}$)(5 - $\sqrt{11}$).
   (a) Find the number of chocolates distributed by her.
   (b) Write the moral values depicted here by Reema.
8. Simplify
   (a) $3\sqrt{45}$ - $\sqrt{125}$ + $\sqrt{200}$ - $\sqrt{50}$
   (b) $\frac{2\sqrt{30}}{\sqrt{6}}$ - $\frac{3\sqrt{140}}{\sqrt{28}}$ + $\frac{\sqrt{55}}{\sqrt{99}}$
   (c) $\sqrt{72}$ + $\sqrt{800}$ - $\sqrt{18}$

EXERCISE 1E

1. Represent $\sqrt{5}$ on the number line.
2. Locate $\sqrt{3}$ on the number line.
3. Locate $\sqrt{10}$ on the number line.
4. Locate $\sqrt{8}$ on the number line.
5. Represent $\sqrt{4.7}$ geometrically on the number line.
6. Represent $\sqrt{10.5}$ on the number line.
7. Represent $\sqrt{7.28}$ geometrically on the number line.
8. Represent (1 + $\sqrt{9.5}$) on the number line.
9. Visualize the representation of $\sqrt{3.765}$ on the number line using successive magnification.
10. Visualize the representation of $\sqrt{4.67}$ on the number line up to 4 decimal places.

EXERCISE 1F

1. Write the rationalising factor of the denominator in $\frac{1}{\sqrt{2}+\sqrt{3}}$.
2. Rationalise the denominator of each of the following.
   (a) $\frac{1}{\sqrt{7}}$ (b) $\frac{\sqrt{5}}{2\sqrt{3}}$ (c) $\frac{1}{2+\sqrt{3}}$
   (d) $\frac{1}{\sqrt{5}-2}$ (e) $\frac{1}{5+3\sqrt{2}}$ (f) $\frac{1}{\sqrt{7}-\sqrt{6}}$
   (g) $\frac{4}{\sqrt{11}-\sqrt{7}}$ (h) $\frac{1+\sqrt{2}}{2-\sqrt{2}}$ (i) $\frac{3-2\sqrt{2}}{3+2\sqrt{2}}$
3. It being given that $\sqrt{2}$ = 1.414, $\sqrt{3}$ = 1.732, $\sqrt{5}$ = 2.236 and $\sqrt{10}$ = 3.162, find the value to three places of decimals, of each of the following.
   (a) $\frac{2}{\sqrt{5}}$ (b) $\frac{2-\sqrt{3}}{\sqrt{3}}$ (c) $\frac{\sqrt{10}-\sqrt{5}}{\sqrt{2}}$
4. Find rational numbers a and b such that
   (a) $\frac{\sqrt{2}-1}{\sqrt{2}+1}$ = a + b$\sqrt{2}$ (b) $\frac{2-\sqrt{5}}{2+\sqrt{5}}$ = a$\sqrt{5}$ + b
   (c) $\frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}$ = a + b$\sqrt{6}$ (d) $\frac{5+2\sqrt{3}}{7+4\sqrt{3}}$ = a + b$\sqrt{3}$
5. It being given that $\sqrt{3}$ = 1.732, $\sqrt{5}$ = 2.236, $\sqrt{6}$ = 2.449 and $\sqrt{10}$ = 3.162, find to three places of decimal, the value of each of the following.
   (a) $\frac{1}{\sqrt{6}+\sqrt{5}}$ (b) $\frac{6}{\sqrt{5}+\sqrt{3}}$ (c) $\frac{1}{4\sqrt{3}-3\sqrt{5}}$
   (d) $\frac{3+\sqrt{5}}{3-\sqrt{5}}$ (e) $\frac{1+2\sqrt{3}}{2-\sqrt{3}}$ (f) $\frac{\sqrt{5}+\sqrt{2}}{\sqrt{5}-\sqrt{2}}$
6. Simplify by rationalising the denominator.
   (a) $\frac{7\sqrt{3}-5\sqrt{2}}{\sqrt{48}+\sqrt{18}}$ (b) $\frac{2\sqrt{6}-\sqrt{5}}{3\sqrt{5}-2\sqrt{6}}$
7. Simplify
   (a) $\frac{4+\sqrt{5}}{4-\sqrt{5}}$ + $\frac{4-\sqrt{5}}{4+\sqrt{5}}$
   (b) $\frac{1}{\sqrt{3}+\sqrt{2}}$ - $\frac{2}{\sqrt{5}-\sqrt{3}}$ - $\frac{3}{\sqrt{2}-\sqrt{5}}$
   (c) $\frac{2+\sqrt{3}}{2-\sqrt{3}}$ + $\frac{2-\sqrt{3}}{2+\sqrt{3}}$ + $\frac{\sqrt{3}-1}{\sqrt{3}+1}$
   (d) $\frac{2\sqrt{6}}{\sqrt{2}+\sqrt{3}}$ + $\frac{6\sqrt{2}}{\sqrt{6}+\sqrt{3}}$ - $\frac{8\sqrt{3}}{\sqrt{6}+\sqrt{2}}$
8. Prove that
   (a) $\frac{1}{3+\sqrt{7}}$ + $\frac{1}{\sqrt{7}+\sqrt{5}}$ + $\frac{1}{\sqrt{5}+\sqrt{3}}$ + $\frac{1}{\sqrt{3}+1}$ = 1
   (b) $\frac{1}{1+\sqrt{2}}$ + $\frac{1}{\sqrt{2}+\sqrt{3}}$ + $\frac{1}{\sqrt{3}+\sqrt{4}}$ + $\frac{1}{\sqrt{4}+\sqrt{5}}$ + $\frac{1}{\sqrt{5}+\sqrt{6}}$ + $\frac{1}{\sqrt{6}+\sqrt{7}}$ + $\frac{1}{\sqrt{7}+\sqrt{8}}$ + $\frac{1}{\sqrt{8}+\sqrt{9}}$ = 2
9. Find the values of a and b if $\frac{7+3\sqrt{5}}{3+\sqrt{5}}$ - $\frac{7-3\sqrt{5}}{3-\sqrt{5}}$ = a + b$\sqrt{5}$
10. Simplify $\frac{\sqrt{13}-\sqrt{11}}{\sqrt{13}+\sqrt{11}}$ + $\frac{\sqrt{13}+\sqrt{11}}{\sqrt{13}-\sqrt{11}}$
11. If x = 3 + 2$\sqrt{2}$, check whether x + $\frac{1}{x}$ is rational or irrational.
12. If x = 2 - $\sqrt{3}$, find the value of $\left(x-\frac{1}{x}\right)^3$.
13. If x = 9 - 4$\sqrt{5}$, find the value of $x^2 + \frac{1}{x^2}$.
14. If x = $\frac{5-\sqrt{21}}{2}$, find the value of x + $\frac{1}{x}$.
15. If a = 3 - 2$\sqrt{2}$, find the value of $a^2 - \frac{1}{a^2}$.
16. If x = $\sqrt{13}$ + 2$\sqrt{3}$, find the value of x - $\frac{1}{x}$.
17. If x = 2 + $\sqrt{3}$, find the value of $x^3 + \frac{1}{x^3}$.
18. If x = $\frac{5-\sqrt{3}}{5+\sqrt{3}}$ and y = $\frac{5+\sqrt{3}}{5-\sqrt{2}}$, show that x - y = - $\frac{10\sqrt{3}}{11}$.
19. If a = $\frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{2}}$ and b = $\frac{\sqrt{5}-\sqrt{2}}{\sqrt{5}+\sqrt{2}}$, show that $3a^2$ + 4ab - $3b^2$ = 4 + $\frac{56}{3}\sqrt{10}$
20. If a = $\frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}$ and b = $\frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}$, find the value of $a^2 + b^2$ - 5ab.
21. If p = $\frac{3-\sqrt{5}}{3+\sqrt{5}}$ and q = $\frac{3+\sqrt{5}}{3-\sqrt{5}}$, find the value of p^2 + q^2.
22. Rationalise the denominator of each of the following.
   (a) $\frac{1}{\sqrt{7}+\sqrt{6}-\sqrt{13}}$ (b) $\frac{3}{\sqrt{3}+\sqrt{5}-\sqrt{2}}$ (c) $\frac{4}{2+\sqrt{3}+\sqrt{7}}$
23. Given, $\sqrt{2}$ = 1.414 and $\sqrt{6}$ = 2.449, find the value of $\frac{1}{\sqrt{3}-\sqrt{2}-1}$ to 3 places of decimal.
24. If x = $\frac{1}{2-\sqrt{3}}$, find the value of x^3 - $2x^2$ - 7x + 5.
25. Evaluate $\frac{15}{\sqrt{10}+\sqrt{20}+\sqrt{40}-\sqrt{5}-\sqrt{80}}$, it being given that $\sqrt{5}$ = 2.236 and $\sqrt{10}$ = 3.162.

EXERCISE 1G

1. Simplify
   (a) $2^{\frac{2}{3}} \times 2^{\frac{1}{3}}$ (b) $2^{\frac{2}{3}} \times 2^{\frac{1}{5}}$
   (c) $7^{\frac{5}{6}} \times 7^{\frac{2}{3}}$ (d) $(1296)^{\frac{1}{4}} \times (1296)^{\frac{1}{2}}$
2. Simplify
   (a) $\frac{6^{1/4}}{6^{1/5}}$ (b) $\frac{8^{1/2}}{8^{2/3}}$ (c) $\frac{5^{6/7}}{5^{2/3}}$
3. Simplify
   (a) $3^{\frac{1}{4}} \times 5^{\frac{1}{4}}$ (b) $2^{\frac{5}{8}} \times 3^{\frac{5}{8}}$ (c) $2^{\frac{2}{3}} \times 7^{\frac{1}{3}}$
4. Simplify
   (a) $(3^4)^{\frac{1}{4}}$ (b) $(3^{1/3})^4$ (c) $(\frac{1}{3^4})^{\frac{1}{2}}$
5. Evaluate
   (a) $(125)^{\frac{1}{3}}$ (b) $(64)^{\frac{1}{6}}$ (c) $(25)^{\frac{3}{2}}$
   (d) $(81)^{\frac{3}{4}}$ (e) $(64)^{-\frac{1}{2}}$ (f) $(8)^{-\frac{1}{3}}$
6. If a = 2, b = 3, find the values of
   (a) $(a^b + b^a)^{-1}$ (b) $(a^a + b^b)^{-1}$
7. Simplify
   (a) $(\frac{81}{49})^{-\frac{3}{2}}$ (b) $(14641)^{0.25}$
   (c) $(\frac{32}{243})^{-\frac{4}{5}}$ (d) $(\frac{7776}{243})^{-\frac{3}{5}}$
8. Evaluate
   (a) $\frac{4}{(216)^{-\frac{2}{3}}} + \frac{1}{(256)^{-\frac{3}{4}}} + \frac{2}{(243)^{-\frac{1}{5}}}$
   (b) $\left(\frac{64}{125}\right)^{-\frac{2}{3}} + \left(\frac{256}{625}\right)^{-\frac{1}{4}} + \left(\frac{3}{7}\right)^0$
   (c) $\left(\frac{81}{16}\right)^{-\frac{3}{4}}\left[\left(\frac{25}{9}\right)^{-\frac{3}{2}} \div \left(\frac{5}{2}\right)^{-3}\right]$
   (d) $\frac{(25)^{\frac{5}{2}} \times (729)^{\frac{1}{3}}}{(125)^{\frac{2}{3}} \times (27)^{\frac{2}{3}} \times 8^{\frac{4}{3}}}$
9. Evaluate
   (a) $(1^3 + 2^3 + 3^3)^{\frac{1}{2}}$ (b) $\left[5(8^{\frac{1}{3}} + 27^{\frac{1}{3}})^3\right]^{\frac{1}{4}}$
   (c) $\frac{2^0+7^0}{5^0}$ (d) $\left[(16)^{\frac{1}{2}}\right]^{\frac{1}{2}}$
10. Prove that
   (a) $\left[8^{-\frac{2}{3}} \times 2^{\frac{1}{2}} \times 25^{-\frac{5}{4}}\right] \div \left[32^{-\frac{2}{5}} \times 125^{-\frac{5}{6}}\right] = \sqrt{2}$
   (b) $\left(\frac{64}{125}\right)^{-\frac{2}{3}} + \frac{1}{\left(\frac{256}{625}\right)^{\frac{1}{4}}} + \frac{\sqrt{25}}{\sqrt[3]{64}} = \frac{65}{16}$
   (c) $\left[7\left\{(81)^{\frac{1}{4}} + (256)^{\frac{1}{4}}\right\}^{\frac{1}{4}}\right]^4 = 16807$
11. Simplify $\sqrt[4]{\sqrt[3]{x^2}}$ and express the result in the exponential form of x.
12. Simplify the product $\sqrt[3]{2} \cdot \sqrt[4]{2} \cdot \sqrt[12]{32}$
13. Simplify
   (a) $\left(\frac{15^{1/3}}{9^{1/4}}\right)^{-6}$ (b) $\left(\frac{12^{1/5}}{27^{1/5}}\right)$ (c) $\left(\frac{15^{1/4}}{3^{1/2}}\right)^{-2}$
14. Find the value of x in each of the following.
   (a) $\sqrt[5]{5x+2} = 2$
   (b) $\sqrt[3]{3x-2} = 4$
   (c) $\left(\frac{3}{4}\right)^3\left(\frac{4}{3}\right)^{-7} = \left(\frac{3}{4}\right)^{2x}$
   (d) $5^{x-3} \times 3^{2x-8} = 225$
   (e) $\frac{3^{3x}.3^{2x}}{3^x} = \sqrt[4]{3^{20}}$
15. Prove that
   (a) $\sqrt{x^{-1}y} \cdot \sqrt{y^{-1}z} \cdot \sqrt{z^{-1}x} = 1$