N1: Numbers and Their Operations (Common Questions w/ Real-World Applications)

- Primes and Prime Factorisation, HCF, LCM, Sq, Cube, Sq Root, Cube Root (Sec 1)
- Calculations with Calculator (Sec 1)
- [Negative, Rational, Irrational, Real] numbers, Integers and Their 4 Operations (Sec 1)
- Approximation and Estimation (Sec 1)
- Standard Form (Sec 3)
- Positive, Negative, Zero and Fractional Indices (Sec 3)
- Laws of Indices (Sec 3)
- Real-World Application of Indices [Compound Interest] (Sec 3)

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1. (a) Express $\sqrt[5]{121}$ in index form with base 11.	[1]
1. (b) Evaluate $3^{\frac{2}{3}} \times 24^{\frac{1}{3}}$ without using a calculator.	[2]
1. (c) Simplify $ab \div \left(\frac{2}{a}\right)^{-2}$.	[1]
2. Simplify $\frac{21p^2q^3r^0}{2r^5} \div \frac{7pq}{4p^2}$, leaving your answer in positive indices.	[2]
3. A group of students line up. If they lined up in 2s or 6s or 9s, there will be one student without a partner. Calculate the least number of students in the contingent.	[2]
4. Calculate the highest common factor of 456 and 696.	[1]
5. Solve the equation $2^{3x} \times 125^{x} = 100$.	[3]
6. Simplify $\frac{24c^3d^2}{\left(3de^2\right)^3} \div \frac{5c^{-2}}{10df}$.	[2]
7. Calculate $\frac{11.27^{\frac{1}{4}}}{30.67-5.23}$. Write your answer correct to 3 significant figures.	[1]
8. Without using a calculator, show that $7^{103} - 7^{101}$ is a multiple of 2.	[1]
9. Use prime factorisation to explain why 72 is not a perfect cube.	[2]
10. Simplify $\left(\frac{ab}{c}\right)^3 \times ab^{-3}c^2$.	[2]

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11. (a) Given $x^9 = 9^0$, find the value of x.	[1]
11. (b) Simplify $\frac{x^2}{3y} \div \frac{x}{9y^2}$.	[1]
12. (a) Express 40 and 138 as the product of their prime factors.	[2]
12. (b) Hence, find the smallest positive integer k such that $138k$ is divisible by 40.	[1]
13. A wooden cube with side 8 cm is cut into two-centimetre cubes. All of the two-centimetre cubes are then arranged to form a cuboid of height greater than 8 cm. The perimeter of the cuboid is 36 cm. Find the height of the cuboid.	
14. Jas deposited $\$m$ into an account that paid a compound interest of 1.85% per annum. He made no other deposits or withdrawals for three years. At the end of three years, he had \$2509.26 in his account. Find the value of m, giving your answer correct to the nearest dollar.	[2]
15. (a) Solve $49^{2x+1} \div \sqrt[3]{7} = \frac{1}{343}$.	[3]
15. (b) Without using a calculator, show that $3^{1161} + 3^{1158}$ is divisible by 7.	[2]
16. Alexandar invested some money in a bank after 3 years. The rate of compound interest was fixed at 2% per annum. At the end of 3 years, Ethan has a total of \$3077.50 in his account. What was the amount of money that Ethan invested in the beginning?	[3]
17. Simplify $\left(\frac{2p}{3q}\right)^2 \div \frac{\sqrt{q^5}}{\sqrt{p}}$.	[2]
18. Given that $\frac{1}{343} = 7^k$, find k.	[1]
19. By approximating each number to 2 significant figures, estimate the value of $\frac{12.1 \times \sqrt{48.8}}{\sqrt[3]{27.3}}$. Show your working and give your answer to a reasonable degree of accuracy.	[2]

20. Express 0.00952 nanoseconds in megaseconds, giving your answer in standard form.	[1]
21. Without using a calculator, show that $2^{17} - 2^{14}$ is divisible by 7.	[2]
22. Simplify the expression $\sqrt[3]{\frac{y}{x^2}} \times \frac{y}{x} \div \sqrt{\frac{x^3}{9y^{-2}}}$.	[2]
23. Write the following in order of size, largest first. $-\frac{7}{8}, \ -8 \times 10^{-1}, \ -0.\overline{81}$	[1]
24. (a) Calculate $\frac{\sqrt{4.73}-3.28}{\sqrt[3]{99.7}\times 1.25}$. Write down the first four digits on your calculator display.	[1]
24. (b) The number 102 999 corrected to ***n*** significant figures is 103 000. Write down the largest possible value of ***n***.	[1]
25. One hundred identical drops of oil have a total mass of 4550 milligrams. 1 milligram $= 1 \times 10^{-3}$ grams. It is given that 1 cm^3 of oil weighs 0.91 grams. Calculate the volume of one drop, in m^3, giving your answer in standard form.	[2]
26. The numbers 98, 784 and 1176, written as a product of their prime factors are $98 = 2 \times 7^2$, $784 = 2^4 \times 7^2$ and $1184 = 2^3 \times 3 \times 7^2$.	
(a) Find the largest possible integer, w, which divides 98, 784 and 1176.	[1]
(b) Find the smallest integer, p, such that $\sqrt[3]{\frac{784\times 1176}{p}}$ is a whole number.	[1]
27. Solve the equation $\frac{1}{4y} = 2^{-6}$.	[2]
28. Given that $2^{x+1} + 2^x = 24$, find the value of x.	[2]
29. Simplify $\frac{(2xy)^2}{35xy^7} \div \left(\frac{x^{-1}y^{-2}}{4}\right)^{-2}$, leaving your answer in positive indices.	[2]

30. Ms Chew invested \$$P$ in a bank that pays compound interest at the rate of 4% per annum compounded half-yearly. If she received \$6341.21 from the Bank after 6 years, find the value of P, giving your answer to the nearest whole number.	[2]
31. (a) Express 315 as a product of prime factors.	[1]
31. (b) Find the smallest whole number by which 315 must be multiplied to obtain a perfect square.	[1]
32. Given that $4^{\left(\frac{1}{2n}\right)} \div 64^{-2} = 2^5$, find the value of n.	[2]
33. \$10 000 was invested in an account which pays r% per annum compound interest. At the end of 3 years, the interest earned \$1910.16. Find the value of r.	[2]
34. (a) Expressed as the products of their prime factors, $196 = 2^2 \times 7^2$ $252 = 2^2 \times 3^2 \times 7$ Write down the highest common factor of 196 and 252.	[1]
34. (b) The lowest common multiple of 252 and an even number is 756.	
(i) Express 756 as the product of its prime factors.	[1]
(ii) Find the smallest possible value of the even number.	[1]
35. (a) Simplify $\frac{a^7b}{2} \times \left(a^3b\right)^{-2}$.	[1]
35. (b) Solve $\frac{2\times3^x}{\sqrt{3}} = 162$.	[2]
36. (a) Express 540 as the product of its prime factors.	[1]
36. (b) Find two numbers, both smaller than 100, that have a lowest common multiple of 540 and a highest common factor of 6.	[2]
37. Kelly has 300 one-centimetre cubes. She arranges all of the cubes into a cuboid. The perimeter of the top of the cuboid is 18 cm. Each side of the cuboid has a length greater than 3 cm. Find the height of the cuboid.	[2]

38. (a) Express 462 as a product of its prime factors.	[1]
38. (b) Written as a product of its prime factors, $1512 = 2^3 \times 3^3 \times 7$.	
(i) Find the smallest whole number n for which $462n$ is a multiple of 1512.	[1]
(ii) Explain why 1512 is not a perfect cube.	[[1]
39. (a) Calculate $\frac{3+\sqrt{-4^2+2\times11}}{5}$. Write down the first 6 digits on your calculator display.	[1]
39. (b) Write your answer to part (a) correct to 3 decimal places.	[1]
40. (a) Given that $6^m \div 6^{-3} = 6^2$, find the value of m.	[1]
40. (b) Arrange the following numbers in increasing value. Show your working clearly. 0.0037×10^6 3.7×10^5 370×10^{-3} 37	[2]
40. (c) Simplify $\sqrt[3]{8x^6} \times \frac{1}{3y^{-5}}$. Leave your answer in positive index form.	[2]
41. Kyran invested \$12 000 into a fund which pays compound interest 4% per annum compounded half-yearly. Calculate the total interest earned in 5 years.	[3]

N1: Numbers and Their Operations (Marking Scheme)

1. (a) Express $\sqrt[5]{121}$ in index form with base 11. $\sqrt[5]{121} = \sqrt[5]{11^2}$ $\sqrt[5]{121} = 11^{\frac{2}{5}}$ $\therefore 11^{\frac{2}{5}}$	[1]
1. (b) Evaluate $3^{\frac{2}{3}} \times 24^{\frac{1}{3}}$ without using a calculator. $3^{\frac{2}{3}} \times 24^{\frac{1}{3}}$ $= 3^{\frac{2}{3}} \times (8 \times 3)^{\frac{1}{3}}$ $= 3^{\frac{2}{3}+\frac{1}{3}} \times 8^{\frac{1}{3}}$ $= 3 \times 2$ $= 6$ $\therefore 6$	[2]
1. (c) Simplify $ab \div \left(\frac{2}{a}\right)^{-2}$. $ab \div \left(\frac{2}{a}\right)^{-2}$ $= ab \div \left(\frac{a}{2}\right)^{2}$ $= ab \div \frac{a^2}{4}$ $= ab \times \frac{4}{a^2}$ $= \frac{4b}{a}$ $\therefore \frac{4b}{a}$	[1]

2. Simplify $\frac{21p^2q^3r^0}{2r^5} \div \frac{7pq}{4p^2}$, leaving your answer in positive indices. $\frac{21p^2q^3r^0}{2r^5} \div \frac{7pq}{4p^2}$ $= \frac{21p^2q^3}{2r^5} \times \frac{4p^2}{7pq}$ $= \frac{6p^3q^2}{r^5}$ $\therefore \frac{6p^3q^2}{r^5}$	[2]
3. A group of students line up. If they lined up in 2s or 6s or 9s, there will be one student without a partner. Calculate the least number of students in the contingent. $2 = 1 \times 2$ $6 = 1 \times 2 \times 3$ $9 = 1 \times 1 \times 3^2$ LCM $= 2 \times 3^2$ Least number of students $= 18+1$ $\therefore 19$	[2]
4. Calculate the highest common factor of 456 and 696. $456 = 2^3 \times 3 \times 19 \times 1$ $696 = 2^3 \times 3 \times 1 \times 29$ HCF $= 2^3 \times 3 \times 1 \times 1$ HCF $= 24$ $\therefore HCF = 24$	[1]
5. Solve the equation $2^{3x} \times 125^x = 100$. $2^{3x} \times 5^{3x} = 2^2 \times 5^2$ By comparison, $3x = 2$ $x = \frac{2}{3}$ $\therefore x = \frac{2}{3}$	[3]

6. Simplify $\frac{24c^3d^2}{(3de^2)^3} \div \frac{5c^{-2}}{10df}$. $\frac{24c^3d^2}{27d^3c^6} \div \frac{5}{10dfc^2}$ $= \frac{24c^3d^2}{27d^3c^6} \times \frac{10dfc^2}{5}$ $= \frac{16c^5f}{9e^6}$ $\therefore \frac{16c^5f}{9e^6}$	[2]
7. Calculate $\frac{11.27^{\frac{1}{4}}}{30.67-5.23}$. Write your answer correct to 3 significant figures. $\frac{11.27^{\frac{1}{4}}}{30.67-5.23}$ $= 0.07202$ $= 0.0720$ (3 s.f.) $\therefore 0.0720$	[1]
8. Without using a calculator, show that $7^{103} - 7^{101}$ is a multiple of 2. $7^{103} - 7^{101}$ $= 7^{101}(7^2 - 1)$ $= 7^{101}(48)$ $= 7^{101}(2^4 \times 3)$ (shown) OR $\therefore$ 7 raised to any index is odd. Hence 7^{103} and 7^{101} are both odd. The difference of two odd numbers is an even number.	[1]
9. Use prime factorisation to explain why 72 is not a perfect cube. $72 = 2^3 \times 3^2$ $\sqrt[3]{72} = \sqrt[3]{2^3 \times 3^2}$ $\sqrt[3]{72} = 2 \times 3^{\frac{2}{3}}$ $\therefore$ Since $3^{\frac{2}{3}}$ is not an integer, 72 is not a perfect cube.	[2]

10. Simplify $\left(\frac{ab}{c}\right)^3 \times ab^{-3}c^2$. $\frac{a^3b^3}{c^3} \times \frac{ac^2}{b^3}$ $= \frac{a^4}{c}$ $\therefore \frac{a^4}{c}$	[2]
11. (a) Given $x^9 = 9^0$, find the value of x. $x^9 = 1$ $x = \sqrt[9]{1}$ $x = 1$ $\therefore x = 1$	[1]
11. (b) Simplify $\frac{x^2}{3y} \div \frac{x}{9y^2}$. $\frac{x^2}{3y} \times \frac{9y^2}{x}$ $= 3xy$ $\therefore 3xy$	[1]
12. (a) Express 40 and 138 as the product of their prime factors. $\therefore 40 = 2^3 \times 5$ $\therefore 138 = 2 \times 3 \times 23$	[2]
12. (b) Hence, find the smallest positive integer k such that $138k$ is divisible by 40. LCM of 40 and 138 $= 2^3 \times 3 \times 5 \times 23$ Smallest positive integer $k = \frac{2^3 \times 3 \times 5 \times 23}{2 \times 3 \times 23}$ $\therefore Smallest\ positive\ integer\ k = 20$	[1]

13. A wooden cube with side 8 cm is cut into two-centimetre cubes. All of the two-centimetre cubes are then arranged to form a cuboid of height greater than 8 cm. The perimeter of the cuboid is 36 cm. Find the height of the cuboid. Total volume $= 8^3 = 512\ cm^3$ Total number of cubes $= 4^3 = 64$ cubes Breadth of cuboid $= 2$ cm Length of cuboid $= 16$ cm Height of cuboid $= \frac{512}{2\times16} = 16$ cm $\therefore$ 16 cm	[2]
14. Jas deposited \$$m$ into an account that paid a compound interest of 1.85% per annum. He made no other deposits or withdrawals for three years. At the end of three years, he had \$2509.26 in his account. Find the value of m, giving your answer correct to the nearest dollar. $A = P\left(1 + \frac{r}{100}\right)^n$ $\frac{2509.26}{\left(1+\frac{1.85}{100}\right)^3} = m$ $m = 2374.99$ $\therefore m = 2375$	[2]
15. (a) Solve $49^{2x+1} \div \sqrt[3]{7} = \frac{1}{343}$. $7^{2(2x+1)} \div 7^{\frac{1}{3}} = 7^{-3}$ $4x + 2 - \frac{1}{3} = -3$ $4x = -\frac{14}{3}$ $x = -\frac{7}{6}$ $\therefore x = -\frac{7}{6}$	[3]
15. (b) Without using a calculator, show that $3^{1161} + 3^{1158}$ is divisible by 7. $3^{1158}\left(3^3 + 1\right)$ $= 3^{1158}(28)$ $= 3^{1158}(4 \times 7)$ Since $3^{1161} + 3^{1158}$ has a factor 7, it is therefore divisible by 7.	[2]

16. Alexandar invested some money in a bank after 3 years. [3]

The rate of compound interest was fixed at 2% per annum.

At the end of 3 years, Ethan has a total of \$3077.50 in his account.

What was the amount of money that Ethan invested in the beginning?

$A = P\left(1 + \frac{r}{100}\right)^n$

$3077.50 = P\left(1 + \frac{2}{100}\right)^3$

$\frac{3077.50}{\left(1+\frac{2}{100}\right)^3} = P$

$P = 2899.99$

$P = 2900.00$ (nearest cent)

$\therefore$ \$2900.00

17. Simplify $\left(\frac{2p}{3q}\right)^2 \div \frac{\sqrt{q^5}}{\sqrt{p}}$. [2]

$\frac{4p^2}{9q^2} \times \frac{p^{\frac{1}{2}}}{q^{\frac{1}{2}}}$

$= \frac{4p^{\frac{5}{2}}}{9q^{\frac{9}{2}}}$

$\therefore \frac{4p^{\frac{5}{2}}}{9q^{\frac{9}{2}}}$

18. Given that $\frac{1}{343} = 7^k$, find k. [1]

$7^{-3} = 7^k$

$k = -3$

$\therefore k = -3$

19. By approximating each number to 2 significant figures, estimate the value of $\frac{12.1\times\sqrt{48.8}}{\sqrt[3]{27.3}}$. Show your working and give your answer to a reasonable degree of accuracy. [2]

$\frac{12\times\sqrt{49}}{\sqrt[3]{27}}$

$= 28$

≈ 30 (2 s.f.)

$\therefore 30$

20. Express 0.00952 nanoseconds in megaseconds, giving your answer in standard form. $0.00952 \times 10^{-9} s = x \times 10^{6} s$ $\frac{9.52\times10^{-3}\times10^{-9}}{10^{6}} = x$ $x = 9.52 \times 10^{-18}$ $\therefore 9.52 \times 10^{-18}$ megaseconds	[1]
21. Without using a calculator, show that $2^{17} - 2^{14}$ is divisible by 7. $2^{14}(2^{3} - 1)$ $= 2^{14}(7)$ Since $2^{17} - 2^{14}$ has a factor 7, it is therefore divisible by 7.	[2]
22. Simplify the expression $\sqrt[3]{\frac{y}{x^{2}}} \times \frac{y}{x} \div \sqrt{\frac{x^{3}}{9y^{-2}}}$. $\frac{y^{\frac{1}{3}}}{x^{\frac{2}{3}}} \times \frac{y}{x} \div \frac{x^{\frac{1}{3}}y}{3}$ $= \frac{y^{\frac{4}{3}}}{x^{\frac{5}{3}}} \times \frac{3}{x^{\frac{1}{3}}y}$ $= \frac{3y^{\frac{1}{3}}}{x^{\frac{19}{6}}}$ $\therefore \frac{3y^{\frac{1}{3}}}{x^{\frac{19}{6}}}$	[2]
23. Write the following in order of size, largest first. $-\frac{7}{8}, \quad -8 \times 10^{-1}, \quad -0.\overline{81}$ $\therefore -8 \times 10^{-1}, -0.\overline{81}, -\frac{7}{8}$	[1]
24. (a) Calculate $\frac{\sqrt{4.73}-3.28}{\sqrt[3]{99.7}\times1.25}$. Write down the first four digits on your calculator display. $\therefore 0.190$	[1]
24. (b) The number 102 999 corrected to ***n*** significant figures is 103 000. Write down the largest possible value of ***n***. $\therefore n = 5$	[1]

25. One hundred identical drops of oil have a total mass of 4550 milligrams. 1 milligram $= 1 \times 10^{-3}$ grams. It is given that 1 cm^3 of oil weighs 0.91 grams. Calculate the volume of one drop, in m^3, giving your answer in standard form. 100 drops →4550 milligrams 100 drops →4.55 g 1 drop→0.0455 g $\frac{0.0455}{0.91} = 0.05\ cm^3$ $\frac{0.05}{100^3} = 5 \times 10^{-8}\ m^3$ $\therefore 5 \times 10^{-8}\ m^3$	[2]
26. The numbers 98, 784 and 1176, written as a product of their prime factors are $98 = 2 \times 7^2$, $784 = 2^4 \times 7^2$ and $1184 = 2^3 \times 3 \times 7^2$.	
(a) Find the largest possible integer, w, which divides 98, 784 and 1176. $w\ (HCF) = 2 \times 1 \times 7^2$ $w = 98$ $\therefore w = 98$	[1]
(b) Find the smallest integer, p, such that $\sqrt[3]{\frac{784 \times 1176}{p}}$ is a whole number.	[1]
27. Solve the equation $\frac{1}{4y} = 2^{-6}$. $\frac{1}{4y} = \frac{1}{2^6}$ $4y = 64$ $y = 16$ $\therefore y = 16$	[2]
28. Given that $2^{x+1} + 2^x = 24$, find the value of x. $2^x(2 + 1) = 24$ $2^x = 8$ $2^x = 2^3$ $x = 3$ $\therefore x = 3$	[2]

29. Simplify $\frac{(2xy)^2}{35xy^7} \div \left(\frac{x^{-1}y^{-2}}{4}\right)^{-2}$, leaving your answer in positive indices. $\frac{4x^2y^2}{35xy^7} \div \left(\frac{1}{4xy^2}\right)^{-2}$ $= \frac{4x^2y^2}{35xy^7} \div \left(4xy^2\right)^2$ $= \frac{4x^2y^2}{35xy^7} \times \frac{1}{16x^2y^4}$ $= \frac{1}{140xy^9}$ $\therefore \frac{1}{140xy^9}$	[2]
30. Ms Chew invested $\$P$ in a bank that pays compound interest at the rate of 4% per annum compounded half-yearly. If she received \$6341.21 from the Bank after 6 years, find the value of P, giving your answer to the nearest whole number. $6341.21 = P\left(1 + \frac{4 \div 2}{100}\right)^{6 \times 2}$ $5000.00 = P$ $P = 5000$ (nearest whole number) $\therefore P = 5000$	[2]
31. (a) Express 315 as a product of prime factors. $\therefore 315 = 3^2 \times 5 \times 7$	[1]
31. (b) Find the smallest whole number by which 315 must be multiplied to obtain a perfect square. $315x = 3^2 \times 5^2 \times 7^2$ $x = 35$ $\therefore 35$	[1]
32. Given that $4^{\left(\frac{1}{2n}\right)} \div 64^{-2} = 2^5$, find the value of n. $2^{2\left(\frac{1}{2n}\right)} \div 2^{-12} = 2^5$ $\frac{1}{n} - (-12) = 5$ $\frac{1}{n} = -7$ $-\frac{1}{7} = n$ $\therefore n = -\frac{1}{7}$	[2]

33. \$10 000 was invested in an account which pays r% per annum compound interest. At the end of 3 years, the interest earned \$1910.16.
Find the value of r. [2]

$I = A - P$

$I = P\left(1 + \frac{r}{100}\right)^n - P$

$1910.16 = 10\,000\left(1 + \frac{r}{100}\right)^3 - 10\,000$

$\frac{1910.16+10\,000}{10\,000} = \left(1 + \frac{r}{100}\right)^3$

$\sqrt[3]{\frac{1910.16+10\,000}{10\,000}} = \left(1 + \frac{r}{100}\right)$

$\sqrt[3]{\frac{1910.16+10\,000}{10\,000}} - 1 = \frac{r}{100}$

$100\left(\sqrt[3]{\frac{1910.16+10\,000}{10\,000}} - 1\right) = r$

$r = 6$

$\therefore r = 6$

34. (a) Expressed as the products of their prime factors, [1]

$196 = 2^2 \times 7^2$

$252 = 2^2 \times 3^2 \times 7$

Write down the highest common factor of 196 and 252.

$\text{HCF} = 2^2 \times 1 \times 7$

$\text{HCF} = 28$

$\therefore HCF = 28$

34. (b) The lowest common multiple of 252 and an even number is 756.

(i) Express 756 as the product of its prime factors. [1]

$\therefore 756 = 2^2 \times 3^3 \times 7$

(ii) Find the smallest possible value of the even number. [1]

$\text{LCM} = 756 = 2^2 \times 3^3 \times 7$

$252 = 2^2 \times 3^2 \times 7$

$x = 2 \times 3^3 \times 1$

$x = 54$

$\therefore 54$

35. (a) Simplify $\frac{a^7b}{2} \times \left(a^3b\right)^{-2}$. $\frac{a^7b}{2} \times \left(\frac{1}{a^3b}\right)^2$ $= \frac{a^7b}{2} \times \left(\frac{1}{a^6b^2}\right)$ $= \frac{a}{2b}$ $\therefore \frac{a}{2b}$	[1]
35. (b) Solve $\frac{2\times3^x}{\sqrt{3}} = 162$. $\frac{2\times3^x}{3^{\frac{1}{2}}} = 2 \times 3^4$ $3^{x-\frac{1}{2}} = 3^4$ $x = 4\frac{1}{2}$ $\therefore 4\frac{1}{2}$	[2]
36. (a) Express 540 as the product of its prime factors. $\therefore 540 = 2^2 \times 3^3 \times 5$	[1]
36. (b) Find two numbers, both smaller than 100, that have a lowest common multiple of 540 and a highest common factor of 6. LCM $= 2^2 \times 3^3 \times 5$ HCF $= 2 \times 3$ $x = 2^2 \times 3 \times 5$ $y = 2 \times 3 \times 1$ $\therefore$ 54 and 60	[2]

37. Kelly has 300 one-centimetre cubes. [2]

She arranges all of the cubes into a cuboid.

The perimeter of the top of the cuboid is 18 cm.

Each side of the cuboid has a length greater than 3 cm.

Find the height of the cuboid.

Trial and Error Method:

$3 \times 2 + 2x = 18$ $x = 6$ $V = lbh$ $h = \frac{300}{3\times6}$ $h = \frac{50}{3}$	$4 \times 2 + 2x = 18$ $x = 5$ $V = lbh$ $h = \frac{300}{4\times5}$ $h = 15$

$\therefore h = 15\ cm$

38. (a) Express 462 as a product of its prime factors. [1]

$\therefore 462 = 2 \times 3 \times 7 \times 11$

38. (b) Written as a product of its prime factors, $1512 = 2^3 \times 3^3 \times 7$.

(i) Find the smallest whole number n for which $462n$ is a multiple of 1512. [1]

$462n$ must be completely divisible by 1512

$\frac{2\times3\times7\times11\times n}{2^3\times3^3\times7}$

$= \frac{11\times n}{2^2\times3^2}$

$n = 2^2 \times 3^2$

$n = 36$

$\therefore n = 36$

(ii) Explain why 1512 is not a perfect cube. [[1]

$1512 = 2^3 \times 3^3 \times 7$

$\sqrt[3]{1512} = \sqrt[3]{2^3 \times 3^3 \times 7}$

$\sqrt[3]{1512} = 2 \times 3 \times 7^{\frac{1}{3}}$

Since $7^{\frac{1}{3}}$ is not an integer, 1512 is not a perfect cube.

39. (a) Calculate $\frac{3+\sqrt{-4^2+2\times11}}{5}$. Write down the first 6 digits on your calculator display. $\therefore 1.08989$	[1]
39. (b) Write your answer to part (a) correct to 3 decimal places. $\therefore 1.090$	[1]
40. (a) Given that $6^m \div 6^{-3} = 6^2$, find the value of m. $m-(-3)=2$ $m+3=2$ $m=-1$ $\therefore m=-1$	[1]
40. (b) Arrange the following numbers in increasing value. Show your working clearly. $0.0037\times10^6 \quad 3.7\times10^5 \quad 370\times10^{-3} \quad 37$ $\therefore 370\times10^{-3},\ 37,\ 0.0037\times10^6,\ 3.7\times10^5$	[2]
40. (c) Simplify $\sqrt[3]{8x^6}\times\frac{1}{3y^{-5}}$. Leave your answer in positive index form. $2x^2\times\frac{y^5}{3}$ $=\frac{2x^2y^5}{3}$ $\therefore \frac{2x^2y^5}{3}$	[2]
41. Kyran invested \$12 000 into a fund which pays compound interest 4% per annum compounded half-yearly. Calculate the total interest earned in 5 years. $I=A-P$ $I=12\,000\left(1+\frac{4\div2}{100}\right)^{5\times2}-12\,000$ $I=2627.93304$ $I=2627.93$ (nearest cent) $\therefore \$2627.93$	[3]