1. Collecting like terms:

Simplify the following expressions

a) $x^3 + 2x^2 - 5x + 7x^2 + 3x - 4$ b) $3x^2 + 6xy - 12x - 2xy + 6y^2 + 8y$

2. Indices

Evaluate (i.e. work out)

a) 2^{-3} b) $25^{\frac{1}{2}}$ c) $\left(\frac{1}{3}\right)^{-2}$ d) $49^{\frac{3}{2}}$

3. Fractions

Work out

a) $\frac{3}{4} + \frac{1}{3}$ b) $5\frac{1}{3} - 3\frac{1}{2}$ c) $2\frac{2}{3} \times \frac{1}{4}$ d) $5\frac{1}{3} \div 2\frac{1}{4}$

4. Laws of Indices

Simplify the following expressions

a) $\dfrac{2^5 \times 2^9}{\left(2^3\right)^5}$ b) $4x^3 \times 2x^5$ c) $(3a)^3$ g) $\left(-2p^2q^3\right)^4$ h) $\dfrac{2x^2y^3z \times 6x^4yz^3}{\left(9xy^4z^2\right)^2}$

5. Changing the subject of a formula

Make the variable shown in brackets the subject

a) $v = u + at$ (a) b) $s = \frac{1}{2}(u + v)t$ (v) c) $A = 2\pi r^2 + 2\pi rh$ (h)

6. Expanding brackets

Multiply out and simplify

a) $6(2x + 3)$ b) $2xy^2(3x - 5y)$ c) $5y(4 - 3x) - 2x(3 - 2y)$

d) $(x + 7)(x - 7)$ e) $(2x + y)(2 - 3y)$

7. Factorising expressions

Factorise fully

a) $7x + 21$ b) $3ab - 12b$ c) $7x^2y + 21x^3y^2$ d) $30xy + 6x^2 - 15x$

8. Algebraic fractions

Simplify these fractions as far as possible

a) $\dfrac{8x+6}{2x-4}$

b) $\dfrac{3x^2+6x}{2x+4}$

Express as a single fraction

c) $3+\dfrac{2}{x}$

d) $\dfrac{1}{x+1}+\dfrac{3}{x-3}$

9. Factorising quadratic expressions

Factorise

a) $x^2+9x+20$

b) $x^2-12x+35$

c) $y^2-2y-63$

d) $a^2-6a-16$

e) $2x^2+3x+1$

f) x^2-9

g) $9x^2-25y^2$

10. Solving quadratic equations

Solve the following equations

a) $x^2+15x+54=0$

b) $t^2-3t-40=0$

c) $7a-6a^2+20=0$

d) $x+1=\dfrac{6}{x}$

11. Solving quadratic equations

Solve the following equations giving your answer in surd form

a) $x^2+12x+20=0$

b) $2t^2-9t+4=0$

12. Surds

Write the following in the form $a\sqrt{b}$

a) $\sqrt{44}$

b) $\sqrt{320}$

c) $\sqrt{75}$

d) $\sqrt{\dfrac{27}{16}}$

13. Surds

Write each of the following as a single surd in its simplest form

a) $4\sqrt{7}-3\sqrt{7}+6\sqrt{7}$

b) $4\sqrt{2}-\sqrt{50}+\sqrt{98}$

c) $\sqrt{3}\left(7+2\sqrt{3}\right)$

d) $\left(\sqrt{7}-\sqrt{3}\right)\left(\sqrt{7}+\sqrt{3}\right)$

14. Solving Simultaneous equations

Solve each of the following pairs of simultaneous equations

a) $\begin{array}{l} 2x + 3y = 10 \\ 5x + 2y = 3 \end{array}$

b) $\begin{array}{l} 8x + 4y = 5 \\ 6x - 8y = 1 \end{array}$
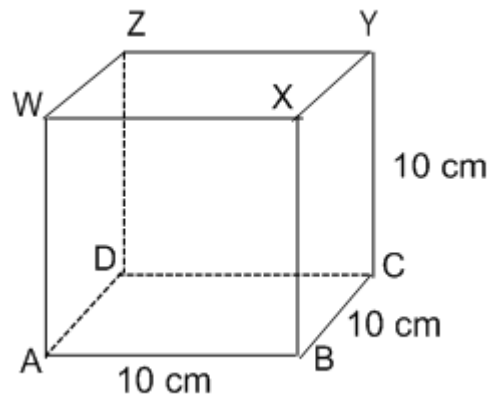
c) $\begin{array}{l} y = x^2 - x - 6 \\ y = x + 2 \end{array}$

15. Trigonometry

a) The figure shows a cube of 10cm Calculate

(i) the length AC

(ii) the angle YAC.

b) In the triangle ABC AB = 7cm, AC = 5cm and the angle BAC = 35°. Calculate the length BC, giving your answer to 1d.p.

True or False?

1	All prime numbers are odd numbers	True	False
2	Every positive integer greater than 10 has an even number of factors	True	False
3	If $x^2 = x$, then x must be the number 1	True	False
4	If we add a given number to both the numerator and denominator of a fraction, then the new fraction is equivalent to the original fraction	True	False
5	If both the numerator and denominator of a fraction are squared, then the new fraction is equivalent to the original fraction	True	False
6	a x (b x c) = (a x b) x c	True	False
7	a ÷ (b ÷ c) = (a ÷ b) ÷ c	True	False
8	If a quadrilateral has exactly 2 lines of symmetry, then it must be a rectangle	True	False
9	Except for 1, no cube number is also a square number	True	False
10	x^2 is never equal to 5x + 14	True	False
11	If m and n are positive integers, then 6m + 4n + 13 is odd	True	False
12	A polygon having all its sides equal is a regular polygon	True	False
13	If $a^2 = 7^2$ then a must equal 7	True	False

14	$\dfrac{a+b}{c} = \dfrac{a}{c} + \dfrac{b}{c}$		
		True	False
15	$\dfrac{a}{b+c} = \dfrac{a}{b} + \dfrac{a}{c}$		
		True	False
16	a x (b + c) = ab + ac	True	False
17	a x (b x c) = ab x ac	True	False
18	$(a + b)^2 = a^2 + b^2$	True	False
19	$\sqrt{x+y} = \sqrt{x} + \sqrt{y}$	True	False
20	x^2 is never less than x	True	False
21	(a + b) (c + d) = ac + bd	True	False
22	2^x is always positive	True	False
23	A triangle has sides 7 cm, 22 cm and 23 cm; it contains a right angle	True	False
24	There is exactly one point which lies on both of the straight lines y = $^1/_2$x + 5 and x - 2y = 3	True	False
25	If the number x is increased by 8.3% and the result is then decreased by 8.3% then the final answer is x	True	False
26	If the product of two numbers is 8 one of the numbers must be 8	True	False
27	If the product of two numbers is 0 one of the numbers must be 0	True	False
28	A pyramid has 5 faces, 8 edges and 5 vertices	True	False
29	The number 133! (the number obtained by working out the product 1 x 2 x 3 x 4 x 5…..x 132 x 133) ends in a zero	True	False
30	$(-6)^2 = 36$		