Planner

Trial and improvement

- Using a calculator to find approximate solutions to an equation
- Using a spreadsheet to find approximate solutions to an equation

Keywords

You should know

explanation 1a explanation 1b explanation 1c

1 Solve these equations.

a $x^2 + 7 = 32$ **b** $x^2 - 1 = 35$ **c** $x^2 + 1 = 10$

d $x^3 = 8$ **e** $x^3 - 1 = 26$ **f** $2 - x^2 = -14$

2 Find two solutions to each of these equations.

a $x^2 + 8 = 72$ **b** $y^2 - 10 = 134$ **c** $5x^2 = 125$ **d** $3x^2 - 4 = 44$

3 Copy the table and use trial and improvement to find an approximate value of x which satisfies the equation $x^2 + 2x = 58$.

Give your answer to one decimal place.

The first trial has been done for you.

Value of x	$x^2 + 2x$ working and result of trial	Comment
7	$7^2 + 2 \times 7 = 63$	Too big

4 **a** Show that one solution to $x^2 - 3x = 38$ lies between 7 and 8.

b Use trial and improvement to find this solution to one decimal place. Use a table to show your working.

5 **a** Show that a solution to $x^3 + 3x - 40 = 0$ lies between 3 and 4.

b Use trial and improvement to find this solution to one decimal place. Use a table to show your working.

6 Use a calculator and trial and improvement to solve these equations to 1 d.p.

a $t^3 = 30$ **b** $x^3 + x = 11$ **c** $y^3 - y = 40$ **d** $3.25g^3 = 7.1$

e $m^3 - m = 80$ **f** $x^3 + x = 97$ **g** $2y^3 + y = 6$ **h** $2y^3 + 3y = 4$

7 Use a calculator to find an approximate solution to 2 d.p. for each equation.

a $e^3 + 2e = 65$ **b** $z^3 - z = 4$ **c** $p^3 + p = 124$

d $q(q^2 + 5) = 35$ **e** $w^4 - 3w^2 = 300$ **f** $x(5 - x^2) = -43$

explanation 2a | explanation 2b | explanation 2c | online

8 Peter is using a spreadsheet to solve the equation $x^3 + 4x = 700$ by trial and improvement.

He wants to give his answer to one decimal place.

B2 *fx*

	A	B	C	D	E
1	**Value of *x***	**Result of trial**			
2	1				
3					
4					
5					
6					

a What formula should he type in cell A3 to increase his x values by 1 each time?

b What formula should he type in cell B2 to work out the value of each trial?

c Set up this spreadsheet and solve the equation, giving your solution to one decimal place.

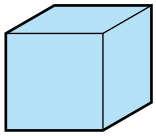
9 Use a spreadsheet to solve each equation to two decimal places.

a $z^3 + 3z = 420$ **b** $(x - 6)(x + 2)(2x - 5) = 310$ **c** $x^4 - 2x^3 + x^2 = 25$

explanation 3

10 Use a calculator to solve this problem.

This cube has volume $50\,\text{cm}^3$.



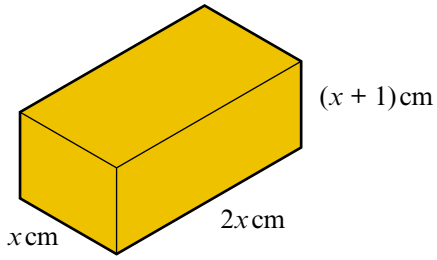
Let the length of the side be x, then find a formula for the volume in terms of x.

Work out the length of the side of the cube to two decimal places.

11 This cuboid has a volume of $400\,\text{cm}^3$.

a Write an expression for the volume of this cuboid.

b Form an equation and solve it using trial and improvement.
Give your answer to two decimal places.



12 Ilana is trying to solve this problem.

A number to the power 5 is equal to the twice the number cubed add 75.

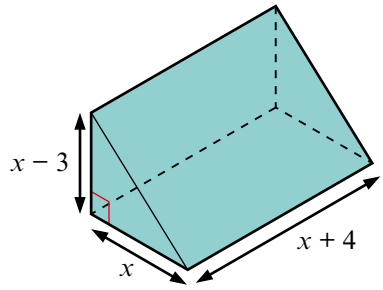
Use a suitable method to find an approximation for this number to one decimal place.

13 The volume of a sphere is given by the formula $V = \frac{4}{3}\pi r^3$ where V is the volume and r is the radius of the sphere.

The Earth has an approximate volume of $1.0868 \times 10^{12}\,\text{km}^3$.

Use trial and improvement to find the approximate diameter of the Earth.
Give your answer to the nearest kilometre.

14 The diagram shows a triangular prism. The prism has a volume of $300\,\text{cm}^3$.



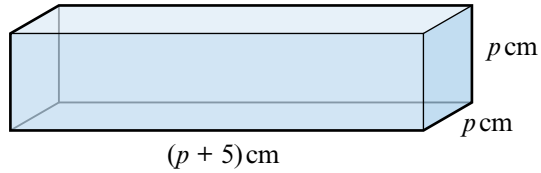
a Show that the equation $x(x - 3)(x + 4) = 600$ can be used in this problem.

b Use trial and improvement to find the value of x correct to one decimal place.

15 A storage box in the shape of a cuboid is manufactured from Perspex. Its dimensions are shown below. The manufacturer has allowed $1000\,\text{cm}^2$ for each box.

a Find the surface area of the box in terms of p.

b Find, by a numerical method, the value of p (to 1 d.p.) for which the surface area is $1000\,\text{cm}^2$.



16 For each of the equations given below, decide whether an algebraic or numerical method is most efficient for finding solutions, then solve the equation (to 1 d.p. where appropriate).

a $4x = 10 - x$ **b** $x^2 = 121$ **c** $3x^3 + 2x = 64$

d $x(x^2 - 2) = 25$ **e** $x^2 + 3x - 54 = 0$ **f** $x^3 + 3x + 2 = 0$

g $x^2 - 49 = 0$ **h** $x^3 - 27 = 0$ **i** $4x^4 + 16 = 8x^2$