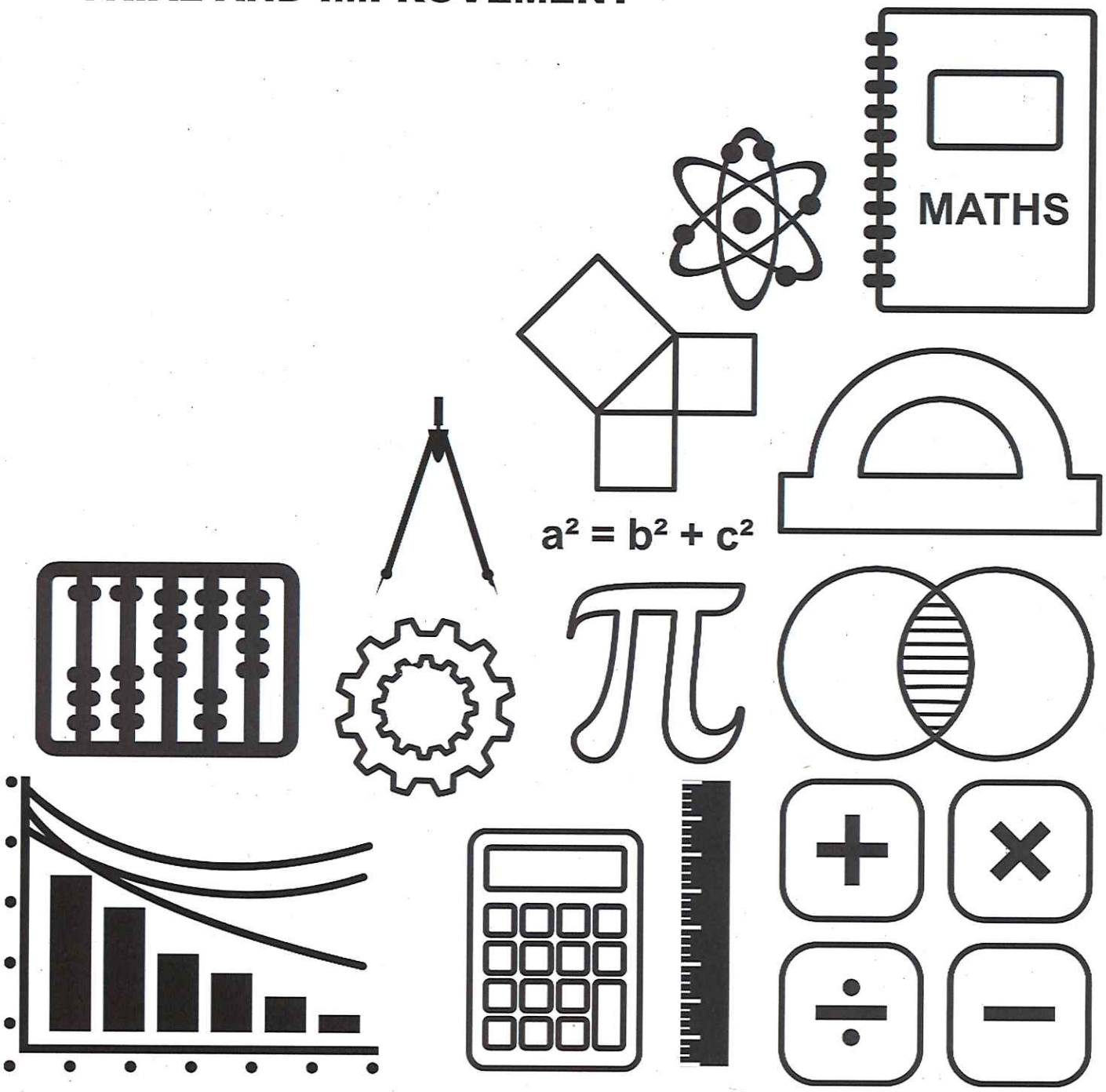
MATHSDIY

GCSE TOPIC BOOKLET SOLUTIONS
TRIAL AND IMPROVEMENT



1. A solution to the equation

$$x^3 + 2x = 7$$

lies between 1 and 2. Use the method of trial and improvement to find this solution correct to one decimal place.

Try $x = 1.5$ $1.5^3 + 2(1.5) = 6.375$ (TOO SMALL)

Try $x = 1.6$ $1.6^3 + 2(1.6) = 7.296$ (TOO BIG)

x is either 1.5 or 1.6 to 1dp

Test halfway

Try,

$x = 1.55$ $1.55^3 + 2(1.55) = 6.823875$ (TOO SMALL)

$x = 1.6$ (1dp)

(4)

2. A solution to the equation

$$x^3 + 6x - 60 = 0$$

lies between 3 and 4. Use the method of trial and improvement to find this solution correct to one decimal place.

Try $x = 3.5$ $3.5^3 + 6(3.5) - 60 = 3.875$ (TOO BIG)

Try $x = 3.4$ $3.4^3 + 6(3.4) - 60 = -0.296$ (TOO SMALL)

x is either 3.4 or 3.5 to 1dp

Test halfway

Try $x = 3.45$ $3.45^3 + 6(3.45) - 60 = 1.763625$ (TOO BIG)

$x = 3.4$ (1dp)

(4)

3. A solution to the equation

$$x^3 + 5x - 30 = 0$$

lies between 2 and 3. Use the method of trial and improvement to find this solution correct to one decimal place.

Try $x = 2.5$ $2.5^3 + 5(2.5) - 30 = -1.875$ (TOO SMALL)

Try $x = 2.6$ $2.6^3 + 5(2.6) - 30 = 0.576$ (TOO BIG)

x is either 2.5 or 2.6 to 1dp

Test halfway

Try $x = 2.55$ $2.55^3 + 5(2.55) - 30 = -0.668625$ (TOO SMALL)

$x = 2.6$ (1dp)

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4. A solution to the equation

$$2x^3 - 3x - 17 = 0$$

lies between 2 and 3. Use the method of trial and improvement to find this solution correct to one decimal place.

Try $x = 2.5$ $2(2.5)^3 - 3(2.5) - 17 = 6.75$ (TOO BIG)

Try $x = 2.4$ $2(2.4)^3 - 3(2.4) - 17 = 3.448$ (TOO BIG)

Try $x = 2.3$ $2(2.3)^3 - 3(2.3) - 17 = 0.434$ (TOO BIG)

Try $x = 2.2$ $2(2.2)^3 - 3(2.2) - 17 = -2.304$ (TOO SMALL)

x is either 2.2 or 2.3 to 1dp. Test halfway.

Try $x = 2.25$ $2(2.25)^3 - 3(2.25) - 17 = -0.96875$ (TOO SMALL)

$x = 2.3$ (1dp)

(4)

5. A solution to the equation

$$x^3 - 6x - 3 = 0$$

lies between 2.6 and 2.7. Use the method of trial and improvement to find this solution correct to two decimal places.

Try $x = 2.65$ $(2.65)^3 - 6(2.65) - 3 = -0.290375$ (TOO SMALL)

Try $x = 2.66$ $(2.66)^3 - 6(2.66) - 3 = -0.138904$ (TOO SMALL)

Try $x = 2.67$ $(2.67)^3 - 6(2.67) - 3 = 0.014163$ (TOO BIG)

x is either 2.66 or 2.67 to 2dp. Test halfway

Try,

$x = 2.665$ $(2.665)^3 - 6(2.665) - 3 = -0.062757\,0375$ (TOO SMALL)

$x = 2.67$ (2dp)

(4)

6. A solution to the equation

$$x^3 - 5x + 2 = 0$$

lies between 0.4 and 0.5. Use the method of trial and improvement to find this solution correct to two decimal places.

Try $x = 0.45$ $(0.45)^3 - 5(0.45) + 2 = -0.158875$ (TOO SMALL)

Try $x = 0.46$ $(0.46)^3 - 5(0.46) + 2 = -0.202664$ (TOO SMALL)

We are getting further away from zero, so try $x = 0.44$

Try $x = 0.44$ $(0.44)^3 - 5(0.44) + 2 = -0.114816$ (TOO SMALL)

Try $x = 0.43$ $(0.43)^3 - 5(0.43) + 2 = -0.070493$ (TOO SMALL)

Try $x = 0.42$ $(0.42)^3 - 5(0.42) + 2 = -0.025912$ (TOO SMALL)

Try $x = 0.41$ $(0.41)^3 - 5(0.41) + 2 = 0.018921$ (TOO BIG)

x is either 0.41 or 0.42 to 2dp. Test halfway

Try $x = 0.415$ $(0.415)^3 - 5(0.415) + 2 = -0.00352\ldots$ (TOO SMALL)

$x = 0.41$ (2dp)

(4)

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7. A solution to the equation

$$x^3 - 5x - 66 = 0$$

lies between 4.4 and 4.5. Use the method of trial and improvement to find this solution correct to two decimal places.

Try $x = 4.45$ $(4.45)^3 - 5(4.45) - 66 = -0.128875$ (TOO SMALL)

Try $x = 4.46$ $(4.46)^3 - 5(4.46) - 66 = 0.416536$ (TOO BIG)

x is either 4.45 or 4.46 to 2dp. Test halfway.

Try $x = 4.455$ $(4.455)^3 - 5(4.455) - 66 = 0.14349\ldots$ (TOO BIG)

$x = 4.45$ (2dp)

(4)

8. A solution of the equation

$$x^3 + 3x - 50 = 0$$

lies between 3.4 and 3.5. Use the method of trial and improvement to find this solution correct to two decimal places.

Try $x = 3.45$ $(3.45)^3 + 3(3.45) - 50 = 1.413625$ (TOO BIG)

Try $x = 3.44$ $(3.44)^3 + 3(3.44) - 50 = 1.027584$ (TOO BIG)

Try $x = 3.42$ $(3.42)^3 + 3(3.42) - 50 = 0.261688$ (TOO BIG)

Try $x = 3.41$ $(3.41)^3 + 3(3.41) - 50 = -0.118179$ (TOO SMALL)

x is either 3.41 or 3.42 to 2dp. Test halfway.

Try $x = 3.415$ $(3.415)^3 + 3(3.415) - 50 = 0.07149\ldots$ (TOO BIG)

$x = 3.41$ (2dp)

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9. The length of the rectangle below is 2cm longer than the width.

The area of the rectangle is 70 cm^2.

Use the method of trial and improvement to find the width, correct to one decimal place.

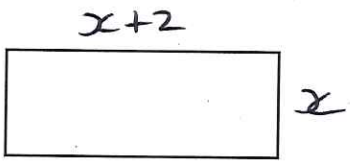

Diagram not drawn to scale

Area = L x W = $(x+2)(x) = 70$

$x^2 + 2x - 70 = 0$

Try $x = 6$ $6^2 + 2(6) - 70 = -22$ (TOO SMALL)

Try $x = 6.5$ $(6.5)^2 + 2(6.5) - 70 = -14.75$ (TOO SMALL)

Try $x = 6.6$ $(6.6)^2 + 2(6.6) - 70 = -13.24$ (TOO SMALL)

Try $x = 7$ $7^2 + 2(7) - 70 = -7$ (TOO SMALL)

Try $x = 7.4$ $(7.4)^2 + 2(7.4) - 70 = -0.44$ (TOO SMALL)

Try $x = 7.5$ $(7.5)^2 + 2(7.5) - 70 = 1.25$ (TOO BIG)

x is either 7.4 or 7.5 to 1dp. Test halfway

Try $x = 7.45$ $(7.45)^2 + 2(7.45) - 70 = 0.4025$ (TOO BIG) (5)

$x = 7.4$cm (1dp)

Width of rectangle = 7.4cm

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10. Jade entered a number into her calculator.

To this number, she added the square of the original number and the cube of the original number.

Jade got the answer 432.288

Find the number that jade first entered into her calculator. Show all your working

$x + x^2 + x^3 = 432.288$

Try 6 $6 + 6^2 + 6^3 = 258$ (TOO SMALL)

Try 7 $7 + 7^2 + 7^3 = 399$ (TOO SMALL)

Try 7.5 $7.5 + 7.5^2 + 7.5^3 = 485.625$ (TOO BIG)

Try 7.4 $7.4 + 7.4^2 + 7.4^3 = 467.384$ (TOO BIG)

Try 7.2 $7.2 + 7.2^2 + 7.2^3 = 432.288$

↓ Jade's number

Jade entered 7.2 into the calculator

(4)