

MATHS



MODEL ANSWERS

TRIAL AND IMPROVEMENT CUBIC

SCORE

/145

PERCENTAGE

%

STEMUP

- 1 Work out the value of $x^3 + 7x$ when $x = 2.9$.

substitute $x = 2.9$: value = 44.689

44.689

1 / 1

- 2 Show that the equation $x^3 + x^2 = 90$ has a solution between $x = 4$ and $x = 5$.

$x = 4$: 80, which is less than 90

$x = 5$: 150, which is more than 90

the value passes the target so there is a solution between 4 and 5

shown (values 80 and 150)

1 / 1

- 3 The equation $x^3 + 3x^2 + 2x = 46$ has a solution between two consecutive whole numbers. Find the two whole numbers. You must show your working.

$x = 1$: 6

$x = 2$: 24

$x = 3$: 60

$x = 4$: 120

the value goes past the target 46 between 2 and 3

2 and 3

1 / 1

- 4 Work out the value of $x^3 + x - 101$ when $x = 5.48$.

substitute $x = 5.48$: value = 69.047

69.047

1 / 1

- 5 Show that the equation $x^3 + 3x = 94$ has a solution between $x = 4$ and $x = 5$.

$x = 4$: 76, which is less than 94

$x = 5$: 140, which is more than 94

the value passes the target so there is a solution between 4 and 5

shown (values 76 and 140)

1 / 1

- 6 The equation $x^3 - x = 107$ has a solution between two consecutive whole numbers. Find the two whole numbers. You must show your working.

$x = 3$: 24

$x = 4$: 60

$x = 5$: 120

$x = 6$: 210

the value goes past the target 107 between 4 and 5

4 and 5

1 / 1

- 7 (a) Work out the value of $x^3 + 2x^2$ when $x = 5.1$.
 (b) Is the solution of $x^3 + 2x^2 = 114$ bigger or smaller than 5.1?

(a) $5.1^3 + \dots = 184.671$

(b) 184.671 is bigger than 114 so the solution is smaller

(a) 184.671 ; (b) smaller

1 / 1

- 8 Show that the equation $x^3 + 6x^2 = 65$ has a solution between $x = 2$ and $x = 3$.

$x = 2$: 32 , which is less than 65

$x = 3$: 81 , which is more than 65

the value passes the target so there is a solution between 2 and 3

shown (values 32 and 81)

1 / 1

- 9 The equation $x^3 + 6x - 66 = 0$ has a solution between two consecutive whole numbers. Find the two whole numbers. You must show your working.

$x = 2$: -46

$x = 3$: -21

$x = 4$: 22

$x = 5$: 89

the value goes past the target 0 between 3 and 4

3 and 4

1 / 1

- 10 (a) Work out the value of $x^3 + 2x^2$ when $x = 5.3$.
 (b) Is the solution of $x^3 + 2x^2 = 74$ bigger or smaller than 5.3?

(a) $5.3^3 + \dots = 205.057$

(b) 205.057 is bigger than 74 so the solution is smaller

(a) 205.057; (b) smaller

1 / 1

- 11 Sion is solving the equation $x^3 + 8x = 47$ using trial and improvement.
 Sion finds that the solution is between $x = 2.8$ and $x = 2.9$.
 Use a trial at $x = 2.85$ to find the solution correct to 1 decimal place.

$x = 2.85$: 45.949 (too small)

greater than 2.85 so the solution is nearer 2.9

$x = 2.9$

2 / 2

- 12 The equation $x^3 + x^2 + 5x = 25$ has a solution between two consecutive whole numbers.
 Find the two whole numbers. You must show your working.

$x = 1$: 7

$x = 2$: 22

$x = 3$: 51

$x = 4$: 100

the value goes past the target 25 between 2 and 3

2 and 3

1 / 1

- 13 Here is part of a table for the equation $x^3 - x = 68$. The solution is the value of x where the second column equals 68.

(a) Complete the table.

(b) Write down the solution of the equation correct to 1 decimal place.

x	$x^3 - x$	Too big or too small?
4.1	64.821	too small
4.15	67.323	too small
4.2	69.888	too big

(a) 4.1: 64.821, too small

4.15: 67.323, too small

4.2: 69.888, too big

(b) the value at 4.15 is too small so the solution is nearer 4.2

(b) $x = 4.2$

3 / 3

- 14 Carys is solving the equation $x^3 + 2x^2 = 11$ using trial and improvement.

Carys finds that the solution is between $x = 1.7$ and $x = 1.8$.

Use a trial at $x = 1.75$ to find the solution correct to 1 decimal place.

$x = 1.75$: 11.484 (too big)

less than 1.75 so the solution is nearer 1.7

$x = 1.7$

2 / 2

- 15 Use trial and improvement to solve $x^3 = 269$.

Give your answer correct to 1 decimal place.

target 269

$x = 6$: 216 (too small)

7: 343 (too big)

6.5: 274.625 (too big)

6.2: 238.328 (too small)

6.3: 250.047 (too small)

6.4: 262.144 (too small)

half-way 6.45: 268.336 (too small)

solution is greater than 6.45 so $x = 6.5$

$x = 6.5$

3 / 3

- 16** Here is part of a table for the equation $x^3 - 2x - 80 = 0$. The solution is the value of x where the second column equals 0.

(a) Complete the table.

(b) Write down the solution of the equation correct to 1 decimal place.

x	$x^3 - 2x - 80$	Too big or too small?
4.4	-3.616	too small
4.45	-0.779	too small
4.5	2.125	too big

(a) 4.4: -3.616, too small

4.45: -0.779, too small

4.5: 2.125, too big

(b) the value at 4.45 is too small so the solution is nearer 4.5

(b) $x = 4.5$

3 / 3

- 17** Iwan is solving the equation $x^3 + 6x^2 = 64$ using trial and improvement.

Iwan finds that the solution is between $x = 2.7$ and $x = 2.8$.

Use a trial at $x = 2.75$ to find the solution correct to 1 decimal place.

$x = 2.75$: 66.172 (too big)

less than 2.75 so the solution is nearer 2.7

$x = 2.7$

2 / 2

- 18** Iwan is using trial and improvement to solve $x^3 + 5x^2 = 43$. The trials so far are shown in the table.

(a) Write down the two values of x from the table that are closest together and either side of the solution.

(b) Work out the next value of x she should try, and use it to give the solution correct to 1 decimal place.

x	2	3	2.5	2.2	2.3	2.4
$x^3 + 5x^2$	28	72	46.875	34.848	38.617	42.624

last row: 2.4 is too small and 2.5 is too big

solution is between 2.4 and 2.5

2.45: 44.719 (too big)

solution is less than 2.45 so $x = 2.4$

$x = 2.4$

3 / 3

- 19 Here is part of a table for the equation $x^3 + 2x - 89 = 0$. The solution is the value of x where the second column equals 0.

(a) Complete the table.

(b) Write down the solution of the equation correct to 1 decimal place.

x	$x^3 + 2x - 89$	Too big or too small?
4.3	<i>-0.893</i>	<i>too small</i>
4.35	<i>2.013</i>	<i>too big</i>
4.4	4.984	<i>too big</i>

(a) 4.3: *-0.893, too small*

4.35: *2.013, too big*

4.4: *4.984, too big*

(b) *the value at 4.35 is too big so the solution is nearer 4.3*

(b) $x = 4.3$

3 / 3

- 20 Sion is solving the equation $x^3 - 2x = 62$ using trial and improvement.

Sion finds that the solution is between $x = 4.1$ and $x = 4.2$.

Use a trial at $x = 4.15$ to find the solution correct to 1 decimal place.

$x = 4.15$: 63.173 (too big)

less than 4.15 so the solution is nearer 4.1

$x = 4.1$

2 / 2

- 21 Use trial and improvement to solve $x^3 = 324$.

Give your answer correct to 1 decimal place.

target 324

$x = 6$: 216 (too small)

7: 343 (too big)

6.5: 274.625 (too small)

6.7: 300.763 (too small)

6.8: 314.432 (too small)

6.9: 328.509 (too big)

half-way 6.85: 321.419 (too small)

solution is greater than 6.85 so $x = 6.9$

$x = 6.9$

3 / 3

- 22 Megan is using trial and improvement to solve $x^3 - x - 92 = 0$. The trials so far are shown in the table.

(a) Write down the two values of x from the table that are closest together and either side of the solution.

(b) Work out the next value of x she should try, and use it to give the solution correct to 1 decimal place.

x	4	5	4.5	4.7	4.6
$x^3 - x - 92$	-32	28	-5.375	7.123	0.736

last row: 4.5 is too small and 4.6 is too big

solution is between 4.5 and 4.6

4.55: -2.354 (too small)

solution is greater than 4.55 so $x = 4.6$

$x = 4.6$

3 / 3

- 23 Elin is solving the equation $x^3 - x^2 - 2x = 116$ using trial and improvement.

Elin finds that the solution is between $x = 5.3$ and $x = 5.4$.

Use a trial at $x = 5.35$ to find the solution correct to 1 decimal place.

$x = 5.35$: 113.808 (too small)

greater than 5.35 so the solution is nearer 5.4

$x = 5.4$

2 / 2

- 24 The equation $x^3 - x^2 + 2x = 85$ has a solution between $x = 4$ and $x = 5$.

Use trial and improvement to find this solution correct to 1 decimal place.

You must show all your trials.

target 85

$x = 4$: 56 (too small)

5: 110 (too big)

4.5: 79.875 (too small)

4.7: 91.133 (too big)

4.6: 85.376 (too big)

half-way 4.55: 82.594 (too small)

solution is greater than 4.55 so $x = 4.6$

$x = 4.6$

3 / 3

- 25 Mari is using trial and improvement to solve $x^3 + x - 85 = 0$. The trials so far are shown in the table.

(a) Write down the two values of x from the table that are closest together and either side of the solution.

(b) Work out the next value of x she should try, and use it to give the solution correct to 1 decimal place.

x	4	5	4.5	4.2	4.3	4.4
$x^3 + x - 85$	-17	45	10.625	-6.712	-1.193	4.584

last row: 4.3 is too small and 4.4 is too big

solution is between 4.3 and 4.4

4.35: 1.663 (too big)

solution is less than 4.35 so $x = 4.3$

$x = 4.3$

3 / 3

- 26 Owen is solving $x^3 - 2x - 59 = 0$.

Owen works out that when $x = 4.0$ the value is -3 (too small) and when $x = 4.1$ the value is 1.721 (too big).

Owen says, "So the solution is 4.0 correct to 1 decimal place."

Explain why Owen may be wrong, then find the solution correct to 1 decimal place.

Owen has not checked $x = 4.05$ (half-way)

4.05: -0.670 (too small)

the solution is greater than 4.05 so $x = 4.1$

$x = 4.1$

3 / 3

- 27 The equation $x^3 - 2x = 109$ has a solution between $x = 4$ and $x = 5$.

Use trial and improvement to find this solution correct to 1 decimal place.

You must show all your trials.

target 109

$x = 4$: 56 (too small)

5: 115 (too big)

4.5: 82.125 (too small)

4.7: 94.423 (too small)

4.8: 100.992 (too small)

4.9: 107.849 (too small)

half-way 4.95: 111.387 (too big)

solution is less than 4.95 so $x = 4.9$

$x = 4.9$

3 / 3

- 28 The equation $x^3 + 3x = -62$ has a solution between $x = -4$ and $x = -3$.

Use trial and improvement to find this solution correct to 1 decimal place.

target -62

$x = -4$: -76 (too small)

-3: -36 (too big)

-3.5: -53.375 (too big)

-3.8: -66.272 (too small)

-3.7: -61.753 (too big)

half-way -3.75: -63.984 (too small)

solution is greater than -3.75 so $x = -3.7$

$$x = -3.7$$

4 / 4

- 29 Emyr is solving $x^3 + x - 86 = 0$.

Emyr works out that when $x = 4.3$ the value is -2.193 (too small) and when $x = 4.4$ the value is 3.584 (too big).

Emyr says, "So the solution is 4.4 correct to 1 decimal place."

Explain why Emyr may be wrong, then find the solution correct to 1 decimal place.

Emyr has not checked $x = 4.35$ (half-way)

4.35: 0.663 (too big)

the solution is less than 4.35 so $x = 4.3$

$$x = 4.3$$

3 / 3

- 30 The equation $x^3 - 2x = 53$ has a solution between $x = 3$ and $x = 4$.

Use trial and improvement to find this solution correct to 1 decimal place.

You must show all your trials.

target 53

$x = 3$: 21 (too small)

4: 56 (too big)

3.5: 35.875 (too small)

3.7: 43.253 (too small)

3.8: 47.272 (too small)

3.9: 51.519 (too small)

half-way 3.95: 53.730 (too big)

solution is less than 3.95 so $x = 3.9$

$$x = 3.9$$

3 / 3

- 31 The equation $x^3 + 5x = -10$ has a solution between $x = -2$ and $x = -1$.

Use trial and improvement to find this solution correct to 1 decimal place.

target -10

$x = -2$: -18 (too small)

-1: -6 (too big)

-1.5: -10.875 (too small)

-1.3: -8.697 (too big)

-1.4: -9.744 (too big)

half-way -1.45: -10.299 (too small)

solution is greater than -1.45 so $x = -1.4$

$$x = -1.4$$

4 / 4

- 32 Bethan is solving $x^3 - 2x = 74$.

Bethan works out that when $x = 4.3$ the value is 70.907 (too small) and when $x = 4.4$ the value is 76.384 (too big).

Bethan says, "So the solution is 4.3 correct to 1 decimal place."

Explain why Bethan may be wrong, then find the solution correct to 1 decimal place.

Bethan has not checked $x = 4.35$ (half-way)

4.35: 73.613 (too small)

the solution is greater than 4.35 so $x = 4.4$

$$x = 4.4$$

3 / 3

- 33 The equation $x^3 - x^2 - x = 92$ has a solution between $x = 4$ and $x = 5$.

Use trial and improvement to find this solution correct to 1 decimal place.

You must show all your trials.

target 92

$x = 4$: 44 (too small)

5: 95 (too big)

4.5: 66.375 (too small)

4.7: 77.033 (too small)

4.8: 82.752 (too small)

4.9: 88.739 (too small)

half-way 4.95: 91.835 (too small)

solution is greater than 4.95 so $x = 5.0$

$$x = 5.0$$

3 / 3

- 34 (a) Show that the equation $x^3 - 5x - 70 = 0$ has a solution between $x = 4$ and $x = 5$.
 (b) Use trial and improvement to find this solution correct to 1 decimal place.

(a) $x = 4$: -26

$x = 5$: 30

change of sign

(b) target 0

$x = 4$: -26 (too small)

5: 30 (too big)

4.5: -1.375 (too small)

4.7: 10.323 (too big)

4.6: 4.336 (too big)

half-way 4.55: 1.446 (too big)

solution is less than 4.55 so $x = 4.5$

(a) shown; (b) $x = 4.5$

4 / 4

- 35 Gareth is solving $x^3 + 5x^2 = 87$.

Gareth works out that when $x = 3.2$ the value is 83.968 (too small) and when $x = 3.3$ the value is 90.387 (too big).

Gareth says, "So the solution is 3.3 correct to 1 decimal place."

Explain why Gareth may be wrong, then find the solution correct to 1 decimal place.

Gareth has not checked $x = 3.25$ (half-way)

3.25: 87.141 (too big)

the solution is less than 3.25 so $x = 3.2$

$x = 3.2$

3 / 3

- 36 The equation $x^3 + x^2 = 53$ has a solution between $x = 3$ and $x = 4$.

Use trial and improvement to find this solution correct to 1 decimal place.

You must show all your trials.

target 53

$x = 3$: 36 (too small)

4: 80 (too big)

3.5: 55.125 (too big)

3.2: 43.008 (too small)

3.3: 46.827 (too small)

3.4: 50.864 (too small)

half-way 3.45: 52.966 (too small)

solution is greater than 3.45 so $x = 3.5$

$x = 3.5$

3 / 3

- 37 (a) Show that the equation $x^3 + x - 15 = 0$ has a solution between $x = 2$ and $x = 3$.
 (b) Use trial and improvement to find this solution correct to 1 decimal place.

(a) $x = 2$: -5

$x = 3$: 15

change of sign

(b) target 0

$x = 2$: -5 (too small)

3 : 15 (too big)

2.5 : 3.125 (too big)

2.2 : -2.152 (too small)

2.3 : -0.533 (too small)

2.4 : 1.224 (too big)

half-way 2.35 : 0.328 (too big)

solution is less than 2.35 so $x = 2.3$

(a) shown; (b) $x = 2.3$

4 / 4

- 38 A box is a cuboid with a square base of side x cm and height $(x + 4)$ cm.
 The volume of the box is 290 cm^3 .
 Use trial and improvement to find the value of x correct to 1 decimal place.

equation: $x^2(x + 4) = x^3 + 4x^2 = 290$ so $x^3 + 4x^2 = 290$

target 290

$x = 5$: 225 (too small)

6 : 360 (too big)

5.5 : 287.375 (too small)

5.7 : 315.153 (too big)

5.6 : 301.056 (too big)

half-way 5.55 : 294.164 (too big)

solution is less than 5.55 so $x = 5.5$

$x = 5.5$

4 / 4

- 39 The equation $x^3 + 3x = 60$ has a solution between $x = 3.6$ and $x = 3.7$.
 Use trial and improvement to find this solution correct to 2 decimal places.
 You must show all your trials, including the half-way value test.

target 60

$x = 3.6$: 57.456 (too small)

3.7 : 61.753 (too big)

3.65 : 59.577 (too small)

3.67 : 60.441 (too big)

3.66 : 60.008 (too big)

half-way 3.655 : 59.792 (too small)

solution is greater than 3.655 so $x = 3.66$

$x = 3.66$

4 / 4

- 40 (a) Show that the equation $x^3 - 3x - 31 = 0$ has a solution between $x = 3$ and $x = 4$.
 (b) Use trial and improvement to find this solution correct to 1 decimal place.

(a) $x = 3$: -13

$x = 4$: 21

change of sign

(b) target 0

$x = 3$: -13 (too small)

$x = 4$: 21 (too big)

3.5 : 1.375 (too big)

3.2 : -7.832 (too small)

3.3 : -4.963 (too small)

3.4 : -1.896 (too small)

half-way 3.45 : -0.286 (too small)

solution is greater than 3.45 so $x = 3.5$

(a) shown; (b) $x = 3.5$

4 / 4

- 41 The volume of a solid is given by $x(x^2 + 2) \text{ cm}^3$, where x is a length in cm.
 The volume is 364 cm^3 .
 Use trial and improvement to find x correct to 1 decimal place.

equation: $x(x^2 + 2) = x^3 + 2x = 364$ so $x^3 + 2x = 364$

target 364

$x = 7$: 357 (too small)

$x = 8$: 528 (too big)

7.5 : 436.875 (too big)

7.2 : 387.648 (too big)

7.1 : 372.111 (too big)

half-way 7.05 : 364.503 (too big)

solution is less than 7.05 so $x = 7.0$

$x = 7.0$

4 / 4

- 42 The equation $x^3 + 4x = 100$ has a solution between $x = 4.3$ and $x = 4.4$.
 Use trial and improvement to find this solution correct to 2 decimal places.
 You must show all your trials, including the half-way value test.

target 100

$x = 4.3$: 96.707 (too small)

4.4 : 102.784 (too big)

4.35 : 99.713 (too small)

4.37 : 100.933 (too big)

4.36 : 100.322 (too big)

half-way 4.355 : 100.017 (too big)

solution is less than 4.355 so $x = 4.35$

$x = 4.35$

4 / 4

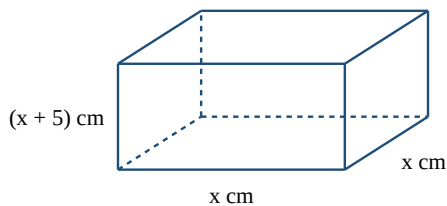
- 43 (a) Show that the equation $x^3 - 4x - 95 = 0$ has a solution between $x = 4$ and $x = 5$.
 (b) Use trial and improvement to find this solution correct to 1 decimal place.

(a) $x = 4$: -47
 $x = 5$: 10
 change of sign
 (b) target 0
 $x = 4$: -47 (too small)
 5 : 10 (too big)
 4.5 : -21.875 (too small)
 4.7 : -9.977 (too small)
 4.8 : -3.608 (too small)
 4.9 : 3.049 (too big)
 half-way 4.85 : -0.316 (too small)
 solution is greater than 4.85 so $x = 4.9$

(a) shown; (b) $x = 4.9$

4 / 4

- 44 The diagram shows a cuboid. Its volume is 120 cm^3 .
 (a) Show that $x^3 + 5x^2 = 120$.
 (b) The equation has a solution between 3 and 4. Use trial and improvement to find it correct to 1 decimal place. Diagram NOT accurately drawn



(a) $x^2(x + 5) = x^3 + 5x^2 = 120$ so $x^3 + 5x^2 = 120$
 (b) target 120
 $x = 3.5$: 104.125 (too small)
 3.7 : 119.103 (too small)
 3.8 : 127.072 (too big)
 half-way 3.75 : 123.047 (too big)
 solution is less than 3.75 so $x = 3.7$

(a) shown; (b) $x = 3.7$

5 / 5

- 45 The equation $x^3 + x - 56 = 0$ has a solution between $x = 3.7$ and $x = 3.8$.
 Use trial and improvement to find this solution correct to 2 decimal places.
 You must show all your trials, including the half-way value test.

target 0
 $x = 3.7$: -1.647 (too small)
 3.8 : 2.672 (too big)
 3.75 : 0.484 (too big)
 3.72 : -0.801 (too small)
 3.73 : -0.375 (too small)
 3.74 : 0.054 (too big)
 half-way 3.735 : -0.161 (too small)
 solution is greater than 3.735 so $x = 3.74$

$x = 3.74$

4 / 4

- 46 The equation $x^3 + 8x = 10$ has a solution between $x = 1.0$ and $x = 1.1$.
Use trial and improvement to find this solution correct to 2 decimal places.
You must show all your trials, including the half-way value test.

target 10

$x = 1.0$: 9 (too small)

1.1: 10.131 (too big)

1.05: 9.558 (too small)

1.07: 9.785 (too small)

1.08: 9.900 (too small)

1.09: 10.015 (too big)

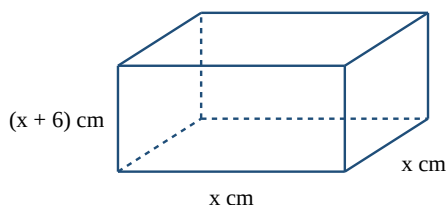
half-way 1.085: 9.957 (too small)

solution is greater than 1.085 so $x = 1.09$

$x = 1.09$

4 / 4

- 47 The diagram shows a cuboid. Its volume is 180 cm^3 .
(a) Show that $x^3 + 6x^2 = 180$.
(b) The equation has a solution between 4 and 5. Use trial and improvement to find it correct to 1 decimal place. Diagram NOT accurately drawn



(a) $x^2(x + 6) = x^3 + 6x^2 = 180$ so $x^3 + 6x^2 = 180$

(b) target 180

$x = 4.5$: 212.625 (too big)

4.2: 179.928 (too small)

4.3: 190.447 (too big)

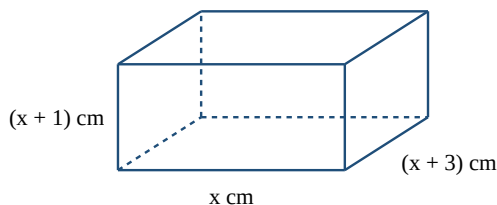
half-way 4.25: 185.141 (too big)

solution is less than 4.25 so $x = 4.2$

(a) shown; (b) $x = 4.2$

5 / 5

- 48 The diagram shows a cuboid. Its volume is 116 cm^3 .
(a) Show that $x^3 + 4x^2 + 3x = 116$.
(b) The equation has a solution between 3 and 4. Use trial and improvement to find it correct to 1 decimal place. Diagram NOT accurately drawn



(a) $x(x + 1)(x + 3) = x(x^2 + 4x + 3) = x^3 + 4x^2 + 3x = 116$ so $x^3 + 4x^2 + 3x = 116$

(b) target 116

$x = 3.5$: 102.375 (too small)

3.7: 116.513 (too big)

3.6: 109.296 (too small)

half-way 3.65: 112.867 (too small)

solution is greater than 3.65 so $x = 3.7$

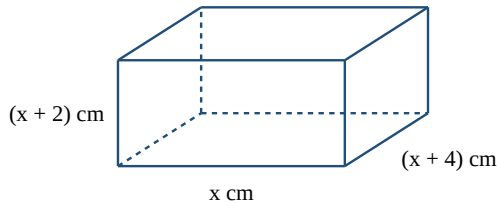
(a) shown; (b) $x = 3.7$

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- 49 The diagram shows a cuboid. Its volume is 53 cm^3 .

(a) Show that $x^3 + 6x^2 + 8x = 53$.

(b) The equation has a solution between 2 and 3. Use trial and improvement to find it correct to 1 decimal place. Diagram NOT accurately drawn



(a) $x(x+2)(x+4) = x(x^2 + 6x + 8) = x^3 + 6x^2 + 8x = 53$ so $x^3 + 6x^2 + 8x = 53$

(b) target 53

$x = 2.5$: 73.125 (too big)

2.2: 57.288 (too big)

2.1: 52.521 (too small)

half-way 2.15: 54.873 (too big)

solution is less than 2.15 so $x = 2.1$

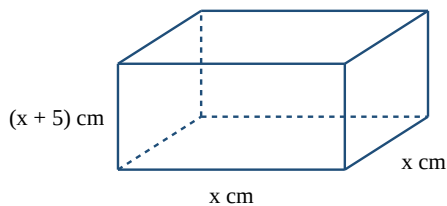
(a) shown; (b) $x = 2.1$

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- 50 The diagram shows a cuboid. Its volume is 129 cm^3 .

(a) Show that $x^3 + 5x^2 = 129$.

(b) The equation has a solution between 3 and 4. Use trial and improvement to find it correct to 1 decimal place. Diagram NOT accurately drawn



(a) $x^2(x+5) = x^3 + 5x^2 = 129$ so $x^3 + 5x^2 = 129$

(b) target 129

$x = 3.5$: 104.125 (too small)

3.7: 119.103 (too small)

3.8: 127.072 (too small)

3.9: 135.369 (too big)

half-way 3.85: 131.179 (too big)

solution is less than 3.85 so $x = 3.8$

(a) shown; (b) $x = 3.8$

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