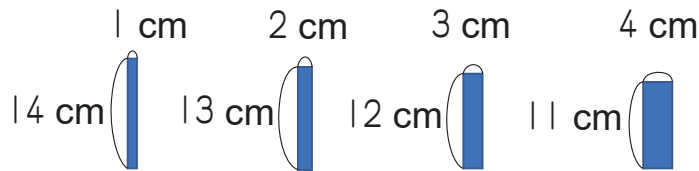## 3 – 1 Proportion

Proportion

Proportion (1)

Example 1 Investigate the relationship of following (a) and (b).

(a) Length and width of a rectangle with a perimeter of 30 m.

1 cm　　2 cm　　3 cm　　4 cm

14 cm　　13 cm　　12 cm　　11 cm

> Perimeter is the length around shape.

1 Summarize the relationship between the number of bricks piled up and total height. Fill in the table.

> There are two lengths and two width, so…
> $10 \times 2 + 5 \times 2$
> $= 30 (cm)$
> 5 cm
> 10 cm　10 cm
> 5 cm

+ 1 + 1

Width (cm)	1	2	3	4	5	…
Length (cm)	14	13	12	11	10	…

− 1 − 1

2 If a number increase by 1, how does the other number change? Fill in the blank of the table above and write the answer.

Answer　　Decrease by 1

(b) Build a wall by piling bricks. The height of bricks is 6 cm.
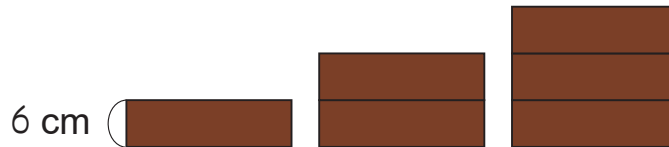
6 cm

1 Summarize the relationship between the number of bricks piled up and total height. Fill in the table.

> This is different from (a).

+ 1 + 1

Number of bricks	1	2	3	4	5	…
Total height (cm)	6	12	18	24	30	…

+ 6 + 6

2 If the number increase by 1, how does the other number change? Fill in the blank of the table and write the answer.

Answer　　Increase by 6

There is a relationship between the two quantities that changes as one increases and the other increases, or as one increases and the other decreases.

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Investigate the relationship of following (a) and (b).

(a) The relationship between your age and the age of your sister, who is four years younger than you, when you celebrates your birthday.

1 Summarize the relationship between your age and the age of your sistar who is four years yonger than you.

	+		+								
Your age	4	5	6	7	8	9	10	11	12	13	⋯
The age of your sister	0	1	2	3	4						⋯

2 If the number increase by 1, how does the other number change? Fill in the blank of the table.

Answer _____

(b) Relationship between the width and area of a rectangle with a length of 4 cm.

1 cm   2 cm   3 cm   4 cm

4 cm   4 cm   4 cm   4 cm

1 Summarize the relationship between the length and width. Fill in the table.

	+		+					
Width (cm)	1	2	3	4	5	6	7	⋯
Area (cm^2)	4	8	12					⋯

2 If the number increase by 1, how does the other number change? Fill in the blank of the table and write the answer.

Answer _____

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3 - 2 Proportion

Proportion (2)

Example There is a ribbon that cost 80 zeds per meter.

> There's also a multiplication relationship!

1 Summarize the relationship between the length of ribbon and the price of ribbon. Fill in the table and blank.
("zed (s)" is the fictional currency unit.)

0 | 1 | 2 | 3 (m)

80 zeds

80 zeds | 80 zeds

80 zeds | 80 zeds | 80 zeds

$\times 3$

$+ 1 + 1$ $\times 2$

Length of ribbon (cm)	1	2	3	4	5	6	⋯
Price of ribbon (zeds)	80	160	240	320	400	480	⋯

$+ 80$ $+ 80$

$\times 3$ $\times 2$

2 If you buy a tape that is four times as long, how many times will the price of the tape be? Choose the symbol for your answer.
　(a) 2 times　(b) 3 times　(c) 4 times.　　Answer ____(c)____

The relationship between doubling or tripling the length of a tape and correspondingly doubling or tripling the price is called proportion.
If the length of tape is ◯ and the price is □ , ◯ proportional to □ .

3 Write an math sentence by using the words and ◯ for the length of ribbon and □ for the price of ribbon.
Math sentence by words
　　Price for 1 m of ribbon × Length = Price　　Answer $80 \times ◯ = □$

4 What is the price of ribbon of 9 cm length of ribbon?

$\times 9$

Length of ribbon (cm)	1	9
Price of ribbon (zeds)	80	720

Note: "zed (s)" is the fictional currency unit.

$\times 9$

Math sentence
　$80 \times 9 = 720$

Answer　　720 zeds

5 How long will be when the price of the ribbon is 1600 zeds?

$\times 20$

Length of ribbon (cm)	1	20
Price of ribbon (zeds)	80	1600

Note: "zed (s)" is the fictional currency unit.

$\times 20$
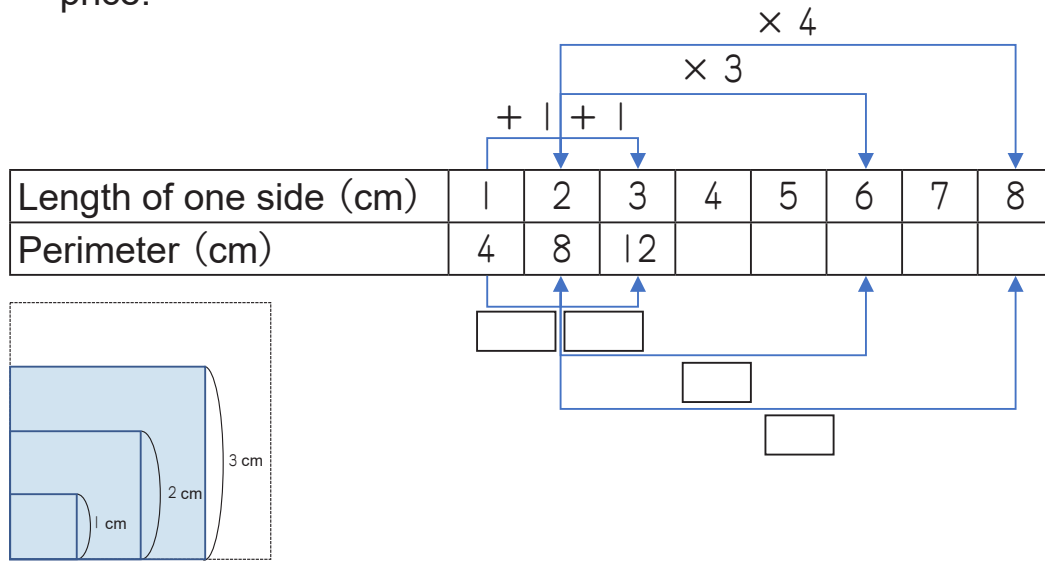
Math sentence
　$1 \times 20 = 20$

Answer　　20 cm

Find the surrounding length of a square that increases its length side by Ⅰ cm. Let's think about the two quantities that change together.

1 Summarize the relationship between the number of pencils and the price.

× 4

× 3

+ Ⅰ + Ⅰ

Length of one side (cm)	Ⅰ	2	3	4	5	6	7	8
Perimeter (cm)	4	8	Ⅰ2					

3 cm
2 cm
Ⅰ cm

2 If length of one side is 5 times long how many times will the perimeter be? Choose the symbol.
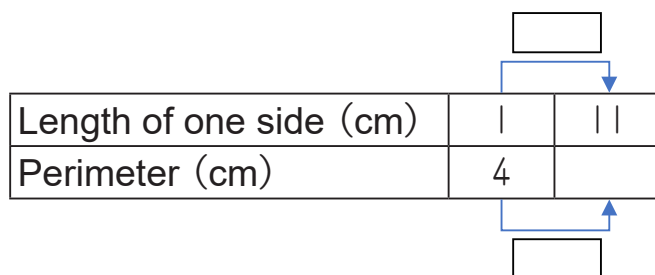
(a) 2 times   (b) 4 times   (c) 5 times.   Answer _____

3 Write a math sentence by using words and ○ for the length of one side and □ for perimeter.

Math sentence by words

Answer _____

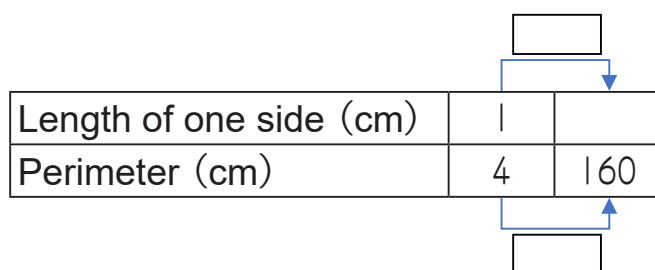**4** If one side is ⅠⅠ cm long, how long is the perimeter?

Math sentence

Length of one side (cm)	Ⅰ	ⅠⅠ
Perimeter (cm)	4	

Answer _____

5 If the perimeter is Ⅰ60 cm, how long is one side?

Math sentence

Length of one side (cm)	Ⅰ	
Perimeter (cm)	4	Ⅰ60

Answer _____

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3 - 3 Proportion

Review

1 On the following（a）〜（c）, in which case is ○ proportional to □ ?

（a）Length □ cm and width ○ cm when a rectangles' perimeter is 26 cm.

Width ○ （cm）	1	2	3	4	5	6	⋯
Length □ （cm）	12	11	10	9	8	7	⋯

（b）○ number of balls and total cost □ zeds when the cost of one ball is 300 zeds.

Number of balls ○	1	2	3	4	5	⋯
Total cost □ （zeds）	300	600	900	1200	1500	⋯

（c）○ number of candies and total cost □ zeds when the cost of one candy is 8 zeds.

Number of candys ○	1	2	3	4	5	⋯
Total cost □ （zeds）	8	16	24	32	40	⋯

Answer _____

2 Water is poured into a water tank so that the depth of water increases 2 cm in 1 minute.

2 cm　4 cm　6 cm
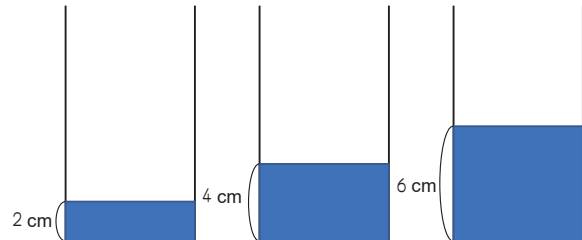
1 Summarize the relationship between time to pour water and the depth of water in following the table.

Time to pour water ○ （min）	1	2	3	4	5	6	⋯
Depth of water □ （cm）	2	4	6				⋯

2 If ○ increase by 1, how much does □ increase?

Answer _____

3 Write the math sentence for the depth of water by word and using ○ min as the time to pour water and □ as the depth of water.

Math sentence by words

Answer _____

4 If the 8 minutes pass, what is the depth of the water?

Math sentence

Answer _____

5 If the depth of water is 28 cm, how many minutes have passed?

Math sentence

Answer _____

3 On the following $(a)\sim(c)$, in which case is $\bigcirc$ proportional to $\square$?

(a) $\bigcirc$ number of notebooks and total cost $\square$ zeds when the cost of one notebook is 120 zeds.

(b) Your brother is age $\bigcirc$ years and his 2 year old younger sitter is age $\square$ years when your brother's birthday reached.
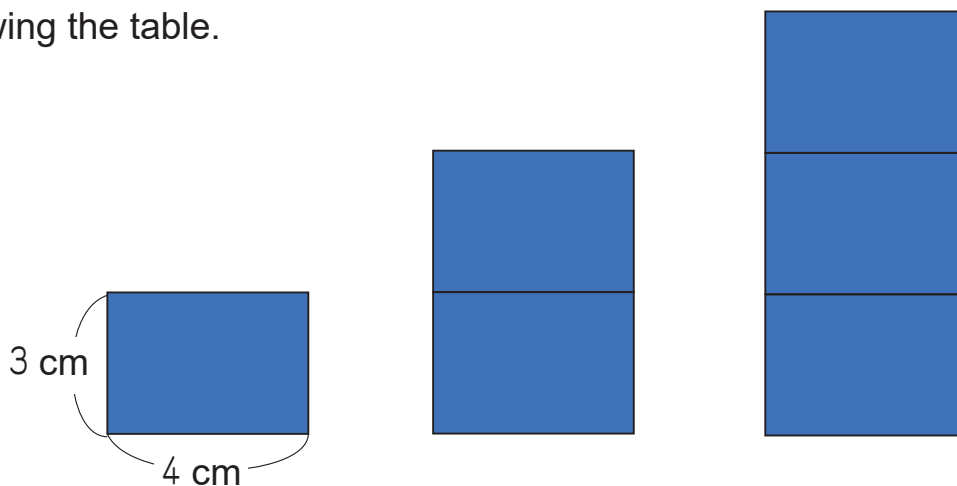
(c) $\bigcirc$ number of practice days and $\square$ total minutes of practice when the practice is everyday for 30 minutes.

(d) Length of one side of a square is $\bigcirc$ cm and area $\square$ m^2.

Answer _____

4 Rectangles with length 3 and width 4 cm are piled up.

1 Summarize the relationship between the length and the width in following the table.

3 cm

4 cm

Length $\bigcirc$ (cm)	3	6					...
Area $\square$ (cm^2)	12						...

2 Write the math sentence by using words length $\bigcirc$ cm and area $\square$ cm^2.

Math sentence by words

Answer _____

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