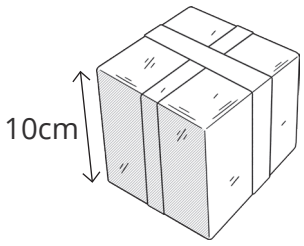
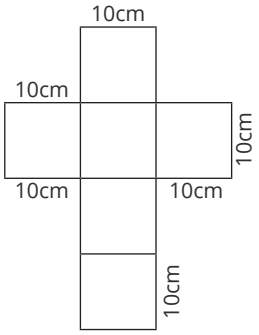
Scaffolded Surface Area of Prisms – Boxes **Answers**

None of the prisms are drawn to scale.

1. A present is in the shape of a cube. A cube is a prism where all 6 faces are identical squares. This present has a height of 10cm. Calculate the surface area of the cube.





A cube has six congruent square faces (congruent means the same size).

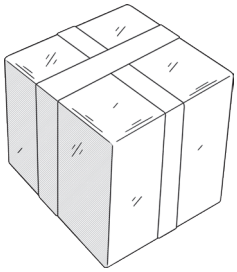
The area of one of the square faces is **10** × **10** = **100**cm^2

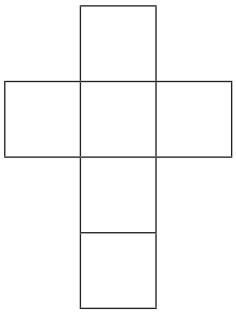
If we know the area of one face, and we know the cube has six faces, we can find the surface area of the whole cube by multiplying the area of one face by six:

Surface area of the cube = **100** × 6

Surface area of the cube = **600**cm^2

2. This present below is a cube. It has a surface area of 486cm^2. Calculate the area of one of its faces.



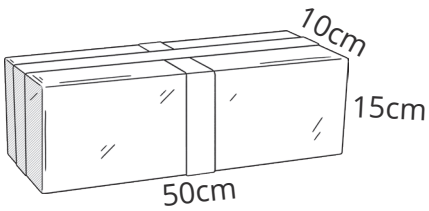


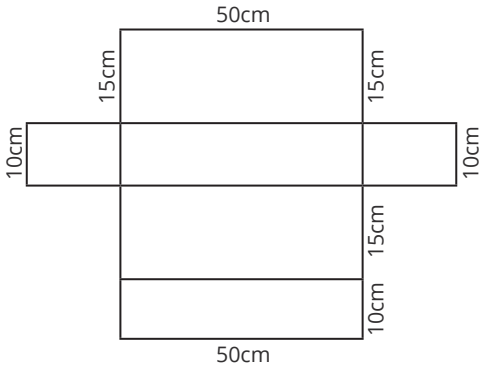
Open the cube out into its net. Count how many congruent square faces it has.

If you know the surface area of the cube, you can divide that by the number of faces to get the area of a single face:

486 ÷ 6 faces = **81**cm^2

3. Calculate the surface area of this present.





Sometimes, it might help to visualise the shape by sketching the net and adding the lengths to it.

Write a list of the faces (use simple names to identify where they are on the shape) to make sure you calculate the area of all the faces.

Top: $10 \times 50 = 500\text{cm}^2$

Bottom: $10 \times 50 = 500\text{cm}^2$

Left: $15 \times 10 =$ **150**cm^2

Right: **15** × **10** = **150**cm^2

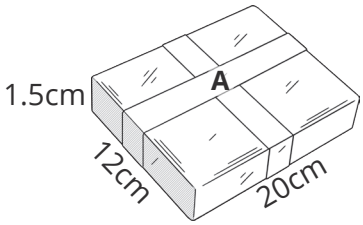
Front: **50 × 15** = **750**cm^2

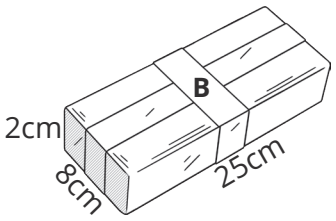
Back: **50 × 15** = **750**cm^2

Calculate the total surface area, by adding up the areas of the six faces:

500 + 500 + 150 + 150 + 750 + 750 = 2800cm^2

4. Which of these prisms has the largest surface area?





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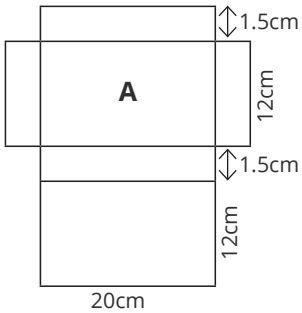
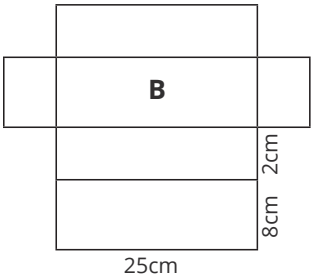




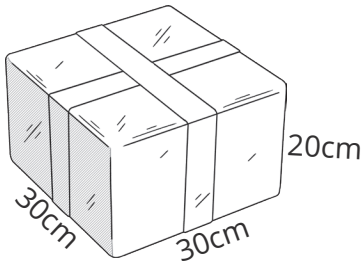
	A	B
Top:	**240cm^2**	**200cm^2**
Bottom:	**240cm^2**	**200cm^2**
Left:	**18cm^2**	**16cm^2**
Right:	**18cm^2**	**16cm^2**
Front:	**30cm^2**	**50cm^2**
Back:	**30cm^2**	**50cm^2**

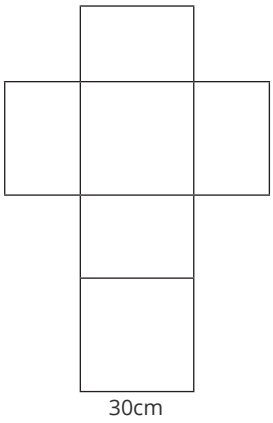
Surface area of A: **240 + 240 + 18 + 18 + 30 + 30** = **576**cm^2

Surface area of B: **200 + 200 + 16 + 16 + 50 + 50** = **532**cm^2

Box A has the larger surface area, by 44cm^2.

5. A present is wrapped in brown paper to be sent as a parcel. Calculate the amount of brown paper needed to wrap the present, giving your answer in centimetres squared.





Top: 30 × 30 = 900cm^2

Bottom: 30 × 30 = 900cm^2

Left: 20 × 30 = 600cm^2

Right: 20 × 30 = 600cm^2

Front: 20 × 30 = 600cm^2

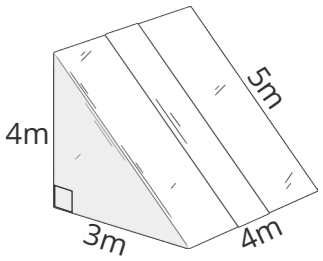
Back: 20 × 30 = 600cm^2

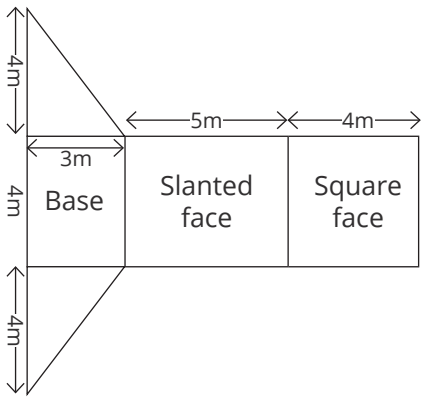
Surface area: 900 + 900 + 600 + 600 + 600 + 600 = 4200cm^2

or: 900 × 2 + 600 × 4 = 4200cm^2

or: (30 × 30 × 2) + (30 × 20 × 2) + (30 × 20 × 2) = 4200cm^2

6. Presents are placed in a large wrapped box for the residents of a care home. Calculate the surface area of the box.





Base: **3 × 4** = **12**m^2

Slanted face: **5 × 4** = **20**m^2

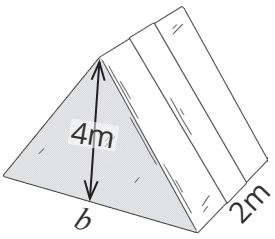
First triangle face: $\frac{1}{2}$ **× 4 × 3** = **6**m^2

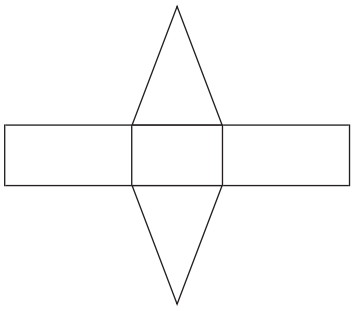
Second triangle face: $\frac{1}{2}$ **× 4 × 3** = **6**m^2

Square face: **4 × 4** = **16**m^2

Total surface area: **12 + 20 + 6 + 6 + 16** = **60**m^2

7. A giant chocolate is wrapped for a charity. Its 3 rectangular sides have a total surface area of 26m^2. Its total surface area is 38m^2. Calculate the length of the base (b). A net is provided to help you.





First, find the total area of the triangular faces: **38 – 26** = **12**m^2

Next, find the area of ***one*** triangular face: **12 ÷ 2** = **6**m^2

You now know the area of the triangular face and its height. You need to find the length of the base. Substitute the values you know into the formula for the area of a triangle:

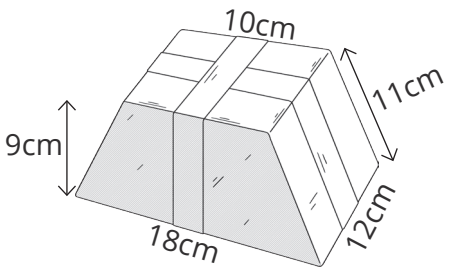
Area = $\frac{1}{2}$ **×** $\boldsymbol{b}$ **×** $\boldsymbol{h}$

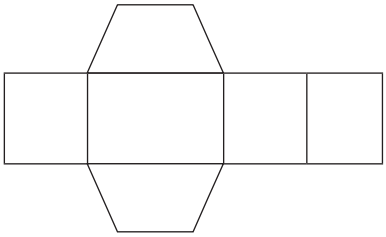
6 = $\frac{1}{2} \times b \times 4$

6 = b × **2** (simplify the right hand side)

b = **3**m (divide both sides)

8. A present is in the shape of an isosceles trapezium. Calculate its surface area.





Front trapezium: $\frac{\mathbf{18 + 10}}{\mathbf{2}} \times \mathbf{9} = \mathbf{126}\text{cm}^2$

Back trapezium: $\frac{\mathbf{18 + 10}}{\mathbf{2}} \times \mathbf{9} = \mathbf{126}\text{cm}^2$

Bottom: $\mathbf{18 \times 12} = \mathbf{216}\text{cm}^2$

Top: $\mathbf{12 \times 10} = \mathbf{120}\text{cm}^2$

Left: $\mathbf{12 \times 11} = \mathbf{132}\text{cm}^2$

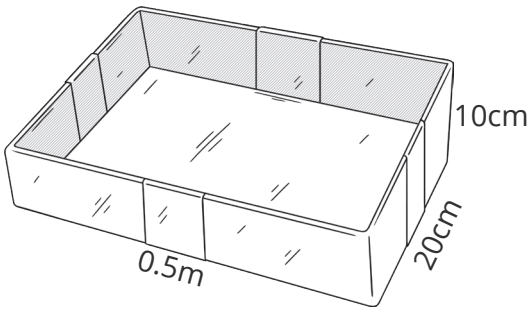
Right: $\mathbf{12 \times 11} = \mathbf{132}\text{cm}^2$

Total surface area: $\mathbf{126 + 126 + 216 + 132 + 132 + 120} = \mathbf{852}\text{cm}^2$

Challenge:

An opened box needs to be lined with wrapping paper for a hamper. The paper covers all surfaces, including the base, both inside and out. Assuming there is no wasted paper, how much paper will be needed? You should give your answer in centimetres squared.

Hint: Sketch the net of the box.



0.5 × 100 = 50cm

Surface area of the outside: (50 × 20) + (50 × 10 × 2) + (20 × 10 × 2) = 2400cm^2

Surface area of the inside: (50 × 20) + (50 × 10 × 2) + (20 × 10 × 2) = 2400cm^2

Total surface area = 4800cm^2

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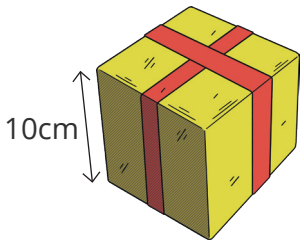

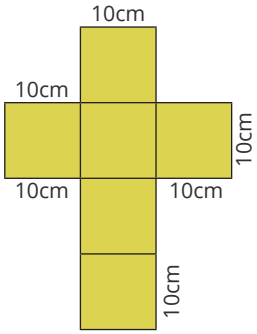

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The area of one of the square faces is _____ × _____ = _____cm^2

If we know the area of one face, and we know the cube has six faces, we can find the surface area of the whole cube by multiplying the area of one face by six:

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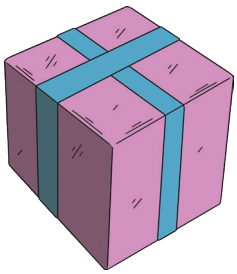

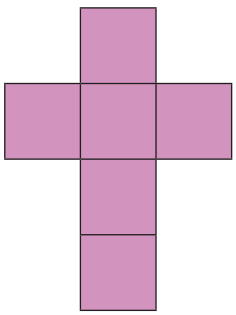

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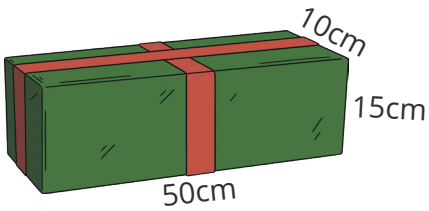
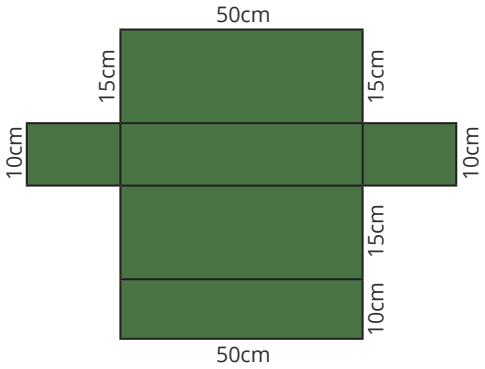
_____ ÷ 6 faces = _____cm^2

3. Calculate the surface area of this present.





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Right: _____ × _____ = _____ cm^2

Front: _____ = _____ cm^2

Back: _____ = _____ cm^2

Calculate the total surface area, by adding up the areas of the six faces:

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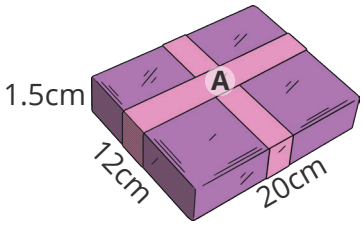
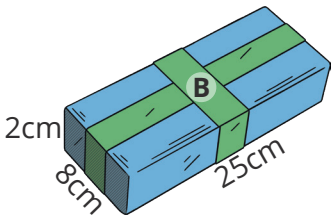
4. Which of these prisms has the largest surface area?





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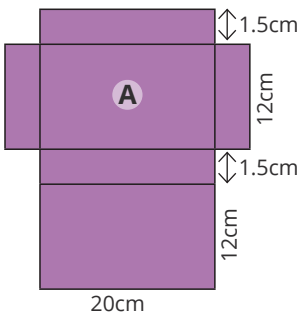

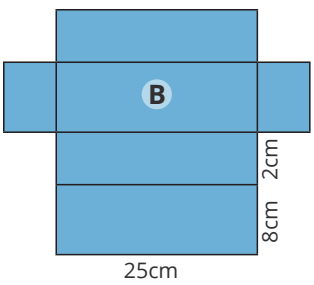

	A	B
Top:		
Bottom:		
Left:		
Right:		
Front:		
Back:		

Surface area of A: _____ = _____ cm^2

Surface area of B: _____ = _____ cm^2

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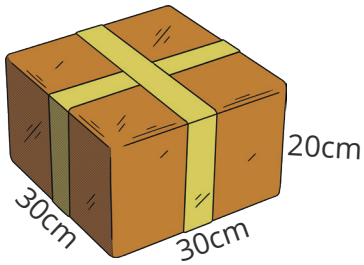

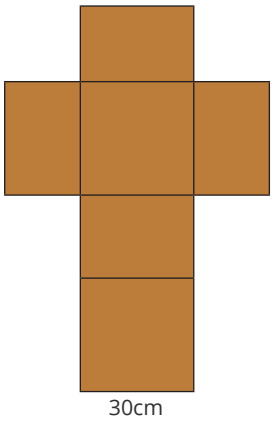

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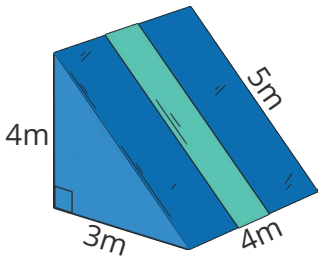

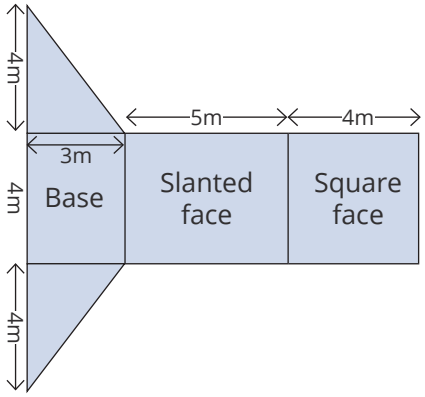

Base: _____ = _____ m^2

Slanted face: _____ = _____ m^2

First triangle face: _____ = _____ m^2

Second triangle face: _____ = _____ m^2

Square face: _____ = _____ m^2

Total surface area: _____ = _____ m^2

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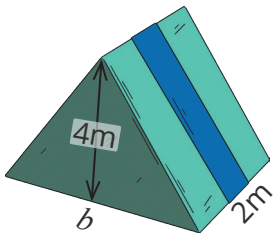

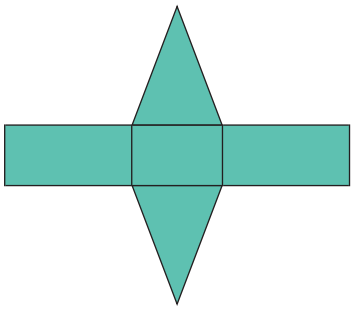

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Next, find the area of ***one*** triangular face: _____ = _____ m^2

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Area = _____

_____ = $\frac{1}{2} \times b \times 4$

_____ = $b \times$ _____ (simplify the right hand side)

b = _____ m (divide both sides)

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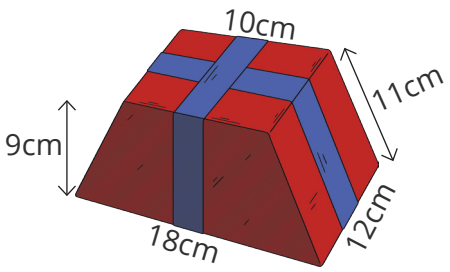

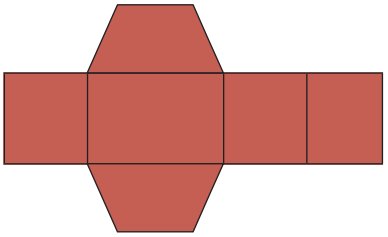

Front trapezium: _____ = _____ cm^2

Back trapezium: _____ = _____ cm^2

Bottom: _____ = _____ cm^2

Top: _____ = _____ cm^2

Left: _____ = _____ cm^2

Right: _____ = _____ cm^2

Total surface area: _____ = _____ cm^2

Challenge:

An opened box needs to be lined with wrapping paper for a hamper. The paper covers all surfaces, including the base, both inside and out. Assuming there is no wasted paper, how much paper will be needed? You should give your answer in centimetres squared.

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