

Area & Volume - Basic

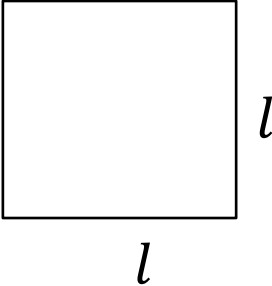
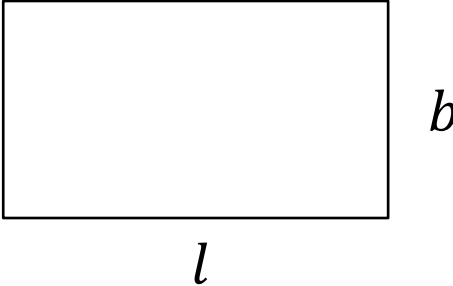
1) Area and perimeter formulae

The following formulae are given in The Formulae & Tables Booklet:

Fad agus achar			Length and area
Seasann A iontu seo a leanas d'achar na fíorach atá i gceist.			In the following, A represents the area of the shape in question.
Comhthreomharán		$A = ah$ $= ab \sin C$	Parallelogram
Traipéisiam		$A = \left(\frac{a+b}{2}\right)h$	Trapezium
Ciorcal / Diosca fad l (imlíne l)		$l = 2\pi r$ $A = \pi r^2$	Circle / Disc length l (circumference l)

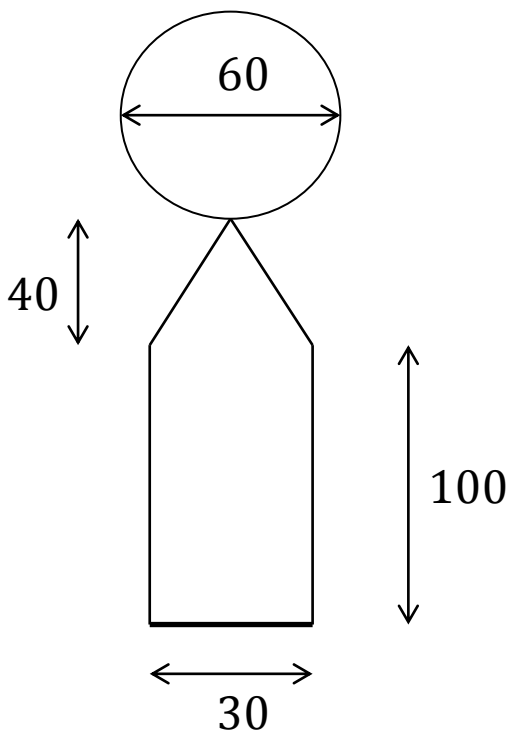
Stua / Teascóg		Arc / Sector	
nuair is ina raidiain atá θ	$l = r\theta$	$A = \frac{1}{2}r^2\theta$	when θ is in radians
nuair is ina chéimeanna atá θ	$l = 2\pi r \left(\frac{\theta}{360^\circ}\right)$	$A = \pi r^2 \left(\frac{\theta}{360^\circ}\right)$	when θ is in degrees
Triantán		$A = \frac{1}{2}ah$ $= \frac{1}{2}ab \sin C$ $= \sqrt{s(s-a)(s-b)(s-c)}$	Triangle taking $s = \frac{a+b+c}{2}$

The following formulae are not provided in The Formulae & Tables Booklet but you still need to know them:

Square	Rectangle
	
Area = l^2 Perimeter = $4l$	Area = lb Perimeter = $2l + 2b = 2(l + b)$

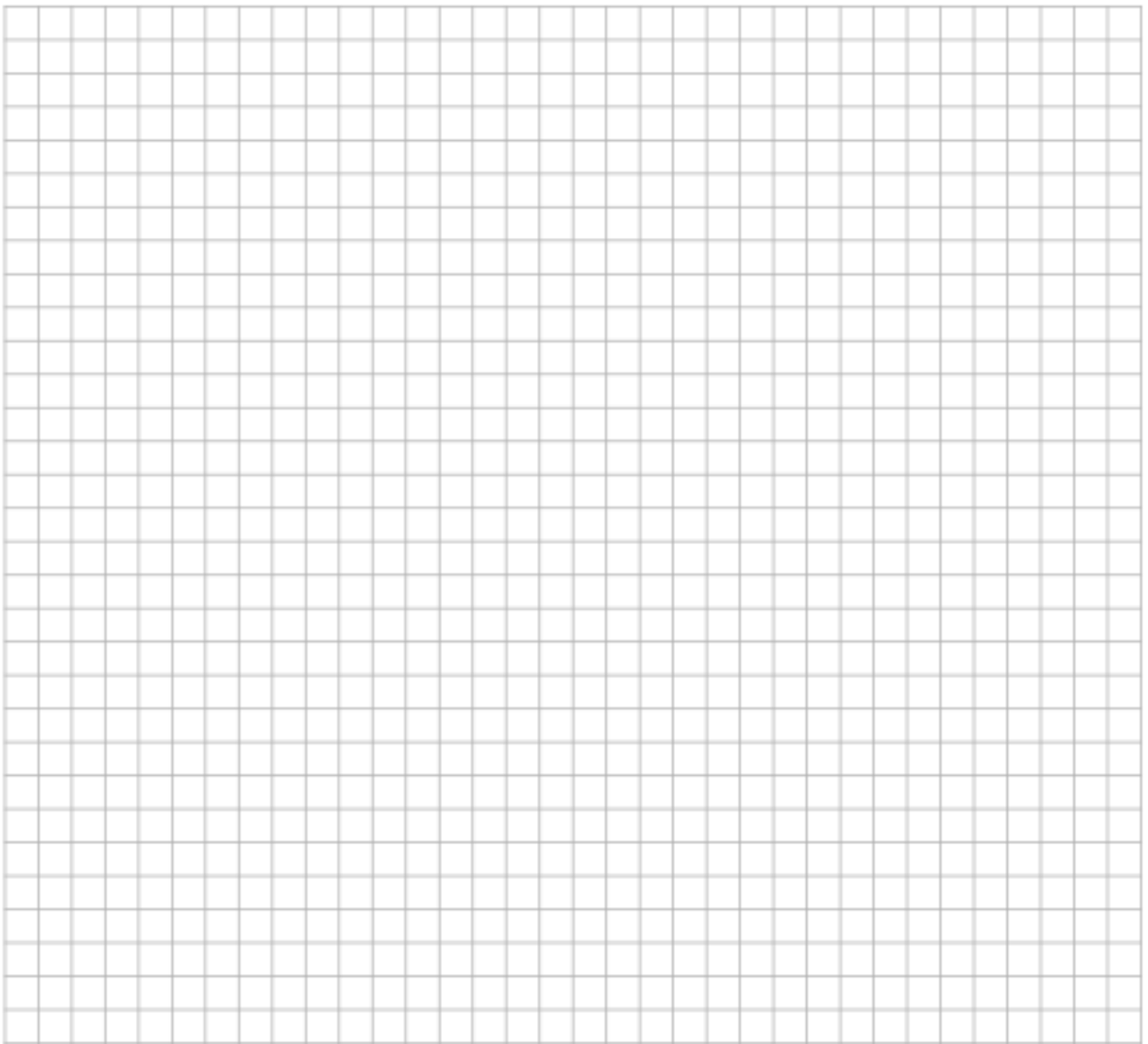
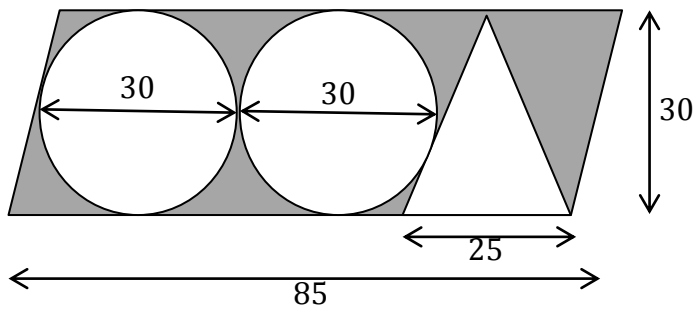
eg1. Find the area of the following shape

(all units in cm, assume $\pi = \frac{22}{7}$)



eg2. Find the area of the shaded region in figure below

(all units in cm, assume $\pi = \frac{22}{7}$)



2) Finding missing lengths when given area or perimeter

eg1. If the circumference of a circle is 80cm. Find its area (assume $\pi = \frac{22}{7}$).

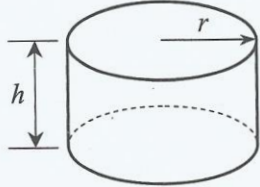
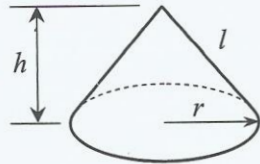
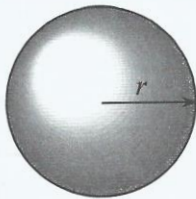


eg2. The perimeter of a rectangle is 180cm. If the ratio of its length to breadth is 5:4 find the area of the rectangle.

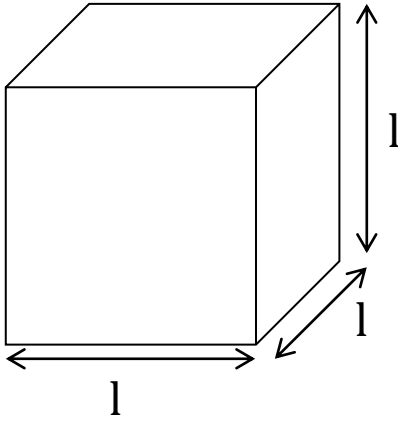
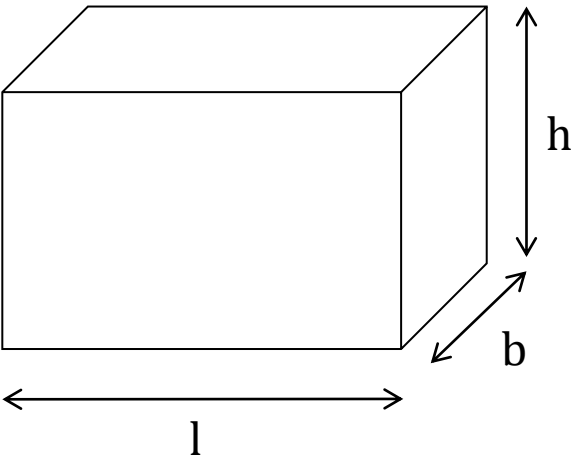


3) Volume and surface area formulae

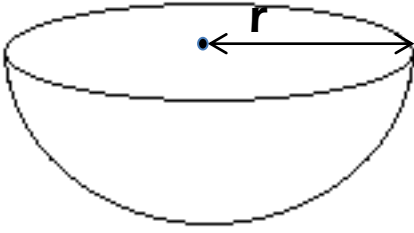
The following formulae are given in The Formulae & Tables Booklet:

Achar dromchla agus toirt		Surface area and volume	
Seasann A iontu seo d'achar cuar an dromchla agus seasann V do thoirt an tsolaid atá i gceist.		In the following, A represents the curved surface area and V represents the volume of the solid in question.	
Sorcóir		$A = 2\pi rh$ $V = \pi r^2 h$	Cylinder
Cón		$A = \pi rl$ $V = \frac{1}{3}\pi r^2 h$	Cone
Sféar		$A = 4\pi r^2$ $V = \frac{4}{3}\pi r^3$	Sphere

The following formulae are not provided in The Formulae & Tables Booklet but you still need to know them:

<p>Cube</p>  <p>Volume = l^3 Surface Area = $6l^2$</p>	<p>Rectangular solid</p>  <p>Volume = lbh Surface Area = $2lb + 2lh + 2bh$</p>
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Hemisphere



$$\text{Volume} = \frac{2}{3}\pi r^3$$

$$\text{Curved surface area} = 2\pi r^2$$

$$\text{Total Surface Area} = 3\pi r^2$$

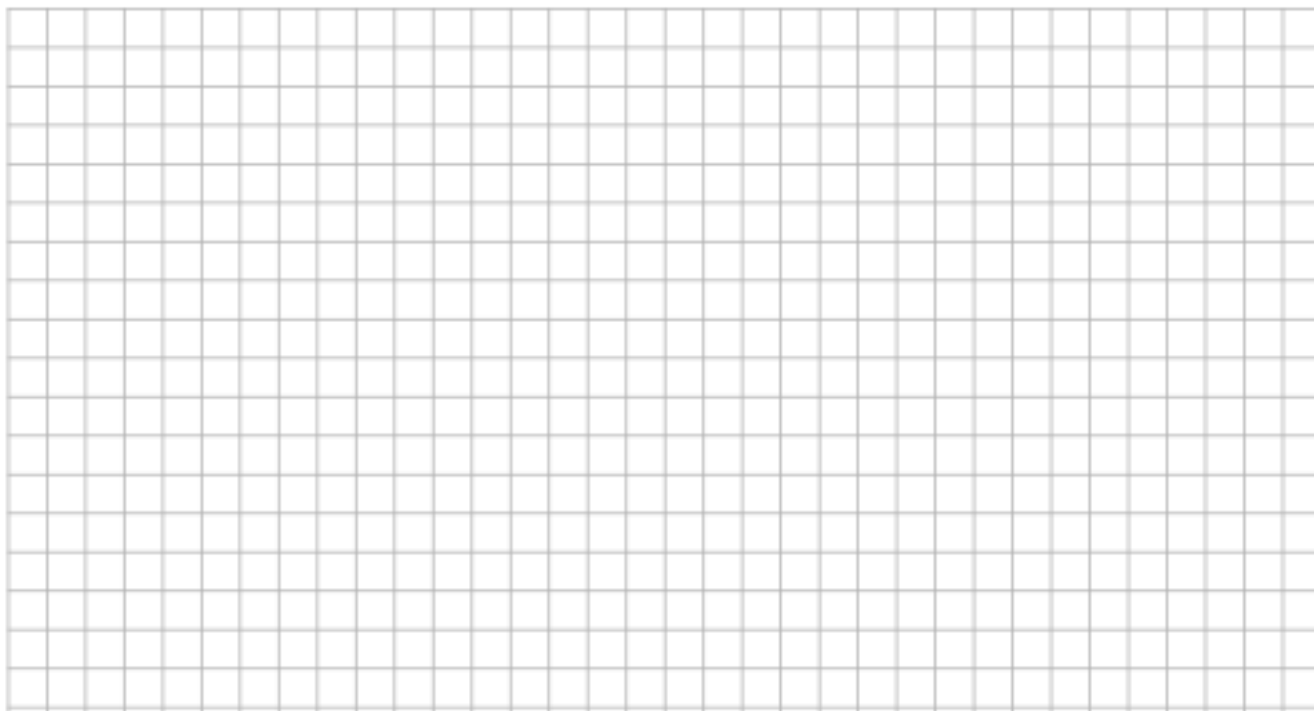
eg1. Find the surface area and volume of a rectangular box with dimensions: 10cm, 7cm and 8cm.



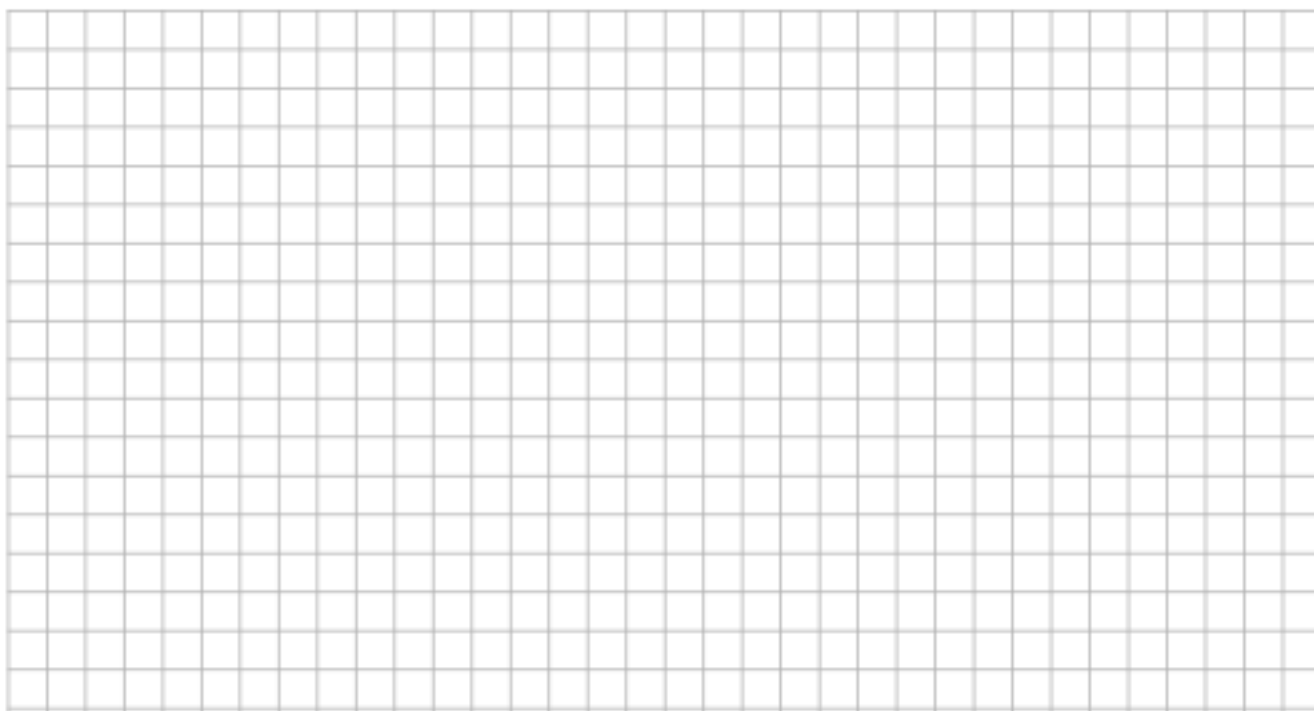
eg2. Calculate the volume and total surface area of a cylinder with a height of 10cm and a radius of 2cm.



eg3. A sphere with a diameter of 10cm fits exactly into a cylindrical container. Find the volume of the empty space inside the container when the sphere is placed inside it.

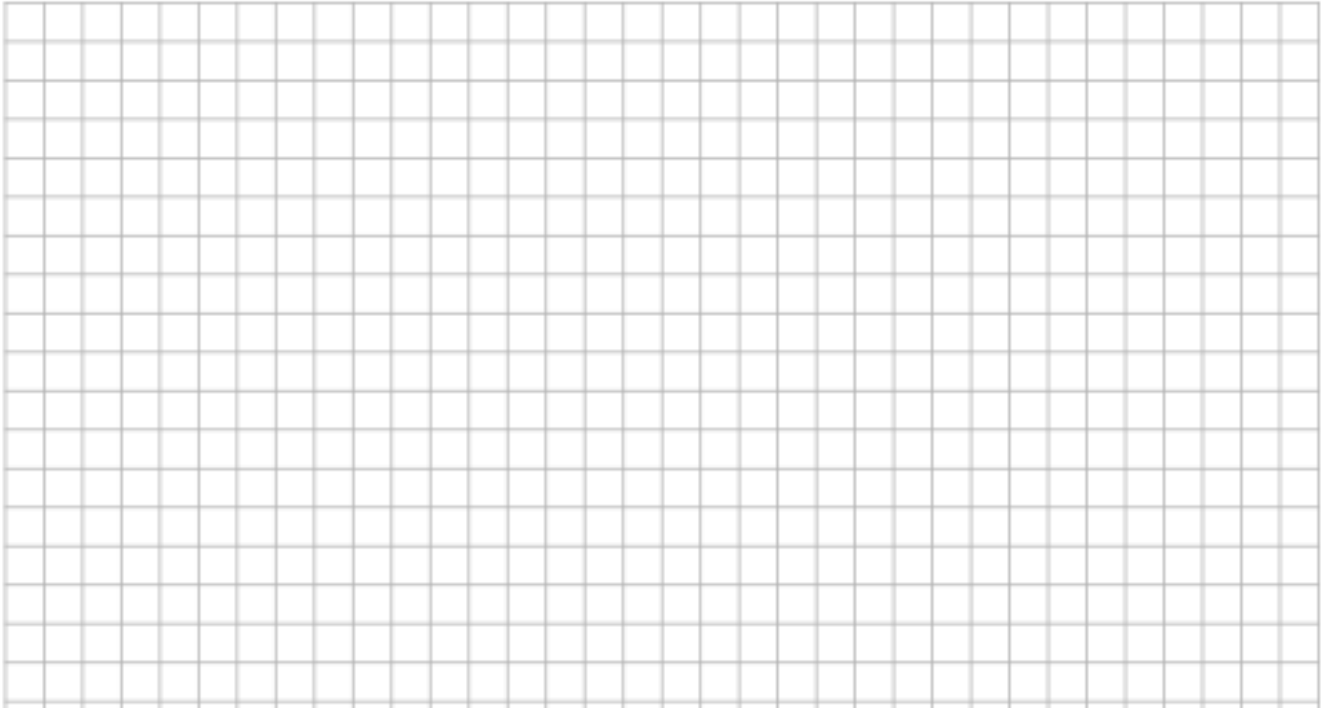


eg4. Find the volume and total surface area of a cone with a height of 8cm and a radius of 4cm. (assume $\pi = 3.14$).



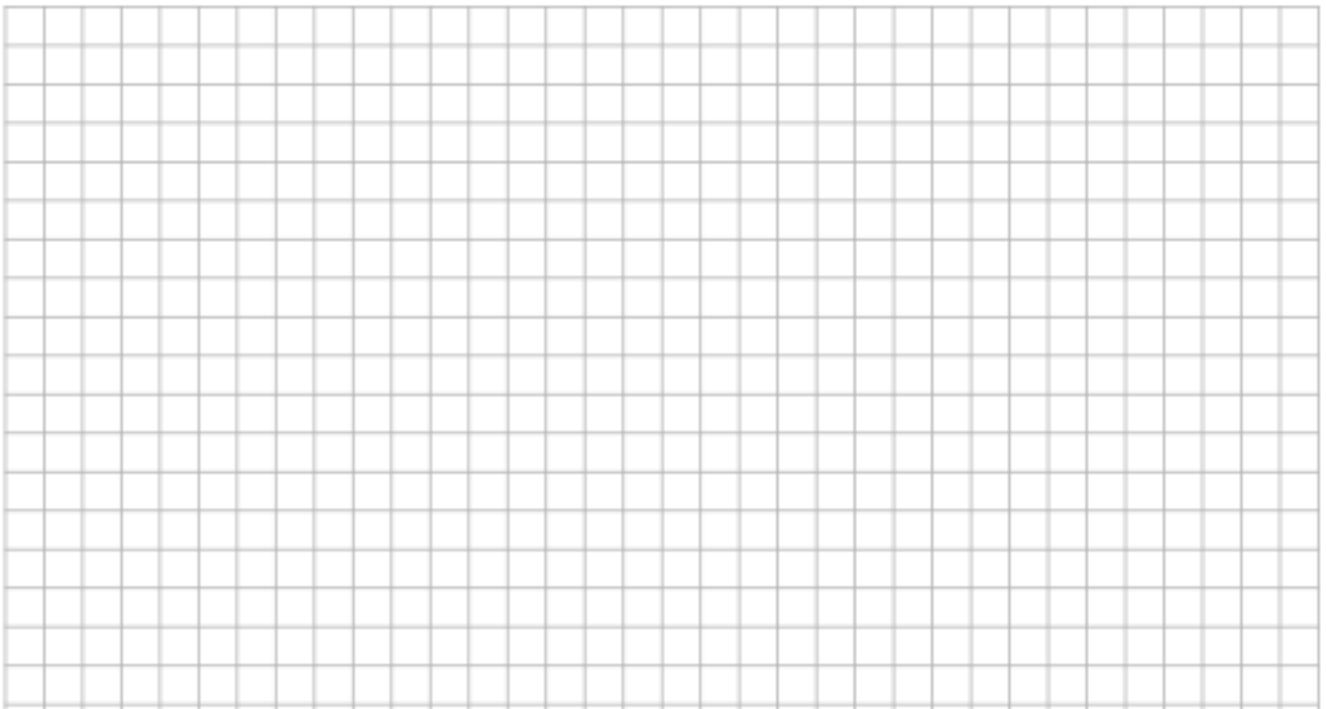
4) Finding missing lengths when given volume or surface area

eg1. The volume of a cone is 400cm^3 , if the base is 7cm , find the height of the cone.



eg2. The curved surface area of a cone is $70\pi\text{cm}^2$. If the radius of the cone 7cm ,

Find (i) its slant height, (ii) its volume, in terms of π .



5) Equal volumes

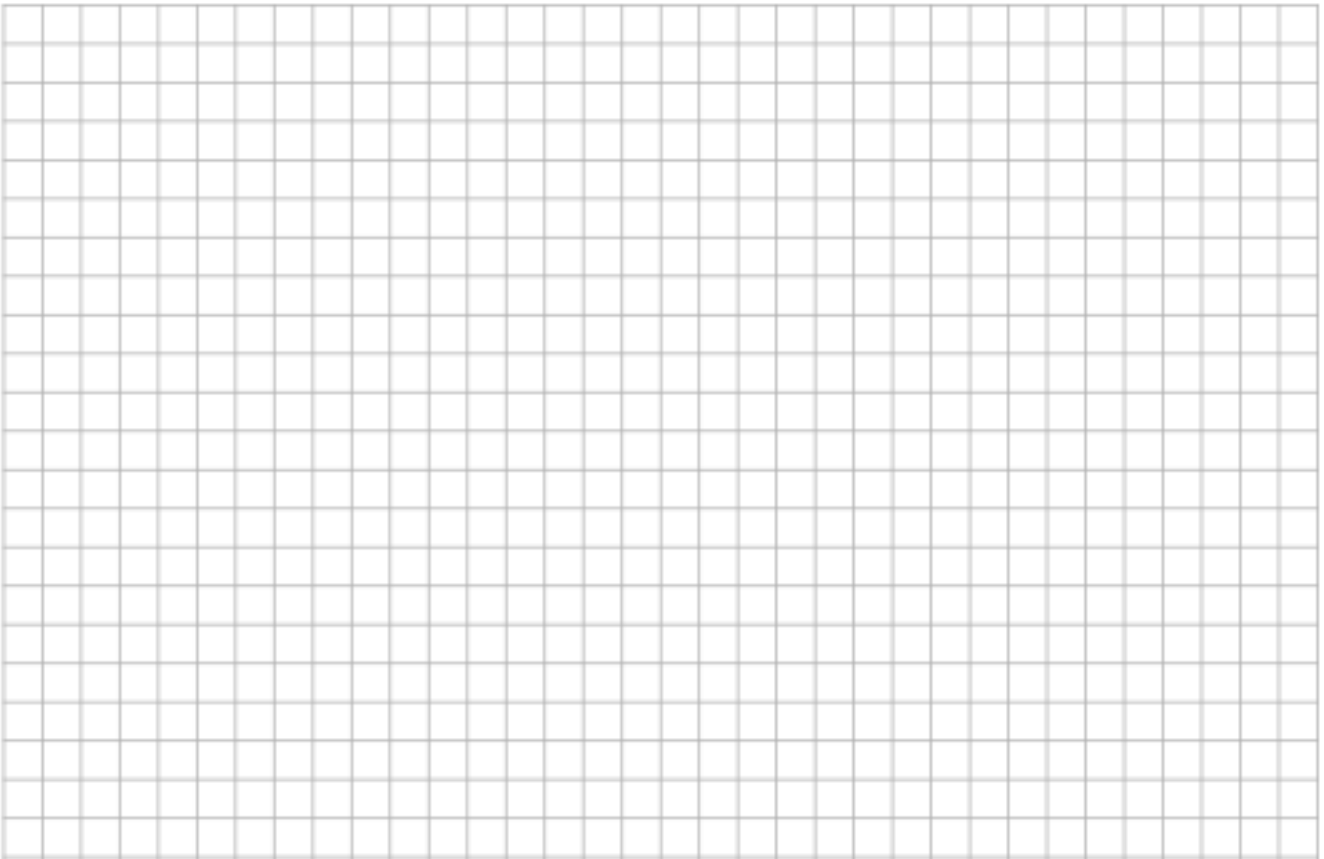
There are 3 different types of these questions:

1. Moving liquids
2. Melting down shapes and recasting them
3. Displacing liquids

1. Moving Liquids

- In these questions, liquid is moved from one container to another container with different dimensions or shape and you are asked to find the dimension of the new container.

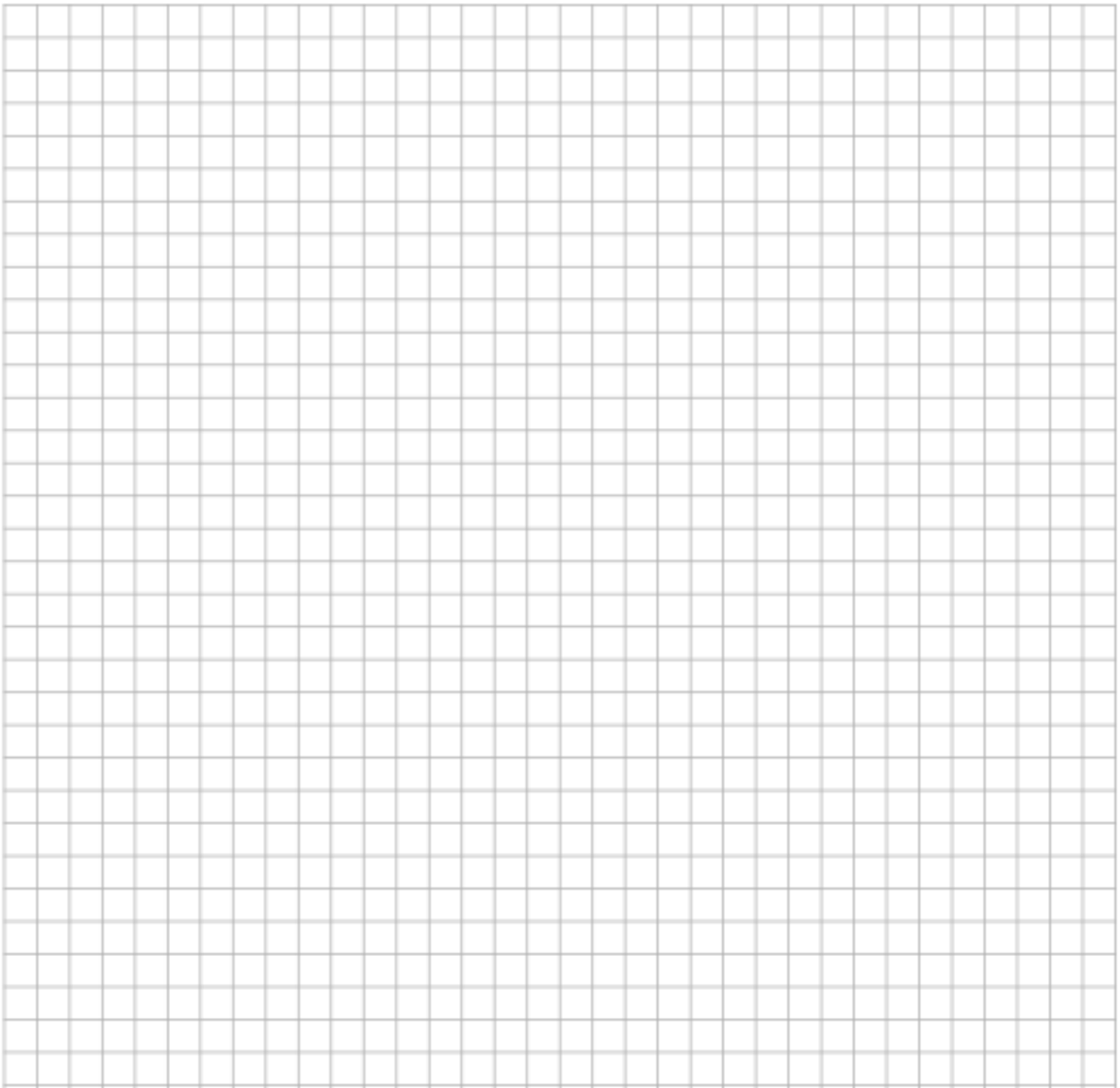
eg1. Water is poured from a cylindrical container with a height of 5cm and a radius of 3cm into another cylindrical container with a radius of 2cm, find the height of the water in the new container.



2. Melting down shapes and recasting them

- In these questions shapes are melted down and recast into different shapes and you are asked to find the dimensions of the new shapes.
- NOTE: THE VOLUME OF THE TWO SHAPES ARE EQUAL

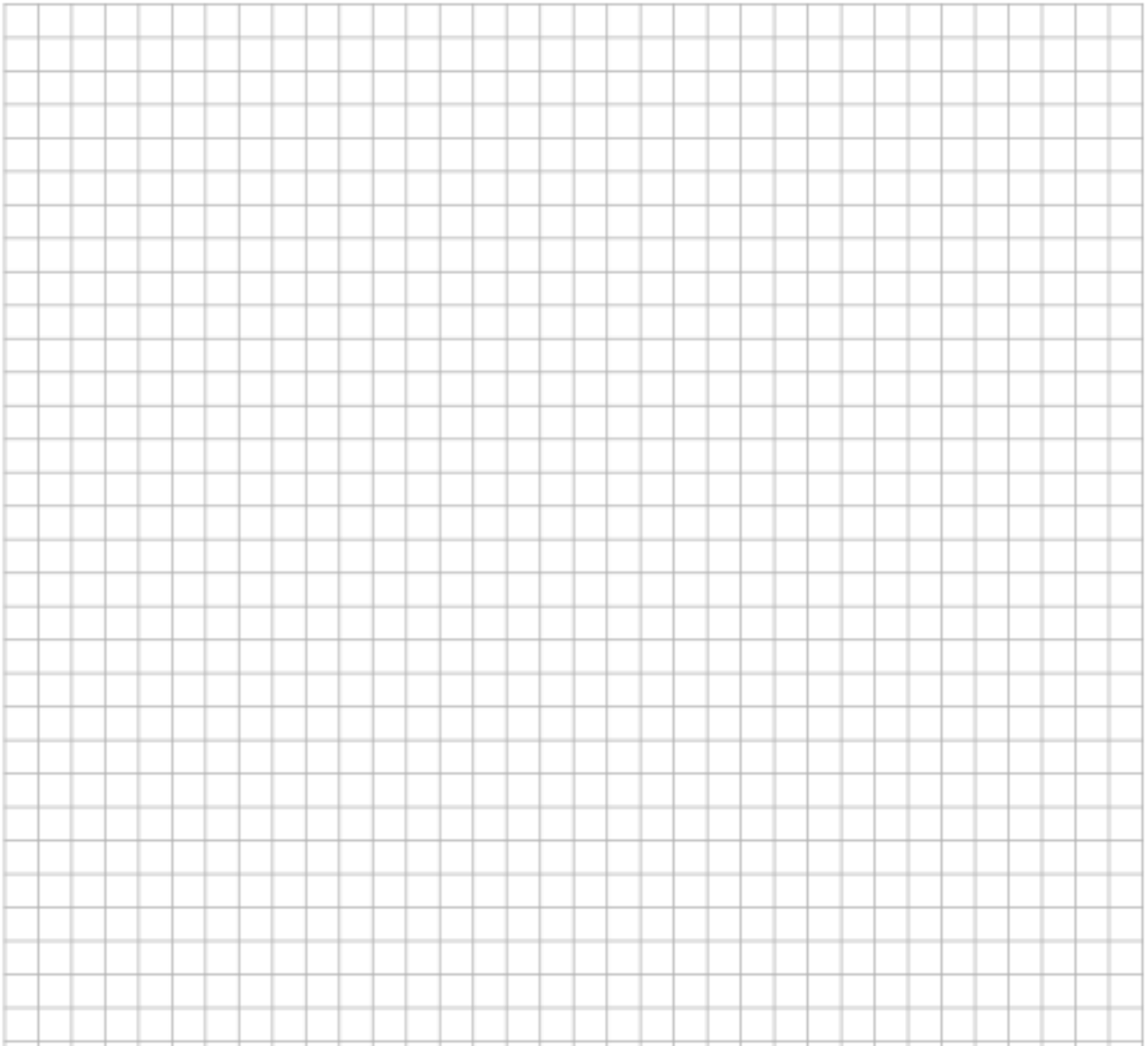
eg1. A sphere of radius 10cm is made of lead. The sphere is then melted down and some of it is used to make to make a solid cone of radius 7cm and of height 18cm, the rest of the lead is used to make a cylinder of height 17cm. Find the radius of the cylinder.



3. Rising or falling liquids

- In these questions liquid is rises or falls by putting in or removing solid objects.
- NOTE: THE VOLUME OF THE DISPLACED LIQUID IS EQUAL TO THE VOLUME OF THE OBJECT THAT IS PUT IN OR REMOVED.
- NOTE 2: In these questions don't put a value in for π as the π 's usually end up cancelling.

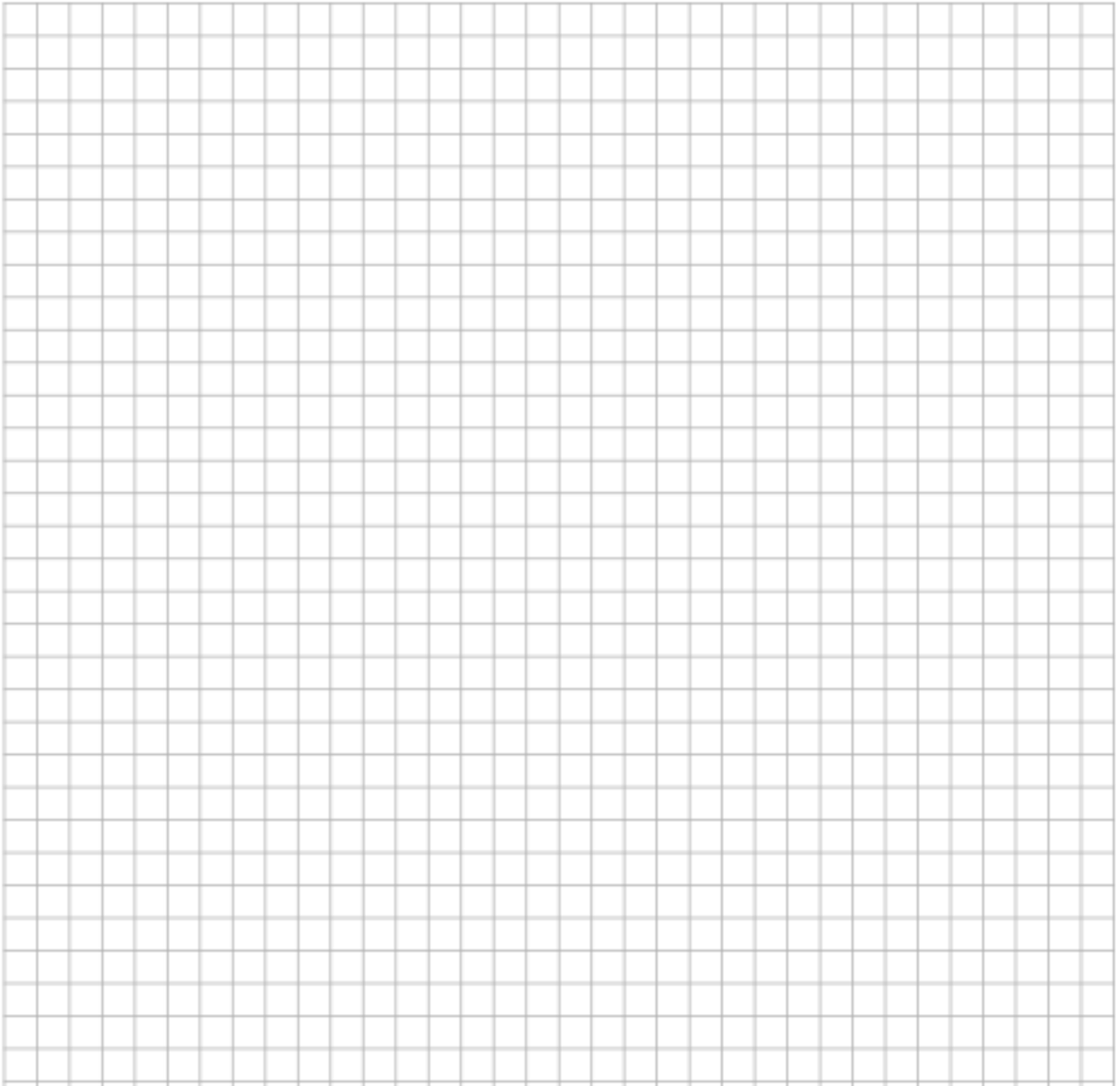
eg1. A solid cone has a height of 20cm and a radius at its base of 10cm. The cone is submerged in a cylinder filled with water with a diameter of 25cm. The cone is then removed from the cylinder. Calculate the drop in the level of the water when the cone is removed.



6) Algebraic substitution

- Some of these area and volume questions require you to use a thing called algebraic substitution to solve them.

eg1. A cylinder and a cone have the same radius and the height of the cone is twice the height of the cylinder. Find the ratio of the volume of the cone to the volume of the cylinder.

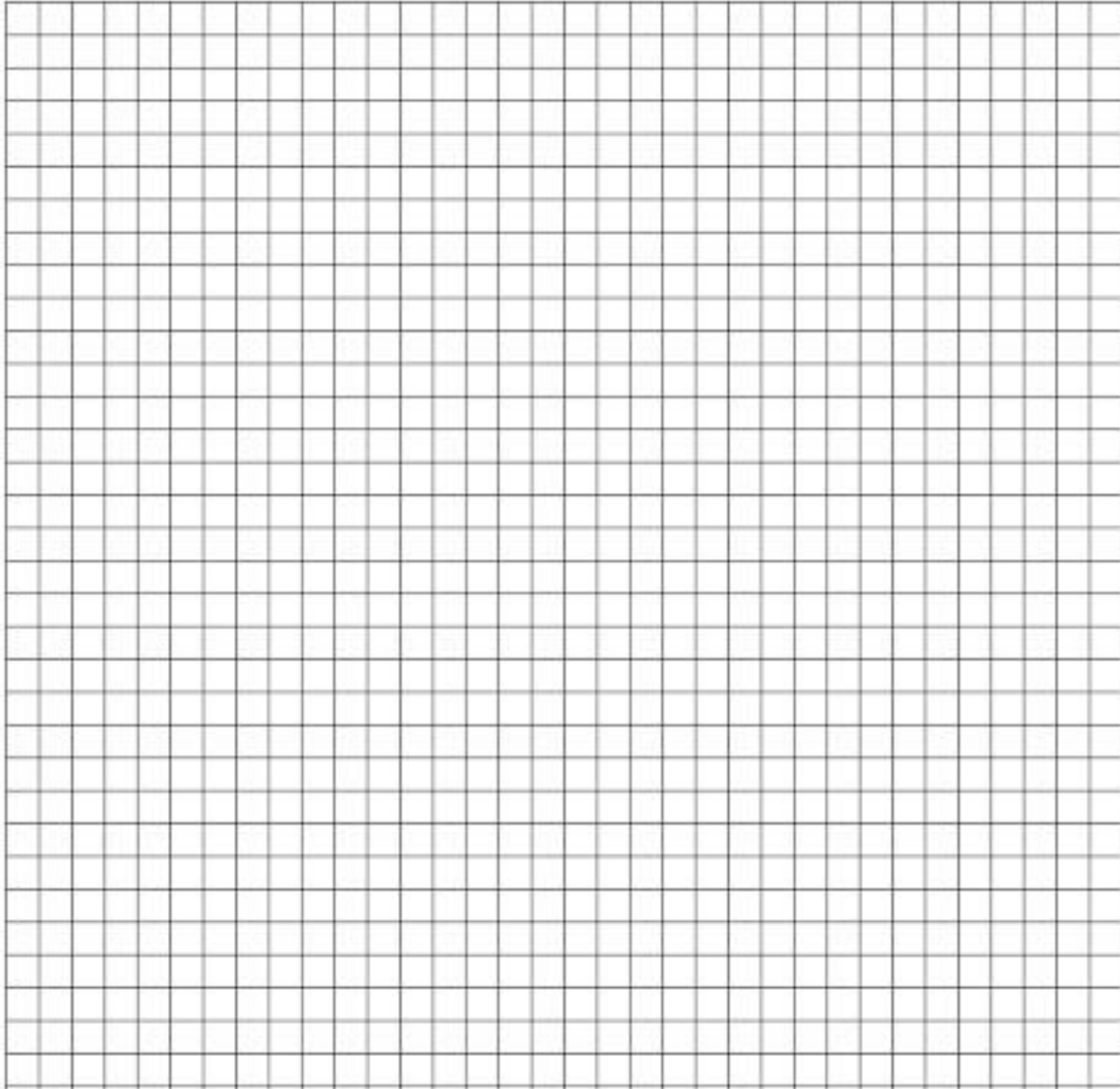


7) Nets

Q1:

The square base of a pyramid has sides of length 4 cm. The triangular faces of the pyramid are all isosceles triangles with two sides of length 5 cm.

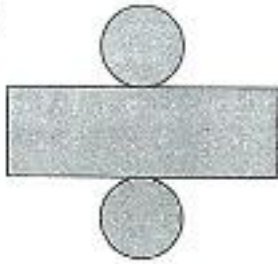
Draw a net for the pyramid.



Q2.

Here are the nets of some 3-D shapes. Identify the shapes.

(i)

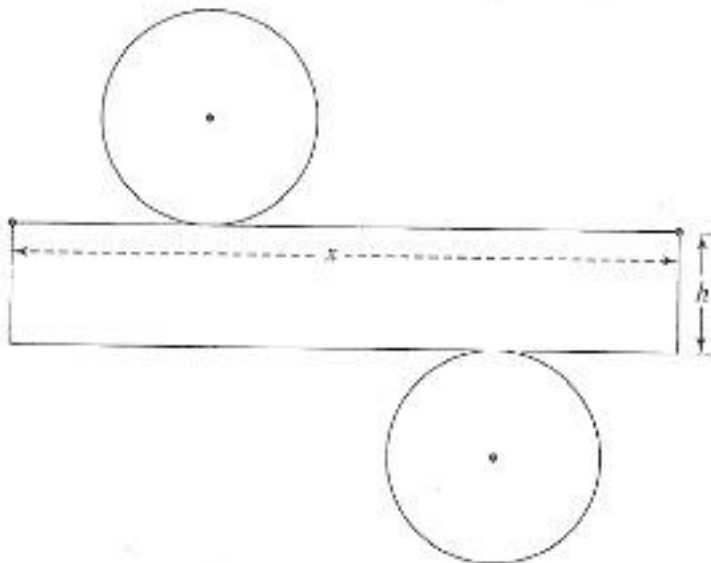


(ii)



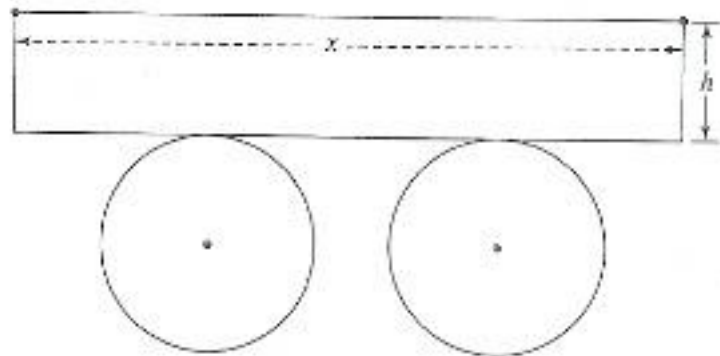
Q3.

The following net has a 3D shape with a volume of $2,512 \text{ cm}^3$.

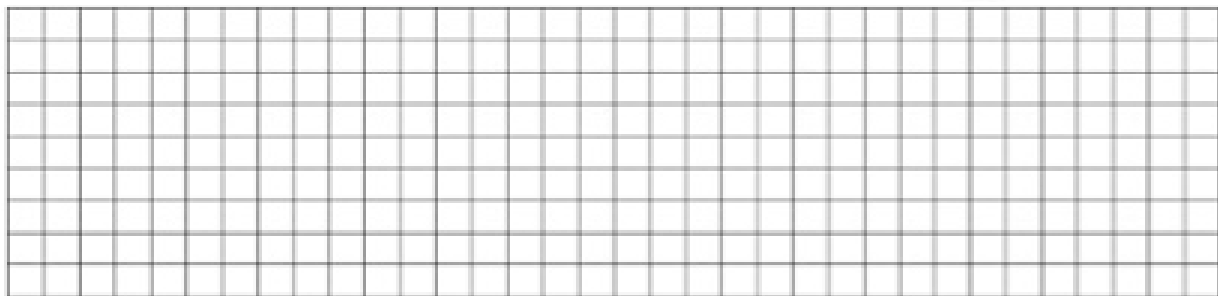


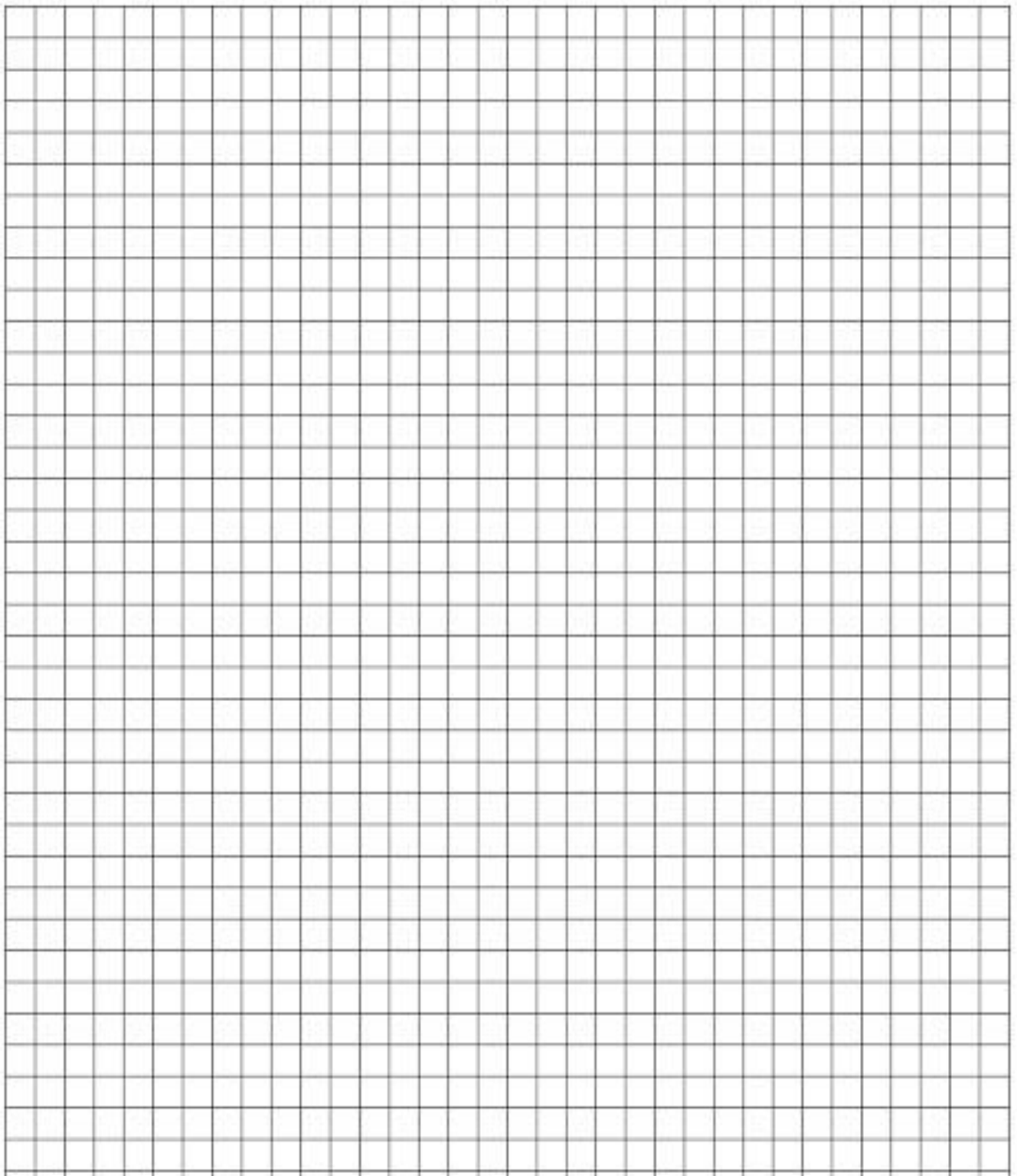
(i) Name the 3D shape.

(ii) Taking $\pi = 3.14$ and given both identical circles have a diameter of 20 cm, calculate h and x , the dimensions of the rectangle.



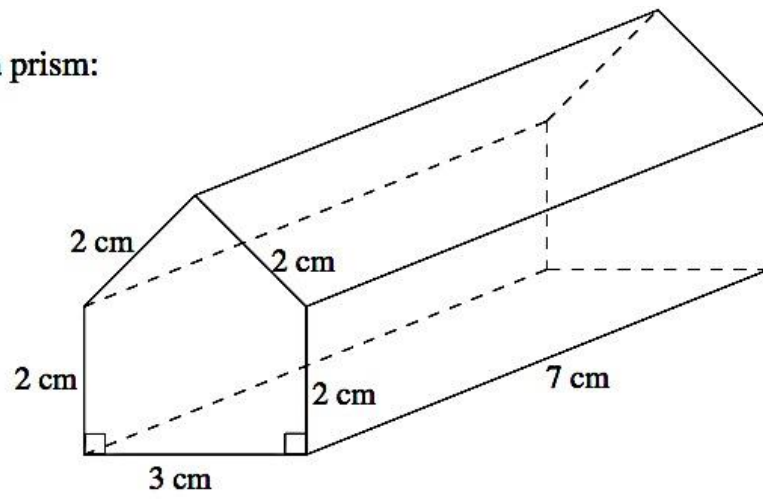
(iii) Can a similar 3D solid be made from the net shown on the right? Justify your answer.



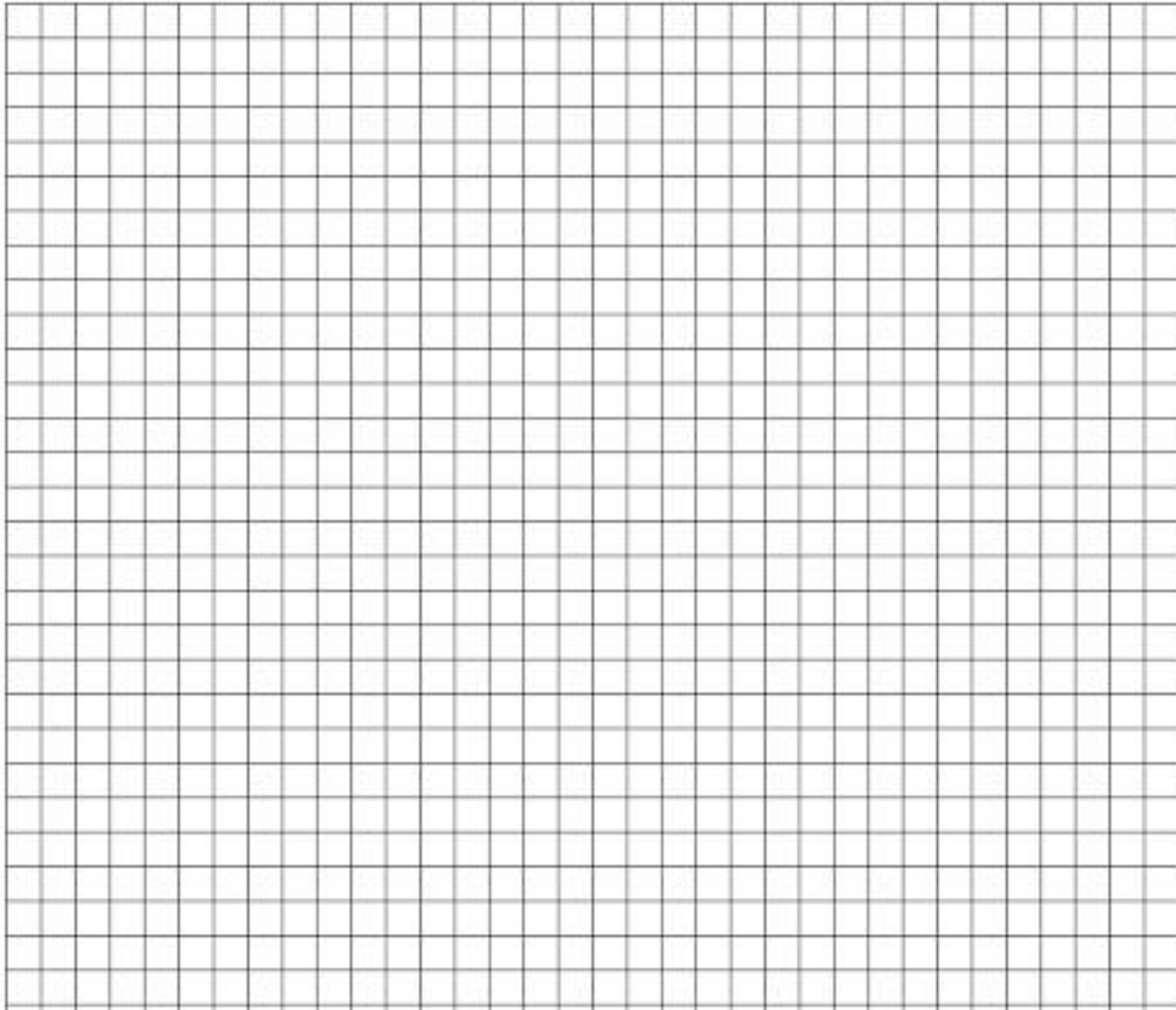


Q4:

The diagram shows a prism:

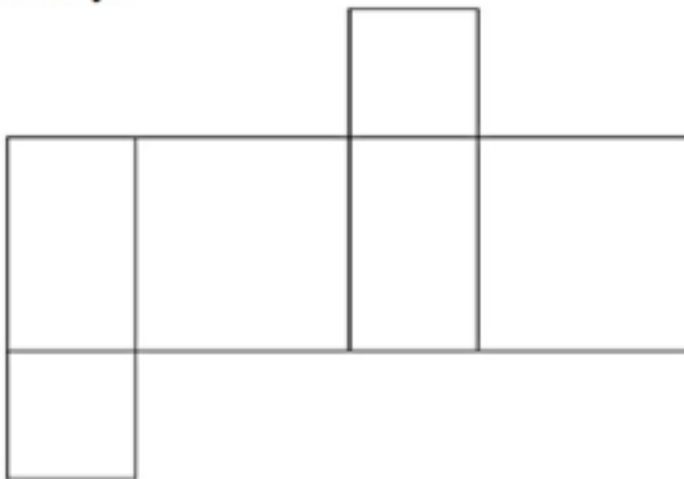


- (a) Draw a net for the prism.
- (b) Find the height of the prism.

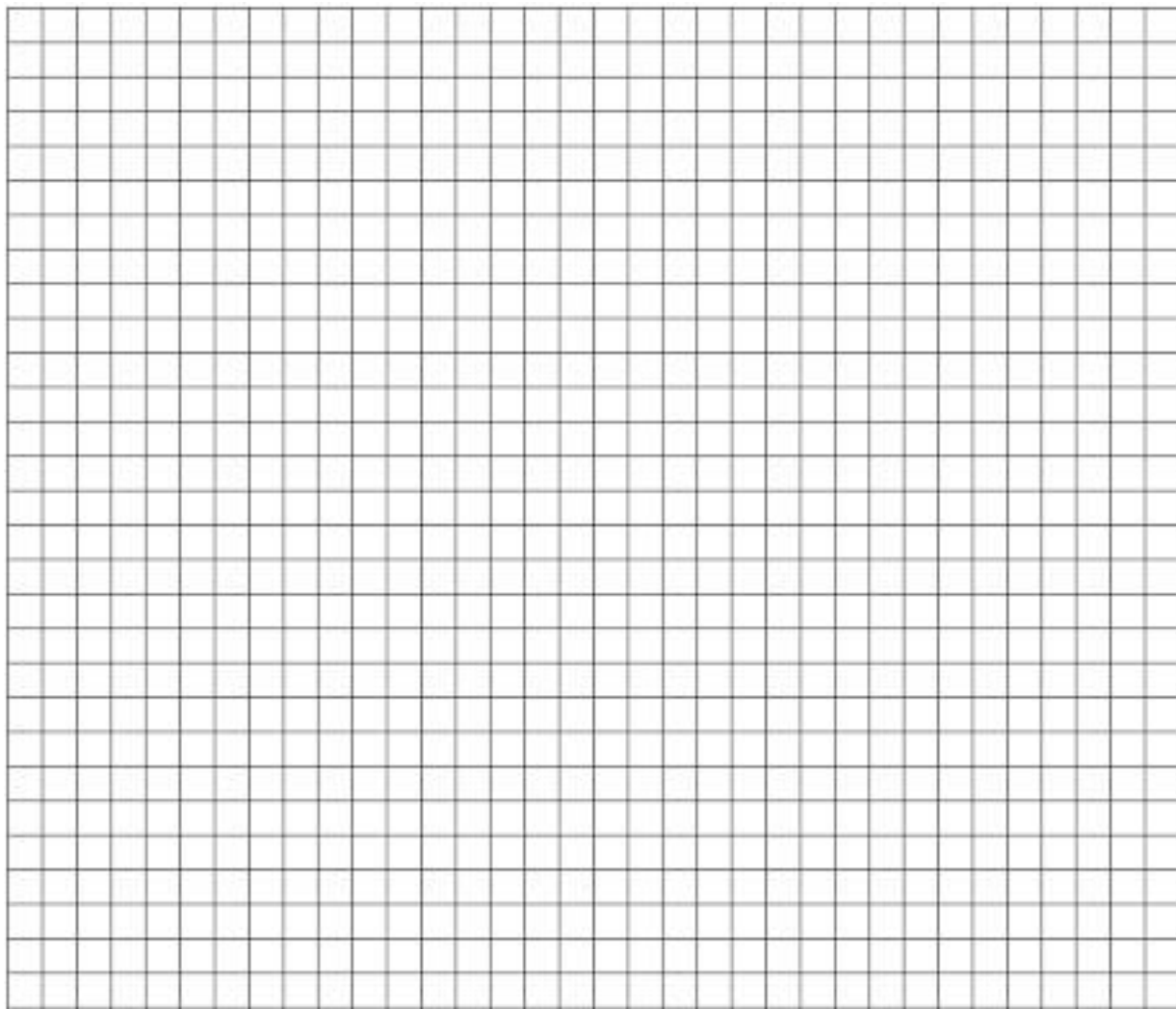


Q5:

A diagram of a net is shown below, where two of the rectangles have been drawn inaccurately.



- (a) Explain what is wrong with the net.
- (b) Draw a modified net that would produce a cuboid, by changing two of the rectangles.



8) The trapezoidal rule

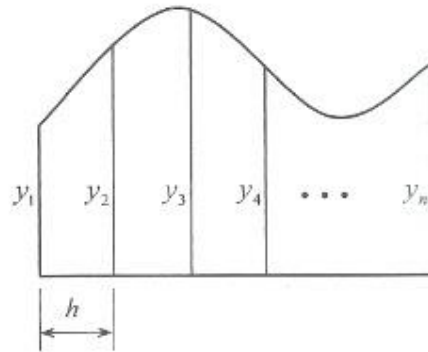
The following is on page 12 of the Formulae and Tables Booklet.

Meastacháin ar achar

Seasann A d'achar na fíorach.

Area approximations

A represents the area of the shape.



Riail thraipéasóideach

$$A \approx \frac{h}{2} [y_1 + y_n + 2(y_2 + y_3 + y_4 + \dots + y_{n-1})]$$

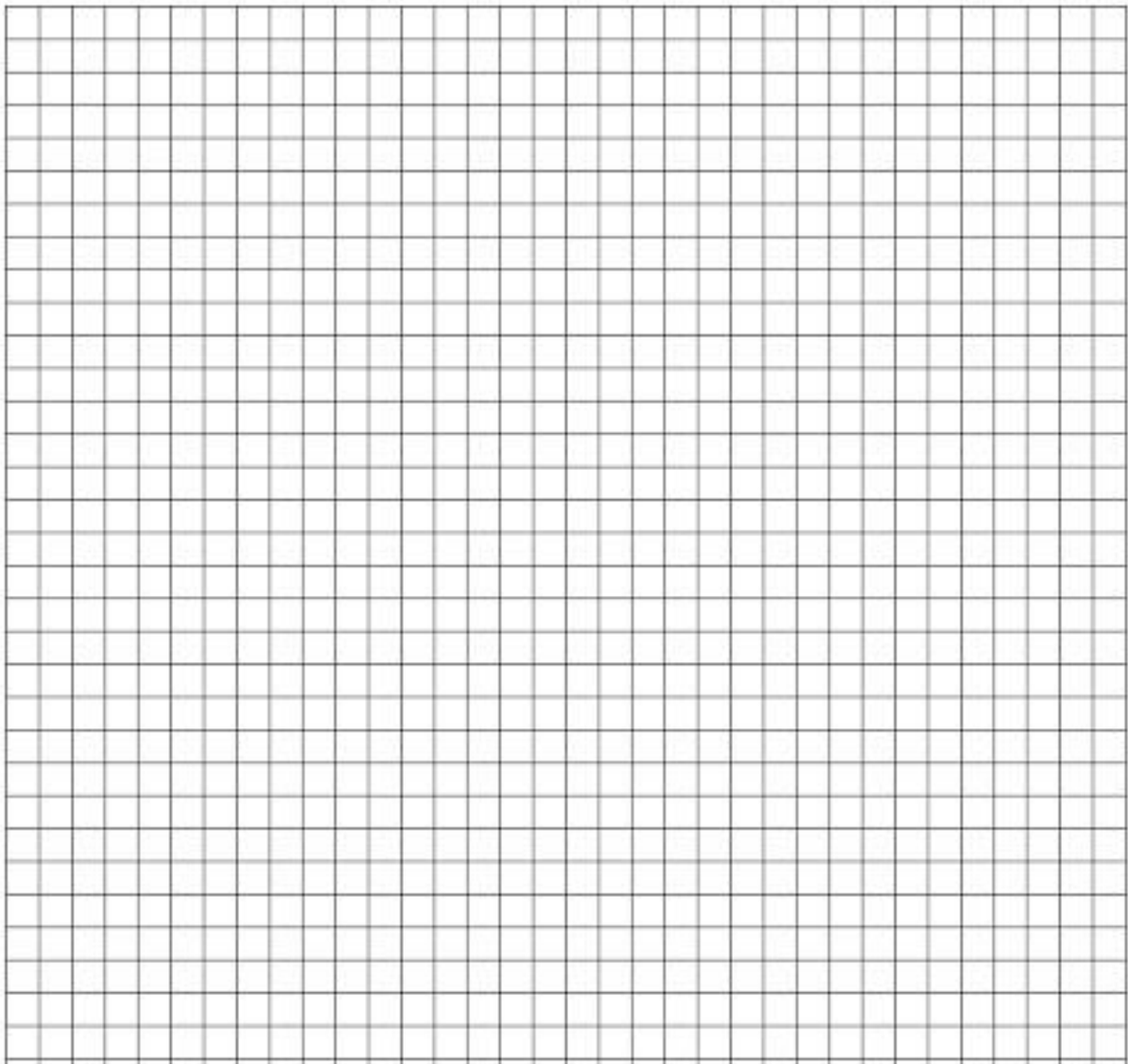
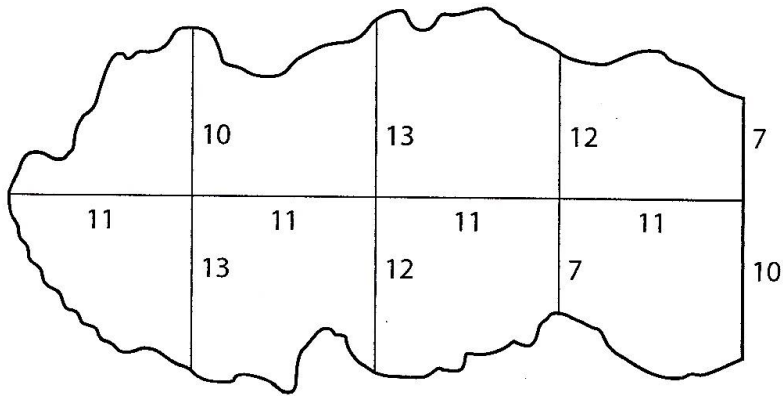
Trapezoidal rule

Riail Simpson
áit ar corruimhir n

$$A \approx \frac{h}{3} [y_1 + y_n + 2(y_3 + y_5 + \dots + y_{n-2}) + 4(y_2 + y_4 + \dots + y_{n-1})]$$

Simpson's rule
for odd n

Q1. Use the trapezoidal rule to find an approximate area of the figure below. All measurements are in metres.



Q2. The trapezoidal rule was used to find the area of the shape below and the result was 656 m^2 . Calculate the length of the line marked x

