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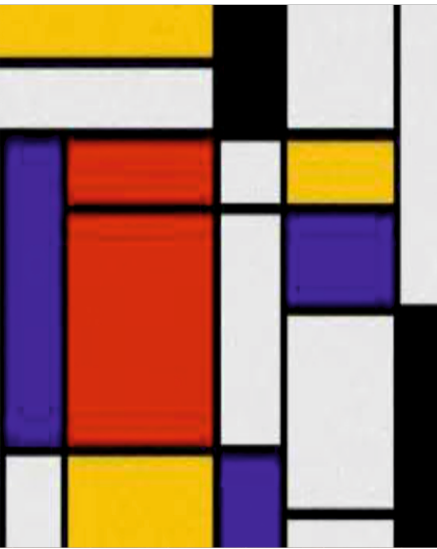
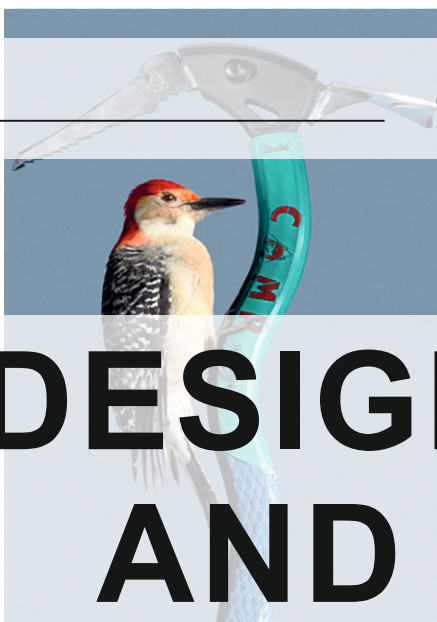
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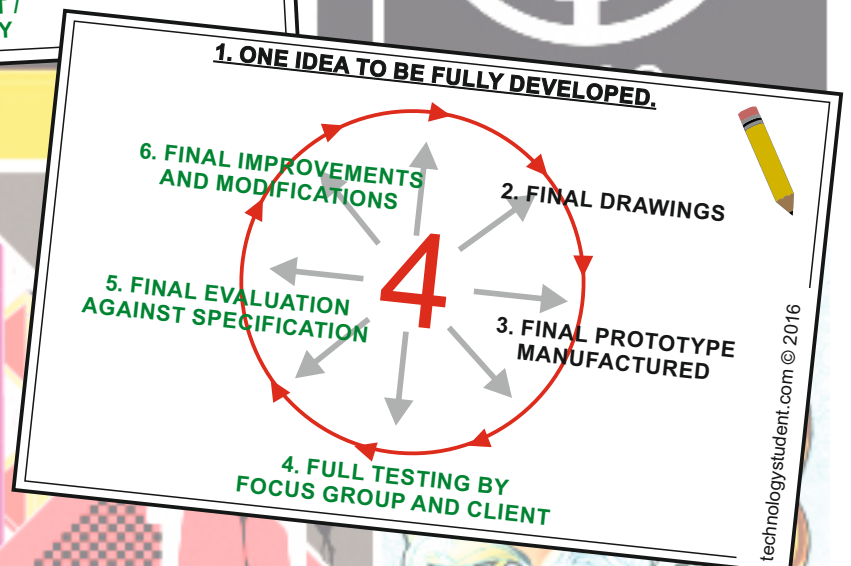
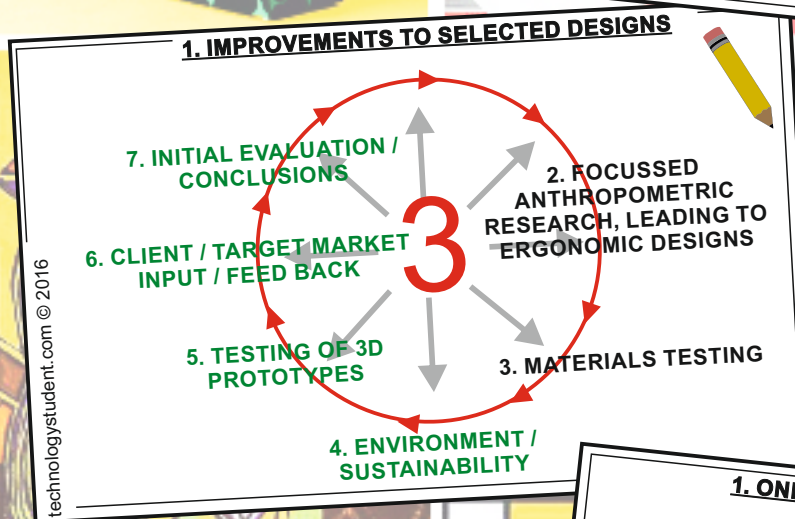
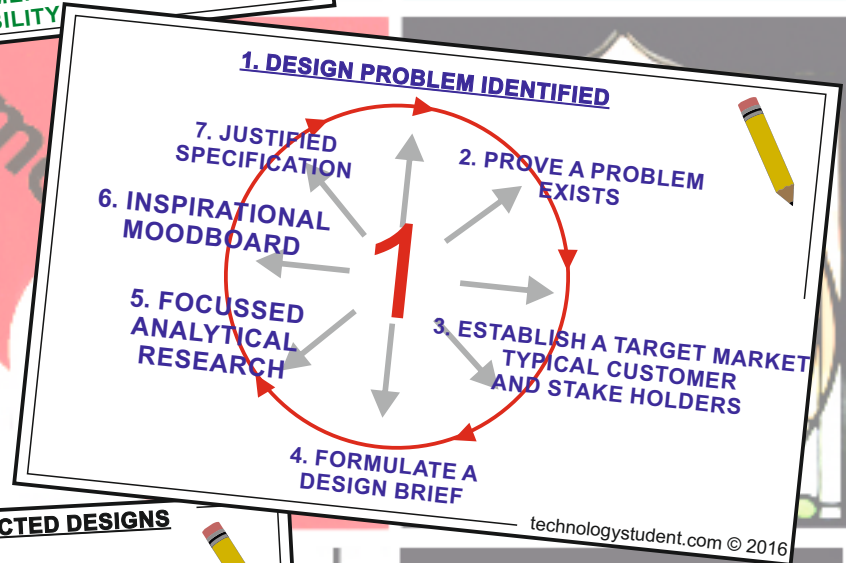
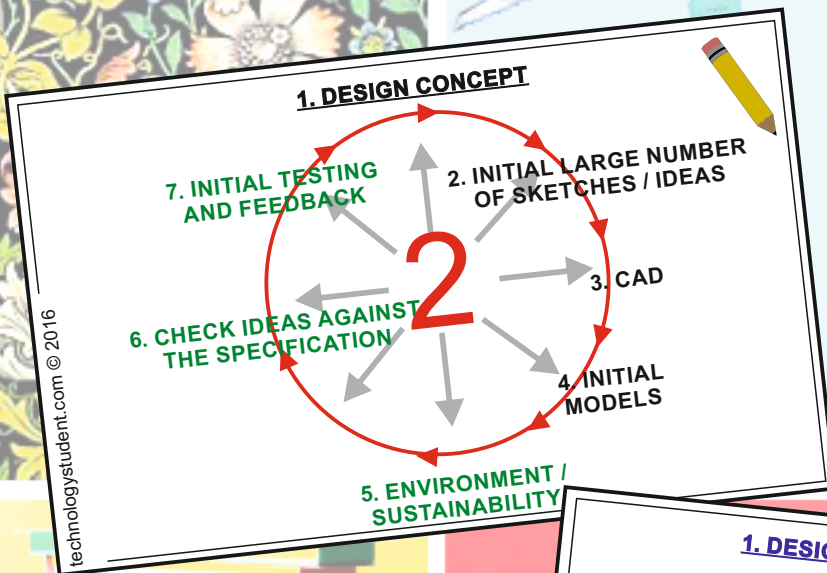
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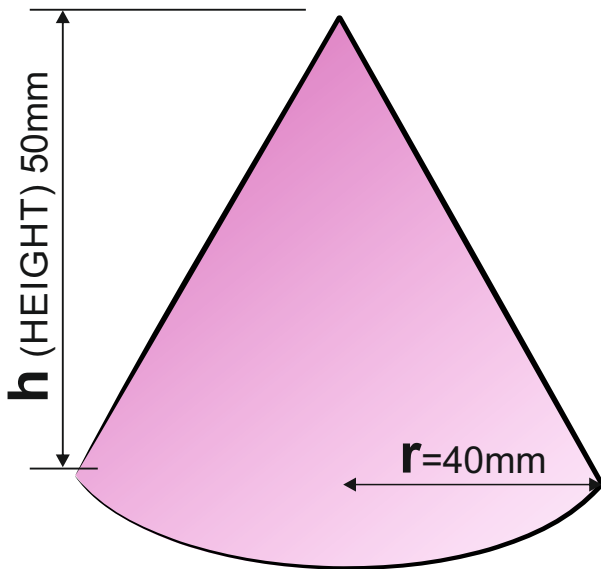


ITERATIVE DESIGN - SUMMARY CARDS



HOW TO CALCULATE THE VOLUME OF A CONE

DEFINITION: A cone has one surface with a circular base. The vertex is directly above the centre of the circular base.



FORMULA

$$v = \frac{1}{3} \pi r^2 h$$

the same as $v = \frac{\pi r^2 h}{3}$

pi (π) is 3.14

If the height (h) is 50mm and the radius is 40mm

Then:

$$v = \frac{1}{3} \pi r^2 h$$

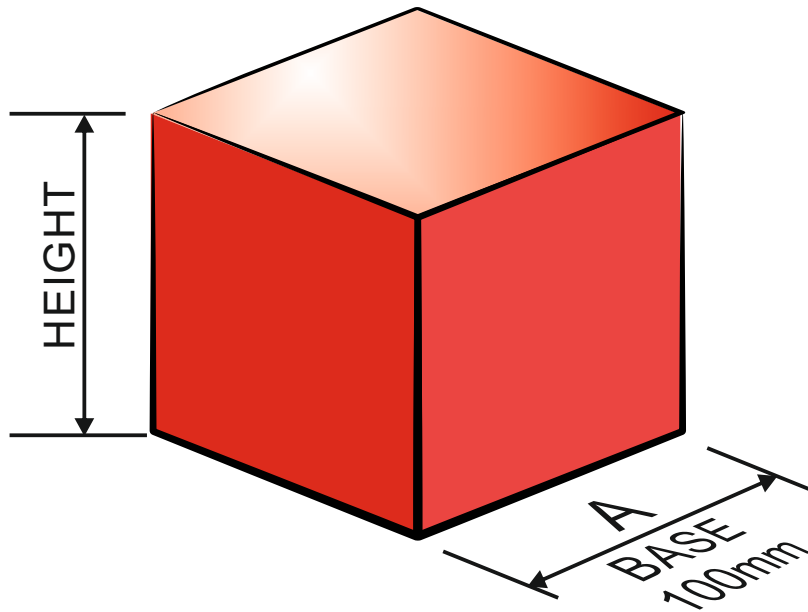
$$v = \frac{1}{3} \times 3.14 \times (40 \times 40) \times 50$$

$$v = \frac{1}{3} \times 251200$$

$$v = \frac{251200}{3} = 83733.33 \text{mm}^3$$

HOW TO CALCULATE THE VOLUME OF A CUBE

DEFINITION: A cube is a solid object, composed of six equal squares, with a 90 degree angle between adjacent sides.



All the sides of a cube are the same measurement. There are two similar formulas for calculating a cube's volume.

$$\text{VOLUME (V)} = A \times A \times A$$

$$\text{OR } A^3$$

EXAMPLE 1

If the measurement of one side is 100mm:

$$\text{VOLUME} = 100\text{mm} \times 100\text{mm} \times 100\text{mm}$$

$$\text{VOLUME} = 1000000\text{mm}^3 \text{ or } 1000\text{cm}^3$$

EXAMPLE 2

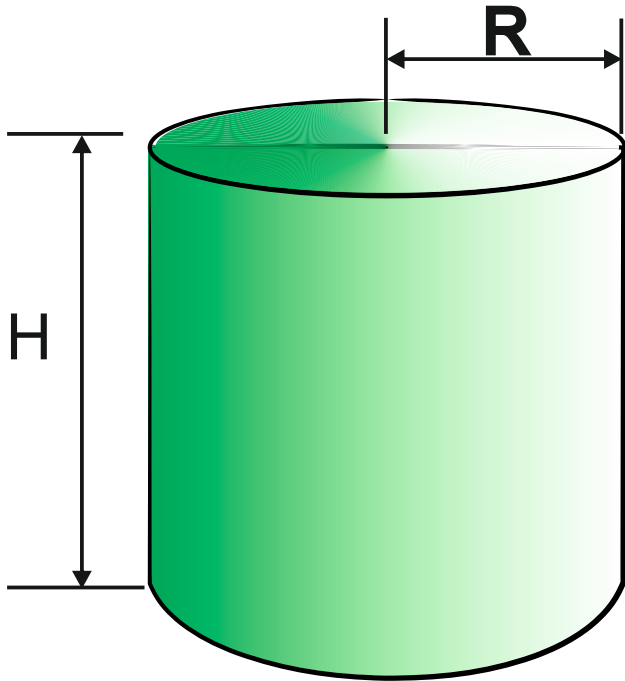
If the measurement of one side is 320mm:

$$\text{VOLUME} = 320\text{mm} \times 320\text{mm} \times 320\text{mm}$$

$$\text{VOLUME} = 32768000\text{mm}^3 \text{ or } 32768\text{cm}^3$$

HOW TO CALCULATE THE VOLUME OF A CYLINDER

DEFINITION: A three dimensional geometrical shape, that has a circle at each end of a single curved surface.

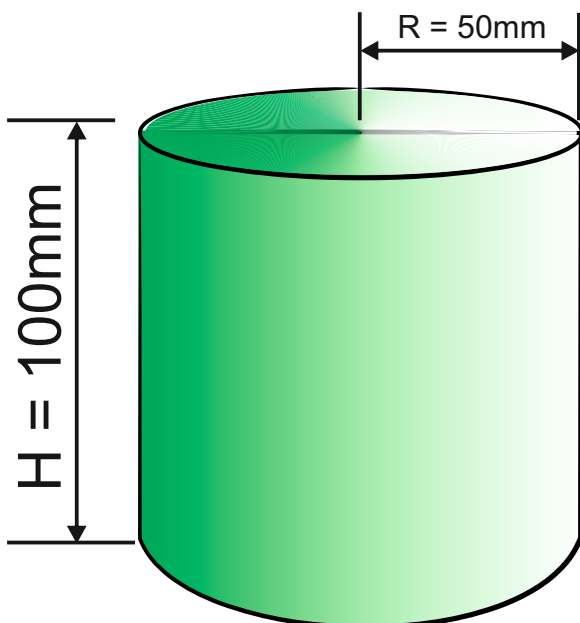


In order to calculate the volume of a cylinder, the height and radius of the circular top /bottom must be known. The following formula is used to calculate the volume.

$$V = \pi r^2 h$$

volume = pi x radius² x height

$$\pi (\text{pi}) = 3.14$$



$$V = \pi r^2 h$$

$$\text{volume} = 3.14 \times 50\text{mm} \times 50\text{mm} \times 100\text{mm}$$

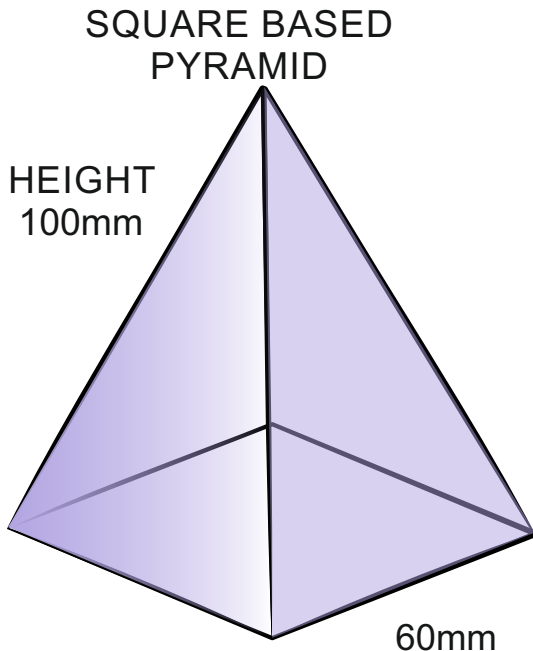
$$\text{volume} = 785000\text{mm}^3$$

or

$$\text{volume} = 7850\text{cm}^3$$

HOW TO CALCULATE THE VOLUME OF A REGULAR SQUARE PYRAMID

DEFINITION: A Regular Square Pyramid has a square base with triangular sides. The apex (highest point), is inline with the centre of the square base. A square pyramid is a relatively common geometrical shape/form.



FORMULA

$$\text{Volume} = \frac{1}{3} \times \text{Base} \times \text{Height}$$

$$V = \frac{1}{3} \times B \times H$$

CALCULATE THE AREA OF BASE FIRST

$$\text{AREA OF BASE} = \text{LENGTH}^2$$

$$\text{AREA OF BASE} = 60\text{mm} \times 60\text{mm} = 3600\text{mm}^2$$

THEN APPLY THE FOLLOWING FORMULA

$$\text{Volume} = \frac{1}{3} \times \text{Base} \times \text{Height}$$

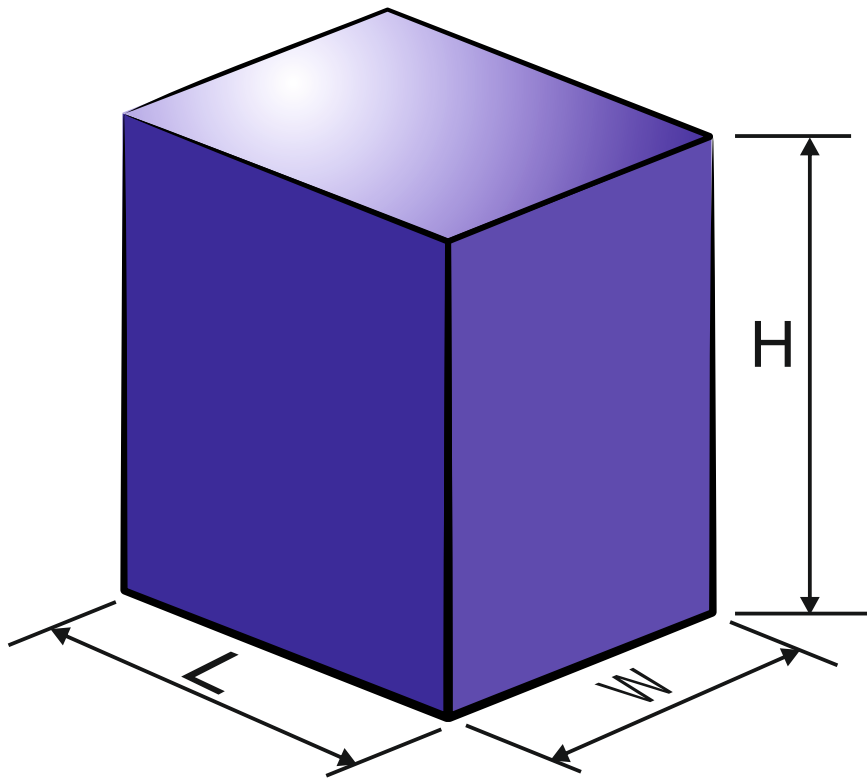
$$V = \frac{1}{3} \times 3600\text{mm} \times 100\text{mm}$$

$$V = \frac{1}{3} \times 360000\text{mm}$$

$$V = \frac{360000\text{mm}}{3} = 120000\text{mm}^3$$

HOW TO CALCULATE THE VOLUME OF A RECTANGULAR PRISM

DEFINITION: A rectangular prism is a solid object, composed of six rectangles, with a 90 degree angle between adjacent sides. Opposite sides of a rectangular prism are equal and parallel to each other.



Unlike a cube, the area of the sides of a rectangular prism / cuboid are not the same, consequently the formula for calculating the volume is as follows:

FORMULA

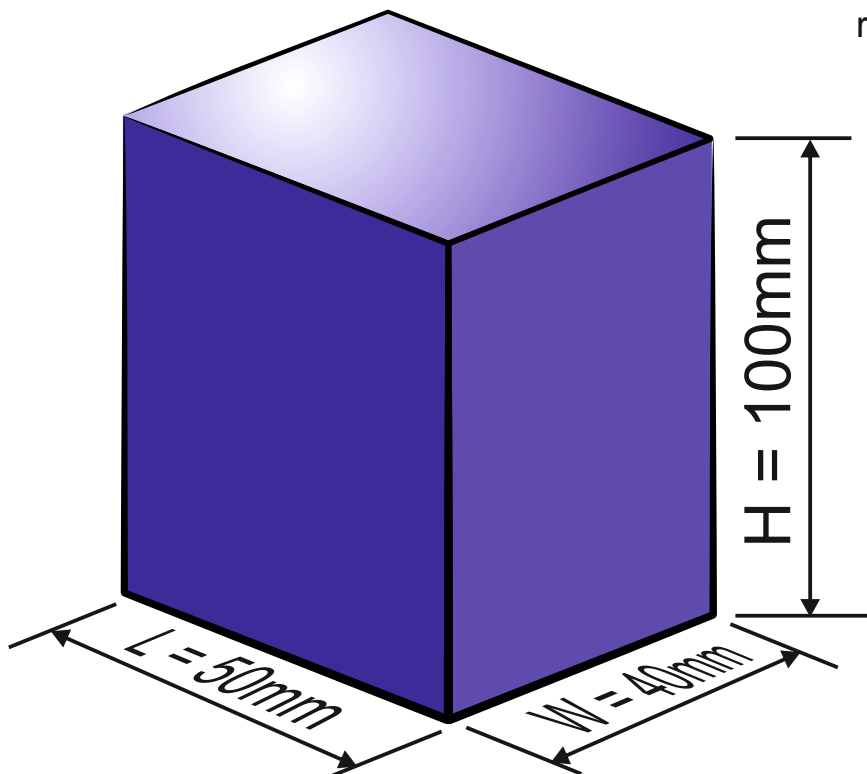
$$V=L \times W \times H$$

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VOLUME = LENGTH X WIDTH X HEIGHT

$$V=L \times W \times H$$

EXAMPLE: What is the volume of the rectangular prism shown opposite?



$$V=L \times W \times H$$

$$V=50 \times 40 \times 100$$

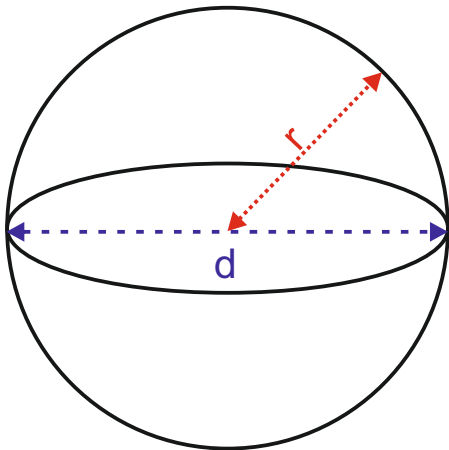
$$V=200000\text{mm}^3$$

or

$$V=2000\text{cm}^3$$

HOW TO CALCULATE THE VOLUME OF A SPHERE

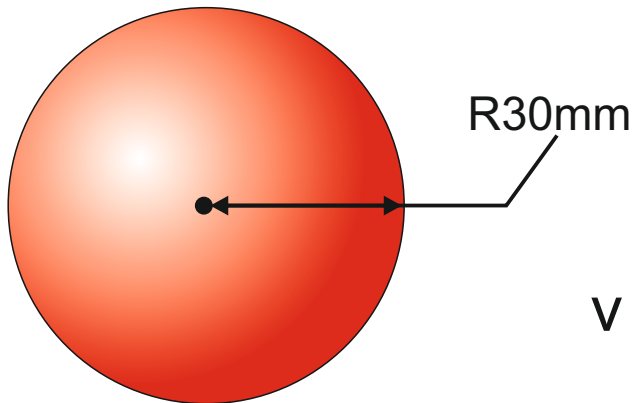
DEFINITION: A sphere is an object that is absolutely symmetrical about its centre. From any angle it appears to be a circle, but it is a true three dimensional object.



FORMULA

$$v = \frac{4}{3}\pi r^3$$

EXAMPLE CALCULATION - VOLUME OF A SPHERE



$$V = \frac{4}{3}\pi r^3$$

$$V = \frac{4}{3} \times \frac{3.14 \times (30 \times 30 \times 30)}{1}$$

$$V = \frac{4}{3} \times \frac{3.14 \times (27000)}{1}$$

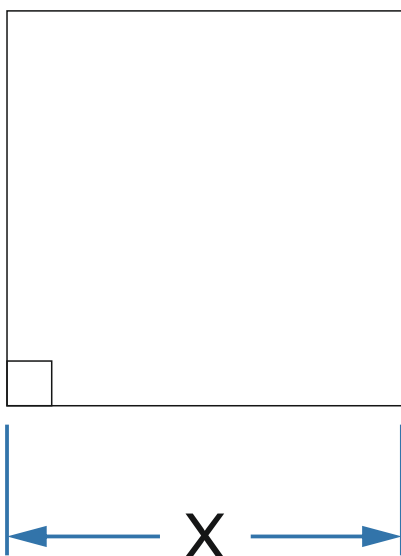
$$V = \frac{4}{3} \times \frac{84780}{1}$$

$$V = \frac{339120}{3}$$

$$V = 113040 \text{mm}^3$$

CALCULATING THE AREA OF A SQUARE

Definition: A square has four sides, with each being equal in length. Each of the four internal angles are right angles, 90 degrees.



FORMULA

$$\text{AREA} = X^2$$

$$\text{OR } X = X \text{ multiplied by } X$$

X IS THE LENGTH OF ONE SIDE

REMEMBER, WITH A SQUARE,
EACH SIDE IS THE SAME LENGTH

SAMPLE QUESTIONS



Calculate the area of the square shown opposite.
The length of one side is 100mm

$$\text{AREA} = X^2$$

$$\text{AREA} = 100\text{mm} \times 100\text{mm}$$

$$\text{AREA} = 10000\text{mm}^2$$



Calculate the area of the square shown opposite.
The length of one side is 50mm

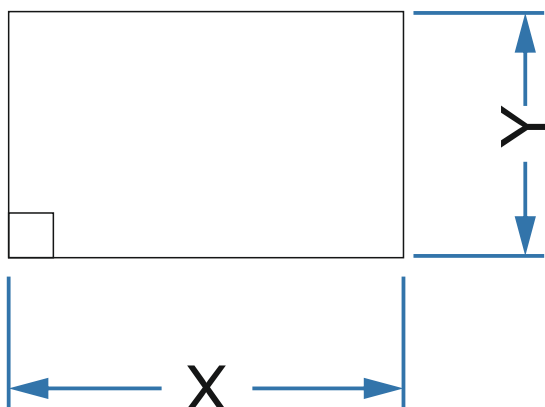
$$\text{AREA} = X^2$$

$$\text{AREA} = 50\text{mm} \times 50\text{mm}$$

$$\text{AREA} = 2500\text{mm}^2$$

CALCULATING THE AREA OF A RECTANGLE

Definition: A rectangle has four sides, with the opposite sides being the same length and parallel. Each of the four internal angles are right angles, 90 degrees.

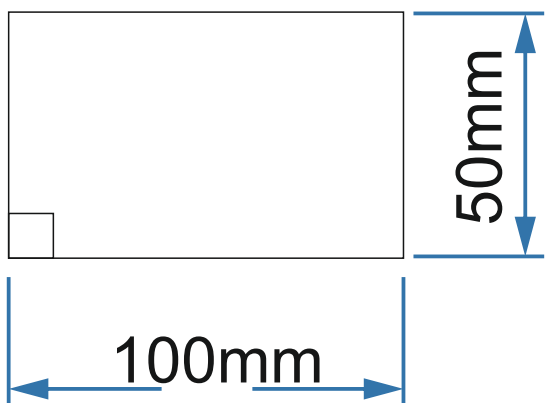


FORMULA

AREA = X multiplied by Y

AREA = LENGTH x HEIGHT

SAMPLE QUESTIONS

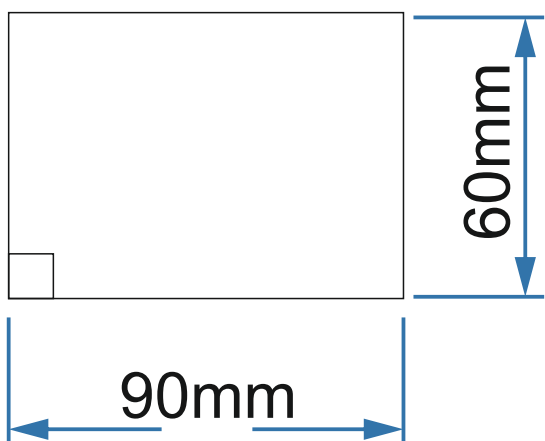


Calculate the area of the rectangle shown opposite.

AREA = X multiplied by Y

AREA = 100mm x 50mm

AREA = 5000mm²



Calculate the area of the rectangle shown opposite.

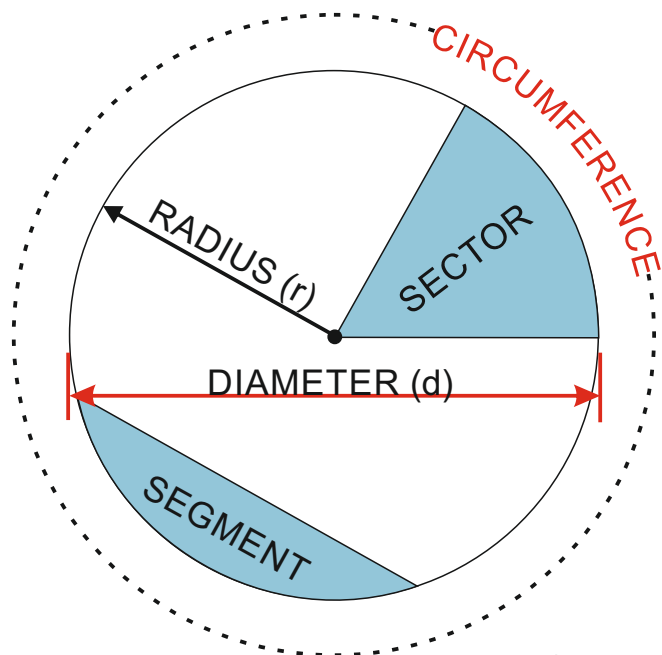
AREA = X multiplied by Y

AREA = 90mm x 60mm

AREA = 5400mm²

CALCULATING THE AREA OF A CIRCLE GIVEN THE RADIUS

Definition: A precise curve around a centre. Any point on the curve is an equal distance from the centre. A circle is composed of a circumference (the precise curve) and a diameter and radius.



FORMULA

$$\text{AREA} = \pi r^2$$

$$\pi (\text{pi}) = 3.14$$

SAMPLE QUESTIONS

A circle has a radius of 100mm. What is the area of the circle?

$$\text{AREA} = \pi r^2 \quad \pi (\text{pi}) = 3.14$$

$$\text{AREA} = 3.14 \times (100 \times 100)$$

$$\text{AREA} = 3.14 \times (10000)$$

$$\text{AREA} = 31400\text{mm}^2$$

A circle has a radius of 60mm. What is the area of the circle?

$$\text{AREA} = \pi r^2 \quad \pi (\text{pi}) = 3.14$$

$$\text{AREA} = 3.14 \times (60 \times 60)$$

$$\text{AREA} = 3.14 \times (3600)$$

$$\text{AREA} = 11304\text{mm}^2$$

A circle has a radius of 80mm. What is the area of the circle?

$$\text{AREA} = \pi r^2 \quad \pi (\text{pi}) = 3.14$$

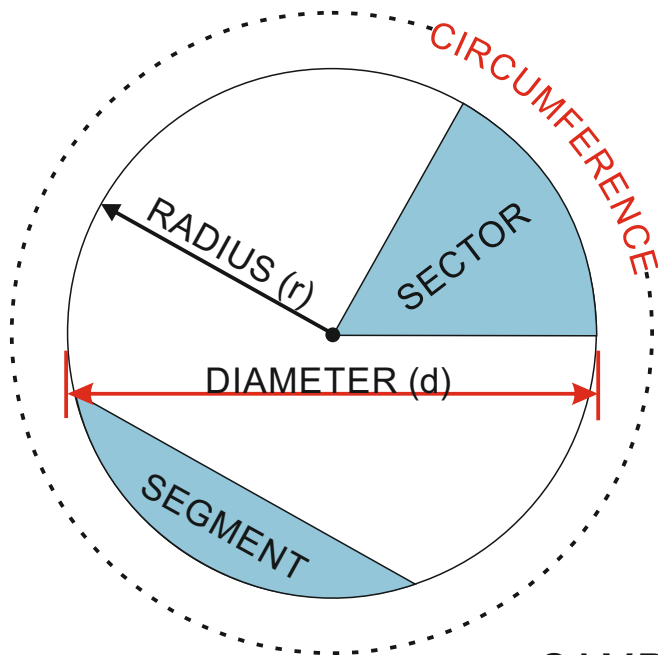
$$\text{AREA} = 3.14 \times (80 \times 80)$$

$$\text{AREA} = 3.14 \times (6400)$$

$$\text{AREA} = 20096\text{mm}^2$$

CALCULATING THE CIRCUMFERENCE OF A CIRCLE GIVEN THE RADIUS

Definition: The circumference of a circle is the measurement of the boundary, all the way round, 360 degrees.



FORMULA

$$\text{CIRCUMFERENCE} = 2 \times \pi \times r$$

$$\pi (\text{pi}) = 3.14$$

SAMPLE QUESTIONS

A circle has a radius of 100mm. What is the circumference?

$$\text{CIRCUMFERENCE} = 2 \times \pi \times r$$

$$C = 2 \times \pi \times r$$

$$C = 2 \times 3.14 \times 100$$

$$C = 628\text{mm}$$

A circle has a radius of 60mm. What is the circumference?

$$\text{CIRCUMFERENCE} = 2 \times \pi \times r$$

$$C = 2 \times \pi \times r$$

$$C = 2 \times 3.14 \times 60$$

$$C = 376.8\text{mm}$$

A circle has a radius of 80mm. What is the circumference?

$$\text{CIRCUMFERENCE} = 2 \times \pi \times r$$

$$C = 2 \times \pi \times r$$

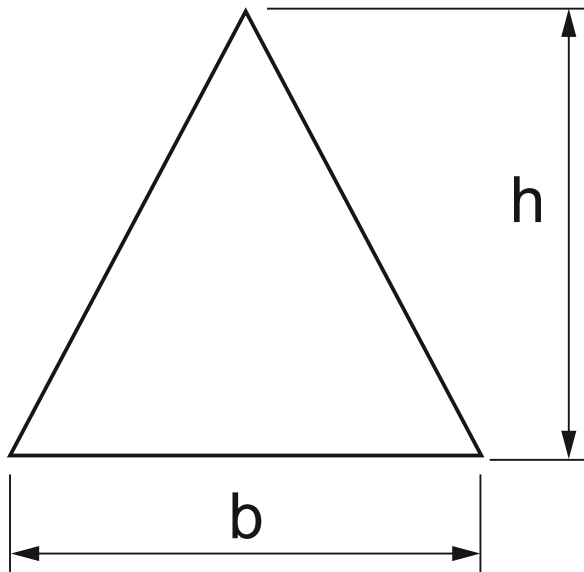
$$C = 2 \times 3.14 \times 80$$

$$C = 502.4\text{mm}$$

CALCULATING THE AREA OF A TRIANGLE

Definition: A triangle can be regarded as a polygon with three sides.

FORMULA



$$\text{AREA} = 1/2 \times \text{BASE} \times \text{HEIGHT}$$

$$\text{AREA} = 1/2 b \times h$$

$$\text{AREA} = \frac{b \times h}{2}$$

SAMPLE QUESTIONS

A triangle has a base of 60mm and a height of 80mm

$$\text{AREA} = 1/2 \times \text{BASE} \times \text{HEIGHT}$$

$$\text{AREA} = \frac{60 \times 80}{2}$$

$$\text{AREA} = \frac{4800}{2}$$

$$\text{AREA} = 2400\text{mm}^2$$

A triangle has a base of 40mm and a height of 50mm

$$\text{AREA} = 1/2 \times \text{BASE} \times \text{HEIGHT}$$

$$\text{AREA} = \frac{40 \times 50}{2}$$

$$\text{AREA} = \frac{2000}{2}$$

$$\text{AREA} = 1000\text{mm}^2$$

A triangle has a base of 70mm and a height of 90mm

$$\text{AREA} = 1/2 \times \text{BASE} \times \text{HEIGHT}$$

$$\text{AREA} = \frac{70 \times 90}{2}$$

$$\text{AREA} = \frac{6300}{2}$$

$$\text{AREA} = 3150\text{mm}^2$$

RATIOS - EXAMPLES

Part of a recipe to serve two people, requires 4 cups of flour and 1 cup of water.



If the has to be scaled up to serve 10 people, how many cups of flour and water will be required as part of the recipe.

$$\text{SERVES TWO PEOPLE} = \begin{array}{ccc} \text{FLOUR} & & \text{WATER} \\ 4 & : & 1 \end{array}$$

To find the number by which the original ratio numbers are multiplied, divide the new number of people to be served (10) by the old number of people to be served (2).

$$\frac{10 \text{ PEOPLE}}{2 \text{ PEOPLE}} = 5$$

Then, multiply each number of the original ratio by the answer 5, to find the new amount of flour and water.

$$4 \times 5 : 1 \times 5$$

The new number of cups of flour and water are seen opposite

$$\begin{array}{ccc} \text{FLOUR} & & \text{WATER} \\ 20 & : & 5 \end{array}$$

If the has to be scaled up to serve 12 people, how many cups of flour and water will be required as part of the recipe.

$$\text{SERVES TWO PEOPLE} = \begin{array}{ccc} \text{FLOUR} & & \text{WATER} \\ 4 & : & 1 \end{array}$$

To find the number by which the original ratio numbers are multiplied, divide the new number of people to be served (12) by the old number of people to be served (2).

$$\frac{12 \text{ PEOPLE}}{2 \text{ PEOPLE}} = 6$$

Then, multiply each number of the original ratio by the answer 6, to find the new amount of flour and water.

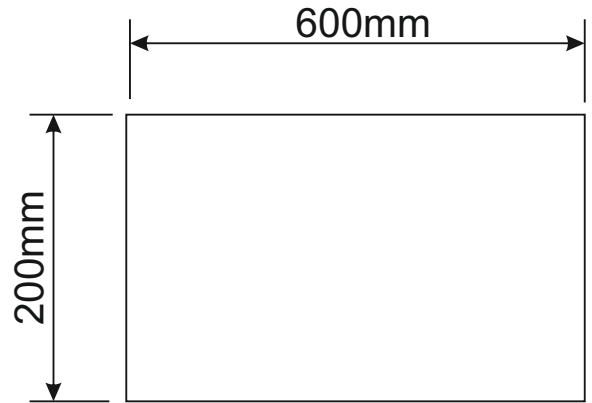
$$4 \times 6 : 1 \times 6$$

The new number of cups of flour and water are seen opposite

$$\begin{array}{ccc} \text{FLOUR} & & \text{WATER} \\ 24 & : & 6 \end{array}$$

USING RATIOS TO SCALE DRAWINGS - EXAMPLES

The rectangle seen opposite has a height of 200mm and a length of 600



The ratio of the HEIGHT to the LENGTH is worked out by dividing the large number by the smaller number.

HEIGHT : LENGTH

$$\frac{600}{200} = 3$$

This means that the ratio is:

1:3

If the height is to be increased to 400mm and the ratio between the height and length is the same, what is the new measurement of the length?

1:3

400mm : ?

Quite simply multiply the 400mm by 3 to find the new measurement of the length

$$400 \times 3 = 1200$$

400mm : 1200mm

If the height is to be increased to 600mm and the ratio between the height and length is the same, what is the new measurement of the length?

1:3

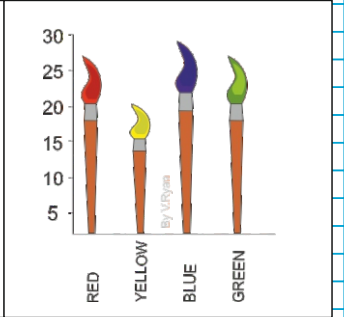
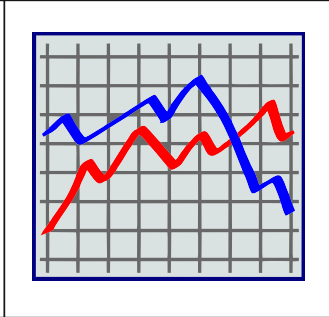
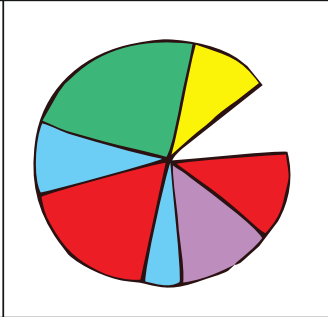
600mm : ?

Quite simply multiply the 600mm by 3 to find the new measurement of the length

$$600 \times 3 = 1800$$

600mm : 1800mm

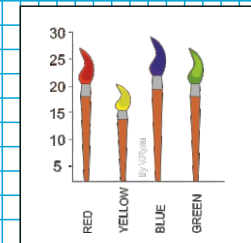
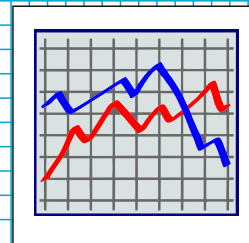
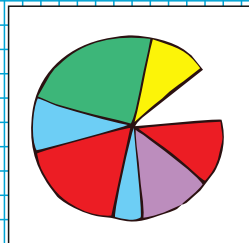
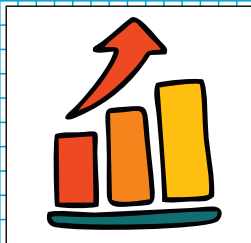
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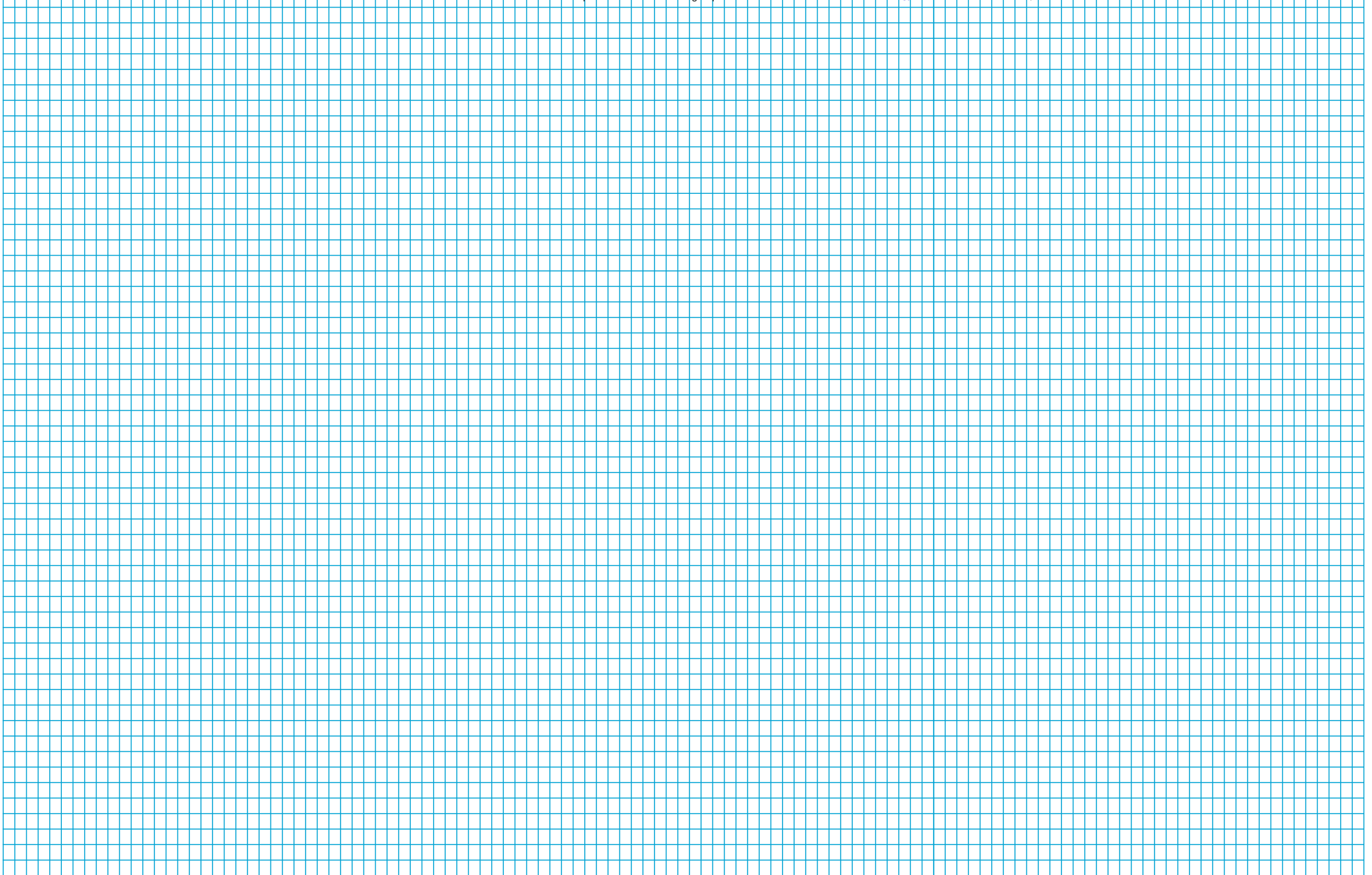
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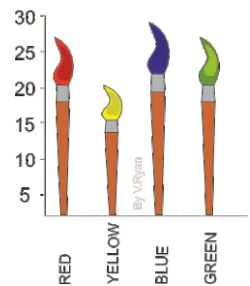
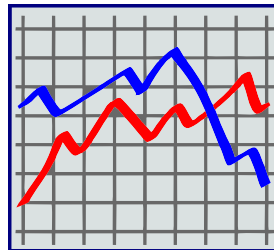


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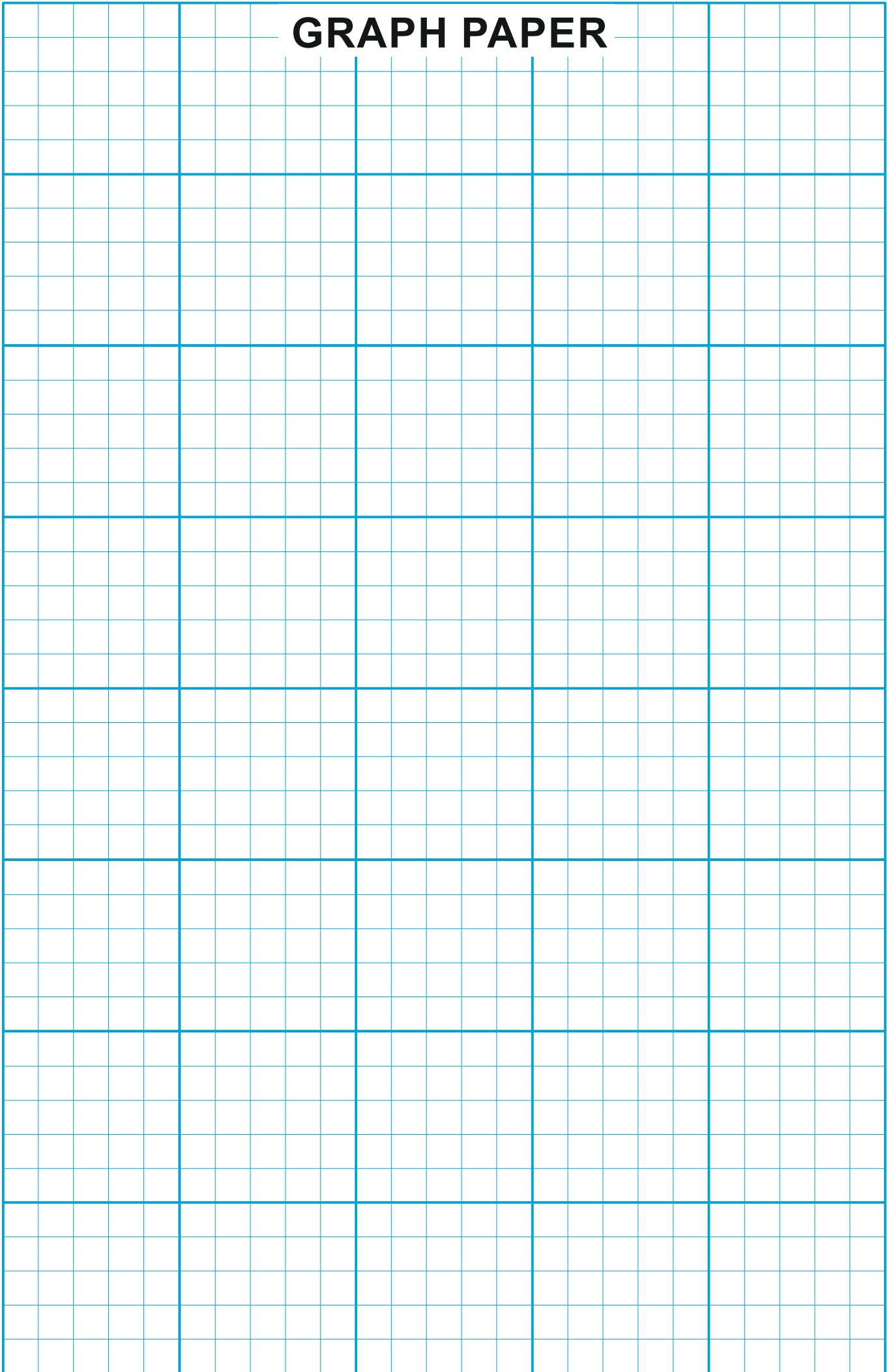
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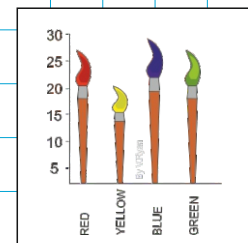
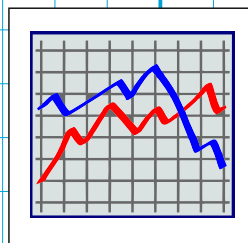
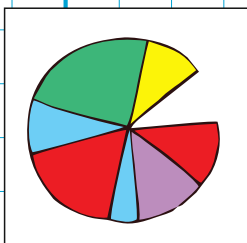
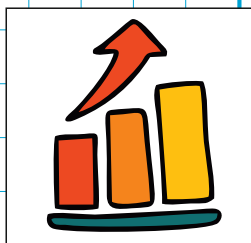
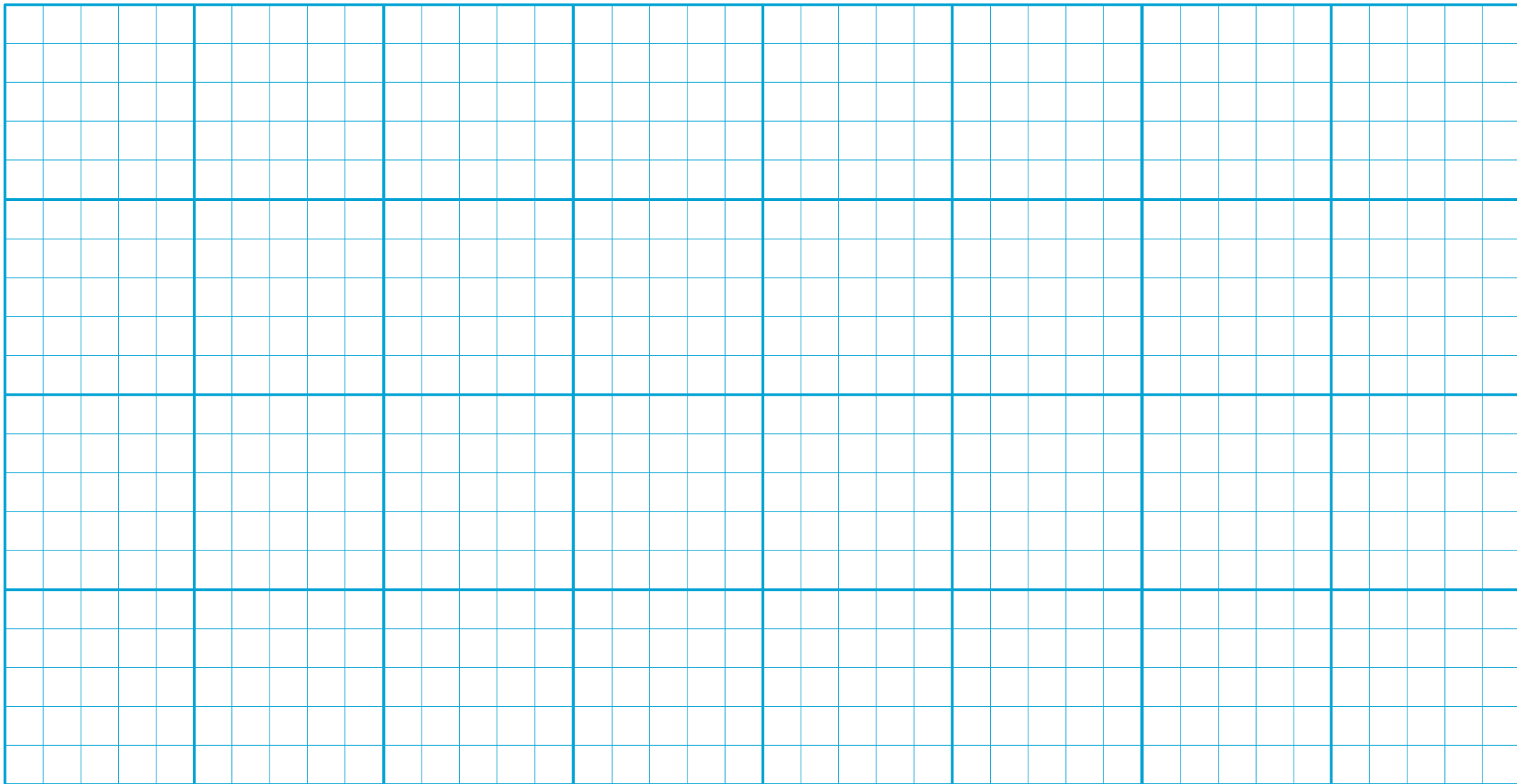




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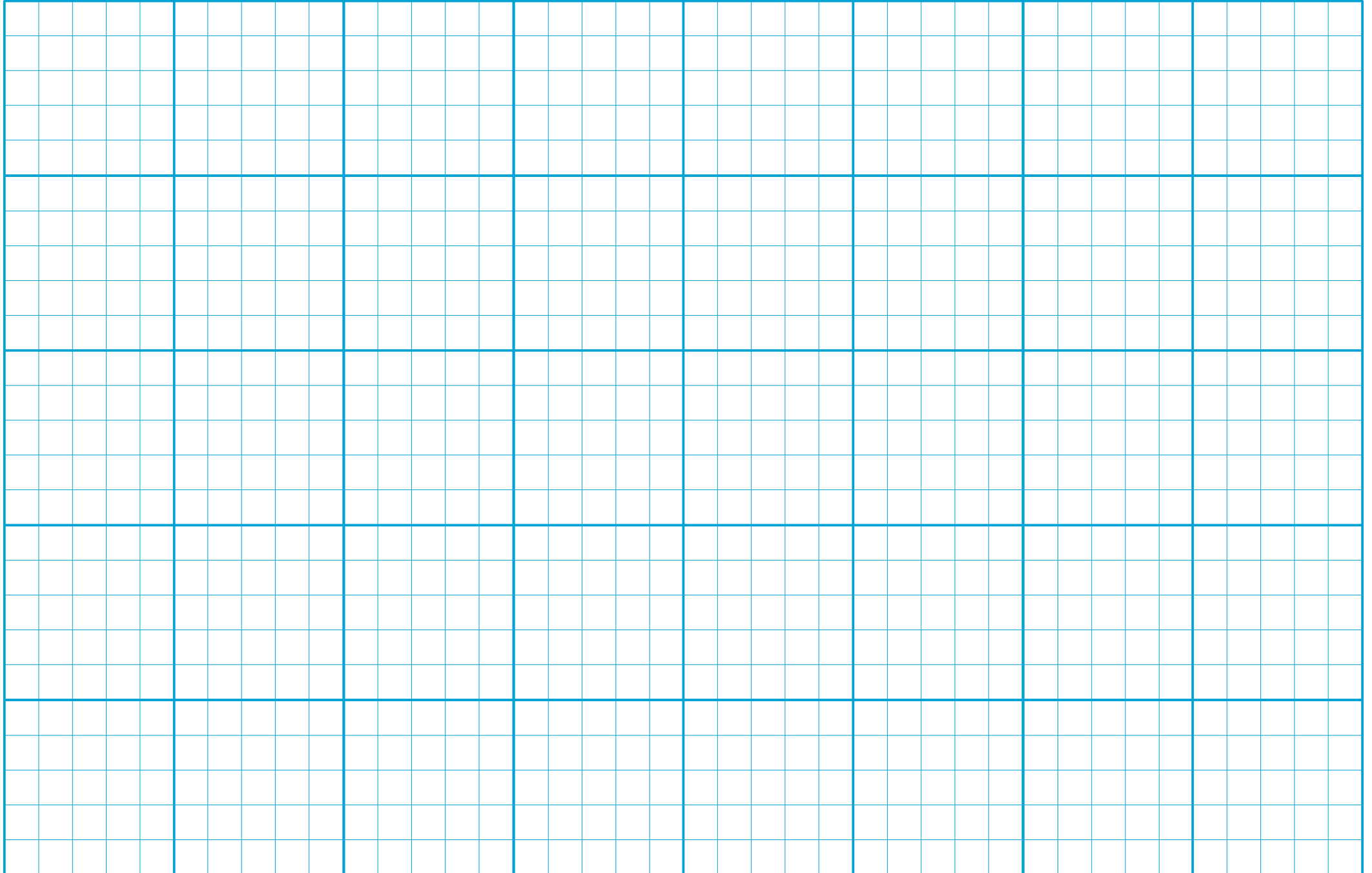




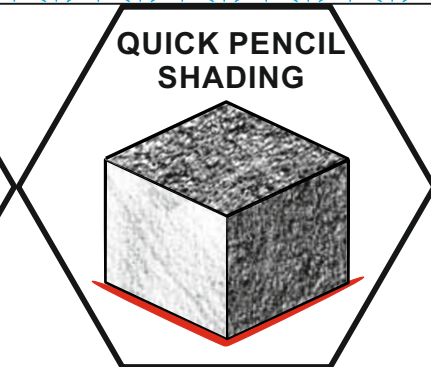
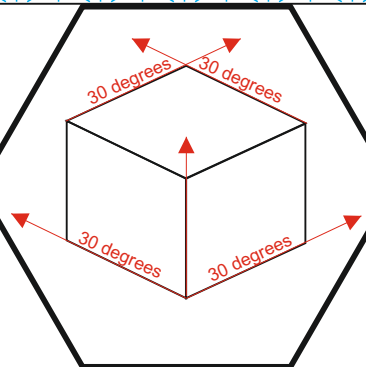
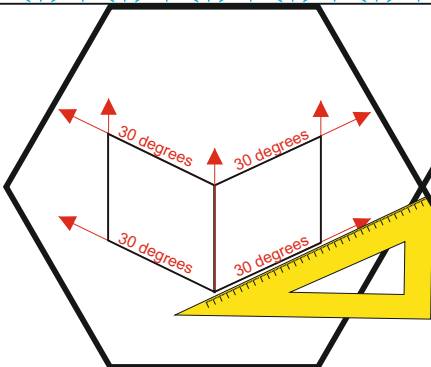
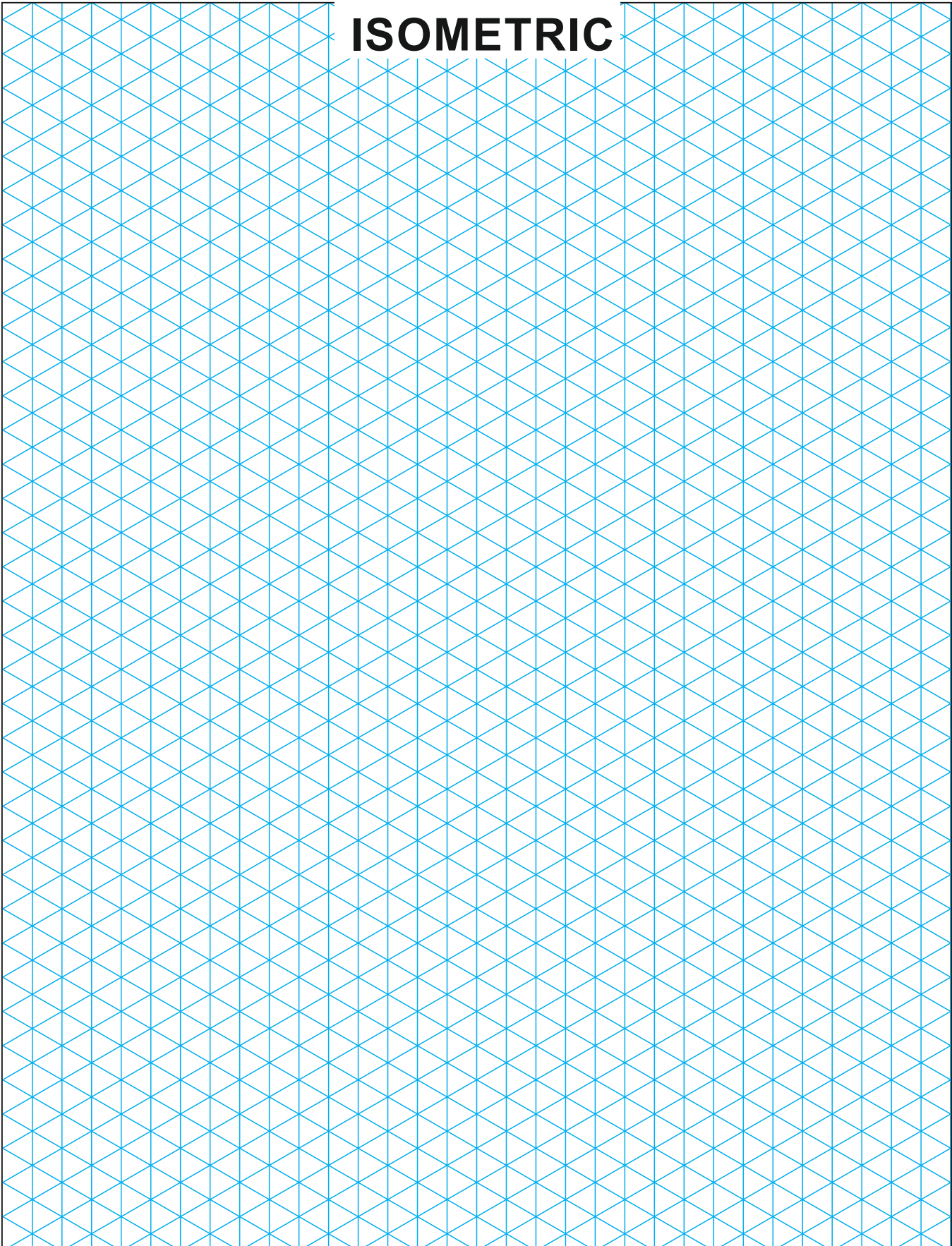
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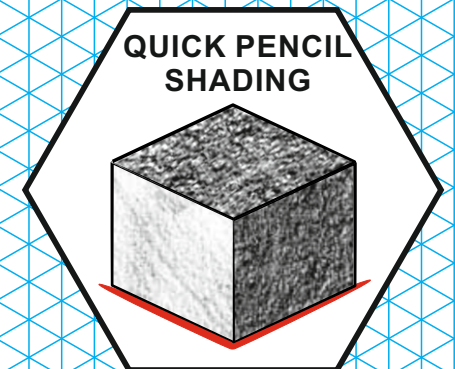
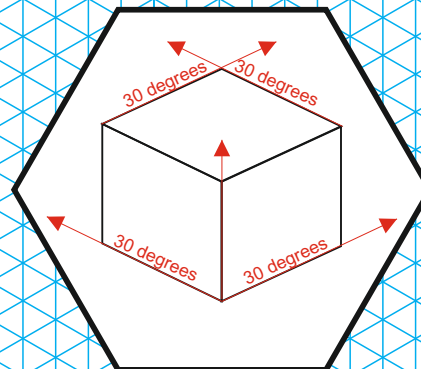
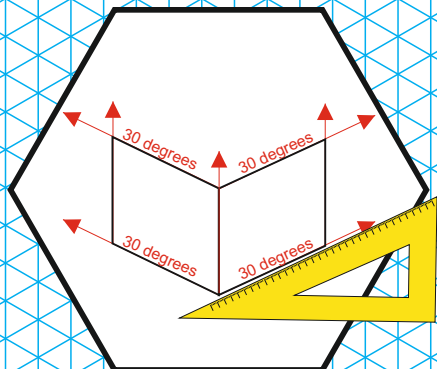


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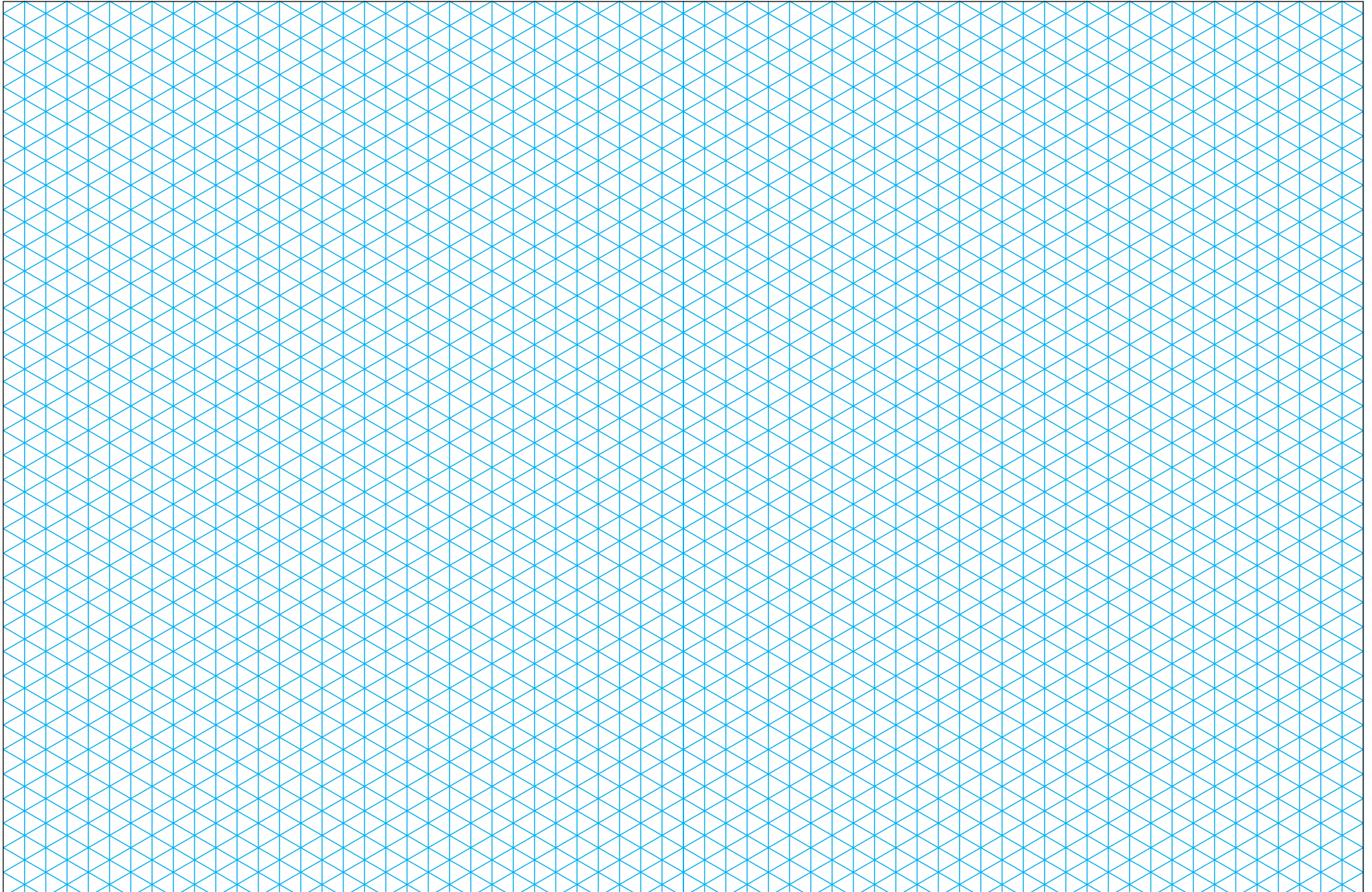


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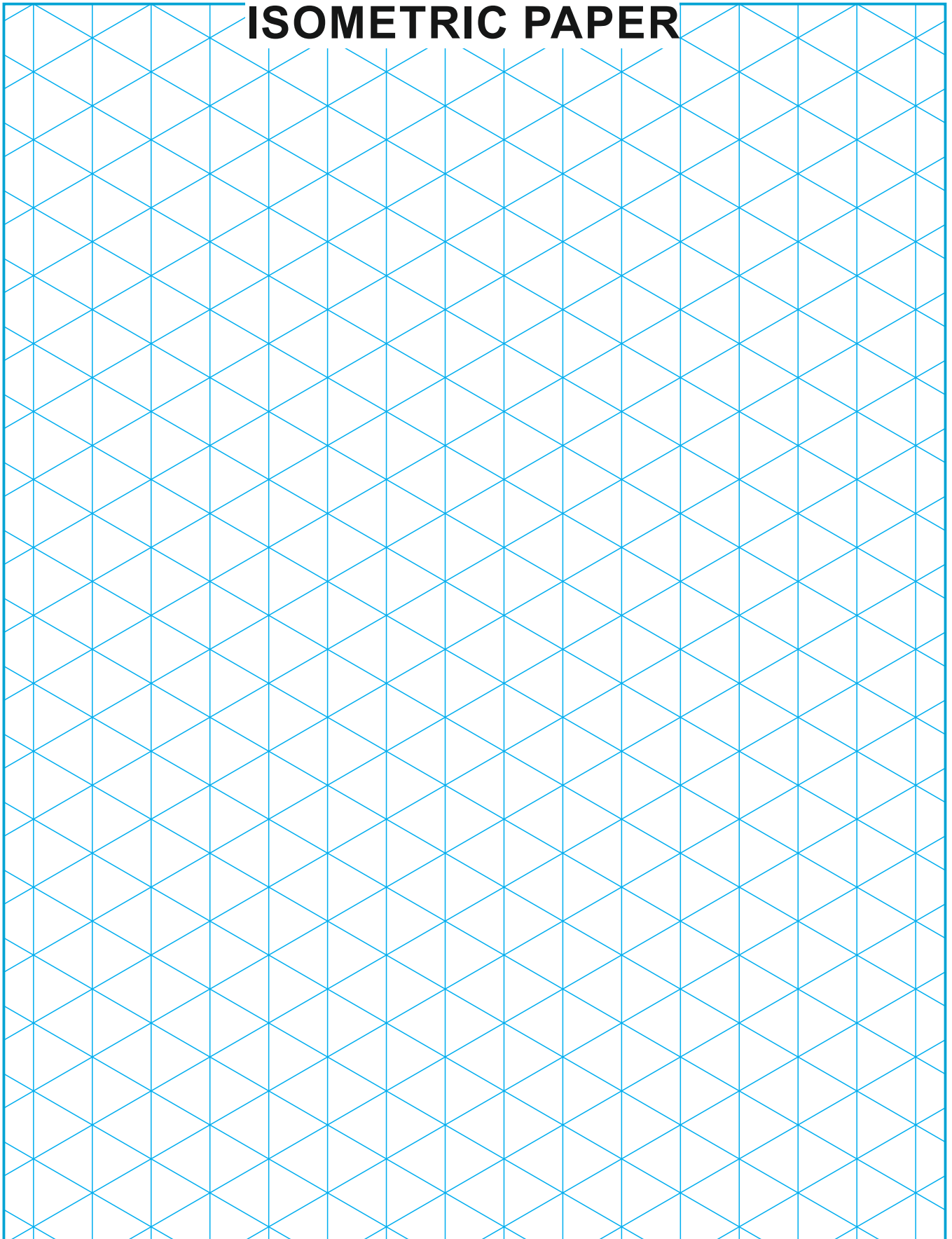
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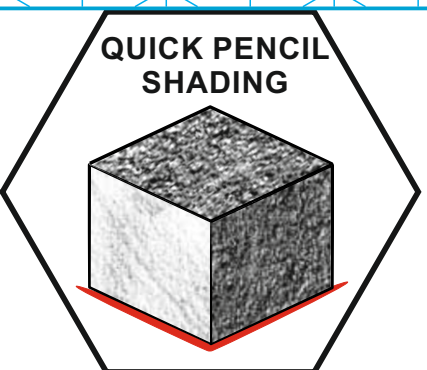
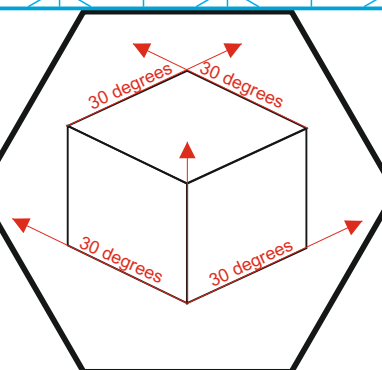
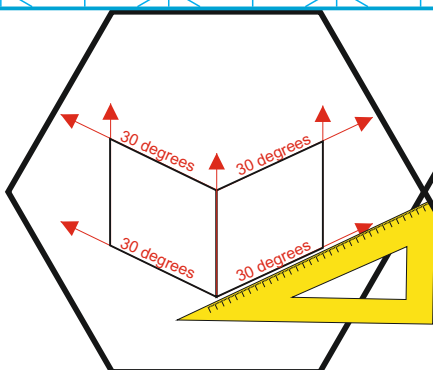
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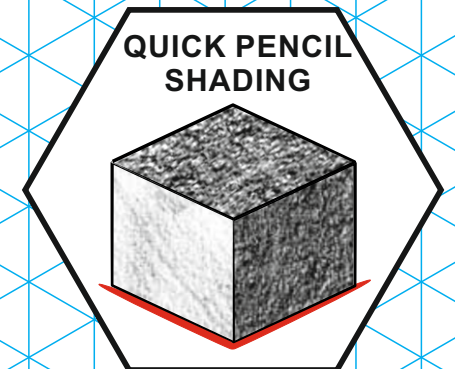
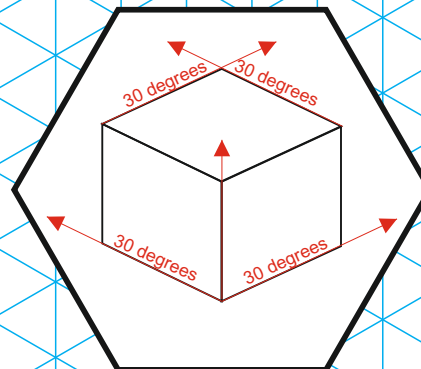
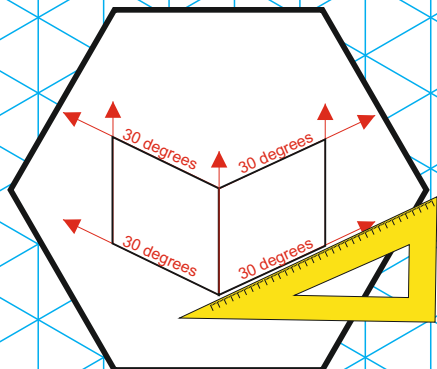


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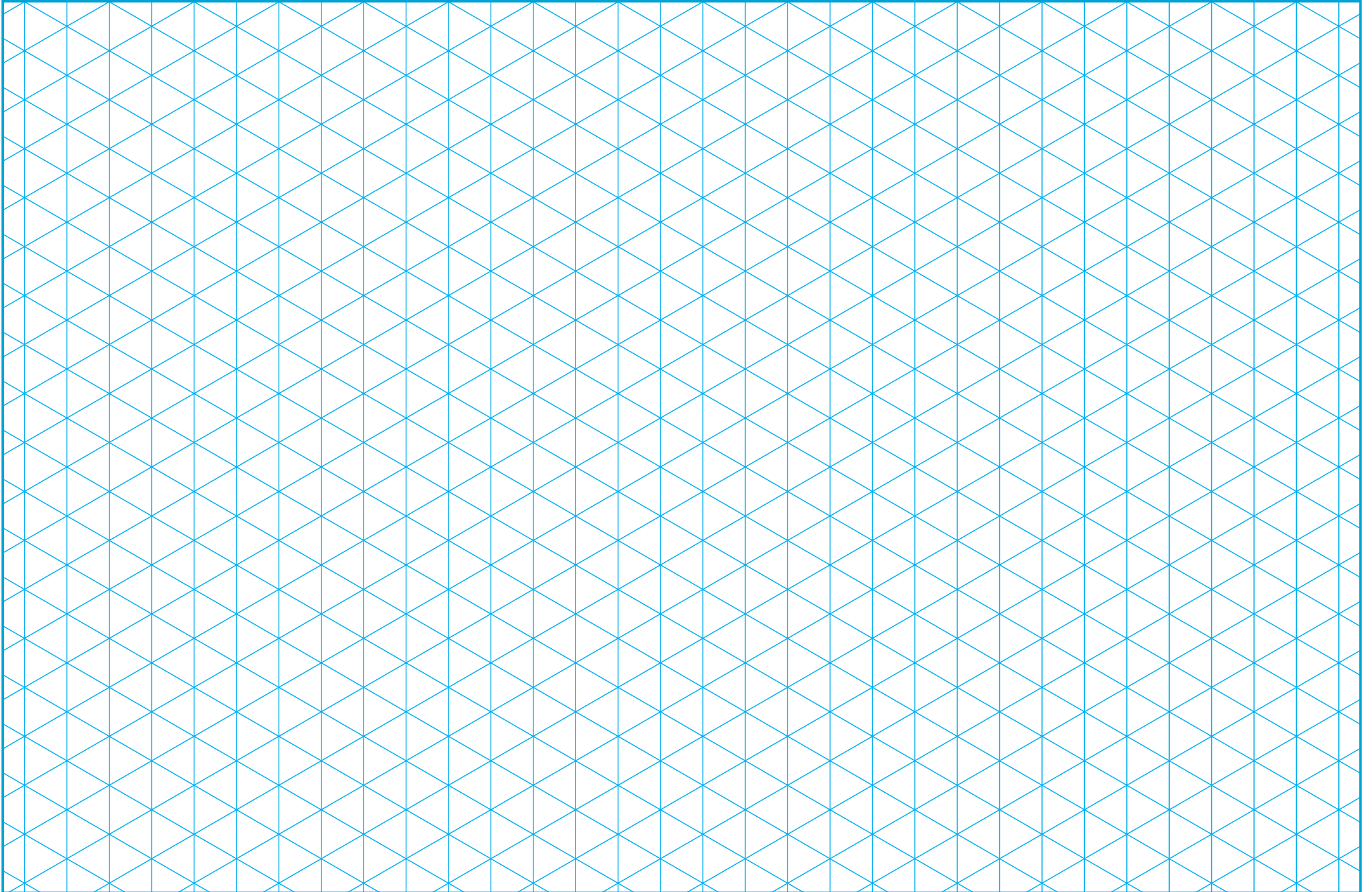
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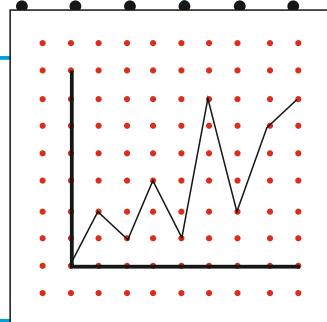
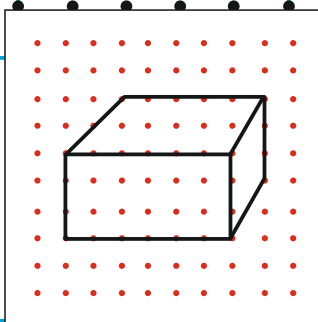
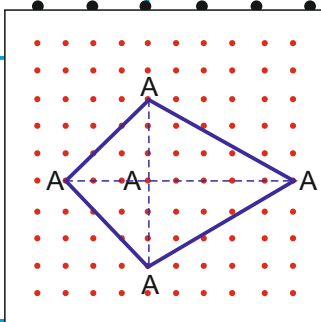


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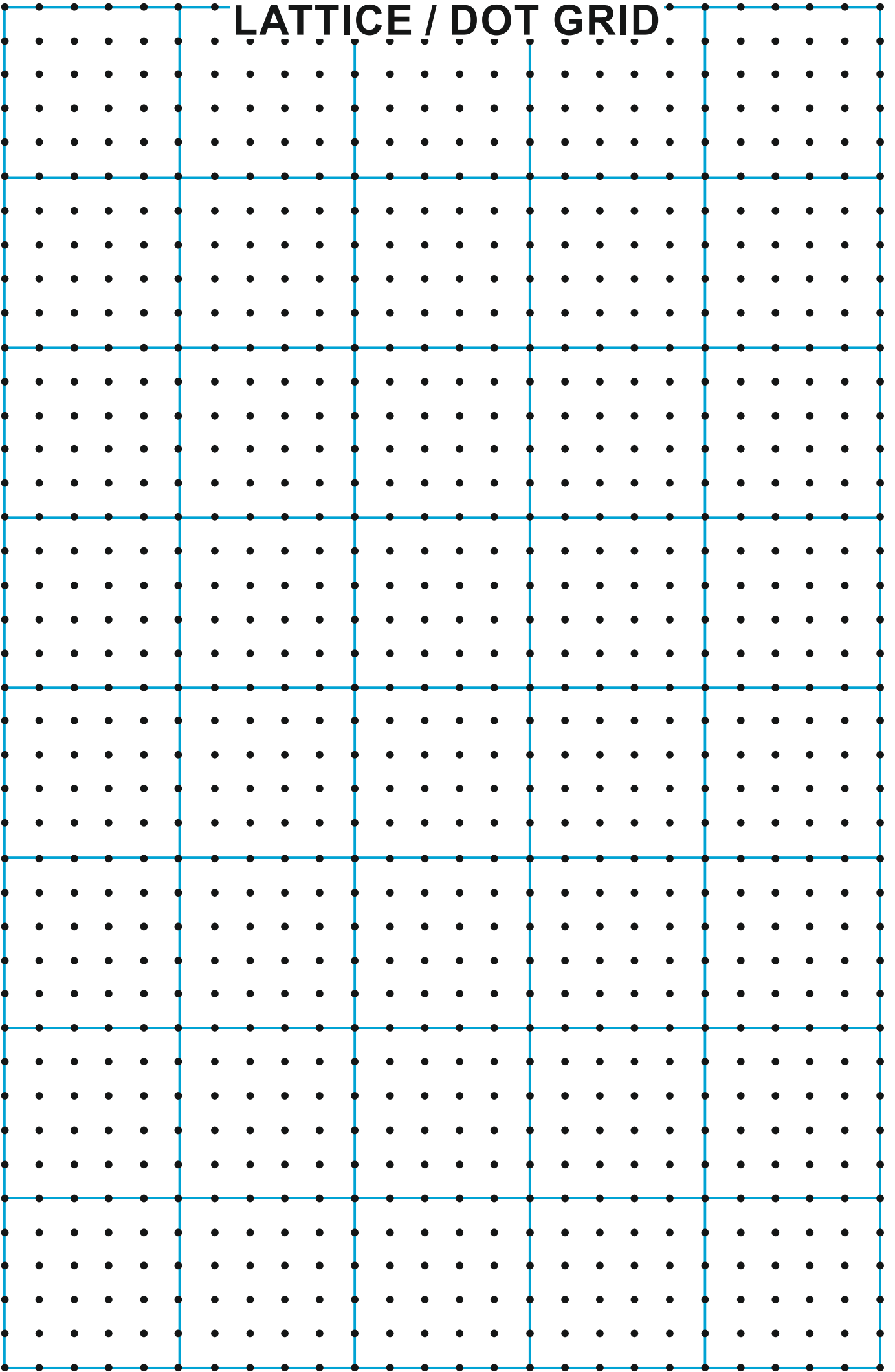
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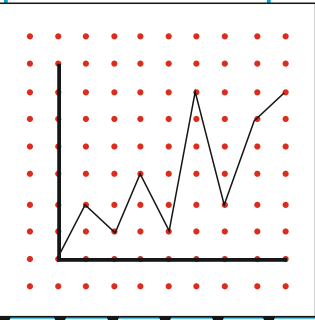
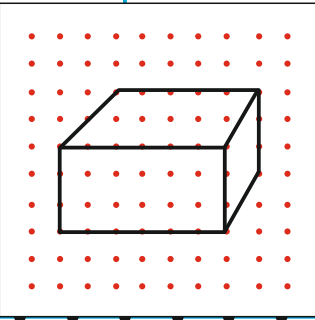
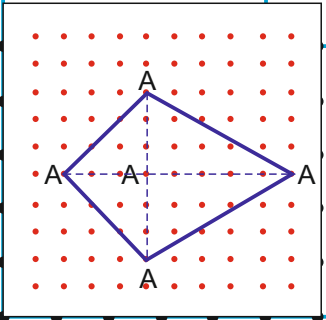
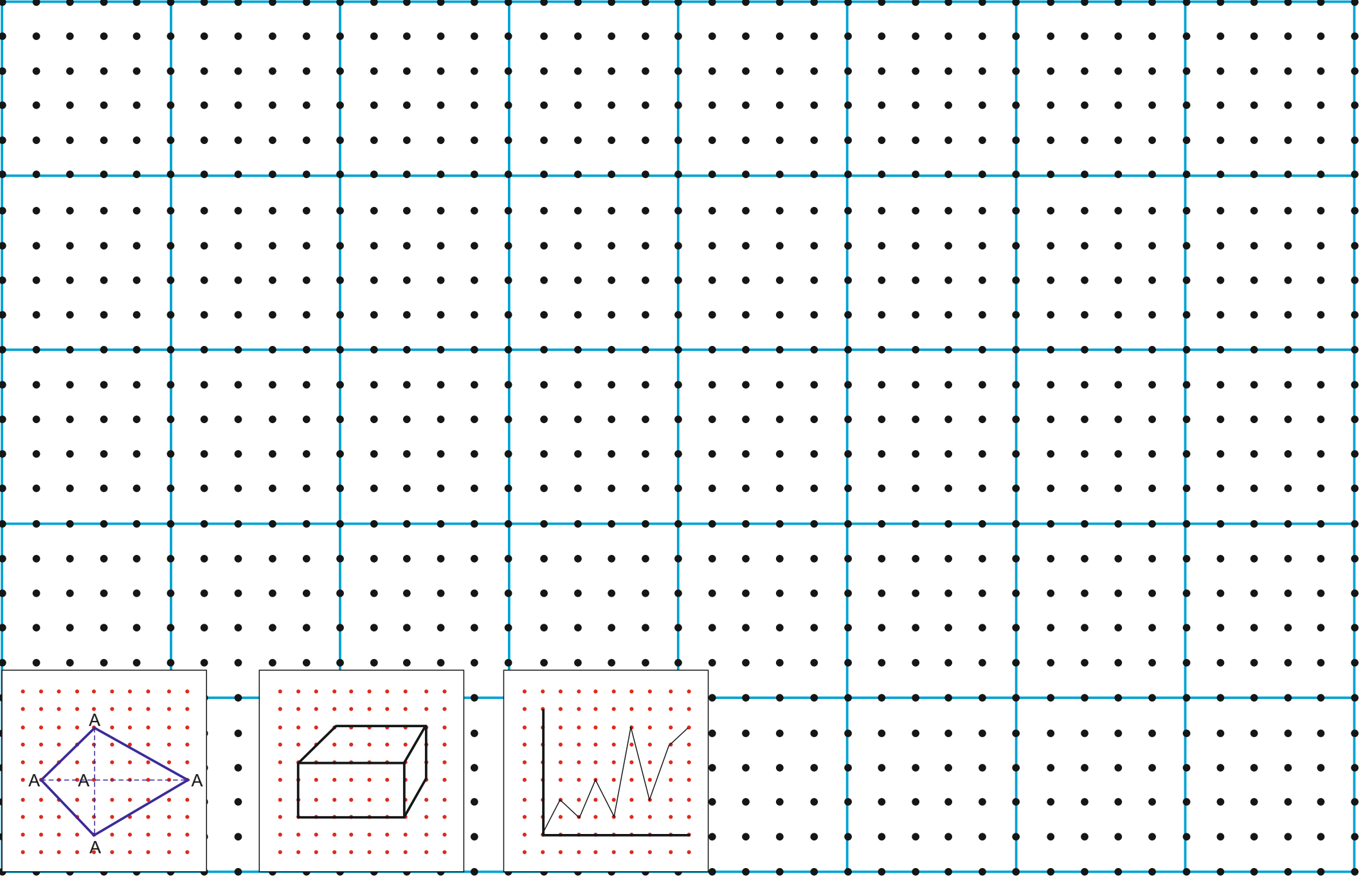




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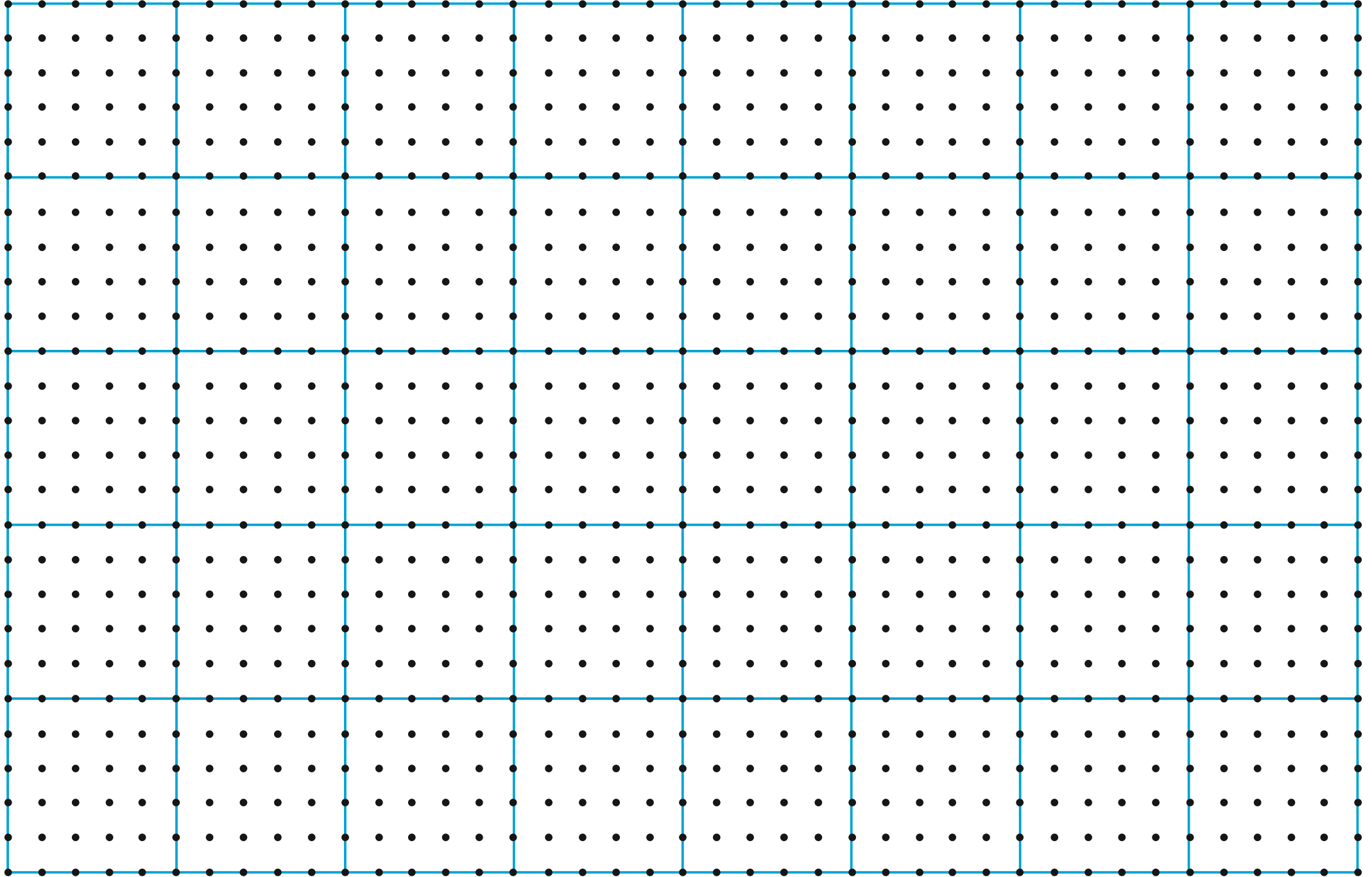
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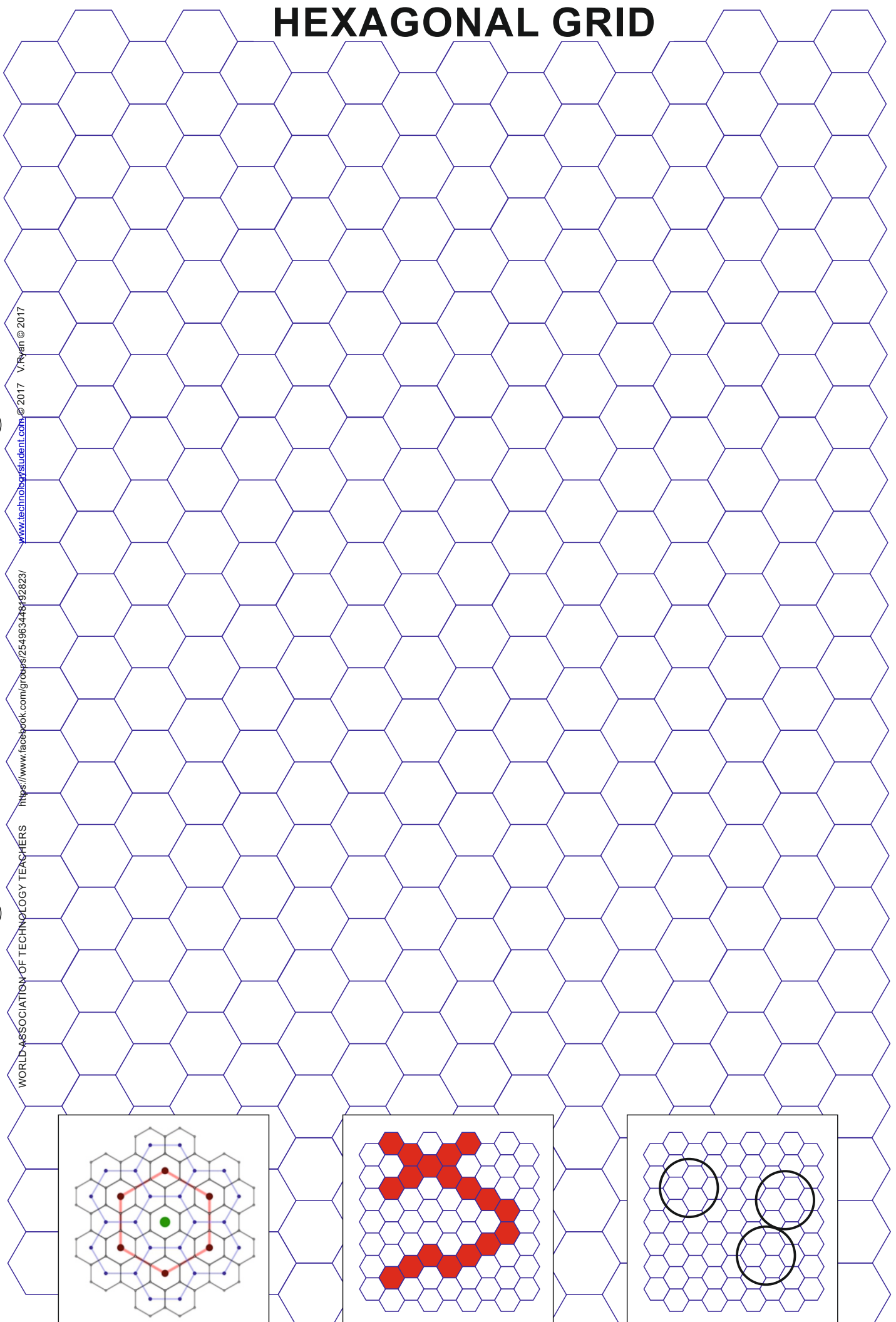
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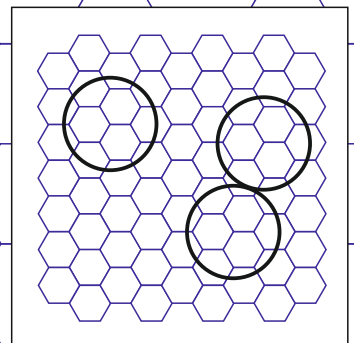
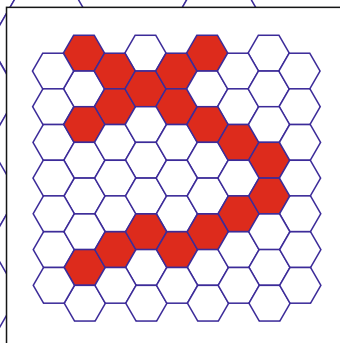
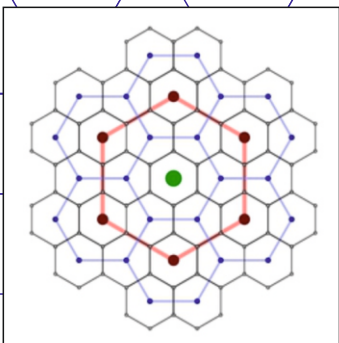
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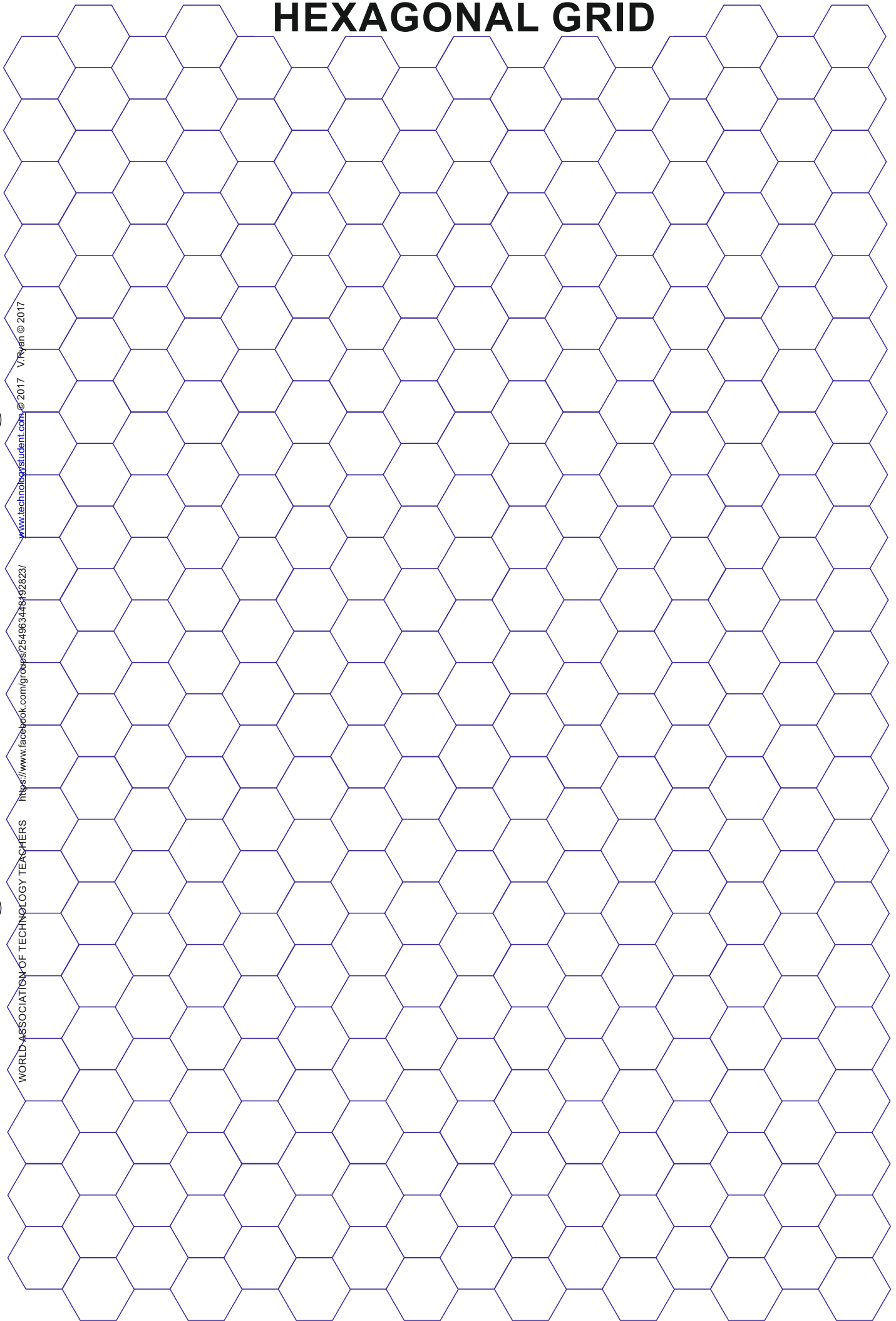
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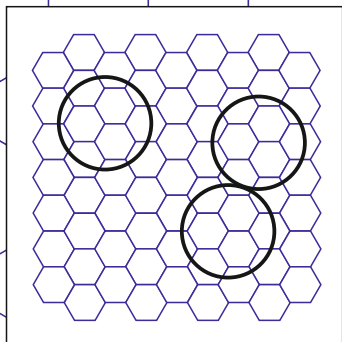
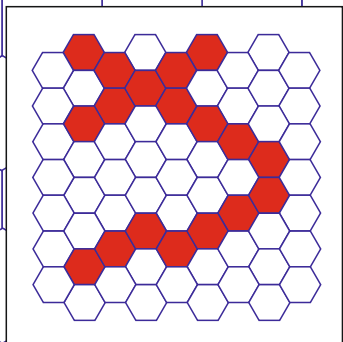
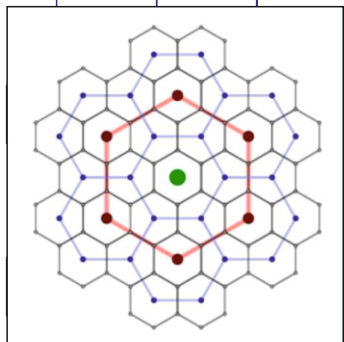
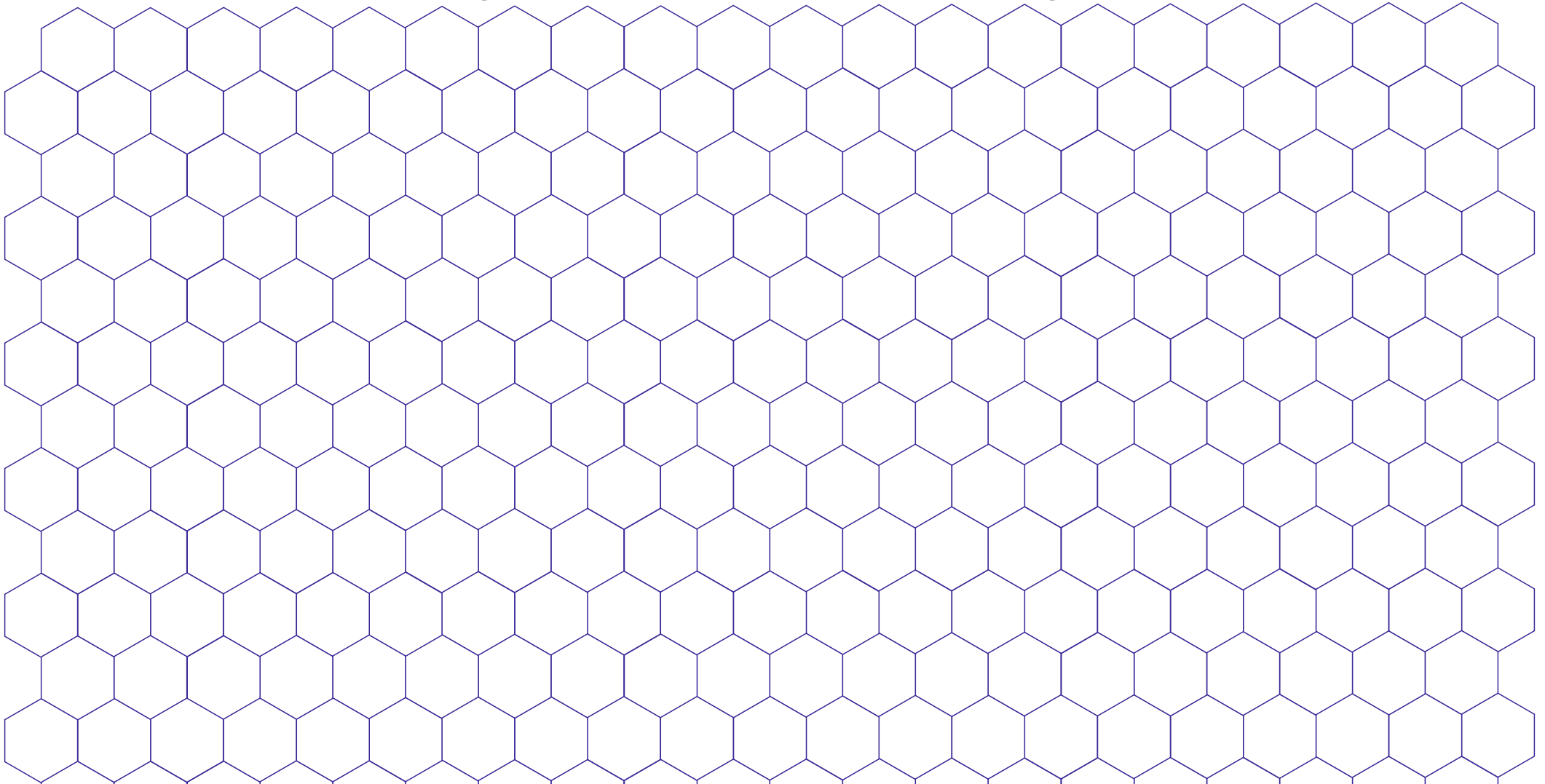


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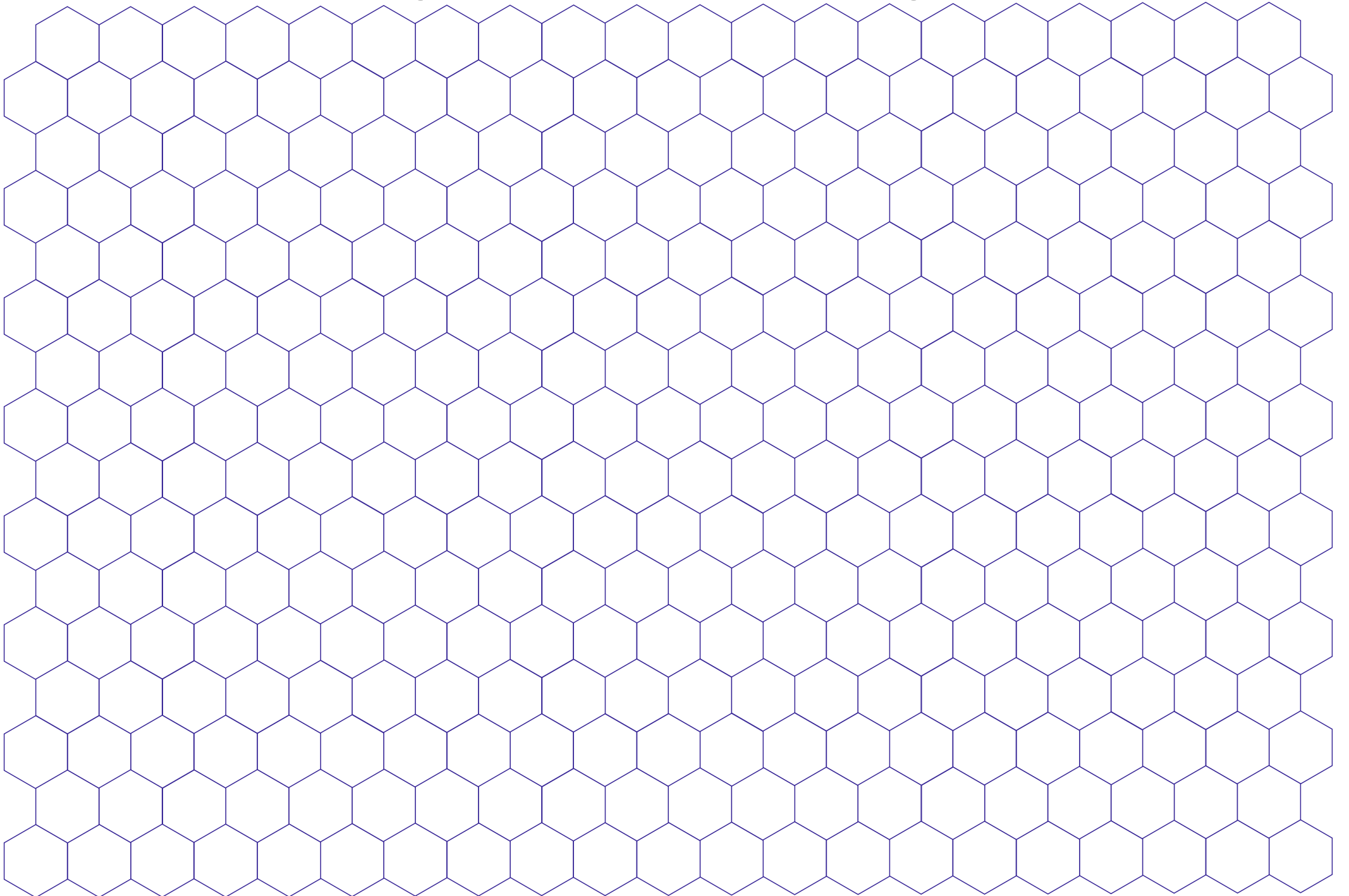
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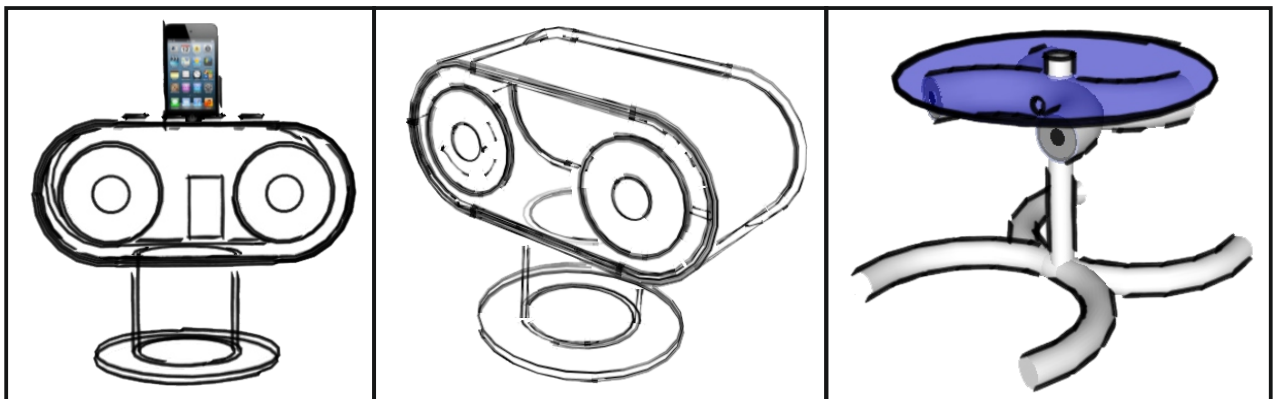
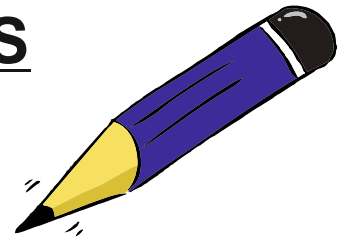
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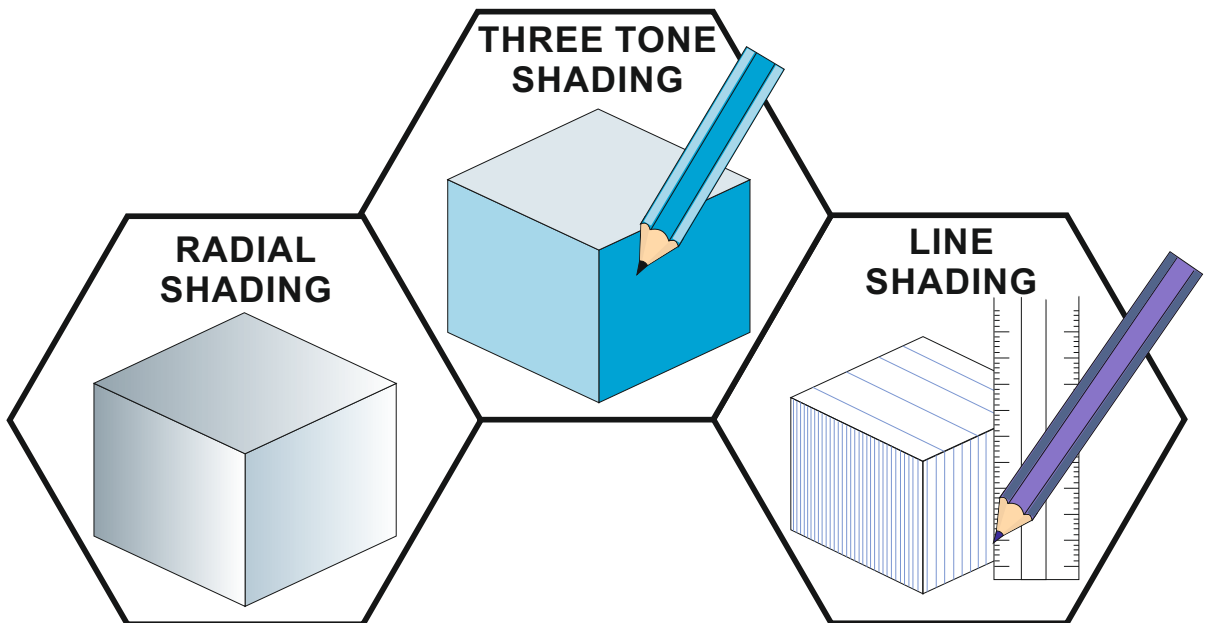
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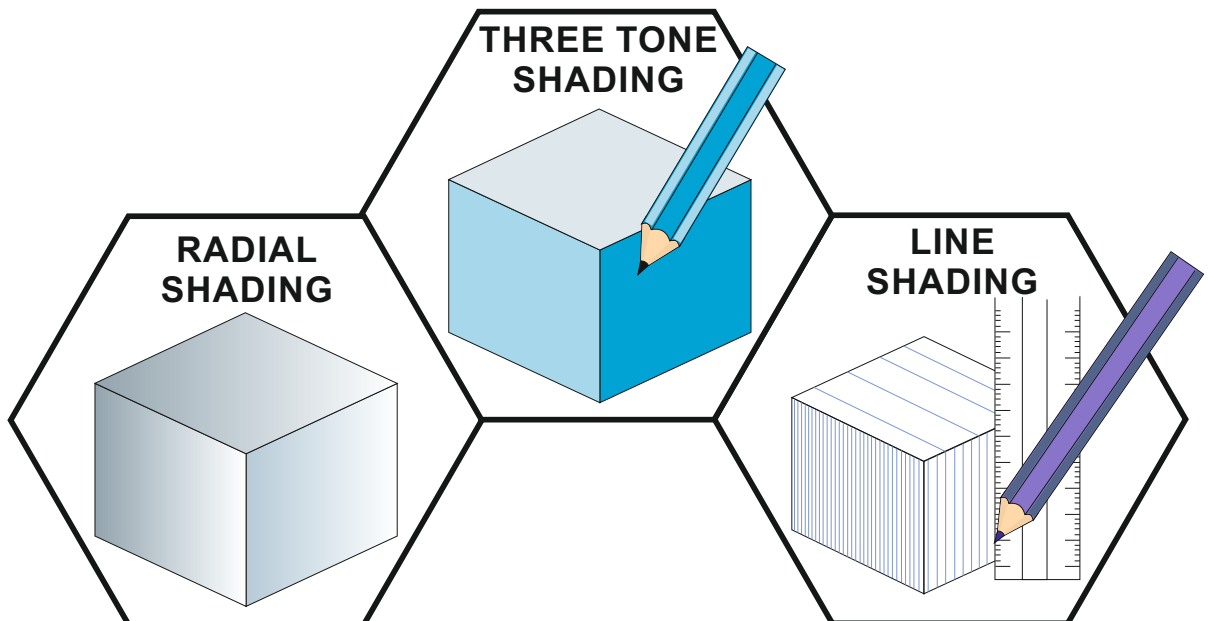
THUMBNAIL SKETCHES



INITIAL IDEAS AND NOTES



INITIAL IDEAS AND NOTES



EVALUATION



WHAT WORKED WELL?

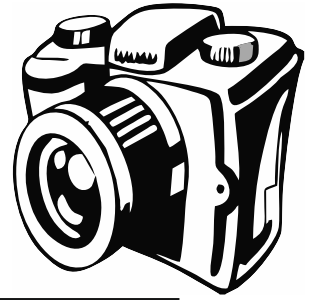
WHAT COULD BE IMPROVED?

WHAT DID A POTENTIAL CUSTOMER SAY?

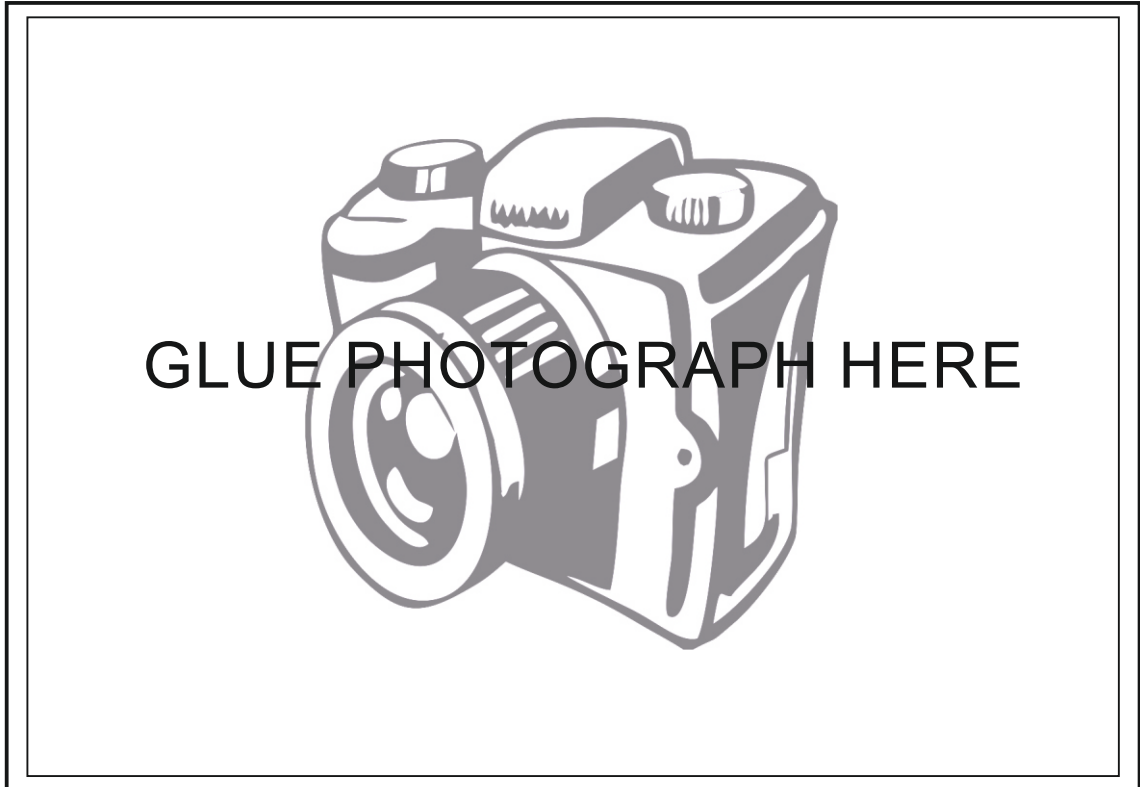
ANALYSED - EVALUATED - TESTED - IMPROVEMENTS - MODIFICATIONS
COST - SAFETY - QUALITY CONTROL - MANUFACTURING TECHNIQUES
EQUIPMENT - SCALE OF PRODUCTION - AESTHETICS - CLIENT SATISFACTION
ENVIRONMENT / RECYCLED MATERIALS - DISASSEMBLY - LIFE CYCLE

PHOTOGRAPHIC EVIDENCE

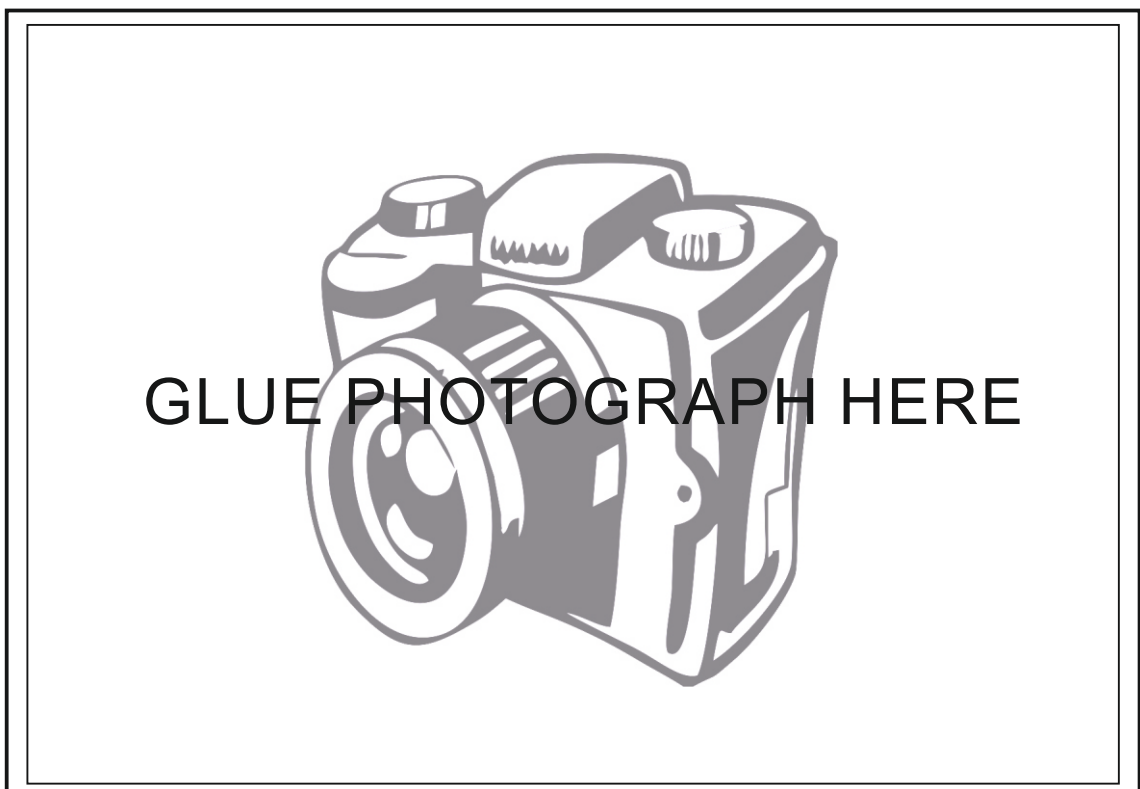
Include a photograph of your product and the testing of your product



MY PRODUCT



TESTING MY PRODUCT



MATERIALS

EVALUATION

AESTHETICS

COST

GLUE PHOTOGRAPH HERE

DOES IT WORK?

FINISH

SAFETY