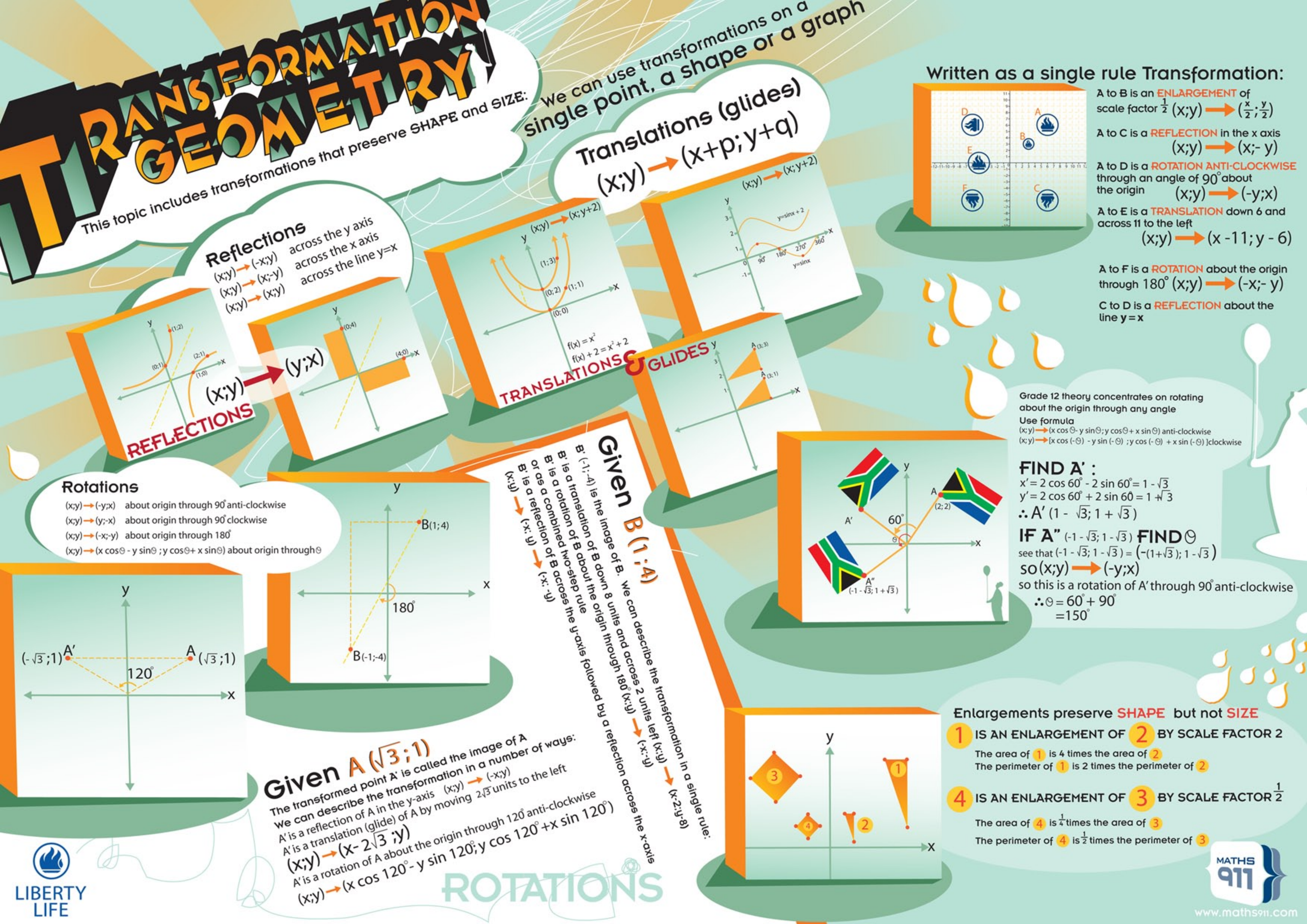

TRANSFORMATION GEOMETRY
This topic includes transformations that preserve SHAPE and SIZE:
We can use transformations on a single point, a shape or a graph
Translations (glides)
(x;y) → (x+p; y+q)
Reflections
(x;y) → (-x;y) across the y axis
(x;y) → (x;-y) across the x axis
(x;y) → (x;y) across the line y=x
(x;y) → (y;x)
REFLECTIONS
(x;y) → (x; y+2)
f(x) = x²
f(x) + 2 = x² + 2
y=sinx + 2
y=sinx
TRANSLATIONS & GLIDES
Rotations
(x;y) → (-y;x) about origin through 90° anti-clockwise
(x;y) → (y;-x) about origin through 90° clockwise
(x;y) → (-x;-y) about origin through 180°
(x;y) → (x cosθ - y sinθ ; y cosθ + x sinθ) about origin through θ
B(1;4)
180°
B(-1;-4)
(-√3;1) A′
A (√3;1)
120°
Given B (1;4)
B′ (-1;-4) is the image of B. We can describe the transformation in a single rule:
B′ is a translation of B down 8 units and across 2 units left (x;y) → (x-2;y-8)
B′ is a rotation of B about the origin through 180° (x;y) → (-x;-y)
B′ is a combined two-step rule
or as a reflection of B across the y-axis followed by a reflection across the x-axis
(x;y) → (-x; y) → (-x; -y)
Given A (√3;1)
The transformed point A′ is called the image of A
We can describe the transformation in a number of ways:
A′ is a reflection of A in the y-axis (x;y) → (-x;y)
A′ is a translation (glide) of A by moving 2√3 units to the left
(x;y) → (x- 2√3 ;y)
A′ is a rotation of A about the origin through 120° anti-clockwise
(x;y) → (x cos 120° - y sin 120°; y cos 120° +x sin 120°)
ROTATIONS
Written as a single rule Transformation:
A to B is an ENLARGEMENT of scale factor ½ (x;y) → (x/2 ; y/2)
A to C is a REFLECTION in the x axis (x;y) → (x;- y)
A to D is a ROTATION ANTI-CLOCKWISE through an angle of 90° about the origin (x;y) → (-y;x)
A to E is a TRANSLATION down 6 and across 11 to the left (x;y) → (x -11; y - 6)
A to F is a ROTATION about the origin through 180° (x;y) → (-x;- y)
C to D is a REFLECTION about the line y = x
Grade 12 theory concentrates on rotating about the origin through any angle
Use formula
(x;y) → (x cos θ - y sin θ; y cos θ + x sin θ) anti-clockwise
(x;y) → [x cos (-θ) - y sin (-θ) ; y cos (-θ) + x sin (-θ) ]clockwise
FIND A′ :
x′ = 2 cos 60° - 2 sin 60° = 1 - √3
y′ = 2 cos 60° + 2 sin 60 = 1 + √3
∴ A′ (1 - √3; 1 + √3)
IF A″ (-1 - √3; 1 - √3) FIND θ
see that (-1 - √3; 1 - √3) = (-(1+√3); 1 - √3)
so (x;y) → (-y;x)
so this is a rotation of A′ through 90° anti-clockwise
∴ θ = 60° + 90°
= 150°
A (2; 2)
60°
A″ (-1 - √3; 1 + √3)
Enlargements preserve SHAPE but not SIZE
1 IS AN ENLARGEMENT OF 2 BY SCALE FACTOR 2
The area of 1 is 4 times the area of 2
The perimeter of 1 is 2 times the perimeter of 2
4 IS AN ENLARGEMENT OF 3 BY SCALE FACTOR ½
The area of 4 is ¼ times the area of 3
The perimeter of 4 is ½ times the perimeter of 3
LIBERTY LIFE
MATHS 911
www.maths911.com