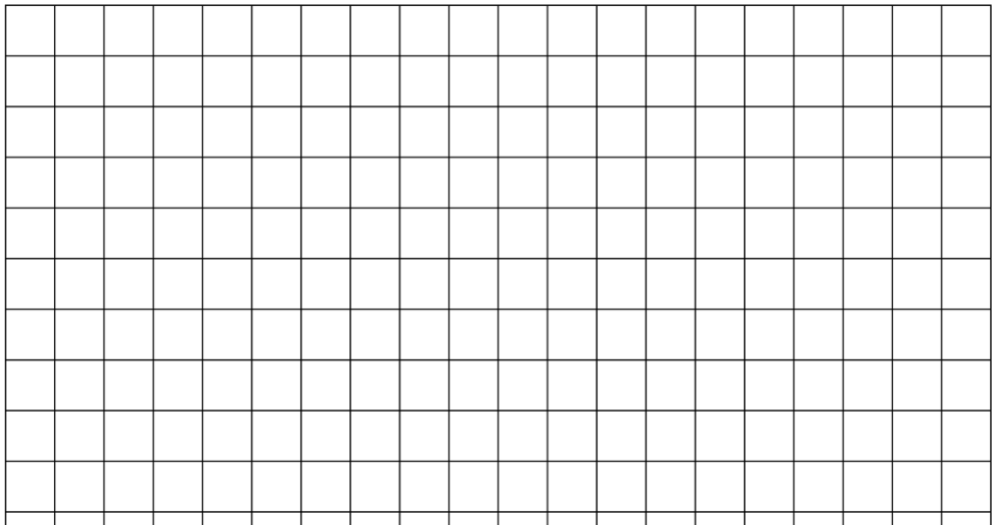
Global Teacher Empowerment Network GTEN
SHADOWS SIMILARITY AND ENLARGEMENT

RESOURCES REQUIRED: *This Worksheet to fill in during the workshop*, Paper, Pencil.

1. What shapes could have made these shadows?

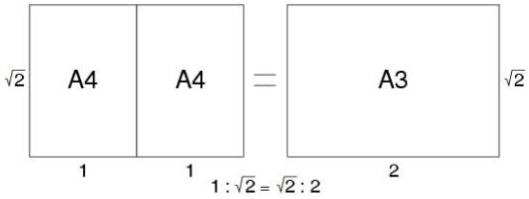
2. Either solve the puzzles by colouring in squares in the grid below to show the enlargements or cut out these shapes (see pages 3 and 4) and put them together to make enlargements.

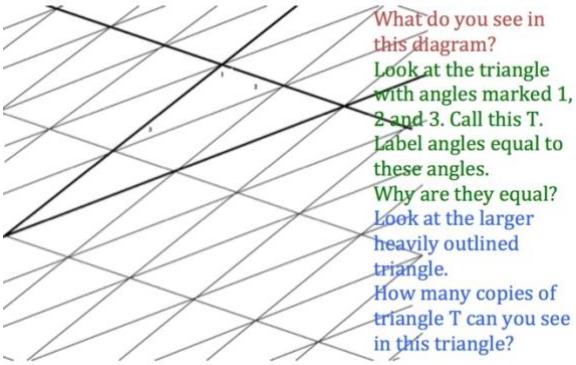


3. Paper sizes

Linear Scale Factor for A4:A3=

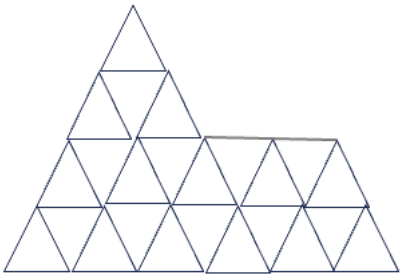
Area scale factor =





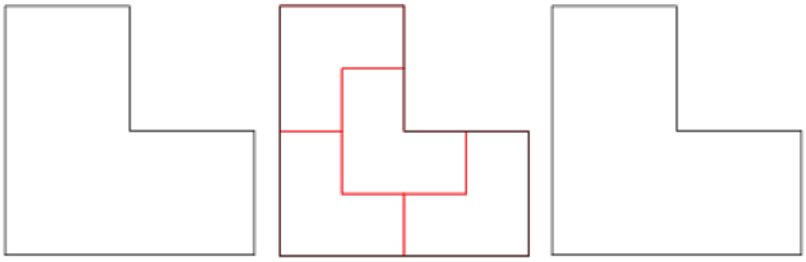
4.

Can you use this diagram to show that the angles of a triangle add up to 180°?

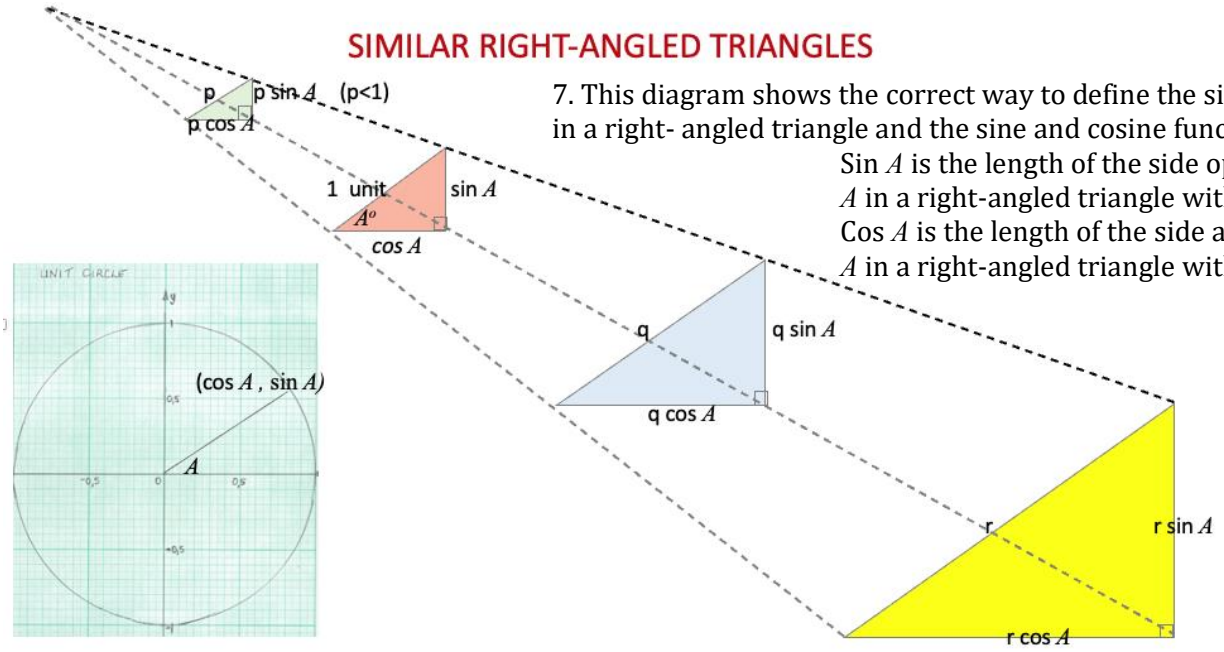


5.

Colour the outline below to show how 4 copies of the smaller similar shape (the sphinx) fit inside it.



6.
The diagram an L shaped triomino with 4 copies of a smaller similar shape inside itself as in question 2. Repeat this process to show 16 smaller copies inside the L shape trionimo.



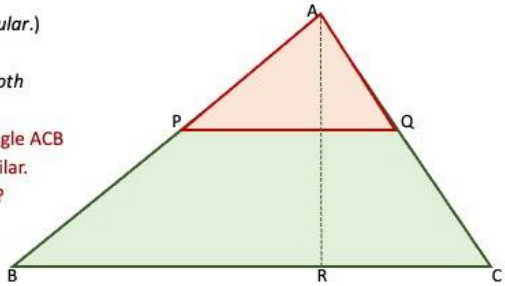
7. This diagram shows the correct way to define the sine and cosine ratios in a right- angled triangle and the sine and cosine functions of angles.
Sin A is the length of the side opposite to the angle A in a right-angled triangle with hypotenuse 1.
Cos A is the length of the side adjacent to the angle A in a right-angled triangle with hypotenuse 1.

Explain how the definitions given above are generalized to give the cosine and sine functions in terms of the coordinates of points on a unit circle. If you have access to a computer see http://nrich.maths.org/5671 Watch the film several times and try to answer the questions.

8.
The best proof of the Ratio Theorem uses similar triangles. Write a formal proof using this method based on this diagram replacing the folds described by geometric constructions making AR perpendicular to BC, and PQ perpendicular to AR and therefore parallel to BC.

TRI-FOLD – TO PROVE THE RATIO THEOREM

1. Draw △ABC.
2. Fold the baseline BC back onto itself so that the fold line goes through point A. Mark the point R at the base of the fold. AR is called an altitude of the triangle.
3. Make a fold by placing point A anywhere on AR. Mark the fold-line PQ with P and Q on the edges of △*ABC*.
4. What do you notice about the lines AR and PQ?
(*Answer: By construction, AR and PQ are perpendicular.*)
5. What do you notice about the lines PQ and BC?
(*Answer: By construction, PQ and BC are parallel, both perpendicular to AR.*)
6. Notice angle APQ = angle ABC and angle AQP=angle ACB (corresponding angles) so △*ABC* and △*APQ* are similar.
7. What else do you notice about △APQ and △ABC?
(*Answer: △ABC is an enlargement of △APQ).*
8. **We have shown that *PQ* and *BC* are parallel and △*APQ* and △*ABC* are similar, so it follows that the three ratios *AP:AB, AQ:AC* and *PQ:BC* are equal (each ratio is the SCALE FACTOR of the enlargement).**



LINKS

SHADOWS https://aiminghigh.aimssec.ac.za/shadows-activity/
ENLARGEMENT https://aiminghigh.aimssec.ac.za/enlargement/
TRISQUARES https://aiminghigh.aimssec.ac.za/trisquares/
SIMSETS https://aiminghigh.aimssec.ac.za/simsets/
TESSELLATING TRIANGLES https://aiminghigh.aimssec.ac.za/tessellating-triangles//
VIDEO: SCALE FACTORS, A4 AND PAPER AIRPLANES https://youtu.be/nIp1Kv138yM
VIDEO SCALE AND CUBIC METRES https://youtu.be/ISnGpHQTE-o

ANIMATIONS http://nrich.maths.org/5671
http://www.intmath.com/trigonometric-graphs/1-graphs-sine-cosine-amplitude.php