Trigonometry Wheel

http://www.virtualmaths.org/activities/shapes

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ASSEMBLY

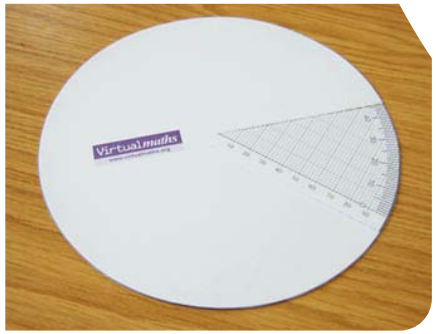
1. Print the two sheets on A4 card or print on A4 paper and laminate. In the PDF print options, set Page Scaling to ‘None’.

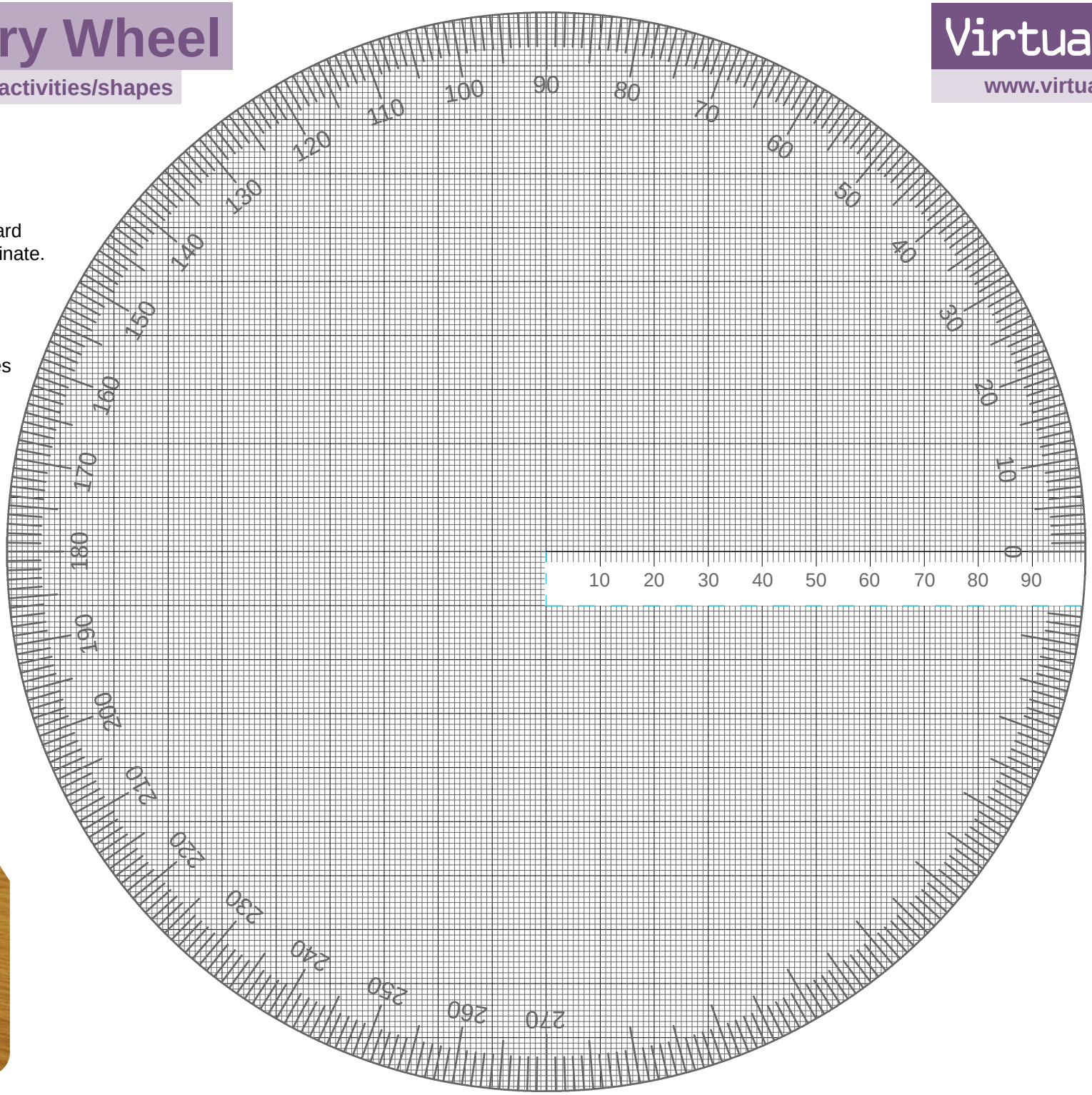
2. Cut out the circles, then cut along the blue dotted lines precisely to the centre of the circles.

3. Place the grid circle under the ruler circle. Align the horizontal cuts, then slide the bottom of the ruler circle under the top of the grid circle.

4. To adjust the angle, hold the bottom circle in place with fingers and rotate the top circle with thumbs.

5. See the Teachers’ Notes sheet for suggested uses.





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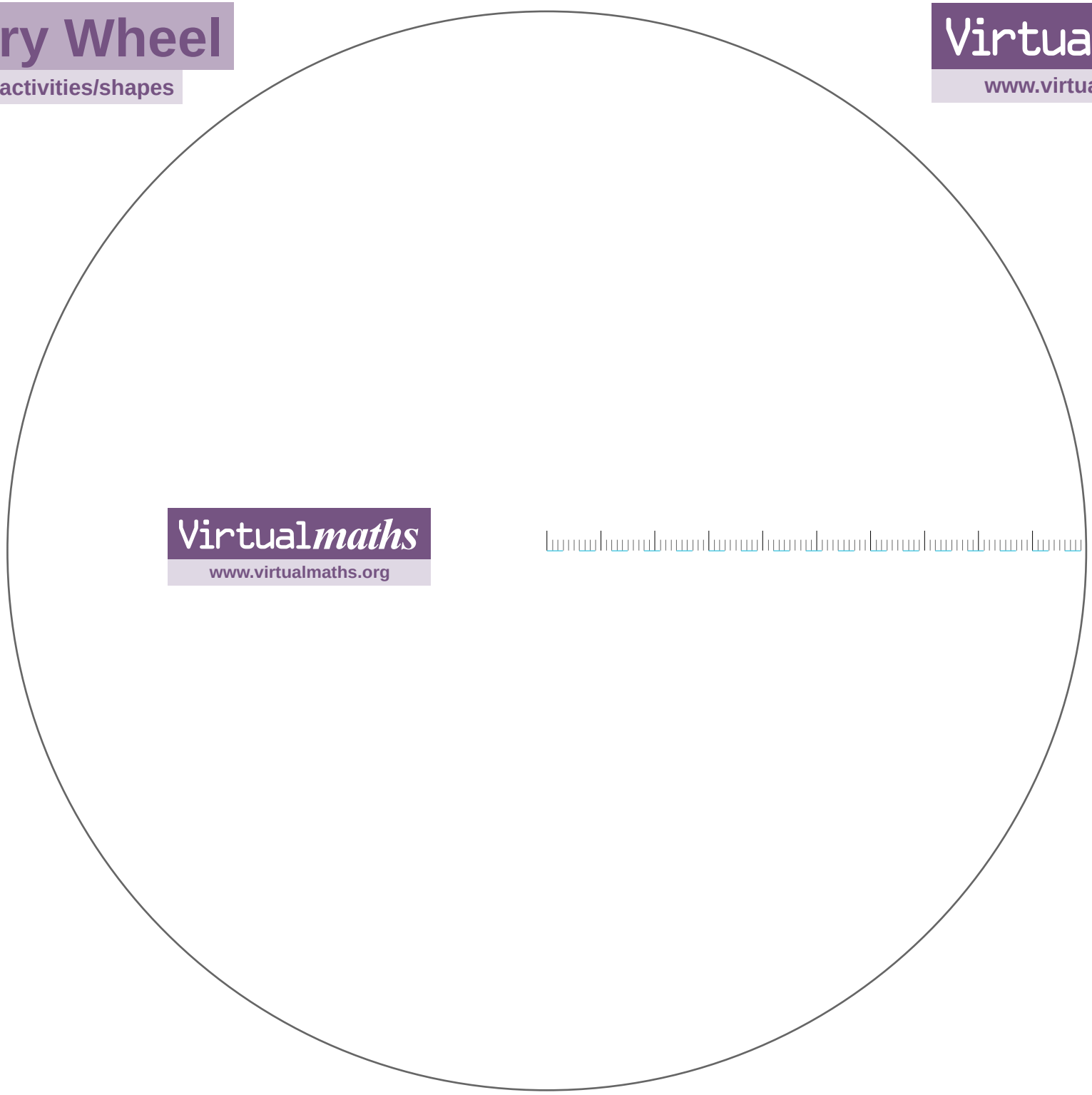

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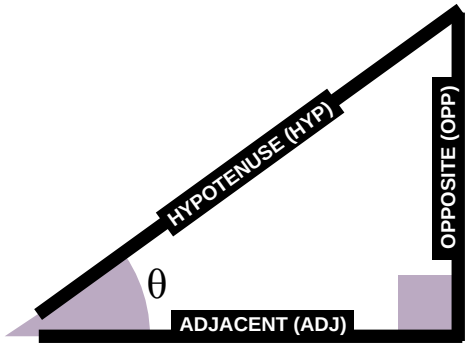
TEACHERS' NOTES 1

ASSUMED KNOWLEDGE

- gradient of straight line is vertical change / horizontal change, i.e. tangent
- decimal place value
- converting between fractions, decimals and percentages
- familiarity with reading divisions on graph paper



AIM FOR LEARNERS

- to link angle sizes and lengths of sides of right angle triangles
- to realise its practical use in construction
- to link this to the trig functions
- to be able to relate a trig ratio to an angle size

RATIONALE

In maths and construction, gradient is measured by the increase in height relative to the horizontal length. This is the tan function: $\frac{\text{opp}}{\text{adj}}$

As the sector size is increased the gradient of the sloping line, the hypotenuse, increases as does the angle at the centre.
This allows the link to be made that a measure of the gradient is also a measure of the angle.

TASKS

By setting the angle in the sector to different values students can work out from the visible graph what the gradients are for different angles and so the tan ratios.
e.g. find the tangent ratios for 30°, 45°, 60°

Roof pitches are given as vertical change per length of sloping roof, so would use vertical change / length of sloping line (hypotenuse).
This is measured as an angle of pitch.Introduce the term 'sine' and 'sin' as a way of distinguishing these gradients (angle sizes) from tangents: $\frac{\text{opp}}{\text{hyp}}$

Students can work out from the visible graph what values the gradient are for the angles already used for the tan ratio and realise they are different.
e.g. find the sine ratios for 30°, 45°, 60°

Horizontal length divided by sloping line length is also used to indicate size of angle. Introduce the term cosine & cos: $\frac{\text{adj}}{\text{hyp}}$

Students can work out from the visible graph paper what the values are for different angles and so the cosine ratio.
e.g. find the cosine ratios for 30°, 45°, 60°

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TEACHERS' NOTES 2

REVERSING THE PROCESS

Find which angles have these tan, sin and cos values.

tan 0.4 sin 0.4 cos 0.4

A chance to remind learners $0.4 = \frac{4}{10} = \frac{2}{5}$

tan 0.22 sin 0.22 cos 0.22

A chance to remind learners $0.22 = \frac{22}{100} = \frac{11}{50}$

POSSIBLE QUESTIONS

A road sign giving a warning of a steep hill gives the gradient as '1 in 10'.
What angle does the road make with the horizontal?

Another road sign gives the gradient as 20%. What is the angle in this case?

A chance to remind learners $20\% = \frac{20}{100} = \frac{1}{5}$

Learners can then be introduced to:

Right angle triangles generally where the sides can be labelled opposite, adjacent & hypotenuse.

The terms tangent, sine and cosine indicate which sides and which angles are used and also indicate the size of the angle.

These ratios are stored on a calculator. Learners can check the accuracy of their calculations.

The trig functions can be used for other calculations.