Investigating Right Angled Triangle Ratios

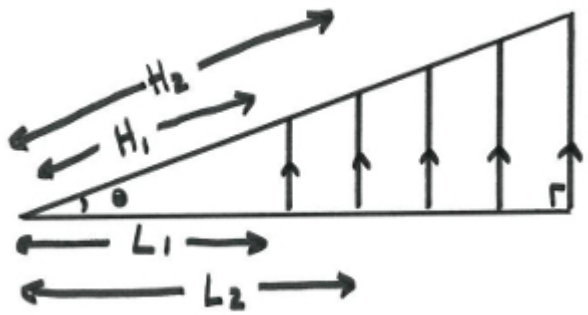
Annotation

Sarah recognises the invariance of the internal angles of a triangle and has used this knowledge as the basis for exploring a trigonometric ratio of right-angled triangles. She confirms that the cosine of an angle gives the ratio of the length of the adjacent side to the length of the hypotenuse.

Problem: Investigating Right Angled Triangle Ratios

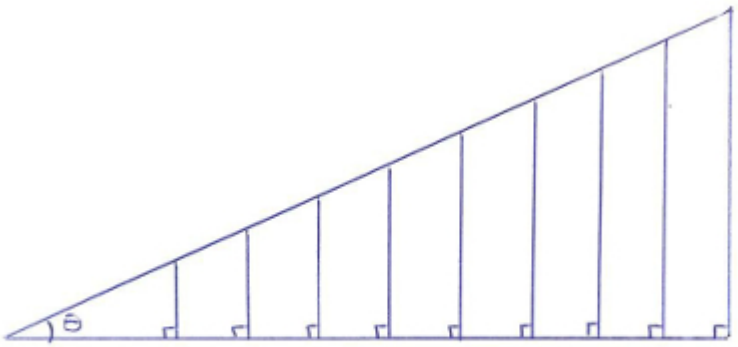
The teacher poses the following challenge:

Construct a right angled triangle and mark off similar triangles by drawing a series of parallel lines as shown below.



Measure the ratio of base length to hypotenuse for each of the similar triangles in your diagram. Compare these ratios to the cosine of the shared angle,θ.

Student Response



length (mm)	31	44	57	69	82	95	107	119	131
hypotenuse (mm)	34	47	62	76	91	105	118	131	144
ratio	0.912	0.936	0.919	0.908	0.901	0.905	0.907	0.908	0.910

Comparison: average $\frac{\text{length}}{\text{hypotenuse}}$ = 0.912 (=0.91 to 2d.p.)

angle = 25°

cos25 = 0.9063 (=0.91 to 2d.p.)

My results agree within 2 decimal places.

Teacher: You have a very clearly set out investigation here. Tell me about your results.

Sarah: I remember being taught about the trig ratios, and when I was about halfway through measuring, I realised that I'm actually measuring adjacent and hypotenuse. So I kind of expected my cos answer to be the same. It wasn't exactly the same, but if I rounded up to 2 d.p. the average ratio was the same as the cos25.

Teacher: Is there any way you could have increased the accuracy of your investigation?

Sarah: I was as careful as possible to get really accurate measurements, but my smaller triangles were harder to be exact with. If I just did the big triangles, my results might be much closer.
(Sarah calculates the average of the 0.908, 0.901, 0.905, 0.907, 0.908 and 0.910)
0.9065. Wow, yep that is much closer to the 0.9063 on the calculator for cos25.