# 4-Figure Tables ? Calculators ?

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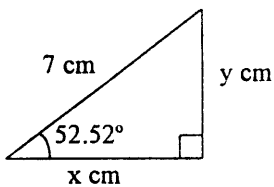
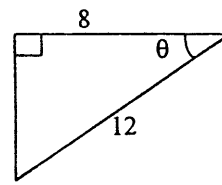
I went to a F.2 class to supervise a student-teacher during a 6-week teaching practicum session. It was the fourth lesson for the teaching of trigonometry. After a brief revision on the sine and cosine ratios, the teacher asked the students to find the unknowns of the following questions.

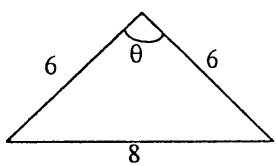
(a)




(b)




(c)




The questions were not difficult and well arranged in an ascending order of difficulty. They could be solved easily if the students knew the sine and cosine ratios. But there was a hidden challenge since students were not allowed to use calculator. Instead, they were required to find the values of sine and cosine functions by using the 4-figure tables. For the first question, the students had to set up two equations:

$\sin 52.52° = y/7$ and $\cos 52.52° = x/7$, then

i. turn to the right page of "natural sine" or natural cosine", not the "log sine" nor "log cosine"
ii. locate the row where the angle belongs to and find the corresponding function value
iii. add (for sine) or minus (for cosine), using the concept of proportion, the correct amount according to the second decimal of the angle.

The second and third questions involved the finding of the angle from the inverse function of sine or cosine. That created even more confusion and students were likely to make mistakes easily. Compared with the second question, the third one was more difficult as the triangle given was not right-angled. The students needed to add a perpendicular line to form two identical right-angled triangles and then form an equation involving sine ratio. Besides that, they had to be aware that the angle found immediately was only half of the unknown required.

A few smart students solved the problems within 10 minutes. But many others looked frustrated as they could not find the exact value of the respective functions in the 4-figure tables. That recalled my teaching of F.2 trigonometry in a college that had student intakes of average band above 3. My students experienced the same frustration. It became even more upsetting when they were having a short test. Many students knew how to apply sine and cosine functions, but their marks were low because they could not get the correct figures from the tables. It was really very discouraging to them. In later years, we allowed our students to use calculators. We found that they were much more confident and their performance in the topic improved a lot.

Students have been allowed to use calculators in the HKCEE for about two decades. At the present moment, however, there are still some schools that do not permit their students to use calculators until they are in Form 3. The main reasons for these schools to keep this policy are:

a) Dependency on calculators may adversely affect student's computation abilities.
b) Form 2 students are not mature enough to look after their properties. If they bring calculators back to school, the number of theft inside the school may rise.
c) Mathematics teachers are supposed to be competent in the subject and most of them used 4-figure tables when they were student. So the use of tables should be good for students.

A lot of research have been done on the effect of the use of calculators. It has been reported that calculators are good learning aids. In the topic of trigonometry at F.2 level, students can use calculators to (i) explore the trends of sine, cosine and tangent functions by increasing the angle at different quadrants, (ii) test whether $\sin^2\theta + \cos^2\theta = 1$ is an

identity, (iii) find out the relationship of cos (90° - θ) and sin θ , and so on. Anxiety may suffocate the learning desire of students. Compared to 4-figure tables, calculators offer fast and accurate results. This certainly helps to reduce the anxiety of students, particularly those with average ability or below, in doing trigonometry and some other topics.

Recently it was reported in the newspapers that calculators will be part of the new primary mathematics curriculum which will be effective from 1999. It is the right time for those schools that still restrict their students to use 4-figure tables to look at the positive sides of using calculators and make a wise judgement.

## 《數學教育》 第三期 EduMath No.3 (12/96)
## 勘誤表

(1) 頁 10 方格內文字段落第 2 行：「... 學*爲*探討焦點，...」 (漏去)

(2) 頁 12 第 2 段第 5 行：「 ... 氣氛及興趣的*困*難・由於...」 (更正)

(3) 頁 53 第 2 段第 3 行：「 ... 的一種認知*歲*略・...」 (更正)

(4) 頁 53 最底一行：「 ... 發展上略遲*的*初小學」 (更正)

(5) 頁 54 第 4 段第 4 行：「 ... 比乙短的丙鉛筆，*著*兒童」 (更正)

(6) 頁 66 頁底倒數第 2 行：「 Editor's Note: ... 」 (更正標點符號 ' )

(7) 頁 71 下半頁有關活動項目：「 6/1/96 ... 數學的古今*中*外》(... 」 (漏去)

(8) 頁 71 下半頁有關活動項目：「 30/3/96...聖保*祿*學校...」(更正)*

(9) 頁 71 下半頁有關活動項目：「 4/96 ... 第四版中・」 (刪去「一」字)

(10) 頁 79 "Aim" 一段第 1 行：「... experience of maths, *be it* teaching ...」 (更正)

(11) 頁 79 "Operation Principles" 一節第 4 段第 1 行:「... Accurate *grammar* and spelling ...」 (更正)

* 第二期頁 63 亦當相應改正