

Rolf Grunseit, circa 1977

APPENDIX B

THE 'THALES OF MILETUS' PLAY

ACTORS IN THE PLAY

Thales (In his maturity)

Anaximander (His pupil and companion)

Merchant (Eager to trade, frightened of war, yet still eager for business)

First Egyptian Priest: Nuiserra

Second Egyptian Priest: Manetho

Third Egyptian Priest: Zoser

Narrator

Soldier 1

Soldier 2

Pirate Leader

Servant

Egyptians

Dancing Girls, Wrestlers, Acrobats

Guide

Guards, Crowds

ENTER NARRATOR DRESSED AS AN ANCIENT GREEK

NARRATOR: This is the story of Thales of Miletus. A simple man, and a gentleman, he was given the title of "One of the seven wise men of Greece". The year in which this play occurs is 540 B.C. The places, Miletus and Egypt. Come with me now and look at the civilised world in which Thales lived. Civilised? - Perhaps! It was much the same as today - peopled by men and women of destiny, whose sole ambition was to become great at the expense of others. There were wars, revolutions and innocent people dying, but there was progress also because some people were progressive and contributed to the quality of life.

Thales, the Founder of Modern Mathematics, was such a man.

Think back to the golden days of Miletus. Here we are at the busy port where merchants are busily selling their goods for profit, and clever men trying to buy these goods for next to nothing with other peoples' money, so that everyone can make a profit - that's right - that's business.

I have said enough. Curtains. Let the play begin.

- SCENE 1 -

THE SCENE TAKES PLACE AT THE DOCKS AT A PORT AT MILETUS AROUND 540 B.C. IN THE BACKGROUND THERE ARE FISHING NETS, OARS AND SAIL. THERE IS A CONSTANT MOVEMENT OF PEOPLE, MERCHANTS INSPECTING MERCHANDISE, AND HAGGLING OVER PRICES; SAILORS REPAIRING NETS, FISHERMEN WITH THEIR CATCHES, AND THE OCCASIONAL SOLDIER PATROLING THE WATERFRONT.

ON THE FRONT STAGE THERE ARE SOME CRATES; ONE IS OPENED AND ITS CONTENTS ARE BEING EXAMINED BY TWO MEN, THALES AND A MERCHANT. THALES IS AN ALERT AND ACTIVE MAN OF SIXTY. THE MERCHANT IS PORTLY AND DIGNIFIED AND KEEN TO SUCCEED IN HIS BUSINESS TRANSACTIONS WITH THALES. THALES IS EXAMINING AN OIL PRESS.

THALES: These oil presses look solid enough.

MERCHANT: (Slaps the press as he makes his point) Solid? Iron hard! There's years of life in these presses. They'll crush all the olives picked here in Miletus, ... but you only want to rent them from me for one season?

THALES: That's right, one season. These all you've got?

MERCHANT: All ... In fact all in Miletus.

THALES: (Smiles) Good ... I'll rent the lot for one season, provided of course that the price is fair.

MERCHANT: You know, it took me a long time to find all these presses.

THALES: Hm ... yes, I'm sure it did.

MERCHANT: To gather and carry all of them took my sons considerable effort, and then there are my expenses, hm ... let's say thirty five gold pieces. (Watches Thales for a moment) It's a fair price, I could not do it for less.

THALES: (Quiet for a moment as he contemplates) Hm ...

MERCHANT: It's the best I can do.

THALES: Well then, I'll take them.

MERCHANT: (He smiles and holds out his arm for the traditional arm clasp, binding an agreement) It's a deal then.

THALES: A deal.

MERCHANT: I can't help wondering ...

THALES: Wondering? About what?

MERCHANT: What are you going to do with them all?

THALES: What do you think I am going to do with many oil presses? Make money, what else?

MERCHANT: Well, I've been trying to make money for a long time, but with no great success. (Displays his clothes) Look at me!

THALES: It's all in the mind ... it's your attitude.

MERCHANT: Are you very rich?

THALES: Not really.

MERCHANT: Well, what happened to your attitude?

THALES: Nothing, I haven't tried it yet. It's my first time in business. There's more to life than money of course, why there's ... (Continues talking softly with noise, shouts and alarms, outside.)

ANNOUNCER, THALES' PUPIL, RUSHES IN.

ANNOUNCER: May the gods help us! The port is being attacked from the sea. We must run, - this way.

MERCHANT: What the deal, the deal sir, we haven't signed anything yet. If you'll just wait here sir, just along the ...

ANNOUNCER: What are we to do?

MERCHANT: Run, quickly, run for your life!

ANNOUNCER: Run to Egypt?

MERCHANT: Run to Egypt on the waterside - that's the only way to survive.

ANNOUNCER: (Scries hysterically) If you pay me now I'm sure we can get the oil presses out of here for all pieces of gold's two hundred pieces of silver!

MERCHANT: I'll write you a note promising you the money.

ANNOUNCER: (Scries) Thales! Thales! Thales! Thales!

MERCHANT: (Scries) Thales! Thales! Thales! Thales!

ANNOUNCER: (Scries) Thales! Thales! Thales! Thales!

SOLDIERS RUSH IN.

SOLDIER 1: Arm yourselves. We're being attacked by Samian pirates.

MERCHANT: (Inches over to the crates) I've some new arms in the crates here. Swords, shields, helmets. Here, grab them.

THALES: And will I have to pay for their use afterwards?

ANAXIMANDER: Please Thales, run. Don't joke about this.

MERCHANT: We'll discuss the price after ... if we're still alive.

THALES: It will be a pleasure. But why was the garrison not alerted before this?

ANAXIMANDER: I've no idea. Let's run.

SOLDIER 2: (Rushes in herding a group of people before him) To the citadel! Leave everything and run for your lives!

THALES: But surely you could see them coming?

MERCHANT: There are lots of ships passing our port every day. We can't have a garrison rushing out at full alert every time they see a ship. Even if we could, there's no telling how far out to sea they are. There is no way by which we can tell the distance of a ship out to sea. If we could gauge the distance, then ships coming too close could be watched, and if its intention were hostile ample warning could be given.

SOLDIER 1: Come on sir, pick up your arms and join the men defending the square.

ANAXIMANDER: He's a visitor to the city.

SOLDIER 1: I don't think the Samians will be interested in introductions, sir.

THALES: But Samos is a beautiful island, surely not worthy of pirates.

SOLDIER 1: These Samians are renegades, or act so. Their booty probably supplies the treasury though ... Fight back to back, it's the safest way.

ANAXIMANDER: Thank you but I told you we're not fighting. (Shouting while running away with Thales) We're visitors.

PIRATE LEADER: (Rushing on) So are we! (Fighting follows)

END OF SCENE

- SCENE 2 -

SCENE 2. IN THE BACKGROUND ARE THE PYRAMIDS. A TABLE IS IN THE FOREGROUND WITH BEIGE COVERED CHAIRS. SLAVES STAND AROUND.

ENTER 10 SLAVES CARRIED ON CHAIRS

PRIME PRIEST: (To the priest) Just help me to get out of this refined torture instrument. (The slaves rush over to pull him out and walk him over to the chair where they sit him down) Let me have some water. (Holds out his hand. A pewter cup of water is put in it) My back is poisoned and that means I do not wish to poison my system, too. Do your work, taster. (To the slaves) I can't bear to look at them a moment longer.

PRIME PRIEST: (To the slaves) I am, 'Miserable'

PRIME PRIEST: (To the slaves) At my age, the waste of time annoys me. I have no more to live for and it's the only possession I have other than my life. I have lived wisely. Now where is this wondrous medicine?

PRIME PRIEST: (To the slaves) I am, 'Miserable'

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ENTER PRIEST 3, CARRIED ON A CHAIR.

ZOSER: Sorry I'm late - have I missed anything? ... Ah! There ...

ENTER THALES, ANAXIMANDER, AND A GUIDE.

GUIDE: (Bowing low) Your Holiness, the Miletian Thales and his man.

THALES: (Bowing) And his student, Anaximander. I am deeply honoured that you can spare me your precious time.

NUISSERA: Your reputation preceeded you. Stories of your wisdom have come to our ears. We are curious.

MANETHO: Our land is old. The pyramids there are over two and a half thousand years old.

ZOSER: And our history and knowledge is recorded in writing. We have been doing that for over three thousand years.

MANETHO: Do you have anything to add to this great store of knowledge?

THALES: I come from a little city with hardly any history at all, and certainly not recorded like yours. I am curious and want to learn, but where I come from there are very few written scrolls or people of knowledge to read them. So I must look at the world around me and the heavens above and observe.

ZOSER: You must feel very deprived.

MANETHO: And this is why you've come to us. To learn. How very nice of you.

THALES: Thank you, but I've also come to do some business. I sell oil.

NUISERRA: A merchant? How is it that one of the seven wise men must earn money like a common merchant?

ANAXIMANDER: With respect, Your Holiness, Thales is a merchant, but not a common one.

NUISERRA: I did not mean to be rude, young man. When we are born, the gods decide the number of days in our lives. Each day is like a precious jewel and not to be thrown away. Unfortunately we who are old and count our remaining days know this only too well. What I meant about Thales was for a man of his genius, the quest for wealth is a useless exercise in greed, unworthy and most surprising.

THALES: It is true that our days are numbered and I try to enjoy every one. I like to meet people and understand their life styles. I love my physical luxuries. I love to travel, see wondrous things and meet wise men, such as yourselves. But how can a poor Miletian afford all of this? In Miletus there are few opportunities to better oneself except by selling one's services to someone of great wealth. I did so; I sold my services to King Croesus of Lyddia, and these he used for war. No thank you, I prefer to be self-employed.

ZOSER: And how are you self-employed?

THALES: As an oil merchant. Last year I observed that Miletus was going to have a record olive crop, so I rented all the available oil presses. The farmers who wanted to press their olives for oil had to come to me for presses. I rented the presses to the farmers for a higher price and made my money. I have also bought much of their oil and am reselling it now throughout the civilised world.

MANETHO: It sounds very simple.

NUISERRA: All good ideas sound simple, Manetho. (Turning to Thales) I have come to meet you, Thales, and not your legend. It is your appearance of humility and simplicity which belie your true genius. It is an expression of your true self that I have come to see.

THALES: My father will appoint you, Nuiserra, to be the next high priest of the temple.

NUISERRA: I will be appointed, Nuiserra, to be the next high priest of the temple.

MANETHO: I will be appointed, Manetho, to be the next high priest of the temple.

ANAXIMANDER: I will be appointed, Anaximander, to be the next high priest of the temple.

ZOSER: I will be appointed, Zoser, to be the next high priest of the temple.

THALES: Please, Anaximander ...

NUISERRA: Look behind you, Thales, look at our pyramids. They were built over two and a half thousand years ago by our ancestors ... two and a half thousand years ago. How high do you think they are?

THALES: About the same length as one hundred and sixty paces.

NUISERRA: A good guess ... better still, how would you measure them exactly?

ANAXIMANDER: He's trying to discredit you.

THALES: Are you asking me for a simple method of measuring the height, or do you also want me to measure the height here and now?

MANETHO: I suppose you want men and equipment to measure the height.

THALES: It's a simple method you want, isn't it?

NUISERRA: Show us how you would do it, for no man has ever measured the height since they were built.

THALES: I need only a man and some wooden pegs.

ZOSER: (To Manetho) Do you really think he can measure the height?

MANETHO: Not a chance. No one has ever answered the problem. The physical effort to measure the pyramid is just too great. The arrogant and conceited always meet defeat with this question. Let's watch him squirm.

THALES: Now you shall see how I would do it. Hm ... (Zoser and Manetho smile at each other and settle in their chairs, comfortably as if expecting a long wait. Anaximander looks expectantly at Thales)

THALES: Sorry ... sorry for the delay. I'll just make myself comfortable on the ground, like this. (Stretches himself out) Anaximander ...

ANAXIMANDER: (Puzzled but eager to do whatever Thales asks him) Yes, Thales, right here. (Whispers) Are you all right?

THALES: Yes, of course. Just do what I ask you. Mark out the length of my body. Put one peg here at my head and the other at my feet. Have you done it? That's right, thank you. Now help me up.

NUISERRA: Will you explain what you are doing, Thales?

THALES: Certainly. My student just marked out the length of my body on the ground. See between these two pegs. Now if I stand here, right where my head was, and the sun casts a shadow of my body the same length on the ground, then the shadow of the pyramid is the same length as its height ... See?

ZOSER: What's that you're saying?

THALES: I'll explain again. It's really very simple ... I lie down in the sand thus ... and my body makes an impression equal to my length. Now I stand up ... for goodness sake, Anaximander, help me stand up ... Now I stand up near where my head was, here. When my shadow, caused by the sun, is the same length as my body impression in the sand (Points to sun and points to sand as he says the words), then the shadow of the pyramid is the same length as its height - right? No - don't answer. So all we have to do is to wait for my shadow to be the same length as my body impression and, at the same time, measure the pyramid's shadow taken from the centre of its side. Right?

ANAXIMANDER: (Big smile) Right!

THALES: It's a right-angled triangle - two sides equal about the right angle. The most important triangle there is.

MANETHO: ... the case!

NUISERRA: ... appointed, Thales.

MANETHO: ... simple.

THALES: ... the pyramid's shadow ... the measurement ...

MANETHO: ... the pyramid's shadow ... the measurement ...

THALES: ... the pyramid's shadow ... the measurement ...

ANAXIMANDER: Providing you have time to wait.

NUISERRA: Time, time yes ... Thales, I'll get some of my servants to measure the height of the pyramid. Let us go back to the house and you join me in a cool glass of wine.

THALES: Thank you, we'll join you.

2 PRIESTS STAND, WALK TO THEIR CHAIRS AND ARE CARRIED AWAY

THALES: Oh, have you a guide? Anaximander would like to stay and see the sights for a longer time.

ZOSER: I will show him personally if he would like. The pupil of such a clever man.

END OF SCENE

- SCENE 3 -

HOME OF NUISERRA. SPLENDID, WELL-LIT COURTYARD, WITH MURALS, SCULPTURE, PAPYRUS IN GREAT CLUSTERS AROUND A FOUNTAIN. IN THE CENTRE ARE TWO LOW CHAIRS COVERED IN RICH FABRIC, WITH A VERY LOW TABLE BETWEEN THEM.

IN COMES A CHAIR BEARING NUISERRA, FOLLOWED BY ONE BEARING THALES

THALES: You have rather an efficient transport service, don't you? In Miletus we have to walk everywhere.

NUISERRA: Yes, but these bearers are new. The last team I had were Nubian and very experienced. This lot gives rather a bumpy ride.

THALES: (Rubbing his back) Yes, a bit bumpy. But surely all these riches ... Aren't they the possessions of the greedy and unworthy?

NUISERRA: I suppose I was rather unjust with that statement and I am sorry. To show my apology I must beg you to stay tonight.

THALES: But what about Anaximander?

NUISERRA: I can send a servant to your lodgings and have him brought here also.

THALES: Then, in that case, I would be greatly honoured to stay.

NUISERRA: Good. Now, how about that glass of wine I promised you? (Claps his hands - enter slave) Some refreshments for my guest and myself. (Slave bows low and leaves) They should not be long.

THALES: Ah! Good. I have had a long morning without refreshment.

NUISERRA: By the way, my personal congratulations as to the solving of our riddle. The measuring of the pyramids is a problem that some of the greatest minds of our civilised world have been unable to solve.

THALES: Thank you. By the way, is there somewhere I may go to wash?

NUISERRA: I should have thought of it earlier. (Claps his hands - slave enters) Water for my guest to wash. (Slave returns, Thales washes, then the wine is laid out with fruit, biscuits, nuts and sweetmeats)

THALES: This is not refreshment, this is a banquet!

NUISERRA: You are impressed.

THALES: I'm too dazzled to be impressed. This wine is like ambrosia.

NUISERRA: What do you dine on in Miletus, Thales?

THALES: I would eat a pig's head to this at night; at breakfast a salad or some cakes, wine and olives. I have said before with the Greek people in Miletus.

NUISERRA: Oh ... enough of that riddle, let us have some refreshment. (Claps his hands)

END OF SCENE 3

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right angled triangle. The distance from the base to the ship is then measured when I turn around and face the whole triangle away from the sea to the beach. I can easily measure the distance on the beach by just pacing it out. Now what do you think?

ANAXIMANDER: Simple. (Smiles)

ALARMS - SOLDIERS RUSH ACROSS THE STAGE

THALES: Our pirate friends again. I think they will get a surprise very soon when they find an armed guard from the city waiting for the pirates swimming ashore from their sunken ships.

MORE SOLDIERS MARCH ACROSS THE STAGE

THALES: Naturally I hired a carpenter and had him make hinged staves of my own design with an angle measuring device. I also hired two scribes who made up the distance tables for every degree. These are now being sold to all who need them: the ships' captains, garrisons, generals, and so on.

ANAXIMANDER: Just like that! (Wanders away while Thales gets warmed to his subject)

THALES: I've been thinking. I make one triangle out to sea and then turn it around to land. If I draw this (demonstrates on a board), I can see that two triangles are exactly alike ... If they have one side and two angles respectively equal ... and see the whole triangle is isosceles. Look, two equal sides. Do you know, I think I've just discovered something else, that the base angles of the isosceles triangle are equal. Now, what do you think of that?

ANAXIMANDER: (Makes a face) Exciting!

THE SOUND OF CHEERING AND MARCHING. ENTER SOLDIERS DRAGGING PIRATES AFTER THEM. THEY STOP FOR A MOMENT.

PIRATE: (To Anaximander) Hail, we meet you again. Remember the last time?

ANAXIMANDER: Of course, we were both visitors then ...

THALES: And this time you can be our guest for as long as we like. We insist.

GUARD: Yes, we insist that you be our guest ... (Prods with his sword) Come on. Let's entertain you.

THALES: Come, Anaximander: we have more work to do also.

CURTAIN

## APPENDIX G

### IMPRESSIONS OF A HISTORIAN OF MATHEMATICS

Comments of Dr John Pottage, Department of History and Philosophy of Science, University of Melbourne

#### Thales Play

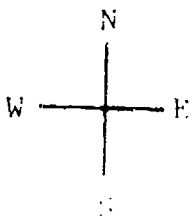
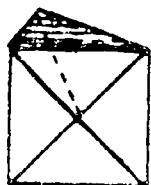
Perhaps the first thing to be mentioned is the dubious nature of the source material. Neugebauer went so far as to write that

"the traditional stories of discoveries made by Thales or Pythagoras must be regarded as totally unhistorical.

Thales, for example, is credited with having discovered that the area of a circle is divided into two equal parts by a diameter. This story clearly reflects the attitude of a much more advanced period when it had become clear that facts of this type require a proof before they can be utilized for subsequent theorems ..." etc. etc. (Exact Sciences in Antiquity, 2nd ed. p. 148)

The latest short account of Thales is in the fine Dictionary of Scientific Biography, of which about 13 volumes have so far appeared. Here the dates of Thales are briefly discussed and the best estimates are given as 625 (?) and 547 (?). So the assertion that Thales was 60 in 540 B.C. is too precise (page 1 of play). For Dating of the Pyramids, see I. E. S. Edwards, The Pyramids of Egypt; for dating in general, see Sir Alan Gardiner, Egypt of the Pharaohs.

Most importantly, some reconsideration of the two applications of similar triangles is in order. If Thales' shadow were a half or a third as long as Thales is high, the pyramid would cast no shadow owing to its shape. Even when the shadow is equal to the height (except perhaps twice in a year) the situation would be as indicated below in plan, so that the passage from measurement to deduced height would be much more complicated than is suggested in the play. As for the distance of the ships being equal to a measurable distance along the beach (need to keep both base lines horizontal), a five foot staff of uncertain perpendicularity would be a quite unsuitable basis for any more reliable data than any experienced look-out might reasonably be expected to supply by looking out to sea. At least Thales could stress how important it is to keep the staff vertical; and perhaps his "angle measuring device" instead of being on sale "to all who need them" could have taken the form of a look-out tower 40 feet (say) above the water, then the angle of depression might not unreasonably be used as an indicator of the distance out to sea. Of course, the turning through a right-angle to sight out a measurable distance along the beach would only be necessary in connection with the graduation of the instrument.



Thales

No Greek ever used "degrees" for measuring angles, so far as any record survives, until well into the Hellenistic Period. Archimedes and Apollonius still used fractions of a right angle to specify even very small angles. And, of course, the suggestion that any scale of angles would need to enter as intermediaries is quite unnecessary (and historically misleading). The natural thing would be mark the scale directly in distances. Needless to say, no precise information survives, as to what methods were used; but the application of similar or of congruent triangles pre-dates even the most primitive "trigonometry" by many centuries. Even some of the problems in the Rhind Papyrus show an application of what amounts to the method of similar triangles - and in connection with heights of pyramids too, though not in connection with shadows. But that is another story.

If Mr. Grunseit is prepared to work a little more on his script it should be worth publishing for school use. Possibly he could include a few historical notes (disclaimers!) so that his readers won't take him too literally. Possibly also some questions for discussion concerning the practicality of the applications of similar triangles, or some suggestions for field work by students.

#### The Conics Article

You ask for a comment on the value of this as something "which teachers could use as a basis for preparing lessons in mathematics". Answer: I'm afraid it has no value as it stands. The slight mathematical content is just too misleading. If "the only instruments allowed were the compass and the straight edge" what is the poor reader to make of the method of Menaechmus, which one presumes is being presented here as a brilliant method (as it was)? The final page with modern graphs, even to the cartesian equations (!), is disturbing to anyone interested in the history of the subject. The generator of a cone should not be referred to as an "edge" (p. 31). For Apollonius (not Appolonius), the Dictionary of Scientific Biography, should be consulted. The dates as given on p. 31 are sheer guess work on someone's part.

The Greek myths may well have a place in secondary (as well as primary and indeed tertiary education) - they might have a greater value than mathematics - but the combination, I should say, juxtaposition, of myth and mathematics, as in this contribution helps nobody.

## APPENDIX H

### IMPRESSIONS OF TWO MATHEMATICS EDUCATORS

#### Comments of Mr Ken Clements, Faculty of Education, Monash University

My wife and I acted out the Thales play tonight. Actually my gut reaction is that Grunseit's work is very creative, and could add interest and variety to secondary mathematics classrooms. There would need to be a fair bit of associated in-service education, but this would probably be easily arranged.

The Thales play is more interesting and would be more likely to succeed in the classroom than the "Discovery of Conics" story.

I applaud the idea of bringing history into mathematics - the kids would be richer for having it. In my opinion Grunseit's efforts deserve every encouragement.

What I would like to see is a small booklet (perhaps 80 pages) with quite a few little plays such as the one on Thales.

#### Comments of Mr Brian Low, School of Education, Macquarie University

My thoughts on the Thales play are recorded below.

1. The play appears to be interesting in a purely dramatic sense.
2. I would see it as very useful in arousing interest in the history of mathematics, and the applications of mathematics in earlier civilizations.
3. I don't think it is very useful as an advance organizer for similar triangles work - rather as an interesting follow-up to the work. I hold this opinion because some of the concepts introduced by the play are a little obscure for Year 8 or Year 9 students who have had no experience of similar triangles.
4. Provided the medium of plays is not overdone (i.e., placed in a large number of content areas), I think this play would promote a much better attitude to mathematics.
5. It is an interesting way of showing some simple practical applications of mathematics.
6. Overall, I think the play is very useful. I could not recommend any improvements.

My thoughts on the conics article are recorded below.

1. I am not impressed as much by this article as by the play. I am not sure that the majority of children would find it fascinating or terribly interesting.
2. Perhaps it could be used to arouse student interest before teaching conics, but I do not see it as applying to the majority of students - probably only the better ones or the 'kinky' ones.
3. For those students interested in the article I think it would promote a better attitude to mathematics.
4. This article has more import for the teaching of history of mathematics than has the play. If it is important to teach the history of mathematics then this probably goes some way towards achieving the objective.
5. Overall, I am not as impressed by this article as by the play. Perhaps it is the medium more than the content which disappoints me. I think it is most applicable to better students who already have a better attitude to mathematics.

## APPENDIX I

### IMPRESSIONS OF TWO DRAMA CRITICS

Comments of Ms Sandra Alexander, School of Education, Macquarie University

The Thales play is a creditable attempt to present to students the discovery of some basic mathematical concepts in a historical and social setting. The discoveries are presented as a response to the needs of the societies among which the mathematician Thales moved.

I make no comment on the mathematical or historical accuracy of the play, but only upon its suitability as drama for lower secondary school students.

To recommend it, the play has the virtue of incorporating material from a number of different subject areas, and thus could be included in programs of study emphasizing integration of subject areas. It has quite a large cast, and provision for numerous extras, so that all students in a class could be actively involved in the performance and rehearsals. It contains a fair measure of action and movement, difficult to accomplish in a play designed to convey abstract concepts. The settings are colourful and exotic, but reasonably easy to accomplish within the usual constraints of school drama production - the odd sheet, potted palm and decorated chair are readily available, although a backdrop of the pyramids might prove expensive or difficult in some circumstances. A production would otherwise present few problems of stage mechanics.

My first criticism is that the characters and their inter-relationships are very sketchily developed. In particular, the relationship between Thales and Anaximander does not evolve as it surely would have done given the changes of time and circumstances between the second and third scenes. The addition of some humour would also make the play more attractive.

The play provides no major parts for girls, indeed, no speaking parts at all. Their presence is acknowledged only by the suggestion that 'dancing girls' might perform at one point in the action. The history and archeology of Egypt attest to the fact that some women held positions of considerable power and influence, and the inclusion of some female speaking parts is surely not an outrageous demand in a play apparently intended for production in coeducational schools.

A further, more specific concern I have is that the information explaining the mathematics concepts is presented in somewhat indigestible lumps. This could be overcome by having another character (Anaximander?) elicit the explanations from Thales in question and answer dialogue. This would be more easily comprehensible to children watching the play than are the present long speeches.

All my criticisms could be answered without major changes to the structure of the play, and I would suggest that the author consult an experienced drama editor to give a final form to a potentially valuable educational innovation.

Comments of Mrs Nel George, School of Education, Macquarie University

The Thales play has a number of positive dramatic qualities:-

1. With the exception of the very long conversation on page 4 (which could possibly be enlivened with some action to match the very individual characters of the people on stage), the movement of the play flows well.
2. There is a development from the outlining of the problem in Scene 1 to its successful solution in Scene 4.
3. There is humour and irony both of situation and dialogue.
4. The dialogue moves well and is in character. There is only one change of idiom (and this may have been used to gain an archaic effect: "How time passes quickly" instead of "How quickly time passes").
5. The characters are consistent throughout, and all the qualities of the main characters develop in a credible fashion.
6. There has been an effort at creating an appropriate setting for each scene, and the details are woven effectively into the fabric of the play.

Maybe the role of the narrator could be eliminated. He merely sets the initial scene and the play can stand by itself without this introduction.