

about right, so individual strings can be left slightly sharp or flat. When the middle section is done, check that the overall pitch is right – if not it is worth readjusting before you spend time on the rest of the piano.

6) If the pitch has to be moved more than a semi-tone, then after tuning the pitch note and all its octaves, tune the next three notes of your scale and then all their octaves. Continue in this way throughout the scale, tuning in groups of two or three scale notes and then all their octaves, until the first rough is complete. This way the pressure is evened across the whole piano, and if there are problems with strings in a particular section it becomes apparent before you get too far on with the job. By this means, you can raise the pitch of the piano almost any amount in a single tuning, without endangering the structure by placing more stress on one area than another.

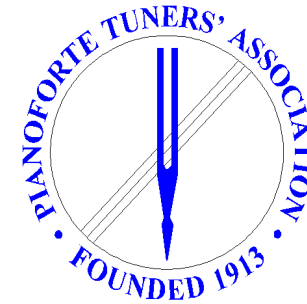
7) If the pitch is to be moved by more than a semi-tone, then do not use wedges during the first rough. After a little practice, it is quite easy to hear the string on which you are working and ignore the others when you are moving it a tone or more. You will be surprised how accurate it is possible to be, and you will

save a lot of time by not having to manipulate the wedges – particularly when using the method described in paragraph 6.

8) By tuning without wedges it should be possible to complete the first rough in 10 – 15 minutes (max.), leaving time to do a second rough (if necessary) before the fine tuning and complete a large pitch change without taking all day!

9) There is no point in attempting a fine tuning until the pitch is consistent right across the piano, so check that each section is fairly close to pitch before doing so. The treble section is usually where an extra rough is required, if at all, as it tends to drop more than the rest of the piano.

10) Finally, I usually warn the customer that the piano will probably need its next tuning a little earlier than normal, but after that it should be stabilised and will stand as well as ever. In practice however, I have found that any change that takes place in the pitch is usually far more to do with humidity change than anything else – many times I have returned to a piano a year or more after a major pitch change (because the customer ignored my advice to have it done sooner!), to find the pitch more-or-less where I left it.



How to Pass the Pianoforte Tuners' Association Membership Test in Piano Tuning

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to the PTA Test, because for that the pitch change is comparatively small and the pianos are known to be capable of the process.

Obviously, it is impossible to guarantee that there will never be a disaster when raising the pitch of older pianos. If every tuner in the country attempted to raise the pitch of every piano they met, then there would be the occasional one that collapsed under the strain (piano that is, not tuner!). I can only say that in 36 years of altering the pitch by anything up to a major 6th, and always in a single session, I have never personally experienced such a problem. Bear in mind I always offer my customers the option of attempting to tune their piano to A-440, and so have undertaken the operation literally hundreds of times. My feeling is that with the correct precautions, the very tiny element of risk is well worth taking, but you must decide for yourself.

The following procedure is one that I have found satisfactory:

1) Check the piano is structurally sound, but bear in mind that rusty strings are not therefore bound to break – often such strings will take the strain quite happily, while others in apparently perfect condition will pop off one after the other. If some strings have been replaced – particularly in the bass – then be very wary. On the other hand I have found sometimes that where the odd string has been replaced earlier, the other strings have happily risen to pitch with no further trouble.

2) Discuss with the customer – would they like the piano tuning *properly?*; are they prepared to pay the cost of the extra work?; strings could break but they will be made good; if too many are at risk then the attempt will be abandoned; and (if you have any doubts

about the instrument) tell them – “There is an element of risk to the piano, but it is very low and if you are prepared to take the chance a successful pitch raise will make the world of difference to the tone.”

3) Sharpen the pitch note by around 1/4 to 1/3 of the amount the piano is flat, to a maximum of 1/4 tone, or 1/3 semi-tone on fairly old strings. (For a large pitch change this means the pitch will end up flat, but I prefer to do an extra rough rather than jeopardise the strings by subjecting them to even more tension). Then tune all the octaves of this note throughout the piano, making them sharper than the pitch note by the amount that you will need to do with all of the notes during the rough tuning to counter the pitch dropping as the tuning progresses (perhaps about the beat of a major third in the scale centre). If one string breaks, it is worth continuing just in case it was an isolated incident, but if a second one goes, then it may be best to abandon the pitch raise and return it to where it was.

4) If the pitch raise is no more than a semi-tone, then whip through the first tuning using your normal procedure, but as quickly as possible. On each string, aim at one single movement of the lever clockwise, bringing the string just sharp enough for a single nudge down to leave it about right. However, in the bass section slacken the string off first before pulling it up; this reduces the tendency of the string to stick at the friction points due to rust, corrosion or indentation and thus lessens the chance of the string breaking. It will help with all the strings of course, but the bass ones are the most expensive to replace.

5) Don't fiddle about trying for perfection; all you need is the average pressure across the soundboard to be

How To Pass the PTA Membership Test

by Les Sherlock MPTA FIMIT

1) “It’s not worth bothering any more”.

In one case, the candidate had done a good tuning, excellent viva voce and all the repairs were fine, apart from the string replacement which went horribly wrong. At the time, I was the PTA President and in that capacity I wrote suggesting that he tried again.

It is not necessary to retake the entire test – just the section(s) which did not come up to the mark – so in this case he simply had to return to do the string replacement. He did so and passed with flying colours. It was only later that I discovered that he had decided not to bother trying again and it was only when he received my letter that he had second thoughts. Don’t give up – silly things can sometimes happen in a test, and it is always worth having another go.

In these circumstances, the PTA ask that the candidate waits a minimum of six months before retaking the failed section (s), in order to give sufficient time for improvement to take place.

2) “I’m good enough for concert pianist x/school y/etc., so I should be good enough for the PTA; who do they think they are....”

One of the benefits of taking a test such as that produced by the PTA, is to find out how your work compares to that of your contemporaries. Since you rely on your own judgement to determine the quality of your work, it is impossible to know how good your judgement is. Bear in mind that there are few musicians – even top-line professionals – who are capable of discerning a good-quality tuning. The PTA has been undertaking these tests for many years and has much experience of the kind of standard that tuners can and do achieve.

Rather than take this kind of

negative attitude (which is quite understandable in the disappointment of an unexpected result), realise that there is a standard of work higher than you had thought attainable, and it is within reach of any professional tuner who is prepared to swallow his pride, perhaps seek help, and work at reaching it.

3) “By hook or by crook I am going to get through this test successfully.”

There has been more than one example of those who have retaken the test one or more times before finally getting through, who have then gone on to become highly valued, respected and active Members of the PTA. We are keen that those who did not make it first time should not be abandoned, but helped to come up to the required standard. So do not be afraid to ask if help is available for you to overcome the difficulty in reaching the mark.

Finally

If you are a good, experienced tuner, then you should sail through the test with flying colours – as long as you have prepared yourself thoroughly and left nothing to chance. Remember, a professional is not necessarily someone who can do his task at the drop of a hat without thinking about it, but a person who knows all the pitfalls and continually checks and tests himself and his work to ensure he does not fall into any of them.

APPENDIX

Because some tuners deny themselves the opportunity of pitch-raising practice due to fear of the consequences, this section is included to dispel some of the myths. It must be noted that not everything here is directly related

INTRODUCTION

This booklet is produced with the aim of preparing candidates for their Membership test, and thus prevent competent tuners from failing to reach the required standard simply due to a lack of understanding regarding what will be expected of them.

While this booklet is my own work, I should also point out that it has been seen by most of the regular examiners and the PTA Executive Council. I am grateful in particular to Lewis Flisher, Bill Gray, Andrew Jamieson, Bill Kreis, and Malcolm McKeand for their input. After implementing changes suggested to me I am satisfied that I have unanimous approval for the following paragraph.

There is more than one way to go about most of the tasks that appear in the PTA Test. I make suggestions based on the way I would do it, but that is not to say you have to follow them – your method may produce a better result for you. But while the method is of secondary importance (as long as it is efficient and the piano remains undamaged) the end result is most important, and the descriptions I give can be considered the standard by which your work will be assessed.

Perhaps the first question a candidate may ask is, “How good do I have to be”? The pass mark is not to be considered the equivalent of ‘concert standard’; however, the PTA Secretary is quite likely to receive a request for a concert tuner anywhere in the UK and quite reasonably would expect to be able to recommend any PTA Member for the

job. So while the criterion actually is “Would this tuning be acceptable if undertaken in the average home?” it must be borne in mind that the candidate could be on a concert stage with the PTA reputation resting on the quality of his/her work a few days after becoming a PTA Member.

The next question may be, “Will it be fair”? Perhaps in reply I should make the point that both the PTA as a whole, and the individual examiners, are keen to see people pass the test. The PTA heavily subsidises the actual cost of the Membership test, on the basis that Membership subscriptions from successful candidates will eventually cover the loss made on the test session. Every failure actually costs the PTA money.

The examiners also subsidise the tests by not receiving from the PTA the full amount they could have earned had they not given up the day to undertake the testing session. Their hope is that the effort they put into each test will be rewarded by additional Members joining the PTA; and they can find it most disheartening to meet (usually) nice people, but see a standard of work making it impossible to accept them into our Association.

So what do we do? Lower the standard in order to have more passes? I think not – certainly not if we wish to maintain our credibility as a professional organisation. But my feeling is that many of those who fail to reach the mark could succeed if they prepared more thoroughly. So I aim to give some suggestions for

each of the three sections of the Membership test which if followed will go some way to enabling a candidate to be successful.

Bear in mind when reading this that the examination procedure is reviewed periodically. It is important that the candidate refers to the information sent at the time of the Membership application for precise details of the elements that make up the test. For example, there may be parts of the regulating procedure the candidate will be told not to do: ignoring this may reduce his/her marks!

Finally, it is normally expected that a candidate will be taking the test on an upright piano. This is for logistical reasons on the one hand, and because the average tuner will be working regularly on uprights, on the other. In an exceptional case where, for example, the candidate as a concert tuner never works on uprights, then a grand can be made available. But in this case everything (tuning & repairs) must be undertaken on the grand. Since this is a very rare event, all my comments are directed toward the 'normal' test using an upright piano.

GENERAL SUGGESTIONS

Before the day of the test arrives, make sure you have all the materials and tools you will need in your kit, and that the latter are in good condition. Include a plaster in case of an accident in the repairs.

You need to be in top form, so have a good night's sleep and rise in time for a decent breakfast. Wear good shoes and comfortable clothing. Arrive early – it will give you time to settle down before the test begins, and if the examiners have a piano prepared you could start early, which will help them to fit everything into a fairly tight schedule. Use the toilet before you present yourself for the tuning

and repairs sections.

Have a pen and paper with you. If you run into a problem of any sort (I shall give a few examples), you can make a note of it and leave it with the piano for the examiners. You will then be assured that they will take it into consideration when they assess your work.

Don't finish early. My heart sinks when ten or fifteen minutes before the time is up, a candidate emerges from the room and declares himself finished. Invariably one finds defects in the work which could have been corrected had that time been spent in careful checking: are all the unisons/octaves as good as they can be in the tuning? Is there anything that could be improved in the regulating? Etc. Obviously, do not twiddle your thumbs waiting for time if you genuinely have finished, but be sure you have checked, double checked and triple checked everything before calling it a day.

Under no circumstances must a third party be in the test room with you. If your test is taking place in a college or university, should any student enter the room, tell him to remove himself immediately and to speak to a member of staff from the department or an examiner if anything is bothering him.

Working in a test situation is like no other work experience, so be prepared for the resulting pressure. But remember, the examiners are not your enemy. They are aware of the problems of pressure and nerves, and will be trying to put you at your ease. If there is anything about which you are unsure, or anything that bothers you during the test, then speak to them. They are hoping you are going to succeed, and will do anything within the rules of the examination in order to help you do so.

PROCEDURE

When you arrive you will be asked

will be no penalty if you take your time and make sure that when you speak it is what you really want to say! So try to relax and respond to the examiners in much the same way that you would to one of your customers who was asking questions about their piano. Assume they know nothing and explain it *all* to them; on the other hand do not waffle about peripheral matters and miss the main point of the question. If possible, talk with trade friends or colleagues to practise expressing your thoughts verbally. Bear in mind that while the test is undertaken on upright pianos, the viva voce may well include questions on grands.

Tuning

When I applied to join the PTA in 1971, I had no idea what would be expected of me. So while waiting for a reply to my application, I memorised all the beat rates of the major thirds, perfect fourths and fifths, and major sixths in the scale (I was not called upon to prove it, and don't ask me to demonstrate – I have long since forgotten most of them!).

While you will not be asked to recite the beat rates of all the intervals in the scale, never-the-less, you may be asked to demonstrate your knowledge of the relative speeds of scale intervals – perhaps in a similar manner to the description I gave when talking about the tuning test earlier.

Be prepared to discuss your tuning method (setting the pitch, tuning the scale, tuning the extreme ends of the piano, stability); things to look out for before working on a piano; pitch raising – how? why? when? whether?; causes of pianos going out of tune; in fact every aspect of the tuning operation.

Repairs

This, in some way, fills in the gaps left by the repairs section of the test. You

may be asked to explain causes of notes sticking, or various types of unwanted noise. Different methods of dealing with the kind of repairs one often is called upon to undertake. Different materials required for different jobs. Lubricants and glues. Regulating principles.

Construction

You will probably be asked to name different casework parts. See the centre pages for a diagram. Look at a piano, and ask yourself why each part is designed and positioned the way it is – strings (steel and covered), different stringing systems, frame, bridges, bridge pins, hitch pins, wrest pins, soundboard, crown, downbearing, side-draught, equal temperament, inharmonicity, etc. You may need to know the answer in your test! Know the different materials from which the parts of the piano are made. Can you explain the operation of upright and grand action parts, and different pedal systems?

Even if you have had a first-class theoretical training at a good college, take nothing for granted. Read up your old notes and books. If you are a PTA Student, why not borrow some books from the PTA Library? If you are an IMIT Member, make use of their library. Otherwise purchase one or two good books from one of the supply houses.

Don't forget, the examiners are not trying to trick you. They are simply ensuring that you have an adequate knowledge of the profession, so that when speaking to your clients, you will not be answering their question with garbage!

If at first you don't succeed...

I have met three different responses from those who for whatever reason did not manage to make it:

Level the keys and adjust the depth of touch in order to produce the correct amount of after-touch (continued downward movement of the key after set-off). Remember to level the sharps at the right height, and check they don't sink below the naturals when pressed right down.

Checks:

Space the check heads and ensure they are all upright and square to the balance hammers. Regulate the checks to hold the hammers about 1/3rd distance from the strings. The checks should be in a straight line when at rest; if not check that the depth of touch is equal throughout.

If through some fault in the action it is not possible to have a straight line of check-heads with the hammers checking correctly, then compromise with the straight line and leave a note for the examiners.

Dampers:

Space the heads and ensure they are centrally positioned on the strings at the bottom of the head as well as the top. Regulate them to lift absolutely together with the lift-rod. Regulate the spoons so the dampers start to lift when the hammers reach the half-way position.

Tapes:

Ensure the tape wires are spaced equally and do not catch the adjacent check wires. Regulate so that all the checks lift together when the half-blow rail is pushed just beyond the normal extent of its travel. Like the check heads, the wires should be in a straight line. If through some fault in the action it is not possible to have a straight line with the checks lifting evenly, then compromise with the straight line and leave a note for the examiners.

Jack slap rail:

Adjust to the correct position (turn it

in until the hammers begin to bobble, then turn it back out until the bobbling stops). If the set-off rail doubles up as the jack slap rail, it should not be necessary to alter it as the examiners have agreed to leave it alone in these circumstances.

Damper slap rail:

Make sure the damper wires do not jam against the rail before reaching the end of their travel, but that it is close enough to prevent 'flapping' when playing *fortissimo*.

Then check everything a second time to ensure the later stages of regulation did not disturb the earlier work. If you removed any washers from the key-bed in the course of the regulating, do not take them away with you – leave them by the side of the action.

VIVA VOCE

The easy way to approach this would be for me to give a list of the questions you are likely to be asked, and the 'official' answers. But that would be silly! Have you ever heard of an examining board giving a list of questions and answers to people about to sit an exam? On the other hand, for me to cover everything adequately would turn this article into a book! So I shall take the middle course and try to give some guidelines regarding the kind of knowledge that will be expected of you.

The *Viva Voce* comes in three sections: Tuning; Repairs; Construction. It is obvious when examining, that candidates are usually rather nervous. Often the result is that answers are given which are either incomplete or totally wrong, because the brain and the mouth seem reluctant to co-ordinate under these circumstances. While the examiners hope to receive snappy, accurate answers, there

to sign a form to say that you understand the rules of the test, and that you will not be using an electronic aid for the tuning. You will be allowed two hours for the tuning and two hours for the repairs. There is usually a break of around half-an-hour or so for lunch in between these two practical sections.

When given the choice most candidates would prefer to undertake the tuning section first. But for some test sessions the situation could arise where it is necessary to start with the repairs. The examiners will try to accommodate any reasonable request from candidates, but please remember that logistics may require a little flexibility.

During the two practical sessions, the examiners may look in from time to time to ensure that everything is OK, and it is usual for them to give a warning when the session is drawing to a close. But do not rely on this, as circumstances could arise which prevent them from doing so: make sure you have a clock or watch so you know how the time is going.

The *Viva Voce* will usually be undertaken either immediately after the morning session, or just before the afternoon one.

At the end of the test, you will be asked to sign that you are happy with the manner in which the test was conducted. It is not possible to give the result of the test there and then, but this will be posted to you at the earliest possible moment – usually within one to two weeks.

Finally, you are requested to leave the test centre as soon as you have signed the forms and collected your tools.

TUNING

Preparation

It is absolutely impossible to undertake a six-beat pitch raise in a single

tuning and reach the required standard. So don't even think about it! Before you arrive, make sure you know exactly how you are going to go about the job. For my tuning test, after some considerable thought I decided to aim at an initial pitch raise of about half-an-hour (longer than usual, but as the pitch change is comparatively small I decided to spend more time on the rough in the hope of leaving a good foundation for the fine); a second fine-tune of around an hour; and a final careful check-through and adjust-where-necessary of about half-an-hour.

In fact it did not quite work out like that because I overestimated the amount of over-pull I needed and ended up with the pitch being a little sharp. (My excuse, to which I am sticking, is that the note I checked from the fork was actually rather flatter than the rest of the piano – I should have been more careful in checking the overall pitch before starting!). So I had to do a second pitch change before I could begin a reasonable fine-tune. But I still feel my initial plan was a good one to aim at.

Learn from my mistake – After rough-tuning the scale and the octave above, stop! Check how the pitch is moving. It may be worth starting afresh. This will prevent raising the pitch too high. Keep checking back, and adjust your over-pulling accordingly. When you have finished the fine tuning, check everything through fairly quickly first, to find and correct any 'silly' errors. Do not get bogged down trying to improve a unison from 90% to 100% when there is a howling treble or bass octave or unison which is at 20%.

Adopt good practice in your day-to-day tunings; this will stand you in good stead for your test (see the *appendix* for suggestions about pitch-raising). Brace the

elbow, hand, wrist – even knees – against something! Use your favourite wedges. Remember to breathe! Check that your teeth are not gritted. Aim to roughly pull up in 15 minutes. At this stage don't bother with making unisons accurate: you are doing a rough! Practise roughing-up without using wedges; it will surprise you how near you get.

Make sure you select a tuning lever that fits snugly on to the wrest pins. If it is so loose that the lever flops around from side to side, or so tight that it only fits part way on the pins, then not only will accurate and efficient tuning be much more difficult, but the wrest pins (and possibly your lever) are likely to be damaged.

If a string happens to break during the tuning, just move it out of the way and then ignore it; but do report it to an examiner at the end. You will not be penalised, as strings do break from time to time. The test for replacing a string comes in the repairs section, so you are not expected to lose tuning time by doing it in this part of the test.

Pitch

In 'real life' it could be argued that when undertaking a pitch raise, leaving the piano sharp is better than leaving it flat. But for the test the objective is to get the pitch bang on the nail; therefore a beat sharp is as bad as a beat flat. So in your day-to-day work when you meet pianos below pitch, practise it. If you can't do it in a customer's home, you will not do it in your test. As a guide, if the beat between the fork and the pitch note is more than that of a perfect fourth in the scale, then a pass mark is in doubt! If it is less than that, don't gamble by resting on your laurels – the aim is a 'perfect' unison.

Electronic tuning aids are not allowed in the test room. A tuning fork

will be provided and the choice is between a 'C' and an 'A' fork – you cannot have both! Keep the fork on the bass key block throughout your tuning. Whatever happened to it before it was handed to you, this will ensure that by the time you use it for your fine-tuning, it will be at the same temperature as when the examiners use it to test the pitch. They will do so by comparing the fork with either C⁵² or A⁴⁹, depending on your selection.

For goodness sake don't just rely on listening to the unison between the fork and the string you have tuned to it. Test in turn the note and the fork alternately, two or three times each, with at least one other note (e.g. a third/sixth/tenth away) to ensure that both the string and the fork produce the same beat against the note with which you are testing.

If at the end of your two hours you realise the pitch has altered slightly, do not try to 'cheat' by bringing the pitch note back in line with the fork. This will be very obvious from the rest of the tuning, the examiners will hear what you have done and mark the pitch accordingly.

Scale

Over the years, I have heard the most extraordinary attempts at a scale. Fifths beating like thirds, thirds beating like fifths – unbelievable had I not heard it for myself. We have to assume that candidates, who by definition have been earning their living as professional tuners for at least two years, are able to hear the beats in the intervals in a scale. So is it that they have difficulty in stabilising the tuning after a pitch change, they are unable to produce a better scale than this, or they think that they have produced a true tempered scale?

In a scale from F³³ to F#⁴⁶, the lowest fifth will have about one beat every two seconds, while the highest one will

The current practice is to create two faults on each of the five notes to be regulated, which usually will be near the middle of the action. However, I would suggest that simply to look for and deal with those faults, may not be the best way of approaching the task. For one thing, you may spot something which was not one of the faults introduced, assume you have completed the task after dealing with ten items, and leave a glaring fault untouched.

To be certain of completing the task, regulate every aspect of the five notes in the same way you would a complete action in a piano you had just fully overhauled. Everyone has their preferred method of regulating, although there are some items which must be done in a particular order otherwise a later job will undo what has been completed in an earlier one. I will describe my normal regulation sequence. Remember you must not alter some items, but it is worth checking them. Refer to the information sent to you for things you are not to touch. If you feel any of these are incorrect, leave a note for the examiners.

Deal with obvious problems first:

Checks or tape wires pushed in/out; keys catching on each other; hammers pushed forward off the half-blow rail; etc.

Rails:

Check that the set-off (but see note under *escapement*) and half-blow rails are in the correct position. It should not be necessary to alter the blow distance, but check it anyway!

Hammers:

Space to strike the strings squarely, ensure the heads are parallel and there is no side travel.

Note: If the hammer nose is not square to the head, you cannot make it square to the string and have the heads

parallel without refacing. In this case, you **must not** reface the hammers, but leave a note for the examiners.

Levers:

Ensure they are equally spaced and seated centrally on the pilots, and the jacks are correctly positioned under the hammer notches.

Escapement:

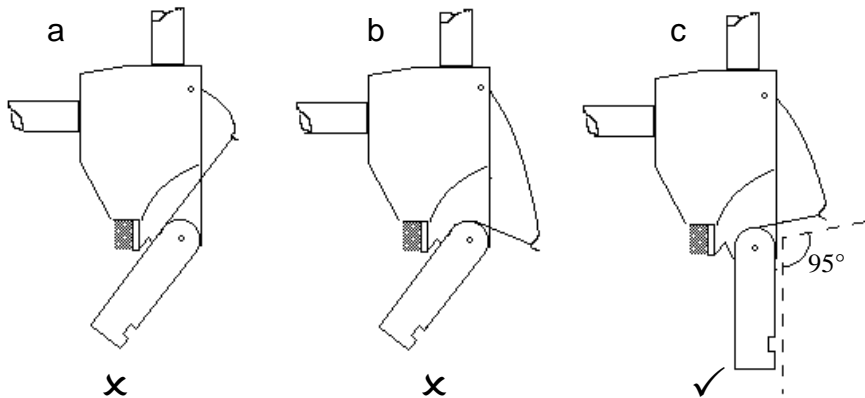
Adjust set-off to between 1/16" & 1/8" for steel strings (half the string thickness for bass strings).

Note: If the set-off rails double up as jack slap rails then check they are correctly positioned before regulating the set-off (although the current practice of examiners is not to alter the rails in these circumstances, so you should not worry about it in your test). This is more awkward than when there are two separate rails for these two functions:

Regulate the set-off buttons each side of each rail bracket, then adjust the rails (described later under *jack slap rail*) by loosening the screws enough to move them, then retighten the screws. Repeat this process until you are sure the rail is correctly positioned, before regulating the set-off throughout the action.

Keys:

Make sure they are equally spaced and square, and that there is the right amount of tolerance in the front bat pins. Adjust the capstans/pilots so there is no play between key and lever, but ensuring the jack is free to slip back under the hammer notch (check by pulling the jack away from the notch – press down just above the jack spring with a screwdriver – while the key is at rest and ensure it can return without sticking on the notch leather). In some cases it may be necessary to introduce a small amount of play to enable this to happen.



The tail should extend the full length of the slot in which it is located, but not protrude over its edge. Make sure the spring cord is cut cleanly and flush with the hole.

Replace a damper spring

Be careful to select a spring the same gauge as those either side, and bend it and cut it to length so that it is identical with them. Make sure the spring cord is cut cleanly and flush with the hole. The tail should go right through its hole in the flange, but not protrude beyond it. Comments about the centre pin will be found in the next section (it may not be possible to test in the same way as the hammer centre pin, but the friction should be the same).

The strength of the spring is crucial. There should be an identical amount of pressure of the head against the string to that of its neighbours; so feel it to be sure this is so – if not, then make adjustment by unhooking the spring from the damper body and bending it against its tail. Ensure the damper head is central on the strings (or the strings are exactly in the indentations – comments as for hammer head grooves), with the head parallel to its neighbours and regulated to match them.

Recentre a flange

When completed, the centre pin should be tight in the wood but free enough in the bushing for the hammer to swing, ideally, 2½ times. However, it is important that the bushing on both sides of the pin is equal in tightness. A hammer can swing the required number of times, but fail because one side is looser than the other. Make sure your centre pin cutters are in good condition. They should cut the pin leaving the end flush with the flange without any projecting ridge. If you rely on filing away any excess, be careful a burr is not created on the edge of the pin.

Five-note regulation

This is presently undertaken on a one-octave action model, although there are plans for replacement with a version having slightly fewer notes in the near future. The present model has standard-sized action parts and keys which fit against a miniature frame, with three steel strings to each note. There are no pedals, but the damper lift-rod and half-blow can be operated by hand (the new version will have pedals). So working on one of these is identical to working on a normal modern piano, except there is only one octave!

still be less than one beat per second. The highest fourth will only be slightly faster than one beat per second. These are very slow beat rates. On the other hand the highest major third should be beating nearly twelve times per second (lowest nearly seven) and the highest major sixth nearly ten times (lowest nearly eight). Since all the frequencies double at every octave (ignoring stretch factors), all intervals will gradually increase in beat rates to double the speed as each octave is reached.

Listen to your scale as you tune from day to day. While there are bound to be slight compromises on different instruments to compensate for different scale designs, if you cannot regularly produce a scale with this kind of pattern,

then either your method or your execution of it is wrong – get advice from a competent, experienced tuner; see if you can attend an evening course at a training college; or investigate the possibility of a PTA tuning tuition class.

Whether your method is based on fourths/fifths, thirds/sixths, or whatever, make sure you are using all possible checks as they become available during the tuning of the scale. For example:

- 1) Are all the intervals gradually and evenly increasing in speed as you progress up the scale? (This is of the utmost importance)
- 2) Where the bottom note of a major 6th is the same as the top note of a minor 3rd, the beat rate should be identical: e.g. D#³¹ – F#³⁴ minor 3rd = F#³⁴ – D#⁴³ major

Bottom note	Minor 3rds	Major 3rds	Perfect 4ths	Perfect 5ths	Minor 6ths	Major 6ths
D# ³¹	8.39	6.07	0.70	0.52	9.79	7.06
E	8.89	6.53	0.74	0.55	10.38	7.47
F	9.42	6.93	0.79	0.59	10.99	7.92
F#	9.98	7.34	0.83	0.62	11.64	8.39
G	10.57	7.77	0.88	0.66	12.34	8.89
G#	11.20	8.26	0.94	0.70	13.08	9.42
A ³⁷	11.87	8.73	0.99	0.74	13.86	9.98
A#	12.57	9.25	1.05	0.79	14.68	-
B	13.32	9.79	1.11	0.83	-	-
C ⁴⁰	14.12	10.38	1.18	-	-	-
C#	14.95	10.99	1.25	-	-	-
D	15.85	11.64	-	-	-	-
D# ⁴³	16.79	-	-	-	-	-

AUTHOR'S NOTE: Because of the problem of inharmonicity, the theoretical beat rates in this table are impossible to achieve in practice, but on a piano with low inharmonicity it should be possible to come somewhere near. When I was learning to tune, I found it very

useful to have with me, since it gives a good guide to the relative speeds of the intervals. If you are having difficulty with the scale, try referring to it alongside your regular checks – it might help!

6th (see the table on page 7).

3) Where the top note of a minor 6th is the same as the bottom note of a major 3rd, the beat rate should be identical: e.g. $D\#^{31} - B^{39}$ minor 6th = $B^{39} - D\#^{43}$ major 3rd.

4) Where the top note of a perfect 4th is the same as the bottom note of a perfect 5th, the beat rate should be identical: e.g. $D\#^{31} - G\#^{36}$ 4th = $G\#^{36} - D\#^{43}$ 5th.

5) Where a perfect 4th and perfect 5th are on top of each other (i.e. either both share the same bottom note or the same top note) the fourth will be beating very slightly faster (as an approximation about a third more beats per second) than the fifth.

If you are not used to utilising checks 2) – 4), they may look a little complicated to remember. Actually they are quite simple. In each case the two intervals make up an octave. With the third/sixth checks, the minor interval is always at the bottom and the major one at the top. With the fourth/fifth check, since fourths beat faster than fifths, the fourth needs to be below the fifth (in a slower position) in order to equal the beat rate of the fifth.

While it is true that these checks are probably more use in octave tuning than in the scale, it is also the case that tuning the octaves exposes any weakness that may exist in the scale. So if, for example, you extend your scale from $D\#^{31}$ to $F\#^{46}$, then checks 2) – 4) will incorporate every note.

I never normally use a muting strip, preferring Papps wedges throughout. However, for my test I decided to use one for the scale once the piano was at the correct pitch to enable a fairly quick means of adjustment until I had the scale exactly where I wanted it. If you decide to do this, don't forget that you will need to recheck the scale after tuning the unisons.

Octaves

As in the case of the pitch note and the scale, never tune a single note without checking it with something else. If you try to tune octaves without any kind of check, you are bound to fail! In the region immediately above the scale, I usually find the fourth/fifth checks (items 4 & 5 mentioned previously) adequate, while the third/sixth checks (items 2 & 3) will very soon become too fast to be useful. Immediately below the scale, the reverse will be the case.

The higher into the treble, the greater the need for other checks, such as tenths and double octaves. Elevenths (octave plus a fourth) and twelfths (octave plus a fifth) are also useful. At the very top, try nineteenth (two octaves and a fourth), twentieth (two octaves and a fifth), and triple octaves. In each case, ensure that the beats from these intervals are gradually increasing in speed as you progress up the piano.

Be consistent. In one case when examining, we found the treble quite acceptable up to about one and a half octaves from the top, when everything went haywire; it appeared at that point that the candidate had either stopped checking, or had switched to different and less effective checks.

In another example, we found the top two single-octaves beating unacceptably quickly, while the double-octaves were not too bad. In this case, it appeared the candidate had sacrificed the single-octaves for the sake of the double-octaves. While it could be argued that it should be possible to get both single and double octaves accurate, it is also the case that sometimes compromises have to be made. On the piano in question, it was possible to bring the single-octaves into an much more acceptable condition, while

should leave the hammer butt at the correct angle such that the balance hammer is perfectly in line with the adjacent ones, and the shank and the butt is parallel to those next door. The hammer head should be perfectly in line with its neighbours both at the felt nose and at the wooden moulding closest to you. The angle of inclination (i.e. the sideways tilt to match the angle of the strings) should be identical to the hammers either side, and the head must also be parallel to them.

When you replace the hammer make sure there is no travel (i.e. sideways movement as it goes toward the strings) and if there is, correct it. The hammer should be lined up so that the strings sit nicely in the grooves in the nose when it is pushed up to them. If this means the hammer is not exactly between its neighbours, or does not strike the strings dead-middle because of faults within the action, the examiners will take account of that and not penalise you; but this is something else you could leave a note about if you want to be sure!

Replace a tape

One candidate dealt with this by stapling the broken ends of tape together and was annoyed when his work failed! The point here, and in all aspects of the test, is that we seek to see what you will do in *real life*. In this case, a broken tape will be so weak that a staple will not produce a permanent repair as the tape will simply break somewhere else. Note, the task is to **replace** a tape, not **repair** it!

Select the right tape. Do not use a tape with a round end if the rest are spear shaped, and vice versa. Make sure you leave the tape the correct length. If you are unsure, take off an adjacent hammer and measure that one (but see final comment in this section) and be sure to replace it accurately afterwards! It is

better to spend a minute in removing and replacing a second hammer than lose valuable points by guessing the length wrongly.

Whatever method you adopt to fit the tape to the hammer, it must be solid; the examiners will check to see if it can be pulled away. A fine, shallow slit cut into the back of the balance hammer into which the tape is glued, is quite acceptable.

Don't forget to regulate the tape tie-wire (both backwards/forwards and sideways). When finished, the wire should be level with its neighbours, and the lever should lift at the same time as the others when the half-blow rail is pushed forward. As with the hammer head, if the others are not consistent, then use your judgement and leave a note for the examiners.

Replace a hammer butt spring

These springs are either right or left-handed. Check on which side of the hammer butt the slot is off-set, and select the correct spring such that the hook end will be central in the butt.

There are various schools of thought: before fitting, the spring should be bent to an angle slightly greater than/ slightly less than/ exactly at 90°. The examiners are aware of this. What you cannot do is simply insert the spring straight from the packet – it will be far too strong.

The length should be such that when pressed down to the butt, the hook end almost reaches the top ends of the flange. This should ensure that: [1] the cord will not be catching the side of the butt and/or pulling the cord in an almost straight line from along the front of the flange (dia. a); [2] it will not be wrapping right around the ends of the flange (dia. b); [3] ideally the cord will be about 95° to the butt when the flange is parallel with the butt (dia. c).

flange, but since there is a law that if things can go wrong they will usually do so at the most inappropriate of times, it is advisable to be prepared to replace a bushing in case of an accident. Don't forget, if you need to rebush one side of a flange, then you need to rebush both sides! It is virtually impossible to get even friction on both sides of the flange with only one side rebushed.

While it is not unknown for a candidate to arrive with a portable hot-glue pot, the use of PVA glue is quite acceptable in the test. For the regulating, there should be enough paper washers under the keys for you to be able to regulate the key level and depth of touch, but there is no harm in having a selection of front and centre paper washers with you to be sure.

Decide the order in which you are going to work. The examiners will test the tuning of the new string and the solidarity of the hammer shank and tape, so these items should be undertaken first to give the maximum time for the string to stretch and the glue to set. The regulating is the one area that is a little open-ended. When I did the test, I decided to leave this until the end, so I knew how much time I had to spend on it and could pace the regulating accordingly.

Replace a string

This will be 'under the covers', so as the bridge and hitch pins will be under the bass strings have something with you that will hold them apart at the relevant point without causing damage. Be careful when gauging the wire; you do not want your work to be wasted by selecting the wrong size! Leave the broken wire with the piano and a note telling the examiners what gauge of wire you used.

Match the adjacent notes: [a] Make sure the wrest pin has the same number of

coils as the others. [b] Aim at leaving the Becket (the elbow that results from the wire coming out of the hole in the wrest pin and bending around it) in the same position as the others. [c] Be sure you leave the wrest pins level with those around them. If the surrounding pins are not consistent in any of these three points, then leave a note for the examiners informing them of what you chose to do.

Squeeze the Becket in as far as it will go. Pull the coils on the wrest pins tight together and make sure they are at 90° to the pin. Be sure you have the wire going along the correct path and do not allow any kinks to form. If there is listing between the strings, make sure the new wire is either under or over it in a way that matches the rest. Bed the wire down by the hitch and bridge pins and ensure the spacing is correct at the pressure bar.

Check the new wire is level with the old at the hammer strike-point by pushing the hammer on to the strings, raising the damper with the sustaining pedal and running your finger nail across the strings. If any of the strings speak, then they are not level. Correct either by pulling the new wire up or pushing it down (which ever is required) close to the pressure bar.

Tune the new strings very sharp and leave them like that until near the end of your two hours, when you should retune to the correct pitch (but don't forget to do it!). In this case, *sharp* is definitely better than *flat*.

Repair a broken shank

The shank almost certainly will be broken very close to the hammer head, so be prepared to drill the old one out at the *correct* (this is vital!) angle. Make sure you have the right size of shank and drill, and the examiners will be looking for a nice collar of glue at each end.

When the job is complete, the shank

still leaving the double-octaves reasonable.

In the bass, some of the faster beating intervals will also be useful, and right at the bottom, a minor ninth (an octave plus a semi-tone) or minor 14th (one octave and a minor 7th) produces a beat slow enough to use to compare adjacent notes. Also try seventeenths (two octaves and a third).

You will not want to use every one of these checks for each note as you tune it, although you should use at least two checks on every note you tune. But when your tuning is complete, or even at different stages (e.g. as you complete each octave), then running through all the available checks is highly recommended.

The examiners are aware of the problems of falseness and will check any doubtful unisons to see if this is the cause. But there is no reason why you should not make a note of any troublesome strings and leave it for them, if you want to make doubly sure. The pianos used for the tests are the best ones made available for us to use at the centre, and remember, previous candidates have passed their test using the piano on which you are working.

Stretch

There are different schools of thought regarding how much octaves should be stretched in order to produce the optimum tuning. The examiners are aware of this and will not penalise anyone if their preferred method does not agree with the candidate's. What the examiners are looking for is consistency (i.e. intervals that increase in speed evenly as one progresses up the piano) and a musical result. If the octaves in the treble or bass are stretched such that there is a very obvious beat, or an attempt to produce beatless octaves results in them sounding flat in the treble (or sharp in the bass),

then a pass mark may become impossible. However, if some of the tests I have suggested are used properly, both of these extremes should be avoided.

Stability

The examiners will give a selected number of notes a very hearty thump to see how solid the tuning is. That being the case, I would suggest that after you have tuned each note you should do the same to make sure it will not move. There is no point in producing a 'perfect' tuning, if it goes straight out when it is played. Try it in your daily tuning. If you regularly find notes going out as a result, you may need to reassess your tuning technique.

REPAIRS

Preparation

My old piano teacher, when preparing me for Associated Board Exams, used to say that scales are 'marks for free'. You can never be sure how difficult the aural tests and sight reading will be, and to a degree the pieces are a matter of personal interpretation. But with scales you know exactly what you have to do, and with thorough preparation you should be able to get a good mark (so why didn't I? ...Practise!).

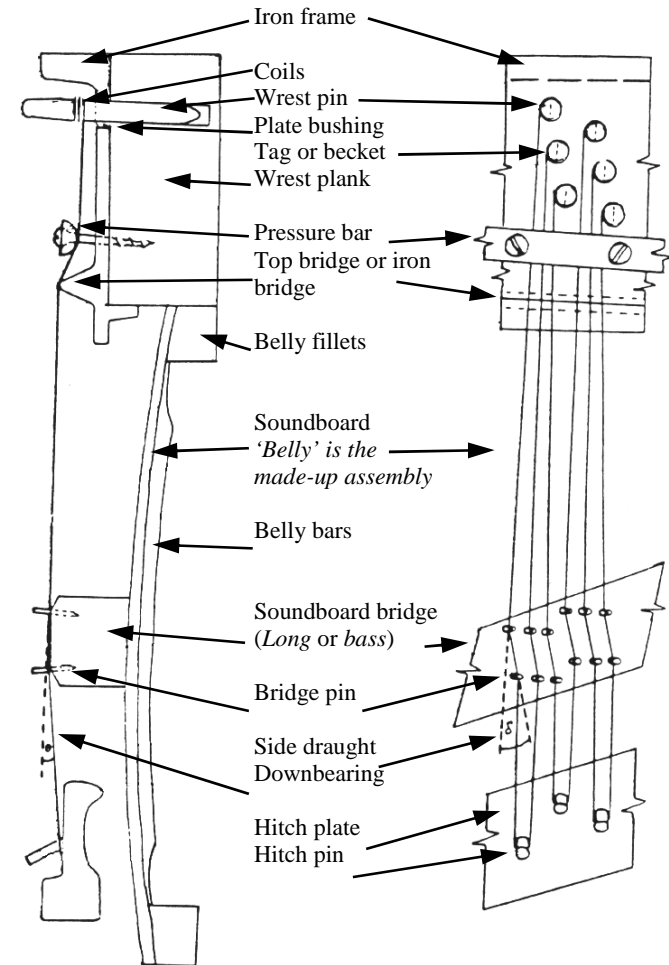
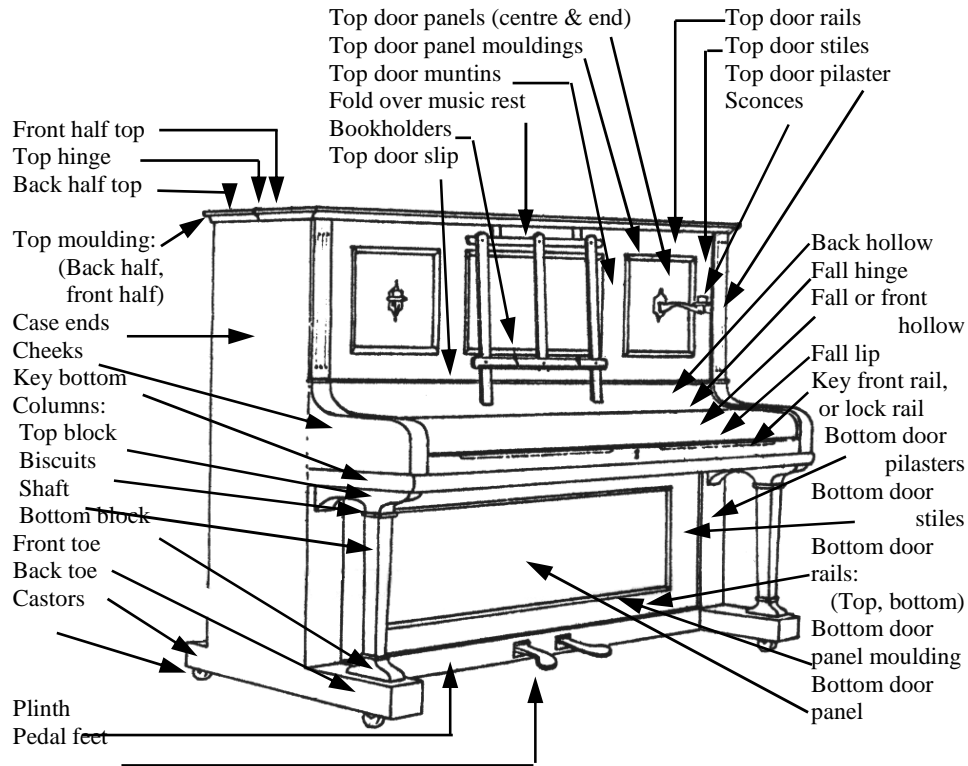
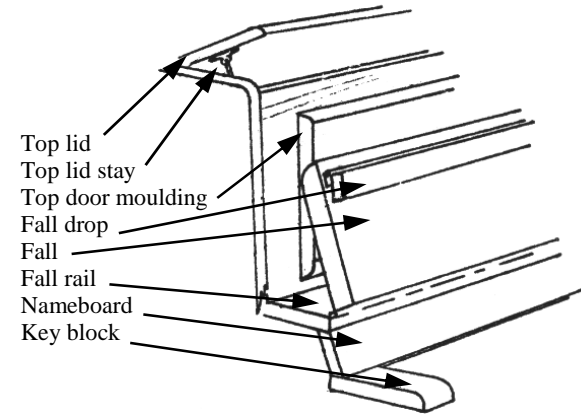
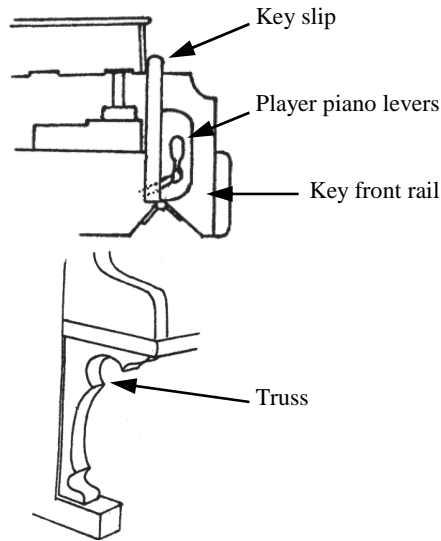
In the PTA test, the repairs section is like scales. You know exactly what you have to do, and as long as you are careful in how you do it, then if you are a competent, experienced tuner, a comfortable pass should be assured.

Wire for the broken string replacement will be provided, but otherwise you will be expected to have all the materials to undertake the repairs properly. So make sure you have a few of every type/size of hammer butt and damper spring, hammer shank, centre pin and tape.

You will not be expected to rebush a

The terms used on these two pages are those traditionally used within the British Piano Industry. In other countries, there will be variations; but people taking the PTA Membership test should be conversant with the terms shown here.

The illustrations are taken from charts produced by Ken Forrest and reproduced in PTA News 97.5



Pressure bar — return stringing system