

rae2008

Panel criteria and working methods

Panel F

- UOA 20 Pure Mathematics
- UOA 21 Applied Mathematics
- UOA 22 Statistics and Operational Research
- UOA 23 Computer Science and Informatics

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RAE 2008 Assessment criteria and working methods: Main Panel F and UOAs 20-23

To	Heads of HEFCE-funded higher education institutions Heads of HEFCW-funded higher education institutions Heads of SFC-funded higher education institutions Heads of universities in Northern Ireland
Of interest to those responsible for	Research assessment, Research policy, Planning
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Executive summary

Purpose

1. This document describes the criteria and working methods of the following main panel and unit of assessment (UOA) sub-panels in the 2008 Research Assessment Exercise (RAE2008):

- Main Panel F
- UOA 20 Pure Mathematics
- UOA 21 Applied Mathematics
- UOA 22 Statistics and Operational Research
- UOA 23 Computer Science and Informatics

Key points

2. These statements of criteria and working methods have been revised and finalised following a public consultation on earlier draft versions which we conducted over summer 2005. They take account of views expressed through the consultation by higher education institutions and their staff, subject associations and other stakeholder bodies.

3. The main and sub-panel statements of criteria and working methods should be read alongside both the generic statement in Section 2 and the guidance on data requirements for the 2008 RAE (RAE 03/2005 'Guidance on submissions').

Action required

4. This document is for information and guidance. No action is required.

Section 1: Introduction

5. Panels met to draft criteria and working methods in spring 2005. The UK higher education (HE) funding bodies invited comments on these drafts via a web-based consultation in summer 2005. The focus of the consultation was on aspects of the panels' criteria and working methods that the panels themselves could change, rather than on matters that had been fixed and published in other documents about the 2008 RAE (for example RAE 01/2004 'Initial decisions by the UK funding bodies', and RAE 01/2005 'Guidance to panels').

6. In autumn 2005, panels met to consider responses to the consultation and to finalise their criteria. A quantitative analysis of responses to the consultation and a summary of the generic issues that respondents raised is available on the RAE web-site at www.rae.ac.uk/pubs/

7. The purpose of publishing statements of criteria and working methods is to give higher education institutions (HEIs) information about how submissions will be assessed, in good time to assist with their planning. As with previous RAEs, the assessment process is based on expert review: each panel will use its professional judgement to form a view about the overall quality of the research activity described in each submission, taking account of all the evidence presented, against its published criteria and in line with its published working methods. Results for each submission will be published in the form of a quality profile, which is described in Annex 1.

8. Section 2 of this document contains a generic statement on the criteria and working methods (hereafter referred to as 'the generic statement') that all panels will adopt. Section 3 contains the specific criteria and working methods of one main panel and the sub-panels for the units of assessment (UOAs) that it covers. Main and sub-panel criteria and working methods must be read alongside the generic statement in Section 2.

9. Panels' criteria and working methods should be read in conjunction with the guidance to HEIs on the data requirements for the 2008 RAE (see RAE 03/2005 'Guidance on submissions'). The latter explains the purpose of the RAE and the principles underpinning it, the role of main and

sub-panels, and the data they will use to make assessments, and gives other details on the context in which the panels' criteria and working methods may be understood.

10. In this document, 'panels' is used to mean both main panels and sub-panels. Where we refer exclusively to main panels or to sub-panels, we identify them as such.

Enquiries

11. Enquiries should be addressed to the RAE team (info@rae.ac.uk or tel 0117 931 7267) and should be routed wherever possible through each HEI's designated RAE contact.

Section 2: Generic statement on criteria and working methods

Definitions

12. For the purposes of the RAE, and throughout the panels' criteria and working methods, the following definitions apply:

- a. **Assessment period** means the period from 1 January 2001 to 31 July 2007. The research described in submissions, including data about research students and research income and the textual commentary, must relate to this period.
- b. **Census date** means the date determining the affiliation of research-active staff to a particular institution. Staff may be submitted in the RAE by the institution that employs them on this date (or, in the case of Category C staff, by the institution that is the focus of their research), regardless of previous or forthcoming changes in their employment status. The census date is 31 October 2007.
- c. **Department** means the staff included in a submission to one of the 67 UOAs recognised by the RAE, and, by extension, their work and the structures which support it. RAE departments are often not identified with a single administrative unit within an HEI, or in the case of joint submissions, across HEIs.
- d. **Early career researchers.** These are individuals of any age who first entered the academic profession on employment terms that qualified them for submission to RAE2008 as Category A staff on or after 1 August 2003.
- e. **FTE** means full-time equivalent:
 - i. For staff, it refers to the extent of a member of staff's contracted duties as compared to those of a typical full-time member of staff in the same category. The length of time in the year for which the individual was employed and the relative proportion of total contracted time spent on research are irrelevant in reporting staff FTEs. The minimum contracted FTE that may be reported for Category A staff is 0.2.

- ii. For students, it refers to the amount of study undertaken in the year of programme of study, compared to a full-time student with the same qualification aim studying for a full year.

FTEs should be expressed to two decimal places, as for example 0.67.

- f. **Publication period** means the period during which research outputs must be placed in the public domain (or in the case of confidential outputs, lodged with the sponsor) if they are to qualify for assessment in RAE2008. The publication period runs from 1 January 2001 to 31 December 2007 for all UOAs.
- g. **Returned** refers to any data included in any of the RAE submission forms RA0 to RA5c.
- h. **Selected staff** refers to the named staff included in RAE submissions by HEIs, in accordance with their own internal code of practice on preparing submissions and selecting staff for inclusion. Other staff may be eligible for inclusion (that is, they may satisfy the data definitions and requirements), but HEIs are not required to include all their eligible staff. Further information, and guidance from the Equality Challenge Unit on preparing a code of practice, is given in Annex G of RAE 03/2005 'Guidance on submissions'.
- i. **Submission** means a complete set of forms RA0 to RA5c returned by an HEI in any of the 67 UOAs.
- j. **UOA** means one of the 67 subject units of assessment defined for the 2008 RAE, which are listed in Annex 2.

13. The definition of research for the 2008 RAE is at Annex 3. Research outputs and research income may be included in submissions, provided that the work they embody or fund meets this definition. Consultancy income and research outputs arising from consultancy contracts should normally be excluded, since consultancy is usually concerned with applying existing knowledge. However, they may be included if the work undertaken or published as a result meets the

RAE definition of research, irrespective of the nature of the contract or invoicing arrangement.

Content of submissions

14. Each submission will contain the core data detailed in sub-paragraphs 14a to 14i below. (The RA code in brackets refers to the research assessment form through which the data will be collected.) For detailed definitions of the data required in each RA form, see RAE 03/2005 'Guidance on submissions'.

- a. Overall staff summary (RA0): summary information on research-active staff selected (FTE and headcount) and related academic support staff (FTE) in the unit of assessment. The data collection software will populate some of RA0 using the data that HEIs enter in RA1.
- b. Research-active individuals (RA1): detailed information on individuals selected by the institution for inclusion as research active.
- c. Research output (RA2): up to four items (or fewer if designated for particular reasons in UOA criteria) of research output produced during the publication period (1 January 2001 to 31 December 2007) by each individual named as research active and in post on the census date (31 October 2007).
- d. Research students (RA3a): numbers of full-time and part-time postgraduate research students and degrees awarded.
- e. Research studentships (RA3b): numbers of postgraduate research studentships and the source of funding for them.
- f. External research income (RA4): amounts and sources of external funding.
- g. Textual description (RA5a): including information about the research environment and indicators of esteem.
- h. Individual staff circumstances (RA5b).
- i. Category C staff circumstances (RA5c).

15. In line with recommendations from the Roberts' Review of research assessment, some panels request that HEIs detail in RA5a further

specific, quantitative information that will contribute to the assessment of the research environment. Such additional information requirements are specified in the relevant panels' criteria statements.

16. The word limits for RA5a, RA5b and RA5c are given in Annex 6.

Categories of research-active individual

17. The definitions of staff Categories A to D are:

- a. **Category A.** Academic staff in post and on the payroll of the submitting institution on the census date. Eligible Category A academic staff must be employed under a contract of employment with the HEI on the census date. Their contract must list research and/or teaching as their primary function.
- b. **Category B.** Academic staff who held a contract with the institution after 1 January 2001 and who left the institution (or transferred into a department returned to a different UOA) after that date and before the census date, and who otherwise would have been eligible for inclusion as Category A.
- c. **Category C.** Independent investigators active in research who do not meet the definition for Category A staff, but whose research on the census date is clearly and demonstrably focused in the department that returns them.
- d. **Category D.** Independent investigators who met the definition for Category C staff during the period 1 January 2001 to 31 October 2007 but not on the census date.

For detailed definitions, please refer to Part 3, Section 1 of RAE 03/2005 'Guidance on submissions'.

Unit of assessment description

18. Each of the sub-panels' criteria statements contains a description of the UOA and of its boundaries with other UOAs. The description indicates the main areas covered by the UOA and is not intended to give an exhaustive account of the sub-disciplinary coverage. HEIs should refer

to the UOA descriptions when deciding in which UOAs to make submissions.

Assessment process

19. This is an expert review exercise. Sub-panel members will exercise their knowledge, judgement and expertise to reach a collective view on the quality profile of research described in each submission, that is the proportion of work in each submission that is judged to reach each of five quality levels from 4* to Unclassified (see Annex 1). The definition of each level relies on a conception of quality (world-leading) which is the absolute standard of quality in each UOA. Each submission will be assessed against absolute standards and will not be ranked against other submissions.

20. The five quality levels from 4* to Unclassified apply to all UOAs. Some panel criteria statements include a descriptive account of the quality level definitions, to inform their subject communities on how they will apply each level in judging quality. These descriptive accounts should be read alongside, but do not replace, the standard definitions.

21. In reaching a view on quality profiles, sub-panels will take account of all components of a submission: research output, research students and studentships, research income, and research environment and esteem indicators. An underpinning principle is that sub-panels should assess each submission in the round: they will not make collective judgements about the contributions of individual researchers, but about a range of indicators relating to the unit, research group or department that is put forward for assessment.

22. Each sub-panel will recommend provisional quality profiles for debate and endorsement by its main panel. Sub-panels must be able to demonstrate in all cases how their quality judgements relate to all the evidence before them and to their published criteria. The quality profile they recommend for any submission must reflect the sub-panel's expert and informed view of the characteristics of that submission as a whole.

23. In all cases, submissions will be assessed against the criteria for the UOA in which the submission was originally made. Responsibility for recommending a quality profile lies with the sub-panel for that UOA, regardless of whether the sub-panel sought advice on aspects of the submission from specialist advisers or other sub-panels (see paragraphs 52-55 below).

24. Although they reflect a common framework, the assessment criteria and working methods of each main panel and each sub-panel differ in varying degrees across the different UOAs. However, in general, sub-panels grouped under the same main panel have developed criteria that reflect broadly similar approaches to research. Aspects of significant variation, for example where research approaches vary substantially between subjects, are described in the relevant main panel criteria statement.

Joint submissions

25. Joint submissions to one UOA by two or more UK HEIs, of research they have developed or undertaken collaboratively, are encouraged where this is the most appropriate way of describing the research. For further details on joint submissions, please refer to paragraphs 52-56 of RAE 03/2005 'Guidance on submissions'. Panels will receive joint submissions as a unified entity, and will assess them in the same way as submissions from single institutions.

Research outputs

26. Submissions should list up to four items of research output by each submitted researcher, but there is no automatic disadvantage in failing to cite four items. Sub-panels will look at each case. The criteria statements offer further guidance on their respective approaches in cases where fewer than four items are listed. Staff citing no research outputs would not usually be considered as research active and should not be submitted to the exercise.

27. HEIs are allowed to list the maximum of four outputs against any researcher, irrespective of their status or the length of time they have had to conduct research. So, for example, four outputs

may be listed against part-time researchers or against individuals whose time for research has been constrained by their ill health – even if the panel's criteria indicate that the panel would not necessarily expect to see four items listed.

28. We have deliberately defined research output broadly: any form of publicly available, assessable output embodying research as defined for the RAE may be submitted, as may confidential outputs that are not publicly available. Where an output is published as a single coherent work it should be submitted as such and not subdivided for submission as two or more separate items.

29. Where a cited research output includes significant material that was previously published separately (for example, an article reissued as a chapter in a book):

- a. If both outputs were published within the publication period and both are cited, the panel may judge that these should be treated as a single output.
- b. If the earlier output was first published outside the publication period, the panel may take the view that not all of the work reported in the later output should be considered as having been issued within the publication period.
- c. In either of the above cases, the publication history should be appropriately noted in the 'Other relevant details' field in RA2, explaining where necessary how far any work published earlier may have been revised to incorporate new findings.

30. In the case of confidential outputs, HEIs must have the prior permission of the person(s) or organisation(s) to whom the work is confidential for the output to be made available for assessment (see paragraph 33).

31. Panels' criteria for judging the quality of research outputs are intended to be sufficiently broad to enable them to recognise high quality research outcomes in all forms of research – whether basic, strategic, applied, practice-based or interdisciplinary. In addition to printed academic work, research outputs may include, but are not

limited to: new materials, devices, images, products and buildings; intellectual property, whether in patents or other forms; performances, exhibits or events; work published in non-print media. Each sub-panel's criteria statement gives further guidance. In some cases, sub-panels may ask for brief supplementary material describing the research content and significance of certain works, particularly where research outputs do not exist in a conventional form.

32. Panels' criteria statements reflect an underpinning principle of the RAE that all forms of research output will be assessed on a fair and equal basis. Sub-panels will neither rank outputs, nor regard any particular form of output as of greater or lesser quality than another *per se*. Some panels may specify in their criteria that where they do not examine an output in detail, they may use, as one measure of quality, evidence that the output has already been reviewed or refereed by experts (who may include users of the research), and has been judged to embody research of high quality. No panel will use journal impact factors as a proxy measure for assessing quality.

33. So that panels can take full account of research that is of relevance to non-academic users, including industry and public bodies, the RAE team has made provision for confidential research outputs that are not publicly available to be submitted for assessment. These could include commercially sensitive research reports for companies, and reports for government departments or agencies which are not in the public domain. Where a confidential output is listed in a submission, the HEI will be responsible for securing permission from the sponsor, and making the output available on request for panels to examine. Please refer to paragraph 98 of RAE 03/2005 'Guidance on submissions' for further information.

Minimum proportions of work examined in detail

34. It is not expected that sub-panels will examine in detail all the research outputs cited. Each sub-panel must, however, examine in detail

a proportion which, in its opinion, is sufficient to make an informed judgement on the quality profile of the work presented. Sub-panels indicate in their criteria statements how they will decide what work to examine in detail, and their approach to assessing work that is not examined in detail.

35. Each sub-panel indicates the minimum proportion of research outputs which it will examine in detail. This is a collective responsibility, not a requirement for each sub-panel member. The phrase 'examine in detail' indicates reading in full, reading substantially from or sufficiently to make an informed assessment, or (for outputs which by their nature cannot be read) an equivalent level of scrutiny. Sub-panel members are not required to re-examine work which they have already examined in detail outside the RAE process as part of their normal academic work. They may include such work in the minimum proportion that they report as having examined in detail. Where 'virtually all' is the phrase used to describe the proportion to be examined in detail, this means 90% or more. Where a sub-panel indicates that it intends to examine in detail all the submitted outputs, the only constraints on fulfilling this intention would be those outside the sub-panel's control, for example, if a fire were to destroy, before the sub-panel was able to assess it, an original artefact listed as an output.

36. Where a sub-panel does not examine a research output in detail, it may use information contained in RA2 in assessing it. Therefore, it is essential that HEIs adhere strictly to the specification that some sub-panels have supplied in their criteria statement for the field in RA2 entitled 'Other relevant details'.

37. For research outputs produced in languages other than English or Welsh, a 300 word abstract in English is required describing the content and nature of the work. A separate field for each output in RA2 will be available for this. Panels will use this abstract to identify appropriate specialist advisers to whom the work may be referred. The abstracts themselves will not form the basis for assessment. This requirement is

waived for outputs submitted in any of UOAs 51 to 57 if the output is produced in any of the languages in the remit of that UOA.

Staffing issues

38. HEIs are invited to use RA5b to describe, confidentially, any circumstances of individual staff that have significantly adversely affected their contribution to the submission. Main and sub-panels' statements describe how they will apply their criteria in assessing the contribution of such staff to submissions. HEIs need not describe circumstances (for example, a disability) that have had no adverse effect on an individual's capacity to undertake research, as reflected by their contribution to the submission.

39. Panels will consider the following individual circumstances to the extent that they are stated to have had a material impact on the individual's ability to produce the expected volume of research outputs in the assessment period:

- a. Family and domestic matters, including:
 - i. Absence on maternity, paternity, parental or adoption leave and arrangements on return to work following these periods of leave.
 - ii. Part-time working or other flexible working arrangements.
 - iii. Time spent acting as a carer or other domestic commitments.
- b. Disability, ill-health and injury, including:
 - i. Any disability to which the Disability Discrimination Act 1995 applies, including both permanent disabilities and any temporary disability with a duration of 12 months or more.
 - ii. Absence from work on the advice of a registered medical practitioner.
- c. Engagement on long-term projects of significant scale and scope.
- d. Status as an early career researcher. These are individuals of any age who first entered the academic profession on employment terms that qualified them for submission to

RAE2008 as Category A staff on or after 1 August 2003.

- e. Prolonged absences (absences for more than six months consecutively in the assessment period) which were agreed by the individual with the institution but which do not fall into one of the categories above. They include:
 - i. Secondment to non-academic positions outside the higher education sector.
 - ii. Career breaks for purposes unconnected with research, teaching or other academic duties.
- f. Other absences which the institution is legally obliged to permit, such as absences for religious observance or absence arising out of involvement as a representative of the workforce.
- g. Any other personal circumstances which are considered to have had a significant impact on an individual's ability to produce the expected volume of research outputs in the assessment period.

40. Other circumstances comparable with the examples in paragraph 39 will be considered, as long as an explanation is provided as to the way in which they are said to have impacted on the individual's ability to produce the expected volume of research outputs.

41. Panels will review the information provided regarding individual circumstances. They will determine whether those circumstances can reasonably be considered to have affected the individual's ability to produce the expected volume of research outputs and, if so, whether and to what extent they will reduce the volume requirement in respect of that individual.

42. While guidance is given below on the information to be provided by HEIs in respect of individual circumstances, it is for the panel to decide the extent of any reduction in the volume requirement.

43. Information about individual circumstances of Category A or C staff should be submitted in RA5b. HEIs must provide the panel with

sufficient information regarding the individual circumstances to enable them to assess the extent of the impact of those circumstances on the individual's research capability. This will normally include:

- a. A broad description of the nature of the circumstances (eg, ill-health, maternity leave).
- b. The timing of circumstances, ie, when they occurred.
- c. The duration of the circumstances.
- d. The extent of the impact of the circumstances on the individual's ability to carry out research activities (eg, impossible to carry out research at all, roughly 50% reduction in time available).

44. As indicated above, an outline description of the nature of the circumstances must be given. This is required so that the panel can ensure that it treats similar situations in a consistent manner. However, personal details such as the precise diagnosis of medical problems need not be given, as long as the HEI explains clearly the nature of the impact on the individual's research capability. It is for the HEI to satisfy itself that the relevant circumstances exist or have existed and that the impact is as described. The panel will seek further information about individual circumstances where it feels unable to make a decision on the basis of the information provided.

45. All information submitted in RA5b will be kept confidential by the RAE team and by the panel members, who are subject to confidentiality undertakings in respect of all information contained in submissions. It will be used only for the purposes of assessing the RAE submission in which it is contained, will not be published at any time and will be destroyed on completion of the RAE.

46. It is the responsibility of the HEI to ensure that the information in RA5b is submitted in compliance with the Data Protection Act 1998 and all other legal obligations.

47. Panels will use the information supplied confidentially in RA5b in assessing submissions against their published criteria. Panels will not

take account of circumstances that may be known to them, but which are not referenced in submissions.

48. In the case of part-time working, HEIs must include an entry in RA5b if they wish a sub-panel to consider this as a mitigating factor for a researcher citing fewer than four outputs.

49. Academic and academic-related duties which might be expected for any staff member working in a UK HEI, including teaching and administration, are not regarded as an explanation in themselves for listing fewer than four items of research output against an individual.

50. The work of Category C staff will not be given less weight purely because the basis of their relationship with the institution is different from that of Category A staff. However, panels may reasonably form a view as to the extent and value of the contribution made by individuals listed in Category C in the light of evidence available.

51. For each individual returned as Category C, HEIs must provide information in RA5c demonstrating that their research is clearly and demonstrably focused in the department that returns them. Sub-panels' criteria statements give examples of the types of evidence to be supplied in each case. If a sub-panel is not convinced by the evidence provided for a Category C staff individual, it may take account of this in assessing that individual's contribution to the research of the department.

Interdisciplinary research: arrangements for cross-referral and specialist advice

52. In view of concerns that the assessment of interdisciplinary research has presented challenges in previous RAEs (see paragraph 12 of RAE 01/2004 'Initial decisions by the UK funding bodies'), panels will continue to have access to mechanisms for cross-referring parts of submissions. There will also be enhanced arrangements for using specialist advisers to ensure that interdisciplinary research is assessed by those competent to do so.

53. An HEI may request that parts of submissions it makes to one UOA are cross-referred to other relevant sub-panels. The RAE team will consider all such requests but will not be bound by them. 'Parts of submissions' may range from all the research output listed against a submitted researcher, to all the research output and textual commentary relating to one or more research groups. HEIs may not request cross-referral of either entire submissions, or single outputs, although sub-panels may refer single outputs to specialist advisers (see paragraph 55).

54. Sub-panels may also request cross-referral of parts of submissions on the same grounds, even where submitting HEIs have not done so. In all cases, whether requested by a sub-panel or an HEI, the RAE manager will consider the request, and take advice from the relevant main and sub-panel chairs. Where it is thought that cross-referral will enhance the assessment process, the relevant parts will be cross-referred to all the sub-panels concerned. Although advice will be sought only on the quality of the cross-referred parts, the entire submission will be made available to the receiving panel so that it can judge the cross-referred part in context. Advice from other sub-panels on cross-referred parts will be sought and given on the basis of the assessment criteria for the UOA to which the work was originally submitted. The sub-panel for the UOA to which the work was originally submitted will retain responsibility for recommending the quality profile awarded.

55. Sub-panels may request that parts of submissions, including but not limited to interdisciplinary research, are referred to specialist advisers where they believe this will enhance the assessment process. This includes where HEIs identify single or multiple research outputs as being outcomes of interdisciplinary research. The RAE team has a database of individuals who were nominated as specialist advisers through the process described in RAE 03/2004 'Units of assessment and recruitment of panel members'.

Assessment of applied research and practice-based research

56. As we indicated in RAE 01/2004 'Initial decisions by the UK funding bodies', we have striven to ensure that the panel membership comprises individuals who have experience in conducting, managing and assessing high quality research; as well as experts who are well equipped to participate in the assessment of applied research and practice-based research from a practitioner, business or other user perspective.

57. Panels will treat on an equal footing excellence in research across the spectrum of applied research, practice-based and basic/strategic research, wherever that research is conducted. Panel criteria encompass a range of indicators of excellence that are sufficiently broad to enable them to recognise the distinctive characteristics of applied research and practice-based research, and to ensure that they apply their quality benchmarks equitably. The panel criteria statements detail how they will assess a broad range of research, including applied research relevant to users in industry, commerce and the public sector. Certain main panels could reasonably expect submissions to cite evidence of applied research or practice-based research, and these panels have defined in their criteria statements a brief typology and appropriate criteria by which the sub-panels will assess such research.

Assessment of pedagogic research

58. Submission of pedagogic research is encouraged where it meets the definition of research for the RAE at Annex 3. Pedagogic research pertaining to sectors other than higher education (for example, pre-school, compulsory education, or lifelong learning) falls squarely within the remit of UOA 45 (Education). We anticipate that submissions substantially comprising research on pedagogy in these sectors would normally be submitted to UOA 45, but see also paragraph 61 below. Higher education pedagogic research is also within the remit of UOA 45. However, in view of the arrangements described in paragraph 61, HEIs need not artificially disaggregate relatively small bodies of

subject-specific higher education pedagogic research from their submissions to other UOAs.

59. The RAE team has consulted the Higher Education Academy to provide a more descriptive account of higher education pedagogic research that HEIs may find helpful in preparing submissions (see paragraph 60).

60. Pedagogic research in HE will be assessed where it meets the definition of research for the RAE. It is research which enhances theoretical and/or conceptual understanding of:

- teaching and learning processes in HE
- teacher and learner experiences in HE
- the environment or contexts in which teaching and learning in HE take place
- teaching and learning outcomes in HE
- the relationships between these processes, outcomes and contexts.

Reports of studies providing descriptive and anecdotal accounts of teaching developments and evaluations do not constitute pedagogic research. Pedagogic research is firmly situated in its relevant literature, and high quality pedagogic research makes a substantial contribution to that literature.

61. In all cases pedagogic research will be assessed by experienced and expert reviewers. Some panels have appointed as panel members one or more experts in higher education pedagogy; others consider research in higher education pedagogy to be within the collective expertise of their membership. In some main panel areas, for example engineering (Main Panel G) and in the medical and related panels (Main Panels A and B), pedagogic research will be cross-referred to a specific member or members of one of the sub-panels. However, as with any other body of research where it considers that seeking external advice will enhance the assessment process, a sub-panel may also refer some pedagogic material to specialist advisers or to the Education sub-panel for advice. We expect that panel members and specialist advisers involved in the assessment of pedagogic research will co-ordinate their activity to ensure consistency of approach in its treatment.

Dealing with declarations of interest and confidentiality

62. All main and sub-panel members, panel secretaries, and specialist advisers have declared any major interests they have in HEIs eligible to participate in the RAE. A 'major interest' is one that could be deemed material to their participation in assessing the submission from that HEI. They will not participate in assessing a submission from any HEI in which they have declared such an interest, and will be required to withdraw from any panel meeting during discussion of that submission. Major interests will be continually updated and a register of interests will be maintained by the RAE manager.

63. The guidance to panels on declaring and dealing with major interests is at Annex 4. How each panel will implement this guidance is described in its criteria statement. Minor interests (for example supervision of doctoral students registered at, or co-holding of grants held at, submitting institutions) will not be kept on the register, but panels will declare, minute and handle them on a case-by-case basis.

64. All main and sub-panel members, panel secretaries, and specialist advisers are bound by a duty of confidentiality governing information contained in RAE submissions and panel discussions. Details are at Annex 5.

Section 3: Criteria and working methods

Main Panel F

Covers the following UOAs:

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Absences of chair and declaration of interests

1. Panel members will not take responsibility for assessing any part of a submission from an institution in which they have declared a major interest, and they will leave the room when the submission is discussed.
2. Members will declare any minor interests in advance, and the chair may decide that they should not take lead or sole responsibility for assessing the submission, or should leave the room.
3. A deputy chair has been appointed and will be responsible for chairing the meeting when the chair is absent. If both the chair and deputy chair are required to leave the room for discussion of a particular submission, a temporary chair will be appointed.

How the main panel will work with its sub-panels

4. Sub-panels are responsible for:
 - a. Preparing draft statements of relevant criteria and working methods.
 - b. Making recommendations to main panels on the quality profiles to be awarded for each submission.
5. Main panels are responsible for:
 - a. Reviewing and endorsing the criteria and working methods to be used by the sub-panels.
 - b. Deciding on the quality profile to be awarded to each submission, following recommendations from the sub-panels.
 - c. Maintaining a good level of communication and joint working with the other main panels.
6. Within Main Panel F, the main and sub-panels will work collaboratively. Sub-panel criteria and recommendations on quality profiles will be developed through a process of iterative dialogue. The sub-panels will provide sufficient information to the main panel to allow it to take decisions on the award of quality profiles.

7. The chair will review all agendas, papers and minutes of sub-panel meetings, and will raise any areas of concern with the relevant sub-panel chair, and also promote areas of best practice to other sub-panel chairs.

Consistency of quality levels

8. All sub-panels will consider research income and research student data as contributing to the profile for the research environment. All sub-panels will adopt a consistent weighting of the components of the final quality profile, as follows:

- research outputs – 70%
- research environment – 20%
- esteem indicators – 10%.

9. These figures represent a consensus between the four sub-panels.

10. Prominence has been given to research outputs over research environment and esteem indicators to reflect the panel's view that the quality of output is more responsive to change in the department; more evenly distributed with respect to age; more capable of objective assessment; and reflects the community's expressed confidence in discipline-based peer review.

Methods for ensuring consistency

11. At an early stage in the assessment process there will be an initial assessment of a small number of submissions so that sub-panels can quickly embed themselves in working practices and develop a common approach and common interpretation of quality levels. The main panel chair will attend all these meetings.

12. The main panel chair will attend at least one meeting of each sub-panel, and the panel secretary and assistant secretary will encourage the consistent application of common criteria and raise any concerns with the main panel chair immediately.

Elements of variation in the criteria statements

13. Sub-panel 23 expects to examine in detail at least 25% of the research outputs in each submission. The other sub-panels expect to

examine in detail at least 50% of the research outputs in each submission. Sub-panel 23 expects a significantly higher volume of submissions, and the proportion of outputs to be examined in detail has been set with the intention of equalising workloads across all sub-panels.

14. The variation in sub-panels' working methods and treatment of the repeated listing of the same co-authored outputs in a department's submission reflect the different research and publication practices in the different disciplines.

Range of indicators of excellence

Research outputs

15. In assessing excellence, the sub-panels will look for originality, innovation, significance, depth, rigour, influence on the discipline and wider fields, and relevance to users. The panels will not use

a rigid or formulaic method of assessing research quality. They will not use a formal ranked list of outlets, nor impact factors, nor will they use citation indices in a formulaic way.

Research environment

16. In assessing excellence, the panels will consider the following (where relevant):

- a. The overall vitality of the research environment, as exemplified by, for example:
 - the leadership of research
 - an active seminar programme and flow of visiting researchers
 - international and industrial collaboration
 - contribution to the public awareness and understanding of science
 - the hosting of conferences, workshops and summer schools
 - the availability of general research support funds
 - the impact of the research, including academic impact and, if appropriate, impact upon wealth creation and the quality of life

- the range and nature of knowledge transfer activities (including spin-outs, licences, consultancy, regional development activities)
 - administrative research support available.
- b. Research students, research studentships and research degrees awarded.
- c. Research income.
- d. Research groups – membership, activities and achievements.
- e. The nature and quality of research infrastructure (including library and computing facilities, and facilities for research students).
- f. The management, training and supervision of research students.
- g. The department's staffing policy, including:
- the extent to which researchers are nurtured at all stages of their career
 - the contribution of early career researchers
 - arrangements for integrating newly recruited staff and staff in Category C into the department
 - arrangements for research leave
 - numbers of research staff
 - how any change of staff has been managed and how it has affected the strength, coherence and research culture of the department.
- h. Sustainability and a viable strategy for the future.
- i. Arrangements for supporting collaborative and interdisciplinary research.
- j. Relationship with research users.
- k. The added value of the environment immediately outside the department.
17. The relative importance each sub-panel will place on the above aspects of the research environment will vary; departments should refer to the guidance provided in the criteria and working methods for each sub-panel.

18. The panels do not expect departments to provide information on the detailed organisation and management structure of the department.

19. Departments should ensure that they provide clear evidence for the claims that they make about their research environment.

Esteem indicators

20. In assessing excellence, the sub-panels will consider indicators of peer esteem and national and international recognition that relate to the staff submitted and were gained in the assessment period. The sub-panels will expect to see a range of esteem indicators, distributed across the department's staff, appropriate to the size and staffing profile of the department.

21. These may include the following:

- awards, prizes, honours and named lectures
- keynote and plenary addresses at conferences
- significant professional service
- editorial roles
- membership of national and international strategic advisory bodies
- personal research awards and election to fellowships
- conference organisation.

22. Esteem indicators that relate to the whole department or research area may also be provided where appropriate.

23. In assessing the quality of esteem indicators the panels will take into account the career stage of the individual.

Applied and interdisciplinary research

24. Applied research is research that makes a substantive contribution to another domain, based on the knowledge, methods and research of the core discipline. The outputs of applied research include software, patents and/or licences, experimental instrumentation and devices, other artefacts, and publications in any discipline or professional journal. Characteristics of excellence in applied research include original methodology, innovative application, impact in the applied field,

uptake in the applied field, feedback to the core discipline, and evidence of synergy between the applied field and the core discipline. The sub-panel recognises that there can be outstanding innovation and originality in solving practical problems, including applied research which is relevant to the needs of commerce, industry and public bodies.

25. The main panel recognises that, in addition to applied research defined above, there is practice-based research in computer science and informatics.

A definition of this is provided in paragraph 25 of the criteria and working methods of Sub-panel 23.

26. Interdisciplinary research is research that brings together methods and perspectives from a number of disciplines. This may involve working with experts from other disciplinary backgrounds, the use of methods and techniques drawn from a number of disciplines, or the development of new interdisciplinary approaches. The outputs of interdisciplinary research include publications, software, patents and/or licences, experimental instrumentation and devices, and other artefacts. Excellence in interdisciplinary research is characterised by originality of the contribution, the rigour of the interdisciplinary approach and techniques used, and the significance of the work to the constituent disciplines involved.

27. The sub-panels welcome the submission of interdisciplinary research. Early in the assessment phase the sub-panels will identify outputs on which they require specialist advice or cross-referral. The advice of external advisers will be used to inform the sub-panels' assessment. Where cross-referrals are within the sub-panels of the main panel they will be requested from and facilitated by the main panel. Other cross-referrals will be requested from and facilitated by the RAE team.

Individual staff circumstances

28. In assessing submissions, all sub-panels will take account of individual staff circumstances disclosed by departments in relation to the categories listed in paragraph 39 of the generic statement.

29. Departments should use RA5b to provide information on individual staff circumstances and their impact on the individual's research, with reference to the principles outlined in each sub-panel's criteria and working methods.

30. Early career researchers are individuals of any age who first entered the academic profession on employment terms that qualified them for submission to the RAE 2008 as Category A staff on or after 1 August 2003. The sub-panel encourages departments to submit early career researchers, even if their volume of output is limited. The sub-panel expects to see a clear statement on how such staff contribute to and are supported by the research environment. Early career researchers may submit up to four outputs.

31. Where individuals who are new to academic research but who have an established research portfolio from an earlier career as post-doctoral researchers or in industry or overseas are included, the sub-panel would normally expect four outputs to be submitted.

Panel observers

32. Panel observers will sit on the main panel. Their role in the assessment process will be a passive one; they will not offer opinion on the quality of research activity submitted. Their role will be to provide any information that the panels may request (eg, on the competitiveness or operation of particular research grant and fellowship competitions) to allow the panels to verify assertions made in submissions.

Discipline-specific matters

33. The sub-panels do not expect to refer to the research strategies outlined in RAE2001 submissions. They acknowledge that circumstances change over time, and will seek to recognise excellence in research whether or not it was part of the department's strategy in 2001.

34. The sub-panels encourage departments to submit staff in multi-discipline departments to the most appropriate UOA for their research. The sub-panels recognise the concerns of departments in presenting the research environment where only a small number of staff are research-active in a particular UOA. In assessing the research environment the sub-panels will take account of the environment in the wider department, and encourage departments to provide this information.

This statement should be read alongside the statement for Main Panel F and the generic statement.

Absences of chair and declaration of interests

1. Sub-panel members will not take responsibility for assessing any part of a submission from an institution in which they have declared a major interest, and they will leave the room when the submission is discussed.
2. Members will declare any minor interests in advance, and the chair may decide that they should not take lead or other responsibility for assessing the submission, or should leave the room.
3. A deputy chair has been appointed who will be responsible for chairing the meeting when the chair is absent. If both the chair and deputy chair are required to leave the room for discussion of a particular submission, a temporary chair will be appointed.

UOA descriptor

4. The UOA includes, but is not restricted to, algebra, analysis, category theory, combinatorics, computational complexity, dynamical systems, geometry, mathematical logic, number theory, ordinary differential equations, operator theory and operator algebras, partial differential equations, probability, stochastic analysis and topology.

UOA boundaries

5. The sub-panel expects to receive submissions from all areas of pure mathematics, as listed above, but also to receive some submissions from, eg, mathematical physics and the history of mathematics.
6. The sub-panel anticipates that it may receive referrals from, and make them to, other sub-panels including: Biological Sciences (UOA 14), Physics (UOA 19), Applied Mathematics (UOA 21), Statistics and Operational Research (UOA 22), Computer Science and Informatics (UOA 23), Education (UOA 45) and History (UOA 62).
7. The sub-panel will take specialist advice in the following circumstances:
 - a. For submissions or outputs in any areas for which the sub-panel does not have the required expertise.

- b. To assist with the review of submissions or outputs where sub-panel members have declared a major interest.
- c. In other cases where, in the professional judgement of the sub-panel, it would be of assistance in reaching decisions.
8. Specialist advisers will be asked to consider the submission or output with reference to the criteria of UOA 20.
9. The advice of specialist advisers or members of other sub-panels to whom aspects of a submission have been cross-referred will be used where necessary to inform the sub-panel's recommended quality profile for a submission.

Research staff

10. The sub-panel will treat staff in Categories C and D in the same ways as staff in Categories A and B, respectively, provided it is satisfied that such staff have (or, in the case of staff in Category D, have had) a genuine close relationship with the department. Evidence of the contribution of Category C staff to the research environment and the extent of their relationship with the department should be provided in RA5c. Such evidence might include the use of a department's address on publications, supervision or co-supervision of research students, membership of a research group, or acting as principal or co-investigator on a research project.
11. The contribution of staff in Categories B and D will be used only in the assessment of research environment and esteem indicators.
12. In the assessment of newly recruited staff, the sub-panel will consider their research output in the same way as for others. However, departments should be aware that these individuals' contribution to the research environment can only be assessed from the date of their appointment.
13. The sub-panel encourages departments to submit early career researchers even if their volume of output is limited.

UOA 20, Pure Mathematics

Research outputs

14. All forms of research output will be treated equally. The sub-panel expects to receive outputs in both traditional and electronic formats, and in any of a number of forms including books, papers, software and output published in non-print media.

15. As far as possible, the sub-panel will examine all research outputs, and expects to examine in detail at least 50% of the research outputs in each submission. Sub-panel members will use their professional judgement to select which outputs to examine in detail (detailed examination may not be required where, for example, sub-panel members have prior knowledge of the output, or where the output has been recognised by a prestigious prize or award).

16. Departments should list a maximum of four outputs per individual submitted for assessment. The sub-panel expects that each individual submitted will normally list four outputs. If fewer than four outputs are listed by an individual an explanation should be provided in RA5b. Reasons for listing fewer than four outputs will be dealt with on a case by case basis. Where there is no reasonable justification, in the sub-panel's view, for listing fewer than four outputs the sub-panel will allocate the Unclassified quality level to the missing output(s).

17. The sub-panel may make allowances for the listing of fewer than four outputs in cases where individual staff circumstances such as those listed at paragraph 39 of the generic statement are cited.

18. The sub-panel recognises that special circumstances may occur in combination and will be responsive to a reasoned case in RA5b based on the following principles:

- each individual submitted for assessment must submit at least one output
- one item of output is expected for each 21 months of full-time equivalent work during the publication period in a Category A post (or similar post outside the UK HE sector).

19. In assessing the quality of research outputs the sub-panel will consider originality, innovation,

significance, depth, rigour, influence on the discipline and wider fields, and, where appropriate, relevance to users. The sub-panel will not use a rigid or formulaic method of assessing research quality. It will not use a formal ranked list of outlets, nor impact factors, nor will it use citation indices in a formulaic way.

20. The sub-panel expects that most outputs listed will have been through a rigorous refereeing process and will take account of this in assessing quality.

21. Any teaching materials listed that embody original research will be evaluated in the same way as other research outputs.

22. The sub-panel may use advisers who are specialists in the field of mathematics education in the assessment of research in higher education pedagogy.

23. The following information should be provided in no more than 300 words in the 'Other relevant details' field in RA2 where appropriate:

- a. The research content of teaching materials, survey articles, software and other non-traditional outputs.
- b. The original research contained in research monographs and books.
- c. Whether and where an output which is in the public domain and which is as yet unpublished has been refereed and accepted in final form for publication.

24. The sub-panel does not expect the 'Other relevant details' field to be used for any other purpose except in exceptional circumstances.

25. It is expected that an individual who declares a co-authored output will have made a substantial contribution to it. Co-authored outputs will carry full weight in the assessment of the submission's research quality, but the repeated listing of the same co-authored output by more than one individual in a department should be avoided. Where repeated listing occurs the repeated output will count only once in the calculation of the quality profile.

Research environment

Research students and research studentships

26. The sub-panel will consider research students and research studentships as contributing to the profile for the research environment.

27. The sub-panel will take account of the standard analyses provided. In addition the sub-panel will request the number of doctoral degrees awarded per research-active staff member.

28. The source of studentships will not carry weight.

Research income

29. The sub-panel will consider research income as contributing to the profile for the research environment.

30. The sub-panel will take account of the standard analyses provided. The amounts and sources of external funding will not be used formulaically. The sub-panel recognises that many pure mathematicians do outstanding work without applying for external research support.

Research structure

31. Departments should provide information on the following (where relevant):

- a. Research activities and achievements (including the structure of research groups if relevant).
- b. Mechanisms and practices for promoting research and nurturing, sustaining and developing an active and vital research culture.
- c. Nature and quality of research infrastructure and facilities.
- d. The management, training and supervision of, and facilities for, research students.
- e. Arrangements for supporting interdisciplinary and collaborative research.
- f. Relationships with research users.

32. In making their submissions, departments should refer to the categories listed in paragraph 16 of the main panel statement.

33. The sub-panel does not expect institutions to provide information on the detailed organisation and management structure of the department.

34. Departments should ensure that they provide clear evidence for the claims that they make about their research environment.

Staffing policy

35. Departments should provide information on their staffing policy using the following sections:

- a. Arrangements for developing and supporting staff in their research.
- b. Arrangements for developing and supporting the research of early career researchers and for integrating them into a wider, supportive research culture.
- c. Arrangements for developing the research of newly recruited staff (who are not early career researchers) and Category C staff and integrating them into the department.
- d. A statement on how any change of staff has been managed and how it has affected the strength, coherence and research culture of the department at the census date.

Research strategy

36. Departments should provide a brief statement on their main research activities and objectives for the next five years, and evidence of the department's sustainability and vitality.

Esteem indicators

37. Departments should list indicators of peer esteem and national and international recognition that relate to the staff submitted and were gained in the assessment period. The sub-panel will expect to see a range of esteem indicators, distributed across the department's staff, appropriate to the size and staffing profile of the department.

38. Esteem indicators that relate to the whole department or research area may also be provided where appropriate.

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39. The maximum number of esteem indicators that may be listed is twice the number (ie, headcount) of Category A and C staff submitted for assessment, plus the number (ie, headcount) of Category B and D staff. Leaving aside indicators attributable to the department or research groups, no more than four esteem indicators may be listed by each member of Category A and C staff and no more than two by each member of Category B and D staff.

40. Esteem indicators should, where appropriate, be grouped by individual and may include the following:

- awards, fellowships, prizes, honours and named lectures
- invitations to give keynote and plenary addresses at conferences
- significant professional service (eg, service on international review panels, learned societies, editorial boards)
- major research grants
- conference organisation.

41. In assessing the quality of esteem indicators the sub-panel will take into account the career stage of the individual.

Applied research

42. Applied research is research that makes a substantive contribution to another domain, based on the knowledge, methods and research of the core discipline. The outputs of applied research include software, patents and/or licences, experimental instrumentation and devices, other artefacts, and publications in any discipline or professional journal. Characteristics of excellence in applied research include original methodology, innovative application, impact in the applied field, uptake in the applied field, feedback to the core discipline and evidence of synergy between the applied field and the core discipline. The sub-panel recognises that there can be outstanding innovation and originality in solving practical problems, including applied research which is relevant to the needs of commerce, industry and public bodies.

Individual staff circumstances

43. In assessing submissions, the sub-panel will take account of individual staff circumstances disclosed by departments in relation to the categories listed in paragraph 39 of the generic statement.

44. Departments should use RA5b to provide information on individual staff circumstances and their impact on the individual's research.

45. Early career researchers are individuals of any age who first entered the academic profession on employment terms that qualified them for submission to RAE2008 as Category A staff on or after 1 August 2003. The sub-panel encourages departments to submit early career researchers, even if their volume of output is limited. The sub-panel expects to see a clear statement on how such staff contribute to and are supported by the research environment. Early career researchers may submit up to four outputs.

46. Where individuals who are new to academic research but who have an established research portfolio from an earlier career as post-doctoral researchers or in industry or overseas are included, the sub-panel would normally expect four outputs to be submitted.

Working methods

47. The assessment will be one of peer review based on professional judgement.

48. The overall process for reaching decisions will be iterative; each submission will be considered in detail more than once during the assessment process.

49. Before the first meeting in the assessment phase, sub-panel members will familiarise themselves with all submissions and identify those outputs within their fields of expertise. The chair will undertake an initial assignment of submissions and outputs to sub-panel members.

50. At the first meeting the sub-panel will:

- a. Identify submissions or outputs for which specialist advice or cross-referral are required.
- b. Allocate each submission to at least two sub-panel members, one of whom will be

UOA 20, Pure Mathematics

nominated as lead assessor, who will consider the submission as a whole in preparation for future meetings.

- c. Assign each output to two sub-panel members, one of whom will be nominated as lead assessor. These assignments will be made in a way appropriate to the expertise of individual sub-panel members. Usually the outputs of each individual will be assigned to the same sub-panel members. They will select which outputs to examine in detail with reference to the section on research outputs.

51. Cross-referrals received from other sub-panels will be considered by the most appropriate member(s) of the sub-panel, who will provide comments to assist the referring UOA in making its assessment.

52. External advice (from specialist advisers or other sub-panels) may be used to inform the sub-panel's assessment of interdisciplinary work.

53. Joint submissions will be assessed in the same way as submissions from single institutions.

54. The determination of the overall quality profile to be recommended to the main panel will be decided at the second and subsequent meetings. Initially the sub-panel will consider research outputs, then research environment and esteem indicators.

55. It is anticipated that the final quality profile recommended for each submission will be agreed by consensus after full discussion, with recourse to voting only as a last resort.

Research outputs

56. This component will be weighted as 70% of the overall quality profile.

57. The whole sub-panel will discuss the initial assessment by the assigned sub-panel members.

58. Each output will be awarded a quality level. In calculating the quality profile the total number of outputs (on which the proportion of outputs in each quality level will be based) will comprise the number of outputs listed in the submission, plus any missing outputs awarded an Unclassified quality level.

59. World-leading quality within the UOA will be calibrated through the initial exercise involving all the sub-panels in Main Panel F.

60. In assessing research outputs the sub-panel will interpret the quality levels within the profile as follows:

- a. To be awarded a 4* quality level a research output must exhibit high levels of originality, innovation and depth, and must have had, or in the view of the sub-panel be likely to have, a significant impact on the development of its field.
- b. To be awarded a 3* quality level a research output must exhibit high levels of originality, and must have had, or in the view of the sub-panel be likely to have, a clear impact on the development of its field.
- c. To be awarded a 2* quality level a research output must exhibit clear originality, and must have had, or in the view of the sub-panel be likely to have, an impact on the development of its field.
- d. To be awarded a 1* quality level a research output must make an original and useful contribution to its field but is unlikely to have more than a minor impact.

61. In the descriptions of quality levels above, the term 'field' includes theoretical, methodological, applied, practical and interdisciplinary work.

Research environment

62. This component will be weighted as 20% of the overall quality profile.

63. The quality profile for the research environment will be calculated by assessing the quality of each of the following elements:

- research students and research studentships
- research income
- research structure
- staffing policy
- research strategy
- sustainability and vitality.

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64. Sustainability and vitality will be assessed on the basis of the whole submission and will be considered the most important element of the research environment, and may be used by the sub-panel as a means of moderating the final quality profile for the research environment.

Esteem indicators

65. This component will be weighted as 10% of the overall quality profile.

66. The quality profile for esteem will be calculated in a similar way to that for research outputs. Each esteem indicator listed will be awarded a quality level. If the number of indicators listed is less than the maximum permitted for the department/submission, the missing indicators will be assigned an Unclassified quality level.

67. Esteem indicators that the sub-panel considers to be 4* could include:

- election to the Royal Society or a foreign academy in the assessment period
- receipt of a major prize
- the invitation to give a lecture at an international congress (for example International Congress of Mathematicians, European Congress of Mathematics)
- the award of a prestigious fellowship in the assessment period.

68. For each submission, discussion will be led by the sub-panel members assigned to that submission at the first meeting. However, the formation of the quality profile for each component will take full account of the views of the whole sub-panel, and be informed by any external advice provided.

69. The three proposed profiles for outputs, environment and esteem will be developed independently. Using the agreed weightings and rounding method, the sub-panel will then combine the three profiles to develop the overall quality profile for the submission. The sub-panel will finally confirm that, in its collective expert judgement, the overall profile recommended to the main panel is a fair reflection of the research activity in that submission, and that the assessment has taken account of all the different components of the submission.

Additional information requested

70. Institutions may wish to provide information (in RA5) on any difficulties of fit between their departmental structure and UOA boundaries, and other UOAs to which related work has been submitted.

This statement should be read alongside the statement for Main Panel F and the generic statement.

Absences of chair and declaration of interests

1. Sub-panel members will not take responsibility for assessing any part of a submission from an institution in which they have declared a major interest, and they will leave the room when the submission is discussed.
2. Members will declare any minor interests in advance, and the chair may decide that they should not take lead or other responsibility for assessing the submission, or should leave the room.
3. A deputy chair has been appointed who will be responsible for chairing the meeting when the chair is absent. If both the chair and deputy chair are required to leave the room for discussion of a particular submission, a temporary chair will be appointed.

UOA descriptor

4. The UOA includes the development of, the analysis of, and the solution or approximate solution of problems arising from mathematical models of phenomena in physical and biological sciences, engineering, industry and finance, or any other area outside mathematics, and the development and application of mathematical theories and techniques that further these objectives. Associated experimental and computational studies are included.

UOA boundaries

5. The sub-panel expects to receive submissions from all areas of applied mathematics listed in paragraph 4 above.
6. There are overlaps between applied mathematics and:
 - all the application areas referred to in paragraph 4 above
 - pure mathematics and other branches of mathematics and physics
 - computer science
 - statistics and operational research.
7. The sub-panel expects to receive submissions from applied mathematicians or theoretical physicists who work in departments, schools

or divisions of mathematics, and from any others who are regarded primarily as applied mathematicians. It anticipates that theoretical physicists who work in physics departments will be submitted to UOA 19, Physics. The sub-panel will welcome outputs of an interdisciplinary nature in which mathematics plays a significant role. Pedagogic and historical research in mathematics is included in this sub-panel's remit.

8. In the case of submissions that span the boundary between applied mathematics and another UOA, and for which the sub-panel does not believe itself to have adequate expertise, it will seek external advice from another sub-panel or a specialist adviser, who will be asked to use the criteria of this sub-panel. The sub-panel may also ask for specialist advice on a submission or output where the sub-panel member with appropriate expertise has declared a major interest. The advice of specialist advisers will be used to inform the sub-panel's assessment and recommended quality profile for a submission.

Research staff

9. The sub-panel will treat staff in Categories C and D in the same ways as staff in Categories A and B, respectively, provided it is satisfied that such staff have (or, in the case of staff in Category D, have had) a genuine close relationship with the department. Evidence of the contribution of Category C staff to the research environment and the extent of their relationship with the department should be provided in RA5c. Such evidence might include the use of a department's address on publications, supervision or co-supervision of research students, membership of a research group, or acting as principal or co-investigator on a research project.

10. The contribution of staff in Categories B and D will be used only in the assessment of research environment and esteem indicators.

11. In the assessment of newly recruited staff, the sub-panel will consider their research output in the same way as for others. However, departments should be aware that these individuals' contribution to the research environment can only be assessed from the date of their appointment.

UOA 21, Applied Mathematics

12. The sub-panel encourages departments to submit early career researchers even if their volume of output is limited.

Research outputs

13. All forms of research output will be treated equally. The sub-panel expects that the majority of research outputs submitted will take the form of original research papers in refereed journals or proceedings (including electronic journals); it expects also to see major review articles, research monographs and other forms of research output. If other forms of research output (eg, software, patents) are submitted, departments should provide an explanation of the research content in up to 300 words in the 'Other relevant details' field in RA2. The sub-panel does not expect the field to be used for any other purpose except in exceptional circumstances.

14. Departments should list a maximum of four outputs per individual submitted for assessment. The sub-panel expects that each individual submitted will normally list four outputs. If fewer outputs are submitted an explanation should be provided in RA5b. Reasons for listing fewer than four outputs will be dealt with on a case by case basis. Where there is no reasonable justification, in the sub-panel's view, for listing fewer than four outputs the sub-panel will allocate the Unclassified quality level to the missing outputs.

15. The sub-panel may make allowances for the listing of fewer than four outputs in cases where individual staff circumstances such as those listed at paragraph 39 of the generic statement are cited.

16. The sub-panel recognises that special circumstances may occur in combination and will be responsive to a reasoned case in RA5b based on the following principles:

- each individual submitted for assessment must submit at least one output
- one item of output is expected for each 21 months of full-time equivalent work during the publication period in a Category A post (or similar post outside the UK HE sector).

17. It is expected that an individual who declares a co-authored output will have made a substantial

contribution to it. Co-authored outputs will carry full weight in the assessment of the submission's research quality, but the repeated listing of the same co-authored output by more than one individual in a department should be avoided. Where repeated listing occurs the repeated output will count only once in the calculation of the quality profile.

18. As far as possible, the sub-panel will examine all research outputs, and expects to examine in detail at least 50% of the research outputs in each submission. Sub-panel members will use their professional judgement to select which outputs to examine in detail (detailed examination may not be required where, for example, sub-panel members have prior knowledge of the output, or where the output has been recognised by a prestigious prize or award).

19. In assessing excellence, the sub-panel will look for originality, innovation, significance, depth, rigour, influence on the discipline and wider fields and, where appropriate, relevance to users. In assessing publications the sub-panel will use the criteria in normal use for acceptance by internationally recognised journals. The sub-panel will not use a rigid or formulaic method of assessing research quality. It will not use a formal ranked list of outlets, nor impact factors, nor will it use citation indices in a formulaic way.

20. The sub-panel will use its professional judgement (and external advice if necessary) to assess pedagogic and historical research, or teaching material embodying research outcomes, in mathematics.

Research environment

Research students and research studentships

21. The sub-panel will consider research students and research studentships as contributing to the profile for research environment.

22. The sub-panel will take account of the standard analyses provided. The sub-panel will also request the following, which will be treated as the main indicators in the assessment of the success of a department's research student programme:

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- the number of doctoral degrees awarded against the total number of students
 - the number of doctoral degrees awarded per research-active staff member.
23. The sources of research studentships will not carry weight.

Research income

24. The sub-panel will consider research income as contributing to the profile for the research environment. The sub-panel will take account of the standard analyses provided. The amounts and sources of external funding will not be used formulaically; the sub-panel recognises that differing funding opportunities exist for different sub-areas. The sub-panel also recognises that some high quality research is not accompanied by external support. The sub-panel expects that particular successes in the acquisition of research grants will be noted under esteem indicators.

Research structure

25. Institutions should provide information on the following (where relevant):
- research groups – membership, activities and achievements
 - the leadership of research
 - arrangements for supporting collaborative and interdisciplinary research
 - the management, training and supervision of, and facilities for, research students
 - appropriate accommodation and facilities, including library, hardware and software
 - an active seminar programme and flow of visiting researchers
 - good relationships with research users
 - the hosting of conferences and summer schools
 - the availability of general research support funds.
26. In assessing the research environment the sub-panel will consider the breadth of research activity of the department, and the success of funded projects in generating further grants and activities.
27. The sub-panel does not expect departments to provide information on the detailed organisation and management structure of the department.

28. Departments should ensure that they provide clear evidence for the claims that they make about their research environment.

Staffing policy

29. Departments should provide information on the following:
- the extent to which researchers at all stages of their career are nurtured
 - arrangements for research leave
 - the contribution of early career researchers
 - how staff changes have affected the strength, coherence and research culture of the department at the census date.

Research strategy

30. Departments should provide a brief statement on their main research activities and objectives for the next five years, and evidence of the department's sustainability and vitality.

Esteem indicators

31. Departments should list indicators of peer esteem and national and international recognition that relate to the staff submitted and were gained in the assessment period. The sub-panel expects to see a range of esteem indicators, distributed across the department's staff, appropriate to the size and staffing profile of the department.
32. The following esteem indicators should be grouped by individual:
- awards, fellowships, prizes, honours and named lectures
 - invitations to give keynote, plenary and other significant addresses at conferences
 - significant professional service, including to industry
 - editorial roles
 - major research grants
 - conference organisation
 - other.
33. Where appropriate, esteem indicators that relate to a research group or department may also be provided.

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34. The maximum number of esteem indicators that may be listed is twice the number (ie, headcount) of Category A and C staff submitted for assessment, plus the number (ie, headcount) of Category B and D staff. Leaving aside indicators attributable to the department or research groups, no more than four esteem indicators may be listed by each member of Category A and C staff and no more than two by each member of Category B and D staff.

35. In assessing the quality of esteem indicators the sub-panel will take into account the career stage of the individual. For example, seminar invitations within the UK might be a meaningful esteem indicator for an early career researcher.

Applied research

36. Applied research is research that makes a substantive contribution to another domain, based on the knowledge, methods and research of the core discipline. The outputs of applied research include software, patents and/or licences, experimental instrumentation and devices, other artefacts, and publications in any discipline or professional journal. Characteristics of excellence in applied research include original methodology, innovative application, impact in the applied field, uptake in the applied field, feedback to the core discipline, and evidence of synergy between the applied field and the core discipline. The sub-panel recognises that there can be outstanding innovation and originality in solving practical problems, including applied research which is relevant to the needs of commerce, industry and public bodies.

Individual staff circumstances

37. In assessing submissions, the sub-panel will take account of individual staff circumstances disclosed by departments in relation to the categories listed in paragraph 39 of the generic statement.

38. Departments should use RA5b to provide information on individual staff circumstances and their impact on the individual's research.

39. Early career researchers are individuals of any age who first entered the academic profession on

employment terms that qualified them for submission to RAE2008 as Category A staff on or after 1 August 2003. The sub-panel encourages departments to submit early career researchers, even if their volume of output is limited. The sub-panel expects to see a clear statement on how such staff contribute to and are supported by the research environment. Early career researchers may submit up to four outputs.

40. Where individuals who are new to academic research but who have an established research portfolio from an earlier career as post-doctoral researchers or in industry or overseas are included, the sub-panel would normally expect four outputs to be submitted.

Working methods

41. The assessment will be one of peer review based on professional judgement. The sub-panel will not use a formulaic approach to assessing the submissions.

42. The overall process for reaching decisions will be iterative, with each submission being considered more than once during that process.

43. Before the first meeting in the assessment phase, sub-panel members will familiarise themselves with all submissions and identify those outputs within their fields of expertise. The chair will undertake an initial assignment of submissions and outputs to sub-panel members.

44. At the first meeting the sub-panel will:

- a. Assign each submission to at least two sub-panel members, one of whom will be nominated as lead assessor, who will consider the submission as a whole in preparation for future meetings.
- b. Assign each output to two sub-panel members, one of whom will be nominated as lead assessor. These assignments will be made in a way appropriate to the expertise of individual sub-panel members. They will select which outputs to examine in detail with reference to the section on research outputs.

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- c. Identify submissions or outputs for which specialist advice or cross-referral are required, paying particularly close attention to applied research (see paragraph 36) and interdisciplinary research.
- d. Identify any requirements for additional information arising from ambiguities or apparent omissions in the submission.
45. Cross-referrals received from other panels will be considered by the most appropriate member(s) of the sub-panel, who will provide comments to assist the referring UOA in making its assessment.
46. Joint submissions will be assessed in the same way as submissions from single institutions.
47. After the outputs have been individually assessed, the whole sub-panel will discuss each component of each submission, which will lead to the assignment of preliminary quality profiles for each component. When assigning profiles, departments of roughly comparable preliminary profiles will be grouped together for discussion to maintain consistency. Each submission will be assessed on its individual merits. The sub-panel members assigned to each submission will lead the discussion of each component of the quality profile.
48. It is anticipated that the final quality profile recommended for each submission will be agreed by consensus after full discussion, with recourse to voting only as a last resort.

Research outputs

49. This component will be weighted as 70% of the overall quality profile.
50. In calculating the quality profile for research outputs, each output will be awarded a quality level. Where possible the two sub-panel members to whom each output is assigned will agree an initial quality level before it is discussed at the sub-panel meeting. Missing outputs will count as Unclassified. Co-authored outputs listed by more than one individual in a department's submission will count only once towards the quality profile.
51. Formulaic definitions of national or international significance or excellence will not be applied, and the sub-panel members will use their

professional judgement to make decisions in the context of the overall RAE 2008 definitions of 4*, 3*, 2*, 1* and Unclassified.

52. In assessing research outputs the sub panel will interpret the quality levels within the profile as follows:

- a. To be awarded a 4* quality level a research output must exhibit high levels of originality, innovation and depth, and must have had, or in the view of the sub-panel be likely to have, a significant impact on the development of its field.
- b. To be awarded a 3* quality level a research output must exhibit high levels of originality, and must have had, or in the view of the sub-panel be likely to have, a clear impact on the development of its field.
- c. To be awarded a 2* quality level a research output must exhibit clear originality, and must have had, or in the view of the sub-panel be likely to have, an impact on the development of its field.
- d. To be awarded a 1* quality level a research output must make an original and useful contribution to its field but is unlikely to have more than a minor impact.

53. In the descriptions of quality levels above, the term 'field' includes theoretical, methodological, applied, practical and interdisciplinary work.

Research environment

54. This component will be weighted as 20% of the overall quality profile.
55. The quality profile for research environment will be calculated by awarding a quality level to each of the following:
- research students and research studentships
 - research income
 - research structure
 - staffing policy
 - research strategy
 - sustainability and vitality.

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56. Of these, sustainability and vitality, assessed on the basis of the whole submission, will be the most important factor.

Esteem indicators

57. This component will be weighted as 10% of the overall quality profile.

58. In calculating the quality profile for esteem each indicator will be awarded a quality level. If the total number of indicators listed is less than the maximum permitted, the missing indicators will be assigned an Unclassified quality level.

59. Examples of esteem indicators that the sub-panel considers to be 4* might include:

- election to the Royal Society or a foreign academy
- receipt of a major prize
- the invitation to give a plenary lecture at a major international conference (eg, International Congress of Mathematicians, International Congress for Industrial and Applied Mathematics, International Congress of Theoretical and Applied Mechanics, Annual Strings Conference)
- the award of a prestigious fellowship.

60. The three proposed profiles for outputs, environment and esteem will be developed independently. Using the agreed weightings and rounding method, the sub-panel will then combine the three profiles to develop the overall quality profile for the submission. The sub-panel will finally confirm that, in its collective expert judgement, the overall profile recommended to the main panel is a fair reflection of the research activity in that submission, and that the assessment has taken account of all the different components of the submission.

Additional information requested

61. Institutions may wish to provide information in RA5 on any difficulties of fit between their departmental structure and UOA boundaries, and other UOAs to which related work has been submitted.

This statement should be read alongside the statement for Main Panel F and the generic statement.

Absences of chair and declaration of interests

1. Sub-panel members will not take responsibility for assessing any part of a submission from an institution in which they have declared a major interest, and they will leave the room when the submission is discussed.
2. Members will declare any minor interests in advance, and the chair may decide that they should not take lead or other responsibility for assessing the submission, or should leave the room.
3. A deputy chair has been appointed who will be responsible for chairing the meeting when the chair is absent. If both the chair and deputy chair are required to leave the room for discussion of a particular submission, a temporary chair will be appointed.

UOA descriptor

4. The UOA includes methodological, applied and theoretical research in statistics, probability and the more mathematical aspects of operational research.

UOA boundaries

5. The sub-panel expects to receive submissions in areas such as statistical methods, mathematical statistics, applied probability, probability theory, operational research, biostatistics, social statistics, and applications in biology and other sciences, finance, government, health and social sciences, industry and commerce, medicine, and other fields.
6. The sub-panel welcomes the submission of applied research to which statistics, probability or operational research has made a substantive contribution. The sub-panel recognises that good research in areas covered by this sub-panel is often found in journals specialising in other subject areas.
7. There are overlaps with areas covered by other panels and sub-panels. Research whose focus is business and management would be more appropriately submitted to UOA 36, and economics and econometrics to UOA 34.
8. Actuarial science and demography may fall within this or another UOA. Specialist advice will be sought on submissions, or parts of submissions relating to these areas.

9. If the sub-panel does not believe itself sufficiently expert to judge a submission, either because it spans the boundary with another UOA, or because the sub-panel member with appropriate expertise has declared a relevant major interest, another sub-panel or a specialist adviser will be asked to provide external advice, using the criteria of this sub-panel. This external advice will be used to inform the sub-panel's assessment and recommended quality profile for a submission.

Research staff

10. The sub-panel will treat staff in Categories C and D in the same ways as staff in Categories A and B, respectively, provided it is satisfied that such staff have (or, in the case of staff in Category D, have had) a genuine close relationship with the department. Evidence of the contribution of Category C staff to the research environment, and the extent of their relationship with the department, should be provided in RA5c. Such evidence might include the use of a department's address on publications, supervision or co-supervision of research students, membership of a research group, or acting as principal or co-investigator on a research project.
11. The contribution of staff in Categories B and D will be used only in the assessment of research environment and esteem indicators.
12. In the assessment of newly recruited staff, the sub-panel will consider their research output in the same way as for others. However, departments should be aware that these individuals' contribution to the research environment can only be assessed from the date of their appointment.
13. The sub-panel encourages departments to submit early career researchers even if their volume of output is limited.

Research outputs

14. All forms of research output will be treated equally. The sub-panel expects to receive a majority of research outputs in the form of original research papers in refereed journals (including electronic journals); it also expects to see major review articles, research books and monographs, substantial software packages and other forms of research output.

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15. Departments should list a maximum of four outputs per individual submitted for assessment. The sub-panel expects that each individual submitted will normally list four outputs. If fewer outputs are submitted an explanation should be provided in RA5b. Reasons for listing fewer than four outputs will be dealt with on a case by case basis. Where there is no reasonable justification, in the sub-panel's view, for listing fewer than four outputs the sub-panel will allocate an Unclassified quality level to the missing outputs.

16. The sub-panel may make allowances for the listing of fewer than four outputs in cases where individual staff circumstances such as those listed in paragraph 39 of the generic statement are cited.

17. The sub-panel recognises that special circumstances may occur in combination and will be responsive to a reasoned case in RA5b based on the following principles:

- each individual submitted for assessment must submit at least one output
- one item of output is expected for each 21 months of full-time equivalent work during the publication period in a Category A post (or similar post outside the UK HE sector)
- no allowance will be made for administrative and teaching loads such as could reasonably be expected of staff in any UK higher education institution.

18. As far as possible, the sub-panel will examine all research outputs. It expects to examine in detail at least 50% of the research outputs in each submission, and will examine in detail at least one output listed by each individual submitted for assessment. Sub-panel members will use their professional judgement to select which outputs to examine in detail. In deciding where detailed examination need not take place, sub-panel members will take into consideration any prior knowledge of the research output itself, or of the rigour of the refereeing process which the output has undergone.

19. In assessing the quality of research outputs the sub-panel will consider originality, innovation, significance, depth, rigour, influence on the

discipline and wider fields, and, where appropriate, relevance to users. When considering the influence on wider fields and relevance to users, a broad view will be taken, including not only other academic fields, but also knowledge and practice in all the application areas indicated in the UOA boundaries. The sub-panel will not use a rigid or formulaic method of assessing research quality. It will not use a formal ranked list of outlets, nor impact factors, nor will it use citation indices in a formulaic way.

20. Any teaching materials and textbooks listed that embody original research outcomes will be evaluated in the same way as other research outputs.

21. The sub-panel may use specialist advisers in the assessment of research in higher education pedagogy.

22. The following information should be provided in no more than 300 words in the 'Other relevant details' field in RA2 where appropriate:

- a. The research content and impact of teaching materials, textbooks, survey articles, software and other non-traditional outputs.
- b. The original research contained in research monographs and books and book chapters.
- c. The status of any output accepted in final form for publication in a refereed journal, but declared as being published in some other way.

23. The sub-panel does not expect the 'Other relevant details' field to be used for any other purpose except in exceptional circumstances.

24. The sub-panel recognises that collaborative research is a standard way of working in the UOA and encourages the submission of such work. It is expected that the author who declares a piece of co-authored work will have made a substantial contribution to it. Co-authored outputs will carry full weight in the assessment of the submission's research quality, but the repeated listing of the same co-authored output by more than one individual in a department should be avoided. Where repeated listing occurs the repeated output will count only once in the calculation of the quality profile.

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Research environment**Research students and research studentships**

25. The sub-panel will consider research students as contributing to the profile for the research environment, and will take account of the standard analyses provided. The sub-panel will place particular emphasis on the number of students and of doctorates awarded, taking into account the number of research active staff. The sources of studentships will not carry weight.

Research income

26. The sub-panel will consider research income as contributing to the profile for the research environment. The sub-panel will take account of the standard analyses provided. The sub-panel notes that excellent research is often carried out without external grant income.

27. In assessing sources of research income the sub-panel will use its professional judgement, with attention paid to the strength of the competition and the quality of the science required for success, as well as the potentially different ways of obtaining support in methodological, theoretical and applied research.

Research structure

28. Departments should provide information on the mechanisms and practices for promoting research and sustaining and developing an active and vital research culture using the following sections:

- a. Research groups – membership, activities and achievements (if relevant).
- b. Nature and quality of research infrastructure (including library and computing facilities).
- c. The management, training and supervision of, and facilities for, research students.
- d. Contribution of research staff and academic visitors to the environment of the department.
- e. Arrangements for supporting collaborative and interdisciplinary research.
- f. Relationships with research users (where applicable).

g. Details of any conferences, workshops and summer schools organised within the department.

29. The sub-panel does not expect departments to provide information on the detailed organisation and management structure of the department.

30. Departments should ensure that they provide clear evidence for the claims that they make about their research environment.

Staffing policy

31. Departments should provide information on their staffing policy using the following sections:

- a. Arrangements for developing and supporting staff, including early career researchers and newly recruited staff, in their research.
- b. Arrangements for integrating newly recruited staff and Category C staff into the department.
- c. A statement on how any change of staff has been managed and how it has affected the strength, coherence and research culture of the department at the census date.

Research strategy

32. Departments should submit a brief strategic statement on how they expect to see their main research activities developing over the next five years, and evidence of the department's sustainability and vitality.

Esteem indicators

33. Departments should list indicators of peer esteem and national and international recognition that relate to the department or its staff submitted, that were gained in the assessment period. The sub-panel will expect to see a range of esteem indicators, distributed across the department's staff, appropriate to the size and staffing profile of the department.

34. The maximum number of esteem indicators that may be listed is twice the number (ie, headcount) of Category A and C staff submitted for assessment, plus the number (ie, headcount) of Category B and D staff. Leaving aside indicators attributable to the department or research groups

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identified in the submission, no more than four esteem indicators may be listed by each member of Category A and C staff and no more than two by each member of Category B and D staff.

35. The following esteem indicators should be grouped by individual:

- awards, prizes, honours and named lectures
- keynote, plenary, and other invited addresses at conferences and workshops
- significant professional and editorial service
- conference organisation
- major research grants and fellowships
- marks of recognition relevant to industry, commerce and government, eg, directorships, consultancies, advisory roles and other significant collaborations
- other.

36. Where appropriate, esteem indicators that relate to a research group or department may also be provided.

37. In assessing the quality of esteem indicators the sub-panel will take into account the career stage of the individual.

Applied research

38. Applied research is research that makes a substantive contribution to another domain, based on the knowledge, methods and research of the core discipline. The outputs of applied research include software, patents and/or licences, experimental instrumentation and devices, other artefacts, and publications in any discipline or professional journal. Characteristics of excellence in applied research include original methodology, innovative application, impact in the applied field, uptake in the applied field, feedback to the core discipline and evidence of synergy between the applied field and the core discipline. The sub-panel recognises that there can be outstanding innovation and originality in solving practical problems, including applied research which is relevant to the needs of commerce, industry and public bodies.

Individual staff circumstances

39. In assessing submissions, the sub-panel will take account of individual staff circumstances disclosed by departments in relation to the categories listed at paragraph 39 of the generic statement.

40. Departments should use RA5b to provide information on individual staff circumstances and their impact on the individual's research.

41. Early career researchers are individuals of any age who first entered the academic profession on employment terms that qualified them for submission to RAE2008 as Category A staff on or after 1 August 2003. The sub-panel encourages departments to submit early career researchers, even if their volume of output is limited. The sub-panel expects to see a clear statement on how such staff contribute to and are supported by the research environment. Early career researchers may submit up to four outputs.

42. Where individuals who are new to academic research but who have an established research portfolio from an earlier career as post-doctoral researchers or in industry or overseas are included, the sub-panel would normally expect four outputs to be submitted.

Working methods

43. The assessment will be one of peer review based on professional judgement.

44. At the beginning of the assessment process every sub-panel member will review the submissions to familiarise themselves with the breadth of submissions to the UOA and identify areas within their fields of expertise. At an early stage there will be an initial assessment of a small number of submissions so that sub-panel members can quickly embed themselves in working practices and develop a common approach and common interpretation of quality levels. These submissions will be revisited later in the assessment process.

45. The sub-panel chair will allocate each submission to a lead and second assessor who will be responsible for leading the development of the quality profile to be recommended to the main

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panel. The sub-panel will identify any submissions for which specialist advice or cross-referral is required for the entire submission, or for a major component of the submission. Throughout the assessment process, discussion of each submission will be led by the lead and second assessors, but the formation of the recommended quality profile for each component, and the overall recommended profile, will take full account of the views of the whole sub-panel, and be informed by any external advice provided.

46. The process of working together and combining the members' experience and expertise will develop the professional judgement of the sub-panel. The sub-panel recognises that the difference between levels of research quality will be one of degree, with a range within each level. Consistency in approach will be maintained by ongoing discussions and cross-collaboration between all lead and second assessors (ensuring calibration) within the sub-panel and its interaction with the main panel.

47. It is anticipated that the final quality profile recommended for each submission will be agreed by consensus after full discussion, with recourse to voting only as a last resort.

Research outputs

48. This component will be weighted as 70% of the overall quality profile.

49. The development of the proposed quality profile for each submission will be led by the designated lead and second assessor, who will assess the research outputs themselves, or where appropriate and in consultation with the chair and other sub-panel members, refer outputs to other sub-panel members for an expert assessment. In every case, the sub-panel member assessing outputs will decide which outputs to examine in detail. Where necessary, external advice about outputs will be sought from a specialist adviser or another sub-panel.

50. Lead and second assessors will then propose an initial allocation of outputs to quality levels and present the draft quality profile to the whole sub-panel. There will then be an iterative discussion leading to the development of the

recommended quality profile. Any cases for which allowances for quantity are being claimed will be judged by the sub-panel as a whole. Any outputs deemed to be missing will be assessed as Unclassified. Co-authored papers listed by more than one individual in a department's submission will count only once.

51. In assessing research outputs the sub-panel will interpret the quality levels within the profile as follows:

- a. To be awarded a 4* quality level a research output must exhibit high levels of originality, innovation and depth, and must have had, or in the view of the sub-panel be likely to have, a significant impact on the development of its field.
- b. To be awarded a 3* quality level a research output must exhibit high levels of originality, and must have had, or in the view of the sub-panel be likely to have, a clear impact on the development of its field.
- c. To be awarded a 2* quality level a research output must exhibit clear originality, and must have had, or in the view of the sub-panel be likely to have, an impact on the development of its field.
- d. To be awarded a 1* quality level a research output must make an original and useful contribution to its field but is unlikely to have more than a minor impact.

52. In the descriptions of quality levels above, the term 'field' includes theoretical, methodological, applied, practical and interdisciplinary work.

Research environment

53. This component will be weighted as 20% of the overall quality profile.

54. The first step in forming the quality profile will be to award an individual quality level (or distribution over levels) to data and information on each of the following elements:

- research students, including their educational environment and their success in achieving doctorates
- research income

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- the overall activity, vitality and sustainability of the department (including the aspects listed in paragraphs 25-32).

55. These will then be combined to form the research environment component of the overall profile.

Esteem indicators

56. This component will be weighted as 10% of the overall quality profile.

57. The quality profile for esteem will be calculated by assessing the individual esteem indicators and assigning them to quality levels. If the total number of indicators listed is less than the maximum permitted, the missing indicators will be assigned an Unclassified quality level.

The overall quality profile

58. The three proposed profiles for outputs, environment and esteem will be developed independently. Using the agreed weightings and rounding method, the sub-panel will then combine the three profiles to develop the overall quality profile for the submission. The sub-panel will finally confirm that, in its collective expert judgment, the overall profile recommended to the main panel is a fair reflection of the research activity in that submission, and that the assessment has taken account of all the different components of the submission.

59. Joint submissions will be assessed in the same way as submissions from single institutions.

60. Cross-referrals received from other panels will be considered by the most appropriate member(s) of the sub-panel, who will provide comments which will assist the referring sub-panel in making its assessment.

Additional information requested

61. Departments may wish to provide information on any difficulties of fit between their departmental structure and UOA boundaries, and other UOAs to which related work has been submitted.

UOA 23, Computer Science and Informatics

This statement should be read alongside the statement for Main Panel F and the generic statement.

Absences of chair and declaration of interests

1. Sub-panel members will not take responsibility for assessing any part of a submission from an institution in which they have declared a major interest, and they will leave the room when the submission is discussed.
2. Members will declare any minor interests in advance, and the chair may decide that they should not take lead or other responsibility for assessing the submission, or should leave the room.
3. A deputy chair has been appointed who will be responsible for chairing the meeting when the chair is absent. If both the chair and deputy chair are required to leave the room for discussion of a particular submission, a temporary chair will be appointed.

UOA descriptor

4. The UOA includes the study of methods for acquiring, storing, processing, communicating and reasoning about information, and the role of interactivity in natural and artificial systems, through the implementation, organisation and use of computer hardware, software and other resources. The subjects are characterised by the rigorous application of analysis, experimentation and design.

UOA boundaries

5. The sub-panel expects to receive submissions from all areas of computer science and informatics, as defined above, and expects that the majority of the research activity submitted will have made a direct contribution to the UOA as characterised in the UOA descriptor. It recognises and welcomes, however, the increasingly interdisciplinary nature of research in this area, and expects that submissions may contain outputs that make contributions to computer science and informatics and other disciplines. Such outputs, together with other information from the submission, may be referred to the relevant sub-panel, for advice on the contribution they should make to the quality profile for that submission. The sub-panel anticipates that it may make referrals to, and receive referrals from, any other sub-panel.

6. The sub-panel may take specialist advice in the following circumstances:

- a. For submissions in any areas for which the sub-panel does not have the required expertise.
- b. In other cases where, in the professional judgement of the sub-panel, it would be of assistance in reaching a decision.

7. Such advice will be used to inform the sub-panel's assessment and recommended quality profile for submissions.

Research staff

8. The sub-panel will treat staff in Categories C and D in the same ways as staff in Categories A and B, respectively, provided it is satisfied that such staff have (or, in the case of staff in Category D, have had) a genuine close relationship with the department. Evidence of the contribution of Category C staff to the research environment, and the extent of their relationship with the department, should be provided in RA5c. Such evidence might include the use of a department's address on publications, supervision or co-supervision of research students, membership of a research group, or acting as principal or co-investigator on a research project.

9. The contribution of staff in Categories B and D will be used only in the assessment of research environment and esteem indicators.

10. In the assessment of newly recruited staff, the sub-panel will consider their research output in the same way as for others. However, departments should be aware that these individuals' contribution to the research environment can only be assessed from the date of their appointment.

11. The sub-panel encourages departments to submit early career researchers even if their volume of output is limited.

Research outputs

12. All forms of research output will be treated equally. The sub-panel acknowledges the breadth of technology transfer and dissemination practice in computer science and informatics. Consequently it will accept outputs in any form including, but not

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necessarily limited to: books, chapters in books, articles in journals, conference contributions; creative media and multimedia; standards documents; patents, product or process specifications; items of software, software manuals; and technical reports, including consultancy reports or independent evaluations. All forms will be given equal consideration.

13. In the normal course of events research outputs within a submission may have a thematic relationship. They may address common research questions, be based on a common technical platform or focus on a common application domain. They may share small amounts of framing or introductory material. Such research outputs will, where the additional scientific contribution can be identified, be regarded as independent and judged as such. In other cases outputs may have overlapping content, such as where a preliminary version of research results appears in a conference and a fuller version subsequently in an archival journal. In such a situation the comments associated with the output should indicate that this is the case, and should further indicate which output can be regarded as an authoritative or final version. In assigning quality levels to these outputs the authoritative output will be assessed in its entirety and related outputs will be assessed only on the basis of additional scientific contributions made by the outputs.

14. Departments should list a maximum of four outputs per individual submitted for assessment. The sub-panel expects that each individual submitted will normally list four outputs. If fewer than four outputs are listed by an individual an explanation should be provided in RA5b. Reasons for listing fewer than four outputs will be dealt with on a case by case basis. Where there is no reasonable justification, in the sub-panel's view, for listing fewer than four outputs the sub-panel will allocate an Unclassified quality level to the 'missing' outputs.

15. The sub-panel may make allowances for the listing of fewer than four outputs in cases where individual staff circumstances such as those listed at paragraph 39 of the generic statement are cited.

16. The sub-panel recognises that special circumstances may occur in combination and will be responsive to a reasoned case in RA5b based on the following principles:

- each individual submitted for assessment must submit at least one output
- one item of output is expected for each 21 months of full-time equivalent work during the publication period in a Category A post (or similar post outside the UK HE sector).

17. As far as possible, the sub-panel will examine all research outputs, and expects to examine in detail at least 25% of the outputs in each submission. The sub-panel will use its professional judgement to select a subset of outputs to examine in detail, in order to increase confidence in the overall quality profile; it may, for example, examine in detail outputs that are published in outlets with which it is unfamiliar, and those which contain interdisciplinary research.

18. In assessing the quality of outputs the sub-panel will look for originality, rigour and significance to the discipline and wider research community and, where appropriate, to users. The assessment will be based on the content of the output and additional evidence provided in RA2 (see paragraph 22). Evidence that outputs have already been reviewed or refereed by experts and judged to embody work of high quality may be used as one measure of quality. However the absence of such review will not, in itself, be taken to imply lower quality.

19. In arriving at an overall assessment of research quality the sub-panel will use its professional judgement rather than applying a rigid or formulaic method of assessing research quality. It will not use a formal ranked list of outlets, nor impact factors, nor will it use citation indices in a formulaic way.

20. The sub-panel may use specialist advisers to assist with the assessment of research in the pedagogy of computer science and informatics. Any teaching materials listed that incorporate research outcomes will be evaluated in the same way as other research outputs.

21. The sub-panel recognises that collaborative research is a standard way of working in the UOA

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and encourages the submission of such work. It is expected that the author who declares a piece of co-authored work will have made a substantial contribution to it. Co-authored outputs will carry full weight in the assessment of the submission's research quality, but the repeated listing of the same co-authored output by more than one individual in a department should be avoided. Where repeated listing occurs the repeated output will count only once in the calculation of the quality profile.

22. To help in the assessment of research quality the sub-panel expects departments to provide additional information (in no more than 100 words, or up to 300 words in exceptional cases) in the 'Other relevant details' field for each output listed in RA2. This should address the three assessment criteria of originality, rigour and significance and should include:

- a statement summarising the research contribution of the output
- evidence of academic or other impact.

23. The sub-panel does not expect the 'Other relevant details' field to be used for any other purpose except in exceptional circumstances.

24. The sub-panel recognises that, in addition to the applied research defined in paragraph 47 and in the main panel statement, there is practice-based research in the field. The sub-panel welcomes the submission of outputs that relate to practice-based research.

25. Practice-based research in this UOA is research that involves direct engagement with users through situated studies, technical deployments, installations and performances in order to gain new scientific knowledge and/or the use of research results to shape practice. Characteristics of excellence in practice-based research include original methodology, new understandings gained from practice, impact on existing practice and evidence of a strong connection between practice and research.

Research environment

26. When the quality, organisation and conduct of research in the UOA is organised in terms of

groups, staff included in RA1, RA2 and RA3 should be listed in groups. Otherwise staff should be listed in alphabetical order.

27. Departments should provide information about the following aspects of the research environment relevant to them:

- a. Infrastructure, facilities and administrative support for research.
- b. Arrangements for developing and supporting staff in their research.
- c. Cumulative impact of research.
- d. Industrial collaboration, relationship with research users, contribution to public awareness and understanding.
- e. Academic collaboration, national and international, within discipline and interdisciplinary.
- f. Research degrees awarded.
- g. Research income: funding strategy, amount received and sustainability.
- h. Credibility, vitality and sustainability of research organisation.

28. In assessing the research environment overall, the sub-panel will consider strategic vision and planning, organisational agility, operational effectiveness, leadership in establishing best practice, and, if applicable, the role played by interdisciplinary research.

29. Where staff are listed in groups, the contribution of each group to the research environment should be described separately.

30. When submitting information about infrastructure and facilities and administrative support, departments should emphasise new institutional investments made during the assessment period.

31. Information should be given on how the department supports early career researchers and how it monitors research students and encourages completion.

32. Cumulative research impact should be reported in terms of an assessment of academic impact, impact on wealth creation and the quality

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of life, including knowledge transfer activities such as spin outs, licences, consultancy and regional development initiatives.

33. The sub-panel does not expect departments to provide information on the detailed organisation and management structure of the department.

34. Departments should ensure that they provide clear evidence for the claims that they make about their research environment.

Research students and research studentships

35. The sub-panel will consider research students and research studentships as contributing to the profile for the research environment.

36. In addition to the standard analyses provided, the sub-panel will consider research masters and doctoral research degrees awarded per research-active staff member.

37. The sub-panel will place emphasis on the number of degrees awarded rather than on the number of students, with doctorates being rated more highly than research masters.

38. The source of studentships will not carry weight.

Research income

39. The sub-panel will consider research income as contributing to the profile for research environment, and will use the standard analyses provided in making its assessment. The sub-panel recognises that some types of research in computer science and informatics do not require external support.

40. The sub-panel is interested in research income from all sources. Departments should describe their needs for research income, the strategies by which they seek income and the sustainability of their sources of income.

Research strategy

41. Departments should provide a statement on their plans and mechanisms to sustain and develop the credibility and vitality of their research organisation over the next five years.

42. Departments should report how any changes of staff leading up to the census date have impacted on their strength, coherence and research culture.

Esteem indicators

43. Departments should list indicators of peer esteem and national and international recognition that relate to the staff submitted and were gained in the assessment period. The sub-panel will expect to see a range of esteem indicators, distributed across the department's staff, appropriate to the size and staffing profile of the department. Indicators should be listed by individual (with early career researchers clearly identified) and, where relevant, ordered by research group. They may include:

- awards, fellowships of learned societies, prizes, honours and named lectures
- personal research awards and fellowships
- keynote and plenary addresses at conferences
- significant professional service
- positions in national and international strategic advisory bodies
- industrial advisory roles
- editorial roles
- research co-ordination
- conference organisation (eg, programme chairs and programme committee memberships, including continued membership of a programme committee over several years).

44. Esteem indicators that relate to the whole department or research groups may also be provided where appropriate.

45. The maximum number of esteem indicators that may be listed is twice the number (ie, headcount) of Category A and C staff submitted for assessment, plus the number (ie, headcount) of Category B and D staff. Leaving aside indicators attributable to the department or research groups no more than four esteem indicators may be listed by each member of

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Category A and C staff and no more than two by each member of Category B and D staff.

46. The sub-panel recognises that indicators of esteem may vary according to experience and seniority of staff included in the submission. In assessing the quality of esteem indicators the sub-panel will take into account the career stage of the individual.

Applied and interdisciplinary research

47. Applied research is research that makes a substantive contribution to another domain, based on the knowledge, methods and research of the core discipline. The outputs of applied research include software, patents and/or licences, experimental instrumentation and devices, other artefacts, and publications in any discipline or professional journal. Characteristics of excellence in applied research include original methodology, innovative application, impact in the applied field, uptake in the applied field, feedback to the core discipline and evidence of synergy between the applied field and the core discipline. The sub-panel recognises that there can be outstanding innovation and originality in solving practical problems, including applied research which is relevant to the needs of commerce, industry and public bodies.

48. Interdisciplinary research is research that brings together methods and perspectives from a number of disciplines. This may involve working with experts from other disciplinary backgrounds, the use of methods and techniques drawn from a number of disciplines or the development of new interdisciplinary approaches. The outputs of interdisciplinary research include publications, software, patents and/or licences, experimental instrumentation and devices, and other artefacts. Excellence in interdisciplinary research is characterised by originality of the contribution, the rigour of the interdisciplinary approach and techniques used, and the significance of the work to the constituent disciplines involved.

Individual staff circumstances

49. In assessing submissions, the sub-panel will take account of individual staff circumstances disclosed by departments in relation to the categories listed at paragraph 39 of the generic statement.

50. Departments should use RA5b to provide information on individual staff circumstances and their impact on the individual's research.

51. Early career researchers are individuals of any age who first entered the academic profession on employment terms that qualified them for submission to RAE2008 as Category A staff on or after 1 August 2003. The sub-panel encourages departments to submit early career researchers, even if their volume of output is limited. The sub-panel expects to see a clear statement on how such staff contribute to and are supported by the research environment. Early career researchers may submit up to four outputs.

52. Where individuals who are new to academic research but who have an established research portfolio from an earlier career as post-doctoral researchers or in industry or overseas are included, the sub-panel would normally expect four outputs to be submitted.

Working methods

53. The assessment will be one of peer review based on professional and scholarly judgement.

54. The overall process for reaching decisions will be iterative; each submission will be considered more than once during that process.

55. At the first meeting the sub-panel will identify submissions or outputs for which specialist advice or cross-referral are required.

56. Cross-referrals received from other sub-panels will be considered by the most appropriate member(s) of the sub-panel, who will provide comments to assist the referring UOA in making its assessment.

57. External advice (from specialist advisers or other sub-panels) may be used to inform the sub-panel's assessment of interdisciplinary work.

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58. Joint submissions will be assessed in the same way as submissions from single departments.

59. Before the first meeting in the assessment phase the chair, together with a small group of sub-panel members, will review the submissions and assign each submission to at least three sub-panel members to lead the assessment. Topic expertise and potential conflicts of interest will be taken into account when making this allocation.

60. The assigned assessors will each draft a quality profile for each component of the submission in advance of the meeting of the sub-panel. They will highlight any differences of opinion, which may require more detailed examination and discussion. The whole sub-panel will then discuss these drafts before the quality profile for each component is agreed.

61. It is anticipated that the final quality profile recommended for each submission will be agreed by consensus after full discussion, with recourse to voting only as a last resort.

Research outputs

62. This component will be weighted as 70% of the overall quality profile.

63. Each assessor assigned to a given submission will examine each output included in the submission for originality, rigour and significance. Originality will be judged by the extent to which the output introduces a new way of thinking about a subject. Rigour will be judged by the extent to which the purpose of the work is clearly articulated, appropriate methodology adopted, and compelling evidence presented to show that the purpose has been achieved. Significance will be judged by the extent to which the work has exerted, or is likely to exert, a significant impact on the academic field or its practical applications. In reaching these judgements the assessor may consider:

- the scope and content of the output
- evidence of rigorous third-party peer review
- the standing of the outlet, relative to others in the same field
- citations of the output, relative to others of similar age in the same field

- evidence that the work has established a new area of study
- evidence of significant practical applications of the work
- other evidence provided in the 'Other relevant details' field in RA2.

64. Taking all the evidence into account, the assessor will use their professional judgement to assign an overall score to the output, on a ten point scale.

65. The sub-panel will compare, selectively, scores assigned to the same outputs by different assessors, over the whole UOA, in order to calibrate the scores of individual sub-panel members. The score needed for an output to be deemed of world-leading quality, and awarded a quality level of 4*, will be established by the whole sub-panel, by sampling papers close to the proposed borderline. This decision will also be influenced by the initial exercise involving all the sub-panels of Main Panel F.

66. In assessing research outputs the sub-panel will interpret the quality levels within the profile as follows:

- a. To be awarded a 4* quality level a research output must exhibit high levels of originality, innovation and depth, and must have had, or in the view of the sub-panel be likely to have, a significant impact on the development of its field.
- b. To be awarded a 3* quality level a research output must exhibit high levels of originality, and must have had, or in the view of the sub-panel be likely to have, a clear impact on the development of its field.
- c. To be awarded a 2* quality level a research output must exhibit clear originality, and must have had, or in the view of the sub-panel be likely to have, an impact on the development of its field.
- d. To be awarded a 1* quality level a research output must make an original and useful contribution to its field but is unlikely to have more than a minor impact.

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67. In the descriptions of quality levels above, the term 'field' includes theoretical, methodological, applied, practical and interdisciplinary work.

68. The assessors for each submission will together agree where allowance should be made for the listing of fewer than four outputs by an individual. In calculating the quality profile the total number of outputs (on which the proportion of outputs in each quality level will be based) will comprise the number of outputs listed in the submission, plus any missing outputs awarded an Unclassified quality level.

Research environment

69. This component will be weighted as 20% of the overall quality profile.

70. The quality profile for research environment will be calculated by awarding a quality level to each of the eight categories in paragraph 27.

Esteem indicators

71. This component will be weighted as 10% of the overall quality profile.

72. The quality profile for esteem will be calculated in a similar way to that for research outputs. Each of the three assessors will award a quality level to each indicator listed in their assigned submissions. If the number of indicators listed is less than the maximum permitted, the missing indicators will be assigned an Unclassified quality level.

73. Examples of esteem indicators that the sub-panel might consider to be 4* include (the list is not exhaustive):

- election to fellowship of The Royal Society, Royal Academy of Engineering, Association for Computing Machinery, Institute of Electrical and Electronics Engineers
- best paper award at a major conference
- programme chair of a major international conference in a relevant research area
- funded senior research fellowship by a national organisation
- invited keynote speaker at an international or national conference in another country.

74. The three proposed profiles for outputs, environment and esteem will be developed independently. Using the agreed weightings and rounding method, the sub-panel will then combine the three profiles to develop the overall quality profile for the submission. The sub-panel will finally confirm that, in its collective expert judgement, the overall profile recommended to the main panel is a fair reflection of the research activity in that submission, and that the assessment has taken account of all the different components of the submission.

Additional information requested

75. Departments may wish to provide information (in RA5) on any difficulties of fit between their departmental structure and UOA boundaries, and other UOAs to which related work has been submitted.

76. Departments may comment on any ongoing research that has not yet produced visible outcomes.

Annex 1

Quality profiles and definitions of quality levels

Table 1 **Sample quality profile***

Unit of assessment A	FTE Category A staff submitted for assessment	Percentage of research activity in the submission judged to meet the standard for:				
		4*	3*	2*	1*	Unclassified
University X	50	15	25	40	15	5
University Y	20	0	5	40	45	10

* The figures are for fictional universities. They do not indicate expected proportions.

Table 2 **Definitions of quality levels**

4*	Quality that is world-leading in terms of originality, significance and rigour.
3*	Quality that is internationally excellent in terms of originality, significance and rigour but which nonetheless falls short of the highest standards of excellence.
2*	Quality that is recognised internationally in terms of originality, significance and rigour.
1*	Quality that is recognised nationally in terms of originality, significance and rigour.
Unclassified	Quality that falls below the standard of nationally recognised work. Or work which does not meet the published definition of research for the purposes of this assessment.

1. Sub-panels will use their professional judgement to form a view about the quality profile of the research activity described in each submission, taking into account all the evidence presented. Their recommendations will be endorsed by the main panel in consultation with the sub-panel.

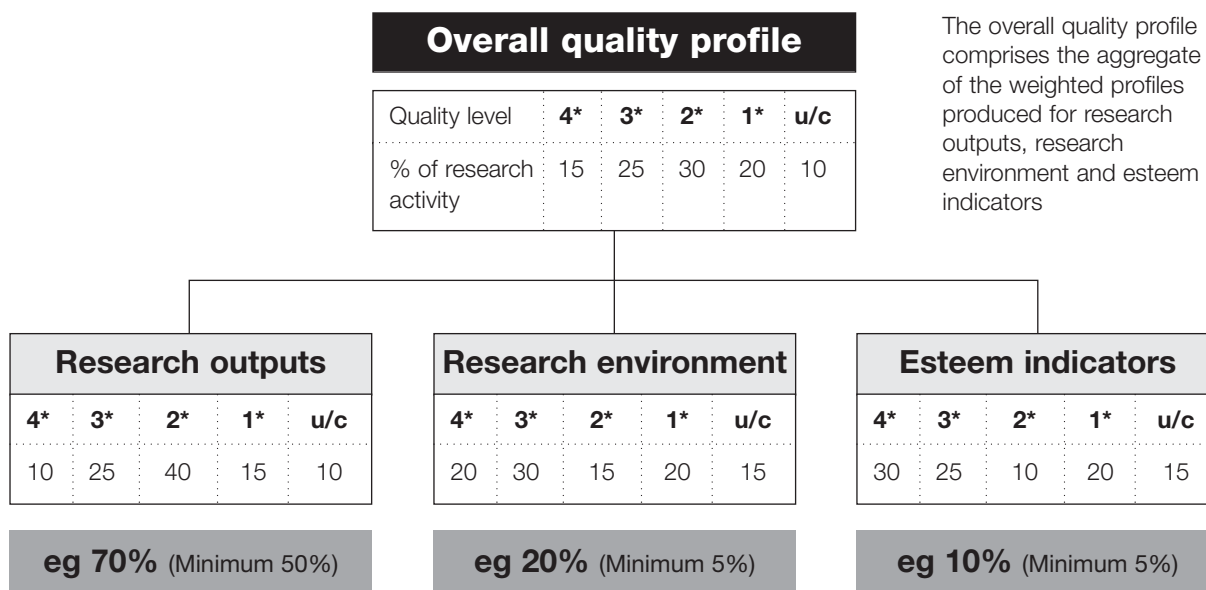
2. ‘World-leading’ quality denotes an absolute standard of quality in each unit of assessment.

3. ‘World leading’, ‘internationally’ and ‘nationally’ in this context refer to quality standards. They do not refer to the nature or

geographical scope of particular subjects, nor to the locus of research nor its place of dissemination, for example, in the case of ‘nationally’, to work that is disseminated in the United Kingdom of Great Britain and Northern Ireland.

4. The profile for a submission that contains no research which meets the 1* threshold will be 100% Unclassified. A submission that contains no research (that is, no work that meets the definition of research for the RAE) will not be awarded a quality profile.

Figure 1 **Building a quality profile**



The percentage weightings for the three elements are illustrative. Panels should allocate these weightings. The minimum weighting for the research outputs profile is 50%. In this example the overall quality profile shows 15% of research activity is at 4* level. This is made up of 70% x 10 (research outputs), 20% x 20 (research environment) and 10% x 30 (esteem indicators), rounded as described in paragraphs 12-15 below.

Building a quality profile

5. Panels are required to consider all the components of the submission when reaching an overall quality profile (see Figure 1). The components equate to the different data collected in the RAE, namely submitted staff information (RA1), research outputs (RA2), research student data (RA3), research income (RA4), and the supporting statement on research environment and esteem indicators (RA5a).

6. These different components will be assessed under three over-arching elements: research outputs, research environment, and esteem indicators. Research outputs (RA2) will always be assessed as one of these three elements.

7. Main panels have decided whether the components of submissions other than research outputs (RA3, 4 and 5) will be assessed under the 'Research environment' or 'Esteem indicators' element. For example, a panel may consider that research income contributes to the research environment, or that it is a measure of esteem in its subject area. Similarly research student numbers, research student completions and

research studentships may either be part of the research environment or an indicator of esteem. Main panels explain in their statements of criteria and working methods their reasoning for assigning components of the submission to a particular element.

8. Main panels have allocated a percentage weighting to each of three elements – research outputs, research environment and esteem indicators – which indicates the extent to which the different elements will contribute to the overall quality profile of a submission. Given the primacy of expert review in the process, the weighting allocated to research outputs must be at least 50% of the overall quality profile: some main panels have decided that research outputs should be weighted more highly. Main panels had to allocate a significant weighting to each of the other aspects (environment and esteem) as they saw fit, but since the quality profile will be defined in multiples of 5%, the minimum weighting in either case will be 5%. Main panels have defined their reasoning in their criteria statements.

9. Sub-panels will assess research outputs and develop a quality profile for this element. Sub-panels will also assess the evidence within the components of the submission assigned to the research environment and esteem indicators elements, and draw up a quality profile for each.

10. Sub-panels will sum the three weighted quality profiles to develop an overall quality profile for the submission. They will use the rounding methodology described in paragraphs 12-15 of this annex to round the overall quality profile. Overall quality profiles will be published in steps of 5%.

11. Sub-panels will finally confirm that, in their expert judgement, the overall profile is a fair reflection of the research activity in that submission, and that their assessment has taken account of all the different components of the submission.

Rounding

12. All sub-panels will adopt a cumulative rounding methodology to ensure that the overall quality profile for any submission will always round to 100%, and to avoid the unfair consequences that simple rounding can produce. They will first sum the weighted quality profiles for outputs, environment, and esteem and then adopt a cumulative rounding methodology.

Worked example

13. Using the example in Figure 1, first calculate the initial overall profile, that is, the sum of the weighted profiles for outputs, environment and esteem.

	4*	3*	2*	1*	u/c
Outputs	10	25	40	15	10
Environment	20	30	15	20	15
Esteem	30	25	10	20	15
Weighted					
70%	7	17.5	28	10.5	7
20%	4	6	3	4	3
10%	3	2.5	1	2	1.5
Initial profile	14	26	32	16.5	11.5

14. Cumulative rounding works in three stages:

a. The initial profile is:

4*	3*	2*	1*	u/c
14	26	32	16.5	11.5

b. Stage 1: Calculate the cumulative totals (for example the cumulative total at 3* or better is 26+14=40).

4*	3* or better	2* or better	1* or better	u/c or better
14	40	72	88.5	100

c. Stage 2: Round these to the nearest 5 %, (rounding up if the percentage ends in exactly 2.5 or 7.5).

4*	3* or better	2* or better	1* or better	u/c or better
15	40	70	90	100

d. Stage 3: Find the differences between successive cells to give the rounded profile. So, for example, the percentage allocated to 2* is the difference between the cumulative total at 2* or better, minus the cumulative total at 3* or better (70-40 =30).

4*	3*	2*	1*	u/c
15	25	30	20	10

15. Cumulating totals the other way (rounding down if the percentage ends in exactly 2.5 or 7.5) gives exactly the same answer.

Annex 2

Units of assessment and main panels

Main panel	UOA	UOA name
A	1	Cardiovascular Medicine
	2	Cancer Studies
	3	Infection and Immunology
	4	Other Hospital Based Clinical Subjects
	5	Other Laboratory Based Clinical Subjects
B	6	Epidemiology and Public Health
	7	Health Services Research
	8	Primary Care and Other Community Based Clinical Subjects
	9	Psychiatry, Neuroscience and Clinical Psychology
C	10	Dentistry
	11	Nursing and Midwifery
	12	Allied Health Professions and Studies
	13	Pharmacy
D	14	Biological Sciences
	15	Pre-clinical and Human Biological Sciences
	16	Agriculture, Veterinary and Food Science
E	17	Earth Systems and Environmental Sciences
	18	Chemistry
	19	Physics
F	20	Pure Mathematics
	21	Applied Mathematics
	22	Statistics and Operational Research
	23	Computer Science and Informatics
G	24	Electrical and Electronic Engineering
	25	General Engineering and Mineral & Mining Engineering
	26	Chemical Engineering
	27	Civil Engineering
	28	Mechanical, Aeronautical and Manufacturing Engineering
	29	Metallurgy and Materials
H	30	Architecture and the Built Environment
	31	Town and Country Planning
	32	Geography and Environmental Studies
	33	Archaeology

Main panel	UOA	UOA name
I	34	Economics and Econometrics
	35	Accounting and Finance
	36	Business and Management Studies
	37	Library and Information Management
J	38	Law
	39	Politics and International Studies
	40	Social Work and Social Policy & Administration
	41	Sociology
	42	Anthropology
	43	Development Studies
K	44	Psychology
	45	Education
	46	Sports-Related Studies
L	47	American Studies and Anglophone Area Studies
	48	Middle Eastern and African Studies
	49	Asian Studies
	50	European Studies
M	51	Russian, Slavonic and East European Languages
	52	French
	53	German, Dutch and Scandinavian Languages
	54	Italian
	55	Iberian and Latin American Languages
	56	Celtic Studies
	57	English Language and Literature
	58	Linguistics
N	59	Classics, Ancient History, Byzantine and Modern Greek Studies
	60	Philosophy
	61	Theology, Divinity and Religious Studies
	62	History
O	63	Art and Design
	64	History of Art, Architecture and Design
	65	Drama, Dance and Performing Arts
	66	Communication, Cultural and Media Studies
	67	Music

Annex 3

Definition of research for the RAE

(Changes in phrasing from the definition used for the 2001 RAE are in **bold**.)

'Research' for the purpose of the RAE is to be understood as original investigation undertaken in order to gain knowledge and understanding. It includes work of direct relevance to the needs of commerce, industry, **and** to the public and voluntary sectors; scholarship*; the invention and generation of ideas, images, performances, artefacts including design, where these lead to new or substantially improved insights; and the use of existing knowledge in experimental development to produce new or substantially improved materials, devices, products and processes, including design and construction. It excludes routine testing and **routine** analysis of materials, components and processes **such as** for the maintenance of national standards, as distinct from the development of new analytical techniques. It also excludes the development of teaching materials that do not embody original research.

* Scholarship for the RAE is defined as the creation, development and maintenance of the intellectual infrastructure of subjects and disciplines, in forms such as dictionaries, scholarly editions, catalogues and contributions to major research databases.

Annex 4

Declarations of interest

Major interests

All panel chairs, members, secretaries, observers and specialist advisers are bound by the following arrangements for avoiding conflicts of interest.

1. All main panel chairs and members, sub-panel chairs and members, panel secretaries and assistant secretaries, observers and specialist advisers (hereafter collectively called panel members) are asked to make a declaration of their interests. For the purpose of the RAE, interests are defined as:
 - a. The institution(s) at which the individual is employed.
 - b. Any institution at which the individual has been employed since January 2001.
 - c. Any institution(s) at which the individual has been engaged in substantial teaching or research since the start of the assessment period (1 January 2001); this might include institutions at which the individual has the status of visiting lecturer/fellow/professor or similar.
 - d. Any institution(s) at which the individual's partner and/or immediate family member is employed.

Panel procedures

2. A complete list of the declared interests of panel members and others involved in the assessment will be prepared by the RAE team and made available, in confidence, to panels when they start their work.
3. Individuals will be asked to update the RAE team regularly on any additional interests. Complete lists of declared interests will be updated and circulated accordingly on an *ad hoc* basis.
4. As a matter of principle, individuals will withdraw from panel meetings when submissions are discussed from the HEIs in which they declare to have an interest. Each main and sub-panel will publish in its criteria statement its protocol for dealing with declared interests, in line with this principle.

Requests for information

5. Panel members are likely to receive numerous invitations to discuss issues concerned with RAE 2008. Although the RAE team seeks improved clarity and transparency during this exercise through the dissemination of information, we do not wish panel members to compromise their position by entering into discussions which could be perceived to give a particular individual or institution an unfair advantage.
6. It is therefore strongly recommended that panel members should not discuss issues concerning individual departmental or institutional submissions. However, they may accept invitations to talk at meetings where a number of different institutions are represented, for example those arranged by a professional body or subject association.
7. If any member has concerns over a potential conflict of interests or the propriety of a proposed action s/he should discuss it with the RAE manager.
8. Panel members are not expected to suspend normal relations with their colleagues and peers during the exercise. They should not feel in any way obliged, for example, to withdraw from external examining, or participation in appointment committees. They are, however, asked to exercise caution in dealings with individual departments, or with subject associations or similar bodies, where there is an actual or clearly inferrable connection with their panel membership.

Minor interests

9. The RAE team has also invited main and sub-panels to consider operating a policy whereby panel members declare minor interests on an *ad hoc* basis, so that they can be minuted in panel meetings and handled on a case by case basis. The following were offered as examples of minor interests and possible methods of dealing with them. They are illustrative and do not constitute an exhaustive or prescriptive list:
 - a. Panel member supervises or co-supervises one or more doctoral students from a submitting

-
- institution. Panel member declares this for the panel to note.
- b. Panel member supervised a doctoral student who went on to become a research active staff member within a submission made to the panel. Panel member declares this and does not take lead/sole responsibility for assessing the published output linked to that individual.
 - c. Panel member was supervised as a doctoral student by a research active staff member within a submission made to the panel. Panel member declares this and does not take lead/sole responsibility for assessing the published output linked to that individual.
 - d. Panel member is co-investigator or co-holder of a grant with the submitting institution. Panel member declares this and does not take lead/sole responsibility for assessing the published output linked to that individual.
 - e. Panel member is on the editorial board of a journal series published by a submitting department or unit, or has co-organised a conference or conference series with a submitting department. Panel member declares this and does not take lead responsibility for assessing the research environment and esteem indicators element of that submission.
 - f. Panel member has acted during the assessment period as a member of an appointment or promotions committee for a submitting department or unit, or has provided references for staff members returned in the submission. Panel member declares this for the panel to note.
 - g. Panel member acts as an external examiner for research degrees for a submitting department or unit. Panel member declares this and does not take lead/sole responsibility for assessing the research environment and esteem indicators element of that submission
 - h. Panel member studied at a submitting department or unit before the assessment period. Panel member declares this and does not take lead/sole responsibility for assessing the research environment and esteem indicators element of that submission.
 - i. A member of the panel member's wider family studies or works at a submitting department or unit. Panel member declares this for the panel to note.
10. Panels might wish to invite a panel member who declares a number of minor interests in one institution to treat that institution as a major interest.

Annex 5

Confidentiality arrangements

All panel chairs, members, secretaries, observers and specialist advisers are bound by the confidentiality arrangements described in the following letter.

CONFIDENTIAL

Dear

Research Assessment Exercise 2008: Confidentiality arrangements

Purpose

1. This letter sets out arrangements for ensuring that all information contained in RAE submissions made by institutions for the 2008 RAE is maintained and treated confidentially by panels¹. As for the 2001 RAE, apart from personal data and details of confidential outputs, information from submissions will be published on the internet following completion of the assessment: we expect to publish this early in 2009. The arrangements described below provide for maintaining the confidentiality of all submission information unless or until such time as it becomes freely available in the public domain.
2. The letter also deals specifically with the treatment by panels of any confidential research outputs that may be cited in submissions. Research outputs in the 2008 RAE are defined as publicly available, assessable outputs of research in whatever form. However, institutions may submit for assessment confidential outputs provided they mark them as 'confidential' in submissions and make them available to panels.
3. The letter also describes arrangements for ensuring the confidentiality of panels' discussions about submissions, or other information deduced from or generated as a result of submissions.
4. We have two objectives in placing confidentiality obligations on panel members. Firstly, subject only to any legal obligations on HEFCE to disclose further, we wish to ensure that the starred quality profile awarded to each submission and the brief feedback given in confidence to heads of institutions by the panel via the RAE team stand as the only public

comment from panels and their constituent members on any individual submission. Secondly, we aim to discourage parties who are not involved in the assessment process from approaching or placing pressure on panel members to disclose information about the panel's discussion of particular submissions. In other words, maintenance of confidentiality is essential if panel members are not to be inhibited from expressing their opinions freely in panel discussions, and therefore essential to the effective operation of the RAE as a peer review. In legal terms, a breach of confidentiality by a panel member may, in certain circumstances, constitute a breach of data protection legislation and/or a breach of a common law duty of confidentiality, may give rise to financial losses, or may infringe or impact upon intellectual property rights in research outputs.

5. The obligations set out below will subsist indefinitely.

Obligations on panel members

Information contained in RAE submissions

6. The higher education funding bodies, through the RAE team, collect a range of information from institutions in RAE submissions for the purpose of assessing the quality of research. In recognition of this purpose, you shall use any information which you receive in RAE submissions from institutions only for the purposes of carrying out your functions as a panel member.
7. You shall not make copies of such information except as is necessary to carry out your function as a panel member. You shall destroy, or return to the RAE manager, originals and any copies you may make of such information, as soon as they are no longer needed for that function or on the request of the RAE manager, whichever may be sooner. This provision applies equally to paper copies or those stored in electronic or other non-paper formats.
8. You shall not disclose the information received to any other person except your fellow panel members and panel observers and secretaries. You

¹ In this context, 'panels' refers both to main and sub-panels. The same arrangements for ensuring confidentiality will apply, so far as they are relevant, to chairs, members, observers and secretaries of main and sub-panels and to specialist advisers.

shall take all reasonable steps to ensure that other people cannot have access to the information, whether held in paper or electronic copy. In particular, it is important to remember that computer systems and specifically e-mail are not necessarily secure, and you agree to exercise appropriate caution when using them. Full guidance on the storage and transmission of RAE information will be included in the guidance to panels which will be provided to panel members and made publicly available in January 2005.

Confidential research outputs

9. Confidential research outputs will be indicated as such in submissions and will clearly be marked 'confidential'. You shall treat as confidential all such information, including the research outputs themselves and details of their sponsors or commissioning organisations. Even if you personally consider that the designation 'confidential' may be wrong, you agree to accept any designation of confidentiality which an institution has placed upon part or all of its submission. If you feel in a particular case that this inhibits you from carrying out your function as a panel member, you should raise the issue with the RAE manager who will be able to provide or seek advice.

10. An institution's submission may contain material which is patented or patentable, which is subject to other intellectual property rights, which is commercially sensitive, or which the interests of the institution and/or its researchers require to be kept confidential or given a restricted circulation. Institutions make submissions to the RAE on the understanding that their position in these regards will not be prejudiced by the fact of submission. You shall respect and honour that understanding and act accordingly. You are in particular reminded of the danger of 'prior disclosure' in the case of potentially patentable material, and the paramount need therefore to respect the confidentiality of such material.

Discussion about submissions and information deduced from submissions

11. You agree that you shall restrict your discussion of submissions and of research groups

described within submissions to panel meetings and to related dialogue between yourself, the RAE team, panel secretary and assistant secretary and members of the main and sub-panels with which you work. You shall not discuss with anyone who is not involved in the assessment process, as described above, either the submission or the assessment of an identifiable institution or group of institutions whose individual members could be identified, still less the work of individual researchers named in submissions, even if ostensibly anonymised. You may, of course, comment on the process and conduct of the 2008 RAE in general terms. If you are at all unsure as to what is covered by 'in general terms' you should seek advice from the RAE manager.

12. Nothing in this agreement prevents you from disclosing information after it becomes freely available in the public domain (without the breach of any obligation of confidentiality), or which you are required by law to disclose, or which was already known to you and not subject to confidentiality obligations before being disclosed to you in the context of the RAE. It would be prudent, however, to contact the RAE manager in advance to discuss any possible disclosure. Some information provided to or generated by RAE panels may be disclosable under the Freedom of Information Act 2000. However, if you receive any request for information which falls or may fall under that Act you must pass it to the RAE manager for consideration and action, and you should not respond to such requests yourself. If you are in any doubt with regard to any issue of confidentiality, either in general terms or in relation to a particular piece of information, you should seek advice from the RAE manager or, following completion of the RAE, the Director (Research and Knowledge Transfer) at HEFCE.

13. Acceptance of these confidentiality obligations is a condition of your appointment as a panel member. The four higher education funding bodies reserve the right to amend the membership of RAE panels in the event of any breach of the confidentiality obligations on panel chairs and members.

Annex 6

Word limits for RA5a, RA5b and RA5c and RA2 'Other relevant details' field

RA5a

The maximum word count for the textual commentary section (RA5a) will vary based on the number of Category A FTE staff in the submission as follows:

FTE Category A staff	Word limit
1-5	3,600
6-10	4,200
11-15	4,800
16-20	5,400
21-30	6,600
31-40	7,800
41-50	9,000
51-60	9,800
61-75	11,000
76-90	12,000
Over 90	12,750

Note that these word counts equate to at least the page limits per FTE used in the 2001 RAE for RA5 and RA6 combined.

RA5b and RA5c

For all UOAs, RA5b (individual staff circumstances) and RA5c (information concerning Category C staff) will be a maximum of 300 words per researcher.

Institutions should refer to the generic statement and to each sub-panel's statement of criteria and working methods for further advice about the information to be returned in each case.

RA2 ‘Other relevant details’ field

Each sub-panel has set a maximum word limit for the ‘Other relevant details’ field in RA2.

Please refer to the appropriate sub-panel statement for details of the information required in this field.

Sub-panel	UOA	Word limit
1	Cardiovascular Medicine	50
2	Cancer Studies	50
3	Infection and Immunology	50
4	Other Hospital Based Clinical Subjects	50
5	Other Laboratory Based Clinical Subjects	50
6	Epidemiology and Public Health	50
7	Health Services Research	50
8	Primary Care and Other Community Based Clinical Subjects	50
9	Psychiatry, Neuroscience and Clinical Psychology	50
10	Dentistry	50
11	Nursing and Midwifery	50
12	Allied Health Professions and Studies	50
13	Pharmacy	50
14	Biological Sciences	50
15	Pre-clinical and Human Biological Sciences	50
16	Agriculture, Veterinary and Food Science	50
17	Earth Systems and Environmental Sciences	50
18	Chemistry	50
19	Physics	50
20	Pure Mathematics	300
21	Applied Mathematics	300
22	Statistics and Operational Research	300
23	Computer Science and Informatics	300
24	Electrical and Electronic Engineering	100
25	General Engineering and Mineral & Mining Engineering	100
26	Chemical Engineering	100
27	Civil Engineering	100
28	Mechanical, Aeronautical and Manufacturing Engineering	100
29	Metallurgy and Materials	100
30	Architecture and the Built Environment	300
31	Town and Country Planning	50

Sub-panel	UOA	Word limit
32	Geography and Environmental Studies	50
33	Archaeology	50
34	Economics and Econometrics	50
35	Accounting and Finance	50
36	Business and Management Studies	50
37	Library and Information Management	50
38	Law	50
39	Politics and International Studies	100
40	Social Work and Social Policy & Administration	100
41	Sociology	100
42	Anthropology	100
43	Development Studies	200
44	Psychology	100
45	Education	150
46	Sports-Related Studies	100
47	American Studies and Anglophone Area Studies	300
48	Middle Eastern and African Studies	300
49	Asian Studies	300
50	European Studies	300
51	Russian, Slavonic and East European Languages	300
52	French	300
53	German, Dutch and Scandinavian Languages	300
54	Italian	300
55	Iberian and Latin American Languages	300
56	Celtic Studies	300
57	English Language and Literature	200
58	Linguistics	300
59	Classics, Ancient History, Byzantine and Modern Greek Studies	300
60	Philosophy	300
61	Theology, Divinity and Religious Studies	300
62	History	300
63	Art and Design	300
64	History of Art, Architecture and Design	300
65	Drama, Dance and Performing Arts	300
66	Communication, Cultural and Media Studies	300
67	Music	300

Annex 7

Standard data analyses for all sub-panels

The following data analyses will be available to sub-panels for each submission (and a total for each UOA).

1. Headcount number of research-active staff, by category.
2. Full-time equivalent (FTE) number of research-active staff in Category A.
3. Headcount number of research-active staff in Categories A and C together.
4. Headcount number of research-active staff in Categories A, B, C and D together.
5. Headcount number of research-active staff in Categories A and C together, with each of 0, 1, 2, 3, and 4 outputs submitted for assessment (five separate totals).
6. Headcount number of research fellows.
7. FTE number of research fellows.
8. Total number of outputs submitted for assessment.
9. FTE research assistants (from RA1).
10. FTE research assistants (from RA1) per FTE research-active staff.
11. FTE research students (from RA1).
12. FTE research students (from RA1) per FTE research-active staff.
13. FTE research students (from RA3a).
14. FTE research students (from RA3a) per FTE research-active staff.
15. Median FTE number of research students (from RA3a) per FTE research-active staff.
16. Number of doctoral degrees awarded, by year.
17. Number of doctoral degrees awarded, by year, per FTE research-active staff.
18. Number of doctoral degrees awarded, by year, per FTE research student (student numbers taken from RA3a).
19. Number of masters degrees awarded, by year.
20. Number of masters degrees awarded, by year, per FTE research-active staff.
21. Number of new studentships (total across all years), by sponsor.
22. Number of new studentships (total across all years) per FTE research-active staff, by sponsor.
23. Number of new studentships (total across all years) per FTE research student (student numbers taken from RA3a), by sponsor.
24. Median number of new studentships (total across all years) per FTE research-active staff (total across all sponsors).
25. Research income (total across all years), by source.
26. Research income (total across all years) per FTE research-active staff, by source.
27. Median value of research income (total across all years) per FTE research-active staff (total across all sources).

There will be two separate sheets of figures: one in which figures per research-active staff will use FTE Category A staff numbers; and another in which figures per research-active staff will use headcount Category A plus Category C staff numbers.

These analyses are in addition to the standard listing of data and information presented to panels in RA1 to RA5.

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