THE UK UNIVERSITY INTEGRATION BEE 2021/22

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ROUND TWO MARK SCHEME

Saturday, 20 November 2021

Sponsored by

1 Group Round

Mark at the end of the round. Each correct answer is worth 8 marks.

From the markers guide: In this one, at the end when they have written down all their answers, I'll provide a sheet with the answers which you can just check. For the rest of the round, you don't need to be doing anything so feel free to go on your phone, study etc. There are some indefinite integrals; marking those is a bit complicated so you can leave those out, pass the answer sheet on to me and I'll mark it :) Each question is worth 8 marks.

1. $\dfrac{\pi^2}{16} + \dfrac{\pi \ln 2}{4} - G$

2. $-\ln 2$

3. $\dfrac{\pi}{2\sqrt{3}}$

4. 0

5. $\dfrac{1}{\sqrt{2}} \arctan\left(\dfrac{t - t^{-1}}{\sqrt{2}}\right)$

6. $\dfrac{1}{2} \log\left(\dfrac{a+b}{a-b}\right)$

7. $\dfrac{\pi^{\frac{3}{2}}}{4}$

8. $\pi \dfrac{\sqrt{2+2\sqrt{2}}}{2} - \pi$

9. $\dfrac{\pi^2}{6\sqrt{3}}$

10. $\dfrac{1}{2}\sqrt{\dfrac{\pi}{2}}$

If the answer to Question 5 differs from what's here, show me and I'll check it :)

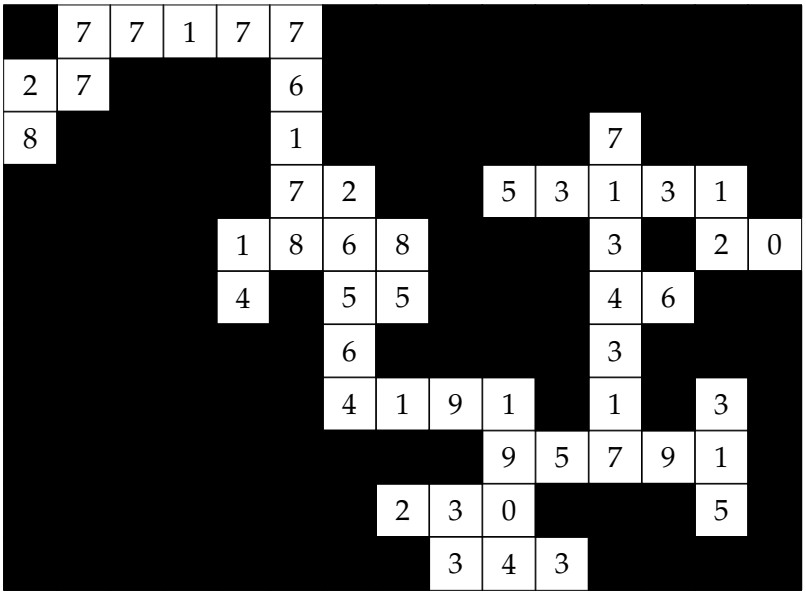
2 Crossnumber Round

In this round, mark as they go along. Each correct answer is worth 1 mark; when they submit an incorrect answer, put down the correct digit on the grid and don't award the mark.

From the markers guide: This is the most involved round to mark. Shortly before the event takes place, I'll send the completed crossnumber. To mark this, the team will say they want to submit an answer e.g '8 ACROSS'. Then they will either give the answer one digit at a time or all at once. If it's one at a time, mark each digit at a time, if it's all at once, mark all of them in a row.

Each half of the team has a copy of the crossnumber. When one of the halves submits an answer, write down the correct digit and put a little tick next to it if they submitted the right one. If they submit a wrong digit, put the correct one down on their crossnumber and put a cross next to it. The total marks at the end is the number of ticks.

2.1 Completed Crossnumber



3 Shuttle Round

In this round, mark at the end of each shuttle or when they want to submit their answers. Each answer is worth 3 marks if it's correct on the first attempt and 1 mark if it's any subsequent attempt. If they complete the whole set correctly within 6 minutes, award 5 bonus marks (even if they didn't get them all correct the first time).

From the markers guide: The shuttle round is marked like the group round but at a quicker pace. Whether the team submits their answers before the end or the time is up, mark each of the answers they submitted - 3 marks for being correct on the first attempt and 1 if its on any later attempt. If they get all 4 of them within 6 minutes then they get an extra 5 bonus marks. The final score at the end is the sum of the scores on each shuttle.

3.1 Shuttle 1

1. 4
2. $2\sqrt{2}$
3. π
4. $-\frac{1}{2}\pi^2 \ln(2)$

3.2 Shuttle 2

1. 0
2. 0
3. $-\infty$
4. $\frac{\ln(\pi)}{2}$

3.3 Shuttle 3

1. 0
2. 0
3. 2
4. $\frac{\pi}{4}$

3.4 Shuttle 4

1. 2,3 or 3,2 - any order is fine.
2. 1
3. $\varphi = \frac{1+\sqrt{5}}{2}$
4. $2\pi^2$