Some comments on exams

As with previous years, exam content given at the Training Camp are grouped by topics such as solid earth (‘geosphere’) and oceanography/hydrology (‘hydrosphere’). This year they consisted of 5 separate exams: rocks and minerals, geosphere, atmosphere, hydrosphere, and solar system astronomy. Each of the 5 camp exams were given equal weight in determining overall performance.

Camp exams are generally geared towards a higher degree of interpretation and reasoning compared to the Open Exam. Camp exams problems are intended to be applications of fundamental concepts; by introducing new topics, we hope broaden students’ view of geoscience.

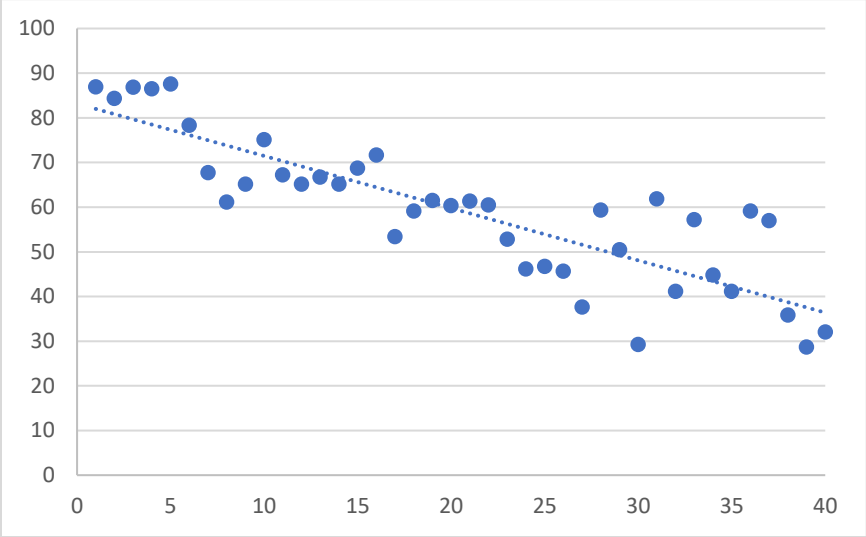
As of this year, we implemented free-response problems in addition to multiple choice questions in order to better assess depth of understanding. We believe that explanatory or open-ended responses provide a valuable view of ability to apply existing knowledge in potentially new contexts. Indeed, free-response questions have proven helpful in distinguishing students in both the Open and camp exams.

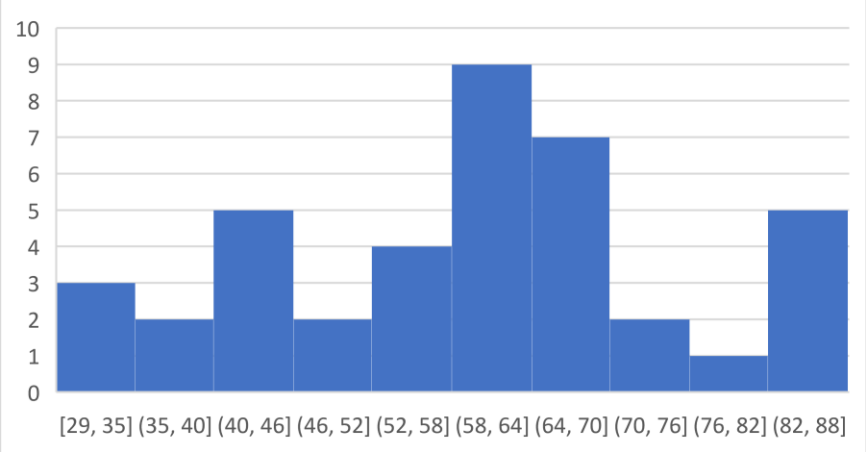
Score distributions & exam-specific commentary

For each exam, the rank-ordered (overall camp rank) scores are given in a scatter plot and the score distribution is given in a histogram. R^2 values are given for the rank-ordered scores.

Rocks and Minerals (theoretical & practical)

Mean: 59.2 (49.3%) | Median: 60.4 (50.3%) | Max: 87.6 (72.9%) | Min: 28.7 (23.9%) | R^2: 0.73 | Points: 120





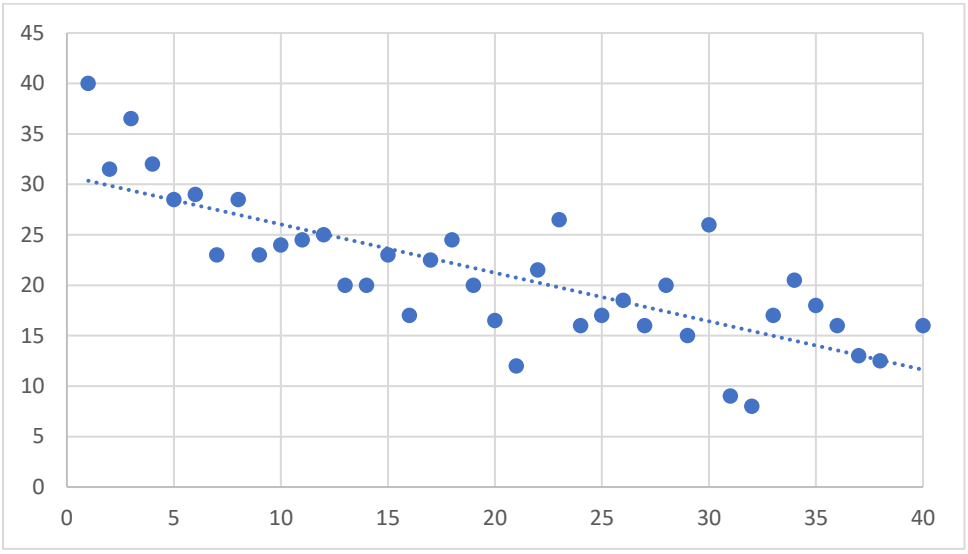
Notes:

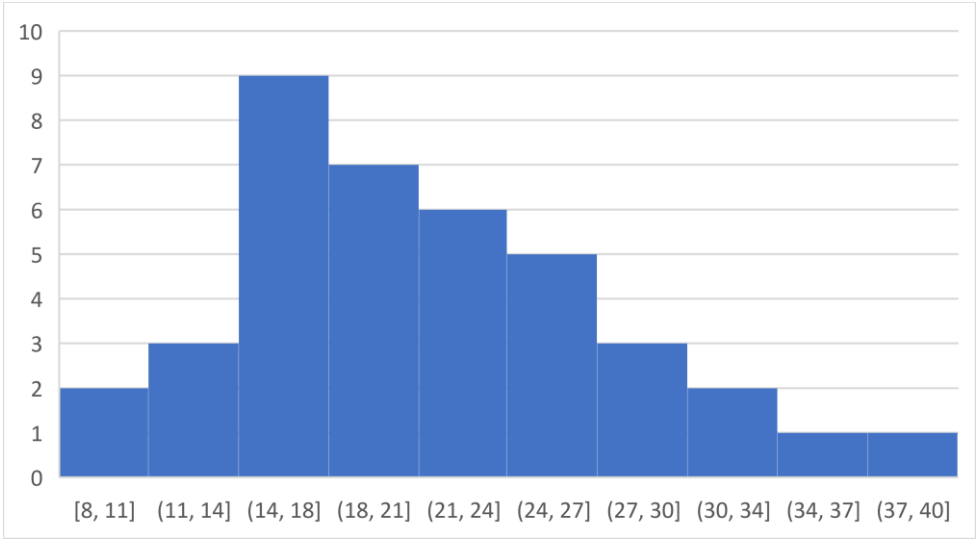
Students performed better on this year's theoretical portion than last year, when it was first introduced. This year's exam was also designed to be more based on the application of core concepts rather than specific knowledge of advanced concepts.

Problems like 1.4 and 2.5 were designed to gauge interpretation or "real-meaning" skills rather than understanding of rigorous earth science concepts. 3.4 was covered in lecture content and does not necessarily represent base knowledge expected from students.

Geosphere

Mean: 21.2 (42.4%) | Median: 20.0 (40%) | Max: 40.0 (80%) | Min: 8 (16%) | R^2: 0.61 | Points: 50





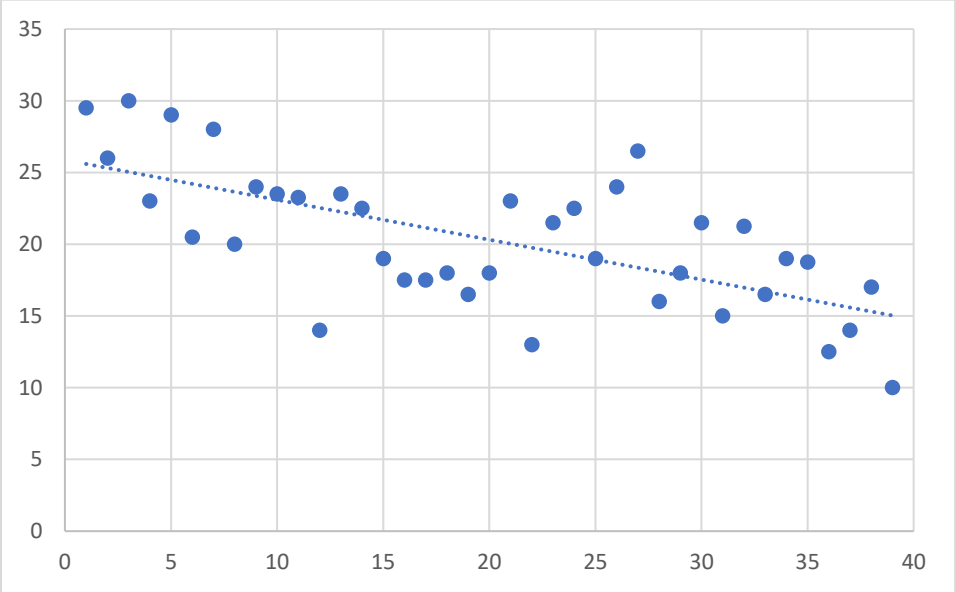
Notes:

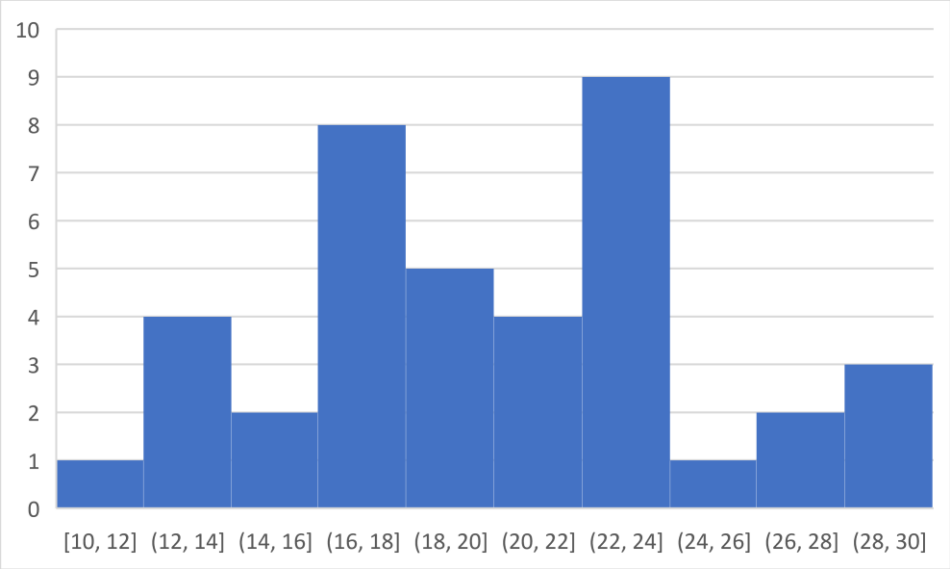
Students occasionally wonder about the difference between the theoretical rocks and mineral exam and the geosphere exam. While there is overlap, the geosphere exam focuses more on tectonics, structural geology, and stratigraphy.

Structural geology problems like S1.1 and S1.8 are more easily approached by drawing.

Atmosphere

Mean: 20.3 (40.6%) | Median: 20.0 (40%) | Max: 30.0 (60%) | Min: 10.0 (20%) | R^2: 0.43 | Points: 50





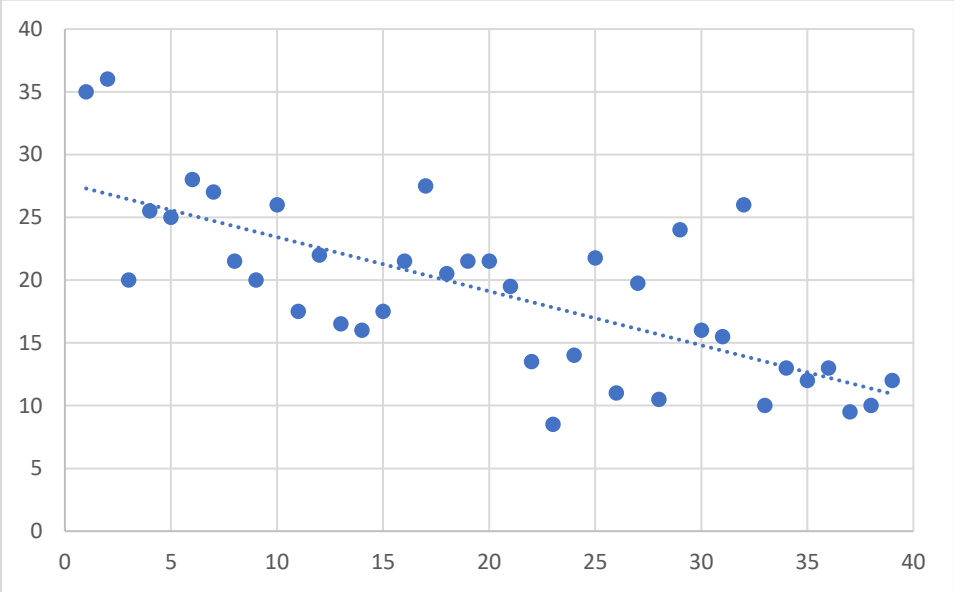
Notes:

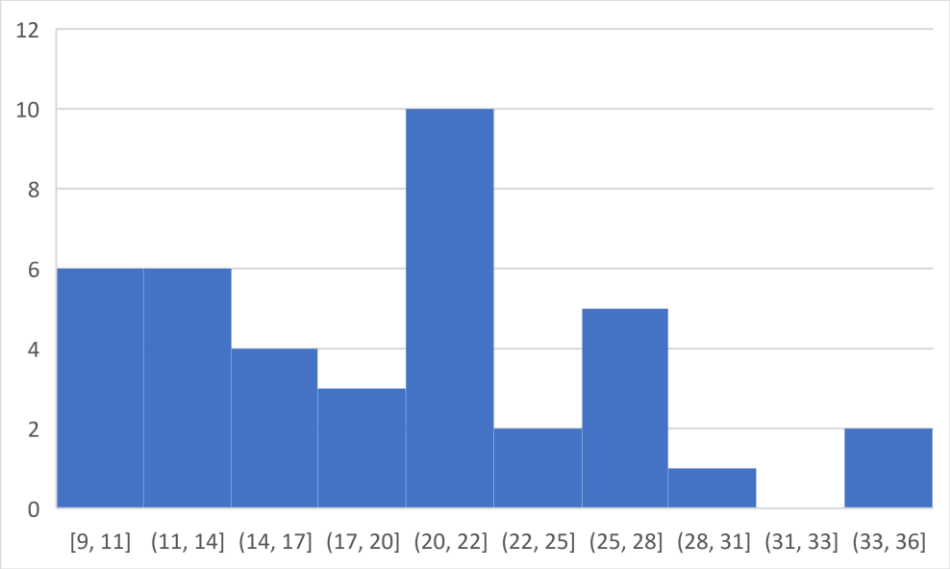
The atmosphere exam tended to have slightly more specific knowledge-based questions (e.g., S1.2, S2.2.3) than other exams.

S1.9 was intended to gauge knowledge of El Nino, which is a topic that does require some memorized knowledge (e.g., that trades weaken during El Nino). However, all of the answer choices were intended to be reasoned from basic El Nino principles; students were not expected to have background knowledge about the Atlantic Nino.

Hydrosphere

Mean: 19.1 (38.2%) | Median: 19.8 (39.5%) | Max: 36 (72%) | Min: 8.5 (17%) | R^2: 0.52 | Points: 50





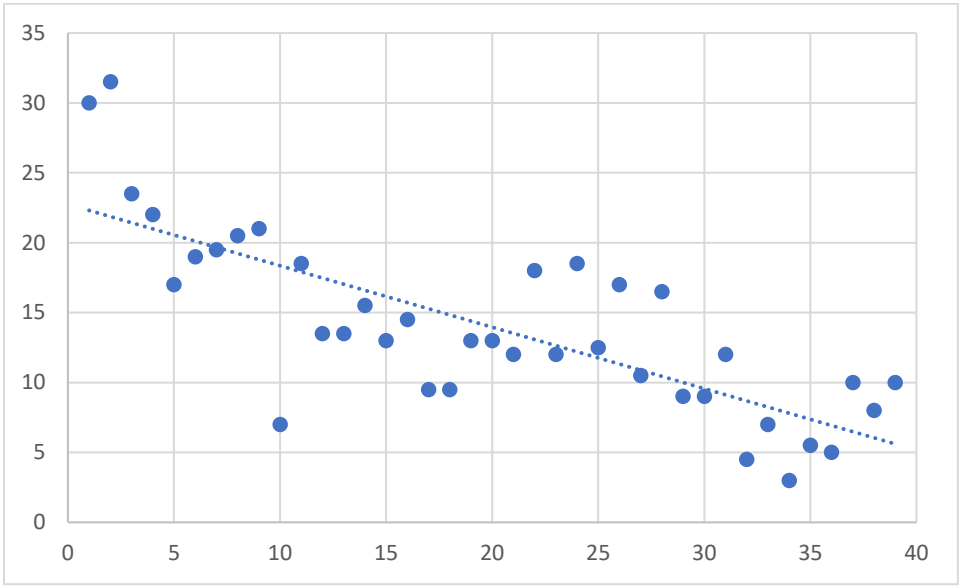
Notes:

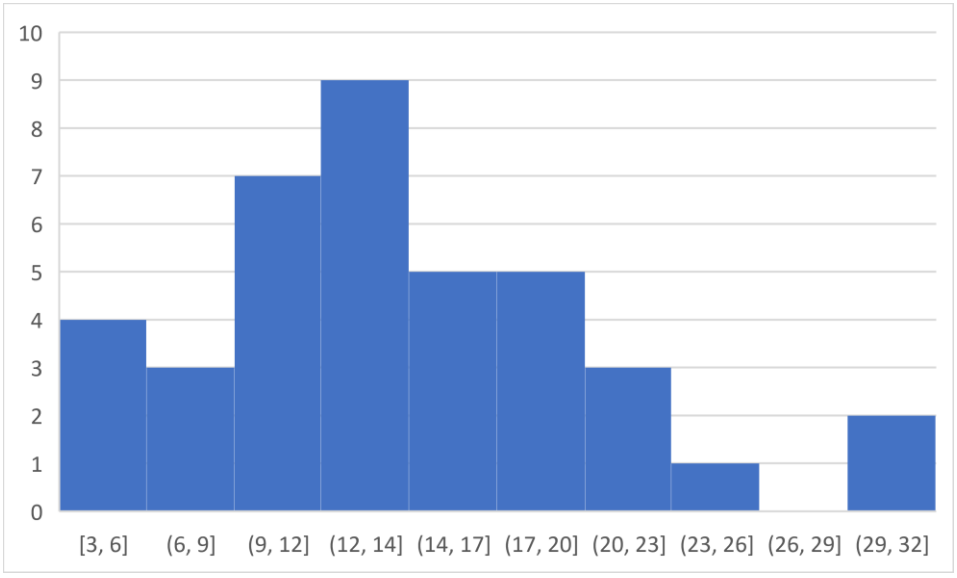
The hydrosphere exam involved many meteorology concepts (e.g., S1.1, S1.5, S2.2.9); indeed, the ocean and atmosphere are closely coupled.

There were some questions in S2.1 that ended up being too open-ended and yielded responses that did not follow the “guiding” of the question.

Astronomy

Mean: 14.0 (27.9%) | Median: 13 (26%) | Max: 31.5 (63%) | Min: 3 (6%) | R^2: 0.60 | Points: 50





Notes:

The astronomy section typically combines basic principles of solar system astronomy (e.g., Kepler's laws) with principles from other Earth systems and applies them to other planetary bodies. This year, the astronomy exam appears to have been the most difficult exam. However, consistent with our approach of applying geoscience concepts to planetary science, students who performed well on other exams also tended to perform well on the astronomy exam.

The final FRQ (S2.2) proved to be particularly difficult, as it involves applying knowledge of phase diagrams to a scheme many students have not previously encountered. Given it was at the end of the exam, students also had limited time to process and synthesize the information.

Drawing diagrams is especially helpful for visualizing problems in the astronomy exam (e.g., S1.9, S2.1.4).