



ASTRONOMY

MINNESOTA REGIONS 2011

ANSWER KEY

by Michael Huberty

- SCORING:** All problems are worth 1 point each except:
- 2 points each for problems 27, 30, 31, 48, 49
 - 3 points for problem 50

Total possible: 57 points

Tie Breakers:

- (A) First use problem 48 to break the tie.
- (B) If still tied, break it with problem 27.
- (C) If still tied, break it by the quality of the answer for problem 50.

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|------------------------------------|------------------------------------|-------------------------------|
| 1. A B C D E | 17. <u>4 times</u> | 33. A B C D E F |
| 2. A B C D E | 18. A B C D E | 34. A B |
| 3. A B C D | 19. A B C D E | 35. <u>100 times</u> |
| 4. <u>Cetus</u> | 20. <u>Pegasus</u> | 36. A C |
| 5. A B C D E | 21. A B C D E | 37. <u>1300 times</u> |
| 6. <u>10.2 billion light years</u> | 22. A B C D | 38. A F |
| 7. <u>10.2 billion years</u> | 23. <u>108 million light years</u> | 39. <u>10 times</u> |
| 8. <u>Cetus</u> | 24. <u>Centaurus</u> | 40. <u>580 nm</u> |
| 9. A B C D E | 25. A B C | 41. B D |
| 10. A B C D | 26. A B C | 42. <u>100 times</u> |
| 11. <u>Cancer</u> | 27. <u>56 million light years</u> | 43. <u>white dwarf</u> |
| 12. A B C D E | 28. A B C | 44. A B C D |
| 13. A B | 29. <u>recurrent</u> | 45. <u>5 billion years</u> |
| 14. X Y | 30. A B C D E F | 46. <u>Mira</u> |
| 15. <u>16 times</u> | 31. A B C D E F | 47. <u>R Coronae Borealis</u> |
| 16. X Y | 32. A B C D E F | 48. <u>0.4 AU</u> |
| | | 49. <u>~ 70-75 (km/s)/Mpc</u> |
50. The Hubble Constant describes how fast objects appear to be moving away from our galaxy as a function of distance. It is the rate at which the universe is expanding.