

2016 Exam – Math Circle Summer Program

Test A Solutions

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|------|----------------------------|--------------------------------|
| 1. A | 10. $2x^2(y-2)(y-4)$       | 19. a. 161616161616161616      |
| 2. B | 11. $-3x^3 + 6x^2 - 12$    | b. 6161616                     |
| 3. A | 12. $\frac{1}{3}, 0$       | c. Yes (smallest is 18 digits) |
| 4. B | 13. 120                    |                                |
| 5. D | 14. 90                     | 20. a. Fibonacci Numbers,      |
| 6. E | 15. 2016                   | $f(1) = 2, f(2) = 3, f(n) =$   |
| 7. D | 16. A=54, B=18, C=25, D=50 | $f(n-1) + f(n-2)$              |
| 8. C | 17. 40                     | b. For a given $n$ there are   |
| 9. D | 18. $\sqrt{2} + \sqrt{6}$  | $f(n-1)$ numbers ending in     |
|      |                            | 1 and $f(n-2)$ numbers         |
|      |                            | ending in 12.                  |

Test B Solutions

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|------|--|--------------------------------|
| 1. D | 10. $\frac{499}{2475}$                                     | 17. a. 161616161616161616      |
| 2. A | 11. $\frac{1}{3}, 0$                                       | b. 6161616                     |
| 3. A | 12. 45   | c. Yes (smallest is 18 digits) |
| 4. D | 13. 1  | d. Multiples of 5 and/or 32    |
| 5. D | 14. $\frac{3\sqrt{2}}{2}$                                  |                                |
| 6. C | 15. $x = \frac{7+\sqrt{41}}{2}, y = \frac{7-\sqrt{41}}{2}$ | 18. a. 23421314                |
| 7. B | 16. $100\pi - 100$   | b. none exist                  |
| 8. B |  |                                |
| 9. E |  |                                |

Test C Solutions

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|------|--|------------------|
| 1. D | 10. $\frac{1}{3}, 0$                                       | 17. a. use mod 3 |
| 2. C | 11. $\log_2 2016 = 5 + \log_2 63$                          | b. $n = 4, 6, 8$ |
| 3. C | 12. $x = \frac{7+\sqrt{41}}{2}, y = \frac{7-\sqrt{41}}{2}$ | 18. a. 23421314  |
| 4. A | 13. 64   | b. none exist    |
| 5. B | 14. 7  | c. $n=7$         |
| 6. D | 15. 432  |                  |
| 7. C | 16. $\frac{21}{20}$  |                  |
| 8. A |  |                  |
| 9. D |  |                  |