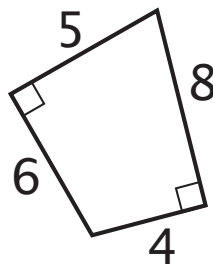


CSU FRESNO MATHEMATICS FIELD DAY  
APRIL 22, 2006  
MAD HATTER MARATHON 6-8  
PART I

1. In the number  $0.1234512345\dots$  (recurring) what is the 2006th digit after the decimal point?
  - (a) 1
  - (b) 2
  - (c) 3
  - (d) 4
  - (e) 5
  
2. The math club orders two pizzas. The diameter of one pizza equals the radius of the second pizza. How many times more area does the second pizza have?
  - (a) 2
  - (b) 3
  - (c) 4
  - (d) 5
  - (e) none of these
  
3. Determine the area of the quadrilateral shown.



- (a) 29
- (b) 30
- (c) 31

- (d) 32
- (e) none of these
4. If one and a half painters can paint one and a half walls in one and a half days, how many walls can six painters paint in nine days?
- (a) 6
- (b)  $6\frac{1}{2}$
- (c) 8
- (d) 9
- (e) none of these
5. An athlete's target heart rate, in beats per minute, is 80% of the theoretical maximum heart rate. The maximum heart rate is found by subtracting the athlete's age, in years from 220. What is the target heart rate of an athlete who is 25 years old?
- (a) 134
- (b) 156
- (c) 176
- (d) 194
- (e) none of these
6. Two 600 ml pitchers contain orange juice. One pitcher is  $\frac{1}{3}$  full and the other is  $\frac{2}{5}$  full. Water is added to fill each pitcher completely, then both pitchers are poured into one large container. What fraction of the mixture in the large container is orange juice?
- (a)  $\frac{1}{8}$
- (b)  $\frac{3}{16}$
- (c)  $\frac{11}{30}$
- (d)  $\frac{11}{19}$
- (e)  $\frac{11}{15}$
7. Three friends have a total of six identical pencils, and each one has at least one pencil. In how many ways can this happen?

- (a) one
  - (b) three
  - (c) six
  - (d) ten
  - (e) twelve
8. A group riding on bicycles and tricycles rode past Space Ghost's house. Space Ghost counted 7 children and 19 wheels. How many tricycles were there?
- (a) 2
  - (b) 4
  - (c) 5
  - (d) 6
  - (e) 7
9. When a fair six-sided die is tossed on a table top, the bottom face cannot be seen. What is the probability that the product of the numbers on the five visible faces is divisible by 6?
- (a)  $33.\bar{3}\%$
  - (b) 50%
  - (c)  $66.\bar{6}\%$
  - (d) 100%
  - (e) none of these
10. How many integers between 1000 and 2000 have all three of the numbers 15, 20, and 25 as factors?
- (a) 1
  - (b) 2
  - (c) 3
  - (d) 4
  - (e) 5

11. This year there were  $11 \times 121 - 11 \times 11$  fewer turkeys eaten than last year. How many fewer turkeys were eaten this year?

- (a) 120
- (b) 121
- (c) 1200
- (d) 1210
- (e) none of these

12. 200% of 50% is:

- (a) 1%
- (b) 100%
- (c) 250%
- (d) 10,000%
- (e) none of these

13. Solve for  $X$ .

$$(2006 + 2005 + 2004) - (2003 + 2002 + 2001) = 2000 - X$$

- (a)  $-2,006$
- (b)  $-2,009$
- (c)  $2,006$
- (d)  $2,009$
- (e) none of these

14. When you divide  $(1 + 4) + (1 + 8) + (1 + 12) + (1 + 16)$  by 4 the remainder is:

- (a) 0
- (b) 1
- (c) 2
- (d) 3
- (e) none of these

15. The greatest common factor of 999,999 and  $2 \times 2 \times 2 \times 2 \times 2$  is:
- (a) 1
  - (b) 2
  - (c) 3
  - (d) 9
  - (e) none of these
16. When Brak was shooting free throws he missed  $4 - 0 \times 2 - 0 \times 1$  shots. How many times did Brak miss?
- (a) 0
  - (b) 2
  - (c) 4
  - (d) 8
  - (e) none of these
17. Moltar wrote a word in secret code. In this code, the number 26 stood for the letter "A", the number 25 stood for "B", and so on. In this code, the sequence
- 19 26 11 11 2
- represents which word?
- (a) RATTY
  - (b) HAPPY
  - (c) HOPPY
  - (d) DANNY
  - (e) none of these
18. If the product of an even number and an odd number is 420, what is the largest possible value of the odd number?
- (a) 21
  - (b) 35
  - (c) 105

- (d) 419
  - (e) none of these
19. What is the sum of the two largest prime numbers less than 30?
- (a) 48
  - (b) 52
  - (c) 56
  - (d) 68
  - (e) none of these
20. A bakery lowered its price for cookies from \$0.25 to \$0.20 each. If you have \$4, how many more cookies can you buy now than before?
- (a) 1
  - (b) 4
  - (c) 5
  - (d) 20
  - (e) none of these
21. Thirty-three minutes after 11 A.M. is how many minutes before 1 P.M.?
- (a) 27
  - (b) 87
  - (c) 93
  - (d) 97
  - (e) none of these
22. The average of seven whole numbers is 7. If six of the numbers are 1, then the seventh number is:
- (a) 1
  - (b) 7
  - (c) 13

- (d) 43
- (e) none of these
23. Lokar has only enough paint to cover a wall 12m by 15m. At most how many non-overlapping squares of size 3m by 3m can he paint on that wall?
- (a) 9
- (b) 18
- (c) 20
- (d) 60
- (e) none of these
24.  $2006200620062006 \div 2006$  is
- (a) 1111
- (b) 1010101
- (c) 1001001001
- (d) 1000100010001
- (e) none of these
25. If 5 widgets = 10 fidgets, then 8 fidgets =    ? widgets.
- (a) 3
- (b) 4
- (c) 13
- (d) 16
- (e) none of these
26. Beavis multiplied three different prime numbers together. How many different whole numbers are factors of this product?
- (a) 3
- (b) 6
- (c) 8

- (d) 9
- (e) none of these

27.  $(2006 - 2004) \times (2004 - 2002) \times (2002 - 2000) \times \cdots \times (6 - 4) \times (4 - 2) =$

- (a)  $2^{998}$
- (b)  $2^{1000}$
- (c)  $2^{1002}$
- (d)  $2^{2000}$
- (e) none of these

28. Jill made square cookies and round cookies. The sides of each square cookie were as long as the radius of each round cookie. What is the area of a round cookie divided by the area of a square cookie?

- (a)  $\pi$
- (b)  $2\pi$
- (c)  $4\pi$
- (d) 4
- (e) none of these

29. The product of six whole numbers is 36. What is the least possible value of their sum?

- (a) 8
- (b) 12
- (c) 14
- (d) 16
- (e) none of these

30. Shrek made a list of three-digit whole numbers, and every digit used was odd. At most how many different numbers were on his list?

- (a) 125
- (b) 150

- (c) 333
  - (d) 450
  - (e) none of these
31. Donkey multiplied one whole number by 18. He then multiplied a second whole number by 21. Then he added the two products. Of the following, which *could* have been the resulting sum?
- (a) 1996
  - (b) 1997
  - (c) 1998
  - (d) 1999
  - (e) none of these
32. Two of the angles of a triangular Calvinball field measure  $20^\circ$  and  $40^\circ$ . What is the measure of the third angle?
- (a)  $60^\circ$
  - (b)  $80^\circ$
  - (c)  $90^\circ$
  - (d)  $120^\circ$
  - (e) none of these
33. If my bad hair day began 720 minutes before 7:20 PM, then my bad hair day began at:
- (a) 1:20 AM
  - (b) 7:20 AM
  - (c) 12:00 PM
  - (d) 7:08 PM
  - (e) none of these
34. 500 nickels have the same value as how many quarters?
- (a) 100

- (b) 250
  - (c) 500
  - (d) 2500
  - (e) none of these
35. Trixie knows that the perimeter of the square handball court at school is either 33, 44, 55, 66, or 77 feet. If the court's side lengths are whole numbers, what is the perimeter?
- (a) 33 feet
  - (b) 44 feet
  - (c) 55 feet
  - (d) 66 feet
  - (e) 77 feet
36. If 3 of every 150 astronauts walk on the moon, then what percentage of all astronauts walk on the moon?
- (a) 2
  - (b) 3
  - (c) 5
  - (d) 50
  - (e) none of these
37.  $\sqrt{100} = \sqrt{36} + \sqrt{?}$ .
- (a) 2
  - (b) 4
  - (c) 16
  - (d) 64
  - (e) none of these
38. By how much does the sum  $19 + 28 + 37 + 46 + 55 + 64 + 73 + 82 + 91$  exceed the sum  $18 + 27 + 36 + 45 + 54 + 63 + 72 + 81 + 90$ ?

- (a) 9
- (b) 10
- (c) 90
- (d) 100
- (e) none of these

39. What is the largest odd factor of 90?

- (a) 3
- (b) 5
- (c) 15
- (d) 35
- (e) none of these

40. At most how many students can sit in a row of 25 chairs, if seated students must be separated by at least one empty chair?

- (a) 11
- (b) 13
- (c) 16
- (d) 24
- (e) none of these

MAD HATTER MARATHON 6-8

PART I ANSWERS

- |       |       |
|-------|-------|
| 1. a  | 21. b |
| 2. c  | 22. d |
| 3. c  | 23. c |
| 4. e  | 24. e |
| 5. b  | 25. b |
| 6. c  | 26. c |
| 7. d  | 27. c |
| 8. c  | 28. a |
| 9. d  | 29. b |
| 10. c | 30. a |
| 11. d | 31. c |
| 12. b | 32. d |
| 13. e | 33. b |
| 14. a | 34. a |
| 15. a | 35. b |
| 16. c | 36. a |
| 17. b | 37. c |
| 18. c | 38. a |
| 19. b | 39. e |
| 20. b | 40. b |

CSU FRESNO MATHEMATICS FIELD DAY  
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MAD HATTER MARATHON 6-8  
PART II

1. The difference between  $\frac{5}{6}$  and its reciprocal is:
  - (a)  $\frac{1}{5}$
  - (b)  $\frac{1}{6}$
  - (c)  $\frac{1}{30}$
  - (d)  $\frac{11}{30}$
  - (e) none of these
  
2. On my scooter, the rear wheel's diameter is 6 cm more than the front wheel's diameter. The rear wheel's circumference is    ?    cm more than the front wheel's.
  - (a)  $3\pi$
  - (b)  $6\pi$
  - (c)  $9\pi$
  - (d)  $36\pi$
  - (e) none of these
  
3. If I divide my age by 5, the remainder is 3. Your age is twice mine. If I divide your age by 5, the remainder will be:
  - (a) 0
  - (b) 1
  - (c) 2
  - (d) 3
  - (e) 4
  
4. In a rectangle with perimeter 30 cm and area  $56 \text{ cm}^2$ , the longer side's length is    ?    cm more than the length of the shorter side.

- (a) 1
  - (b) 5
  - (c) 20
  - (d) 26
  - (e) none of these
5. If the sum of two whole numbers is 24 more than their difference, then one of the numbers *must* be:
- (a) 0
  - (b) 6
  - (c) 12
  - (d) 48
  - (e) none of these
6. The first 10 contestants in a game show won an average of \$80. The next 20 won an average of \$65. The 30 contestants won an average of:
- (a) \$70
  - (b) \$72
  - (c) \$75
  - (d) \$68
  - (e) none of these
7. At most how many circles of radius one can fit inside a  $4 \times 4$  square so that none of the circles overlap?
- (a) 1
  - (b) 4
  - (c) 5
  - (d) 16
  - (e) none of these
8. Today is Jar-Jar's birthday. His age today, in months, is 72 times his age 5 years ago, in years. How many years old is Jar-Jar today?

- (a) 6
  - (b) 7
  - (c) 8
  - (d) 12
  - (e) none of these
9. Of 2006 integers whose product is even, at most how many can be odd?
- (a) 2006
  - (b) 2005
  - (c) 1
  - (d) 0
  - (e) none of these
10. How many of the numbers 11, 21, 31, 41, 51, 61, 71, 81, 91 are prime?
- (a) 4
  - (b) 5
  - (c) 6
  - (d) 7
  - (e) none of these
11.  $(301 + 302 + 303 + \cdots + 325) - (1 + 2 + 3 + \cdots + 25) =$
- (a) 25
  - (b) 2500
  - (c) 5000
  - (d) 7500
  - (e) none of these
12. If the Weasleys' Wizard Wheezes "OPEN" sign is square with a perimeter of 4, then the area of the sign is:
- (a) 1

- (b) 4
- (c) 8
- (d) 16
- (e) none of these

13.  $300 \div 200 = 1 \div \underline{\quad ? \quad}$

- (a)  $\frac{1}{3}$
- (b)  $\frac{1}{2}$
- (c)  $\frac{2}{3}$
- (d)  $\frac{3}{2}$
- (e) none of these

14.  $3 - \frac{5}{x+2} =$

- (a)  $\frac{-2}{x+2}$
- (b)  $\frac{3x-5}{x+2}$
- (c)  $\frac{6x-5}{x+2}$
- (d)  $\frac{3x+1}{x+2}$
- (e) none of these

15. Exactly 120 seconds after midnight, the correct time is:

- (a) 12:02 PM
- (b) 12:02 AM
- (c) 2:00 PM
- (d) 2:00 AM
- (e) none of these

16. The reciprocal of  $\left(\frac{1}{2} \times 4\right)$  is

(a)  $\frac{1}{4} \times 2$

(b)  $\frac{1}{2} \times 4$

(c)  $\frac{1}{2} \times \frac{1}{4}$

(d)  $2 \times 4$

(e) none of these

17. What is the sum of all one-digit positive prime numbers?

(a) 15

(b) 16

(c) 17

(d) 18

(e) none of these

18.  $2 \times \frac{1}{2} \times 4 \times \frac{1}{4} \times 6 \times \frac{1}{6}$

(a) 1

(b) 6

(c) 12

(d) 24

(e) none of these

19. Dr. Orloff wears his headphones only on cloudy days. The day after each cloudy day is a sunny day. Orloff wears his headphones at most how many times in a week?

(a) 3

(b) 4

(c) 5

- (d) 6
- (e) none of these

20. Of the following, which has the largest value?

- (a) 7
- (b)  $(-1)^2$
- (c)  $(-2)^2$
- (d)  $(-3)^2$

21.  $9000\% + 900\% + 90\% + 9\% =$

- (a) 9999
- (b) 999.9
- (c) 99.99
- (d) 0.9999
- (e) none of these

22. A dealer paid Bunny Fufu 50 pennies for each of his decorated eggs. The dealer then sold each egg for 50 quarters. Bunny Fufu got what percentage of the purchase price for his eggs?

- (a) 2%
- (b) 4%
- (c) 25%
- (d) 50%
- (e) none of these

23.  $\sqrt{\sqrt{\sqrt{256}}} =$

- (a) 2
- (b) 4
- (c) 8
- (d) 16

- (e) none of these
24.  $30\% \times 40\% =$
- (a) 12%
  - (b) 120%
  - (c) 1200%
  - (d) 12000%
  - (e) none of these
25. Which of the following numbers has exactly 4 different whole number factors?
- (a) 30
  - (b) 24
  - (c) 12
  - (d) 10
  - (e) none of these
26. When rounded to the nearest *fifth*, 0.33 becomes:
- (a) 0.2
  - (b) 0.3
  - (c)  $\frac{2}{5}$
  - (d)  $\frac{3}{5}$
  - (e) none of these
27.  $1.5 \text{ m} + 60 \text{ cm} + 0.02 \text{ km} =$
- (a) 0.221 m
  - (b) 2.21 m
  - (c) 22.1 m
  - (d) 221 m
  - (e) none of these

28. How many of the positive multiples of 2 are factors of 222?
- (a) 111
  - (b) 4
  - (c) 3
  - (d) 1
  - (e) none of these
29. If  $\frac{2}{3}$  of a cup of fish food can feed eight goldfish, then four cups of food should be able to feed how many goldfish?
- (a) 12
  - (b) 24
  - (c) 36
  - (d) 48
  - (e) none of these
30. An integer *cannot* be    ? if the integer's square is even.
- (a) prime
  - (b) odd
  - (c) even
  - (d) zero
  - (e) none of these
31. Boss Nass was immunized on the one millionth second of this calendar year. That happened on:
- (a) January 11
  - (b) January 12
  - (c) February 1
  - (d) February 2
  - (e) none of these
32.  $\sqrt{16^{16}} =$

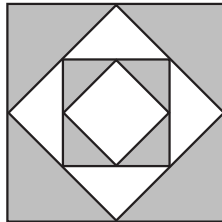
- (a)  $4^4$
  - (b)  $4^8$
  - (c)  $16^4$
  - (d)  $16^8$
  - (e) none of these
33. If  $x$  is a whole number, what is the largest possible perimeter of a triangle with side lengths 3, 4, and  $x$ ?
- (a) 11
  - (b) 12
  - (c) 13
  - (d) 14
  - (e) none of these
34. When fully expanded,  $10,000^{999}$  has how many digits?
- (a) 9999
  - (b) 10,000
  - (c) 39,996
  - (d) 39,997
  - (e) none of these
35. How many of the fifteen positive factors of 400 are divisible by 4?
- (a) 4
  - (b) 8
  - (c) 9
  - (d) 10
  - (e) none of these
36. How many integers equal their own squares?
- (a) none

- (b) one
- (c) two
- (d) three
- (e) none of these

37. At 12:22, a clock's hour hand is how many degrees away from a vertical position?

- (a)  $10^\circ$
- (b)  $11^\circ$
- (c)  $21^\circ$
- (d)  $22^\circ$
- (e) none of these

38. In the figure below, each square is inscribed at the midpoints of the sides of the next larger square. The largest square measures 10 inches on a side. What is the area of the smallest square?



- (a)  $8\frac{1}{2}$  square inches
- (b)  $10\frac{1}{2}$  square inches
- (c)  $12\frac{1}{2}$  square inches
- (d)  $14\frac{1}{2}$  square inches
- (e) none of these

39. Matt has 2 cats, 4 rats, and 5 bats. All the animals eat gnats. Each bat eats 3 gnats per day. If a cat eats 3 times as many gnats as a rat and 4 times as many gnats as a bat, how many gnats does Matt have to feed his pets each day?

- (a) 44
- (b) 47
- (c) 51
- (d) 55
- (e) none of these

40. Assume the three positive real numbers  $x, y, z$  satisfy the system of equations

$$\frac{z}{x+y} = 2, \quad \frac{z}{x-y} = 3$$

Which of the following is true?

- (a)  $x < y < z$
- (b)  $y < z < x$
- (c)  $z < x < y$
- (d)  $y < x < z$
- (e) none of these

MAD HATTER MARATHON 6-8

PART II ANSWERS

- |       |       |
|-------|-------|
| 1. d  | 21. c |
| 2. b  | 22. b |
| 3. b  | 23. a |
| 4. a  | 24. a |
| 5. c  | 25. d |
| 6. a  | 26. c |
| 7. b  | 27. c |
| 8. a  | 28. b |
| 9. b  | 29. d |
| 10. b | 30. b |
| 11. d | 31. b |
| 12. a | 32. d |
| 13. c | 33. c |
| 14. d | 34. d |
| 15. b | 35. c |
| 16. a | 36. c |
| 17. c | 37. b |
| 18. a | 38. c |
| 19. b | 39. d |
| 20. d | 40. d |