Math Field Day 2012
Mad Hatter 6-8

CSU Fresno `http://www.csufresno.edu/math`

21 April 2012

The Mad Hatter Marathon is a competition in rapid computation and problem solving. You will find that you do not have time to solve every problem. After a few minutes you may feel "mentally out of breath." Do not let this discourage you. Your fellow contestants feel the same way. That is why this contest is called *Mad Hatter Marathon!*

Mad Hatter 6-8

The Mad Hatter Marathon is divided into two problem solving periods, each lasting 45 minutes. Between the two periods there will be a 15 minute break.

Part I

- This part of the exam consists of 30 problems.
- The problems will be shown one at a time.
- You will have one and a half minutes to solve the problem shown.
- After one and a half minutes a new problem will be shown.
- You may move to a new question without solving the old one.

As soon as you have solved the problem mark your answer in the corresponding space on the Scantron form.

Rules and Scoring

You may use pencil and scratch paper to do calculations, but **calculators are not allowed.**

Your score is the total number of correct answers, so give the best answer that you can in the time available for each problem. There is no penalty for guessing.

Ready... Set... Go!

Prepare to begin the *Mad Hatter Marathon!*

Part I - Problem 1

Paul's father is 3 times Paul's age. How old is Paul if the sum of their ages is 40?

A. 12
B. 13
C. 8
D. 15
E. 10

Part I - Problem 2

Cameron and Katie both work night shifts. When they have the same night off they go dancing together. If Cameron has every sixth night off and Katie has every eighth night off, how often do they go dancing together?

A. more than four times per month
B. one or two times per month
C. less than once per month
D. three or four times per month
E. never

Part I - Problem 3

Kay's mom buys 72 chocolate bars, 36 cookies, and 108 lollipops for Kay's birthday party. If each of Kay's 6 best friends are to get an equal number of sweets, how many sweets will each friend receive, if Kay's mom does not have any leftovers?

A. 30
B. 24
C. 18
D. 36
E. 42

Part I - Problem 4

Donny has a rectangular bulletin board that measures 20 inches by 45 inches. He notices that the square he has just cut out of construction paper has the same area as that of the bulletin board. What is the side length of the square?

A. 30
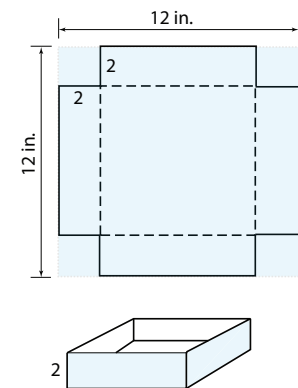B. 20
C. 40
D. $\sqrt{45}$
E. 10

Part I - Problem 5

$$\sqrt{2012 + 2011 \times 2012} =$$

A. 2011
B. 2010
C. 2013
D. 2009
E. 2012

Part I - Problem 6

A square of side length 2 inches is removed from each corner of a 12-inch × 12-inch piece of cardboard. The sides of the cardboard are then folded up to form an open-topped box. What is the volume of the resulting box?

A. 128 in.^{3}
B. 200 in.^{3}
C. 144 in.^{3}
D. 288 in.^{3}
E. 102 in.^{3}

Part I - Problem 7

What digit is in the ones place of the number 2^{26}?

- A. 2
- B. 4
- C. 6
- D. 8
- E. 0

Part I - Problem 8

$$\frac{2}{9} - \frac{5}{18} + \frac{1}{6} =$$

- A. $-\frac{1}{18}$
- B. $\frac{7}{6}$
- C. $\frac{1}{9}$
- D. $\frac{1}{18}$
- E. $-\frac{1}{9}$

Part I - Problem 9

The sum of the even numbers from 52 to 304 (inclusive) is how much *more* than the sum of the odd numbers from 51 to 303 (inclusive)?

- A. 125
- B. 255
- C. 252
- D. 127
- E. 254

Part I - Problem 10

You have a long list of numbers. The first number is 3 and the second number is 7. Every number after that is the sum of the two preceding numbers. The sixth number in your list is:

- A. 10
- B. 24
- C. 44
- D. 52
- E. 68

Part I - Problem 11

In a triangle *ABC*, the angle $\angle A$ is twice as much as the angle $\angle B$ and 20° less than the angle $\angle C$. Find the angle $\angle A$.

A. 20°

B. 60°

C. 40°

D. 64°

E. 44°

Part I - Problem 12

$28 \times 5 - 25 \times 4 + 16 \times 3 =$

A. 140

B. 48

C. 64

D. 75

E. 88

Part I - Problem 13

Charlene wants to mail a package that weighs 14 ounces. The postmaster tells her that the postage costs $1.34 for the first ounce and $0.95 for each additional ounce. How much will Charlene have to pay in postage?

A. $11.96

B. $13.21

C. $13.30

D. $13.69

E. $14.64

Part I - Problem 14

A jar containing 130 marbles weighs 21 oz. The same jar containing only 100 marbles weighs 18 oz. What is the weight of the jar?

A. 4 oz.

B. 6 oz.

C. 8 oz.

D. 10 oz.

E. 12 oz.

Part I - Problem 15

$(3 + 4) \times 6 + 2 \times (4 - 1) - (3 \times 4) =$

A. 36

B. 15

C. 39

D. 46

E. 108

Part I - Problem 16

The table below shows five different monthly plans for cellular phone service from Amble Wireless. Which plan is the cheapest in terms of cost per minute?

Monthly Cost	$40	$50	$60	$80	$100
Minutes per month	350	500	650	850	1050

A. 350 minute plan

B. 500 minute plan

C. 650 minute plan

D. 850 minute plan

E. 1050 minute plan

Part I - Problem 17

$3.87 \div 0.05 =$

A. 102.1

B. 77.4

C. 25.5

D. 96.2

E. 15.2

Part I - Problem 18

The perimeter of a rectangle with length 6 and width 5 is:

A. 11

B. 60

C. 30

D. 41

E. 22

Part I - Problem 19

A 30′ × 60′ room has a 14′ × 28′ dance floor. What percentage of the room is to be used for dancing?

  A. less than 20%

  B. between 20% and 30% inclusive

  C. between 30% and 50%

  D. between 50% and 60% inclusive

  E. more than 60%

Part I - Problem 20

The longest side of the triangle is a diameter of the circle shown. What is the total area of the shaded portions?

  A. $25\pi - 24$ square units

  B. $50\pi - 48$ square units

  C. $100\pi - 80$ square units

  D. $24\pi - 60$ square units

  E. $48\pi - 100$ square units
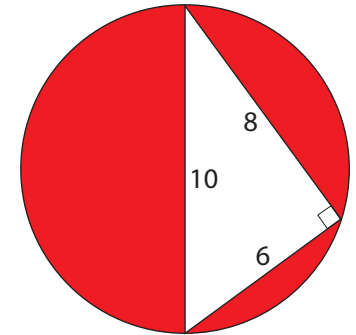

Part I - Problem 21

Karo read 12 of the 75 books on his reading list in the first two months of the school year. How many books per month must he now read, on average, in order to complete the reading list by the end of the 9-month school year?

  A. 9

  B. 12

  C. 11

  D. 8

  E. 14

Part I - Problem 22

0.16 is what percentage of 4?

  A. 16%

  B. 4%

  C. 8%

  D. 40%

  E. 0.4%

Part I - Problem 23

The second Wednesday of a certain month falls on a date which is a one digit odd number. The date of the fourth Saturday of that month will be:

A. 22

B. 23

C. 24

D. 25

E. 26

Part I - Problem 24

The ratio of boys to girls at a class picnic is 4 to 5. Then three more girls show up, making the ratio 2 to 3. How many students are now at the picnic?

A. 30

B. 33

C. 35

D. 42

E. 44

Part I - Problem 25

$\frac{3}{5}$ of 150 equals

A. 30

B. 120

C. 90

D. 60

E. 150

Part I - Problem 26

Which of the following products is *not* divisible by 15?

A. 9×30

B. 21×5

C. 35×12

D. 70×27

E. 50×28

Part I - Problem 27

Raul gets 80 different cable channels. If each channel has a different program each hour, all day, every day, then the total number of different programs in a week is:

A. 9,800
B. 13,440
C. 15,870
D. 18,168
E. 24,000

Part I - Problem 28

The Backpack Shack is open from 10 AM until 7 PM Monday through Friday and from 11 AM to 5 PM on Saturdays and Sundays. What is the total number of hours that the store is open during one week?

A. 72
B. 57
C. 62
D. 48
E. 91

Part I - Problem 29

Ms. Jewl's class wants to buy a computer that sells for $650. The computer manufacturer offers to discount the price by $15 for each student who earns an A in the class. How many students must earn As in order to bring the price of the computer down to $335?

A. 8
B. 14
C. 18
D. 21
E. 26

Part I - Problem 30

Which of the following pizzas would provide the most to eat?

A. two whole 6-inch-diameter pizzas
B. one whole 8-inch-diameter pizza
C. three-fourths of a 10-inch-diameter pizza
D. one half of a 12-inch-diameter pizza
E. one third of an 14-inch-diameter pizza

Mad Hatter - Part 2

The rules for this part of the exam are the same as the previous part.

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Ready... Set... Go!

Prepare to restart the *Mad Hatter Marathon!*

Part II - Problem 1

One brand of computer monitor has a 27-inch screen (measured diagonally) and has a height of 15 inches. The width of the screen must be approximately:

A. 22.4 inches

B. 20.5 inches

C. 15.5 inches

D. 25.7 inches

E. 17.1 inches

Part II - Problem 2

A large bakery regularly orders cartons of Maine blueberries. Find the average weight (in lbs.) of the cartons if the past five orders weighed

17 lbs.   23 lbs.   21 lbs.   22 lbs.   27 lbs.

A. 20 lbs.

B. 23.25 lbs.

C. 20.75 lbs.

D. 21.5 lbs.

E. 22 lbs.

Part II - Problem 3

Two fair 6-sided dice are rolled, and the two numbers that show on the upper faces of the dice are recorded. What is the probability that the sum of the two numbers is 7?

A. $\dfrac{1}{36}$

B. $\dfrac{6}{36}$

C. $\dfrac{2}{36}$

D. $\dfrac{3}{36}$

E. $\dfrac{5}{36}$

Part II - Problem 4

A circular wheel of radius 18 inches rolls far enough to complete one rotation. The approximate distance traveled by the wheel is:

A. 6 feet

B. 4.5 feet

C. 9 feet

D. 12 feet

E. 18 feet

Part II - Problem 5

$$\frac{10^7 \times 10^8}{10^{12}} =$$

A. 100

B. 1000

C. 10,000

D. 100,000

E. 1,000,000

Part II - Problem 6

Amy has 5 pairs of pants, 4 T-shirts and 6 pairs of shoes in her wardrobe. How many different outfits can she possibly make, assuming that an outfit is composed of a pair of pants, a pair of shoes, and a T-shirt?

A. 120 outfits

B. 24 outfits

C. 30 outfits

D. 20 outfits

E. 15 outfits

Part II - Problem 7

What is the 12th digit to the right of the decimal point in the decimal expansion of $\frac{43}{111}$?

A. 9

B. 1

C. 8

D. 3

E. 7

Part II - Problem 8

Ren needs 26 lbs. of flour to make cookies for a bake sale. Flour can be purchased in 4-lb. packages for $3.50 or in 6-lb. packages for $4.50. How many of each package should Ren buy in order to get the best deal?

A. six of the 4-lb. packages

B. four of the 4-lb. packages and two of the 6-lb. packages

C. two of the 4-lb. packages and three of the 6-lb. packages

D. one of the 3-lb. packages and four of the 6-lb. packages

E. five of the 6-lb. packages

Part II - Problem 9

A large cube is built from 1000 small cubes and then is painted on all six sides. The big cube is then accidentally dropped and shatters back into the 1000 smaller cubes. How many of the small cubes have paint on exactly two of their faces?

A. 120

B. 108

C. 96

D. 64

E. 240

Part II - Problem 10

The nine squares are to be filled such that each row and each column contains the numbers 1, 2, and 3. What number goes in the location marked "**X**"?

2		
	1	**X**

A. 1

B. 2

C. 3

Part II - Problem 11

$2012 \times 2012 = \ldots$

  A. 4,248,064
  B. 4,048,144
  C. 4,024,024
  D. 4,264,184
  E. 4,280,204

Part II - Problem 12

If one-third of one-half of a day remains how many hours are left in the day?

  A. 4
  B. 6
  C. 3
  D. 12
  E. 2

Part II - Problem 13

Fifty percent of Fresno State professors have a Wii. Of the professors with Wii's, thirty percent have a Playstation. What percentage of professors have both a Wii and a Playstation?

  A. 15
  B. 20
  C. 25
  D. 40
  E. 80

Part II - Problem 14

What is the remainder when you divide

$$2008 + 2009 + 2010 + 2011 + 2012$$

by 2011?

  A. 0
  B. 2005
  C. 2006
  D. 2007
  E. 2008

Part II - Problem 15

Select the largest number.

A. $\frac{66}{77}$

B. $\frac{4}{5}$

C. $\frac{55555}{66666}$

D. $\frac{777}{888}$

E. $\frac{2222}{3333}$

Part II - Problem 16

Katniss has a 40-foot rope which she cuts into equal-length segments by making four cuts. How long is each segment?

A. 4 feet

B. 5 feet

C. 6 feet

D. 8 feet

E. 10 feet

Part II - Problem 17

Peeta has two bottles and three canteens that altogether hold 8 liters of water. Each canteen holds twice as much water as a bottle. What is the combined volume of the two bottles?

A. 2 liters

B. 3 liters

C. 4 liters

D. 5 liters

E. 1 liter

Part II - Problem 18

$$\frac{\square}{\square} + \frac{\square}{\square} = \frac{26}{30}$$

If you place the numbers 1, 6, 7, and 10 in the boxes to make the equation true, then the sum of the two numerators is:

A. 7

B. 8

C. 11

D. 13

E. 16

Part II - Problem 19

What is the value of

$$(1 - 2) - (3 - 4) - (5 - 6) - (7 - 8) - (9 - 10) - (11 - 12)?$$

A. 0

B. -6

C. 6

D. 4

E. 13

Part II - Problem 20

Form all possible three-digit numbers that have the digits 1, 2, and 3. When you add them together what do you get?

A. 998

B. 1000

C. 1332

D. 1498

E. 1664

Part II - Problem 21

Which product ends with the greatest number of zeroes?

A. 1000×16

B. 651×16

C. 520×16

D. 496×16

E. 625×16

Part II - Problem 22

I'm thinking of ten different positive numbers and the average of all my numbers is 10. What is the largest possible number that I could be thinking of?

A. 10

B. 45

C. 50

D. 55

E. 91

Part II - Problem 23

Eight students take an exam. The mean score is 86. Then two students who missed class complete their make-up exams. Their scores are 89 and 93. What is the new class average?

A. 86
B. 87
C. 88
D. 89
E. 90

Part II - Problem 24

A tank holds 12,800L of water. At the end of each day half of the water is drained and not replaced. How much water will there be at the end of the ninth day?

A. 5L
B. 10L
C. 15L
D. 20L
E. 25L

Part II - Problem 25

In a month that has three Sundays with even dates, what day of the week will the 20th day of the month be?

A. Monday
B. Tuesday
C. Wednesday
D. Thursday
E. Friday

Part II - Problem 26

A room has seven doors. In how many ways is it possible to enter by one door and leave by a different door?

A. 12
B. 24
C. 42
D. 56
E. 36

Part II - Problem 27

The diagram shows the floor plan of a room. Adjacent walls are perpendicular to each other. Letters a and b represent the lengths of some of the walls. What is the area of the room?

A. $2ab + a(b - a)$

B. $3a(a + b) - a^2$

C. $3a^2b$

D. $3a(b - a) + a^2$

E. $3ab$
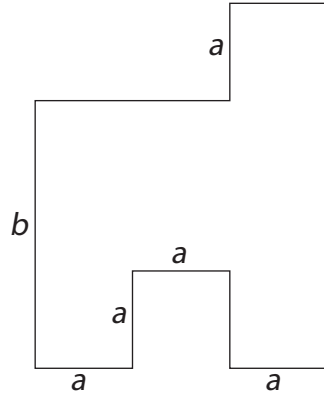
Part II - Problem 28

If you increase each side of a rectangle by 10%, by what percentage does the area increase?

A. 10%

B. 11%

C. 20%

D. 21%

E. 33%

Part II - Problem 29

A recipe calls for $2\frac{1}{4}$ cups of corn meal. Malcolm put in $1\frac{2}{3}$ cups before the old package was empty. How much corn meal needs to be added from the new package?

A. $\frac{5}{6}$ cup

B. $1\frac{1}{8}$ cups

C. $\frac{7}{12}$ cup

D. $1\frac{1}{12}$ cups

E. $\frac{7}{8}$ cup

Part II - Problem 30

If

$$\frac{x - 3y}{y} = 12,$$

then what is $\frac{x}{y}$?

A. 2

B. 3

C. 9

D. 10

E. 15

Solutions

The correct answer choices are on the next page.

Part I

1	e	2	b	3	d	4	a	5	e	6	a
7	b	8	c	9	d	10	c	11	d	12	e
13	d	14	c	15	a	16	c	17	b	18	e
19	b	20	a	21	a	22	b	23	e	24	a
25	c	26	e	27	b	28	b	29	d	30	c

Part II

1	a	2	e	3	b	4	c	5	b	6	a
7	e	8	c	9	c	10	b	11	b	12	a
13	a	14	c	15	d	16	d	17	a	18	b
19	d	20	c	21	e	22	d	23	b	24	e
25	d	26	c	27	e	28	d	29	c	30	e