

Name SOLUTIONS

(circle your lab section)

- ▷ **AB1**, Fri 11:00-12:40, Brian Benson ▷ **AB2**, Thu 3:00-4:40, Paul Spiegelhalter
 ▷ **AB3**, Thu 1:00-2:40, Brian Benson ▷ **AB4**, Fri 1:00-2:40, Paul Spiegelhalter

- Sit in your assigned seat (shown below).
- Do not open this test booklet until I say *START*.
- Turn off electronic devices and put away all items except a pen/pencil and an eraser.
- No calculators are allowed.
- Be sure that your work is neat and that sufficient work is shown to justify each answer.
- While the test is in progress, we will not answer questions concerning the test material.
- Quit working and close this test booklet when I say *STOP*.
- Quickly turn in your test to me or a TA and show your Student ID.

J	1	2	3	4	5	6	7	-	-	8	9	10	11	12	13	14	J
H	1	2	3	4	5	6	7	8	9	10	11	12	13	14	H		
G	1	2	3	4	5	6	7	8	9	10	11	12	13	14	G		
F	1	2	3	4	5	6	7	8	9	10	11	12	13	14	F		
E	1	2	3	4	5	6	7	8	9	10	11	12	13	14	E		
D	1	2	3	4	5	6	7	8	9	10	11	12	13	14	D		
C	1	2	3	4	5	6	7	8	9	10	11	12	13	14	C		
B	1	2	3	4	5	6	-	-	9	10	11	12	13	14	B		
A	1	2	3	4	5	6	-	-	9	10	11	12	13	14	A		

FRONT OF ROOM - 103 Talbot Lab

1. (5 points) Fill in the five missing numbers so that the list below is of the first 30 prime numbers written in increasing order.

2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59
61, 67, 71, 73, 79, 83, 89, 97, 101, 103, 107, 109, 113

2. (6 points) To determine whether or not $10^{12} + 1$ is prime, the *Prime Number Test* indicates that one only needs to check if it is divisible by primes up to which amount below?

- (a) 100 (b) 1000 (c) 10,000 (d) 100,000 (e) 1,000,000 (f) 10,000,000

$$\sqrt{10^{12} + 1} \approx \sqrt{10^{12}} = 10^6$$

we actually used that $10^6 < \sqrt{10^{12} + 1} < 10^6 + 1$

↑ think about this

3. (6 points) Which one of the following numbers is prime?

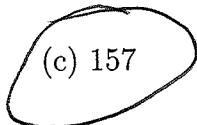
(a) 153

(b) 155

(c) 157

(d) 159

(e) 161



4. (7 points) What is the value of $LCM(12, 20)$?

60

or $2^2 \cdot 3 \cdot 5$

12: 12, 24, 36, 48, 60, 72, 84, ...

~~60, 60, ...~~

20: 20, 40, 60, 80, ...

5. (6 points) Suppose that p is a prime number between 100 and 200 and that q is a prime number between 300 and 500. What is the value of $GCF(10 \times p^2, 12 \times q)$?

(a) 0

(b) 1

(c) 2

(d) $p^2 \times q$

(e) $2 \times p^2 \times q$

(f) $120 \times p^2 \times q$

$$10p^2 = 2 \cdot 5 \cdot p^2$$

$$12q = 2^2 \cdot 3 \cdot q$$

6. (6 points) Two positive integers a and b satisfy $GCF(a, b) = 1$ and $a \times b = 3000$. Compute the value of $LCM(a, b)$.

$$GCF(a, b) \cdot LCM(a, b) = a \cdot b$$

3000

$$1 \cdot LCM(a, b) = 3000$$

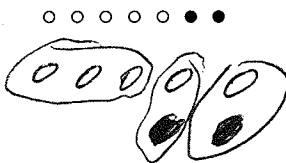
For the next two problems, when using the black and red chips model for arithmetic, we will use

• for each black chip (+) and ○ for each red chip (-).



7. (6 points) What integer is represented by the following sets of chips?

-3



8. (5 points) Carefully explain or carefully sketch how one could use the black and red chips model to show that $1 - 4 = -3$.



9. (7 points) Write the fraction $\frac{3^6 \times 5^5}{3^8 \times 5^4}$ in lowest terms.

$$\frac{5^1}{3^2} = \frac{5}{9}$$

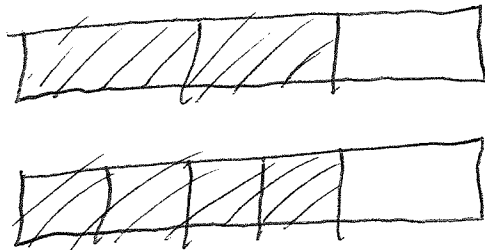
10. (7 points) Write one rational number which is between the numbers $\frac{2}{3}$ and $\frac{3}{4}$.

ANSWER: $\frac{17}{24}$

bet. $\frac{8}{12}$ & $\frac{9}{12}$

bet. $\frac{16}{24}$ & $\frac{18}{24}$

11. (7 points) Draw fraction bars which demonstrate that $\frac{2}{3} = \frac{4}{6}$.



12. (6 points) Use the fact that there are 100 centimeters in a meter. If a square has an area of 50 square meters (m^2), then what is its area in square centimeters (cm^2)?

(a) 0.005 (b) 0.5 (c) 50 (d) 500 (e) 50,000 (f) 500,000 5,000,000

If each side has length x meters, then $x \cdot x = x^2 = 50$. If we convert to centimeters, then each side has length $100x$, the area in cm^2 is $(100x)(100x) = 10000x^2 = 10000(50) = 500,000$

13. (6 points) Which one of the following numbers can be written as a terminating decimal?

(a) $\frac{12}{1440}$

(b) $\frac{23}{1440}$

(c) $\frac{34}{1440}$

(d) $\frac{45}{1440}$

$1440 = 12 \cdot 12 \cdot 10$
 $= 2^3 \cdot 3 \cdot 2^2 \cdot 3 \cdot 2 \cdot 5$
 $= 2^5 \cdot 3^2 \cdot 5$

9 must divide the numerator if the simplified fraction is to have 2 or 5 as the only prime factors.

14. (7 points) Use any method to rewrite the number $0.04 = 0.04040404\dots$ as a simplified fraction.

$0.040404\dots$
 $= \frac{4}{100} + \frac{4}{10000} + \frac{4}{1000000} + \dots$
 $= \frac{4/100}{1 - 1/100} = \frac{4}{99}$

geom. series with ratio $r = \frac{1}{100}$, $-1 < \frac{1}{100} < 1$

15. (7 points) Determine the sum of the infinite geometric series below.

$5 + \frac{5}{2} + \frac{5}{4} + \frac{5}{8} + \dots$

ratio $r = \frac{1}{2}$

since $-1 < \frac{1}{2} < 1$

sum = $\frac{5}{1 - \frac{1}{2}} = 10$

16. (6 points) What is the approximate value of the quantity $0.32987352654 \times 454.719727786$?

(a) 15

(b) 90

(c) 150

(d) 210

(e) 225

(f) 1350

$\approx \frac{1}{3} \cdot 450$

$= 150$

Students – do not write on this page!

1. (5 points) _____

2. (6 points) _____

3. (6 points) _____

4. (7 points) _____

5. (6 points) _____

6. (6 points) _____

7. (6 points) _____

8. (5 points) _____

9. (7 points) _____

10. (7 points) _____

11. (7 points) _____

12. (6 points) _____

13. (6 points) _____

14. (7 points) _____

15. (7 points) _____

16. (6 points) _____

TOTAL (100 points) _____