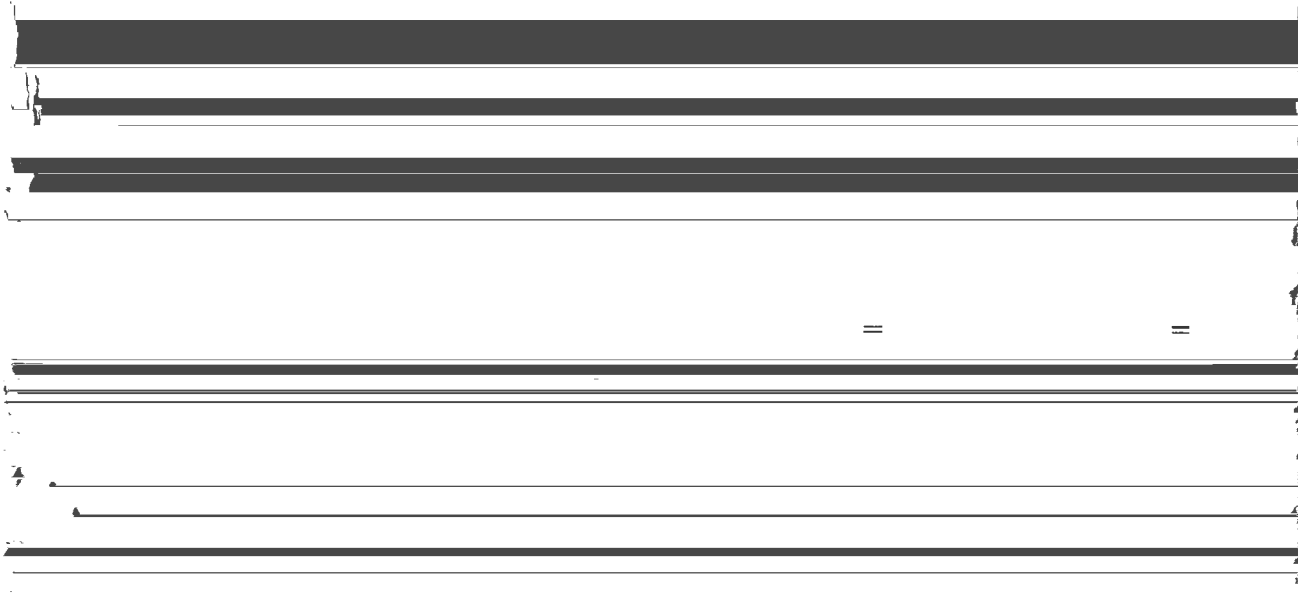
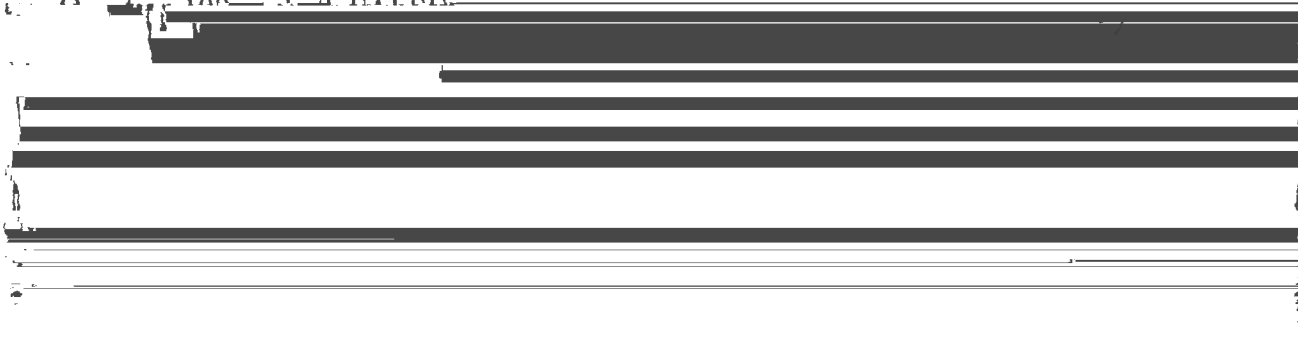


4. Jaden takes a mathematics test consisting of 100 questions, where the answer to each question is either TRUE or FALSE. For every five consecutive questions on the test, the



answers to exactly three of the questions are TRUE. If the answers to Question 1 and



- a. Find the number of questions on the test for which the correct answer is TRUE.
- b. Find the correct answer to the sixth question on the test.



**2022 John O'Bryan Mathematical Competition
Freshman-Sophomore Individual Test**

Directions: Please answer all questions on the answer sheet provided. All answers must be written legibly and in simplest form. Exact answers are to be given unless otherwise specified in the question. No units of measurement are required. Each problem has the same point-value.

1. Determine which of the following five statement(s) is sufficient to deduct that $x > y$.

- A) $x + 1 = y$ B) $x + 2.2 = y$ C) $x - 1.3 = y$ D) $xy > 0$ E) $xy < 0$

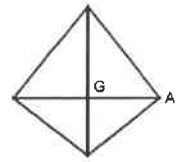
2. Jedyn just completed a 4-question quiz. On the first question, he earned 1 point. On the second question, he earned 2 points. On the third question, he earned 3 points. On the fourth question, he earned 4 points. What is the average number of points he earned per question?

3. A number x is greater than or equal to 2 and less than or equal to 6. A number y is greater than or equal to 1 and less than or equal to 5. Which of the following is a possible value for $x + y$?

A) 1 B) 2 C) 3 D) 4 E) 5

5. Let $x^2 - 4y^2 = 30$ and $x - 2y = 5$. Determine the value of $(x + 2y)$.
6. The sum of twice a number and three times a second number is 16. The difference between the two numbers is 3. If the first number is greater than the second number, determine the sum of the two numbers.
7. Circle P has diameter \overline{AB} . $\triangle ABC$ is isosceles with base \overline{BC} intersecting the circle at point D . $AC = 4$ and $DC = 1$. Determine the numeric area of $\triangle ABC$. Give your answer as a radical expression (in the form $a\sqrt{b}$), where b is a whole number as small as possible.
8. In a circle with center C , minor arc \widehat{AB} has length $\frac{8\pi}{9}$. $\angle ACB = 40^\circ$. Determine the radius of the circle C .
9. Let $k = 110 + 110 + 110 + 110 \dots$. Determine the exact value of k .
10. Let b and c be integers with $g(x) = x^2 + bx + c$ and $f(x) = x^2 + cx + b$. Determine the sum $(b + c)$ when $g(c) = f(b)$ and $c \neq b$.

11. A square with numeric area k is inscribed in a semicircle (two vertices of the square lie on the semicircle)



Name:

Team Code:

**2022 John O'Bryan Mathematical Competition
Freshman/Sophomore Individual Test**

Note: All answers must be written legibly in the correct blanks on the answer sheet and in simplest form. Exact answers are to be given unless otherwise specified in the question. No units of measurement are required. Each problem has the same point-value.

1.

11.

2.

12.

3.

13.

4.

14.

5.

15.

6.

16.

7.

17.

8.

18.

9.

19.

10.

20.

Name: _____ ANSWERS _____

Team Code: _____

2022 John O'Bryan Mathematical Competition
Freshman-Sophomore Individual Test

Note: All answers must be written legibly and in simplest form. Exact answers are to be given unless otherwise specified in the question. No units of measurement are required. Each problem has the

1.

11.

2.

640

12.

4850

3.



13.

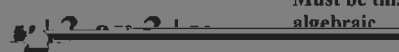
11

4.

$\frac{1}{18}$

reduced common fraction.

14.



Must be this algebraic

5.

6

15.

$2\sqrt{61}$

Must be this exact answer.

6.

7

16.

$\frac{1}{2}$

Must be this reduced common fraction.

7.

$\sqrt{15}$

Must be this exact answer.

17.

8

8.

4

18.

1.457

Must be this decimal.

9.

11

19.

88.443

Must be this decimal.

10.

-1

20.

3560

2022 John O'Bryan Mathematical Competition
Junior-Senior Individual Test

Directions: Please answer all questions on this page. All answers must be written in the space provided.

A

— = —

M

G

S

in simplest form. Exact answers are to be given unless otherwise specified in the question. No units of

Name: _____

Team Code: _____

**2022 John O'Bryan Mathematical Competition
Junior/Senior Individual Test**

Note: All answers must be written legibly in the correct blanks on the answer sheet and in simplest form. Exact answers are to be given unless otherwise specified in the question. No units of measurement

1. _____

11. _____

2. _____

12. _____

3. _____

13. _____

4. _____

14. _____

5. _____

15. _____

6. _____

16. _____

7. _____

17. _____

8. _____

18. _____

9. _____

19. _____

10. _____

20. _____

**2022 John O'Bryan Mathematical Competition
Junior-Senior Individual Test**

Note: All answers must be written legibly and in simplest form. Exact answers are to be given unless otherwise specified in the question. No units of measurement are required. Each problem has the same point-value (1 point).

$\sqrt{15}$ Must be this radical expression.

3. 24

13. $-\frac{3}{2}$ Must be this reduced fraction.

14.

5. $2\sqrt{61}$ Must be this radical expression.

15. 3560

6. 2

16. 0 or zero

7. 8

17. $\frac{5}{2}$

8. -15

18. 0.375 or .375 Must be this decimal.

9. $i-1$ or $\sqrt{-1} - 1$ Must be one of these.

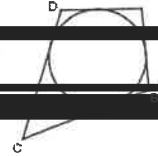
19. 2:5 Must be this exact ratio.

10. 14

20. $\frac{10}{10}$ Must be this

2022 John O'Bryan Mathematical Competition
Questions for the Two-Person Speed Event

Calculators may not be used on the first four questions



1. A system of equations has $x^2 - 4y^2 = 30$ and $x - 2y = 5$ and $k = x + 2y$.
Quadrilateral $ABCD$ is circumscribed about a circle with side lengths $BC = 20$ and $AD = 17$. The perimeter of the quadrilateral is w . Determine the value of $k + w$.

$$3x - 4y = 3$$

Names: _____

School: _____

2022 John O'Bryan Mathematical Competition
Answers for the Two-Person Speed Event

Note: All answers must be written legibly and in simplest form. Exact answers are to be given unless otherwise specified in the question. No units of measurement are required. Each problem has the same point-value.

1. 80 _____ SCORE _____

Calculators are not allowed to be used on the first four questions!

2. -9 _____ SCORE _____

This competition consists of eight competitive rounds. Correct answers will receive the following scores:

3. 90 _____ SCORE _____

1st: 7 points

2nd: 5 points

4. 9 _____ SCORE _____

5. 294 _____ SCORE _____

There is a three minute time limit

6. 1000 _____ SCORE _____

7. $\frac{7}{128}$ _____ SCORE _____
Must be this reduced common fraction

8. 23 _____ SCORE _____

T1. 69 _____ SCORE _____

T2. 24 _____ SCORE _____