

ST. MARY'S DOMINICAN HIGH SCHOOL
Calculus and Advanced Math II Summer Worksheet



Dear student: _____ (name)

The purpose of this summer worksheet is to help you practice your math skills while providing examples of ACT/PSAT-type questions. The questions were specifically chosen because they relate to topics that will be used in your math class next year or because they cover material you have learned that is on the ACT/PSAT.

In order to receive full credit for your work, be sure to follow these instructions.

- 1. Print out the worksheet (print on both sides if possible) and show all work neatly next to each question– in PENCIL!**
IF WORK CAN NOT BE SHOWN, EXPLAIN HOW YOU WERE ABLE TO SOLVE THE PROBLEM. ALL PROBLEMS MUST HAVE WORK OR AN EXPLANATION!
- 2. Check your answers with the answer key provided. Review and re-try any questions you missed. If you have difficulty with any of the concepts, please review them during the summer.**
- 3. Bring this completed assignment to school on the second day of class. It will be collected and a grade will be given based on correctness of work/explanations. Points will be deducted for any problem not including correct work or an explanation. Try your best!**

Sincerely,

St. Mary's Dominican Mathematics Department

Standardized Test-Taking Tips:

1. Underline or circle key numbers/words in the problem.
2. Read the question that is being asked. Many times the answer to the question is not necessarily the solution to the equation.
3. As you eliminate choices, scratch them out.
4. Use these strategies as they apply:
 - Guess and check with the choices (start with the middle choice)
 - Assign numbers to represent variables in the question
 - Start at the end and work backwards
 - Look for a pattern on a simpler problem
 - Use a graphing calculator to assist when needed

Choices are usually listed from either greatest to least or least to greatest.

You may use your calculator for any problems you choose, but many of the problems may best be done without using a calculator. Reference the "ACT Math Formulas" file in School Links and Files.

Pre-Algebra

1. The five integers in a set are 121, 118, 133, 142, and x . Which of the following could be equal to x if x is the median number in the set?
 - A. 120
 - B. 129
 - C. 133
 - D. 135
 - E. 144

2. Joelle earns her regular pay of \$7.50 per hour for up to 40 hours of work in a week. For each hour over 40 hours of work in a week, Joelle is paid 1.5 times her regular pay. How much does Joelle earn for a week in which she works 42 hours?
 - A. \$126.00
 - B. \$315.00
 - C. \$322.50
 - D. \$378.00
 - E. \$472.50

3. Jerome, Kevin, and Seth shared a submarine sandwich. Jerome ate $\frac{1}{2}$ of the sandwich, Kevin ate $\frac{1}{3}$ of the sandwich, and Seth ate the rest. What is the ratio of Jerome's share to Kevin's share to Seth's share?
 - A. 3:6
 - B. 2:6:3
 - C. 2:3:1
 - D. 3:2:1
 - E. 6:3:2

4. How many possible combinations of answers can one have for answers on a 5-question True/False test?
 - A. 2
 - B. 4
 - C. 8
 - D. 16
 - E. 32

5. The table below gives the number of questions answered correctly on the 20-question written section of a driver education test.

Number Correct	12	13	14	15	16	17	18	19	20
Frequency	2	3	0	3	3	5	5	6	4

What is the mode of the data?

- A. 3
B. 6
C. 18
D. 19
E. 20
6. While away at school, Eileen receives an allowance of \$400 each month, 35% of which she uses to pay her bills. If she budgets 30% of the remainder for shopping, allots \$130 for entertainment, and saves the rest of the money, what percentage for her allowance is she able to save each month?
- A. 2.5%
B. 13%
C. 20%
D. 35%
E. 52%
7. 40% of 250 is equal to 60% of what number?
- A. 150
B. 160
C. $166\frac{2}{3}$
D. 270
E. 375

Elementary Algebra

8. Which of the following ordered pairs (x, y) satisfies both equations $y = x^2 + 3x - 4$ and $x = y - 4$?
- A. $(0, -4)$
B. $(2, 6)$
C. $(3, 14)$
D. $(5, 9)$

9. A line is graphed in the xy -plane. If the line has a negative slope and a positive y -intercept, which of the following points cannot lie on the line?
- A. $(-3, -3)$
 - B. $(-3, 3)$
 - C. $(3, -3)$
 - D. $(3, 3)$
10. There are 18 boys and 10 girls in Mr. Jackson's class. If Mr. Jackson chooses a student at random, what is the probability that the student is a girl?
- A. $\frac{5}{14}$
 - B. $\frac{5}{9}$
 - C. $\frac{9}{14}$
 - D. $\frac{4}{5}$
 - E. $\frac{9}{5}$
11. If $2x + y = 6$ and $x + 3y = -2$, then $x - 2y = ?$
- A. -12
 - B. 0
 - C. 4
 - D. 8
 - E. 12
12. Which of the following statements completely describes the solution set for the inequality $2(x - 3) > 3(x + 4)$?
- A. $x < -18$
 - B. $x < 18$
 - C. $x > 18$
 - D. $x > -18$
 - E. There are no solutions for x .

13. If t is 5 more than x , and x is 3 less than r , what is t when $r = 3$?
- A. -5
 - B. -2
 - C. 1
 - D. 5
 - E. 8
14. If the average of 292, 305, 415, and x is 343, what is the value of x ?
- A. 315
 - B. 339
 - C. 360
 - D. 364
 - E. 382
15. The expression $3x^2y(xy^2 + 4x^3y)$ is equivalent to which of the following?
- A. $3xy + 12x$
 - B. $xy^2 + 4x^3y$
 - C. $15x^8y^5$
 - D. $3x^3y^3 + 12x^5y^2$
 - E. $3xy^2 + 12x^3y$
16. When $2x$ is subtracted from 48 and the difference is divided by $x + 3$, the result is 4. What is the value of x ?
- A. 2
 - B. 5
 - C. 6
 - D. 8
 - E. 12

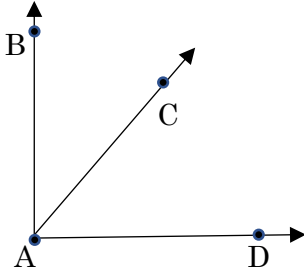
Plane Geometry

17. The angle of elevation from a point on the ground to the top of a building is 37° . The point is 75 feet away from base of the building. Which of the following is closest to the height, in feet, of the building?
- A. 45
 - B. 57
 - C. 60
 - D. 94
 - E. 125

18. What is the volume, in cubic centimeters, of a cube if the area of 1 square face is 144cm^2 ?

- A. 36
- B. 1,728
- C. 20,736
- D. 46,656
- E. 373,248

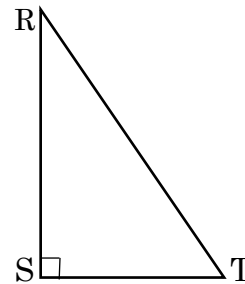
19. In the figure shown below, the measure of $\angle BAC$ is $(x+20)^\circ$ and the measure of $\angle BAD$ is 90° . What is the measure of $\angle CAD$?



- A. $(x-70)^\circ$
- B. $(70-x)^\circ$
- C. $(70+x)^\circ$
- D. $(160-x)^\circ$
- E. $(160+x)^\circ$

20. The length of the hypotenuse of right triangle RST is 16. If the measure of $\angle R = 30^\circ$, what is the length of RS?

- A. 4
- B. 8
- C. $8\sqrt{3}$
- D. $\frac{16}{\sqrt{2}}$
- E. 12



Intermediate Algebra

21. Students studying motion observed a cart rolling at a constant rate along a straight line. The table below gives the distance, d feet, the cart was from a reference point at 1-second intervals from $t = 0$ seconds to $t = 5$ seconds.

t	0	1	2	3	4	5
d	14	20	26	32	38	44

Which of the following equations represents this relationship between d and t ?

- A. $d = t + 14$
 - B. $d = 6t + 8$
 - C. $d = 6t + 14$
 - D. $d = 14t + 6$
 - E. $d = 34t$
22. In the equation below, a is a constant. For what value of a does the equation have an infinite number of solutions?

$$32x - 20 = 4(8x + a)$$

- A. -5
 - B. 2
 - C. 5
 - D. 10
23. If function f is defined by $f(x) = 3x^2 - 5x + 4$, what is $f(x - 4)$?

- A. $f(x - 4) = 3x^2 - 5x$
- B. $f(x - 4) = 3x^2 - 5x + 72$
- C. $f(x - 4) = 3x^2 - 29x + 52$
- D. $f(x - 4) = 3x^2 - 29x + 72$

24. The determinant of a matrix $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$ equals $ad - bc$. What must the value of x for the matrix

$\begin{bmatrix} x & 8 \\ x & x \end{bmatrix}$ to have a determinant of -16?

- A. -4
- B. -2
- C. $-\frac{8}{5}$
- D. $\frac{8}{3}$
- E. 4

25. Find the points at which the graphs of $y = \frac{1}{2}x^2 - 3$ and $y = x + 1$ intersect.

- A. $(-2, -3)$ and $(4, 5)$
- B. $(-1, -2)$ and $(5, 4)$
- C. $(-4, -3)$ and $(-2, 4)$
- D. $(-4, -3)$ and $(2, 3)$
- E. $(-2, -1)$ and $(4, 5)$

26. Which value is *not* in the domain of $f(x) = \sqrt{x-5}$?

- A. 4
- B. 5
- C. 6
- D. 7
- E. 8.5

27. What is the range of $f(x) = -(x-2)^2 - 4$?

- A. All real numbers
- B. $y \geq -8$
- C. $y \leq -8$
- D. $y \geq -4$
- E. $y \leq -4$

Note: For #26-27, if you graphed these equations on your calculator to determine your answer, sketch the graph(s) on this page.

28. Which of the following gives the solution to the inequality $|x - 3| + 6 < 15$?

- A. $-6 < x < 12$
- B. $-6 < x < 9$
- C. $-9 < x < 9$
- D. $x < -9$
- E. $x < -6$

29. If $\frac{p+q}{s} = 9$, $\frac{q}{p} = 4$, and $\sqrt{q} = 6$, what is the value of s ?

- A. $\frac{5}{6}$
- B. 5
- C. 9
- D. 13
- E. 36

Coordinate Geometry

30. A circle is graphed in the xy -plane. If the circle has a radius of 3 and the center of the circle is at $(4, -2)$, which of the following could be an equation of the circle?

- A. $(x+4)^2 + (y-2)^2 = 3$
- B. $(x+4)^2 - (y-2)^2 = 3$
- C. $(x-4)^2 + (y+2)^2 = 9$
- D. $(x-4)^2 - (y+2)^2 = 9$

31. What is the distance in the standard (x, y) coordinate plane between the points $(-3, 6)$ and $(-2, -1)$?

- A. $\sqrt{26}$
- B. $\sqrt{74}$
- C. $2\sqrt{5}$
- D. $5\sqrt{10}$
- E. $5\sqrt{2}$

32. Consider the following lines in the standard (x, y) coordinate plane:

$$3x + y = 10$$

$$y - kx = 4$$

What value of k would make the lines perpendicular to each other?

A. -3

B. $-\frac{1}{3}$

C. $\frac{1}{3}$

D. $\frac{2}{3}$

E. 3

33. Line l has an undefined slope and contains the point $(-2, 3)$. Which of the following points is also on line l ?

A. $(0, 3)$

B. $(5, 5)$

C. $(0, 0)$

D. $(3, -2)$

E. $(-2, 5)$

Trigonometry

34. In which quadrant must θ lie if $\cos \theta > 0$ and $\sin \theta < 0$?

A. I

B. II

C. III

D. IV

E. No such angle exists

35. The sides of an acute triangle measure 14cm, 18cm, and 20cm, respectively. Which of the following equations, when solved for θ , gives the measure of the smallest angle of the triangle?

Recall: Law of Sines: $\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$

Law of Cosines: $c^2 = a^2 + b^2 - 2ab \cos C$

A. $\frac{\sin \theta}{14} = \frac{1}{18}$

B. $\frac{\sin \theta}{14} = \frac{1}{20}$

C. $\frac{\sin \theta}{20} = \frac{1}{14}$

D. $14^2 = 18^2 + 20^2 - 2(18)(20) \cos \theta$

E. $20^2 = 14^2 + 18^2 - 2(14)(18) \cos \theta$

36. What is the measure of the angle $\frac{3\pi}{4}$ expressed in degrees?

A. 45°

B. 60°

C. 120°

D. 135°

E. 270°

37. According to the measurements given in the figure below, which of the following expressions gives the distance, in miles, from the boat to the dock?

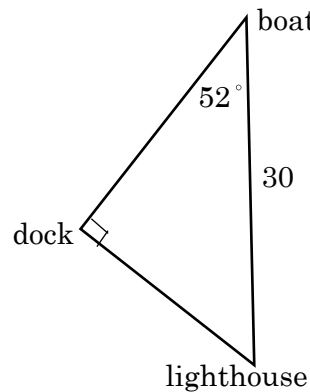
A. $30 \tan 52^\circ$

B. $30 \cos 52^\circ$

C. $30 \sin 52^\circ$

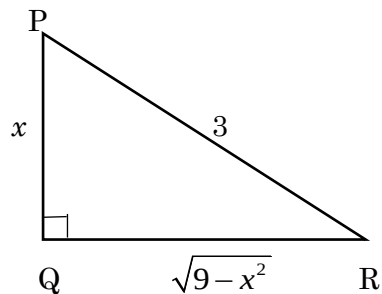
D. $\frac{30}{\cos 52^\circ}$

E. $\frac{30}{\sin 52^\circ}$



Note: For #37, write the original ratio (before you simplified it to one of the choices).

38. The lengths in feet of the sides of a right triangle PQR are as shown in the diagram below, with $x \geq 0$. What is the cosecant of P in terms of x ?



- A. $\frac{3}{\sqrt{9-x^2}}$
 B. $\frac{\sqrt{9-x^2}}{3}$
 C. $\frac{3}{x}$
 D. $\frac{x}{\sqrt{9-x^2}}$
 E. $\frac{\sqrt{9-x^2}}{x}$
39. If $\cos \theta = \frac{12}{13}$, and θ is located in Quadrant IV, then $\tan \theta = ?$ **Draw the picture.**

- A. $-\frac{5}{13}$
 B. $-\frac{5}{12}$
 C. $-\frac{12}{5}$
 D. $\frac{5}{12}$
 E. $\frac{12}{5}$

40. What is the period of $y = 3\sin 2x$?

- A. $\frac{\pi}{2}$
 B. 2
 C. 3
 D. π
 E. 2π

Answer Key

- 1. B
- 2. C
- 3. D
- 4. E
- 5. D

- 6. B
- 7. C
- 8. B
- 9. A
- 10. A

- 11. D
- 12. A
- 13. D
- 14. C
- 15. D

- 16. C
- 17. B
- 18. B
- 19. B
- 20. C

- 21. C
- 22. A
- 23. D
- 24. E
- 25. E

- 26. A
- 27. E
- 28. A
- 29. B
- 30. C

- 31. E
- 32. C
- 33. E
- 34. D
- 35. D

- 36. D
- 37. B
- 38. A
- 39. B
- 40. D