

# College Prep Pre-Calculus

## Summer Review Packet

These problems represent a review of both Geometry and Algebra skills that you will need for this course. You are expected to have a full understanding of this material **prior** to the start of this course. If you wait until the week before school starts to complete this packet, you may not have enough time to access additional resources if you need them.

Directions for completing:

1. Copy all problems onto loose leaf paper. Do not write on the packet since it will not be collected.
2. Make sure to **show all work** to arrive at the answer. No credit will be given for answers only since the answers are included at the end of the packet for you to use to check your work. You must attempt every problem.
3. All graphs **must** be done on graph paper.
4. Bring it with you **ALREADY STAPLED** on the first day of class.

Because this is review material, **we will answer any questions the first few days of class** and will then move in to the new material for the course.

If you are having difficulty on a section of these problems, refer to the following resources:

- Your Algebra I/II notebook
- Your Geometry notebook
- Khanacademy.com



**Definitions:**

Write the letter of the word that best matches each definition. Copy onto loose leaf – this page will not be collected.

Word Bank:

- |                   |                         |                         |
|-------------------|-------------------------|-------------------------|
| A. acute angle    | B. angle                | C. complementary angles |
| D. obtuse angle   | E. ray                  | F. right angle          |
| G. straight angle | H. supplementary angles | I. vertex               |

1. \_\_\_\_ The joining of two rays at a common endpoint.
2. \_\_\_\_ The common endpoint which joins two rays.
3. \_\_\_\_ All points extending from a single point in a single direction.
4. \_\_\_\_ An angle measuring  $180^\circ$
5. \_\_\_\_ An angle measuring  $90^\circ$
6. \_\_\_\_ An angle greater than  $0^\circ$  but less than  $90^\circ$
7. \_\_\_\_ An angle greater than  $90^\circ$  but less than  $180^\circ$
8. \_\_\_\_ Two angles that sum to  $90^\circ$
9. \_\_\_\_ Two angles that sum to  $180^\circ$

**Radicals:** Simplify completely.

10.  $3\sqrt{98}$

11.  $\sqrt{\frac{3}{5}}$

12.  $\frac{18}{\sqrt{2}}$

13.  $5\sqrt{80}$

14.  $\sqrt{20} \cdot \sqrt{2}$

15.  $8\sqrt{2} \cdot 3\sqrt{6}$

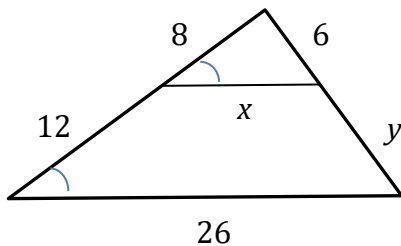
16.  $\frac{3\sqrt{2}}{5\sqrt{3}}$

17.  $\frac{\sqrt{10}}{3\sqrt{30}}$

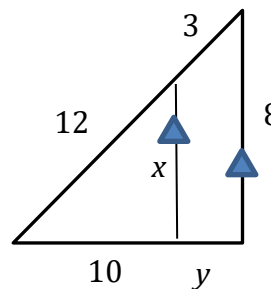
**Similar Triangles:** Two triangles are similar if corresponding angles are congruent. If two triangles are similar, corresponding sides are proportional.

Similar triangles are shown. Find the values of  $x$  and  $y$ .

18.



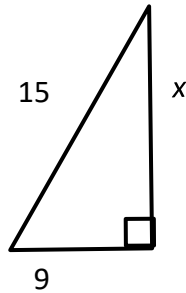
19.



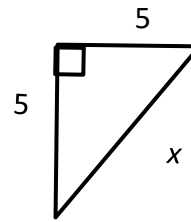
**Pythagorean Theorem:** In a right triangle, the square of the hypotenuse is equal to the sum of the squares of the legs (If  $\angle C$  in  $\triangle ABC$  is a right angle, then  $a^2 + b^2 = c^2$ )

Find the value of  $x$ .

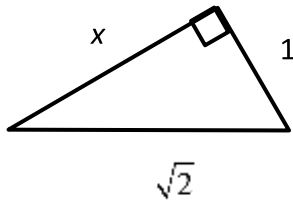
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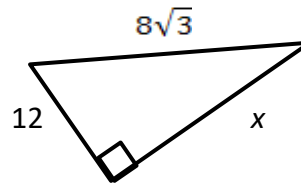
21.



22.

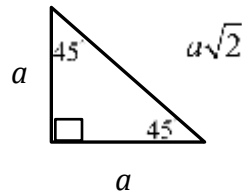


23.



**Special Right Triangles (45-45-90):**

A  $45^\circ - 45^\circ - 90^\circ$  triangle is an isosceles right triangle with congruent legs. If the length of a leg is  $a$ , then the length of the hypotenuse is  $a\sqrt{2}$ .



Given the length of the legs, find the length of the hypotenuse of each  $45^\circ - 45^\circ - 90^\circ$  triangle.

24.  $3\sqrt{2}$

25.  $5\sqrt{6}$

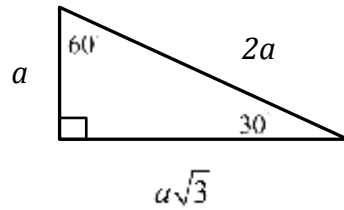
Given the length of the hypotenuse, find the length of the legs of each  $45^\circ - 45^\circ - 90^\circ$  triangle.

26. 10

27.  $4\sqrt{3}$

**Special Right Triangles (30-60-90):**

In a  $30^\circ - 60^\circ - 90^\circ$  triangle, the shorter leg is opposite the  $30^\circ$  angle and the longer leg is opposite the  $60^\circ$  angle. If the shorter leg has a length  $a$ , then the hypotenuse has length  $2a$  and the longer leg has the length  $a\sqrt{3}$ .



Using the side given, find the other two sides of each  $30^\circ - 60^\circ - 90^\circ$  triangle.

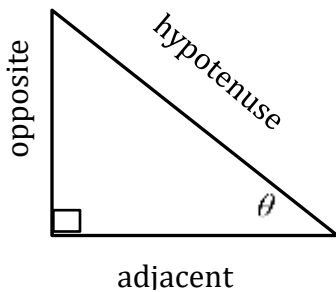
28. Short leg:  $8\sqrt{3}$

29. Hypotenuse: 12

30. Long leg:  $\sqrt{6}$

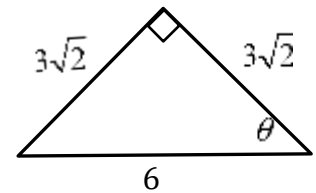
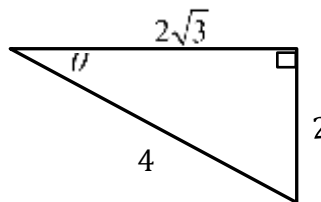
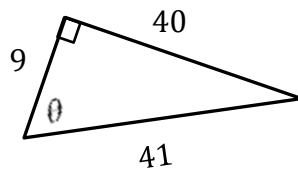
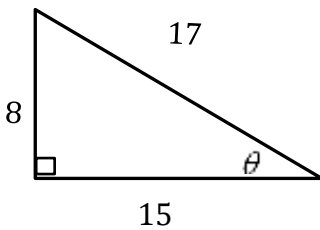
31. Hypotenuse:  $4\sqrt{2}$

**SOH CAH TOA:**



$\sin \theta = \frac{\text{opposite}}{\text{hypotenuse}}$
$\cos \theta = \frac{\text{adjacent}}{\text{hypotenuse}}$
$\tan \theta = \frac{\text{opposite}}{\text{adjacent}}$

Express  $\sin$ ,  $\cos$ , and  $\tan$  of  $\theta$  as ratios for each triangle.



$\sin \theta =$

$\sin \theta =$

$\sin \theta =$

$\sin \theta =$

32.  $\cos \theta =$

33.  $\cos \theta =$

34.  $\cos \theta =$

35.  $\cos \theta =$

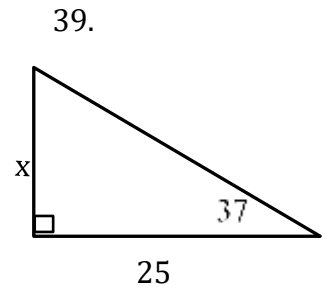
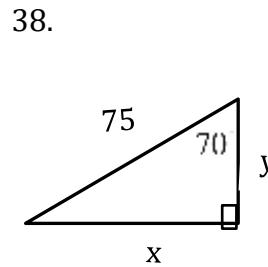
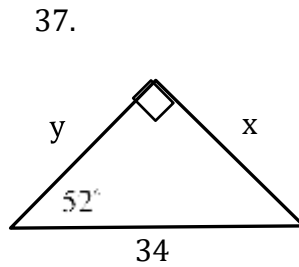
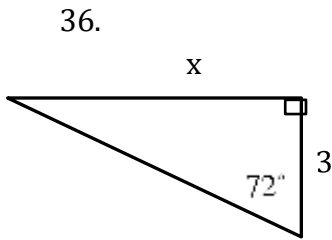
$\tan \theta =$

$\tan \theta =$

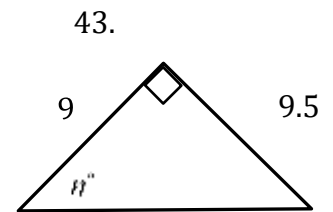
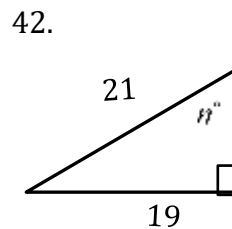
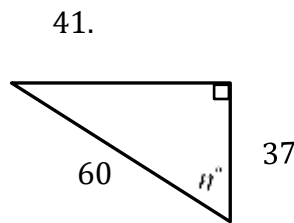
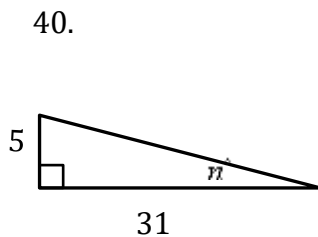
$\tan \theta =$

$\tan \theta =$

Write and solve a trig equation to find the values of  $x$  and  $y$  to the nearest tenth. Make sure your calculator is in degree mode.



Write and solve a trig equation to find  $n^\circ$  to the nearest degree. Make sure your calculator is in degree mode.



**Applications of Right Triangle Trigonometry:**

Angle of elevation: If a person on the ground looks up to the top of a building, the angle formed between the line of sight and the horizontal

Angle of depression: If a person standing on the top of a building looks down at an object on the ground, the angle formed between the line of sight and the horizontal

44. From a point 80 meters from the base of a tower, the angle of elevation to the top of the tower is  $28^\circ$ . How tall is the tower?

45. The angle of depression from the top of a tower to a boulder on the ground is  $38^\circ$ . If the tower is 25 meters high, how far from the base of the tower is the boulder?

**Unit Conversions:** Perform the following conversions. Round answers to two decimal places if necessary. Make sure to show your unit analysis!

Example: Convert 2 days into seconds  $2 \text{ days} \cdot \frac{24 \text{ hours}}{1 \text{ day}} \cdot \frac{60 \text{ min}}{1 \text{ hour}} \cdot \frac{60 \text{ sec}}{1 \text{ min}} = 172,800 \text{ sec}$

**Conversions**

1 hour = 3600 seconds

1 mile = 5280 feet

1 yard = 3 feet

1 meter = 3.28 feet

1 km = 0.62 miles

1 foot = 12 inches

1 kg = 2.2 lbs

1 lb = 0.45 kg

1 inch = 2.54 cm = 25.4 mm

46. 565,900 seconds into days
47. 17 years into minutes
48. 43 miles into feet
49. 165 pounds into kilograms
50. 100 yards into meters
51. 22,647 inches into miles
52. 1100 feet per second into miles per hour
53. 53 yards per hour into inches per week
54. 721 lbs per week into kg per second
55. 88 inches per second into miles per day

**Function Transformations:**

1. Describe the transformations for each function. (vertical shift, horizontal shift, reflection, vertical stretch, vertical compression) with respect to its parent function. Parent functions are  $y = |x|$ ;  $y = x^2$ ;  $y = \sqrt{x}$ .
2. Identify the domain and range for each function.
3. Graph each function (all graphs are to be done on graph paper). You should check your graphs using your calculator.

56.  $y = |x - 4| + 3$

57.  $y = |x + 5| - 1$

58.  $y = 2|x|$

59.  $y = -\frac{1}{3}|x|$

60.  $y = (x + 3)^2 + 6$

61.  $y = (x - 8)^2 - 2$

62.  $y = -2x^2$

63.  $y = \frac{1}{2}x^2$

64.  $y = \sqrt{x - 5} - 2$

65.  $y = \sqrt{x + 3} + 1$

66.  $y = -\frac{1}{2}\sqrt{x}$

67.  $y = 4\sqrt{x}$

**Factoring:** Factor the following expressions completely.

68.  $n^2 - 8n$

70.  $4x^3 + 38x^2 + 90x$

72.  $4x^2 + 12x + 9$

74.  $8k^3 - 8k^2 + 3k - 3$

69.  $b^2 - 14b + 40$

71.  $14a^2 - 2a - 12$

73.  $16m^2 - 1$

75.  $m^4 - m^2 - 12$

**Solve:** Use the most efficient method possible.

76.  $4n^2 + 9 = 157$

78.  $4r^2 = 25$

80.  $6a^2 - 8 = 28$

77.  $3x^2 - 28 = 5x$

79.  $25b^2 - 60b = -36$

81.  $10v^2 = 6v - 8$

Evaluate:

82.  $\log_2 32$

83.  $\log 1000$

Solve:

84.  $\log_4 x = 2$

85.  $\log_3(x + 2) = \log_3(5x - 6)$



**Pre-Calculus Summer Review Packet – Answers**

1. B	2. I	3. E	4. G
5. F	6. A	7. D	8. C
9. H	10. $21\sqrt{2}$	11. $\frac{\sqrt{15}}{5}$	12. $9\sqrt{2}$
13. $20\sqrt{5}$	14. $2\sqrt{10}$	15. $48\sqrt{3}$	16. $\frac{\sqrt{6}}{5}$
17. $\frac{\sqrt{3}}{9}$	18. $x=10.4, y=9$	19. $x=6.4, y=2.5$	
20. 12	21. $5\sqrt{2}$	22. 1	23. $4\sqrt{3}$
24. 6	25. $10\sqrt{3}$	26. $5\sqrt{2}$	27. $2\sqrt{6}$
28. $24, 16\sqrt{3}$	29. $6, 6\sqrt{3}$	30. $\sqrt{2}, 2\sqrt{2}$	31. $2\sqrt{2}, 2\sqrt{6}$
$\sin \theta = 8/17$ 32. $\cos \theta = 15/17$ $\tan \theta = 8/15$	$\sin \theta = 40/41$ 33. $\cos \theta = 9/41$ $\tan \theta = 40/9$	$\sin \theta = 1/2$ 34. $\cos \theta = \sqrt{3}/2$ $\tan \theta = \sqrt{3}/3$	$\sin \theta = \sqrt{2}/2$ 35. $\cos \theta = \sqrt{2}/2$ $\tan \theta = 1$
36. $x \approx 9.2$	37. $x \approx 26.8, y \approx 20.9$	38. $x \approx 70.5, y \approx 25.7$	39. $x \approx 18.8$
40. $n \approx 9^\circ$	41. $n \approx 52^\circ$	42. $n \approx 65^\circ$	43. $n \approx 47^\circ$
44. $\approx 42.5$ m	45. $\approx 32$ m	46. $\approx 6.55$ days	47. 8,935,200 min
48. 227,040 ft	49. 75 kg	50. $\approx 91.46$ m	51. $\approx 0.36$ miles
52. 750 mi/hr	53. 320,544 in/wk	54. $\approx 5.42 \times 10^{-4}$ kg/sec	55. 120 mi/day
56. shift right 4, up 3 D: all $\mathbb{R}$ R: $y \geq 3$	57. shift left 5, down 1 D: all $\mathbb{R}$ R: $y \geq -1$	58. vertical stretch D: all $\mathbb{R}$ R: $y \geq 0$	59. vertical comp/refl. D: all $\mathbb{R}$ R: $y \leq 0$
60. shift left 3, up 6 D: all $\mathbb{R}$ R: $y \geq 6$	61. shift right 8, down 2 D: all $\mathbb{R}$ R: $y \geq -2$	62. vertical stretch/refl. D: all $\mathbb{R}$ R: $y \leq 0$	63. vertical comp D: all $\mathbb{R}$ R: $y \geq 0$
64. shift right 5, down 2 D: $x \geq 5$ R: $y \geq -2$	65. shift left 3, up 1 D: $x \geq -3$ R: $y \geq 1$	66. vertical comp/refl. D: $x \geq 0$ R: $y \geq 0$	67. vertical stretch D: $x \geq 0$ R: $y \geq 0$
68. $n(n-8)$	69. $(b-10)(b-4)$	70. $2x(2x+9)(x+5)$	71. $2(7a+6)(a-1)$
72. $(2x+3)^2$	73. $(4m+1)(4m-1)$	74. $(8k^2+3)(k-1)$	75. $(m+2)(m-2)(m^2+3)$
76. $\pm\sqrt{37}$	77. $-\frac{7}{3}, 4$	78. $\pm\frac{5}{2}$	79. $\frac{6}{5}$
80. $\pm\sqrt{6}$	81. $\frac{3 \pm i\sqrt{71}}{10}$	82. 5	83. 3
84. 16	85. 2		