

MTH 111, Final Exam, Part 1, Fall 2020 Name KEY

Instructions: For this portion of the exam, you may use the geometry formula sheet provided by your instructor, and a scientific calculator to find the solutions to the questions. You will then post the answers to those questions in Canvas under Final Exam Part 1. You may not use other people or notes to complete the exam, and while submitting the exam you will be required to use the Lockdown Browser. After completing this exam, also submit your work and answers for Part 2 in the Part 2 submission folder.

Academic Integrity Statement

I affirm that, I, _____ (student name), do attest that I alone am completing the problems on this test without receiving unauthorized assistance. I understand that violations of academic integrity may result in sanctions, up to and including expulsion from the college.

_____(Student Signature)

_____(Student ID number)

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Every answer is worth 5 points.

1. If triangle ABC is a right triangle and $a = 25.0 \text{ cm}$, $b = 60.0 \text{ cm}$, find the length of side c . Round to one decimal place.

$$25^2 + 60^2 = 4225$$

$$c = \sqrt{4225} = \boxed{65}$$

2. Find the value of each of the following expressions. Round your answers to four decimal places.

a. $\sin(41.6^\circ)$ 0.6639

b. $\cos(98.3^\circ)$ -0.1444

c. $\tan(432.1^\circ)$ 3.0961

3. Find the value of each of the following expressions. Round your answers to one decimal place.

a. $\sin^{-1}(0.4512)$ 26.8°

b. $\cos^{-1}(0.9876)$ 9.03°

c. $\tan^{-1}(2.3184)$ 66.7°

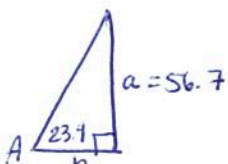
4. Assuming that triangle ABC is a right triangle and $a = 11.4 \text{ m}$, and $c = 18.9 \text{ m}$. Use an appropriate trig function to find the value of angle A.



$$\sin A = \frac{11.4}{18.9}$$

$$\sin^{-1}\left(\frac{11.4}{18.9}\right) = A = 37.1^\circ$$

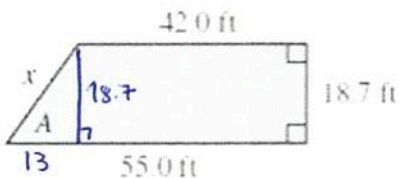
5. Assuming that triangle ABC is a right triangle and $a = 56.7 \text{ m}$, and $A = 23.4^\circ$. Use an appropriate trig function to find the length of side b.



$$\tan 23.4 = \frac{56.7}{b}$$

$$b = \frac{56.7}{\tan 23.4} = 131.0$$

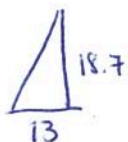
6. Use the illustration below to find the length of x , and the angle A. [Hint: split up the trapezoid into a rectangle, and a right triangle.]



$$13^2 + 18.7^2 = 518.69$$

$$55 - 42 = 13$$

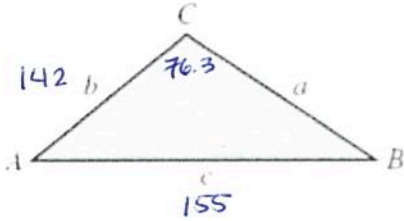
$$x = 22.8$$



$$A = \tan^{-1}\left(\frac{18.7}{13}\right) = 55.2^\circ$$

7. For the function $y = 15 \sin\left(\frac{2}{3}x - 120^\circ\right)$, find each of the following:
- The amplitude 15
 - The period (or wavelength) 540°
 - The phase shift 180°

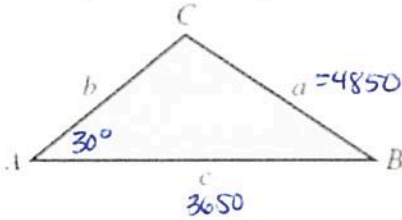
8. Given that $C = 76.3^\circ$, $b = 142$ cm, $c = 155$ cm, find the value of angle B . Round to one decimal place.



$$\frac{\sin 76.3}{155} = \frac{\sin B}{142}$$

$$\sin^{-1}(0.89006...) = B = 62.9^\circ$$

9. Given that $A = 30^\circ$, $a = 4850$ m, $c = 3650$ m, determine whether there are two triangles, one triangle or no triangle with these measurements.



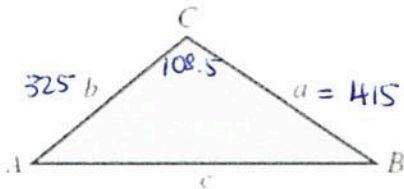
$$\frac{\sin C}{3650} = \frac{\sin 30}{4850}$$

one triangle

$$\sin^{-1}(0.3762...) = C = 22.1^\circ$$

$$? \quad C = 157.9 \quad 157.9 + 30 = 187.9 > 180$$

10. Given that $C = 108.5^\circ$, $a = 415$ in, $b = 325$ in, find the length of side c .

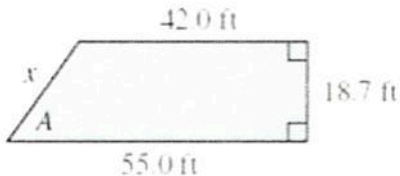


$$c^2 = a^2 + b^2 - 2ab \cos C$$

$$= 363,442.9311$$

$$c = 602.9 \text{ in}$$

11. Find the area and perimeter of the trapezoid. Use the information from #6 for the perimeter.



$$x = 22.8$$

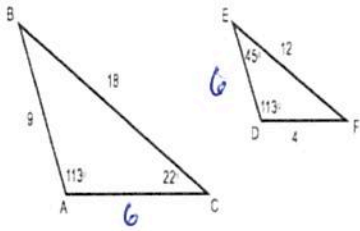
$$P = 22.8 + 42 + 18.7 + 55 =$$

$$138.5$$

$$A = \frac{1}{2}(18.7)(42 + 55) =$$

$$906.95$$

12. Use the properties of similar triangles to find the lengths of \overline{DE} and \overline{AC} .



$$\frac{AC}{4} = \frac{18}{12}$$

$$AC = \frac{4 \cdot 18}{12} = 6$$

$$\frac{18}{12} = \frac{9}{DE} \quad 18DE = 108$$

$$DE = 6$$

13. A circle has a radius of 27 ft. Find the circumference and the area.

$$C = 2\pi(27)$$

$$169.6$$

$$A = \pi(27)^2$$

$$2290.2$$

14. How many degrees are in a $\frac{\pi}{5}$ radian angle?

$$\frac{\pi}{5} \cdot \frac{180}{\pi} = \frac{180}{5} = 36^\circ$$

15. A central angle in a circle has a measure of 75° . If the radius is 23 cm, what is the length of the arc? What is the area of the sector?

$$75^\circ = \frac{5\pi}{12} \text{ radians}$$

$$S = r\theta = 23 \cdot \frac{5\pi}{12}$$

$$30.1$$

$$A = \frac{1}{2}r^2\theta$$

$$= \frac{1}{2}(23)^2 \frac{5\pi}{12}$$

$$= 346.2$$

16. Spherical tank has a diameter of 45 ft. Find the volume of the water in the tank. If water weighs 62.4 lb/ft³, what is the weight of the water the tank can hold?

$$V = \frac{4}{3}\pi r^3 = \frac{4}{3}\pi (45)^3 = 381703.5 \text{ ft}^3$$

$$\text{Weight} = V * 62.4 = 23818,298.86 \text{ lbs}$$

17. Simplify.

a. $\frac{42k^3 - 21k^2 + 108k}{6k} = \frac{42k^3}{6k} - \frac{21k^2}{6k} + \frac{108k}{6k} = 7k^2 - 3.5k + 18$

b. $(-4a^2b)^2(-5ab^3)(-2a)^3$

$$(16a^4b^2)(-5ab^3)(-8a^3)$$

$$640a^9b^5$$

18. Evaluate $\frac{x^2+(z-y)^2}{4x^2-z^2}$ when $x = -1, y = -3, z = 2$

$$\frac{(-1)^2 + (2+3)^2}{4(-1)^2 - 4} = \frac{1+25}{0} = \text{undefined}$$

19. Combine like terms.

$$(7x^2 + 3x + 8) - 2(x - 6) + (5 - x^2)$$

$$7x^2 + 3x + 8 - 2x + 12 + 5 - x^2$$

$$6x^2 + x + 25$$

20. Solve $27 - 8(2 - y) = -13$ for the variable.

$$27 - 16 + 8y = -13$$

$$11 + 8y = -13$$

$$8y = -24$$

$$y = -3$$

21. Jeff invested \$40,000 in a business whereas his partner Kris invested \$50,000. How much more needs to be invested in order to generate a total that will yield \$8250 annually with a 6% rate of return? Round to the nearest dollar.

$$(40,000 + 50,000 + x) 0.06 = 8250$$

$$(90,000 + x)(0.06) = 8250$$

$$5400 + 0.06x = 8250$$

$$0.06x = 2850$$

$$x = 47,500$$

22. What is the slope of the line passing through the points $(-2, 3)$ and $(1, -6)$?

$$\frac{-6-3}{1-(-2)} = \frac{-9}{3} = -3$$

23. Determine if the following pairs of lines are parallel, perpendicular or neither.

$$\begin{cases} y = \frac{2}{3}x + 2 \\ y = -\frac{3}{2}x - 5 \end{cases}$$

perpendicular

24. Simplify $\frac{4 \times 6 + 8 + 2 + 6^2}{5 \times 3 - 8 + 9} = \frac{24 + 4 + 36}{15 + 1} = \frac{64}{16} = 4$

25. A rectangular tank is 6 ft by 7 ft by 15 ft. Gasoline weighs approximately $62 \frac{\text{lbs}}{\text{ft}^3}$. Find the weight of gasoline if the tank is full.

$$6 \times 7 \times 15 = 630 = V$$

$$630 \times 62 = 39,060 \text{ lbs}$$

26. If you convert the fraction $5\frac{3}{7}$ to an improper fraction, what is the value of the numerator?

$$35 + 3 = 38$$

27. What is the common denominator if you add $\frac{1}{5} + \frac{3}{14} + \frac{4}{35}$?

70

28. Write the number **Three hundred forty-nine and five ten-thousandths** in decimal form.

349.0005

29. Round 627,897 to 4 significant digits

627,900

30. What percent of 71.5 is 11.2? Report your answer as a percent.

$$\frac{11.2}{71.5} = 0.15664$$

15.7%

31. Simplify the expression $\left(\frac{10^{-5}10^{-3}}{10^8}\right)^{-2}$. What is the resulting power of 10?

$$\left(\frac{10^{-8}}{10^8}\right)^{-2} = (10^{-16})^{-2} = 10^{32}$$

32. What is the unit name for $1/10^{\text{th}}$ of a meter?

- a. Kilometer
- b. Decimeter
- c. Micrometer
- d. Nanometer

33. The surface temperature of Venus is approximately -173°C in darkness. What is the equivalent temperature in Fahrenheit?

$$F = -173 \left(\frac{9}{5}\right) + 32 = -279.4^{\circ}$$

34. How many yd^2 are in 13 m^2 ? Round your answer to two decimal places if needed.

$$15.5479 \rightarrow 15.55$$

35. Solve the proportion $\frac{10}{13} = \frac{44}{y}$ for y .

$$10y = 572$$

$$y = 57.2$$

36. Distance and the amount of gasoline used vary directly when driving at a constant speed. Zachary driving at a constant speed of 70 mi/h travels 88 mi and uses 19.3 gal of gasoline. How much gasoline does he use driving 912 mi traveling at the same speed? Round your answer to one decimal place if needed.

$$\frac{88}{19.3} = \frac{912}{x}$$

$$88x = 17601.6$$

$$x = 200.0$$

MTH 111, Final Exam, Part 2, Fall 2020 Name KEY

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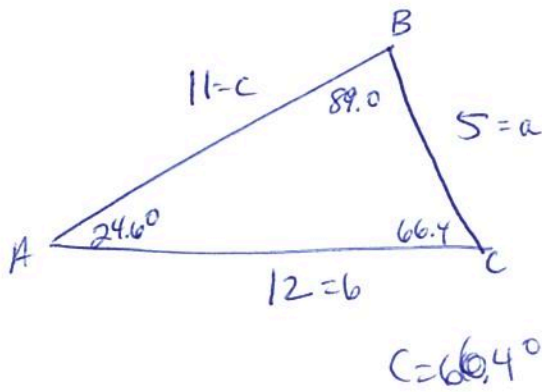
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Every answer is worth 18 points. Round the lengths of sides and angles to one decimal place.

1. Find the missing angles for the triangle. Show your work using the Law of Cosines.



$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

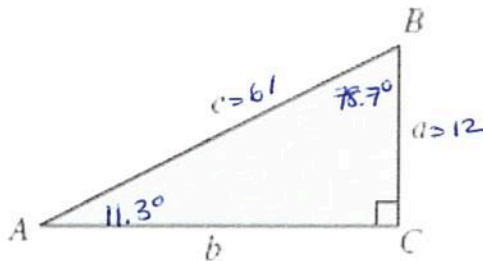
$$A = 24.6^\circ$$

$$\cos B = \frac{a^2 + c^2 - b^2}{2ac}$$

$$B = 89.0^\circ$$

$$C = 66.4^\circ$$

2. Given that $a = 12.0 \text{ km}$ and $c = 61 \text{ km}$, finding the missing sides and angles of the right triangle. Label everything on the triangle.



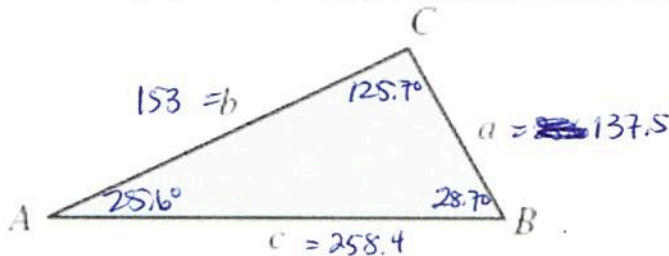
$$61^2 - 12^2 = 3577$$

$$b = \sqrt{3577} = 59.8 \text{ km}$$

$$\sin^{-1}\left(\frac{12}{61}\right) = 11.3^\circ = A$$

$$B = 78.7$$

3. Given $A = 25.6^\circ$, $b = 153 \text{ cm}$, $a = 137.5 \text{ cm}$ find the length of the missing side and missing angles using the Law of Sines. Be sure to check if there is one triangle or two (or none). If there are two triangles, find the missing lengths and angles of both.



$$\frac{\sin 25.6}{137.5} = \frac{\sin B}{153}$$

$$B = 28.7^\circ$$

$$\frac{\sin 25.6}{137.5} = \frac{\sin 125.7}{c}$$

$$c = \frac{\sin 125.7 \cdot 137.5}{\sin 25.6} = 258.4$$

$$180 - 28.7 = 151.3 = B$$

$$151.3 + 25.6 = 176.9$$

2 triangles

$$B = 151.3 \quad C = 3.1^\circ$$

$$c = \frac{\sin(3.1) \cdot 137.5}{\sin 25.6} = 17.2$$

