

15. Find the first 4 terms of the sequence

$$a_1 = 5\frac{1}{4} \quad a_1 = 5\frac{1}{4}$$

$$a_n = 2(a_{n-1})^2 + 1 \quad a_2 = 2(5\frac{1}{4})^2 + 1 = 2(56.125) + 1 = 113.25$$

$$a_3 = 2(113.25)^2 + 1 = 2(12825.5625) + 1 = 25652.125$$

$$a_4 = 2(25652.125)^2 + 1 = 2(658031.25) + 1 = 1316063.5$$

16.

Write the first five terms of the sequence

$$a_1 = 6$$

$$a_n = \frac{1}{2}a_{n-1} + 4$$

$$a_2 = \frac{1}{2}(6) + 4 = 7$$

$$a_3 = \frac{1}{2}(7) + 4 = 7.5$$

$$a_4 = \frac{1}{2}(7.5) + 4 = 7.875$$

$$a_5 = \frac{1}{2}(7.875) + 4 = 8.0375$$

17. Write a recursive formula for the sequence
9, -18, 36, -72, ...

$$a_1 = 9$$

$$a_n = -2a_{n-1} \text{ recursive}$$

18. Egor has two parents, four grandparents, and so on.

Write an explicit formula and a recursive formula for the number of ancestors Egor has if we go back n generations.

$$a_n = 2^n \quad a_1 = 2$$

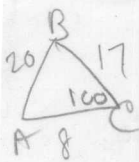
$$a_n = 2 \cdot a_{n-1} \text{ recursive formula}$$

19.

In $\triangle ABC$, $AC = 8$, $BC = 17$, and $AB = 20$.

a) Find the measure of the largest angle to the nearest degree. [6] 100°

b) Find the area of $\triangle ABC$ to the nearest integer. [4] 67



$$20^2 = 17^2 + 8^2 - 2(17)(8)\cos C$$

$$400 = 289 + 64 - 272\cos C$$

$$-353 = -272\cos C$$

$$1.2978 = \cos C = 99.8^\circ$$

$$\text{Area} = \frac{1}{2}ab\sin C = \frac{1}{2}(17)(8)\sin 100^\circ = 66.96 \approx 67$$

20. In a rhombus, each side is 15, and one angle is 130° . Find the area of the rhombus, to the nearest square unit.

$$\text{Area} = \frac{1}{2} \sin 130^\circ (15)(15)$$

$$= \frac{1}{2} (0.7660) 225$$

$$= 86.175 \approx 86 \text{ sq units}$$

21. Two forces of 40 and 20 pounds, respectively, act simultaneously on an object. The angle between the two forces is 40° . a) Find the magnitude of the resultant, to the nearest tenth of a pound. b) Find the measure of the angle, to the nearest degree, between the resultant and the larger force.

a) 56.8
b) 13°

$$X^2 = 40^2 + 20^2 - 2(40)(20)\cos 140^\circ$$

$$1600 + 400 - 1600(-0.7660)$$

$$2000 - (-1225.67) = 3225.67$$

$$X = 56.8$$

$$\frac{\sin 40^\circ}{20} = \frac{\sin X}{56.8}$$

$$\sin X = 0.2263 = 13^\circ \text{ resultant}$$

22. Sam is designing a triangular piece for a metal sculpture. He tells Martha that two of the sides of the piece are 40 inches and 15 inches, and the angle opposite the 40-inch side measures 120° . Martha decides to sketch the piece that Sam described. How many different triangles can she sketch that match Sam's description?

(1) 1 (2) (3) 3 (4) 0 Show work

$$\frac{\sin 120^\circ}{40} = \frac{\sin X}{15}$$

$$\sin 120^\circ (15) = \sin X (40)$$

$$12.99 = \sin X (40)$$

$$0.3247 = \sin X = 19^\circ$$

23. A ship at sea heads directly toward a cliff on the shoreline. The accompanying diagram shows the top of the cliff, D , sighted from two locations, A and B , separated by distance S . If

$m\angle DAC = 30^\circ$, $m\angle DBC = 45^\circ$, and $S = 30$ feet, what is the height of the cliff, to the nearest foot?

Ans
40 ft.

$$\sin 45^\circ = \frac{h}{56.96}$$

$$1.771 = \frac{h}{56.96}$$

$$h = 40.27 \approx 40 \text{ ft}$$

$$\frac{\sin 15^\circ}{30} = \frac{\sin 30^\circ}{X} = 30(\frac{1}{2}) = 15.588X$$

$$= 57.96$$

24. A sign 46 feet high is placed on top of an office building. From a point on the sidewalk level with the base of the building, the angle of elevation to the top of the sign and the angle of elevation to the bottom of the sign are 40° and 32° , respectively. Sketch a diagram to represent the building, the sign, and the two angles, and find the height of the building to the nearest foot.

$$\frac{\sin 8^\circ}{46} = \frac{\sin 50^\circ}{X}$$

$$35.2380 = 0.7660X$$

$$253.15 = X$$

$$\sin 32^\circ = \frac{X}{253.15}$$

$$= 134.149$$

25. A ship at sea is 70 miles from one radio transmitter and 130 miles from another. The angle between the signals sent to the ship by the transmitters is 117.4° . Find the distance between the two transmitters, to the nearest mile.

$$X^2 = 70^2 + 130^2 - 2(70)(130)\cos 117.4^\circ$$

$$4900 + 16900 - 18200(-0.4602)$$

$$5800 + 1932.84$$

$$\text{Distance} = 7,733 \text{ m}$$

26. A landscape designer is designing a triangular garden with two sides that are 4 feet and 6 feet, respectively. The angle opposite the 4-foot side is 30° . How many distinct triangular gardens can the designer make using these measurements?

$$\frac{\sin 30^\circ}{4} = \frac{\sin X}{6} \quad (\frac{1}{2})6 = 4\sin X$$

$$\frac{3}{4} = \sin X$$

$$\sin X = 49^\circ \text{ or } 131^\circ$$

2 triangles may be formed