Golden Ratio and the Fibonacci Sequence

Count a sunflower's seed spirals and you often get 34 and 55. They come from the Fibonacci sequence, whose ratios settle on the golden ratio, 1.618…

Name: Date: Score: ____ / 19

A. Fill in the blanks

1. In the Fibonacci sequence, each term is the ____ of the two terms before it.

2. The term after 8 and 13 is ____.

3. The golden ratio is approximately ____.

4. The golden ratio is written with the Greek letter ____.

5. Sunflower seeds grow about ____ degrees apart.

B. True or False

6. 13/8 is closer to the golden ratio than 3/2. True / False

7. Every flower has a Fibonacci number of petals. True / False

8. The golden ratio equals $(1 + \sqrt{5})/2$. True / False

9. Seeds placed 135° apart pack without gaps. True / False

C. Assertion and reason

10. Assertion (A): Sunflower seeds fill the head without gaps.
Reason (R): Each seed grows about 137.5° from the last.

(a) Both A and R are true, and R explains A
(b) Both A and R are true, but R does not explain A
(c) A is true, R is false
(d) A is false, R is true

Answer: _____

11. Assertion (A): Fibonacci ratios get closer to 1.618.
Reason (R): Each term is the sum of the two before it.

(a) Both A and R are true, and R explains A
(b) Both A and R are true, but R does not explain A
(c) A is true, R is false
(d) A is false, R is true

Answer: _____

D. Choose the correct option

12. The 10th Fibonacci number (starting 1, 1) is:

(a) 34
(b) 55
(c) 89
(d) 21

Answer: _____

13. 21/13 is about:

(a) 1.5 (b) 1.615

(c) 1.667 (d) 2

Answer: _____

14. Squares with Fibonacci sides and quarter arcs make the:

(a) golden spiral (b) circle

(c) parabola (d) helix

Answer: _____

15. Pinecones often show spiral counts of:

(a) 8 and 13 (b) 10 and 20

(c) 7 and 9 (d) 4 and 6

Answer: _____

E. Numerical problems

16. Find the 12th Fibonacci number (starting 1, 1).

17. Compute 34/21 to three decimals.

F. Short answer questions

18. Explain how the golden spiral is drawn.

G. Match the columns

19. Match each item in Column A with the correct item in Column B.

Column A	Column B	Your answer
1. 1, 1, 2, 3, 5	(a) Golden angle	1 → ____
2. 1.618	(b) Golden ratio	2 → ____
3. 137.5°	(c) Sunflower spirals	3 → ____
4. 34 and 55	(d) Fibonacci sequence	4 → ____

Detailed solutions

1. sum

2. 21

3. 1.618

4. φ (phi)

5. 137.5

6. True. 13/8 = 1.625 and 3/2 = 1.5; φ ≈ 1.618.

7. False. Many do, but not all.

8. True. (1 + 2.236)/2 ≈ 1.618.

9. False. 135° is 3/8 of a turn, so seeds line up in 8 spokes with gaps.

10. (a) R explains A.

11. (a) R explains A: that rule makes the ratio settle on φ.

12. (b) 55. 1, 1, 2, 3, 5, 8, 13, 21, 34, 55.

13. (b) 1.615. 21 ÷ 13 = 1.615.

14. (a) golden spiral. The arcs join into a spiral.

15. (a) 8 and 13. Consecutive Fibonacci numbers.

16. 1, 1, 2, 3, 5, 8, 13, 21, 34, 55; 34 + 55 = 89; 55 + 89 = 144. **Answer: 144**

17. 34 ÷ 21 = 1.619. **Answer: 1.619**

18. Tile squares of sides 1, 1, 2, 3, 5, 8 into a rectangle, then draw a quarter circle in each square, joined end to end.

19. 1 → (d), 2 → (b), 3 → (a), 4 → (c). Each item matches its name.