QUIZ 0: Elementary skills

Say whether the statement is TRUE OR FALSE and give a REASON for your answer. Grade yourself using the answer key. If you scored less than 18 correct answers, consider this quiz as failed, and a warning sign about your elementary mathematics skills.

1. $-1^{2014} = 1$.

2. $\sqrt{4} = \pm 2$.

3. If 1 and 2 are the roots of some polynomial $P(x)$, then $P(x) = (x^2 - 3x + 2)Q(x)$, where $Q(x)$ is some polynomial.

4. If $P(x)$ is a polynomial, then $P(x) - P(2014) = (x - 2014)Q(x)$, where $Q(x)$ is some polynomial.

5. If $a, b, c$ are reals and $a < b$ then $ac < bc$.

6. If $a < b$ and $a < c$ then $b < c$. 
7. If \( a, b \) are reals and \( a < b \) then \( a^2 < b^2 \).

8. If \( a, b \) are reals and \( a < b \) then \( a^3 < b^3 \).

9. If \( a, b, c, d \) are reals, \( b, d \neq 0 \), then \( \frac{a/b}{c/d} = \frac{ac}{bd} \).

10. If \( a, b, c, d \) are reals, \( c \neq d \), then \( \frac{a - b}{c - d} = \frac{b - a}{d - c} \).

11. If \( a, b \) are reals, the expression \( a^2 - b^2 \) can be factored into two real factors.

12. If \( a, b \) are reals, the expression \( a^3 - b^3 \) can be factored into three real factors.

13. If \( a, b \) are positive reals, the expression \( \sqrt{a} - \sqrt{b} \) can be rewritten as \( (a - b)/(\sqrt{a} + \sqrt{b}) \).
14. $\sqrt{2} = 1.414213562$.

15. The equation $x^2 + 1 = 0$ has the solutions $x = \pm 1$.

16. The inequality $x^2 + 3x + 2 < 0$ is true for all $x$ in the interval $(-3, -1)$.

17. $\sqrt{x^2 + 1} = x + 1$ for all real $x$.

18. If $x < y$ are real then $|x - 1| < |y - 1|$; $|a|$ denotes the absolute value of the real number $a$.

19. If $a, b$ are reals, then $\sqrt[3]{ab} = a^{1/3}b^{1/3}$.

20. $\frac{n^3 + 2}{n^2 + 2} = n + 1$ for all integers $n$. 
21. If $a, b, c$ are positive reals, $a^{bc} = a^{bc}$.

22. If $x$ is real, $\sqrt{(x+1)^2} = x + 1$.

Answers

1. F; order of operations gives the true answer -1.

2. F; the square root is positive.

3. T; both $x - 1$ and $x - 2$ are factors of $P$.

4. T; since $x = 2014$ is a root of $P(x) - P(2014)$, $x - 2014$ must be a factor of $P(x) - P(2014)$.

5. F; $a = 1, b = 2, c = -1$.

6. F; $a = 1, b = 3, c = 2$.

7. F; $a = -2, b = -1$.

8. T; the cubic function is increasing.

9. F; $= \frac{ad}{bc}$.

10. T; $a - b = -(b - a); c - d = -(d - c)$.

11. T; $(a - b)(a + b)$.

12. F; $(a - b)(a^2 + ab + b^2)$ and the second one is irreducible (cannot be factored further into real linear factors).

13. T; cross multiply and use 11.

14. F; $\sqrt{2}$ is irrational, the number on the right is rational.

15. F; $1^2 + 1 = 2$.

16. F; the interval is $(-2, -1)$.

17. F; $(x + 1)^2 = x^2 + 2x + 1$.

18. F; $x = -1, y = 0$.

19. T; rules of exponents.

20. $(n + 1)(n^2 + 2) \neq n^3 + 2$.

21. F; order of operations, $(a^b)^c = a^{bc}$.

22. F; $\sqrt{(x + 1)^2} = |x + 1|$.