CAUD Diagnostic Test

1. Evaluate $3.4 \times 10^3 \times 4.12 \times 10^{-2}$ giving your answer in scientific notation to the correct number of significant figures.

   Answer: 1.4×10^2

2. Calculate $\frac{-3}{2} \times (10+2) \div (4-10)$ without using a calculator.

   Answer: 3

3. Calculate $\frac{2}{3} + \frac{3}{4}$ without a calculator.

   Answer: $\frac{17}{12}$ or $1\frac{5}{12}$

4. Solve $3x + y = 9$ for y.

   Answer: $y = 9 - 3x$

5. Simplify $x - (5 - 2x)$.

   Answer: $3x - 5$

6. Solve $\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$ for f.

   Answer: $f = \frac{uv}{u+v}$

7. Solve for x in the equation $\frac{x-6}{2} + \frac{x+8}{6} = 1$ giving your answer to 2 decimal places.

   Answer: $x = 4.00$

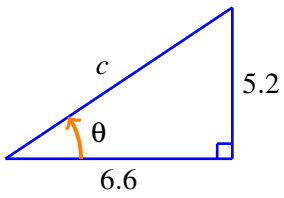
8. In the expression $3^{12} \times 3^5 = 3^x$, what is the value of x?

   Answer: $x = 17$

9. Simplify the expression $\frac{(x^{1/2}y)^2}{x^2}$.

   Answer: $\frac{y^2}{x}$

10. Find the value of c and θ in the diagram given.



Answer: $c = 8.4$ to one decimal place, $\theta = 38.2^\circ$ or $\theta = 38^\circ 14'$

11. Find the angle ϕ (in degrees) with $0 \leq \phi \leq 90^\circ$ such that $\tan\phi = 1$.

Answer: $\phi = 45^\circ$

12. Find all angles θ (in radians) with $0 \leq \theta < 2\pi$ such that $\cos\theta = \dfrac{1}{2}$.

Answer: $\theta = \frac{\pi}{3}$ or $\frac{5\pi}{3}$

13. A surveyor standing at a distance of 40m from the base of a tower has measured the angle (in degrees) to the top of the tower as 60° . Write an expression for the height of the tower in terms of that angle (in degrees) and find the height of the tower.

Answer: The expression for the height is $h = 40 \times \tan(60^\circ)$. The height is 69 metres correct to the nearest whole number.

14. What is the amplitude and period of the function $y = 2\sin\left(\dfrac{x}{2}\right)$?

Answer: The amplitude is 2, the period is 4π.

15. (a) Solve $\cos\left(x - \dfrac{\pi}{4}\right) = 0$ for x (in radians) with $0 \leq x < \pi$.

(b) What is the value of x in degrees?

Answer: (a) $x = \frac{3\pi}{4}$, (b) $x = 135^\circ$

16. Given that $10^x = 136.14$ find the value of x.

Answer: $x = 2.134$ to 3 decimal places

17. True or false? $\log\left(\dfrac{a}{b}\right) = \dfrac{\log a}{\log b}$ for all positive numbers a and b.

Answer: False

18. Simplify $\log_3 9 + \log_4 2$.

Answer: 2.5

19. If $\log_2(x) = 5$, what is x?

Answer: $x = 32$

20. Find all real numbers x such that $e^{-x} = \dfrac{1}{2}$.

Answer: $x = \ln 2$ or you could write $x = \log_e 2$