

1 Session One - Revision of Basics

Workshop Questions

You should not use a calculator for these questions except where explicitly stated, please.

1. Simplify or evaluate the following:

(a) $g^2 \cdot g^3$ (b) $x^5 \cdot x^{-6}$ (c) $(y^8)^{0.5}$ (d) $(2^6 \times 5^7)/(50 \times 10^3)$

2. Evaluate e^0

3. Between what two integers must $\log(3163)$ lie?

4. Determine the following expressions as a single logarithm:

(a) $\log(3) + \log(8)$ (b) $\log(8) + \log(2)$

5. Knowing that $\log(2)$ is 0.301, determine the following without the aid of a calculator:

(a) $\log(200)$ (b) $\log(4)$

6. Solve for x in $2 \log(x) - \log(10x) = 0$

7. Given that $y = e^{5.3}$, find $\ln(y)$.

8. Given that $C = Q/V$, and that Q is $6\mu\text{C}$ and V is 100 mV , what is C ?

9. Given that $E = \frac{1}{2}kx^2$, and that k is 3.0 Nmm^{-1} and x is 4 mm , what is E in basic SI units?

10. A cube has sides each 4 mm long. Determine the volume of the cube
(a) by working in millimetres, then converting the determined volume to m^3 .
(b) by converting the length to metres, then determine the volume in m^3 .

11. Find x given that $2/x + 7/3 = 5$

12. Rewrite $E = \frac{1}{2}kx^2$ so that x is the subject of the equation.

13. Rewrite $R = (d^2 + L^2)/2d$ so that L is the subject of the equation.

14. Determine x in the following equations:
 $x^2 + 3x = 10$ $2x^2 - 5x - 3 = 0$ $2x^4 + x^2 - 10 = 0$
15. Solve for x in the following pairs of simultaneous equations:
 $x + y = 7$ $96 - 2t = 12x$
 $x - y = -1$ $t - 15 = 5x$
16. A spherical ball has a radius of 4 cm. What is its surface area and its volume?
17. A circle has a radius of 4 cm. What is its area and circumference?
18. A right-angled triangle has a hypotenuse of length 5 cm, and one other side of length 3 cm.
(a) What is the length of the third side?
(b) What is the cosine of the angle θ between the hypotenuse and the side of length 3 cm (no calculator needed)?
(c) Again without a calculator, what is $\sin \theta$?
(d) What is $\sin^2 \theta + \cos^2 \theta$ in this case? (Note: $\sin^2 \theta$ means $[\sin \theta]^2$.)
19. A triangle has two sides of length 5 and 4 units, and an angle of 100 degrees between them. Use the cosine rule to determine the length of the third side (calculator allowed).
20. A triangle has its largest internal angle as 140 degrees. The side opposite that angle has length 6 units. One of the other internal angles is 15 degrees. Use the sine rule (calculators allowed) to find the length of the side opposite the 15 degree angle.
21. Without using your calculator, express 30 degrees in radians, including π in the answer.
22. Using your calculator, determine the sine of
(a) 10 degrees (b) 1.57 radians (c) 0.02451 radians (d) 0.12700 radians

Comment on the results of part (c) and (d).
23. Sketch $\sin \theta$ for θ ranging from 0 to 2π radians. Sketch also $\sin^2 \theta$ over the same range.
24. Determine the dimensions of pressure.
25. Determine the dimensions of Kinetic Energy and Potential Energy.
26. Is it possible to add 5 N to 6 kg ms^{-2} ? Is it possible to multiply 5 N by 6 m?