

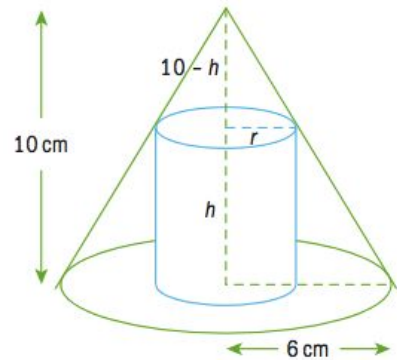
Math SL PROBLEM SET 76

Section A (Short Answer)

- (SP5.6 - R) (CI)** The events A and B are such that $P(A) = 0.3$, $P(B) = 0.5$ and $P(A \cup B) = 0.55$. Find the probability of:
(Cirrito 15.2, p510)
 - $A|B$
 - $B|A$
 - $A|B'$
 - $A'|B'$
- (T3.5 - R) (CI)** Solve the following trigonometric equations on the domain of $0 \leq x \leq 2\pi$.
(Cirrito 10.4, p359)
 - $3\tan^2(2x) - 1 = 0$
 - $\cos^2(\pi x) = 1$
- (SP5.9 - R) (CA)** A machine in a factory is making bolts. The proportion of bolts from this machine that have a diameter greater than 1.00 cm is 0.05 and the proportion of bolts whose diameter is less than 0.90 cm is 0.01. Assuming the distribution of diameters of bolts to be normally distributed, find the mean and standard deviation of the diameter.
(Cirrito 17.2, p568)

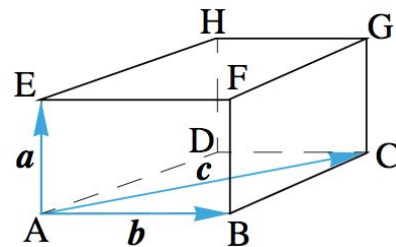
- (CA6.3 - R) (CI)** A cylinder is inscribed in a cone with radius 6 centimetres and height 10 centimetres.

- Show that an expression for r , the radius of the cylinder in terms of h , the height of the cylinder is $r = 6 - \frac{3h}{5}$.
- Show that an expression of the volume, V , of the cylinder in terms of h is $V(h) = \pi \left(36h - \frac{36}{5}h^2 + \frac{9}{25}h^3 \right)$.
- Find $\frac{dV}{dh}$ and $\frac{d^2V}{dh^2}$.
- Hence find the radius and height of cylinder with maximum volume.



- (CA6.6 - E) (CA)** A cuboid is a fancy name for a rectangular prism. The cuboid ABCD,EFGH has vector $AB = xi$ and vector $AD = 3j$ and vector $AE = 4k$. Included is a diagram of the cuboid ABCD,EFGH to show you how to “label” a cuboid diagram. **(Cirrito 12.3, p415)**

- Explain/Show that the diagonal DF can be written as $xi - 3j + 4k$
- Hence, find the value(s) of x if the angle between the diagonals given by DF and BH is a right angle.



Math SL PROBLEM SET 76

6. **(A1.3 - R) (CA)** The position vectors of the points A, B and C are given by $OA = i + 2j + 2k$, $OB = i + aj - 2k$ and $OC = bi + 3j + ck$, where a, b and c are constants. Find:

(Cirrito 12.3, p415)

- a if OA is perpendicular to OB
- b and c if O, A and C are collinear

Section B (Extended Response/Investigation)

7. **(CA6.5 - N) (CA)** The following questions deal with volumes of rotation: **(Oxford 9.6, p318)**

- Find the volume of the solid generated by rotating the region bounded by the y axis and the following 2 curves $\Rightarrow y^2 = x^3$ and $y^2 = 2 - x$ about the x -axis. (DESMOS may help to visualize, but you can use your TI-84)
- (IB level 7 Question) The volume of the solid formed when the region bounded by the curve $y = e^x - k$, the x -axis and the y -axis and the line $x = \ln(3)$ is $\pi \ln 3$ square units. Find the value of k .

8. **(CA6.5 - E) (CI)** Consider the functions $f(x) = \sqrt{e^x}$ and $g(x) = e^{\sqrt{x}}$.

(Cirrito 5.3.3, p133; Cirrito 22.5.6, p753)

- State the domain of $f(x)$ and $g(x)$.
- Show that $f(x) = e^{0.5x}$
- Find $f'(0)$.
- Show that $g'(0)$ does not exist.
- Find the solution to the equation $f(x) = g(x)$.
- Hence, solve $f(x) > g(x)$.
- Given that $\int e^{\sqrt{x}} dx = 2e^{\sqrt{x}}(\sqrt{x} - 1) + c$, find the area enclosed by the curves f and g .