5th Year Honours Maths Test on Algebra 1(a.) **Name:……**

1.) Solve the equation $x^2 - 2\sqrt{3}x - 9 = 0$, giving your answers in the form $a\sqrt{3}$, where $a \in \mathbb{Q}$.

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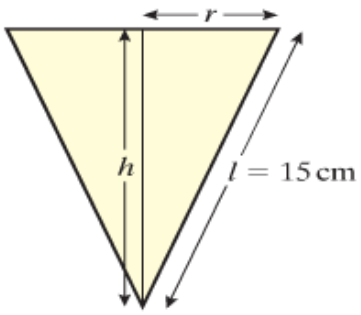
2.) A cone has a radius r cm and a vertical height h cm. If the slant height $l = 15$ cm, and using Pythagoras' theorem,

(i) express h in terms of r.
(ii) Hence find the value of h when $r = 5$ cm.
(iii) At what value of h will the radius r be equal to half the slant height l?
Give your answer correct to the nearest cm.



(i)

(ii)

(iii)

3.) If $x^2 - px + 1$ is a factor of $ax^3 + bx + c$, prove that

(i) $c = ap$ (ii) $c^2 = a(a - b)$

(i)

(ii)

4.) Write c in terms of the other variables in each of the following.

(i) $d = \sqrt{\frac{a-b}{ac}}$ (ii) $b = \frac{2c-1}{c-1}$

(i)

(ii)

5.) Factorise the following: (i) $y^3 - 1$ (ii) $1000a^3 - 343b^3$

(i)

(ii)

6.) Factorise the following:

(i) $51 + x^2 + 20x$

(ii) $-x^2 + 169$

(iii) $ax + by + ay + bx$

(iv) $a^2 + b^2 - 2ab$

(v) $a^2 + b^2 - c^2 - 2ab$

7.) Simplify: (i) $\frac{8x^3 + 27}{4x^2 - 9}$

(ii) $\frac{3t - 10}{3t - 2} - \frac{8}{2 - 3t}$

(iii) $\frac{2x}{x+3} + \frac{3x}{x-3} - \frac{5x^2+9}{x^2-9}$

8.)

(i) The area of a rectangle can be expressed as $2x^2 + 3x - 20$. The length of the rectangle is $x + 4$. Find the breadth of the rectangle in terms of x:

(ii) This rectangle is used as a base for a rectangular box. The volume of the box can be expressed as $6x^3 + 7x^2 - 63x + 20$. Find the height of the box in terms of x:

9.) The future value of €P, invested for 3 years at i %, is given by the formula :

$$A = P\left(1 + \frac{i}{100}\right)^3$$

(i) Find, i in terms of P and A.

(ii) If €2500 invested 3 years ago has a present value of €2650, find the rate of interest correct to one decimal place: