Summative Assessment - 1

X Class, Mathematics, Paper - 1

Valuation Key.

1. $\log_{\sqrt{3/5}} \frac{243}{3125} = \log_{\sqrt{3/5}} (3/5)^5$ — 1 M

$= 5 . \log_{\sqrt{3/5}} 3/5$ ($\because \log_a M^N = N \log_a M$) — $\frac{1}{2}$ M

$= 5 . 1$ ($\because \log_a a = 1$.)

$= 5$ } — $\frac{1}{2}$ M

2. $A \cup B = \{0, 1, 2\} \cup \{2, 4\}$

$= \{0, 1, 2, 4\}$ } — $\frac{1}{2}$ M

$n(A \cup B) = 4$ — $\frac{1}{2}$ M

3. $P(x) = 2x^2 + x - 1$

If $x = \frac{1}{2}$ then $P(\frac{1}{2}) = 2(\frac{1}{2})^2 + \frac{1}{2} - 1$ } — $\frac{1}{2}$ M

$= 2 \times \frac{1}{4} + \frac{1}{2} - 1$

$P(\frac{1}{2}) = 0.$

$\therefore$ $\frac{1}{2}$ is the zero of the polynomial. — $\frac{1}{2}$ M

4. $V = l \times b \times h$

'V' is the volume of a cuboid

'l' is the length of the cuboid

'b' is the breadth of the cuboid

'h' is the height of the cuboid. } 1 M

5. $7^x = 9^{x-2}$

Taking logarithms on both the sides we have } - $\frac{1}{2}$ M

$\log 7^x = \log 9^{x-2}$

$x \log 7 = \cancel{\log} (x-2) \log 9$

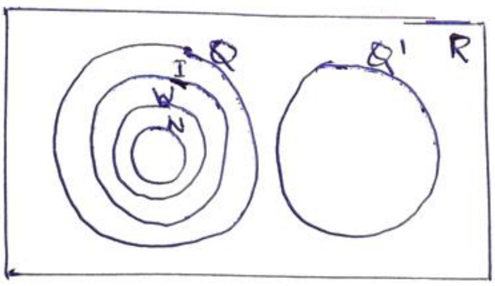
$= x \log 9 - 2 \log 9$

$x \log 9 - x \log 7 = 2 \log 9$ — 1 M

$x \log \frac{9}{7} = \log 9^2$

$x = \frac{\log 9^2}{\log 9/7}$ — $\frac{1}{2}$ M

6.



For drawing the shapes — $1\frac{1}{2}$ M

for ~~labling~~ labeling with proper symbols — $\frac{1}{2}$ M

7. $P(x) = x^2 - 25 = (x+5)(x-5)$

For $P(x) = 0$ $(x+5)(x-5) = 0$

If product of two numbers is zero, either of them is zero.

$\therefore x + 5 = 0 \Rightarrow x = -5$

$x - 5 = 0 \Rightarrow x = +5$ — $\frac{1}{2}$ M

From the ~~roots~~ zeroes

Sum of the zeroes $5 + (-5) = 0$

Product of the zeroes $5 \times (-5) = -25$

From $P(x) = x^2 + 0 \cdot x - 25$

Sum of zeroes $= -\frac{\text{Coefft of } x}{\text{Coefft of } x^2}$

$= -\frac{0}{1} = 0$

Product of zeroes $= \frac{\text{Constant}}{\text{Coefft of } x^2}$

$= -\frac{25}{1} = -25$ — 1 M

Hence the relation between zeroes and coefficients is verified — 1 M

8. $p(x) = \ldots\ldots\ldots\ldots$

$g(x) = \ldots\ldots\ldots\ldots$

[This is an open ended question. Student must write examples so that $g(x)$ is a factor of $p(x)$]

$P(x)$ — 1 M

$g(x)$ — $\frac{1}{2}$ M

Verification — $\frac{1}{2}$ M

9 A is set of all primes below 5 $A = \{2, 3\}$
B is set of all prime factors of 30 $B = \{2, 3, 5\}$ } - 1M

$A - B = \{2, 3\} - \{2, 3, 5\} = \{\ \} = \phi$
$B - A = \{2, 3, 5\} - \{2, 3\} = \{5\}$ } - 1M

$\therefore A - B \neq B - A.$

10 a. $P(x) = 4x^3 - 11x^2 - 19x - 4$

$p(4) = 4(4)^3 - 11 \cdot 4^2 - 19 \cdot 4 - 4 = 0$
$p(-1) = 4(-1)^3 - 11 \cdot (-1)^2 - 19(-1) - 4 = 0$ } $-\frac{1}{2}$M
$p\left(-\frac{1}{4}\right) = 4\left(-\frac{1}{4}\right)^3 - 11\left(-\frac{1}{4}\right)^2 - 19\left(-\frac{1}{4}\right) - 4 = 0$

$\therefore 4, -1$ and $-\frac{1}{4}$ are the zeroes of $p(x)$. $-\frac{1}{2}$M

Sum of the zeroes $= -\dfrac{\text{Coefft of } x^2}{\text{Coefft of } x^3}$ $-\frac{1}{2}$M

$4 + (-1) + \left(-\frac{1}{4}\right) = -\dfrac{-11}{4}$ } $-\frac{1}{2}$M

$\dfrac{11}{4} = \dfrac{11}{4}$

Product of the zeroes $= -\dfrac{\text{Constant term}}{\text{Coefft of } x^3}$ $-\frac{1}{2}$M

$4 \times (-1) \times \left(-\frac{1}{4}\right) = -\dfrac{-4}{4}$ } $-\frac{1}{2}$M

$1 = 1$

Sum of the products of zeroes taken two at a time $= \dfrac{\text{Coefft of } x}{\text{Coefft of } x^3}$ $-\frac{1}{2}$M

$4(-1) + (-1)\left(-\frac{1}{4}\right) + \left(-\frac{1}{4}\right) \times 4 = \dfrac{-19}{4}$
$-4 + \frac{1}{4} - 1 = \dfrac{-19}{4}$ } $-\frac{1}{2}$M
$-\dfrac{19}{4} = -\dfrac{19}{4}$

Hence the relations are checked to be true.

10 b. Let us suppose $2\sqrt{5}+\sqrt{7} = \frac{a}{b}$ is a rational number where a, b are integers, $b \neq 0$ } $\frac{1}{2}$M

Re-arranging and squaring on both the sides we have

$$(2\sqrt{5})^2 = \left(\frac{a}{b} - \sqrt{7}\right)^2$$

$$20 = \frac{a^2}{b^2} - \frac{2a}{b}\sqrt{7} + 7$$

$$\Rightarrow \sqrt{7} = \frac{a^2 - 13b^2}{2ab}$$ } 1M

a, b are integers $\Rightarrow \frac{a^2-13b^2}{2ab}$ is rational number.

$\Rightarrow \sqrt{7}$ is rational number. } $\frac{1}{2}$M

This is a contradiction to the fact that $\sqrt{7}$ is irrational

$\therefore$ $2\sqrt{5}+\sqrt{7}$ is not a rational number, but irrational. } $\frac{1}{2}$M

$(2\sqrt{5}+7) \times (2\sqrt{5}-7) = (2\sqrt{5})^2 - 7^2$ $\quad \because (a+b)(a-b) = a^2-b^2$

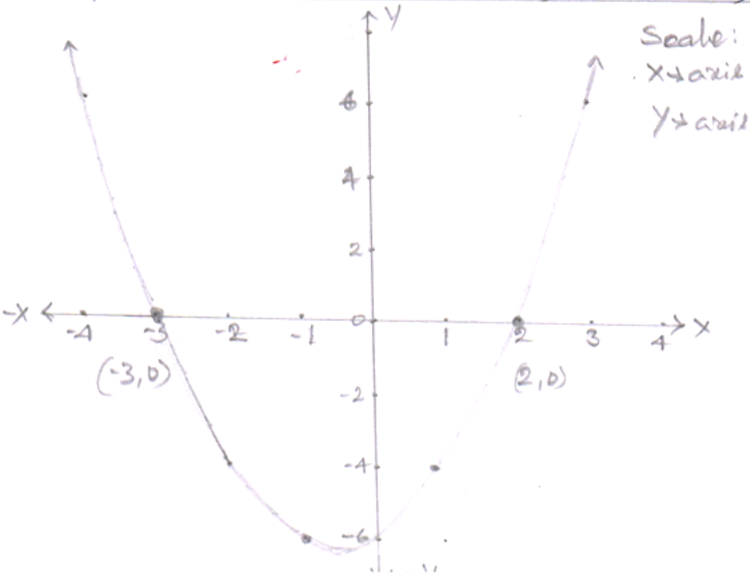
$= 20-7 = 13$ is a rational number } 1M

$\therefore$ $(2\sqrt{5}+7)(2\sqrt{5}-7)$ is a rational number — $\frac{1}{2}$M

11 a. $y = x^2 + x - 6$

x	−4	−3	−2	−1	0	1	2	3
y	6	0	−4	−6	−6	−4	0	6
(x,y)	(−4,6)	(−3,0)	(−2,−4)	(−1,−6)	(0,−6)	(1,−4)	(2,0)	(3,6)

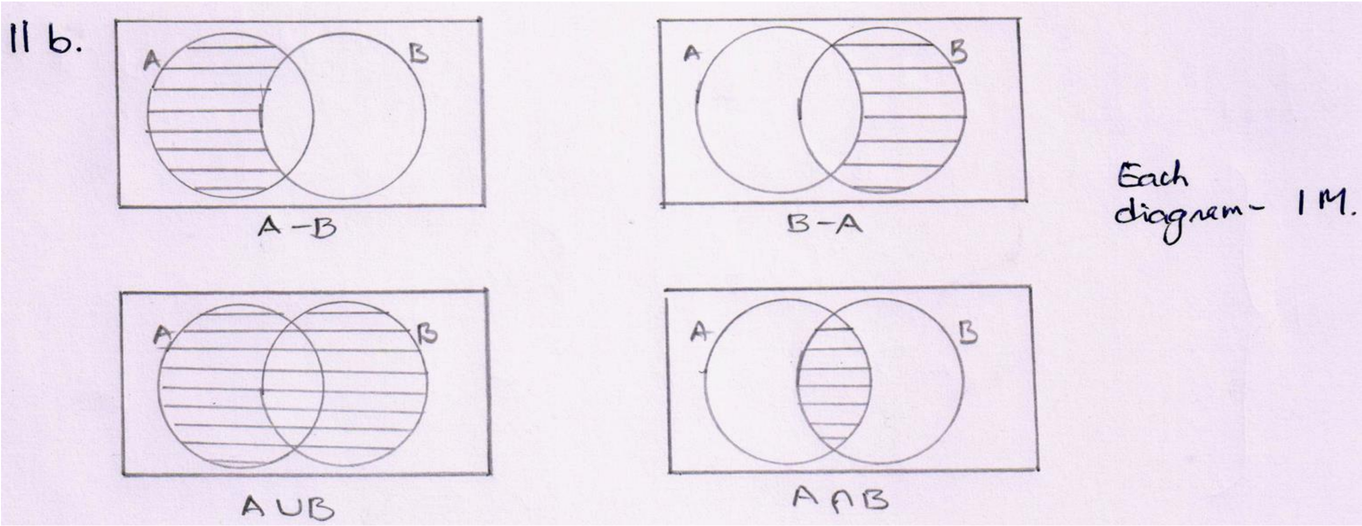
} — 1M



Scale:
X-axis 1cm = 2 units
Y-axis 1cm = 2 units

Axes and scale — 1M
Graph — $1\frac{1}{2}$M
Marking zeroes — $\frac{1}{2}$M.

11 b.



12a. Radius of conical cap $r = 6$ cm

height of the conical cap $h = 8$ cm } $\frac{1}{2}$M

∴ Its slant height $l = \sqrt{r^2 + h^2}$ — $\frac{1}{2}$M

$= \sqrt{6^2 + 8^2} = 10$ cm. — $\frac{1}{2}$M

Area of paper required = curved surface area of cone

$= \pi r l$

$= \frac{22}{7} \times 6 \times 10 = \frac{1320}{7}$ cm^2 } 1M

Area of the available paper = 1000 cm^2

∴ No of caps that can be made $= \frac{1000}{1320/7}$

$\simeq 5\frac{10}{33}$ } 1M

∴ Only 5 caps can be made out of available paper. — $\frac{1}{2}$M

12b. This problem belongs to 'Quadratic Equations' which scheduled in October.

So add score may be given for attempting and trying to solve like a problem in polynomials. } 1M.

13 a. $A - B = \{x / x \text{ is a Natural number below } 10\} - \{x / x \text{ is an even number less than } 10\}$

$= \{x / x \text{ is an odd number less than } 10\}$ } 1M

$A - C = \{x / x \text{ is an even number less than } 10\}$ — 1M

$B \cup C = \{x / x \text{ is a natural number less than } 10\}$ — 1M

$A - B$ and $B - A$ are disjoint sets. — 1M

13 b: (i) $\log\left(\frac{x+y}{3}\right) = \frac{1}{2}\log(xy)$

$\log \frac{x+y}{3} = \log (xy)^{1/2}$ } 1M

Removing logarithms on both the sides

$\frac{x+y}{3} = \sqrt{xy}$

$x+y = 3\sqrt{xy}$ } 1M

Squaring on both the sides we have

$x^2 + 2xy + y^2 = 9xy$

$\Rightarrow \frac{x}{y} + \frac{y}{x} = 7$ } 1M

(ii) $3^{2+\log_3 2} = 3^2 \times 3^{\log_3 2}$ $[\because a^{m+n} = a^m \times a^n]$ — $\frac{1}{2}$M

$= 9 \times 2$ $[\because a^{\log_a x} = x]$ } - $\frac{1}{2}$M

$= 18$

Part B.

14	D	24	A
15	D	25	D
16	D	26	C
17	A	27	C
18	B	28	C
19	C	29	D
20	A	30	A
21	A	31	C
22	D	32	A
23	D	33	C