SUMMATIVE ASSESSMENT - II - 2016 - 2017

CLASS-X - MATHS - PAPER-I

Part - A & B

KEY

Class : X **Part - A** **Marks : 60**

Section - I (Each question carries 1 mark)

1. A = {x : x is a prime factor of 30} = {2, 3, 5}
   B = {x : x is a prime below of 20} = {2, 3, 5, 7, 11, 13, 17, 19} $\Big\}\ \frac{1}{2}m$

   (i) $A \cup B$ = {2, 3, 5} $\cup$ {2, 3, 5, 7, 11, 13, 17, 19}
   = {2, 3, 5, 7, 11, 13, 17, 19}
   = B

   (ii) $A \cap B$ = {2, 3, 5} $\cap$ {2, 3, 5, 7, 11, 13, 17, 19}
   = {2, 3, 5}
   = A 1m

2. Given Q.E $3x^2 - 2x + \frac{1}{3} = 0$

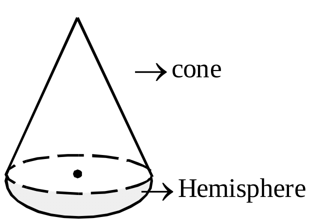
   Here $a = 3, b = -2, c = \frac{1}{3}$

   $\Delta = b^2 - 4ac$

   $= (-2)^2 - 4(3)\left(\frac{1}{3}\right)$
   $= 4 - 4$ $\Big\}\ \frac{1}{2}$

   $= 0$ $\therefore$ Roots are real and equal $-\frac{1}{2}$ 1m

3. If $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ are a pair of linear equations and if $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ then the system of linear equations are in 'consistent' system. 1m

4. 

   Name : A toytop

   (or) For any such figure Figure $-\frac{1}{2}$
   Name $-\frac{1}{2}$ $\Big\}$ 1m

Section - II (Each question carries 2 marks)

5. $99x + 101y = 499 \times 99$

$101x + 99y = 501 \times 101$

$$\left.\begin{aligned} 99^2 x + (101)(99)\,y &= 499\times 99 \\ 101^2 x + (99)(101)\,y &= 501\times 101 \end{aligned}\right\} \frac{1}{2}$$

Sub $-$ $-$ $-$

$(99^2 - 101^2)\,x = 499\times 99 - 501\times 101$ .... $\frac{1}{2}$

$(99+101)(99-101)x = (500-1)(100-1)-(500+1)(100+1)$

$$\therefore\ x = \frac{50000-600+1-50000-600-1}{200\times(-2)} \quad \Big\} \frac{1}{2}$$

$$= \frac{1200}{400}$$

$$= 3$$

$99x + 101y = 499$

$99(3) + 101y = 499$

$$101y = 499-297 \Rightarrow y = \frac{202}{101} = 2 \quad \Big\} \frac{1}{2}$$

$\therefore$ x = 3, y = 2 is the solution.

2m

6. $x^2 - 5x + 6 = 0$

$$\left.\begin{aligned} x^2 - 5x &= -6 \\ x^2 - 2(x)\left(\frac{5}{2}\right) &= -6 \end{aligned}\right\} \frac{1}{2}$$

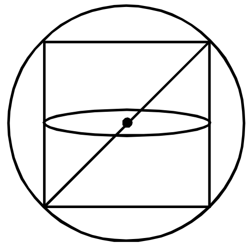
Add $\left(\frac{5}{2}\right)^2$ on both sides to make LHS as a perfect square. $\Big\} \frac{1}{2}$

$$\left.\begin{aligned} x^2 - 2x\left(\frac{5}{2}\right) + \left(\frac{5}{2}\right)^2 &= -6 + \left(\frac{5}{2}\right)^2 \\ \left(x-\frac{5}{2}\right)^2 &= \frac{1}{4} \end{aligned}\right\} \frac{1}{2}$$

$$x - \frac{5}{2} = \sqrt{\frac{1}{4}} = \pm\frac{1}{2} \Rightarrow x - \frac{5}{2} = \frac{1}{2} \text{ or } x - \frac{5}{2} = -\frac{1}{2}$$

$\therefore$ x = {3, 2} $\Big\} \frac{1}{2}$

2m

7. 

Radius of the sphere $= 6\sqrt{3}$ cm

when largest possible 'cube' is carvedout of sphere, then diagonal of the cube = diameter of sphere $\Big\} \frac{1}{2}$

$\therefore$ d $= 2\left(6\sqrt{3}\right)$

$\sqrt{3}S = 12\sqrt{3}$ $\Big\} \frac{1}{2}$

S = 12

$\therefore$ Surface area of cube $= 6S^2$

$= 6(12)^2 = 864 \text{ cm}^2$ $\Big\}$ 1 cm

2m

8. Assume that $\frac{1}{3\sqrt{2}}$ is rational

Let $\frac{1}{3\sqrt{2}} = \frac{p}{q}$ ($q \neq 0$, p, q are co-primes) $\Big\} \frac{1}{2}$

$3\sqrt{2}p = q$

$\sqrt{2} = \frac{q}{3p}$ $\Big\} \frac{1}{2}$

Here LHS is an irrational and $\frac{q}{3p}$ is rational. $\Big\} \frac{1}{2}$

This is a contridiction

$\therefore$ Our assumption is false.

$\therefore$ $\frac{1}{3\sqrt{2}}$ is irrational. $\Big\} \frac{1}{2}$

2m

9. Let no. of honey bees = x

no. of flowers = y $\Big\} \frac{1}{2}$

(i) Two honey bees sit on each flower, one bee was leftout

$\therefore$ $x = 2y + 1$

$\Rightarrow x - 2y = 1$ .... (1) $\Big\} \frac{1}{2}$

(ii) Three bees sit on each flower, no flower is left

$\therefore$ $y = \frac{x}{3} + 0$

$\Rightarrow x - 3y = 0$ .... (2) $\Big\} \frac{1}{2}$

2m

Section - III (Each question carries 4 marks)

10 (a) Given Q.E $x^2-(m+1)x+6=0$

$x=3 \Rightarrow (3)^2-(m+1)3+6=0$
$9-(3m+3)+6=0$ } 1

$-3m+12=0$
$m=4$ } 1

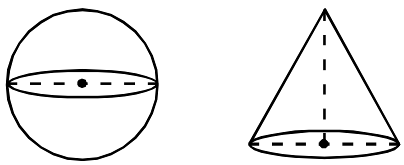
Now the equation become

$x^2-(4+1)x+6=0$
$x^2-5x+6=0$ } 1

$(x-2)(x-3)=0 \Rightarrow x=\{2,3\}$
$\therefore$ Other root = 2 } 1

4m

10 (b)



Diameter of sphere = 28 cm, Diameter of cone = $4\frac{2}{3}$ cm

$r = \frac{28}{2} = 14$ cm .... (1) } 1

radius $= \frac{14}{3}\times\frac{1}{2} = \frac{7}{3}$ cm } 1

height = 3cm

ATP

The sphere is melted and cost into some (n) cones
$\therefore$ n $\times$ volume of each cone = volume of sphere } $\frac{1}{2}$

$$n \times \frac{1}{3}\pi r^2h = \frac{4}{3}\pi r^3$$

$$n \times \frac{1}{3}\times\frac{22}{7}\times\frac{7}{3}\times\frac{7}{3}\times 3 = \frac{2}{3}\times\frac{22}{7}\times 14\times 14\times 14$$

$\therefore n = 672$ } $\frac{1}{2}$

4m

11 (a) $x^2+y^2=6xy$

Add '2xy' on both sides

$x^2+y^2+2xy=6xy+2xy$
$(x+y)^2=8xy$ } 1

Apply 'log' on both sides
$\log(x+y)^2 = \log 8xy$ } 1

$2\log(x+y) = \log 8+\log x+\log y$ [$\because \log xy=\log x+\log y$]
$= \log 2^3+\log x+\log y$ } 1

$= 3\log^2+\log x+\log y$ } 1 [$\because \log x^m = m\log x$]

Hence proved

4m

(b) Let 'a' be a positive integer

Take b = 3, Acc to Euclids division Lemma

$a = bq + r, \ r = 0, 1, 2 \ (\because 0 \leq r < b)$ $\Big\} \frac{1}{2}$

$\Rightarrow a = 3q$

$= 3q + 1$ $\Big\} \frac{1}{2}$

$= 3q + 2$

(i) If a = 3q

$\Rightarrow a^3 = (3q)^3$

$= 27a^3$ $\Big\} 1$

$= 9\ (3q^3) = 9m$

(ii) a = 3q + 1

$\Rightarrow a^3 = (3q+1)^3$

$= 27q^3 + 27q^2 + 9q + 1$

$= 9\ (3q^3 + 3q^2 + q) + 1$ $\Big\} 1$

$= 9m + 1$

(iii) If a = 3q + 2

$\Rightarrow a^3 = (3q+2)^3$

$= 27q^3 + 54q^2 + 36q + 8$

$= 9\ (3q^3 + 6q^3 + 4q) + 8$ $\Big\} 1$

$= 9m + 8$

For any positive integer, the cube is always in the form of

9m, 9m + 1 or 9m+8

Hence proved 4m

12 (a) Let the speed of the car = x kmph

distance travelled = 36 km

$\therefore$ time taken $= \frac{36}{x}$ .... (1)

If speed is increased by 10 kmph, then $\Big\} 1$

time taken $= \frac{36}{x+10}$ .... (2)

ATP

Difference in time taken = 18 min

$= \frac{18}{60}$ hr

$\therefore \frac{36}{x} - \frac{36}{x+10} = \frac{18}{60}$ $\Big\} 1$

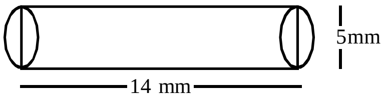
Simplifying $x^2 + 10x - 1200 = 0$ $\Big\} 1$

Solving $(x+40)(x-30) = 0$

$\Rightarrow x = \{-40, 30\}$ $\Big\} 1$

Speed of the car = 30 kmph 4m

12 (b)



Length of the capsule = 14mm

Width of the capsule = 5mm

The capsule is the combination of two hemispheres and a cylinder

$\therefore$ radius of hemisphere = $\frac{d}{2} = \frac{5}{2}$ mm

$\therefore$ Volume of two hemispherical ends $= 2\times\frac{2}{3}\pi r^3$

$= 2\times\frac{2}{3}\times\frac{22}{7}\times\frac{5}{2}\times\frac{5}{2}\times\frac{5}{2}$ } 1

$= \frac{1375}{21}\,mm^3$

Volume of cylinder = $\pi r^2 h$

$= \frac{22}{7}\times\frac{5}{2}\times\frac{5}{2}\times\left(14-2\left(\frac{5}{2}\right)\right)$ } 1

$= \frac{22}{7}\times\frac{5}{2}\times\frac{5}{2}\times 9\ m^3m = \frac{2475}{14}\,mm^3$

$\therefore$ Total volume of capsule

= Volume of two hemispherical ends + Volume of cylinder

$= \frac{1375}{21}+\frac{2475}{14}$ } 1

= 65.47 + 176.78

= 242.25 mm^3 } 1 4m

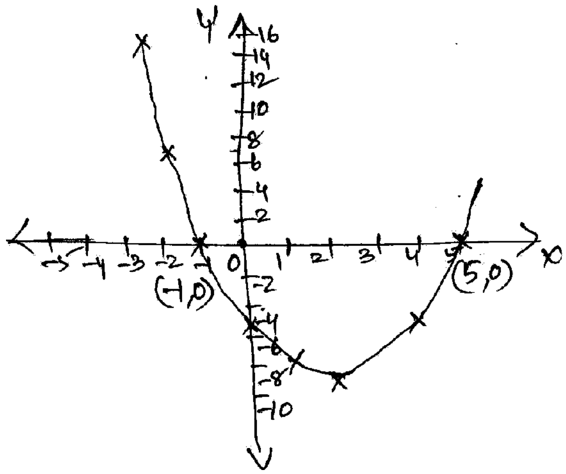
13 (a) For writing the table for $p(x) = x^2 - 4x - 5$ } $1\frac{1}{2}$

x	-3	-2	-1	0	1	2	3	4
$p(x) = x^2-4x-5$	$(-3)^2-4(-3)-5$	$(-2)^2-4(-2)-5$	$(-1)^2-4(-1)-5$	$0^2-4(0)-5$	$1^2-4(1)-5$	$2^2-4(2)-5$	$3^2-4(3)-5$	$4^2-4(4)-5$
y	16	7	0	-5	-8	-9	-8	-5
(x, y)	(-3, 16)	(-2, 7)	(-1, 0)	(0, 5)	(1, -8)	(2, -9)	(3, -8)	(4, -5)

Scale = X-axis = 1 cm = 1 unit

Y-axis = 1 cm = 2 unit

For Graph :



$1\frac{1}{2}$

Check : P(x) = $x^2 - 4x - 5$

P(−1) = $(-1)^2 - 4(-1) - 5$

= $1 + 4 - 5$

= 0

P(5) = $(5)^2 - 4(5) - 5$

= $25 - 20 - 5$

= 0

$1\frac{1}{2}$

Solution : 1) The Graph of the polyminal is a curve

2) It cuts x-axis at (−1, 0) and (5, 0)

3) Zeroes = {−1, 5}

$\frac{1}{2}$

4m

13 (b) For writing tables for equations

(i) $2x - y = 5$

x	0	$5/2$	2
y	-5	0	-1
(x, y)	(0, -5)	($5/2$, 0)	(2, -1)

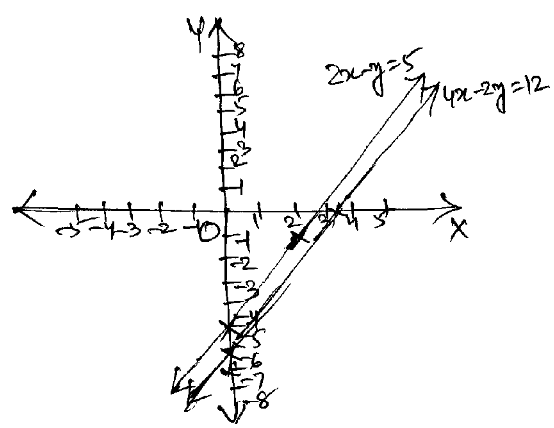
(ii) $4x - 2y = 12$

x	0	3	-2
y	-6	0	-10
(x, y)	(0, -6)	(3, 0)	(-2, -10)

2

Scale = X-axis = 1 cm = 1 unit

Y-axis = 1 cm = 2 unit



$1\frac{1}{2}$

Solution : 1) The Graph of pair of linear equations is a pair of parallel lines.

2) Hence the Equations are in inconsistent system. $\left.\right\} \frac{1}{2}$ 4m