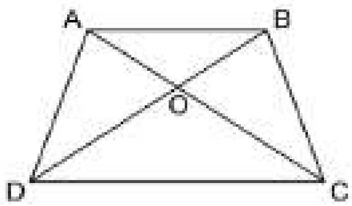
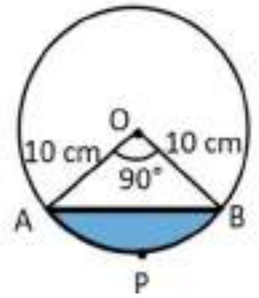
MARKING SCHEME OF Mock Test 08: Complete Syllabus (Basic Maths)-241

1	(A)	1
2	(D)	1
3	(A)	1
4	(B)	1
5	(A)	1
6	(B)	1
7	(C)	1
8	(C)	1
9	(A)	1
10	(C)	1
11	(C)	1
12	(C)	1
13	(B)	1
14	(D)	1
15	(D)	1
16	(A)	1
17	(D)	1
18	(D)	1
19	(A)	1
20	(A)	1
21	Let, the first term of two AP be a_1 and a_2 respectively And the common difference of these APs be d. For the first A.P., $a_n = a+(n-1)d$ $a_{100} = a_1+(100-1)d = a_1 + 99d$ $a_{1000} = a_1+(1000-1)d$ $a_{1000} = a_1+999d$ For second A.P., we know, $a_n = a+(n-1)d$ $a_{100} = a_2+(100-1)d = a_2+99d$ $a_{1000} = a_2+(1000-1)d = a_2+999d$ Given that, difference between 100^{th} term of the two APs = 100 Therefore, $(a_1+99d) - (a_2+99d) = 100$	2

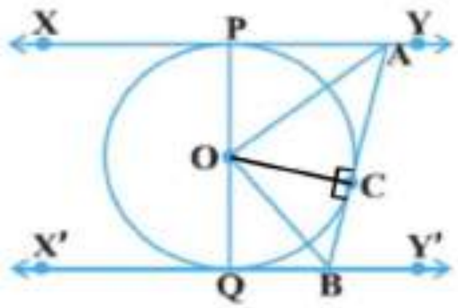
	$a_1 - a_2$ =100............(i) **Difference between 1000th terms of the two APs** **$(a_1+999d) - (a_2+999d) = a_1 - a_2$** **From equation (i),** **This difference, $a_1 - a_2$ = 100. Hence, the difference between 1000th terms of the two A.P. will be 100.**	
22	 **In ΔDOC and ΔBOA,** **AB || CD, thus alternate interior angles will be equal,** **∴∠CDO = ∠ABO** **Similarly,** **∠DCO = ∠BAO** **Also, for the two triangles ΔDOC and ΔBOA, vertically opposite angles will be equal;** **∴∠DOC = ∠BOA** **Hence, by AAA similarity criterion,** **ΔDOC ~ ΔBOA** **Thus, the corresponding sides are proportional.** **DO/BO = OC/OA** **⇒OA/OC = OB/OD**	 **1** **1**
23	$7\sin^2\theta + 3\cos^2\theta = 4$ $7(1-\cos^2\theta) + 3\cos^2\theta = 4$ $7 - 7\cos^2\theta + 3\cos^2\theta = 4$ $7 - 7\cos^2\theta + 3\cos^2\theta = 4$ $7 - 4\cos^2\theta = 4$ $4\cos^2\theta = 3$ $\cos^2\theta = 3/4$ $\cos\theta = \frac{\sqrt{3}}{2}$ $\theta = 30^o$ $\tan\theta = \tan 30^o = \frac{1}{\sqrt{3}}$	 **1** **1**

24	**Let the chord AB subtends right angle at the centre O.**  **Area of segment with an angle 90°** $\frac{90}{360} \times \pi r^2 = \frac{1}{4} \times 3.14 \times 10 \times 10 = 78.5 \text{ cm}^2$ **Area of triangle OAB =** $\frac{1}{2}$ **X OA** $\times$ **OB =** $\frac{1}{2} \times 10 \times 10 =$ 50 cm^2 **Area of minor segment = Area of minor sector - Area of triangle OAB =** $78.5 \text{ cm}^2 - 50 \text{ cm}^2 = 28.5 \text{ cm}^2$	1 1
25	**We know that, length of tangents from an external point are equal.** **∴ AD = AF ....(1)** **DB = BE ....(2)** **EC = FC. ....(3)** **Now, it is given that AB = AC** **⇒ AD + DB = AF + FC** **⇒ DB = FC ....(4) (∵AD = AF)** **From equation (2) , (3) and (4)** **BE = EC**	1 1
26	**Let us assume, that √5 is rational number.** **i.e. √5 = x/y (where, x and y are co-primes)** **y√5= x** **Squaring both the sides, we get,** $(y\sqrt{5})^2 = x^2$ $\Rightarrow 5y^2 = x^2$**....................................... (1)** **Thus,** x^2 **is divisible by 5, so x is also divisible by 5.**	3

	Let us say, x = 5k, for some value of k and substituting the value of x in equation (1), we get, $5y^2 = (5k)^2$ $\Rightarrow y^2 = 5k^2$ is divisible by 5 it means y is divisible by 5. Clearly, x and y are not co-primes. Thus, our assumption about √5 is rational is incorrect. Hence, √5 is an irrational number.	
27	$$\alpha+\beta = -\frac{b}{a} = -\frac{2}{3}$$ $$\alpha\beta = \frac{c}{a} = -\frac{10}{3}$$ The new zeroes are $(2\alpha+1)$ and $(2\alpha+1)$ sum of these new zeroes= (2α+1) + (2β+1) =2(α+β)+2 =2(-2/3)+2 =2/3 Product of zeroes are = (2α+1)(2β+1)=4αβ+2α+2β+1 = 4 αβ + 2$(\alpha+\beta)$ +1 = 4(-10/3) + 2(-2/3) +1 = -5/3 Required polynomial is given by: x^2- (sum of zeroes)x + product of zeroes = x^2 −2/3x−5/3 ⇒ $3x^2$-2x-5 **OR** $f(x) = 6x^2 – 7x – 3$ To find the zero: Let us put f(x) = 0 $6x^2 – 7x – 3 = 0$ $\Rightarrow 6x^2 – 9x + 2x – 3 = 0$ ⇒ 3x(2x – 3) + 1(2x – 3) = 0 ⇒ (2x – 3)(3x + 1) = 0 ⇒ 2x – 3 = 0 x = 3/2	3

	⇒ 3x + 1 = 0 ⇒ x = -1/3 For x = 3/2 and x = -1/3, it gives us two zeros. As a result, the quadratic equation's zeros are 3/2 and -1/3. Now it's time for verification. − coefficient of x / coefficient of x^2 = sum of zeros 3/2 + (-1/3) = – (-7) / 6 ⇒ 7/6 = 7/6 Roots product = constant / x^2 coefficient 3/2 x (-1/3) = (-3) / 6 ⇒ -1/2 = -1/2	
28	**Adding the first equation** ($401x - 577y = 1027$) **and the second equation** ($-577x + 401y = -1907$) **gives:** $(401x - 577y) + (-577x + 401y) = 1027 + (-1907)$ **(401x−577y)+(−577x+401y)=1027+(−1907)** $-176x - 176y = -880$ **−176x−176y = −880** **Dividing the entire equation by -176, we get a simplified equation:** $x + y = 5$ **........(1)** **Subtracting the second equation** ($-577x + 401y = -1907$) **from the first equation** ($401x - 577y = 1027$) **gives:**$(401x - 577y) - (-577x + 401y) = 1027 - (-1907)$ **(401x−577y)−(−577x+401y)=1027−(−1907)** **401x-577x -577y-401y=1027+1907** **978x−978y=2934** **Dividing the entire equation by 978, we get another simplified equation:** $x - y = 3$ **........(2)** **Now we have a simpler system of two equations:** **x + y = 5** **x – y = 3** **Add these two new equations together to eliminate y** **(x + y) + (x-y) = 5 + 3** **2x = 8** **x = 4** **substitute x=4 into the equation x + y = 5, we get** **4 + y = 5** **y = 1.** **So, x = 4 and y = 1.**	**3**

29	$\frac{\sin 30°+\tan 45°-\text{cosec } 60°}{\sec 30°+\cos 60°+\cot 45°} = \frac{\frac{1}{2}+1-\frac{2}{\sqrt{3}}}{\frac{2}{\sqrt{3}}+\frac{1}{2}+1} = \frac{\frac{\sqrt{3}+2\sqrt{3}-4}{2\sqrt{3}}}{\frac{4+\sqrt{3}+2\sqrt{3}}{2\sqrt{3}}}$ Now, cancel the term $2\sqrt{3}$, in numerator and denominator, we get $=\frac{\sqrt{3}+2\sqrt{3}-4}{4+\sqrt{3}+2\sqrt{3}} = \frac{3\sqrt{3}-4}{3\sqrt{3}+4}$ Now, rationalize the terms $= \frac{3\sqrt{3}-4}{3\sqrt{3}+4} \times \frac{3\sqrt{3}-4}{3\sqrt{3}-4}$ $=\frac{27-12\sqrt{3}-12\sqrt{3}+16}{27-12\sqrt{3}+12\sqrt{3}+16} = \frac{27-24\sqrt{3}+16}{11} = \frac{43-24\sqrt{3}}{11}$ Therefore, $\frac{\sin 30° + \tan 45° - \text{cosec } 60°}{\sec 30° + \cos 60° + \cot 45°} = \frac{43-24\sqrt{3}}{11}$	**3**
	OR **First find the simplified form of L.H.S** **L.H.S. = (1 + sec A)/sec A** **= (1 + 1/cos A)/1/cos A** **= (cos A + 1)/cos A/1/cos A** **Therefore, (1 + sec A)/sec A = cos A + 1** **R.H.S. = $\sin^2 A$/(1-cos A)** **We know that $\sin^2 A = (1 - \cos^2 A)$, we get** **= $(1 - \cos^2 A)$/(1-cos A)** **= (1-cos A)(1+cos A)/(1-cos A)** **Therefore, $\sin^2 A$/(1-cos A)= cos A + 1** **L.H.S. = R.H.S.** **Hence proved**	**3**
30	**Join OC**	**3**



Now, the triangles △OPA and △OCA are congruent using SSS congruency as

(i) OP = OC They are the radii of the same circle

(ii) AO = AO It is the common side

(iii) AP = AC These are the tangents from point A

So, △OPA ≅ △OCA

Similarly,

△OQB ≅ △OCB

So,

∠POA = ∠COA … (Equation i)

And, ∠QOB = ∠COB … (Equation ii)

Since the line POQ is a straight line, it can be considered as the diameter of the circle.

So, ∠POA +∠COA +∠COB +∠QOB = 180°

Now, from equations (i) and equation (ii), we get,

2∠COA+2∠COB = 180°

∠COA+∠COB = 90°

∴ ∠AOB = 90°

31	A ball is drawn at random from the box it means that all outcomes are equally likely. Sample space = {1, 2, 3, ……, 20}, which has 20 equally likely outcomes. (i) Let B be the event 'the number on the ball is divisible by 2 or 3', then B = {2, 3, 4, 6, 8, 9, 10, 12, 14, 15, 16, 18, 20}. ∴ The number of favourable outcomes to the event B = 13. ∴ P(number is divisible by 2 or 3) = $\frac{13}{20}$. (ii) Let C be the event 'the number on the ball is divisible by 2 and 3', then C = {6,12,18}. ∴ The number of favourable outcomes to the event C = 3. ∴ P(number is divisible by 2 and 3) = $\frac{3}{20}$. **(iii) Perfect squares numbers between 1 and 20 = 1,4,9,16** **So, number of favourable outcomes = 4** **Required probability = $\frac{4}{20}$ = $\frac{1}{5}$**	3
32	**Let the shortest side of the right triangle be x meters.** **According to the problem, the longest side (hypotenuse) is $x + 4$ meters,** **and the third side is $(x + 4) - 2 = x + 2$ meters.** **Using the Pythagorean theorem** $x^2 + (x + 2)^2 = (x + 4)^2$ $x^2 + (x^2 + 4x + 4) = x^2 + 8x + 16$ $2x^2 + 4x + 4 = x^2 + 8x + 16$ $x^2 - 4x - 12 = 0$ **Factoring the quadratic equation gives:** $(x - 6)(x + 2) = 0$ **The possible values for x are 6 and -2.** **Since the length of a side cannot be negative, we take $x = 6$** **Shortest side: $x = 6$ m**	5

Third side: $x + 2 = 6 + 2 = 8$ **m**

Longest side: $x + 4 = 6 + 4 = 10$ **m**

The area of the triangle is calculated as $\frac{1}{2} \times$ **base** $\times$ **height**

Area of given triangle, Area $= \frac{1}{2} \times 6 \times 8 = 24$**m**^{2}

The perimeter is the sum of all sides.

Perimeter $= 6 + 8 + 10 = 24$**m**

The difference between the numerical values of the area and the perimeter is: $24 - 24 = 0$

OR

We have

$$\frac{x-2}{x-3} + \frac{x-4}{x-5} = \frac{10}{3}$$

$$\Rightarrow \quad \frac{(x-2)(x-5) + (x-4)(x-3)}{(x-3)(x-5)} = \frac{10}{3}$$

$$\Rightarrow \quad \frac{(x^2 - 7x + 10) + (x^2 - 7x + 12)}{(x^2 - 8x + 15)} = \frac{10}{3}$$

$$\Rightarrow \quad \frac{(2x^2 - 14x + 22)}{(x^2 - 8x + 15)} = \frac{10}{3}$$

$$\Rightarrow \quad 3(2x^2 - 14x + 22) = 10(x^2 - 8x + 15)$$

[by cross multiplication]

$$\Rightarrow \quad 6x^2 - 42x + 66 = 10x^2 - 80x + 150$$

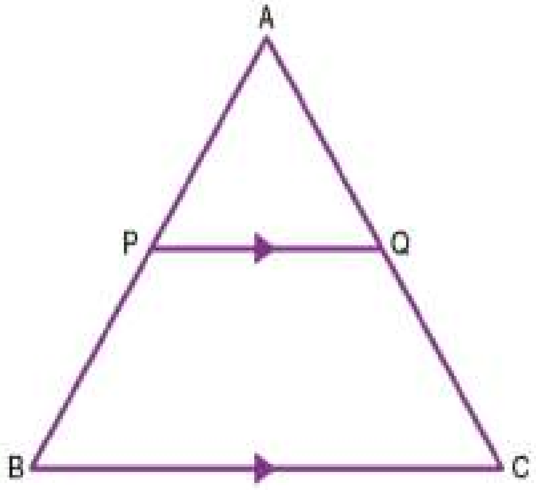
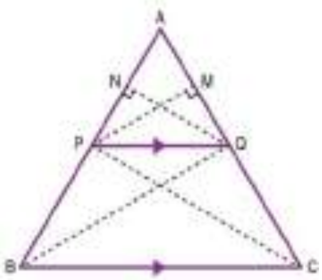
$$\Rightarrow \quad 4x^2 - 38x + 84 = 0 \Rightarrow 2x^2 - 19x + 42 = 0$$

$$\Rightarrow \quad 2x^2 - 12x - 7x + 42 = 0 \Rightarrow 2x(x-6)$$
$$- 7(x-6) = 0$$

$$\Rightarrow \quad (x-6)(2x-7) = 0 \Rightarrow x - 6 = 0 \text{ or } 2x$$
$$- 7 = 0$$

$$x = 6 \text{ or } x = \frac{7}{2}.$$

Hence, 6 and $\frac{7}{2}$ are the roots of the given equation.

33	Consider a triangle ΔABC, as shown in the given figure. In this triangle, we draw a line PQ parallel to the side BC of ΔABC and intersecting the sides AB and AC in P and Q, respectively.  According to the basic proportionality theorem as stated above, we need to prove: AP/PB=AQ/QC Construction: Join the vertex B of ΔABC to Q and the vertex C to P to form the lines BQ and CP and then drop a perpendicular QN to the side AB and also draw PM⊥AC as shown in the given figure. 	5

	Now the area of ΔAPQ = 1/2 × AP × QN (Since, area of a triangle= 1/2× Base × Height) Similarly, area of ΔPBQ= 1/2 × PB × QN area of ΔAPQ = 1/2 × AQ × PM Also,area of ΔQCP = 1/2 × QC × PM .... (1) Now, if we find the ratio of the area of triangles ΔAPQand ΔPBQ, we have $\frac{Area\ of\ \triangle APQ}{Area\ of\ \triangle PBQ} = \frac{\frac{1}{2}\times AP\times QN}{\frac{1}{2}\times PB\times QN} = \frac{AP}{PB}$ Similarly, $\frac{Area\ of\ \triangle APQ}{Area\ of\ \triangle QCP} = \frac{\frac{1}{2}\times AQ\times PM}{\frac{1}{2}\times QC\times PM} = \frac{AQ}{QC}\ldots(2)$ According to the property of triangles, the triangles drawn between the same parallel lines and on the same base have equal areas. Therefore, we can say that ΔPBQ and QCP have the same area. area of ΔPBQ = area of ΔQCP ....(3) Therefore, from the equations (1), (2) and (3) we can say that, AP/PB = AQ/QC **OR**	

In ΔFDC and ΔFBA,

$\angle FDC = \angle FBA$ ...(Since DC ∥ AB)

$\angle DFC = \angle BFA$ ...(Common angle)

$\Delta FDC \sim \Delta FBA$ ...(AA criterion for similarity)

$$\Rightarrow \frac{DC}{AB} = \frac{DF}{BF}$$

$$\Rightarrow \frac{z}{x} = \frac{DF}{BF} \quad ...(i)$$

In ΔBDC and ΔBFE,

$\angle BDC = \angle BFE$ ...(Since DC ∥ FE)

$\angle DBC = \angle FBE$ ...(Common angle)

$\Delta BDC \sim \Delta BFE$ ...(AA criterion for similarity)

$$\Rightarrow \frac{BD}{BF} = \frac{DC}{EF}$$

$$\Rightarrow \frac{BD}{BF} = \frac{z}{y} \quad ...(ii)$$

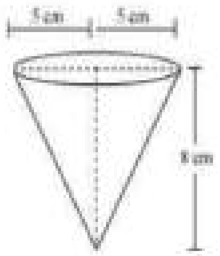
Adding (i) and (ii), we get

$$\frac{BD}{BF} + \frac{DF}{BF} = \frac{z}{y} + \frac{z}{x}$$

$$\Rightarrow 1 = \frac{z}{y} + \frac{z}{x}$$

$$\Rightarrow \frac{1}{z} = \frac{1}{x} + \frac{1}{y}$$

Hence proved.

34	For the cone, Radius = 5 cm, Height = 8 cm Also, Radius of sphere = 0.5 cm The diagram will be like  It is known that, The volume of cone = volume of water in the cone $= \frac{1}{3}\pi r^2 h = (200/3)\pi \text{ cm}^3$ Now, Total volume of water overflown= $(\frac{1}{4})\times(200/3)\ \pi = (50/3)\pi$ The volume of lead shot $= (4/3)\pi r^3$ $= (1/6)\ \pi$ Now, The number of lead shots = Total volume of water overflown/Volume of lead shot $= (50/3)\pi/(\frac{1}{6})\pi$ $= (50/3)\times 6 = 100$	**5**

35

Class interval	Frequency	Cumulative Frequency
0 – 100	2	2
100 –200	5	7
200 – 300	x	7 + x
300 –400	12	19 + x
400 – 500	17	36 + x
500 – 600	20	56 + x
600 – 700	y	56 + x + y
700 – 800	9	65 + x + y
800 – 900	7	72 + x + y
900 – 1000	4	76 + x + y

Median = 525, so Median Class = 500 – 600

76 + x + y = 100

⇒ x + y = 24 ......(i)

$$\text{Median} = l + \frac{\frac{n}{2} - cf}{f} \times h$$

Since, l = 500, h = 100, f = 20, cf = 36 + x and n = 100

Therefore, putting the value in the Median formula, we get;

$$525 = 500 + \frac{50 - (-36 + x)}{20} \times 100$$

So x = 9

y = 24 – x ......[From equation (i)]

y = 24 – 9 = 15

Therefore, the value of x = 9 and y = 15.

5

36

(i) We have a_{10} = 109 and a_{15} = 149
Then a + 9d = 109 ....(1)
a + 14d = 149 ....(2)
on subtracting eq(1) from eq(2), we get
d = 8
on substituting value of d in eq (1) we get
a=37so, first term is 37

(ii) From eq(1) and eq (2)

1+1 +2

	d=8 **(iii)** $S_{20} = \frac{n}{2}$ **(2a + (n-1)d)** $S_{20} = \frac{20}{2}$ **(2 × 37 + 19 × 8)** S_{20}**= 2260** **OR** **Sum of last 10 terms =** $S_{25} - S_{15}$ **=** $\frac{25}{2}$**(2 × 37 + 24 × 8) -** $\frac{15}{2}$**(2 × 37 + 14 × 8)** **= 3325 – 1395** **= 1930**	
37	**Height of the light house is 80 m.** **(i) let the required distance be x m.** **Then, tan30= 80/x** $\frac{1}{\sqrt{3}}$ **= 80/x ⇒ x= 80**$\sqrt{3}$ **m.** **(ii) let the required distance be y m.** **Then, tan45 = 80/y** **1= 80/y ⇒ y= 80 m** **(iii) let the required distance be z m.** **Then, tan60 = 80/z** $\sqrt{3}$ **= 80/z ⇒ z=80/**$\sqrt{3}$ **z = 80**$\sqrt{3}$**/3 m.** **OR** **Speed of the ship =** $\frac{80\sqrt{3} - 80\sqrt{3}/3}{5}$ **=32**$\sqrt{3}$**/3 m/min**	**1+1 +2**

38	i. Let D be (a, b), then Mid point of AC = Midpoint of BD $\left(\frac{1+6}{2}, \frac{2+6}{2}\right) = \left(\frac{4+a}{2}, \frac{3+b}{2}\right)$ $4 + a = 7$ $a = 3$ $3 + b = 8$ $b = 5$ Central midfielder is at (3, 5) ii. $GH = \sqrt{(-3-3)^2 + (5-1)^2}$ $= \sqrt{36+16}$ $= \sqrt{52}$ $= 2\sqrt{13}$ $GK = \sqrt{(0+3)^2 + (3-5)^2}$ $= \sqrt{9+4}$ $= \sqrt{13}$ $HK = \sqrt{(3-0)^2 + (1-3)^2}$ $= \sqrt{9+4}$ $= \sqrt{13}$ GK + HK = GH $\Rightarrow$ G,H and K lie on a same straight line [or] $CJ = \sqrt{(0-5)^2 + (1+3)^2}$ $= \sqrt{25+16}$ $= \sqrt{41}$ $CI = \sqrt{(0+4)^2 + (1-6)^2}$ $= \sqrt{16+25}$ $= \sqrt{41}$ Full-back J(5, –3) and centre-back I(–4, 6) are equidistant from forward C(0, 1) Mid-point of IJ = $\left(\frac{5-4}{2}, \frac{-3+6}{2}\right) = \left(\frac{1}{2}, \frac{3}{2}\right)$ C is NOT the mid-point of IJ iii. A, B and E lie on the same straight line and B is equidistant from A and E $\Rightarrow$ B is the mid-point of AE $\left(\frac{1+a}{2}, \frac{4+b}{2}\right) = (2, -3)$ $1 + a = 4$; $a = 3$. $4 + b = -6$; $b = -10$ E is (3, –10)	1+1 +2