SAMPLE QUESTION PAPERS
for
H.S.L.C. EXAMINATION

2021

MIZORAM BOARD OF SCHOOL EDUCATION
AIZAWL : 796 012

MATHEMATICS
SAMPLE QUESTION PAPER
Full Marks - 80
### Time - 3 hours

General Instructions :
(i)   *All questions are compulsory.*
(ii)   *Figures in the margin indicate marks.*
(iii)   *In question on construction, the drawing should be neat and exactly as per the given measurements.*
(iv)   *Use of calculator is not allowed.*

1.   Choose the correct answer :   24×1 = 24

     (a)   1 km/hr is equal to -

           (i) $\frac{15}{18} m/s$ (ii) $\frac{18}{15} m/s$

           (iii) $\frac{5}{18} m/s$ (iv) $\frac{18}{5} m/s$

     (b)   The relation between time, distance and speed is -
           (i)   speed = distance × time   (ii)   speed = distance + time
           (iii)   distance = speed × time   (iv)   time = distance × speed

     (c)   A can do a piece of work in 10 days which B can do it in 15 days.
           The time taken by them, working together on it, is -
           (i)   7 days   (ii)   6 days
           (iii)   5 days   (iv)   4 days

     (d)   A quadratic polynomial whose zeroes are α and β is -
           (i) $x^2 - (\alpha + \beta)x + \alpha\beta$ (ii) $x^2 - (\alpha + \beta)x - \alpha\beta$
           (iii) $x^2 + (\alpha + \beta)x - \alpha\beta$ (iv) $x^2 + (\alpha + \beta)x + \alpha\beta$

     (e)   The multiplicative inverse of $\frac{x-1}{x+1}$ is -

           (i) $\frac{1-x}{x+1}$ (ii) $\frac{x-1}{1-x}$

           (iii) $\frac{x+1}{x-1}$ (iv) $\frac{x-1}{x+1}$

     (f)   In a quadratic equation, when discriminant D < 0, then the nature of the roots is -
           (i)   not real   (ii)   real and equal
           (iii)   real and unequal   (iv)   none of these

     (g)   The sum of the first 26 terms of an AP 1, 3, 5, 7, ... is -

           (i)   767   (ii)   676
           (iii)   576   (iv)   675

     (h)   If A = {a, b, c, d} and B = {c, d, e}, then A − B is -
           (i)   A   (ii)   B
           (iii)   {a, b}   (iv)   {e}

(i) In the given figure, A and B are two sets,
then the shaded portion represents

(i) $A \cap B$ (ii) $A \cup B$

(iii) A' (iv) $B - A$
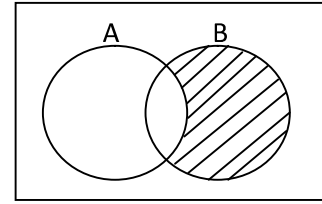
(j) In a group of 70 people, 37 like coffee, 42 like tea and each person likes at least one of the two drinks. How many people like both coffee and tea ?
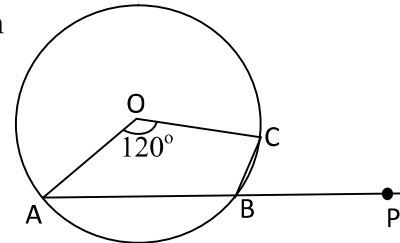
(i) 7   (ii) 8

(iii) 9   (iv) 10

(k) D and E are points on the sides AB and AC respectively of a ΔABC such that DE // BC. If AD = 2.5 cm, DB = 3 cm and AE = 5 cm, find EC.

(i) 1.5 cm   (ii) 3 cm

(iii) 5.5 cm   (iv) 6 cm

(l) In the given figure, O is the centre of a circle and $\angle AOC = 120°$, find the value of $\angle CBP$.

(i) 40°   (ii) 60°

(iii) 75°   (iv) 110°

(m) A ladder is placed against a wall such that it is at a distance of 3 m from the foot of the wall and its top reaches a window 4 m above the ground. Then the length of the ladder is -

(i) 5 m   (ii) 6 m

(iii) 7 m   (iv) 7.5 m

(n) $\square ABCD$ is a square with vertices A(1,7), B(4, 2), C(−1, −1) and D(−4, 4). Then the length of its diagonal is -

(i) $4\sqrt{17} Units$ (ii) $2\sqrt{17} Units$

(iii) $3\sqrt{17} \ Units$ (iv) $5\sqrt{17} \ Units$

(o) The midpoint of the line segment joining the points A(−1,7) and B(−5,−3) is -

(i) (−3, −5)   (ii) (1, 5)

(iii) (−3, 2)   (iv) (3, 1)

(p) The coordinates of the centroid of a triangle ABC whose vertices are A(a,b), B(c,d) and C(e,f) is -

(i) $\left(\dfrac{a+c+e}{3}, \dfrac{b+d+f}{3}\right)$ (ii) $\left(\dfrac{a+c+e}{2}, \dfrac{b+d+f}{2}\right)$

(iii) $\left(\dfrac{a+c}{3}, \dfrac{c+e}{3}\right)$ (iv) $\left(\dfrac{b+d}{2}, \dfrac{d+f}{2}\right)$

(q) The value of $\sec^2 62° - \csc^2 28°$ is -

(i) 0   (ii) 1

(iii) 2   (iv) $\sqrt{3}$

(r) If $\csc^2\theta\,(1 + \cos\theta)(1 - \cos\theta) = k$, the value of k is -
(i) -1 (ii) 0
(iii) 2 (iv) 1

(s) The radii of two circles are 15 cm and 12 cm respectively. The radius of the circle which has circumference equal to the sum of the circumference of the two circles is -

(i) 17 cm (ii) 27 cm
(iii) 37 cm (iv) 47 cm

(t) The total surface area of a cuboid is -
(i) $2(l \times b \times h)$ (ii) $2(l + b + h)$
(iii) $2(lb+bh+lh)$ (iv) $2(l^2+b^2+h^2)$

(u) If two solid hemispheres of same base radius r are joined together along their bases, then curved surface area of this new solid is -

(i) $4\pi r^2$ (ii) $3\pi r^2$
(iii) $6\pi r^2$ (iv) $8\pi r^2$

(v) The formula for finding the total surface area of a right circular cone is -
(i) $\pi l(r + h)$ (ii) $\pi h(r + l)$
(iii) $\pi r(l + h)$ (iv) $\pi r(l + r)$

(w) The area of a square inscribed in a circle of radius 5 cm is -
(i) 75 cm^2 (ii) 50 cm^2
(iii) 40 cm^2 (iv) 25 cm^2

(x) A die is tossed once. The probability of getting a prime number is -
(i) $\dfrac{1}{2}$ (ii) $\dfrac{1}{3}$

(iii) $\dfrac{1}{4}$ (iv) $\dfrac{1}{6}$

2. Answer the following: 10×2=20

(a) A and B together can finish a piece of work in 30 days. They worked together for 20 days and then A left. After another 20 days, B finished the remaining work. In how many days B alone can finish the piece of work ?

(b) Solve : $3x^2 + 10x - 8 = 0$

(c) What should be added to $\dfrac{6}{(x+1)\,(x+2)}$ to obtain $\dfrac{18}{x^2+x-2}$?

(d) The 8th term of an AP is 31 and its 15th term is 16 more than the 11th term. Find the first term.

(e) Prove that the angles in the same segment of a circle are equal.

(f) In the given figure, APB is the tangent at P to the circumcircle of ΔPQR. If APB is parallel to QR. Prove that PQ = PR.
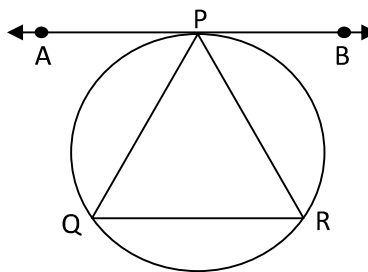
(g) A(x, 3) and B(4, 7) are the two end points of a diameter of a circle with centre O(3, 5). Find the value of x.

(h) Evaluate : $\left(\dfrac{cos7°4'}{sin16°}\right)^2 + \left(\dfrac{cos51°}{sin39°}\right)^2 - 4sin^2 45°$

(i) A metallic sphere of radius 4.2 cm is melted and recast into the shape of cylinder of radius 6 cm. Find the height of the cylinder.

(j) Draw a Pie-chart showing the following information. The table shows the colours preferred by a group of people.

Colours	No. of people
Blue	40
Green	30
Red	30
Yellow	20

3. Mr. Sanga borrowed Rs.1360 at 12 % per annum, compounded annually. He paid it back in 2 years in two equal annual instalments. Calculate the value of each instalment. 3

4. (a) Find the HCF and LCM of $2x^2 - 5x - 3$ and $x^4 - 27x$ 3

OR

(b) The perimeter of a rectangular field is 80 m and its area is 400 m². Find the length and breadth of the field. 3

5. (a) Prove that the length of tangents drawn from an external point to a circle are equal. 3

OR

(b) Prove that a cyclic parallelogram is a rectangle. 3

6. Name the type of a quadrilateral having vertices A(−1, 0), B(3, 1), C(2, 2) and D(−2, 1) 3

7. Prove that :

    (a) $\dfrac{cos^2\theta}{(1-tan\theta)} + \dfrac{sin^3\theta}{(sin\theta - cos\theta)} = (1 + sin\theta.cos\theta)$ 3

8. The angles of elevation of the top of a tower from two points at distances '*a*' and '*b*' from its foot are complementary. Prove that the height of the tower is $\sqrt{ab}$ 3

9. A solid wooden toy is in the shape of a right circular cone mounted on a hemisphere. If the radius of the hemisphere is 7 cm and the total height of the toy is 17 cm. Find the volume of the wooden toy.   3

10. Solve the following system of equations graphically :
    $2x + 3y = 8, x - 2y = -3$.
    Shade the region bounded by these lines and the y-axis.   5

11. (a) Using ruler and compass only, construct a ΔABC in which BC = 6.5 cm, ∠A = 60° and the median from A on BC is 5 cm long. Also, write the steps of construction.   5

    OR

    (b) Using ruler and compass only, draw a circle of radius 2.9 cm and take a point P at a distance of 5 cm from the centre of the circle. Without using the centre of the circle, draw two tangents from the point P. Also, write the steps of construction.   5

12. Find the Median of the following frequency distribution: 5

C.I.	0-10	10-20	20-30	30-40	40-50	50-60
Frequency	6	9	14	12	19	10

    Also, find the mean using empirical formula, given that the mode for the above data is 44.3