DESIGN OF THE SAMPLE QUESTION PAPERS
MATHEMATICS-CLASS X

Time : 3 Hours
Max. Mark : 100

The weightage or the distribution of marks over different dimensions of the question paper shall be as follows:

1. **Weightage to Learning Outcomes**

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Learning Outcomes</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Knowledge</td>
<td>31</td>
</tr>
<tr>
<td>2.</td>
<td>Understanding</td>
<td>45</td>
</tr>
<tr>
<td>3.</td>
<td>Application</td>
<td>12</td>
</tr>
<tr>
<td>4.</td>
<td>Skill</td>
<td>12</td>
</tr>
</tbody>
</table>

2. **Weightage to content/subject Unit**

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Learning Outcomes</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Algebra</td>
<td>26</td>
</tr>
<tr>
<td>2.</td>
<td>Commerical Mathematics</td>
<td>12</td>
</tr>
<tr>
<td>3.</td>
<td>Mensuration</td>
<td>10</td>
</tr>
<tr>
<td>4.</td>
<td>Trigonometry</td>
<td>10</td>
</tr>
<tr>
<td>5.</td>
<td>Geometry</td>
<td>22</td>
</tr>
<tr>
<td>6.</td>
<td>Statistics</td>
<td>12</td>
</tr>
<tr>
<td>7.</td>
<td>Coordinate Geometry</td>
<td>8</td>
</tr>
</tbody>
</table>

Total : 100

3. **Weightage to form of questions**

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Form of Question</th>
<th>Marks for each question</th>
<th>Number of questions</th>
<th>Total Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>SA I</td>
<td>3</td>
<td>10</td>
<td>30</td>
</tr>
<tr>
<td>2.</td>
<td>SA II</td>
<td>4</td>
<td>10</td>
<td>40</td>
</tr>
<tr>
<td>3.</td>
<td>LA</td>
<td>6</td>
<td>05</td>
<td>30</td>
</tr>
</tbody>
</table>

4. The expected length of answer under different forms of questions and expected time would be as follows:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Form of Questions</th>
<th>No. of credit points</th>
<th>Approx. Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Short answer type (SA I)</td>
<td>Upto 4 Credit Points</td>
<td>3-5 minutes</td>
</tr>
<tr>
<td>2.</td>
<td>Short answer type (SA II)</td>
<td>Upto 6 Credit Points</td>
<td>5-7 minutes</td>
</tr>
<tr>
<td>3.</td>
<td>Long answer type (LA)</td>
<td>Upto 8 Credit Points</td>
<td>8-10 minutes</td>
</tr>
</tbody>
</table>
Q4. A suit is available for Rs. 1500 cash or for Rs. 500 cash down payment followed by 3 monthly instalments of Rs. 345 each. Find the rate of interest charged under the instalment scheme.

Q5. A loan has to be returned in two equal annual instalments. If the rate of interest is 16% per annum compounded annually and each instalment is of Rs. 1682, find the sum borrowed and the total interest paid.

Q6. If \((x - 2)\) is a factor of \(x^2 + ax + b\) and \(a + b = 1\), find the values of \(a\) and \(b\).

Q7. Using quadratic formula, solve the following equation for \(x\):
\[abx^2 + (b^2 - ac)\ x - bc = 0\]

OR

The sum of the squares of two positive integers is 208. If the square of the larger number is 18 times the smaller, find the numbers.

Q8. Which term of the A.P. 3, 15, 27, 39,... is 132 more than its 54th term?

OR

Derive the formula for the sum of first \(n\) terms of an A.P. whose first term is \(a\) and the common difference is 'd'.

Q9. Find the sum of the following arithmetic progression:
\[1+3+5+7+.........+199\]

Q10. Show that a line drawn parallel to the parallel sides of a trapezium divides the non-parallel sides proportionally.

SECTION B

Q11. Solve for \(x\), \[\frac{1}{x+1} + \frac{2}{x+2} = \frac{4}{x+4}, \quad (x\neq -1, -2, -4)\]

Q12. Find graphically, the vertices of the triangle formed by the x-axes and the lines
\[2x - y + 8 = 0\]
\[8x + 3y - 24 = 0\]

Q13. Construct a triangle ABC in which \(BC = 13\) cm, \(CA = 5\) cm and \(AB = 12\) cm. Draw its incircle and measure its radius.

Q14. The total surface area of a closed right circular cylinder is 6512 cm², and the circumference of its base is 88 cm. Find the volume of the cylinder (use \(\pi = \frac{22}{7}\)).

Q15. Prove the identity:
\[(1 + \cot \theta - \csc \theta) (1 + \tan \theta + \sec \theta) = 2.\]
Q8. The rain water from a roof 22m x 20m drains into a conical vessel having diameter of base as 2m and height 3.5m. If the vessel is just full, find the rainfall (in cm.)

OR

The largest spere is carved out of a cube of side 7cm; find the volume of the sphere.

Q9. The following table shows the marks secured by 100 students in an examination

<table>
<thead>
<tr>
<th>Marks</th>
<th>0-10</th>
<th>10-20</th>
<th>20-30</th>
<th>30-40</th>
<th>40-50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>15</td>
<td>20</td>
<td>35</td>
<td>20</td>
<td>10</td>
</tr>
</tbody>
</table>

Find the mean marks obtained by a student.

Q10. A dice is thrown once. Find the probability of getting.

(i) a number greater than 3
(ii) a number less than 5

OR

A bag contains 5 red balls, 8 white balls, 4 green balls and 7 black balls. A ball is drawn at random from the bag. Find the probability that it is

(i) black
(ii) not green

SECTION B

Q11. Solve for x and y

(a—b)x + (a+b)y = a² — 2ab — b²
(a+b) (x+y) = a² + b²

Q12. If (x+3) (x —2) is the G.C.D. of

\[ f(x) = (x+3) (2x²—3x+a) \]

and \[ g(x) = (x—2) (3x² + 10x—b) \]

find the value of \( a \) and \( b \)

Q13. If \( A = \frac{2x+1}{2x—1}, B = \frac{2x—1}{2x+1}, \) find

\[ \frac{A+B}{A—B} \]

Q14. Solve for \( x \):

\[ \frac{x—1}{x—2} + \frac{x—3}{x—4} = \frac{10}{3} \quad (x \neq 2, x \neq 4) \]

Q15. A passenger train takes 2 hours less for a journey of 300 km if its speed is increased by 5 km/h from its usual speed. Find the usual speed of the train.
SECTION C

Q21. Making the table:
Correct Central angles

<table>
<thead>
<tr>
<th>Activity</th>
<th>Duration in hours</th>
<th>Central angle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sleep</td>
<td>7</td>
<td>105°</td>
</tr>
<tr>
<td>School</td>
<td>8</td>
<td>120°</td>
</tr>
<tr>
<td>Home work</td>
<td>4</td>
<td>60°</td>
</tr>
<tr>
<td>Play</td>
<td>3</td>
<td>45°</td>
</tr>
<tr>
<td>Others</td>
<td>2</td>
<td>30°</td>
</tr>
</tbody>
</table>

Drawing correct Pie chart with markings

Q22. Writing the trigonometric equation

\[
\frac{b}{x} = \tan \alpha \Rightarrow x = b \cot \alpha
\]

Again
\[
\frac{b + h}{x} = \tan \beta \Rightarrow \frac{b + h}{b \cot \alpha} = \tan \beta
\]

\[
(b+h) = \frac{b \tan \beta}{\tan \alpha}
\]

\[
\Rightarrow b \tan \alpha + h \tan \alpha = b \tan \beta
\]

\[
h \tan \alpha = b(\tan \beta - \tan \alpha)
\]

\[
b = \frac{h \tan \alpha}{\tan \beta - \tan \alpha}
\]
Given, to prove construction & correct figure

\[ \frac{1}{2} \times 4 = 2 \]

Correct proof

**Figure** \( \frac{1}{2} \)

OPO' is a straight line

Since \( OA = OP = r \), \( \angle A = \angle 1 \), Similarly \( \angle B = \angle 2 \)

But \( \angle 1 = \angle 2 \) (vert. Opp. \( \angle \)s) \( \therefore \) \( A = \angle B \)

But these are alternate angles \( \therefore \) \( OA \parallel O'B \)

Q25. Taxable income = Rs. 145000 - 30,000 = Rs. 115,000

Income tax = Rs. 115,000 x \( \frac{20}{100} \) = Rs. 12,000

Annual savings = Rs \([2000 \times 12 + 15000]\) = Rs. 39,000

Rebate = 20% of Rs. 39000 = Rs. 7800

\[ \therefore \) Tax = Rs. (12000 — 7800) = Rs. 4200

Income tax paid for first 11 months = Rs. (250 x 11) = Rs. 2750

\[ \therefore \) Income tax to be paid in the last month = Rs. (4200 — 2750) = Rs. 1450

<table>
<thead>
<tr>
<th>Q. No.</th>
<th>Value Points</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>55000 x 20</td>
<td>100</td>
<td>1/2</td>
</tr>
<tr>
<td><strong>OR</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>