Instructions to candidates

1. This examination paper contains four (4) questions and comprises nine (9) printed pages.

2. Attempt to answer ALL questions. Answers should be written on this question paper.

3. Candidates may use calculators. However, they should lay out systematically the various steps in the calculations.
1. Draw the Archimedean tilings. [15 marks]
   a. \((3^3, 4^2)\)
   b. \((3^2, 4, 3.4)\)
   c. \((4.8^2)\)
   d. \((3.12^2)\)
   e. \((3.4.6.4)\)
   f. \((4.6.12)\)
   g. \((3.6.3.6)\)
   h. \((3^3.6)\) in both left and right versions.

a) 

b) 

c) 

d)
e)

f)

g)

h)
2. Complete the table for the Platonic and Archimedean solids. [44 marks]

<table>
<thead>
<tr>
<th>Shape of face</th>
<th>Degree of vertex</th>
<th>Vertices</th>
<th>Edges</th>
<th>Faces</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetrahedron</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Cube</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Octahedron</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Dodecahedron</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Icosahedron</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Truncated tetrahedron</td>
<td></td>
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<tr>
<td>Truncated cube</td>
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<tr>
<td>Truncated octahedron</td>
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<td>Truncated dodecahedron</td>
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<tr>
<td>Truncated icosahedron</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Cuboctahedron</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Great rhombicuboctahedron</td>
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<tr>
<td>Rhombicuboctahedron</td>
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<tr>
<td>Icosidodecahedron</td>
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<tr>
<td>Great rhombicosidodecahedron</td>
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<tr>
<td>Rhombicosidodecahedron</td>
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</tr>
<tr>
<td>Snub cube</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Snub dodecahedron</td>
<td></td>
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</tr>
</tbody>
</table>
3. Use the chart in Attachment 1 to determine the symmetry type of the frieze patterns below. [7 marks]
4. Use the chart in Attachment 2 to determine the symmetry type of the wallpaper patterns below. [34 marks]

a.
b.
c.
d.
e.
f.
g.
h.
i.
j.
k.
l.
m.
n.
o.
p.
q.
Attachment 1: Flow chart for frieze patterns.

Is there a vertical reflection?
  yes
  no
  Is there a horizontal reflection?
    yes
    no
    pmm2
    Is there a rotation of 180°?
      yes
      no
      pma2
  yes
  no
  pm11

Is there a horizontal reflection or glide reflection?
  yes
  no
  Is there a horizontal reflection?
    yes
    no
    Is there a rotation of 180°?
      yes
      no
      p1m1
    yes
    no
    p1a1
  yes
  no
  p112
  p111
Attachment 2: Flow chart for wallpaper patterns.

None

Is there a reflection?

180°

Is there a reflection?

90°

Is there a reflection?

120°

Is there a reflection?

60°

Is there a reflection?

What is the smallest rotation?

Are there reflections in lines that intersect at 45°?

Are all rotation centres on reflection axis?

Is there a glide reflection in an axis that is not a reflection axis?

Is there a glide reflection?

Are there reflections in two directions?

Is there a glide reflection?

Are there reflections in lines that intersect at 45°?

Are all rotation centres on reflection axis?