education

Department:
Education
**PROVINCE OF KWAZULU-NATAL**

# Grades 4 to 7
# Just-in-Time Training Workshop
# 2019: No.2

# Resources Handout

# Mathematics

**Endorsed by:**

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what I do matters

SADTU
SOUTH AFRICAN DEMOCRATIC TEACHERS UNION

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# APPENDIX 1: SHAPE AND SPACE – Extract from the Intermediate Phase and Senior Phase CAPS

## 1.1 PHASE OVERVIEW – The Properties / Geometry of 3-D Objects – page 30

| PROPERTIES OF 3-D OBJECTS – page 22 | | | GEOMETRY OF 3-D OBJECTS – page 28 |
|---|---|---|---|
| **Grade 4** | **Grade 5** | **Grade 6** | **Grade 7** |
| **Range of objects**<br>Recognize, visualize and name 3-D objects in the environment and geometric settings, focusing on:<br>• rectangular prisms,<br>• spheres<br>• cylinders<br>• pyramids | **Range of objects**<br>Recognize, visualize and name 3-D objects in the environment and geometric settings, focusing on:<br>• rectangular prisms and other prisms<br>• cubes<br>• cylinders<br>• cones<br>• pyramids<br>• similarities & differences between cubes and rectangular prisms | **Range of objects**<br>Recognize, visualize and name 3-D objects in the environment and geometric settings, focusing on<br>• rectangular prisms<br>• cubes<br>• tetrahedrons<br>• pyramids<br>• similarities & differences between tetrahedrons and other pyramids | **Building 3D models**<br>Revise using nets to create models of geometric solids, including:<br>• cubes<br>• prisms (rectangular and triangular)<br>• pyramids (square base and triangular base)<br>• cylinders |
| **Characteristics of objects**<br>Describe, sort and compare 3-D objects in terms of<br>• shapes of faces<br>• flat and curved surfaces | **Characteristics of objects**<br>Describe, sort and compare 3-D objects in terms of<br>• shape of faces<br>• number of faces<br>• flat and curved surfaces | **Characteristics of objects**<br>Describe, sort and compare 3-D objects in terms of<br>• number and shape of faces<br>• number of vertices<br>• number of edges | **Classifying 3-D objects**<br>Describe, sort and compare polyhedra in terms of<br>• shape and number of faces<br>• number of vertices<br>• number of edges |
| **Further activities**<br>Make 3-D models using cut out polygons | **Further activities**<br>• Make 3-D models using cut out polygons<br>• Cut open boxes to trace and describe their nets | **Further activities**<br>Make 3-D models using:<br>• drinking straws, toothpicks etc<br>• nets | |

# 1.2 CLARIFICATION OF CONTENT – Properties / Geometry of 3-D Objects

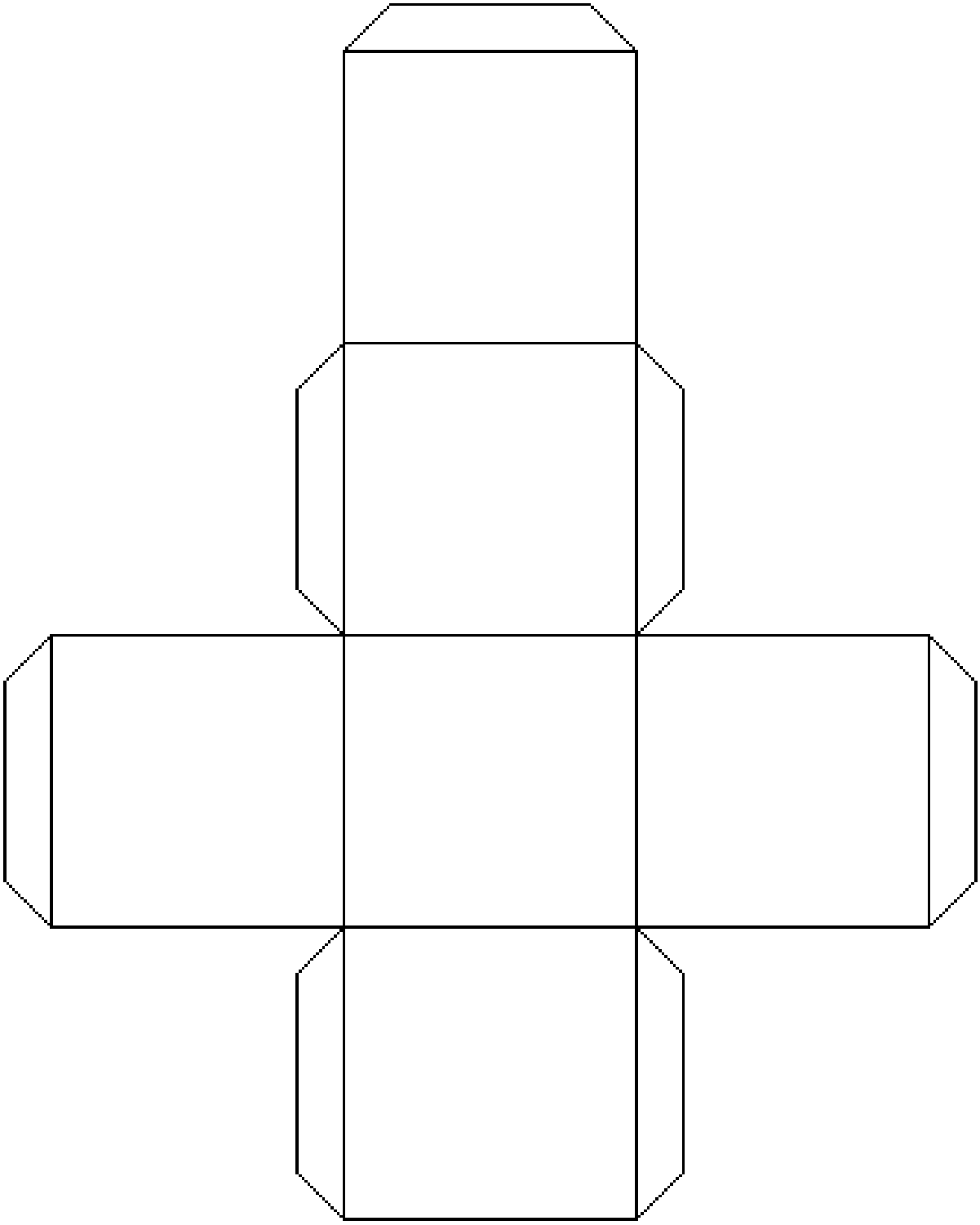
| PROPERTIES OF 3-D OBJECTS | | | GEOMETRY OF 3-D OBJECTS |
|---|---|---|---|
| **Grade 4 (p.78 & 79)** | **Grade 5 (p. 167 & 168)** | **Grade 6 (p. 244 – 246)** | **Grade 7 (p. 66)** |
| **What is different to Grade 3?**<br>In Grade 4 Learners focus on the same 3-D geometrical objects as Grade 3, but:<br>• In Grade 3 they spoke of boxes, and in Grade 4 they call these rectangular prisms<br>• In Grade 3 they spoke of ball shapes and in Grade 4 they call these spheres | **What is different to Grade 4?**<br>In Grade 5<br>• Cubes are introduced<br>• Learners work with prisms as a group for the first time<br>• In the same way that learners use the lengths of their sides to distinguish between rectangles and squares, the learners use the shapes of their faces to distinguish between cubes and rectangular prisms<br>• Learners count the number of faces on 3-D objects and use this as part of their descriptions of objects | **What is different to Grade 5?**<br>In Grade 6<br>• Tetrahedrons are new objects<br>• Other pyramids are new objects<br>• Learners distinguish between tetrahedrons and other pyramids by looking at the shapes of their bases,<br>• Learners use nets to build objects<br>• Learners match nets with drawings of objects<br>• Learners count the number of edges of 3-D objects<br>• Learners build skeleton objects using drinking straws<br>• Learners count the number of vertices of objects. | **What is different to Grade 6?**<br>• Most of the Grade 7 work consolidates what has been done in Grade 6.<br><br>**Polyhedra**<br>Examples of sorting or grouping categories:<br>• cubes (only square faces)<br>• rectangular prisms (only rectangular faces)<br>• triangular prisms (only triangular and rectangular faces)<br>• pyramids (square and triangular faces)<br>• cylinders (2 circular faces and a curved edge that opens out into a rectangle). |
| **Objects and their distinguishing characteristics**<br>There are two ways in which learners distinguish 3-D objects in Grade 4<br>1. By checking whether they have flat or curved surfaces.<br>2. When looking at a group of objects with flat surfaces, learners should know that the flat surfaces of a 3-D object are called **faces.** They describe these objects according to the kinds of 2-D shapes that make up the flat surfaces e.g. the faces of a rectangular prism can all be rectangles, or some can be squares. Square-based pyramids have one square face and the other faces are triangles | **Objects and their distinguishing characteristics**<br>There are three ways in which learners distinguish 3-D objects in Grade 5<br>1. By checking whether they have flat or curved surfaces.<br>2. When looking at a group of objects with flat surfaces, learners should know that the flat surfaces of a 3-D object are called **faces.** They describe these objects according to the kinds of 2-D shapes that make up the flat surfaces e.g. the faces of a rectangular prism can all be rectangles, or some can be squares. Square-based pyramids have one square face and the other faces are triangles<br>3. Learners can also look for right angles on the faces of objects. If the object that they are examining has faces with only right angles, then it will be either a cube or as rectangular prism. | **Objects and their distinguishing characteristics**<br>There are three ways in which learners distinguish 3-D objects in Grade 5<br>1. By checking whether they have flat or curved surfaces.<br>2. When looking at a group of objects with flat surfaces, learners should know that the flat surfaces of a 3-D object are called **faces.** They describe these objects according to<br>- the kinds of 2-D shapes that make up the flat surfaces e.g. a rectangular prism can have 6 faces that are rectangles, or 4 that are rectangles and 2 that are squares.<br>- The number of edges<br>- The number of vertices.<br>3. Learners can also look for right angles on the faces of objects. If the object that they are examining has faces with only right angles, then it will be either a cube or as rectangular prism. | **Using and constructing nets**<br>• Using and constructing nets are useful contexts for exploring or consolidating properties of polyhedra.<br>• Learners should recognize the nets of different solids.<br>• Learners should draw sketches of the nets using their knowledge of shape and number of faces of the solids, before drawing and cutting out the nets to build models.<br>• The construction of nets is based on the number and shape of faces of the solids, and do not require measuring of internal angles of polygons.<br>• Learners have to work out the relative position of the faces of the nets and use trial and error to match up the edges and vertices, in order to build the 3-D object. |
| **Making models of 3-D objects**<br>Making 3-D objects by putting together cut-out polygons helps to focus attention on the shapes of the 3-D objects. | **Further activities to focus learners on characteristics of objects**<br>Learners create 3-D objects by putting together cut-out polygons, which helps to focus attention on the shapes of the faces of the 3-D objects | **Further activities to focus learners on characteristics of objects**<br>• Learners create 3-D objects from nets.<br>• Learners create skeletons of 3-D objects with straws / toothpicks, etc | |

| PROPERTIES OF 3-D OBJECTS | | | GEOMETRY OF 3-D OBJECTS |
|---|---|---|---|
| **Grade 4 (p.78 & 79)** | **Grade 5 (p. 167 & 168)** | **Grade 6 (p. 244 – 246)** | **Grade 7 (p. 66)** |
| **Interpreting drawings of 3-D objects and written exercises**<br>• Learners need to work with real objects. However, they also need to do written exercises on 3-D objects.<br>• Interpreting pictures of 3-D objects is more difficult than working with the real objects. Learners should practise interpreting drawings of 3-D objects.<br>• They should identify and name 3-D objects in drawings; compare 3-D objects from drawings; identify everyday objects that look like geometric objects<br>EXAMPLES<br>- a milk carton looks like a rectangular prism;<br>- describe the surfaces of objects when shown drawings of 3-D objects;<br>- match the 2-D shapes that have the same shape as the face of 3-D objects. | **Interpreting drawings of 3-D objects and written exercises**<br>• Learners need to work with real objects. However, they also need to do written exercises on 3-D objects.<br>• Interpreting pictures of 3-D objects is more difficult than working with the real objects. Learners should practise interpreting drawings of 3-D objects.<br>• They should identify and name 3-D objects in drawings; compare 3-D objects from drawings; identify everyday objects that look like geometric objects<br>EXAMPLES<br>- a milk carton looks like a rectangular prisms.<br>- describe the surfaces of objects when shown drawing of 3-D objects,<br>- match the 2-D shapes that have the same shape as the faces of 3-D objects,<br>- match nets of rectangular prisms to the appropriate drawing of rectangular prisms<br>- compare 3-D objects from drawings. | **Interpreting drawings of 3-D objects and written exercises**<br>• Learners need to work with real objects. However, they also need to do written exercises on 3-D objects.<br>• Interpreting pictures of 3-D objects is more difficult than working with the real objects. Learners should practise interpreting drawings of 3-D objects.<br>• They should identify and name 3-D objects in drawings; compare 3-D objects from drawings; identify everyday objects that look like geometric objects<br>EXAMPLES<br>- a milk carton looks like a rectangular prism,<br>- match nets of objects to drawing of objects,<br>- describe 3-D objects by stating the number of flat and curved surfaces, count the number of vertices, edges, and number and shape of faces when shown drawings of 3-D objects. | |

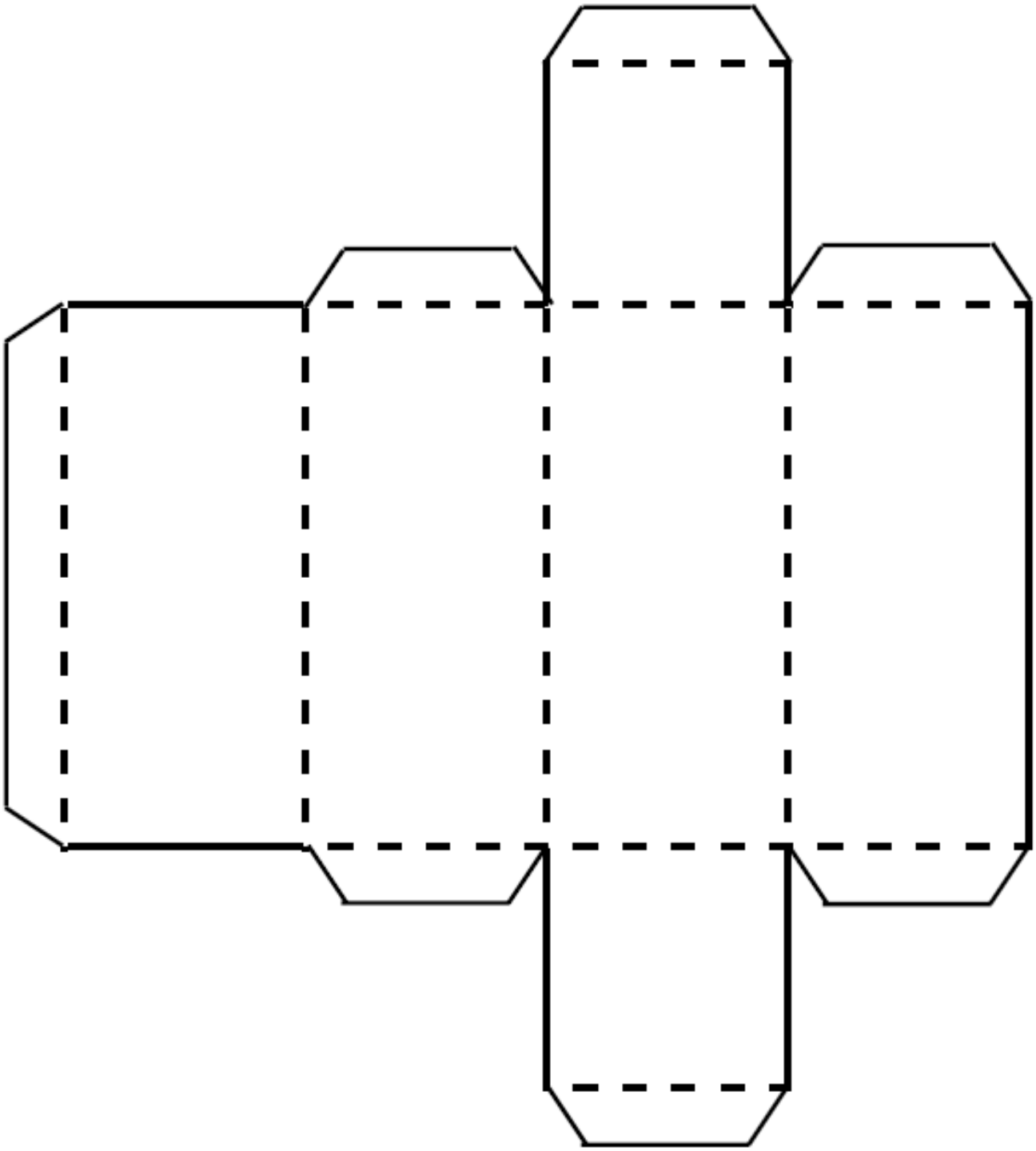
# APPENDIX 2: NETS OF 3D OBJECTS

1) Before you cut out the nets allocated you, write the name of the 3D object on one of the faces.
2) Cut out the net and the tabs very carefully
3) Use a pen/pencil and a ruler to draw along the fold-lines – this makes them easier to fold
4) Put glue on the tabs. If necessary, put the glue on both pieces that have to be stuck together.
5) Carefully stick the 3D object together as accurately as you can. Accuracy is VERY important.

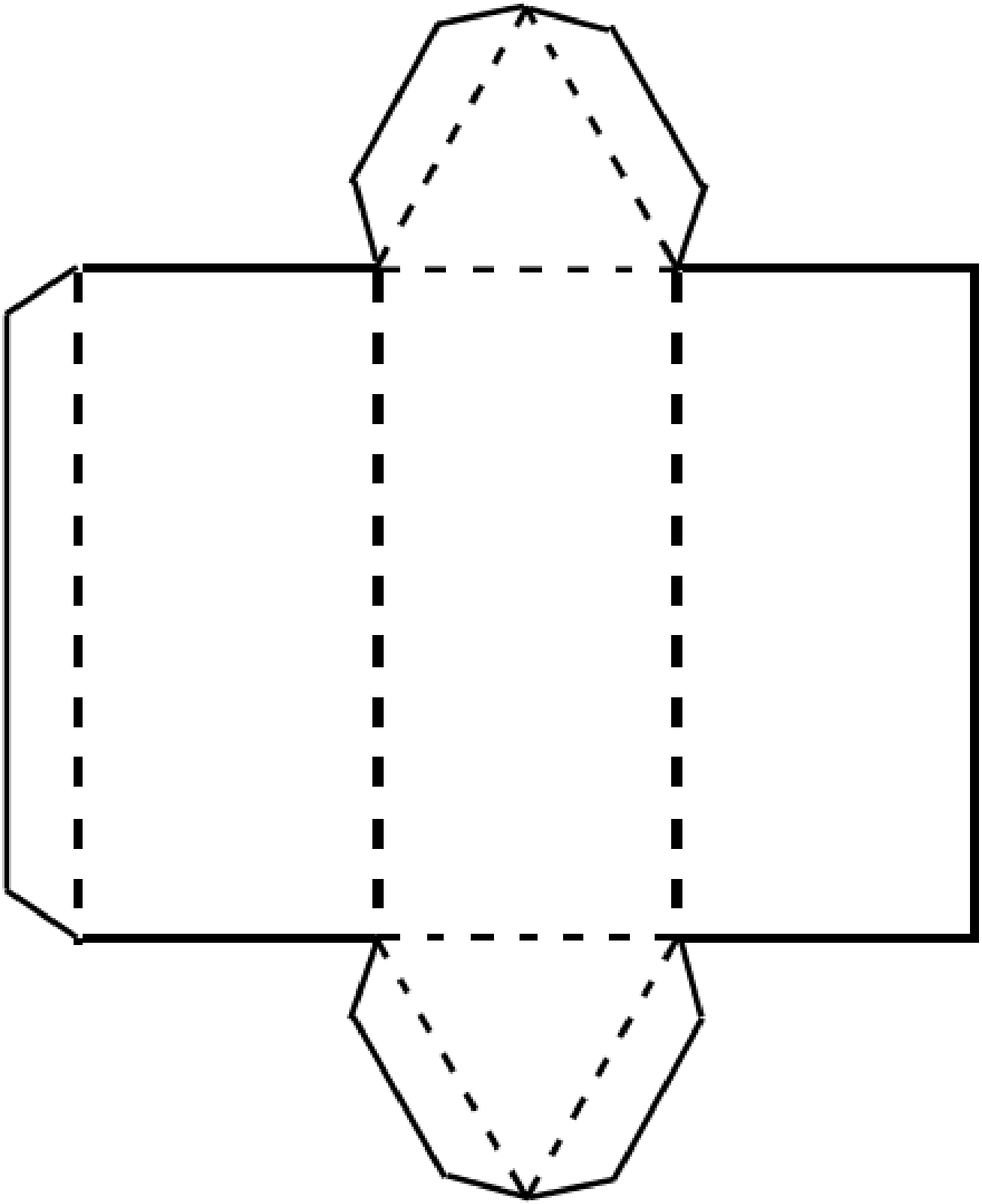
## I. CUBE / REGULAR SQUARE PRISM



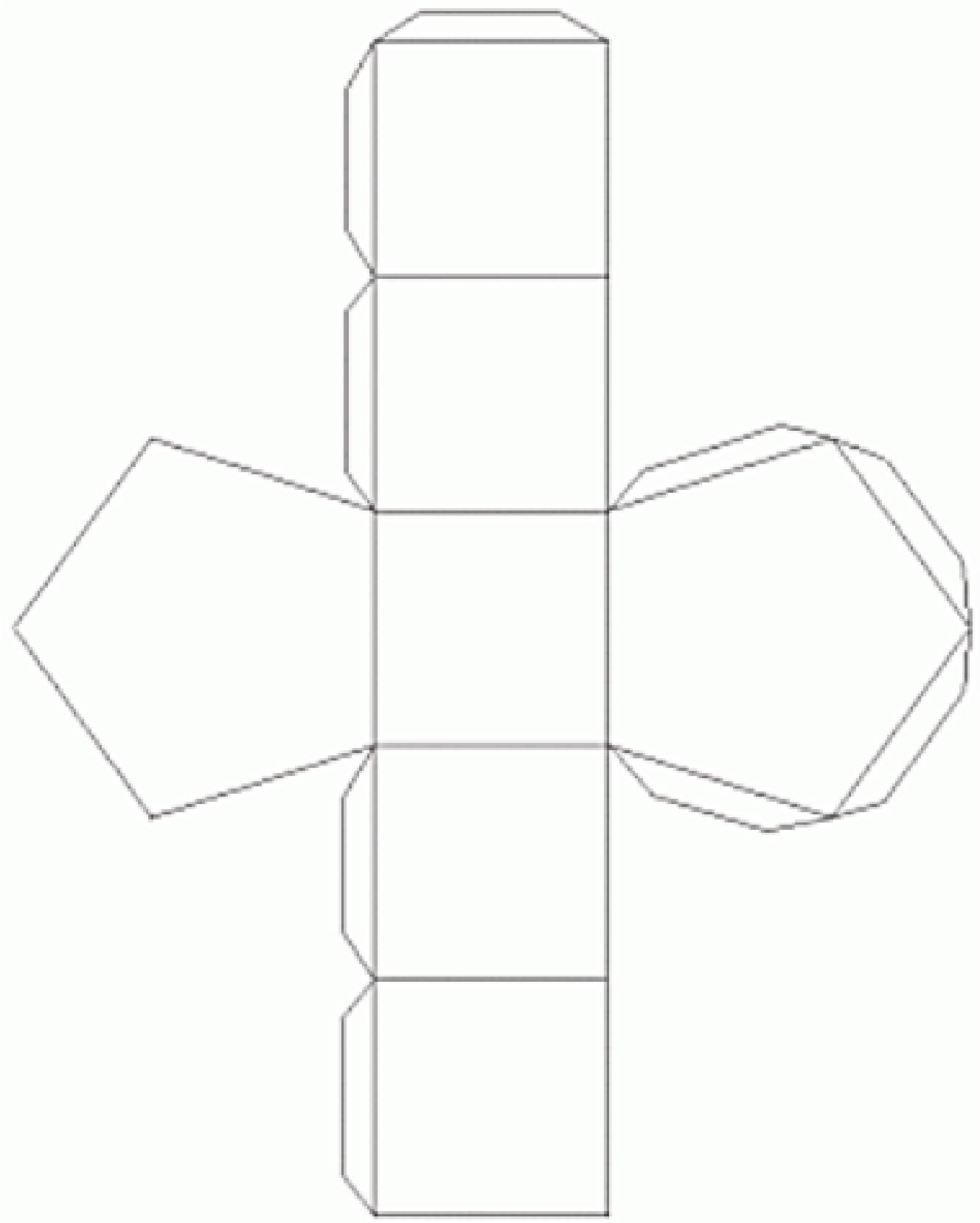
## II. RECTANGULAR PRISM OR CUBOID



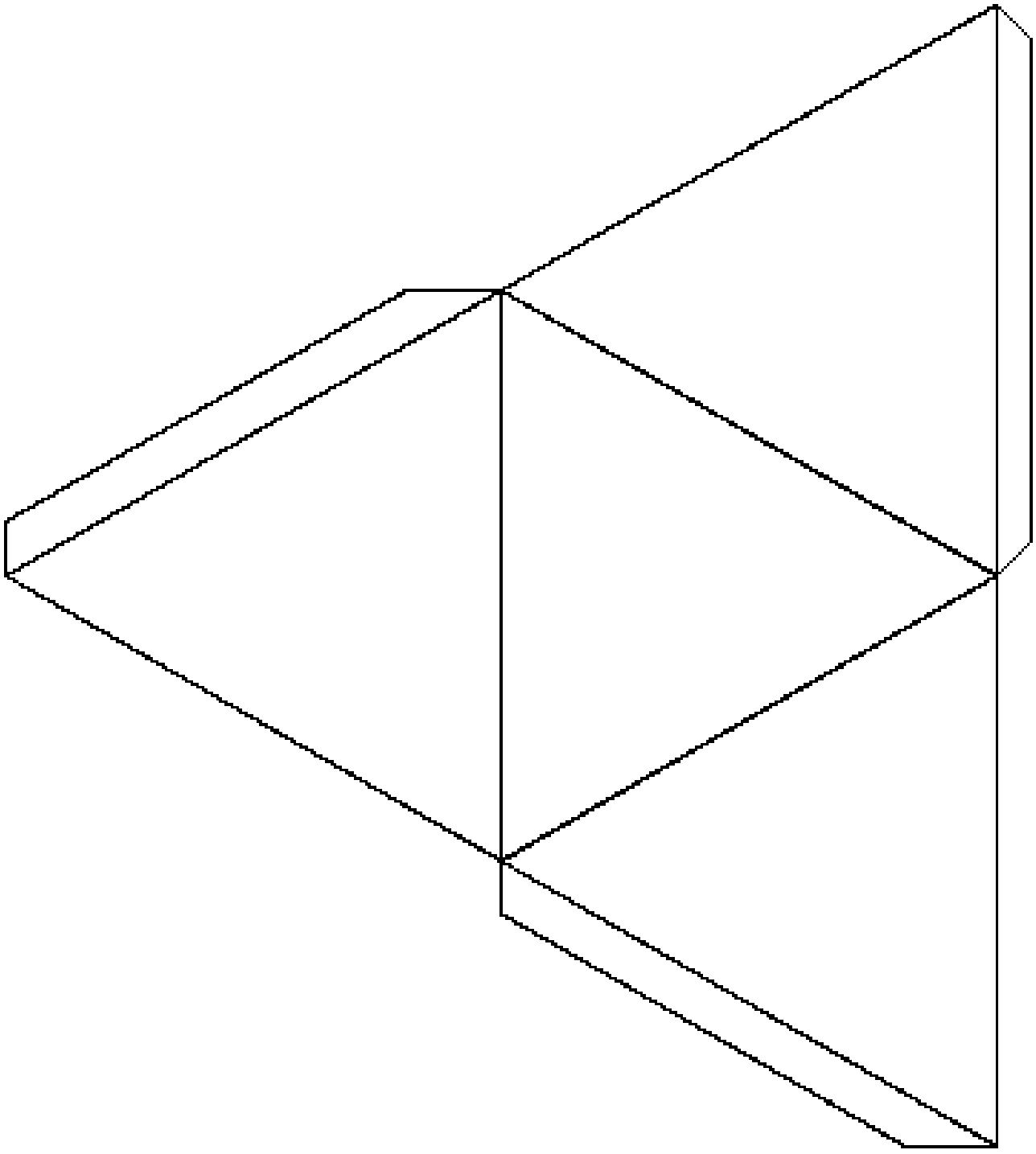
**III. <u>TRIANGULAR PRISM</u>**



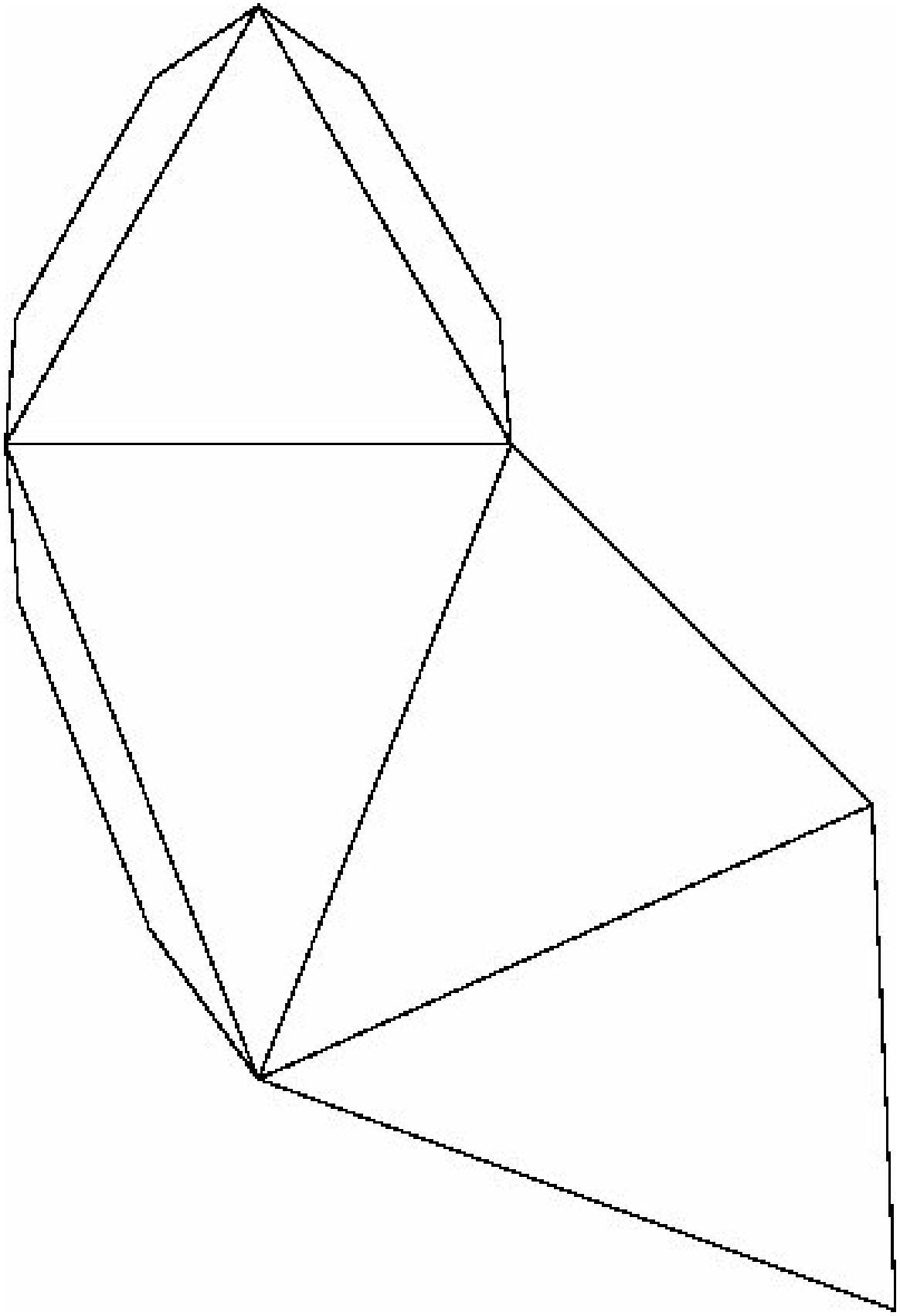
## IV. PENTAGONAL PRISM



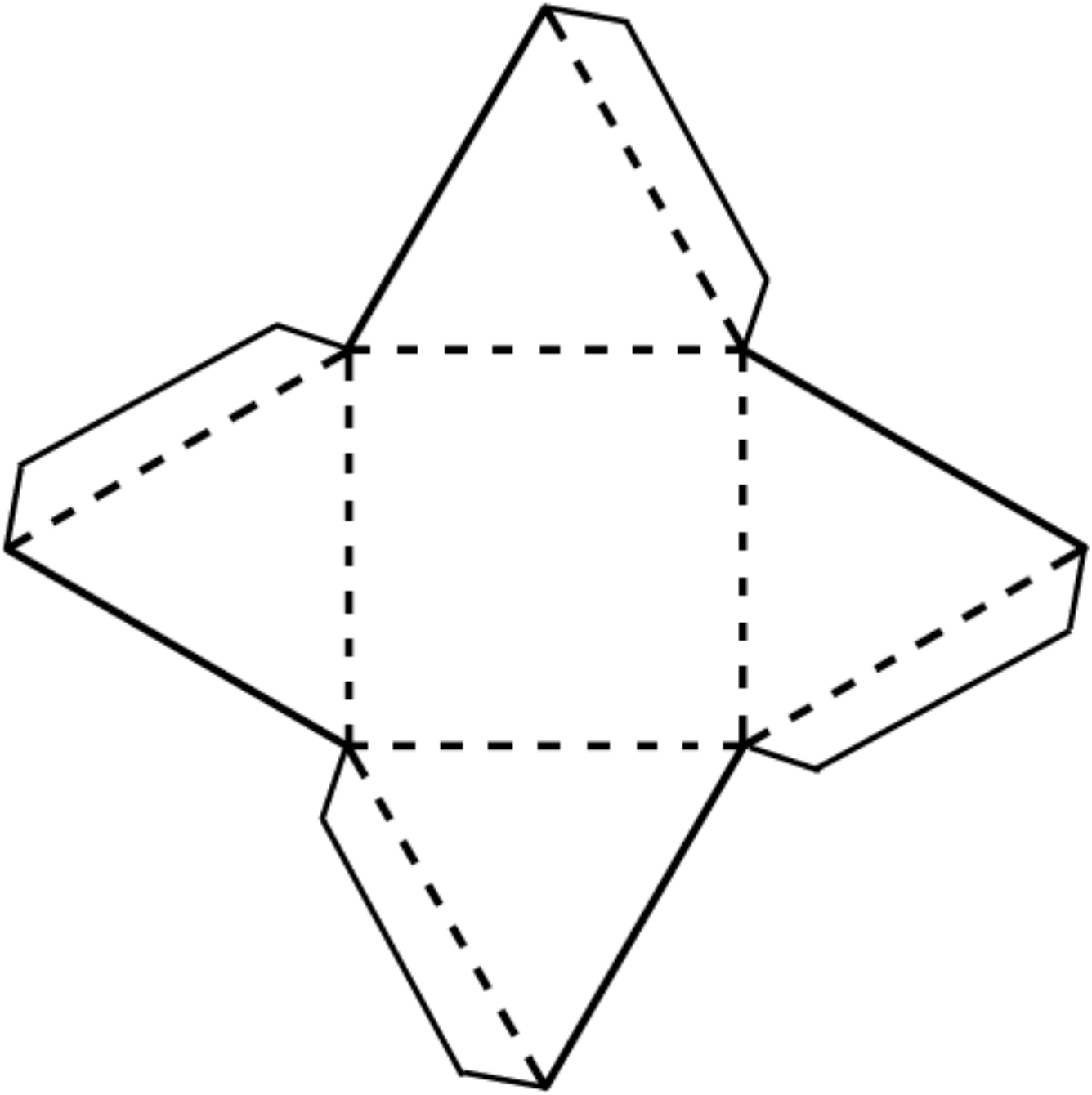
## V. TETRAHEDRON / REGULAR TRIANGULAR PYRAMID



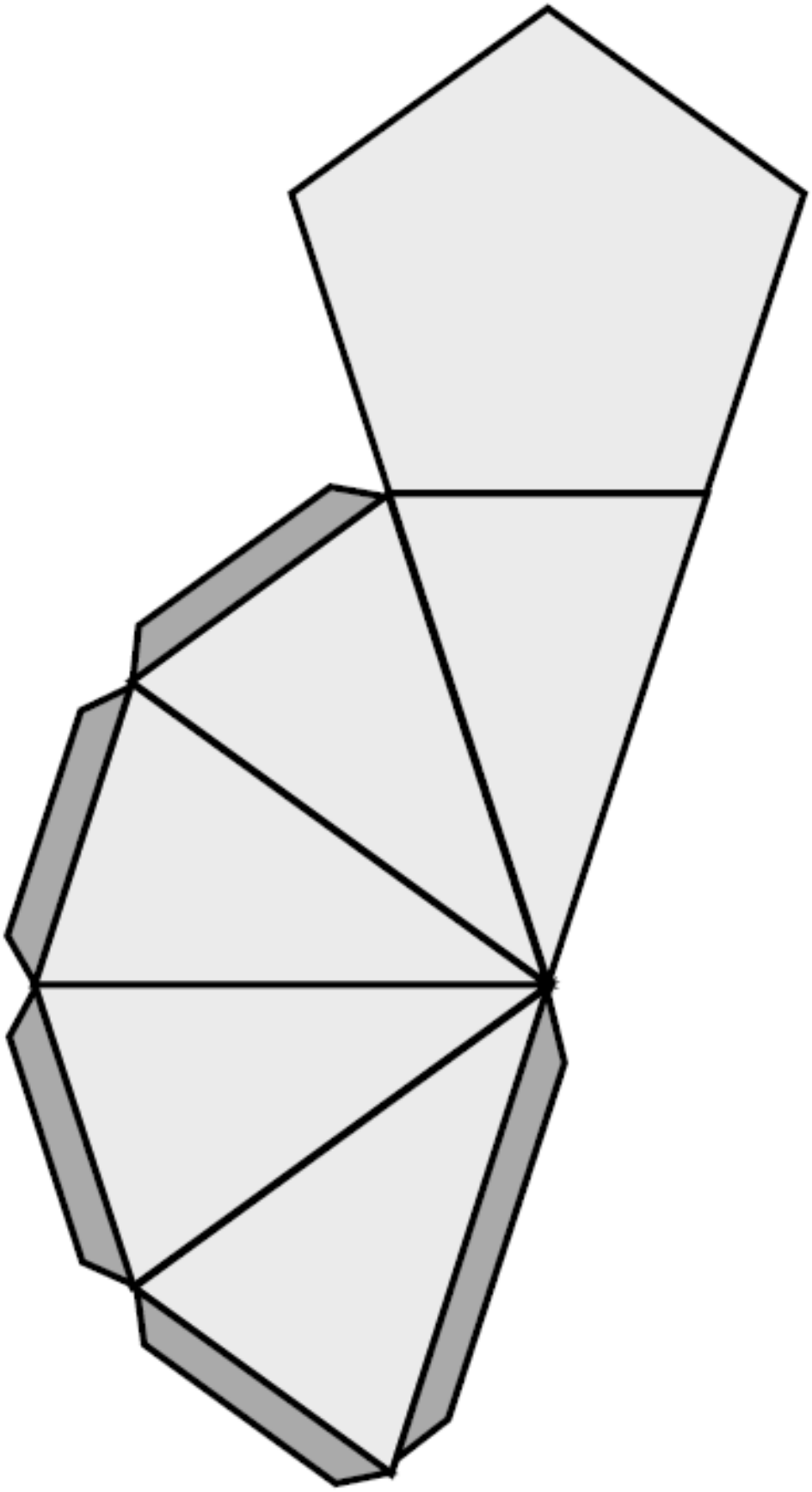
## VI. TRIANGULAR PYRAMID / TRIANGULAR BASED PYRAMID



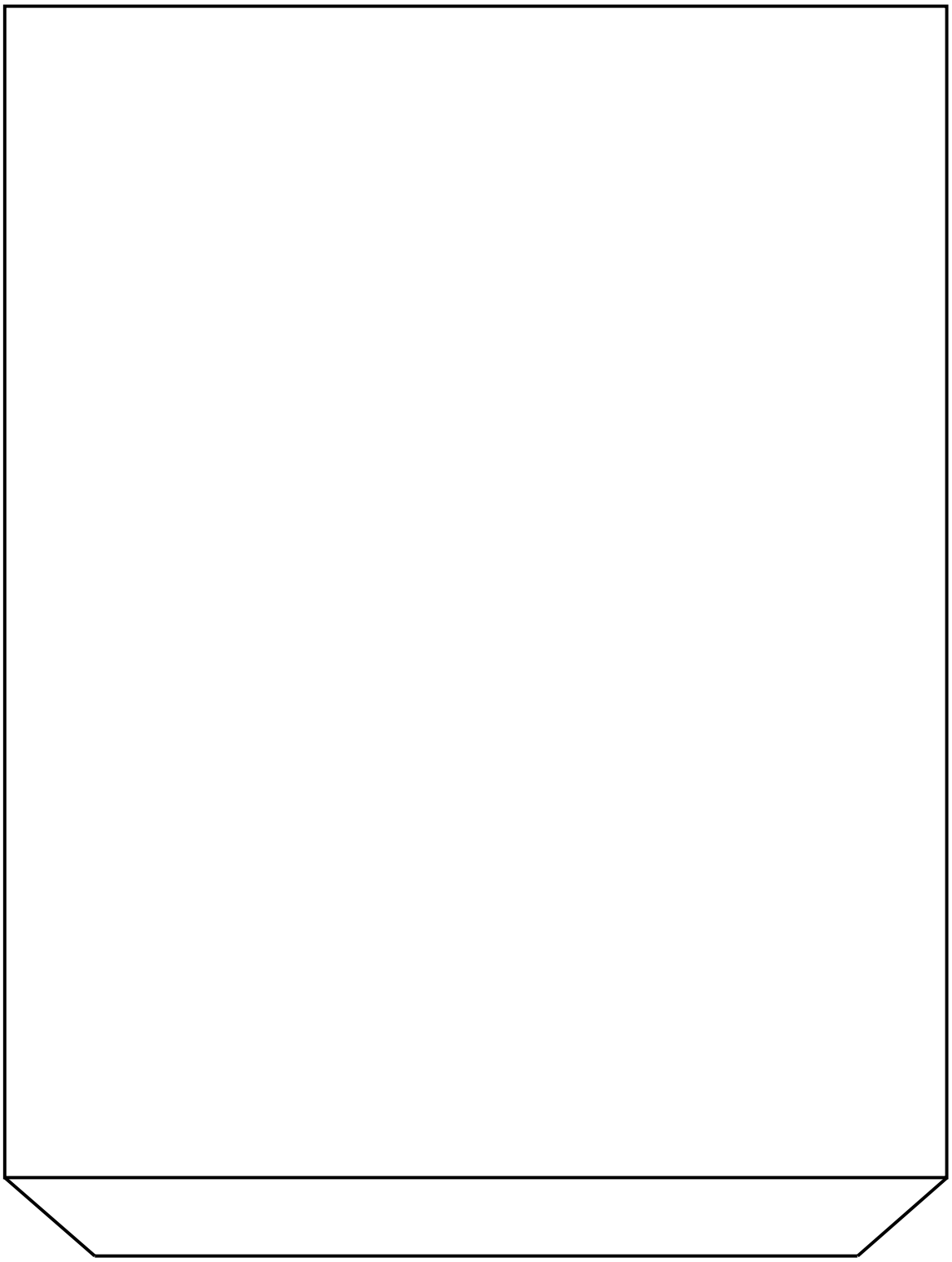
## VII. SQUARE PYRAMID / SQUARED BASED PYRAMID



## VIII. PENTAGONAL PYRAMID / PENTAGONAL BASED PYRAMID

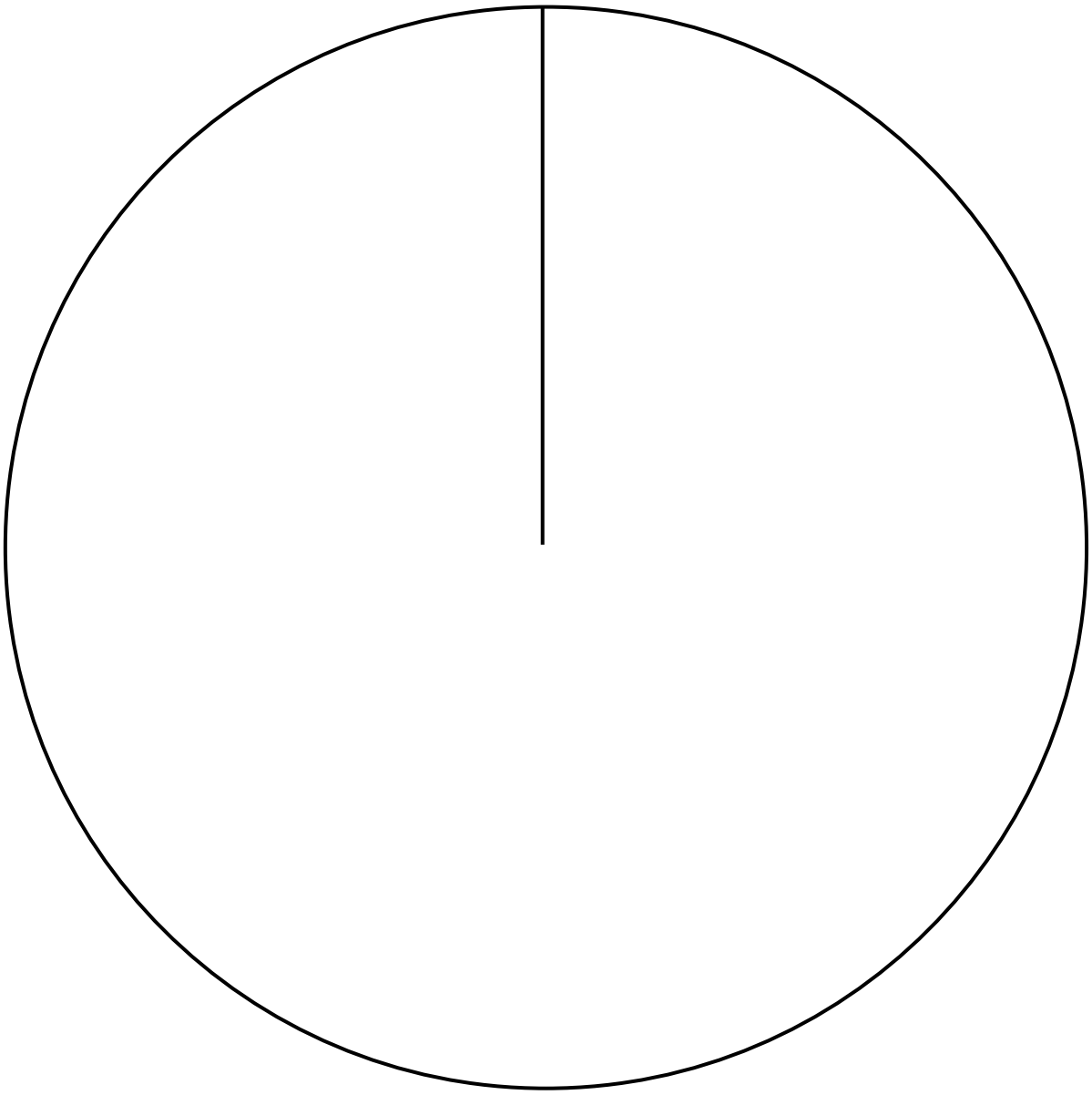


## IX. AN OPEN CYLINDER



## X. AN OPEN CONE

*Note: Cut out the circle and then cut along the line from the edge to the centre*
*Only put glue onto the paper after you decide on the shape of your cone.*



# APPENDIX 3: ONLINE 3D RESOURCES

**a) Nets for Making 3D Solids**
http://www.mathsmentality.com.au/images/Nets_for_making_solids_U.pdf

**b) Making 3D Shapes**
https://www.greatmathsteachingideas.com/wp-content/uploads/2012/03/Making-3D-Shapes.pdf

**c) Nets for Making 3D Shapes**
https://www.tes.com/teaching-resource/nets-for-making-3d-shapes-6329038

**d) Math Art Idea: 3D Geometric Shapes**
https://babbledabbledo.com/math-art-idea-3d-geometric-shapes/

This site shows how the nets can be decorated (like the ones in the picture below) before gluing them together, and also has nets of the Platonic Solids which you can download.


**e) 3D Shapes | Paper Stick Maths Model**
This YouTube video shows how you can use pages of scrap to make tubes which you can link together with string to make 3D Objects.
https://www.youtube.com/watch?v=Be5Ehs_-Bz4

**f) 3D Playdough and Toothpick Shapes**
This You Tube video shows how you can make 3D objects using playdough (or plasticine). The video at times is out of focus, and there doesn't seem to be any sound, but it gives you an idea of how the objects are made.
https://www.youtube.com/watch?v=bhChx4VfBCY

**g) Skeleton Shapes – see the next page**
https://nrich.maths.org/1156/note
This site contains a worksheet for the learners plus advice for the educator – see the next two pages.

# Skeleton Shapes

**Why do this problem?**
This problem helps children begin to understand the various properties of common geometric solid shapes, concentrating on edges and vertices. It also helps in promoting discussion and experimentation.

Naming the shapes should be a help during discussion and description of what has been done, rather than being an exercise in its own right.

## Possible approach

Before doing this problem, children should have had plenty of free play, building with sets of solid shapes so that they begin to get a feel for their properties. They should also have chance to experiment with building skeleton shapes either with a kit such as "Constructo-Straws" or with drinking straws and modelling clay (such as plasticine).

You could start on the problem by asking the group to tell you what they know about cubes. Using a large cube, ask them to count the faces, the edges and the vertices (corners). (Avoid the word "side" which can be confusing when discussing 3D shapes and use instead "face" and "edge".)

After this you could encourage the group to work in pairs on the actual problem from a printed sheet so that they are able to talk through their ideas with a partner. It is essential that children have real 3D shapes to handle and count as they work and if at all possible, they should have opportunity to experiment by making skeleton shapes as well. This sheet might be useful for recording for those children who would find making their own table for results difficult.

## Key questions

How many edges did you count? What does this tell you about the number of straws we need?
How many corners did you count? What does this tell you about the number of balls of modelling clay we need?
How many edges meet at this corner?

## Possible extension

Children could find other solid shapes and continue the activity. They could also record by drawing the shapes they have used on isometric paper although this is rather tricky!

## Possible support

Start by counting the faces on a cube - a large dice might be useful - and then the edges and finally the vertices. A non-permanent pen could be used to mark a real shape if children are having difficulty keeping track of their counting.

**ANSWERS TO THE WORKSHEET ON THE NEXT PAGE**

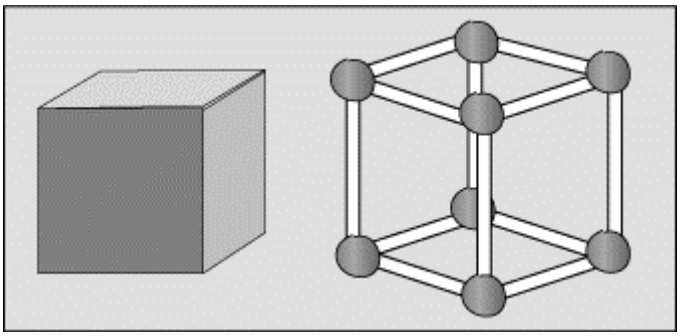
1) It takes 8 balls of modelling clay and 12 straws to make the cube.
2) Triangular prism – 6 balls of clay and 9 straws
   Tetrahedron – 4 balls of clay and 6 straws
   Cuboid – 8 balls of clay and 12 straws
   Square pyramid – 5 balls of clay and 8 straws
   Hexagonal prisms – 12 balls of clay and 18 straws

# Skeleton Shapes

https://nrich.maths.org/1156/note

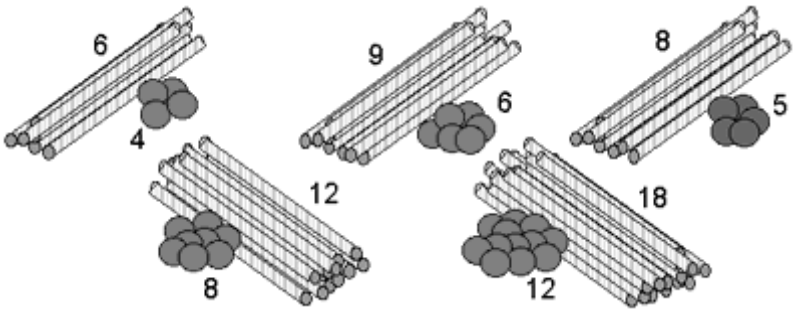
Skeleton shapes are made with balls of modelling clay and straws.

1) This shows a cube and a skeleton cube:

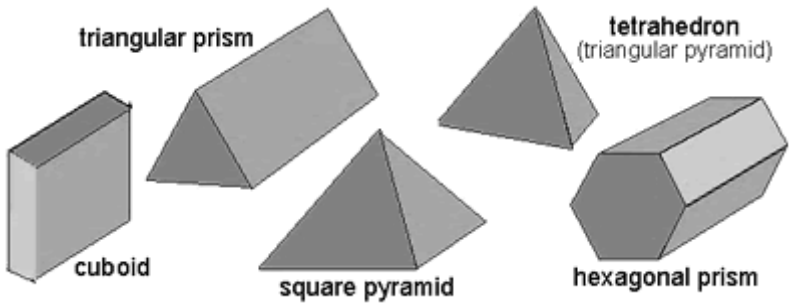


How many balls of modelling clay and how many straws does it take to make the cube?

2) Here are some piles of modelling clay balls and straws:




Look at the shapes below and decide which piles are needed to make a skeleton of each shape.



# APPENDIX 4: MEASUREMENT OF 3-D OBJECTS – Extract from the Intermediate Phase and Senior Phase Caps

## 4.1 PHASE OVERVIEW – Capacity, Volume and Surface Area

| Grade 4 (p 26 and p 28) | Grade 5 (p 26 and p 28) | Grade 6 (p 26 and p 28) | Grade 7 (p 32) |
|---|---|---|---|
| **Practical measuring** of 3-D objects by<br>• estimating<br>• measuring<br>• recording<br>• comparing and ordering<br>**Measuring instruments:**<br>measuring spoons, measuring cups, measuring jugs<br>**Units:**<br>millilitres (*ml*), litres (*l*)<br><br>**Calculations and problem-solving involving capacity/volume include:**<br>• problems in contexts involving capacity/volume<br>• converting between litres and millilitres limited to examples with whole numbers and fractions<br><br>**Measurement of volume**:<br>Find volume/capacity of objects by packing or filling them in order to develop an understanding of cubic units | **Practical measuring** of 3-D objects by<br>• estimating<br>• measuring<br>• recording<br>• comparing and ordering<br>**Measuring instruments:**<br>measuring spoons, measuring cups, measuring jugs<br>**Units:**<br>millilitres (*ml*), litres (*l*)<br><br>**Calculations and problem-solving involving capacity/volume include:**<br>• problems in contexts involving capacity/volume<br>• converting between litres and millilitres limited to examples with whole numbers and fractions<br><br>**Measurement of volume**:<br>Find volume/capacity of objects by packing or filling them in order to develop an understanding of cubic units | **Practical measuring** of 3-D objects by<br>• estimating<br>• measuring<br>• recording<br>• comparing and ordering<br>**Measuring instruments:**<br>measuring jugs<br><br>**Units:**<br>millilitres (*ml*), litres (*l*) and kilolitres (*kl*)<br>**Calculations and problem-solving involving capacity/volume include:**<br>• problems in contexts involving capacity/volume<br>• converting between kilolitres, litres and millilitres; conversions should include fraction and decimal forms (to 2 decimal places)<br>**Measurement of volume**:<br>Find volume/capacity of objects by packing or filling them in order to develop an understanding of cubic units | **Surface area and volume**<br>• Use appropriate formulae to calculate the surface area, volume and capacity of cubes and rectangular prisms<br>• Describe the interrelationship between surface area and volume of the objects mentioned above<br><br>**Calculations and solving problems**<br>• Solve problems involving surface area, volume and capacity<br>• Calculate to at least 1 decimal place<br>• Use and convert between appropriate SI units, including:<br>- $mm^2 \leftrightarrow cm^2$<br>- $cm^2 \leftrightarrow m^2$<br>- $mm^3 \leftrightarrow cm^3$<br>- $cm^3 \leftrightarrow m^3$<br>• Use equivalence between units when solving problems:<br>- $1\ cm^3 \leftrightarrow 1\ ml$<br>- $1\ m^3 \leftrightarrow 1\ kl$ |

## 4.2 CLARIFICATION OF CONTENT – Capacity, Volume and Surface Area of 3-D Objects

| Grade 4 (pp 88 to 90) | Grade 5 (pp 150 – 153) | Grade 6 (pp 253 – 256) | Grade 7 (pp 57) |
|---|---|---|---|
| **In Grade 4**, learners work with new measuring instruments and convert between units.<br><br>Grade 4 learners need to<br>• consolidate their sense of how much 1 litre is;<br>• further develop a sense of how much 1 millilitre is;<br>• understand and know the relationship between the two units of capacity; and<br>• read any measurement on a measuring jug i.e. at both numbered and unnumbered calibration lines. | **In Grade 5**, learners need to:<br>• consolidate their sense of how much 1 litre is<br>• consolidate their sense of how much 1 millilitre is<br>• understand and know the relationship between litres and millilitres.<br><br>Check whether learners have a sense of which units and instruments are appropriate for measuring which various capacities.<br>For example, learners need to know which units to use to state the capacity of<br>• a kettle<br>• a petrol tank<br>• a baby's milk bottle<br>• liquid medicine to give to a baby<br>• milk for a pudding recipe<br>• water to dilute a packet of powdered cool drink | **In Grade 6,** learners<br>• continue work with litres and millilitres, but now they also work with kilolitres.<br><br>Learners need to:<br>• consolidate their sense of how much 1 litre is<br>• consolidate their sense of how much 1 millilitre is<br>• understand and know the relationship between litres and millilitres<br>• understand and know the relationship between kilolitres and litres and millilitres<br><br>Check whether learners have a sense of which units and instruments are appropriate for measuring which sorts of capacities e.g. What units would you use if you wanted to measure:<br>• the amount of water you use in a month<br>• the amount of water to use when mixing baby milk formula for one feed<br>• the amount of water in a full bathtub.<br>• liquid medicine to give to a baby<br>• milk for a pudding recipe<br>• water to dilute a packet of powdered cool drink. | **In Grade 7**, learners have to use formulae to calculate surface area and volume. |
| **Formulae**<br>In Grades 4, 5 and 6<br>• Area and volume are only measured informally.<br>• Learners are not required to know or apply formulae for the perimeter, area or volume of any shape or objects.<br><br>**Volume**<br>In Grades 4, 5 and 6 learners<br>• count how many cubes or rectangular prisms are used to fill a container<br>• state the volume of the container in number of cubes or rectangular prisms such as boxes or blocks<br>• make stacks with cubes or rectangular prisms. The volume of the stack is stated in number of cubes or rectangular prisms such as boxes or blocks<br>• interpret pictures of<br>- stacks made of cubes or rectangular prisms in order to state the volume in terms of the number of cubes or rectangular prisms<br>- containers filled with cubes or rectangular prisms in order to state the volume in terms of the number of cubes or rectangular prisms | | | **Formulae**<br>In Grade 7, learners have to use the following formulae<br>a) AREA<br>• area of a square = $l^2$<br>• area of a rectangle = $l \times b$<br>• area of a triangle $= \frac{1}{2}(b \times h)$<br>b) VOLUME<br>• the volume of a prism = the area of the base × the height<br>• the surface area of a prism = the sum of the area of all its faces<br>• the volume of a cube = $l^3$<br>• the volume of a rectangular prism= $l \times n \times h$ |

| Grade 4<br>(pp 88 to 90) | Grade 5<br>(pp 150 – 153) | Grade 6<br>(pp 253 – 256) | Grade 7<br>(pp 57) |
|---|---|---|---|
| **What is capacity? What is volume?**<br>• **Capacity** is the amount of substance that an object can hold or the amount of space inside the object.<br>• **Volume** is the amount of space that an object occupies.<br>• A bottle can have a 1 litre capacity, but it may not be filled to its full capacity. It could for example, only contain a volume of 250*ml*. | **What is capacity? What is volume?**<br>• **Capacity** is the amount of a substance that an object can hold or the amount of space inside the object.<br>• **Volume** is the amount of space that an object occupies.<br>• A bottle can have a 1 litre capacity, but it may not be filled to its full capacity. It could for example, only contain a volume of 250*ml*. | **What is capacity? What is volume?**<br>• Capacity is the amount of substance that an object can hold or the amount of space inside the object.<br>• Volume is the amount of space an object occupies.<br>• So, a bottle can have a 1 litre capacity, but it may not be filled to its full capacity It could, for example, only contain a volume of 250*ml* | **Capacity and Volume**<br>Emphasize that the amount of space inside a prism is called its ***capacity***; and the amount of space occupied by a prism is called its ***volume.*** |
| **Compare capacities** up to 4 digits in *ml* and *l*<br>• Learners should sequence containers marked in millilitres and / or litres.<br>• Here learners need to be able to translate the decimal numbers on some packaging into fractions e.g. 1,5 litres of cool drink is the same as $1\frac{1}{2}$ litres of cool drink.<br>• One should also choose examples that allow learners to realize that the height of a container is **not** directly proportional to the capacity and that learners need to take into account the diameter of the container. | **Compare capacities in millilitres and litres**<br>• Learners should sequence containers marked in millilitres and litres.<br>• Here learners need to translate the decimal numbers on some packaging into fractions e.g. 1,5 litres of cool drink is the same as $1\frac{1}{2}$ litres of cool drink.<br>• One should also choose examples that allow learners to realize that the height of a container is not directly proportional to the capacity and that learners need to take into account the diameter of the container. | **Compare capacities** with up to 6 digits in *ml* and *l*<br>• Learners should already have sequenced containers marked in *ml* and *l*<br>• Here learners need to be able to translate the decimal numbers on some packaging into fractions e.g. 1,5 litres of cool drink is the same as $1\frac{1}{2}$ litres of cool drink.<br>• Examples should be chosen to allow learners to realize that the height of a container is not directly proportional to the capacity and that learners need to take into account the diameter of the container. | |
| **Convert** between units<br>• Converting between the units of measurement (*ml* ↔ *l*) provides a context for practising multiplying and dividing by 1 000.<br>• Conversions should be limited to whole numbers and fractions given only as halves, thirds, quarters, fifths, sixths, sevenths, eighths.<br>• Conversions can also include converting the decimal half to the common fraction form of a half.<br>• Remember learners can also state their answers in a combination of units, e.g. 3*l* and 4*ml* or 5*l* and 26*ml* | **Convert** between units<br>• Converting between *l* and *ml* provides a context for practising multiplication and division by 1 000.<br>• Conversions should be limited to whole numbers and fractions (given only as halves, thirds, quarters, fifths, sixths, sevenths, eighths).<br>• Conversions can also include converting the decimal 0,5 to $\frac{1}{2}$.<br>• In Grade 5 learners do not calculate with decimals. When doing division, they sometimes have a remainder e.g. 37 ÷ 4 = 9 remainder 1.<br>• Similarly, when converting between units they may state their answers in a combination of units e.g. 3 750 *ml* = 2 *l* and 750 *ml*<br>$4\frac{1}{2}$ *l* = 4 500 *ml* | **Convert** between units:<br>*(ml ↔ l; l ↔ kl; ml ↔ kl)*<br>• Conversions can also include converting whole numbers, fractions and decimal fractions.<br>• Decimal fraction calculations should be carefully chosen so as only to include, even in the answers, decimal fractions with one or two decimal places.<br>• Problems with decimals should be limited to addition and subtraction | **For conversions, note:**<br><br>If 1 *cm* = 10 *cm*, then<br>$1\ cm^3 = 1cm \times 1cm \times 1cm$<br>$= 1cm^3$<br><br>If 1 *m* = 100 *cm*, then<br>$1m^3$<br>$= 100cm \times 100cm \times 100cm$<br>$= 1\,000\,000\ cm^3$<br>$= 10^6\ cm^3$<br><br>An object with a volume of 1 $cm^3$ will displace exactly 1 *ml* of water<br><br>An object with a volume of 1 $m^3$ will displace exactly 1 *kl* of water. |

# APPENDIX 5: NUMBER – Extract from the Intermediate Phase and Senior Phase Caps

## 5.1 PHASE OVERVIEW – Common Fractions, Decimal Fractions and Percentages

| | Grade 6 (p 16) | Grade 7 (p 17 – 18) | Grade 8 (p 17 – 18) |
|---|---|---|---|
| **COMMON + DECIMAL FRACTIONS** | **Equivalent forms:** Recognize equivalence between common fraction, decimal fraction and percentage forms of the same number | **Equivalent forms** Recognize equivalence between common fraction, decimal fraction and percentage forms of the same number | **Equivalent forms** Revise equivalent forms between common fraction, decimal fraction and percentage forms of the same number |
| **PERCENTAGES** | Find percentages of whole numbers | • Revise finding percentages of whole numbers<br>• Calculate the percentage of part of a whole<br>• Calculate percentage increase or decrease of whole numbers<br>• Solve problems in contexts involving percentages | • Revise:<br>- finding percentages of whole numbers<br>- calculating the percentage of part of a whole<br>- calculating percentage increase or decrease<br>• Calculate amounts if given percentage increase or decrease<br>• Solve problems in contexts involving percentages |

## 5.2 CLARIFICATION OF CONTENT – Common Fractions, Decimal Fractions and Percentages

| Grade 6 (p 225 and p 257) | Grade 7 (p 50 – 51) |
|---|---|
| **Percentages is a new topic for Grade 6 learners.**<br>• Learners have already worked with tenths and hundredths in common fraction form.<br>• They should start by rewriting and converting tenths and hundredths in common fraction form to percentages.<br>• Where denominators of other fractions are factors of 10 e.g. 2, 5 or factors of 100 e.g. 2, 4, 5, 20, 25, 50 learners can convert these to hundredths using what they know about equivalence.<br><br>**Equivalence between common fractions and percentage**<br>• Learners are not expected to be able to convert any common fraction into its percentage form, merely to see the relationship between tenths and hundredths in their percentage form.<br>• Learners should be able to convert any decimal fraction in tenths or hundredths into a percentage.<br><br>**Calculations**<br>Learners should be able to find percentages of whole numbers<br>e.g. What is 25% of R300?<br>Here learners use what they know about both converting between percentage and common fraction form and also what they know about finding fractions of whole numbers<br><br>So, 25% of R300 = ¼ of R300 = $\frac{R300}{4}$ = R75. | **Calculation using percentages**<br>• Learners should do context free calculations and solve problems in contexts.<br>• When doing calculations using percentages, learners have to use the equivalent common fraction form, which is a fraction with denominator 100.<br>• Learners should become familiar with the equivalent fraction and decimal forms of common percentages like<br>a) 25% or ¼ or 0,25;<br>b) 50% or ½ or 0,5;<br>c) 60% or $\frac{3}{5}$ or 0,6.<br>• To calculate percentage of part of a whole, or percentage increase or decrease, learners have to learn the strategy of multiplying by $\frac{100}{1}$%. It is useful for learners to learn to use calculators for some of these calculations where the fractions are not easily simplified.<br>• When using calculators, learners can also use the equivalent decimal fraction form for percentages to do the calculations.<br>**Examples:**<br>a) Calculate 60% of R105: Amount = $\frac{3}{5} \times$ R105 = R63<br>b) What percentage is 40c of R3,20?<br>Percentage = $\frac{40}{320} \times \frac{100}{1}\% = \frac{100}{8}\% = 12{,}5\%$<br>c) Calculate the percentage increase if the price of a bus ticket of R60 is increased to R84.<br>Amount increased = R24.<br>Therefore, percentage increase = $\frac{24}{60} \times \frac{100}{1}\% = 40\%$<br>d) Calculate the percentage decrease if the price of petrol goes down from 20 cents a litre to 18 cents a litre.<br>Amount decreased = 2 cents.<br>Therefore, percentage decrease = $\frac{2}{20} \times \frac{100}{1}\% = 10\%$ |