LEARNING AT THE AGA KHAN MUSEUM

A CURRICULUM RESOURCE GUIDE FOR TEACHERS GRADES ONE TO EIGHT

INTRODUCTION TO THE AGA KHAN MUSEUM

The Aga Khan Museum in Toronto, Canada is North America's first museum dedicated to the arts of Muslim civilizations. The Museum aims to connect cultures through art, fostering a greater understanding of how Muslim civilizations have contributed to world heritage. Opened in September 2014, the Aga Khan Museum was established and developed by the Aga Khan Trust for Culture (AKTC), an agency of the Aga Khan Development Network (AKDN). Its state-of-the-art building, designed by Japanese architect Fumihiko Maki, includes two floors of exhibition space, a 340-seat auditorium, classrooms, and public areas that accommodate programming for all ages and interests.

The Aga Khan Museum's Permanent Collection spans the 8th century to the present day and features rare manuscript paintings, individual folios of calligraphy, metalwork, scientific and musical instruments, luxury objects, and architectural pieces. The Museum also publishes a wide range of scholarly and educational resources; hosts lectures, symposia, and conferences; and showcases a rich program of performing arts.

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Patricia Bentley and Ruba Kana'an

AGA KHAN MUSEUM

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Cover Image: Detail of Episode from the Story of Haftvad and the Worm
Folio 521v from a Shah-Nameh (Book of Kings) produced for Shah Tahmasp I
Signed by Dust Mohammad, Tabriz, Iran, ca. 1540. Opaque watercolour, ink, gold, and silver on paper, 45 x 30 cm, AKM164

Design by Damian Salter

Library and Archives Canada Cataloguing in Publication

Kana'an, Ruba, author
Learning at the Aga Khan Museum : a curriculum resource guide for teachers, grades one to eight / Patricia Bentley and Ruba Kana'an.

ISBN 978-1-926473-06-2 (paperback)

1. Aga Khan Museum (Toronto, Ont.)--Guidebooks.
I. Bentley, Patricia, 1946-, author
II. Aga Khan Museum (Toronto, Ont.), issuing body
III. Title.

N6264.C3T668 2015
709.17'67074713541
C2015-905678-0

First published in Canada in 2015 by
Aga Khan Museum
77 Wynford Drive
Toronto, Ontario
M3C 1K1
www.agakhanmuseum.org

Printed in Canada by Friesens

ISBN 978-1-926473-06-2

CONTENTS

HOW TO USE THIS GUIDE

Learning at the Aga Khan Museum: A Curriculum Resource Guide for Teachers, Grades One to Eight gives teachers ideas and resources for using the Aga Khan Museum collections, exhibitions, and performing arts programs to teach core competency skills in Arts, Sciences, Mathematics, Literacy, and Social Studies while fulfilling specific expectations in the Ontario Ministry Curriculum.

As a teacher, you can use this *Guide* in the classroom and access other resources such as high-resolution images on the Aga Khan Museum website. You can also use the *Guide* as additional help in the galleries during a class visit to the Museum.

The *Guide* is divided into five sections:

Section One: Introduction gives a general introduction to the Aga Khan Museum and ways to understand its core mission, vision, and values, as well as a brief background on the significant cross-cultural exchanges that have always characterized the history of the arts in Muslim civilizations.

Section Two: Art-Based Learning describes the ways teachers can use works of art — whether visual or performing arts — to foster learning and understanding with their students.

Section Three: Learning with Aga Khan Museum Resources gives examples from the Aga Khan Museum Permanent Collection, or from performances in the Museum's auditorium, to illustrate the method of art-based learning for specific school grades. This method involves posing questions and conducting activities that engage students in active inquiry.

Section Four: Lesson Plans includes lesson plans that demonstrate step by step how to use the Museum's resources to fulfill the Ontario Curriculum requirements.

Section Five features a glossary of terms and a list of resources for further exploration.

SECTION ONE: INTRODUCTION

Canadian teachers are constantly searching for new resources that allow them to respond to immediate curriculum expectations while taking into consideration rapid social and cultural changes in their classrooms and communities. These changes require new information and new insights about the world: its history and its future. Museums of the 21st century play a key role in supporting teachers by offering exciting possibilities and informal learning environments that fulfill educational expectations. With its brand new galleries, classrooms, libraries, and performance spaces, the Aga Khan Museum provides teachers and students with informal yet intensive learning experiences that foster their knowledge and understanding of Canada's diverse social landscapes.

The Curriculum Resource Guide describes the knowledge and skills that students can acquire through interaction with Museum resources for in-class projects, or during a visit to the Museum with their schools.

THE AGA KHAN MUSEUM

The Aga Khan Museum is an art institution in Toronto, Canada, with an international scope and mission. It is dedicated to the collection, research, preservation, and display of works of art, objects, and artifacts of artistic, cultural, and historical significance from various periods and geographic areas where Muslim societies were predominant.

The Aga Khan Museum
in Toronto, Canada.
Photo by Tom Arban Photography.

The Aga Khan Museum's Permanent Collection is comprised of art and artifacts acquired by His Highness the Aga Khan and his family and spans over one thousand years of history. The objects – ceramic, metalwork, ivory, stone, wood, textile, and carpet; glass and rock crystal; parchment and painted manuscripts on paper – present an overview of the artistic accomplishments of Muslim civilizations from the Iberian Peninsula to China. The Museum houses and exhibits some of the most important works of Islamic art. Up to 250 pieces from the Museum's collection are showcased in a permanent gallery that combines state-of-the-art display systems with innovative approaches to design and interpretation.

The Aga Khan Museum also features:

- Three to four temporary exhibitions each year that balance work from historical periods with the creative practice of artists working today from across the Islamic world and its diaspora.
- Performances in a 350-seat auditorium featuring local, national, and international artists in dance, music, spoken word, theatre, and multidisciplinary arts.
- School programs.

The mission of the Aga Khan Museum is to build bridges between cultures by educating different audiences about the diverse heritage of Muslim civilizations. This mission is accomplished through the Museum's programmatic activities, which in turn are based on its art collection, its exhibitions, and its conferences, performances, and community projects. The role of the Museum as an educational institutional in 21st-century Canada is vitally important since the Canadian public at large knows little about the histories and contemporary contexts of Muslim civilizations but is very curious about them.

The Museum becomes a means for expanding opportunities for learning about Islam. It aims to enlarge experience, discuss knowledge interpretively, and enrich capacity to engage others in the plurality and diversity inherent in Muslim societies past and present. The Museum does not exist in isolation; it is part of a process of dialogue on social practices to achieve pedagogies that support students' explorations of these complex issues.

FREQUENTLY ASKED QUESTIONS ABOUT ISLAM, THE AGA KHAN MUSEUM, AND ARTS OF MUSLIM CIVILIZATIONS

WHAT DO THE WORDS ISLAM AND MUSLIM MEAN?

Islam, like Judaism and Christianity, is a monotheistic religious tradition that is based on the belief in God, Creation, and the Day of Judgment. Its followers are called Muslims.

WHAT DO MUSLIMS BELIEVE?

Muslims believe that the Qur'an is the Word of God revealed to the Prophet Muhammad in the 7th century CE. The central message of the Qur'an is for humanity to believe in and worship God and to live by a set of ethical principles of peace, tolerance, and service to others. The Qur'an also contains histories, parables, and stories that teach life lessons and have inspired great art.

ARE ALL MUSLIMS THE SAME?

Muslims' belief in God and the centrality of the Qur'an does not imply sameness. The diversity of Muslims is reflected in their arts as well as in their religious practices and interpretations. Muslims live in more than fifty-seven countries, with substantial populations in Europe, North America, Africa, and South and Southeast Asia, and they speak and use many languages, including Chinese, English, Malay, Dari, and Swahili.

WHAT IS ISLAMIC ART?

In its simplest definition, "Islamic art" encompasses all the arts produced in the lands where Islam is the dominant religion and culture, regardless of the function of the art piece or the religious affiliation of its patron or maker. Islamic art thus is not limited to the arts specifically linked to the religion of Islam, such as places of worship or objects of liturgical relevance, but includes paintings, ceramics, and other secular objects that offer insights into the many different ways people live and express their responses to their environments. Therefore, art is a cultural production reflecting the social, political, and economic context in which it was produced and/or used.

WHO IS THE AGA KHAN?

His Highness the Aga Khan, the founder and chairman of the Aga Khan Development Network (AKDN), is the 49th hereditary Imam (Spiritual Leader) of the Shia Ismaili Muslims. In Islam's ethical tradition, religious leaders not only interpret the faith but also have a responsibility to help improve the quality of life in their community and in the societies amongst which they live. For His Highness the Aga Khan, this has meant a deep engagement with development for over 50 years through the agencies of the AKDN.

WHAT KINDS OF WORKS OF ART ARE IN THE AGA KHAN MUSEUM COLLECTION?

About half of the Museum collection comprises works on paper, including manuscripts, individual folios of calligraphy, miniature paintings, and related documents. The remainder of the collection is three-dimensional objects such as ceramics, metalwork, jewellery, architectural elements, textiles, and glass.

MANY PEOPLE SAY THAT ISLAM PROHIBITS THE DEPICTION OF LIVING BEINGS. WHY ARE THERE SO MANY IMAGES OF PEOPLE AND ANIMALS ON THE WORKS OF ART?

Islamic art and architecture specifically for religious use, for example, in the decoration of a mosque or in a copy of the Qur'an, does not have images of humans or animals, but secular arts have historically depicted living beings.

WHAT DOES THE CALLIGRAPHY (DECORATIVE WRITING) ON THE OBJECTS AND PAINTINGS MEAN? IS IT MEANT TO BE READ?

Calligraphy is used for its decorative effect and for its content to embellish material objects and architecture. It is a highly developed art that is often appreciated less for its legibility and more for its form and the skill of the calligrapher.

WHAT ARE THE MAIN THEMES FOR PAINTINGS IN ISLAMIC ART?

Similar to other cultures, in the medieval period Muslim artists chose scenes of animals and hunting, historical narratives and epic poems, and famous battles as the topics of their paintings. In later periods portraiture was added as a style of painting, influenced by trade and political encounters with Europe.

WHAT IS THE SHAH-NAMEH?

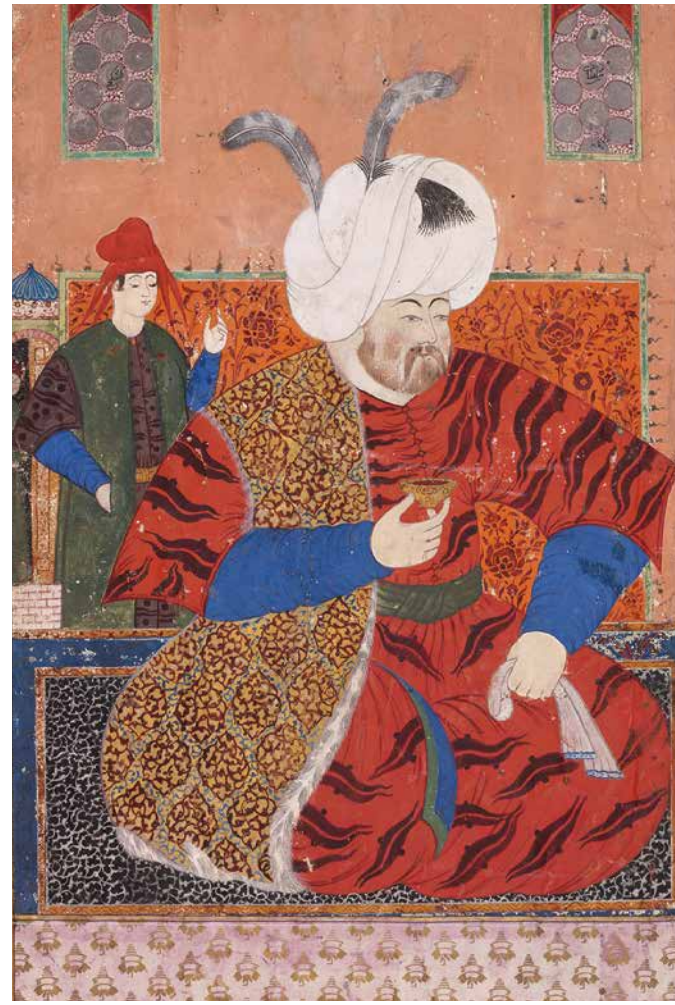
The *Shah-Nameh* is an epic poem written by the poet Ferdowsi in the late 10th/early 11th centuries in Iran. It recounts the stories and fables of ancient Iran from its creation in ancient times to the Arab conquests in the 7th century. Rostam and Bahram Gur, two of the *Shah-Nameh*'s most famous heroes, are featured in the paintings in this *Curriculum Resource Guide*. Take a look at Figures 16, 41, 45, 55, and 56.
The painting in Figure 9 also illustrates a story from the *Shah-Nameh*; in the painting, Haftvad's daughter finds a worm in an apple and nurtures it until it grows into a monstrous dragon.

THE ARTS OF MUSLIM SOCIETIES: CULTURAL CONNECTIONS

The visual arts that were produced in regions where Islam was the predominant religion and culture are usually referred to under the collective name *Islamic art*. This term has a broad definition that includes manuscript illumination and painting; objects made out of glass, ceramics, metal, wood, ivory, and textile; and architecture. It is not restricted to the arts and material culture that relate to Islam as a religion, nor is it limited to objects and spaces related to Muslim ritual practices.

The term *Islamic art* is inadequate to describe the vast diversity of art forms that have developed across expanses of Europe, Africa, and Asia, from Spain in the west to China in the east, and from the 7th century up to today. The *Curriculum Resource Guide* looks at the arts of Muslim societies as multiple and innovative forms whose development has continually influenced and been influenced by other regions and other cultures.

Figure 2:
Portrait of Sultan Selim II
Istanbul, Turkey, ca. 1570
Opaque watercolour and gold on paper
44.2 x 31.2 cm
AKM219



The Turkish Ottoman Sultan Suleyman the Magnificent (reigned 1520–66) had this inscription carved on one of his monumental buildings:

> I am Suleyman and my name is being read in the prayers in the Holy cities of Islam. I launched fleets in the Mediterranean against the Franks in the Maghreb as well as in the Indian Ocean. I am the Shah of Baghdad and Iraq, the Caesar of the Roman lands and the Sultan of Egypt....

Just as Suleyman declared himself the heir of Roman, Sassanian, and Byzantine cultures, Muslim artists and artisans drew upon the accomplishments of ancient civilizations and developed them further, often to a very high degree. Through trade routes that had already been well established between continents in the ancient world, Muslims shared the results of this artistic production with the world. Materials, goods, and aesthetic approaches formed knowledge networks that contributed to creativity wherever artists were exposed to them and learned how to use them.

Paper was one material that travelled westward from China and dramatically changed the artistic production of the Muslim world. Early copies of the Qur'an, the Muslim holy book, were written on animal skin (parchment), but by the 8th century CE papermaking technology had reached Baghdad from the Far East. Copies of the Qur'an, the Muslim holy book, show a great diversity of expression – there are examples in the Aga Khan Museum's Permanent Collection from all parts of Asia as well as Spain and Africa – but they also show how, based on the evidence, Muslims took a lot of care, and at great expense, to beautify this Holy Book.

Ceramics also moved along trade routes as artists widely travelled to distant regions. They carried patterns, decorative styles, and technological innovations that artists adapted as they created new products with available raw materials. The history of ceramics provides many examples of this. For example, artists in 9th-century Baghdad had no clay that could duplicate the hard, white ceramic bodies of Chinese ceramics, so they developed a white glaze opacified with tin that imitates the look. This innovation spread to Egypt, Iran, and Spain before reaching Renaissance Italy.

Art objects can demonstrate how important the transmission of knowledge between different cultures and distant regions was for the advancement not only of artistic expertise, but also of scientific, medical, and engineering knowledge. One of the objects on show at the Aga Khan Museum is the *Canon* by Ibn Sina, a 10th-century philosopher who is considered the father of modern medicine. The *Canon* is both an illustrated manuscript handwritten on paper and a medical treatise. It exemplifies how Muslim scientists translated and developed Pre-Islamic knowledge from different sources, including Greeks, Indians, and Chinese. A 14th-century Spanish astrolabe is a masterwork of silver-inlaid bronze, a testament to pluralism through its inscriptions in Latin, Arabic, and Hebrew, and a scientific instrument. Both the *Canon* and the astrolabe are on show at the Aga Khan Museum.

Figure 3:
Planispheric Astrolabe
Spain (Historic al-Andalus), 14th century
Bronze inlaid with silver
Diameter: 13.5 cm
AKM611

With objects like these, the *Curriculum Resource Guide* shows teachers how they can bring artistic and social histories to life for their students through their discovery of exhibitions, performances, and works of art in the Museum's collection.

SECTION TWO: ART-BASED LEARNING

ART-BASED LEARNING: A DESCRIPTION

This Curriculum Resource Guide uses art-based learning as its basis. This approach assumes that each person, however young, brings his or her own unique life experience to an encounter with a work of art, and that learning is an active process of inquiry (asking questions), dialogue (exchange of ideas), and interaction. This pedagogical space creates room for speculation, interaction, and new learning.

Besides providing an opportunity for inquiry-based learning that addresses cultural diversity and inclusion, art-based learning serves different learning styles especially well. It does this by employing approaches and strategies ranging from those centred in concrete actions and sensory responses all the way to the evidence-based methodologies of science. You will find these approaches and strategies described in the grade-by-grade suggestions for using Aga Khan Museum resources in your teaching, and in the detailed lesson plans.

CURRICULUM EXPECTATIONS

Ontario Ministry of Education Curriculum expectations are provided for all subject areas. In many cases, Museum works of art can be used as springboards for the fulfillment of expectations in multiple subject areas. The *Guide* also includes a section called “Cross-Curricular Connections” that identifies ways in which the same learning activity with a work of art can fulfill multiple curriculum expectations.

Visits to the Aga Khan Museum and use of the *Curriculum Resource Guide* will facilitate learning across several disciplines. A focus on big ideas and key understandings invites clustering of curriculum expectations and interdisciplinary learning.

The following big ideas about Islamic arts and Muslim societies are evident in this *Guide*:

- Islamic artistic production varies immensely in range and breadth across time and geographical boundaries.
- There is a wide spectrum of kinds of Islamic art, ranging from religious to secular and from courtly to utilitarian.
- Calligraphy has a prominent place in Islamic art.
- Islamic art is a wonderful source of inspiration for creative design projects.
- There are numerous mathematical principles and proficiencies inherent in Islamic art that can lead to understanding of both art and mathematics.
- There are numerous connections between art and science in Islamic art that can lead to understanding of both art and science.
- The diversity and plurality characteristic of many Muslim societies in the past can lead to understanding of diversity and plurality in contemporary Canada, and in the world.

Note: The *Curriculum Resource Guide* relies upon and owes a particular debt to the Ontario Ministry of Education (OME) Curriculum documents. The OME Curriculum is the basis for the planning and delivery of K-12 education in every school, whether public or private, in Ontario. It provides an invaluable template and guide.

GRAPHIC TOOLS: LEARNING FROM A MAP

A teacher can use graphics to aid students' inquiries:

1) The map showing the places where works of art were made can stimulate explorations of how geography has influenced and determined the ways or life of various peoples. For example, the Egyptian Mamluk Fountain in Figure 49 can be used as a starting point for an exploration of engineering innovations involving the efficient use of water. Students can put pictures of other sites on the map and connect them to the fountain to show how ideas and innovations travelled around the world.

2) The label graphic breaks down a museum label into its component parts to show students what they can learn from it about a work of art and how art is created in a geographic and historic context.

1. A MAP SHOWING SITES OF ORIGIN

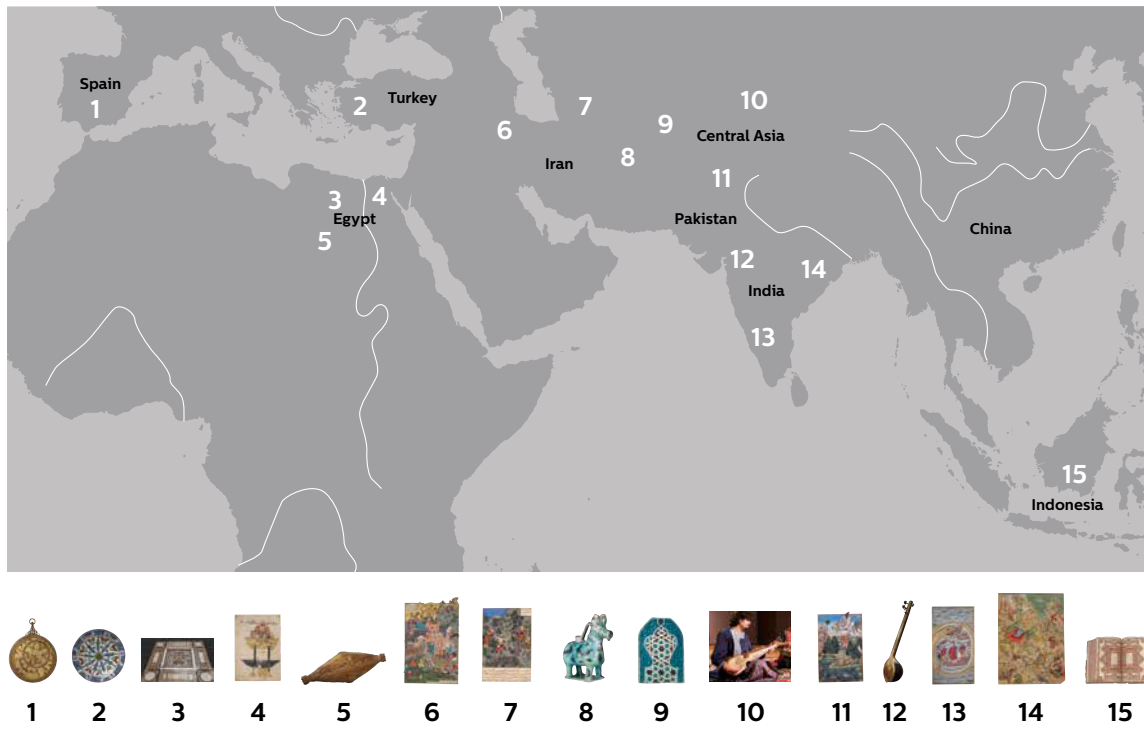


Figure 4:
This map shows the places of origin of several paintings and objects in the *Guide*.

Learning Through Inquiry and Learning by Doing: Prompts and Activities

The following are examples of geography-related questions and activities you can use in the classroom, based on the three key geographic questions: What's there? Why there? And why care?

1. Why do you think there are no boundaries of countries on this map? Are the boundaries as they existed at the time of origin of the works of art the same as they are now?
2. What is the modern location of the works of art on the map? What is different about these locations and what do they have in common?
3. How do discoveries of scientific knowledge, mathematics, literature, cultural arts, civilization, architectural traditions, and religions spread from place to place? What are the benefits of discoveries spreading?
4. How were locations connected in these regions during the times when the works of art were made? Investigate the Silk Road, the spice routes, and the gold routes between continents.

2. A LABEL OF A MUSEUM OBJECT

Whether in the Museum or on the website, all works of art have a label. What is in a label, and how can you use it as an active process of inquiry (asking questions), dialogue (exchange of ideas), and interaction?

Figure 5:
Panel
Egypt, 15th century
Marble and stone mosaic
225 x 49 x 5 cm
AKM571
(See Figure 24
for more about this object.)

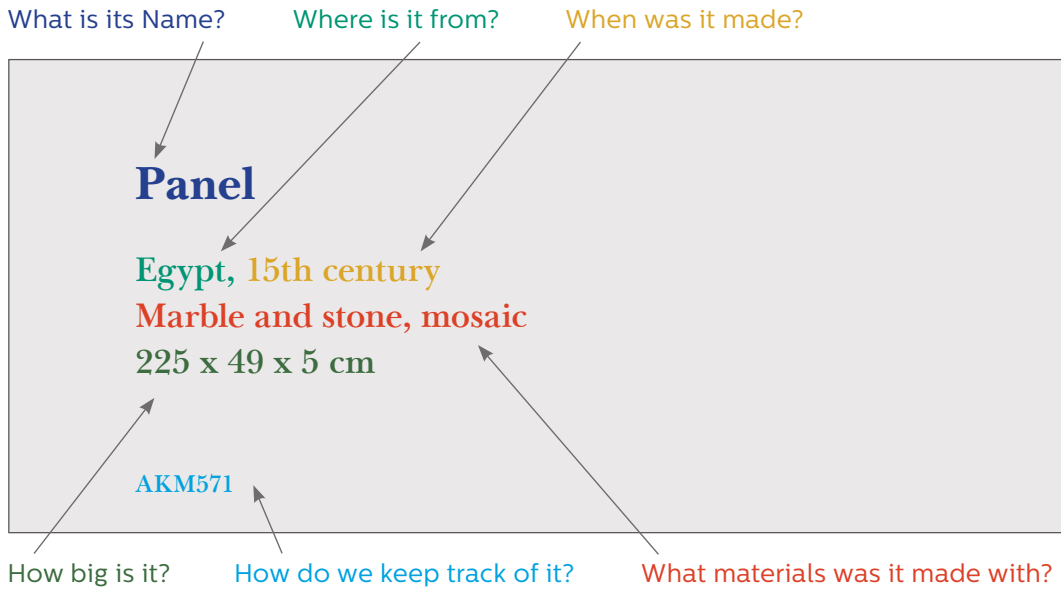


Figure 6:
An example of an Aga Khan Museum label with explanations of its various parts.

Learning Through Inquiry and Learning by Doing: Prompts and Activities

Using the label for the marble wall panel as a guide, select an object in the classroom and write a label for it as if it were an object in a museum.

3. THE CREATIVE PROCESS

For a description and graphic of this model, please refer to *The Ontario Ministry of Education Arts Curriculum, Grades 1–8*, pages 19–22. A PDF of the document is available at: www.edu.gov.on.ca/eng/curriculum/elementary/arts18b09curr.pdf.

SECTION THREE: LEARNING WITH AGA KHAN MUSEUM RESOURCES

This section of *Learning at the Aga Khan Museum* is arranged according to three levels: Grades One to Three, Grades Four to Six, and Grades Seven and Eight. Each level is further divided according to the resource — painting or manuscript, three-dimensional object, or performance.

HOW TO USE THIS SECTION

The information, questions, and activities for each resource are not meant as formal lesson plans. Rather, they can be integrated into an existing unit to stimulate students' inquiry, inspire their creative work, and encourage their reflection according to the disciplinary approach of a specific subject area.

Grade Level

Art Form

Title, Image, and Label of Work of Art

Short Description

Did You Know?

Expectations and Ideas

Prompts and Activities

GRADES ONE TO THREE

LEARNING FROM PAINTINGS

Figure 8:
Young Men Carried Off by a Simorgh
Possibly folio from a dispersed Khamseh
(Quintet) of Amir Khosrow (d. 1325)
Attributed to Basawan
India (Historic Hindustan), ca. 1590
Opaque watercolour and gold on paper
38.6 x 25.1 cm
AKM140

The fantastic painting in Figure 8 depicts an equally fantastic subject: a giant mythical bird known as a *simorgh* carries two men gripped tightly in her beak while another clings to her talons. The illustration is possibly from a tale in the poetry collection *Haft Paykar* (Seven Beauties) of the Persian poet Nezami Ganjavi (d. 1209).

Did You Know?

Although quite similar to the phoenix, the simorgh is different from other mythical beasts. Unlike dragons, which are usually depicted as male, ferocious, and threatening, the simorgh is female and often helps human beings.

CURRICULUM EXPECTATIONS AND KEY UNDERSTANDINGS

VISUAL ART

OME Expectation	Key Understanding
Identify the elements of design. Understand how these elements work and learn to use them in creative work. Identify contrast (Grade One), repetition (Grade Two), and variety (Grade Three) as principles of design that are used with the elements of design to make art. Learn to use them in creative work.	Developing Creativity, Communicating: Works of art communicate thoughts, feelings, and ideas, and an understanding of the elements and principles of design supports both the creation and analysis of works of art.

LEARNING THROUGH INQUIRY AND LEARNING BY DOING: PROMPTS AND ACTIVITIES

Visual Arts: Discovering elements and principles of design in a work of art

- Colour: How has the artist used colour in the work in Figure 8? Look at where the lighter and darker colours are. Try colouring in squares of the colours you see in the painting with the darkest at the top and the lightest at the bottom. Now turn the page around so the order is reversed. Why do you think the artist arranged the colours the way you see them?

Figure 7:
Layout of a page in Section Three of the *Guide*.

All images can be accessed at www.agakhanmuseum.org/collection/collection-highlights

LEARNING FROM PAINTINGS 1

Figure 8:
Young Men Carried Off by a Simorgh
Possibly folio from a dispersed
Khamseh (Quintet)
of Amir Khosrow (d. 1325)
Attributed to Basawan India
ca. 1590
Opaque watercolour
and gold on paper
38.6 x 25.1 cm
AKM140

The fantastic painting in Figure 8 depicts an equally fantastic subject: a giant mythical bird known as a *simorgh* carries two men gripped tightly in her beak while another clings to her talons. The illustration is possibly from a tale in the poetry collection *Haft Paykar* (Seven Beauties) of the Persian poet Nezami Ganjavi (d. 1209). In this epic poem, the seven wives of the mythical king Bahram Gur live in different-coloured pavilions. The king visits each one during a different day of the week. Each princess tells a different story. Here, the Indian princess tells the tale of a hero who is rescued by hanging on to a *simorgh*, which brings him to a paradise-like land.

Did You Know?
Although quite similar to the phoenix, the *simorgh* is different from other mythical beasts. Unlike dragons, which are usually depicted as male, ferocious, and threatening, the *simorgh* is female and often helps human beings.

CURRICULUM EXPECTATIONS AND KEY UNDERSTANDINGS

VISUAL ART

OME Expectation	Key Understanding
Identify the elements of design. Understand how these elements work and learn to use them in creative work. Identify contrast (Grade One), repetition (Grade Two), and variety (Grade Three) as principles of design that are used with the elements of design to make art. Learn to use them in creative work. Understand (Grades Two and Three) how perspective works in a painting and learn how to use it as a principle of design.	Developing Creativity, Communicating: Works of art communicate thoughts, feelings, and ideas, and an understanding of the elements and principles of design supports both the creation and analysis of works of art.
Demonstrate an understanding of a variety of art forms, styles, and techniques from the past and present, as well as their social and/or community contexts.	Understanding Culture, Making Connections: There are different ways to portray depth and focus in paintings. Muslim artists in the past have portrayed perspective differently than artists in Europe have done in landscape painting.

LANGUAGE

OME Expectation	Key Understanding
Read and demonstrate an understanding of how a story is told in pictorial form (all three grades).	Paintings can tell stories.
Demonstrate an understanding of a variety of media texts.	Paintings convey specific messages that you can read by looking critically.

LEARNING THROUGH INQUIRY AND LEARNING BY DOING: PROMPTS AND ACTIVITIES

Visual Arts: Discovering elements and principles of design in a work of art

- Colour: How has the artist used colour in the work in Figure 8? Look at where the lighter and darker colours are. Try colouring in squares of the colours you see in the painting with the darkest at the top and the lightest at the bottom. Now turn the page around so the order is reversed. Why do you think the artist arranged the colours the way you see them?
- Contrast: What is big and what is small in the painting in Figure 8? Why?
- Patterns: Find three different patterns in the painting in Figure 8. How many patterns can you find?
- Variety: Find three different kinds of fish in the painting in Figure 8. How many kinds of fish can you find?
- Emphasis: What is a focal point? Where do you think the focal point is in the painting in Figure 8?

Language

- What do you think is happening in the painting in Figure 8? Look carefully at the picture. What do you think a *simorgh* is?
- If you could give the painting in Figure 8 your own title, what would you call it?
- Do you think this is a true story?

LEARNING FROM PAINTINGS 2

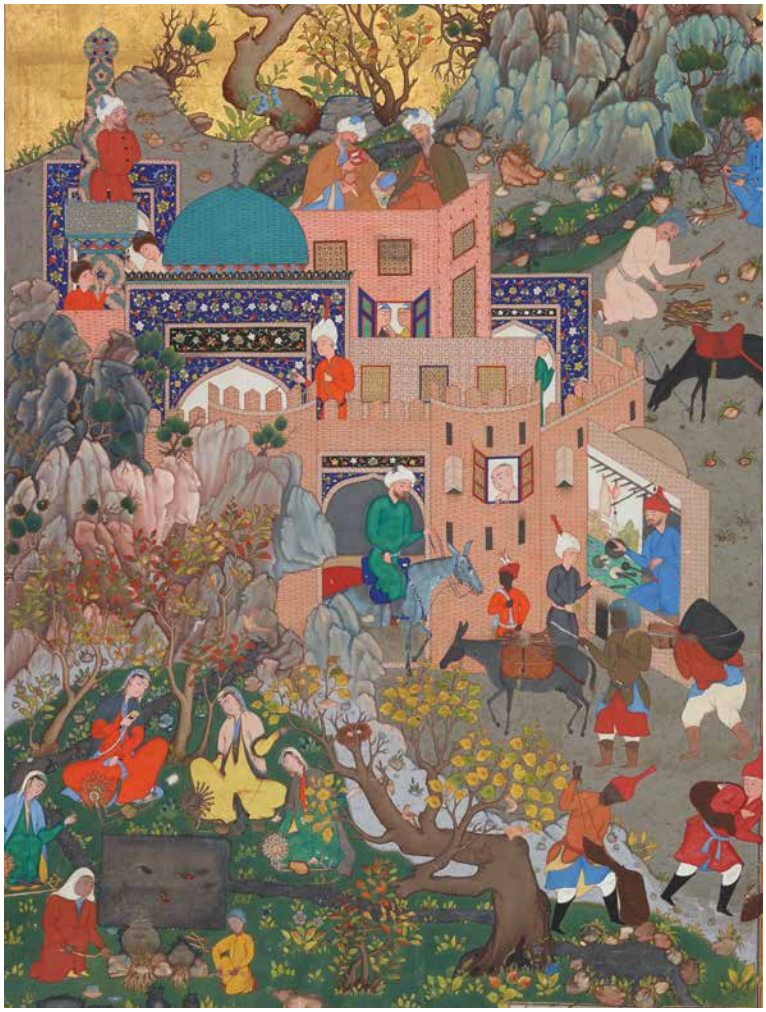


Figure 9:
Episode from the Story of Haftvad and the Worm
Folio 521v from a *Shah-Nameh* (Book of Kings)
produced for Shah Tahmasp I
Signed by Dust Mohammad
Tabriz, Iran, ca. 1540
Opaque watercolour, ink, gold, and silver on paper
45 x 30 cm
AKM164

The story of Haftvad and the worm is told in the *Shah-Nameh*, the Iranian epic of legendary kings. It details the changing fortunes of a poor man after his daughter found a magical worm in her apple while she was spinning cotton. She kept the worm in her spindle case, feeding it with apples, and in return it granted her the ability to spin ever-greater quantities of cotton. Eventually she told her parents of the marvellous creature, and the whole family's fortunes improved as they looked after the worm, building larger and larger enclosures for it as it grew to an enormous size. Haftvad and his seven sons quickly increased their local power and wealth and eventually threatened the ruler, Ardashir, who remained the ruler by killing the worm. In disguise he and his men poured boiling bronze down the creature's throat, destroying the worm and Haftvad's good fortune with it.

The painting in Figure 9 shows the daughter of Haftvad and her companions working at spinning yarn outdoors at bottom left: Haftvad's daughter (in red) holds up the apple from which the story will grow. Behind, a walled town, decorated in jewel-like splendour, appears to grow before our eyes.

Did You Know?
The painting in Figure 9 is full of information about daily life in 16th-century Iran. A man sells bread in a shop; men gather wood and bring it to the town for sale; sages read and write in a tower; women converse inside a room; and a muezzin performs the call to prayer. The buildings feature a massive dome, a minaret, a city gate with towers, windows with *mashrabiyya* (latticed screens), and walls of plain and patterned brickwork.

CURRICULUM EXPECTATIONS AND KEY UNDERSTANDINGS

VISUAL ART

OME Expectation	Key Understanding
Identify the elements of design. Understand how these elements work and learn to use them in creative work. Identify contrast (Grade One), repetition (Grade Two), and variety (Grade Three) as principles of design that are used with the elements of design to make art. Learn to use them in creative work. Understand (Grades Two and Three) how perspective works in a painting and learn how to use it as a principle of design.	Developing Creativity, Communicating: Works of art communicate thoughts, feelings, and ideas, and an understanding of the elements and principles of design supports both the creation and analysis of works of art.
Demonstrate an understanding of a variety of art forms, styles, and techniques from the past and present, and their social and/or community contexts.	Understanding Culture, Making Connections: There are different ways to portray depth and focus in paintings. Muslim artists in the past have portrayed perspective differently than artists in Europe have done in landscape painting.

LANGUAGE

OME Expectation	Key Understanding
Read and demonstrate an understanding of how a story is told in pictorial form (all three grades).	Paintings can tell stories.
Demonstrate an understanding of a variety of media texts.	Paintings convey specific messages that you can read by looking critically.

SOCIAL STUDIES

OME Expectation	Key Understanding
People and Environments: The Local Community (Grade One): Describe the different aspects of a community.	People live in different ways in different regions (Grade One).
Identify and locate various physical features of communities around the world (Grade Two).	The world is made up of different regions, each of which has distinct characteristics (Grade Two).

LEARNING THROUGH INQUIRY AND LEARNING BY DOING: PROMPTS AND ACTIVITIES

- Which people are in a town and which are in the countryside?
- People are busy doing many things. Find five different activities. How many can you find? How are their activities like the ones you do in your community? How are they different? Why do you think they are different? (e.g. differences in climate, available technologies, etc.).

LEARNING FROM THREE-DIMENSIONAL OBJECTS 1

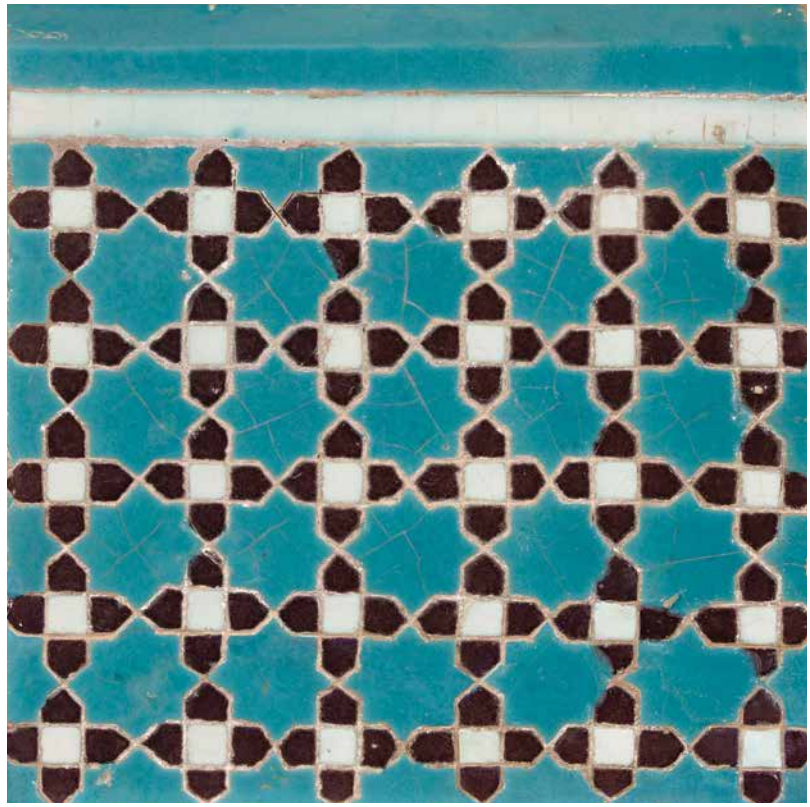


Figure 10:
Architectural Tile
Central Asia, 19th century
Fritware, *cuerda seca* and glazed
32 x 32 cm
AKM577

The tile in Figure 10 uses squares, pentagons, and octagons in a limited number of vibrant colours to achieve its bold effect. Instead of making the shapes individually and putting them together, the craftsmen who made this tile were trained in the *cuerda seca* (translated as "dry cord") technique. Artists who wanted to make multicoloured tiles invented this type of glazing in the 15th century; earlier, they had used tiny individual pieces of tiles in different colours to make tile mosaics. *Cuerda seca* required several steps: the body of the tile was air-dried, after which the tile makers used a greasy or waxy substance to draw the lines, which would separate one colour of glaze from another – here, between the white squares, purple polygons and blue ground. The areas were painted with their coloured liquid glazes, which the greasy lines prevented from running into each other. During the firing, the substance burned off as the glazes fused to the ceramic body. As seen here, the final effect is colourful and shiny.

Did You Know?
The blue glaze used for centuries to colour ceramics in Europe and Asia was made from the mineral cobalt oxide, which was mined only in Iran and the Caucasus until sources in Europe became available in the 19th century. It was very expensive and highly prized.

CURRICULUM EXPECTATIONS AND KEY UNDERSTANDINGS

VISUAL ART

OME Expectation	Key Understanding
Identify the elements of design. Understand how these elements work and learn to use them in creative work. Identify contrast (Grade One), repetition (Grade Two), and variety (Grade Three) as principles of design that are used with the elements of design to make art. Learn to use them in creative work.	Developing Creativity, Communicating: Works of art communicate thoughts, feelings, and ideas, and an understanding of the elements and principles of design supports both the creation and analysis of works of art.

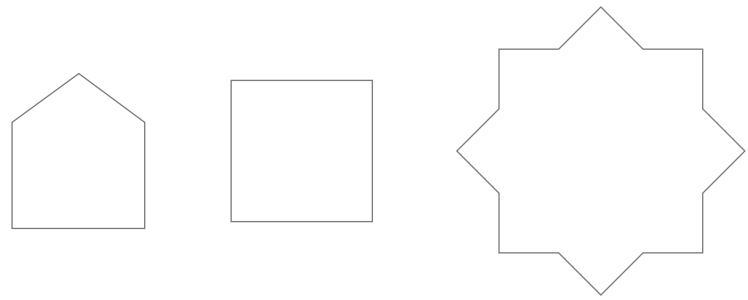
MATHEMATICS

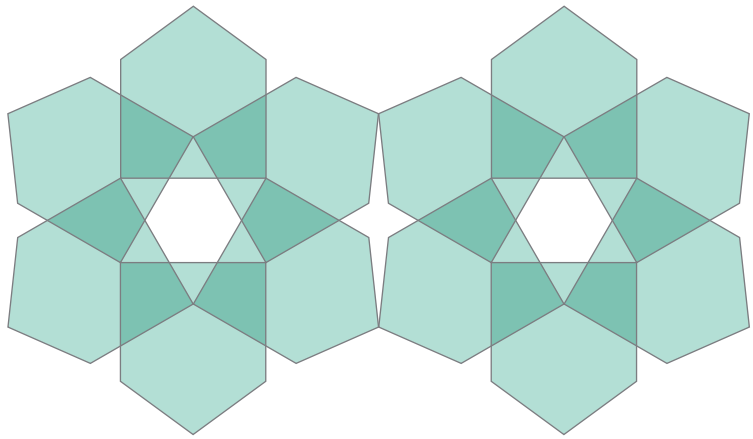
OME Expectation	Key Understanding
Geometry and Spatial Sense: Identify two-dimensional geometric shapes and make representations of them. Data Management and Probability: Organize objects into categories.	Geometric shapes can be combined and coloured in many different ways.
Patterning and Algebra: Identify, describe, extend, and create repeating patterns.	When you repeat multiple shapes exactly, you get a pattern that could go on forever.
Patterning and Algebra: Identify growing and shrinking patterns.	You apply a pattern rule to a pattern to make it grow or shrink.

LEARNING THROUGH INQUIRY AND LEARNING BY DOING: PROMPTS AND ACTIVITIES

Mathematics

- Geometry and Spatial Sense: How many shapes can you find in the tile in Figure 10?
- Geometry and Spatial Sense and Patterning and Algebra:
  - Paper method: Draw and cut out the individual shapes in multiples of ten and rearrange them to make another pattern. Make bigger and smaller shapes if you like. Use different colours to make patterns that look different from the original.
  - Computer method: Use *Geometer's Sketchpad* to create multiples of the three shapes and combine them. Make a pattern with only one or two of the three shapes. You can enlarge or shrink any shape. What new shapes have you made? What shapes have you made in the spaces between the shapes?





Figures 11a and 11b:
New patterns
made with the pentagonal shape.

- Data Management and Probability: Arrange the cut-out shapes according to colour. How many piles do you have? Put the results of your findings on a chart.

Visual Art

- Creating and Presenting: What do you think is positive (foreground) and what is negative (background) space in the tile pattern? Are these qualities decided by colour, by size, or by some other metric? Describe the shapes in the tile in terms of the negative and positive design that has been created.

LEARNING FROM THREE-DIMENSIONAL OBJECTS 2

Figure 12:
Aquamanile (Jug)
Kashan, Iran, ca. 1200
Fritware, glazed
Height 14 cm, length 10 cm
AKM793

The water jug, or aquamanile, in Figure 12 takes the form of a sturdy little bull with an alert posture and upright head. Its horns curve down, necessary for their stability during shaping and firing, and its snout has been turned into a spout. A hole in the middle of its back, used to fill it with water, is joined to its head by a handle.

This aquamanile was probably made in Kashan, Iran, which was famous as a ceramic production centre. The potters of Kashan were able to work in several styles, and single-colour glazed wares in blue or turquoise were among the most popular. The potters almost certainly used a mould for the main body, though they finished it by hand; the horns and handle required careful attention.

Two black birds, probably peacocks, decorate each side of this turquoise blue vessel, while black leaves occur intermittently on its body. One implies a blaze on the chest of the bull, while more black paint emphasizes its horns and snout.

Did You Know?
The ceramic body used for the jug in Figure 12 contains a large percentage of ground quartz, also called "frit." The stiffness of fritware is less suitable than softer earthenware for techniques like wheel-based throwing but better for moulding into the shape of a standing animal like this bull.

CURRICULUM EXPECTATIONS AND KEY UNDERSTANDINGS

VISUAL ART

OME Expectation	Key Understanding
Identify the elements of design. Understand how these elements work and learn to use them in creative work. Identify contrast (Grade One), repetition (Grade Two), and variety (Grade Three) as principles of design that are used with the elements of design to make art. Learn to use them in creative work.	Developing Creativity, Communicating: Works of art communicate thoughts, feelings, and ideas, and an understanding of the elements and principles of design supports both the creation and analysis of works of art.

SCIENCE AND TECHNOLOGY

OME Expectation	Key Understanding
Structures and Mechanisms: Investigate structures that are built for a specific purpose to see how their design and materials suit the purpose (Grade One).	The materials and structure of an object determine its purpose (Grade One).
Structures and Mechanisms: Assess the importance of form, function, strength, and stability in structures through time (Grade Three).	A structure has both form and function (Grade Three).
Matter and Energy: Assess the impact of changes in state of solids and liquids on individuals and society (Grade Two).	Materials that exist as liquids and solids have specific properties (Grades Two and Three).

LEARNING THROUGH INQUIRY AND LEARNING BY DOING: PROMPTS AND ACTIVITIES

Science

- Structures and Mechanisms: Relating Science and Technology to Society and the Environment: How did the artist make the bull in Figure 12 to stand up?
- Why do you think he has an opening in his back and snout?
- Matter and Energy: Relating Science and Technology to Society and the Environment: What do you think this bull is made of? What has happened to make the bull change its state from soft to hard?
- Earth and Space Systems: Basic Concepts: Tell how this feels (malleable clay), then tell how this feels (fired clay).

Visual Art

- Exploring Forms and Cultural Contexts: Choose a four-legged animal from a work of art in the Museum as a model for your ceramic jug. How will you use the self-hardening clay to create the hollow structure of the vessel? You will need to attach a handle and spout for pouring as well as create a strong base to give stability to your pottery.

LEARNING FROM THE PERFORMING ARTS

(Visit the Aga Khan Museum website for information on performances, especially for schools, by artists such as Abbos Kosimov.)

Figure 13:
Uzbek musician Abbos Kosimov plays the *doyra* at an Aga Khan Music Initiative concert at Paris's Cité de la Musique.

Photo © Sebastian Schutyser/Aga Khan Music Initiative

Abbos Kosimov is recognized globally as a master of *doyra* and an ambassador of Uzbek culture. He was born in Tashkent, Uzbekistan, to a highly musical family. As a youth, Kosimov learned to play the *doyra*, an Uzbek percussion instrument, and in 1988 he graduated from the College of Culture and Music. Kosimov's performance, pictured in Figure 13, was part of a multi-day presentation of music, vocal, and dance traditions of the Silk Route, including court traditions and customs of nomadic and sedentary dwellers of the region.

Kosimov has established his own school, where he teaches the youth of his country to play *doyra*. At present there are more than 100 students at the school. When asked about *doyra*, Kosimov says: "Uzbek culture and national identity is deeply rooted in its music and dance traditions. As such, *doyra* has grown with the country over time and evolved to play a deeper role in reflecting Uzbek history, religion, heritage, and cultural traditions…. *Doyra* is my life and I cannot live without it."

Did You Know?

The *doyra* is a percussion instrument, originally from Uzbekistan, which is played with sticks. It is sometimes heated over a fire to increase its resonant sound.

CURRICULUM EXPECTATIONS AND KEY UNDERSTANDINGS

DANCE, DRAMA, AND MUSIC

OME Expectation	Key Understanding
Dance: Describe and discuss dances, showing an understanding of the elements of dance, with particular emphasis on body and space (Grades One and Two) and time and energy (Grade Three). Drama: Demonstrate an awareness of a variety of roles and themes in drama, showing an understanding of the elements of drama (all three grades). Music: Describe and discuss a musical piece, showing an understanding of the elements of music (all three grades).	Understanding Culture, Making Connections: People all around the world express their cultural ideas by creating and performing dances and dramas, and by creating and playing music.
Music: Sing and/or play accompaniments from a wide variety of cultures, styles, and historical periods (Grade Two).	Understanding Culture, Making Connections: Dances, dramas, and music can be different in different places in the world.

CROSS-CURRICULAR CONNECTIONS

OME Expectation	Key Understanding
Dance and Mathematics: Use your body in a dance to show symmetrical shapes.	Symmetry is the same principle, whether it is in mathematics, works of art, or the human body.
Music, Visual Art, and Science: Demonstrate an understanding that sounds can be represented by symbols (Grade One).	Pattern is something that you can see in pictures, actions, colours, sounds, numbers, and letters (Grade One).
Drama and Language: Demonstrate an awareness of drama as the acting out of stories.	A drama tells a story that can also be told orally, or can be written down.

LEARNING THROUGH INQUIRY AND LEARNING BY DOING: PROMPTS AND ACTIVITIES

- Music: What was your favourite piece in the concert? Which instrument did you like the best? What did you like about it?
- Music: Sing or play an instrument, accompanied by body percussion or found sounds; sing or play a rhythmic or melodic ostinato (a continually repeated musical phrase or rhythm).
- Music, Visual Art, and Science (sounds represented by symbols in music; scientific symbols): Make a drawing with one colour that shows a fast beat you just heard in the concert; make a drawing with another colour that shows a slow beat. How do you show the fastness or slowness? (size, interval, colour).

LEARNING FROM PAINTINGS 1

Figure 14:
Khosrow Killing the Lion Outside Shirin's Tent
Folio from a dispersed Khamseh (Quintet) of Nezami (d. 1209)
Tabriz, Iran, ca. 1525
Opaque watercolour, ink, gold, and silver on paper
25.4 x 21.2 cm
AKM93

The arresting painting in Figure 14 illustrates a pivotal scene from the romance of Khosrow and Shirin, one of the five poems that comprise the *Khamseh* of Nezami Ganjavi (d. 1209). Khosrow, a prince and hero, strikes the lion with his bare hands, killing it to protect his adored Shirin, an Armenian princess. The artist has provided a wealth of detail to capture the attention: Khosrow is dressed in his nightclothes to underscore the urgency of his mission, and Shirin shows her surprise by biting her finger.

Shirin's spectacular tent, however, dominates the scene. The dome is of particular interest since it uses a fanciful decoration of human heads, leopards, cheetahs, and a monkey framed with a spiralling pattern of vines and leaves.

Did You Know?

The domed tent in Figure 14 features a version of the fabled *waqwaq* tree that was believed to grow at the edges of the earth and bears human and animal heads as fruit. The painting in Figure 15 is an illustration of another episode in the *Khamseh* poems, when Alexander the Great learns of his own death from a *waqwaq* tree. The tree symbolizes how far Alexander travelled.

Figure 15:
Alexander's Ship Arrives at the Waqwaq Tree
Painting depicting Alexander the Great's far travels
Qazvin, Iran, ca. 1590
Opaque watercolour, ink, and gold on paper
44.2 x 31.2 cm
AKM219

CURRICULUM EXPECTATIONS AND KEY UNDERSTANDINGS

VISUAL ART

OME Expectation	Key Understanding
Develop an understanding of the elements of design. Learn to use them in creative work.	Developing Creativity, Communicating: Works of art communicate thoughts, feelings, and ideas, and an understanding of the elements and principles of design supports both the creation and analysis of works of art.
Develop an understanding of the principles of design, with a focus on emphasis (Grade 4), proportion (Grade 5), and balance (Grade 6). Learn to use them in creative work.	Developing Creativity, Communicating: The principles of design are strategies to create works of art. Giving attention to the principles of design allows the artist to create, communicate, and represent ideas and feelings in interesting ways.
Understand the principle of perspective as it relates to the element of space and as a principle of design: diminishing perspective (Grade 4), atmospheric perspective (Grade 5), and one-point perspective (Grade 6).	Developing Creativity, Communicating: There are different ways to portray depth and focus in paintings. Muslim artists in the past have portrayed perspective differently in Persian and Moghul painting than artists in Europe have done in landscape painting.

LANGUAGE

OME Expectation	Key Understanding
Media Literacy: Demonstrate an understanding of a variety of media texts (all grades).	A painting represents one or several points of view about what is portrayed.

LEARNING THROUGH INQUIRY AND LEARNING BY DOING: PROMPTS AND ACTIVITIES

Visual Art

- Creating and Presenting: Using a 4 x 4 cm viewfinder, find your favourite segment of the painting in Figure 15. Then make your own painting of that segment sized 15 x 15 cm. Put the class's or group's paintings together on a wall and discuss your piece, and what you noticed about the original. Using the terminology of foreground, middle ground, and background describe what is going on in each area of the composition.
- Cultural Contexts: How do you think the actions of the people in the painting in Figure 15 convey their ways of life? What information is communicated through this depiction? What questions do you have? (Invite and record "I wonder" questions. "I wonder …") How would you change the actions of people to convey different information?
- Reflecting, Responding, and Analyzing: How did the artist use the principle of balance in this painting?

Language

- Describe the story in your own words and explain how the artist has incorporated landscape, architecture, and human and animal drama into the work.

LEARNING FROM PAINTINGS 2

Figure 16:
Rostam Shooting the Turanian Hero Ashkabus
Folio from a dispersed *Shah-Nameh*
(Book of Kings) produced for
Sultan ʻAli Mirza Lahijan, Iran, 1494
Opaque watercolour, ink, and gold on paper
23.3 x 15.2 cm
AKM92

The cascade of arrows hurtling back and forth between the two warring parties in Figure 16 is symbolic of one of the recurring themes of the *Shah-Nameh*: the war between the Iranians and the Turanians, their Central Asian opponents.

Advancing from the right is an Iranian army led by the mythical warrior Rostam on his loyal blue-armoured horse, Rakhsh. As always, Rostam is identified by his tiger-skin clothes and by his prominent position in the painting. Not only is he larger in size than all the other characters, but he alone has the courage to lead them into battle on the open field. Rostam's valour and forward movement are contrasted on the left by the reticence of the Turanian army and the fall of their leader, Ashkabus, pierced by Rostam's flying arrow. By raising the horizon line to the top of the painting, the artist managed to create a large battle scene in the confined space of the paper.

Did You Know?

Rostam the hero is always identified by the tiger-skin tunic he wears. Rostam's horse, Rakhsh, was as much a character in the *Shah-Nameh* as his master. The painting in Figure 17 shows one of his exploits in which he kills a lion near the sleeping Rostam.

Figure 17:
Rakhsh Fights the Lion While Rostam Sleeps
Folio 69v from a *Shah-Nameh* (Book of Kings) by Ferdowsi (d. 1020)
Shiraz, Iran, 1457
Opaque watercolour, ink, and gold on paper
33.8 x 24.6 cm
AKM268

CURRICULUM EXPECTATIONS AND KEY UNDERSTANDINGS

VISUAL ART

OME Expectation	Key Understanding
Develop an understanding of the elements of design. Learn to use them in creative work. Develop an understanding of the principles of design, with a focus on emphasis (Grade 4), proportion (Grade 5), and balance (Grade 6). Learn to use them in creative work.	Developing Creativity, Communicating: Works of art communicate thoughts, feelings, and ideas, and an understanding of the elements and principles of design supports both the creation and analysis of works of art.
Understand the principle of perspective as it relates to the element of space, and as a principle of design: diminishing perspective (Grade 4), atmospheric perspective (Grade 5), and one-point perspective (Grade 6).	Developing Creativity, Communicating: There are different ways to portray depth and focus in paintings. Muslim artists in the past have portrayed perspective differently in Persian and Moghul painting than artists in Europe have done in landscape painting.

LANGUAGE

OME Expectation	Key Understanding
Media Literacy: Demonstrate an understanding of a variety of media texts (all grades).	A painting can represent multiple points of view and can be interpreted in different ways.

SUPPORTING ENGLISH LANGUAGE LEARNERS

OME Expectation	Key Understanding
Oral Communication: Communicate orally about what you see using short words and phrases.	A painting can be described effectively using words, phrases, and sentences.
Writing: Organize information by copying words or using ready-printed word cards into a point-form report on a painting.	A statement in writing can describe what is happening in a painting.

LEARNING THROUGH INQUIRY AND LEARNING BY DOING: PROMPTS AND ACTIVITIES

Language

- Reading and Media Literacy: What do you learn about the painting in Figure 16 from reading the label? What do you still want to know about it?
- How is the warfare in Figure 16 different from the way battles are fought today?
- Writing: Research an object in an Aga Khan Museum exhibition or online database and write a letter to the artist or maker expressing a particular point of view. For example, for the painting in Figure 16, respond to how the scene depicted makes you feel. Pick two adjectives from the following list or from your own imagination and use them in your letter: (excited, frightened, bored, uncomfortable, itchy, admiring, sleepy, happy, unhappy).

Supporting English Language Learners

- Writing: Complete this cloze activity focusing on nouns for Figure 16:
  The great hero Rostam rode his ____ into the battle. Many ____ flew back and forth between the soldiers. One soldier blew a ____ shaped like a ____. Some soldiers flying a red ____ watched the ____ from above. Rostam shot an ____ into the ____ of Ashkabus and he fell forward from his ____.

LEARNING FROM PAINTINGS 3

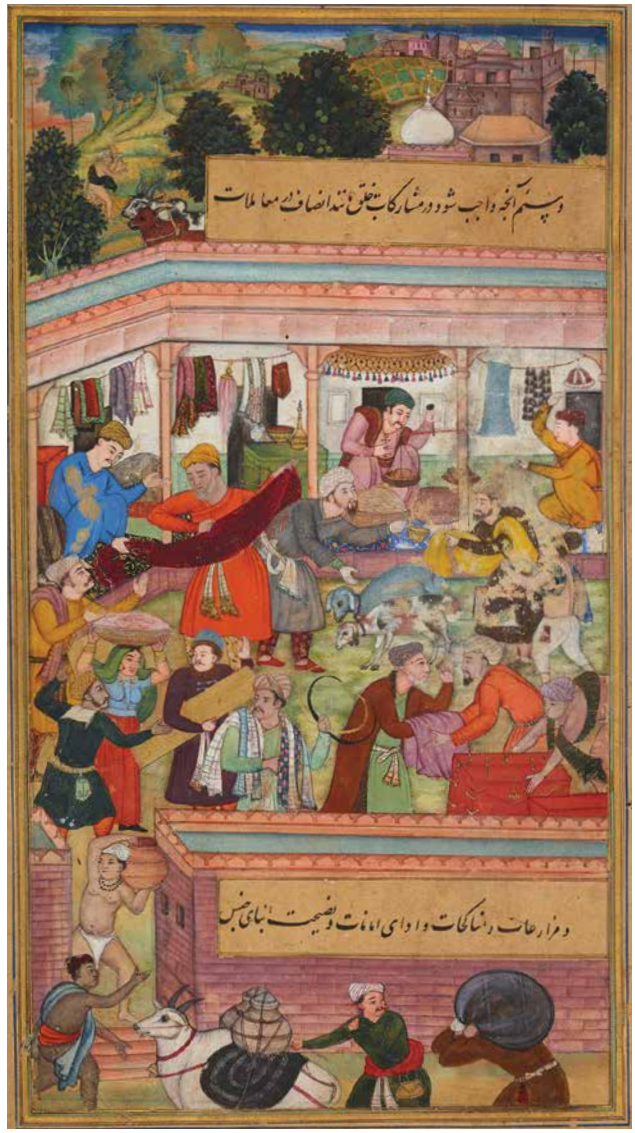


Figure 18:
A Market Square
Folio 80r from the *Akhlaq-e Nasiri*
(Ethics of Nasir) by Tusi (d. 1274)
Northern India, 1590–95
Opaque watercolour, ink, and gold on paper
23.9 x 14.2 cm
AKM288

The colourful painting in Figure 18 comes from a treatise on ethics, social justice, and politics by a medieval Iranian philosopher, Nasir al-Din Tusi (d. 1274), who lived in Iran and studied among the great scholars and mystics of the period. More than 300 years later, the *Akhlaq-e Nasiri* was a favourite book of Akbar the Great, the third Moghul emperor of India. It was in one of Akbar's courtly workshops that the manuscript containing this painting was copied and illustrated. The way the artists animated its philosophical ideas with stories makes this manuscript very remarkable.

For this painting, market activities illustrate fair dealing – such as giving a product a fair price – in transactions, which is the subject of the upper text panel. The lower text panel extends the rule of fair dealing to the sharing of possessions and the counselling of one's fellow citizens.

Did You Know?
Markets in towns and cities bring people together for trade and exchange. Many different kinds of people are pictured living and working together, rich people, poor people, dark- and light-skinned people, shepherds, cloth sellers, and food sellers.

CURRICULUM EXPECTATIONS AND KEY UNDERSTANDINGS

SOCIAL STUDIES

OME Expectation	Key Understanding
Demonstrate an awareness of ways in which works of art express the ways of life of pre-modern societies (Grade 4).	Conditions and ways of life were very different in the past yet people acted (interacted and behaved) in ways we can recognize and relate to today.
Compare key aspects of life in medieval societies with present-day Canadian society (Grade 4).	By studying the past, we can better understand the present.
Use the social studies process to investigate different perspectives on the historical and/or contemporary experience of two or more distinct communities in Canada (Grade 6).	Different groups may experience the same development or event in different ways.

VISUAL ART

OME Expectation	Key Understanding
Develop an understanding of the elements of design. Learn to use them in creative work. Develop an understanding of the principles of design, with a focus on emphasis (Grade 4), proportion (Grade 5), and balance (Grade 6). Learn to use them in creative work.	Developing Creativity, Communicating: Works of art communicate thoughts, feelings, and ideas, and an understanding of the elements and principles of design supports both the creation and analysis of works of art.
Understand the principle of perspective as it relates to the element of space, and as a principle of design: diminishing perspective (Grade 4), atmospheric perspective (Grade 5), and one-point perspective (Grade 6).	Developing Creativity, Communicating: There are different ways to portray depth and focus in paintings. Muslim artists in the past have portrayed perspective differently in Persian and Moghul painting than artists in Europe have done in landscape painting.

LANGUAGE

OME Expectation	Key Understanding
Media Literacy: Demonstrate an understanding of a variety of media texts (all grades).	A painting represents one or several points of view about what is portrayed.

LEARNING THROUGH INQUIRY AND LEARNING BY DOING: PROMPTS AND ACTIVITIES

Social Studies

- Heritage and Identity: (Grade 4): Use the scene in the painting in Figure 18 to research and write a report on the way people lived in the time and place of the work of art. What do you think is different from today? What do you think is similar? (For help with resources, check the Further Reading section at the end of this *Guide*.)

- Think about a marketplace in your neighbourhood. This place could be in the downtown core or in a suburban shopping mall. Compare this setting to the painting in Figure 18. Are there any similarities? Use the Venn diagram in Figure 19 as a sample to record your observations. Three categories are added, but you can add many more as you observe. Put differences in the outer circles and similarities in the space where the circles overlap. This can be an individual or group activity.

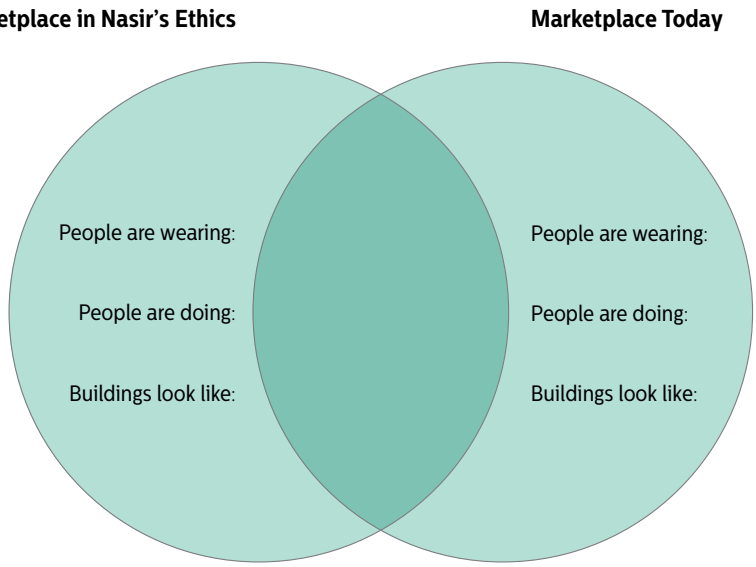


Figure 19:
Venn Diagram
for Marketplace Comparison

Language

- Describe the story in your own words and explain how the artist has incorporated landscape, architecture, and human and animal drama into the work.

LEARNING FROM PAINTINGS 4

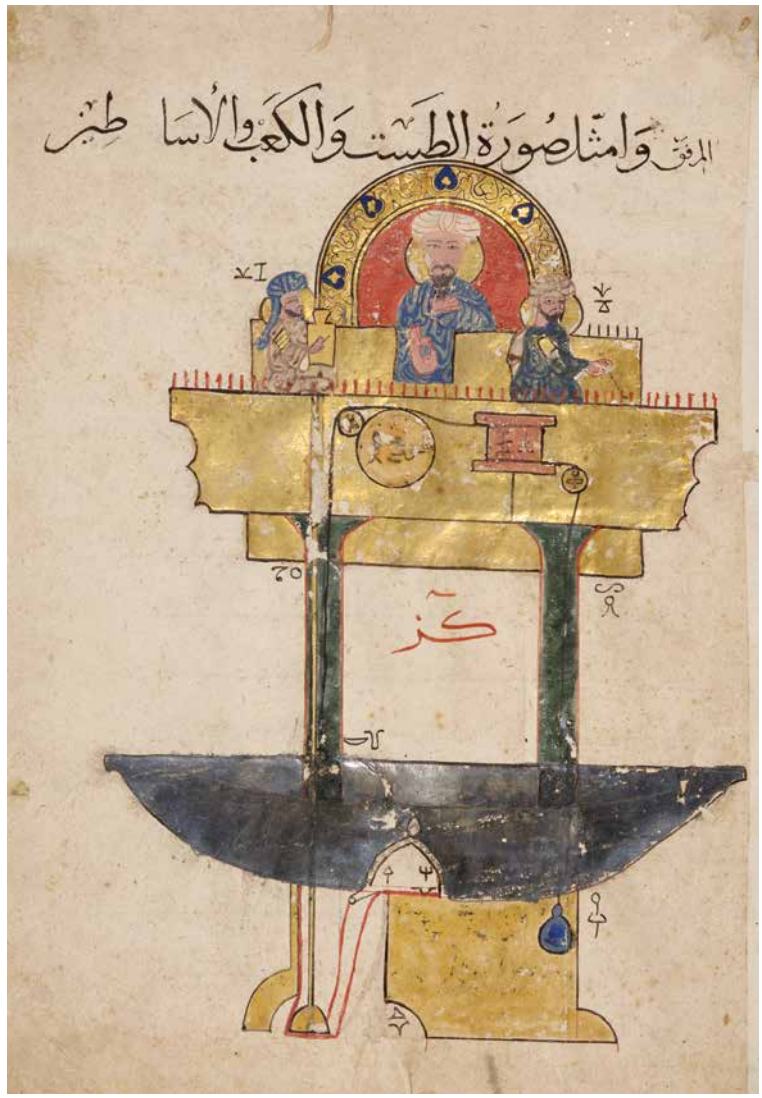


Figure 20: A Blood-Measuring Device
Kitab al-Hiyal al-nafi'ah
(The Book of Knowledge
of Ingenious Mechanical Devices)
Al-Jazari (d. 1206)
Cairo, Egypt, 1354
Opaque watercolour, ink, gold,
and silver on paper
27.3 x 39.1 cm
AKM11

The painting in Figure 20 comes from a popular treatise on mechanical devices and automata that was written in 1206 and copied continuously in the following centuries. Al-Jazari, the author of *Kitab al-Hiyal al-nafi'ah* (The Book of Knowledge of Ingenious Mechanical Devices), included descriptions of more than 100 devices in his treatise, one of which is can be seen here. This fascinating device builds on two scientific ideas: bloodletting as a medical treatment, and the use of simple machines to create complex automata. The treatment of various ailments through bloodletting was common until the 19th century, and it clearly did not require such a complex device.

Did You Know?

The patient puts a cut finger into a hole in the basin; blood falls through channels into a lower chamber and displaces a float. The float is attached to one end of a rod that, on its other end, attaches to the pen in the hand of the scribe on the upper left. As the level of the blood in the basin rises, it pushes the float up, moving the scribe's pen and indicating marks on his writing board. A string fixed to the rod controls the action of the other two figures. It loops over the large pulley and then around a vertical pulley, and its other end holds a weight. The large pulley's rotation makes the hands of the central figure alternate to indicate the drams collected in units of ten. The vertical pulley controls the scribe on the right, which rotates to point to the upright markers, indicating the individual drams.

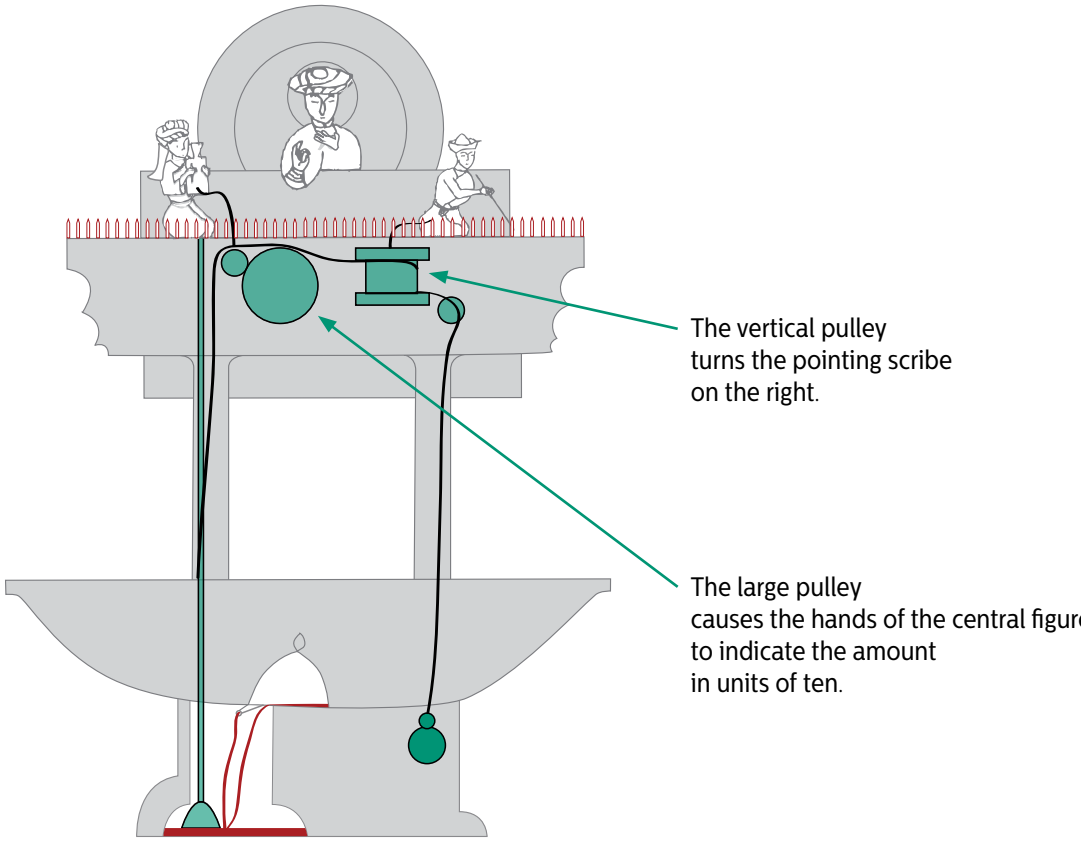


Figure 21:
A diagram showing the mechanism
of the device.

CURRICULUM EXPECTATIONS AND KEY UNDERSTANDINGS

SCIENCE AND TECHNOLOGY

OME Expectation	Key Understanding
Pulleys and Gears (Grade 4): Understand the basic principles and functions of pulley systems and gear systems.	Pulleys and gears change the speed, direction, and motion of, and force exerted on moving objects.

VISUAL ART

OME Expectation	Key Understanding
Develop an understanding of the elements of design. Learn to use them in creative work. Develop an understanding of the principles of design, with a focus on emphasis (Grade 4), proportion (Grade 5), and balance (Grade 6). Learn to use them in creative work.	Developing Creativity, Communicating: Works of art communicate thoughts, feelings, and ideas, and an understanding of the elements and principles of design supports both the creation and analysis of works of art.

SOCIAL STUDIES

OME Expectation	Key Understanding
Demonstrate an awareness of ways in which works of art express the ways of life of pre-modern societies (Grade 4).	Conditions and ways of life were very different in the past yet people acted in ways we can recognize today.
Compare key aspects of life in medieval societies and compare them to present-day Canadian society (Grade 4).	By studying the past, we can better understand the present.
Use the social studies process to investigate different perspectives on the historical and/or contemporary experience of two or more distinct communities in Canada (Grade 6).	Different groups may experience the same development or event in different ways.

LEARNING THROUGH INQUIRY AND LEARNING BY DOING: PROMPTS AND ACTIVITIES

Science, Technology, Engineering, Mathematics (STEM)

- Pulleys and Gears (Grade 4): Forces Acting on Structures and Mechanisms (Grade 5): How do you think the pulley system works in the machine depicted in the painting in Figure 20? Explain the external forces causing it to work.
- Construct a simple pulley using an empty ribbon spool and some cord, or other materials you can find at home or in the classroom.

Visual Art

- Look closely at a gadget in your home or classroom, e.g. a pencil sharpener or egg beater, and draw it, looking carefully at the mechanism and trying to show how it works.

LEARNING FROM PAINTINGS 5

Figure 22:
Qur'an
Copied by Mahmud Sha'ban
Gwalior Fort, India, 1399
Ink, opaque watercolour, and gold on paper
Folio: 28.9 x 22.2 cm
AKM281

Copied under the Tughluqs (1320–1414) who ruled parts of present-day India and Pakistan before the Moghuls, the unique Qur'an in Figure 22 is one of the earliest surviving manuscripts in the *bihari* script. Known as the Gwalior Qur'an after the Gwalior Fort where it was copied, this Qur'an testifies to the active diplomatic networks and cultural and economic interactions in the 14th and 15th centuries. Although the *bihari* script, which was common in pre-Moghul India, is a unique variation on *naskh*, the decorative features of the Gwalior Qur'an bring together elements from Mamluk (1250–1517) and Ilkhanid (1256–1353) layout and illuminations, as well as the exuberance of Indian painting conventions.

The multicoloured design of this spectacular opening folio is a version of the geometric star-and-polygon pattern that may have originated as early as the 9th century in Iraq. It has been employed ever since in countless variations in architecture, manuscript embellishment, and decoration of objects.

Did You Know?
Muslims believe that the Qur'an is the Word of God revealed to the Prophet Muhammad in the 7th century CE. The central message of the Qur'an is for humanity to believe in and worship God, and to live a pious and ethical life. The Qur'an, the Muslim Holy Book, also contains histories, parables, and stories that have inspired artists, writers, thinkers, and scientists.

CURRICULUM EXPECTATIONS AND KEY UNDERSTANDINGS

MATHEMATICS

OME Expectation	Key Understanding
Geometry and Spatial Sense: Identify and classify the symmetry operations of reflection (Grade 4), translation (Grade 5), and rotation (Grade 6).	Geometric objects have properties that allow them to be classified in a variety of ways.
Patterning and Algebra: Extend and create repeating two-dimensional patterns involving reflections (Grade 4), translations (Grade 5), and rotations (Grade 6).	The symmetry operations of reflection, translation, and rotation are the rules according to which patterns are constructed.

VISUAL ART

OME Expectation	Key Understanding
Develop an understanding of the elements of design. Learn to use them in creative work. Develop an understanding of the principles of design, with a focus on emphasis (Grade 4), proportion (Grade 5), and balance (Grade 6). Learn to use them in creative work.	Developing Creativity, Communicating: Works of art communicate thoughts, feelings, and ideas, and an understanding of the elements and principles of design supports both the creation and analysis of works of art.
Understand the principle of perspective as it relates to the element of space and as a principle of design: diminishing perspective (Grade 4), atmospheric perspective (Grade 5), and one-point perspective (Grade 6).	Developing Creativity, Communicating: There are different ways to portray depth and focus in paintings. Muslim artists in the past have portrayed perspective differently in Persian and Moghul painting than artists in Europe have done in landscape painting.

LEARNING THROUGH INQUIRY AND LEARNING BY DOING: PROMPTS AND ACTIVITIES

Cross-Curricular Connections

- Visual Art and Mathematics: What artistic principles of design do you think the artist used for the creation of the Qur'an folio in Figure 22? What geometry operations can you find in the design? Make a list of all that you can find. Then create your own design on paper with a compass or on a computer, following the guide in Figure 23.

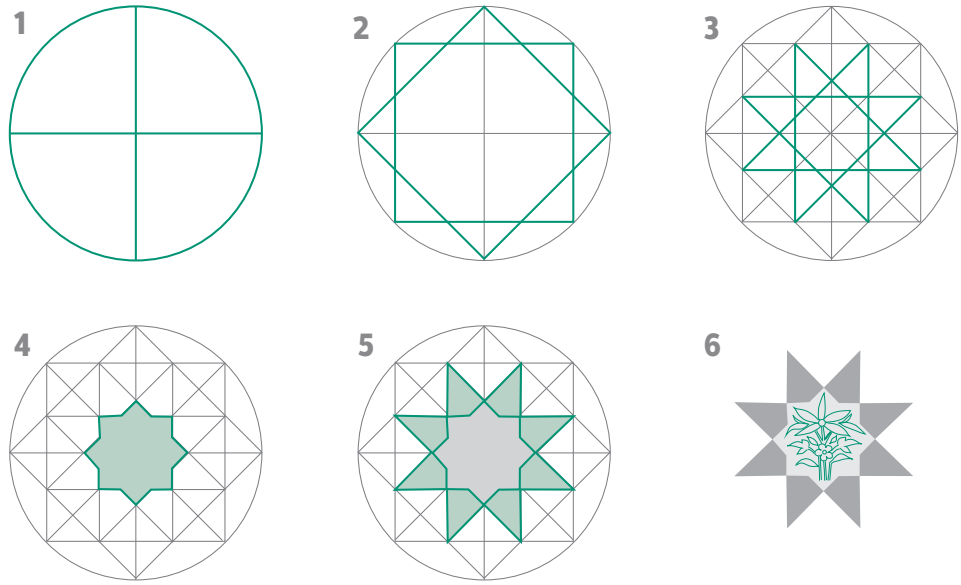


Figure 23:
Creating a design based on the Qur'an in Figure 22.

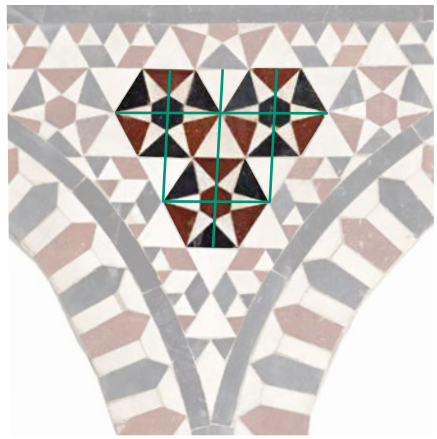
1. Draw a circle and two intersecting lines at right angles.
2. Draw two squares within the circle, one at 45 degrees to the other.
3. Use the circle and squares to create an eight-pointed star.
4. Colour the inner eight-pointed star.
5. Colour the outer eight-pointed star differently.
6. Create a design within the inner star and colour it in.

Students can continue this pattern-making activity by going back to the original Qur'an folio and studying it, then drawing more of the design, adding the stars, and using colours taken from the original folio. Or students can try creating their own geometric design, starting with step 2 and experimenting with different star and polygon shapes. Steps 1 to 5 can be done in *Geometer's Sketchpad* and then the design can be printed for the completion of step 6.

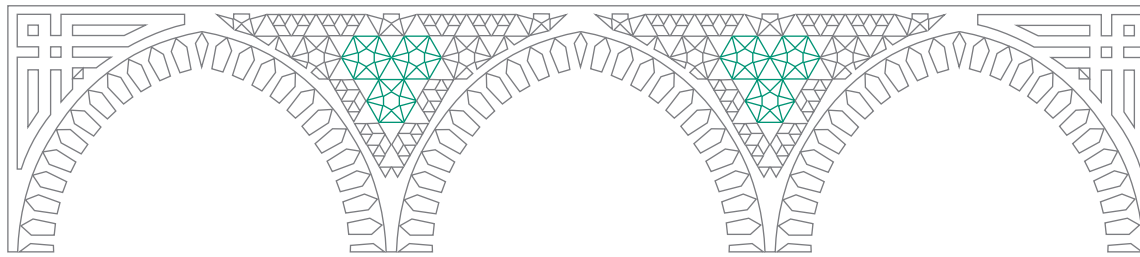
LEARNING FROM THREE-DIMENSIONAL OBJECTS 1

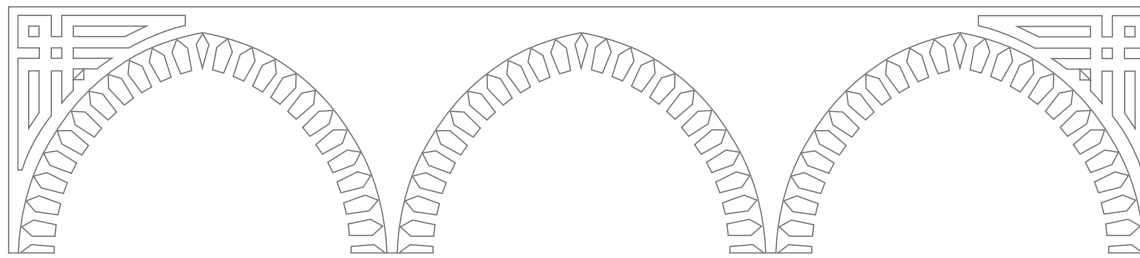
Figure 24:
Panel
Egypt, 15th century
Marble and stone mosaic
225 x 49 x 5 cm
AKM571

Typical of the decorative approach to stone, the triple-arched wall panel in Figure 24 uses the natural variety of stone colours to produce intricate polychrome compositions. Different stones and marble were cut according to the desired design, here forming a star-and-hexagon mosaic with knot-like interlace on the end spandrels. This panel would have decorated a reception room in a residential building in Egypt or Syria of the Mamluk period (1250–1517), where arched panels, similar to this one, separated the central hall with its gushing fountain from the two raised reception areas that flanked it.



Figures 25a and 25b:
Diagrams of Figure 24
with and without patterns.





Did You Know?
The patterns on the panel in Figure 24 are not painted on but composed of individual stone pieces meticulously cut to fit. To make the panel, artisans would have cut all the pieces from different coloured stones, laid down all the stones in the desired pattern, poured plaster over them, let it harden, and raised the panel to its standing placement.

CURRICULUM EXPECTATIONS AND KEY UNDERSTANDINGS

VISUAL ART

OME Expectation	Key Understanding
Develop an understanding of the elements of design. Learn to use them in creative work. Develop an understanding of the principles of design, with a focus on emphasis (Grade 4), proportion (Grade 5), and balance (Grade 6). Learn to use them in creative work.	Developing Creativity, Communicating: Works of art communicate thoughts, feelings, and ideas, and an understanding of the elements and principles of design supports both the creation and analysis of works of art.

MATHEMATICS

OME Expectation	Key Understanding
Geometry and Spatial Sense: Identify and classify the symmetry operations of reflection (Grade 4), translation (Grade 5), and rotation (Grade 6).	Geometric objects have properties that allow them to be classified in a variety of ways.
Patterning and Algebra: Extend and create repeating two-dimensional patterns involving reflections (Grade 4), translations (Grade 5), and rotations (Grade 6).	The symmetry operations of reflection, translation, and rotation are the rules according to which patterns are constructed.

SCIENCE AND TECHNOLOGY

OME Expectation	Key Understanding
Earth and Space: Assess the social and environmental impacts of human uses of rocks and minerals (Grade 4).	The properties of rocks and minerals determine society's possible uses for them.

CROSS-CURRICULAR CONNECTIONS

OME Expectation	Key Understanding
Visual Art and Mathematics: Develop an understanding of the ways artists combine the elements and principles of design with the mathematical principles of patterning and geometry to produce works of art.	An artist needs to use mathematical skills to make patterned works of art.

LEARNING THROUGH INQUIRY AND LEARNING BY DOING: PROMPTS AND ACTIVITIES

Visual Art

- Use the diagram in Figure 25a to try different colour combinations and shapes. What is the effect of a dark background? Of different shapes? Can you find shapes that fit together tighter than the ones the artist chose? What happens if you use different shapes on each of the three arches?

Mathematics

- If you use different shapes for the decorations in the previous art activity, how do you divide up the spaces to calculate how to fill them with a repeating pattern of shapes?
- Grades 4 and 5: How many reflections can you find in this mosaic pattern? Draw the lines of reflection as in the diagram of the panel in Figure 25b. What are the components of the six-pointed stars? How would you reconfigure them into another pattern?
- Grade 5: How many translations can you find in this mosaic? How have the various components of the pattern been fitted into the arch shape?

Science

- Earth and Space: What are the qualities of the rocks and minerals used in this wall panel? How were they mined? How were they constructed into the final shape? Try making a segment of the panel in a new material, such as carved Styrofoam, and compare its qualities to the original.

LEARNING FROM THREE-DIMENSIONAL OBJECTS 2

Figure 26:
Tile Panel
Central Asia, 14th century
Earthenware, carved and glazed
56 x 39 cm
AKM572

The ceramic tile in Figure 26 is a fine example of the flexibility and creativity of the ceramic workers of Iran and Central Asia: it uses two different techniques to achieve its final effect, which melds their two styles seamlessly. In the main field, the team of ceramicists created a geometric strapwork design in dark blue, turquoise, and white using a technique similar to *cuerda seca* ("dry cord"), in which the coloured glazes were prevented from running by the use of a greasy substance that burns off during firing – the "dry cord."

The turquoise frame has an abstract vegetal motif of a continuously unfolding vine that was deeply hand-carved into the surface of the tile. This frame surrounds a perfectly balanced geometric interlace with a star pattern incised in its central field. The carving was done while the tile was still soft, with the glazing applied in the form of powdered minerals fused into shiny glazes of different colours when baked in the kiln.

Did You Know?

Tile panels like the one in Figure 26 covered architectural surfaces during the Timurid era in Central Asia, creating a patterned cloak of glittering blue. Figure 27 shows this effect in a building in Samarqand.

Figure 27:
Shah-e Zendeh Complex
Samarqand, Uzbekistan
Source: *http://archnet.org*

CURRICULUM EXPECTATIONS AND KEY UNDERSTANDINGS

VISUAL ART

OME Expectation	Key Understanding
Develop an understanding of the elements of design. Learn to use them in creative work. Develop an understanding of the principles of design, with a focus on emphasis (Grade 4), proportion (Grade 5), and balance (Grade 6). Learn to use them in creative work.	Developing Creativity, Communicating: Works of art communicate thoughts, feelings, and ideas, and an understanding of the elements and principles of design supports both the creation and analysis of works of art.

MATHEMATICS

OME Expectation	Key Understanding
Geometry and Spatial Sense: Identify and classify the symmetry operations of reflection (Grade 4), translation (Grade 5), and rotation (Grade 6).	Geometric objects have properties that allow them to be classified in a variety of ways.
Patterning and Algebra: Extend and create repeating two-dimensional patterns involving reflections (Grade 4), translations (Grade 5), and rotations (Grade 6).	The symmetry operations of reflection, translation, and rotation are the rules according to which patterns are constructed.

CROSS-CURRICULAR CONNECTIONS

OME Expectation	Key Understanding
Visual Art and Mathematics: Develop an understanding of the ways artists combine the elements and principles of design with the mathematical principles of patterning and geometry to produce works of art.	An artist needs to use mathematical skills to make patterned works of art.

LEARNING THROUGH INQUIRY AND LEARNING BY DOING: PROMPTS AND ACTIVITIES

Figure 28:
Detail of the tile panel in Figure 26.

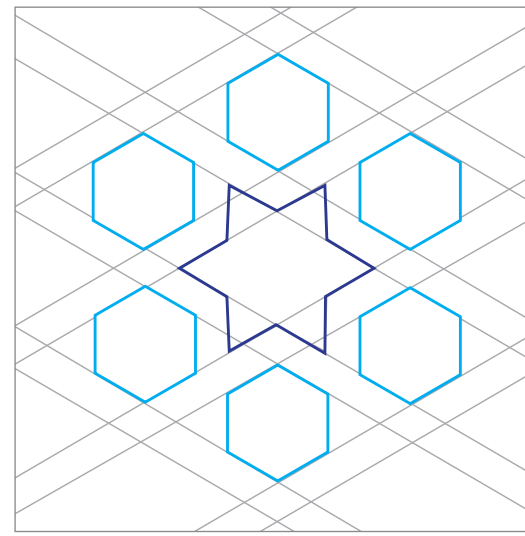


Figure 29:
Diagram of Figure 28.

Visual Art

- Figure 28 is a line drawing of the detail in Figure 26. Think of the design as being composed of three regions: the star and six hexagons, the thick diagonal lines, and the background. Make copies and try different colour combinations in all three regions. What is the effect of making the star and hexagons dark and the thick lines light? What is the effect of colouring the background in a light colour and the thick lines in a dark colour? Can you find a combination of three colours or lightness/darkness of a colour that you are happy with?
- Notice how the thick diagonal lines around the star and hexagons go over and under each other as threads do in woven cloth, or like ribs in a basket. Try drawing this effect yourself. How do you have to change the diagram in Figure 29?

Mathematics

- Grade 6: How many reflections, translations, and rotations can you find in the ceramic tile in Figure 26?
- Identify the angle of rotation. How would you turn the rotation into a reflection? Hint: look at the interlacements.

LEARNING FROM THREE-DIMENSIONAL OBJECTS 3

Figure 30:
Dish
Iznik, Turkey, 1560–85
Fritware, underglaze-painted
Diameter 29 cm
AKM867

The dish in Figure 30 has an international heritage: its distinctive style was developed during the Ottoman Empire and was called Iznik after the centre in Turkey where it was made, but the style makes use of two prior inventions. The opaque white glaze comes from 9th-century Iraq; it was invented to mimic the hard white clays of Chinese ceramics. The body of fritware clay was invented in the 11th century in Iran. It has a high percentage of glass that makes it easy to mould; once air-dried, it can be smoothed and polished. The decoration is international, as well; the blue-and-white palette and the cloudlike forms in the border are adapted from sought-after 14th-century Chinese vessels, but the addition of red in the glaze and tulips in the design make this dish unmistakably Iznik.

Did You Know?
Tulips were introduced into Europe from Turkey in the 16th century. Their introduction caused an interesting phenomenon known as "Tulipmania." It gripped Holland when tulip bulbs first arrived, causing intense trading and speculation. At first the market expanded in value, then it unexpectedly collapsed a century later when an outbreak of bubonic plague in Haarlem closed a tulip auction.

CURRICULUM EXPECTATIONS AND KEY UNDERSTANDINGS

VISUAL ART

OME Expectation	Key Understanding
Develop an understanding of the elements of design. Learn to use them in creative work. Develop an understanding of the principles of design, with a focus on emphasis (Grade 4), proportion (Grade 5), and balance (Grade 6). Learn to use them in creative work.	Developing Creativity, Communicating: Works of art communicate thoughts, feelings, and ideas, and an understanding of the elements and principles of design supports both the creation and analysis of works of art.

MATHEMATICS

OME Expectation	Key Understanding
Geometry and Spatial Sense: Identify and classify the symmetry operations of reflection (Grade 4), translation (Grade 5), and rotation (Grade 6).	Geometric objects have properties that allow them to be classified in a variety of ways.
Patterning and Algebra: Extend and create repeating two-dimensional patterns involving reflections (Grade 4), translations (Grade 5), and rotations (Grade 6).	The symmetry operations of reflection, translation, and rotation are the rules according to which patterns are constructed.

SCIENCE AND TECHNOLOGY

OME Expectation	Key Understanding
Earth and Space: Assess the social and environmental impacts of human uses of rocks and minerals (Grade 4).	The properties of rocks and minerals determine society's possible uses for them.
Matter and Energy: Demonstrate an understanding of changes of state and changes of matter by physical and chemical changes (Grade 5).	Chemical change implies the formation of a new substance.

CROSS-CURRICULAR CONNECTIONS

OME Expectation	Key Understanding
Visual Art and Mathematics: Develop an understanding of the ways artists combine the elements and principles of design with the mathematical principles of patterning and geometry to produce works of art.	An artist needs to use mathematical skills to make patterned works of art.

LEARNING THROUGH INQUIRY AND LEARNING BY DOING: PROMPTS AND ACTIVITIES

Science and Technology

- Understanding Matter and Energy: Properties and Changes in Matter (Grade 5): Investigate the dish in Figure 30 from the perspective of the state changes it has undergone in its making. How has the change from soft and wet to hard, dry, and impermeable made it useful for its particular tasks? Is the change a physical change or a chemical change? Explore vitrification (from solid to liquid to solid).

Mathematics

- Patterning and Algebra: First, identify the symmetry operations in the Iznik dish in Figure 30.

Figure 31:
The petals (left) have slight rotational symmetry (centre), the tulips have nine-point radial reflectional symmetry, and (right) the border has six-point translational symmetry.

Use the same motifs in Figure 31 to create your own design, but with a two-dimensional infinite repeat pattern as opposed to the two-dimensional finite (radial) pattern on the dish. You may change the colours if you wish.

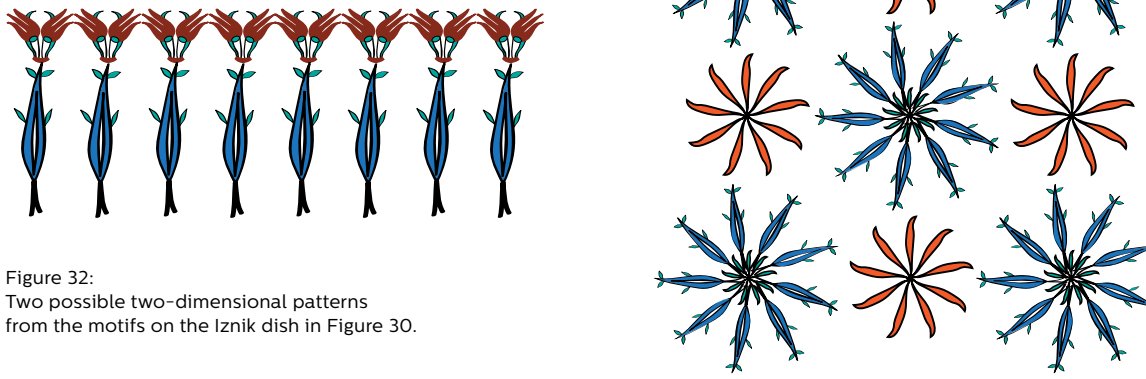


Figure 32:
Two possible two-dimensional patterns from the motifs on the Iznik dish in Figure 30.

LEARNING FROM PERFORMING ARTS

Figures 33a and 33b:
Leher (On the Tide),
Tehreema Mitha Dance Company.
Photographs by Aabvaan Barron.

Artistic Director Tehreema Mitha, originally from Pakistan, has been choreographing and performing dance professionally for more than 22 years. She brings a repertoire of more than 60 dances to the Tehreema Mitha Dance Company, a pioneering South Asian troupe based in the United States known for its signature presentations and unique style. The company's programs include dances from the classical repertoire, moving fluidly into the classical/contemporary, and onto contemporary dances. Mitha believes that seeing all three styles on the stage in the same evening shows the progression of a generation in sync with the world of today yet unwilling to leave its roots behind, forging ahead without losing its identity.

CURRICULUM EXPECTATIONS AND KEY UNDERSTANDINGS

DANCE, DRAMA, AND MUSIC

OME Expectation	Key Understanding
Extend an understanding of the elements of dance, with particular attention to time and energy (Grade 4), and relationship (Grade 5).	Developing Creativity: The elements of dance are used in a variety of ways to create dance compositions. Understanding Culture, Making Connections:
Demonstrate an awareness of musical forms and traditions across cultures.	People around the world create and perform dances and dramas and create and play music.

CROSS-CURRICULAR CONNECTIONS

OME Expectation	Key Understanding
Dance and Language: Demonstrate an understanding of the narrative and socio-cultural aspects of dance as an expressive art form.	Dance can communicate ideas, messages, feeling, and stories. Dance is often used to communicate social and cultural beliefs and traditions.

LEARNING THROUGH INQUIRY AND LEARNING BY DOING: PROMPTS AND ACTIVITIES

- Dance: What kinds of relationships do the dancers have with each other? What kinds of relationships do the dancers have with their performing space?
- Music: What kinds of percussive metres did you hear in the music? Try beating them out, then compare them to the metres in the music you listen to at home or with your friends.

LEARNING FROM PAINTINGS 1

Figure 34:
Qur'an
Copied by Isma'il b.
'Abdallah Makassar
Sulawesi Island, Indonesia
1804
Ink, opaque watercolour,
and gold on paper
Folio: 34.5 x 21.5 cm
AKM488

Figure 34a and 34b:
Details

The impressive copy of the Qur'an (the Muslim Holy Book) in Figure 34 survives in complete form, with all of its folios and binding intact. It is one of three Qur'ans in what is called the "Sulawesi geometric style," for its place of origin and its decorative scheme. Even more extraordinary, it mentions its exact place of production on the south peninsula of Sulawesi, one of the largest of the islands of Indonesia. It is a magnificent example of the localized artistic traditions in which Muslims chose to copy and decorate their sacred text. Although Islam reached the Indian Ocean and Southeast Asia as early as the 13th century, the earliest surviving manuscripts of the Qur'an from the region date to the 17th and 18th centuries.

Did You Know?
In the Qur'an manuscript of Figure 34, there are hundreds of flower medallions used at a full stop, but no two medallions are identical.

CURRICULUM EXPECTATIONS AND KEY UNDERSTANDINGS

VISUAL ART

OME Expectation	Key Understanding
Develop an understanding of the elements of design. Learn to use them in creative work.	Developing Creativity: Works of art are created with the elements of design as basic building blocks.
Develop an understanding of the principles of design, with a focus on unity and harmony (Grade 7) and movement (Grade 8). Learn to use them in creative work.	Developing Creativity: The principles of design are strategies to create works of art.
Understand the principle of perspective as it relates to the element of space and as a principle of design: one- and two-point perspective (Grade 7) and alternative systems for representing space such as layering of images (Grade 8).	Understanding Culture: There are different ways to portray depth and focus in painting. Muslim artists in the past have portrayed perspective differently than artists in Europe have done in landscape painting.

MATHEMATICS

OME Expectation	Key Understanding
Geometry and Spatial Sense: Apply transformations to create and analyze designs (Grades 7 and 8).	The symmetry operations of reflection, translation, and rotation are the rules according to which patterns are constructed.
Geometry and Spatial Sense: Develop an understanding of the difference between similarity and congruence (Grade 7).	Dilations create similar shapes, and symmetry operations create congruent (identical) shapes.
Geometry and Spatial Sense: Identify applications of geometric principles in the real world (Grade 8).	Artists use symmetry operations as tools to create art.

LEARNING THROUGH INQUIRY AND LEARNING BY DOING: PROMPTS AND ACTIVITIES

Visual Art

- Principles of Design: Unity and Harmony: How do you find the principles of unity and harmony represented in Figure 34a? Make your own coloured drawing or painting of a flower medallion inspired by this example, focusing on radial balance and harmony of colours.

Mathematics

- What kinds of symmetry operations are present in the medallion in Figure 34a? Design your medallion to exhibit each of the features shown in Figure 35.

Figure 35 (left to right):
Within the pink circle the motif does not exhibit any symmetry, within the blue circle the motifs exhibit horizontal and vertical reflection, and within the green circle the hooks exhibit rotational symmetry.

LEARNING FROM PAINTINGS 2

Figure 36:
Jahangir Hunting Lions
Agra, India, ca. 1610
Ink, opaque watercolour, and gold on paper
28.6 x 21.7 cm
AKM121

In his memoirs, the Moghul emperor Jahangir (reigned 1605–27) wrote: "Since I am naturally fond of hunting lions, as long as lion hunting is possible I don't bother with any other kind." And, indeed, the emperor himself is at the centre of the composition in Figure 36, sitting squarely astride an elephant.

The artist may have been in fact depicting an actual event recounted in the emperor's memoirs: in 1610, while out hunting with the emperor, the courtier Anup Rai was attacked by a lion and was only rescued after he had been severely injured. Jahangir dismounted from his horse to shoot at the lion, which was eventually killed. The painting does not illustrate an exact depiction of this event, but the artist has included other details from the anecdote: the servants who panicked and fled up a tree (at the top right of this composition); the attempt to shoot the lion with muskets (middle right); and the falconer who was the lion's first victim (bottom left).

Did You Know?
Lion hunting is an ancient symbol of kingship from the traditions of ancient Egypt, Assyria, and Greece. In ancient Greece, lion hunting was portrayed in Heracles's first labour. The lion hunt was used in Moghul India as a metaphor for kingly virtue, and its depiction in this painting may reflect that general theme.

CURRICULUM EXPECTATIONS AND KEY UNDERSTANDINGS

VISUAL ART

OME Expectation	Key Understanding
Develop an understanding of the elements of design. Learn to use them in creative work.	Developing Creativity: Works of art are created with the elements of design as basic building blocks.
Develop an understanding of the principles of design, with a focus on unity and harmony (Grade 7), and movement (Grade 8) Learn to use them in creative work.	Developing Creativity: The principles of design are strategies to create works of art.
Understand the principle of perspective as it relates to the element of space, and as a principle of design: one and two-point perspective (Grade 7), and alternative systems for representing space such as layering of images (Grade 8).	Understanding Culture: There are different ways to portray depth and focus in painting. Muslim artists in the past have portrayed perspective differently in Persian and Moghul painting than artists in Europe have done in landscape painting.

LANGUAGE

OME Expectation	Key Understanding
Media Literacy: Demonstrate an understanding of a variety of media texts (all grades).	A painting represents one or several points of view about what is portrayed.

SUPPORTING ENGLISH LANGUAGE LEARNERS

OME Expectation	Key Understanding
Oral Communication: Communicate orally about what you see using short words and phrases.	A painting can be described effectively using words, phrases, and sentences.
Writing: Organize information by copying words or using ready-printed word cards into a point-form report on a painting.	A written statement can describe what is happening in a painting.

LEARNING THROUGH INQUIRY AND LEARNING BY DOING: PROMPTS AND ACTIVITIES

Visual Art

- How has the artist used perspective in this painting? Colour in the greyscale version of Figure 36 in Figure 37 to show the different levels of images as different colours. Make the most important part of the painting a colour that stands out.
- How has the artist used the principle of movement in this painting? On your drawing, draw lines showing the direction of the movement. Where do the arrows point?

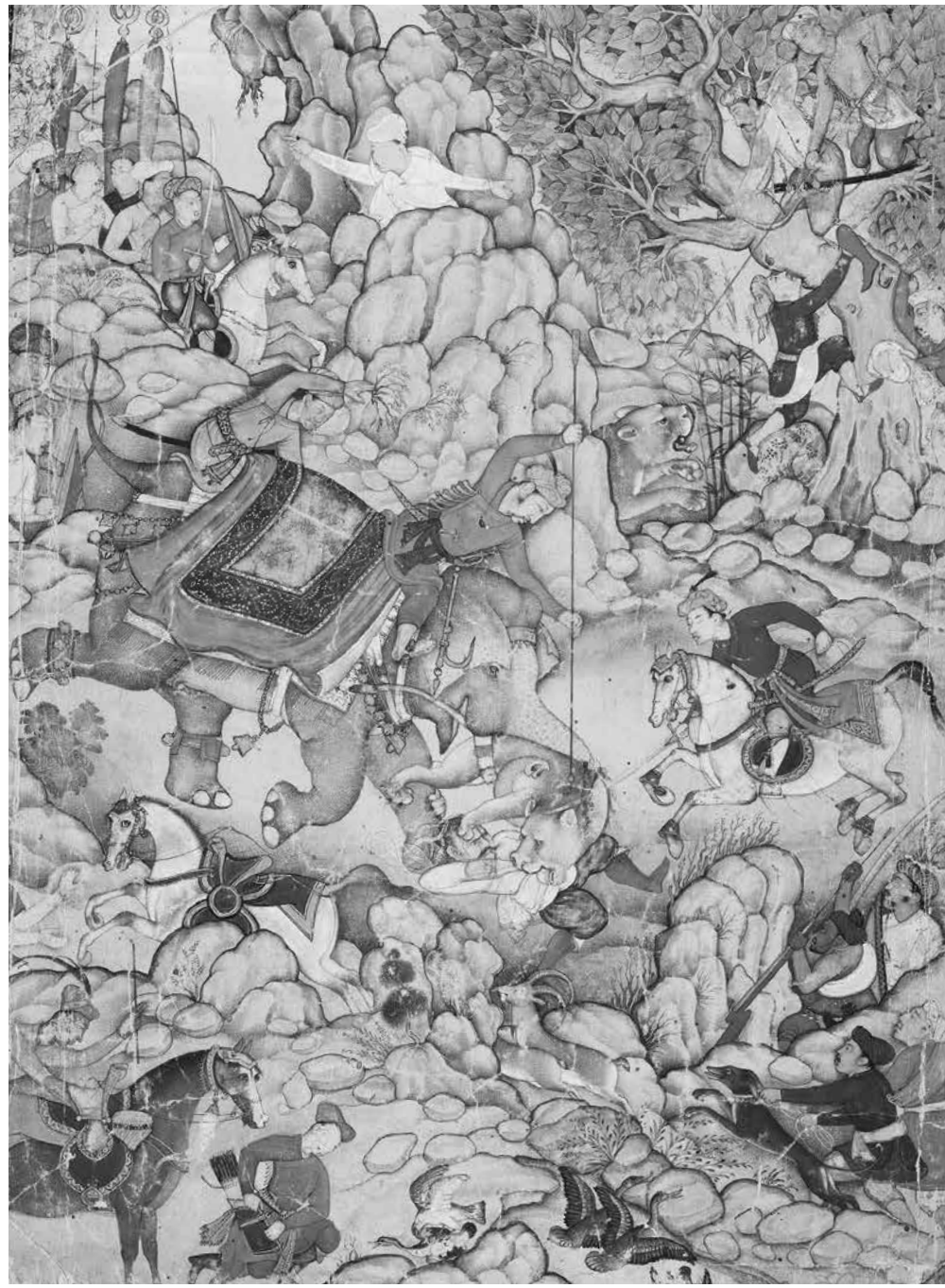


Figure 37:
Greyscale version of Figure 36.

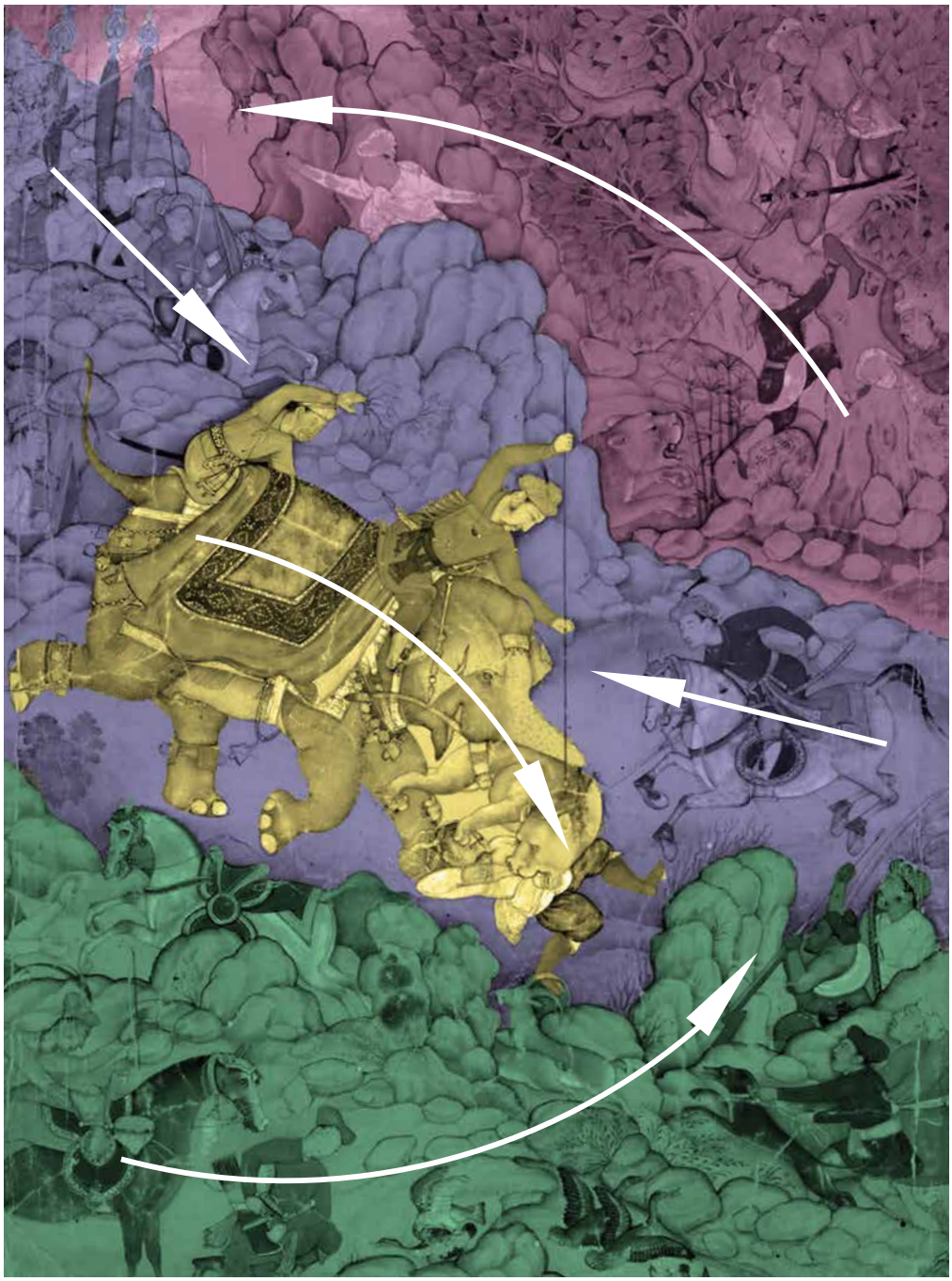


Figure 38:
Figure 37 with colours and arrows showing foreground and background as well as dynamics.

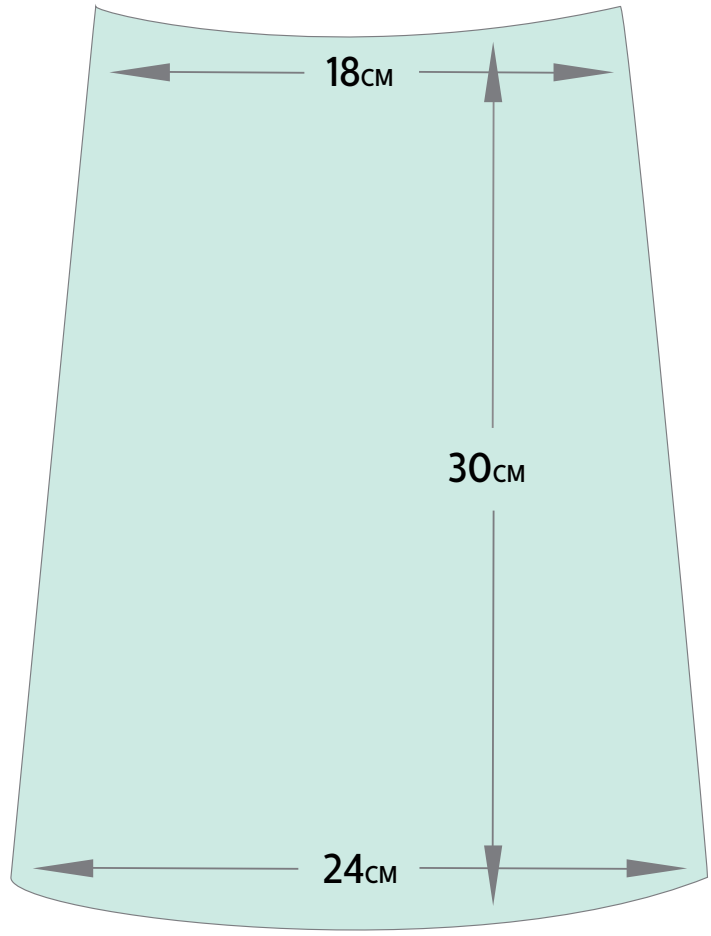
Language

- Create a story map for your version of this painting, considering setting, characters, rising and falling action, climax, and resolution.
- Write your own version of the story in this painting, constructing a main plot and at least two subplots, and relating all the plots to the others.

Supporting English Language Learners

- Complete this cloze activity focusing on nouns and verbs:
  Jahangir rode his ____ and plunged his spear into a ____who was ____ a man. The man's ran away while another man tried to ____ him. Prince Parviz rode his ____ in to join the rescue, ____ the ____ with a long ____. A man in the rocks ____ at some ____ while a group chased by a ____ try to climb a ____.

LEARNING FROM THREE-DIMENSIONAL OBJECTS 1



Figures 39a and 39b:
Candlestick
Iran, 16th century
Engraved brass
Height 43.2 cm
AKM614

The upper inscription on the candlestick (*sham'dan*) in Figure 39a may be translated, "Sometimes my heart burns with love for beloved ones, sometimes my heart bleeds; every moment my heart burns with a new mark, like the butterfly I am attracted to a candle; if I go close, I burn my wings." The inscription around the base may be translated: "In loyalty to your love I am known among the fair ones like the candle; I am the one who like a candle stays up at night where the wise ones dwell; the thread of my patience is cut with the scissors of your sorrow; I am burning in the fire of your love like the candle."

Artisans working for Timurid courtiers and princes (1370–1507) used poetry to adorn their work, and the traditions continued under the Safavid dynasty (1501–1722). The artisans almost certainly made this expensive and luxurious candlestick for a wealthy patron.

Did You Know?
A metalworker hammered this candlestick into shape from a sheet of brass, an alloy of copper and zinc. Then by engraving, removing some metal with a sharp chisel, he created intricate patterns on its surface.

CURRICULUM EXPECTATIONS AND KEY UNDERSTANDINGS

VISUAL ART

OME Expectation	Key Understanding
Develop an understanding of the elements of design. Learn to use them in creative work.	Developing Creativity: Works of art are created with the elements of design as basic building blocks.
Develop an understanding of the principles of design, with a focus on unity and harmony (Grade 7) and movement (Grade 8). Learn to use them in creative work.	Developing Creativity: The principles of design are strategies to create works of art.
Use a variety of materials, tools, techniques, and technologies to determine solutions to increasingly complex sculptural design challenges.	Developing Creativity: Choices of materials, tools, and strategies dramatically affect the completion of a work of art.

LANGUAGE

OME Expectation	Key Understanding
Media Literacy: Demonstrate an understanding of a variety of media texts (all grades).	Besides their decorative function, writing, images, or patterns on an object can carry considerable meaning through narrative or poetry.

MATHEMATICS

OME Expectation	Key Understanding
Geometry and Spatial Sense: Apply transformations to create and analyze designs (Grades 7 and 8).	The symmetry operations of reflection, translation, and rotation are the rules according to which patterns are constructed.
Geometry and Spatial Sense: Develop an understanding of the difference between similarity and congruence (Grade 7).	Dilatations create similar shapes and symmetry operations create congruent (identical) shapes.
Geometry and Spatial Sense: Identify applications of geometric principles in the real world (Grade 8).	Artists use symmetry operations as tools to create art.

SCIENCE AND TECHNOLOGY

OME Expectation	Key Understanding
Structures and Mechanisms: Form and Function (Grade 7): Demonstrate an understanding of the relationship between structural forms and the forces that act upon them.	The form of a structure is dependent on its function.
Matter and Energy: Pure Substances and Mixes (Grade 7): Investigate the properties and applications of pure substances and mixes.	Pure substances and mixes have an impact on society and the environment.
Matter and Energy: Heat in the Environment (Grade 8): Investigate ways in which heat changes substances, and describe how heat is transferred.	Heat is a source of energy that can be transformed and transferred. These processes can be explained by the particle theory of matter.

CROSS-CURRICULAR CONNECTIONS

OME Expectation	Key Understanding
Visual Art and Mathematics: Use geometric principles in a work of art to express unity and harmony (Grade 7).	An artist needs to use mathematical skills to make patterned works of art.
Visual Art, Mathematics, and Social Studies: Demonstrate an understanding of how to read and interpret signs and symbols from multiple perspectives (Grades 7 and 8).	The same signs and symbols can be interpreted from mathematical, artistic, and cultural perspectives.
Science and Mathematics: Structures and Mechanisms: Form and Function: Describe the role of symmetry in structures (Grade 7).	Symmetry is the same principle whether it is in mathematics, art, and architecture, or the human body.

LEARNING THROUGH INQUIRY AND LEARNING BY DOING: PROMPTS AND ACTIVITIES

Mathematics

- Analyze the designs on the candlestick in Figure 39a, listing the number and type of transformations and estimating the degree of dilation in the zigzags on the stem of the stand.

Visual Art

- Using the diagram in Figure 39b to guide you, make a drawing of a graduated cylinder and experiment with designs that cover it and meet smoothly when you fold the edges together.

Language

- Find a functional object in the classroom or your home and develop a short piece of imaginative writing in which you use the object as a metaphor for your feelings, as the poem on the candlestick in Figure 39a does, or your actions (e.g. "I am a flashlight that lights your way home.").

Visual Art, Mathematics, and Social Studies

- Using objects in the Aga Khan Museum's Permanent Collection as examples, investigate how calligraphy is employed in works of art. Focus on the visual effect of the calligraphy, geometric strategies the maker has used to fit it into spaces, and the significance in its specific use.

LEARNING FROM THREE-DIMENSIONAL OBJECTS 2

Figure 40:
Panel
Egypt, 15th century
Marble and stone mosaic
225 x 49 x 5 cm
AKM571

Typical of the decorative approach to stone, the triple-arched wall panel in Figure 40 uses the natural variety of stone colours to produce intricate polychrome compositions. Different stones and marble were cut according to the desired design, here forming a star-and-hexagon mosaic with knot-like interlace on the end spandrels. This panel would have decorated a reception room in a residential building in Egypt or Syria of the Mamluk period (1250–1517), where arched panels, similar to this one, separated the central hall with its gushing fountain from the two raised reception areas that flanked it.

Did You Know?
The patterns on the panel in Figure 40 are not painted on but composed of individual stone pieces meticulously cut to fit. To make the panel, artisans would have cut all the pieces from different coloured stones, laid out down all the stones in the desired pattern, poured plaster over them, let it harden, and raised the panel to its standing placement.

CURRICULUM EXPECTATIONS AND KEY UNDERSTANDINGS

MATHEMATICS

OME Expectation	Key Understanding
Geometry and Spatial Sense: Apply transformations to create and analyze designs (Grades 7 and 8).	The symmetry operations of reflection, translation, and rotation are the rules according to which patterns are constructed.
Geometry and Spatial Sense: Develop an understanding of the difference between similarity and congruence (Grade 7).	Dilations create similar shapes and symmetry operations create congruent (identical) shapes.
Geometry and Spatial Sense: Identify applications of geometric principles in the real world (Grade 8).	Artists use symmetry operations as tools to create art.

SCIENCE AND TECHNOLOGY

OME Expectation	Key Understanding
Structures and Mechanisms: Form and Function (Grade 7): Demonstrate an understanding of the relationship between structural forms and the forces that act upon them.	The form of a structure is dependent on its function.
Matter and Energy: Pure Substances and Mixes (Grade 7): Investigate the properties and applications of pure substances and mixes.	Pure substances and mixes have an impact on society and the environment.
Matter and Energy: Heat in the Environment (Grade 8): Investigate ways in which heat changes substances, and describe how heat is transferred.	Heat is a source of energy that can be transformed and transferred. These processes can be explained by the particle theory of matter.

LEARNING THROUGH INQUIRY AND LEARNING BY DOING: PROMPTS AND ACTIVITIES

Mathematics

- Geometry and Spatial Sense: The panel in Figure 40 is built entirely of geometric shapes. Identify, measure, and describe the properties of these shapes in mathematical language. Using mathematical tools, construct another set of geometric shapes that fits the panel exactly. See Figure 25a for a line diagram of the panel.

Visual Art

- Form and Function (Grade 7): Investigate the panel in Figure 40 and describe how it is constructed to support its arches. Using locking building blocks, such as LEGO, build an arch with these considerations in mind.

LEARNING FROM THREE-DIMENSIONAL OBJECTS 3

Figure 41:
Bowl
Iran, mid-18th century
Fritware, underglaze lustre-painted
Diameter 22.2 cm, height 9 cm
AKM697

The figure depicted on the bowl in Figure 41 may be Rostam, the hero of the *Shah-Nameh*, who also plays a role in the painting in Figure 16, or he may be Bahram Gur, another important *Shah-Nameh* character who appears in the painting in Figure 45. He pursues a fancifully drawn dragon around a central rosette while two sets of triangular mountain peaks appear behind the figures, setting the scene for the hunt. The artist has managed the difficult task of portraying an action scene in the round, complete with a mountainous background.

Did You Know?
Two styles of decoration in two different colours appear on this bowl, each one entirely unrelated to the other. Either one could be removed, leaving either a blue-and-white bowl decorated with floral and geometric patterns, or a brown-and-white bowl with a figural scene.

CURRICULUM EXPECTATIONS AND KEY UNDERSTANDINGS

VISUAL ART

OME Expectation	Key Understanding
Develop an understanding of the elements of design. Learn to use them in creative work.	Developing Creativity: Works of art are created with the elements of design as basic building blocks.
Develop an understanding of the principles of design, with a focus on unity and harmony (Grade 7) and movement (Grade 8). Learn to use them in creative work.	Developing Creativity: The principles of design are strategies to create works of art.
Use a variety of materials, tools, techniques, and technologies to determine solutions to increasingly complex sculptural design challenges.	Developing Creativity: Choices of materials, tools, and strategies dramatically affect the completion of a work of art.

LANGUAGE

OME Expectation	Key Understanding
Media Literacy: Demonstrate an understanding of a variety of media texts (all grades).	A painting on a ceramic bowl can tell a story.

MATHEMATICS

OME Expectation	Key Understanding
Geometry and Spatial Sense: Apply transformations to create and analyze designs (Grades 7 and 8).	The symmetry operations of reflection, translation, and rotation are the rules according to which patterns are constructed.
Geometry and Spatial Sense: Develop an understanding of the difference between similarity and congruence (Grade 7).	Dilatations create similar shapes and symmetry operations create congruent (identical) shapes.
Geometry and Spatial Sense: Identify applications of geometric principles in the real world (Grade 8).	Artists use symmetry operations as tools to create art.

SCIENCE AND TECHNOLOGY

OME Expectation	Key Understanding
Structures and Mechanisms: Form and Function (Grade 7): Demonstrate an understanding of the relationship between structural forms and the forces that act upon them.	The form of a structure is dependent on its function.
Matter and Energy: Pure Substances and Mixes (Grade 7): Investigate the properties and applications of pure substances and mixes.	Pure substances and mixes have an impact on society and the environment.
Matter and Energy: Heat in the Environment (Grade 8): Investigate ways in which heat changes substances, and describe how heat is transferred.	Heat is a source of energy that can be transformed and transferred. These processes can be explained by the particle theory of matter.

CROSS-CURRICULAR CONNECTIONS

OME Expectation	Key Understanding
Visual Art and Mathematics: Use geometric principles in a work of art to express unity and harmony (Grade 7).	An artist needs to use mathematical skills to make patterned works of art.
Visual Art, Mathematics, and Social Studies: Demonstrate an understanding of how to read and interpret signs and symbols from multiple perspectives (Grades 7 and 8).	The same signs and symbols can be interpreted from mathematical, artistic, and cultural perspectives.
Science and Mathematics: Structures and Mechanisms: Form and Function: Describe the role of symmetry in structures (Grade 7).	Symmetry is the same principle, whether it is in mathematics, art, and architecture, or the human body.

LEARNING THROUGH INQUIRY AND LEARNING BY DOING: PROMPTS AND ACTIVITIES

Visual Art

- What do you see first when you look at the bowl in Figure 41? Do you think it is the most important part of the design? How has the artist used unity and harmony, and/or movement, to create the composition?
- How has the artist used perspective in the treatment of the mountains? Do you think it is successful?
- How has the artist used layered images in the design? Do you think it is successful?

Language

- Describe the story in your own words and explain how the artist has incorporated landscape, plants, and the environment, as well as human and animal drama into the work.

Mathematics

- Geometry and Spatial Sense: Is there reflection, translation, and/or rotation in the composition? Using mathematical tools, create your own geometric designs showing each transformation.

Science and Technology

- Matter and Energy: Pure substances and mixes (Grade 7): Investigate the bowl in Figure 41 from the perspective of the mixes that comprise it. What would happen if the proportions were changed?
- Matter and Energy: Heat in the Environment (Grade 8): Research the firing process of pottery, using appropriate scientific vocabulary and inquiry.

LEARNING FROM PERFORMING ARTS

Figure 42:
Tambura
Northern India, ca. 1800
Teak wood, a calabash, metal, and bone
Length 126 cm
AKM700

The *tambura*, or tempura, is a long-necked stringed instrument made of light, hollow wood, with either a wooden or a gourd resonator. It is typically used in accompaniment, where it provides a drone pitch that comes from the flat bridge, called the *jawari*.

This *tambura* is from northern India. Similar examples from southern India often include representations of Hindu gods and use a different decorative vocabulary. The quality of the craftsmanship suggests that the *tambura* in Figure 42 may have been made as much as a decorative object as a musical instrument. It may also have been made for a woman; those made for men tend to be larger.

Did You Know?
A gourd like the one that makes the body of the instrument in Figure 42 is a giant seedpod that makes a perfect resonator when the seeds and flesh are removed and it is dried. Because of their resonating properties, gourds have been formed into musical instruments for much of human history.

CURRICULUM EXPECTATIONS AND KEY UNDERSTANDINGS

MUSIC

OME Expectation	Key Understanding
Communicating: Apply the critical analysis process to communicate feelings, ideas, and understandings in response to a variety of music and musical experiences (Grades 7 and 8).	A piece of music has meanings that can be expressed in language.
Understanding Culture: Demonstrate an understanding of a variety of musical genres and styles from the past and present, and their sociocultural and historical contexts (Grades 7 and 8).	Music is different in different places in the world, but it has the same elements and principles.

LEARNING THROUGH INQUIRY AND LEARNING BY DOING: PROMPTS AND ACTIVITIES

Music

- What kind of sound does the instrument in Figure 42 make? What are some of its variations? Investigate these questions and create a short video and sound piece to convey your findings.

Language and Music

- Express analytical and personal responses to a musical performance at the Aga Khan Museum through written work.

SECTION FOUR: LESSON PLANS

GRADES ONE TO THREE: A VISUAL ARTS COLLABORATIVE PROJECT

LESSON INTENT

- Students learn how to look closely at a painting from the Aga Khan Museum's Permanent Collection, to analyze its components, and then to use it as inspiration for their own large-scale collaborative mural.

LEARNING GOALS

- Make accurate observations about the elements and principles of design in a painting (Visual Arts).
- Explain how a painting can convey information about how people lived, held certain beliefs, and formed communities based on those beliefs, in the time of its making (Social Studies).
- Demonstrate an understanding of the capacity of a painting to tell a story (Language).
- Demonstrate the ability to use units of measurement to calculate length and to display the results in chart form (Mathematics).
- Demonstrate an understanding of the research process and how to use it by finding references to fish and wildlife in the Bay of Bengal and using them to identify fish in a painting (Science).

BACKGROUND INFORMATION FOR THE TEACHER: CREATING CONTEXT FOR THE LEARNING

Figure 43:
A Sea Serpent Swallows the Royal Fleet
Folio from a dispersed *Golshan-e 'Ishq*
(Rose Garden of Love) by Nusrati
Deccan, India, ca. 1670
Opaque watercolour and gold on paper
39.3 x 23.5 cm
AKM167

The disaster of a fleet swallowed by a giant sea serpent unfolds before the viewer's eyes: one boat is already in the maw of the monster, while two men futilely attempt to wound the creature with an axe and a bow and arrow. The rest of the fleet, and the prince, in the big ship in the centre, look on in horror. The outcome seems assured – the coils of the beast are wrapped around the boats, breaking masts and throwing men overboard. The sailors all raise their hands in prayer, as does the prince, who sits on a colourful fabric-covered throne.

The painting in Figure 43 has been identified as an illustration from the *Golshan-e 'Ishq*, a heroic epic written in 1657 by the poet Mian Nusrati for Sultan 'Ali II ibn Muhammad 'Adil Shahi (reigned 1656–72). Nusrati was the court poet and incorporated words in Persian, Arabic, and Marathi into his works, which were otherwise in the Urdu spoken in the Deccan region of India. The poem recounts the story of the Hindu Prince Manohar, drawing on characteristic romantic themes: travel through strange and foreign lands, danger from fantastic creatures, and journeys by sea. The last theme, which appears consistently in other Indian epics, may take its inspiration from the thriving trade between the people of the Deccan and those in Persian, Arab, and Ottoman lands.

The city of Bijapur was the seat of the Adil Shahis from 1489 until 1689, and this painting, like the poem it accompanies, shows the diversity of cultures and traditions that flourished in the region. While the Adil Shahis were great patrons, it is likely that this book was made for a wealthy nobleman sometime in the last quarter of the 17th century, just as the dynasty was absorbed into the Moghul Empire.

ONTARIO MINISTRY CURRICULUM CONNECTIONS, GRADES 1–3

THE ARTS: VISUAL ART

- Identify the elements of design.
- Identify contrast (Grade 1), repetition (patterns) (Grade 2), and variety (Grade 3) as three of the eight principles of design that are used with the elements of design to make art.
- Reflecting, responding, and analyzing: Apply the critical analysis process to communicate feelings, ideas, and understanding in response to a variety of works of art and art experiences.
- Exploring forms and cultural contexts: demonstrate an understanding of a variety of art forms, styles, and techniques from the past and present, and their social and/or community contexts.
- Demonstrate an understanding of composition, using principles of design to create narrative works of art or works of art on a theme or topic.

MATHEMATICS: MEASUREMENT, ATTRIBUTES, UNITS, AND MEASUREMENT SENSE (GRADE 1)

- Estimate, measure, and describe length, area, mass, capacity, time, and temperature, using non-standard units of the same size.
- Compare and order objects by their linear measurements, using the same non-standard unit.
- Describe, through investigation using concrete materials, the relationship between the size of a unit and the number of units needed to measure length.

MATHEMATICS: DATA MANAGEMENT AND PROBABILITY (GRADE 1)

- Collect and organize categorical primary data and display the data using concrete graphs and pictographs without regard to the order of labels on the horizontal axis.

SCIENCE: UNDERSTANDING LIFE SYSTEMS: NEEDS AND CHARACTERISTICS OF LIVING THINGS (GRADE 1)

- Demonstrate an understanding of the basic needs and characteristics of plants and animals, including humans.

SCIENCE: UNDERSTANDING BASIC CONCEPTS

- Identify the physical characteristics (e.g., size, shape, colour, common parts) of a variety of plants and animals (Grade 1).
- Describe ways in which living things, including humans, depend on air and water.

LANGUAGE: READING FOR MEANING

- Demonstrate understanding of a text by retelling the story or restating information from the text, including the main idea.
- Use stated and implied information and ideas in texts, initially with support and direction, to make simple inferences and reasonable predictions about them.

MATERIALS

- Overhead projector or data projector connected to a computer to project the image of *A Sea Serpent Swallows the Royal Fleet*.
- Disc, memory stick, overhead transparency with image of *A Sea Serpent Swallows the Royal Fleet*.
- A roll of white paper that is cut to size for the class collaborative mural. Alternative suggestions for the mural ground could be fabric paper or white canvas primed with gesso.
- Sketchbooks, journals.
- Pencils.
- White tissue paper cut in different sizes for drawing the fish, people, and ships.
- A class set of permanent Sharpie markers.
- A range of coloured permanent markers.
- Gel medium (matte) commercially available from art stores (also available in the TDSB Board Stock catalogue).
- Medium-sized paintbrushes for the application of the gel medium.
- Small detail paint brushes.
- Metallic permanent markers.
- A selection of index cards, blocks, measuring sticks, or string for students to choose from for the measuring activity.
- Plastic drop cloth to protect the floor.
- Aprons/art smocks for the students.
- Acrylic paint mixed with white. Red, yellow, blue, and white for the underpainting of the sea and sea serpent.
- Collage materials, e.g. patterned gift wrap, origami paper, sequins.
- Glue sticks.
- Images of fish found in the Bay of Bengal close to the Bijapur region of India: skipjack tuna, large skipjack, yellowfin tuna, eastern little tuna, frigate tuna, reef fish (students will be able to look closely at these images for their drawings of fish).

THE CREATIVE PROCESS

CHALLENGING/INSPIRING

Drawing the sea serpent using a projected traced image:

- The teacher projects an overhead transparency or projected digital image of *A Sea Serpent Swallows the Royal Fleet* onto a wall that has been covered with white paper taped together to become the mural backing for this large collaborative class project. (White gessoed canvas or fabric paper are alternative choices for this process.)
- The activities will be completed over a number of days, with students working in small groups to facilitate the process.
- The students all look critically at the painting and engage in a discussion of the many details they see. The teacher lists the students' observations and responses.

Teacher prompts:

- If you could give this painting your own title, what would you call it?
- Do you think this is a true story?

The discussion moves to a more focused discussion of the Visual Arts Elements of Design and the building of the students' visual vocabulary.

Teacher prompts:

- What is a focal point? Where do you think the focal point is in this painting?
- Colour: How has the artist used colour in the work?
- Contrast: What is big and what is small in this painting?
- Patterns: Find five different patterns in this painting. How many patterns can you find?
- Variety: Find five different kinds of fish in this painting. How many kinds of fish can you find?
- Look for strong contrasts in this painting (e.g. use of different lines, shapes, values, and colours to create interest [bright or light colour values, dark colour values]).

Using a science lens, students identify the physical characteristics of the sea serpent.

Teacher prompts:

- What is the sea serpent covered in?
- Why do you think sea serpents need this covering?

In small groups, students are invited up to the projected image to trace the contour of the sea serpent and then trace over the scales and fangs using thick black markers. Because the image is cut off in the original, students are encouraged to complete the outline of the sea serpent.

(Safety Note: During the enlarging process, students will probably need to stand on a low table to draw the image, so safety concerns must be a consideration during this phase of the work.)

The projector is switched off and the drawing of the sea serpent is revealed. The drawing is placed on the floor in readiness for devising a plan to calculate the measurement of the sea serpent.

(Please note that the focus is exclusively on the sea serpent drawing at this stage — the water, fish, mermaids, and mermen, as well as the interior details of fish, ships, sails, rigging, people, and all the rich patterning will be considered later.)

IMAGINING/GENERATING

Measuring the sea serpent:

- Students are encouraged to suggest different units of measurement and to decide on one that will be used to estimate the length of the sea serpent, i.e. straws, index cards, blocks, measuring sticks, string.

Teacher prompts:

- How big do you think this sea serpent is?
- If you unwound the sea snake and stretched it out to form a straight line, how many big ships would you be able to fit on the line?
- If you used the smaller ships, would there be more or fewer ships?
- How could we show this so others would understand your problem-solving?

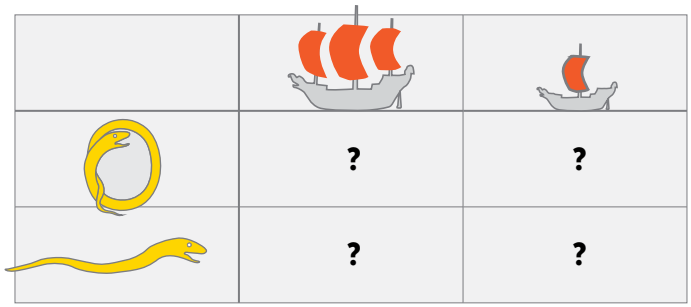


Figure 44:
A chart showing relative lengths of the sea serpent and the boats.

PLANNING/FOCUSING

In their groups, the students devise a problem-solving model by:

- Understanding the problem.
- Making a plan.
- Carrying out the plan.
- Looking back at the solution and communicating their findings.

Once the students have measured the sea serpent, they compare and order objects using the same non-standard unit (Note: The mathematical processes of problem-solving, reasoning and proving, reflecting, selecting tools and computational strategies, connecting, representing, and communicating, as well as finding enjoyment in a task, are all inherent in this activity).

EXPLORING/EXPERIMENTING

Looking closely at the painting for information:

- Revisiting the story and looking at the painting. Students decide on the fish and sea creatures they are going to create to populate the sea around the sea serpent. A discussion of the mermaids and mermen and all the interesting small details can happen at this point.
- For greater cultural relevancy, showing students images of fish that are found in the Bay of Bengal close to Bijapur, India, where this painting was created, and having photocopies of these for the students to look at closely to observe, shape, pattern, and details will heighten their perception as they begin to make preliminary drawings of the fish in their journals/sketchbooks.
- The students are going to create their own interpretations of the creatures, people, and the ships. Preliminary sketching in the student's sketchbooks/journals is encouraged. Students engage in a discussion about who the people in the boats are.

Teacher prompts:

- If this painting were painted today, what would the people be wearing?
- Students can draw directly on the mural or use the suggested tissue paper collage drawing method below.

PRODUCING PRELIMINARY WORK

Drawing the details, referencing *A Sea Serpent Swallows the Royal Fleet* painting, and also looking at photographs or photocopies of fish as stimulus, will enrich the quality of the drawings.

- After a number of preliminary drawings in the sketchbooks, the teacher gives the students pieces of precut white tissue paper in a range of sizes so the students know what scale they wish to use for each drawing. They are encouraged to "fill the page," to create good-sized drawings based on careful looking.
- Preliminary drawings can be done in pencil and then traced over with permanent markers for this drawing activity.

Teacher prompts:

- Only outline your drawings — you will be able to colour them later.
- Scale will be important in deciding the size of the ships that will be collaged onto the white paper that already has the outline of the sea serpent. Students decide in groups who will re-create the ships and what size they will be. (Note: The precut white tissue paper becomes an indicator to help with deciding on a relative scale.)
- The role of the teacher during this phase is to continue to ask questions, provide numerous varied learning opportunities, support the learning needs and experiences of the students, and give descriptive feedback and create opportunities for reflection and revision.

Once the students have created drawings of the people who will be on the ships, the ships and masts, the fish, mermaids, etc., it is time to place them on the large white paper to see how they can be arranged. Students sit around the paper as they contribute their pieces and discuss the placement of these drawings.

Teacher prompts:

- Do we have enough people, will all the drawings fit, and can we overlap some of them?
- Cut out these tissue paper drawings close to the outlines in readiness for them to be collaged onto the large paper.

REVISING AND REFINING

Painting the background in readiness for the collage:

- Prior to pasting the tissue paper outline drawings onto the white paper, a light background colour for the sea serpent and a colour for the water in the background are blocked in by the students, using acrylic paint. Acrylic paint can be thinned down for easier paint application. Larger brushes are recommended for blocking out these areas.
- The scales and patterning on the sea serpent can now be enriched with marker and metallic paint.

Collaging the drawings onto the mural

- Apply a thin layer of gel medium in a small area to the water and then assist the students as they carefully paste their fish, mermaids, and mermen onto the water. The tissue paper bonds with the gel medium and merges with the paint surface below so that the tissue paper almost disappears. (The teacher can seal the tissue paper with another layer of gel medium, since this is a delicate process if the tissue is still wet!)
- Have the students arrange the ships in the interior of the sea serpent and then add the people.
- The composition is now ready for details like the addition of flags, hats, weapons, and patterning, using paint, pattern from magazines, gift wrap, etc., to embellish the mural.
- Small paintbrushes, marker, and glue sticks will help facilitate this part of the collaboration.
- A gold border surrounds the original painting; discussions about a possible frame and how to measure and decorate it are expanded opportunities for this project.

PRESENTING/PERFORMING/SHARING

Promote student conversations about the part of the work of art they have enjoyed most.

- What was the most important part of learning for them?
- Have the students suggest how the story ends.

Teacher prompts:

- What happens after this scene you have created?
- Stimulate discussion on a range of scenarios and devise possible endings and resolutions to the story. Encourage collaborative sharing about the process the students have followed and discussion about where the work should be installed.

REFLECTING/EVALUATING

Students and teacher provide descriptive feedback. Further learning goals, success, opportunities, and next steps are suggested. The teacher evaluation is based on a body of evidence of learning collected over time.

SUCCESS CRITERIA AND ACHIEVEMENT CHART CATEGORIES

Achievement Chart Categories	Success criteria for assessment as learning (not for marks) to help students become more observant in making inferences from works of art	Rating Scale/ Comments
Knowledge and Understanding	How well did the student demonstrate an understanding of techniques from the past and present, and their social and/or community contexts? Did the student use his/her sketchbook/visual journal to create preliminary drawings using the photocopies of fish as stimulus? To what degree does the student understand how to estimate, measure, and describe length, using non-standard units of the same size?	1 2 3 4
Thinking	How well did the student demonstrate an understanding of techniques from the past and present, and their social and/or community contexts? Did the student use his/her sketchbook/visual journal to create preliminary drawings using the photocopies of fish as stimulus? To what degree does the student understand how to estimate, measure, and describe length, using non-standard units of the same size?	1 2 3 4
Communication	Was the student able to communicate ideas in a logical well thought out manner orally and in his/her work of art? Did the student participate in the discussion of the painting and reflect, respond, and apply the critical analysis process to communicate feelings, ideas, and understanding?	1 2 3 4
Application	Was the student able to communicate ideas in a logical well thought out manner orally and in his/her work of art? Did the student participate in the discussion of the painting and reflect, respond, and apply the critical analysis process to communicate feelings, ideas, and understanding?	1 2 3 4

GRADES FOUR TO SIX: A DRAMA PROJECT

LESSON INTENT

- Students learn how to look closely at a painting from the Aga Khan Museum's Permanent Collection, to analyze its components, and to use it as inspiration for dramatic role play and collaborative dioramas of the scene in the painting.

LEARNING GOALS

- Make accurate observations about the elements and principles of design in a painting (Visual Arts).
- Explain how a painting can convey information about how people lived, held certain beliefs, and formed communities based on those beliefs, in the time of its making (Social Studies).
- Demonstrate an understanding of the capacity of a painting to tell a story (Language).
- Demonstrate an understanding of the elements of drama and how to use them by creating a dramatic interpretation of the painting (Drama).

BACKGROUND INFORMATION FOR THE TEACHER: CREATING CONTEXT FOR THE LEARNING

Figure 45:
Bahram Gur at the House of Mahyar the Jeweller
Folio from a dispersed *Shah-Nameh* (Book of Kings)
Iran or Iraq, ca. 1300
Opaque watercolour, ink, and gold on paper
24 x 19.2 cm
AKM16

Bahram Gur, one of the great hero-kings of the Iranian national epic, the *Shah-Nameh*, and a notable heartbreaker, stayed incognito during a visit to the house of a jeweller. Unaware of his guest's true identity, the jeweller refreshed the well-dressed stranger with a beverage and called for his daughter, Arzu, to play her harp for him. Bahram Gur's beauty and noble bearing caused the girl to fall hopelessly in love with him, and in her song she compared the stranger favourably with Shah Bahram Gur, to his great but secret delight.

While the simple brick construction of the interior depicted in the painting in Figure 45 is unremarkable, the painter has taken an obvious enjoyment in the depiction of the rich textiles that decorate the jeweller's house. Hanging panels at left and right serve as doors or room dividers, while a larger piece of striped cloth has been tied up in a swag at the top of the picture frame. Bahram Gur himself, as befits an honoured guest, sits against cushions while holding a goblet.

GOLD IN THE MEDIEVAL WORLD

Gold is a chemical element with the symbol Au. It has been a highly sought after precious metal for coinage, jewellery, and other arts since the beginning of recorded history. Gold has served as a symbol of wealth and a store of value throughout history, and gold standards have provided a basis for monetary policies. The ancient and medieval science of alchemy aimed to create gold by chemical transformations of base materials. It was not until 1941 that this was achieved, not by a chemical but by a nuclear reaction.[1] During the medieval period, jewellery was worn by men and women for its beauty as well as to signify wealth and rank. Gold was used to decorate architecture, works of art, books, religious artifacts, and other objects.

The webpage "History of Gold in Civilizations – An Overview" charts how during the Early Medieval European period, when the Romans withdrew from Northern and Western Europe under attack from various warlike tribes, Roman gold-working styles that had stretched right across the then known world disappeared. In their place came the gold jewellery of the Saxons, Merovingians, Franks, and others.

In the 8th century and later, gold-working skills of the highest quality were re-established, from the amazing wire and granulation work of Fatimid Islamic work to the enamelled gold of Western Europe. Gold was the main trading commodity in the Islamic world; mines from Africa to Afghanistan were exploited and even ancient Egyptian tombs were deliberately plundered.[2]

In *Eastern Islamic Lands*, Richard Ettinghausen, Oleg Grabar, and Marilyn Jenkins refer to the vogue for filigree jewellery during the Medieval Islamic period: "The major decorative technique for jewellery in the Medieval Islamic period was filigree. Bracelets, rings earrings, necklace elements, hair, and headdress ornaments and pendants are known, as are amulet cases. The vogue in the eleventh century for such ornaments is corroborated by the drawings in the early copy of al-Sufi's *Book of Fixed Stars*."[3] (See Figure 47).

Figure 46:
Bead
Egypt or Syria, 11th century
Gold filigree
Length 7.2 cm, height 2.9 cm
AKM618

Figure 47:
Sagittarius
Folio 102v from a Kitab
Suwar al-Kawakib al-Thabita
(Images of the Fixed Stars)
by ʻAbd al-Rahman al-Sufi (d. 986)
Isfahan, Iran, 1640s–1650s
Ink, opaque watercolour,
and gold on paper
Folio: 31.4 x 18.3 cm
AKM266

ONTARIO MINISTRY CURRICULUM CONNECTIONS GRADES 4–6

THE ARTS: VISUAL ART

- Create two- and three-dimensional works of art that express feelings and ideas inspired by their interests and experiences.
- Use a variety of materials, tools, and techniques to determine solutions to design challenges.
- Interpret a variety of works of art and identify the feelings, issues, themes, and social concerns that they convey.

THE ARTS: DRAMA

- Creating and presenting: Engage actively in drama exploration and role play, with a focus on exploring drama structures, key ideas, and pivotal moments in their own stories and stories from diverse communities, times, and places (e.g. use role play to explore the hierarchical structure of medieval society; use "inner and outer circle" to examine moments of conflict and power imbalance in group improvisations on a common theme).

THE ARTS: DANCE AND LANGUAGE

- Demonstrate an understanding of how the language of dance can express ideas and sociocultural beliefs.

LANGUAGE: MEDIA LITERACY

- Demonstrate an understanding of a variety of media texts.

SOCIAL STUDIES

- Compare social organization (e.g. social classes, general political structure, inherited privilege, the status of women).
- Compare aspects of the daily lives of different groups in an early society and explain how differences were related to the social organization of that society.
- Demonstrate the ability to extract information on daily life in early societies from visual evidence.

MATERIALS FOR CREATING THE DIORAMA

- Overhead projector or data projector connected to a computer to project the image of *Bahram Gur at the House of Mahyar the Jeweller*.
- Shoeboxes for creating individual dioramas, or a few larger boxes if students are going to work collaboratively in small groups.
- Popsicle sticks and tongue depressors to be used as armatures for building the cast of characters.
- Fimo, plasticine, or modelling clay for faces, features, and hands.
- Medium- and small-sized paintbrushes for larger and smaller details.
- Gold paint.
- Metallic permanent markers.
- Acrylic paint (Red, yellow, blue, and white).
- Mixing trays.
- A variety of collage materials.
- Glue guns and glue sticks.
- Fabric paper to create the rich swags of drapery in the painting.
- Fabric pieces for clothing, drapery, etc.
- Small feathers, scraps of leather.
- Cardboard.
- Wallpaper.
- String.
- Scissors.
- Markers.

THE CREATIVE PROCESS

CHALLENGING/INSPIRING

Looking for clues in the painting:

- A close study of *Bahram Gur at the House of Mahyar the Jeweller* will provide opportunities for students to explore issues of culture and diverse identities. Students will be able to draw inferences and implied messages and construct meaning about the image. (A description of the painting at the beginning of this lesson plan will be useful for providing context and background information about the group of people assembled in the jeweller's house.)
- Some background about gold in earlier times will begin a discussion about decoration, wealth, and personal adornment.

Teacher prompts:

- Why do you think personal adornment was so important in earlier times?
- Who wore the jewellery?
- Where else might you find precious stones being used decoratively?
- Where do you think the gold came from? How was it brought from place to pace?

Issues of class, social standing, and hierarchy are clear in the painting.

Teacher prompt:

- What do you notice about the hierarchical structure in this painting and the types of people in it (e.g. servants, artisans, royalty, and the jeweller's daughter)? Look carefully at the clothing, e.g. the owl-feathered hats worn by the attendants are typical Mongol costume, which indicates that these men have come from afar to work in the home of Mahyar the jeweller.
  They are also wearing large, square, Chinese-style rank badges on the front of their clothing.

  Note: Critical thinking skills include the ability to identify perspectives, values, and issues; detect bias; and read for implicit as well as explicit meaning. In the context of anti-discrimination, critical literacy involves asking questions and challenging the status quo, and leads students to look at issues of power and justice in society (Ontario Curriculum, Grades 1–8 Language, page 28).

PLANNING/FOCUSING

Describing the setting:

- Students describe the setting where the action is taking place. The house, with its richly patterned swags of drapery, is a stage setting for the action that will follow. An extension here would be create a diorama of the scene in a box with the actors as small rod puppets to scale that are anchored to the floor through slits in the stage. This facilitates movement into and out of the scene. The suggested list of materials and textures can be used to create the background for the action onstage and the decoration of the small rod puppets.

EXPLORING/EXPERIMENTING

Students in Grades 4 continue to focus on role play as the foundational component of learning in drama. Process drama, small-group improvisations, partner role play, independent writing in role, and interpretation of simple scripts allow students to develop their ability to maintain focus and sustain belief while they are in a role. Students also learn to enhance their roles and build belief in the fictional context of the drama by using the elements of relationship, time and place, tension, focus, and emphasis in their work.[4]

Using the elements of drama to create dramatic role play:

- Students and teacher begin to use the Elements of Drama to create a dramatic role play about the incognito visit of Bahram Gur to the house of Mahyar the jeweller. There are eight characters in the painting.
- Divide the class into groups of eight so that each person has a role in the scene. Refer to the painting description for a better understanding of who the protagonists are.

Teacher and students develop the scene using the following principles of drama:

- Role/character: considering in-depth the inner and outer life in developing a character; differentiating between authentic characters and stereotypes; using gestures and movement to convey character.
- Relationship: analyzing and portraying how relationships influence character development/change.
- Time and place: establishing a clear setting; sustaining belief in the fictional setting.
- Tension: using sound, light, technology, and stage effects to heighten tension/suspense.
- Focus and emphasis: using drama conventions to reveal or communicate key emotions, motivations, perspectives, and ideas to the audience.

PRODUCING PRELIMINARY WORK

Point of view:

- What do the students understand about point of view?

Students will use a variety of drama and movement strategies as springboards to a fuller understanding of the image:

- Drama Strategy, "ROLE ON THE WALL": On chart paper or the smartboard, the teacher draws an outline of a figure (e.g. the jeweller Mahyar). This can be done with all the characters in the story. Students are invited to write words on the inside of the outline that describe what they imagine to be the figure's values, characteristics, and feelings. On the outside of the figure, have the students write down words or phrases that describe the jeweller as they believe others see him.
- Drama Strategy, "TABLEAU": A tableau is a frozen picture (like a photograph) that clearly expresses and communicates a thought, feeling, idea, or situation. In role, the frozen statues in the tableau will come alive and introduce themselves to the audience and describe their inner and outer voice: the person they represent to the outside world and the person they are inside. This self-identification is important because some of the characters are misrepresenting themselves, while others are in roles that define their status, and they may have aspirations and dreams that they cannot share.

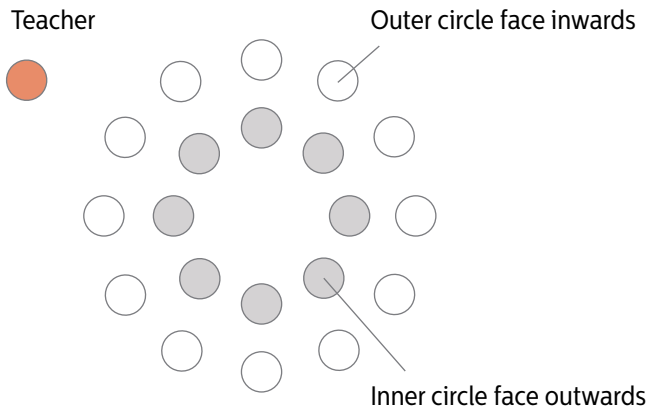


Figure 48:
Diagram of the inner and outer circle exercise.

- Drama Strategy, "INNER AND OUTER CIRCLE": A convention used for ensemble sharing of contrasting perspectives related to a drama. Students gather in two circles: an inner circle representing one character in the drama (e.g. Bahram Gur) and an outer circle representing a second character (e.g. the jeweller's beautiful daughter, Arzu). In role, students as characters describe their reactions and state of mind at a particular point in the drama. Out of role, students share personal reflections with one another as they are given prompts. Students may speak spontaneously or read from a short passage. Typically, the teacher orchestrates the sharing (e.g. by tapping a student on the shoulder when it is that student's turn to speak) so that the contrasting points of view are highlighted for dramatic effect.

PRESENTING/PERFORMING/SHARING

- Drama Strategy, "MINI SCENES": The story in the picture is a static one that gives us a glimpse of a moment in time. In their groups, the students now have an opportunity to begin to explore dramatically how they think the story resolves itself. For example:
  - Is Bahram Gur's true identity revealed? How does this happen? Are any of the minor characters involved in this revelation?
  - Why have the two men in the owl-feathered hats come from afar? What is their role here?
  - Why was the jeweller tricked? How does he respond?
  - What is happening in Arzu's life 10 years later? Does she still play the harp?
- Have the students share these mini-scenes. Each scene needs to have an introduction or prologue to explain the action the audience will experience.

REFLECTING/EVALUATING

Students and teacher provide descriptive feedback. Further learning goals, directions, opportunities, and next steps are suggested. The teacher evaluation is on the basis of a body of evidence of learning collected over time.

SUCCESS CRITERIA AND ACHIEVEMENT CHART CATEGORIES

Achievement Chart Categories	Success criteria for assessment as learning (not for marks) to help students become more observant in making inferences from works of art	Rating Scale/ Comments
Knowledge and Understanding	What insights have the students gained from reflecting on the painting? Are they able to make inferences and construct meaning from their observations and research?	1 2 3 4
Thinking	Were students able to make connections to the image in terms of the hierarchical structure in this painting and the types of people from their prior knowledge of the feudal system?	1 2 3 4
Communication	Have students been able to make connections from the painting to the use of gold in different contexts in medieval times? How have they related to gold in the context of works of art that they have seen in the Aga Khan Museum?	1 2 3 4
Application	Were the students able to create a dramatic interpretation of the story of *Bahram Gur at the House of Mahyar the Jeweller* based on their own interpretation of the painting and the added insights from the Museum documentation, using a variety of drama and movement strategies? Do the small dioramas give an impression of small stage sets? How have the students used the Elements of Design and the Principle of Emphasis in their work?	1 2 3 4

GRADES SIX TO EIGHT: A PROJECT COMBINING SCIENCE AND ART

LESSON INTENT

- Students learn how to look closely at a fountain as both a work of art and a functional structure and then use principles of art, as well as those of science, technology, engineering, and mathematics (STEM), to make a small working model of a fountain.

LEARNING GOALS

- Make accurate observations about the elements and principles of design in a three-dimensional work of art (Visual Arts).
- Make accurate observations about the way the patterned tiles and tesserae are arranged according to the principles of symmetry, and how this bears upon the structure of the fountain (Mathematics, Science).
- Demonstrate an ability to create a scaled model by using pattern blocks, grid paper, or dynamic geometry software to create a model of a simple fountain (Mathematics).
- Demonstrate an ability to create a working model of a fountain using problem-solving skills (Science).
- Show how geography can determine technological innovation by researching the history of water use in arid lands (Social Studies, Science).

BACKGROUND INFORMATION FOR THE TEACHER: CREATING CONTEXT FOR THE LEARNING

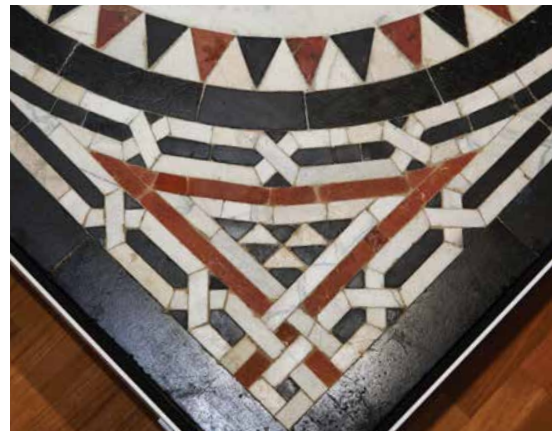


Figure 49:
Fountain
Egypt, 15th century and later
Marble and sandstone mosaic
430 x 430 cm
AKM960

The fountain in Figure 49 is said to have come from a palace in Cairo, dating from near the end of the 15th century. Indeed, most of the palatial residences of the Mamluk period have disappeared entirely, and the origin of the present fountain is not known. This type of fountain was usually incorporated into a domestic interior; the sound of falling water from its multiple jets would create a comfortable atmosphere of soothing calm.

BACKGROUND TO HYDRAULIC MACHINES

Islamic engineers were active in the construction and development of hydraulic machines for water raising and power supply throughout the medieval period and beyond. Similar activity took place in Europe, India, and East Asia.[5]

Adequate supplies of water are necessary to sustain life. In the part of the world where the fountain in Figure 49 was made, and in many other regions with Muslim populations, water is a precious and scarce resource. Engineers worked from very early times to manage supplies of water and invented a variety of water-raising machines. The *shaduf* was an early invention; it is a simple machine consisting of a long pole pivoted on a fulcrum with a bucket on one end and a counterweight on the other. The *shaduf* has been in continuous use since ancient Egyptian times.

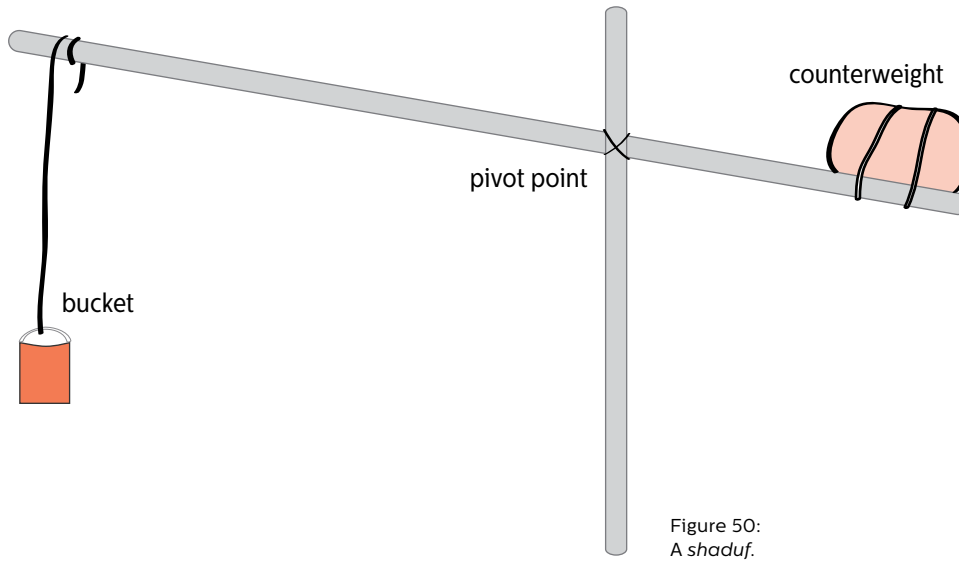


Figure 50:
A *shaduf*.

Two other complex machines are in use based on water wheels: the *saqiya*, the action of which is driven by an animal, and the *noria*, which relies on fast-flowing water that can drive the wheels.

BACKGROUND TO FOUNTAINS

Fountains with many jets, like the one in Figure 49, were fed by gravity, by hydraulic machines, or by underground tunnels known as *qanats*, which took water from an aquifer to the place where the water was needed. The *qanat* system is still in use in Iran and parts of Arabia and Central Asia today.

Kitab al-Hiyal al-nafi'ah (The Book of Knowledge of Ingenious Mechanical Devices) by Ibn al-Razzaz al-Jazari was written in 1206. For the period from ancient times until the Renaissance, it has been called the most important document on machines to come from any cultural area.[6] In it, al-Jazari describes the operation of various clocks, water-raising machines, bloodletting devices (see Figure 20), and fountains. The diagram in Figure 51 shows the operation of a fountain with automatically changing jets.

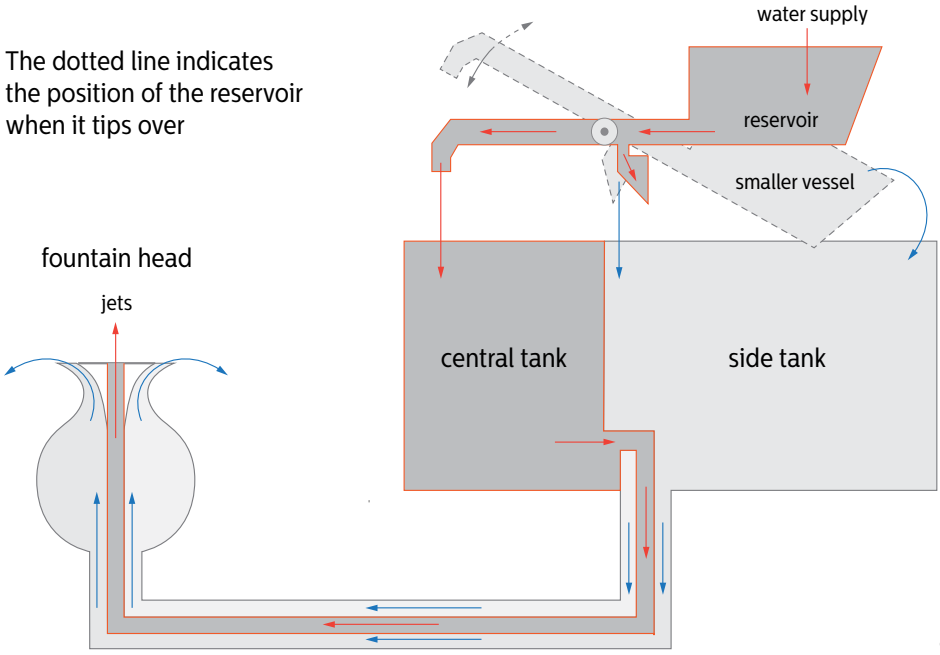


Figure 51:
Diagram of the operation of a fountain.

The water supply flows into a reservoir that is mounted at a pivot point. The central tank fills and water shoots up through the central jet. Meanwhile, a small amount of water trickles down into a smaller vessel. When the smaller vessel is full, its weight pivots the reservoir backward and water flows into the side tank. Thus, the central tank empties and water flows from the side tank and up through the side jets. The central jet produces a shape of water called a spear; the side jets produce a shape called a lily, or a shield. What kind of water shape do you think was produced by the fountain in Figure 49?

ONTARIO MINISTRY CURRICULUM CONNECTIONS, GRADES 7–8

VISUAL ARTS

- Creating and presenting: Use a variety of materials, tools, techniques, and technologies to determine solutions to increasingly complex design challenges (Grades 7 and 8).
- Reflecting, responding, and analyzing: Apply the critical analysis process to communicate feelings, ideas, and understandings in response to a variety of works of art and art experiences (Grades 7 and 8).
- Exploring forms and cultural contexts: Identify and describe some of the ways in which visual art forms and styles reflect the beliefs and traditions of a variety of cultures and civilizations (Grade 7).
- Identify and explain some of the ways in which artistic traditions in a variety of times and places have been maintained, adapted, or appropriated (Grade 8).

MATHEMATICS

- Geometry and spatial sense, geometric relationships: Distinguish between and compare similar shapes and congruent shapes, using a variety of tools (e.g. pattern blocks, grid paper, dynamic geometry software) and strategies (e.g. by showing that dilations create similar shapes and that translations, rotations, and reflections generate congruent shapes) (Grade 7).
- Demonstrate an understanding of the geometric properties of quadrilaterals and circles and the applications of geometric properties in the real world.
- Develop geometric relationships involving lines, triangles, and polyhedra, and solve problems involving lines and triangles (Grade 8).
- Geometry and spatial sense, location and movement: Determine, through investigation using a variety of tools (e.g. pattern blocks, polydrons, grid paper, tiling software, dynamic geometry software, concrete materials), polygons or combinations of polygons that tile a plane, and describe the transformation(s) involved (Grade 7).

SCIENCE

- Investigate a working system and the ways in which components of the system contribute to its desired function (Grade 8).
- Relating science and technology to society and the environment: Investigate a working system and the ways in which components of the system contribute to its desired function.
- Use technological problem-solving skills to investigate a system (e.g. an optical system, a mechanical system, an electrical system) that performs a function or meets a need.
- Use appropriate science and technology vocabulary, including mechanical advantage, input, output, friction, gravity, forces, and efficiency, in oral and written communication.
- Understanding earth and space systems, water systems: Use technological problem-solving skills to design, build, and test a water system device that performs a practical function or meets a need.

SOCIAL STUDIES

- Geography: The themes of geographic inquiry: Explain the geographic concept of location/place (e.g. “location” means where a place is and where it is relative to other places; “place” is defined by unique physical and human characteristics).

THE CREATIVE PROCESS

CHALLENGING/INSPIRING

- The focus of this unit is the central role of water in the arid lands of the Islamic world, how fountains were constructed, and where the water came from. The surface decoration of the fountains and the exquisite mosaic designs are other important aspects of this work.
- Students will look closely at the structure of the fountain in Figure 49 and describe how the patterned pieces are arranged according to the principles of symmetry, and how this bears upon its structure. Students will describe the interlocking geometric shapes of the black, white, and blood-red tesserae and then draw a plan of the architectural design of the fountain. Students will identify the shapes they observe, e.g. polygons, hexagonal shapes, etc.

PLANNING/FOCUSING

- The students have had the opportunity to visit the Aga Khan Museum and look carefully at the placement of the fountain. The fountain itself gives students an opportunity to bring an interdisciplinary lens to the appreciation of the structure. Mathematically, structurally, visually, and geographically it makes connections to culture, civilization, innovation, decoration, aesthetics, and structure.
- Back in the classroom, students can project images of the fountain as they begin to deconstruct the patterns in terms of the geometric relationships involving lines, triangles, and polyhedra.
- Using pattern blocks, grid paper, or dynamic geometry software, the students work in small groups to recreate a scale drawing of the fountain.
- A prompt about the mechanics of how the fountain operated can become the catalyst for the students in their group to devise a system for how the fountain worked in Islamic times and how it would work today, with recent technological advances.

EXPLORING/EXPERIMENTING

- During this phase of the process, students are working across disciplines as they research, experiment with ideas, and begin to formulate proposals for the architectural drawings and structural design.

PRODUCING PRELIMINARY WORK

- Students decide on the scale ratio that they will be working with as they begin to build their prototypes.
- During the collaborations, students define their roles and responsibilities so that they have distinct areas of focus and ownership for tasks throughout the process.
- Process work that documents each stage is an important indicator of progress and documentation.
- Detailed instructions for making a Heron's Fountain using common materials are available on many websites, including Wikipedia; the students can gather materials and work in small groups to make one out of plastic bottles and tubing.

HOW TO MAKE A HERON'S FOUNTAIN

Gather three plastic bottles with tops. Cut one in thirds and use the top third as bottle A. Bottle A is open to the air. Attach it with a tight seal (Plasticine works well) to an inverted second bottle, B, in which you have cut a hole. Fill bottle B with water and attach to bottle C with a tight seal. Run one pipe (green pipe) from bottle A to bottle C. Run another pipe from bottle C to bottle B (blue pipe) with its top above bottle B's water level. Run a third pipe from bottle B to bottle A (red pipe). Fill bottle A with water. The water will run into bottle C, then into bottle B, and then will make a fountain out of the orange pipe in bottle A.

Why does this work? Gravity causes the water to flow from A to C. Displacement of the air in C forces the water up into B, and from there into A.

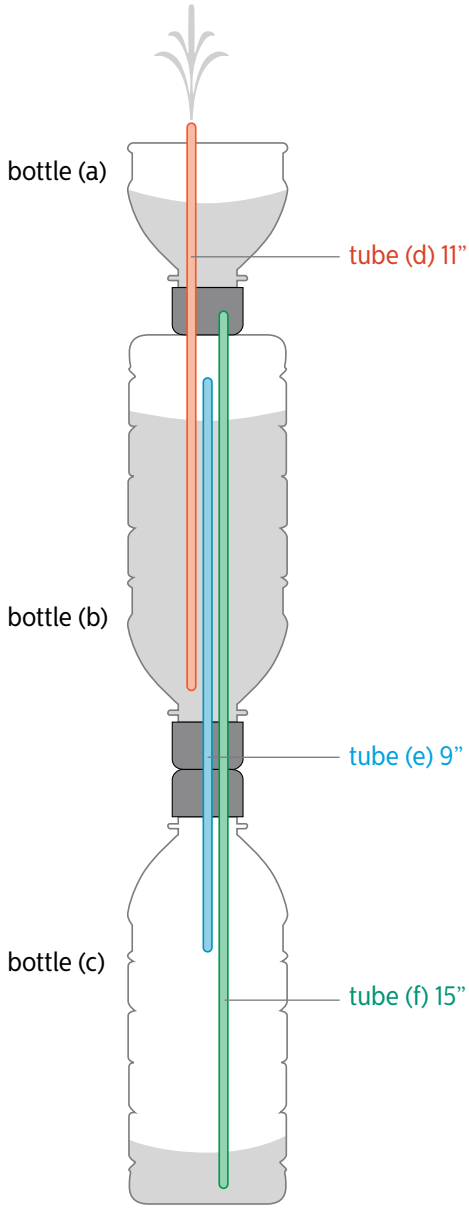


Figure 52:
Diagram of a Heron’s Fountain.

PRESENTING/PERFORMING/SHARING

- During the presenting and sharing, the students will be able to talk about their problem-solving and the Scientific Inquiry/Research Skill Continuum they have explored. (See page 15 in the Ontario Curriculum Grades 1–8, Science and Technology.)
- Research includes both primary research, which is done through first-hand, direct observation of objects and processes, and secondary research, which is done by reviewing the work and the findings of others.

REFLECTING/EVALUATING

Students and teacher provide descriptive feedback. Further learning goals, directions, opportunities and next steps are suggested. The teacher evaluation is on the basis of a body of evidence of learning collected over time.

SUCCESS CRITERIA AND ACHIEVEMENT CHART CATEGORIES

Achievement Chart Categories	Success criteria for assessment as learning (not for marks) to help students become more observant in making inferences from works of art	Rating Scale/ Comments
Knowledge and Understanding	What insights have the students gained from reflecting on the architectural structure of the fountain? Are they able to bring an interdisciplinary lens to their problem-solving by accessing knowledge from a variety of sources?	1 2 3 4
Thinking	Have the students been thoughtful in devising a working system for their model of a fountain?	1 2 3 4
Communication	Have the students been able to use a variety of documentation to describe the problem and how they solved it?	1 2 3 4
Application	To what degree have students been successful in initiating, planning, and exploring technological problem-solving skills to design, build, and test a water system device that performs a practical function or meets a need?	1 2 3 4

GRADE FOUR: A SOCIAL STUDIES FOCUS ON CLOTHING AND OBJECTS IN PAINTINGS

HERITAGE AND IDENTITY: EARLY SOCIETIES, 3000 BCE–1500 CE

- Guiding Questions: What are the most significant differences between Canadian society and societies of the past? In what ways did the environment influence clothing in early societies?

LESSON INTENT

- Students look at selected paintings from the Aga Khan Museum's Permanent Collection to analyze and compare clothing and objects from two different parts of the world — Egypt and Iran — and then make inferences from these about the ways of life of the time period and the locale of the paintings.
- Students learn how to interpret and analyze information about people's relationships with the environment from the clothing they wear.
- Students compare their observations with the clothing and objects of today.

LEARNING GOALS

- Make accurate observations and comparisons by looking at an object or painting.
- Make accurate inferences about aspects of a society, specifically clothing, based on observations.
- Explain how and why clothing can reflect a person's religion, social class, daily life, or the environment in which they live.

BACKGROUND INFORMATION FOR THE TEACHER: CREATING CONTEXT FOR THE LEARNING

Figure 53:
Three Court Officials
Frontispiece from a dispersed Sulwan al-Muta'
(The Comforts of Those Who Are Obeyed) by Ibn Zafar al-Siqilli (d. 1170)
Egypt, ca. 1325
Opaque watercolour and gold on paper
24.5 x 17.2 cm
AKM12

Three young men dressed in patterned silk tunics and soft leather boots stand together. One attendant extends his wrist, on which a cormorant, trained to catch fish, is perched. Next to him, the Royal Falconer stands with the female hawk trained to hunt game. Far left, the Master of the Hunt clutches three arrows in one hand and the royal bow in the other.

The clothing and features of the men suggest influences from geographically distant places: their rounded faces and features are Mongol and Chinese and their front-wrapped robes are typically Mongol. This style of robe, with a full calf-length skirt and tight sleeves, was developed for comfort on the horses that the Mongols rode for centuries across the great steppes of Central Asia. However, the lotus flowers embroidered on the armbands are Chinese symbols of purity. And while the garments and possibly the fabrics of the robes are typically East or Central Asian, the way they are decorated with wide, embroidered bands called tiraz is Egyptian or Syrian.

Figure 54:
The Tomb of Alexander the Great
Folio from a dispersed *Khamseh*
(Quintet) of Amir Khosrow Dihlavi (d. 1325)
Delhi, India, ca. 1450
Opaque watercolour and ink on paper
34.1 x 25.2 cm
AKM15

Although the manuscript from which the painting in Figure 54 was taken was created in India, the location of the tomb it depicts may be Alexandria, Egypt. The exact location of Alexander the Great's tomb is unknown and has been the subject of much conjecture. The painting illustrates an episode from the *Khamseh* of Nezami, a collection of long poems written in the 12th century. One of the poems, called "Alexander's Mirror," recounts the story of Alexander, known as Esfandiyar in Persian, a Macedonian king who conquered parts of Iran and Central Asia in the 4th century BCE. Three courtiers regard the tomb; while they lack the moon faces of AKM12, their costumes are variations on the same style of dress.

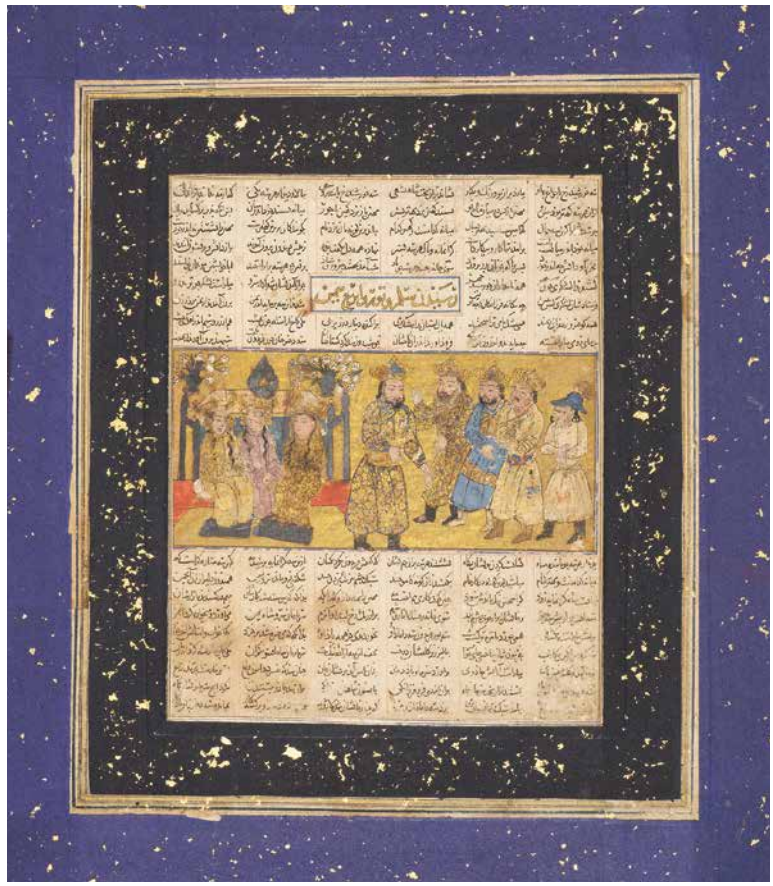


Figure 55:
The Sons of Faridun at the Court of King Sarv of Yemen
Folio from a dispersed Shah-Nameh (Book of Kings) by Ferdowsi (d. 1020)
Iran, ca. 1300
Opaque watercolour, ink, gold, and silver on paper
15.5 x 12.4 cm
AKM19

In Figure 55, a painting of an episode from the Persian epic poem the *Shah-Nameh*, King Sarv of Yemen stands between his three daughters and the three sons of Faridun, who have come to win their hands in marriage. According to the story, the princes were required to guess the order of the princesses' ages. The princesses are splendidly dressed in long robes, with gold crowns and dots of henna on their hands, while the princes' garb is similar to the costumes in Figures 53 and 54. The middle prince has a square embroidered rank badge on the front of his robe. Rank badges were used in Imperial China to identify the status of court personages.

Figure 56:
Gushtasp Working as a Smith in Rum
Folio from a dispersed *Shah-Nameh*
(Book of Kings) by Ferdowsi (d. 1020)
Shiraz, Iran, 1482
Opaque watercolour, ink, gold,
and silver on paper
32.5 x 21.3 cm
AKM48

In Figure 56, an illustration from a *Shah-Nameh* episode, Prince Gushtasp, wearing a turban and leather apron, works incognito in Byzantium as a smith. Byzantium, a city founded by Greeks in 657 BCE, was strategically located at the point in modern-day Turkey where the Mediterranean Sea runs into the Black Sea, and various warring groups fought one another for control of it. As Constantinople, it was the centre of the Byzantine Empire from 330 to 1453 CE, when it was conquered by the Ottoman Turks and renamed Istanbul. Gushtasp is engaged in a heroic feat: the scene depicts the moment before he brings down his hammer to strike a piece of metal on an anvil, shattering it and the anvil with a mighty blow. Although the figures are performing humble tasks, they themselves are obviously prosperous, as indicated by the gold embroidery on their robes.

There is more variation in the men's clothing in Figure 56 than in Figures 53, 54, and 55. While some robes cross in front, the robes on the people in blue and in purple are front-opening kaftans. All of the robes are long, reaching to the ankle, and some men wear little black shoes that are ill-suited to horse riding.

Figure 57:
Robe
Iran or Central Asia, 13th–14th centuries
Silk and metal thread
Height 140 cm
AKM677

Figure 58:
Robe
Central Asia, 11th–12th centuries
Brocaded silk
Length 142 cm, width 197 cm
AKM816

ONTARIO MINISTRY CURRICULUM CONNECTIONS, GRADE 4

SOCIAL STUDIES OVERALL EXPECTATIONS

- Compare key aspects of life in a few early societies (3000 BCE–1500 CE), each from a different region and era and representing a different culture, and describe some key similarities and differences between these early societies and present-day Canadian society.
- Use the social studies inquiry process to investigate ways of life and relationships with the environment in two or more early societies (3000 BCE–1500 CE), with an emphasis on aspects of the interrelationship between the environment and life in those societies.

SOCIAL STUDIES SPECIFIC EXPECTATIONS

- Gather and organize information on ways of life and relationships with the environment in early societies, using a variety of primary and secondary sources in both print and electronic formats (e.g. thematic and physical maps showing rivers, vegetation, volcanoes, soil types; images depicting the daily life of different social classes; religious/spiritual stories that provide evidence of society's view of the environment; agricultural artifacts).
- Interpret and analyze information relevant to their investigations, using a variety of tools (e.g. use a graphic organizer to help them determine the relationship between soil type, availability of water, and agricultural activity; analyze the content of paintings on the Internet or at a local gallery for information on a society's religious practices; analyze artifacts found in a museum or on a website for information on a society's daily life and relationship with the environment).

MATERIALS/RESOURCES

- Clothing Inquiry Template (included).
- Images of the paintings in this lesson plan: AKM12, AKM15, AKM19, AKM48.
- Images of robes AKM677 and AKM816.
- Drawings of a crossover robe and a crossover robe pattern (included).
- Additional images of paintings in the *Curriculum Resource Guide*.

THE CREATIVE PROCESS

CHALLENGING/INSPIRING

- Teacher asks students to brainstorm reasons why people wear clothes. Answers such as warmth/comfort (related to the environment, fashion, special occasions, religious or cultural reasons, status) should be elicited from students.

IMAGINING/GENERATING

- With a partner, discuss elements of fashion that help us to categorize clothing. Then, as a large group, record some of these characteristics.

PLANNING/FOCUSING

- Teacher divides students into small groups and provides each group with a couple of pictures of clothing worn in either medieval Iran or Egypt, or potentially both.
- As students look at images, ask them to make inferences and use the Clothing Inquiry Template to classify the clothing as primarily for comfort, status, fashion, or religious purposes. Students are to support their answer with inferred evidence from the image and to explain their thought process in making the inferences. Ask the students to refer to some of the characteristics obtained from the Challenging/Inspiring phase. Student can also consider how certain they are about their hypotheses.
- As a large group, discuss the elements of good observations and inferences, and what needs to be included in the responses.

EXPLORING/EXPERIMENTING

- As students are observing the images of clothing, they should be making observations regarding the style, richness, potential comfort, everyday, or ceremonial nature of the clothing. They can refer to the descriptions of the paintings as research and also look at the sources in Section 5 of the *Guide*. Questions to consider: Why is there a lack of ordinary people and of women in the paintings? Why are these groups less represented in the art of the time?
- Students can also look at the crossover robe drawing and pattern to understand how the robes are cut from cloth in a series of rectangles and triangles and put together to make a "one-size-fits-all" garment. They can compare this kind of "square-cut" garment to their own clothing; if it is modern Western style, students' clothing will feature pieces of cloth that are closely shaped and formed to the body.

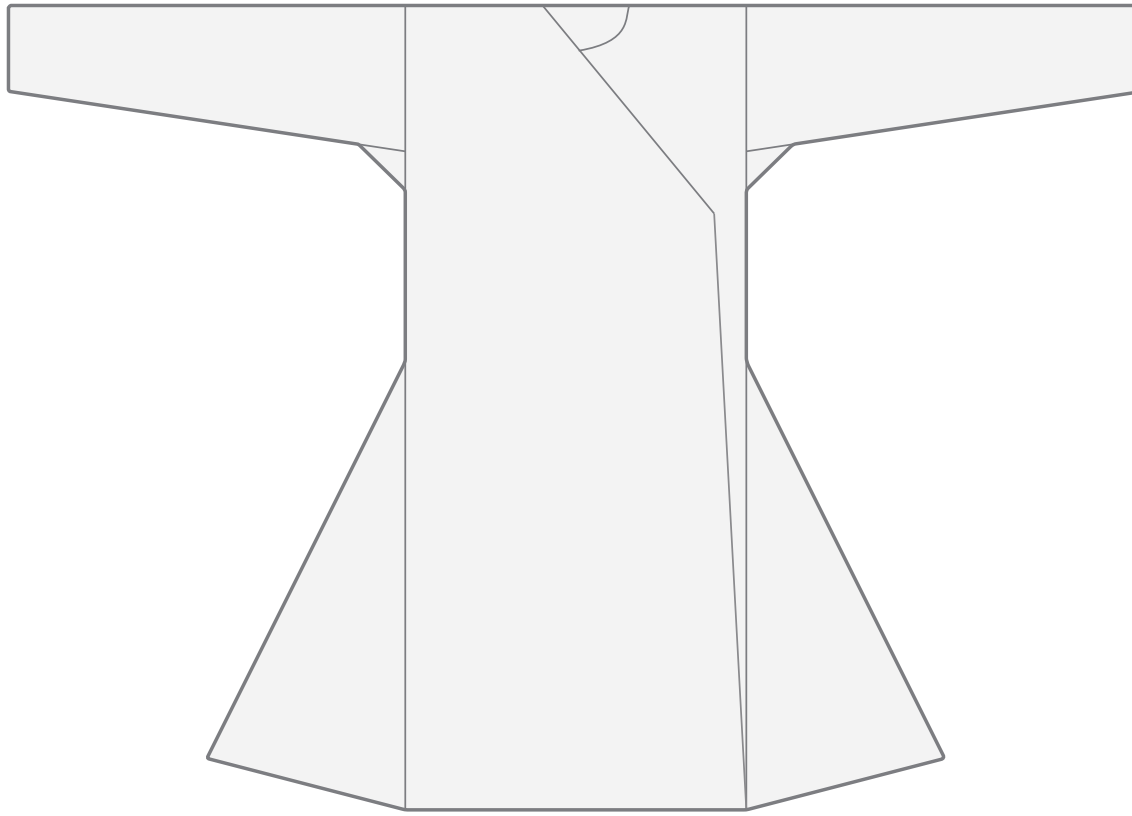


Figure 59:
Basic Crossover Coat.

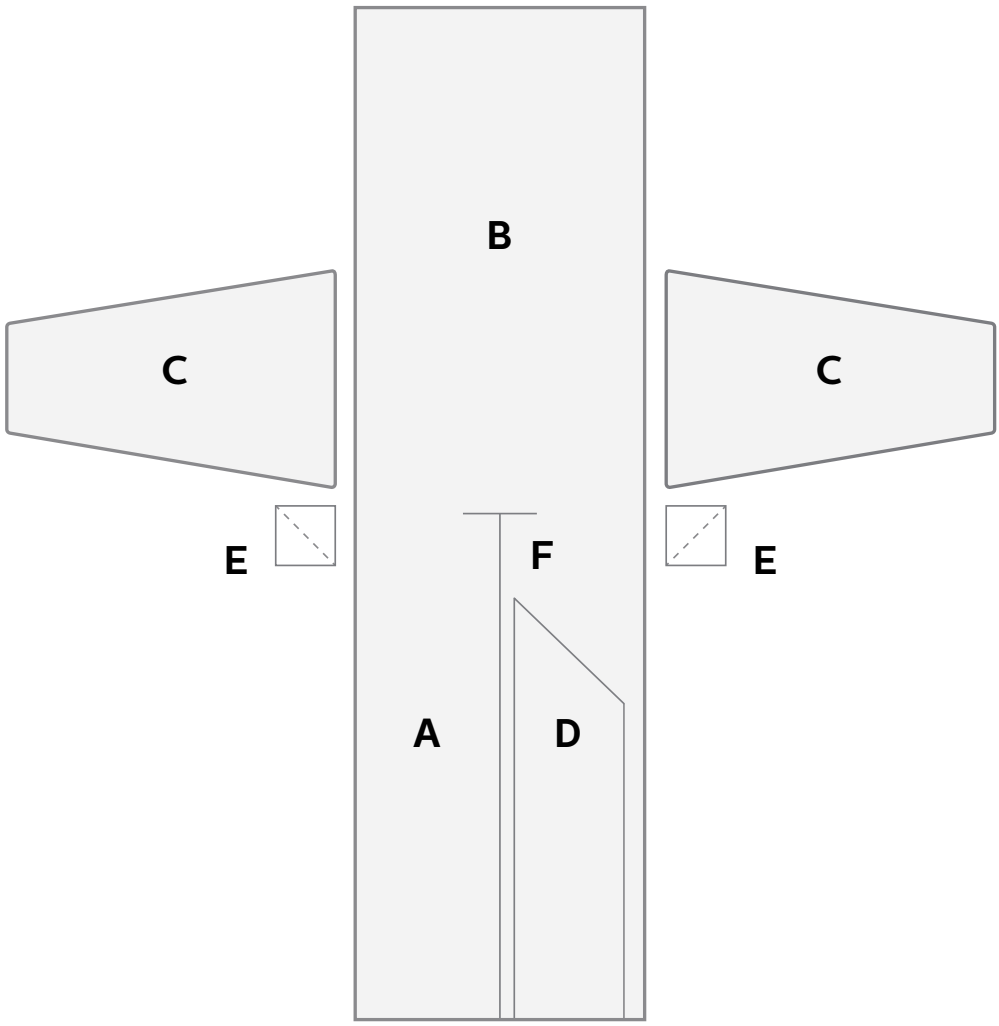


Figure 60:
Basic crossover coat pieces showing the rectangle AB that is the front and back with a neck opening F; the triangle D that attaches to the centre front to form the crossover; sleeves C; and pieces E at the armpits to give more freedom of movement. E is also shown as a square to indicate that it is folded on the diagonal along the dotted line to attach to the sleeve and body.

PRODUCING PRELIMINARY WORK

- Based on their observations for each image of clothing, using the Clothing Inquiry Template, students should work to determine what the primary purpose of the clothing is and provide inferred evidence from their observations.

REVISING AND REFINING

- Regardless of whether students are looking at clothing images from the same society or different societies, they should carousel to other groups looking at different images and should examine the evidence presented and compare and contrast their findings.

PRESENTING/PERFORMING/SHARING

- Teacher debriefs the activity by asking how the clothing images the students looked at from the society in question are different from the clothing the students wear in terms of style and purpose.
- As a large group, record some of the key vocabulary relating to this activity on chart paper to be placed on the Social Studies bulletin board.

REFLECTING/EVALUATING

Students are asked to share observations of how the environment influences the differences in the clothes we wear in Canada and the clothes that are worn in Iran or Egypt, or complete an exit card recording their ideas.

SUCCESS CRITERIA AND ACHIEVEMENT CHART CATEGORIES

Achievement Chart Categories	Success criteria for assessment as learning (not for marks) to help students become more observant in making inferences from works of art	Rating Scale/ Comments
Knowledge and Understanding	Teacher should assess how many accurate observations students can make by looking at an object or painting.	1 2 3 4
Thinking	Teacher should assess the extent that students can make accurate inferences about aspects of a society, specifically clothing, based on their observations.	1 2 3 4
Communication	Teacher should assess the extent that students can explain how and why clothing can reflect a person's religion, social class, daily life, or the environment in which they live.	1 2 3 4
Application	Teacher should assess the extent that students can accurately compare the clothing styles and purposes from one society to another and to Canadian society, based on environmental differences.	1 2 3 4

CLOTHING AND OBJECT INQUIRY TEMPLATE

Object Number _____.

What do you observe?

Where and who would wear it?

After reviewing your observations, make inferences as to whether the clothing pictured is worn primarily for environmental, practical, religious, or status (social class) purposes. Rank these below with inferred evidence-based reasons.

Ranked Purpose of Clothing/Object Observed	Evidence Inferred from Observations

GRADES SEVEN AND EIGHT: USING VISUAL ARTS AS INSPIRATION

LESSON INTENT

- Students examine a 16th-century painting from the *Akhlaq-e Nasiri* (Ethics of Nasir) and use a cut-out frame in the proportions of the golden ratio to select a detail of the painting to work with. The framed detail inspires the students' creation of a drawing in pencil crayon. Students also develop a description of their drawings as illustrations of episodes in imaginative stories of their own devising.

LEARNING GOALS

- Make accurate observations about the elements and principles of design in a painting.
- Identify details in a painting that contribute to an overall impression of both unity and harmony, and movement.
- Explain how a painting can convey information about how people lived, held certain beliefs, and formed communities based on those beliefs in the time of its making.
- Demonstrate an understanding of the capacity of a painting to tell a story.
- Demonstrate an understanding that there can be mathematical principles of symmetry and proportion operating in a figurative painting and identify those principles.

BACKGROUND FOR THE TEACHER: CREATING CONTEXT FOR THE LEARNING

Figure 61:
The Art of Chivalry
Folio 80r of the *Akhlaq-e Nasiri*
(Ethics of Nasir) by Tusi (d. 1274)
Northern India, 1590–95
Opaque watercolour, ink, and gold on paper
AKM288

The colourful painting in Figure 61 comes from a treatise on ethics, social justice, and politics by a medieval Iranian philosopher, Nasir al-Din Tusi (d. 1274), who lived in the eastern Persianate world and studied among the great scholars and mystics of the period. More than 300 years later, the *Akhlaq-e Nasiri* was a favourite book of Akbar the Great, the third Moghul emperor of India. It was in one of Akbar's courtly workshops that the manuscript containing this painting was copied and illustrated. The way the artists animated its philosophical ideas with stories makes this manuscript very remarkable.

In the painting in Figure 61, the action takes place in a rural environment as a young Moghul prince strives to show his peers that he can control a powerful horse with skill, at the same time managing his lance, a crop, and a golden sword. At top right three older gentlemen on horseback represent the ministers of state, one of the noble professions. They converse with one another while watching closely the progress of the young prince. Some younger peers at lower right observe the skill of the prince, since they will soon need to show off their own abilities.

ONTARIO MINISTRY CURRICULUM CONNECTIONS, GRADES 7 AND 8

VISUAL ART

- Recognize and learn to work effectively with the elements and principles of design, especially unity and harmony (Grade 7) and movement (Grade 8).

LANGUAGE AND LITERACY

- Learn how to read a painting for meaning; practise creative-writing techniques.

MATHEMATICS AND SCIENCE

- Recognize and learn to work effectively with the mathematical principles underlying the golden ratio (1.618).

MATERIALS

- Six poster-sized (24 x 36 inch) colour prints of the painting. These can either be commercially printed or printed on a colour copier from the DVD or the Web and tiled together with tape.
- A box of 72–100 Prismacolor pencil crayons.
- An electric pencil sharpener.
- For each student:
- Page with a printed golden ratio frame (Figure 62).
- Scissors.
- Glue stick.
- Graphite pencil.
- Piece of 80 lb. sketch paper, 9 x 12 inches.

THE CREATIVE PROCESS

CHALLENGING/INSPIRING

- Introduce the students to the notion of visiting a museum, what a museum is, how it maintains and displays a society's history, etc.
- Give a brief introduction to the tradition of Iranian and South Asian painting of the 15th and 16th centuries, of which the paintings in the *Akhlaq-e Nasiri* are excellent examples. See Section 5 in the *Guide* for help with this.
- Make sure the students have a grade-specific understanding of the elements — line, shape, colour, texture, space, and value (light/dark); and principles of design, including contrast, repetition, variety, emphasis, proportion, pattern, balance, and unity.
- Introduce the students to some of the great myths and stories of the world, with special emphasis on those that relate to the cultural makeup of the particular class. Suggested resources include *Shahnameh: The Persian Book of Kings* by Elizabeth Laird, a book that retells the famous Iranian stories for children; and "The Adventures of Hamza," an interactive website about the fabled exploits of the uncle of the Prophet Muhammad developed by the Smithsonian Institution in Washington, D.C. Details about these are in Section 5 of the *Guide*.
- Introduce the students to the principle of the golden ratio as it is found in nature and as it is used as a design tool in art and architecture. For example, students could bring in magazine images of natural phenomena such as sunflowers and seashells.

IMAGINING/GENERATING

- Students examine the painting in Figure 61 closely and note differences or similarities between it and the other paintings in the *Guide*. The teacher can project each painting with an overhead or data projector or whiteboard, or by going to the Aga Khan Museum's website (www.agakhanmuseum.org/collection/collection-highlights).

PLANNING/FOCUSING

- The class divides into groups of up to five; each group has a poster of *The Art of Chivalry* to work from, and each student has a frame.
- Each student cuts a frame out and applies it to the poster to identify a detail to work on. This stage should not be rushed. The frame can be applied horizontally, vertically, or obliquely, and the white lines should line up with the focal point of the detail. This strategy results in a golden ratio composition.
- The frames should not overlap one another, so some negotiating and collaborating may be necessary.

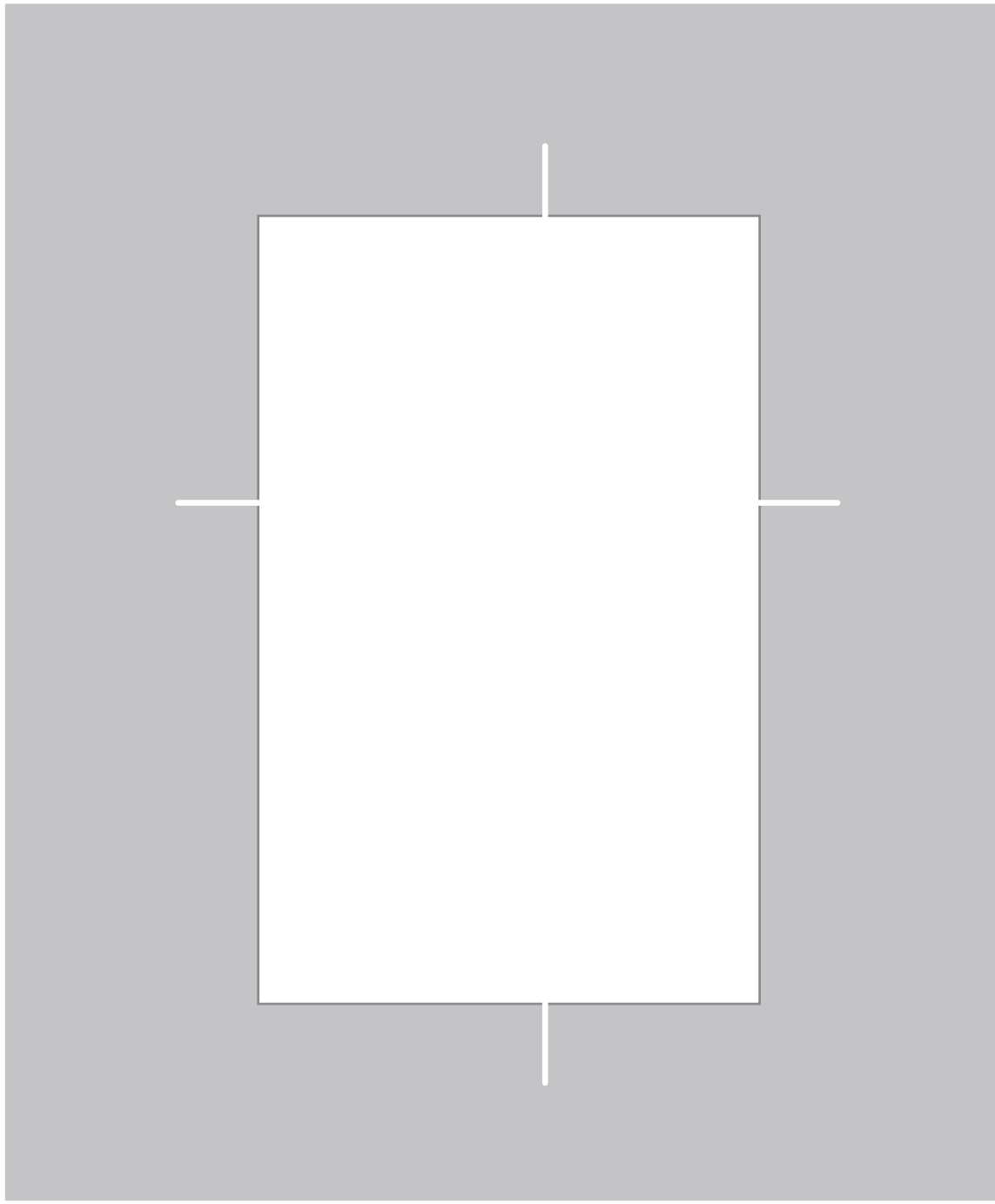
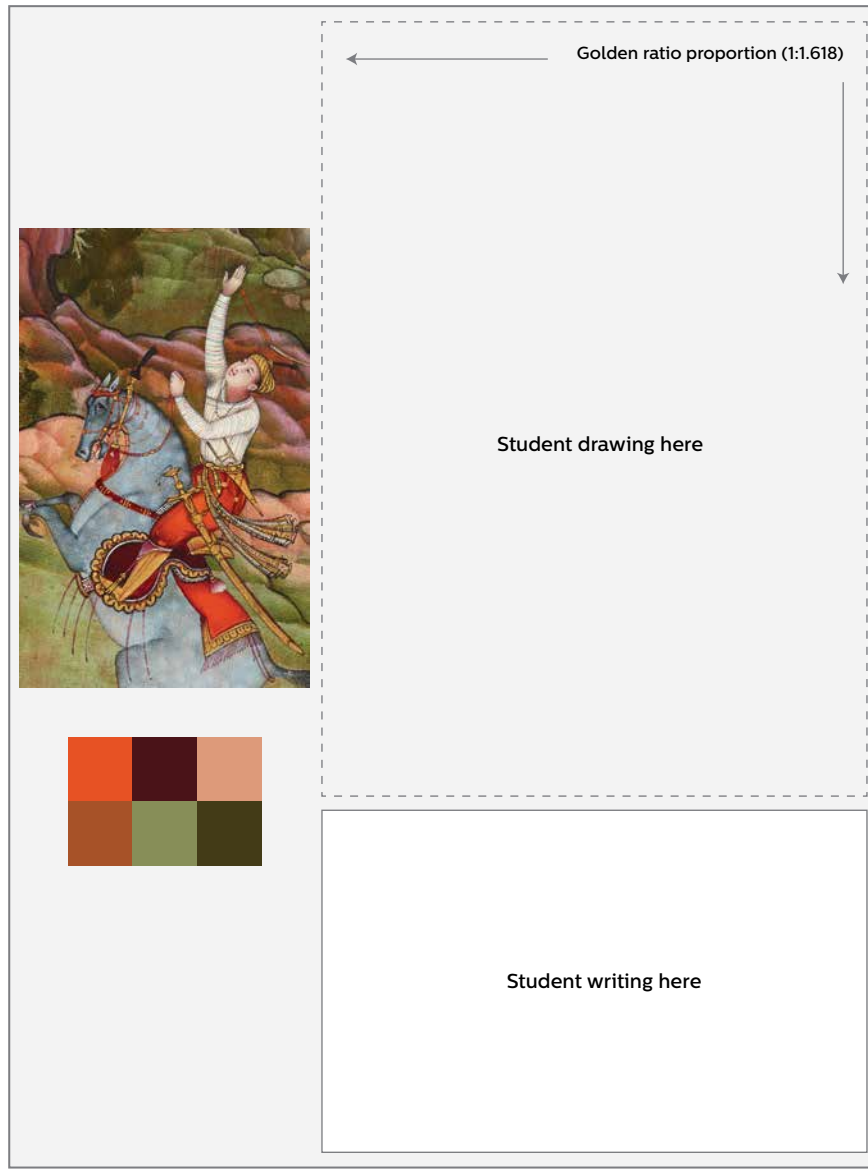


Figure 62:
The Golden Ratio Frame.

PRODUCING PRELIMINARY WORK

- Each student cuts a detail out of the poster and glues the piece to the top of a sheet of sketch paper. Below the detail is space for (1) a colour bar with six or more squares, and (2) the student's drawing using the colours in the colour bar. See Figure 63 for a sample page showing the placement of the various elements. Students can add or change elements, but they must reflect the golden ratio in their drawings.

Figure 63: Sample page for student activity (not to scale).



REVISING/REFINING

- After each drawing is completed, the student writes a title and a few sentences of narrative, setting the illustration in a larger story. In keeping with the *Akhlaq-e Nasiri*, the story should have a clear message about ways of life at the time of the painting.
- Note: any element in the painting can be a character in the story, whether it is an animal, a human, or even a plant.

PRESENTING/PERFORMING/SHARING

- Each group in turn presents its drawings and reads the narrative sentences, explaining the rationales – why details were picked and why the drawings illustrate the narratives.

REFLECTING/EVALUATING

In the classroom, the class can collaborate on putting together the different narratives into a coherent story. This becomes a class creative-writing exercise that involves editing and changing the different episodes so that they all work together.

SUCCESS CRITERIA AND ACHIEVEMENT CHART CATEGORIES

Achievement Chart Categories	Success criteria for assessment as learning (not for marks) to help students become more observant in making inferences from works of art	Rating Scale/ Comments
Knowledge and Understanding	How well do the students understand the elements and principles of design? Are they able to point out instances of unity and harmony and of movement in the painting, and explain how they work together?	1 2 3 4
Thinking	Have the students been thoughtful in choosing their detail and creating a story for it?	1 2 3 4
Communication	Have the students been able to communicate their impressions of the painting and of their detail?	1 2 3 4
Application	To what degree have students been successful in planning and creating their page composed of the detail, the colour study, their drawing, and their story?	1 2 3 4

NOTES

1. Phillip Ball, *The Elements: A Very Short Introduction* (Oxford: Oxford University Press, 2002), 54.

2. "History of Gold in Civilizations — An Overview," *http://info.goldavenue.com/Info_site/in_arts/in_civ/in_civ_overview.html*.

3. Richard Ettinghausen, Oleg Grabar, and Marilyn Jenkins, Eastern Islamic Lands (New Haven, CT: Yale University Press, 2001), 171.

4. *The Ontario Curriculum Grades 1–8 Drama, The Arts*.

5. *Encyclopedia of Islam*, 3rd ed. "Hydraulic Machines" and "Water" (Leiden and Boston: E.J. Brill, 2007).

6. Ahmad Y. al-Hassan and Donald Hill, *Islamic Technology: An Illustrated History* (Cambridge: Cambridge University Press, 1986).

SECTION FIVE: GLOSSARY AND ADDITIONAL RESOURCES

CURRICULUM TERMS

ARTS

DANCE

Elements of Dance: Body awareness, space, time, energy, relationship.

DRAMA

Elements of Drama: Role, relationship, time and place, tension, focus, and emphasis.

MUSIC

Elements of Music: Duration, pitch, dynamics, timbre, texture/harmony, form.
Metre: The grouping of beats in music using time signatures.
Ostinato: A continuous repeated rhythmic or melodic pattern.

VISUAL ART

Earthenware: Ceramic made of clay fired to a porous state that can be made impervious to water by the use of a glaze.
Elements of Design: Line, shape, colour, texture, space, value (light/dark).
Fritware: Ceramic made of quartz, glass, and clay that is harder and more durable when fired than earthenware. Fritware was a major Muslim invention in the eleventh century in Egypt and Iran.
Glaze: A vitreous (glasslike) substance used to coat ceramics before re-firing them.
Interlacement: Two-dimensional or relief design consisting of bands that appear to pass over and under one another, creating the illusion of three-dimensionality.
Lustre: A technique for decorating ceramics and glass; on ceramics, metal alloys are applied to a fired ceramic object. After further firing, the ceramic surface has an iridescent sheen. Lustre was a major Muslim invention in 9th-century Iraq.
Mosaic: A work of art made of small pieces of a rigid material such as glass, pottery, or coloured stones.
Pattern: (1) A regular arrangement of repeated elements (shapes, lines, colours); (2) a template, model, or guide for making something.
Porcelain: A hard, light, translucent type of pottery that was invented by the Chinese early in their history. Fritware was invented by Muslim artisans as an attempt to imitate porcelain.
Principles of Design: Contrast, repetition, variety, emphasis, proportion, pattern, balance, unity, harmony.
Relief Design: A feature of carving or sculpture in which the form projects somewhat from a background but is still meant to be viewed from one side.
Slip: A creamy mixture of clay and water used to coat ceramics or to attach handles, etc.

MATHEMATICS

GEOMETRY AND SPATIAL SENSE

Congruent: Having the same size and shape.
Symmetry Operations: The specific motions by which a fundamental motif is repeated as an isometry; that is, exact replicas are related to the original by the transformations of translation, reflection, rotation, or glide reflection to make a pattern. The symmetry operations are used in art, although almost never isometrically. However, they are vital tools of design, and the practice of "symmetry breaking" can contribute to the liveliness of a composition.

Translation: A motif is repeated exactly, with no reflection or rotation.

Reflection: A motif is repeated along an axis of reflection. Also called mirror symmetry.

Rotation: A motif is repeated around a central point. Also called radial symmetry.

Glide reflection: A motif is repeated by translating it horizontally, then reflecting it vertically, or by translating it vertically, then reflecting it horizontally.

Transformation: A change in a motif in a pattern that results in a different position, orientation, or size.

SCIENCE AND TECHNOLOGY

STRUCTURES AND MECHANISMS

Hydraulic System: A system that use the pressure of a liquid to do work.
Pneumatic System: A system that uses the pressure of a gas.

MATTER AND ENERGY

Chemical Change: A change in matter that implies the formation of a new substance. The changes are irreversible.
Particle Theory: All matter is made up of tiny particles that are always moving, that attract one another, and that have space between them.
Physical Change: A change in the shape, appearance, or state of material so that it can still be recovered as the original material.

LANGUAGE

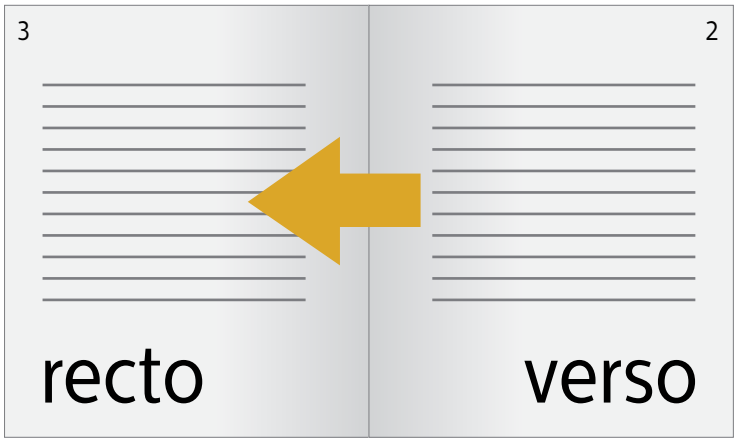
Blog: A short term for weblog, an online diary or journal.
Critical Literacy: Critical thinking that involves looking beyond literal meaning to analyze and evaluate a text's complete meanings and the author's intent.
Digital Storytelling: Using digital methods, including video, audio, and still photography, to tell a story.
Media Literacy: An informed and critical understanding of the nature of the media, their techniques, and the impact of those techniques.

SOCIAL STUDIES

Culture: The way in which people live, think, and define themselves as a community.
Diversity: The variety of groups of people who share a range of physical, cultural, or social characteristics.
Pluralism: The ability of diverse groups of people to live together, with disagreement but without conflict.

OTHER TERMS

Deccan: A triangular plateau in southern India bounded by the Malabar Coast in the west, the Coromandel Coast in the east, and the Vindhaya Mountains in the north.
Folio: A sheet or leaf in a manuscript; the pages are referred to as recto, or front, and verso, or back. In an Arabic manuscript, which is read in the opposite direction to English (from right to left), verso is the page to the right of the binding and recto is the page to the left of the binding.



Hinduism: A religious and social system in India that includes a belief in reincarnation, the worship of several gods, and vegetarianism for some Hindus.
Mamluks: A group of warriors who ruled in Egypt and Syria from the 13th to 16th centuries.
Moghuls: Rulers in India from the 16th to 19th centuries.
Ottomans: A group of Turkoman rulers of the Turkish empire in Asia Minor and much of Southern Europe from the 13th to early 20th centuries.
Persia: A country in Southwest Asia, now known as Iran. In historical times Persia included West Asia, Egypt, and parts of Central Asia and Eastern Europe.
Qur'an: The sacred book of the Islamic religion. Muslims believe that the Qur'an is the Word of God revealed to the Prophet Muhammad in the 7th century CE. The central message of the Qur'an is for humanity to believe in and worship God and live a pious and ethical life.
Safavids: Rulers of Persia from the 16th to 18th centuries.
Shah: A title of the rulers of Iran and later of India.
Sufism: Islamic mysticism dating back to the 8th century that seeks a spiritual path to God.
Sultan: An Islamic title of authority.
Timurids: Rulers of West and Southwest Asia in the 14th and 15th centuries.

Unless otherwise noted, term definitions are taken from the Ontario Ministry of Education Curriculum; *Islam: Art and Architecture*, edited by Markus Hattstein and Peter Delius; and the *Canadian Oxford Dictionary*.

RESOURCES AND FURTHER READING

ARTS

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Ekhtiar, Maryam D., and Claire Moore, eds. Art of the Islamic World: A Resource for Educators. Accessed at *www.metmuseum.org/learn/for-educators/publications-for-educators/art-of-the-islamic-world*.

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NOTES