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Executive
Preview

ICT

for Cambridge IGCSE™

COURSEBOOK

Victoria Wright, Denise Taylor & David Waller



Third edition

Digital Access



Cambridge Assessment
International Education

Endorsed for full syllabus coverage



Brighter Thinking

Better Learning

Dear Cambridge Teacher,

The new Cambridge IGCSE™ ICT series will publish in late 2021, updated for the new Cambridge International syllabuses (0417/0983) for first teach in September 2021.

This Executive Preview contains sample content from the coursebook, including:

- A guide explaining how to use the series
- The table of contents from the coursebook
- Chapter 12 from the coursebook – this is one of the chapters covering a practical topic from the syllabus

Please note that source files for practical tasks are referenced in the coursebook chapter, but are not provided in this sample.

This new series has been designed around extensive research interviews and lesson observations with teachers and students around the world following the course. As a result of this research, some changes have been made to the new series, with the aim of solving and supporting your biggest classroom challenges and developing your students' passion and excitement for understanding how technology works and how it can be applied in their everyday lives.

We have increased our focus on developing students' practical skills, from a variety of practical tasks in the coursebook, to a new 'worked example' feature in the coursebook that hones in on key skills, giving students a model to work with and questions to try out themselves. We have also introduced a practical ICT skills workbook to the series for the first time, giving students additional tasks and source files to develop their practical application skills and understanding.

To bring this new series to life, we have introduced an 'ICT in context' feature. Each chapter is introduced with an interesting real-life example of the topic and throughout the chapters, there are smaller examples linking learning to life outside the classroom walls to help you to further engage your students.

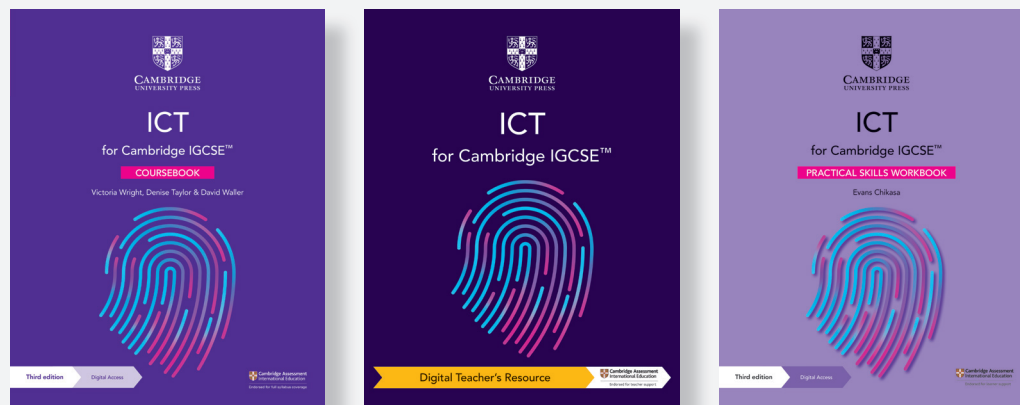
As we develop new resources, we ensure that we are keeping up-to-date with best practice in pedagogies. For this series we have added new features to the coursebook, such as 'getting started' questions and activities to help you to evaluate students' learning starting points and 'reflection' questions after certain tasks to encourage students to take control of their own learning journey. We have developed our differentiated support in this new series, with a three-tier approach to our practical tasks in the coursebook and practical ICT skills workbook, progressing from 'getting started', to 'practice', to 'challenge', supporting all your learners' different needs.

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Finally, we have updated the digital teacher's resource to make it as useful and relevant as possible to your day-to-day teaching needs. From over 300 teaching activity, assessment and homework ideas, to how to tackle common misconceptions in each topic, to a new feature developing your own teaching skills, the resource aims to inspire and support you.

Visit our website to view the full series or speak to your local sales representative. You can find their contact details here:

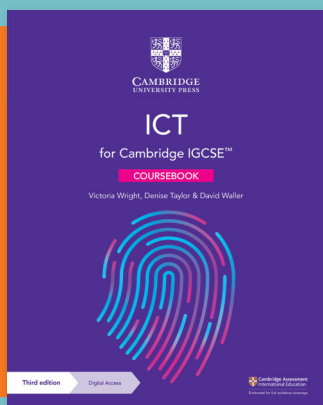
cambridge.org/education/find-your-sales-consultant



Gemma Coleman
Commissioning Editor, Cambridge IGCSE ICT

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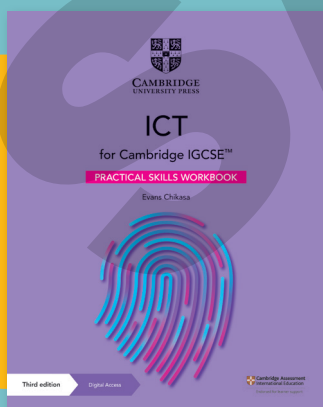
> How to use this series



The coursebook provides coverage of the full Cambridge IGCSE ICT syllabuses (0417/0983). Each chapter explains facts and concepts and uses relevant real-world contexts to bring topics to life. There is a focus on skills development, with worked examples providing step-by-step support for developing key ICT skills, as well as practical tasks in both the theory and practical chapters to develop students' practical applications of ICT. The practical tasks include 'getting started' skills development questions and 'challenge' tasks to ensure support is provided for every student. Questions and exam-style questions in every chapter help learners to consolidate their understanding.

The digital teacher's resource contains detailed guidance for all topics of the syllabus, including common misconceptions to predict the areas where learners might need extra support, as well as an engaging bank of over 300 lesson ideas. Differentiation is emphasised with advice for identification of different learner needs and suggestions of appropriate interventions to support and stretch learners. Teachers are supported and empowered to develop their teaching skills with the 'teaching skills focus' feature, which embeds pedagogical approaches within the context of each chapter.

The teacher's resource also contains scaffolded worksheets for each chapter, as well as exam-style papers. Answers to all questions in the coursebook and practical ICT skills workbook are accessible to teachers for free on the 'supporting resources' section of the Cambridge GO platform.



The workbook provides further practice of the practical topics in the coursebook. A three-tier, scaffolded approach to skills development allows learners to gradually progress through 'getting started', 'practice' and 'challenge' tasks, ensuring that every learner is supported. There are worked examples to help students understand how to approach different types of tasks, as well as tips to help address common misconceptions and provide helpful advice.

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How to use this book

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> How to use this book

Throughout this book, you will notice lots of different features that will help your learning. These are explained below. Answers to all questions and tasks are accessible to teachers in the supporting resources area of cambridge.org/go.

LEARNING INTENTIONS

These set the scene for each chapter, help with navigation through the coursebook and indicate the important concepts in each topic.

GETTING STARTED

This contains questions and activities on subject knowledge you will need before starting this chapter.

OPENING DISCUSSION

This feature presents real-world examples and applications of the content in a chapter, encouraging you to look further into topics. There are discussion questions at the end which encourage you to think more about the benefits and problems of these applications.

KEY WORDS

Key vocabulary is highlighted in the text when it is first introduced. Definitions are then given in the margin, which explain the meanings of these words and phrases. You will also find definitions of these words in the glossary at the back of this book.

COMMAND WORDS

Command words that appear in the syllabus and might be used in exams are highlighted in the exam-style questions when they are first introduced. In the margin, you will find the Cambridge International definition. You will also find these definitions in the glossary at the back of the book.

Questions

Appearing throughout the text, questions give you a chance to check that you have understood the topic you have just read about.

ACTIVITY

Activities give you an opportunity to check your understanding throughout the text in a more active way, for example by creating presentations, posters or role plays.

PRACTICAL TASK

This feature focuses on developing your practical skills. Each task is divided into three parts:

- Getting started questions will help build your basic skills.
- Practice questions provide more opportunities for practice, pushing your skills further.
- Challenge questions will stretch and challenge you even further.

SELF/PEER ASSESSMENT

This appears at the end of some practical tasks or activities, and gives you an opportunity to think about how you performed on the task, and what you could do to improve your work in the future.

ICT IN CONTEXT

These short boxes appear throughout the book to help you understand how ICT is used in the real world and why it is important in your everyday life.

WORKED EXAMPLE

Worked examples appear in the practical chapters, and explain key skills by breaking them down step-by-step and showing what a good answer looks like.

REFLECTION

These activities ask you to think about the approach that you take to your work, and how you might improve this in the future.

Further Information: This feature highlights the advanced aspects in this Book that go beyond the immediate scope of the syllabus.

SUMMARY

There is a summary of key points at the end of each chapter.

EXAM-STYLE QUESTIONS

Questions at the end of each chapter provide more demanding exam-style questions, some of which may require use of knowledge from previous chapters.

SELF-EVALUATION CHECKLIST

The summary checklists are followed by 'I can' statements which match the Learning intentions at the beginning of the chapter. You might find it helpful to rate how confident you are for each of these statements when you are revising. You should revisit any topics that you rated 'Needs more work' or 'Getting there'.

> Introduction

When we wrote this book our main aim was to provide material to cover the new Cambridge IGCSE ICT syllabuses (0417/0983). However, we also wanted to include current, interesting examples of ICT use to invite you to find out more by carrying out your own research. The constant change in the world of ICT has made this edition of the textbook vital. There are many examples of how to transfer your ICT skills to other subjects, and the book provides new perspectives on familiar aspects of ICT.

Content

The book is entirely based around the 0417/0983 syllabuses. The first 11 chapters contain the theory topics with activities that you can carry out either on your own or with your class. Chapters 12 to 21 contain the practical topics to help you to carry out tasks that include creating a variety of publishing documents, modelling using spreadsheets, writing websites and using a database. Practical tasks for chapters 12 to 21 have been supported with source files provided in the supporting resources area of Cambridge GO.

Focus of the book

This book will help you to work through your course and give you the opportunity and the support to carry out research, use independent thinking and gain new skills following a structured path.

Throughout this book you will gain background knowledge to help you to answer the types of questions and understand the practical techniques that you will meet in your studies. This edition also includes ideas about how ICT is used in real-life situations. To support your learning, every chapter ends with some exam-style questions.

Focus on you

One of the advantages of this book is that it contains everything in the syllabus for your course so you will know that everything that is important for your study is in this book. The opening discussions at the start of each chapter will also encourage you to think independently and to arrive at your own answers after studying the issues and listening to others.

This book is therefore aimed at teaching you underlying skills as well as encouraging you to become critical thinkers, which are important both during your course and afterwards in your subsequent studies.

We hope that you will enjoy using this book to help you throughout your course.

Chapter 12

Images

IN THIS CHAPTER YOU WILL:

- place an image with precision
- resize an image and maintain or adjust its aspect ratio
- crop, rotate and flip an image horizontally and vertically
- adjust the colour depth, brightness and contrast of an image
- group and layer images
- explain how to reduce file size by reducing image resolution and colour depth.

GETTING STARTED

Figure 12.1 shows some tools in a graphic editing program. Working with a partner, identify the tools labelled A to F.

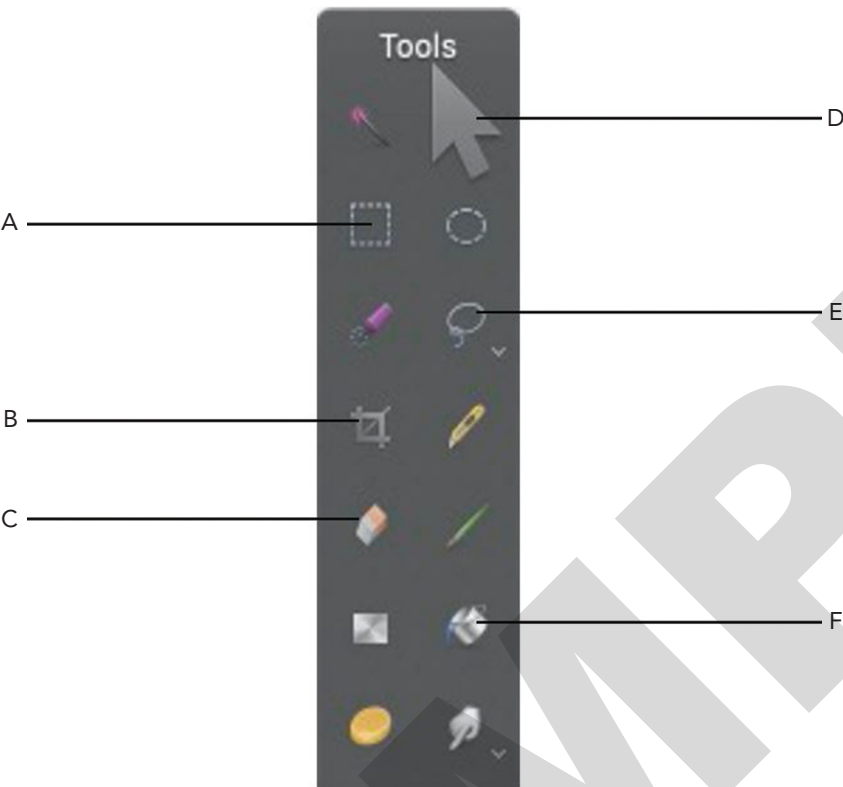


Figure 12.1: Graphic editing tools

WHEN DID WE FIRST START COMMUNICATING?

Painting and graphics are a vital form of communication – and were probably the first form of non-verbal communication we had. Long before written communication, people were drawing on the walls of caves.

The image in Figure 12.2 shows graphics painted in a cave near Raha, Muna Island, Southeast Sulawesi province, Indonesia. Nobody is sure why they were painted but maybe the animal ones were to help the hunters – capture the image and you’ll capture the animal. Or maybe they were just boasting about what they had already caught. Many cave drawings are of people or just their handprints, so maybe people just wanted to leave their marks. Or maybe they just felt like doodling.



Figure 12.2: Early cave drawings

CONTINUED

Throughout history, images, design and graphics have played an important part in human existence and have helped people to understand their lives. Everyone has a creative need but unfortunately not everyone has the skills to express it through painting and drawing. Computers and graphics programs have helped those people to express their creativity.

Today we are surrounded by graphics – in magazines, leaflets, advertising, logos and online. An image can create a mood or communicate excitement, sadness, reflection or an idea of perfection. They can be manipulated in many ways to enhance or change the impressions they create but as well as revealing truths, images can be manipulated to imply a situation completely different to what was originally intended.

Discussion questions

- 1 What are the advantages of creating digital art on a computer rather than painting on paper or a canvas?
- 2 Some people argue that only paintings and objects created by hand are true art and that digital art cannot be included. What are your views?

12.1 Placing and editing images

When you create a document in a word processor, a spreadsheet, a database or a presentation program, there are times when you will need to place images at appropriate places in the document.

You will also most likely need to edit the image to make it fit in with the needs of your intended audience. For example, many adverts use airbrushing on celebrities to make them appear slimmer and more beautiful. The ‘red eye’ problem in some images can also be edited out, and image processing techniques are used in blue-screen and green-screen technology, which makes video clips appear as if they were filmed on location when really they were filmed in the studio.

At times images might need to be resized or you might wish to cut a part of the image (crop an image). At other times you might place one image on top of, or partially on top of, other images (layering of images) or need to turn an image around from the way it was originally facing (reflect or rotate an image).

Place an image with precision

Images can easily be imported into a document, usually by using the ‘Insert’ menu. An image can often be pasted into a document if you have copied it onto the clipboard from elsewhere.

Once they have been imported, images can be positioned in various ways. The image can be dragged using the mouse into a suitable position, but this method does not achieve an accurate, absolute position, only a position that is acceptable to the user.

Place relative to the page

Most software allows users to enter coordinates for a more precise position **relative** to the margin or the edge of the page.

KEY WORD

relative: considered where something is in relation to something else

ACTIVITY 12.1

Open a new document and place an image somewhere within in. Then investigate your software to find how to access the picture controls for sizing, positioning and text wrapping.

Figure 12.3 shows the image aligned to the upper and left edges of the page. In Word, this dialogue box can be accessed from the ‘Picture Format’ menu or by right-clicking on the image and selecting ‘Size and Position’. Other software may have different ways to access the dialogue box.

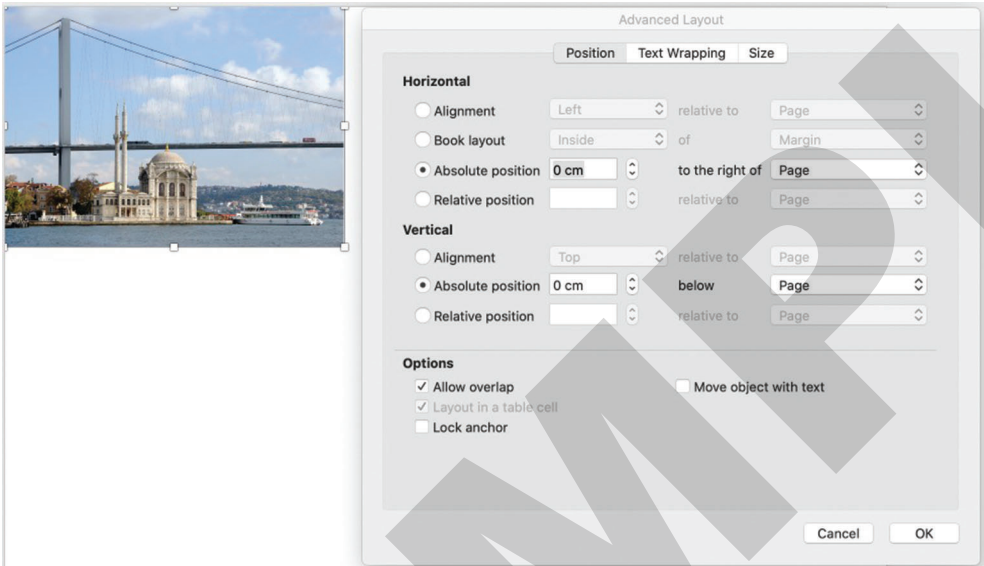


Figure 12.3: Image aligned to left and top edges

Figure 12.4 shows the image 3 cm from the left edge and 1 cm from the top edge.

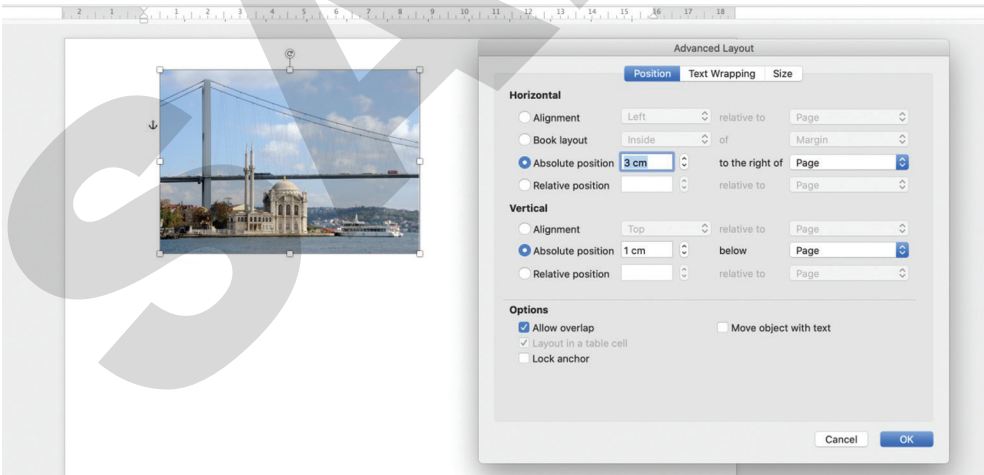


Figure 12.4: Image 3cm from left edge and 1 cm from top edge

The image can also be aligned relative to the margins.

Place relative to the text

Images can be aligned relative to the text on the page. This is known as **text wrapping**.

Examples of text wrapping include:

- tight text wrapping, where the text surrounds the image; notice how you can also adjust the margins around the image (see Figure 12.5)
- top and bottom wrapping, which places the image on its own line within the text (see Figure 12.6)
- behind text wrapping, which allows the text to carry on over the image (see Figure 12.7).

KEY WORD

text wrapping:
surrounding an
image with text

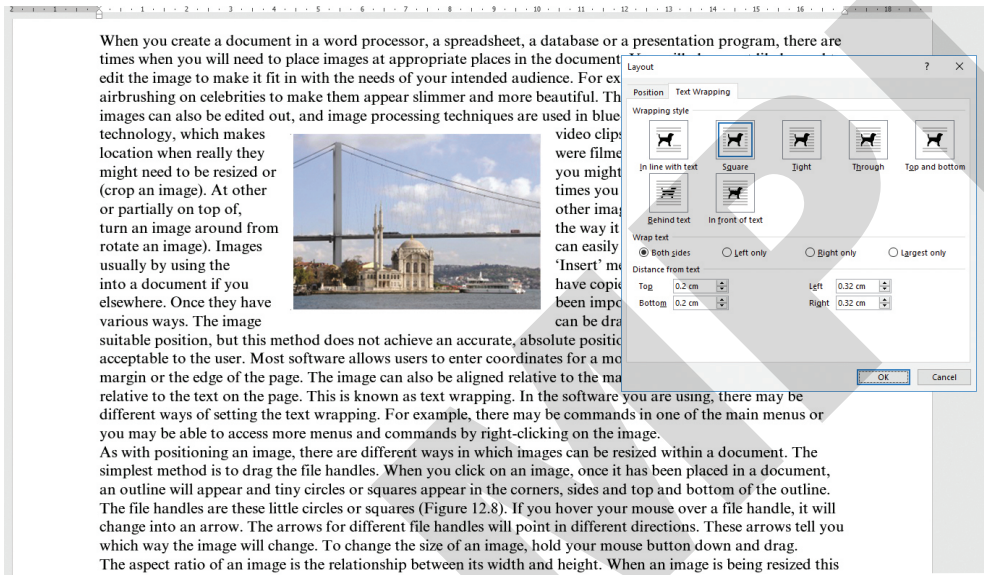


Figure 12.5: Tight text wrapping

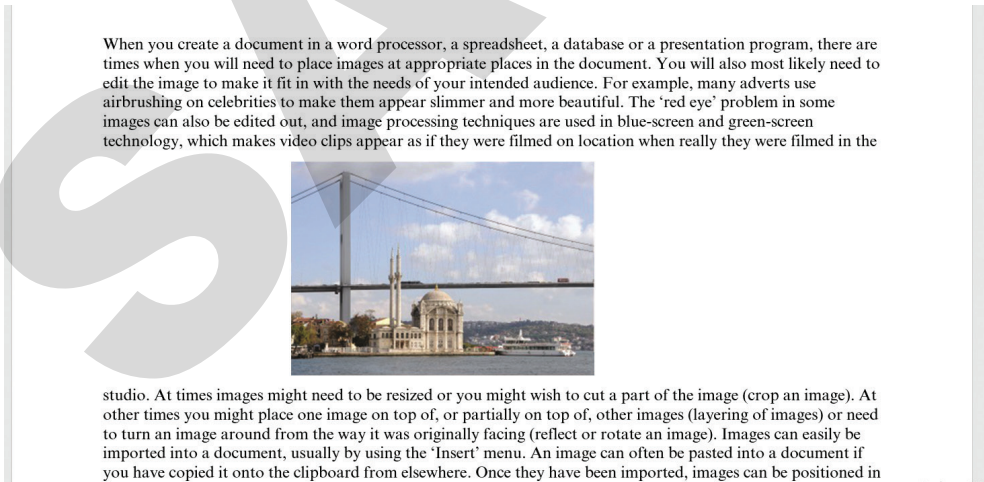


Figure 12.6: Top and bottom wrapping

When you create a document in a word processor, a spreadsheet, a database or a presentation program, there are times when you will need to place images at appropriate places in the document. You will also most likely need to edit the image to make it fit in with the needs of your intended audience. For example, many adverts use airbrushing on celebrities to make them appear slimmer and more beautiful. The 'red eye' problem in some images can also be edited out, and image processing techniques are used in blue-screen and green-screen technology, which makes video clips appear as if they were filmed on location when really they were filmed in the studio. At times images might need to be resized or you might wish to cut a part of the image (crop an image). At other times you might place one image on top of, or partially on top of, other images (layering of images) or need to turn an image around from the way it was originally facing (reflect or rotate an image). Images can easily be imported into a document, usually by using the 'Insert' menu. An image can often be pasted into a document if you have copied it onto the clipboard from elsewhere. Once they have been imported, images can be positioned in various ways. The image can be dragged using the mouse into a suitable position, but this method does not achieve an accurate, absolute position, only a position that is acceptable to the user. Most software allows users to enter coordinates for a more precise position relative to the margin or the edge of the page. The image can also be aligned relative to the margins. Images can be aligned relative to the text on the page. This is known as text wrapping. In the software you are using, there may be different ways of setting the text wrapping. For example, there may be commands in one of the main menus or you may be able to access more menus and commands by right-clicking on the image. As with positioning an image, there are different ways in which images can be resized within a document. The simplest method is to drag the file handles. When you click on an image, once it has been placed in a document, an outline will appear and tiny circles or squares appear in the corners, sides and top and bottom of the outline. The file handles are these little circles or squares (Figure 12.8). If you hover your mouse over a file handle, it will change into an arrow. The arrows for different file handles will point in different directions. These arrows tell you

Figure 12.7: Behind text

In the software you are using, there may be different ways of setting the text wrapping. For example, there may be commands in one of the main menus or you may be able to access more menus and commands by right-clicking on the image.

ACTIVITY 12.2

Investigate your software to find the different menus and commands you can use to set the text wrapping around an image.

Create a document with text and insert an image. Create screen prints of the different types of text wrapping you can apply with your software.

Questions

- 1 List five 'Wrap Text' options.
- 2 Explain, using diagrams, how each of the following 'Wrap Text' would position the image relative to the text:
 - a square
 - b tight
 - c through.

Resize an image to maintain or adjust the aspect ratio of an image

As with positioning an image, there are different ways in which images can be resized within a document.

The simplest method is to drag the file handles. When you click on an image, once it has been placed in a document, an outline will appear and tiny circles or squares

appear in the corners, sides and top and bottom of the outline. The file handles are these little circles or squares (see Figure 12.8).

- When you create a document in a word processor, a spreadsheet, a database or a presentation program, there are times when you will need to place images at appropriate places in the document. You will also most likely need to edit the image to make it fit in with the needs of audience. For adverts use celebrities to slimmer and 'red eye' images can and image your intended example, many airbrushing on make them appear more beautiful. The problem in some also be edited out, processing techniques are used in blue-screen and green-screen technology, which makes video clips appear as if they were filmed on location when really



Figure 12.8: File handles

If you hover your mouse over a file handle, it will change into an arrow. The arrows for different file handles will point in different directions. These arrows tell you which way the image will change. To change the size of an image, hold your mouse button down and drag.

The **aspect ratio** of an image is the relationship between its width and height. When an image is being resized this relationship should be preserved. Unless you want to deliberately distort the image.

If the file handles at the corners are dragged, the aspect ratio of the image will be retained.

KEY WORD

aspect ratio:
relationship between
the width and height
of an image

- When you create a document in a word processor, a spreadsheet, a database or a presentation program, there are times when you will need to place images at appropriate places in the document. You will also most likely need to edit the image to make it fit in with the needs of intended audience. For many airbrushing celebrities them slimmer beautiful. eye' some images can also be edited out, and image processing



Figure 12.9: Image is enlarged and aspect ratio maintained

In Figure 12.9, the image has been enlarged and the aspect ratio has been maintained.

If the file handles at the sides are dragged, then the aspect ratio will change and can be adjusted (see Figure 12.10).

When you create a document in a word processor, a spreadsheet, a database or a presentation program, there are times when you will need to place images at appropriate places in the document. You will also most likely need to edit the image to



make it fit in with the needs of your intended audience. For example, many adverts use airbrushing on celebrities to make them appear slimmer and more beautiful. The 'red eye' problem in some images can also be edited out, and image processing techniques are used in blue-screen and green-screen technology, which makes video clips appear as if they were filmed on location when really they were filmed in the studio. At times

Figure 12.10: The image has been distorted as the file handle on the right side was dragged

Images can be resized more accurately by using menu commands. In Word, this dialogue box (see Figure 12.11) can be accessed from the 'Picture Format' menu or by right-clicking on the image and selecting 'Size and Position'. Other software will have the commands with their own picture formatting tools.

When you create a document in a word processor, a spreadsheet, a database or a presentation program, there are times when you will need to place images at appropriate places in the document. You will also



make it fit in with your intended audience. For example, many adverts use airbrushing on celebrities to make them appear slimmer and more beautiful. The 'red eye' problem in some images can also be edited out, and image processing techniques are used in blue-screen and green-screen technology, which makes video clips appear as if they were filmed on location when really they were filmed in the studio. At times images might wish to cut a part of the image (crop an image, place one image on top of, or partially on top of, other images, or to turn an image around from the way it was originally oriented (image)). Images can easily be imported into a document using the Insert > Picture > From File menu. An image can often be pasted into a document from the clipboard from elsewhere. Once they have been imported, there are various ways. The image can be dragged using the mouse, but this method does not achieve an accurate, absolute position, only a position that is acceptable to the user. Most software allows users to enter coordinates for a more precise position relative to the margin or the edge of the page. The image can also be aligned relative to the margins. Images can be aligned relative to the text on the page.

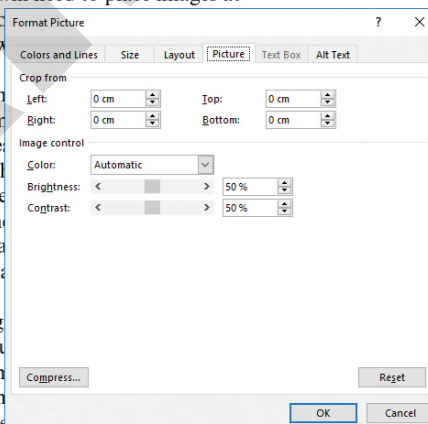


Figure 12.11: The size can be set very accurately using a dialogue box

Questions

- 3 Explain what is meant by the aspect ratio of an image.
- 4 Describe how an image can be resized to keep the aspect ratio the same.

ICT IN CONTEXT

One of the most successful mediums for communicating using combined images and text is the 'comic' (see Figure 12.12) using hand-drawn images and text.

Graphic novels are becoming ever more popular and manga is a huge hit in Japan.

Perhaps one day ICT textbooks will be written and displayed like this?



Figure 12.12: Child reading a comic

Crop an image

There are times when you might not require a whole image, but just a part of it. This can be done by **cropping** a part of it away so that only the part you require remains visible. Some software packages allow you to crop an image only in a regular (rectangular) shape, while others allow you to cut out any irregular shape from the image in the same way that you would manually use a pair of scissors to cut out shapes from a picture.

To crop an image, the command may be in the image/picture menus or main menu bar or it may also be accessed by right-clicking in the image (see Figure 12.13).

The image can be cropped by dragging the file handles (see Figure 12.14). The part of the image you crop does not just disappear forever. You can reverse the process by selecting 'crop' and dragging the file handles in the reverse direction.

KEY WORD

cropping: to remove unwanted portions of an image by 'cutting off' or removing the sides. The crop tool is used to achieve this

ACTIVITY 12.3

Images can also be cropped to a particular shape, for example, an oval or circle. Investigate your software to see if it has a 'Crop to Shape' option.



Figure 12.13: Cropping an image by right-clicking on the image



Figure 12.14: File handles for cropping

Rotate an image

Rotating an image refers to turning it through an angle. Again, there are usually different ways of doing this.

Using the mouse

When you right-click on an image you will see the file handles and also a box with a circular arrow (see Figure 12.15). This can be dragged to rotate the image.

KEY WORD

rotating: to turn an image in a clockwise or counter-clockwise direction



Figure 12.15: Rotating an image

The angle of rotation will be shown as you drag (see Figure 12.16).



Figure 12.16: Angle of rotation

Using a menu option

Here the angle of rotation can be set precisely (see Figure 12.17).

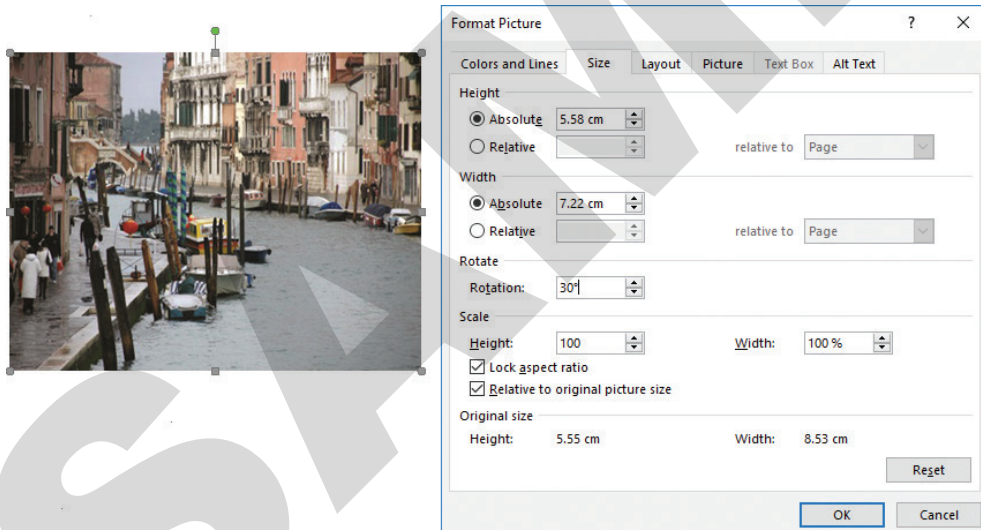


Figure 12.17: Setting angle of rotation

Reflect (flip) an image horizontally or vertically

Reflecting, or flipping, an image means producing a mirror image of the original image. The image can be reflected horizontally (see Figure 12.18) or vertically (see Figure 12.19). The software tools vary between the different software packages but in most the commands are usually in the main menu bar.

KEY WORD

reflecting: to flip an image so it a mirror of the original



Figure 12.18: Original image and flipped horizontally



Figure 12.19: Original image and flipped vertically

PRACTICAL TASK 12.1

Getting started

When an image is inserted into a document, the text can be made to flow around the image in different ways.

- 1 On paper, sketch the differences between the following types of text flow:
 - tight
 - square
 - top and bottom.
- 2 For the software you are using, explain, giving the toolbar, menu or ribbon options, how to carry out the following tasks:
 - resize an image
 - move an image behind/in front of the text
 - change the transparency of an image.

CONTINUED

Practice

3 Open Task1.doc. It contains some sample text but don't try to read it as it doesn't make sense. It is there for you to practise text flow.

4 Insert Image_a.jpg and format it to the following specification:

- Maintaining the aspect ratio, resize the image so that the height is 3 cm.
- Position it at the top, left corner of the text with a square text flow.

5 Insert Image_b.jpg and format it to the following specification:

- Maintaining the aspect ratio, resize the image so that the height is 4 cm.
- Position it 8 cm from the top margin and 6 cm from the left one.
- Set the text flow around the image to Top and Bottom.

6 Insert Image_c.jpg and format it to the following specification:

- Maintaining the aspect ratio, resize the image so that the height is 3 cm.
- Position it 1.2 cm from the top of paragraph 3 and 8 cm to the right of the left margin.
- Set the text flow around the image to Tight.

The page should appear as in Figure 12.20.



When you create a document in a word processor, a spreadsheet, a database or a presentation program, there are times when you will need to place images at appropriate places in the document. You will also most likely need to edit the image to make it fit in with the needs of your intended audience. For example, many adverts use airbrushing on celebrities to make them appear slimmer and more beautiful. The 'red eye' problem in some images can also be edited out, and image processing techniques are used in blue-screen and green-screen technology, which makes video clips appear as if they were filmed on location when really they were filmed in the studio. At times images might need to be resized or you might wish to cut a part of the image (crop an image). At other times you might place one image on top of, or partially on top of, other images (layering of images) or need to turn an image around from the way it was originally facing (reflect or rotate an image). Images can easily be imported into a document, usually by using the 'Insert' menu. An image can often be pasted into a document if you have copied it onto the clipboard from



elsewhere. Once they have been imported, images can be positioned in various ways. The image can be dragged using the mouse into a suitable position, but this method does not achieve an accurate, absolute position, only a position that is acceptable to the user. Most software allows users to enter coordinates for a more precise position relative to the margin or the edge of the page. The image can also be aligned relative to the margins. Images can be aligned relative to the text on the wrapping. In the software you are setting the text wrapping. For one of the main menus or you may commands by right-clicking on the As with positioning an image, there can be resized within a document. file handles. When you click on an document, an outline will appear and corners, sides and top and bottom of the outline. The file handles are these little circles or squares (Figure 12.8). If you hover your mouse over a file handle, it will change into an arrow. The arrows for different file handles will point in different directions. These arrows tell you which way the image will change. To change the size of an image, hold your mouse button down and drag.



The aspect ratio of an image is the relationship between its width and height. When an image is being resized this relationship should be preserved. Unless you want to deliberately distort the image. If the file handles at the corners are dragged, the aspect ratio of the image will be retained. In Figure 12.9, the image has been enlarged and the aspect ratio has been maintained. If the file handles at the sides are dragged, then the aspect ratio will change and can be adjusted (Figure 12.10). Images can be resized more accurately by using menu commands. In Word, this dialogue box (see Figure 12.11) can be accessed from the 'Picture Format' menu or by right-clicking on the image and selecting 'Size and Position'. Other software will have the commands with their own picture formatting tools. There are times when you might not require a whole image, but just a part of it. This can be done by cropping a part of it away so that only the part you require remains visible. Some software packages allow you to crop an image only in a regular (rectangular) shape, while others allow you to cut out any irregular shape from the image in the same way that you would manually use a pair of scissors to cut out shapes from a picture. To crop an image, the command may be in the image/picture menus or main menu bar or it may also be accessed by right-clicking in the image (see Figure 12.13). The image can be cropped by dragging the file handles (see Figure 12.14). The part of the image you crop does not just disappear forever. You can reverse the process by selecting 'crop' and dragging the file handles in the reverse direction. Rotating an image refers to turning it through an angle. Again, there are usually different ways of doing this.

Figure 12.20: The finished page

CONTINUED

Challenge

- 7 Rotate Image_b.jpg through 10° (see Figure 12.21).



Figure 12.21: Image rotated through 10°

- 8 Make a copy of Image_c.jpg and paste the copy directly to the left of the original. Flip the copy so that it is a mirror image of the original (see Figure 12.22).



Figure 12.22: Original image and flipped copy

ICT IN CONTEXT

One of the first forms of writing used images to represent sounds. These are the hieroglyphics invented in Egypt (see Figure 12.23).

Hieroglyphics means 'holy writings' and the images can stand for the objects they represent but usually stand for sounds. For example, the owl stands for the sound 'm'. The Egyptians believed there was great power in a name. If someone's name was remembered, then he or she would survive in the afterlife. That's why pharaohs' names were written in hieroglyphics in their tombs.



Figure 12.23: Egyptian hieroglyphics

Adjust the brightness of an image

The **brightness** of an image refers to how much light the image is emitting. Obviously, if it is emitting no light, it will be completely black and at maximum brightness, it will be completely white.

In Word, the tools for adjusting the brightness can usually be obtained by selecting 'Corrections' from the 'Format' tab or by right-clicking on the image and selecting 'Format Picture'. Usually, a slider is provided to increase or decrease the brightness (see Figure 12.24). Alternatively, a box for a number is provided; the greater the number, the brighter/whiter the image.

In the same dialogue box, you will probably find a far more useful function – changing the **transparency**. That means how easy it is to see through it. It is very useful for showing text and other objects underneath it. Usually there is a slider to increase or decrease the transparency from 0% to 100%. In Figure 12.25, the image is placed on top of the word VENICE, and the transparency of the image is 50% – so you can see the word coming through.

KEY WORDS

brightness: the amount of light an image is emitting; an image with 0% brightness will be all black, an image with 100% brightness will be all white

transparency: how see-through an image is

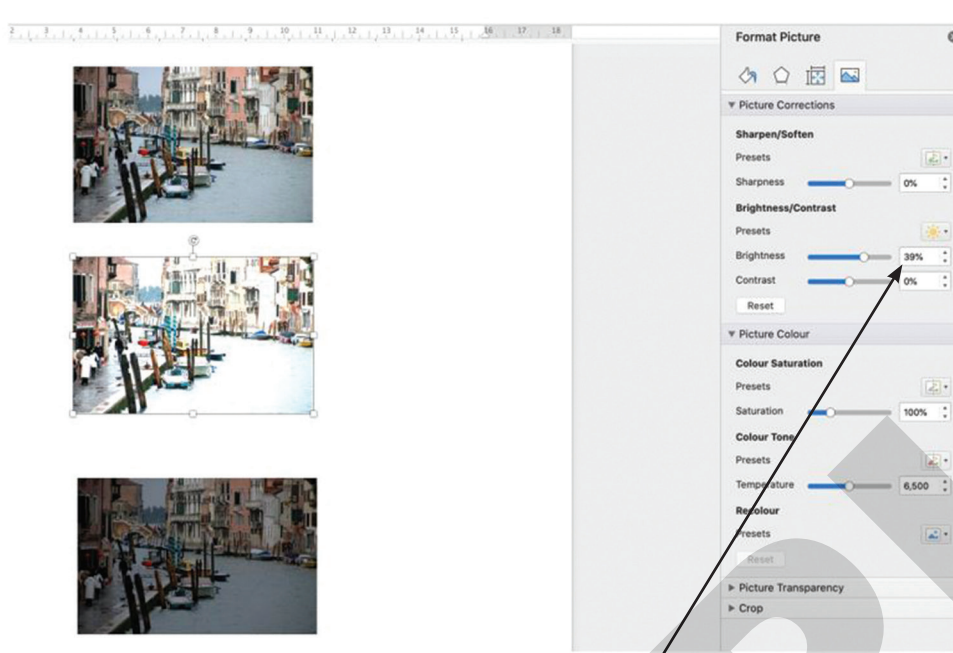


Figure 12.24: The original image, brightness increased by 39% and decreased by 42%



Figure 12.25: Image with transparency increased by 50%

Adjust the contrast of an image

Contrast means 'difference'. When you are editing images, it is the difference between the highest and lowest colour intensities of that image. High contrast means that there is a wide range (the top image in Figure 12.26) and low contrast means that they are very similar (the bottom image in Figure 12.26).

KEY WORD

contrast: the difference between the highest and lowest light intensities in an image



Figure 12.26: High and low contrast

The controls for adjusting the contrast should be with those for brightness and transparency. The higher the number, the greater the contrast; the negative numbers reduce the contrast.

PRACTICAL TASK 12.2

Getting started

- 1 Explain what is meant by saying that an image is over- or under-exposed.
- 2 Explain what is meant by the contrast of an image.

Practice

- 3 Create a new document and insert Image_h.jpg.
- 4 This image is very over-exposed and the contrast is poor. Using image editing tools such as brightness, contrast, saturation and temperature (saturation and temperature can usually be found in a similar place to brightness and contrast), edit the image to improve its appearance.

CONTINUED

Challenge

Using a graphics program, perform the same edits (e.g. brightness, contrast, saturation and temperature). See Figure 12.27 for an example.



Figure 12.27: Editing an image

- 5 In which program is it easier to edit the image?
- 6 Does the graphics program have more editing options to improve the image?
- 7 Insert the image you edited in the graphics program next to your original. Are there noticeable differences between them?

ICT IN CONTEXT

Logos usually combine images and text and have been used for hundreds of years.

The Twinings Tea logo has been used continuously for 227 years, making it the world's oldest unaltered logo in continuous use.

The first product logo is thought to be a drinks company that still exists today, which was first used in 1366.

Question

- 5 Explain what are meant by the following terms:
 - a pixel
 - b image resolution
 - c image colour depth
 - d image contrast.

Grouping, ungrouping and moving to front or back

Sometimes it is easier to move images if they are grouped together. Word processing and image editing software allows you to treat a collection of images as if it was one image by selecting all of the images and using the ‘**Group**’ option. This can be useful, even to just move a collection of objects together on a page.

You can remove this feature from an image by using the ‘**Ungroup**’ option.

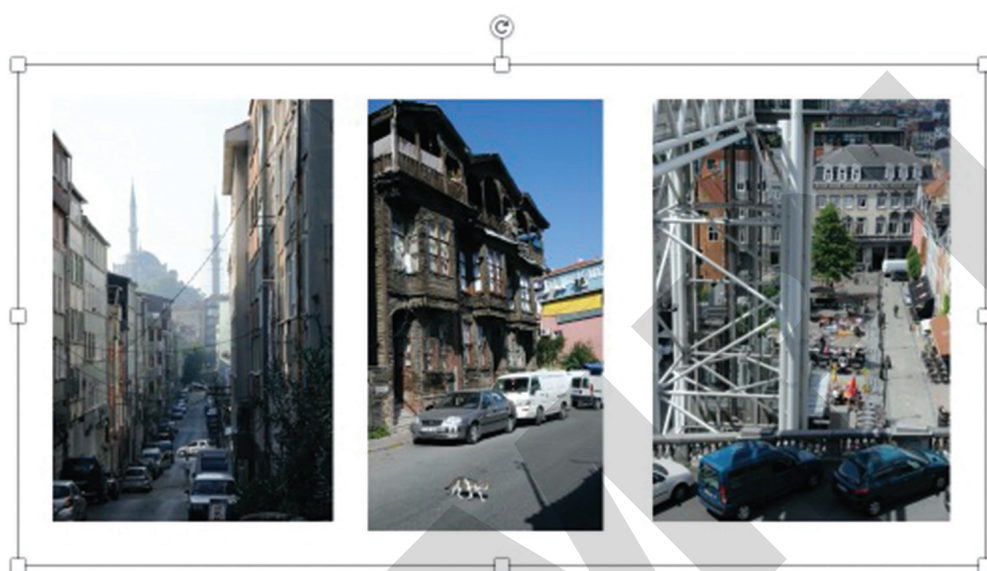


Figure 12.28: A group of images

In Figure 12.28, the images have been grouped and can be moved together as one.

Images can be placed on top of each other in **layers** (see Figure 12.29), and in most image editing software, you can change the order of how the images are placed on top of each other. You can usually do this by right-clicking your layer and selecting ‘Move to Front’, ‘Move Forward’, ‘Move Backward’ and ‘Move to Back’ (see Figure 12.30). Each of these options changes the order of the layers in the image.

KEY WORDS

group: combining images so that they can be selected and moved together

ungroup: separating the image group so that they all have to be selected and moved individually

layer: the term used to describe the different levels at which you can place an image



Figure 12.29: Images placed on top of each other



Figure 12.30: Images rearranged

PRACTICAL TASK 12.3

Getting started

- 1 Explain what is meant by the 'aspect ratio' of an image.
- 2 Explain what is meant by the 'transparency' of an object.
- 3 On paper, using a rectangular outline shape, sketch how it would appear if it had been rotated through the following degrees: 60° , 90° , 240° , 300° .

Practice

You are going to create this front page (see Figure 12.31) for a document about your holidays.

- 4 Start a new document and change the orientation to landscape.
- 5 At the top of the page, centre the heading 'My Holidays'.
- 6 Insert Image_a.jpg. Use the crop and resize tools to edit the image to retain the central part. The final dimensions of the image should be 5 cm in height and 2 cm in width.
- 7 Insert Images (b) to (f) and crop and resize them to the same dimensions.
- 8 These images are going to be arranged around a circle. Five of the images have to be rotated through the following degrees: 60° , 120° , 180° , 240° and 300° .

Decide which image has to be rotated by which amount.

- 9 In the centre of the page, insert a circle shape with a diameter of approximately 6 cm. This can be done by selecting 'Shapes' from the 'Insert' tab and selecting the 'Oval' shape. Click in your document where you want the top right corner of your circle to be. To make a circle, hold down the 'Shift' key as you are drawing it.
- 10 Arrange the images around the circumference of the circle in their correct positions.
The image at 180° should be flipped vertically.
- 11 Edit the circle shape using the 'Shape Format' tab and format it to 'No Fill' and 'No Outline'. Right-click on the shape and select 'Add Text' and write '2020' inside it.
- 12 Group all of the images and the circle so that they can be moved together.
- 13 Insert Image_g.jpg and resize it so that it fills the whole page. Change its transparency to 80%.



Figure 12.31: My Holidays

CONTINUED

Challenge

You are going to edit the page to that shown in Figure 12.32.

- 14 Move the grouped images to the bottom, right corner of the page.
- 15 Make a copy of the group and resize it. You will have to change the font size of the text '2020' to 5.5 pts so that it fits within the circle. Move this copy to the top left corner of the page and rotate it through 90°.
- 16 Make two further copies, gradually increasing in size, between the top left and bottom right corners. These should be rotated through 180° and 270° and the font for '2020' should increase to 11 and 12 pts respectively. In the copy rotated through 180°, flip the image at the bottom of the circle vertically.



Figure 12.32: The edited front page

Peer assessment

Swap your documents with a partner and assess each other's work.

	Yes/No
The document has a heading.	
All of the images have been inserted.	
The images have been cropped as requested.	
The images have been rotated through the correct angles.	
A circular shape with the text '2020' has been inserted.	
The objects have been grouped.	
Background image has been inserted and transparency increased to 80%.	
Copies have been made, resized and rotated as requested.	

WORKED EXAMPLE 12.01

THE FOOTBALL CLUB

You are going to insert some images into a document and then edit and position them accurately to the following specification.

- 1 Open WorkedExample.doc into your word processing software and add the heading 'The Football Club' with a Calibri font of 20 pts and emboldened and centred.
- 2 Insert the image Stadium.jpg. and from it make a circular clip, showing the main gates, from the centre of the image. The clip should have a diameter of 5 cm.
- 3 This image should be centred horizontally and be 1.15 cm below the top margin. It should have Tight text flow with the 'Distance from Text' set to 0 cm top and bottom and 0.1 cm left and right.
- 4 Insert the image Score.jpg and clip it so that it shows only the central, black area of the scoreboard with none of the surrounding material.
- 5 This image should have a Tight text flow, be rotated 30° and positioned 11.09 cm below the top margin and 6.79 cm to the right of the left margin.
- 6 Save the document as Football.doc.

Step 1

WorkedExample.doc is a page of text (see Figure 12.33).

When you create a document in a word processor, a spreadsheet, a database or a presentation program, there are times when you will need to place images at appropriate places in the document. You will also most likely need to edit the image to make it fit in with the needs of your intended audience. For example, many adverts use airbrushing on celebrities to make them appear slimmer and more beautiful. The 'red eye' problem in some images can also be edited out, and image processing techniques are used in blue-screen and green-screen technology, which makes video clips appear as if they were filmed on location when really they were filmed in the studio. At times images might need to be resized or you might wish to cut a part of the image (crop an image). At other times you might place one image on top of, or partially on top of, other images (layering of images) or need to turn an image around from the way it was originally facing (reflect or rotate an image). Images can easily be imported into a document, usually by using the 'Insert' menu. An image can often be pasted into a document if you have copied it onto the clipboard from elsewhere. Once they have been imported, images can be positioned in various ways. The image can be dragged using the mouse into a suitable position, but this method does not achieve an accurate, absolute position, only a position that is acceptable to the user. Most software allows users to enter coordinates for a more precise position relative to the margin or the edge of the page. The image can also be aligned relative to the margins. Images can be aligned relative to the text on the page. This is known as text wrapping. In the software you are using, there may be different ways of setting the text wrapping. For example, there may be commands in one of the main menus or you may be able to access more menus and commands by right-clicking on the image.

As with positioning an image, there are different ways in which images can be resized within a document. The simplest method is to drag the file handles. When you click on an image, once it has been placed in a document, an outline will appear and tiny circles or squares appear in the corners, sides and top and bottom of the outline. The file handles are these little circles or squares (Figure 12.8). If you hover your mouse over a file handle, it will change into an arrow. The arrows for different file handles will point in different directions. These arrows tell you which way the image will change. To change the size of an image, hold your mouse button down and drag. The aspect ratio of an image is the relationship between its width and height. When an image is being resized this relationship should be preserved. Unless you want to deliberately distort the image. If the file handles at the corners are dragged, the aspect ratio of the image will be retained. In Figure 12.9, the image has been enlarged and the aspect ratio has been maintained. If the file handles at the sides are dragged, then the aspect ratio will change and can be adjusted (Figure 12.10). Images can be resized more accurately by using menu commands. In Word, this dialogue box (see Figure 12.11) can be accessed from the 'Picture Format' menu or by right-clicking on the image and selecting 'Size and Position'. Other software will have the commands with their own picture formatting tools.

There are times when you might not require a whole image, but just a part of it. This can be done by cropping a part of it away so that only the part you require remains visible. Some software packages allow you to crop an image only in a regular (rectangular) shape, while others allow you to cut out any irregular shape from the image in the same way that you would manually use a pair of scissors to cut out shapes from a picture.

To crop an image, the command may be in the image/picture menus or main menu bar or it may also be accessed by right-clicking in the image (see Figure 12.13).

The image can be cropped by dragging the file handles (see Figure 12.14). The part of the image you crop does not just disappear forever. You can reverse the process by selecting 'crop' and dragging the file handles in the reverse direction. Rotating an image refers to turning it through an angle. Again, there are usually different ways of doing this. When you right-click on an image you will see the file handles and also a box with a circular arrow (Figure 12.15). This can be dragged to rotate the image. The angle of rotation will be shown as you drag (Figure 12.16). Here the angle of rotation can be set precisely (Figure 12.17). Reflecting, or flipping, an image means producing a mirror image of the original image. The image can be reflected horizontally (Figure 12.18) or vertically (Figure 12.19). The software tools vary between the different software packages but in most the commands are usually in the main menu bar. The brightness of an image refers to how much light the image is emitting. Obviously, if it is emitting no light, it will be completely black and at maximum brightness, it will be completely white. In Word, the tools for adjusting the brightness can usually be obtained by selecting 'Corrections' from the 'Format' tab or by right-clicking on the image and selecting 'Format Picture'. Usually, a slider is provided to increase or decrease the brightness (see Figure 12.24). Alternatively, a box for a number is provided; the greater the number, the brighter/whiter the image.

In the same dialogue box, you will probably find a far more useful function – changing the transparency. That means how easy it is to see through it. It is very useful for showing text and other objects underneath it. Usually there is a slider to increase or decrease the transparency from 0% to 100%. In Figure 12.25, the image is placed on top of the word VENICE, and the transparency of the image is 50% – so you can see the word coming through. Contrast means 'difference'. When you are editing images, it is the difference between the highest and lowest

Figure 12.33: The page of text

CONTINUED

Add the heading ‘The Football Club’ with a Calibri font of 20 pts, emboldened and centred.

Step 2

The image of the stadium can be inserted anywhere in the document. It may move onto another page and push the text down (see Figure 12.34).



Figure 12.34: The image has moved down to the second page

This will be easy to fix when the image is resized.

A circular clip can be made using the ‘Clip to Shape’ tool – obviously using the ellipse shape.

Unfortunately, if this shape is used on the current image it will not produce a perfect circle (see Figure 12.35).



Figure 12.35: The oval clip

CONTINUED

This looks more like an oval!

To ensure that the clip is a circle, the original image must be made into a square using the crop and resize tools ensuring the main part of the edited image shows the main gates.

Figure 12.36 shows the image now as a square of 14 cm height and width.



Figure 12.36: A square from the original image

Now use the 'Clip to Shape' tool again. As the clip was made from a square this time, it should be a perfect circle.

The size can now be changed to 5 cm × 5 cm.

Step 3

The clip can now be centred and placed 1.15 cm below the top margin with Tight text flow and the 'Distance from Text' set correctly (see Figure 12.37).

CONTINUED

The Football Club

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Painting and graphics are a vital form of communication – and were probably the first form of non-verbal communication we had. Long before written communication, people were drawing on the walls of caves.

The image in Figure 12.2 shows graphics painted in a cave near Raka, Muna Island, Southeast Sulawesi province, Indonesia. Nobody is sure why they were painted but maybe the animal ones were to help the hunters – capture the image and you'll capture the animal. Or maybe they were just boasting about what they had already caught. Many cave drawings are of people or just their handprints, so maybe people just wanted to leave their marks. Or maybe they just felt like doodling.

Throughout history, images, design and graphics have played an important part in human existence and have helped people to understand their lives. Everyone has a creative need but unfortunately not everyone has the skills to express it through painting and drawing. Computers and graphics programs have helped those people to express their creativity. Today we are surrounded by graphics – in magazines, leaflets, advertising, logos and online. An image can create a mood or communicate excitement, sadness, reflection or an idea of perfection. They can be manipulated in many ways to enhance or change the impressions they create but as well as revealing truths, images can be manipulated to imply a

Figure 12.37: The circular clip on the page

Steps 4-5

Score.jpg can now be inserted and cropped (see Figure 12.38) in line with the specification.



Figure 12.38: Before and after cropping

Step 6

The document can then be saved as Football.doc.

Questions

- 1 Create this document with the required specification, using your own software.
- 2 Edit the circular image by applying a red border with a weight of 3 pts.

12.2 Reducing file size

When images are used on websites and transmitted over the internet, it is important that they can be downloaded in the quickest time possible. It is therefore important that the file sizes of images should be as low as possible.

To a computer, an image consists of millions of 1s and 0s, the total amount determining its file size.

When a picture is digitised, it is divided up into thousands of points or elements, and the colour data of each point is stored as bits – 1s and 0s. Each of these elements is called a **pixel**.

Obviously, the more pixels that are used, the more detailed and accurate the picture will be, but the larger will be the file size.

The number of pixels per unit of area is called the **image resolution**. This is often referred to as pixels per inch (ppi).

The colour of each pixel is stored as a number of bits (1s and 0s) and the greater the number of bits used to represent a colour, the greater the number of colours can be represented.

If one bit is used (0 or 1), then only two colours can be represented, white and black.

Two bits would represent four colours, but this is rarely used. Table 12.1 shows how each colour is represented.

Bit 2	Bit 1
0	0
0	1
1	0
1	1

Table 12.1: How two bits can allow for four colours

With four bits, 16 different colours and with 8 bits, 256 different colours.

Most modern cameras and scanners now use 24 bits so giving 16 777 216 different colours. If more colours are available, more colour differences can be represented rather than grouping similar ones into one colour.

The number of bits used is called the **colour depth** of the image.

Therefore, image file size can be reduced by:

- reducing the number of pixels used
- reducing the colour depth.

KEY WORDS

pixel: short for picture element

image resolution: the number of pixels per unit area of an image

colour depth: the number of bits used to store colour data about each pixel

Reducing the number of pixels



Figure 12.39a: 2696 × 4085 pixels: size 11 megabytes



Figure 12.39b: 300 × 455 pixels: size 250 kilobytes



Figure 12.39c: 60 × 91 pixels: size 20 kilobytes

As the number of pixels is reduced, the image becomes less detailed. Try reading the street banner on the different versions in Figures 12.39a-c.

Reducing colour depth

Compare the images in Figures 12.40a and b with Figure 12.39b which has 65,536 colours.



Figure 12.40a: 16 colours Size 2.6 megabytes



Figure 12.40b: 2 colours 2 megabytes

PRACTICAL TASK 12.4

Getting started

- 1 Explain what is meant by a 'pixel'.
- 2 How can the file size of an image be reduced?

Practice

- 3 Image_i.jpg shows a view of the city of Rome. It has an image size of 4217×2814 pixels.
- 4 The image has a file size of 6.2 megabytes. In order to prevent document files from having large file sizes, the file sizes of the images they contain can be reduced.
- 5 Load Image_i.jpg into a graphics editing package. From this image, export three others with the following image sizes:
 - 640×424 pixels
 - 150×100 pixels
 - 75×50 pixels.Export the images as Image_i_2, Image_i_3 and Image_i_4.
- 6 Create a new document and set it to landscape orientation.
On the first page put the title 'Images of different sizes'.
Insert the four images so that they each fill a page – set each to a height of 14 cm.
Under each image write the size – for example, ' 640×424 pixels' – and the file size – for example, 130 kilobytes.
- 7 Add a fifth page and explain what happens when the size of images are reduced but they are all displayed at the same size.

Challenge

Another way of reducing file size is to reduce the colour depth of the image.

- 8 Load Image_i.jpg into a graphic editing program and change the colour depth to a higher value and a lower one – for example, 8 Bits/Channel or 16 Bits/Channel. Export the new image each time.
- 9 Does changing the colour depth affect the file size?
- 10 Insert the new versions into the document. Can you see any difference between the images of lower and higher colour depth?

REFLECTION

Think about your work in the practical tasks. What could you improve on?
Discuss your ideas with a friend.

SUMMARY

Images provide an important method of communication.
There are tools to position an image precisely within a document.
An image can be resized preserving its aspect ratio or be deliberately distorted.
An image can be cropped to remove unwanted material.
An image can be rotated through any angle to enhance the design of a page.
Flipping an image produces a mirror image.
Both the brightness and contrast of an image can be adjusted to enhance its appearance.
Images can be grouped so that they can all be moved together.
Images can be moved in front of or behind each other.
The file size of an image can be lowered by reducing the number of pixels or the colour depth.

EXAM-STYLE QUESTIONS

- 1 In suitable software, open image Q1.jpg. It shows a view of part of a bridge. Examine the properties of this image in suitable software.
- a What is the resolution of this image? [1]
- b Import this image into a blank document in a word processor and position it exactly 3 cm from the left edge of the page and 2 cm from the top. [1]
- Make a copy of this image.
- c Paste a copy of this image and rotate the copy through 3°. [1]
- d Paste another copy and flip the image horizontally. [1]
- e Paste a further three copies of the image next to each other on the page. Group these three copies and rotate the group through 63°. [3]
- f In suitable software make versions of the image with the following sizes:
- i version a – 640 × 453 pixels
- ii version b – 200 × 141 pixels. [2]
- Import these versions into your document.
- Place these versions with image Q1 so that they are all overlapping.
- g Arrange the images so that version b is at the top, image Q1 is in the middle and version a is at the bottom. [3]
- 2 Define the following words with reference to images: [10]
- a resize b crop c rotate d reflect e text wrap.

COMMAND WORD

define: give the precise meaning of an idea or concept

CONTINUED

- 3 a** In suitable software, open Q3_text.doc.
- b** Insert Q3_image.jpg. [1]
- c** Resize the image so that it has a height of 5 cm while maintaining the aspect ratio. [1]
- d** Set the text flow around the image to tight. [1]
- e** Set the position of the image to 3 cm from the left page edge and 10 cm from the top. [1]
- f** Make a copy of the image and paste it into the document, immediately to the right of the original. [1]
- g** Flip the copy horizontally. [1]
- h** Save the document as Question3.doc. [1]

[Total: 29]

SELF-EVALUATION CHECKLIST

The self-evaluation checklists are followed by 'I can' statements which match the Learning Intentions set at the beginning of the chapter. You might find it helpful to rate how confident you are for each of these statements when you are revising. You should revisit any sections that you rated 'Needs more work' or 'Getting there'.

I can...	See section	Needs more work	Getting there	Confident to move on
place an image with precision	12.1			
resize an image and maintain or adjust its aspect ratio	12.1			
crop, rotate and flip an image horizontally and vertically	12.1			
adjust the colour depth, brightness and contrast of an image	12.1			
group and layer images	12.1			
explain how to reduce file size by reducing image resolution and colour depth.	12.2			