CHAPTER

13

How knowledge is acquired

We all know learning when we see it! Or at least, many would make this claim. But we do not learn in a straightforward way – it is more staccato – we listen, we try, we concentrate, we try again, we make mistakes, we correct, and we learn together. Over the past century we have learnt a lot about learning, and this chapter looks at these findings grouped under three major topics:

a six principles of acquisition;

b six principles of memory retention; and

c five aspects of handling information overload.

After discussing each of these topics, we will briefly review the notion that we possess three types of memory systems, specifically, the iconic or sensory store, the working memory, and the long-term memory.

Six principles of acquisition

1 Learning requires time, effort, and motivation

Human learning is a slow process that can happen over months and years rather than hours or days. The necessary ingredients are (a) time, (b) goal-orientation, (c) supportive feedback, (d) accumulated successful practice, and (e) frequent review. Notions such as instant experts, superfast learning, speed-reading, and other magic-like programs, amount to faddish quackery in violation of known and validated principles of human learning. If only it was that simple.

We *appear* to learn specific small-scale behaviours, isolated bits of knowledge, or low-level objectives within only a few minutes. But impressions of quick learning are deceptive for many reasons. Unless the material is strongly meaningful, relevant and timely, it is subject to rapid and substantial forgetting. Any new learning can be readily disrupted. To become skilful in a new area takes about 50 to 100 hours of practice. Genuine expertise requires some 10,000 hours, or 8 to 10 years of consistent skill development. It is known that the

average intelligent person can learn basic rules of chess within an hour, and might then play a rudimentary game. But it takes a decade to become a chess master.

2 Concentration spans are short

Most of us have a natural attention or concentration span of around 15 to 20 minutes before significant levels of **mind wandering** occur. Well-motivated learners may then refocus their mental activities back onto a task, but will still need short breaks from the task being learned in order to avoid overload effects. If you need to teach anyone some new information, you need to do it within 15 minutes, or else you will 'lose them'. Attention is easily disrupted. Paying attention to music as you try to learn something else will harm your mental focusing and disrupt your learning, a finding that stands in contrast to the fallacious Mozart effect, popularised within the media, and reviewed later in this book (Chapter 23).

3 Distributed practice is more effective than massed practice or cramming

To try to learn material within a single block of time often turns out to be less effective than if the same duration of time is broken into shorter periods spaced over several days or weeks. This distributed practice effect is especially true when developing new procedural skills. For example, if you were to learn to drive a car, you would benefit more from 6 sessions, 20 minutes each, spaced over a week, than from a single block session of 2 hours. In most human learning situations, blocks of 15 to 30 minutes are effective in cost–benefit terms. The effect of distributed practice is sometimes also called the spacing effect.

4 Prior knowledge effects are powerful

David Ausubel claimed 'that if I had to reduce all of educational psychology to just one principle, I would say this "The most important single factor influencing learning is what the learner already knows. Ascertain this and teach him accordingly."' A major determinant of knowledge acquisition will be what the mind already knows. It is far easier to build on coherently organised *existing knowledge* than it is to learn new material *de novo*. Our current knowledge and understanding is the filter (sometimes correctly, sometimes not) of new information – hence the importance of prior knowledge. New information that cannot be related to existing knowledge is quickly shed. In sheer learning power, prior knowledge effects are stronger than other variables likely to impact learning. Prior knowledge effects readily outweigh effects due to IQ or so-called 'learning styles', which have fairly weak effects on learning. When your prior knowledge is based upon misconception, however, it will create an obstacle, an effect called *interference*. Sometimes we have to start by unlearning what we already know so that correct and more powerful learning can take place.

The mind does not relate well to unstructured data. We find it extremely taxing to learn random lists or when coping with unrelated materials. We need to find the organisation, structure, and meaning in whatever we learn. *Meaningfulness*, or relatedness, stems directly from prior knowledge. We benefit enormously from being shown how to group information, how to locate patterns, how to use order, and how to schematise and summarise. Often we need to be taught a 'coat hanger' (or higher order concept) on which to hang new knowledge. In teaching situations, good teachers often provide overviews of what we are to learn, and these are referred to as **advance organisers**, which serve to activate prior knowledge and so enable us to acquire new information efficiently. If these advance organisers also demonstrate what success criteria look like at the end of learning this helps provide the coat hanger such that we can then say, 'Aha, now I know.'

5 Your mind responds well to multimedia input

From time to time, we come across theories describing 'visual learners', or 'auditory learners', or 'tactile learners', or whatever. But people are more similar than they are different in such learning styles. We cover this in depth in Chapter 19. We all are visual learners, and we all are auditory learners, not just some of us. Laboratory studies reveal that we all learn well when the inputs we experience are **multi-modal** or conveyed through different media. Our brain is set up, incredibly well, as a device that integrates information from different source inputs, especially from different modalities. Strong learning occurs when words and images are combined. Claims made such that 'some students learn from words, but others from images' are incorrect, as all students learn most effectively through linking images with words. These effects become especially strong when the words and images are made meaningful through accessing prior knowledge. Differences between students in learning are determined strongly by their prior knowledge, by the patterns they can recognise, and not by their learning style.

6 To learn, your mind has to be active

This principle is simply that learning occurs effectively once the mind responds to a meaningful experience through making a meaningful response. When the mind *actively* does something with the stimulus, it becomes memorable. Our brains are never inert when we are learning. It is possible to pay attention, to watch, and learn a good deal from many apparently 'passive' experiences (i.e., without any apparent overt responding taking place). In many classroom situations, those who observe carefully can pick up more information than someone performing a given task. This observational learning effect is especially true when there is no physical or motor skill involved. But passivity in learning situations can bring inherent dangers such as (a) not realising that you have failed to learn, (b) being distracted, or (c) falling asleep. This principle is aligned with the notion of **elaboration,** which will be discussed later in this chapter.

Six principles of memory retention

1 To recognise is easy: to recall is hard

The term *recognise* means to indicate that the material is known. This entails signalling, in a coherent way, such as ticking a box on a multiple-choice test. But to *recall* means to produce, reconstruct, or rebuild. Measures of recognition pick up partial or incomplete knowledge very easily. Recall measures are more severe and insensitive to partial knowledge. Hence, in terms of items remembered, a recall test typically yields lower scores than a recognition test. Indeed, part of the art of constructing high quality multiple-choice tests is to devise items that cannot be answered by simple, direct recognition, but which involve deeper levels of processing.

2 Information given first and information given last is often recalled more easily

As a learner, the individual deals inevitably with sequences of information. The human brain is a type of linear processor, and how you remember events is subject to what are called *serial position effects*. Obviously, some information entering the mind is more important than other information, and information that enters the mind first within a sequence is recalled more readily, and this effect is called **primacy**. In contrast, the **recency effect** occurs when the information that enters the mind last has an advantage in your learning. Put these together: when you listen to a lecture you are more likely to recall the beginning and end bits, but the middle is more readily forgotten. Recency effects can be strong immediately after a learning experience, but the primacy effect may tend to become strong remembering something that occurred a while ago. It is difficult to generalise here, however, since laboratory studies indicate some individuals tend to show strong primacy effects, whereas others will show stronger recency effects.

3 Over time, there are different rates of forgetting

With effort, it is possible to learn meaningless material. Lists of nonsense words, or columns of random numbers can be committed to memory. But retention level for this type of rote learning is dramatically low, possibly about 20 per cent can be recalled after a day. Rote acquisition results in rapid forgetting within minutes of the original learning. If such material is to stay with us, it must be constantly rehearsed or otherwise a clear pattern must be perceived – this is the difference between rote and deep memorisation. Various mnemonic devices may be activated to aid retention levels and to free working memory to attend to deeper thinking, but recall through the use of such devices should not be confused with deep learning.

The rate of forgetting will depend on the type of original learning. For example, once mastered, motor actions may be retained for a lifetime. A healthy senior citizen is able to ride a bicycle even after not riding for 50 years. Also, the retention level for vocabulary words is very high, at least within your native language. But there will be moderate levels of decay over time for most intellectual-type skills, especially if the skill hinges upon detailed knowledge of specific facts or numbers. Unfortunately, the mind will shed isolated facts very rapidly. We all have great difficulty holding onto arbitrary items such as telephone numbers, and bank account numbers, even when such things may be seen as important.

4 Memory is a highly constructive process

It is tempting to think of the memory as a 'play-back video recorder.' This metaphor is misleading. Memory is highly constructive in that it relies on the brain making sense of partial cues and imprecise information. Memory is dependent upon the focus of attention at the time of learning. But what two people focus upon, given the same experience, can be different. As Nietzsche claimed, there is no such notion as immaculate perception. Human beings are notoriously unreliable as eyewitnesses to complex events. Memory for aspects such as time estimates, vocal emphasis, specific words spoken, causal sequences, and even actor–action associations vary dramatically between witnesses. Interpretations vary in accordance with prior expectations and other sense-making strategies. The act of recall must be seen as a person's attempt to find meaningful patterns in what otherwise is chaos. Hence, our memories are subject to many different types of error such as oversimplification, abbreviation, schematizing, distortion, and intrusion. An *intrusion* is where a person recalls some aspect that was not part of the original learning experience, but which makes sense within the context of what they have remembered.

People are not aware when their memory plays tricks upon them. We fall into the trap of believing that our memories correlate perfectly with reality. Eyewitness confidence level, however, is a flawed predictor of what actually took place. Instead, such confidence reflects whether or not we as a witness are able to construct a story that makes sense. The success of the worldwide phenomenon, *The Innocence Project*, stands as testimony to tragic errors made through courts accepting eyewitness constructions. Modern DNA methods have so far been used to free more than 280 falsely accused individuals.

At times, our memory reports can be biased by factors such as stereotypes, prejudices, and faulty expectations. There can be many sources of distortion at work whenever people report on events in which they took part. It is important to realise that human interactions, especially when occurring within split seconds, are almost impossible things to recall accurately with your mind alone. Many studies have been conducted into **false memory effects**, where people report on events that did not happen. Within controlled studies, various subtle techniques have been used to implant such memories.

5 The principle of savings: what is forgotten can still help

Suppose you learnt a foreign language 20 years ago, but now appear to have forgotten it completely. Well, this is unlikely to be the full story. Studies have shown that we can learn material the second time very rapidly, even when the original learning appeared inaccessible. We know about this principle because of the huge time advantage people have whenever they relearn material. In such situations, people are unaware of the power of this effect, and may not realise that substantial savings are being made. All they know is that they seem to be 'picking it up fast'. This effect is dramatic when a person visits a country after not having spoken a specific language there for 20 years and then 'picks it up' within a week of arriving in the country. Such effects appear unconscious and can account for why you can acquire some skills very quickly.

6 Your memory is subject to interference

Interference refers to natural memory loss due to experiences either before or after the original experience. For example, if you learn a list of 20 Spanish vocabulary words and then a list of 20 French words, your recall of the Spanish words is inhibited by learning the French list. This is called **retroactive interference**. But similarly, your recall of the French list is reduced by the fact that you had earlier learnt the Spanish list, and this form of interference is called **proactive interference**. These are genuine memory effects, not merely the result of fatigue or overload.

In school situations these effects can operate in subtle ways. Although we hold that prior knowledge generally will help learning, there are times when prior knowledge can become a source of proactive interference. This occurs when your prior knowledge is faulty, or constitutes a misconception. For example, within the science curriculum words such as force, matter, vector, ratio, space, and living all have technical definitions that can be hard for students to assimilate because such words also have common-sense meanings remarkably different from their technical meanings.

Five aspects of handling information overload

At times, people find themselves in situations where they are overloaded. The efficiency and organisation of actions is threatened because there is too much going on within the mind. Overload is implicated in a host of human pathologies and miseries. This notion provides one powerful reason why people at times will act against their intentions and self-interest. For example, under provocation and stress, a teacher may strike a student despite knowing such physical gestures are illegal, ineffective, and inappropriate. The explanation for many forms of violence is that the actors were overloaded and unable to cope. In recognition of this fundamental aspect of the human condition, we can describe five key points.

1 From the learner's perspective, learning is not always a pleasant experience

Overall, learning will bring high levels of reward and personal satisfaction. But, look at this closely. Positive emotions are correlated with two things: (a) planning and goal setting in the first place and (b) achieving planned goals. For the most part the actual learning is *not* enjoyable. It is enjoyable to have skill, to display prowess, and to envisage what one can do. It is pleasurable to perform, or dream about performance benefits. However, learning can be tough. The actual process of learning, the moment when learning takes place can be stressful and loaded with emotions of uncertainty. This can quickly shift into negative feelings, once capacity is exceeded. This notion is consistent with the Willingham thesis cited in Chapter 1.

One factor implicated in this principle is that most students possess a natural tendency toward **overconfidence** in being able to learn. That is, we tend to be optimists and so believe we can perform better than we really can in most situations. Similarly, we *underestimate* the amount of time and practice it takes to master a new skill. We underestimate how much discipline and determination is needed to develop expertise. These natural tendencies are simply human default positions, neither 'good nor bad', but can be recognised by all instructors, teachers, and parents. The overconfidence effect is especially strong *before* people receive objective feedback about performances. Feedback can force a person to radically alter such assessments.

2 Learning places great stress on mental resources

A learner is vulnerable. A learner has to maintain composure in the face of often unpredictable consequences. It is necessary to mobilise high levels of effort and vigilance, and so be prepared to respond to input experiences in a variety of ways. Learners may not know how the world is going to react towards an action they have initiated. They may not know of the appropriate stimuli to devote attention to, may not know how to match the intensity of their response to the immediate input, or how to pull back if they have optimistically overstated current capabilities. In short, mental resources are stretched, and once an overload point is reached, then the ability to take on board any new information is reduced severely.

3 For all learners, it is crucial to develop coping strategies

We all develop ways of coping with overload. We can do things such as pay attention, work slowly, increase the level of practice, reread the materials, or find a good teacher. Our coping strategies need to apply to two fundamental aspects: (a) increasing our opportunities to learn, and (b) managing our emotional responses. It is necessary for every student to develop a wide range of possible coping methods. Failure to learn coping skills renders the individual passive in

the face of inevitable overload experiences. Incidentally, it has been found that there is a surprisingly high level of consistency in the way individuals will respond to quite different sources of stress. These coping strategies do not seem to relate strongly to other aspects such as personality, but they are nevertheless consistent within the individual. It is thought that these individual coping styles and strategies are set by the time students go to high school.

4 Sources of overload can be identified

There is no one single cause of overload and some students will adapt to overload stress better than others. However, at the level of the individual learner, it is possible to specify that overload can be linked to *any one* of the following:

- low levels of prior knowledge;
- deficient use of mental strategies or inappropriate coping strategies;
- unrealistic expectations (e.g., overconfidence, goals set too high, or immutable);
- poor instruction, inadequate teaching, or failure to engage with learning material;
- unfavourable learning conditions (e.g., study facilities, presence of distractions);
- assessment apprehension (e.g., unfair tests, competition, emotional problems).

5 We are all subject to overload

When conditions such as those listed above are unfavourable, all of us will experience problems in learning or otherwise performing at an optimal level. There does not appear to be any natural 'alarm bell' telling us we are about to experience an overload. Instead, this is something we often discover once it is occurring. One recurring fallacy about human information processing is that the mind can learn more than one thing at a time. This trait is occasionally ascribed to young people who grew up around computers (so-called **digital natives**). There have been many studies into this effect, and we review these issues in Chapter 20 and 21. The overwhelming conclusion is that no human has yet evolved that can genuinely multitask when tasks involve active levels of conscious cognitive processing. When it concerns two deliberate acts, then *any degree of mental switching* will cost you, often dearly. Instead of being a solution to your busy life, attempting to multitask, or dividing your attention, adds to overload.

Multi-store theory

The multi-store theory suggests that the human memory system consists of at least three levels of memory, which can loosely be called banks or stores. They

are the iconic store, the short-term, or working, memory, and long-term memory. These will be discussed below together with a discussion on the need for every learner to develop strategies to enable learning to occur.

Iconic memory

This form of memory is also known as sensory memory, or as ultra-short-term memory. Iconic memory relates to input experiences and perceptions within a sensory modality. Within the visual system, for example, experiments reveal that a large amount of data can be stored for around a second. In a laboratory study, for example, you might be asked to look at a screen where an image appears for one twentieth of a second. Your visual system takes it in and then has perhaps up to a second to 'read' from the image until it fades from your mind. The auditory system appears to have longer duration sensory images of possibly two or three seconds duration.

Short-term or working memory

Although researchers use different ways of assessing short-term memory, and working memory, these two terms are clearly related, and often are used interchangeably. In essence, short-term memory refers more to our basic biological capacity, and working memory refers to what the mind is doing within this capacity. Metaphorically, this is the working area or the 'workbench' of your conscious mind. But it is a system that has to stay active, lest items drop off the workbench and are lost forever. Indeed, it is a limited capacity workbench, which presents a huge bottleneck to our ability to learn.

The short-term memory system has two basic problems. First, the amount of information it easily holds is limited to only a few items at a time. Second, information is lost quickly from the system. How much information can be held, if they are to be 'worked' on? *Answer*: around four items if they are unfamiliar ones, but around eight if they are relatively familiar items such as numbers, letters or simple words.

How long does information stay within the system? *Answer*: somewhere between 5 and 20 seconds. For example, you find a telephone number in the White Pages. But someone speaks to you between your reading the number and being able to dial. This interaction destroys mental rehearsal. Your ability to get the number correct is lost after 5 seconds. And after a 20-second interruption, it has gone. To retain such information you need to rehearse in order to maintain it within an active buffer called the **articulatory loop**. Laboratory studies show that the mind uses a natural articulatory loop of 1.5 seconds. It is easy to retain as much as you can say to yourself within 1.5 seconds, and do so indefinitely. The other way to retain information is to transfer it to long-term memory.

Long-term memory

Metaphorically, the long-term memory is the archival library store where data are filed for retrieval. It is held that this system holds information in permanent storage form. Certainly, long-term memory storage will be affected dramatically by disease or brain trauma. But this system is not subject to the same decay processes that beset one's working memory efficiency. In essence, the passage of time alone does not dim this system.

There are many issues associated with storage within the long-term memory. One major issue is that the system does not possess anything like the file transfer protocol (or FTP) download capability of a computer. There is no human equivalent to transferring information from your USB to your hard drive. It can also be noted that the major cause of apparent forgetting in humans is failing to learn properly in the first place. As we noted earlier, humans tend to be overly confident in their learning ability, and will underestimate the time and effort required to achieve skills. Hence, people will often fail to pay sufficient attention to learning opportunities as they underestimate how much effort is required.

There are no known spatial or capacity limits on long-term memory. Actually, the principle of prior knowledge even suggests the opposite: the more knowledge you have the easier it is to learn even more. In the course of aging, the mind may lose certain agilities, notably those to do with fast accessing, but the volume of material stored is not affected primarily by aging itself.

The major problems of the long-term memory system hinge around three aspects: (a) the sheer difficulty of loading information into the system, (b) the need to develop efficient encoding strategies that enable inputs to be fully processed and interpreted in such a way as to relate to what the head already knows, and (c) the need to use retrieval strategies which enable ease in accessing stored memories.

Never think of your long-term memory as a passive repository. In action, it is nothing like that since this form of memory determines who you are, what you can do, and how you see your world. Every mental operation you perform hinges upon ease of access to information you acquired earlier in your life. Every time you find an experience meaningful it is because of its relationship to what is already in your head. For example, you might think of tasks being objectively 'easy', or 'hard'. This is illusory since easy and hard are defined by individual learning histories (the accessibility of information from long-term memory) and not by objective criteria. A task you find hard is easy to someone with greater knowledge in this area.

The need to develop efficient learning strategies

The multi-store theory portraits learning in terms of transfer of information across the memory banks within the mind. Whereas the iconic store appears to take in

a good deal, the process of attention ensures that only a few items are transferred from the iconic store to the short-term memory. In this sense, attention operates as a filter keeping a high level of information out of consciousness.

Within the short-term memory, information may be held for brief periods, but unless immediately refreshed it fades quickly, and is lost forever. On the other hand, the learner can use strategies to move the data into long-term memory. This entails some form of active responding in that the mind has to 'do something with this stuff before it disappears'. But what? What can you do?

Within your mind you could try a bit of CRIME. These are chunking, **rehearsal**, imagery, mnemonics, and **elaboration**. *Chunking* is involved whenever the mind groups items together that did not necessarily come together in direct experience. Chunking can mean to group, sort, organise or classify. The central idea is that the mind is able to reduce mental load by arranging related items into a meaningful pattern using prior knowledge.

Rehearsal means literally to repeat oneself, to refresh the data. This can be done sub-vocally within the working memory (thus making it work). When one rehearses aloud it is called reciting. The mind is working on the notion that repetition will make the memory trace more permanent. When this practice is applied to data that cannot be linked to existing knowledge we may use the term 'rote learning'. In early childhood one basic memory strategy takes the form of *labelling* (i.e. naming whatever stimulus is present within immediate view). In later childhood, rehearsals may take the form of a list that can be quietly repeated to oneself even when objects are not in sight. By adolescence, rehearsal will take the form of a **cumulative rehearsal and fast finish**, a much more sophisticated form.

Imagery is another way to respond to an input experience. Literally, this means to 'picture it' within the mind, a skill that some people report they use very naturally. We encounter some people, for example, who claim that they even recall telephone numbers not by rehearsing them sub-vocally, but by imagining what the numbers look like written down. One of us (Greg Yates) once worked with a person who claimed to recall telephone numbers by projecting mentally the number onto a blank wall. Then by reading what was on the wall he could read them either forwards or backwards.

Mnemonics is a general word that can be used to refer to any memory device. But we often use the term to refer to temporary tricks such as using ROYGBIV for the colours of the rainbow, or Every Good Boy Deserves Fruit for the notes on the treble clef in music, or even CRIME. As a student you will know of specific mnemonics that relate to problems within your areas of knowledge. Such tricks exist, for example, for being able to memorise the value of pi, the periodic tables, the positions of planets, or the nerves of the body, and so on.

Elaboration means to process information by adding to it in meaningfully. You can use the input information as a trigger for bringing other data from long-term memory into working memory consciousness. So fusing the new with the old

creates a more durable and accessible memory trace. Let us try to illustrate this: (a) you have to learn a number, 8912815, and realise that you were born in 1989, in the month of December, so you 'pretend' that it was quarter past eight in the morning. Another example, (b) you read the word Taipan in the TV program, and your mind crosses back to when you were in Queensland and the farmer told you to watch out for deadly snakes in the cane fields.

In both instances your memory for the inputs (the number and the TV program) is enhanced because your mind elaborated at the *moment of initial exposure*. Such elaborations may be either involuntary, or quite deliberately employed as a conscious learning strategy in which prior knowledge associations are used to advantage. We note that all the memory training schemes or books we have ever seen base themselves on principles of elaboration, organization and chunking.

IN PERSPECTIVE: So far, so good, but what is missing? *Answer*: our social brain

Thus ends Learning 101. This chapter offers a broad survey into factors that underpin learning. Many of these basic ideas are discussed in other chapters in this book. However, what is notably missing from this specific chapter is any sense of the social context in which we expect our students to successfully build their knowledge.

Of all the species on this planet, the one with the highest level of sensitivity towards fellow members of the same species is Homo sapiens. Our capacity to learn from social experience exceeds that of any other species. We are built to pick up subtle cues from other people and use such information to base our own actions upon. Although animals do learn a huge amount from watching fellow species members, none of the apes or monkeys possesses such acute ability to learn from observation, from social cues, and from language, as does our species. The imitative capabilities of a chimpanzee are roughly akin to that of the human child about 3 years of age. Contemporary notions concerning human brain development now highlight the role of the brain as an organ predominantly concerned with interpreting social situations. We have evolved large brains that allow us to establish and maintain social relationships and to transmit culture from one generation to the next.

We are an archetypal social animal. Such a perspective, with its implications for understanding how we learn through interpersonal contact, emerges through many of the chapters of this book. However, it is still important to consider just how the individual mind stores and organises knowledge. This becomes the topic of the next chapter.

Study guide questions

1 If we want people to focus intensively, with relatively low levels of mind wandering, learning experiences might profitably last for just how long?

2 Effects due to prior knowledge are often shown to be stronger than the effects of IQ. Can you recall any experiences with students that appear consistent with this finding? What happens when you have a student who arrives with high levels of knowledge about a topic?

3 Do some students learn better than others from images or from listening?

4 If the mind has to be active in learning, how come we learn by just observing others?

5 What types of learning are retained easily? What things are forgotten quickly?

6 The principle of savings means we often can learn things remarkably quickly. But what is actually occurring?

7 One factor implicated in overload is our natural overconfidence. This has nothing to do with self-esteem as such, but reflects a type of error people are prone to make. What experiences enable this error to be reduced?

8 Explain why learning is not always a pleasant experience.

9 The chapter lists six causes of overload. What are they?

10 Describe the strategies students are likely to use in learning situations? What is CRIME?

Reference notes

Please consult the reference notes for Chapter 14 on p. 135.