



<b>Unit title</b>	Surveying in Construction
<b>Guided learning hours</b>	60
<b>Number of lessons</b>	30
<b>Duration of lessons</b>	2 hours (unless otherwise stated)
<b>Links to other units</b>	
<ul style="list-style-type: none"> <li>• Unit 2: Construction Design</li> <li>• Unit 4: Safe Working Practices</li> <li>• Unit 7: Graphical Detailing</li> <li>• Unit 10: Surveying in Construction</li> <li>• Unit 13: Site Engineering for Construction</li> </ul>	

<b>Key to lesson types</b>			
<b>AW</b>	Assignment writing	<b>RS</b>	Revision session
<b>GS</b>	Guest speaker	<b>V</b>	Visit
<b>IS</b>	Independent study	<b>GW</b>	Group Work

Lesson	Topic	Lesson type	Suggested activities	Classroom resources
<b>Learning aim A: Understand the methods and technologies that underpin surveys</b>				
<b>1</b>	<p><b>A1:</b> Linear, levelling and angular measurement</p> <p><b>A2:</b> Equipment used to perform fieldwork surveys</p>	IS/GW	<ul style="list-style-type: none"> <li>• <b>Tutor presentation:</b> give an overview of the unit, the learning outcomes and the modes of assessment. Give a reading list and suggest useful online resources. Reinforce the need to bring equipment to all sessions (e.g. calculator and outdoor clothing).</li> <li>• <b>Individual activity:</b> give a handout with tape measure close-ups on it and learners are to fill in the tape readings indicated. Learners are then to complete the handout. Include an imperial</li> </ul>	<ul style="list-style-type: none"> <li>• Presentation resources</li> <li>• Tape measure</li> <li>• 30m reel tape measures</li> </ul>



			<p>tape measurement as the last instance, in order to stretch more able learners and also to show the lineage of equipment origination.</p> <ul style="list-style-type: none"> <li>● <b>Paired activity:</b> exercise on a set of known dimensions. Learners asked to measure between two known points in the field. Tutor to select suitable items to measure. Learners work round the set of points as an exercise. Class discussion on recorded dimensions checking and levels of accuracy.</li> <li>● <b>Plenary:</b> tutor to collate and summarise the key points from the session. Learners are to capture the type of tape used and establish a cost for a good quality tape measure and where it can be sourced locally.</li> </ul>	<ul style="list-style-type: none"> <li>● Hand out sheet with tasks to be measured</li> </ul>
<p><b>Learning aim A: Understand the methods and technologies that underpin surveys</b> <b>Learning aim B: Undertake fieldwork surveys to collect data for drawings</b></p>				
2	<p><b>A1:</b> Linear, levelling and angular measurement <b>B1:</b> Linear surveys <b>B4:</b> Basic arithmetic operations</p>	GW	<ul style="list-style-type: none"> <li>● <b>Tutor-led discussion:</b> remind learners of tape reading techniques before introducing the fieldwork activity to be completed in pairs. Allocate each learner with a number and run an online 'Random Sequence Generator' to put learners into pairs. Inform learners that random photographs will be taken during the session in order to build a repository of photographic evidence that will assist later with coursework. Reassure learners that the photographs will be shared only on the centre's virtual learning environment (VLE).</li> <li>● <b>Tutor-led practical demonstration:</b> learners to carry out a measure of several elevations of a building, capturing door openings etc. A simple continuous run of walls is recommended, along one or two edges of the building depending on the length and complexity. Tutors should allow learners to attempt this</li> </ul>	<ul style="list-style-type: none"> <li>● 'Random.org' website – for the random sequence generator</li> <li>● Presentation resources</li> <li>● Tapes</li> <li>● High visibility vests</li> <li>● Health and safety toolbox talk</li> <li>● Phone/camera</li> </ul>



			<p>activity unaided, capturing both good and bad practices by taking photographs. Remind learners of their signed code of conduct and good behaviour. Explain that this is a measured survey that would be required for an architect to draw up existing plans for redevelopment work</p> <ul style="list-style-type: none"> <li>● <b>Paired activity:</b> learners add up the measurements from the elevation to establish an overall length and width of the building. Check with each other's dimensions and establish any errors.</li> <li>● <b>Plenary:</b> tutor to capture the overall lengths from each group and question the range and variety. Ask learners why the differences are so large and discuss their responses, then collect the named surveys. Collate where the errors have occurred and why.</li> </ul>	<ul style="list-style-type: none"> <li>● Print credit (learners)</li> </ul>
3	<p><b>A1:</b> Linear, levelling and angular measurement  <b>A2:</b> Equipment used to perform fieldwork surveys  <b>A3:</b> Sources of systematic errors  <b>B1:</b> Linear surveys  <b>B4:</b> Basic arithmetic operations</p>	IS/GW	<ul style="list-style-type: none"> <li>● <b>Class discussion:</b> remind learners about the survey from the last session and discuss any errors, problems and issues that they may have encountered, highlighting any potential areas for improvement.</li> <li>● <b>Tutor presentation:</b> expand on the class discussion to capture systematic errors such as slope, sag, temperature, twisting and obstruction, and use photographs from the last session to illustrate some of these errors mentioned.</li> <li>● <b>Individual activity:</b> learners to make notes and sketch out the potential systematic errors that can occur when conducting fieldwork linear surveys.</li> <li>● <b>Tutor presentation:</b> describe how tram lines are used to record a linear survey, with a demonstration of how you would do this for a base line between two stations. Handouts on survey notes and annotations for recording features.</li> </ul>	<ul style="list-style-type: none"> <li>● Presentation resources</li> <li>● Tapes</li> <li>● High visibility vests</li> <li>● Health and safety toolbox talk</li> <li>● Phone/camera</li> </ul>



			<ul style="list-style-type: none"> <li>● <b>Paired practical activity:</b> learners to form into different pairs than from the last session, and they are to carry out another short survey (ideally in a different area). Learners are to work along one base line and record survey featured using the demonstrated method. Tutor to check and advise each small group. Learners take it in turns measuring and recording</li> <li>● <b>Individual activity:</b> learners obtain a copy of the survey data for the line that they have worked upon. Tutor to ensure that this line can be trilaterated with another point so two additional survey lines can be completed. Learners take photographs of their survey line and establish and record the position of the two station points for the next session</li> <li>● <b>Plenary:</b> facilitate a class discussion on the significance of human error in its many forms, e.g. reading 1.298 but booking 1.928 can occur, so ensure to always double check before confirming any details. Tutor checks the one base line surveys and guides and advises to improve performance for the next two which will be undertaken as an assessment independently.</li> </ul>	
4	<p><b>A1:</b> Linear, levelling and angular measurement</p> <p><b>A2:</b> Equipment used to perform fieldwork surveys</p> <p><b>A3:</b> Sources of systematic errors</p> <p><b>B1:</b> Linear surveys</p>	IS/GW	<ul style="list-style-type: none"> <li>● <b>Tutor demonstration:</b> preparation for completion of the two survey lines – issues equipment, discusses any risk assessment, supervises activity. Ensure that learners know what they have to produce in terms of three survey lines and field notes.</li> <li>● <b>Small group activity:</b> learners to form into groups of three to survey the other two survey lines with two learners measuring the area and one booking. Ensure that learner roles rotate halfway through, so all have carried out a linear survey. Learners should take photographs as this could be used as evidence for the assignment.</li> </ul>	<ul style="list-style-type: none"> <li>● Presentation resources</li> <li>● Tapes</li> <li>● High visibility vests</li> <li>● Health and safety toolbox talk</li> <li>● Phone/camera</li> </ul>



			<ul style="list-style-type: none"> <li>● <b>Individual activity:</b> learners to write up a bullet point summary of the completed survey, to include information such as the techniques used, any problems or issues encountered, type of weather, time of day and conditions.</li> <li>● <b>Plenary:</b> facilitate a class discussion about the sources of error and how learners approached their work. Copy field notes so each individual within the group has a set of notes for each survey line.</li> </ul>	
5	<p><b>A1:</b> Linear, levelling and angular measurement</p> <p><b>A2:</b> Equipment used to perform fieldwork surveys</p> <p><b>A3:</b> Sources of systematic errors</p>	AW	<ul style="list-style-type: none"> <li>● <b>Tutor presentation:</b> introduce the summative assignment and talk learners through the requirements. Set up drawing boards, paper and drawing equipment for the linear survey production. Photographs should be included by learners in their evidence.</li> <li>● <b>Individual activity:</b> learners are to produce a linear survey on A3/A2 media using drawing equipment and the survey booking from the three sides of the triangle. Tutor may have to set out the three station points using a transparent template so learners have an accurate start.</li> </ul>	<ul style="list-style-type: none"> <li>● Presentation resources</li> <li>● PC access</li> </ul>
<p><b>Learning aim A: Understand the methods and technologies that underpin surveys</b></p> <p><b>Learning aim C: Develop drawings from completed fieldwork surveys</b></p>				
6	<p><b>A1:</b> Linear, levelling and angular measurement</p> <p><b>C1:</b> Conventions used in survey drawings</p> <p><b>C2:</b> Production of survey drawings</p>	AW	<ul style="list-style-type: none"> <li>● <b>Individual activity:</b> learners to draw up their linear surveys. Drawing boards are not required for this exercise, although scale rulers and a pencil will be needed. The tutor to give learners a template with the three survey stations upon it which can be used to establish the three stations.</li> <li>● <b>Small group activity:</b> in the case of any missing or unclear measurements, learners can ask the original group to return to the survey area and obtain it.</li> </ul>	<ul style="list-style-type: none"> <li>● Triangle template of survey stations</li> <li>● Hardcopies from linear surveys</li> </ul>



7	<p><b>A1:</b> Linear, levelling and angular measurement</p> <p><b>C1:</b> Conventions used in survey drawings</p> <p><b>C2:</b> Production of survey drawings</p>	AW	<ul style="list-style-type: none"> <li>● <b>Individual activity:</b> learners to continue drawing up the surveys. Two sessions are sufficient to achieve this, especially if manual drawings are used or if learners are less familiar with CAD. These drawing sessions can be delivered earlier in the year if weather patterns are a determining factor.</li> </ul>	<ul style="list-style-type: none"> <li>● PC access</li> <li>● Hardcopies from prior surveys</li> </ul>
8	Revision	RS	<ul style="list-style-type: none"> <li>● <b>Small group activity:</b> a tutorial workshop. Issue assignment No 1 session can be held to answer any learner queries regarding their summative assessment.</li> </ul>	
<p><b>Learning aim A: Understand the methods and technologies that underpin surveys</b></p> <p><b>Learning aim B: Undertake fieldwork surveys to collect data for drawings</b></p>				
9	<p><b>A1:</b> Linear, levelling and angular measurement</p> <p><b>A2:</b> Equipment used to perform fieldwork surveys</p> <p><b>B2:</b> Levelling surveys</p>	IS/GW	<ul style="list-style-type: none"> <li>● <b>Tutor presentation:</b> using an OS map example, introduce the purpose of 'contours' and 'spot levels'. Give learners an overview of the different types of level and their use (including water as a level), concentrating on modern-day provision.</li> <li>● <b>Individual activity:</b> learners to capture the differing level types by creating an information booklet or by sketching images.</li> <li>● <b>Tutor presentation:</b> give an explanation of how to read a staff. Keep it simple and concentrate on staff reading skills only (cover other terminology later).</li> <li>● <b>Paired activity:</b> give learners a handout to complete, which includes level crosshair close-ups. Ensure that the size of the staff varies to give a real-life context. Learners to check their results in their pairs, before swapping work with the pair next to them (or alternatively, tutor could hold a Q&amp;A session).</li> </ul>	<ul style="list-style-type: none"> <li>● Presentation resources</li> <li>● Staff handouts</li> <li>● Levels</li> </ul>



			<ul style="list-style-type: none"> <li>● <b>Individual activity:</b> learners to set up a level and take readings from the staffs set up around the room.</li> <li>● <b>Tutor demonstration:</b> demonstrate how to set up a level, emphasising the importance of keeping it horizontal and how to align thumbscrews to put it back.</li> <li>● <b>Plenary:</b> learners to discuss the advantages and disadvantages of a dedicated instrument versus a mobile phone app.</li> </ul>	
10	<p><b>A1:</b> Linear, levelling and angular measurement</p> <p><b>A2:</b> Equipment used to perform fieldwork surveys</p> <p><b>B2:</b> Levelling surveys</p>	GW	<ul style="list-style-type: none"> <li>● <b>Tutor demonstration:</b> remind learners how to set a level up by recapping the demonstration and answering any learner queries. Run through how levels are booked using Height of Collimation method. Explain backsights and foresights and change points using a diagram</li> <li>● <b>Paired activity:</b> learners to be given one staff/level per pair and they must read it at regular intervals along a line. Elevated ground (as opposed to flat ground) is preferable. Lay a tape out so that learners can gauge regular intervals.  It is important for learners to demonstrate the correct booking techniques and show that they know how to set the level up and read it correctly. Learners should make a note of the readings with an accompanying sketch.</li> <li>● <b>Plenary:</b> facilitate the HOC method of booking levels correctly. Calculate each points reduced level, apply arithmetic checks. <i>(Same lessons 10-12 to cover full levelling content.)</i></li> </ul>	<ul style="list-style-type: none"> <li>● Levelling equipment</li> <li>● Tape(s)</li> <li>● Phone/camera</li> </ul>
11	<p><b>A1:</b> Linear, levelling and angular measurement</p> <p><b>A2:</b> Equipment used to perform fieldwork surveys</p>	GW	<ul style="list-style-type: none"> <li>● <b>Tutor demonstration:</b> remind learners how to set a level up by recapping the demonstration and answering any learner queries. Run through how levels are booked using Height of Collimation method. Explain backsights and foresights and change points using a diagram</li> </ul>	<ul style="list-style-type: none"> <li>● Levelling equipment</li> <li>● Tape(s)</li> <li>● Phone/camera</li> </ul>



	<b>B2:</b> Levelling surveys		<ul style="list-style-type: none"> <li>● <b>Paired activity:</b> learners to be given one staff/level per pair and they must read it at regular intervals along a line. Elevated ground (as opposed to flat ground) is preferable. Lay a tape out so that learners can gauge regular intervals.  It is important for learners to demonstrate the correct booking techniques and show that they know how to set the level up and read it correctly. Learners should make a note of the readings with an accompanying sketch.</li> <li>● <b>Plenary:</b> facilitate the HOC method of booking levels correctly. Calculate each points reduced level, apply arithmetic checks.</li> </ul>	
12	<p><b>A1:</b> Linear, levelling and angular measurement</p> <p><b>A2:</b> Equipment used to perform fieldwork surveys</p> <p><b>B2:</b> Levelling surveys</p>	GW	<ul style="list-style-type: none"> <li>● <b>Tutor demonstration:</b> remind learners how to set a level up by recapping the demonstration and answering any learner queries. Run through how levels are booked using Height of Collimation method. Explain backsights and foresights and change points using a diagram.</li> <li>● <b>Paired activity:</b> learners to be given one staff/level per pair and they must read it at regular intervals along a line. Elevated ground (as opposed to flat ground) is preferable. Lay a tape out so that learners can gauge regular intervals.  It is important for learners to demonstrate the correct booking techniques and show that they know how to set the level up and read it correctly. Learners should make a note of the readings with an accompanying sketch.</li> <li>● <b>Plenary:</b> facilitate the HOC method of booking levels correctly. Calculate each points reduced level, apply arithmetic checks</li> </ul>	<ul style="list-style-type: none"> <li>● Levelling equipment</li> <li>● Tape(s)</li> <li>● Phone/camera</li> <li>● Assignment No 1 issued</li> </ul>



<p><b>13</b></p>	<p><b>A1:</b> Linear, levelling and angular measurement <b>A2:</b> Equipment used to perform fieldwork surveys <b>B2:</b> Levelling surveys <b>B4:</b> Basic arithmetic operations <b>B5:</b> Application of applied mathematical techniques</p>	<p>GW</p>	<ul style="list-style-type: none"> <li>• <b>Tutor demonstration:</b> run through how levels are booked using Rise and Fall method. Explain backsights and foresights and change points using a diagram and how each is booked.</li> <li>• <b>Paired activity:</b> learners to be given one staff/level per pair and they must read it at regular intervals along a line. Elevated ground (as opposed to flat ground) is preferable. Lay a tape out so that learners can gauge regular intervals.</li> <li>• <b>Plenary:</b> facilitate the Rise and Fall method of booking levels correctly. Calculate each points reduced level, apply arithmetic checks.</li> </ul>	<ul style="list-style-type: none"> <li>• Levelling equipment</li> <li>• Tape(s)</li> <li>• Phone/camera</li> <li>• Booking sheets</li> </ul>
<p><b>14</b></p>	<p><b>A1:</b> Linear, levelling and angular measurement <b>A2:</b> Equipment used to perform fieldwork surveys <b>A3:</b> Sources of systematic errors <b>B2:</b> Levelling surveys <b>B4:</b> Basic arithmetic operations <b>B5:</b> Application of applied mathematical techniques</p>	<p>GW</p>	<ul style="list-style-type: none"> <li>• <b>Tutor-led discussion:</b> describe the meaning and purpose of a two-peg test. Learners must individually prepare a note (or be given a handout) that covers 'what to do step-by-step'.</li> <li>• <b>Paired activity:</b> learners to carry out two-peg test on the levels available. Ensure that each level has its own reference, which learners must remember to document. Each pair must test at least three levels to act as a check for one another. If learners are not fully confident booking, sketches and notes capturing the staff positions and readings will suffice, as they can be transferred onto correct booking sheets later on in the session.</li> <li>• <b>Plenary:</b> learners to create a spreadsheet capturing the results and check and/or calibrate any levels as necessary.</li> </ul>	<ul style="list-style-type: none"> <li>• Presentation resources</li> <li>• Levelling equipment</li> <li>• Tape(s)</li> <li>• Phone/camera</li> <li>• Booking sheets</li> </ul>
<p><b>15</b></p>	<p><b>A1:</b> Linear, levelling and angular measurement <b>A2:</b> Equipment used to perform fieldwork surveys</p>	<p>GW</p>	<ul style="list-style-type: none"> <li>• <b>Tutor demonstration:</b> take learners outdoors and (ideally on sloping land) lay two tapes extended fully out so that learners can gauge an approximate grid.</li> <li>• <b>Paired practical activity:</b> learners to conduct a level grid survey in pairs. Tutor to mandate a known fixed point that will</li> </ul>	<ul style="list-style-type: none"> <li>• Levelling equipment</li> <li>• Tape(s)</li> <li>• Ranging poles</li> <li>• Phone/camera</li> <li>• Booking sheets</li> </ul>



	<p><b>A3:</b> Sources of systematic errors</p> <p><b>B2:</b> Levelling surveys</p> <p><b>B4:</b> Basic arithmetic operations</p> <p><b>B5:</b> Application of applied mathematical techniques</p>		<p>be used as the temporary benchmark (TBM) or suitable fixed benchmark that all reduced levels (RLs) will be related to.</p> <ul style="list-style-type: none"> <li>• <b>Plenary:</b> learners to calculate the grid of reduced levels and run checks on accuracy. Draw up a grid with completed RLs at each grid point.</li> </ul>	
16	<p><b>A1:</b> Linear, levelling and angular measurement</p> <p><b>A2:</b> Equipment used to perform fieldwork surveys</p> <p><b>A3:</b> Sources of systematic errors</p> <p><b>B2:</b> Levelling surveys</p> <p><b>B4:</b> Basic arithmetic operations</p> <p><b>B5:</b> Application of applied mathematical techniques</p>	GW	<ul style="list-style-type: none"> <li>• <b>Tutor presentation:</b> demonstrate how to calculate contour positions (using similar triangles) such that they could be plotted on a drawing. Give a quick formula for learners to use rather than focus on the mathematics behind it, for example: <math display="block">\frac{\text{Desired Contour Level} - \text{Lower RL}}{\text{Upper RL} - \text{Lower RL}} \times \text{Overall Horizontal Distance} = \text{Horizontal Distance to Contour line from lowest RL}</math></li> <li>• <b>Paired activity:</b> learners form into small groups and are assigned contour values to calculate. One group to determine the values for 7m contour line, while the next group tackles the 7.5m contour line (or whichever interval of contour suits the gradient of the ground). Some learner groups may have more than others to complete, so it may be wise to appoint more to groups that require a challenge; assist less confident groups accordingly. These results are then shared and learners plot them on an A3 grid, most likely one that is hand drawn to aid freehand sketching.</li> </ul>	<ul style="list-style-type: none"> <li>• Presentation resources</li> <li>• Grid of levels</li> <li>• Assignment No 1 submission</li> </ul>
17	<p><b>A1:</b> Linear, levelling and angular measurement</p> <p><b>A2:</b> Equipment used to perform fieldwork surveys</p>	IS	<ul style="list-style-type: none"> <li>• <b>Tutor presentation:</b> introduce fly-levelling and booking techniques.</li> <li>• <b>Individual activity:</b> learners to complete pre-filled booking sheets and 'missing number' activities and exercises, e.g.</li> </ul>	<ul style="list-style-type: none"> <li>• Presentation resources</li> <li>• Booking sheets/exercise</li> </ul>



	<p><b>A3:</b> Sources of systematic errors</p> <p><b>B2:</b> Levelling surveys</p> <p><b>B4:</b> Basic arithmetic operations</p> <p><b>B5:</b> Application of applied mathematical techniques</p>		worksheets can be given out with certain results missing that learners can solve. Learners to then create an animated presentation that captures how to book fly-levelling results.	
18	<p><b>A1:</b> Linear, levelling and angular measurement</p> <p><b>A2:</b> Equipment used to perform fieldwork surveys</p> <p><b>A3:</b> Sources of systematic errors</p> <p><b>B2:</b> Levelling surveys</p> <p><b>B4:</b> Basic arithmetic operations</p> <p><b>B5:</b> Application of applied mathematical techniques</p>	IS	<ul style="list-style-type: none"> <li>● <b>Individual practical activity:</b> learners to practise fly levelling around the centre. Learners are to set up a closed survey in quieter areas and ensure that they set up to one side for health and safety reasons.</li> <li>● <b>Plenary:</b> facilitate a class discussion and ask learners 'What went wrong? What are the closing errors?' Learners can write up a reflective paragraph about their experience in this session.</li> </ul>	<ul style="list-style-type: none"> <li>● Presentation resources</li> <li>● Levelling equipment</li> <li>● Phone/camera</li> <li>● Booking sheets</li> </ul>
19	<p><b>A1:</b> Linear, levelling and angular measurement</p> <p><b>A2:</b> Equipment used to perform fieldwork surveys</p> <p><b>A3:</b> Sources of systematic errors</p> <p><b>B2:</b> Levelling surveys</p>	IS	<ul style="list-style-type: none"> <li>● <b>Individual practical activity:</b> learners to continue (or repeat) the fly-levelling activity around the centre. Try to introduce competition and highlight that the tolerance for this is 25mm. Repetition is necessary, as this can make for a good assignment task. Ensure that substantial booking notes are taken and that staffs are placed on 'known points' wherever possible.</li> <li>● <b>Plenary:</b> facilitate a class discussion to capture any closing errors and what went wrong. Learners do not necessarily need to keep doing this once tolerance is reached; rather know or</li> </ul>	<ul style="list-style-type: none"> <li>● Presentation resources</li> <li>● Levelling equipment</li> <li>● Phone/camera</li> <li>● Booking sheets</li> </ul>



	<p><b>B4:</b> Basic arithmetic operations</p> <p><b>B5:</b> Application of applied mathematical techniques</p>		document what they must be doing wrong (i.e. human error most often: staffs not fully extended, levels not levelled, a catalogue of mistakes etc).	
20	<p><b>A1:</b> Linear, levelling and angular measurement</p> <p><b>A2:</b> Equipment used to perform fieldwork surveys</p> <p><b>A3:</b> Sources of systematic errors</p> <p><b>B4:</b> Basic arithmetic operations</p> <p><b>B5:</b> Application of applied mathematical techniques</p>	IS	<ul style="list-style-type: none"> <li>• <b>Lead-in:</b> recap on the previous lesson and answer any learner queries.</li> <li>• <b>Individual activity:</b> learners to document retrospectively the method surveys for the levelling surveys undertaken. Utilise VLE photographs, videos etc. Use this evidence as a basis for honouring the levelling aspect of the forthcoming assignment.</li> <li>• <b>Tutor presentation:</b> on the 'rise and fall' method of booking levels.</li> <li>• <b>Individual activity:</b> learners to complete pre-filled booking sheets and 'missing number' activities and exercises. Learners are then to create an animated presentation that captures how to book in this manner.</li> </ul>	<p>Presentation resources</p> <p>Booking sheets/Rise and fall exercises</p>
<p><b>Learning aim A: Understand the methods and technologies that underpin surveys</b></p> <p><b>Learning aim C: Develop drawings from completed fieldwork surveys</b></p>				
21	<p><b>A1:</b> Linear, levelling and angular measurement</p> <p><b>A2:</b> Equipment used to perform fieldwork surveys</p> <p><b>A3:</b> Sources of systematic errors</p> <p><b>C1:</b> Conventions used in survey drawings</p>	IS	<ul style="list-style-type: none"> <li>• <b>Tutor presentation:</b> introduce Assignment No 2 and talk it through with learners. Allow learners to either add levels to a satellite view of the centre, or to choose their preferred survey from the ones undertaken for the summative assignment. Discuss scales and conventions.</li> <li>• <b>Individual activity:</b> learners to draw up the surveys (this is to be continued). Numerous sessions may be needed to achieve this; these drawing sessions can be delivered earlier in the year if weather conditions are favourable.</li> </ul>	<ul style="list-style-type: none"> <li>• PC access</li> <li>• Survey hardcopies</li> <li>• Assignment No 2 issued</li> </ul>



	<b>C2:</b> Production of survey drawings			
<b>22</b>	<b>A1:</b> Linear, levelling and angular measurement <b>C1:</b> Conventions used in survey drawings <b>C2:</b> Production of survey drawings	IS	<ul style="list-style-type: none"> <li>• <b>Individual activity:</b> learners to continue drawing up their surveys.</li> </ul>	<ul style="list-style-type: none"> <li>• PC access</li> <li>• Survey hardcopies</li> </ul>
<b>23</b>	<b>A1:</b> Linear, levelling and angular measurement <b>C1:</b> Conventions used in survey drawings <b>C2:</b> Production of survey drawings	IS	<ul style="list-style-type: none"> <li>• <b>Individual activity:</b> learners to continue drawing up their surveys.</li> </ul>	<ul style="list-style-type: none"> <li>• PC access</li> <li>• Survey hardcopies</li> </ul>
<p><b>Learning aim A: Understand the methods and technologies that underpin surveys</b> <b>Learning aim B: Undertake fieldwork surveys to collect data for drawings</b></p>				
<b>24</b>	<b>A1:</b> Linear, levelling and angular measurement <b>A2:</b> Equipment used to perform fieldwork surveys <b>B3:</b> Read and record horizontal angles of a closed traverse <b>B4:</b> Basic arithmetic operations	GW	<ul style="list-style-type: none"> <li>• <b>Tutor presentation:</b> introduce angular measurements; whole circle bearing (WCB); azimuth; horizontal angles; digital theodolites; electronic distance measurement (EDM) devices; global positioning systems (GPS); Scan to BIM; Point clouds etc. This is also an opportunity for the tutor to recap the assignment requirements if desired.</li> <li>• <b>Tutor-led practical demonstration:</b> show learners how to set up a theodolite, with learners documenting the key steps. Show learners how to measure angles using Degrees, Minutes and Seconds (DMS).</li> </ul>	<ul style="list-style-type: none"> <li>• Equipment</li> <li>• Booking sheets</li> </ul>



			<ul style="list-style-type: none"> <li>● <b>Paired practical activity:</b> learners to set up the theodolites in the room, with one partner videoing the other to capture the process step-by-step. This can be uploaded to the centre's VLE. Measure between two known points to establish an angle.</li> <li>● <b>Tutor-led practical demonstration:</b> introduce angle booking sheets, then learners are to read the crosshairs marked on the walls and book them accordingly. Learners are to rotate around the room so that all of the instruments are set up and used.</li> <li>● <b>Plenary:</b> facilitate a class discussion regarding the session and any learner concerns.</li> </ul>	
25	<p><b>A1:</b> Linear, levelling and angular measurement</p> <p><b>A2:</b> Equipment used to perform fieldwork surveys</p> <p><b>A3:</b> Sources of systematic errors</p> <p><b>B3:</b> Read and record horizontal angles of a closed traverse</p> <p><b>B4:</b> Basic arithmetic operations</p>	GW	<ul style="list-style-type: none"> <li>● <b>Tutor-led presentation:</b> on the types of traverse, survey stations, sources of systematic errors and mitigation. Show learners how to set up the equipment over a specific point.</li> <li>● <b>Paired activity:</b> learners set up a theodolite over a known point and measure an internal horizontal angle. Tutor checks set up and angular measurements.</li> <li>● <b>Paired activity:</b> learners set up a theodolite on a three peg traverse, learners rotate around each peg and read each others theodolites, booking of readings.</li> <li>● <b>Plenary:</b> learners calculate the internal angles of each station, add up to 180 degrees and see how accurate readings taken were.</li> </ul>	<ul style="list-style-type: none"> <li>● Equipment</li> <li>● Booking sheets</li> </ul>
26	<p><b>A1:</b> Linear, levelling and angular measurement</p> <p><b>A2:</b> Equipment used to perform fieldwork surveys</p>	GW	<ul style="list-style-type: none"> <li>● <b>Lead-in:</b> tutor to recap the prior session.</li> <li>● <b>Paired practical activity:</b> learners to carry out a short closed traverse and record their results. Correct using Bowditch method (if time permits). Suggest 3 pegs survey.</li> </ul>	<ul style="list-style-type: none"> <li>● Equipment</li> <li>● Booking sheets</li> </ul>



	<p><b>A3:</b> Sources of systematic errors</p> <p><b>B3:</b> Read and record horizontal angles of a closed traverse</p> <p><b>B4:</b> Basic arithmetic operations</p>			
27	<p><b>A1:</b> Linear, levelling and angular measurement</p> <p><b>A2:</b> Equipment used to perform fieldwork surveys</p> <p><b>A3:</b> Sources of systematic errors</p> <p><b>B3:</b> Read and record horizontal angles of a closed traverse</p> <p><b>B4:</b> Basic arithmetic operations</p>	GW	<ul style="list-style-type: none"> <li>• <b>Lead-in:</b> recap on prior session.</li> <li>• <b>Paired activity:</b> learners carry out another short-closed traverse, using an instrument different from the one used in the last week and in different pairs, again recording and adjusting their results. Suggest 5 peg survey.</li> </ul> <p>Should additional time be needed, this session can be used to apply Bowditch method to prior results.</p>	<ul style="list-style-type: none"> <li>• Equipment</li> <li>• Booking sheets</li> </ul>
<p><b>Learning aim A: Understand the methods and technologies that underpin surveys</b></p> <p><b>Learning aim B: Undertake fieldwork surveys to collect data for drawings</b></p> <p><b>Learning aim C: Develop drawings from completed fieldwork surveys</b></p>				
28	<p><b>A1:</b> Linear, levelling and angular measurement</p> <p><b>B5:</b> Application of applied mathematical techniques</p>	IS/GW	<ul style="list-style-type: none"> <li>• <b>Individual activity:</b> learners to correct their traverse survey results by balancing and error distribution.</li> <li>• <b>Paired activity:</b> learners to draw one of their closed traverse surveys and capture a retrospective method statement.</li> </ul>	<ul style="list-style-type: none"> <li>• Handouts</li> <li>• PC access</li> </ul>



	<p><b>C2:</b> Production of survey drawings</p> <p><b>C3:</b> Corrected closed traverse drawing</p>			
29	<p><b>A1:</b> Linear, levelling and angular measurement</p> <p><b>B4:</b> Basic arithmetic operations</p> <p><b>B5:</b> Application of applied mathematical techniques</p>	IS	<ul style="list-style-type: none"> <li>• <b>Tutor presentation:</b> on how to perform the calculations for rectangular coordinates.</li> <li>• <b>Individual activity:</b> learners to receive worksheets and calculate rectangular coordinates before checking the results using CAD, mathematical problem-solving mobile phone apps and/or websites.</li> </ul>	<ul style="list-style-type: none"> <li>• Worksheets</li> <li>• PC access</li> <li>• Assignment No 2 handed in</li> </ul>
30	Revision	RS	<ul style="list-style-type: none"> <li>• <b>Small group activity:</b> learners to review any resubmission or corrective work required for their Assignment No 2. Final summative grades calculated.</li> </ul>	

*Pearson is not responsible for the content of any external internet sites. It is essential for tutors to preview each website before using it in class so as to ensure that the URL is still accurate, relevant and appropriate. We suggest that tutors bookmark useful websites and consider enabling learners to access them through the school/college intranet.*