TRADE OF PLASTERING

PHASE 2

Module 3

Slabbing, Skimming, Dry Lining and Floors

UNIT: 8

Coving/Stippling

Produced by

SOLAS

An tSeirbhís Oideachais Leanúnaigh agus Scileanna
Further Education and Training Authority

In cooperation with subject matter expert:

Terry Egan

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Introduction

Welcome to this section of your course which is designed to introduce you the learner, to interpret and draw and triangles, estimate and calculate coving, artex and project costs.

Unit Objective

By the end of this unit each apprentice will be able to:

- Interpret and draw triangles
- Estimate and calculate lengths of coving and quantities of Artex
- Calculate project costs

1.0 Interpreting and Drawing Triangles

Key Learning Points

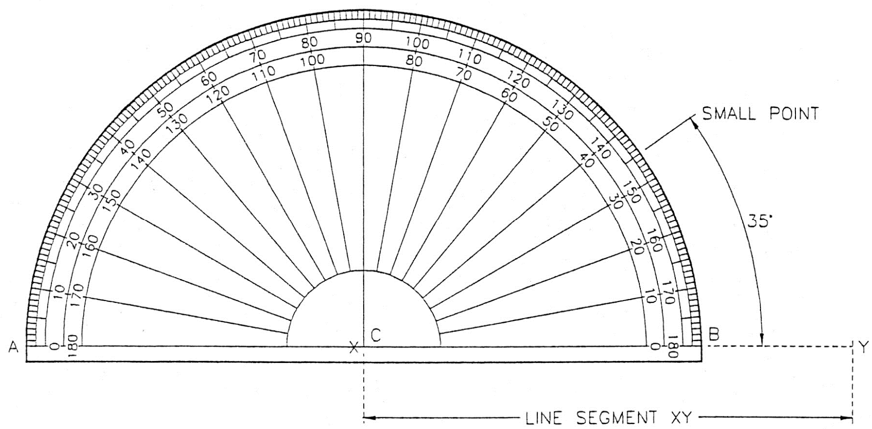
- Triangles - degrees, bisecting lines and angles, definition and type

1.1 Triangles and Degrees

The Protractor

So far we have constructed angles which could be constructed by using the set-squares only. In this lesson, we use another instrument, known as a protractor, by which we can construct angles of any dimension.

Protractors are usually semi-circular and made from celluloid. A typical protractor of this kind is shown below.



How to Use the Protractor

Let us construct an angle of 35º. First put down a line segment, say XY. Let this represent one arm of the angle and let X be the vertex.

Now place the protractor on the line so that the line AB lies on XY with the point C exactly on X. On the right side of the protractor, mark off 35º. Place a small point at the 35º mark, and when the protractor is removed join this point with X.

There is a slight danger of misreading the angle as one of 145°. To guard against this get into the habit of estimating the magnitude of an angle before you measure it. Ask yourself whether the angle is acute or obtuse.

Figs. 1, 2, 3 and 4 show some exercises in the use of the protractor.

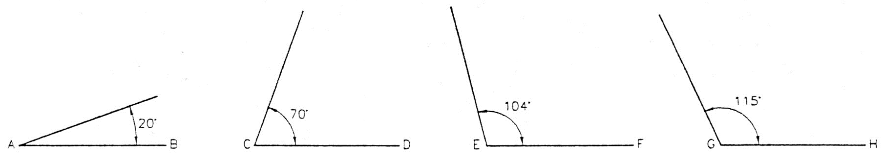


Fig. 1 Fig. 2 Fig. 3 Fig. 4

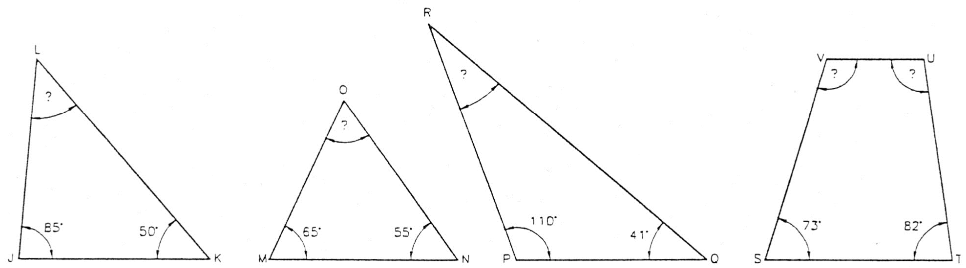


Fig. 5 Fig. 6 Fig. 7 Fig. 8

The line segments AB, CD, EF and GH are 100mm down from the top of the page. Each line segment is 50mm in length and there is a space of 30mm between them.

In figs. 5, 6, 7 and 8 angles are both constructed and measured. The line segments JK, MN, PQ and ST are each 65mm in length, with a distance of 20mm between them. In these figures the arms of the angles are continued until they meet. In this way they form angles at L, O and R in figures 5, 6 and 7. In figure 8 the line VU is a horizontal line, drawn at any distance along the arms of the angles from the base.

The figures in fig. 5, 6 and 7 are called triangles. We will learn more about these later. Add up the total number of degrees in the triangles in figs. 5, 6 and 7. Do you notice anything?

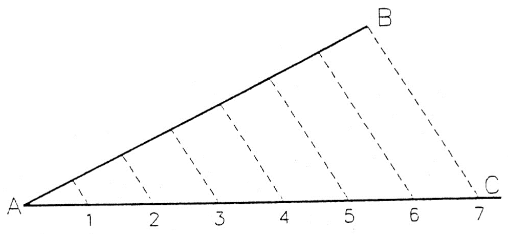
Fig. 8 is called a quadrilateral. We will also learn more about this figure later. Add the total number of degrees here also. What total do you get?

To Construct a Perpendicular at the End of a Given Line

1. Draw the line AB.
2. With centre A and any radius, draw the arc CD.
3. From C, step off the same radius twice along the arc CD to give points E and F.
4. With centres E and F, draw arcs of the same radii to intersect at G.
5. Join GA.
6. This is the required perpendicular.

To Divide a Straight Line into a Given Number of Equal Parts

1. Draw the line AB.
2. At any suitable angle to AB draw the line AC.
3. Step off along AC the required number of divisions. These may be of any convenient length but all must be equal, here 7 divisions are shown.
4. Number these divisions from A along AC as shown.
5. Join the last number to point B.
6. Draw parallel lines from the other numbers to the given line as shown. AB is now divided into the required number of equal parts.



Note: This can be a very useful method for setting out, e.g. setting out stairs.

Facts about Right Angled Triangles

The hypotenuse of a right angled triangle is the side opposite the right angle.

In the example shown below the square drawn on the hypotenuse of a right angled triangle is equal in area to the sum of the areas of the squares drawn on the other two sides.

Types of Triangles

a) A **right-angled** triangle has one of its angles set at 90°. Figure 9 is a right-angled triangle, its longest side, called the hypotenuse, is always opposite the right angle.

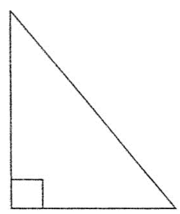


Figure 9

b) In **acute-angled** or **scalene** triangle (Figure 10) every angle is less than 90°.
c) If one of the angles in a triangle is greater than 90° (as x is in Figure11) then it is an **obtuse-angled** triangle.

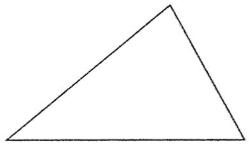


Figure 10

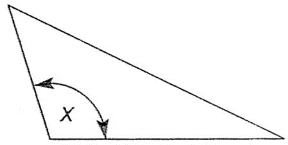


Figure 11

d) An **isosceles** triangle (Figure 12) has two sides, AB and AC, that are equal in length and two angles, x and y, that are equal. The two equal angles lie opposite the equal sides. A single line (sometimes a double line) is drawn through the two sides to show they are equal.
e) An **equilateral** triangle, as shown in Figure 13, has three sides that are equal in length (AB, BC and CA) and three angles of equal size (x, y and z. The angles are all 60° (180 ÷ 3 = 60). A single line (sometimes a double line) is drawn through the three sides to show they are equal.

Note: The word equilateral is Latin for 'equal sided'.

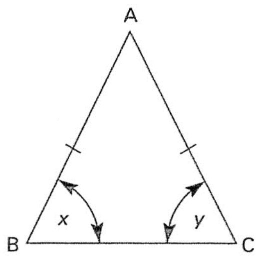


Figure 12

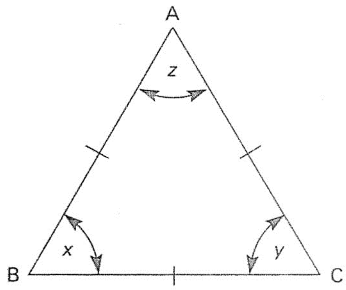


Figure 13

Exercise:

What is the size of the angles marked x and y in Figure 14?

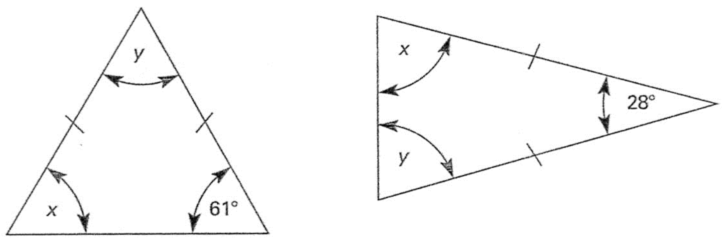


Figure 14

Pythagoras' Theorem

Pythagoras was born on the Greek island of Samos at the beginning of the sixth century BC. At the age of 22 he belonged to and led a group of mathematicians who, among other things, worked out mathematical rules and theorems. The theorem we are interested in is his 45th, concerning right-angled triangles, in which he states that:

> 'In a right-angled triangle, the square on the hypotenuse is equal to the sum of the squares on the two other sides'.

Before we look closely at his theory, let's go further back in time and history. One of the civilisations before the Greeks was the Egyptians, who were ruled by a type of king called a Pharaoh. The Egyptians, who even today must be thought of as among the world's best builders, built the pyramids as burial tombs for their kings and queens, and their treasure.

The pyramids were built to a strict plan, a square base, with each corner being a true right angle and four sloping sides, each side an isosceles triangle. It has been estimated that some of the 82 pyramids built contained 2,000,000 blocks of stone, each having an average weight of 2.5 tonnes. Even if this task were done today, it would present problems to engineers, yet it was carried out with none of the sophisticated surveying and levelling equipment we now possess. Among the many problems they had to overcome was how to ensure that the base of the pyramids and the stones were square. They used a method to find a right angle that is still in use today, and Pythagoras theorized much later, known in the building trade as 3, 4, 5.

Note: At the time of the Pharaohs the measurement in use, the **cubit**, was said to be the length of the Pharaoh's forearm. As there was a succession of Pharaohs there was probably some confusion about the length of the cubit.

2.0 Lengths of Coving and Quantities of Artex

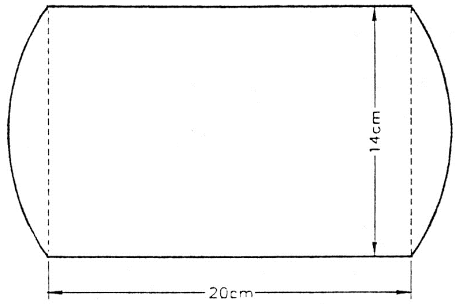
Key Learning Points

- Calculation of coving and Artex for projects

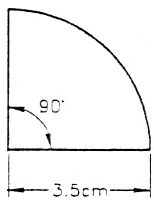
2.1 Calculation of Coving and Artex

Quantity	Description	Unit Price
1	Artex Traditional Cove 1 x 2 m Pkt	€27.00
1	Artex Multi-Purpose Adhesive 2.5 Ltr	€9.30
1	Artex Univeral Feature Joint – Internal	€14.63
1	Artex stipple 30kgs	€18.50

1. Calculate the amount of coving needed for a room 3.6m × 3.6m.
2. Find the cost of coving at €4.95 per metre.
3. Calculate the perimeter of the figure below (Take p = $^{22}/_{7}$).



4. Find the perimeter of the figure below (Take p = $^{22}/_{7}$)



3.0 Calculating Project Costs

Key Learning Points

- Costing of job - materials, labour, profit, bonuses

3.1 Costing of Job

Tendering for Contract

The main way a building contractor obtains work is via the preparation and submission of tenders. There are three main methods of tendering in common use:

- Open tendering
- Selective tendering
- Negotiated contracts

Open tendering - Architects place advertisements in newspapers and construction journals inviting contractors to tender for a particular project. Interested contractors will apply for the contract documents, and prepare and submit a tender within a specific time period. AT the close of this tender period the quantity surveyor will open all the tenders and make recommendations to the architect and client as to the most suitable contractor, bearing in mind the contractor's expertise and his tender price.

Selective tendering - Architects establish a list of contractors wit h the expertise to carry out a specific project and will ask them to submit tenders for it. The architect may make up this list, simply from their experience of various contractors expertise. Alternatively, advertisements may be placed in the newspapers and construction journals inviting contractors to apply to be included in a list for tenderers. From these applications, the architect will produce a shortlist of t he most suitable contractors and ask them to tender. Again the quantity surveyor will open the returned tenders and make their recommendation to the architect and client.

Negotiated contracts - Here the architect select and approaches suitable contractors and ask them to undertake the project. If the contractor is willing to undertake the project they will negotiate with the quantity surveyor to reach an agreed price.

Materials

A number of factors affect the cost of materials you purchase, not least the supplier or builders merchant, you use. Once you have built up a financial record with a builders merchant they will normally allow credit with a monthly discount.

Other factors include:

- Quantity of materials purchased
- The quality of materials required
- Whether the materials are delivered or collected
- The payment procedure

Those materials that you do not often use or are special for the job in hand, will require special quotations from the supplier. Other reasons for asking for quotations may be:

- Large quantities of one type of material
- Small quantities
- Extra distance for delivery

Any enquiry to a supplier of builders merchant should always give the appropriate information on which they can accurately price the materials requested.

You should always try to state:

- The precise quantity of materials you require
- The address of the site to which the materials are to be delivered
- Any unloading problems or special arrangements such as pallets, packaging, crane offloading
- The date (or dates) delivery is required
- Access to site, stating any traffic or police restrictions
- The time limit on the price, if any

When you commence pricing the materials for a job, do not forget to make allowance for waste. However careful you and your employees are, there will be a considerable amount of waste. It is normal to allow a percentage for waste on different materials, based on experience. It is also important to control waste using effective buying methods, efficient site staff and general overall efficiency.

The areas to watch are:

- Cutting waste on sheet material, e.g., ply, blockboard, plasterboard
- Workplace waste too much material delivered to the point of building in, e.g., concrete, plaster, bricks
- Stock waste loose materials store or stacked around a site and not used, e.g., sand and aggregates
- Transport waste fragile materials broken or damaged while being transported to the site or around the site
- Theft and/or vandalism extra security needed in certain areas. Secure store for valuable materials

Labour

There are many ways of setting out and calculating an all-in hourly rate.

Eventually you will need to use your own figures in this calculation but if you follow the example below you should have included everything.

The calculation is in two stages.

Stage 1 – calculate the number of hours effectively worked in a year

Stage 2 – calculate the cost of employment

Stage 1 - Number of Effective Hours

52 weeks at 39 hours	2028
Deduct 21 days annual holiday	
16 days at 8 hours	128
5 days at 7 hours	35
128+35	= 163
Deduct 8 days public holiday	
7 days at 8 hours	56
1 day at 7 hours	7
56+7 =	63
2028-163-63	= 1802 hours

Other deductions that might be considered are:

- Sickness
- Inclement weather

Stage 2 - Cost of Employment

Let us say that the basic rate for craftsmen is €18.50.per hour. Therefore cost of basic wage is 1802x18.50 = €33337.00

1. Inclement weather:

Minimum rate for one week	= €721.50.

Non-productive time; this applies to hours worked over the normal 39 hours. Summer time only (39 weeks)

Mon-Fri 1 hour per day = 5 at time and a quarter

= 5 x 1.25	= 6.25
Weekly total non-productive time = 6.25-5	= 1.25
Summer period 39x1.25	= 48.75
Less 2 weeks holiday = 2x1.25	= 2.50
9 other days (1.8 weeks) = 1.8 x 1.25 = 2.25	=4.75
48.75-4.75	= 44

Therefore summer period total: **44 hours**

Cost of non-productive overtime is:

€721.50 basic rate÷39 = €18.50x4.75	= €87.87
Yearly cost x 39	= €3426.93

Winter - no overtime costs

2. Training

Allow for CLTB levy at €330.00 per craftsman = €330.00

3. Sundry Items

- Absenteeism
- Employment risks, extra holidays, abortive insurance
- Loss of production due to notice
- Severance pay etc.

Allow one week's basic wage €721.50

4. Employers Liability and Third Party Insurance, allow 2.5% of labour costs.

Therefore the totals are:

• Cost of basic wage	€33337.00
• Inclement weather	€721.50.
• Non-productive time	€3426.00
• Training Levy	€330.00
• Sundries	€721.50.
	€38536.00

- Employers liability and third Party insurance at 2.50 %
  €963.40

<u>€39499.40</u>

SOLAS
An tSeirbhís Oideachais Leanúnaigh agus Scileanna
Further Education and Training Authority

27-33 Upper Baggot Street
Dublin 4