

ROTAGRAM 2 — Rotation

GEOFF GILES

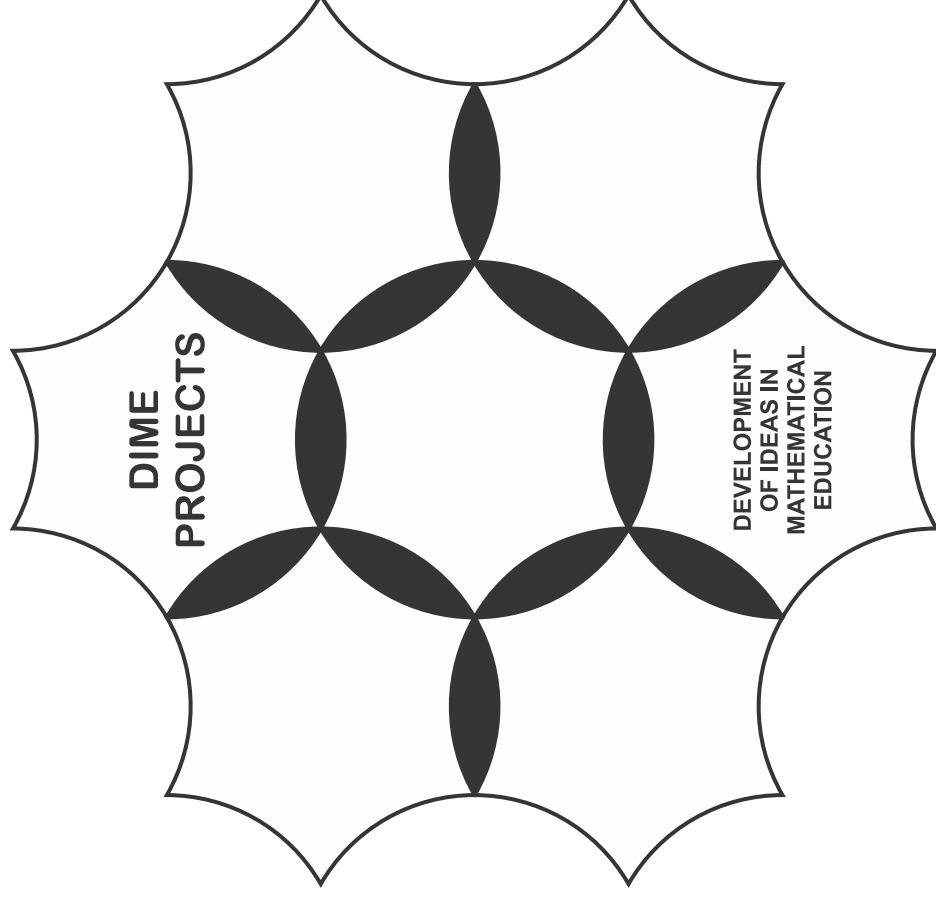
Related DIME Booklets and Worksheets

A rotagram is a deceptively simple tool made from transparent plastic which enables angle concepts to be quickly and easily understood. These concepts are developed in the series of three books and their related worksheets.

Rotagram 1 — *Equal Angles*
Rotagram 1 *Worksheets*
Rotagram 2 — *Rotation*
Rotagram 2 *Worksheets*
Rotagram 3 — *Directions*
Rotagram 3 *Worksheets*

First published 1979
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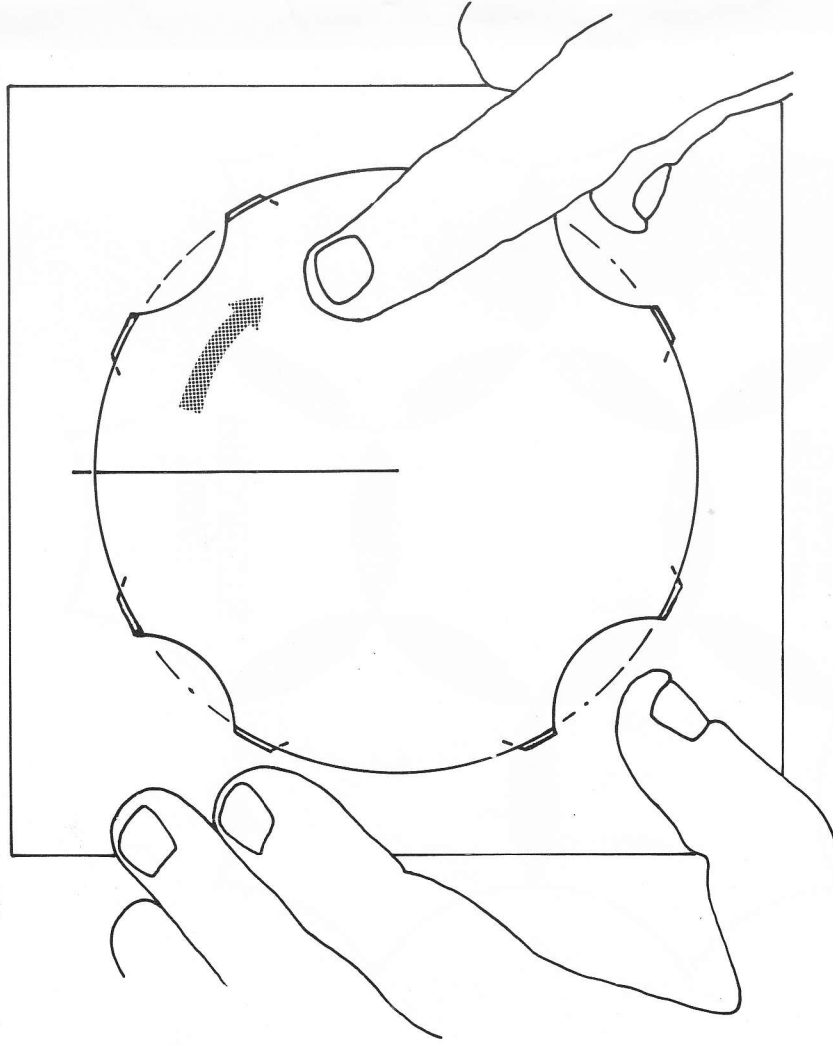
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Doug. Williams 2019



Start here ~

You will need a ROTAGRAM.

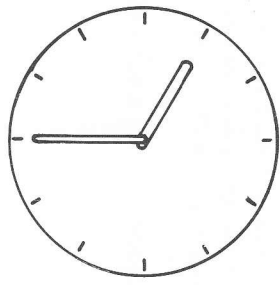
Lay it here with the circle on top, and the blue line on top of the black line.



Use one finger on the circle to turn it so that the blue line rotates about the centre. Make it rotate right round until it comes back to its first position.

Before going on you will need a WORKSHEET.

Target test - ADVANCED



1. The time is 4 o'clock.

Look at the angle between the hands.

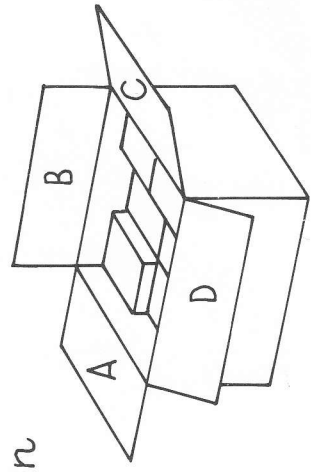
- (a) What is it now?
- (b) What will it be in 1 hour?
- (c) What will it be in $\frac{1}{2}$ hour?

2. How long does it take the hour hand

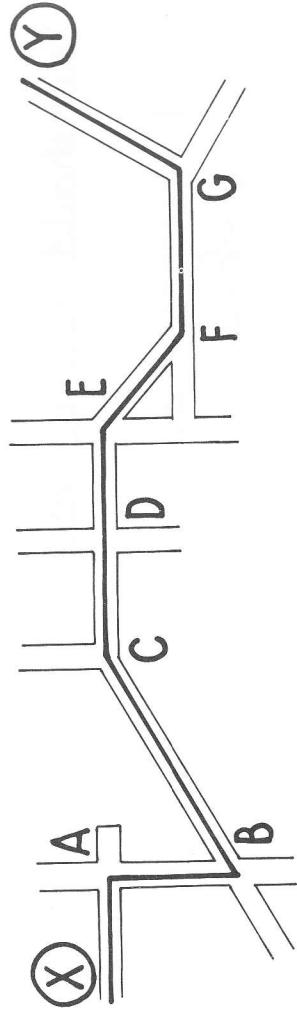
- (a) to turn through 90° ?
- (b) to turn through 1° ?

How long does it take the minute hand to turn through 1° ?

3. Estimate the rotation each flap needs to close the box.

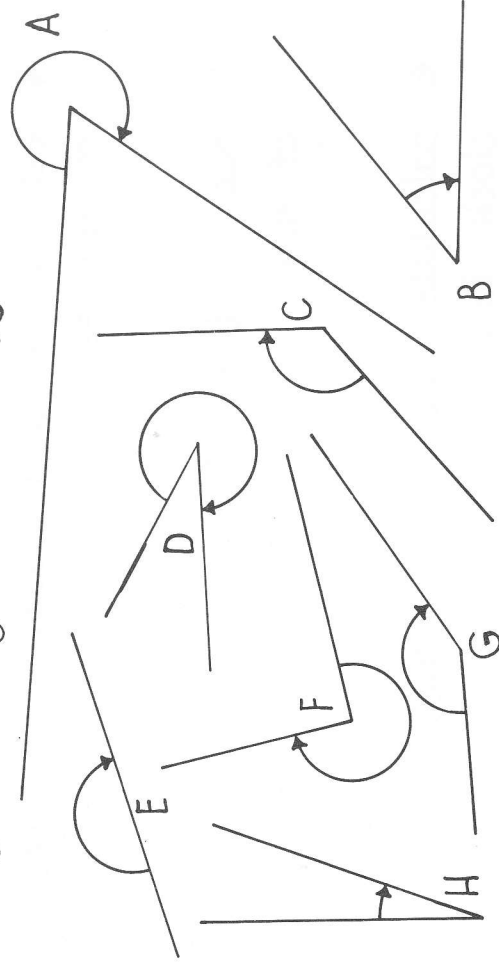


Target test - STANDARD



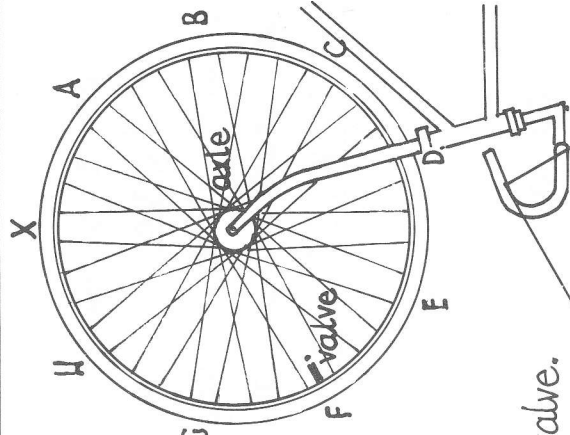
1. A car travels from X to Y. Estimate the amount it turns at each junction and give the direction of rotation.

2. Put these clockwise rotations in order of size, starting with the biggest.



3. In 26 minutes a minute hand rotates through degrees.

Turning a wheel 1



Tom has a puncture.

With his bicycle upside down, he turns the wheel until the valve comes to the top.

To show the rotation place your rotagram with:
(a) the centre at the axle;
(b) both lines through the valve.

Rotate the blue line until it goes through X.

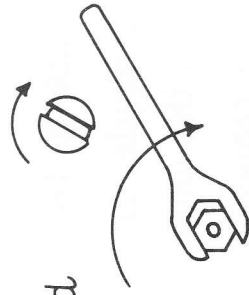
The rotagram now looks like this.

This amount of rotation can be shown by an angle and an arrow.



Different amounts of rotation will take the valve to different places. Put in the correct letters on the worksheet.

2 Direction of rotation



To put a screw into wood or to tighten a nut,

we turn it this way:

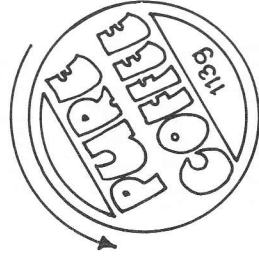
This direction is called

CLOCKWISE. (Can you think why?)



To undo a screw or nut, or to take the screw top off a bottle or jar, we must turn the other way.

We call this ANTICLOCKWISE.



The direction of rotation can be very important. Think of the steering wheel of a car!

Fill in the directions in the table on the worksheet. Write C for CLOCKWISE

A for ANTICLOCKWISE.

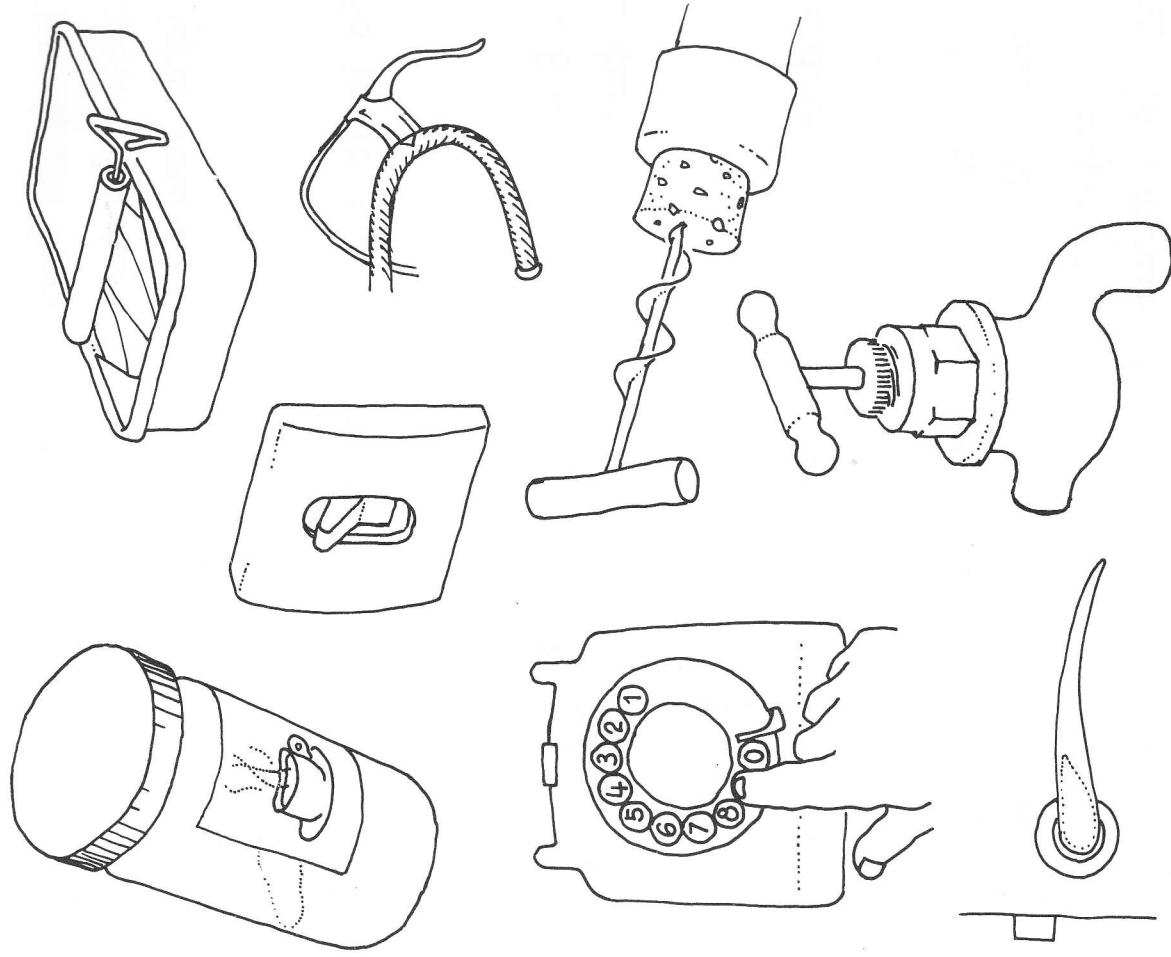
What have you learnt?

You should now be able to:

1. recognise all sorts of rotations, clockwise and anticlockwise;
2. estimate the size of a rotation in revolutions or degrees;
3. measure the size of a rotation;
4. estimate and measure the size of angles;
5. put rotations (or angles) in order of size;
6. calculate angles on the clock face.

Test yourself on the Target Tests.

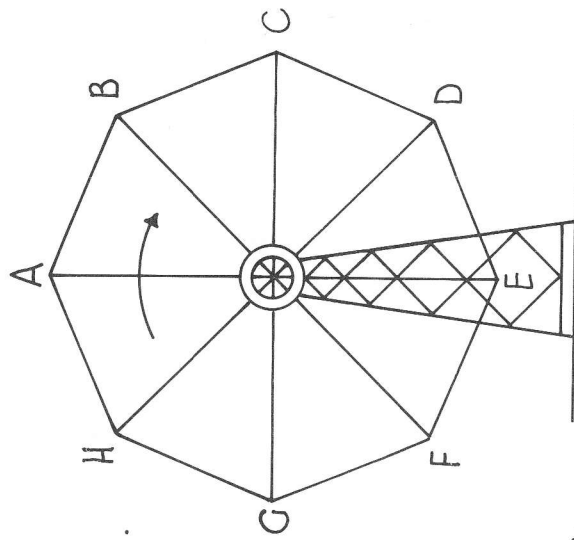
10 Estimating rotations



Estimate the amount of rotation involved and fill in the table on the worksheet.

The Big Wheel

3



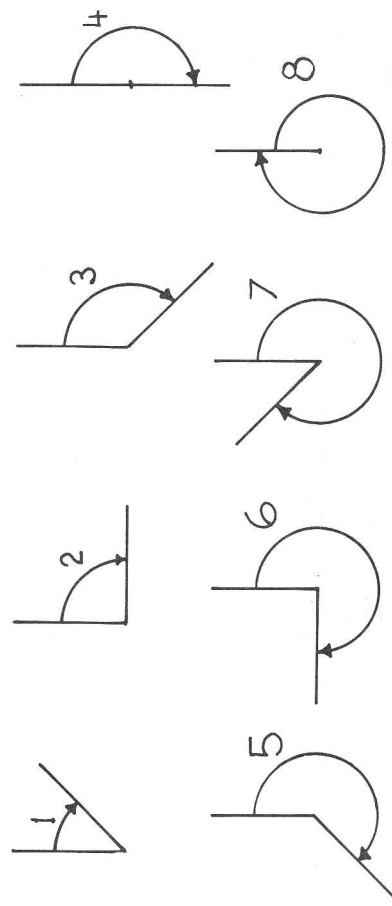
This Big Wheel has eight chairs.

It turns in the direction of the arrow.

Bob is in the chair

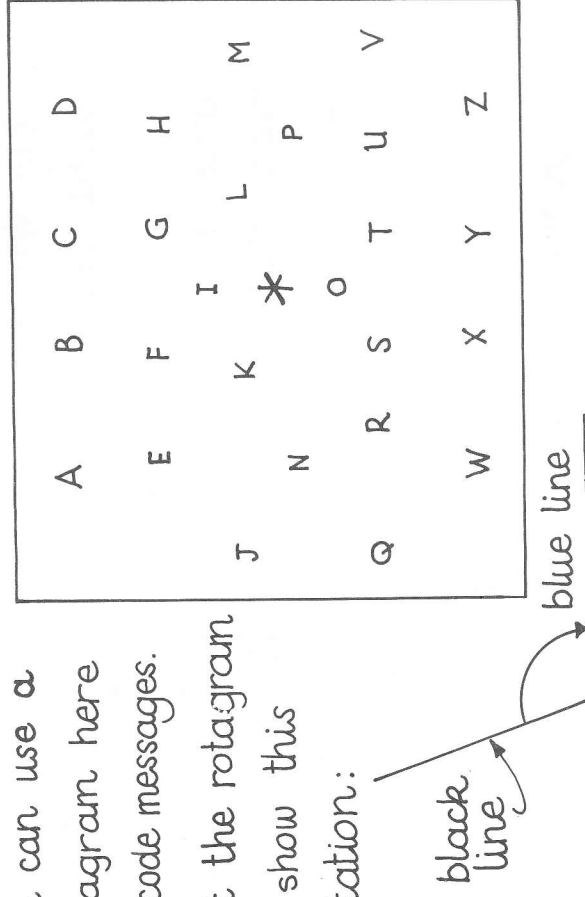
at B, and Dick is in the chair at D.

Read the questions about Bob and Dick on the worksheet. The answer to each is given by one of the amounts of rotation below.



You can use a rotogram here to code messages.

Set the rotogram to show this rotation:



Place the rotogram on the rectangle of letters with (a) its centre on the *;

(b) the black line through W.

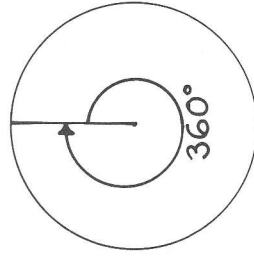
The blue line now passes through F. This is the code letter for W.

Keeping the rotogram angle fixed, find the code letter for H.

Code the rest of the message on the worksheet.

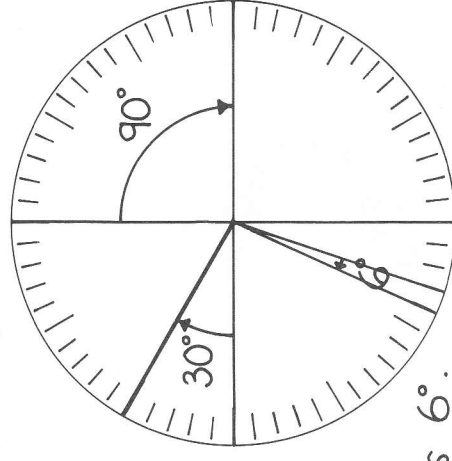
Can you decode the reply? (Take care!)
Code a message of your own.

The minute hand of a clock takes 60 minutes to turn right round through 360° .



So in 15 minutes it turns 90° ,

in 5 minutes it turns 30° ,



and in 1 minute it turns 6° .

To find the rotation for, say, 22 minutes:
either 22 minutes = $15 + 5 + 2$ minutes

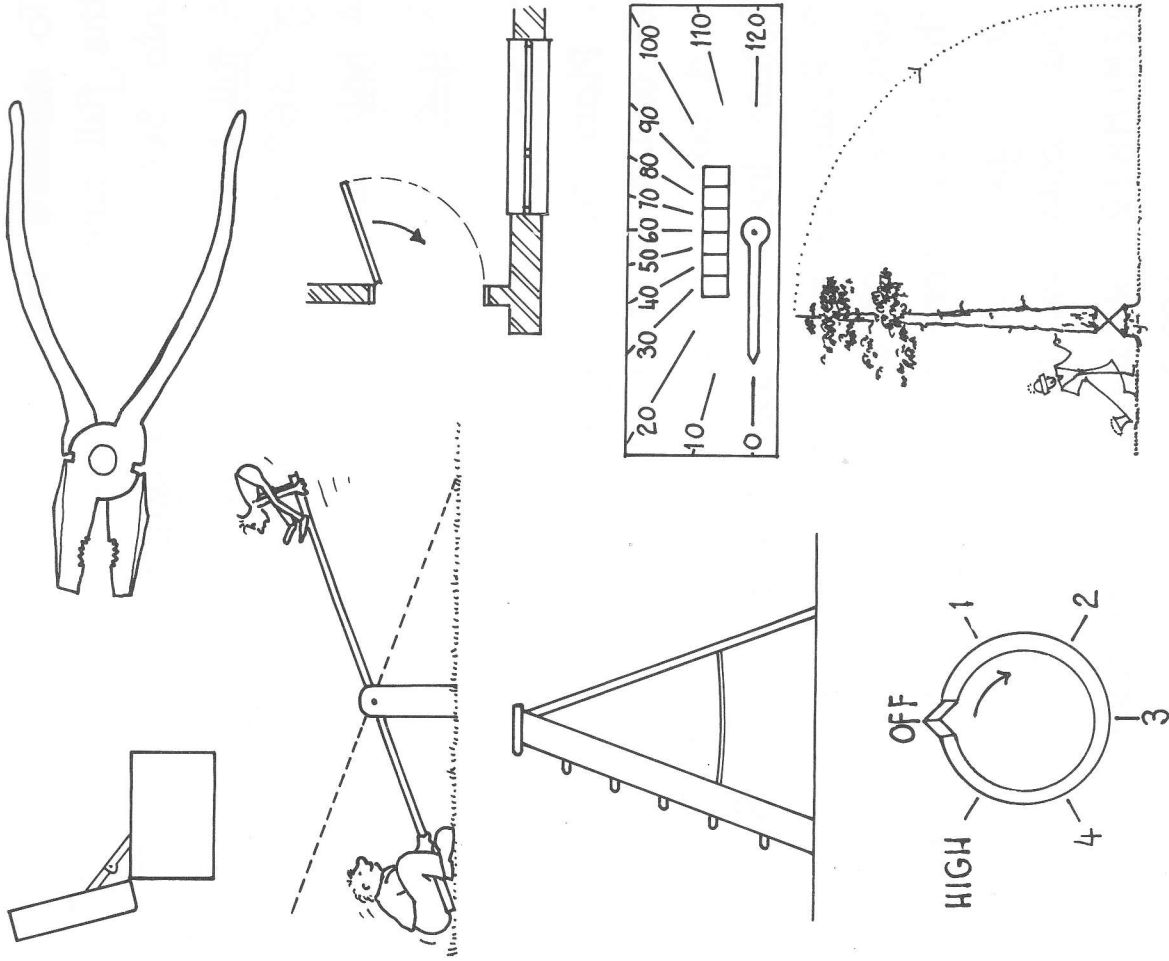
so angle of rotation = $90^\circ + 30^\circ + 12^\circ = 132^\circ$

or In 1 minute the hand turns 6°

so in 22 minutes the hand turns $22 \times 6^\circ = 132^\circ$.

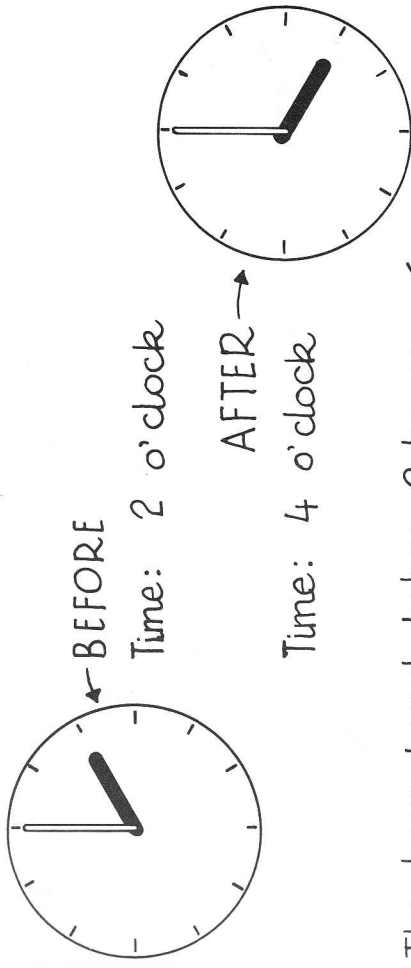
Complete the table on the worksheet.

8 Practical examples of rotation

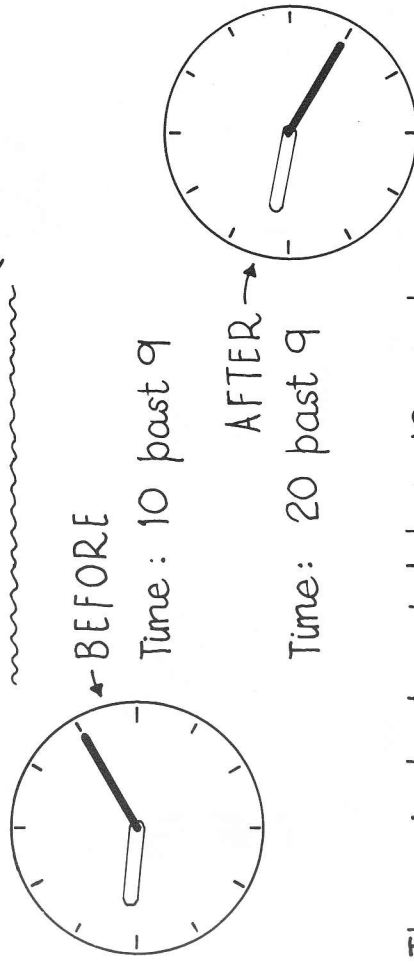


Measure the amounts of rotation and fill in the table on the worksheet.

The hands of a clock 5



The hour hand takes 2 hours to rotate through this angle.



The minute hand takes 10 minutes to rotate through the same angle.
How long would a second hand take?

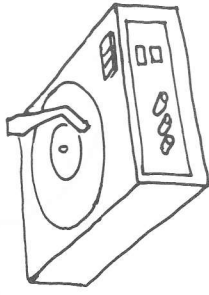


Now fill in the table on the worksheet.

6 Big rotations

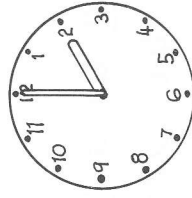
Big rotations are measured by counting the number of turns or revolutions.

An LP turns $33\frac{1}{3}$ times every minute. Its speed is $33\frac{1}{3}$ rpm (revolutions per minute). During a track lasting 3 minutes it turns 100 times.

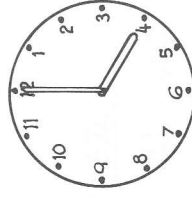


This racing motorcyclist is travelling at 110 mph. His front wheel turns 100 times in 4 seconds!

Whatever the size of the watch or clock, the hour hand turns 100 times in 50 days!!



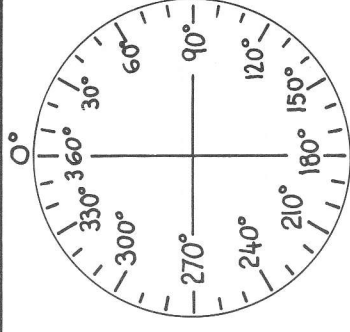
Between 2 o'clock and 4 o'clock



the minute hand makes 2 revolutions and the second hand makes 120 revolutions. Now complete the table on the worksheet.

Small rotations

7



To measure small rotation, the full circle is divided into 360 units called degrees.

A full turn is a rotation of 360 degrees (written 360°).

A half turn is a rotation of 180° .

A quarter turn is a rotation of 90° .

To measure this rotation:

1. Place the rotagram with its centre on the point B

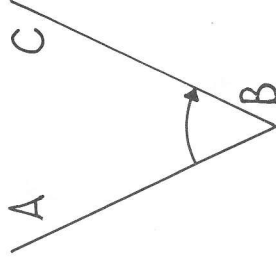
and both lines on AB.

Rotate the blue line on to BC.

2. Place the rotagram on the circle with the black line from the centre to 0° .

The point where the blue line cuts the circle gives the angle of rotation.

You should find that $\hat{ABC} = 50^\circ$.



REMEMBER Rotations can be bigger than 180° .

List the rotations on the worksheet in order of size. Then measure the size of each.