

# Test Angles – Right, Acute, Obtuse.

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## Differentiate and Assess

Not every student will be ready to investigate this concept at this Level and so we will need to differentiate to ensure every student is learning at their leading edge. Select the Differentiate button on this screen.

## Integrate

Every mathematical concept is integrally related to other mathematical concepts. Teaching and learning related concepts simultaneously develops deep relational understanding. Select the Integrate button on this screen.

## Intervene

Some students may not yet be ready to investigate this concept at any Level, and so we will need to provide some intervention. Select the Intervention button on this screen.

# TEST ANGLES – RIGHT, ACUTE, OBTUSE.

## EXPLICIT TEACHING PLAN OVERVIEW PAGE

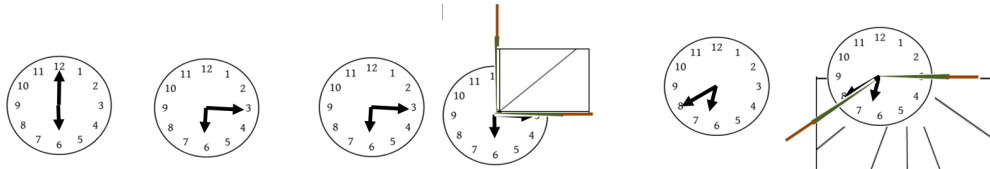
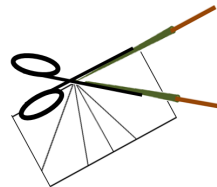
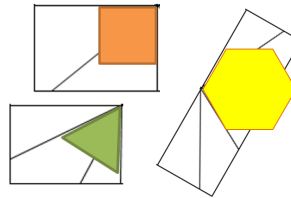
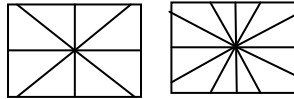
THIS PAGE IS A SUMMARY OF THE EXPLICIT TEACHING PLAN, INCLUDING STRATEGIC QUESTIONS, AND DESCRIBING THE SEQUENCE WHICH WILL OCCUR OVER MULTIPLE LESSONS.

RESOURCES: PAPER, STRAWS AND CHENILLE STICKS TO MAKE ANGLE TESTERS, PATTERN BLOCKS, SHAPES, CLOCKS, SCISSORS, PENCIL, PAPER

### WHAT COULD WE DO?

Children:

- make angle testers from paper to test right angles, half right angles, thirds of right angles, for example,
- use the angle testers to test 2 line angles as the relative slant of 2 arms that meet at a vertex on shapes, for example,
- make angle testers from straws and chenille sticks to test right angles, acute angles, obtuse angles
- use the angle testers to test 2 line angles as amount of turn around a vertex, for example,
- use the paper and the straw angle testers to test 1 line angles as the amount of turn around a vertex, for example,



6:00 to 6:15 1 right angle 6:15 to 6:40  $1\frac{2}{3}$  right angles

### WHAT LANGUAGE COULD WE USE TO EXPLAIN AND ASK QUESTIONS?

Children

- ask one another questions about testing angles as the relative slant of 2 arms that meet at a vertex on shapes and as the amount of turn around a vertex, for example:
  - ▶ How could we construct an angle tester with right angles and half right angles?
  - ▶ How could we construct an angle tester with right angles and thirds of right angles?
  - ▶ How could we use the angle testers to test 2 line angles as the relative slant of 2 arms that meet at a vertex on shapes as right angles acute angles or obtuse angles?
  - ▶ How could we construct an angle tester using a straw and a chenille stick?
  - ▶ How could we use the angle tester to test 2 line angles as the amount of turn around a vertex as right angles acute angles or obtuse angles?
  - ▶ How could we use the angle testers to test 1 line angles as the amount of turn around a vertex as right angles acute angles or obtuse angles?

# TEST ANGLES – RIGHT, ACUTE, OBTUSE.

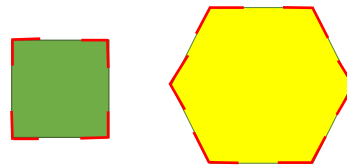
## EXPLICIT TEACHING PLAN

FULL EXPLICIT TEACHING PLAN, EMBEDDING DEEP RELATIONAL UNDERSTANDING, METALANGUAGE, AND QUESTIONS THAT MAY BE USED OVER MULTIPLE LESSONS.

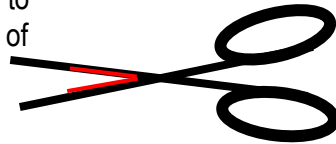
### WHAT COULD WE DO?

Children think about, talk and listen to a friend about, then have the opportunity to share what they already know.

Display some shapes or pattern blocks, identifying the arms and vertex of the angles, for example,

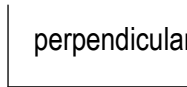


Display a pair of scissors with the blades turned to create an angle, identifying the arms and vertex of the angle, for example,

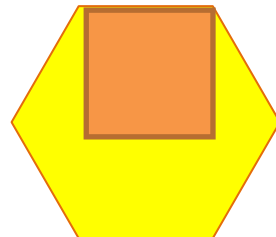


Record, for example,

perpendicular lines



Superimpose the square onto the hexagon to investigate whether the arms of the angles on this hexagon slant further apart than right angles, or closer together than right angles, for example,



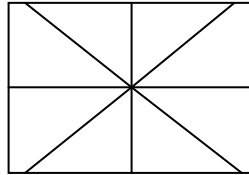
### WHAT LANGUAGE COULD WE USE TO EXPLAIN AND ASK QUESTIONS?

- ▶ Today brings an investigation about angles.
- ▶ What do you know about angles?
- ▶ Talk about angles with a friend.
- ▶ Is anyone ready to share what they are thinking about angles?
  
- ▶ We've investigated angles.
- ▶ And we found there are 2 ways to think about angles.
- ▶ We found one way is as the relative slant of 2 lines that meet at a vertex.
- ▶ We investigated angles like this on shapes.
- ▶ We found that another way to think about angles is as the amount of turn around a vertex.
- ▶ We investigated angles like this on scissors, doors and clocks.
- ▶ And we identified the arms and the vertex of each angle.
- ▶ We investigated right angles.
- ▶ And we found that a right angle is angle formed by perpendicular lines.
  
- ▶ We found that a square has 4 right angles.
- ▶ And we used the right angles in the square to test angles to see if they were larger than a right angle, smaller than a right angle, or a right angle.

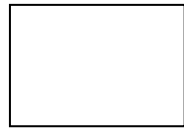
Display a sheet of A4 paper (or use the template on page 17)

Demonstrate the two ways to fold the paper to make angle testers that can test different-sized angles:

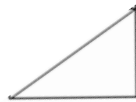
Fold the paper in half and in half again to make quarters. Then fold in half again diagonally. This angle tester can test angles that are right angles ( $90^\circ$ ), half a right angle ( $45^\circ$ ), one and a half right angles ( $135^\circ$ ) and two right angles which is also a straight angle ( $180^\circ$ ).



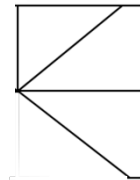
Fold the angle tester to make a right angle, for example,



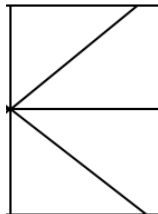
Fold the angle tester to make half a right angle, for example,



Fold the angle tester to make one and a half right angles, for example,



Fold the angle tester to make 2 right angles, a straight angle, for example,

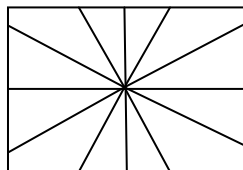


- ▶ Today we're going to investigate using an angle tester to test angles to see if they are larger than a right angle, smaller than a right angle, or a right angle.
- ▶ Let's start with a piece of paper.
- ▶ We're going to fold this paper in a special way so that we have right angles and fractions of right angles.
  
- ▶ Let's fold it in half, and then in half again to make quarters.
- ▶ Have we made a right angle?
- ▶ Do you think we could make half a right angle?
- ▶ Let's fold the angle in the centre, the right angle, in half.
  
- ▶ What angles could we use the angle tester to test?
- ▶ Could we use the angle tester to test right angles?
  
- ▶ Could we use the angle tester to test half a right angle?
  
- ▶ Could we use the angle tester to test one and a half right angles?
  
- ▶ Could we use the angle tester to test 2 right angles?
- ▶ What does 2 right angles look like?
- ▶ Do 2 right angles look like a straight line?
- ▶ Could we call 2 right angles, a straight angle?

Display a sheet of A4 paper (or use the template on page 18)

Fold the paper in half and in half again to make quarters.

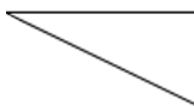
Then estimate and fold in thirds diagonally. This angle tester can test angles that are right angles ( $90^\circ$ ), one-third of a right angle ( $30^\circ$ ), two-thirds of a right angle ( $60^\circ$ ), one and a third right angles ( $120^\circ$ ), one and two-thirds right angles ( $150^\circ$ ) and two right angles which is also a straight angle ( $180^\circ$ )



Fold the angle tester to make a right angle, for example,



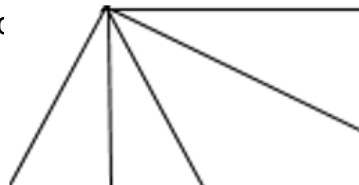
Fold the angle tester to make a third of a right angle, for example,



Fold the angle tester to make two-thirds of a right angle, for example,

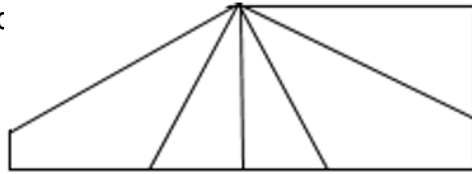


Fold the angle tester to make one and a third angles, for example,

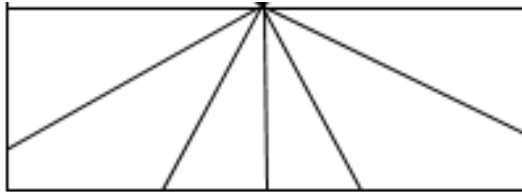


- ▶ Let's make an angle tester that can test different angles.
- ▶ Let's start with another piece of paper.
- ▶ Again, let's make a right angle first.
- ▶ Let's fold it in half, and then in half again to make quarters.
- ▶ Have we made a right angle?
  
- ▶ Do you think we could make thirds of a right angle?
- ▶ Let's estimate and fold the right angle in the centre into thirds.
  
- ▶ What angles could we use the angle tester to test?
- ▶ Could we use the angle tester to test right angles?
  
- ▶ Could we use the angle tester to test a third of a right angle?
  
- ▶ Could we use the angle tester to test two-thirds of a right angle?
  
- ▶ Could we use the angle tester to test one and a third right angles?

Fold the angle tester to make one and two-thirds right angles, for example,



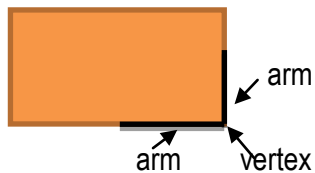
Fold the angle tester to make 2 right angles, a straight angle, for example,



Draw an angle on the two-dimensional shape, for example,



Record, for example,



Record, for example, an angle is the relative slant of two arms that meet at a vertex.

▶ Could we use the angle tester to test one and two-thirds right angles?

▶ Could we use the angle tester to test 2 right angles?

▶ What does 2 right angles look like?

▶ Do 2 right angles look like a straight line?

▶ Could we call 2 right angles, a straight angle?

▶ Today we're going to use our angle testers to investigate angles on two-dimensional shapes.

▶ Where are the angles on this shape?

▶ Is this an angle?

▶ How do you know?

▶ Where are the arms?

▶ Where is the vertex?

▶ Do the sides and the vertex form an angle?

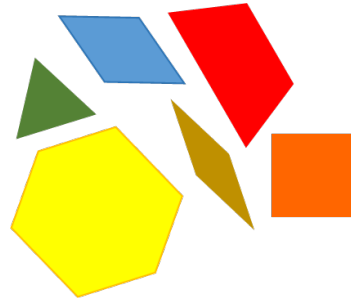
▶ Are the sides the arms of the angle?

▶ And is the vertex on the shape, also the vertex of the angle?

▶ How could we describe the angles on the shapes?

▶ Could we describe these angles as the relative slant of 2 arms that meet at a vertex?

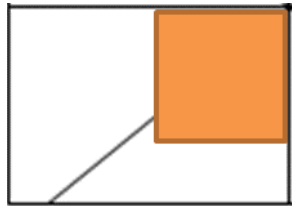
Display a set of pattern blocks, for example,



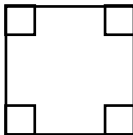
Select a square, for example,



Superimpose the square onto the angle tester, for example,



Record, for example,

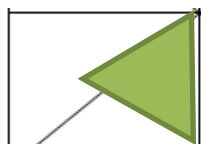


- ▶ The surfaces of these pattern blocks are two-dimensional shapes.
- ▶ Do the shapes have angles?
- ▶ How could we describe the angles on the shapes?
- ▶ Could we describe these angles as the relative slant of 2 arms that meet at a vertex?
- ▶ Could we test the sizes of the angles on these shapes using our angle testers?
  
- ▶ Let's select a square.
- ▶ What do we know about the size of the angles on a square?
- ▶ Do we know that angles in a square are right angles?
- ▶ What is a right angle?
- ▶ Is a right angle, an angle formed where perpendicular lines meet?
- ▶ Could we use our paper angle testers to test if the angles in a square are right angles?
- ▶ Could we superimpose the square onto the angle tester?
- ▶ Are the angles in a square right angles?
- ▶ How could we record this?
- ▶ How do we record right angles?
- ▶ Do we record a square in the angle to show it is a right angle?
- ▶ Could we record a square in each angle of the square to show that each angle is a right angle?

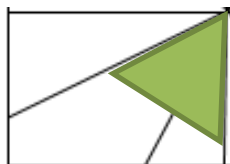
Children select a regular triangle, for example,



Superimpose the triangle onto the angle tester with right angles and half right angles, for example,



Superimpose the triangle onto the angle tester with right angles, a third of a right angle and two-thirds of a right angle, for example,



Record, for example, angles on a regular triangle =  $\frac{2}{3}$  of a right angle

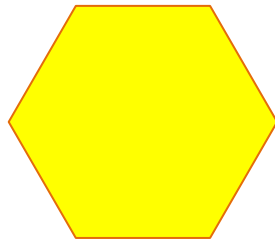
- ▶ Let's select another shape.
- ▶ Let's select a regular triangle.
- ▶ What do we know about a regular triangle?
- ▶ Do we know that the sides and angles are the same size?
  
- ▶ Could we use our paper angle testers to test if the angles in a triangle are the same size?
- ▶ Could we use our paper angle testers to test if the angles in a triangle are right angles, are smaller than right angles, or are larger than right angles?
  
- ▶ Could we superimpose the triangle onto the angle tester?
- ▶ Let's superimpose the triangle onto the angle tester with right angles and half right angles.
- ▶ Is the angle half a right angle?
- ▶ Is the angle larger than half a right angle?
- ▶ Is the angle a right angle?
- ▶ Is the angle smaller than a right angle?
  
- ▶ Could we superimpose the triangle onto the angle tester with right angles, a third of a right angle and two-thirds of a right angle?
- ▶ Is the angle two-thirds of a right angle?
- ▶ Are all of the angles two-thirds of a right angle?
- ▶ How could we record this?



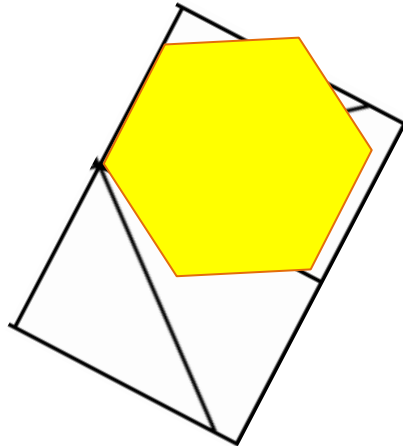
Record, for example, acute angle

Record, for example, angles on a regular triangle = acute angles

Children select a regular hexagon, for example,



Superimpose the hexagon onto the angle tester with right angles and half right angles, for example,



Superimpose the hexagon onto the angle tester

- ▶ If the angle is two-thirds of a right angle, is it smaller than a right angle?
- ▶ When an angle is smaller than a right angle, we call it an acute angle.
- ▶ Are the angles on the triangle, acute angles?
  
- ▶ Let's select another shape.
- ▶ Let's select a regular hexagon.
- ▶ What do we know about a regular hexagon?
- ▶ Do we know that the sides and angles are the same size?
- ▶ Could we use our paper angle testers to test if the angles in a hexagon are the same size?
- ▶ Could we use our paper angle testers to test if the angles in a hexagon are right angles, are smaller than right angles, or are larger than right angles?
  
- ▶ Could we superimpose the hexagon onto the angle tester?
- ▶ Let's superimpose the hexagon onto the angle tester with right angles and half right angles.
- ▶ Is the angle a right angle?
- ▶ Is the angle larger than a right angle?
- ▶ Is the angle one and half right angles?
- ▶ Is the angle smaller than one and half right angles?

with right angles, a third of a right angle and two-thirds of a right angle, for example,

Record, for example,

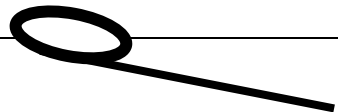
angles on a regular hexagon =  $1\frac{1}{3}$  right angles

Record, for example, obtuse angle

Record, for example, angles on a regular hexagon = obtuse angles

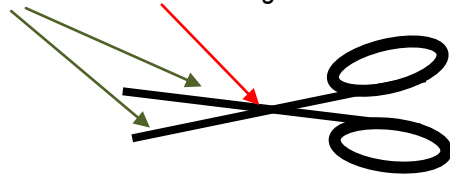
Display a pair of scissors, for example,

- ▶ Could we superimpose the hexagon onto the angle tester with right angles, a third of a right angle and two-thirds of a right angle?
- ▶ Is the angle one and a third right angles?
  
- ▶ Are all of the angles one and a third right angles?
- ▶ How could we record this?
  
  
- ▶ If the angle is one and a third right angles, is it larger than a right angle?
- ▶ When an angle is larger than a right angle, we call it an obtuse angle.
- ▶ Are the angles on the hexagon, obtuse angles?

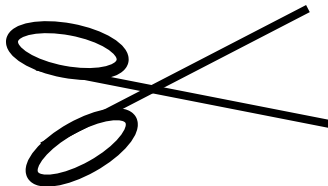




Display the arms and vertex of the angle on the scissors, for example,

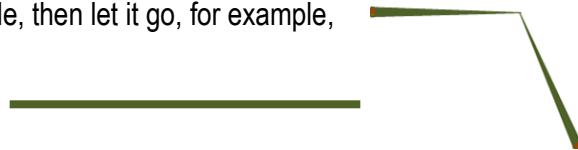


Turn the arms to make an angle that is smaller than a right angle, for example,

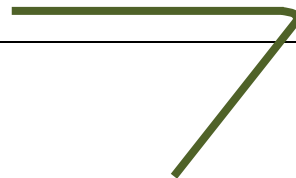


Display a chenille stick and a straw

Bend the straw to make an angle, then let it go, for example,



Bend the chenille stick, then let it go, for



▶ **We've investigated making angles by opening the arms of scissors.**

▶ We found that the blades of scissors are the arms of the angle.

▶ And we found that when we open the scissors, we are turning the arms.

▶ We found that the vertex is in the centre where the arms meet.

▶ Let's turn the arms around the vertex to make an angle that is smaller than a right angle.

▶ Did we create an angle by turning the arms around the vertex?

▶ Could we place the scissors onto our paper angle tester?

▶ Is it a bit difficult to keep the scissors open to the same angle?

▶ Do the blades open a little wider, or close a little narrower?

▶ Could we make the angle using a straw or a chenille stick, so that the angle remains the same?

▶ Here we have a straw and a chenille stick.

▶ Could we bend the straw to make an angle?

▶ But when we let go, the straw bounces back straight.

example,

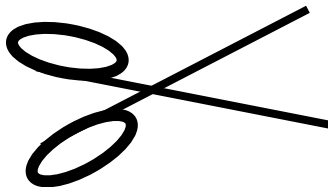
Place the chenille stick inside the straw, for example,



Bend it, then turn one arm of the straw to demonstrate how angles of different sizes could be created, for example,

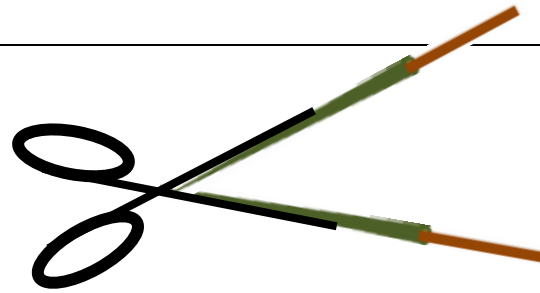


Turn the arms to make an angle that is smaller than a right angle, for example,

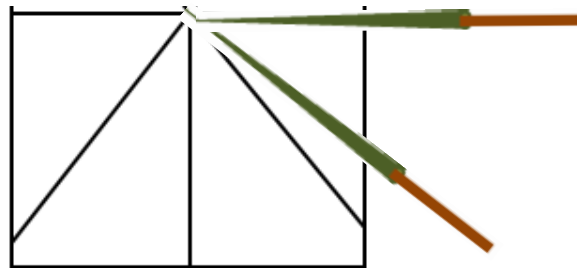


Create the same angle using our straw angle tester, for example,

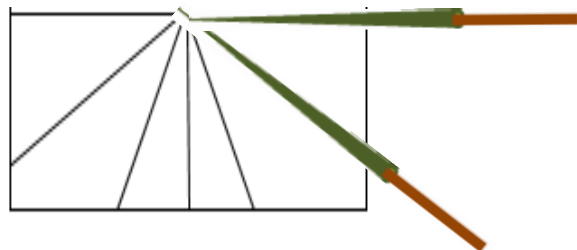
- ▶ Could we bend the chenille stick to make an angle?
- ▶ It stays bent but the vertex of the angle a little hard to find because it's not a sharp bend.
  
- ▶ But what if we make an angle tester by placing the chenille stick inside the straw?
  
- ▶ When we bend the angle tester now to make angles that keep their shape?
  
  
- ▶ Could we use the straw angle tester to create the angle made by the scissors, then superimpose it onto the paper angle tester to test right angles? Let's investigate!
  
  
- ▶ Let's make an angle by turning the blades of the scissors.
  
  
- ▶ Could we create the same angle using our straw angle tester so the angle



Superimpose the angle onto the angle tester with right angles and half right angles, for example,



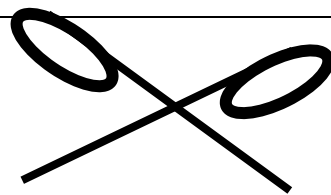
Superimpose the triangle onto the angle tester with right angles, a third of a right angle and two-thirds of a right angle, for example,



Record, for example, angle =  $\frac{1}{3}$  right angle

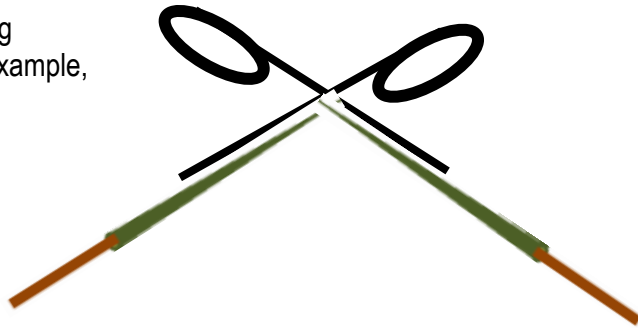
remains the same size?

- ▶ Could we test the angle using the paper angle tester?
- ▶ Let's superimpose the straw angle tester onto the paper angle tester with right angles and half right angles.
- ▶ Is the angle a right angle?
- ▶ Is the angle smaller than a right angle?
- ▶ Is the angle half a right angle?
- ▶ Is the angle smaller than half a right angle?
  
- ▶ Could we superimpose the angle onto the angle tester with right angles, a third of a right angle and two-thirds of a right angle?
- ▶ Is the angle a third of a right angle?
- ▶ How could we record this?
- ▶ Is our angle smaller than a right angle?
- ▶ Is our angle an acute angle?
- ▶ Let's turn the arms around the vertex to make an angle that is larger than a right angle.

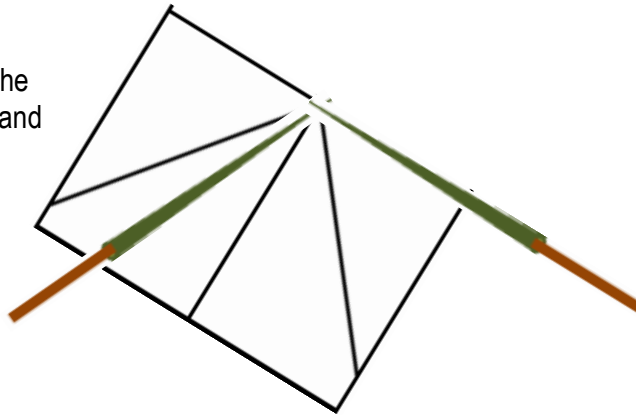


Turn the arms to make an angle that is larger than a right angle, for example,

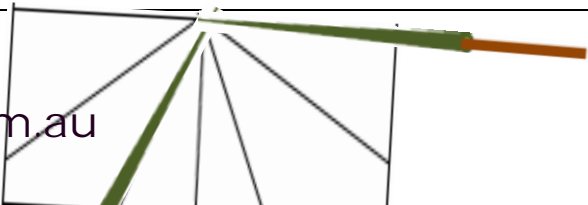
Create the same angle using our straw angle tester, for example,



Superimpose the angle onto the angle tester with right angles and half right angles, for example,



Superimpose the triangle onto



- ▶ Did we create an angle by turning the arms around the vertex?
- ▶ Could we create the same angle by turning the arms of our straw angle tester?
- ▶ Could we test the angle using the paper angle tester?
- ▶ Let's superimpose the angle onto the angle tester with right angles and half right angles.
- ▶ Is the angle a right angle?
- ▶ Is the angle larger than a right angle?
- ▶ Is the angle one and a half right angles?
- ▶ Is the angle smaller than one and a half right angles?
- ▶ Could we superimpose the angle onto the angle tester with right angles, a third of a right angle and two-thirds of a right angle?

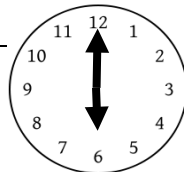
the angle tester with right angles, a third of a right angle and two-thirds of a right angle, for example,

Record, for example, angle =  $1\frac{1}{3}$  right angles

- ▶ Is the angle one and a third right angles?
- ▶ How could we record this?
- ▶ Is our angle larger than a right angle?
- ▶ Is our angle an obtuse angle?

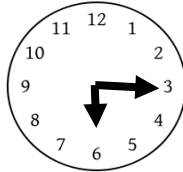
- ▶ **Let's investigate angles where you can only see one arm.**
- ▶ We've investigated angles created by the 2 hands on a clock.
- ▶ Could we test the angle created when one hand moves around the clock? Let's

Distribute clocks with hands that move in sync, to children.

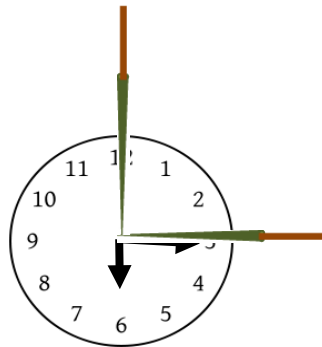


Children set their clock to 6 o'clock, for example,

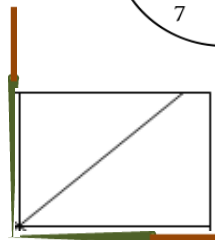
Children move the minute hand to quarter past six, for example,



Use the straw angle tester to make the same turn as the minute hand, for example,



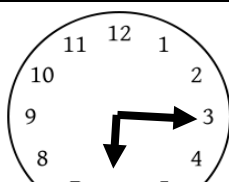
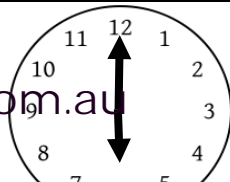
Use the paper angle tester to check if the angle is a right angle, for example,



Record, for example, the 2 times on analog clocks and digital clocks and 'right

investigate!

- ▶ Let's set the time at 6 o'clock.
- ▶ Let's move the minute hand to quarter past 6.
- ▶ What angle did the minute hand turn?
- ▶ Could we use our angle testers to test the angle the minute hand moved from 6 o'clock to quarter past 6?
- ▶ Can we see where the minute hand was at 6 o'clock?
- ▶ Or do we have to visualise where the minute hand was at 6 o'clock?
- ▶ Let's use the straw angle tester to make the same turn as the minute hand.
- ▶ Can we see what angle the minute hand turned?
- ▶ Did the minute hand turn a right angle?
- ▶ Let's use our paper angle tester to check!
- ▶ Is the angle that the minute hand turns from 6 o'clock to quarter past 6, a right angle?
- ▶ How could we record this?





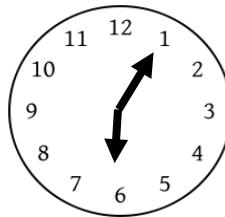
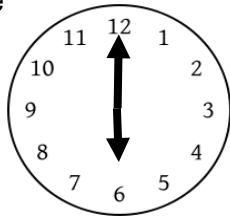
angle'

6:00

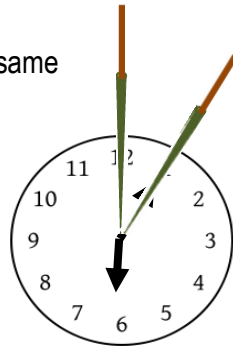
6:15

right angle

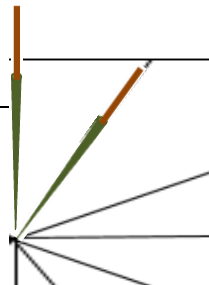
Children move the hands on the clock to show 6 o'clock and then 5 past 6, for example



Use the straw angle tester to make the same turn as the minute hand, for example,

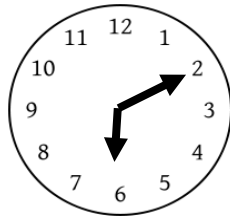


Use the paper angle tester to test the size of the angle, for example,



- ▶ If the minute hand turns a right angle when it turns a quarter of the clock, what fraction of a right angle do you think it moves from one number to the next?
- ▶ How many numbers does the minute turn through when it turns a quarter of the clock?
- ▶ Does the minute hand turn through 3 numbers when it turns a quarter of the clock?
- ▶ Do you think the minute hand turns a third of a right angle when it turns from one number to the next? Let's test!
  
- ▶ Let's set the time at 5 past 6.
  
  
  
  
  
  
  
- ▶ Let's test the angle the hand turned from 6 o'clock to 5 past 6.
- ▶ Did the hand of the clock turn a third of a right angle to go from 6 o'clock to 5 past 6?

Move the hand to 10 past 6,  
for example,



- ▶ Do you think the hand of the clock will turn another third of a right angle to go from 5 past 6 to 10 past 6?
- ▶ What angle do you think the hand will turn from 6 o'clock to 10 past 6?

