

Unit 9 Measures

Five daily lessons

National
Numeracy Strategy

Year 5
Autumn term

Unit Objectives Year 5

- Suggest suitable units and measuring equipment to estimate or measure length, mass or capacity. Measure and draw lines to the nearest millimetre.
- Use, read and write standard metric units (km, m, cm, mm, kg, g, l, ml), including their abbreviations and relationships between them. Convert larger to smaller units (e.g. km to m, m to cm or mm, kg to g, l to ml). Know imperial units (mile, pint, gallon).
- Understand, measure and calculate perimeter of rectangles and regular polygons.

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This Unit Plan is designed to guide your teaching.
You will need to adapt it to meet the needs of your class.

Resources needed to teach this unit:

- Resource sheet 9.1
- Resource sheet 9.2
- Activity sheet 9.1
- Activity sheet 9.2
- Activity sheet 9.3
- OHT 9.1
- OHT 9.2
- OHT 9.3
- OHT 9.4
- OHT 9.5
- Rulers with millimetres marked
- A fine OHP pen
- 20 cm paper square
- String – 40 cm long when tied with a knot
- Centimetre squared paper
- 0-9 dice
- Counters

Link Objectives

Year 4

Year 6

- Suggest suitable units and measuring equipment to estimate or measure length, mass or capacity.
- Use, read and write standard metric units (km, m, cm, mm, kg, g, l, ml), including their abbreviations, and imperial units (mile, pint).
- Measure and calculate perimeter and area of rectangles and other simple shapes using counting methods and standard units (cm, cm²).

- Suggest suitable units and measuring equipment to estimate or measure length, mass or capacity.
- Use, read and write standard metric units (km, m, cm, mm, kg, g, l, ml, cl) including their abbreviations, and relationships between them. Convert smaller to larger units (e.g. m to km, cm or mm to m, g to kg, ml to l) and vice versa. Know imperial units (mile, pint, gallon, lb, oz).
- **Calculate perimeter and area of simple compound shapes that can be split into rectangles.**

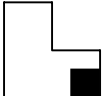
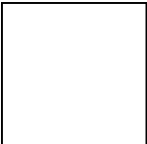
(Key objectives in bold)

| Planning sheet | Day One | Unit 9 Measures | Term: Autumn | Year Group: 5 |
|---|---|---|--|---|
| Oral and Mental | | Main Teaching | | Plenary |
| Objectives and Vocabulary | Teaching Activities | Objectives and Vocabulary | Teaching Activities | Teaching Activities/Focus Questions |
| <p>To multiply and divide whole numbers up to 10 000 by 10 or 100.</p> <p>VOCABULARY product digits decimal point</p> <p>RESOURCES Whiteboards OHP calculator</p> | <ul style="list-style-type: none"> Using an OHP calculator, enter a two-digit number. <p>Q What will be the product if I multiply this by 10?</p> <p>Remind children about the movement of the digits when multiplying and dividing by 10 and 100.</p> <p>Continue to ask questions with a range of numbers up to 10 000.</p> <p>Children respond using whiteboards. Ask:</p> <p>Q What will happen if I divide 10 by 10? 1 by 10?</p> <p>Collect answers and demonstrate on the OHP calculator. Emphasise the role of the decimal point. Repeat with other questions.</p> | <p>To use, read and write standard metric units of length, including their abbreviations and relationships between them.</p> <p>To convert larger to smaller units of length.</p> <p>To know imperial units (mile).</p> <p>VOCABULARY convert kilometre, km metre, m centimetre, cm millimetre, mm mile</p> <p>RESOURCES Resource sheet 9.1 OHT 9.1 OHT 9.2</p> | <ul style="list-style-type: none"> Say: <p>Q Tell me the name of a unit of measurement of length.</p> <p>Write responses on board, identifying metric units.</p> <p>Q Which of these units is the longest?</p> <p>Explain that a mile is a unit of distance that is a bit more than 1.5 km. Order the units on the board beginning with the longest. Discuss the meanings of the prefixes milli, centi, kilo and the abbreviated form.</p> <p>Q How many m are there in 1 km?</p> Display OHT 9.1. Ask questions relating to converting 2 km, 3 km, 1 ½ km etc. to metres. Repeat with m/cm and cm/mm. Show OHT 9.2. Ask children to discuss in pairs the missing conversions. Complete chart on OHP. Using Resource sheet 9.1, ask children to work in pairs, cut up cards, and take turns to identify equivalent measures. <p>Q Can you explain to your partner why they are equivalent?</p> <p>Discuss children's responses. Include km → mm and m → mm conversions.</p> | <ul style="list-style-type: none"> Ask: <p>Q How do you remember the terms 'kilo', 'mile', 'centi'?</p> <p>Discuss responses. Remind pupils about moving digits when multiplying and dividing by 10 and 100.</p> <p>Display cards 3.2 m 3200 mm 3.2 cm 32 mm to pair.</p> <p>Discuss the conversions.</p> Show the number 450. <p>Q If this were a measurement in mm, what would the equivalent in cm be?</p> <p>Repeat with other numbers and measures.</p> <p>By the end of the lesson, children should be able to:</p> <ul style="list-style-type: none"> Use correct abbreviations m/cm/mm; Convert between metric units of length and know e.g. 1.6 m = 160 cm. <p>(Refer to supplement of examples, section 6, page 91.)</p> |

| Planning sheet | | Day Two | Unit 9 Measures | Term: Autumn | Year Group: 5 |
|--|--|--|---|--|---------------|
| Oral and Mental | | Main Teaching | | | Plenary |
| Objectives and Vocabulary | Teaching Activities | Objectives and Vocabulary | Teaching Activities | Teaching Activities/Focus Questions | |
| <p>Use vocabulary related to measure.</p> <p>Know and use relationships between familiar units.</p> <p>VOCABULARY metre kilometre centimetre millimetre length approximate</p> <p>RESOURCES Counting stick OHT 9.3</p> | <ul style="list-style-type: none"> Use a metre stick with 1 m at one end and 2 m at the other. Point to the middle. <div>Q What measurement would this be? Q What is this measurement in m, cm and mm?</div> <ul style="list-style-type: none"> Change the end measures e.g. 1 m at one end and 3 m at the other. Point to different positions and ask similar questions. Use OHT 9.3. <div>Q Which of these measurements would be closest to the width of your fingernail, the length of the classroom etc? Q What would these measurements be in other units?</div> | <p>Estimate/ measure and draw lines to the nearest mm.</p> <p>VOCABULARY measurement standard distance millimetre accurate estimate</p> <p>RESOURCES Activity sheet 9.1 OHT 9.4 Rulers with millimetres marked A fine OHT pen.</p> | <ul style="list-style-type: none"> Introduce the lesson by reviewing essential skills for measuring lines accurately using a ruler. (Ensure that all pupils have a 30 cm ruler.) Either using the board or an OHP and acetate sheet, ask a child to come out and draw a line of 15 cm. Ask another child out to check the line, using a ruler. <div>Q Why is it important to start measuring from zero on the ruler and not from the end of the ruler?</div> <ul style="list-style-type: none"> Ask one child to draw a line 150 mm long and another to check this measurement. Draw out the fact that 15 cm is the same as 150 mm. Invite different children to draw a range of lines measured in millimetres. <p>Ensure the children realise that a millimetre is a very small unit of measurement and therefore more difficult to draw and measure accurately.</p> Using OHT 9.4, introduce the game 'Hit the Spot'. <p>Ask two children to each choose a spot. Highlight the spots and ask the class for estimates of the distance between them. Record the estimates.</p> <div>Q How did you decide on your estimate?</div> <p>Ask another child to join the dots and measure. Check the accuracy in terms of how far out the estimates were. Repeat using two more spots.</p> <div>Q Who was the closest to their estimate?</div> <p>Ask children to explain their methods. Emphasise the idea that estimating involves careful judgement and adjustment of ideas. For example, some children might use personal knowledge such as length of finger, or hand span to help. Others might have good eye – judgement of 1 cm, 5 cm, 10 cm and 20 cm of length.</p> <ul style="list-style-type: none"> Using Activity sheet 9.1 children continue the game highlighting the importance of close estimates and accurate measurements. Working in pairs one child nominates a start and finish point for the other and that child estimates distance in millimetres then draws the line and measures it. <p>Graded scoring: accurate estimate = 5 points; 10 mm out = 3 points; 20 mm out = 1 point.</p> | <ul style="list-style-type: none"> Take feedback on methods of estimation. Share points scored and review the case needed when drawing and measuring in mm. <div>Q In what types of jobs might you have to measure in millimetres?</div> <p>Draw out suggestions to include architects and plumbers.</p> <ul style="list-style-type: none"> Return to OHT 9.4 and choose two spots far apart and two nearer. Ask children to estimate, explain their estimates, then measure the distances. <div>By the end of the lesson the children should be able to:</div> <ul style="list-style-type: none"> Measure and draw lines to the nearest millimetre; Read and write standard units of lengths, mm, cm, and m. <p>(Refer to supplement of examples, section 6, pages 93, 95.)</p> | |

| Planning sheet | | Day Three | Unit 9 Measures | Term: Autumn | Year Group: 5 |
|---|---|--|---|---|---------------|
| Oral and Mental | | Main Teaching | | | Plenary |
| Objectives and Vocabulary | Teaching Activities | Objectives and Vocabulary | Teaching Activities | Teaching Activities/Focus Questions | |
| <p>Double or halve any whole number to 100.</p> <p>VOCABULARY halve double</p> <p>RESOURCES Whiteboards</p> | <ul style="list-style-type: none"> Ask a child to write a two-digit number on the board and ask the class to halve or double it. Children write the answer down as quickly as they can on their whiteboards. Draw out the link between halving and dividing by 2, doubling and multiplying by 2. Repeat with children suggesting different numbers, ensuring that some odd numbers are halved. | <p>Understand, measure and calculate perimeter of polygons.</p> <p>Express the formula for the perimeter of a rectangle as 'twice length, twice breadth'.</p> <p>VOCABULARY perimeter length/edge breadth distance formula twice regular polygon</p> <p>RESOURCES Activity sheet 9.2</p> | <ul style="list-style-type: none"> Show the class an L-shape. <div>Q What is the correct mathematical term for finding the distance around the outside edge of a 2D shape? How would you calculate this distance?</div> <p>Write the word 'perimeter'.</p> <ul style="list-style-type: none"> Draw a rectangle on the board and ask a child to draw the white line around the edge of the pitch. <div>Q How can we calculate the perimeter of this shape?</div> <p>Collect ideas from the class, encourage correct use of vocabulary including length and breadth.</p> <p>Draw out the formula in words 'twice the length plus twice the breadth' Point out that this often is often written as $2 \times l + 2 \times b$.</p> <div>Q When we calculate the perimeter of a rectangle, do we need to measure all sides?</div> <p>Demonstrate finding the perimeter of a rectangle by measuring only two sides and then calculating $2 \times l + 2 \times b$.</p> <div>Q Can you think of any other shapes where you would not need to measure every side in order to work out the perimeter?</div> <p>Take some answers and write up the words and corresponding letters, e.g. six times the length of one side, $6 \times l$. Using Activity sheet 9.2, decide which shapes would need every side measured to calculate the perimeter and which ones could have short cuts. In each case express the perimeter in words and in letters where appropriate.</p> | <ul style="list-style-type: none"> Invite children to share answers from Activity sheet 9.2. and write up some of the words and letters as appropriate. Emphasise that when calculating the perimeter of a rectangle, we do not have to measure all four sides, only two and then use the formula $2 \times l + 2 \times b$. <p>HOMEWORK Calculate the perimeter of shapes D, E, G and J from Activity sheet 9.2 in centimetres and then convert your answers to millimetres. In each case write down the number of sides you measured and show how you worked out the perimeter.</p> <div> <p>By the end of the lesson, children should be able to:</p> <ul style="list-style-type: none"> Express the formula and calculate the perimeter of a rectangle. <p>(Refer to supplement of examples, section 6, page 97.)</p> </div> | |

| Planning sheet | | Day Four | Unit 9 Measures | Term: Autumn | Year Group: 5 |
|--|---|--|---|---|---------------|
| Oral and Mental | | | Main Teaching | | Plenary |
| Objectives and Vocabulary | Teaching Activities | Objectives and Vocabulary | Teaching Activities | Teaching Activities/Focus Questions | |
| <p>Choose and use appropriate number operations to solve problems.</p> <p>VOCABULARY multiply divide product division quotient</p> <p>RESOURCES Resource sheet 9.2 OHT 9.5 0-9 dice Counters</p> | <ul style="list-style-type: none"> Explain the following activity using OHT 9.5. Two children take turns to throw two 0-9 dice. The first player throws two numbers. That player can use any of the four number operations to generate numbers on the 100 square e.g. 6 and 7 could generate: 42 (6×7) 13 ($6 + 7$) 1 ($7 - 6$) etc. Counters are then placed on 42, 13 and 1. The second player takes his/her turn. Using Resource sheet 9.2, children take turns in this way until one player has placed four of their counters in a row. Encourage the children to justify their answers. | <p>Understand, measure and calculate perimeter of rectangles and regular polygons.</p> <p>Measure lines to the nearest millimetre.</p> <p>Use read and write standard metric units of length, including their abbreviations and relationships.</p> <p>VOCABULARY perimeter distance length breadth centimetre, cm millimetre, mm regular polygon equilateral</p> <p>RESOURCES Large equilateral triangle Regular polygons 30 cm rulers Whiteboards</p> | <ul style="list-style-type: none"> Discuss the answers to the homework, highlighting any short cuts used and also the accuracy of the conversions. Set the following problem: A farmer is fencing off sections of land using straight edges. For each section, the farmer uses 30 m of wire. What different shapes could each of the sections be? Show at least 5 different shapes. In each case show how you have used the 30 m of wiring. Stick a large equilateral triangle on the board. <div> <p>Q What kind of triangle is this and what is special about it?</p> <p>Q If the length of one side is 80 mm, what is the perimeter of this equilateral triangle in mm? in cm?</p> </div> <ul style="list-style-type: none"> Allow the children to discuss this in pairs before taking their responses. Write the children's ideas on the board in a formula. (e.g. $3 \times l$) Remind the children of the definition of a regular polygon. <div> <p>Q If a regular pentagon has a side of 8 cm what would the perimeter be?</p> </div> | <ul style="list-style-type: none"> Take feedback from the children on the fencing problem. <div> <p>Q Where in real life do you think you would need to know or calculate the perimeter of something?</p> </div> <ul style="list-style-type: none"> Ask questions like: <div> <p>Q If a rectangle has a perimeter of 20 m, what could the length of its sides be in whole numbers?</p> <p>Q If a regular hexagon has a perimeter of 75 cm, what would the length of its side be?</p> </div> <div> <p>By the end of the lesson, children should be able to:</p> <ul style="list-style-type: none"> Work out and express in words a formula for finding the perimeter of a regular polygon; Measure perimeters to the nearest millimetre. <p>(Refer to supplement of examples, section 6, pages 91 and 97.)</p> </div> | |

| Planning sheet | Day Five | Unit 9 Measures | Term: Autumn | Year Group: 5 |
|---|--|--|---|--|
| Oral and Mental | | Main Teaching | | Plenary |
| Objectives and Vocabulary | Teaching Activities | Objectives and Vocabulary | Teaching Activities | Teaching Activities/ Focus Questions |
| <p>Convert larger to smaller units of measure (e.g. km to m and l to ml).</p> <p>VOCABULARY half quarter three-quarters millilitres ml litres, l metres, m centimetres, cm kilograms, kg grams, g</p> <p>RESOURCES Activity sheet 9.3</p> | <ul style="list-style-type: none"> Divide the class into teams of four. Share the follow-me cards from Activity sheet 9.3 equally between the teams and place them in the middle of each team's table. Select a starting card from one table to begin the game. Teams should work collaboratively when finding the follow-on card. | <p>Use knowledge of perimeter and area to investigate and solve a given problem.</p> <p>Explain methods and reasoning.</p> <p>VOCABULARY perimeter area</p> <p>RESOURCES 20 cm paper square String – 40 cm long when tied with a knot Centimetre squared paper</p> | <ul style="list-style-type: none"> Show children a 20 cm square. <div>Q What is the perimeter of this square? Q What is the area of this square?</div> <p>Agree that the area is 400 cm² and that the perimeter is 80 cm. Fold the square in half.</p> <div>Q What is the area of the rectangle? Q What is the perimeter of the rectangle?</div> <p>Fold the rectangle in half.</p> <div>Q What is the name and area of the shape now? Q What is the perimeter of the shape?</div> <p>Open up the paper to the original square. Cut out one quarter of the square.</p> <div>Q What has happened to the area of the original square? Q What has happened to the perimeter of the original square?</div> <p>Cut out sections of the square. Make sure that the cuts are parallel to the sides of the square.</p>  <div>Q What has happened to the area/perimeter of the original square?</div> <p>Keep cutting sections out of the original square and each time, ask:</p> <div>Q What has happened to the area/perimeter of the original square?</div> <p>Encourage the children to see that each time the area is getting smaller and the perimeter remains the same.</p> <ul style="list-style-type: none"> Use the string on the OHP and form a square. <div>Q What is the perimeter of the square? Q What is the area of the square?</div> <p>Rearrange the string to show a range of different rectangles. Each time ask:</p> <div>Q What is the perimeter/area of the rectangle?</div> <p>Establish that the area changes but the perimeter remains the same.</p> <ul style="list-style-type: none"> Ask the children to investigate using rectangles. <div>Q How many different rectangles can you draw which have different areas but have a perimeter of 24 cm? Q What is the largest area you can make?</div> | <ul style="list-style-type: none"> Share all the possible rectangles. Encourage the children to explain their methods and reasoning. <div>Q Did anyone use a system as they were working? (e.g. reducing the width and extending the length.)</div> <ul style="list-style-type: none"> Demonstrate a systematic approach to the problem if appropriate. Establish that the largest possible area is 6 x 6 cm: <div> <div>6 cm</div> <div>6 cm</div>  </div> <p>Perimeter = 24 cm Area = 36 cm²</p> <div> <p>By the end of the lesson, children should be able to:</p> <ul style="list-style-type: none"> Use their knowledge of perimeter to solve a problem; Explain their methods and reasoning; Realise the benefits of a systematic approach when solving problems. <p>(Refer to supplement of examples, section 6, page 79.)</p> </div> |

5 mile = 8 km

1 mile = 1.6 km

1 kilometre = 1000 metres

1 metre = 100 centimetres
1000 millimetres

1 centimetre = 10 millimetres

1 kilometre = 1 000 000 millimetres

1.5 km = 1500 metres

2.6 km = _____metres

5.2 m = _____cm

_____ m = 240cm

10.5 cm = _____mm

_____ cm = 152mm

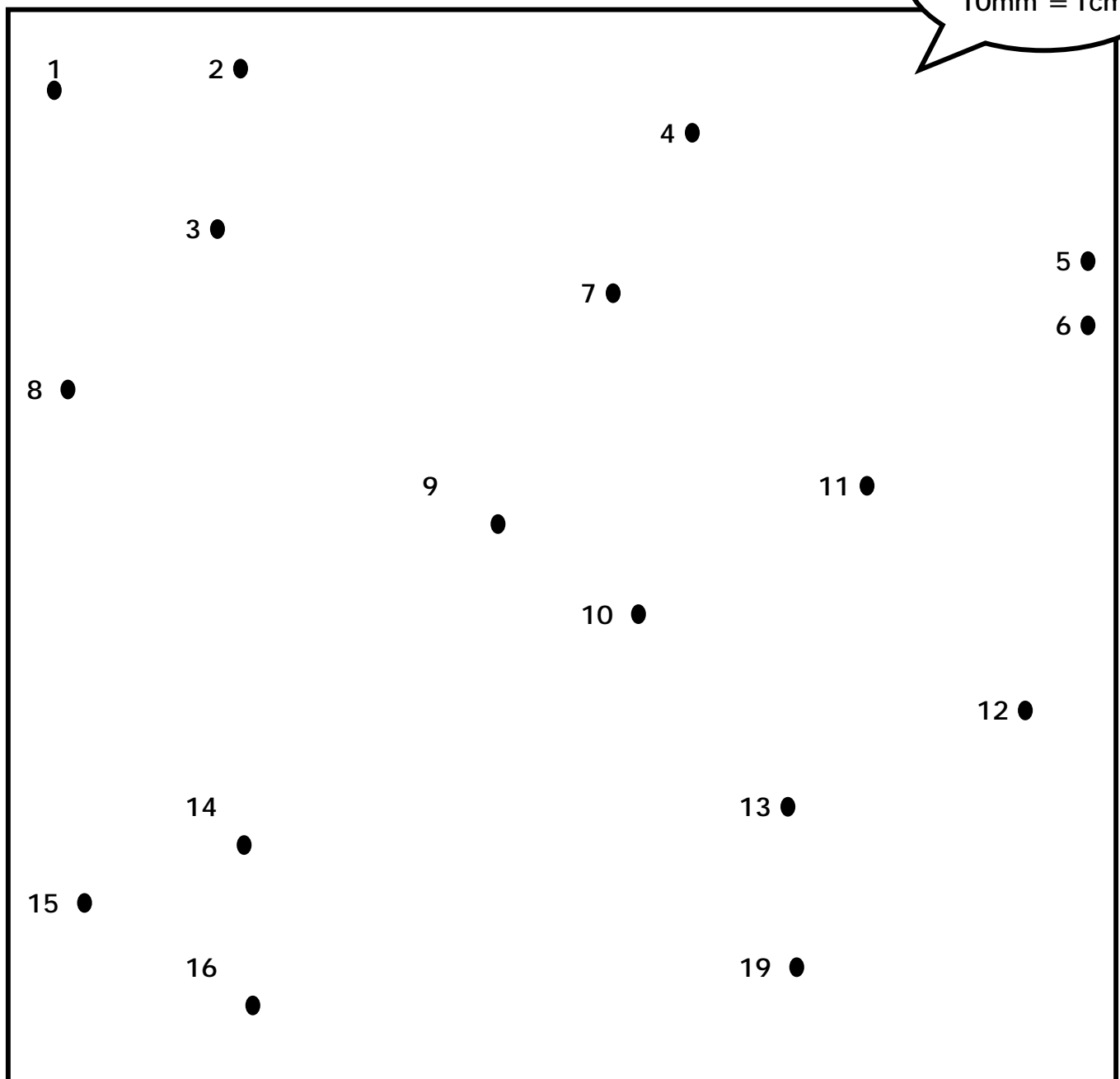
3 km = _____ mm

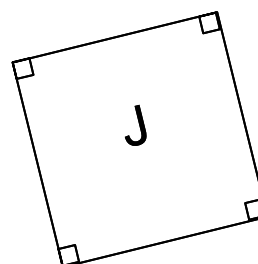
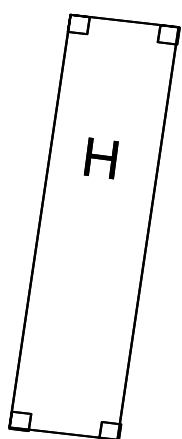
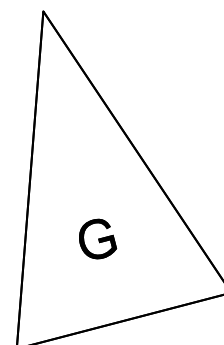
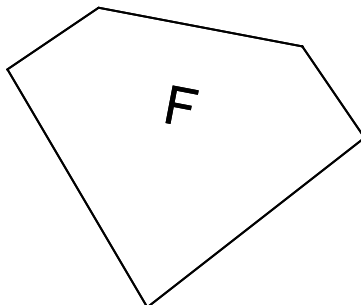
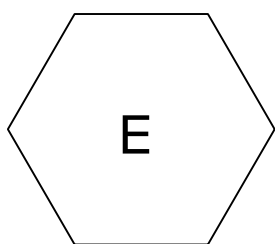
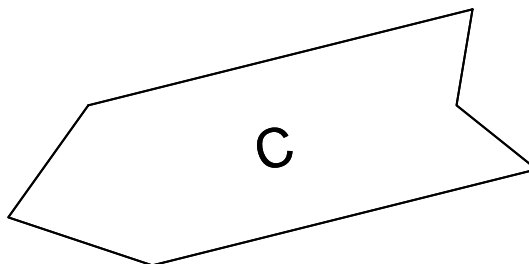
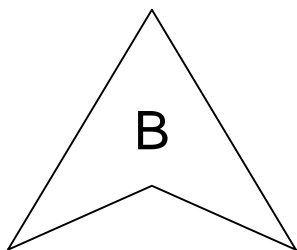
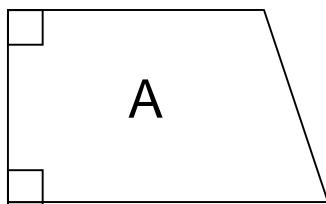
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|-------|--------|--------|-------|--------|
| 1 km | 15 cm | 50 cm | 15 m | 97 mm |
| 200 m | 10 mm | 100 cm | 5 cm | 300 mm |
| 4 m | 180 km | 1 mm | 6.2 m | 50 km |

Hit the Spot!

- Work with a partner
- Player A chooses 2 numbered spots
- Player B ¹. Estimates the distance between the 2 spots in millimetres. ². Joins the 2 spots with a straight line drawn with a ruler. ³. Measures the line in millimetres.
- Player B scores 5 points for a direct hit, 3 points for an estimate within 10mm and 1 point for an estimate within 20mm.
- Player B chooses 2 numbers for player A.

Remember
10mm = 1cm





| | | | |
|---|---|--|---|
| I have... 500 m who has... $\frac{1}{4}$ km? | I have... 250 m who has... 150 cm? | I have... $1\frac{1}{2}$ m who has... $\frac{1}{2}$ kg? | I have... 500 g who has... $\frac{3}{4}$ l? |
| I have... 750 ml who has... 240 cm? | I have... 2.4 m who has... 3000 ml? | I have... 3 l who has... $\frac{1}{2}$ m? | I have... 50 cm who has... 750g? |
| I have... $\frac{3}{4}$ kg who has... 1.8 m? | I have... 180 cm who has... 100 cm? | I have... 1 m who has... 250 g? | I have... $\frac{1}{4}$ kg who has... 1000 g? |
| I have... 1 kg who has... $1\frac{1}{2}$ l? | I have... 1500 ml who has... 200 cm? | I have... 2 m who has... $1\frac{3}{4}$ m? | I have... 1 m 75 cm who has... 5000 ml? |
| I have... 5 l who has... 310 m? | I have... 3.1 m who has... 5 mm? | I have... $\frac{1}{2}$ cm who has... $\frac{1}{2}$ m? | I have... 500 m who has... 10 mm? |
| I have... 1 cm who has... $\frac{3}{4}$ km? | I have... 750 m who has... 28 mm? | I have... 2 cm 8 mm who has... 250 cm? | I have... $2\frac{1}{2}$ m who has... $1\frac{1}{2}$ km? |
| I have... 1500 m who has... 1000 ml? | I have... 1 l who has... $3\frac{1}{2}$ m? | I have... 3 m 50 cm who has... $1\frac{1}{2}$ l? | I have... 1500 ml who has... 0.1 m? |
| I have... 10 cm who has... 3 m? | I have... 300 cm who has... $4\frac{1}{2}$ km? | I have... 4 km 500 m who has... 600 cm? | I have... 6 m who has... $\frac{1}{2}$ km? |

| | | | |
|---------------|---------------|---------------|----------------|
| 1.5 km | 1500 m | 3.2 m | 3200 mm |
| 5.9 m | 590 cm | 7.7 km | 7700 m |
| 3.2 cm | 32 mm | 1.5 m | 15 mm |
| 5.9 km | 5900 m | 77 cm | 0.77 m |

| | | | | | | | | | |
|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|------------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |
| 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 |
| 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 |
| 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 |
| 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 |
| 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 |
| 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 |