# How does Vitruvian Man stand up today?

Why do this?

Leonardo da Vinci's drawing 'Vitruvian Man' is a representation of the human body's proportions. In this activity, children measure different parts of the body to determine whether the statements da Vinci made about body proportions are still true. This activity is good for practising accurate measuring, collecting, handling and evaluating data and for discussing variation.
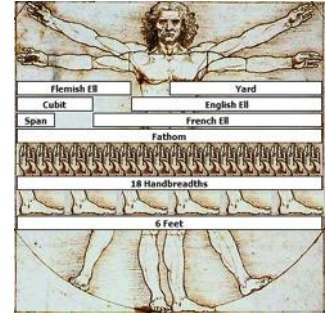
Suitability

Years 5-6

Practical details

> **Equipment per group**
>
> - Tape measure (min 150 cm long)
> - Metre rule
> - Ruler
> - Vitruvian Man statements sheet
>
> - Vitruvian Man results table (1 per child)
> - Vitruvian Man data handling sheet (1 per child)
> - Pencils
> - Calculators
>
> **Optional resource (downloadable from the CLEAPS primary website)**
>
> - P056a Vitruvian Man spreadsheet with formulas to collate class results and see the averages and a sample spreadsheet of Y5/6 pupil data

Notes

1. At least 3 children are needed per group: one to be measured and two to hold the tape for accurate measuring.
2. The Vitruvian Man statements could be displayed on an interactive whiteboard for the whole class to see.

Pgs. 1-3 of this document are designed to support planning. Pgs. 4-6 are worksheets for children to use.

Procedure

1. Show the children some of da Vinci's statements from the 'Vitruvian Man statements sheet' and ask them 'Are his claims still true today?'
2. To find out the answer, children need to collect some data using the 'Vitruvian Man results table' to record their measurements. However, it is important to discuss:
   - How will they ensure everyone is taking comparable measurements?
   - Which equipment is best for each measurement?
   - How will they ensure consistency? E.g. take jumpers off, take shoes off.
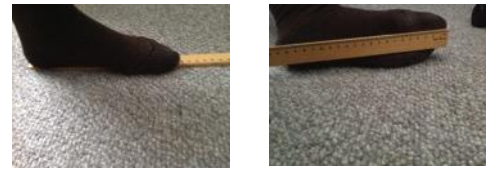
Note: Measuring in cm to the nearest half cm, or to 1 decimal place works well.

3. There are several ways to approach these discussions depending on your learning objective, for instance:
   - If accurate and consistent measuring is a focus, demonstrate one of the instructions from the 'what to measure column' of the results table before the children start the activity.
   - If following instructions is a focus, allow the children to start taking their measurements but then stop the activity if they are not measuring consistently and discuss why this is problematic.
4. Once the children have taken their measurements they use them to complete the 'Vitruvian Man data handling sheet'. This allows them to compare their data to the Vitruvian Man statements.

Note: At this stage, each child could enter their data in to the 'Vitruvian Man spreadsheet' to check their calculations and contribute to an averaging class data set.

	Initials	Height	Arm span	Hand length	Forearm+ hand	Foot	Upper arm	Shoulders	Face		Height/ armspan	Height/ hand	Height/ forearm	Height/foot
1	Initials													
2	SAKS	136.0	131.5	15	33.5	20.0	20.0	32.0	18.5		1	9	4	6
3	TO	142.0	143.5	16.0	36.0	22.0	17.0	37.0	19.0		0	8	3	6
4	LW	136.0	123.0	14.0	32.0	22.0	25.0	35.0	20.0		1	9	4	6
5	PA	153.0	147.0	17.5	22.0	42.0	29.0	38.0	23.0		1	8	6	3
6	BH	145.0	127.0	14.0	36.0	23.0	24.0	34.0	22.0		1	10	4	6
7	SA	132.0	135.0	14.0	31.0	23.0	19.0	34.0	15.0		0	9	4	5
8	EH	144.0	144.0	16.0	38.0	38.0	21.0	36.0	16.0		1	9	3	3
9	AM	150.0	150.0	16.0	41.0	25.0	29.0	40.0	21.0		1	9	3	6
10	MS-W	146.0	149.0	17.0	40.5	23.0	25.0	39.0	21.0		0	8	3	6
11	MP	147.0	151.0	17.0	36.5	24.0	24.0	36.0	20.5		0	8	4	6
12	BE	126.0	133.0	16.0	32.5	20.0	21.0	34.0	17.0		0	7	3	6
13	LS	142.0	151.0	16.5	40.0	24.5	22.5	34.0	19.0		0	8	3	5
14	ES	132.5	134.5	14.0	36.5	22.0	25.0	34.0	14.0		0	9	3	6
15	MA	139.0	142.5	15.0	38.0	22.0	23.0	34.0	20.0		0	9	4	6
16	DB	144.0	136.0	16.5	36.5	23.0	22.0	34.0	19.0		1	8	3	6
17	E.C	143.5	145.0	14.0	38.5	23.0	27.0	34.0	14.0		0	10	3	6

5. Discuss whether their results need to be an exact match for da Vinci's statements to be considered as still being true. What is an acceptable variance and why?
6. Discuss with the children why their data may not match the Vitruvian Man statements eg children haven't finished growing, natural variation between individuals and inaccuracies in measuring or recording results.
7. If you have used the spreadsheet, compare the class averages to the Vitruvian Man statements to see if they match the statements better than individual results.
8. Encourage the children to check their data for inaccuracies in measuring or recording results. For example, by comparing their measurements to a similar sized person and looking for differences, comparing a specific measurement eg their hand length to the class data set, or by scanning the spreadsheet for any note-worthy differences (anomalies) for a particular measurement. If a reading appears irregular, check the measurement. A set of data for Year 5/6 pupils is provided within the spreadsheet that you can use for comparison. Note, this is real data containing variation and inaccuracies.

Expected observations and explanations

1. Children should discover that some of the statements are true, or approximately true, for them.
2. Natural variation means that the children's individual results may not reliably match all the Vitruvian Man statements.
3. When comparing class averages, more of the statements will be true demonstrating how individuals can vary widely from an average. The bigger the data set the closer the match will be.
4. Whilst most differences will be due to natural variation, some will be due to different postures eg some may stretch their arms out more, or stand up straighter or slump a little when measuring. These are good points for discussing and evaluating.

Possible further activities

- Collect a set of results from adults. Compare them to the children's results and to the statements. There will be differences between adult results and results collected from children. A new-born's head is about a quarter of the baby's height, a 2 year old has a head size that is approximately a fifth of its height, and an adult about a tenth. With a data set of adult results, most of the Vitruvian Man statements will be true.
- Explore the data to make links of your own, e.g. "I noticed my forearm length is the same as my knee to heel length. Is this the same for others?" "If hand and face are both are tenth of height, then is my hand length the same as my face?" "What else can I measure?" (eg shoulder width, elbow to armpit, back of knee to heel).

Background notes

The Vitruvian Man is a drawing that Leonardo da Vinci produced in the 15th Century, inspired by the ideas of a 1st Century BC Roman architect, engineer and author called Vitruvius.

Vitruvius felt that architecture should imitate nature and be solid, useful and beautiful. To be beautiful, buildings needed to have the right proportions and that meant they should be based on the human body.

Leonardo was also very interested in the proportions of the human body and used his knowledge of anatomy, as well as his understanding of mathematics and geometry to produce the drawing.

Leonardo made notes in Latin in reverse (mirror) writing (something else he was famous for) above and below the sketch that list measurements and proportions of the human body.

Below are some of the original statements, translated:

__The length of a man's outspread arms is equal to his height.__

__From the roots of the hair to the bottom of the chin is the tenth of a man's height;__

From the bottom of the chin to the top of his head is one eighth of his height;

From the top of the breast to the top of his head will be one sixth of a man.

From the top of the breast to the roots of the hair will be the seventh part of the whole man.

The greatest width of the shoulders contains in itself the fourth part of the man.

__From the elbow to the tip of the hand will be the fifth part of a man;__

From the elbow to the angle of the armpit will be the eighth part of the man.

__The whole hand will be the tenth part of the man__

__The foot is the seventh part of the man.__

From the sole of the foot to below the knee will be the fourth part of the man.

The distance from the bottom of the chin to the nose and from the roots of the hair to the eyebrows is, in each case the same, and like __the ear, a third of the face__

The six in bold have been included in this activity and are given in the original form, together with a 'user-friendly version.

Vitruvian Man statements

Vitruvian Man is a drawing by Leonardo da Vinci that shows ideal proportions of the body.

This version of the drawing of 'Vitruvian Man' has had some old units of measurements added to it.

Leonardo made notes in Latin in mirror writing above and below the drawing that stated measurements and proportions of the human body.

Some of them are shown below, for you to investigate.
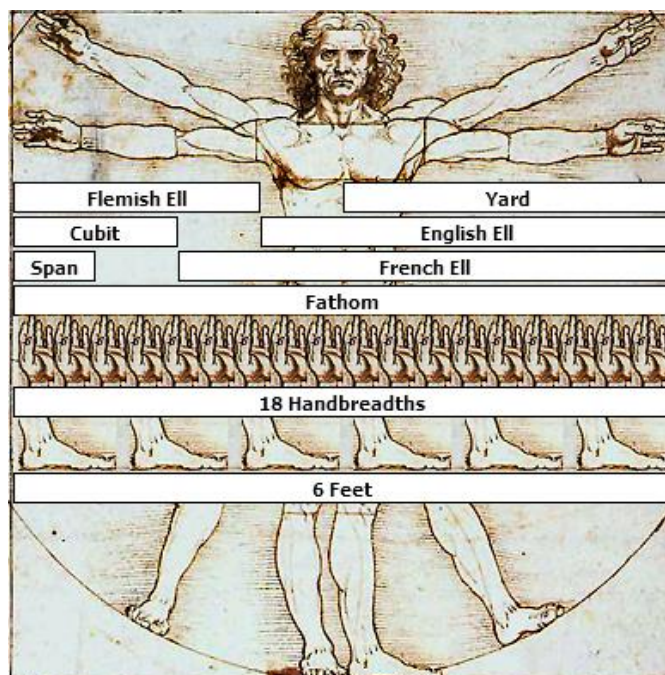
Original statement	Explanation
The length of a man's outspread arms is equal to his height	Height= arm span
The whole hand will be the tenth part of the man	The length of the hand is $\frac{1}{10}$ of the height So: Height = hand length x 10
From the roots of the hair to the bottom of the chin is the tenth of a man's height	The face is $\frac{1}{10}$ of the height So: Height = face size x 10
From the elbow to the tip of the hand will be the fifth part of a man	The forearm with hand is $\frac{1}{5}$ of the height So: Height = forearm with hand x 5
The foot is the seventh part of the man	The foot length is $\frac{1}{7}$ of the height So: Height = length of foot x 7
The ear, (is) a third of the face	The ear length is $\frac{1}{3}$ of the face So: Face size = ear length x 3

Vitruvian Man Results Table

Name   **Date**

What to measure **Keep the measuring tape taut (not sagging) and do not let it twist.**	Measurement/units
Height: Stand up straight, no shoes on and feet together; chin up & face forward (do not look down to the floor). Place a ruler horizontally on top of head so it sticks out the front. Measure straight up from the floor to the ruler. Or stand by a whiteboard and make a mark where the ruler touches it, then measure from the floor to the mark.	
Arm span: Stretch out arms horizontally from shoulders, palms facing forward not down, measure from middle fingertip to middle fingertip.	
Hand length: Base of palm by wrist crease line to tip of longest finger (do not include nails).	
Forearm+ hand: Hold arm out in front bent 90 degrees at the elbow (palm facing ceiling). Length of inside elbow at the bend to fingertip of longest finger.	
Foot length: Heel to tip of big toe.	
Face size: From hairline at centre of forehead to bottom of chin, down the side of the nose (not over the top).	
Length of ear: Bottom of lobe to top at longest point.	

Vitruvian Man Data Handling

Name   **Date**

Vitruvian Man statement	Calculation In the space underneath the words write out the calculation using your measurements e.g. for height÷ arm span=1: if your height is 150cm and your arm span is 151cm then the calculation is: 150÷151=0.99 this is nearly 1 so it is approximately true	True/approx true/ false
Height= arm span	**Does height ÷ arm span = 1?**	
Height = Hand length x 10	**Does height ÷ hand length =10?**	
Height = Face size x 10 Face = a tenth of height	**Does height ÷ face size =10?**	
Height = Forearm+ hand x 5 Forearm + hand = a fifth of height	**Does Height ÷ forearm with hand = 5?**	
Height = length of foot x 7 Foot length = a sixth of height	**Does Height ÷ foot = 7?**	
Length of face = length of ear x 3 Ear = a third of face	**Does face ÷ ear = 3?**	