Whitstone School
inspiring futures

Maths Home Learning Task

Year 9

Higher 3

Name _____

Tutor Group _____

Teacher _____

Given out: Monday 24 February Hand in: Monday 2 March

Parent/Carer Comment
Staff Comment ATL
Target

Reading Task

Proofs and Pythagoras - Greek Mathematics

In the high mountains of Greece in the north-eastern part of the Mediterranean, a civilization was born that influenced the world for centuries. Ancient Greece made great strides in the areas of art, philosophy, and politics, and its civilization lasted from approximately 2000 BC to 300 BC. Greece also produced some of the finest mathematical minds that ever pondered numbers. The Greeks were the first people of the ancient world who systematically studied geometry, which is the study of the size and shape of an object. While the first surveyors of Egypt understood practical elements of geometry, the Greeks asked why these applications worked. The Greeks wrote down rules for geometry that verified the observations of other ancient mathematicians.

The Greek language formed the basis of some of the mathematical words we use today. The word geometry comes from a Greek word for "earth measuring." Another modern word that comes from Greek is arithmetic, which comes from *arithmos.* The Greeks had fun with numbers, and *arithmos,* which means number, denoted discovering secrets and figuring out puzzles about numbers. The Greek sense of curiosity about numbers probably helped them unravel many problems that earlier mathematicians could not figure out. The Greeks loved to argue, debate, and figure out how to prove everything they observed.

The Greeks had a simple number system, but it was different from the Egyptian system. While the Egyptians used pictures to represent numbers, the Greeks used the letters of their alphabet. The Greeks got the idea for an alphabet from the Phoenicians, a seafaring people who lived around 1500 BC along the coast of Syria. The Greek number system used units of 5 and 10. The Greek alphabet had twenty-seven letters, so the first nine letters represented the digits 1 through 9; the second nine letters represented the tens, and the last nine letters represented the hundreds. The highest Greek number was 900. The Greeks did not have a zero, and since they rarely needed numbers higher than hundreds, the system worked fairly well. Even though the Greeks were logical about numbers, they were surprisingly superstitious too. Some numbers were evil, while other numbers were friendly or even sacred. Number 10 was the number of harmony. Number 8 was the symbol of death. Odd numbers were female, and even numbers were male.

The Greeks had great respect for their mathematicians. Two famous and brilliant mathematicians were Thales, the "father of geometry," and his inquisitive student, Pythagoras. The laws of nature fascinated Thales, and he studied everything from magnets to weather patterns. He also loved geometry. Thales taught Pythagoras, who became a brilliant pioneer in geometry.

Pythagoras is most famous for the Pythagorean Theorem, which explained what the surveyors of ancient Egypt had figured out by observation. His theorem stated that, *"in any right triangle, the sum of the squares of two sides is equal to the square of the hypotenuse."*This theorem means that if the lengths of two sides of a right triangle are known, the length of the third side can be calculated. The Pythagorean Theorem became the cornerstone of the science of geometry. Pythagoras shared his discoveries in his school at Croton, and his students formed a secret brotherhood to study *mathematica.* The word *mathematica* meant "studies" at that time, but it eventually meant mathematics in the modern sense because of what Pythagoras taught. They defined circles, straight lines, and three-dimensional shapes, called regular solids. They also studied the relationships between degrees and angles in different kinds of triangles.

Another famous Greek mathematician who made remarkable contributions to geometry was Euclid. He published his book, *Elements,* in 330 BC, and it contained his ideas on geometry and number theory. A century after Euclid published his book, another great Greek mathematician was making other discoveries. Archimedes invented many mechanical devices and calculated the correct value for *pi,* which is 3.14. *Pi* is the number that expresses the ratio between the circumference of any circle and its diameter, and the symbol for *pi* is the sixteenth letter of the Greek alphabet. Archimedes also made many discoveries about the geometry of circles. When Syracuse, his home, fell to the Romans in 212 BC, Archimedes was studying his diagrams of circles. A Roman soldier approached him. Archimedes told him, "Do not touch my circles!" because he valued his work in geometry more than his life.

Area and Volume

1. **a,** Convert each area to square centimetres.

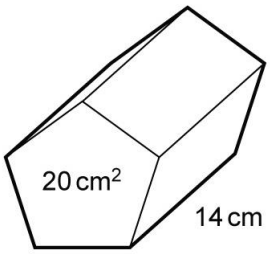
i 6 m^2 **ii** 3.7 m^2 **iii** 0.8 m^2 **iv** 4200 mm^2

b. Convert each area to square metres.

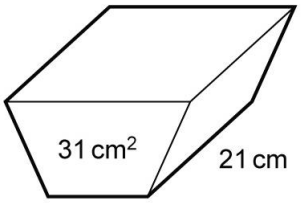
i 200 000 cm^2 **ii** 42 000 cm^2 **iii** 3100 cm^2 **iv** 790 cm^2

2. Work out the volume of each prism. The area of the cross-section is given.

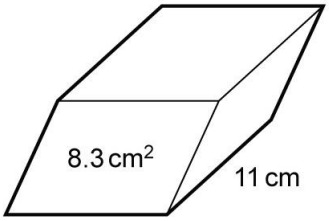
b



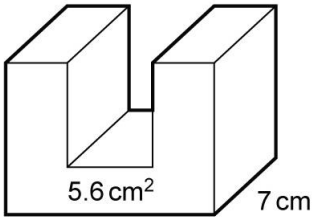
e



c



f



The volume of:

b =

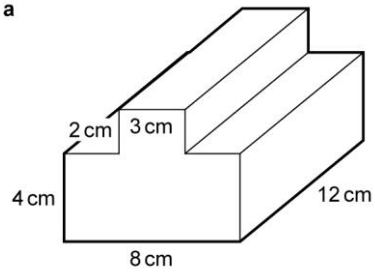
c =

e =

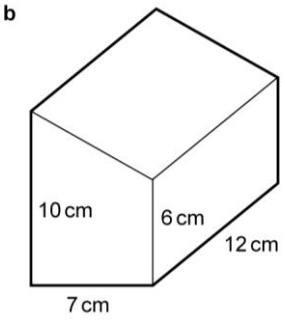
f =

3 Work out the volume of each prism.

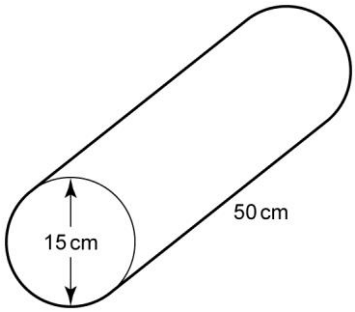
a



b



4 A concrete pipe is the shape of a hollow cylinder. It has a diameter of 15 cm and is 50 cm long.



Work out:

a the circumference of the circle

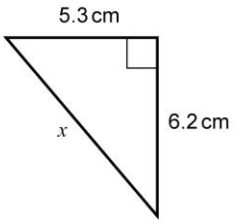
b the curved surface area of the pipe.

Give your answers to one decimal place.

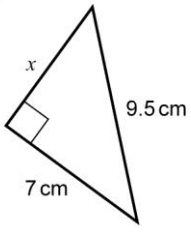
Pythagoras' Theorem

1 Find the length of the side marked x in each triangle.

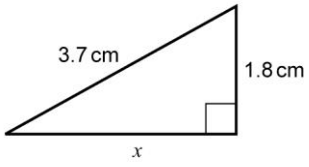
a



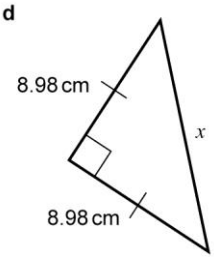
b



c



d



Not drawn accurately

Properties of Polygons

1 Write down the names of all the quadrilaterals which have:

a the diagonals the same length

b the diagonals different lengths

c diagonals that bisect each other

d diagonals that bisect each other at right angles

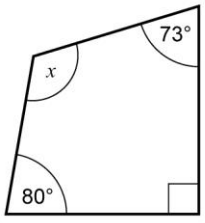
e diagonals that are not equal but meet each other at right angles

f diagonals that are not equal but bisect each other at right angles

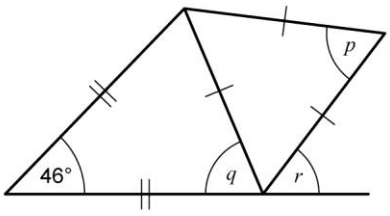
g the shorter diagonal bisected by the longer diagonal.

2 Calculate the angles marked with letters in each diagram.

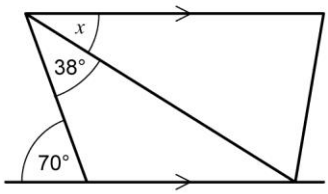
a



b



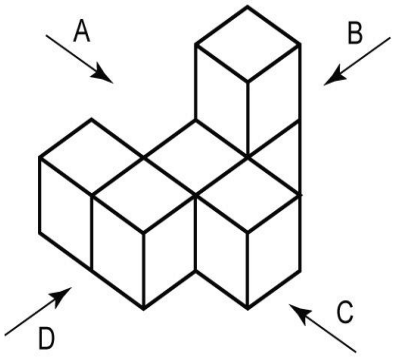
c



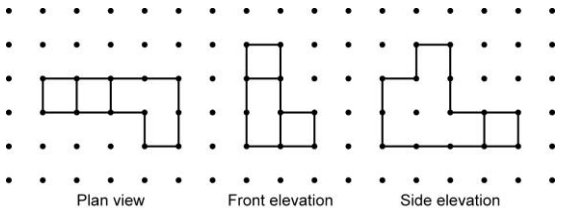
Plans and Elevations

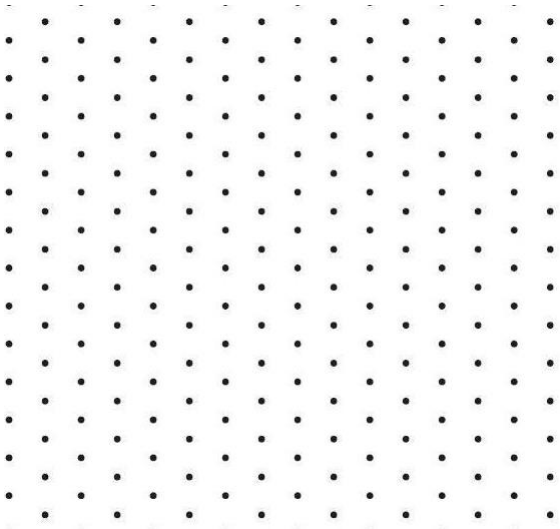
1 This shape is made from six multilink cubes.

Draw the plan view and the side elevations seen from each of the directions *A*, *B*, *C* and *D*. Label each sketch clearly.



2 Here are the plan and elevations for an object made from multilink cubes.





Indices and standard form

1 Write in index notation:

a $10 \times 10 \times 10$

b $\frac{1}{100000}$

2 Simplify the following leaving your answer in index form.

a $10^2 \times 10^4$

b $10^{11}/10^2$

3 Simplify the following leaving your answer in index form.

a $(10^2)^3$

b $(10^3)^6$

4 Are the following statements true or false? Give a reason for your answer.

a $10^3 = 30$

b $10^6 \div 10^3 = 10^2$

c $10^{100} \times 10^{10} = 10^{1000}$

5 Simplify the following, leaving your answer in index form.

a $\frac{10^6 \times 10^3}{10^4}$ **b** $\frac{10^4 \times 10^6}{10^2}$

6 Write the following ordinary form numbers in standard index form.

a 4800 **b** 37 000 000 **c** 410 200 **d** 6 400 000 000

7 Write the following standard form numbers in ordinary form.

a 6×10^4 **b** 4×10^5 **c** 3.6×10^{-2} **d** 5.027×10^{-4}

8 The distance from the earth to the sun is approximately 150 000 000 km.

Write this number in standard index form.