Year 5

(Entry into Year 6)

15 Hour Revision Course

Mathematics

NORD
ANGLIA
EDUCATION

Section 1 – Numbers and Algebra

5.5 hours

Multiplication and Division (1 hour)

Powers of Ten

When multiplying any number by ten, one hundred or another power of ten (10^3, 10^4 and so on), rapid solutions may be found by observing that multiplying by ten is equivalent to moving the decimal place one spot to the *right* and filling in a zero if moved past the end of the number. Similarly, division by ten can be performed quickly by moving the decimal place one spot to the *left*.

$$41.\times 10 = 410.$$

Find the following products or quotients:

1. 7×10
2. 0.007×20
3. $620 \div 100$
4. $330 \div 110$
5. 10001×10
6. $420 \div 60$
7. 6×20
8. $9.25 \div 10$
9. $754 \div 100$
10. 30×40
11. 1000×1000
12. 600×200

13. A farmer is storing hay for his horses and needs 10 kilograms of for each one. If he has 32 horses, how many kilograms of hay will he need in total?

14. During the Middle Ages, Mongol armies contained units of soldiers consisting of 100 men each called *zuun*. If an army contained 2000 men, how many zuun did it have?

Mental Maths

Compute the following products and quotients with mental math.

5	9	4	3	2	8	5	6
× 3	× 5	× 4	× 8	× 7	× 9	× 6	× 10

8	5	4	7	8	4	7	4
× 6	× 5	× 6	× 4	× 5	× 9	× 9	× 8

9	3	6	42	32	96	27	99
× 3	× 7	× 6	÷ 7	÷ 8	÷ 8	÷ 3	÷ 11

7	8	9	84	60	24
× 7	× 8	× 9	÷ 7	÷ 12	÷ 6

Decimals (30 minutes)

Multiplication

One method of writing out quantities that lie between whole numbers is to use a decimal. The decimal point follows the ones' place in a number. When multiplying decimal numbers, the end product should have the same number of places *after* the decimal point as the numbers being multiplied have together. For example, the product of 1.01 and 2.83 should have four numbers after the decimal point because each factor has two decimal places and two plus two equals four. In practice, it would look like this:

$$
\begin{array}{r}
2.83 \\
\times\ 1.01 \\
\hline
283 \\
0 \\
+\ 28300 \\
\hline
2.8583
\end{array}
$$

Each of the factors in this multiplication problem has two decimal places. Thus, the final product will have four decimal places.

There should be four digits after the decimal place.

Division

A simple method for performing division with decimals is to multiply both the quotient and the divisor by some power of ten and make both into whole numbers. Then, you may use normal long division to find the answer. To illustrate this, examine the following comparison.

$$0.65\overline{)\,13} \qquad 65\overline{)\,1300}$$

The two division problems shown above are completely equivalent and give the same answer. The numbers on the right have both been scaled up by a factor of 100 compared to the ones on the left.

For the following problems, perform all calculations to the third decimal place

For example, 2.212 – 0.09 = 2.122

1. 9 – 8.64

2. 6.211 + 4.878

3. 6.43 × 2

4. 0.665 ÷ 5

5. 9×1.011

6. 65×0.2

7. 2.88×6

8. Thomas and Eleanor ran a race. Eleanor finished first, in 6.2 seconds and Thomas finished second in 8.71 seconds. By how many seconds did Eleanor win?

9. A taxi drives 9.81 kilometres, picks up a passenger and then drives another 1.55 kilometres. How far did the taxi travel in total?

10. A minaret (a type of tower) is 22.3 meters tall and is next to a flagpole which is 4.99 meters tall. What is the difference in their height?

11. A widget costs fifty-eight cents. There are one hundred cents in a dollar. What is the price, in dollars and cents, of seven widgets?

Rounding (30 minutes)

To approximate a *rough* answer, it is useful to round to the nearest whole number before performing calculations. For example, to approximate the product 49.892 × 2.96, we can see that 49.892 is very close to 50 and 2.96 is almost 3. Then, our approximation is 50 × 3 = 150. This is not very far off from the actual answer, which is 147.68032. Without approximating, this would have been a more difficult calculation. Remember that numbers with a decimal value lower than 0.5 round down to the nearest whole number (2.45 rounds down to 2) and numbers with a decimal value greater than 0.5 round up (3.6 rounds up to 4)

Perform the following operations by approximating your answer.

1. 5.889 × 1.023

2. 100.322 ÷ 9.8

3. 7.95726 + 0.05827

4. Hamid would like to fill up the petrol tank in his vehicle. He has seventy dirham to spend. If petrol costs 1.88 dirham per litre and his tank can hold 28.8 litres, will he be able to fill his tank?

5. A pantry holds 6.29 kilograms of flour and Kevin would like to bake several cakes. If each cake requires 1.88 kilograms of flour, approximately how many can Kevin bake?

6. $8.232 - 6.101$

7. $80.9 \div 9$

Division and Multiplication (30 minutes)

1. $225 \div 25$

2. 119×24

3. 65×452

4. $410 \div 30$

5. $121 \div 11$

6. A teacher bought each of her students an ice cream bar. If each bar costs £1.4 and she spent £70 altogether, how many students does she have?

Percentages and Fractions (2 hours)

Percentages, fractions and decimals can all be used to express portions of numbers. A decimal represents the whole (that is, the entirety of a quantity) with *1.0* while *100%* indicates the full portion in terms of percentage. Any fraction with the same number on the top and the bottom equals one. To express half of a quantity, for example, we could use the decimal 0.5, the percentage 50% or the fraction $\frac{1}{2}$ and they would all be equivalent.

1. Mayor Walid is running for re-election and needs to get 60% of the votes to win. Out of a total of 200,000 votes, 150,000 votes were cast for him.

2. Did he win enough votes?

3. How many did he need?

4. A new dress sells for £5 and has an additional tax of 20%. How much will the dress cost in total, including tax?

5. 21 students showed up for class on Monday. Only 14 were present for class on Tuesday.
    a. Calculate the attendance on Tuesday (14) as a percentage of the attendance on Monday (21)

    b. Calculate the attendance on Monday (21) as an improper fraction of the attendance on Tuesday (14).

6. The city of New Hampton had one thousand residents last year. Between then and today, it gained 33% more people.
    a. What is its current population?

    b. What fraction does 33% represent?

7. Give the fraction that is equivalent or nearest to each of the following decimals. If you get stuck, try using a calculator and using a guess-and-check method to see if dividing different numbers gets you a close approximation.
    a. 0.5

    b. 0.75

    c. 0.66

    d. 0.6

    e. 0.125

8. Rewrite the following fractions as decimals:
    a. 3/8

    b. 9/10

    c. 1/6

    d. 2/5

    e. 2/3

    f. 12/24

g. 18/27

h. 3/9

i. 5/6

9. Out of a crop of sixty oranges, forty have been damaged by frost.
   a. Write the percentage of the crop which was damaged.

   b. Write the fraction of the crop which was not damaged.

10. Rewrite the number 50 as a percentage of 10.

11. Calculate 20% of 25% of 100.

12. Calculate one-third of 150% of 30.

Square and Cube Roots (1 hour)

Square numbers can be written as the product of a number with itself. Four equals two squared which can be written as $4 = 2 \times 2$ or $4 = 2^2$. The smaller *2* above the larger *2* indicates that this is the second power. The third power, or the cube of the number two would be written as $8 = 2 \times 2 \times 2$ or$8 = 2^3$.

The *area* of a square is its side length *squared*. Additionally, the *volume* of a cube is simply one of its side lengths taken to the third power, or *cubed*.

1. The following table lists numbers side-by-side with their squares and cubes. Complete the table.

x	**x^2**	**x^3**
1	1	1
2	4	8
3	9	27
4		
5		
6		
7		
8		
9		
10		

2. Compute the following:
   a. $\sqrt{121}$

b. $\sqrt{100}$

c. $\sqrt{64}$

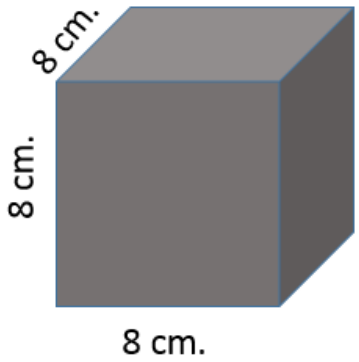
d. $\sqrt{81}$

e. $\sqrt{49}$

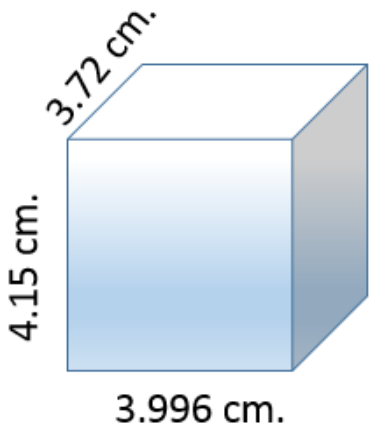
f. $\sqrt{144}$

g. $\sqrt{36}$

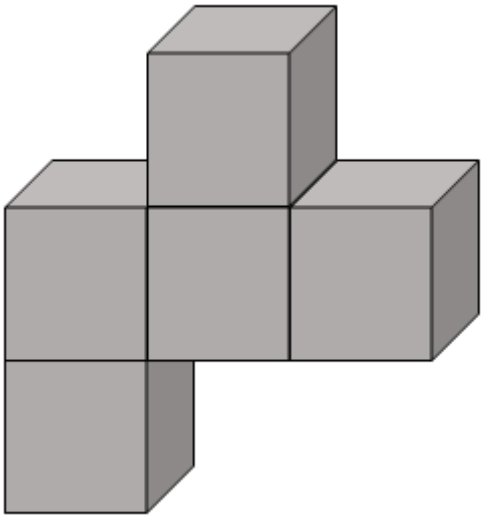
3. Find the volume of this cube.



4. Find the volume of this cube by using rounding and approximation.



The volume of irregular shapes can be found by separating them into cubes of a set volume. The solid shown below consists of several cubes, each of which is one cubic meter.



5. What is the total volume of the shape?

Word Problems (1 hour)

Everyday situations can be described using algebra and equations. Words like *doubled*, *squared* and phrases like *for each* and *per item* in a problem indicate that maths may be useful. All sorts of typical occurrences can be modelled with formulas. For example, stores usually sell fruits and vegetables by the kilogram. The total price of your groceries would then be an equation like this:

$$total\ price = price\ per\ kilogram\ \times number\ of\ kilograms$$

If you had a coupon which took two dollars off the price, then the formula would be the following:

$$total\ price = price\ per\ kilogram\ \times number\ of\ kilograms\ -\ 2$$

1. A stone is a unit of measurement which is equal to 14 pounds. Write a formula for expressing s, the number of stones in terms of p, the number of pounds.

2. In eight years' time Alexander will be three times as old as he is today. Find his current age.

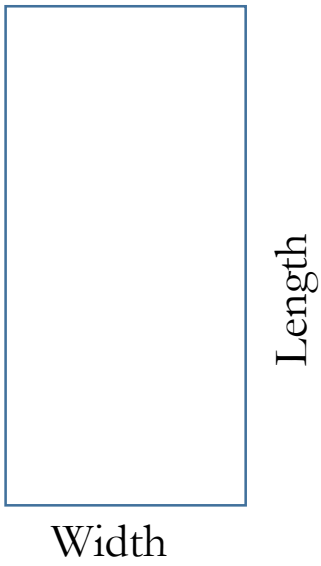
3. In a swampy marsh, there are five ducks living in every square meter. There are also two fish in each square meter. Provide a formula for the total number of fish and ducks living in a pond of size x square meters.

Section 2 – Geometry and Space

4.5 hours

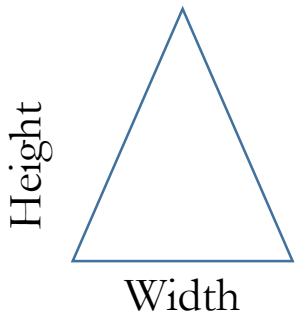
Area (2 hours)

The formula for finding the area of a rectangle is the length multiplied by the width:



$$Area = Length \times Width.$$

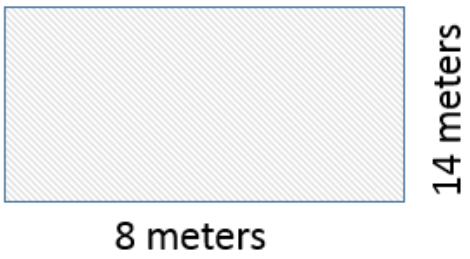
For a triangle, the formula for area is the product of the height and width divided by two, or:



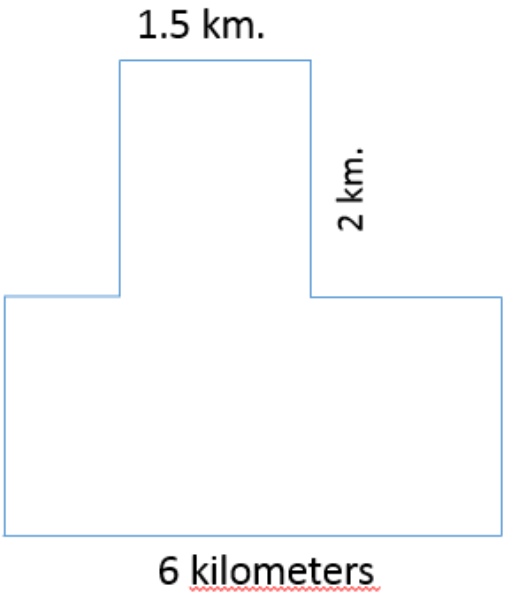
$$Area = \frac{Height \times Width}{2}$$

More complex shapes can be broken down into squares and triangles to find total area.

1. Find the area of the figures shown below.
   a.



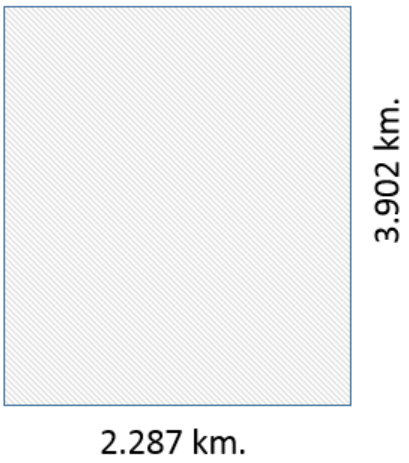
b.



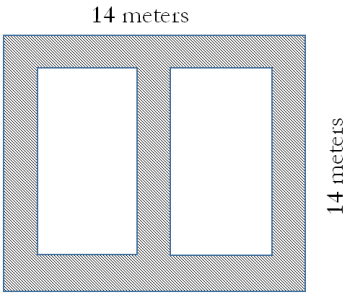
2. Find the perimeter and the side lengths of this square. The area is listed below.

81 square meters

3. Find the approximate area and perimeter of this figure by using rounding.



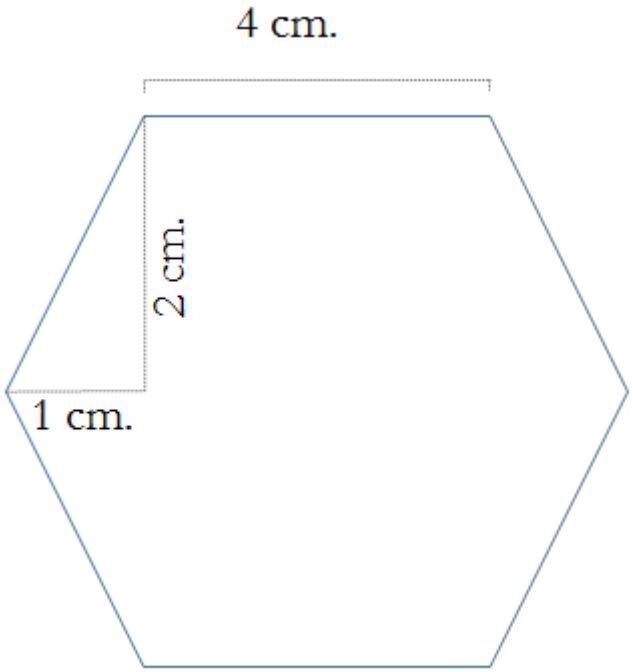
4. The shape below consists of a shaded region containing two smaller, unshaded regions which each have an area of 12 meters.



   a. What is the area of the unshaded region?

b. If the dimensions of the interior region are three meters by four meters, what is the total perimeter of the outside and the inside borders combined?

5. Find the area of the shape below by breaking it down into triangles and rectangles. Note that it is equilateral.



6. Create a cube out of the following figure by drawing 3 edges. Shade in the faces which you create as a result.

   a. Additionally, how many sides and edges are there on this cube?

   b. If the edges which you drew were each 2.5 meters long, what is the volume of the cube?

Shapes (2 hours)

In the following problems, use a compass, ruler and set square to construct various shapes.

1. Create a square with an area greater than 4 square centimetres.

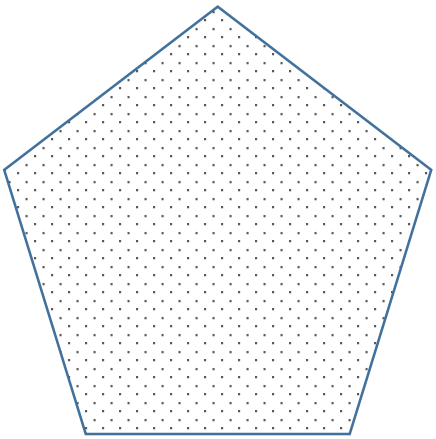
2. Create a rectangle with a length twice as large as its width and an area of at least 10 square centimetres.

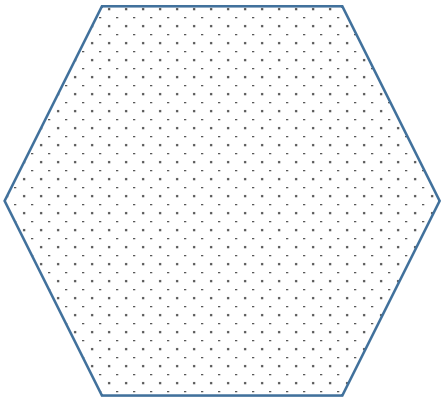
3. Draw a triangle with a right angle of 90°.

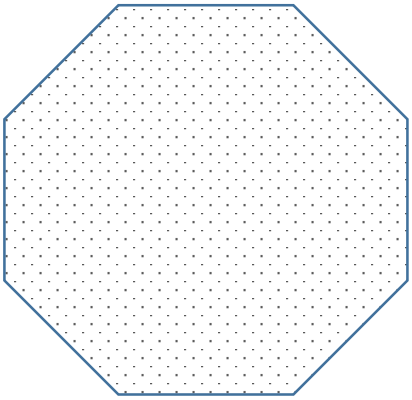
4. Draw a triangle with at least one angle of 60°

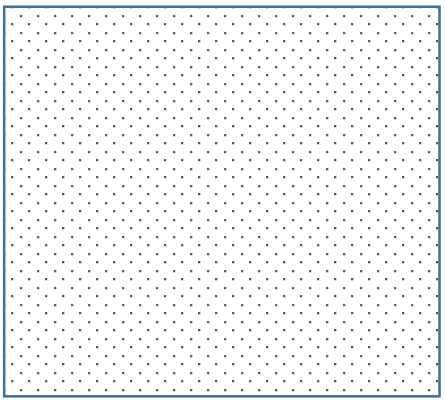
5. Match the following shapes with their names by writing the name inside the shape.

Square Octagon Pentagon Hexagon







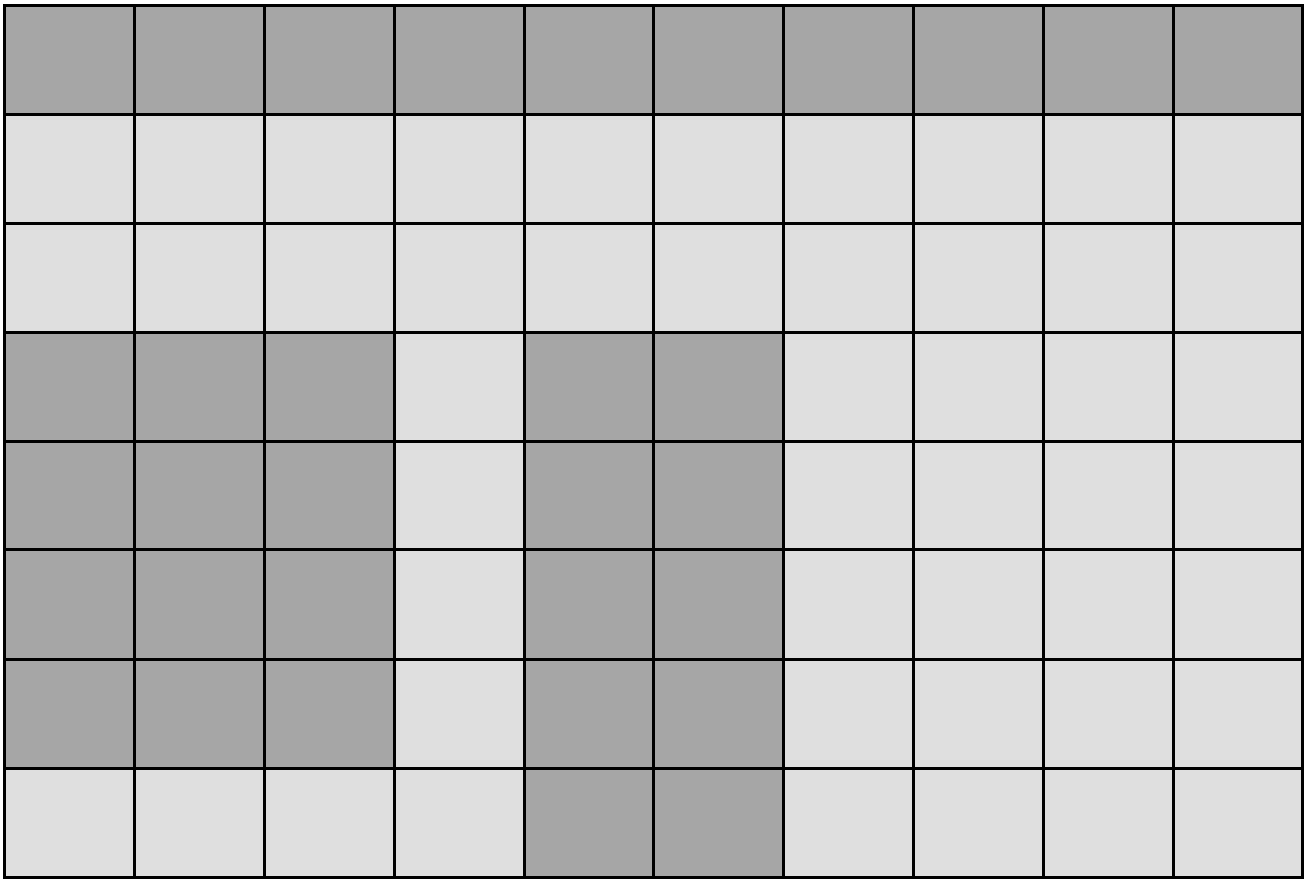


a. Of the shapes listed above, which ones are quadrilateral?

b. Which ones are regular?

c. Which ones are polygons?

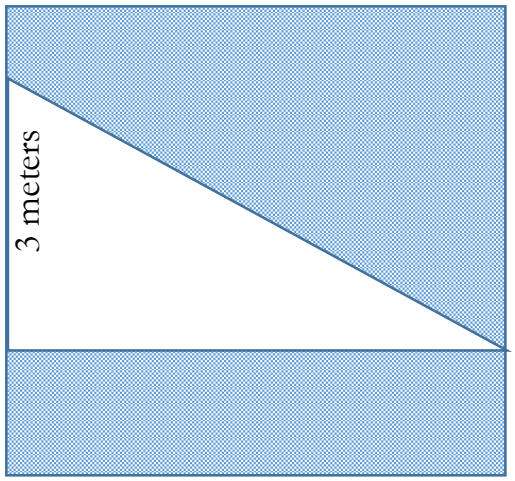
The plot shown below is a simple map which represents water with the light grey region and land with the dark grey region. Each smaller square represents 1 square kilometre and the total area is 100 square kilometres. Use it to answer the following questions.



6. What is the total area of the land shown in the map?

7. What is the area of the largest unbroken plot of land?

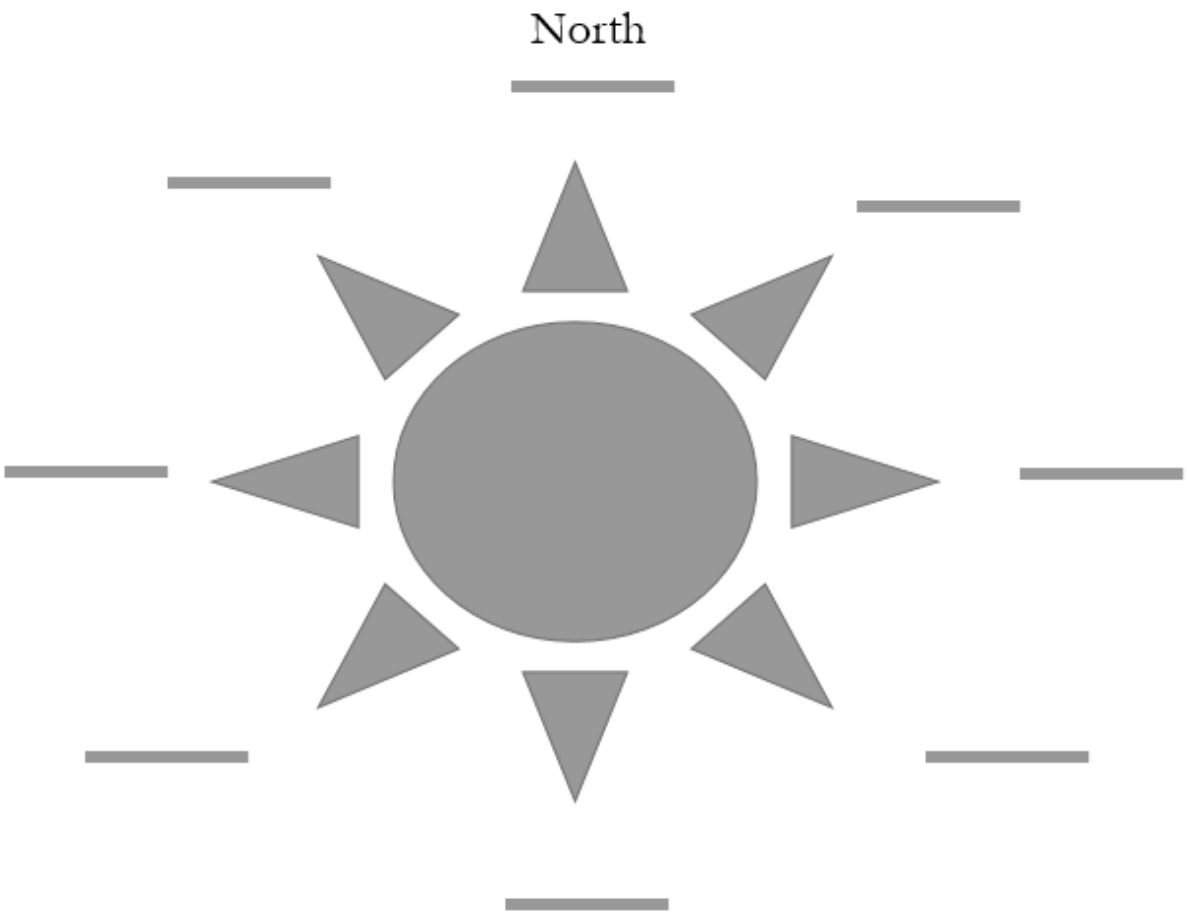
The picture shown here is a square with a triangle contained within. The triangle has a height of three meters and the square has side lengths of 5 meters each.



8. Compute separately the area of the shaded and unshaded region.

9. What percentage of the total area of the square does the triangle occupy?

10. Fill out the following directions on a compass rose. North has already been oriented for you.

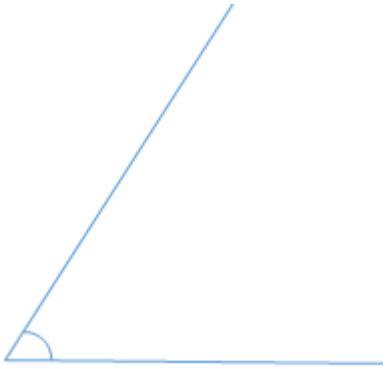


11. How many degrees does it take to make a full rotation around the compass rose?

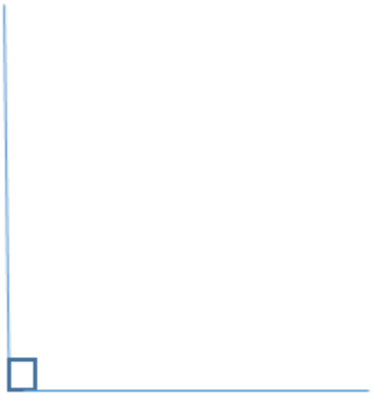
12. How many degrees separate each direction?

13. Using a protractor, find how many degrees are in each angle below:

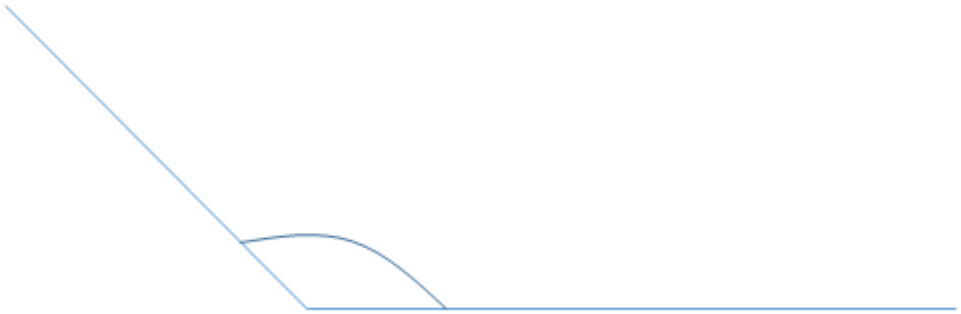
a.



b.

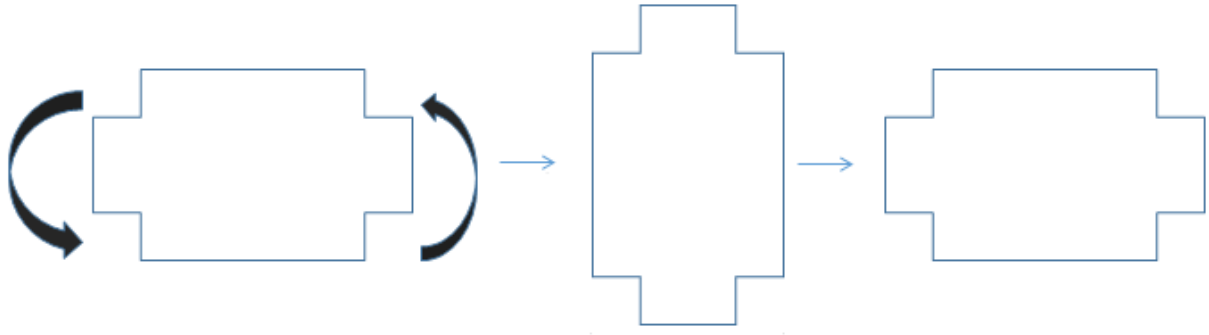


c.



Symmetry and Rotation (30 minutes)

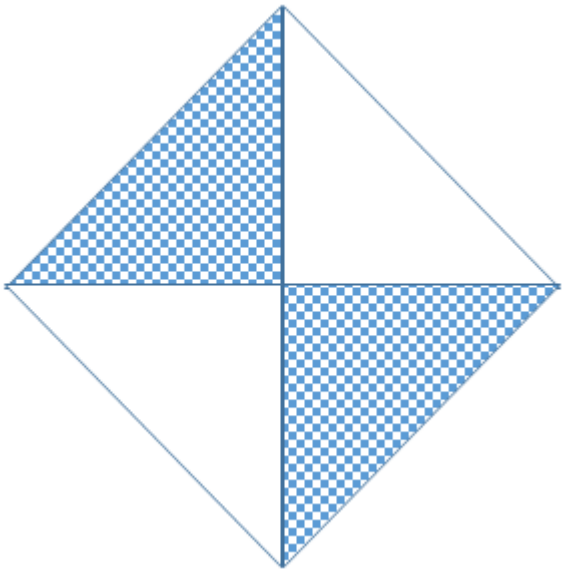
Symmetry is a measure of how much the structure of an object repeats itself in space. The order of an object's rotational symmetry refers to the number of times an object appears the same during a full rotation. The picture below shows a shape rotating twice.



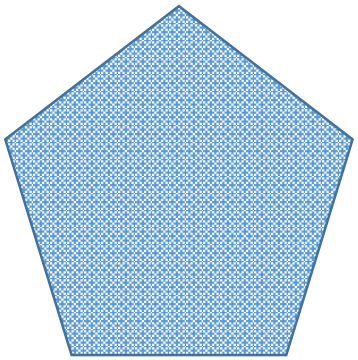
As the object rotates, has rotational symmetry if it becomes a shape which is unchanged from the beginning. We would say that this object has rotational symmetry of order *2* because if a full rotation is made through 360 degrees, the original shape will appear twice. A square has rotational symmetry of order 4 because a full rotation will bring it to its original appearance four times.

List the order of rotational symmetry for each of the following shapes:

1.

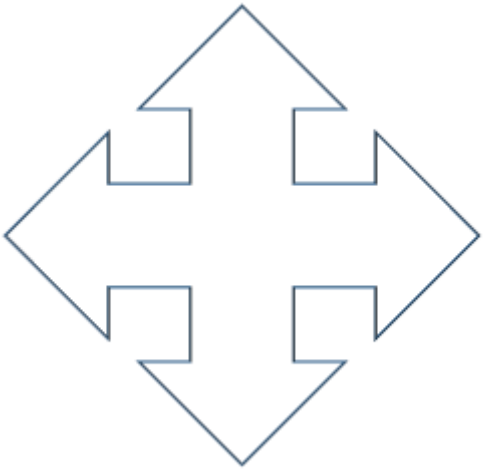


2.



3.

4.



Section 3 – Data and Graphs

5 hours

Data (1.5 hours)

Interpreting the numerical results of an event such race times or test scores can be done with three different types of averages. In everyday language, we often take the word average to be the same as mean. The mean, median and mode of a set of numbers are all actually averages, though.

The mean is defined as the sum of a list of numbers divided by how many numbers are in the list.

$$mean\ of\ (0,1,2,3) = \frac{0+1+2+3}{4}$$

The median is defined as the number which is closest to the middle of the list; that is, if you ordered all the numbers by size, the median would be in the middle. If there are two numbers which are both in the middle (this happens in lists with an even number of items) then the median is the mean of those two numbers.

$$median\ of\ (1,2,4,6,8) = 4$$

$$median\ of\ (6,4,5,3) = \frac{4+5}{2} = 4.5$$

Finally, the mode is just the most common number in a list of numbers.

$$mode\ of\ (1,2,2,1,3,5,1) = 1$$

Five students have decided to hold a race over two lengths to determine which is fastest. Use the table of times shown below (in seconds) to answer the following questions:

	Kevin	**Carl**	**Waleed**	**Layla**	**Jenny**
100 m.	14.23	22.91	17.01	18.3	15.6
200 m.	35.90	57.01	37.1	42.9	50.6

1. Which student ran the fastest race in the 100 meter run? Which was fastest in the 200 meter run?

2. Use the data above to complete the following table. Two of the fields have been completed already.

Distance	Mean	Median	Range	Maximum	Minimum
100 m.			8.68		
200 m.				57.01	

The race is so popular that the students decide to invite many more of their friends and hold more events in their track and field competition. The chart shown below depicts the number of students that compete in each event. Each student competed in only one event. Use it to answer the following questions.

Event Name	Number of Competitors
100 Meter Dash	𝍸 ||
200 Meter Dash	𝍸 𝍸 |
400 Meter Run	𝍸 𝍸 ||
1600 Meter Run	||||
Javelin Throw	𝍸 𝍸 𝍸 |

3. Is the data in this chart discrete or continuous?

4. What about the data from the previous two tables? Are they discrete or are they continuous?

5. Write out the numbers 3, 21 and 30 with tally marks.

6. What is the total number of students competing in all events?

7. What is the mean number of students in an event?

8. What is the median number of students in an event?

9. The total number of participants in the competition is 50. With this in mind, fill out the following table to indicate what percentage of the total number of participants were in each event. Two have already been filled in.

Event Name	**Percentage of total number of competitors**
100 Meter Dash	**14%**
200 Meter Dash	
400 Meter Run	
1600 Meter Run	**10%**
Javelin Throw	

10. Find the median and mode from the list of numbers below:

12 21 44 20 32 31 4 30 46

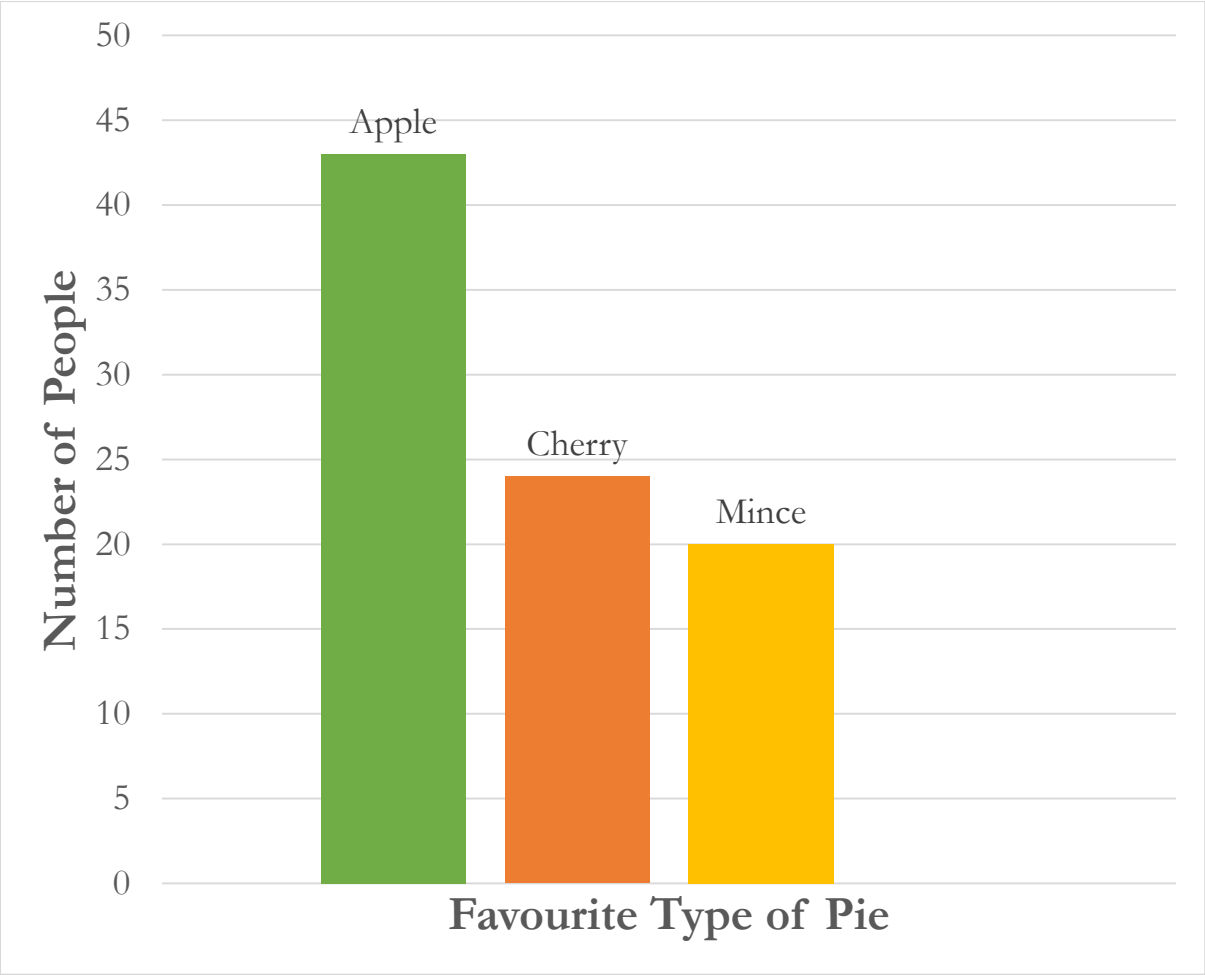
11. A teacher gives the same class two different English tests. The two tests have different mean scores. What might by a reason for this?

12. The outcome of rolling a six-sided die ten times is shown below as a list of numbers 1-6. Do the results appear fair? Why or why not?

1 2 2 1 3 1 2 1 2 6

Graphs (1.5 hours)

This bar graph illustrates the results of a survey asking 97 random people about their favourite type of pie. Use it to answer some questions about this group.



1. Out of the following list of cherry, apple and mince, rank the pies according to their popularity.

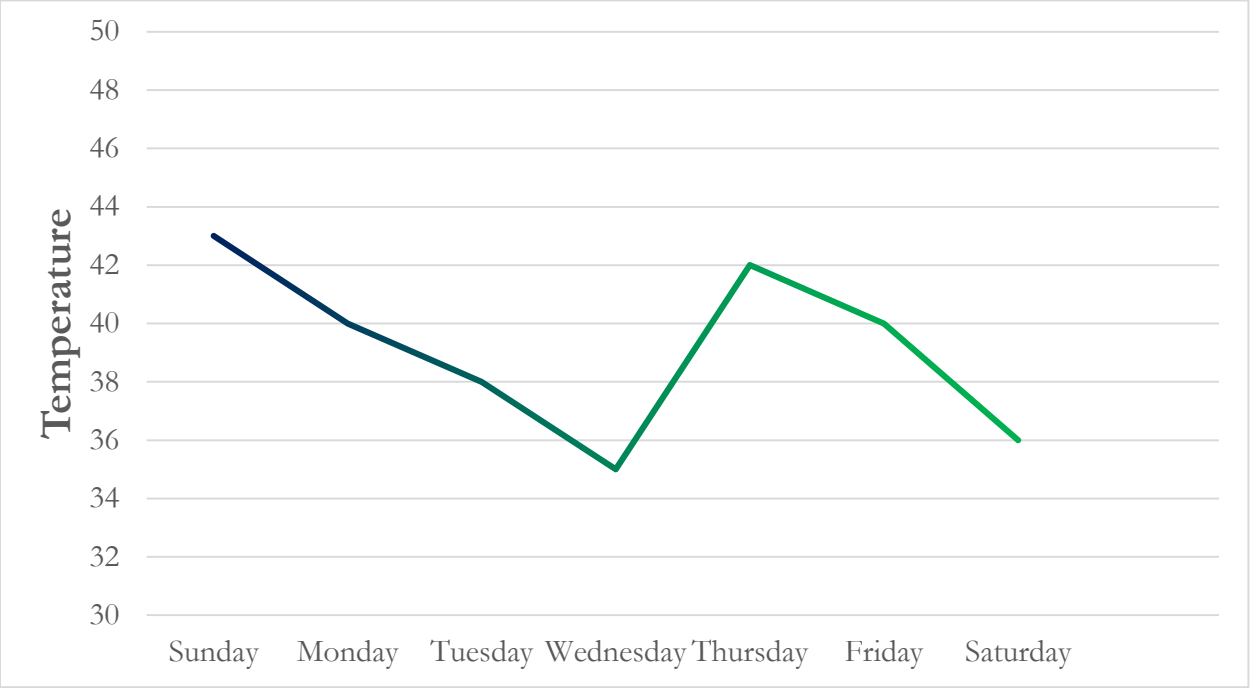
2. Approximately how many more people prefer apple pie to mince?

3. Approximately how many more people prefer cherry pie to mince?

4. Draw a fourth column on the chart for chocolate pie. Indicate that 30 people prefer chocolate pie to any other.

5. Given that the total number of people surveyed is now 127 after adding the option of chocolate pie, approximately what percentage of the total listed apple pie as the favourite?

The line chart and table below plots the temperature in a certain place over the course of several days.



Day	Temp.
Sunday	43
Monday	?
Tuesday	38
Wednesday	?
Thursday	42
Friday	40
Saturday	36

1. Fill in the missing temperatures on the table above, as recorded on the line graph.

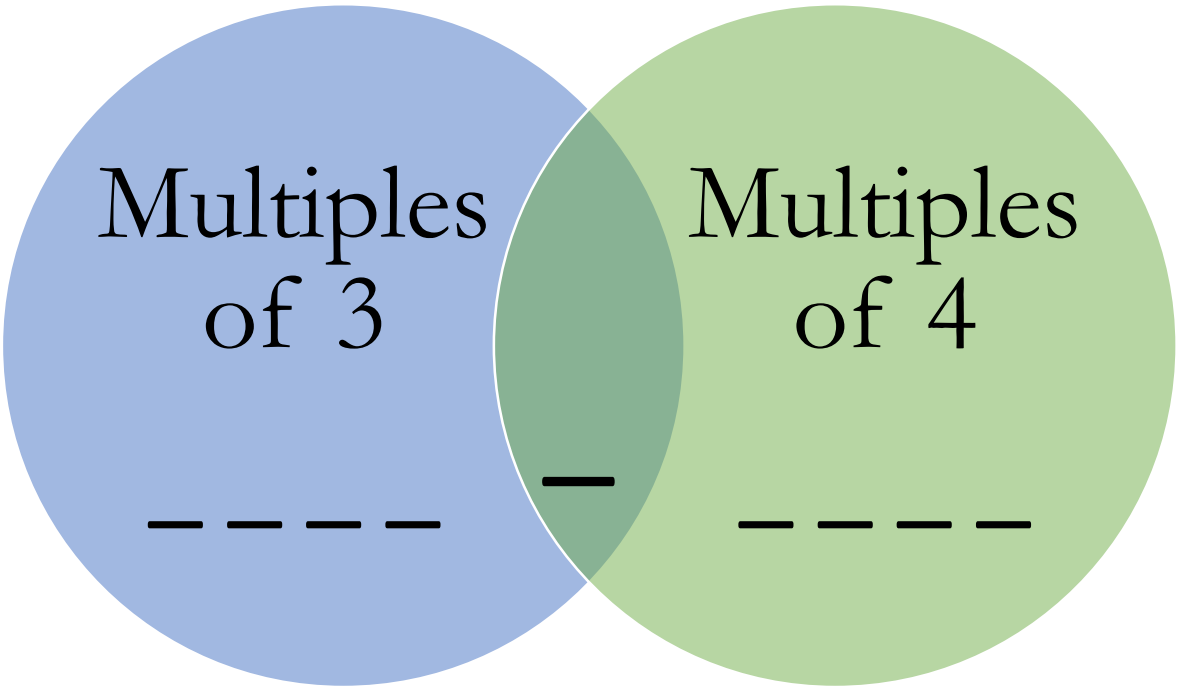
2. What was the coldest day during this week?

3. By approximately how many days did the temperature change from Wednesday to Friday?

4. Between which two days was the change in temperature most extreme?

Relation Diagrams (1.5 hours)

The Venn diagram below shows the relationship between numbers that are divisible by three and four.



1. Fill in the blanks in the Venn diagram above with appropriate numbers taken from the list below.

- 9 8 12 21 28 40 4 6

Carroll diagrams are also a useful way to categorize information. They allow more classifications, but do not show any overlap.

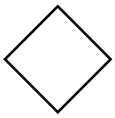
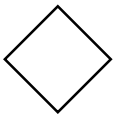
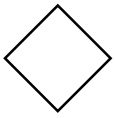
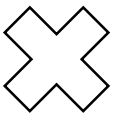
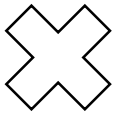
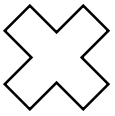
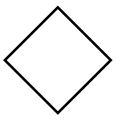
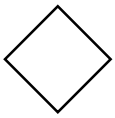
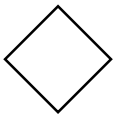
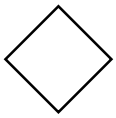
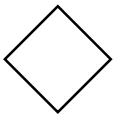
	Prime Numbers	**Non-Prime Numbers**
Even Numbers		
Odd Numbers		

2. Sort the numbers 1 to 20 into the categories in the Carroll diagram above.

3. Sort these numbers into the appropriate box in the Carroll diagram

2 3 4 5 6 7 8 9 10 11

This pictogram shows four students' performance in various areas. A star is worth two points, a diamond is worth one point and the letter *X* is worth zero points. Each student can earn a maximum of eight points.

	Layla	**Carl**	**Thomas**	**Waleed**
Homework				
Project				
Test				
Attendance				

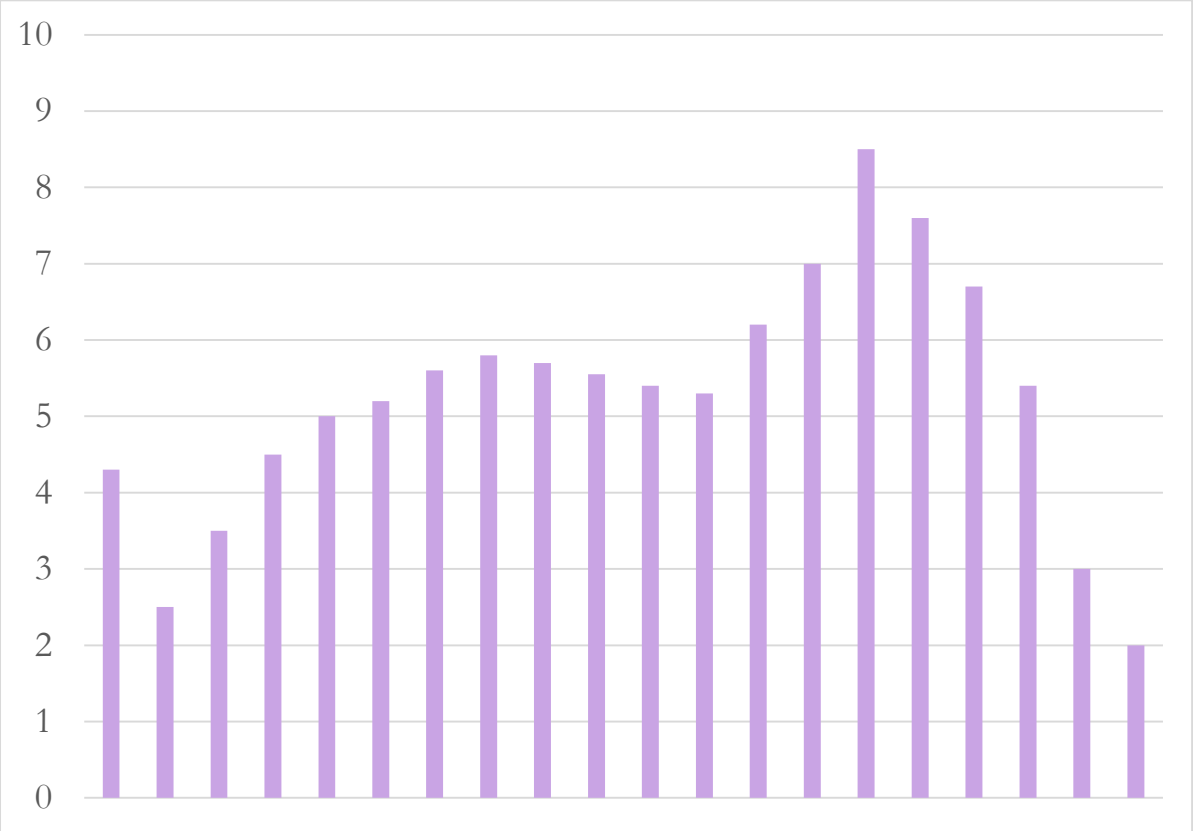
4. Which student had the lowest total score?

5. Compute the total score across homework, projects, tests and attendance for each student.

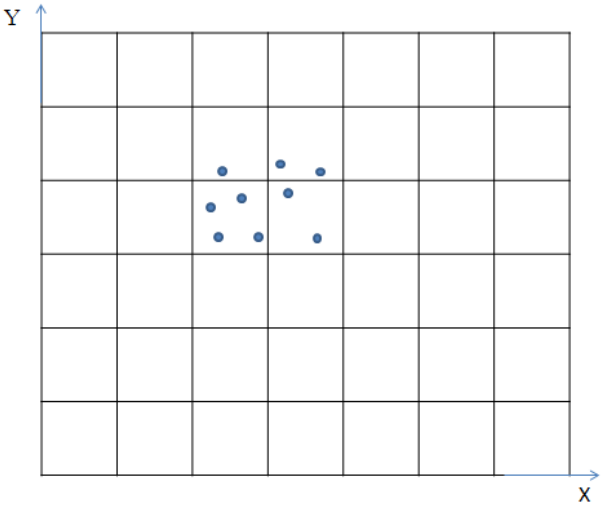
6. Rank each area (homework, project, test and attendance) by the number of total points scored in it by all students

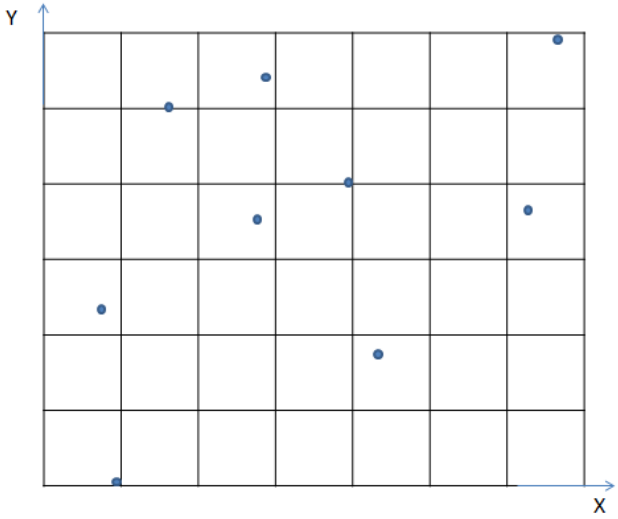
7. In which category did the students have the highest mean score? The lowest?

8. Convert the graph shown above into a line graph.



9. Compare the distribution of the points on the scatter plots shown below:





10. Assuming the plots cover an equal range, which shows a distribution of points with a greater correlation, the right or the left?

Measurements and Units (30 minutes)

Imperial	Metric
1 inch	2.54 centimeters
1 mile	1.61 kilometers
1 pound	0.45 kilograms
1 gallon	3.79 liters
1 acre	0.40 hectares

1. Use the chart listed above to make the following unit conversions
    a. 22 inches in centimetres

    b. 19 kilometres in miles

    c. 100 gallons in litters

    d. 12,000 acres in hectares

    e. 900 pounds in kilograms

2. A stone is defined as fourteen pounds. How many kilograms are in one stone?

3. A nautical mile is approximately 115% of a normal mile. How many kilometres are in one nautical mile?

4. The measurement table above lists imperial units in terms of metric. Fill out the following table to indicate the metric units in terms of imperial units.

Imperial	Metric
? inches	1 centimeter
? miles	1 kilometer
? pounds	1 kilogram
? gallons	1 liter
? acres	1 hectare