



Grade 10

# Tutorials

2008

## GRADE 10 TUTORIALS

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## Question 1

Add the next three terms to each number pattern and explain how you calculated these terms:

1.1 2; 7; 12; 17; ...

1.2 10; 8; 6; 4; ...

1.3  $1\frac{1}{4}$ ; 2;  $2\frac{3}{4}$ ;  $3\frac{1}{2}$ ; ...

1.4 1; 3; 9; 27; ...

1.5 1; 1; 2; 3; 5; 8; 13; ...

## Question 2

Write down the next three terms and the general (or nth term) of each pattern:

2.1 2; 4; 6; 8; ...

2.2 1; 7; 13; 19; ...

2.3 1; 4; 9; 16; ...

2.4 25; 21; 17; 13; ...

2.5  $x - 1$ ;  $2x - 2$ ;  $3x - 3$ ;  $4x - 4$ ; ...

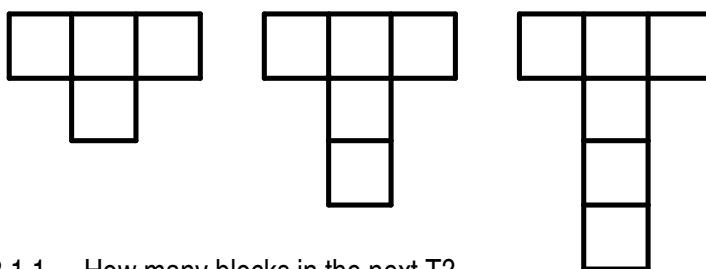
2.6  $\frac{1}{2}$ ;  $\frac{1}{3}$ ;  $\frac{1}{4}$ ;  $\frac{1}{5}$ ; ...

2.7  $\frac{1}{2}$ ; 1;  $\frac{3}{2}$ ; 2; ...

2.8  $3\frac{3}{4}$ ;  $3\frac{1}{2}$ ;  $3\frac{1}{4}$ ; 3; ...

## Question 3

3.1



3.1.1 How many blocks in the next T?

3.1.2 How many blocks in the nth T?

3.1.3 Which T has 69 blocks?

3.2

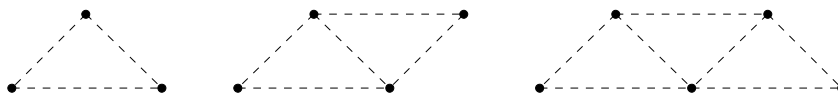


3.2.1 How many faces in the next pattern?

3.2.2 How many faces in the  $n$ th pattern?

3.2.2 In which pattern are there 84 faces?

3.3



3.3.1 How many lines in the pattern with 4 triangles?

3.3.2 How many lines are needed for  $n$  triangles?

3.3.3 How many triangles are formed with 46 lines?

#### Question 4

Figure 1



Figure 2



Figure 3



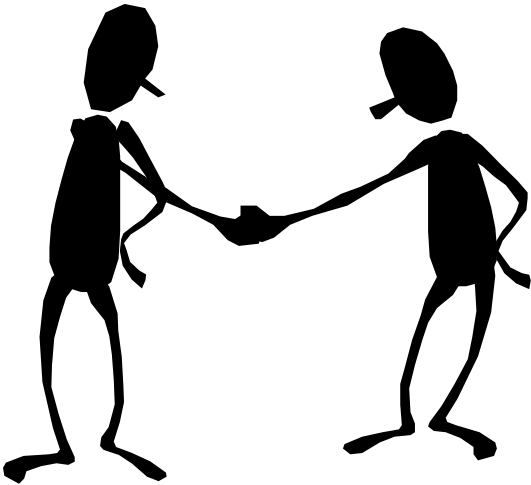
4.1 How many flowers would be used in the 4<sup>th</sup> figure?

4.2 How many flowers would be used in the 10<sup>th</sup> figure?

4.3 How many flowers would be used in the  $n$ -th figure?

### Question 5

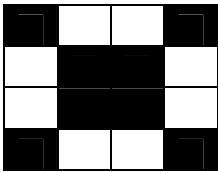
When two people meet, they shake hands, resulting in 1 handshake. If three people met and all shook hands, there would be three handshakes.



- 5.1 How many handshakes would there be if 4 people met and shook hands?
- 5.2 How many handshakes would there be if 5 people met?
- 5.3 Can you generalize this result?

### Question 6

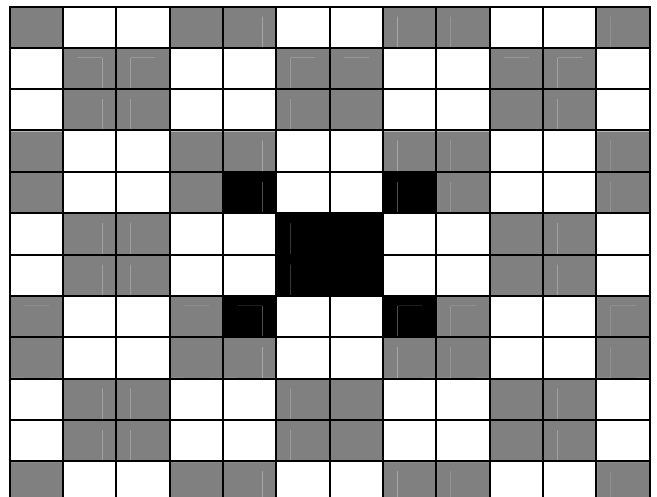
Your mother has chosen a base pattern for your bathroom floor. The figure below illustrates the pattern she chose. As shown, the pattern is made up of 16 squares, 8 of which are shaded and 8 which are not.



**Step 1: Base Pattern**

Duplicates of the same pattern are then added to create Step 2.

- 6.1 How many base patterns were added to the original in order to complete Step 2?
- 6.2 How many shaded unit squares would you need for Step 2?
- 6.3 Each step is accomplished by surrounding the existing figure with copies of the base pattern. How many of the base patterns need to be added to complete Step 3?
- 6.4 How many shaded unit squares would you need for Step 3?
- 6.5 How many shaded unit squares would you need for Step 6?
- 6.6 Write a generalization or rule for determining the number of shaded unit squares that are added in Step  $n$ .



## Question 1

If  $f(x) = 2^x$  and  $g(x) = \frac{1}{x}$  and  $h(x) = -x^2$ , answer the following questions;

1.1 Determine the values of the following;

1.1.1  $f(-1)$

1.1.2  $f(2)$

1.1.3  $x$  if  $f(x) = 0$

1.1.4  $g(-1)$

1.1.5  $g(2)$

1.1.6  $x$  if  $g(x) = 2$

1.1.7  $h(-2)$

1.1.8  $h(2)$

1.2 Describe the type of function that is defined in each case.

1.3 Draw a sketch graph of each of the functions showing all critical points, asymptotes, axes of symmetry and intercepts with the axes. You can use the values in question 1.1 to assist you if necessary. Each function must be sketched on a separate set of axes.

1.4 Determine the domain and range of the functions  $f$ ,  $g$  and  $h$ .

## Question 2

Consider the functions  $s(x) = x^2 - 9$  and  $t(x) = 2x - 6$

2.1 Sketch the graphs of  $s$  and  $t$  on the same system of axes, showing ALL intercepts with the axes and relevant turning points

2.2 Use your sketch to find the values of  $x$  if;

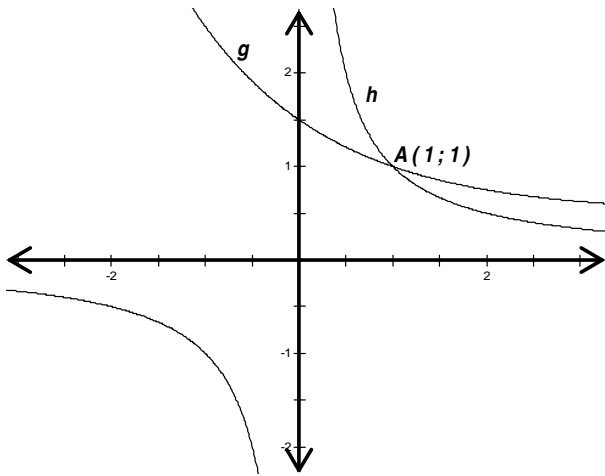
2.2.1  $s(x) = t(x)$

2.2.2  $s(x) > 0$

2.3 Write down the equation of  $q$  if  $q(x)$  results from shifting  $s(x)$  2 units up.

### Question 3

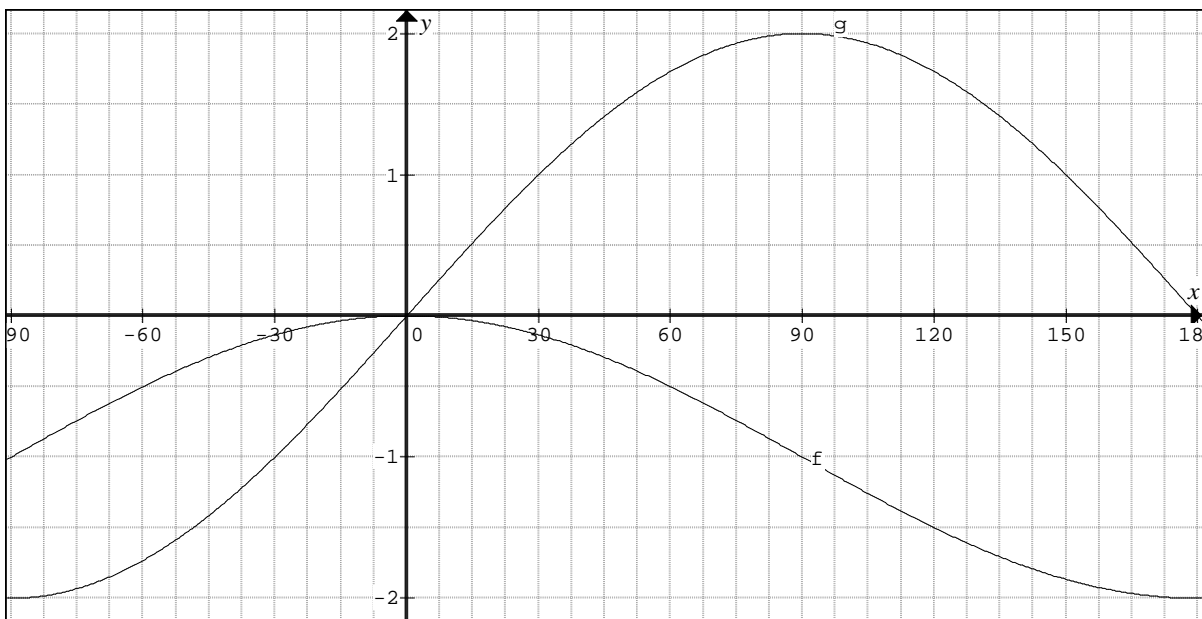
Sketched below are the functions  $g(x) = b^x + c$  and  $h(x) = \frac{k}{x}$  and A, the point of intersection, is  $(1; 1)$



- 3.1 Find the values of  $k$ ,  $c$  and  $b$
- 3.2 What is the equation of the asymptote of  $g$
- 3.3 What is the range of  $g$
- 3.4 What is the equation of  $f$  if  $f(x)$  is the reflection of  $g(x)$  in the  $y$ -axis

### Question 4

Below is a sketch of  $f(x) = \cos x + q$  and  $g(x) = a \sin x$



- 4.1 Write down the amplitude of  $f$  and  $g$
- 4.2 What is the range of  $f$
- 4.3 What is the period of  $f$
- 4.4 Determine the values of  $a$  and  $q$
- 4.5 What is the equation of  $h$  if  $h(x)$  is the reflection of  $g(x)$  in the  $x$ -axis?

## Question 1

1.1 Use the laws of exponents to simplify the following expressions:

1.1.1  $x^6 \times x^{-2} \div x^2$

1.1.2  $(3p)^q \times 3p^2$

1.1.3  $6^0 \div 12^2 \times 3^3$

1.1.4  $\frac{(-x^{-2}y)^2}{(-xy^3)^{-1}}$

1.2 When working with computers, data is measured in powers of 2 as given below:

1 Kilobyte (KB) =  $2^{10}$  bytes , 1 Megabyte (MB) =  $2^{10}$  KB , 1 Gigabyte (GB) =  $2^{10}$  MB

1.2.1 How many bytes are there in a Megabyte? Give your answer as a power of 2.

1.2.2 A memory stick holds 512MB of data. How many bytes is this? Express your answer as a power of 2.

1.2.3 If a digital photograph contains 524 288 bytes of data, how many photographs can be stored on a CD? Work in powers of 2 and show all your work.

## Question 2

Remove brackets and simplify the following expressions:

2.1  $5a(a-3)$

2.2  $2x(x+4) - (3x+1)$

2.3  $(4m-1)(3m+2)$

2.4  $(2x+4y)^2$

2.5  $-3(x-2)^2$

2.6  $(6p+5)(6p-5)$

2.7  $(y+7)(5y^2+y-3)$

## Question 3

Factorise the following expressions:

3.1  $15xy - 3y$

3.2  $\frac{1}{4}m^2 - 25$

3.3  $3x^2 - 8x + 4$

3.4  $2r^2 - 11r - 6$

3.5  $6s(r+2) - 2(r+2)$

3.6  $x+5+qx+5q$

3.7  $kx+ky-x-y$



#### Question 4

Simplify the following expressions:

$$4.1 \quad \frac{24a^3b^2}{-6a^2b}$$

$$4.2 \quad \frac{18x^5}{4xy} \times \frac{2y^3}{6x^2} \div \frac{3x^4y^2}{2x^2}$$

$$4.3 \quad \frac{3}{10m} + \frac{1}{5m^2}$$

$$4.4 \quad \frac{3-x}{5x} - \frac{5x-2}{3x}$$

$$4.5 \quad \frac{a-b}{a} + \frac{a+b}{2a}$$

#### Question 5

Check, by substitution, whether or not  $x = -1$  is a solution to each of the following equations: (Show all your work)

$$5.1 \quad 7 + 2(x-1) = 3 - 4x$$

$$5.2 \quad (x-1)(x+1) = 0$$

$$5.3 \quad 3x(x-1)^2 = 0$$

$$5.4 \quad \frac{-4x}{3} = \frac{1}{3}(4-x)$$

$$5.5 \quad 8^x = \frac{1}{8}$$

#### Question 6

Solve for  $x$  in each of the following equations:

$$6.1 \quad 7x - 8 = 27$$

$$6.2 \quad 3x - 18 = -3(x + 7)$$

$$6.3 \quad \frac{x}{3} - \frac{2x}{5} = \frac{4}{5}$$

$$6.4 \quad \frac{2x+1}{8} - \frac{x-1}{3} = \frac{5}{24}$$

$$6.5 \quad 4x^2 - 3x = 0$$

$$6.6 \quad 25 - x^2 = 0$$

$$6.7 \quad 12x^2 - 16x + 5 = 0$$

$$6.8 \quad 5^{x+1} = 25$$

$$6.9 \quad 2 \cdot 3^{x-2} = 54$$

#### Question 7

Solve the following inequalities and represent the solution on a number line:

$$7.1 \quad 3x - 5 \geq 1$$

$$7.2 \quad 2(x-1) + 3 > 5x$$

### Question 8

Use your calculator and the trial and error method to find an approximate solution (correct to one decimal place) to the following equations.

8.1  $3x^2 - x - 1 = 30$

8.2  $4^x = 44$

### Question 9

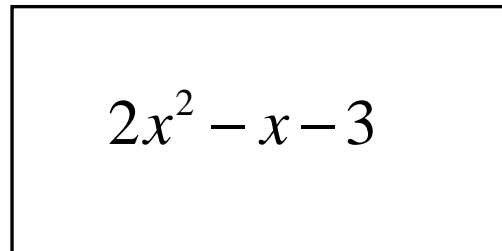
Solve the following simultaneous equations:

9.1  $y = x - 5$  and  $y = 2x + 3$

9.2  $x - 3y = 0$   
 $3x + y = 5$

### Question 10

The area of the rectangle in the diagram is  $2x^2 - x - 3 \text{ cm}^2$ .



10.1 Find the length and breadth of the rectangle in terms of  $x$ .

10.2 For which value(s) of  $x$  will the rectangle be a square?

### Question 11

11.1 The cost of operating a taxi includes the wage paid to the driver as well as the cost per kilometre to run the taxi. If a taxi owner pays his drivers R250 per day and the per km cost of running the taxi is R3.50, write an equation for the daily cost of operating the taxi. Let  $C$  be the daily cost and  $x$  be the km travelled in a day.

11.2 If the taxi travel 234km in one day, what is the cost of operating the taxi for that day?

11.3 If the cost of taxi operation for a day is R684, how many kilometres did the taxi cover in the day?

### Question 12

- 12.1 Set up two equations to represent the following statements:
- 12.1.1 The sum of two numbers is 12.
  - 12.1.2 The difference of the two numbers is 7.
- 12.2 Draw graphs of these two equations on graph paper and on the same set of axes.
- 12.3 Solve the two simultaneous equations using the graphs and write down your solution.
- 12.4 Check your answer by substituting your solution into both equations.

### Question 13

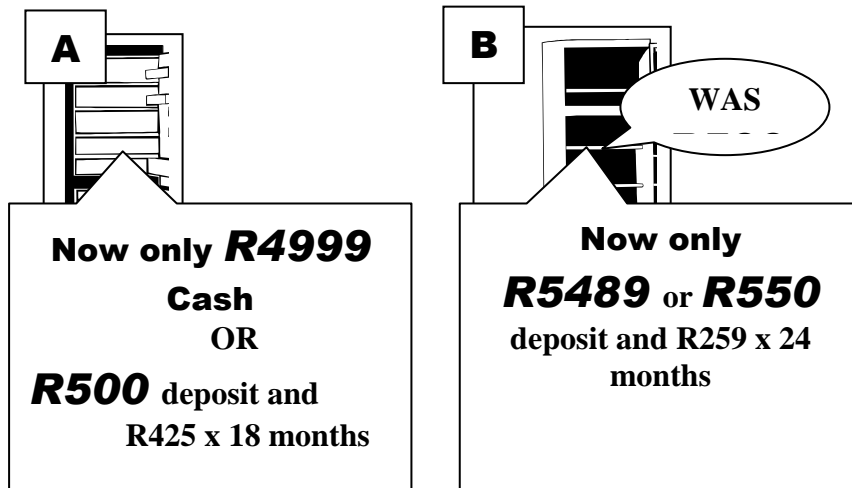
An engineer is testing the emergency stopping time of a lift that is being installed in a high-rise building. The time that the lift takes to stop after the emergency brakes have been applied is given by the equation:

$x^2 - 4x = k$ , where  $x$  is the time in seconds and  $k$  is the number of the floor where the brakes were applied. Calculate how long it will take the lift to stop if the brakes are applied on the 12<sup>th</sup> floor.

- 1 Erin invests R5000 in a financial institution.
  - 1.1 Calculate the amount she would receive if she invests at simple interest rate of 10% p.a. for five years.
  - 1.2 Calculate the amount she would receive if she invests at compound interest rate of 10% p.a. for five years.
  - 1.3 Calculate the amount she would receive if she invests at compound interest rate of 10% p.a. compounded monthly for five years.
  
- 2 Determine through calculation which of the following investments will be more profitable:
  - (a) R10 000 at 9 % p.a. compound interest for 3 years.
  - (b) R10 000 at 11 % p.a. simple interest for 3 years.
  
3. How much must you invest in order to receive R1 250 interest at a simple interest rate of 8% over three years?
  
- 4 At what interest rate must you invest R12 500 to receive R18 000 in total after 4 years?
  
- 5 Thandi made a loan of R42 000 which she settled after 5 years at a rate of 17,5% compounded annually. Calculate :
  - 5.1 the total amount that she repaid
  - 5.2 the monthly instalments over the five years.
  
- 6 The inflation rate over the past two years was 5,6% and 6,1%. What are the current prices of the following articles if they cost the following amounts two years ago:  

CD player: R 195	DVD player: R595,	Music Center: R2 495
------------------	-------------------	----------------------

- 7 Jane would like to buy a refrigerator. The local furniture store is advertising refrigerators as shown below.



- 7.1 Decide which refrigerator Jane should buy. Show all calculations you used to make your decision.
- 7.2 Jane decides that she will rather save R350 per month and buy Refrigerator A cash. How long will it take her to save enough money? Is this a wise decision? Explain your reasoning.
- 8 Peter invested R 6 500 into a savings account offering 8,5 % interest compounded annually. After 3 years Peter deposits a further R 2 800 into the account. What is the total amount of money in the account at the end of the fifth year, assuming Peter has made no withdrawals from the account?
- 9 R5000 is deposited into a savings account. The money is doubled after a period of 8 years. Calculate the interest rate at which this would happen if the interest is calculated as:
- 9.1 simple interest
- 9.2 compound interest
- 10 Use the table below to answer the questions that follows:

Country	Currency	Value of Unit (in Rand)
United States of America	Dollar	7,081
Switzerland	Franc	5,892
United Kingdom	Pound	13.982

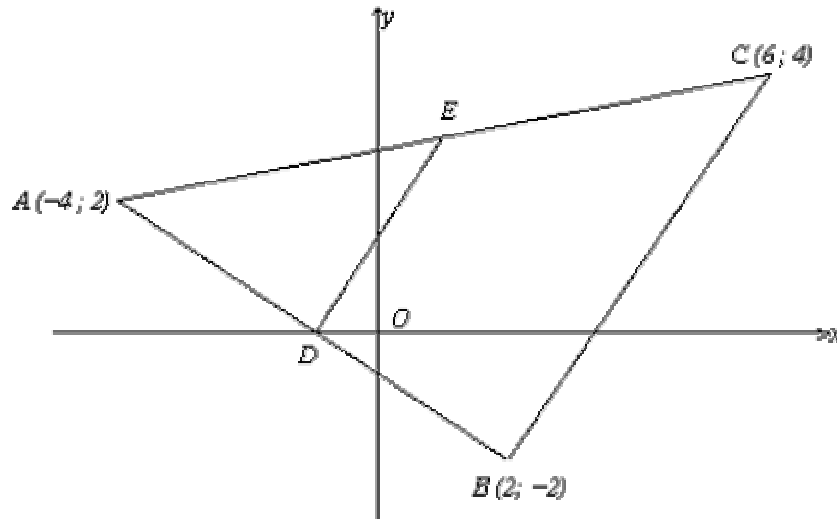
- 10.1 You have R5000 to spend in Switzerland. How much Francs can you buy?
- 10.2 What will it cost you in Rands to purchase 4500 dollars?
- 10.3 If you exchange 600 pounds how much Rands will you get?

## Question 1

1. In each case below, decide whether the triangle is:
- right-angled or not and whether it is
  - scalene, isosceles or equilateral
- $\triangle ABC$  in which A is the point  $(-1;3)$ , B is the point  $(-3;1)$  and C is  $(1;-1)$
  - $\triangle PQR$  with vertices  $P(0;3)$ ,  $Q(-2;1)$  and  $R(3;0)$
  - $\triangle XYZ$  in which X is the point  $(1;2)$ , Y is the point  $(-1;-2)$  and Z is  $(2;-1)$ .
  - $\triangle ABC$  with vertices  $A(-1;-1)$ ,  $B(-2;-3)$  and  $C(1;-2)$ .
  - $\triangle OPQ$  where O is the origin, P is  $(0;2)$  and Q is  $(\sqrt{3};1)$ .

## Question 2

Sketched below is  $\triangle ABC$ . The co-ordinates of the vertices are as indicated on the sketch.



- Calculate the co-ordinates of the mid-points D and E of AB and AC respectively.
- Show that  $DE \parallel BC$
- Show that  $DE = \frac{1}{2} BC$
- Determine the co-ordinates of F, the mid-point of CB
- Is  $EF \parallel AB$ ? Explain.

### Question 3

Given the points  $P(-1;0)$ ,  $A(-3;-3)$ ,  $R(-2;-4)$  and  $M(0;-1)$ , show that:

- 3.1 PARM is a parallelogram by proving both pairs of opposite sides parallel.
- 3.2 Prove that  $PA = MR$

### Question 4

The vertices of a quadrilateral are  $R(-4;2)$ ,  $H(-4;-3)$ ,  $O(0;0)$ ,  $M(0;5)$ . Prove that:

- 4.1 RHOM is a rhombus;
- 4.2 the diagonals RO and HM bisect each other.

### Question 5

Show that SQRE with vertices  $(-1;4)$ ,  $(-2;1)$ ,  $(1;0)$  and  $(2;3)$ , is a square.

### Question 6

Quadrilateral RECT with vertices  $R(-1;3)$ ,  $E(-2;1)$ ,  $C(2;-1)$  and  $T(3;y)$  is a rectangle.

- 6.1 Determine the value of  $y$ .
- 6.2 Determine the co-ordinates of the mid-point of the diagonal RC and show that this point is also the mid-point of the diagonal ET.
- 6.3 Show that the diagonals of the rectangle are equal in length.

### Question 7

Given the co-ordinates of the four vertices, A, B, C and D, determine by calculation the type of quadrilateral and hence fill in the table. Notice that more than one column might need to be filled in. For example a square is also a rhombus, a rectangle and a parallelogram.

	A	B	C	D	Rectangle	Square	Rhombus	Trapezium	Parallelogram	Kite
7.1	$(-2;2)$	$(-2;1)$	$(2;3)$	$(0;3)$						
7.2	$(-3;1)$	$(-1;0)$	$(1;1)$	$(-1;2)$						
7.3	$(-1;1)$	$(-2;-1)$	$(0;-3)$	$(4;1)$						
7.4	$(-2;-2)$	$(-3;-4)$	$(2;-2)$	$(3;0)$						
7.5	$(-2;2)$	$(0;-1)$	$(3;0)$	$(1;4)$						
7.6	$(-1;2)$	$(-2;0)$	$(2;-2)$	$(3;0)$						

## Question 1

1.1 Describe the translations in each of the following. Use an ordered pair to describe the translation.)

1.1.1 From A to B

1.1.2 From C to J

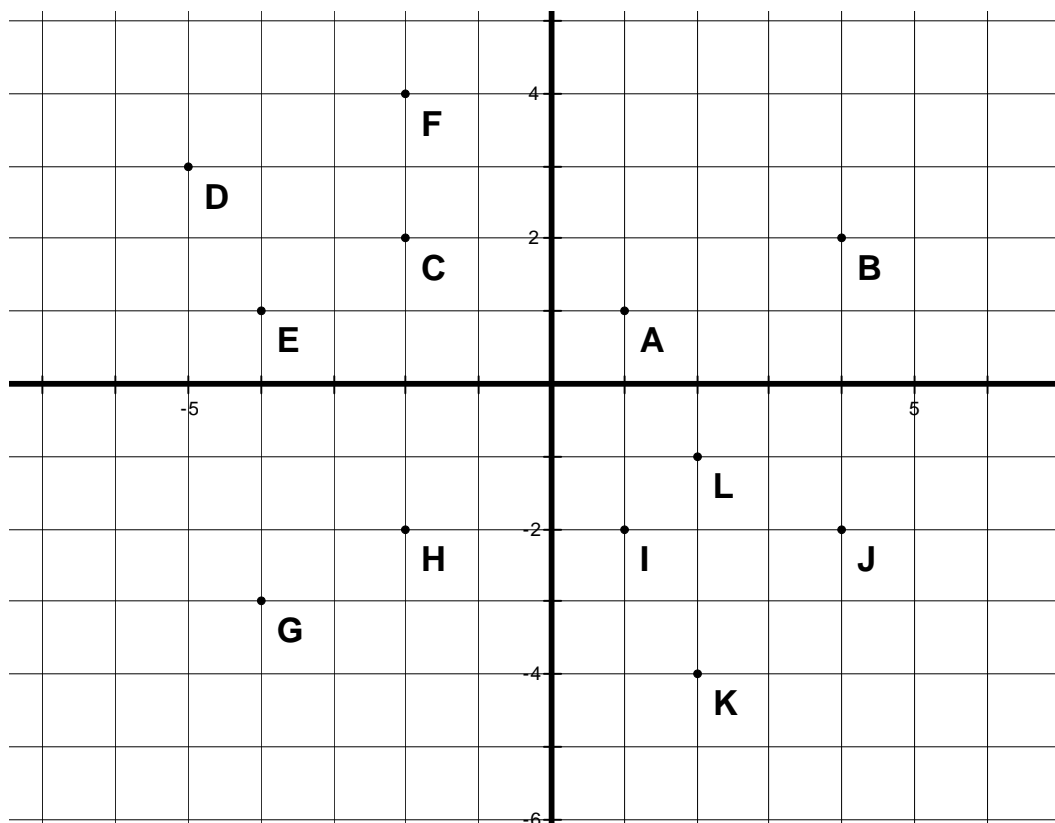
1.1.3 From F to H

1.1.4 From I to J

1.1.5 From K to L

1.1.6 From J to E

1.1.7 From G to H



1.2 A is the point (4;1). Use the grid on your answer sheet to plot each of the following points under the given transformations. Give the co-ordinates of the points you have plotted.

1.2.1 B is the reflection of A in the  $x$ -axis.

1.2.2 C is the reflection of A in the  $y$ -axis.

1.2.3 D is the reflection of B in the line  $x=0$ .

1.2.4 E is the reflection of C in the line  $y=0$ .

1.2.5 F is the reflection of A in the line  $y=x$

1.2.6 G is the reflection of D in the line  $y=x$ .



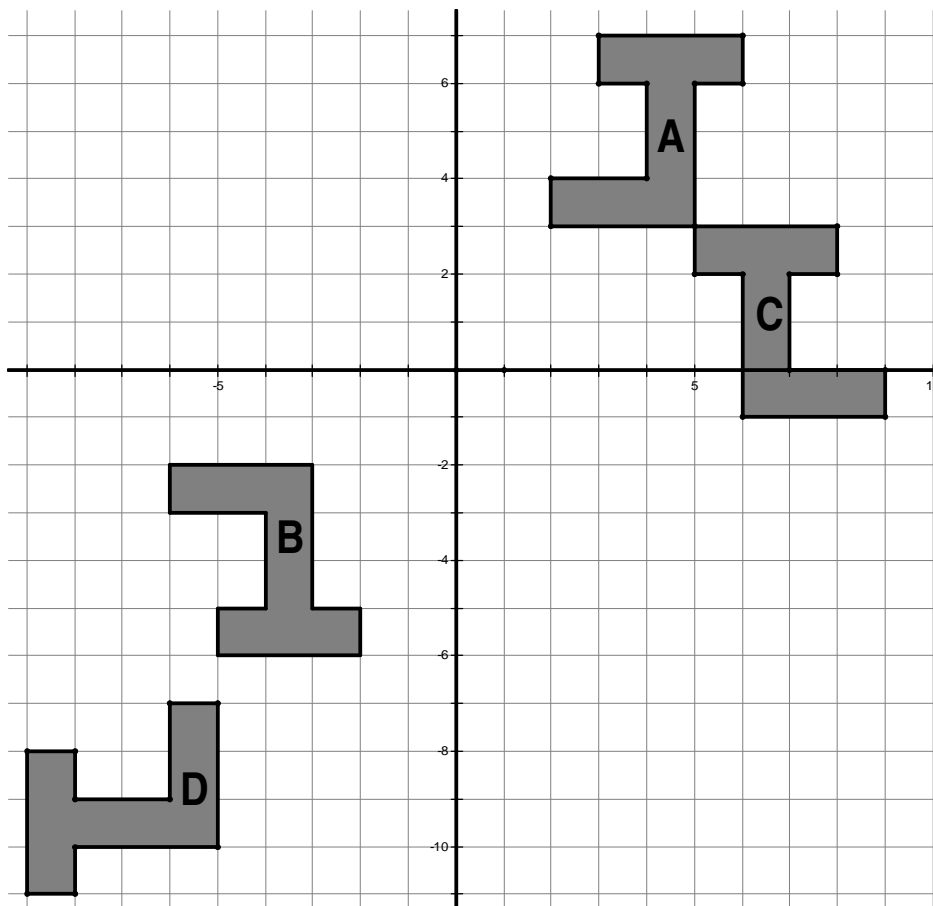
### Question 2

Complete the table on the answer sheet provided.

Point	Image	Transformation
$(-2;3)$		$(x; y) \rightarrow (x + 3; y - 4)$
$(3;5)$	$(5;3)$	
$(2;-4)$		Reflection in the line $x=0$
	$(-1;1)$	Reflection in the line $y=0$
	$(-6;-4)$	A translation according to the mapping $(x; y) \rightarrow (x + 3; y - 4)$ , following by a reflection in the $x$ -axis.
$(2;7)$		A reflection in the line $y=x$ , followed by a reflection in the $y$ -axis.

### Question 3

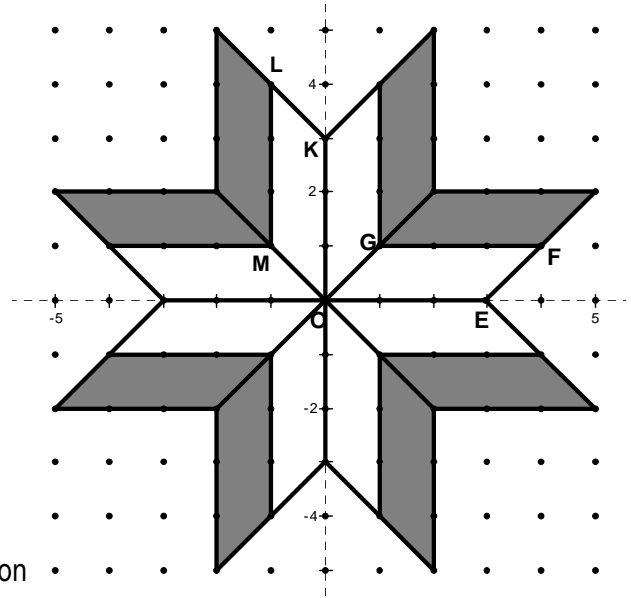
In the diagram, B, C and D are images of polygon A. In each case, the transformation that has been applied to obtain the image involves a reflection and a translation of A. Write down the letter of each image and describe the transformation applied to A in order to obtain the image.



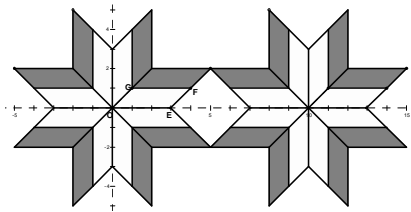
### Question 4

The design in the diagram has been constructed using various transformations of quadrilateral OEFG.

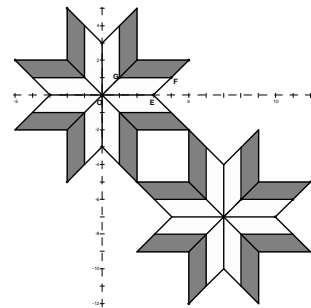
- 4.1 Describe any reflections of OEFG that you can see in the design.
- 4.2 Describe any translations of OEFG that you can see in the design.
- 4.3 OKLM is an image of OEFG. Describe the transformation that has been applied to OEFG.
- 4.4 Give the equations of the lines of symmetry in the design.
- 4.5 In each of the following describe the transformation required to generate the second design:



4.5.1

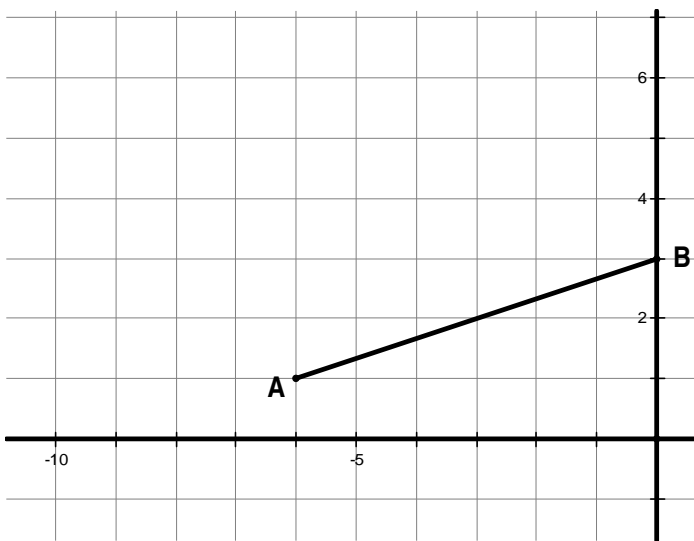


4.5.2



### Question 5

In the diagram, A is the point  $(-6;1)$  and B is the point  $(0;3)$ .



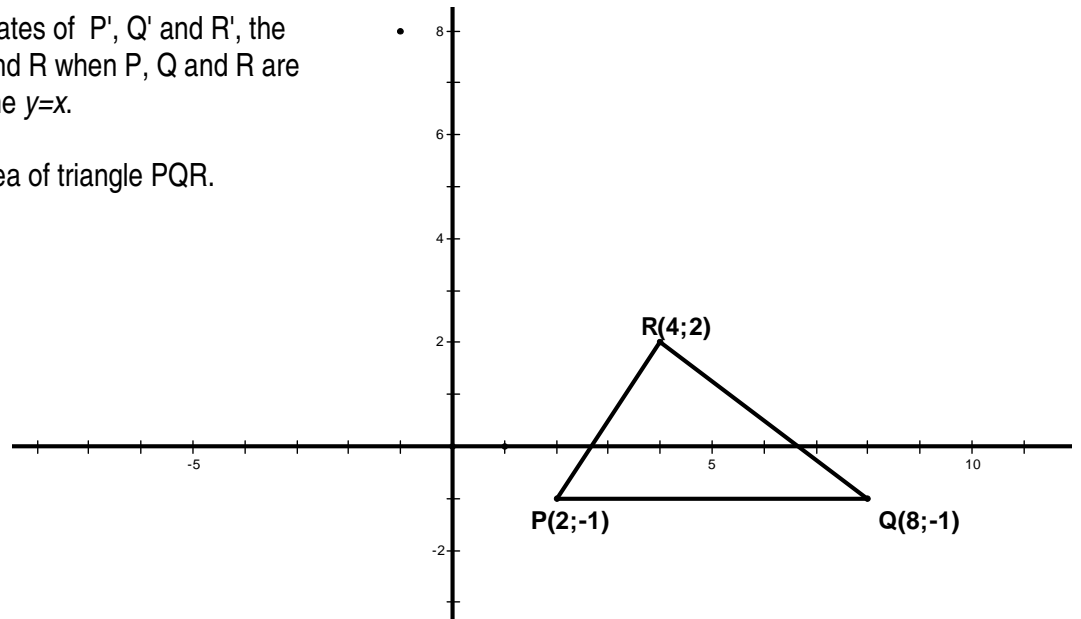
- 5.1 Find the equation of line AB
- 5.2 Calculate the length of AB
- 5.3  $A'$  is the image of A and  $B'$  is the image of B. Both these images are obtained by applying the following transformation:  
 $(x; y) \rightarrow (x - 4; y - 1)$   
 Give the coordinates of both  $A'$  and  $B'$
- 5.4 Find the equation of  $A'B'$
- 5.5 Calculate the length of  $A'B'$

5.6 Can you state with certainty that  $AA'B'B$  is a parallelogram? Justify your answer.

### Question 6

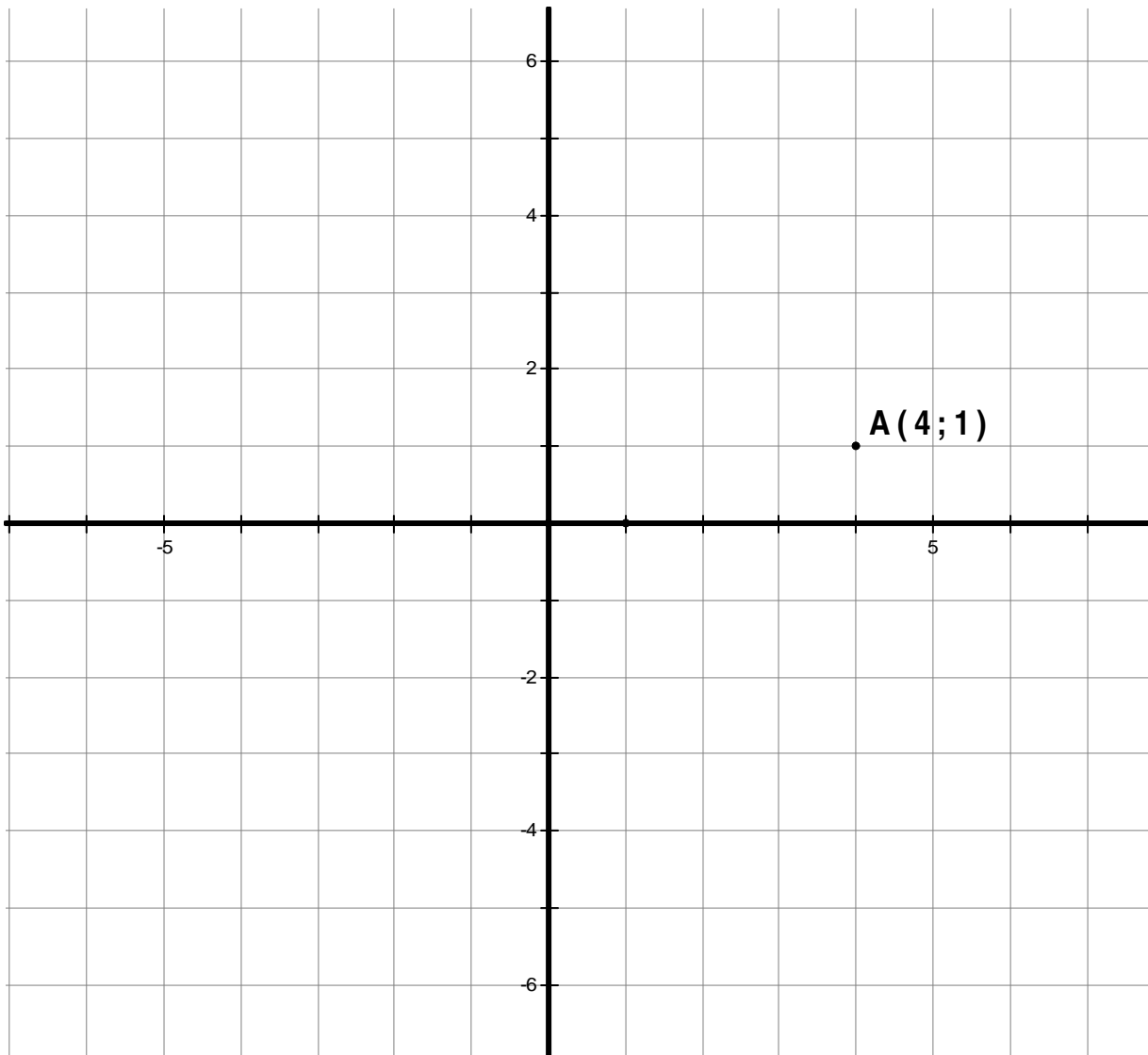
The vertices of triangle PQR have co-ordinates as shown in the diagram.

- 6.1 Give the co-ordinates of  $P'$ ,  $Q'$  and  $R'$ , the images of P, Q and R when P, Q and R are reflected in the line  $y=x$ .
- 6.2 Determine the area of triangle PQR.



**Diagram Sheet**

**Question 1.2**



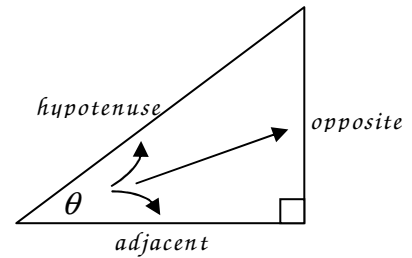
**Question 2**

Point	Image	Transformation
(-2;3)		$(x; y) \rightarrow (x + 3; y - 4)$
(3;5)	(5;3)	
(2;-4)		Reflection in the line $x=0$
	(-1;1)	Reflection in the line $y=0$
	(-6;-4)	A translation according to the mapping $(x; y) \rightarrow (x + 3; y - 4)$ , following by a reflection in the $x$ -axis.
(2;7)		A reflection in the line $y=x$ , followed by a reflection in the $y$ -axis.

Section A - Trigonometry

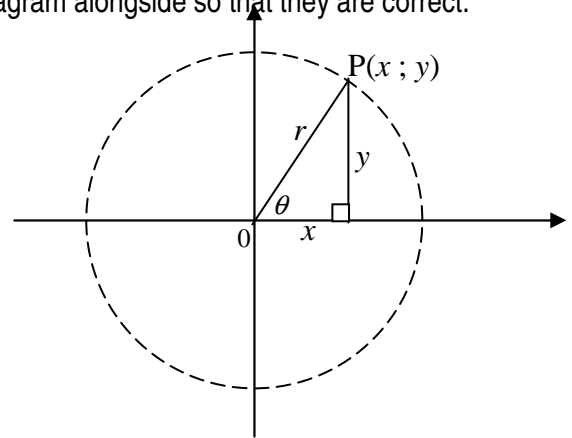
1 Complete the following statements with reference to the diagram alongside so that they are correct:

- 1.1 the definition of  $\sin \theta = \dots\dots\dots$
- 1.2 the definition of  $\cos \theta = \dots\dots\dots$
- 1.3 the definition of  $\tan \theta = \dots\dots\dots$

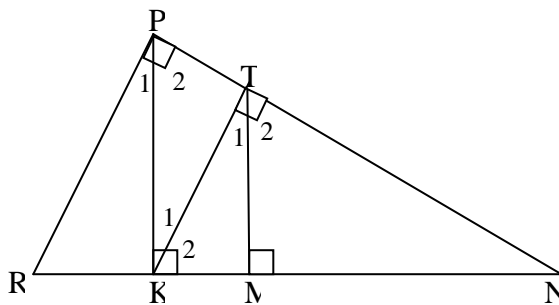


2 Complete the following statements with reference to the diagram alongside so that they are correct:

- 2.1 the definition of  $\sin \theta = \dots\dots\dots$
- 2.2 the definition of  $\cos \theta = \dots\dots\dots$
- 2.3 the definition of  $\tan \theta = \dots\dots\dots$



3.1 Consider the diagram alongside and write down all possible ratios for sine, cosine and tangent of the following angles:



- 3.1.1  $\hat{R}$
- 3.1.2  $\hat{N}$
- 3.1.3  $\hat{K}_1$
- 3.1.4  $\hat{K}_2$
- 3.1.5  $\hat{T}_1$
- 3.1.6  $\hat{T}_2$
- 3.1.7  $\hat{P}_1$
- 3.1.8  $\hat{P}_2$

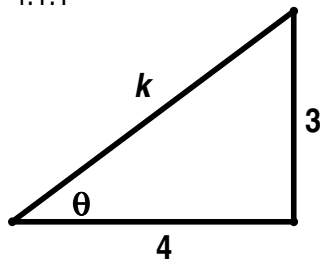
3.2 List all pairs of complementary angles in the diagram above.

3.3 Make a conjecture about the sine and cosine trigonometric ratios for complementary angles.

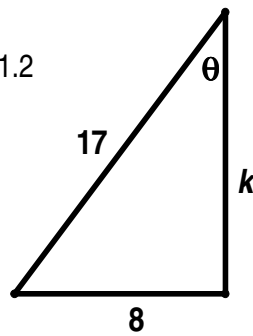
4.1 In each of the following first calculate  $k$  and then find the value of:

$$\sin \theta ; \cos \theta ; \tan \theta ; \frac{\sin \theta}{\cos \theta} ; \sin^2 \theta + \cos^2 \theta$$

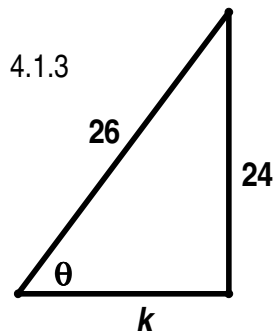
4.1.1



4.1.2

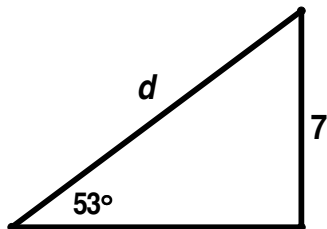


4.1.3

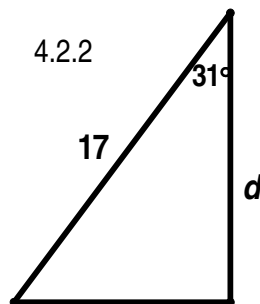


4.2 Calculate  $d$  in each of the following:

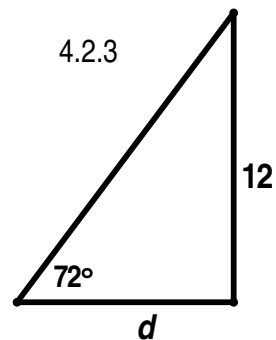
4.2.1



4.2.2



4.2.3



4.3 If  $\sin \theta = \frac{5}{13}$ , determine each of the following without the use of a calculator:

(Hint: Use a sketch) ( $\theta < 90^\circ$ )

4.3.1  $\cos \theta$

4.3.2  $\tan \theta$

4.3.3  $\frac{\sin \theta}{\cos \theta}$

4.3.4  $\sin^2 \theta$

4.3.5  $\cos^2 \theta$

4.3.6  $\sin^2 \theta + \cos^2 \theta$

4.4 If  $\cos \theta = t = \frac{t}{1}$ , express each of the following in terms of  $t$ . (Hint: Use a sketch)

4.4.1  $\sin \theta$

4.4.2  $\frac{\sin \theta}{\cos \theta}$

4.4.3  $\sin^2 \theta + \cos^2 \theta$

4.4.4 Make a conjecture about

a)  $\frac{\sin \theta}{\cos \theta}$

and

b)  $\sin^2 \theta + \cos^2 \theta$

5 Use a calculator to determine  $\theta$  (correct to ONE decimal place) in each of the following:

5.1  $\sin \theta = \frac{12}{25}$

5.2  $\cos \theta = \frac{5}{17}$

5.3  $\tan \theta = \frac{24}{7}$

5.4  $3 \cos \theta = 5$

5.5  $7 \sin \theta = 3$

5.6  $3 \tan \theta = 5$

5.7  $\tan \theta = 0,536$

5.8  $2 \cos \theta = 1,754$

5.9  $\sin 3\theta = 0,894$

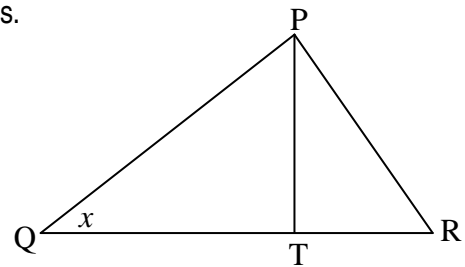
5.10  $\tan(\theta - 50^\circ) = 2,182$

5.11  $5 \sin(2\theta + 10^\circ) - 4 = 0$

6 In  $\triangle PQR$ ,  $PT \perp QR$ ,  $\angle Q = x$ ,  $QT = 15$  units and  $QP = 27$  units.

6.1 Calculate the numerical value of  $PQ$ .

6.2 Calculate the numerical value of  $x$



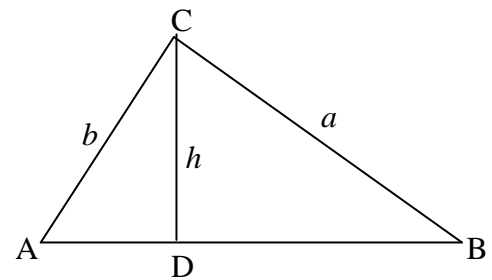
7 In  $\triangle ABC$ ,  $CD \perp AB$ ,  $CD = h$  units,  $AC = b$  units and  $BC = a$  units.

7.1 Write down  $\sin A$  in terms of  $h$  and  $b$ .

7.2 Write down  $\sin B$  in terms of  $h$  and  $a$ .

7.3 Hence show that  $\frac{\sin A}{a} = \frac{\sin B}{b}$

7.4 Now calculate  $\angle B$  if  $\angle A = 63^\circ$ ,  $a = 11,4$  cm and  $b = 9,7$  cm.

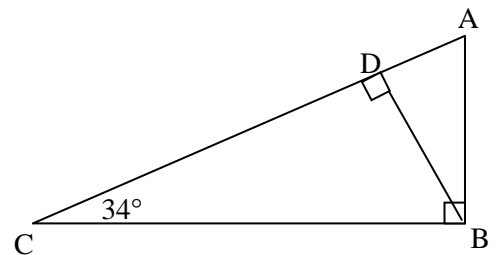


8 With reference to the figure alongside:

8.1 Write down two ratios for  $\cos 34^\circ$ .

8.2 If  $CD = 8,3$  cm, calculate the value of  $BD$

8.3 Write down a trigonometric definition for  $\frac{BD}{AB}$ .

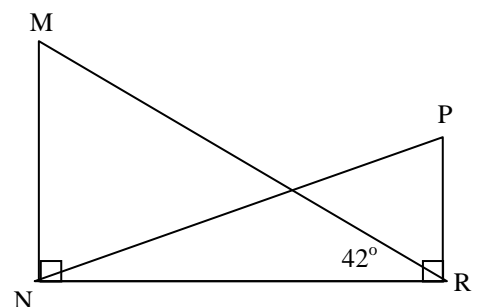


9 In the figure alongside  $MN \perp NR$ ,  $\angle MRN = 42^\circ$ ,  $MN = 8$  units,  $PR = 5$  units and  $PR \perp NR$ .

9.1 Calculate  $NR$ .

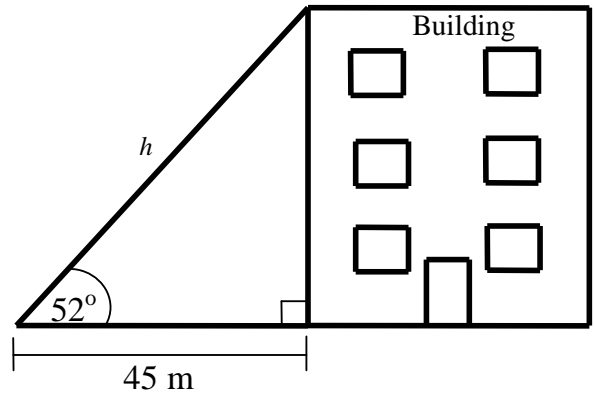
9.2 Calculate  $MR$

9.3 Calculate  $PN$



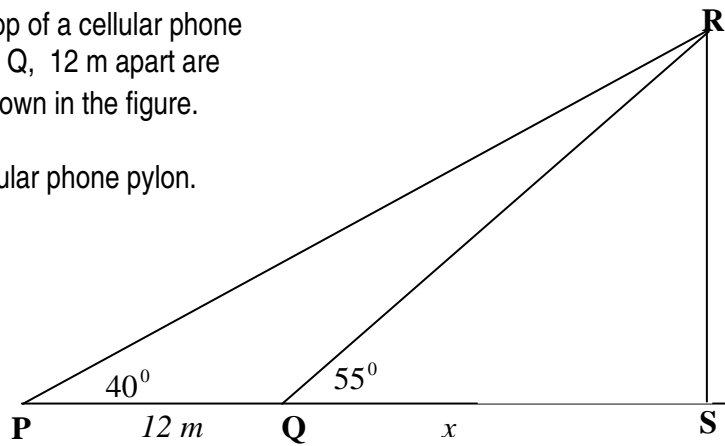
- 10 From a point on the ground the angle of elevation to the top of a building is  $52^\circ$ .  
The distance to the base of the building is 45 m.

Calculate the height of the building.  
(Correct to ONE decimal place)



- 11 The angles of elevation of the top of a cellular phone pylon RS from two points P and Q, 12 m apart are  $40^\circ$  and  $55^\circ$  respectively as shown in the figure.

Determine the height of the cellular phone pylon.



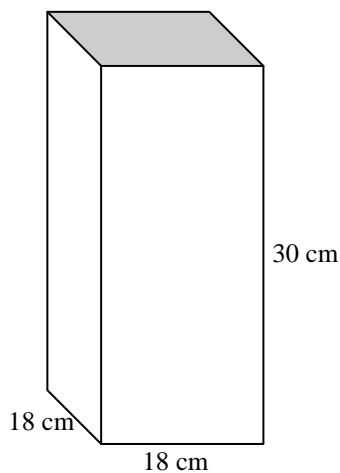
### Section B - Mensuration

- 1 Consider the figures below and in each case determine:

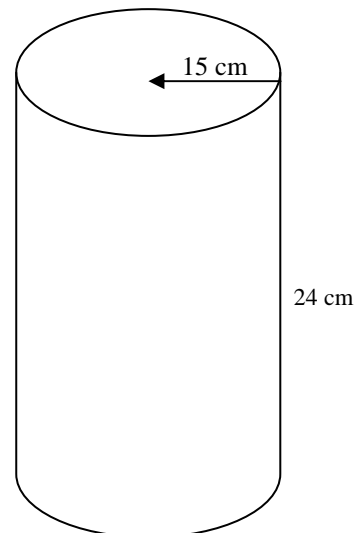
1.1 the surface area

1.2 the volume

(a)



(b)



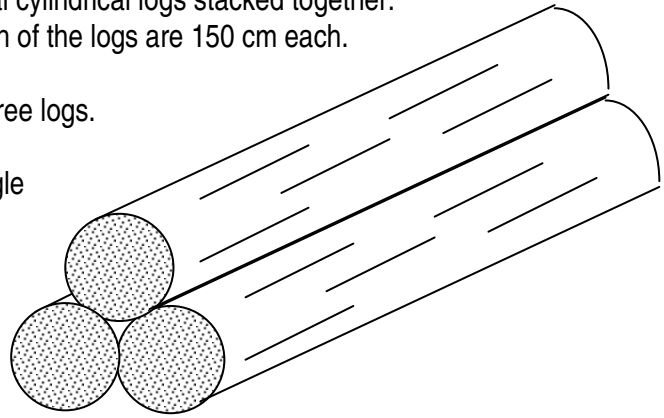
1.3 Determine the surface area if the edge of the base in (a) is doubled.

1.4 Determine the volume in (b) if the radius is doubled.



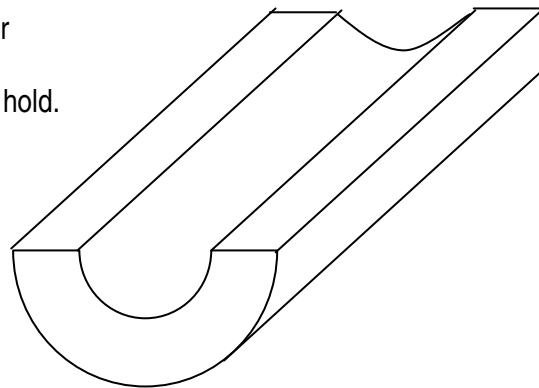
- 2 The diagram below represents three identical cylindrical logs stacked together. The diameter of a log is 20 cm and the length of the logs are 150 cm each.

- 2.1 Determine the total volume of the three logs.
- 2.2 Determine the surface area of a single log if the length is multiplied by a factor of 3.

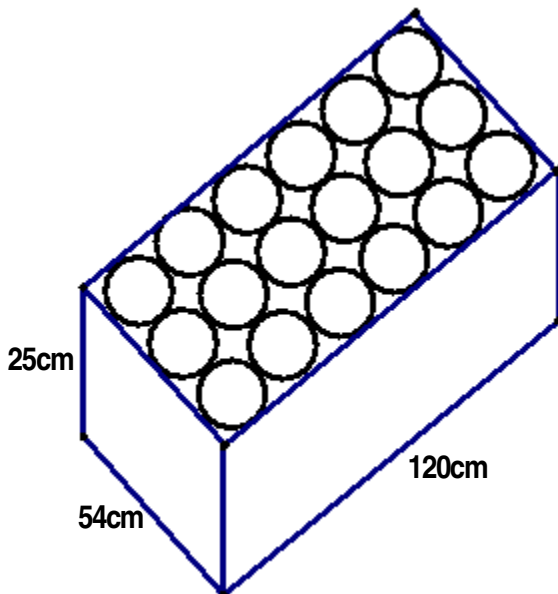


- 3 The municipality uses gutters as shown below to channel water away from buildings. The gutters are solid and in the shape of semi-cylinders. The inner radius is 23 cm and 5cm less than the outer radius. The gutter is 2 m long and is made of concrete.

- 3.1 Calculate the volume of the solid gutter
- 3.2 How much water in *litre* can the gutter hold.



- 4 The open cardboard box below have length, 120 cm, width, 54 cm and height, 25 cm. The box contains 18 cans of jam. The height of the jam can is 25 cm.



- 4.1 Calculate the total surface area of the box.
- 4.2 What is the radius of each can? Show ALL calculations.
- 4.3 What volume of the box do the cans occupy?
- 4.4 Hence, determine the unused volume of the box.

In the appendix you will find two tables. Table 1 indicates the meals offered at the local fast food outlet, All Day Burger, together with the ingredients for each menu item. Table 2 shows daily intake guidelines for Boys and Girls between 15 and 18. Use the two tables to assist you in answering the following questions.

**Question 1**

- 1.1 Samuel orders a Burger Special with super onion rings, a packet of large chips and a large Coke. What percentage of his daily intake of calories is he consuming in this one meal?
- 1.2 Taking all menu items into consideration;
  - 1.2.1 Determine the mean, median and mode grams of protein on the menu
  - 1.2.2 Which of the measures of central tendency calculated in 1.2.1 are most appropriate to describe this fast food menu. Give reasons for your answer.
- 1.3 Consider the carbohydrate content of the menu items.
  - 1.3.1 Determine the mean, median and mode grams of carbohydrate on the menu
  - 1.3.2 Discuss the relevance of these averages.
- 1.4 Discuss how coffee, tea and Diet Coke affect the mean calorie content of fast food.
- 1.5
  - 1.5.1 Calculate the range and inter quartile range of sugar content amongst the menu items
  - 1.5.2 What are the items most heavily weighted with respect to sugar and how does this affect the range?

**Question 2**

Most foods eaten consist of a combination of different nutrients. Some nutrients we need more than others. All foods also have a measurement of energy (calories) which we should try to limit. In Table 2 we see what the recommended daily allowance is for boys and girls between the ages of 15 and 18. Draw a pie chart to represent the Guideline Daily Amount of nutrients (i.e. exclude calories) for Girls. Be sure to use a suitable heading and a key. All calculations must be shown.

### Question 3

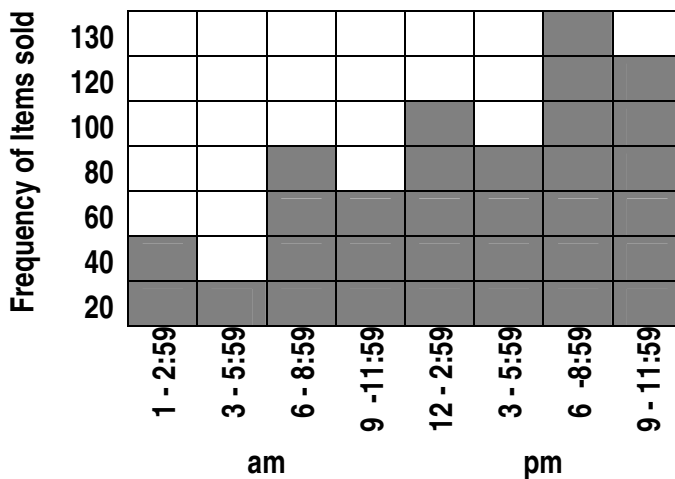
A group of 10 boys put in different orders as follows;

Boy	Fast Food Order
David	Chicken burger with medium chips
Ian	Hamburger with super onion rings and a large Coke
Samuel	Bacon double cheese burger with a Diet Coke
Adnaan	Chicken and cheese burger with medium Coke
Thembi	Cheese burger with medium chips
Matthew	Cheese burger with super onion rings and large chips
Lyle	Bacon cheese burger with coffee
Chuck	Burger special with onion rings and a medium Coke
Clinton	Hamburger with super onion rings and large chips
Mvuyo	Large chips and large Coke

- 3.1 Sum up the number of calories, grams of carbohydrate and grams of protein for each boy placing an order.
- 3.2 Represent the boys' intake of these two nutrients together with their calories using a compound (sectional) bar graph.
- 3.3 Referring to you bar graph, comment on their choice of meal

### Question 4

All Day Burger is open 24 hours a day, 7 days a week. They work with a staff of 12 for most of the day. Between 3 pm and 9 pm, an extra 3 people are on duty. The staff feel that management should arrange their shifts better according to the times when they are busiest. They record the number of items they sell on a Saturday and then present the graph below to their management team. Write a motivation, to accompany this graph, explaining how you would organize the shifts at All Day Burger, if you were the manager.



## Appendix

Table 1

Menu Item / Ingerdients	Energy (Cal)	Protein (g)	Carbohydrate (g)	Sugars (g)	Fat (g)	Fibre (g)	Sodium (mg)
Burger Special	613	29	47	8	34	4	908
Burger Special with Cheese	695	33	47	8	40	4	1308
Hamburger	295	16	30	4	11	2	559
Cheeseburger	336	18	30	4	14	2	759
Bacon Cheese Burger	495	34	28	2	26	2	881
Bacon Double Cheese Burger	694	39	40	7	41	1	910
Chicken Burger	572	25	43	4	31	4	1191
Chicken and Cheese Burger	600	28	43	6	40	4	1200
Medium Chips	326	3	43	2	15	4	626
Large Chips	489	5	65	4	23	6	940
Onion Rings	261	4	32	5	12	3	181
Super Onion Rings	522	8	66	10	26	6	362
Medium Coke	164	0	40	40	0	0	0
Large Coke	369	0	90	90	0	0	0
Tea	22	1	2	2	3	0	33
Coffee	1	0	0	0	0	0	4
Diet Coke	1	0	0	0	0	0	0

Table 2

Guideline Daily Amounts for Boys and Girls Aged 15 - 18		
	Boys	Girls
Energy (Calories)	2750	2100
Protein (g)	55	45
Carbohydrates (g)	345	265
Sugar (g)	140	105
Fat (g)	105	80
Fibre (g)	24	24
Sodium (g)	2.4	2.4

Ingredients and GDA tables from <http://www.burgerking.co.uk>