Scheme of work year 11 mathematics

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| **Week** | **Day** | **Topic** | **Learning outcome: Students should be able to:** | **Activities** |
| 9 | Monday | **INDICES** | * Identify negative indices * Simplify negative indices | * Read and study “Rules of indices” p.71 * Redo examples (p.72) * Do exercise 9.3, Q1.a,c,e,g,i (p.72) * Q2.a,c,e,g,i,k,m,o (p.77) |
| Tuesday |  | * Identify Fractional indices * Simplify Fractional indices | * Ready and study (p.72-73) * Redo examples * Do exercise 9.4, Q1.a,b,e * Q2. .a,c,e,i, k, l, m * Q3. A,b,d,e * Q4.a,b,c,d |
| Wednesday |  | * Identify Fractional indices * Simplify Fractional indices | * Q5.a,c,d,h,j,l * Q6. A,b,e,g (p.74) * Q.7.b,d,e,g * *Q8* |
| Thursday |  | * Combining Powers and Roots * Evaluate negative and fractional indices | * Read and study “fractional and negative indices” (P.74) * Redo examples * Do exercise 9.5; Q1.a,d,e,g * Q2.a,d,e,f,j,k,n (p.75) * Q3. A,c,d,e,h,I,m,p |
| Friday |  | * Combining Powers and Roots * Evaluate negative and fractional indices | * Q4.a,b,e,f(p.75) * Q6. A,c,f,g,I,j,m,o * Q8 & Q9 (p.75) |
| 10 | Monday |  | * Simplify numbers with the same base | * Read and study (p.76) * Redo examples * Do exercise 9.6, Q1.a,b,c,d * Q2.a,b,d,e * Q3.a,b,c,d * Q6. A,b,c,d,e(p.76) |
| Tuesday | **SURDS** | * Definesquare roots and cube roots * Simplifyany square roots expressions (i.e √16 x √16) * Simplifyany cube roots expressions | * Read and study (p.77) * Redo examples * Do exercise 10.1, Q1, Q2, Q3, Q4, Q5(p.77) |
| Wednesday |  | * Definesurds. * Simplifyand complete surds. | * Read and study (p.78) * Redo examples * Do exercise 10.2, Q1.a,c,e,h,k,m,p,s(p.78) * Q2.a,c,e,g,I,k,m (p.78) |
| Thursday |  | * Simplify the surds * Complete the surds | * Q3.a,b,c,d(p.79) * Q4.a,c,g,j,l (p.79) * Q5.a,b,c,e * Q7. (p.79) |
| Friday | Good Friday (Public Holiday) | | |
| 11 | Monday | Easter Monday (Public Holiday) | | |
| Tuesday |  | * Solve simple everyday problems and leave answer in surds form | * Do Exercise 10.3, Q’s.1-3 |
| Wednesday |  | * Addition and subtraction of surds. | * Read and study (p.82) * Redo examples * Do exercise 10.4, Q1.a-f * Q2. A,c,d,f * Q3.a,c,e,g,h,I,k,m(p.82) |
| Thursday |  | * Multiply and divide surds | * Read and study (p.84) * Redo examples * Exercise 10.5, Q1.a, c,e,g,i,,j,l,n,p,r * Q3.a,c,e,g,l,n * Q4.a,c,e,g,i |
| Friday |  | * Multiply and divide surds | * Q5.a,b,d,f,h,I,k (p.85) * Q6.a,c,d,e,g,I,k,m,o,q (p.85) * Q7.a,c,e,g,j(p.85) |
| 12 | Monday |  | * Solve surd equations involving every example. | * Read and study p.86 * Redo Example * Do exercise 10.6 (1,2,3,4,8,10,12,13) (p.86) |
| Tuesday |  | **-**Solve surd equations involving every example | * Finish off any incomplete questions |
| Wednesday | **CO-ORDINATE GEOMETRY** | * Find the midpoint using any appropriate method | * Read and study (p.127) * Redo examples * Do exercise 16.1, Q1.a,c,e,g * Q3.a,b (p.127) * Q4, Q5 & Q6 |
| Thursday |  | * Find the distance between two points using the Distance Formula. * Find the distance between two points using Pythagoras Theorem. | * Read and study (p.128 * Redo examples * Do exercise 16.2, Q1.a,c,e,g * Q2 a, c |
| Friday |  | * Find the distance between two points using the Distance Formula. * Find the distance between two points using Pythagoras Theorem | * Q6, Q7 & Q8 (p.129) |
| 13 | Monday |  | * Calculate gradient using the coordinates of two points. | * Read and study (p.129-130) * Redo examples * Do exercise 16.3, Q1.a,c,e,f * Q2 a, b, c, e, f * Q3 a, c, e |
| Tuesday |  | * Calculate gradient using the coordinates of two points | * Q4 & Q5 (p.129) * Q6.a,b,c(p.129) * Q7 & Q8(p.129) |
| Wednesday |  | * Finding gradient using an angle . | * Read and study (p.131) * Redo examples * Do exercise 16.4, Q1.a,c,d,f(p.131)   Q2.a,b,c (p.131-132)  Q3. a,c,e,g,i |
| Thursday |  | * Finding gradient using an angle . | * Do Exercise 16.4   Q4 - Q7 |
| Friday | Labour day (Public Holiday) | | |
| 1 | Monday |  | * Write the equation in the form y = mx+c. | * Read and study (p.131) * Redo examples * Do Exercise 16.5 (p. 132)   Q1 a,c,e,g,i,k  Q3 a,c,e  Q4  Q5 |
| Tuesday |  | * Write the equation of a line in the form   Ax+By+C= 0 | * Read and study (p.133) * Redo examples * Do Exercise 16.6 (p. 133)   Q’s 1-12 |
| Wednesday |  | * Write the equation of a line in the form   Ax+By+C= 0  -Find the equation of a line using the formula | * Read and study (p.134) * Redo examples * Do Exercise 16.7 (p. 134)   Q’s 1-8 |
| Thursday |  | * Find the equation using two points on the line | * Read and study (p.134) * Redo examples * Do Exercise 16.8 (p. 135)   Q1. a,c,e,g,i  Q2.a,b,d,f  Q3, Q4, Q5 |
| Friday |  |  | * Finish off incomplete questions |
| 2 | Monday |  | * Define parallel and perpendicular lines. * Find the gradients of parallel lines. * Find the equations of parallel lines. | * Read and study (p.136) * Redo examples * Do Exercise 16.10 (p.134- 135)   Q1. a,c,e,g,i  Q2 |
| Tuesday |  | * Define parallel and perpendicular lines. * Find the gradients of parallel lines. * Find the equations of parallel lines. | Continue with Exercise 16.10  Q3, Q4, Q6,Q7 |
| Wednesday |  | * Define perpendicular line * Find the gradients of perpendicular lines. * Find the equation of perpendicular lines | * Read and study (p.137) * Redo examples * Do Exercise 16.11 (p.134- 135)   Q1. a,c,e,g,  Q3 a,c,e,g,h,  Q5  Q6 |
| Thursday |  | * Define perpendicular line * Find the gradients of perpendicular lines. * Find the equation of perpendicular lines. | * Do Exercise 16.11 (p.134- 135)   Q7, Q9, Q13, 14 |
| Friday |  |  | Finish off incomplete questions |
| 3 | Monday |  | * Define collinear points * Finding collinear points | * Read and study (p.138-139) * Redo examples * Do Exercise 16.12 (p.139)   Q’s 1- 4 |
| Tuesday |  | -Identify conditions which give rise to two lines intersecting at one point |  |
| Wednesday |  | -Solve the two linear equations simultaneously. |  |
| Thursday |  | -Solve word problems from which two linear simultaneous equations are derived and solved |  |
| Friday |  |  |  |

**SOME EXPLANATIONS AND ANSWERS**

* **Simplify Negative Indices**

Negative Index Law

Negative indices are written with a negative index or power. There can be written as a reciprocal(or Flip of the fraction) of the

base and the power becomes a positive.

Examples:

i)

ii)

Example:

Simplify by writing as positive indices only.

a) b) c)

Answer:

a) = 3 (*When multiplying the same bases, you add the indices or power)*

=

=

= (*x has a negative index therefore it will be written as a reciprocal so that the power becomes a positive)*

b) c) ( *power becomes positive)*

= =

=

=

* **Simplify Fractional indices**

Fractional Indices are used to express *roots(or surds)* of the numbers

Example:

, ,

Example1:

Write in surd form.

Answer:

Example 2:

Evaluate

Answer:

Example3:

Write in index form.

Answer:

Example 4:

Simplify

Answer:

=

=

* **Fractional and Negative indices**

An approach which works well is to first deal with the negative index by taking the reciprocal of the base and changing the sign of the index at the same time.

\ Example1:

Write in surd form.

Answer:

Example 2:

Evaluate: a) b)

Answer: a) b)

* **Combining Powers and Roots**

Powers and roots can be combined in the same index.

Example 1:

Evaluate .

Answer: .

=

= 64

Example 2:

Write in index form.

Answer:

* **Simplify numbers with the same base**

Example1:

Simplify

Answer:  *use the smaller base as your common base (ie: )*

*apply index law to simplify*

Example 2:

Solve

Answer:

*( x term is the power of the base. To find the value of x, makesure you have the same base on both sides)*

**SURDS**

A root of a *positive* real number is called a surd if its value cannot be exactly determined.

Surds are the irrational numbers which are roots of positive integers and the value of roots can’t determined. This means that the roots of these integers do not give exact values.

Examples: , , which are square root or cube roots of any positive integer.

The following properties are useful when we need to operate with surds.

**PROPERTY** **APPLICATIONS**

1.

3.

* **Simplify and complete surds**

Note: Students must write down on their exercise books the first 20 square numbers and the first 10 cubic numbers.

To get the first 20 square numbers, *multiply* a number *twice* and you get: (1, 4, 9, 16, 25, 36, 49, 64, 81, 100, ..........).

To get the first 10 cubic numbers, *multiply* a number *three* times and you get: (1, 8, 27, 64,..........).

**Simplify Surds**

A surd can be expressed in its simplest form when the number under the radical sign is as small as possible.

This can be done by writing the number under the surd sign as a *product* of a *perfect square* and *another number*.

Example 1:

Simplify

Answer: (Two numbers that multiply to give 45 and one of the number must be the highest square number)

=

=

=

**Complete Surds**

Complete surds is the opposite of simplifying surds.

Example:

Write as a complete surds.

Solution:

First check the surd sign that is used on the question. In this question it is the square root sign used.

*(Find a number that when it is squared gives 5 so square5 to find the number)*

* **Addition and subtraction surds.**

*Like surds can be added or subtracted*. Like surds have the same number under the surd sign.

Recall:

In algebra, *like terms can be added or subtracted*. When adding or subtracting like terms we only add or subtract the coefficient of the term.

Example 1:

Solution:

Since all the surds have the same number under the radical sign, there are all like surds. When adding or subtracting surds use the coefficients only.

In general before attempting to add or subtract surds each surd should be reduced to its simplest form.

Example 2:

Solution:

*(First simplify the number under the radical sign)*

*(All the surds are like surds so only the coefficients are added and subtracted)*

* **Multiplying and dividing surds**

**Multiplying Surds**

When multiplying surds, find the product of all the terms in the expression.

Example:

Simplify the following in their simplest form:

a) b) c)

Solutions:

a) b) c)

= =

= =

= =

=

**Dividing surds**

To simplify a fraction such as the denominator is changed into a rational number. This is called *rationalizing* the denominator.

Example:

Simplify the following expressions:

a) b)

Solution:

a) b) (To rationalize the denominator, multiply with the surd denominator)

=

=

= (divide by 3)

=

**Binomial Denominator**

To rationalise a surd with two terms in the denominator (binomial denominator), we multiply the numerator and the denominator with its conjugate.

Example:

Simplify

Answer:

=

=

=

=

=

=

=

**CO-ORDINATE GEOMETRY**

**LINEAR FUNCTION**

Linear function or equation can be expressed in the form *y = mx*+ *c,* where *m* is the *gradient or slope* and *c* is the

and they can be replaced by numbers and can be represented by a straight line graph.

Examples: *y=2x+5, ,* ,

Example 1:

Express

Answer:

*( Divide all the terms by 3 to make y the subject)*

Example 2:

Sketch the graph of

Answer:

First find the and the *y- intercepts.*

i) *x-intercept:* To find the *x-* intercept, make *y=0.* ii) *y-intercept:* To find the *y-* intercept, make *x=0.*

(

)

Sketch: y

5

x

**Exercise:**

1. Express the following equations in the form

a) c) e)

b) d) f)

2. Find the *x* and *y* intercepts for the line and sketch its graph.

3. Sketch the graphs of the linear functions:

a) b) c) d)

Solutions:

1. a) b) c) d)

e) f)

2. *x-intercept =*

* **Find the midpoint using any appropriate method**

The mid-point of the interval joining the points and is given by

Example 1:

A and B are the points and . Find the coordinates of the midpoint of AB.

Solution:

The midpoint of AB

Midpoint =

=

=

The midpoint is .

Example 2:

The point is the mid-point of the interval *AB* where *A* is the point . Find the coordinates of *B.*

Solution:

The coordinates of *M* are given by

The coordinates of *B* are .

* **Find the distance between two points using the Distance Formula.**

The distance between two points and is given by the formula

Example:

*A* and *B* are the points and Find the distance *AB.*

Solution:

To find the distance *AB*  substitute the values of points *A* and *B* to the distance formula:

*AB* = 10

**The gradient(or slope) of a line**

The gradient or slope of a line is the steepness of the line.

Example:

* **Calculate gradient using the coordinates of two points**

The gradient of the line through two points and is given by

Example 1:

Find the slope of the line *PQ*  where *P* is the point and *Q is the point*

Solution:

Gradient of *PQ =*

=

=

* **Finding gradient using an angle .**

If is the angle that the graph of a straight line makes with the *positive* direction of the *x-axis,* then is the *angle of inclination* of the straight line. *y*

*y*

*x x*

*m= tan m= tan*

Fig 1: The angle of inclination is an acute. Fig 2: The angle of inclination is an obtuse.

The slope or gradient of a line is the tangent of its angle of inclination

To find the gradient of a line using the angle of inclination, we use the formula:

*m = tan*

Examples:

Find the gradient of a line using the angle of inclination:

i) ii)

Solution:

i) is an *acute* angle ii) is an *obtuse* angle so the gradient will be a *negative*.

*m = tan*  *m = tan*

*1 m = tan m = tan*

*m =* 1

**The Equations of Straight Lines**

The general equation of a straight line is *Ax + By + C = 0.* The equation of a line can also be written in a gradient- intercept form, *y=mx+c.*

The equation of a line passing through with gradient *m* is:

or

Example 1:

A line passes through the point and has a gradient of What is its equation?

Solution:

Gradient*(m) =*  and the point the lines through is

*Example 2:*

Find the equation of the straight line passing through the two points *A* and .

*Solution:*

Firstly, you need to find the gradient of the line *AB* using the gradient formula .

Now, find the equation of the line by using the equation formula

Use the gradient and one pair of coordinate point or . Let’s use .

**Parallel and Perpendicular Lines**

* Define Parallel and Perpendicular Lines.

**Parallel Lines**

Parallel Lines are lines that never meet because they have the same distance in between. They also have the *same* gradients.

If a line with gradient is parallel to a line with gradient then

Example 1:

The line is parallel to the line . Find the gradients of the lines.

Solution:

Line 1: Line 2:

*m=2 m=2*

Line 1 and line 2 have the same gradient*(m)* = 2.

Example 2:

Find the equation of a straight line through the point parallel to

*Solution:*

The given line has the equation . In the gradient-intercept form the equation will be

The gradient of the line is

Therefore the line that is parallel to will have the same gradient *(since )*

To find the equation of the line through with the gradient , use the equation formula:

**Perpendicular Lines**

Perpendicular lines are lines that *meet* at a point because their gradients are *reciproca*l to each other. This means that their gradients multiply to give

If two perpendicular lines have gradients and then,

or

Example 1:

Show that the two lines and are perpendicular to each other.

*Solution:*

The equation of the first line is In the gradient-intercept form the equation will be

Its gradient

The equation of the second line is . In the gradient-intercept form the equation will be

Its gradient

Now

This shows that the two lines are perpendicular.