

N5 Topic Supported Study

Is there one particular topic you have just never fully understood?

Don't know where to start with your Maths revision?

Are there topics mentioned on your report that you need to do more work on?

Every Thursday lunchtime 12.30 - 1.00pm

Maths 7

Just bring your lunch and a pen!

You are welcome to attend one/a few or all sessions!

Week 1 - Thursday 17th January - Surds and Indices

Full list of topics and dates can be found around the Maths department or on the website (www.firrhillhigh.org/curriculum/mathematics)

January 17th – Surds and Indices

January 24th – Arc Length and Sector Area

January 31st – Volume

February 7th – Equation of a Straight Line

February 21st – Simultaneous Equations

February 28th – Quadratics

March 7th – Vectors

March 14th – Sine/Cosine Rule

March 21st – Percentages

March 28th – Standard Deviation

Surds and Indices

You should be able to:

- simplify surds;
- rationalise denominators;
- multiply and divide using positive, negative and fractional indices;

Simplify Surds

Need to know your square numbers up to 144

a) Simplify $\sqrt{63}$

$$\begin{aligned} &= \sqrt{9} \sqrt{7} \\ &= 3\sqrt{7} \end{aligned}$$

1, 4, 9, 16, 25, 36, 49

$$\begin{aligned} 1x &= x \\ \sqrt{6} &= 1\sqrt{6} \end{aligned}$$

Same rules as algebra - collect like terms

b) Simplify $\sqrt{6} + 3\sqrt{6} - \sqrt{5} + 2\sqrt{5}$

$$= 4\sqrt{6} + \sqrt{5}$$

Rationalise a Denominator

1) Rationalise the denominator of the following: $\frac{2}{\sqrt{14}}$

$$\begin{aligned} &= \frac{2}{\sqrt{14}} \times \frac{\sqrt{14}}{\sqrt{14}} \\ &= \frac{2\sqrt{14}}{14} \div 2 \\ &= \frac{\sqrt{14}}{7} \end{aligned}$$

2) Rationalise the denominator of the following and simplify: $\frac{3}{2\sqrt{5}}$

$$\begin{aligned} &\frac{3}{2\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}} \\ &= \frac{3\sqrt{5}}{2 \times 5} \\ &= \frac{3\sqrt{5}}{10} \end{aligned}$$

Multiply/Divide using positive, negative and fractional indices

1. $a^m \times a^n = a^{m+n}$

2. $\frac{a^m}{a^n} = a^{m-n}$ ★ These must be learned!! ★

3. $(a^m)^n = a^{m \times n}$

4. $a^0 = 1$

5. $a^{-m} = \frac{1}{a^m}$

6. $a^{\frac{m}{n}} = \sqrt[n]{a^m}$

1. Simplify:

(a) $\frac{x^5}{x^3}$ (b) $x^4 \times x^3$ (c) $\frac{x^2 \times x^5}{x^3}$ (d) $\frac{x^{-3} \times x^4}{x^5}$ (e) $5x^3 \times 4x^{\frac{1}{2}}$

$= x^{5-3} = x^2$
 $= x^7$

$= x^{4+3} = x^7$
 $= x^4$

$= \frac{x^7}{x^3} = x^4$

$= \frac{x^1}{x^5} = x^{-4} = \frac{1}{x^4}$

$= 20x^{\frac{7}{2}}$

2) Remove brackets and simplify

$a^{\frac{1}{2}}(a^{\frac{1}{2}} - 2)$
 $= a^{\frac{1}{2}} \times a^{\frac{1}{2}} - a^{\frac{1}{2}} \times 2$
 $= a - 2a^{\frac{1}{2}}$

value
↓

3) Evaluate

$x^{\frac{2}{3}}$
 $= \sqrt[3]{x^2}$

$8^{\frac{2}{3}}$
 $= \sqrt[3]{8^2} = (\sqrt[3]{8})^2$
 $= 2^2$
 $= 4$

$a^{\frac{m}{n}} = \sqrt[n]{a^m}$

$x^{\frac{1}{2}} = \sqrt{x}$

Next Steps:

1. Learn Indices Rules
2. Complete practice questions
3. Try the topic exam questions
4. Past Papers!

Practice Questions - Surds

- Q1:** Simplify $\sqrt{45}$
.....
- Q2:** Simplify $\sqrt{\frac{50}{36}}$
.....
- Q3:** Simplify $5\sqrt{5} - 3\sqrt{5} + 2\sqrt{5}$
.....
- Q4:** Simplify $\sqrt{2}(3 + 2\sqrt{2})$
.....
- Q5:** Rationalise the denominator and simplify $\frac{2}{\sqrt{10}}$
.....
- Q6:** Simplify $3\sqrt{12}$
.....
- Q7:** Simplify $\sqrt{72} - 2\sqrt{2}$
.....
- Q8:** Simplify $\frac{\sqrt{8}}{\sqrt{48}}$
.....
- Q9:** Simplify $(\sqrt{3} + 2)(\sqrt{3} - 1)$
.....
- Q10:** Rationalise the denominator and simplify $\frac{5\sqrt{2}}{2\sqrt{5}}$
.....
- Q11:** Rationalise the denominator and simplify $\frac{5}{\sqrt{5} + 2}$
.....

Practice Questions - Indices

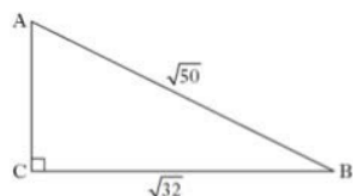
- Q12:** Simplify $\frac{a^4 \times a^5}{a^7}$
.....
- Q13:** Simplify $(3b^3)^2$
.....
- Q14:** Simplify, giving your answer with a positive index $\frac{2e^5}{(e^3)^2}$
.....
- Q15:** Simplify $\frac{6b^{\frac{1}{2}}}{3b^{\frac{1}{2}}}$
.....
- Q16:** Simplify $16^{\frac{3}{2}}$
.....
- Q17:** Multiply out the brackets and simplify $y^{\frac{1}{4}} \left(y^{-\frac{1}{4}} + y^{\frac{7}{4}} \right)$
.....
.....

Surds - Exam Questions

- Express $\sqrt{50}$ as a surd in its simplest form.
- Simplify $\sqrt{48} - 3\sqrt{3}$
- Express $\sqrt{32} - \sqrt{2}$ as a surd in its simplest form.
- Express $\sqrt{72} - \sqrt{2} + \sqrt{50}$ as a surd in its simplest form
- Simplify

$$\frac{\sqrt{24}}{\sqrt{2}}$$

11. A right angled triangle has dimensions as shown



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Calculate the length of AC, leaving your answer as a surd in its simplest form.

Indices Exam Questions

- Simplify $\frac{7a^3b^2}{a\sqrt{b}}$
 - If $a = -1$ and $b = 4$, find the value of the expression in part (a)
- Given that $y = 2x^{-\frac{2}{3}}$, find y when $x = 8$.
- Simplify $x^{\frac{2}{3}}(x^{\frac{2}{3}} + x^{-\frac{2}{3}})$
- Simplify $\frac{m^5}{m^{-3}}$
 - Evaluate $125^{-\frac{2}{3}}$
- Express $\frac{p^5 \times 8p}{2p^{-3}}$ in its simplest form.
- Simplify, writing your answer with a positive index: $3a^4 \times a^{-6}$
- Simplify the fraction, giving your answer in positive index form: $\frac{x^3 \times x^4}{x^9}$
- Simplify $\frac{a^2 \times a^5}{a^{-3}}$.
- Remove the brackets and simplify: $p^{\frac{1}{2}}(p^{\frac{5}{2}} - 2)$.
 - Hence, or otherwise, find the value of $p^{\frac{1}{2}}(p^{\frac{5}{2}} - 2)$ when $p = 4$.

Answers - Surds

Q1: $3\sqrt{5}$

Q2: $\frac{5\sqrt{2}}{6}$

Q3: $4\sqrt{5}$

Q4: $3\sqrt{2} + 4$

Q5: $\frac{\sqrt{10}}{5}$

Q6: $6\sqrt{3}$

Q7: $4\sqrt{2}$

Q8: $\frac{1}{\sqrt{6}}$

Q9: $1 + \sqrt{3}$

Q10: $\frac{\sqrt{10}}{2}$

Q11:

Hint:

- Multiply the numerator and denominator by $\sqrt{5} + 2$

Answer: $5\sqrt{5} + 10$ or $5(\sqrt{5} + 2)$

Answers - Indices

Q12: a^2

Q13: $9b^6$

Q14: $\frac{2}{e}$

Q15: 2

Q16: 64

Q17: $1 + y^2$

