Daily Practice 31.1.2017

Q1. Mulply out and simplify 7(2x - 1) + 3x

$14x - 7 + 3x$

$17x - 7$

Q2. Factorise $16x^2 - 24x$

$8x(2x - 3)$

Q3. Calculate the speed a car travels at if it travels 120km in 3 hours and 20 minutes

$S = \frac{120}{3\frac{1}{3}} = 36$ km

Q4. Find the cost of a sofa that is £423 with 15% off

1% = 423 ÷ 100 = 4.23

15% = 15 x 4.23 = £63.45

£423 - £63.45 = £359.55

Today we will be learning about surds.

Surds

A surd is a square root that cannot be written reduced to a whole number.

E.g. $\sqrt{16} = 4$ is not a surd

$\sqrt{2} = 1.41421...$ is a surd

Writing an answer as a surd is more accurate than a rounded decimal.

There are some rules for surds that help solve problems involving surds.

List of Square Numbers

1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169, 196, 225

$400 = 20^2$

$\sqrt{2} \times \sqrt{3} = 2.44...$

$\sqrt{6} = 2.44...$

$\sqrt{9} \times \sqrt{4} = 6$

$\sqrt{36} = 6$

Square Numbers

Daily Practice 1.2.2017

Q1. Factorise $3x^2y - 15xy^2$

$3xy(x - 5y)$

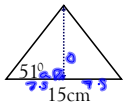
Q2. Calculate the height of the isosceles triangle shown

$\tan x° = \frac{o}{a}$

$\tan 51° = \frac{x}{7.5}$

$7.5 \tan 51° = x$

$x = 9.26$cm (2.d.p)



Q3. Solve the inequation $7k + 1 \leq 7 + k$

$7k \leq 6 + k$

$-k \quad -k$

$6k \leq 6$

$k \leq 1$

Q4. Multiply out and simplify 5(3k - 1) +2(2k + 4)

$15k - 5 + 4k + 8$

$19k + 3$

Today we will be continuing to learn how to simplify surds.

$\sqrt{a} \times \sqrt{b} = \sqrt{ab}$ and $\sqrt{ab} = \sqrt{a} \times \sqrt{b}$

Examples:

1. $\sqrt{3} \times \sqrt{4}$ $= \sqrt{12}$

2. $\sqrt{48}$ $\sqrt{6} \times \sqrt{8}$ or $\sqrt{4} \times \sqrt{12}$ or $\sqrt{2} \times \sqrt{24}$ or $\sqrt{3} \times \sqrt{16}$

3. $\sqrt{45}$ $\sqrt{9} \times \sqrt{5}$ or $\sqrt{5} \times \sqrt{9}$

4. $\sqrt{4} \times \sqrt{4}$ $= \sqrt{16} = 4$

5. $\sqrt{9} \times \sqrt{9}$ $= \sqrt{81} = 9$

6. $\sqrt{7} \times \sqrt{7}$ $= \sqrt{49} = 7$

$\sqrt{a} \times \sqrt{a} = a$

Surds

Simplify :

a. $\sqrt{2} \times \sqrt{2} = \sqrt{4} = 2$	b. $\sqrt{3} \times \sqrt{3} = \sqrt{9} = 3$	c. $\sqrt{11} \times \sqrt{11} = \sqrt{121} = 11$	d. $\sqrt{a} \times \sqrt{a} = \sqrt{a^2} = a$
e. $\sqrt{5} \times \sqrt{5} = \sqrt{25} = 5$	f. $\sqrt{c} \times \sqrt{c} = \sqrt{c^2} = c$	g. $\sqrt{6} \times \sqrt{6} = \sqrt{36} = 6$	h. $\sqrt{k} \times \sqrt{k} = \sqrt{k^2} = k$
i. $\sqrt{2} \times \sqrt{8} = \sqrt{16} = 4$	j. $\sqrt{12} \times \sqrt{3} = \sqrt{36} = 6$	k. $\sqrt{5} \times \sqrt{20} = \sqrt{100} = 10$	l. $\sqrt{2} \times \sqrt{32} = \sqrt{64} = 8$
m. $\sqrt{a} \times \sqrt{b} = \sqrt{ab}$	n. $\sqrt{10} \times \sqrt{x} = \sqrt{10x}$	o. $\sqrt{p} \times \sqrt{q} = \sqrt{pq}$	p. $\sqrt{k} \times \sqrt{6} = \sqrt{6k}$
q. $\sqrt{2} \times \sqrt{10} = \sqrt{20}$	r. $\sqrt{24} \times \sqrt{3} = \sqrt{72}$	s. $\sqrt{5} \times \sqrt{10} = \sqrt{50}$	t. $\sqrt{6} \times \sqrt{12} = \sqrt{72}$
u. $\sqrt{6} \times \sqrt{3} = \sqrt{18}$	v. $\sqrt{20} \times \sqrt{3}$ $= \sqrt{60}$	w. $\sqrt{4} \times \sqrt{8}$ $= \sqrt{32}$	x. $\sqrt{15} \times \sqrt{10}$ $= \sqrt{150}$

Surds

Simplify :

a. $\sqrt{2} \times \sqrt{2} = 2$	b. $\sqrt{3} \times \sqrt{3} = 3$	c. $\sqrt{11} \times \sqrt{11} = 11$	d. $\sqrt{a} \times \sqrt{a} = a$
e. $\sqrt{5} \times \sqrt{5} = 5$	f. $\sqrt{c} \times \sqrt{c} = c$	g. $\sqrt{6} \times \sqrt{6} = 6$	h. $\sqrt{k} \times \sqrt{k} = k$
i. $\sqrt{2} \times \sqrt{8} = \sqrt{16} = 4$	j. $\sqrt{12} \times \sqrt{3} = 6$	k. $\sqrt{5} \times \sqrt{20} = 10$	l. $\sqrt{2} \times \sqrt{32} = 8$
m. $\sqrt{a} \times \sqrt{b} = \sqrt{ab}$	n. $\sqrt{10} \times \sqrt{x} = \sqrt{10x}$	o. $\sqrt{p} \times \sqrt{q} = \sqrt{pq}$	p. $\sqrt{k} \times \sqrt{6} = \sqrt{6k}$
q. $\sqrt{2} \times \sqrt{10} = \sqrt{20}$	r. $\sqrt{24} \times \sqrt{3} = \sqrt{72}$	s. $\sqrt{5} \times \sqrt{10} = \sqrt{50}$	t. $\sqrt{6} \times \sqrt{12} = \sqrt{72}$
u. $\sqrt{6} \times \sqrt{3} = \sqrt{18}$	v. $\sqrt{20} \times \sqrt{3} = \sqrt{60}$	w. $\sqrt{4} \times \sqrt{8} = \sqrt{32}$	x. $\sqrt{15} \times \sqrt{10} = \sqrt{150}$

Daily Practice 2.2.2017

Q1. Calculate the size of a box of cereal that weighs 500grams with 25% extra free

50% of 500 = 250g

25% = 250 ÷ 2 = 125g

625grams

Q2. Multiply out and simplify $3(2x - 1) - 4x + 8$

$6x - 3 - 4x + 8$

$2x + 5$

Q3. Write 7000.184 in scientific notation

7.000184×10^3

Q4. Simplify $\sqrt{720}$

$\sqrt{5}\sqrt{144}$

$12\sqrt{5}$

Q5. 20% of £40 - £3.86

£8.00

-£3.86

£4.14

Simplifying Surds

$\sqrt{a} \times \sqrt{b} = \sqrt{ab}$ and $\sqrt{ab} = \sqrt{a} \times \sqrt{b}$

Surds can also be simplified using these rules. (Square numbers will help here)

Examples: Simplify the following

(a) $\sqrt{32}$

$\sqrt{16}\sqrt{2}$

$4\sqrt{2}$

(b) $\sqrt{75}$

$\sqrt{25}\sqrt{3}$

$= 5\sqrt{3}$

(c) $\sqrt{108}$

$\sqrt{9}\sqrt{12} = 3\sqrt{12}$

$= 3\sqrt{4}\sqrt{3} = 3 \times 2 \times \sqrt{3}$

$= 6\sqrt{3}$

(d) $3\sqrt{50}$

$3\sqrt{25}\sqrt{2}$

$3 \times 5 \times \sqrt{2}$

$15\sqrt{2}$

$\sqrt{300}$

$\sqrt{100}\sqrt{3}$

$10\sqrt{3}$

$\sqrt{72}$

$\sqrt{9}\sqrt{8}$ | $\sqrt{36}\sqrt{2}$

$3\sqrt{8}$ | $6\sqrt{2}$

$3\sqrt{4}\sqrt{2}$

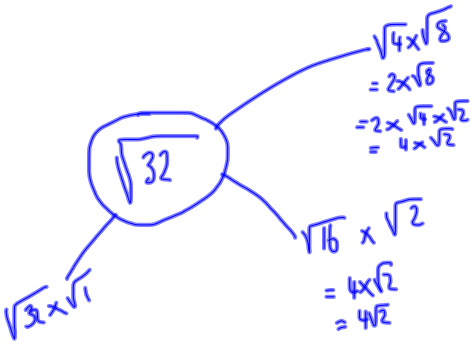
$6\sqrt{2}$

$\sqrt{150}$

$\sqrt{25}\sqrt{6}$

$5\sqrt{6}$

① Think of square numbers that divide into your number.



Simplifying Surds

Simplify :

a. √20	**b.** √12	**c.** √8	**d.** √90	**e.** √18	**f.** √28
g. √45	**h.** √24	**i.** √80	**j.** √72	**k.** √300	**l.** √32
m. √160	**n.** √27	**o.** √150	**p.** √44	**q.** √63	**r.** √50
s. √175	**t.** √60	**u.** √1200	**v.** √224	**w.** 10√48	**x.** 2√108

Simplifying Surds

Simplify :

a. √20 = 2√5	**b.** √12 = 2√3	**c.** √8 = 2√2	**d.** √90 = 3√10	**e.** √18 = 3√2	**f.** √28 = 2√7
g. √45 = 3√5	**h.** √24 = 2√6	**i.** √80 = 4√5	**j.** √72 = 6√2	**k.** √300 = 10√3	**l.** √32 = 4√2
m. √160 = 4√10	**n.** √27 = 3√3	**o.** √150 = 5√6	**p.** √44 = 2√11	**q.** √63 = 3√7	**r.** √50 = 5√2
s. √175 = 5√7	**t.** √60 = 2√15	**u.** √1200 = 20√3	**v.** √224 = 4√14	**w.** 10√48 = 40√3	**x.** 2√108 = 12√3

3√8 = 3√4√2 = 6√2

Today we will be continuing to learn how to simplify surds.

Daily Practice 6.2.2017

Q1.

L	1	2	3	4	5
F	3	7	11	15	19

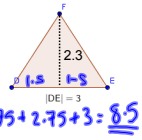
(i) State the rule for the table shown

F = 4L − 1

(ii) Find the value of L when F = 35

35 = 4L − 1
+1 +1
36 = 4L
÷4 ÷4
L = 9

Q2. Calculate the perimeter of the triangle



$x^2 = 1.5^2 + 2.3^2$

$x^2 = 7.54$

$x = \sqrt{7.54} = 2.75$ (2dp)

Perimeter = 2.75 + 2.75 + 3 = 8.5

Simplifying Surds

Surds can be added and subtracted just like algebraic terms.

Examples:

(a) 2√3 + 4√3 − √3
= 6√3 − √3
= 5√3

(b) 5√2 + 8√2
= 13√2

(c) √12 + √27
√4√3 + √9√3
2√3 + 3√3
= 5√3

(d) 9√20 + √500
9√4√5 + √100√5
18√5 + 10√5
= 28√5

Express each of the following in its simplest form.

a. 4√3 + 5√3	**b.** 8√6 − 2√6	**c.** √2 + 2√2	**d.** 3√7 − 9√7
e. 5√10 − 5√10	**f.** √5 + 5√5 − 3√5	**g.** 2√3 + √3 − 5√3	**h.** 5√11 + 7√11 − √11

Daily Practice 7.2.2017

Q1. Write 567 000 000 in scientific notation

5.67×10^8

Q2. Calculate the value of a car that was worth £12 000 and has depreciated by 15% in its first year and 12% in its second

$12000 \times 0.85 = 10200$

$10200 \times 0.88 = £8976$

Q3. Multiply out and simplify 3(x - 7) - 2x

$3x - 21 - 2x$

$x - 21$

Q4. $1\frac{2}{5} - \frac{3}{4}$

$\frac{7}{5} - \frac{3}{4}$

$\frac{28}{20} - \frac{15}{20} = \frac{13}{20}$

Simplifying Surds

Trickier Examples: Multiply out and simplify

$\sqrt{3}(\sqrt{5} + \sqrt{3})$

Question:

Multiply out the brackets and simplify, where possible.

a. $\sqrt{3}(\sqrt{2} + 1)$ **b.** $\sqrt{2}(\sqrt{8} + \sqrt{2})$ **c.** $\sqrt{3}(\sqrt{2} + \sqrt{6})$

Simplifying Surds

Q1.

Express each of the following in its simplest form.

a. $4\sqrt{3} + 5\sqrt{3}$ **b.** $8\sqrt{6} - 2\sqrt{6}$ **c.** $\sqrt{2} + 2\sqrt{2}$ **d.** $3\sqrt{7} - 9\sqrt{7}$

e. $5\sqrt{10} - 5\sqrt{10}$ **f.** $\sqrt{5} + 5\sqrt{5} - 3\sqrt{5}$ **g.** $2\sqrt{3} + \sqrt{3} - 5\sqrt{3}$ **h.** $5\sqrt{11} + 7\sqrt{11} - \sqrt{11}$

Q2.

Express each of the following in its simplest form.

a. $\sqrt{12} + \sqrt{27}$ **b.** $\sqrt{32} - \sqrt{8}$ **c.** $\sqrt{72} - \sqrt{50}$ **d.** $\sqrt{2} + \sqrt{98}$

e. $\sqrt{80} + \sqrt{20}$ **f.** $\sqrt{24} + \sqrt{54}$ **g.** $\sqrt{180} - \sqrt{45}$ **h.** $\sqrt{1000} - \sqrt{90}$

(j) $\sqrt{3} - \sqrt{12}$ **(k)** $\sqrt{75} + \sqrt{108} - \sqrt{3}$ **(l)** $\sqrt{5} + \sqrt{20} + \sqrt{80}$

(m) $\sqrt{108} + \sqrt{12}$ **(n)** $\sqrt{32} - \sqrt{8}$ **(o)** $\sqrt{72} - \sqrt{50}$

(p) $\sqrt{2} + \sqrt{98}$ **(q)** $\sqrt{80} + \sqrt{20}$ **(r)** $\sqrt{24} + \sqrt{54}$

(s) $\sqrt{8} + 5\sqrt{2}$ **(t)** $3\sqrt{12} + \sqrt{27}$ **(u)** $3\sqrt{2} + 2\sqrt{8} - \sqrt{18}$

Multiply out the brackets and simplify, where possible.

a. $\sqrt{3}(\sqrt{2} + 1)$ **b.** $\sqrt{2}(\sqrt{8} + \sqrt{2})$ **c.** $\sqrt{3}(\sqrt{2} + \sqrt{6})$

Expand and simplify:

(a) $\sqrt{2}(1 - \sqrt{2})$ **(b)** $\sqrt{3}(\sqrt{3} + 1)$ **(c)** $\sqrt{5}(\sqrt{5} - 1)$

(d) $\sqrt{2}(5 + \sqrt{2})$ **(e)** $\sqrt{2}(3 + \sqrt{6})$ **(f)** $2\sqrt{3}(\sqrt{8} + 1)$

(g) $\sqrt{3}(\sqrt{6} - 2\sqrt{8})$ **(h)** $\sqrt{5}(\sqrt{5} + 2)$ **(i)** $4\sqrt{6}(2\sqrt{6} - \sqrt{8})$

(j) $\sqrt{8}(\sqrt{2} + 4)$ **(k)** $2\sqrt{12}(\sqrt{3} + \sqrt{6})$ **(l)** $\sqrt{5}(\sqrt{200} + \sqrt{50})$

(m) $\sqrt{3}(\sqrt{2} + 1)$ **(n)** $\sqrt{2}(\sqrt{8} + \sqrt{2})$ **(o)** $\sqrt{3}(\sqrt{2} + \sqrt{6})$

(p) $\sqrt{5}(3 - \sqrt{5})$

Pegasys

Daily Practice 8.2.2017

Q1. Solve $3x + 5 = -25$

$-5 \quad -5$

$\frac{3x}{3} = \frac{-30}{3} \quad x = -10$

Q2. State the gradient of the line that passes through (4, 1) and (-2, 5)

$x_1\ y_1 \quad x_2\ y_2$

Remember? $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{5-1}{-2-4} = -\frac{4}{6} = -\frac{2}{3}$

Q3. State the median and quartiles of 2, 3, 5, 6, 1, 8

1, 2, 3 | 5, 6, 8

$Q_2 = 4 \quad Q_1 = 2 \quad Q_3 = 6$

Q4. 25% of $4 \times 8 + 2$

$\frac{1}{4} \times 8 + 2$

$8 + 2 = 10$

Q5. Simplify $\sqrt{450}$

$\sqrt{45}\sqrt{10}$

$\sqrt{9}\sqrt{5}\sqrt{10}$

$3\sqrt{5}\sqrt{10}$

$3\sqrt{50}$

$3\sqrt{25}\sqrt{2}$

$3 \times 5 \times \sqrt{2} = 15\sqrt{2}$

$\sqrt{90}\sqrt{5}$

$\sqrt{9}\sqrt{10}\sqrt{5}$

Today we will be learning how to divide surds.

Dividing Surds

When dividing two surds, they can be written as a division sum under one square root. This can be used as another way to help us simplify surds.

$$\frac{\sqrt{a}}{\sqrt{b}} = \sqrt{\frac{a}{b}}$$

Examples: Simplify

(a) $\frac{\sqrt{30}}{\sqrt{3}} = \sqrt{\frac{30}{3}} = \sqrt{10}$ (b) $\sqrt{\frac{9}{4}} = \frac{\sqrt{9}}{\sqrt{4}} = \frac{3}{2}$ (c) $\frac{\sqrt{50}}{\sqrt{18}} = \sqrt{\frac{50}{18}} = \sqrt{\frac{25}{9}} = \frac{\sqrt{25}}{\sqrt{9}} = \frac{5}{3}$

$\frac{\sqrt{25}\sqrt{2}}{\sqrt{9}\sqrt{2}} = \frac{5\sqrt{2}}{3\sqrt{2}} = \frac{5}{3}$

Dividing Surds

Simplify:

$\sqrt{\frac{8}{2}} = \sqrt{4} = 2$ $\sqrt{\frac{27}{12}} = \sqrt{\frac{9}{4}} = \frac{\sqrt{9}}{\sqrt{4}} = \frac{3}{2}$

(a)	$\frac{\sqrt{8}}{\sqrt{2}}$	(b)	$\frac{\sqrt{27}}{\sqrt{12}}$	(c)	$\frac{\sqrt{2}}{\sqrt{32}}$	(d)	$\frac{\sqrt{3}}{\sqrt{27}}$
(e)	$\frac{\sqrt{20}}{\sqrt{5}}$	(f)	$\frac{\sqrt{12}}{\sqrt{48}}$	(g)	$\frac{\sqrt{54}}{\sqrt{24}}$	(h)	$\frac{\sqrt{175}}{\sqrt{63}}$
(i)	$\frac{\sqrt{18}}{\sqrt{72}}$	(j)	$\frac{\sqrt{6}}{\sqrt{54}}$	(k)	$\frac{\sqrt{288}}{\sqrt{8}}$	(l)	$\frac{\sqrt{1000}}{\sqrt{90}}$
(m)	$\frac{\sqrt{48}}{\sqrt{6}}$	(n)	$\frac{\sqrt{3}}{\sqrt{24}}$	(o)	$\frac{\sqrt{98}}{\sqrt{7}}$	(p)	$\frac{\sqrt{50}}{\sqrt{250}}$

Pegasys

Daily Practice 9.2.2017

Q1. Find the percentage profit made on an antique that was purchased at auction for £220 and sold for £680

$680 - 220 = 460$ $\frac{460}{220} \times 100 = 209\%$ Profit

Q2. Write 0.00704 in scientific notation

7.04×10^{-3}

Q3. Multiply out and simplify $7(2m + 3) - 4(m + 5)$

$14m + 21 - 4m - 20$ $10m + 1$

Q4. $2\frac{3}{5} - \frac{1}{3} = \frac{13}{5} - \frac{1}{3} = \frac{39}{15} - \frac{5}{15} = \frac{34}{15} = 2\frac{4}{15}$ (×3, ×5)

Q5. Find the mean, median, mode and range of ~~12~~, 1, ~~-3.4~~, 7, 1

Mean $= \frac{12}{6} = 2$ Mode $= 1$ $-3, 1, 1, 2, 4, 7$

Range $= 7 - (-3) = 10$ Median $= 1.5$

Today we will be learning how to rationalise the denominator.

Rationalising the denominator

This means ensuring that the denominator of a fraction with surds in it is a whole number.

We can eliminate the surd on the bottom of the fraction by multiplying both numerator and denominator by the denominator to get an equivalent fraction.

$$\frac{a}{\sqrt{b}} \times \frac{\sqrt{b}}{\sqrt{b}} = \frac{a\sqrt{b}}{b}$$

Rationalising the denominator

Examples: Rationalise the denominator for each

(a) $\frac{2}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{2\sqrt{3}}{3}$ (b) $\frac{6}{\sqrt{15}} \times \frac{\sqrt{15}}{\sqrt{15}} = \frac{6\sqrt{15}}{15} \div 3 = \frac{2\sqrt{15}}{5}$

(c) $\frac{1+\sqrt{2}}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{2}(1+\sqrt{2})}{2} = \frac{\sqrt{2}+2}{2}$

(d) $\frac{30}{\sqrt{50}} \times \frac{\sqrt{50}}{\sqrt{50}} = \frac{30\sqrt{50}}{50} = \frac{30(\sqrt{25}\sqrt{2})}{50}$

$\frac{30(5\sqrt{2})}{50} = \frac{150\sqrt{2}}{50} \div 50 = \frac{3\sqrt{2}}{1} = 3\sqrt{2}$

① $\frac{6}{\sqrt{3}}$

② $\frac{12}{\sqrt{5}}$

③ $\frac{20}{\sqrt{10}}$

④ $\frac{9+\sqrt{2}}{\sqrt{2}}$