

Revision

Fraction Arithmetic

$$\begin{aligned} 1) \quad & 3\frac{2}{3} + 1\frac{4}{5} \\ &= 4\frac{10+12}{15} \\ &= 4\frac{22}{15} \\ &= 5\frac{7}{15} \end{aligned}$$

$$\begin{aligned} 2) \quad & 6\frac{1}{4} - 4\frac{2}{3} \\ &= 12\frac{3-8}{12} \\ &= 1\frac{7}{12} \end{aligned}$$

$$\begin{aligned} 3) \quad & 1\frac{2}{3} \times 2\frac{1}{7} \\ &= \frac{5}{\cancel{3}_1} \times \frac{\cancel{15}^5}{7} \\ &= \frac{5 \times 5}{1 \times 7} \\ &= \frac{25}{7} \\ &= 3\frac{4}{7} \end{aligned}$$

$$\begin{aligned} 4) \quad & 6\frac{1}{4} \div 1\frac{3}{7} \\ &= \frac{25}{4} \div \frac{10}{7} \\ &= \frac{\cancel{25}^5}{4} \times \frac{7}{\cancel{10}_2} \\ &= \frac{5 \times 7}{4 \times 2} \\ &= \frac{35}{8} = 4\frac{3}{8} \end{aligned}$$

Recurring Decimal to Fraction

$$1) \quad 0.4\dot{3}\dot{5}$$

$$\text{Let } x = 0.4353535\dots$$

$$10x = 4.353535\dots$$

①

$$1000x = 435.3535 \dots$$

(2)

$$\textcircled{2} - \textcircled{1} \quad 990x = 431$$

$$x = \frac{431}{990}$$

$$2) \quad 0.\dot{2}5\dot{7}$$

$$\text{Let } x = 0.257257 \dots$$

(1)

$$1000x = 257.257257 \dots$$

(2)

$$\textcircled{2} - \textcircled{1} \quad 999x = 257$$

$$x = \frac{257}{999}$$

Prime Factors

$$84$$

$$2 \overline{)84}$$

$$2 \overline{)42}$$

$$3 \overline{)21}$$

$$7 \overline{)7}$$

$$84 = 2 \times 2 \times 3 \times 7$$

1)

$$2) \quad 120$$

$$2 \overline{)120}$$

$$2 \overline{)60}$$

$$2 \overline{)30}$$

$$3 \overline{)15}$$

$$5 \overline{)5}$$

$$120 = 2 \times 2 \times 2 \times 3 \times 5$$

$$= 2^3 \times 3 \times 5$$

Negative and fractional Indices

$$x^{-p} = \frac{1}{x^p}$$

$$x^{\frac{1}{p}} = \sqrt[p]{x}$$

$$x^{p/q} = (\sqrt[q]{x})^p$$

$$5^{-3} = \frac{1}{5^3} = \frac{1}{125}$$

$$64^{\frac{1}{3}} = \sqrt[3]{64} = 4$$

$$27^{\frac{2}{3}} = (\sqrt[3]{27})^2 = 3^2 = 9$$

$$\left(\frac{9}{64}\right)^{-\frac{1}{2}} = \left(\frac{64}{9}\right)^{\frac{1}{2}} = \sqrt{\frac{64}{9}} = \frac{\sqrt{64}}{\sqrt{9}} = \frac{8}{3}$$

Surds

$$\sqrt{2} + \sqrt{50}$$

$$\sqrt{2} + \sqrt{25 \times 2}$$

$$= \sqrt{2} + 5\sqrt{2} = 6\sqrt{2}$$

$$\sqrt{48} - \sqrt{27}$$

$$\sqrt{16 \times 3} - \sqrt{9 \times 3}$$

$$= 4\sqrt{3} - 3\sqrt{3} = \sqrt{3}$$

$$(5 + 2\sqrt{3})(3 - 4\sqrt{3})$$

$$= 15 + 6\sqrt{3} - 20\sqrt{3} - 24$$

$$= -9 - 14\sqrt{3}$$

Rationalising Denominator

$$\frac{5}{\sqrt{7}} = \frac{5}{\sqrt{7}} \times \frac{\sqrt{7}}{\sqrt{7}} = \frac{5\sqrt{7}}{7}$$

$$\frac{12}{\sqrt{3}} = \frac{12}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{12\sqrt{3}}{3} = 4\sqrt{3}$$

$$\frac{3}{4+\sqrt{5}} = \frac{3}{4+\sqrt{5}} \times \frac{4-\sqrt{5}}{4-\sqrt{5}}$$

$$= \frac{12 - 3\sqrt{5}}{4^2 - \sqrt{5}^2} = \frac{12 - 3\sqrt{5}}{16 - 5}$$
$$= \frac{12 - 3\sqrt{5}}{11}$$

Standard Form

$$857,000 = 8.57 \times 10^5$$

$$0.00416 = 4.16 \times 10^{-3}$$

$$\left(4.2 \times 10^8\right) \times \left(3 \times 10^9\right)$$

$$= 12.6 \times 10^{17}$$

$$= 1.26 \times 10^{18}$$

Mult

$$9.6 \times 10^{20} \div 3 \times 10^5$$

Div

$$= \frac{9.6 \times 10^{20}}{3 \times 10^5}$$

$$= 3.2 \times 10^{15}$$

$$6.2 \times 10^5 + 4.3 \times 10^4$$

Add

$$\begin{array}{r} 620000 \\ + 43000 \\ \hline 663000 \end{array} = 6.63 \times 10^5$$

$$4.14 \times 10^4 - 3.2 \times 10^3$$

Subtract

$$\begin{array}{r} ~~3~~ 1400 \\ - 3200 \\ \hline 38200 \end{array} = 3.82 \times 10^4$$

Brackets

$$6(2x - 3) - 4(x + 5)$$

$$= 12x - 18 - 4x - 20$$

$$= 8x - 38$$

$$5(3x + 2) + 7(4x - 8)$$

$$= 15x + 10 + 28x - 56$$

$$= 43x - 46$$

$$\begin{aligned}
& (x+2)(2x+3)(3x-5) \\
&= [2x^2 + 4x + 3x + 6](3x-5) \\
&= [2x^2 + 7x + 6](3x-5) \\
&= \begin{array}{r} 6x^3 + 21x^2 + 18x \\ - 10x^2 - 35x - 30 \\ \hline 6x^3 + 11x^2 - 17x - 30 \end{array}
\end{aligned}$$

$$\begin{aligned}
& (x+2)(x+3)(x+4) \\
&= [x^2 + 2x + 3x + 6](x+4) \\
&= [x^2 + 5x + 6](x+4) \\
&= \begin{array}{r} x^3 + 5x^2 + 6x \\ + 4x^2 + 20x + 24 \\ \hline x^3 + 9x^2 + 26x + 24 \end{array}
\end{aligned}$$

Algebraic Fractions

$$\begin{aligned} 1) \quad \frac{x+2}{3} + \frac{x+4}{5} &= \frac{5(x+2) + 3(x+4)}{15} \\ &= \frac{5x+10+3x+12}{15} \\ &= \frac{8x+22}{15} \end{aligned}$$

$$\begin{aligned} 2) \quad \frac{5}{x+1} + \frac{7}{x} &= \frac{5x + 7(x+1)}{x(x+1)} \\ &= \frac{5x + 7x + 7}{x(x+1)} \\ &= \frac{12x + 7}{x(x+1)} \end{aligned}$$

$$\begin{aligned} 3) \quad \frac{x^2 + 5x + 6}{x-1} \times \frac{x-1}{x^2 + 6x + 8} \\ &= \frac{\cancel{(x+2)}(x+3)}{\cancel{(x-1)}} \times \frac{\cancel{(x-1)}}{\cancel{(x+2)}(x+4)} = \frac{x+3}{x+4} \end{aligned}$$

$$\begin{aligned}
 4) \quad \frac{x^2 - 16}{x^2 + 6x + 8} &= \frac{x^2 - 4^2}{(x+2)(x+4)} \\
 &= \frac{\cancel{(x+4)}(x-4)}{(x+2)\cancel{(x+4)}} \\
 &= \frac{x-4}{x+2}
 \end{aligned}$$

Linear Inequality

$$2x + 3 < 11$$

$$2x < 11 - 3$$

$$2x < 8$$

$$x < \frac{8}{2}$$

$$x < 4$$

equ

$$2x + 3 = 11$$

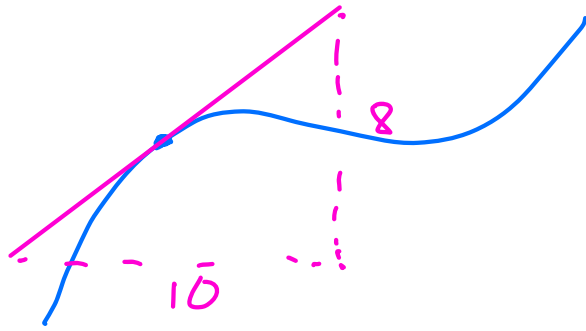
$$2x = 11 - 3$$

$$2x = 8$$

$$x = \frac{8}{2}$$

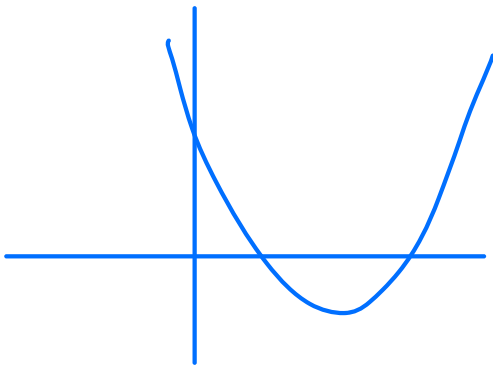
$$x = 4$$

Gradient of Curve

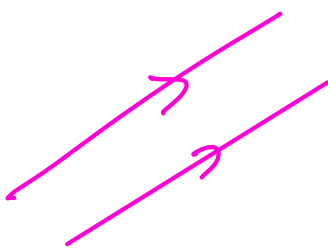


Gradient of curve
is gradient of
tangent at that point
gradient = $\frac{8}{10}$

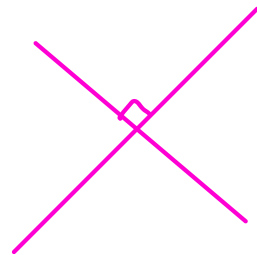
Quadratic Graph



Gradients of parallel and perpendicular lines



Parallel
Same gradient



Perpendicular

m and $-\frac{1}{m}$

eg $\frac{3}{2}$ $-\frac{2}{3}$

or 4 $-\frac{1}{4}$

Find eqn of line parallel to
 $y = 3x - 4$ passing through $(2, 7)$

Line is of form $y = 3x + c$

$(2, 7)$

$$7 = 3(2) + c$$

$$7 = 6 + c$$

$$7 - 6 = c$$

$$1 = c$$

Answer $y = 3x + 1$

Find eqn of perpendicular line
to $y = 2x + 3$ passing through $(4, 8)$

Line is of the form $y = -\frac{1}{2}x + c$

$(4, 8)$

$$8 = -\frac{1}{2}(4) + c$$

$$8 = -2 + c$$

$$8 + 2 = c$$

$$10 = c$$

Answer $y = -\frac{1}{2}x + 10$

Ratio

Share £40 between A and B
in ratio 5:3

$$8 \text{ shares} = £40$$

$$1 \text{ share} = \frac{£40}{8} = £5 \quad \text{so } £25 : £15$$

Cows : Sheep

$$4 : 3$$

Sheep : Pigs

$$7 : 4$$

Final ratio Cows : Sheep : Pigs

Cows Sheep Pigs

$$4 : 3$$

$$28 : 21$$

$$7 : 4$$

$$21 : 12$$

$$28 : 21 : 12$$

$$\text{Density} = \frac{\text{Mass}}{\text{Vol}}$$

A has density 5 g/cm^3

B has density 8 g/cm^3

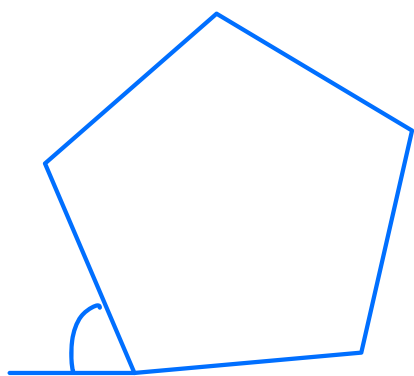
40g of B are mixed with 4 cm^3 of A
to make C Find density of compound C

	Density	Mass	Vol
A	5 g/cm^3	20g	4 cm^3
B	8 g/cm^3	$\frac{40\text{g}}{60\text{g}}$	$\frac{5 \text{ cm}^3}{9 \text{ cm}^3}$

$$\text{Density of C} = \frac{\text{Total Mass}}{\text{Total Vol}}$$

$$\text{Density of C} = \frac{60}{9} \text{ g/cm}^3$$

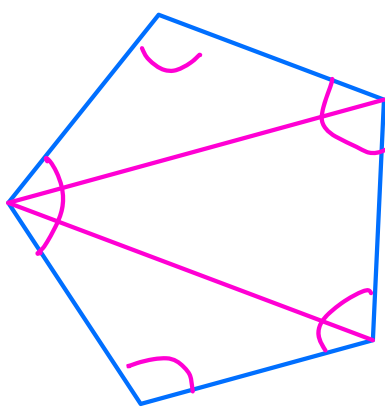
Ans is Polymer



ext angle of regular n-sided polygon

$$= \frac{360}{n}$$

$$\text{interior} = 180 - \text{exterior}$$



Sum of interior angles

$$= (n-2) \times 180$$

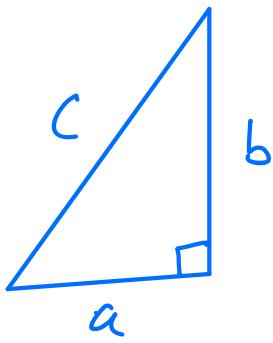
For pentagon $(5-2) \times 180$

$$= 3 \times 180$$

$$= \underline{540}$$

	30°	45°	60°
cos	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$
sin	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$
tan	$\frac{1}{\sqrt{3}}$	1	$\frac{\sqrt{3}}{1}$

Pythagoras



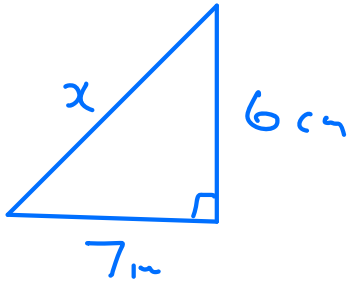
$$a^2 + b^2 = c^2$$

3, 4, 5

5, 12, 13

7, 24, 25

8, 15, 17



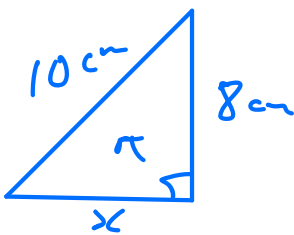
Find x as a surd

$$7^2 + 6^2 = x^2$$

$$49 + 36 = x^2$$

$$85 = x^2$$

$$\sqrt{85} = x$$



$$x^2 + 8^2 = 10^2$$

$$x^2 = 10^2 - 8^2$$

$$x^2 = 100 - 64$$

$$x^2 = 36$$

$$x = \sqrt{36} = 6 \text{ cm}$$