

Number Part 2



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Rules of indices

$$\bullet 5^3 \times 5^4 = 5^7$$

$$\bullet (5^3)^4 = 5^3 \times 5^3 \times 5^3 \times 5^3 = 5^{12}$$

$$\bullet 5^5 \div 5^3 = \frac{5 \times 5 \times 5 \times 5 \times 5}{1 \times 5 \times 5} = 5^2$$

$$\bullet 5^3 \div 5^3 = 1 = 5^0$$

$$\bullet 5^3 \div 5^5 = \frac{1}{5 \times 5} = \frac{1}{5^2} = 5^{-2}$$

$$\underline{a^m \times a^n = a^{(m+n)}}$$

$$\underline{(a^m)^n = a^{mn}}$$

$$\underline{a^m \div a^n = a^{(m-n)}}$$



Standard Form (SF)



- Write 387640000 in SF to 3s.f.

$$3.8764 \times 10^8 = 3.88 \times 10^8$$

- Write 0.000005796 in SF to 3s.f.

$$5.796 \times 10^{-6} = 5.80 \times 10^{-6}$$

- What is 3.46×10^7 as an ordinary number?

$$34600000$$

- What is 734.8×10^3 in SF

$$7.348 \times 10^5$$

- What is 0.00389×10^{-3} in SF

$$3.89 \times 10^{-6}$$



Four rules in SF

- What is $(3 \times 10^7) \times (7 \times 10^5)$ $\approx 21 \times 10^{12} = 2.1 \times 10^{13}$
- What is $(8 \times 10^{-3}) \times (7 \times 10^{-4})$ $\approx 56 \times 10^{-7} = 5.6 \times 10^{-6}$
- What is $(8 \times 10^7) \div (2 \times 10^5)$ $\approx \frac{8}{2} \times \frac{10^7}{10^5} = 4 \times 10^2$
- What is $(2 \times 10^7) \div (4 \times 10^{-3})$ $\approx 0.5 \times 10^{10} = 5 \times 10^9$
- What is $(3 \times 10^4) + (2.8 \times 10^5)$ $\approx 0.3 \times 10^5 + 2.8 \times 10^5 = 3.1 \times 10^5$



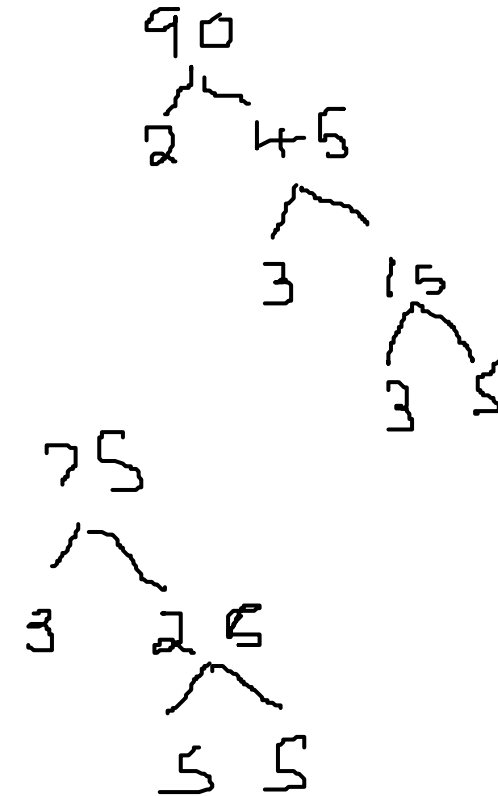
Prime Factor Form (expressing as a product of its prime factors)

- Express 90 as a product of its prime factors

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

- Express 75 as a product of its prime factors

$$= 3 \times 5 \times 5$$



- Find the HCF and LCM of 75 and 90

$$HCF = 3 \times 5 = 15$$

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

$$LCM = 15 \times 2 \times 3 \times 5$$
$$= 450$$

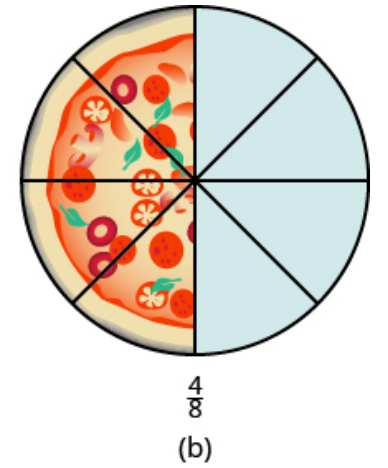
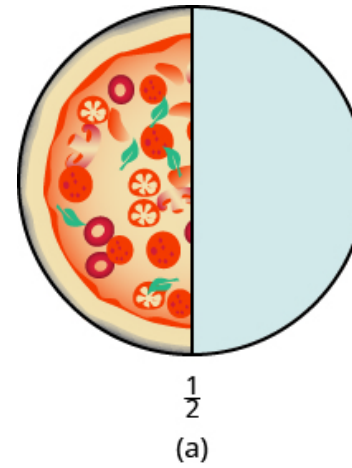


Fractions

• $\frac{3}{8} = \frac{9}{?} = \frac{?}{40}$

Handwritten annotations: A bracket above the first two fractions is labeled "x 3". A bracket below the last two fractions is labeled "x 5".

$$\frac{9}{24} = \frac{15}{40}$$



• $\frac{3}{5} + \frac{3}{8} = \frac{24}{40} + \frac{15}{40} = \frac{39}{40}$

Handwritten annotations: A bracket below the first two fractions is labeled "x 8". A bracket below the last two fractions is labeled "x 5".



Fractions



$$\bullet \frac{3}{10} \times \frac{5}{8} = \frac{15}{80}$$

$$= \frac{3}{16}$$

$$\bullet 4\frac{4}{5} \times 2\frac{7}{9} = \frac{24}{5} \times \frac{25}{9} = \frac{600}{45} = 13\frac{20}{9}$$

$$\bullet \frac{3}{10} \div \frac{9}{15} = \frac{3}{10} \times \frac{15}{9} = \frac{45}{90} = \frac{1}{2}$$

$$\bullet \frac{7}{12} - \frac{3}{8} = \frac{14}{24} - \frac{9}{24} = \frac{5}{24}$$



Percentages

- What is 20% as a fraction and as a decimal

$$\frac{20}{100} = \frac{2}{10} = \frac{1}{5}$$

$$20\% = 0.2$$

- What is 20% of £280?

$$10\% = \pounds 28$$

$$20\% = \pounds 56$$

$$\frac{20}{100} \times \frac{280}{1} = \frac{56}{1} = \pounds 56$$

- Reduce £60 by 30%

$$10\% = \pounds 6$$

$$30\% = \pounds 18$$

$$= 60 - 18 = \pounds 42$$



Percentages (expressing as a %)



- What is 11 out of 20 as a %?

$$\frac{11}{20} = \frac{55}{100} = 55\% \quad \frac{11}{20} \times \frac{100}{1} = 55\%$$

- Express 8 as a % of 40 or what is 8 out of 40 as a %?

$$\frac{8}{40} \times \frac{100}{1} = 20\%$$

- What is 28 as a % of 73 to 3 s.f.

$$\frac{28}{73} \times 100 = 38.356 = 38.4\%$$



Percentages (using multipliers)

- Multiplier to increase by 5% $100\% + 5\% = 105\% = \underline{\underline{1.05}}$
- Multiplier to decrease by 18% $100\% - 18\% = 82\% = 0.82$
- Increase of 8% then increase of 10% $(1.08 \times 1.1) = \underline{\underline{1.188}} \quad 18.8\%$
- Increase £220 by 5% then decrease by 5%

$$220 \times 1.05 = £231 \times 0.95 = £219.45$$



Compound Interest and depreciation

- I invest £12000 at 3% Compound Interest for 8 years, how much now?

$$12000 \times 1.03^8 = \pounds 15201.24$$

- A car loses 15% of its value each year from £20000, how much is it worth after 6 years?

$$20000 \times 0.85^6 = \pounds 7542.99$$

- I invest £3000 for 3 years and now have £3993, what was the interest rate?

$$\frac{3993}{3000} = (1.03)^3 = 1.1 = 10\%$$



Harder %'s

- I buy a car for £2000 and sell it for £2500. What is my % profit?

$$\frac{\text{Change}}{\text{Original}} \times 100 = \frac{500}{2000} \times 100 = 25\% \text{ profit}$$

- A meal costs £132 including 10% service. What did it cost without service?

$$x \times 1.1 = 132 \quad 132 \div 1.1 = \pounds 120$$

- With 70% off a jacket costs £36. What did it cost before?

$$x \times 0.3 = 36 \quad 36 \div 0.3 = \pounds 120$$



Ratio

- Simplify 10 apples : 15 oranges

$$2a : 3o$$

$$\frac{2}{5} \text{ or } \frac{10}{25}$$



If Squash is 3 parts juice to 10 parts water 3:10

- How much water would you add to 12cl of juice?

$$3p : 12cl$$

$$1p : 4cl$$

$$10 \text{ parts} = 10 \times 4 = 40cl$$

- How much juice is in 78cl of squash? $3 + 10 = 13p$

$$13p : 78cl$$

$$1p : 6cl$$

$$3p = 3 \times 6 = 18cl$$



Ratio (a tough question)

- I have red, blue and green counters. I want the ratio of red to blue to be 2 : 3 and the ratio of blue to green to be 2 : 1 using less than 100 counters what is the most counters I can use?

$$\begin{array}{l} 2R : 3B \\ 4R : 6B \\ 2B : 1G \\ 6B : 3G \end{array}$$

$$4R : 6B : 3G = 13$$

$$\frac{100}{13} = 7.692$$

$$7 \times 13 = \underline{\underline{91 \text{ counters}}}$$

