

Making Connections

The Power of Interweaving

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Interweaving

Using questions and tasks that bring together multiple different topics from across mathematics.

Interweaving

It's not interleaving!



Averages with... Surds

For each set of numbers find: (i) the mean, (ii) the median, (iii) the range.

Leave your answers in their simplest form.

a) $5\sqrt{3}$ $4\sqrt{3}$ $6\sqrt{3}$

b) $\sqrt{3}$ $\sqrt{108}$ $\sqrt{12}$

c) $2\sqrt{12}$ $4\sqrt{12}$ $3\sqrt{27}$

d) $2\sqrt{27}$ $3\sqrt{12}$ $\sqrt{243}$

e) $2\sqrt{75}$ $\sqrt{48}$ $5\sqrt{12}$

f) $\sqrt{243}$ $5\sqrt{27}$ $3\sqrt{75}$

g) $\sqrt{20}$ $\sqrt{20}$ $\sqrt{80}$ $\sqrt{320}$

h) $\sqrt{28}$ $\sqrt{63}$ $3\sqrt{63}$ $4\sqrt{7}$

i) $-\sqrt{99}$ $2\sqrt{44}$ $-\sqrt{11}$ $4\sqrt{44}$

j) 0 $-2\sqrt{44}$ $-4\sqrt{44}$ $\sqrt{44}$

k) $\sqrt{2}$ $-\sqrt{18}$ $\sqrt{48}$ $\sqrt{8}$

l) $2\sqrt{150}$ $-2\sqrt{54}$ $2\sqrt{24}$ $-2\sqrt{96}$

Solving Linear Equations with... **Standard Form**

1) $x + 3 \times 10^6 = 5 \times 10^6$

2) $0.7x + 3.3 \times 10^6 = 5.4 \times 10^6$

3) $1.3x - 3.7 \times 10^{-3} = 5.4 \times 10^{-3}$

4) $(2.3 \times 10^3)x = 9.2 \times 10^{-5}$

5) $(6.1 \times 10^{11})x = 8 \times 10^6 - (3.5 \times 10^{11})x$

6) $3 \times 10^{-2} + 5x = 3x + 8 \times 10^{-2}$

7) $(3 \times 10^{-2})x + 5 = 3 + (8 \times 10^{-2})x$

8) $8x + 2.6 \times 10^8 = 12x + 1.2 \times 10^8$

9) $x + 3 \times 10^5 = 5 \times 10^6$

10) $0.7x - 1.1 \times 10^4 = 5.4 \times 10^6$

11) $1.3x + 5.3 \times 10^{-4} = 9 \times 10^{-7}$

12) $(9.2 \times 10^3)x = 2.3 \times 10^{-5}$

13) $(1.2 \times 10^{11})x = 8 \times 10^6 - (5 \times 10^9)x$

14) $3 \times 10^{-2} + 5x = 3x + 8 \times 10^{-3}$

15) $(2 \times 10^{-2})x - 7 = 11 + (8 \times 10^{-3})x$

16) $11x + 2.4 \times 10^8 = 1.2 \times 10^{12} - 13x$

Solving Trig Equations with... The Factor Theorem

Solve each equation in the given region:

Round answers to 1 decimal place, where appropriate.

- 1) $6 \sin^3 x - 5 \sin^2 x - 3 \sin x + 2 = 0$, for $0^\circ \leq x < 360^\circ$,
- 2) $12 \cos^4 x - \cos^3 x - 18 \cos^2 x + \cos x + 6 = 0$, for $-180^\circ \leq x < 180^\circ$,
- 3) $6 \tan^5 x + 35 \tan^4 x + 62 \tan^3 x + 35 \tan^2 x + 6 \tan x = 0$, for $0^\circ \leq x < 180^\circ$.

- 4) $2 \cos^3 x + 3 \sin^2 x - 8 \cos x - 6 = 0$, for $0^\circ \leq x < 720^\circ$,
- 5) $-3 \sin(x) \cos^2 x + 11 \sin^2 x - 16 \sin x + 5 = 0$, for $-360^\circ \leq x < 360^\circ$,
- 6) $\tan(x) \sin^2 x - 3 \sin^2 x - 10 \sin(x) \cos x + 24 \cos^2 x = 0$, for $-360^\circ \leq x < 0^\circ$.

- 7) $6 \sin^4 2x - 5 \sin^3 2x - 14 \sin^2 2x - \sin 2x + 2 = 0$, for $0^\circ \leq x < 180^\circ$,
- 8) $5 \cos^5 3x - 19 \cos^4 3x - 9 \cos^3 3x + 79 \cos^2 3x - 44 \cos 3x - 12 = 0$, for $0^\circ \leq x < 120^\circ$,
- 9) $\tan^4(4x + 5) - 27 \tan^2(4x + 5) - 14 \tan(4x + 5) + 120 = 0$, for $0^\circ \leq x < 90^\circ$.

Reciprocals with... Equations

By forming and solving an equation, find the following:

- a) A number that is $\frac{1}{4}$ of its reciprocal
- b) A number that is 36% of its reciprocal
- c) Two numbers that are their own reciprocals
- d) Two numbers that are 2.1 greater than their reciprocals
- e) Two numbers that are 1 greater than their reciprocals
- *f) A number and its reciprocal that have a mean of $\frac{29}{20}$

Why do Interweaving?

1 – Making Connections

2 – Retrieval

3 – Depth

4 – Challenge

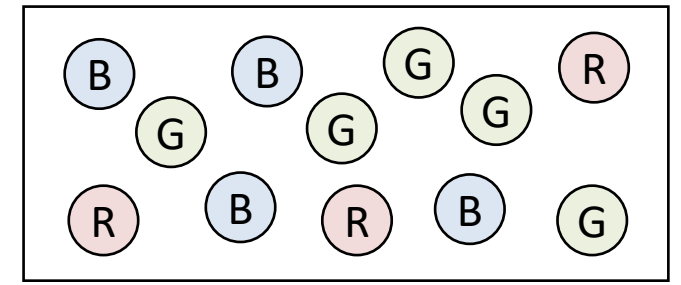
5 – Purpose

Proportional Reasoning

12% of a number is 4.

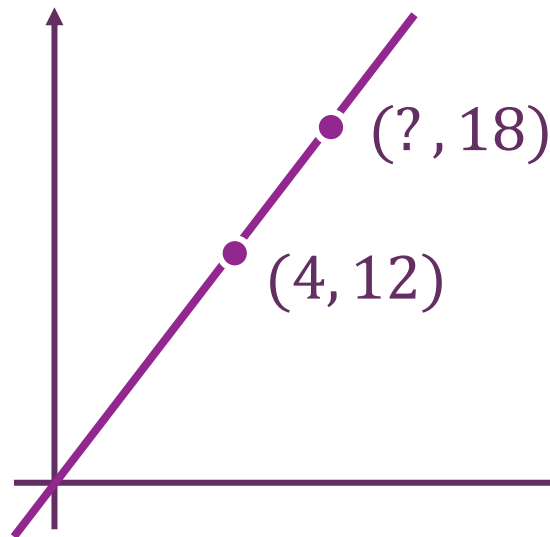
What is 18% of that number?

$$\frac{4}{12} = \frac{?}{18}$$



Charlotte takes a counter from the box at random 18 times. Estimate the number of times she will take a blue counter.

Which is the odd one out?



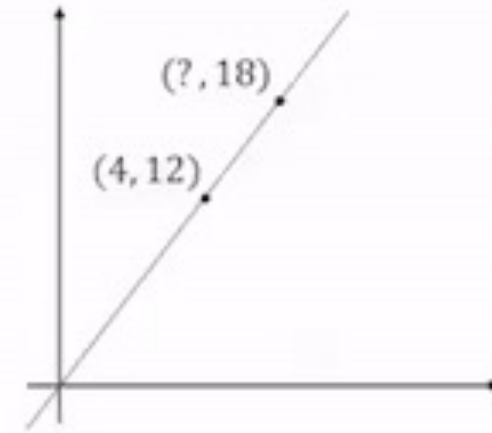
Jonny walks 12 miles in 4 hours. How far does he walk in 18 hours?

Proportional Reasoning

$$\frac{4}{12} = \frac{?}{18}$$

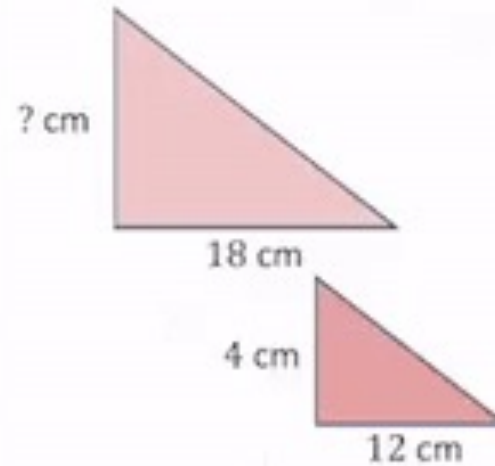
Kathryn earns £12 for every 4 trees she plants.

How much does she earn for planting 18 trees?



Maryse walks 12 miles in 4 hours.

How long does it take her to walk 18 miles?



4 yards is equal to 12 feet.

How many yards are there in 18 feet?

Multiplication

What is...

$$\frac{1}{3} + \frac{1}{4}$$

Solve...

$$3x = 12$$

Find the area of...



$$3 \times 4 = 12$$

Calculate...

3% of £400

Share £12...

in the ratio 3 : 1

Expand...

$$3(4x - 1)$$

What is...

$$\frac{1}{32} + \frac{1}{45}$$

Solve...

$$32x = 1440$$

Find the area of...



Given that $32 \times 45 = 1440$...

Calculate...

32% of £45

Share £1440...

in the ratio 44 : 1

Expand...

$$32(45x - 1)$$

Multiplication

What is...

$$\frac{1}{16} + \frac{1}{45}$$

Solve...

$$32x = 1472$$

Find the area of...



Given that $32 \times 45 = 1440$...

Calculate...

33% of £45

Share **£1395**...

in the ratio 44 : 1

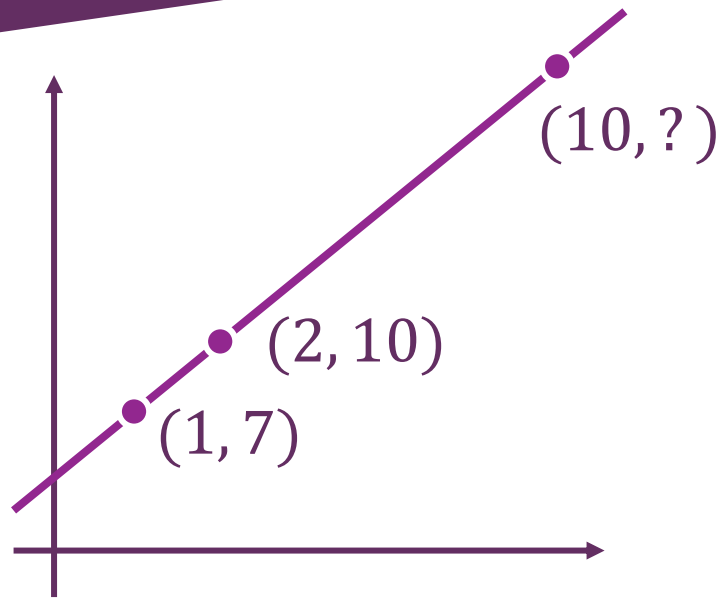
Expand...

31(45x - 46)

Linear Relationships

Find the 10th term of the sequence

7, 10, ...



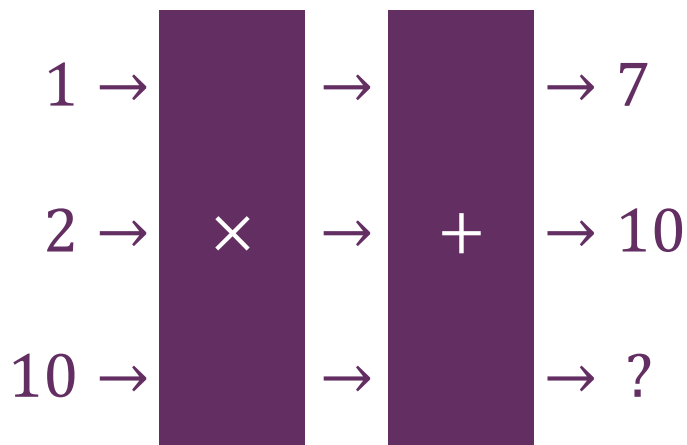
A taxi fare includes a call-out fee and a price per mile driven.

1 mile → £7 total

2 miles → £10 total

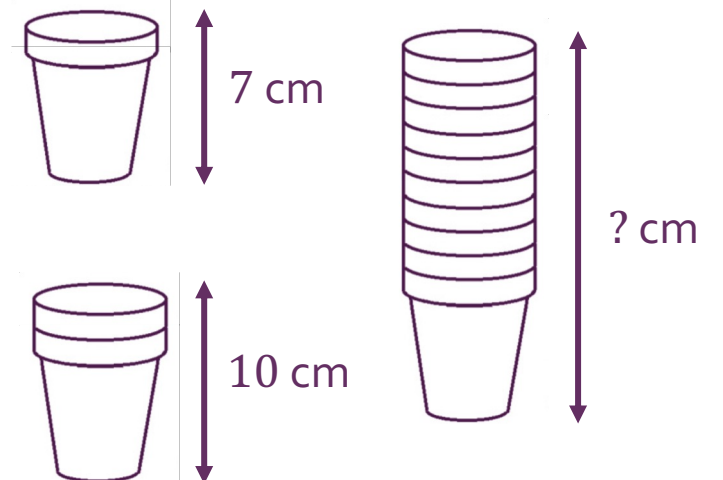
10 miles → ?

Change each question to make the answer 43



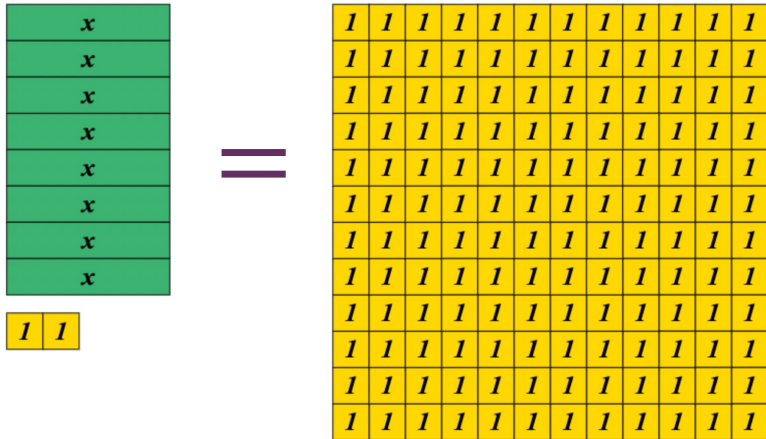
$$\triangle \square = 7$$
$$\triangle \triangle \square = 10$$

$$\triangle \triangle \triangle \triangle \triangle \triangle \triangle \triangle \triangle \square = ?$$



Different Presentations

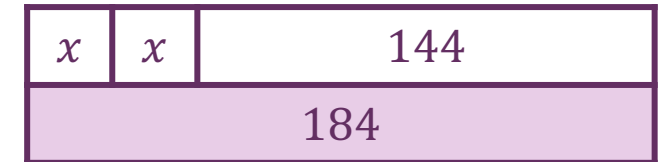
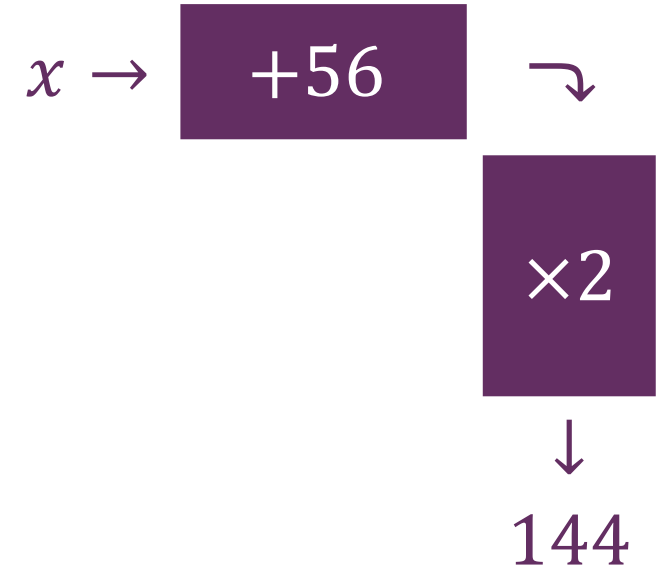
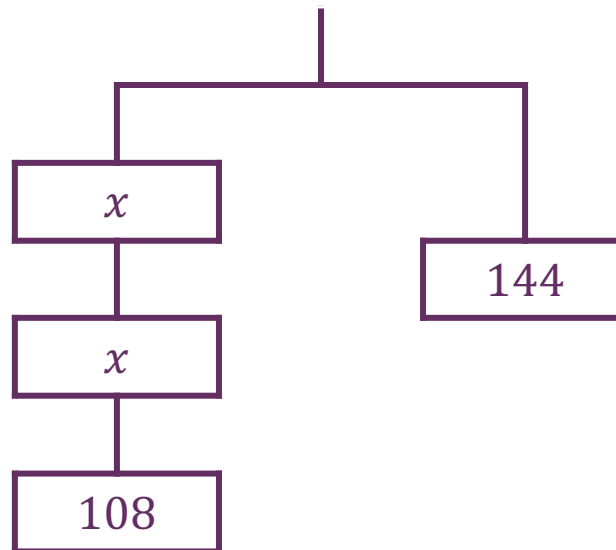
$$2x + 144 = 180$$

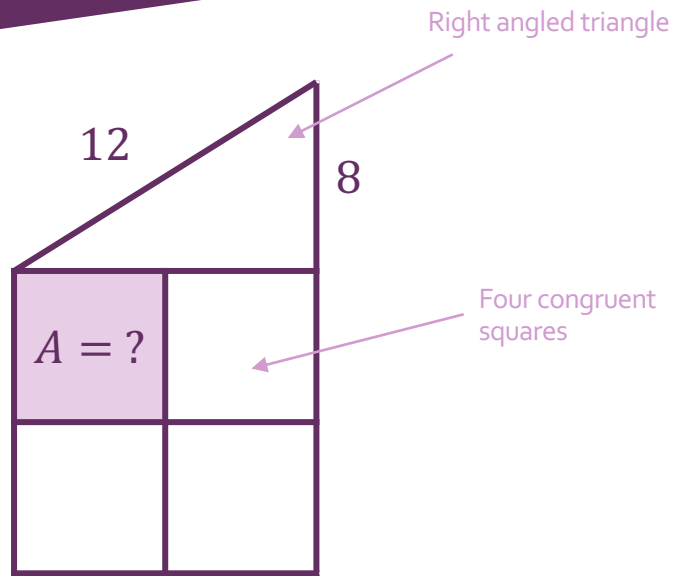
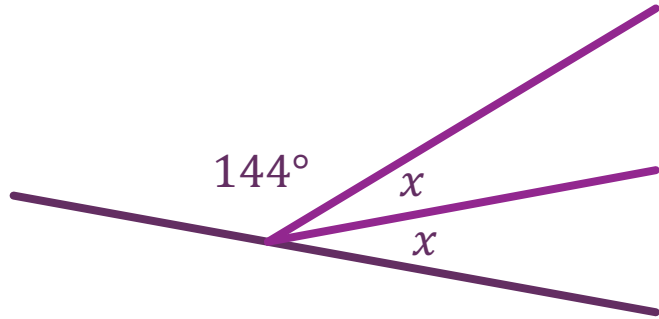


I think of a number,
multiply it by 4,
and add 64.

I end up with 144.
What did I start with?

Pair them up





56

$$P = 144$$

?

Pair them up

Anne and Bob share £144 in the ratio $2 : x$

Anne receives £16.

An isosceles triangle has an angle of 144° .

What are the other angles?

$(x, 184)$ lies on the line $y = 2x + 144$

What is x ?

Pondering Planning in Mathematics

Thoughts about lesson planning: based on conversations with teachers, stuff I've read and courses attended.

[Home](#) [Contents](#) [About this blog](#) [Contact](#)

Using Numbers to Highlight Connections

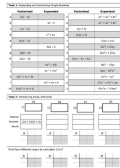
 Pondering Planning  Uncategorized  April 13, 2022  7 Minutes

This year I had the pleasure of contributing a chapter to a book edited by Ed Southall and published by The Mathematical Association called '[If I Could Tell You One Thing](#)'. The chapter discusses a collection of situations where the numbers that are used in a worked example or practice question can obscure the reasoning behind the calculations

Interwoven Maths



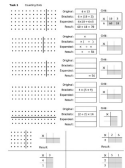
- Home
- Contents
- Interwoven Tasks
- Worked Examples
- Booklets
- Other



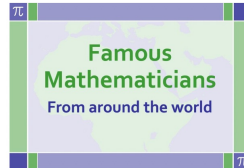
(BK) Expanding and Factorising Quadratics



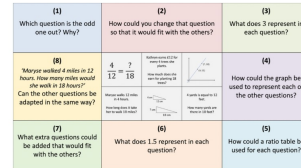
Daydream Interweaver



(BK) Distributivity



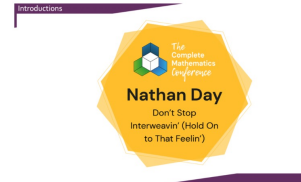
Famous Mathematicians From Around the World



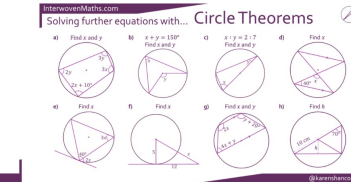
(IW) Interwoven Proportion



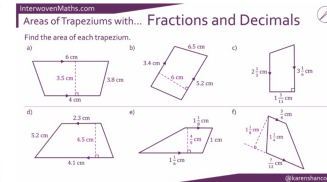
(BK) Fractions, Decimals, Bounds



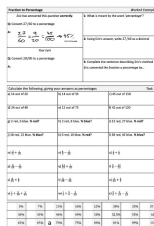
Don't Stop Interweavin'



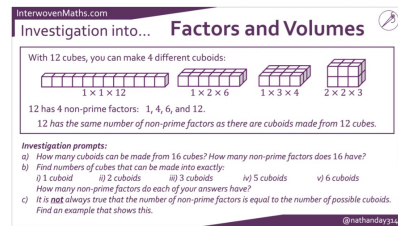
(IW) Solving Further Equations from Circle Theorems



(IW) Areas of Trapeziums



(BK) Percentages



(IW) Investigation into Factors and Volumes



(BK) Simultaneous Equations

Nathan Day
The History and Future of Mathematics



The History and Future of Mathematics

Thank you!



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Nottingham, England [interwovenmaths.com](https://www.interwovenmaths.com) Joined March 2015

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