Some Observations

Not Linear

Doubling an angles does NOT usually double the ratio. Compare $\sin 10°$ with $\sin 20°$, for example.

$$\text{generally, ...} \qquad \sin(2x) \neq 2\sin x$$

"sin" IS NOT a number

If x, y and z are real numbers, then certainly, $x(y+z) = xy + xz$ is true by the Distributive Law, but sin is not a real number, and the Distributive Law does not apply to it.

$$\text{generally, ...} \qquad \sin(y+z) \neq \sin y + \sin z$$

"sin 23°" IS a number

By the very definition sin of some angle, θ, IS a ratio. Thus, its a real number, thus if follows all Real Number Axioms, such as DL, Associations Laws, Commutativity Laws, etc...

$$\text{generally, ...} \qquad (y+z)\sin 23° = y\sin 23° + z\sin 23°$$

Special Exponent Notation By convention, the following notation has been adopted for exponents.

$$[\sin x][\sin x] = [\sin x]^2 = \sin^2 x$$

Special Exponent Notation

By convention, the following notation has been adopted for exponents.

$$\sin x^2 = \sin\left(x^2\right) = \sin(x \cdot x)$$

Special Exponent Notation

By convention, the -1 exponent has been reserved for composition inverse, not multiplicative inverse of the functions. That is..

$$\frac{1}{\sin x} \neq \sin^{-1} x \qquad \text{.... however,} \qquad \frac{1}{\sin x} = [\sin x]^{-1}$$

sec, csc, or cot NOT on most Calculators

To calculate $\sec 23°$ for example, you will most likely calculate $\cos 23°$, then find the reciprocal. sec NOT on CALCULATOR, Do not confuse with $\cos^{-1}$ button which IS on most scientific calculators.

Some Observations

1. $$\frac{\cos 10^\circ}{\cos 30^\circ} = \frac{1}{3}$$

   A. TRUE B. FALSE

2. $$\frac{\tan 100^\circ}{\tan 50^\circ} = 2$$

   A. TRUE B. FALSE

3. $$\tan\left(100^\circ + 50^\circ\right) = \tan\left(100^\circ\right) + \tan\left(50^\circ\right)$$

   A. TRUE B. FALSE

4. Generally,
   $$\tan\left(xy\right) = \tan\left(x\right) \cdot \tan\left(y\right).$$

   A. TRUE B. FALSE

5. Generally,
   $$\tan\left(2y\right) = 2\tan\left(y\right).$$

   A. TRUE B. FALSE

6. Generally,
   $$\sin\left(2y\right) = 2\sin\left(y\right).$$

   A. TRUE B. FALSE

7. Generally,
   $$\cos\left(-5y\right) = -5\cos\left(y\right).$$

   A. TRUE B. FALSE

8. Generally,
   $$\frac{\cos\left(10x\right)}{x} = \cos 10$$

   A. TRUE B. FALSE

9. NOT LINEAR:
   (a) Calculate $\cos 10^\circ$

   Solution: $\cos 10^\circ \approx 0.985584766909560709$

   (b) Calculate $\cos 20^\circ$

   Solution: $\cos 20^\circ \approx 0.939372712847378920$

   (c) Does doubling an angle generally double the corresponding cosine ratio?

   Solution: most definitely not..

   (d) Does doubling an angle double the adjacent to hypothenuse ratio? Draw a for each of the ref. triangles.

Solution: done above...

(e) Make your best guess (TRUE OR FALSE): generally...

$$\cos 2x = 2\cos x$$

Solution: generally false... may occasionally be true for certain values of x.

Solution:

10. NOT LINEAR:

(a) Calculate $\cos 20°$

Solution: $\cos 20° \approx 0.939372712847378920$

(b) Calculate $\cos 60°$

Solution: $1/2$

(c) Does tripling an angle generally triple the corresponding cosine ratio?

Solution: most definitely not..

(d) Does tripling an angle generally triple the adjacent to hypothenuse ratio? Draw a for each of the ref. triangles.

Solution: most definitely not..

(e) Make your best guess (TRUE OR FALSE): generally...

$$\cos 3x = 3\cos x$$

Solution: generally false... may occasionally be true for certain values of x.

Solution:

11. NOT LINEAR:

(a) Calculate $\sin 30°$

Solution: $\frac{1}{2}$

(b) Calculate $\sin 60°$

Solution: $\frac{\sqrt{3}}{2}$

(c) Does doubling an angle generally double the sine ratio?

Solution: most definitely not..

(d) Does doubling an angle generally double the opp to hypothenuse ratio?

Solution: most definitely not..

(e) Make your best guess (TRUE OR FALSE): generally...

$$\sin 2x = 2\sin x$$

Solution: generally false... may occasionally be true for certain values of x.

Solution:

12. 'cos' is not a number :

(a) Calculate $\cos 30°$

Solution: $\frac{\sqrt{3}}{2}$

(b) Calculate $\cos 15°$

Solution: $\cos 15° \approx 0.966389978134513226$

(c) Calculate $\cos 45°$

Solution: $\frac{1}{\sqrt{2}}$

(d) :

$$\cos 45° = \cos(30° + 15°) = \cos 30° + \cos 15$$

Solution: $\frac{1}{\sqrt{2}} \neq \frac{\sqrt{3}}{2} + 0.966389978134513226$

(e) Make your best guess (TRUE OR FALSE): generally...

$$\cos(x + y) = \cos x + \cos y$$

Solution: the above exercises show this is generally not true.

Solution:

13. 'sin' is not a number :

(a) Calculate $\sin 100°$

(b) Calculate $\sin 80°$

(c) Calculate $\sin 180°$

(d) (TRUE OR FALSE):

$$\sin 180^\circ = \sin(100^\circ + 80^\circ) = \sin 100^\circ + \sin 80^\circ$$

(e) Make your best guess (TRUE OR FALSE): generally...

$$\sin(x + y) = \sin x + \sin y$$

Solution: the above exercises show this is generally not true.

Solution:

14. 'sin' is not a number :

(a) Calculate $\sin 180^\circ$

Solution: 0

(b) Calculate $\sin 360^\circ$

Solution: 0

(c) Calculate $\sin 540^\circ$

(d) (TRUE OR FALSE):

$$\sin 540^\circ = \sin(180^\circ + 360^\circ) = \sin 180^\circ + \sin 360^\circ$$

Solution: this is true.. $0 + 0 = 0$ ... lucky shot...

(e) Make your best guess (TRUE OR FALSE): generally...

$$\sin(x + y) = \sin x + \sin y$$

Solution: generally not true.. try...

$$\sin(90^\circ + 90^\circ) \neq \sin 90^\circ + \sin 90^\circ$$

since

$$0 \neq 1 + 1$$

Solution:

15. 'sin' is not a number:

(a) (TRUE OR FALSE explain your answer):

$$\frac{5c}{5w} = \frac{c}{w}$$

Solution: True, you should try to explain...

(b) (TRUE OR FALSE explain your answer):

$$\frac{5w}{3w} = \frac{5}{3}$$

Solution: True, so long as these are non zero constants.... you should try to explain...

(c) (TRUE OR FALSE explain your answer):

$$\frac{xyzc}{xyzw} = \frac{c}{w}$$

Solution: True, so long as these are non zero constants.... you should try to explain...

(d) (TRUE OR FALSE explain your answer):

$$\frac{\sin c}{\sin w} = \frac{c}{w}$$

Solution: not true.. 'sin' is not a non zero constant.. in fact it is not a constant.. it is a function

(e) (TRUE OR FALSE explain your answer):

$$\frac{\sin 30^\circ}{\sin 60^\circ} = \frac{30^\circ}{60^\circ}$$

Solution: not true.. 'sin' is not a non zero constant.. in fact it is not a constant.. it is a function

(f) (TRUE OR FALSE explain your answer):

$$(xy)z = x(yz)$$

Solution: True, so long as these are constants.... associative law of mult....

(g) (TRUE OR FALSE explain your answer):

$$(\sin y)z = \sin(yz)$$

Solution: not true... "sin" is not a constant.. no associative law for this..

(h) (TRUE OR FALSE explain your answer):

$$xy = yx$$

Solution: True, so long as these are constants.... commutativity law of mult....

(i) (TRUE OR FALSE explain your answer):

$$\sin y = y \sin$$

Solution: NOT True, so long as these are NOT constants.... NO commutativity law of mult.... here..

Solution:

16. 'sin 23°' IS a number:

(a) (TRUE OR FALSE explain your answer):

$$\frac{5 \sin 23^\circ}{7 \sin 23^\circ} = \frac{5}{7}$$

(b) (TRUE OR FALSE explain your answer):

$$(\sqrt{5} + 3) \sin 23^\circ = \sqrt{5} \sin 23^\circ + 3 \sin 23^\circ$$

(c) (TRUE OR FALSE explain your answer):

$$(\sqrt{3}t)(\sin 23^\circ) = (\sqrt{3})(t \sin 23^\circ)$$

(d) (TRUE OR FALSE explain your answer):

$$5(\sin 23^\circ) = (\sin 23^\circ)5$$

(e) (TRUE OR FALSE explain your answer):

$$\text{if} \quad x(\sin 23^\circ) = 7 \quad \text{then} \quad x = \frac{7}{\sin 23^\circ}$$

Solution:

17. 'sin' is not a number:

(a) (TRUE OR FALSE explain your answer):

$$5c = c5$$

(b) (TRUE OR FALSE explain your answer):

$$xyzw = wxyz$$

(c) (TRUE OR FALSE explain your answer):

$$\sin w = w \sin$$

Solution:

18. 'sin' is not a number:

(a) (TRUE OR FALSE explain your answer):

$$\text{if} \quad 5c = x \quad \text{then} \quad c = \frac{x}{5}$$

(b) (TRUE OR FALSE explain your answer):

$$\text{if} \quad yc = x \quad \text{then} \quad c = \frac{x}{y}$$

(c) (TRUE OR FALSE explain your answer):

$$\text{if} \quad \sin c = x \quad \text{then} \quad c = \frac{x}{\sin}$$

Solution: