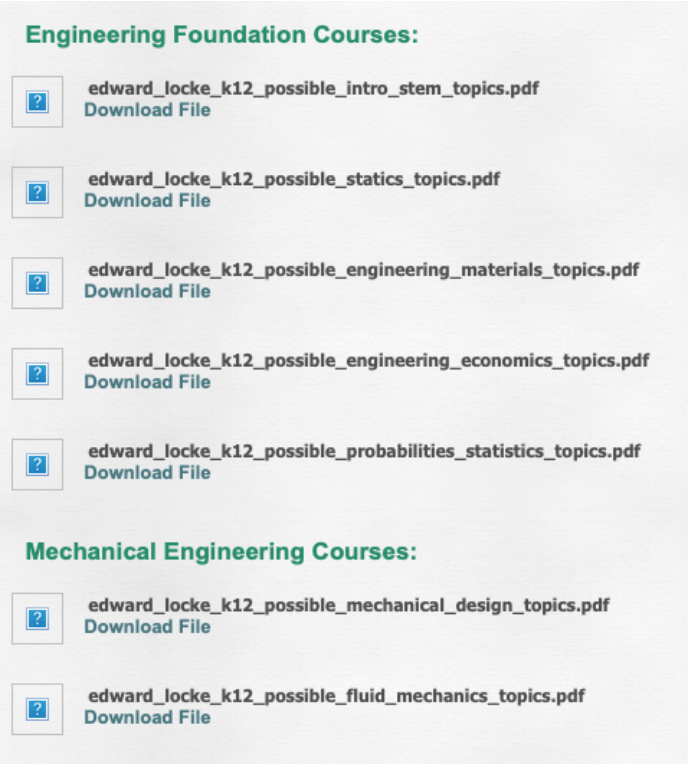
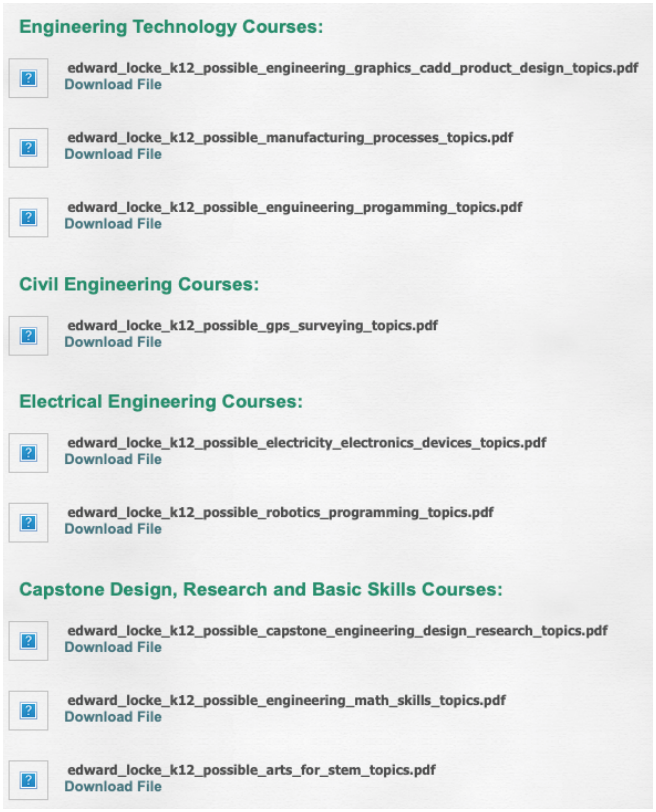
Math Skills for K-12 Age-Possible Engineering Courses
By Edward Locke | Monday, July 17, 2023

This report is compiled from data available from Edward Locke's research reports at:
https://suniseacreation.weebly.com/edward-lockes-innovation-deal-usa-21st-century-project.html

Edward Locke's
Innovation Deal USA in the 21st Century
Project for an Interactive K12 Engineering Curriculum
(IDUSA21-PIK12EC)
Special Exhibition 2019

Edward Locke's reports on research outcomes on the topics of K-12 age-possible engineering and technology course content or topics





K-12 Age-Possible Engineering Courses

Pre-Calculus Math

Basics Arithmetic

Numbers:

1. [set]
2. [variable]
3. [sign] (+, -)
4. [absolute value]
5. [percentage]
6. [integer], [fraction] and [decimals]
7. [limit] and [infinity]
8. [inequality]
9. [square] and [square root]
10. [problem-solving steps]
11. [summation] and [sigma notation]
12. [systems of units] (metric, customary) [precision], [significant digit]
13. and [unit conversion]
14. [binary number system] (0, 1)

Computations:

1. [four operations]
2. [power]
3. [root]
4. [exponent]
5. [remainder]
6. [scale]
7. [ratio]

Measurements:

1. [space] (length, width, depth or thickness, radius, angle)
2. [time]

Geometry

Geometry Basics:

1. [two-dimensions] [multiple dimensions]
2. [measurements] (distance or length, width, height, angle in degrees, minutes, seconds, arc, chord, radians),
3. [Cartesian Coordinate system] (XYZ axes, XY, YZ, XZ planes, origin)
4. [quadrant]
5. [bearing]
6. [azimuths]
7. [latitude] and [longitude]
8. [point or node]
9. [length]
10. [tangency]
11. [vector]
12. [lines] (vertical, horizontal, straight, curve, arc, irregular, oblique, slanted, spline)
13. [roulette] (spirals and cycloids)
14. [double-curved lines] (helixes, etc.)
15. [conic curves] (parabolas, hyperbolas)
16. [arrays] (rectangular and circular/polar)
17. [direction] (CW or clockwise, CCW or counterclockwise)
18. [measurements] (distance or length, width, height, angle in degrees/minutes/seconds, arc, chord and radians)

Geometry in 2D:

1. [surface areas of 2D geometric shapes] (circle, ellipse, rectangle, square, polygon, triangle)
2. [Boolean operation] (union, difference and intersection)
3. [special two-dimensional figures: parabolic spandrel, general spandrel]

Geometry in 3D:

1. [spatial volume of 3D geometric solids] (cylinder or rod, cone, sphere, pyramid, prism or plate, cube, cone, wedge, ellipsoid, geoid, paraboloid)
2. [formation of 3D geometric solid] (loft, swept)
3. [triangulation]
4. [cross section]

Total numbers of math topics to be reviewed

Basics Arithmetic: 23	Geometry: 25

K-12 Age-Possible Engineering Courses			
Pre-Calculus Math			
Trigonometry	**Algebra**	**Functions**	**Graphing**
1. [triangle] (right, oblique, abstruse), 2. [trigonometric functions] (sine, cosine, secant, cosecant, tangent, cotangent) 3. [Parallelogram Law for the Addition of Force/Vector Graphics] 4. [Pythagorean Theorem]	1. [one unknown] 2. [two unknowns] 3. [three unknowns]	1. [exponential functions] 2. [Fibonacci series] 3. [log] and [natural log] 4. [logarithmic functions] 5. [analytic geometry: hyperbolic tangent]	1. [table] 2. [graphs] (flow chart, bar chart, etc.) 3. [flow chart], 4. [flow diagram], 5. [block diagram] 6. [schematics] 7. [data tables] and [matrix]

Basics Arithmetic:	**Geometry:**	**Trigonometry:**	**Algebra:**	**Functions:**	**Graphing:**
23	**25**	**4**	**3**	**5**	**7**
Total numbers of pre-calculus math topics to be reviewed: 67					

K-12 Age-Possible Engineering Courses	
Advanced Math	
Special Topics	**Calculus**
1. [linear algebra] [cross product] 2. [dot product] 3. [gradient: "del"] 4. [Eulerian method] 5. [statistics] and [probability] 6. [permutation] and [combination]	1. [first derivative] 2. [first integral] 3. [second integral] [second derivative] [first partial derivative] 4. [second partial derivatives] 5. [chain rule] 6. [integration: area of surface of revolution curve, volume of body of revolution] 7. [Lagrangian method] 8. [3rd order non-linear differential equation]

Pre-Calculus:	**Special Topics:**	**Calculus:**
67	**6**	**8**
Total number of all math topics to be reviewed: 81		

Embedding Engineering, Math and Science Topics into Math Skill Review

Total numbers of science topics to be embedded into mathematics review:	
Physics: 49	Chemistry: 11

Pre-calculus only

Total number of pre-calculus math topics to be reviewed: 67
Total number of engineering topics to be embedded: 30

Beginning calculus and special topics included

Total number of all math topics to be reviewed: 81
Total number of engineering topics to be embedded: 40