Area

• Area of a square equals?
  o Area = Side \times Side

• Area of a rectangle equals?
  o Area = \text{Length} \times \text{Width}

• Area of a triangle equals?
  o Area = \frac{1}{2} \text{Base} \times \text{Height}

• Area of a circle equals?
  o Area = \pi \times R^2
  \quad = \pi \times \text{Diameter} / 4

• Perimeter of a square equals?
  o Perimeter = \text{Length} + \text{Width} + \text{Length} + \text{Width}
  o Sums of all sides. P = 4 \times \text{side}

• Perimeter of a rectangular equals?
  o Sum of sides. P = (\text{L} + \text{W}) \times 2

• Circumference of a circle equals?
  o Circumference = \pi \times \text{Diameter}.

• Volume of a cube equals?
  o Volume = \text{L} \times \text{W} \times \text{H}

• Volume of a rectangle equals
  o Volume = \text{L} \times \text{W} \times \text{H}

• Volume of a cylinder equals
  o Volume = \pi \times \text{R}^2 \times \text{H}

RATIOS

1. What is a ratio?
   Comparison of two numbers or values. Example 5:1 input : output  Page 203

2. What is proportion?
   Comparison of two ratios. 3:4 compared to 6:8

3. What is direct proportion?
   Increase in one value resulting in an increase of another value.

4. What is indirect proportion?
   Increase in one value is result in decrease in another value.
Pulley size to rpm Large pulley size decreases in rpm.

5. What is the area of a rectangle 12” long 6” wide, a) in square inches, b) square feet, c) square yards?

6. \( A = L \times W \)
   \[ \text{Square feet} = \text{72 square inches} / \left( \frac{12 \times 12 \text{ square feet}}{} \right) = \frac{72}{12 \times 12} = 0.5 \text{ square feet} \]

7. The side of a square is 9” a) what is its perimeter? b) What is its area?
   \[ P = 4 \times 9 \quad P = 36'' \quad A = L \times W = 9 \times 9 = 81 \text{ Square inches} \]

8. What is the decimal equivalent of 7/8 and 9/16?
   \[ 7/8 = 0.875 \quad 9/16 = 0.5625 \]

9. How many square feet of material are needed to build a cylindrical tank 15 feet high which has a 9-foot diameter and an open top?
   \[ C = \pi \times D \quad \text{Side area} = 15 \times 28.27 = 424 \]
   \[ = 3.14 \times 9 \quad \text{Bottom} = A = \pi \times R^2 \]
   \[ = 28.27' \quad = 63.62 \]
   \[ \text{Total square feet} = 487.62 \text{ square feet}. \]

10. An 8” and a 10” emery wheel are on the same shaft. If the grinding wheel speed of the 10” wheel is 4800 surface feet per minute, what is the grinding speed of the 8” wheel?
    \[ 4800 / 10 = 480 \times 8 = 3840 \]
    \[ 8/10 = x / 4800 = 8 \times 4800 / 10 = 3840 \text{ ft / minute}. \]

11. What is the circumference of a circle with a diameter of a) 7” b) 14” c) 21” d) 35” e) 2.8”?
    \[ C = \pi \times D = \pi \times 7'' = 21.99'' \]
    \[ C = \pi \times D = \pi \times 14'' = 43.98'' \]
    \[ C = \pi \times D = \pi \times 21'' = 65.97'' \]
    \[ C = \pi \times D = \pi \times 35'' = 109.96'' \]
    \[ C = \pi \times D = \pi \times 2.8 = 8.80'' \]

12. What is the diameter of a circle if it’s circumference is a) 3.14 b) 31.3 c) 62.8 d) 9.42.
    \[ D = C / \pi = 3.14 / 3.14 = 1 \quad D = C / \pi = 31.3 / 3.14 = 9.97'' \]
    \[ D = C / \pi = 62.8 / 3.14 = 20.00 \quad D = C / \pi = 9.42 / 3.14 = 2.49 \]

13. How much belt passes over a 12 “ pulley in 3 revolutions if there is no slippage?
    \[ C = \pi \times \text{Diameter} = 3.14 \times 12'' = 37.70'' \quad 37.70'' \times 3 = 113.097'' \]

14. A 20-foot ladder is required to reach a window 16 feet above the ground. What length of ladder would be required if the window were 25 feet up?
    \[ 20 / 16 = 1.25 \quad 1.25 \times 25 = 31.25 \]
15. A motor driven with a 6” driver pulley rotates at 1200 driven side R.P.M. It drives a
generator with an 8” driven pulley. Find the R.P.M. of the generator.
\[
\frac{\text{Driver}}{\text{Driven}} = \frac{\text{Driven}}{\text{Driver}} \quad \frac{6}{8} = \frac{x}{1200}
\]
\[
6 \times 1200 / 8 = 900 \text{ R.P.M.}
\]

16. What is the volume of a box which is 8” x 5” x 2”?
\[
\text{Vol} = L \times W \times H = 8 \times 5 \times 2 = 80 \text{ inches cubed}
\]

17. What volume of earth must be removed for a basement 24’ by 15’ by 6’6” deep?
\[
\text{Volume} = L \times W \times D = 24 \times 15 \times 6.5’ = 2340 \text{ ft cubed}
\]

18. A motor rotates at 1730 R.P.M. (driver) Find the size of the motor pulley required to
turn a grinding wheel at 3000 R.P.M. (driven) through a 1.750” diameter pulley?
\[
\frac{\text{Driver}}{\text{Driven}} = \frac{\text{Driven}}{\text{Driver}} \quad \frac{1730}{3000} = \frac{1.750}{x} = \frac{3000 \times 1.750}{1730} = 3.034”
\]
\[
\text{Diameter}
\]

19. A concrete column is 18 inches in diameter and 12 feet high. How many cubic yards of
concrete does it contain?
\[
V = \pi \times \text{Radius squared} \times \text{length}
\]
If concrete weighs 150 lbs. per cubic foot, find the weight of the column in question 28.
\[
x \times 150 = 3180.86 \text{ lb.}
\]

20. What would the pressure in PSI be on the soil below the above concrete column?
\[
\text{Force} = 3180.86 \text{ lb.}
\]
\[
A = \pi \times \text{R squared} = \pi \times 9 \text{ squared} = 254.47
\]
\[
\text{divided by} \ 254.47 = 12.50 \text{ PSI}
\]

21. A gear with teeth turns at 500 RPM. What is the number of teeth required on a gear to
be driven at 200 RPM?
\[
\frac{\text{Driver}}{\text{Driven}} = \frac{\text{Driven}}{\text{Driver}} \quad 500 / 200 = x / 80 = 500 \times 80 \text{ divided by} \ 200 = 200 \text{ teeth.}
\]

22. A pulley rotates at 450 RPM driving pulley B with a diameter 15”, pulley C with an 18”
diameter, drives D with a diameter at 1350 RPM. Find the diameter of A. Pulley B & C
are on the same shaft.
\[
\text{Pulley A} = 450 \text{ RPM driver}
\]
\[
\text{Pulley B} = 15 \text{ Diameter Driven}
\]
\[
\text{Pulley C} = 18 \text{ Diameter Driver}
\]
\[
\text{Pulley D} = 10 \text{ Diameter Driven}
\]
\[
1350 \text{ RPM}
\]
\[
\text{Driver divided by} \text{ Driven} = \text{Driven divided Driver}
\]
\[
18”/10 = 1350 / x \quad x = 750
\]
\[
\text{Driver divided by} \text{ Driven} = \text{Driven divided Driver}
\]
\[
x / 15 = 750 / 450 \quad x = 25”
\]
\[
\text{Diameter of A is} \ 25”
\]

23. A 10” diameter pulley turning at 1200 RPM drives a 20” pulley on a jackshaft. The same
jackshaft is a 15” pulley driving a 30” pulley. What is the value of the following?
\[
\text{Ratio of the pulley size ( first drive )}
\]
10: 20  Ratio 1:2

24. Speed of the jackshaft.
   Driver divided by Driven = Driven divided Driver
   \[\frac{10}{20} = \frac{X}{1200} = 600 \text{ RPM}\]

25. Ratio of pulley speeds (first drive)
   \[1200:600 = 2:1\]

26. Ratio of the pulley sizes (second drive)
   \[15:30 = 1:2\]

27. Speed of the final shaft
   Driver divided by Driven = Driven divided Driver
   \[\frac{15}{30} = \frac{X}{600} = 300 \text{ RPM}\]

28. Ratio of pulley speeds (2nd drive)
   \[600 = 300  = 2:1 \text{ Ratio}\]

29. Ratio of speeds, input shaft to output shaft.
   \[1200:300 = 4:1 \text{ Ratio}\]