40:1 RATIO DIVIDING HEAD CALCULATOR

Dividing Head Problem:

Divide a circle into this number of segments/divisions: **57.0**

Answer:

Turn the crank **0** whole revolutions plus:

You can use the **17** ring and advance the index by 4 holes on the index plate

15
17
17
18
19
20
21
23
27
29
31
33
37
39
41
43
47
49
51
58
62
65

Convert degrees to divisions:

Degrees **48**

Divisions 7.500

Enter this number into the segments box above

ROTARY TABLE CALCULATOR

Rotary Table Problem:

Divide a circle into this number of segments/divisions: **25**

Answer:

(Convert circle segments/divisions:to degrees)

Decimal Degrees	14.400
Whole Degrees	14
Whole minutes	24
Seconds	0.000
Radians	0.12566
	Use these figures on rotary/indexing table.

INSTRUCTIONS
==========

This spreadsheet contains calculators for dividing heads and rotary tables. A calculator for converting an of degrees to circle divisions is also provided.

The dividing head calculator is based on a standard 40:1 turns ratio. Your dividing head may be equippe dividing rings having different numbers of holes to those shown here. If that is the case, refer to the item "Changing the number of indexing holes".

IMPORTANT
=========
This spreadsheet has been protected to prevent accidental corruption of formulae. If you need to change the protected cells, refer to item "Changing the number of indexing holes" below.

DIVIDING HEAD CALCULATOR
========================

The primary purpose of a dividing head is to divide a circle into any number of equal segments (sometim referred to as divisions) as is required for gear cutting, machining spokes, etc.

Depending on the range of indexing circles, almost any division is possible. It may even be possible to d unequal segments. For example, a dividing head fitted with a 51 hole indexing ring can divide a circle int one half segments (7 segments of 48 degrees and one of 24 degrees).

When using a dividing head it is best to think in terms of divisions rather than degrees. (You can convert divisions using the converter immediately below the dividing head calculator at left).

To divide a circle into "n" divisions, enter the number n into the box titled "Divide a circle into this number segments/divisions:"

The answer will be shown as the total number of revolutions of the crank handle plus the number of holes index plate. (See item below "Changing the number of indexing holes".)

Indexing rings that provide an exact solution are boldly displayed with the comment "you can use the X ri advance the index by Y holes on the index plate" where X is the number of holes in the ring and Y is num holes used. Y may take any value from zero to X. When a ring provides no solution, no text or numbers displayed.

Use the V-rulers to count holes. Tighten them into a V that is exactly the number of holes apart that you a counting. Spin them until they hit the index pin, advance the pin to the other ruler.

The following examples are only valid when the dividing head has a 40:1 crank to spindle ratio and is equ with rings having the following numbers of holes: 46, 47, 49, 51, 58, 62 & 65. If your calculator has addit numbers, the solutions may contain additional options to those discussed below.

Example1:
7 equal divisions:
Enter 7 into the box.
Answer: Turn the crank 5 times plus 35 holes on the 49 ring of the index plate.

Example 2:
8 equal divisions:
The zero's indicate that this is a full revolution of the crank (5 turns only).

Example 3:
27 divisions
Observe that there is no exact solution if you only possess rings having 46, 47, 49, 51, 58, 62 & 65 holes

Observe that there is no exact solution if you only possess rings having 46, 47, 49, 51, 58, 62 & 65 holes Since these rings provide solutions for 26 and 28, one option may be to advance the head by divisions fo 28 then 26, and so on. However this only works so long as the angular error is tolerable.

As can be verified using the Rotary Table Calculator, the angular difference between 26 and 27 is 0.5287 (overshoot) and the difference between 27 and 28 is 0.4762 degrees (undershoot). The cumulative error 26+28 cycle of divisions is the difference between the two errors. Since the overshoot error is greater tha undershoot error the cumulative error will be about 0.0525 degrees of overshoot and will increase by the amount after each successive division cycle.

To produce 27 divisions (segments of the circle), it is necessary to advance the dividing head by 13 cycle 28 = 26 segments from the starting point. The 27th segment is then the remainder of the circle after the the 26th segment has been established. The total cumulative angular error after the 13 cycles will be 13 +0.0525 = +0.6835 degrees. In other words the last segment will be narrow by 0.6835 degrees. All the o segments will be alternately wider by 0.5287 degrees or narrower by 0.4762 degrees compared to the de width.

Changing the number of indexing holes.

Before you can change the number of indexing holes you will need to unprotect this spreadsheet. I have password protected it only to prevent accidentally overwriting cell contents and formulae. The password i (all caps). The password is entered under Tools/Protection/Protect Sheet.

The column of numbers from C10 to C16 represents the numbers of holes in the concentric rings of an in Index plates are usually stamped with these numbers on the face.

Every index plate is different so it will be necessary to change those numbers if the index plate has a diff number of holes (very likely). Likewise, if you have indexing plates that cater for more than seven rings y need to expand the columns by strategically inserting rows and entering new numbers.

To change any number in the existing column, simply unprotect the spreadsheet (see first paragraph of th and type in the numbers that are on your index plate.

To add new numbers to the existing column, simply unprotect the spreadsheet (see first paragraph of this and add (insert) as many rows as you wish to add numbers. To ensure automatic creation of the necess formulae during row insertion, insert the new row(s) within the existing column. In other words, insert the anywhere below the first number AND above the last number in the column.

I recommend that you then protect the page again to prevent accidentally overwriting a formula.

ROTARY TABLE CALCULATOR
==========

Use the rotary table calculator at left to determine the angle of rotation when the circle is to be divided int number of equally sized segments.

Geometrically speaking, the calculator gives the number of degrees included in each segment expressed decimal degrees, degrees, minutes & seconds and radians.

Example: Divide a circle into 26 equal segments.
Answer: Each segment is:
13.646 decimal degrees
13 degrees, 50 minutes, 46.154 seconds
0.12083 radians

A rotary table can be employed as a dividing head provided you carry out the angular mathematics (using calculator). This works best when the segments are whole degree fractions of the circle (see table below

However, when segments involve fractions of a degree it becomes easy to introduce errors when rotating to each successive position. In such cases it is preferable to use a dividing head.

Table 1: Circle segments that have whole numbers of degrees.

Segments:	1	2	3	4	5	6	8	9	10	12	15	18	20	24	30	36	45	60	72	90	120
Degrees:	360	180	120	90	72	60	45	40	36	30	24	20	18	15	12	10	8	6	5	4	3

ny number

ed with
below

e any of

es

ivide into
to 7 and

t degree to

of

s in the

ing and
nber of
are

are

uipped
tional hole

;.
)r 26 then

7 degrees
r for a
an the
same

es of 26 +
position of
x
other
esired

is "OPEN"

ndex plate.

erent
/ou may

his item)

s item)
ary
row(s)

to any

l as

g the
v).

g the table

180.
2