Assignment #1
The Rule of Three
Due on Friday, 19 January.

Cocker's Arithmetick was a standard basic math text that saw widespread use in England for about a century and a half, from the late Seventeenth to the early Nineteenth, going through over a hundred editions. Read the attached excerpt from the 22nd edition of this book and answer the following questions.

1. Explain the *Single Rule of Three Direct* presented by Cocker in your own words. What does the Rule accomplish? *[3]*

2. Fill in the blank in each of the following. If the result is not an integer, please give it in decimal form. *[5 = 5 × 1 each]*
   a. 5 is to 3 as ___ is to 87.   **b.** 480 is to 132 as ___ is to 11.   **c.** 18.75 is to 3 as ___ is to 4.
   d. 15.3 is to 1.2 as ___ is to 0.4.   **e.** 59 is to 2.5 as ___ is to 3.

3. Why might Cocker have presented the *Single Rule of Three Direct* as he did, without using algebra? *[2]*

REFERENCE

1. *Cocker's Arithmetick, perused by J. Hawkins* (22nd Edition), by Edward Cocker & John Hawkins, London, 1702. May be read at or downloaded in pdf form from Google Books:
   `books.google.ca/books?id=GWcFAAAAQAAJ`

Arithmetic

Arithmetic is where numbers fly like pigeons in and out of your
   head.
Arithmet ic tell you how many you lose or win if you know how
   many you had before you lost or won.
Arithmetic is seven eleven all good children go to heaven – or five
   six bundle of sticks.
Arithmetic is numbers you squeeze from your head to your hand
   to your pencil to your paper till you get the answer.
Arithmetic is where the answer is right and everything is nice and
   you can look out of the window and see the blue sky – or the
   answer is wrong and you have to start all over and try again
   and see how it comes out this time.
If you take a number and double it and double it again and then
   double it a few more times, the number gets bigger and bigger
   and goes higher and higher and only arithmetic can tell you
   what the number is when you decide to quit doubling.
Arithmetic is where you have to multiply – and you carry the
   multiplication table in your head and hope you won't lose it.
If you have two animal crackers, one good and one bad, and you
   eat one and a striped zebra with streaks all over him eats the
   other, how many animal crackers will you have if somebody
   offers you five six seven and you say No no no and you say
   Nay nay nay and you say Nix nix nix?
If you ask your mother for one fried egg for breakfast and she
   gives you two fried eggs and you eat both of them, who is
   better in arithmetic, you or your mother?

   Carl Sandburg

Also if 3, 9, 21, 63, were given (which are inter-
rupted) I say 9 times 21 is equal to 3 times 63, which
is equal to 189.

From hence ariseth that precious Gem in Arithme-
tick, which for the Excellency thereof is called the
Golden Rule, or *Rule of Three*.

CHAP. X.

The Single Rule of Three Direct.

THE *Rule of Three* (not undeservedly call'd the
Golden Rule) is, that by which we find out
a fourth number, in proportion unto three given Numbers,
so as this fourth Number sought may bear the same
Rate, Reason, or Proportion to the *third* (given) num-
ber, as this second doth to the first, from whence it is
also called the Rule of *Proportion*.

2. Four Numbers are said to be *Proportional*, when
the first containeth or is contained by the second, as
often as the third containeth or is contained by the
fourth. *Vide Wingate's Arith Chap. 8. Sect. 4.*

So these Numbers are said to be *Proportional*, viz.
3, 6, 9, 18, for as often as the first Number is con-
tained in the second, so often is the third contained in
the fourth, viz. twice. Also 9, 3, 15, 5, are said to
be *proportional*, for as often as the first Number con-
taineth the second, so often the third Number contain-
eth the fourth; viz. 3 times.

3. The *Rule of Three* is either simple or compound.

4. The simple (or single) *Rule of Three*, consisteth
of 4 Numbers; that is to say, it hath 3 Numbers given
to find out a fourth; and this is either Direct, or In-
verse. *Vide Alsted. Math. lib. 2. cap. 13.*

5. The single *Rule of Three Direct*, is when the pro-
portion of the first Term is to the second, as the third is
to the fourth; or when it is required that the Number
sought

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sought (viz.) the fourth Number must have the same
proportion to the second, as the third hath to the first.

6. In the *Rule of Three*, the greatest difficulty is
(after the Question is propounded) to discover the
order of the 3 Terms, viz. which is the first, which is
the second, and which the third, which that you may
understand, observe, That (of the three given numbers)
two are always of one kind, and the other is of the
same kind with the proportional number that is sought:
as in this Question, viz. If 4 yards of Cloth cost 12
shillings, what will 6 yards cost at that rate? Here the
two numbers of one kind are 4 and 6, viz. they both
signifie (or mean) yards; and 12 shillings is the same
kind with the number sought, for the price of 6 yards
is sought.

Again, observe, that of the 3 given numbers, those
two that are of, the same kind, one of them must be the
first and the other the third, and that which is of the
same kind with the number sought, must be the second
number in the Rule of Three; and that you may know
which of the said numbers to make your first, and
which your third, know this, that to one of those two
numbers there is always affixed a demand, and that
number upon which the demand lieth shall always be
reckoned the third number. As in the forementioned
Question, the demand is affixed to the number 6, for it
is demanded what 6 yards will cost ? and therefore 6
must be the third number, and 4 (which is of the first, and
denomination (or kind) with it) must be the second, and
consequently the number 12 must be the first, and
then, the numbers being placed in the forementioned
order, will stand as followeth, viz.

$$ yards \quad s. \quad yards $$
$$ 4 \text{——} 12 \text{——} 6 $$

7. In the Rule of *Three Direct* (having placed the
numbers as is before directed) the next thing to be done
will be to find out the fourth number in proportion,
which (that you may do) multiply the second number
by

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by the third, and divide the product thereof by the
first, (or which is all one) multiply the third term (or
number) by the second, and divide the product thereof
by the first, and the Quotient thence arising is the 4th
number in a direct proportion, and is the number sought,
or Answer to the question, and is of the same deno-
mination that the second number is of. As then, let the
same Question be again repeated, viz. If 4 yards of
Cloth cost 12 Shillings, what will 6 yards cost ?

Having placed my numbers according to the sixth
Rule (of this Chapter) foregoing, I multiply (the se-
cond number) 12 by (the third number) 6, and the pro-
duct is 72, which product I divide by (the first num-
ber) 4, and the quotient thence arising is 18, which is
the fourth proportional or number fought, viz. 18 Shil-
lings, (because the second number is Shillings) which is
the price of the 6 yards, as was required by the que-
stion. See the work following :

$$ yds \quad s. \quad yds. $$
$$ 4 \text{——} 12 \text{——} 6 $$
$$ 6 $$
$$ (c) $$
$$ 4)72 \quad \frac{72}{32} $$
$$ \underline{18 \text{ shillings}} $$

Quest. 2: Another Question may be this, viz. If
7 C. of Pepper cost 21 l. how much will 1 C. cost at
that rate ?

To resolve which question, I consider that (accord-
ing to the 6th Rule of this Chapter) the terms or num-
bers ought to be placed thus, viz. the Demand lying
upon 1 C. it must be the third number, and that of the
same kind with it must be the first, viz. 7 C. and 21 l.
(being of the same kind with the number fought) must
be the second number in this question ; then I proceed
according