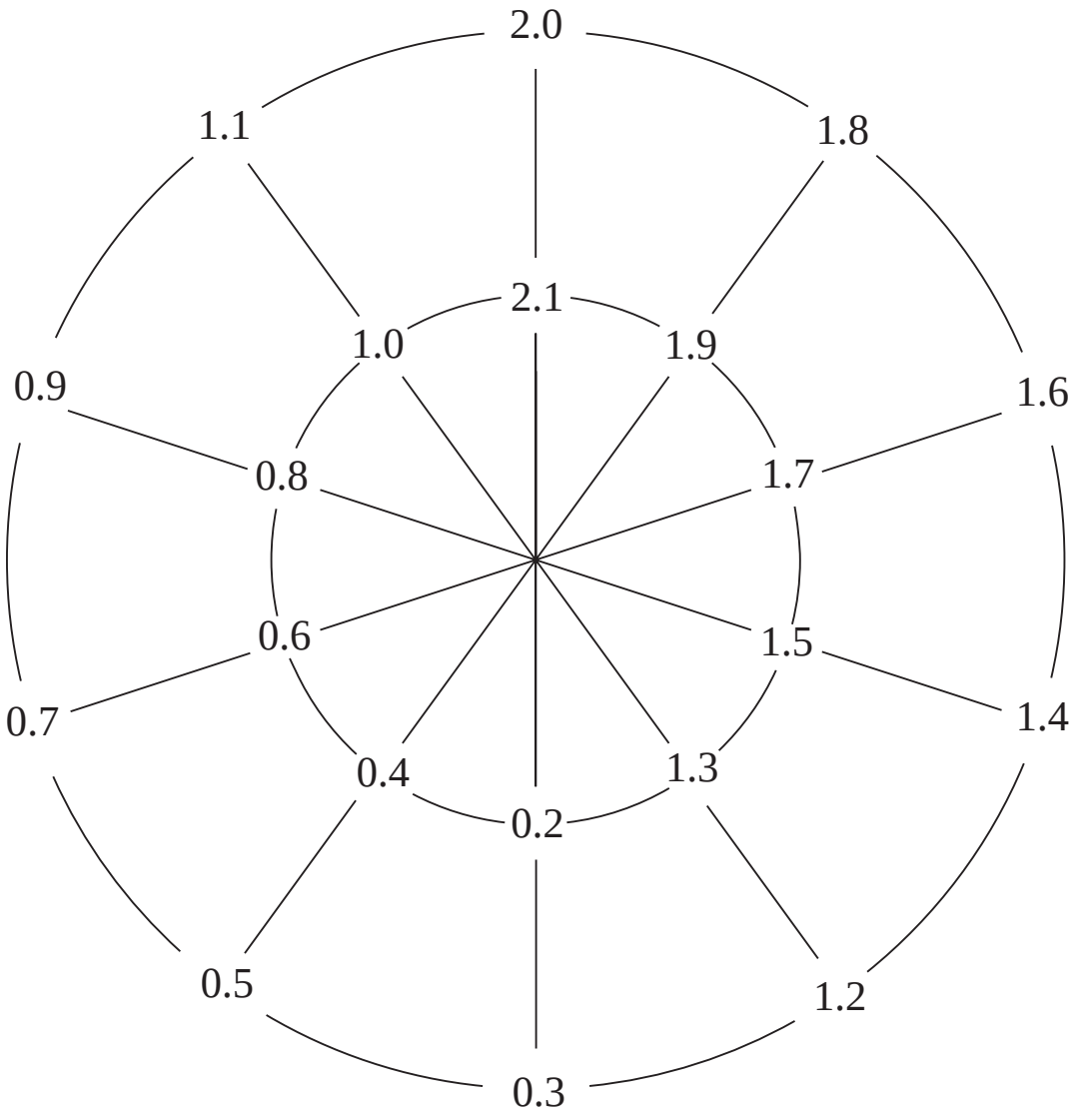
UNIT 4 *Rounding and Estimating* Activities

Activities

ACTIVITY 4.1 *Magic Circle*

1. In the following magic circle, there are two 'magic' totals.



(a) What are they?

(b) Explain how you found them.

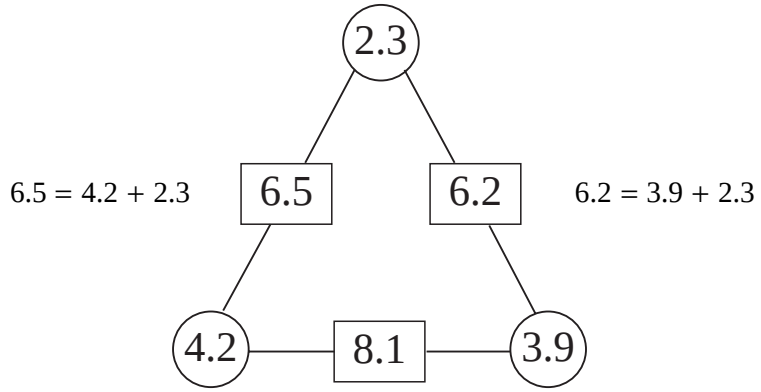
Extension

Design another magic circle of your own and ask a friend to solve it.

ACTIVITY 4.2 *Decimal Arithmagons*

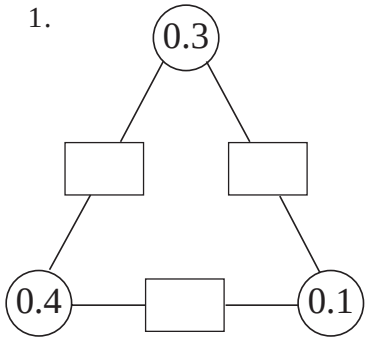
In the following arithmagons, the number in each *rectangle* is the *sum* of the numbers in the circles on either side of the rectangle.

For example,

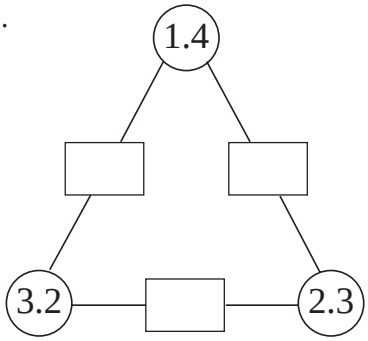


Find the numbers missing from the rectangles in the following arithmagons:

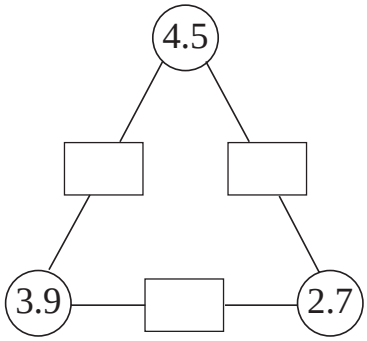
1.



2.



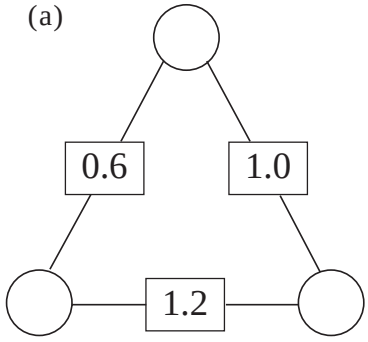
3.



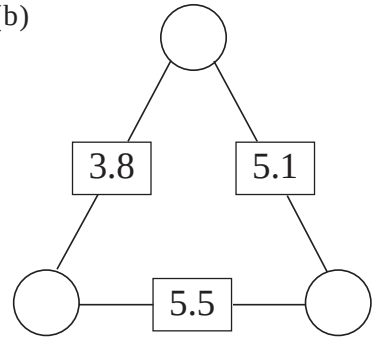
Extension

Find the numbers missing from the circles in the following arithmagons:

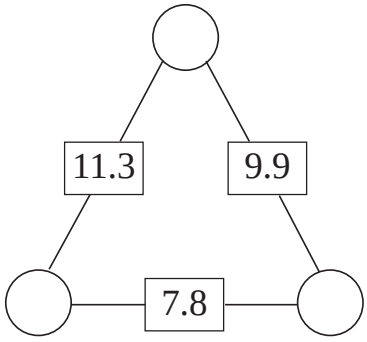
(a)



(b)



(c)



ACTIVITY 4.3 *Super Shopper*

When you shop at a supermarket, you can estimate the total cost of your shopping by rounding the price of every item to the nearest £1.

Make an estimate for the till listing shown here.

Try making an estimate in this way next time you go shopping! See how close your estimate is to the final total.

Extension

Round items to the nearest 50p. Will this give a more accurate estimate? If it does not, explain why not.

SAFESHOP
for best value

SUPPORT THE CITY'S
FUN-DAY HERE 7TH DECEMBER
FATHER CHRISTMAS
COMPETITIONS, CLOWNS
IN AID OF LOCAL CHARITIES

Customer Services Manager
PETER PRICE

Your checkout operator today was
TYE

SW S/S TOFFEE RIPPLE	1.59
S S/S I/C VANILLA	1.99
S S/S I/C RSAPYRIP	1.59
S S/S I/C CHOC	1.59
T+L TOPS SYRP CHOC	0.99
S M/SHELL TOP CHOC	1.29
S/C CHOC STRANDS	0.76
S/CK SUGAR STRANDS	0.76
S S/CUT OVEN CHIPS	1.79
S S/CUT OVEN CHIPS	1.79
CAD FINGER M/ CHOC	0.99
CAD FINGER M/ CHOC	0.99
S SAVERS CUST CRMS	0.53
KIN CHOC LOLL T/T	0.55
SHL S/JCE W/GR+PCH	1.89
SHL S/JCE W/GRAPE	1.89
S SAVERS SPR/WATER	0.24
S SAVERS SPR/WATER	0.24
S SAVERS SPR/WATER	0.24
0.52 lb @ £2.44 /lb	
SWEETS P+M	1.27
RAINBOW PENS	1.25
S S/SKIM MILK	1.27
S S/SKIM MILK	1.27
S SAVER WH/ROLLX12	0.23
S SAVER WH/ROLLX12	0.23
S SAVER WH/ROLLX12	0.23
FLORA BUTTERY SPRD	1.63
S SAVER WH/ROLLX12	0.23
ASK CORNETS	1.09
ASK CORNETS	1.09
S T/BAGS DECAFX80	1.99
S SAV DIGEST M/CHOC	0.55
TOT	34.03
CASH	40.00
CHANGE	5.97

20/10/99 13:26 4756 06 145
MEPTON

ACTIVITY 4.4 *Calculator Keys*

You are allowed to use only the following keys on your calculator:

[7] [1] [×] [−] [=] [(] [)]

You may use each key as many times as you like.

1. Can you make all the numbers between 1 and 20 appear on the calculator screen?

   For example,

   [7] [−] [1] [−] [1] [−] [1] [=] 4

   [(] [7] [−] [1] [−] [1] [)] [×] [(] [7] [−] [1] [−] [1] [−] [1] [)] [=] 20

   In each case, find the way which uses the least possible total number of keys to make each number.

2. Which other pairs of digits could you use instead of the [7] and the [1], and still be able to make all the numbers from 1 to 20 ?

3. Which pairs of digits would *not* allow you to make all the numbers from 1 to 20 ?

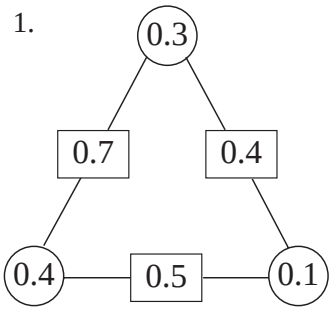
ACTIVITIES 4.1 and 4.2 *Notes for Solutions*

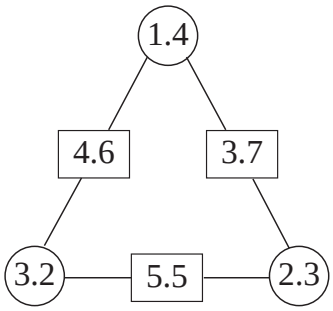
Notes and solutions given only where appropriate.

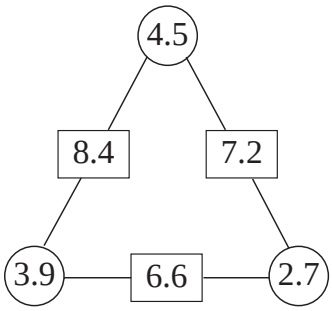
4.1 1. (a) Across each diameter, the total is 4.6.

(b) Around each circle, the total is 11.5.

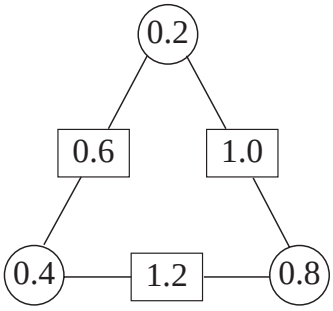
4.2 1.

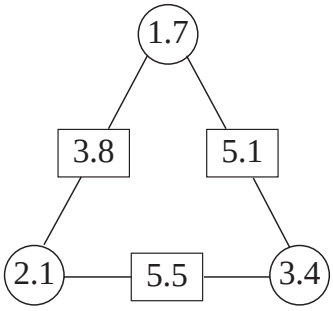


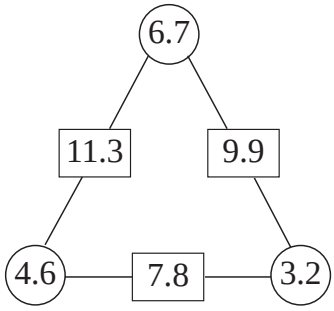




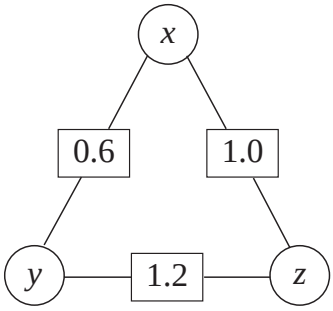
Extension







Note: these problems are best tackled using an algebraic approach:



$$\left.\begin{aligned} x + y &= 0.6 \\ y + z &= 1.2 \\ z + x &= 1.0 \end{aligned}\right\} \left.\begin{aligned} z - x = 0.6 \end{aligned}\right\} 2z = 1.6 \Rightarrow z = 0.8, \text{ etc.}$$

ACTIVITIES 4.3 and 4.4 *Notes for Solutions*

4.3 The estimate is:

$$2 + 2 + 2 + 2 + 1 + 1 + 1 + 1 + 2 + 2 + 1 + 1 + 1 + 1 + 2 + 2 + 0 + 0 + 0$$
$$+ 1 + 1 + 1 + 1 + 0 + 0 + 0 + 2 + 0 + 1 + 1 + 2 + 1 = £35$$

This is reasonably close to the actual total of £34.03.

Extension

$$1.50 + 2 + 1.50 + 1.50 + 1 + 1.50 + 1 + 1 + 2 + 2 + 1 + 1 + 0.50 + 0.50 + 2 + 2 + 0$$
$$+ 0 + 0 + 1.50 + 1.50 + 1.50 + 1.50 + 0 + 0 + 0 + 1.50 + 0 + 1 + 1 + 2 + 0.50 = £34$$

This is much closer to the true value.

Note: more accurate rounding does not necessarily produce a more accurate final answer; for example, try:

0.76
0.76
1.26
1.26

rounded to (a) nearest £1, (b) nearest 50p, and compare with the true answer.

4.4 1. [1]

[7] [−] [1] [−] [1] [−] [1] [−] [1] [−] [1] [=] 2

[7] [−] [1] [−] [1] [−] [1] [−] [1] [=] 3

[7] [−] [1]

ACTIVITY 4.4 *Notes for Solutions*

4.4

(7 − 1 − 1 − 1 − 1 − 1) × 7 − 1 = 13

(7 − 1 − 1 − 1 − 1 − 1) × 7 = 14

(7 − 1 − 1 − 1 − 1) × (7 − 1 − 1) = 15

(7 − 1 − 1 − 1) × (7 − 1 − 1 − 1) = 16

(7 − 1 − 1 − 1 − 1) × (7 − 1) − 1 = 17

(7 − 1 − 1 − 1 − 1) × (7 − 1) = 18

(7 − 1 − 1 − 1) × (7 − 1 − 1) − 1 = 19

(7 − 1 − 1 − 1) × (7 − 1 − 1) = 20

2. If you can make 1 and all the *prime* numbers between 1 and 20, then all the others can be produced as products of the primes. These primes are 2, 3, 5, 7, 11, 17 and 19.

   With any pair of *even* numbers it is *impossible* to make an *odd* number.

   The table below lists the pairs of odd numbers, and the number 1, and they can be used to produce the required primes.

	1, 3	1, 5	1, 9	3, 5	3, 7	3, 9	5, 7	5, 9	7, 9
1	✓	✓	✓	✓	✓	×	✓	✓	
2	✓	✓	✓	✓	✓	×	✓	✓	✓
3	✓	✓	✓	✓	✓	✓	✓	✓	
5	✓	✓	✓	✓	✓	×	✓	✓	
7	✓	✓	✓	✓	✓	×	✓	✓	
11	✓	✓	✓	✓	✓	×	✓	✓	
17	✓	✓	✓	✓	✓	×	✓	✓	
19	✓	✓	✓	✓	✓	×	✓	✓	

Note that once 1, 2 and 3 have been obtained, the other primes can be obtained using these results.

$$5 = 2 \times 3 - 1$$
$$7 = 2 \times 2 \times 2 - 1$$
$$11 = 3 \times 2 \times 2 - 1$$
$$17 = 3 \times 3 \times 2 - 1$$
$$19 = 5 \times 2 \times 2 - 1$$