

**TABLE 1**

**Means, standard deviations and ranges of scores  
(out of 60) on the estimation task**

**(44 subjects in each group)**

<b>GROUP</b>	<b>MEAN</b>	<b>S.D.</b>	<b>RANGE</b>
Mathematicians	51.45	6.65	32-60
Accountants	41.95	9.36	14-57
Psychology Students	41.61	10.46	18-57
English Students	36.51	11.06	14-56

**TABLE 2**

**F-values for one-way analyses of variance  
comparing accuracy scores**

<b>COMPARISON</b>	<b>SCORE F(1,86)</b>
Mathematicians / Accountants	33.99**
Mathematicians / Psychology Students	25.57**
Mathematicians / English Students	57.38**
Accountants / Psychology Students	1.17
Accountants / English Students	5.23*
Psychology Students / English Students	4.5*

\* =  $p < 0.05$

\*\* =  $p < 0.01$

**TABLE 3**

**Number of responses involving each strategy type  
in each group (880 responses per group)**

	S T R A T E G Y							
Problem	Fractions	Rounding two numbers	Rounding one number	Using known and 'nicer' numbers	Factoriz-ati on	Proceeding Algorith-mi cally	Distribu-tiv ity	Other
Mathematicians	340	173	74	109	61	36	28	59
Accountants	284	229	108	38	19	113	46	36
Psychology Students	266	237	124	55	19	71	41	41
English Students	238	189	138	41	24	124	31	50

**TABLE 4****Chi-square figures for group comparisons  
on frequency of use of each strategy type**

	<b>C O M P A R I S O N S</b>					
<b>Strategy Type</b>	<b>Mathematicians &amp; Accountants</b>	<b>Mathematicians &amp; Psychology Students</b>	<b>Mathematicians &amp; English Students</b>	<b>Accountants &amp; Psychology Students</b>	<b>Accountants &amp; English Students</b>	<b>Psychology Students &amp; English Students</b>
Fractions	*7.31	*13.53	*26.8	0.34	3.15	2.27
Rounding 2 numbers	*10.54	*13.02	0.89	0.54	0.38	*7.14
Rounding 1 number	*7.3	*14.23	*21.97	1.76	2.89	0.88
Using Known and 'Nice' numbers	*36.88	3.32	*10.67	3.74	*6.07	2.16
Factorization	*22.85	*16.92	*23.10	0.006	0.86	0.6
Proceeding Algorithmically	*43.97	*12.19	*53.24	*9.62	1.34	*16.20
Distributivity	*4.68	22.55	0.16	0.19	2.37	1.45
Other	*4.69	3.43	0.79	0.21	2.37	0.94

\* =  $p < 0.05$

\*\* =  $p < 0.01$

**TABLE 5**

**Means, standard deviations and ranges of (a) number of strategy types used per protocol, and (b) number of responses involving Class 2 strategies per protocol**

**(44 subjects in each group - 20 items per protocol)**

	<b>(a) Number of strategy types used</b>			<b>(b) Number of responses involving Category 2 strategies (out of 20)</b>		
<b>GROUP</b>	<b>MEAN</b>	<b>S.D.</b>	<b>RANGE</b>	<b>MEAN</b>	<b>S.D.</b>	<b>RANGE</b>
Mathematicians	5.75	1.12	3-8	12.9	2.4	7-17
Accountants	5.56	1.01	4-8	10.8	3.69	4-17
Psychology Students	4.86	1.15	2-8	10.2	3.11	3-16
English Students	5.56	1.21	3-8	9.7	2.94	2-16

**TABLE 6**

**F-values for one-way analyses of variance  
comparing (a) number of strategy types per protocol,  
and (b) number of responses per protocol involving  
Class 2 strategies**

<b>Comparison</b>	<b>(a) Number of strategy types per protocol F(1,86)</b>	<b>(b) Number of responses per protocol involving Class 2 strategies F(1,86)</b>
Mathematicians / Accountants	5.41*	9.34**
Mathematicians / Psychology Students	7.97**	22.25**
Mathematicians / English Students	0.82	83.81**
Accountants / Psychology Students	0.08	0.75
Accountants / English Students	1.76	3.01*
Psychology Students / English Students	2.82	0.95

\* = p<0.05

\*\* = p<0.01

**TABLE 7**

**Number of specific strategies used by each group  
for each of the 20 problems (total of 44 protocols in each group)**

**(Numbers here refer only to actual numbers of strategies,  
and not to instances of their use)**

	<b>Mathematicians</b>		<b>Accountants</b>		<b>Psychology Students</b>		<b>English Students</b>	
	<b>Appropriate Strategies</b>	<b>Inappropriate Strategies</b>	<b>Appropriate Strategies</b>	<b>Inappropriate Strategies</b>	<b>Appropriate Strategies</b>	<b>Inappropriate Strategies</b>	<b>Appropriate Strategies</b>	<b>Inappropriate Strategies</b>
76 x 89	14	0	13	0	14	1	15	1
93 x 18	12	1	10	1	8	1	8	0
145 x 37	16	0	17	0	13	1	9	2
924 x 26	10	0	13	1	11	1	12	2
187 x 906	12	2	13	3	12	7	10	3
482 x 51.2	7	1	7	1	9	0	8	2
64.6 x 0.16	13	5	21	3	7	6	12	8
424 x 0.76	7	0	9	3	7	3	7	2
12.6 x 11.4	14	0	13	0	10	0	9	0
0.47 x 0.26	6	4	10	3	11	2	9	3
9208 ÷ 32	17	0	13	2	9	9	10	2
4645 ÷ 18	14	3	15	1	13	2	10	2
7858 ÷ 51	8	0	10	4	8	2	12	2
25410 ÷ 65	13	3	17	4	11	3	8	6
648.9 ÷ 22.4	10	2	15	2	19	1	14	1
546 ÷ 33.5	14	3	17	2	15	3	13	2
1292.8 ÷ 712	18	2	10	3	10	3	10	4
66 ÷ 0.86	17	0	15	3	10	4	9	7
943 ÷ 0.48	10	1	7	3	5	2	7	5
0.76 ÷ 0.89	17	1	10	4	7	5	11	5

**TABLE 8**

**T-figures for group comparisons on numbers of appropriate and inappropriate specific strategies used per problem**

	<b>C O M P A R I S O N S</b>					
<b>Strategy Type</b>	<b>Mathematicians &amp; Accountants</b>	<b>Mathematicians &amp; Psychology Students</b>	<b>Mathematicians &amp; English Students</b>	<b>Accountants &amp; Psychology Students</b>	<b>Accountants &amp; English Students</b>	<b>Psychology Students &amp; English Students</b>
Appropriate Strategies	0.34	1.17	*2.59	*3.17	*3.4	1.04
Inappropriate Strategies	[*]-1.99	*-2.44	*-3.32	-1.41	*-2.14	-0.78
All Strategies	-1.33	0.41	0.93	*2.19	*2.85	0.56

\* = p<0.05

[\*] = p=0.06



**TABLE 9**

**Pearson correlation coefficients within each group  
between score and (a) number of strategy types used  
and (b) number of responses involving  
Category 2 strategies**

	<b>(a) Correlation between score and number of strategy types (per protocol)</b>	<b>(b) Correlation between score and number of Category 2 responses (per protocol)</b>
Mathematicians (n=44)	0.02	0.47**
Accountants (n=44)	0.03	0.14
Psychology Students (n=44)	0.37*	0.52**
English Students (n=44)	0.47**	0.32**
All Subjects (n=176)	0.18*	0.46**

\* = p<0.05  
\*\* = p<0.01

## STRATEGIES USED FOR ESTIMATING ANSWERS TO THE PROBLEM

$$4645 \div 18 \text{ (exact answer} = 258.06)$$

### *Appropriate Strategies:*

#### CLASS 1:

##### Rounding two numbers:

- (1)  $4640 \div 20 = 230.$
- (2)  $4000 \div 20 = 200$ , so a bit more than 200.
- (3)  $4700 \div 20 = 235.$
- (4)  $4600 \div 20 = 230.$
- (5)  $5000 \div 20 = 250.$

##### Rounding one number:

- (6)  $4645 \div 20 = 232.5.$
- (7)  $3636 \div 20 = 232.3.$
- (8)  $4600 \div 18 = \text{about } 250.$

##### Proceeding algorithmically:

- (9) Straight long division.

#### CLASS 2:

##### Fractional relationships:

- (10)  $4600 \div (1/5 \times 100) = 46 \times 5 = 230.$
- (11)  $4645 \div (1/5 \times 100) = 46.45 \times 5 = 232.5.$
- (12)  $4600 \div (\text{a bit more than } 1/6 \times 100) = 4.$

##### Using known and 'nicer' numbers:

- (13)  $45 \div 18 = \text{about } 2.5$ ;  $4500 \div 18 = 250.$
- (14)  $3600 \div 18 = 200$ , so about 210.
- (15)  $3600 \div 18 = 200$ ;  $5400 \div 18 = 300$ ; so between 200 and 300: about 250.
- (16)  $5400 \div 18 = 300.$
- (17)  $4800 \div 20 = 240.$
- (18)  $4400 \div 20 = 220.$
- (19)  $4900 \div 20 = 245.$

##### Factorization:

- (20)  $(4500 \div 9) \div 2 = 500 \div 2 = 250.$
- (21)  $4000 \div 18 = 2000 \div 9 = 230.$
- (22)  $(4645 \div 3) \div 6 = \text{about } 1500 \div 6 = \text{under } 250.$
- (23)  $(4645 \div 2) \div (18 \div 2) = 2325 \div 9 = 250.$
- (24)  $(4645 \div 9) \div 2 = 577 \div 2 = 280.$

##### Distributivity:

- (25)  $(4645 \times 20) \div (18 \times 2) = 9290 \div 36 = \text{about } 250.$

### *Inappropriate Strategies:*

- (1)  $4645 \times 1/5 \text{ of } 100.$  (*Fractional relationships*)

(2) Long *multiplication* of  $4645 \times 18$ . (*Proceeding algorithmically*)

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