Answers

2382 to 2403

SMILE MATHEMATICS

2382 Areas of Polygons

1. A) 4cm^2 B) $5\frac{1}{2}\text{cm}^2$ C) $3\frac{1}{2}\text{cm}^2$

   D) $3\frac{1}{2}\text{cm}^2$ E) 7cm^2 F) $2\frac{1}{2}\text{cm}^2$

   G) 5cm^2 H) $3\frac{1}{2}\text{cm}^2$ I) 4cm^2

2. In order of area (largest first): E, B, G, A and I, C and D and H, F

3. Make sure you recorded your area in cm^2.
   Get somebody else to check your answers.

2383 Solid Expressions

1. a) $\frac{1}{2}hwl$

   b) $hw + hl + wl + l\sqrt{h^2 + w^2}$

   c) $3l + 2h + 2w + 2\sqrt{h^2 + w^2}$

2. a) The cylinder is made up of two circles and a curved rectangular strip.

   Each circle has area $\pi\left(\frac{d}{2}\right)^2 = \frac{\pi d^2}{4}$

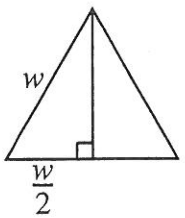
   The curved strip has area $\pi d \times h$

   The total surface area is $2\left(\frac{\pi d^2}{4}\right) + \pi dh = \frac{\pi d^2}{2} + \pi dh$

   b) $\frac{\pi d^2 h}{4}$

   c) $2\pi d$

3. a)



   The height of the equilateral triangle is $\sqrt{w^2 - \left(\frac{w}{2}\right)^2} = \frac{\sqrt{3}w}{2}$

   The volume of the prism is $\frac{1}{2} \times w \times \frac{\sqrt{3}w}{2} \times l = \frac{\sqrt{3}lw^2}{4}$

   b) $\frac{\sqrt{3}w^2}{2} + 3wl$

   c) $3l + 6w$

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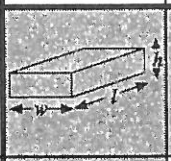
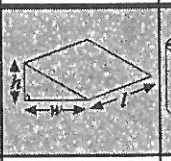
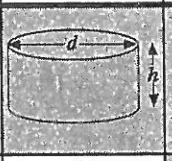
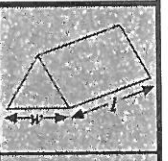
4.

	Cuboid	Right-angled triangular prism	Cylinder	Equilateral triangular prism
Diagram				
Volume	hwl	$\frac{1}{2}hwl$	$\frac{\pi d^2 h}{4}$	$\frac{\sqrt{3}lw^2}{4}$
Surface area	$2(hw+hl+wl)$	$hw+hl+wl$ $+l\sqrt{h^2+w^2}$	$\frac{\pi d^2}{2}+\pi dh$	$\frac{\sqrt{3}w^2}{2}+3wl$
Total edge length	$4(h+w+l)$	$3l+2h+2w$ $+2\sqrt{h^2+w^2}$	$2\pi d$	$3l+6w$

5. When you multiply together two lengths, you multiply the values **and the units**,
   e.g. 2cm x 3cm = 6cm^2 (cm x cm gives cm^2)
   When you add together two lengths or multiply by a number, you change the values **but the units stay the same**,
   e.g. 2cm + 3cm = 5cm, 3 x 2cm = 6cm
   Hence:
   a) An expression describing volume (measured in cm^3) would include terms containing three lengths multiplied together.
   b) An expression describing surface area (measured in cm^2) would include terms containing two lengths multiplied together.
   c) An expression describing total edge length (measured in cm) would include terms containing lengths only.

6. a) $\frac{3\sqrt{3}lw^2}{2}$ describes volume.

   b) $6lw + 3\sqrt{3}w^2$ describes surface area.

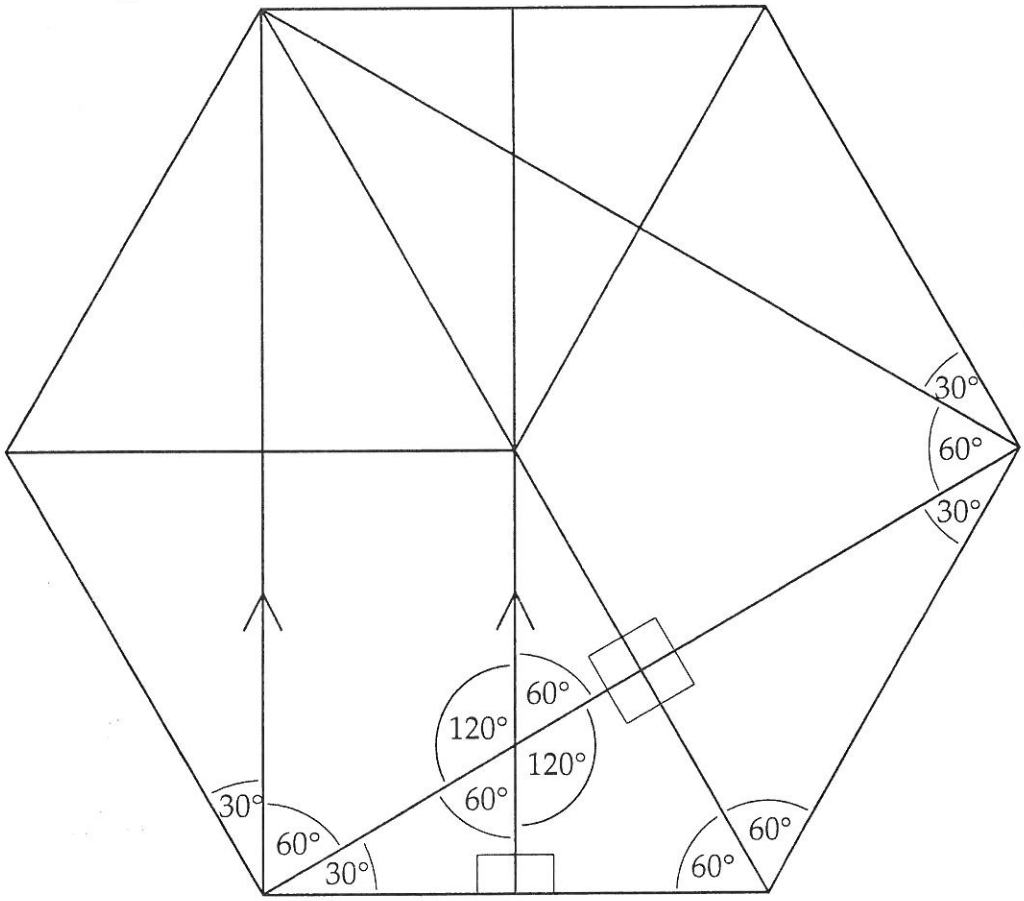
   c) $12w + 6l$ describes total edge length.

2384 Angles in a Regular Hexagon

Here are some of the facts that you need to use to find all the unmarked angles:

- Angles around a point add up to 360°.
- Angles on a straight line add up to 180°.
- The interior angles of a triangle add up to 180°.
- The interior angles of a quadrilateral add up to 360°.
- Vertically opposite angles are equal.

Some of the angles in the worksheet have been marked in the diagram below.



2385 Nine Nine Nine

1.

1 x 9 = 9	1 x 99 = 99	1 x 999 = 999	1 x 9999 = 9999	1 x 99999 = 99999
2 x 9 = 18	2 x 99 = 198	2 x 999 = 1998	2 x 9999 = 19998	2 x 99999 = 199998
3 x 9 = 27	3 x 99 = 297	3 x 999 = 2997	3 x 9999 = 29997	3 x 99999 = 299997
4 x 9 = 36	4 x 99 = 396	4 x 999 = 3996	4 x 9999 = 39996	4 x 99999 = 399996
5 x 9 = 45	5 x 99 = 495	5 x 999 = 4995	5 x 9999 = 49995	5 x 99999 = 499995
6 x 9 = 54	6 x 99 = 594	6 x 999 = 5994	6 x 9999 = 59994	6 x 99999 = 599994
7 x 9 = 63	7 x 99 = 693	7 x 999 = 6993	7 x 9999 = 69993	7 x 99999 = 699993
8 x 9 = 72	8 x 99 = 792	8 x 999 = 7992	8 x 9999 = 79992	8 x 99999 = 799992
9 x 9 = 81	9 x 99 = 891	9 x 999 = 8991	9 x 9999 = 89991	9 x 99999 = 899991

continued/

2385 Nine Nine Nine (cont)

2. Here are some things you may have noticed:
   - The first digit of each number increases by 1.
   - The last digit of each number decreases by 1.
   - The outside digits give the 9 times table.
   - There are 9's in between.

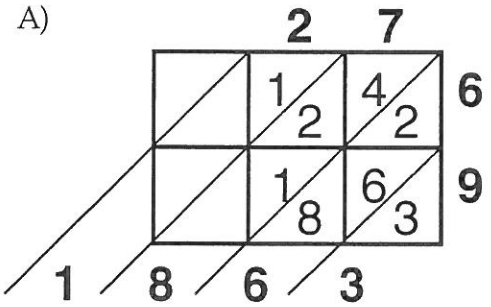
   'Add 9' is the same as 'add 10 and subtract 1'.
   'Add 99' is the same as 'add 100 and subtract 1'.
   Etc.

3. 10 x 9 = 90 10 x 99 = 990 10 x 999 = 9990
   11 x 9 = 99 11 x 99 = 1089 11 x 999 = 10989
   12 x 9 = 108 12 x 99 = 1188 12 x 999 = 11988
   13 x 9 = 117 13 x 99 = 1287 13 x 999 = 12987
   The pattern will break down after the 10th term of each sequence.

2386 Multiplication Review

2. You might like to find out more about some of the methods for multiplication in this activiy:
   Method A is the Chinese or Gelosia method (see Smile 0174).
   Method B is based on the area of rectangles (see Smile 0850).
   Method C is Egyptian multiplication.
   Method D is the Vedic method from India.
   Method E is Russian multiplication (see Smile 2064).

3. A)



B)

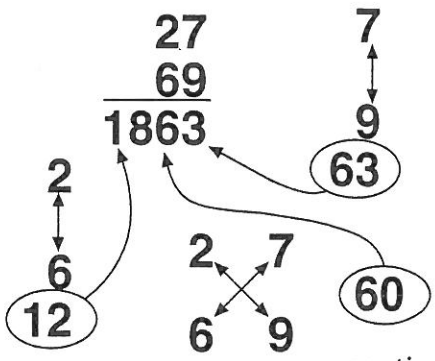
	20	7
60	1200	420
9	180	63

1200 + 420 + 180 + 63 = 1863

C)

27 x 10 = 270
27 x 20 = 540
27 x 40 = 1080 +
27 x 70 = 1890
27 x 1 = 27 −
27 x 69 = 1863

D)



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2386 Multiplication Review (cont)

E)

27	69
13	138
~~6~~	~~276~~
3	552
1	1104
	1863

4. Explain each of the methods to another student or your teacher.

2387 Multiples of Ten

1. These are the five other pairs.

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

2. These are the three groups.

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

3. These are the five groups.

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

4. These are the two groups.

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

continued/

5. These are the four groups.

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

6. These are the four groups.

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

7. There are six groups in this shape.

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

There are six groups in this shape.

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

If you found a group in a different shape, ask your teacher to check your answers.

2388 Six Pyramids

The length and width of the base of each pyramid are both 6cm.
The vertical height is 3cm.
Using Pythagoras' Theorem:

The height of each triangular face is $\sqrt{3^2+3^2} = \sqrt{18} = 4.24$cm.

The length of each sloping edge of the pyramid is $\sqrt{18+3^2} = \sqrt{27} = 5.20$cm.

If you have drawn the nets of your pyramids accurately using ruler and compasses, they will fold back into a cube.

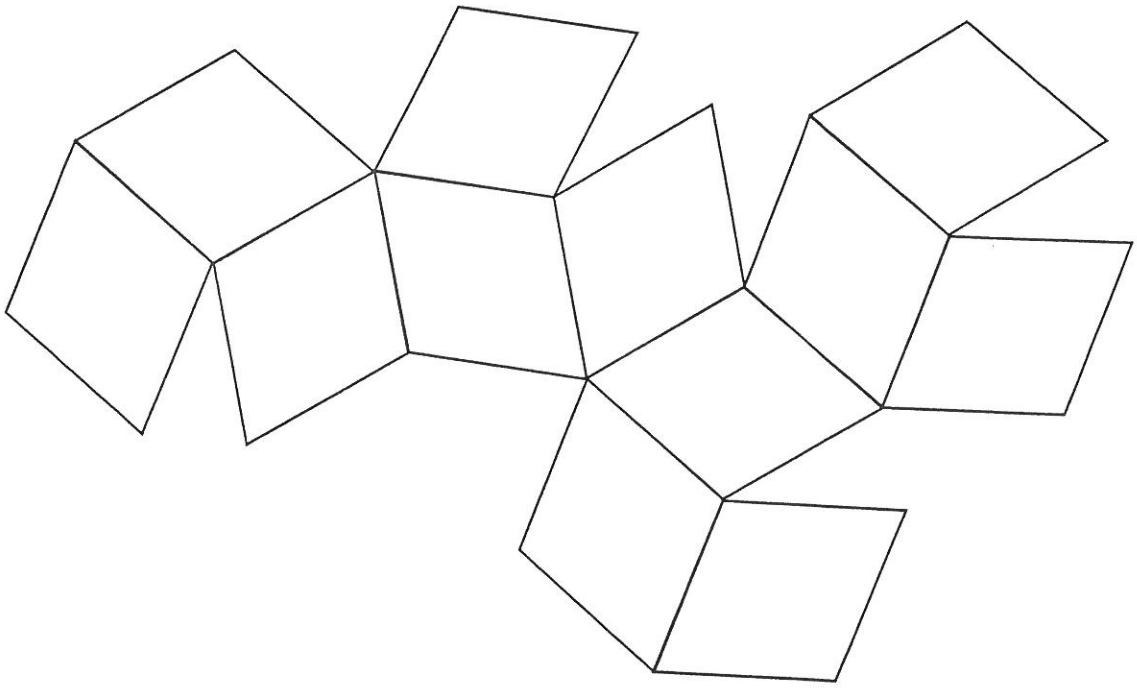
Solutions to the four problems:

The six pyramids make a cube with volume 6 x 6 x 6 = 216cm^3. They surround another cube with volume 216cm^3. The volume of the new solid is therefore 432cm^3.

The area of each triangular face of a pyramid is 6 x 4.24 ÷ 2 = 12.72cm^2.
The surface area of the new solid is therefore 12.72 x 24 = 305.28cm^2.

The new solid will have 12 faces. The angle between the triangular face and the base of each pyramid is 45°. Therefore each face, together with a triangular face from a neighbouring pyramid, will make a rhombus.

Here is one possible net for the new solid. Each rhombus has an edge length of 5.20cm and a short diagonal of 6cm.



2389 Percentage Puzzle

There are two possibilities for each correct calculation.

10%	of	150	=	15	or	150%	of	10	=	15
50%	of	70	=	35	or	70%	of	50	=	35
25%	of	80	=	20	or	80%	of	25	=	20
60%	of	75	=	45	or	75%	of	60	=	45

2390 Consecutive Products

1. a) 12 → 3, 4 b) 72 → 8, 9 c) 90 → 9, 10 d) 56 → 7, 8

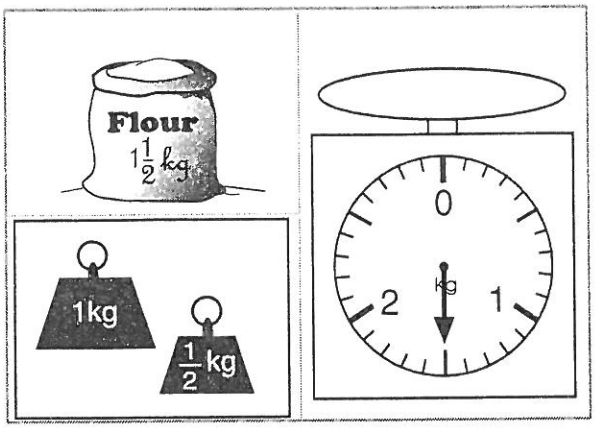
   e) 110 → 10, 11 f) 462 → 21, 22 g) 306 → 17, 18 h) 756 → 27, 28

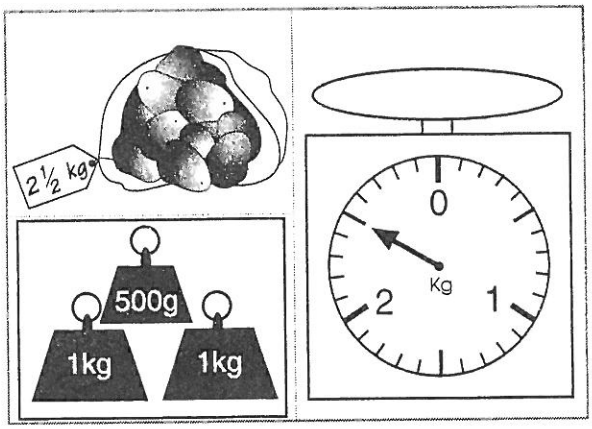
   i) 210 → 14, 15 j) 1806 → 42, 43 k) 3782 → 61, 62 l) 3192 → 56, 57

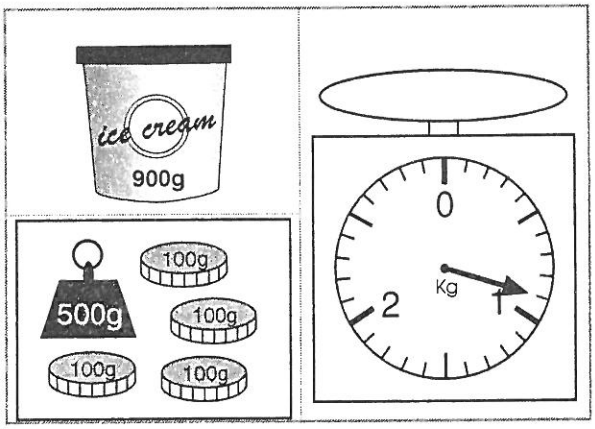
2. a) 336 → 6, 7, 8 b) 990 → 9, 10, 11 c) 21924 → 27, 28, 29

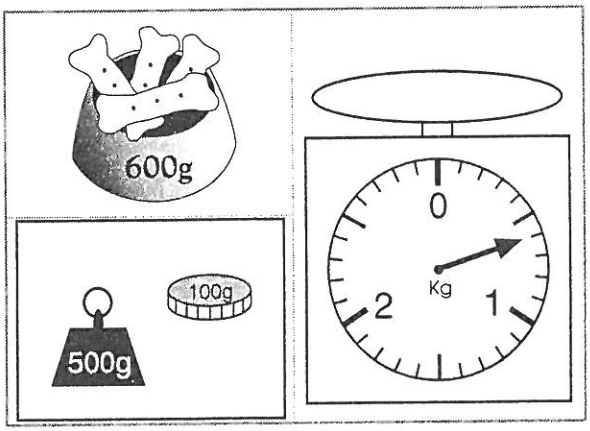
2391 Matching Weights

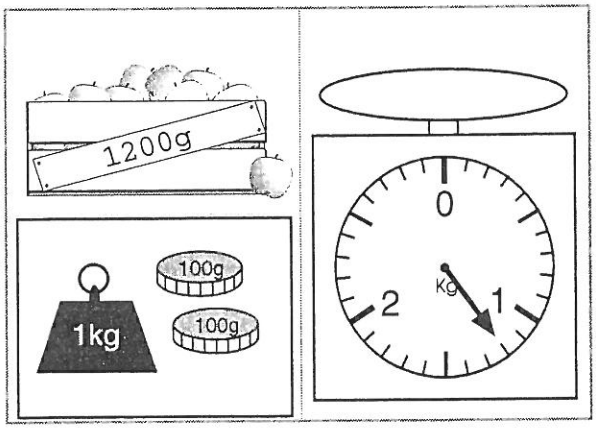
Make sure that you have matched the weights **and** shown each weight correctly on the scales.

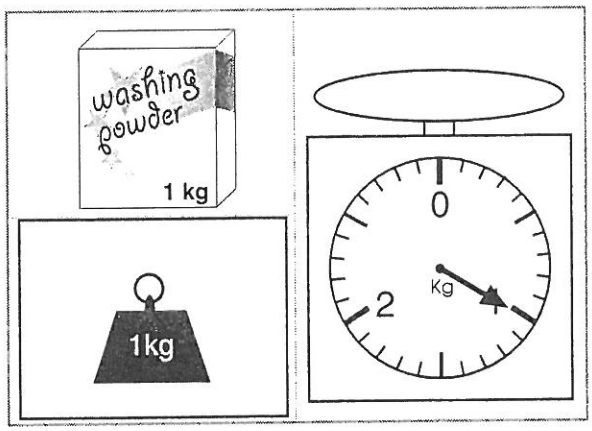












2392 Sensible Answers

1. 169 divided by 50 is between 3 and 4 . With 3 coaches only 150 people could go.
   So the sensible answer is 4.

2. 49 divided by 11 is between 4 and 5. The football club would need 55 players to field 5 teams.
   So the sensible answer is 4.

3. 116 divided by 25 is between 4 and 5. With 4 tins of paint you could only cover 100 square metres.
   So the sensible answer is 5.

4. 102 divided by 12 is between 8 and 9. To make up 9 crates the wholesaler would need 108 bottles.
   So the sensible answer is 8.

5. 67 divided by 10 is between 6 and 7. If Ms Kershaw ordered 6 packets of books there would only be enough for 60 students.
   So the sensible answer is 7.

6. 1 hour is 60 minutes, so 3 hours is 180 minutes.
   180 divided by 40 is between 4 and 5. To record 5 episodes Jameela would need 200 minutes of tape.
   So the sensible answer is 4.

2393 Equivalent Pairs

You may have played the game against the clock. Well done if you managed to collect all 10 pairs in under 2 minutes.

2394 Make That Number

You may have played the game against the computer. Well done if you managed to beat the computer, especially if you were playing at level 2.

2395 Maximum Remainder

Did you manage to complete the Practice Round successfully?
You may have played the games against the computer. Well done if you managed to beat the computer at both games.

2396 FindTheLine

Well done if you managed to score full marks on all four levels and claim your SMILE FindTheLine Certificate.

2397 Guess Inequality

Well done if you managed to score full marks on all four levels and claim your SMILE Guess Inequality Certificate.

2398 Decimal Places Match

Number on calculator	Number to 1 decimal place	Number to 2 decimal places	Number to 3 decimal places
3.4457982	3.4 to 1 dp	3.45 to 2 dp	3.446 to 3 dp

Number on calculator	Number to 1 decimal place	Number to 2 decimal places	Number to 3 decimal places
3.4561207	3.5 to 1 dp	3.46 to 2 dp	3.456 to 3 dp

Number on calculator	Number to 1 decimal place	Number to 2 decimal places	Number to 3 decimal places
3.4672331	3.5 to 1 dp	3.47 to 2 dp	3.467 to 3 dp

Number on calculator	Number to 1 decimal place	Number to 2 decimal places	Number to 3 decimal places
3.5471035	3.5 to 1 dp	3.55 to 2 dp	3.547 to 3 dp

Number on calculator	Number to 1 decimal place	Number to 2 decimal places	Number to 3 decimal places
3.5568156	3.6 to 1 dp	3.56 to 2 dp	3.557 to 3 dp

2399 Number Stories

1) This is the number story for 8 – 5 + 2.
I had eight stickers. Then I gave five to my friend. Then my sister gave me two.

This is the number story for 6 + 5 – 4.
I had six stickers. My friend gave me five more. Then I gave four to my little brother.

2) This is the number story for 6 x 2 – 5.
I had six pounds saved up. On my birthday my money was doubled. Then I spent five pounds on a CD.

This is the number story for 10 ÷ 2 – 4.
My parents gave me ten pounds. Then I gave my brother half of my money. I spent four pounds at the cinema.

3) Show your number stories for the other two calculations to your teacher.

2400 Circle Cut

The area of each small semicircle is $\frac{\pi r^2}{2}$
The area of the large circle is πR^2
Since R = 2r, the area of the large circle can also be written as $\pi(2r)^2 = 4\pi r^2$
Hence the area of a quarter of the large circle is πr^2

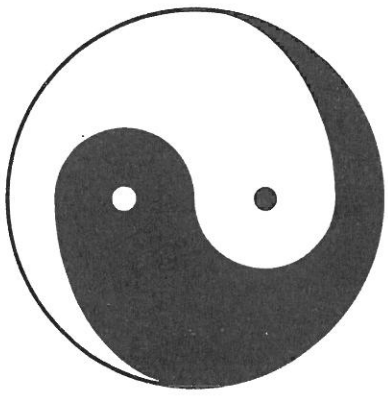
The area of this shape is therefore $\pi r^2 - \frac{\pi r^2}{2} = \frac{\pi r^2}{2}$
which is the same as the area of each small semicircle.

Therefore a straight cut at an angle of 45° to the vertical passing through the centre of the circle will divide each of the two regions exactly in two.

If your solution is different to the one above, ask your teacher to check it.

Note: The diagram on the worksheet is based upon the symbol representing Yin-Yang (shown on the right). Yin-Yang, in Chinese thought, are the two complementary forces that make up all aspects and phenomena of life. Yin is conceived of as earth, female and is present in even numbers, valleys and streams. Yang is conceived of as heavén, male and is present in odd numbers and mountains. When in harmony, the two forces are depicted as the light and dark halves of a circle.

(Source: Encyclopaedia Britannica web site)



2401 Play Your Cards Right

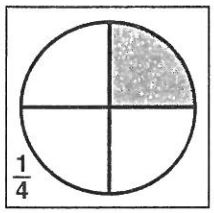
Show your scores to your teacher.

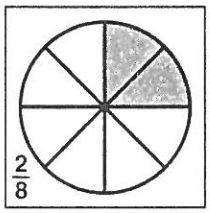
It may be impossible to make an even number or an odd number with your cards. For example, with the cards 2, 4, 8, 6, 2, it is impossible to make an odd number. How likely is this to happen?

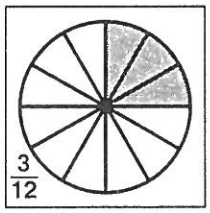
2402 Equivalent Fractions Sort

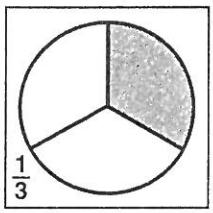
1. For each fraction, check that you have shaded the correct number of sectors by using the diagrams below.

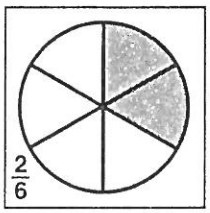
2. The fractions are arranged below in order of size with the smallest at the top and the largest at the bottom.

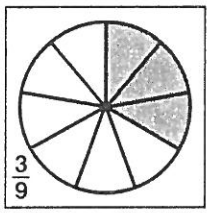


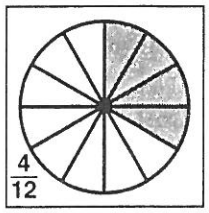


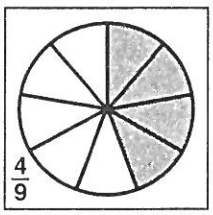


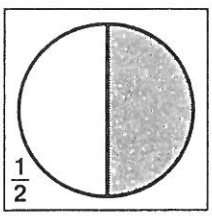


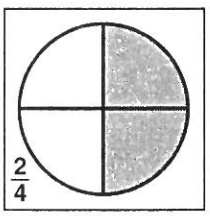


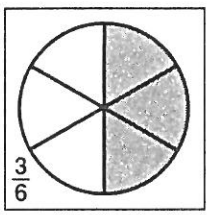


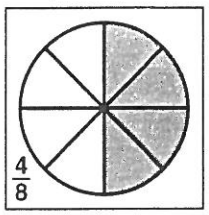


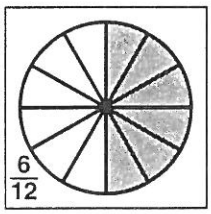


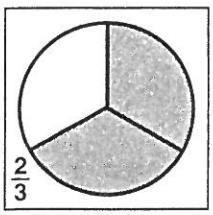


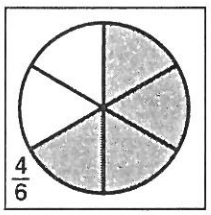


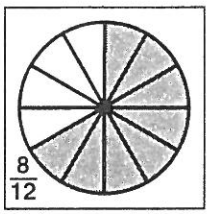












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2402 Equivalent Fractions Sort (cont)

3. The fractions in each row above are equivalent:

$$\frac{1}{4} = \frac{2}{8} = \frac{3}{12}$$

$$\frac{1}{3} = \frac{2}{6} = \frac{3}{9} = \frac{4}{12}$$

$$\frac{1}{2} = \frac{2}{4} = \frac{3}{6} = \frac{4}{8} = \frac{6}{12}$$

$$\frac{2}{3} = \frac{4}{6} = \frac{8}{12}$$

4. You could have chosen any two fractions from this sequence, which are all equivalent to $\frac{3}{4}$

$$\frac{6}{8}\ ,\ \frac{9}{12}\ ,\ \frac{12}{16}\ ,\ \frac{15}{20}\ ,\ \ldots$$

2403 Missing the Point

Check carefully that your decimal points are in the right places. Here are the correct additions and subtractions:

A) 1. $4.05 + 24.05 = 28.1$
2. $5.8 + 7.4 = 13.2$
3. $0.7 + 4 = 4.7$
4. $77.7 + 7.07 = 84.77$
5. $0.45 + 0.55 = 1$
6. $0.3 + 7 = 7.3$

B) 1. $4.5 - 1.95 = 2.55$
2. $60.5 - 3.12 = 57.38$
3. $49 - 4.9 = 44.1$
4. $0.5 - 0.01 = 0.49$
5. $123 - 122.9 = 0.1$
6. $60 - 3.12 = 56.88$

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Answers

2382 to 2403

SMILE MATHEMATICS

2382 Areas of Polygons

1. A) 4cm^2 B) $5\frac{1}{2}\text{cm}^2$ C) $3\frac{1}{2}\text{cm}^2$

   D) $3\frac{1}{2}\text{cm}^2$ E) 7cm^2 F) $2\frac{1}{2}\text{cm}^2$

   G) 5cm^2 H) $3\frac{1}{2}\text{cm}^2$ I) $4\,\text{cm}^2$

2. In order of area (largest first): E, B, G, A and I, C and D and H, F

3. Make sure you recorded your area in cm^2.
   Get somebody else to check your answers.

2383 Solid Expressions

1. a) $\frac{1}{2}hwl$

   b) $hw + hl + wl + l\sqrt{h^2 + w^2}$

   c) $3l + 2h + 2w + 2\sqrt{h^2 + w^2}$

2. a) The cylinder is made up of two circles and a curved rectangular strip.

   Each circle has area $\pi\left(\frac{d}{2}\right)^2 = \frac{\pi d^2}{4}$

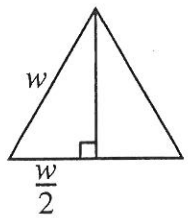
   The curved strip has area $\pi d \times h$

   The total surface area is $2\left(\frac{\pi d^2}{4}\right) + \pi dh = \frac{\pi d^2}{2} + \pi dh$

   b) $\frac{\pi d^2 h}{4}$

   c) $2\pi d$

3. a)



   The height of the equilateral triangle is $\sqrt{w^2 - \left(\frac{w}{2}\right)^2} = \frac{\sqrt{3}w}{2}$

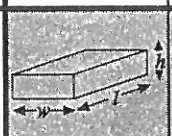
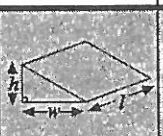
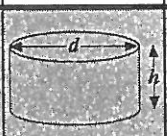
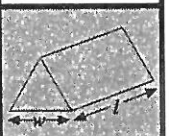
   The volume of the prism is $\frac{1}{2} \times w \times \frac{\sqrt{3}w}{2} \times l = \frac{\sqrt{3}lw^2}{4}$

   b) $\frac{\sqrt{3}w^2}{2} + 3wl$

   c) $3l + 6w$

continued/

4.

	Cuboid	Right-angled triangular prism	Cylinder	Equilateral triangular prism
Diagram				
Volume	hwl	$\frac{1}{2}hwl$	$\frac{\pi d^2 h}{4}$	$\frac{\sqrt{3}lw^2}{4}$
Surface area	$2(hw+hl+wl)$	$hw+hl+wl+l\sqrt{h^2+w^2}$	$\frac{\pi d^2}{2}+\pi dh$	$\frac{\sqrt{3}w^2}{2}+3wl$
Total edge length	$4(h+w+l)$	$3l+2h+2w+2\sqrt{h^2+w^2}$	$2\pi d$	$3l+6w$

5. When you multiply together two lengths, you multiply the values **and the units,**
   e.g. 2cm x 3cm = 6cm^2 (cm x cm gives cm^2)
   When you add together two lengths or multiply by a number, you change the values **but the units stay the same,**
   e.g. 2cm + 3cm = 5cm, 3 x 2cm = 6cm
   Hence:
   a) An expression describing volume (measured in cm^3) would include terms containing three lengths multiplied together.
   b) An expression describing surface area (measured in cm^2) would include terms containing two lengths multiplied together.
   c) An expression describing total edge length (measured in cm) would include terms containing lengths only.

6. a) $\frac{3\sqrt{3}lw^2}{2}$ describes volume.

   b) $6lw + 3\sqrt{3}w^2$ describes surface area.

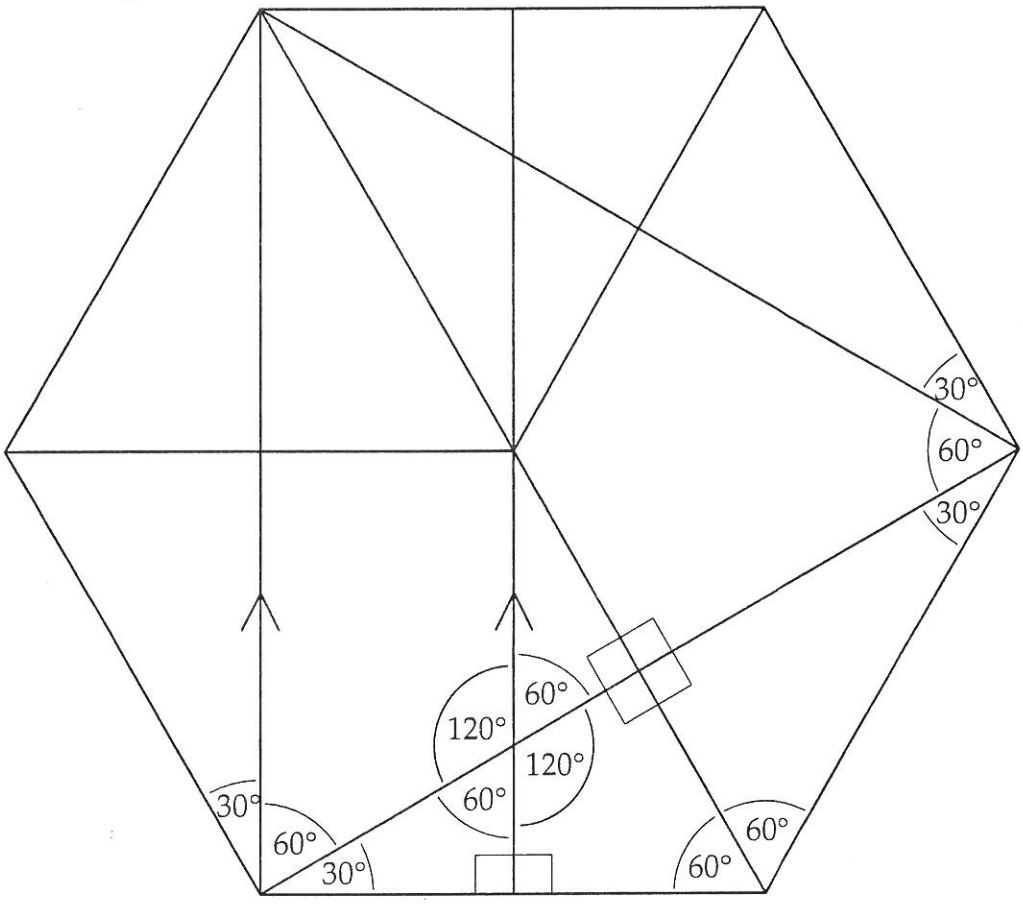
   c) $12w + 6l$ describes total edge length.

2384 Angles in a Regular Hexagon

Here are some of the facts that you need to use to find all the unmarked angles:

- Angles around a point add up to 360°.
- Angles on a straight line add up to 180°.
- The interior angles of a triangle add up to 180°.
- The interior angles of a quadrilateral add up to 360°.
- Vertically opposite angles are equal.

Some of the angles in the worksheet have been marked in the diagram below.



2385 Nine Nine Nine

1.

1 x 9 = 9	1 x 99 = 99	1 x 999 = 999	1 x 9999 = 9999	1 x 99999 = 99999
2 x 9 = 18	2 x 99 = 198	2 x 999 = 1998	2 x 9999 = 19998	2 x 99999 = 199998
3 x 9 = 27	3 x 99 = 297	3 x 999 = 2997	3 x 9999 = 29997	3 x 99999 = 299997
4 x 9 = 36	4 x 99 = 396	4 x 999 = 3996	4 x 9999 = 39996	4 x 99999 = 399996
5 x 9 = 45	5 x 99 = 495	5 x 999 = 4995	5 x 9999 = 49995	5 x 99999 = 499995
6 x 9 = 54	6 x 99 = 594	6 x 999 = 5994	6 x 9999 = 59994	6 x 99999 = 599994
7 x 9 = 63	7 x 99 = 693	7 x 999 = 6993	7 x 9999 = 69993	7 x 99999 = 699993
8 x 9 = 72	8 x 99 = 792	8 x 999 = 7992	8 x 9999 = 79992	8 x 99999 = 799992
9 x 9 = 81	9 x 99 = 891	9 x 999 = 8991	9 x 9999 = 89991	9 x 99999 = 899991

continued/

2385 Nine Nine Nine (cont)

2. Here are some things you may have noticed:
   - The first digit of each number increases by 1.
   - The last digit of each number decreases by 1.
   - The outside digits give the 9 times table.
   - There are 9's in between.

   'Add 9' is the same as 'add 10 and subtract 1'.
   'Add 99' is the same as 'add 100 and subtract 1'.
   Etc.

3.

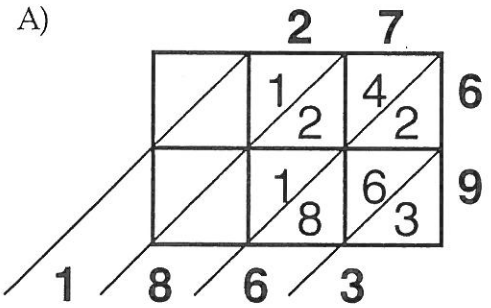
10 x 9 = 90	10 x 99 = 990	10 x 999 = 9990
11 x 9 = 99	11 x 99 = 1089	11 x 999 = 10989
12 x 9 = 108	12 x 99 = 1188	12 x 999 = 11988
13 x 9 = 117	13 x 99 = 1287	13 x 999 = 12987

The pattern will break down after the 10th term of each sequence.

2386 Multiplication Review

2. You might like to find out more about some of the methods for multiplication in this activiy:
   Method A is the Chinese or Gelosia method (see Smile 0174).
   Method B is based on the area of rectangles (see Smile 0850).
   Method C is Egyptian multiplication.
   Method D is the Vedic method from India.
   Method E is Russian multiplication (see Smile 2064).

3. A)



B)

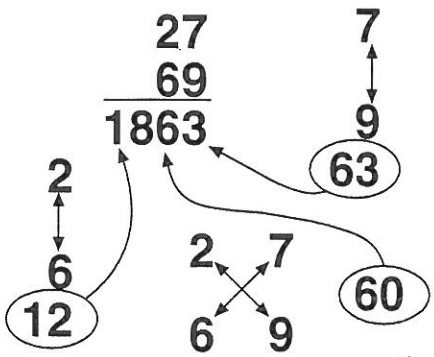
	20	7
60	1200	420
9	180	63

1200 + 420 + 180 + 63 = 1863

C)

27 x 10 = 270
27 x 20 = 540
27 x 40 = 1080 +
27 x 70 = 1890
27 x 1 = 27 −
27 x 69 = 1863

D)



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E)

27	69
13	138
~~6~~	~~276~~
3	552
1	1104
	1863

4. Explain each of the methods to another student or your teacher.

2387 Multiples of Ten

1. These are the five other pairs.

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

2. These are the three groups.

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

3. These are the five groups.

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

4. These are the two groups.

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

continued/

5. These are the four groups.

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

6. These are the four groups.

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

7. There are six groups in this shape.

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

There are six groups in this shape.

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

If you found a group in a different shape, ask your teacher to check your answers.

2388 Six Pyramids

The length and width of the base of each pyramid are both 6cm.
The vertical height is 3cm.
Using Pythagoras' Theorem:

The height of each triangular face is $\sqrt{3^2+3^2} = \sqrt{18} = 4.24\text{cm}$.

The length of each sloping edge of the pyramid is $\sqrt{18+3^2} = \sqrt{27} = 5.20\text{cm}$.

If you have drawn the nets of your pyramids accurately using ruler and compasses, they will fold back into a cube.

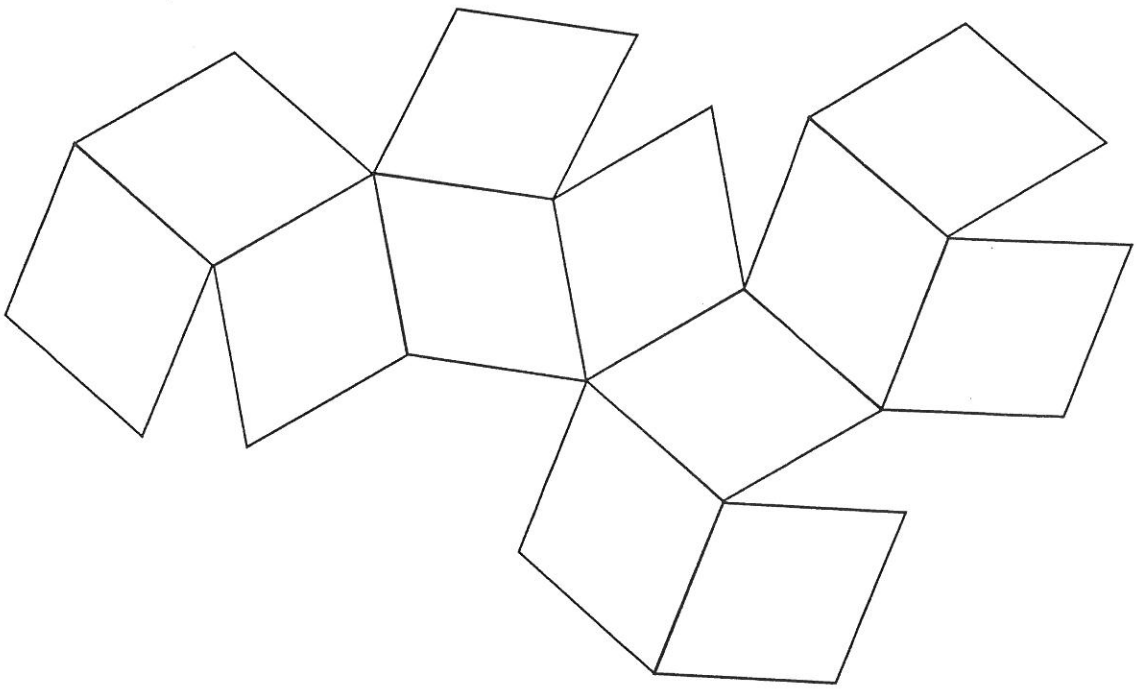
Solutions to the four problems:

The six pyramids make a cube with volume 6 x 6 x 6 = 216cm^3. They surround another cube with volume 216cm^3. The volume of the new solid is therefore 432cm^3.

The area of each triangular face of a pyramid is 6 x 4.24 ÷ 2 = 12.72cm^2.
The surface area of the new solid is therefore 12.72 x 24 = 305.28cm^2.

The new solid will have 12 faces. The angle between the triangular face and the base of each pyramid is 45°. Therefore each face, together with a triangular face from a neighbouring pyramid, will make a rhombus.

Here is one possible net for the new solid. Each rhombus has an edge length of 5.20cm and a short diagonal of 6cm.



2389 Percentage Puzzle

There are two possibilities for each correct calculation.

10%	of	150	=	15	or	150%	of	10	=	15
50%	of	70	=	35	or	70%	of	50	=	35
25%	of	80	=	20	or	80%	of	25	=	20
60%	of	75	=	45	or	75%	of	60	=	45

2390 Consecutive Products

1. a) 12 → 3, 4 b) 72 → 8, 9 c) 90 → 9, 10 d) 56 → 7, 8

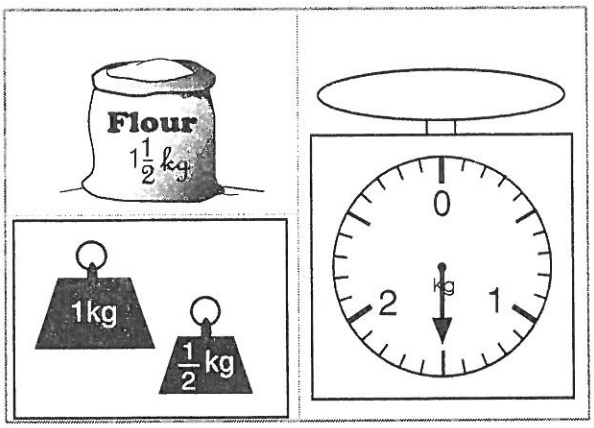
   e) 110 → 10, 11 f) 462 → 21, 22 g) 306 → 17, 18 h) 756 → 27, 28

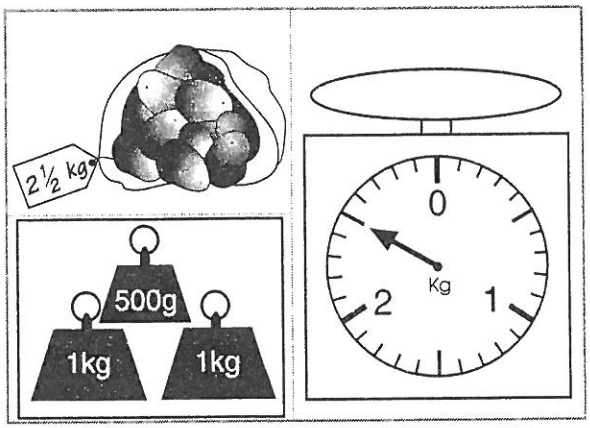
   i) 210 → 14, 15 j) 1806 → 42, 43 k) 3782 → 61, 62 l) 3192 → 56, 57

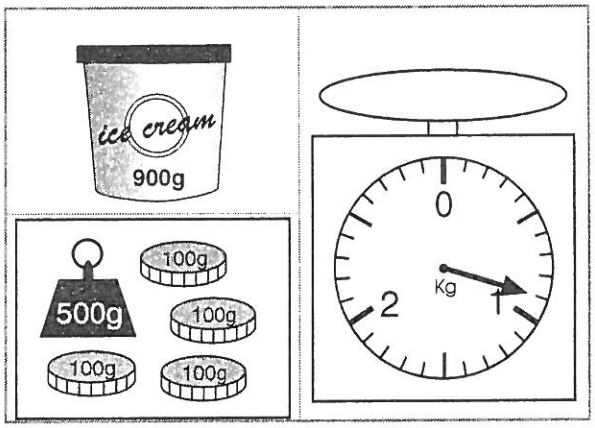
2. a) 336 → 6, 7, 8 b) 990 → 9, 10, 11 c) 21924 → 27, 28, 29

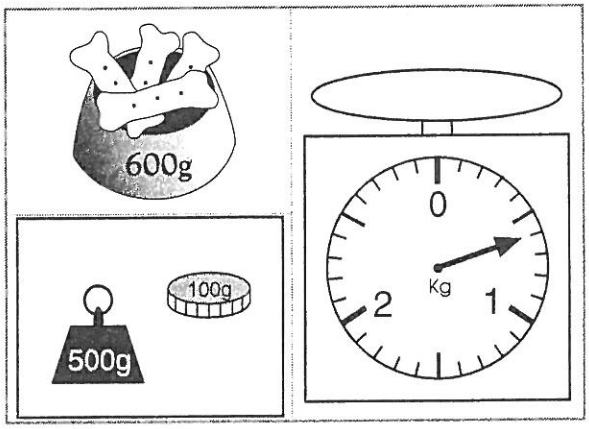
2391 Matching Weights

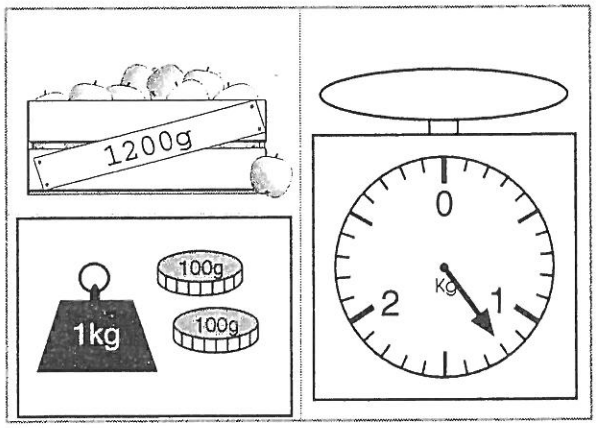
Make sure that you have matched the weights **and** shown each weight correctly on the scales.

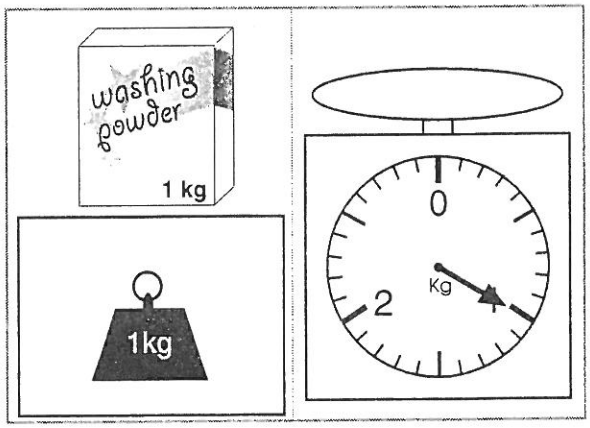












2392 Sensible Answers

1. 169 divided by 50 is between 3 and 4 . With 3 coaches only 150 people could go.
   So the sensible answer is 4.

2. 49 divided by 11 is between 4 and 5. The football club would need 55 players to field 5 teams.
   So the sensible answer is 4.

3. 116 divided by 25 is between 4 and 5. With 4 tins of paint you could only cover 100 square metres.
   So the sensible answer is 5.

4. 102 divided by 12 is between 8 and 9. To make up 9 crates the wholesaler would need 108 bottles.
   So the sensible answer is 8.

5. 67 divided by 10 is between 6 and 7. If Ms Kershaw ordered 6 packets of books there would only be enough for 60 students.
   So the sensible answer is 7.

6. 1 hour is 60 minutes, so 3 hours is 180 minutes.
   180 divided by 40 is between 4 and 5. To record 5 episodes Jameela would need 200 minutes of tape.
   So the sensible answer is 4.

2393 Equivalent Pairs

You may have played the game against the clock. Well done if you managed to collect all 10 pairs in under 2 minutes.

2394 Make That Number

You may have played the game against the computer. Well done if you managed to beat the computer, especially if you were playing at level 2.

2395 Maximum Remainder

Did you manage to complete the Practice Round successfully?
You may have played the games against the computer. Well done if you managed to beat the computer at both games.

2396 FindTheLine

Well done if you managed to score full marks on all four levels and claim your SMILE FindTheLine Certificate.

2397 Guess Inequality

Well done if you managed to score full marks on all four levels and claim your SMILE Guess Inequality Certificate.

2398 Decimal Places Match

Number on calculator	Number to 1 decimal place	Number to 2 decimal places	Number to 3 decimal places
3.4457982	3.4 to 1 dp	3.45 to 2 dp	3.446 to 3 dp

Number on calculator	Number to 1 decimal place	Number to 2 decimal places	Number to 3 decimal places
3.4561207	3.5 to 1 dp	3.46 to 2 dp	3.456 to 3 dp

Number on calculator	Number to 1 decimal place	Number to 2 decimal places	Number to 3 decimal places
3.4672331	3.5 to 1 dp	3.47 to 2 dp	3.467 to 3 dp

Number on calculator	Number to 1 decimal place	Number to 2 decimal places	Number to 3 decimal places
3.5471035	3.5 to 1 dp	3.55 to 2 dp	3.547 to 3 dp

Number on calculator	Number to 1 decimal place	Number to 2 decimal places	Number to 3 decimal places
3.5568156	3.6 to 1 dp	3.56 to 2 dp	3.557 to 3 dp

2399 Number Stories

1) This is the number story for 8 – 5 + 2.
I had eight stickers. Then I gave five to my friend. Then my sister gave me two.

This is the number story for 6 + 5 – 4.
I had six stickers. My friend gave me five more. Then I gave four to my little brother.

2) This is the number story for 6 x 2 – 5.
I had six pounds saved up. On my birthday my money was doubled. Then I spent five pounds on a CD.

This is the number story for 10 ÷ 2 – 4.
My parents gave me ten pounds. Then I gave my brother half of my money. I spent four pounds at the cinema.

3) Show your number stories for the other two calculations to your teacher.

2400 Circle Cut

The area of each small semicircle is $\frac{\pi r^2}{2}$
The area of the large circle is πR^2
Since R = 2r, the area of the large circle can also be written as $\pi(2r)^2 = 4\pi r^2$
Hence the area of a quarter of the large circle is πr^2

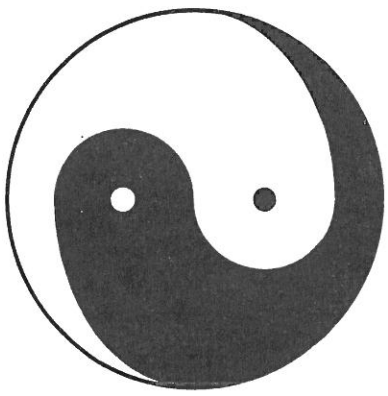
The area of this shape is therefore $\pi r^2 - \frac{\pi r^2}{2} = \frac{\pi r^2}{2}$
which is the same as the area of each small semicircle.

Therefore a straight cut at an angle of 45° to the vertical passing through the centre of the circle will divide each of the two regions exactly in two.

If your solution is different to the one above, ask your teacher to check it.

Note: The diagram on the worksheet is based upon the symbol representing Yin-Yang (shown on the right). Yin-Yang, in Chinese thought, are the two complementary forces that make up all aspects and phenomena of life. Yin is conceived of as earth, female and is present in even numbers, valleys and streams. Yang is conceived of as heavén, male and is present in odd numbers and mountains. When in harmony, the two forces are depicted as the light and dark halves of a circle.

(Source: Encyclopaedia Britannica web site)



2401 Play Your Cards Right

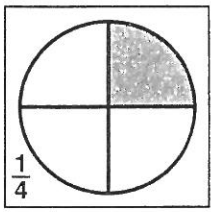
Show your scores to your teacher.

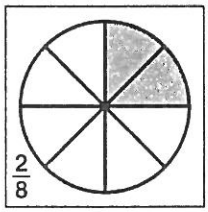
It may be impossible to make an even number or an odd number with your cards. For example, with the cards 2, 4, 8, 6, 2, it is impossible to make an odd number. How likely is this to happen?

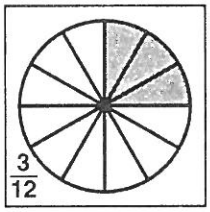
2402 Equivalent Fractions Sort

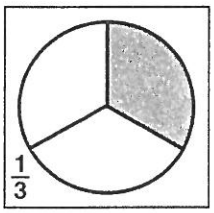
1. For each fraction, check that you have shaded the correct number of sectors by using the diagrams below.

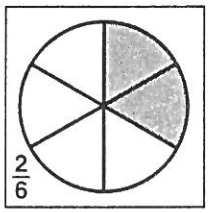
2. The fractions are arranged below in order of size with the smallest at the top and the largest at the bottom.

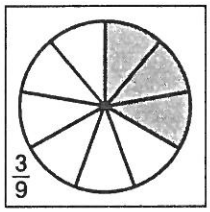


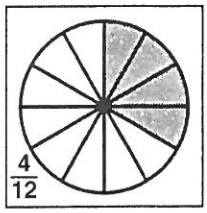


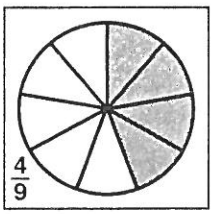


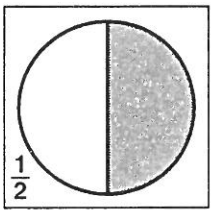


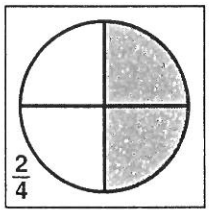


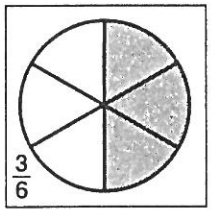


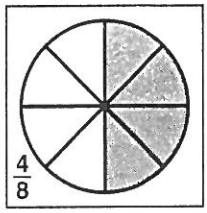


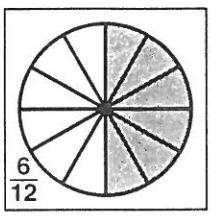


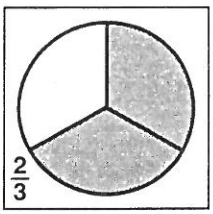


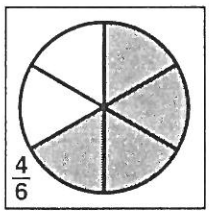


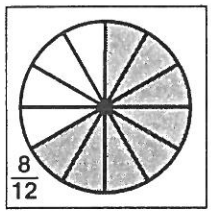












continued/

2402 Equivalent Fractions Sort (cont)

3. The fractions in each row above are equivalent:

$$\frac{1}{4} = \frac{2}{8} = \frac{3}{12}$$

$$\frac{1}{3} = \frac{2}{6} = \frac{3}{9} = \frac{4}{12}$$

$$\frac{1}{2} = \frac{2}{4} = \frac{3}{6} = \frac{4}{8} = \frac{6}{12}$$

$$\frac{2}{3} = \frac{4}{6} = \frac{8}{12}$$

4. You could have chosen any two fractions from this sequence, which are all equivalent to $\frac{3}{4}$

$$\frac{6}{8}\ ,\ \frac{9}{12}\ ,\ \frac{12}{16}\ ,\ \frac{15}{20}\ ,\ \ldots$$

2403 Missing the Point

Check carefully that your decimal points are in the right places. Here are the correct additions and subtractions:

A) 1. $4.05 + 24.05 = 28.1$
2. $5.8 + 7.4 = 13.2$
3. $0.7 + 4 = 4.7$
4. $77.7 + 7.07 = 84.77$
5. $0.45 + 0.55 = 1$
6. $0.3 + 7 = 7.3$

B) 1. $4.5 - 1.95 = 2.55$
2. $60.5 - 3.12 = 57.38$
3. $49 - 4.9 = 44.1$
4. $0.5 - 0.01 = 0.49$
5. $123 - 122.9 = 0.1$
6. $60 - 3.12 = 56.88$

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Answers

2382 to 2403

SMILE MATHEMATICS

2382 Areas of Polygons

1. A) 4cm^2 B) $5\frac{1}{2}\text{cm}^2$ C) $3\frac{1}{2}\text{cm}^2$

   D) $3\frac{1}{2}\text{cm}^2$ E) 7cm^2 F) $2\frac{1}{2}\text{cm}^2$

   G) 5cm^2 H) $3\frac{1}{2}\text{cm}^2$ I) 4cm^2

2. In order of area (largest first): E, B, G, A and I, C and D and H, F

3. Make sure you recorded your area in cm^2.
   Get somebody else to check your answers.

2383 Solid Expressions

1. a) $\frac{1}{2}hwl$

   b) $hw + hl + wl + l\sqrt{h^2 + w^2}$

   c) $3l + 2h + 2w + 2\sqrt{h^2 + w^2}$

2. a) The cylinder is made up of two circles and a curved rectangular strip.

   Each circle has area $\pi\left(\frac{d}{2}\right)^2 = \frac{\pi d^2}{4}$

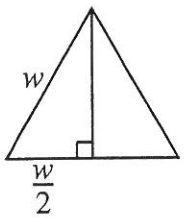
   The curved strip has area $\pi d \times h$

   The total surface area is $2\left(\frac{\pi d^2}{4}\right) + \pi dh = \frac{\pi d^2}{2} + \pi dh$

   b) $\frac{\pi d^2 h}{4}$

   c) $2\pi d$

3. a)



   The height of the equilateral triangle is $\sqrt{w^2 - \left(\frac{w}{2}\right)^2} = \frac{\sqrt{3}w}{2}$

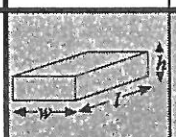
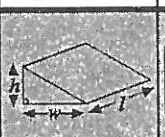
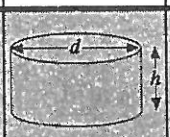
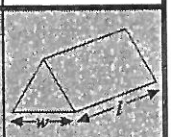
   The volume of the prism is $\frac{1}{2} \times w \times \frac{\sqrt{3}w}{2} \times l = \frac{\sqrt{3}lw^2}{4}$

   b) $\frac{\sqrt{3}w^2}{2} + 3wl$

   c) $3l + 6w$

continued/

4.

	Cuboid	Right-angled triangular prism	Cylinder	Equilateral triangular prism
Diagram				
Volume	hwl	$\frac{1}{2}hwl$	$\frac{\pi d^2 h}{4}$	$\frac{\sqrt{3}lw^2}{4}$
Surface area	$2(hw+hl+wl)$	$hw+hl+wl$ $+l\sqrt{h^2+w^2}$	$\frac{\pi d^2}{2}+\pi dh$	$\frac{\sqrt{3}w^2}{2}+3wl$
Total edge length	$4(h+w+l)$	$3l+2h+2w$ $+2\sqrt{h^2+w^2}$	$2\pi d$	$3l+6w$

5. When you multiply together two lengths, you multiply the values **and the units**,
   e.g. 2cm x 3cm = 6cm^2 (cm x cm gives cm^2)
   When you add together two lengths or multiply by a number, you change the values **but the units stay the same**,
   e.g. 2cm + 3cm = 5cm, 3 x 2cm = 6cm
   Hence:
   a) An expression describing volume (measured in cm^3) would include terms containing three lengths multiplied together.
   b) An expression describing surface area (measured in cm^2) would include terms containing two lengths multiplied together.
   c) An expression describing total edge length (measured in cm) would include terms containing lengths only.

6. a) $\frac{3\sqrt{3}lw^2}{2}$ describes volume.

   b) $6lw + 3\sqrt{3}w^2$ describes surface area.

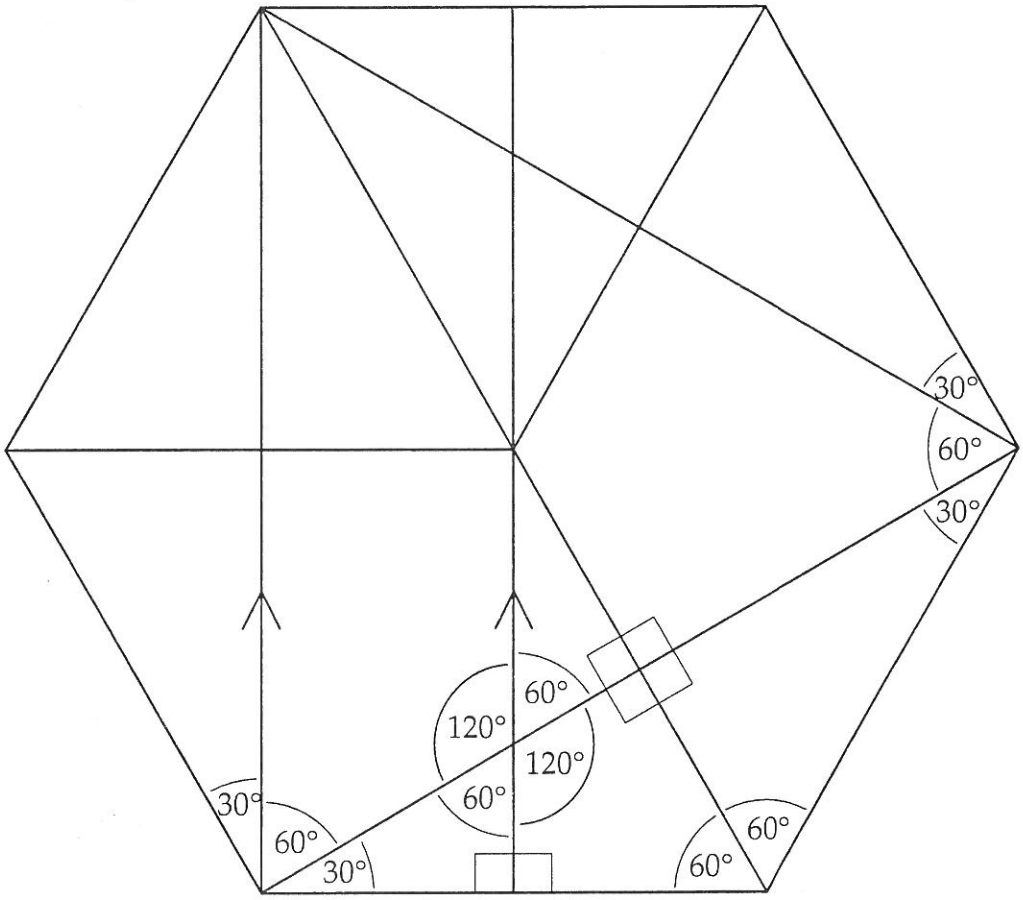
   c) $12w + 6l$ describes total edge length.

2384 Angles in a Regular Hexagon

Here are some of the facts that you need to use to find all the unmarked angles:

- Angles around a point add up to 360°.
- Angles on a straight line add up to 180°.
- The interior angles of a triangle add up to 180°.
- The interior angles of a quadrilateral add up to 360°.
- Vertically opposite angles are equal.

Some of the angles in the worksheet have been marked in the diagram below.



2385 Nine Nine Nine

1.

1 x 9 = 9	1 x 99 = 99	1 x 999 = 999	1 x 9999 = 9999	1 x 99999 = 99999
2 x 9 = 18	2 x 99 = 198	2 x 999 = 1998	2 x 9999 = 19998	2 x 99999 = 199998
3 x 9 = 27	3 x 99 = 297	3 x 999 = 2997	3 x 9999 = 29997	3 x 99999 = 299997
4 x 9 = 36	4 x 99 = 396	4 x 999 = 3996	4 x 9999 = 39996	4 x 99999 = 399996
5 x 9 = 45	5 x 99 = 495	5 x 999 = 4995	5 x 9999 = 49995	5 x 99999 = 499995
6 x 9 = 54	6 x 99 = 594	6 x 999 = 5994	6 x 9999 = 59994	6 x 99999 = 599994
7 x 9 = 63	7 x 99 = 693	7 x 999 = 6993	7 x 9999 = 69993	7 x 99999 = 699993
8 x 9 = 72	8 x 99 = 792	8 x 999 = 7992	8 x 9999 = 79992	8 x 99999 = 799992
9 x 9 = 81	9 x 99 = 891	9 x 999 = 8991	9 x 9999 = 89991	9 x 99999 = 899991

continued/

2385 Nine Nine Nine (cont)

2. Here are some things you may have noticed:
   - The first digit of each number increases by 1.
   - The last digit of each number decreases by 1.
   - The outside digits give the 9 times table.
   - There are 9's in between.

   'Add 9' is the same as 'add 10 and subtract 1'.
   'Add 99' is the same as 'add 100 and subtract 1'.
   Etc.

3.

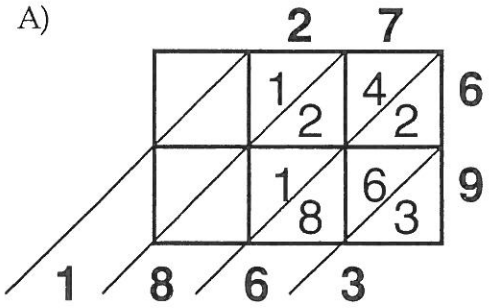
10 x 9 = 90	10 x 99 = 990	10 x 999 = 9990
11 x 9 = 99	11 x 99 = 1089	11 x 999 = 10989
12 x 9 = 108	12 x 99 = 1188	12 x 999 = 11988
13 x 9 = 117	13 x 99 = 1287	13 x 999 = 12987

The pattern will break down after the 10th term of each sequence.

2386 Multiplication Review

2. You might like to find out more about some of the methods for multiplication in this activiy:
   Method A is the Chinese or Gelosia method (see Smile 0174).
   Method B is based on the area of rectangles (see Smile 0850).
   Method C is Egyptian multiplication.
   Method D is the Vedic method from India.
   Method E is Russian multiplication (see Smile 2064).

3. A)



B)

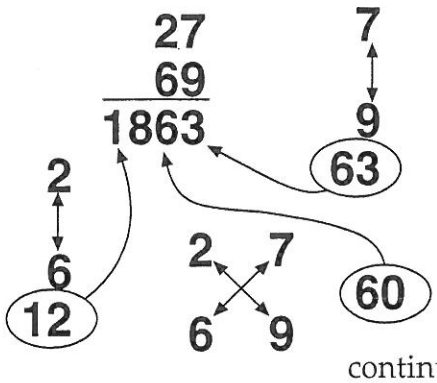
	20	7
60	1200	420
9	180	63

1200 + 420 + 180 + 63 = 1863

C)

27 x 10 = 270
27 x 20 = 540
27 x 40 = 1080 +
27 x 70 = 1890
27 x 1 = 27 −
27 x 69 = 1863

D)



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2386 Multiplication Review (cont)

E)

27	69
13	138
~~6~~	~~276~~
3	552
1	1104
	1863

4. Explain each of the methods to another student or your teacher.

2387 Multiples of Ten

1. These are the five other pairs.

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

2. These are the three groups.

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

3. These are the five groups.

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

4. These are the two groups.

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

continued/

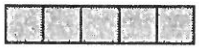
5. These are the four groups.

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

6. These are the four groups.

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

7. There are six groups in this shape.



1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

There are six groups in this shape.

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

If you found a group in a different shape, ask your teacher to check your answers.

2388 Six Pyramids

The length and width of the base of each pyramid are both 6cm.
The vertical height is 3cm.
Using Pythagoras' Theorem:

The height of each triangular face is $\sqrt{3^2+3^2} = \sqrt{18} = 4.24$cm.

The length of each sloping edge of the pyramid is $\sqrt{18+3^2} = \sqrt{27} = 5.20$cm.

If you have drawn the nets of your pyramids accurately using ruler and compasses, they will fold back into a cube.

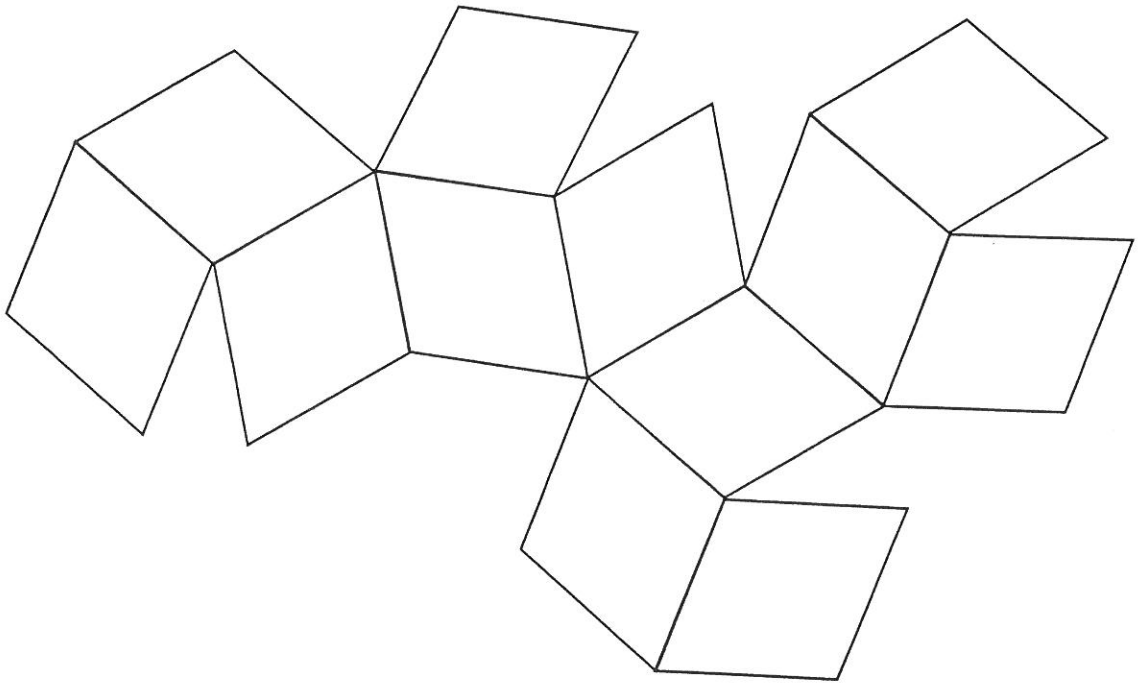
Solutions to the four problems:

The six pyramids make a cube with volume 6 x 6 x 6 = 216cm^3. They surround another cube with volume 216cm^3. The volume of the new solid is therefore 432cm^3.

The area of each triangular face of a pyramid is 6 x 4.24 ÷ 2 = 12.72cm^2.
The surface area of the new solid is therefore 12.72 x 24 = 305.28cm^2.

The new solid will have 12 faces. The angle between the triangular face and the base of each pyramid is 45°. Therefore each face, together with a triangular face from a neighbouring pyramid, will make a rhombus.

Here is one possible net for the new solid. Each rhombus has an edge length of 5.20cm and a short diagonal of 6cm.



2389 Percentage Puzzle

There are two possibilities for each correct calculation.

10%	of	150	=	15	or	150%	of	10	=	15
50%	of	70	=	35	or	70%	of	50	=	35
25%	of	80	=	20	or	80%	of	25	=	20
60%	of	75	=	45	or	75%	of	60	=	45

2390 Consecutive Products

1. a) 12 → 3, 4 b) 72 → 8, 9 c) 90 → 9, 10 d) 56 → 7, 8

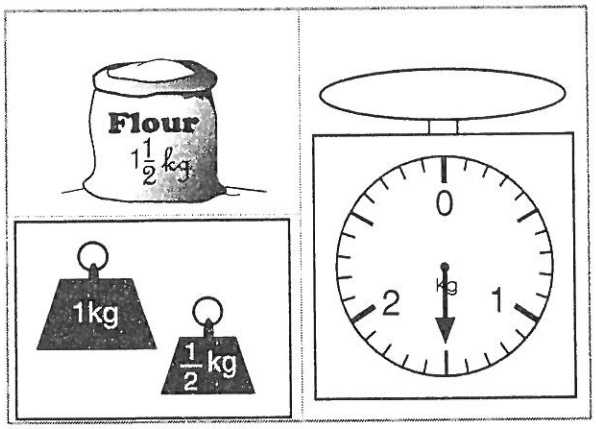
   e) 110 → 10, 11 f) 462 → 21, 22 g) 306 → 17, 18 h) 756 → 27, 28

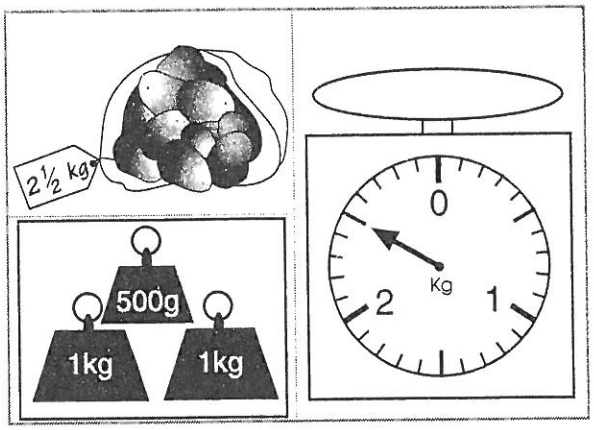
   i) 210 → 14, 15 j) 1806 → 42, 43 k) 3782 → 61, 62 l) 3192 → 56, 57

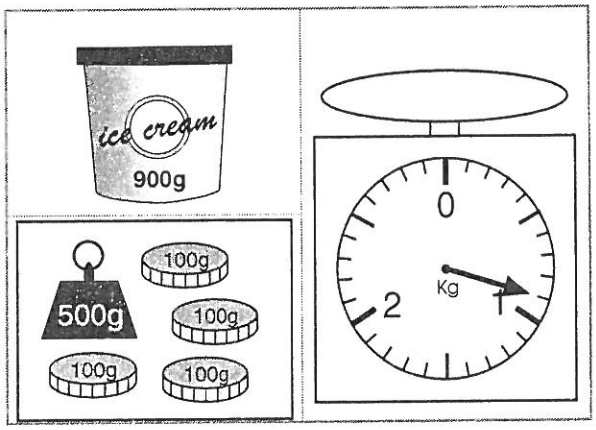
2. a) 336 → 6, 7, 8 b) 990 → 9, 10, 11 c) 21924 → 27, 28, 29

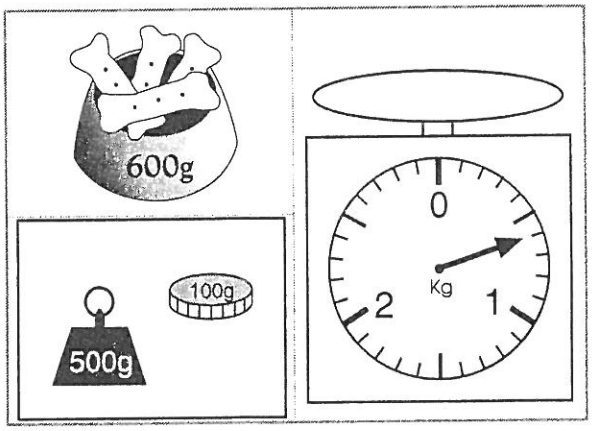
2391 Matching Weights

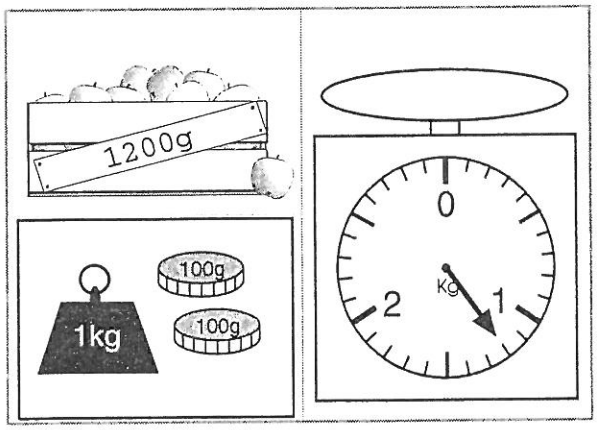
Make sure that you have matched the weights **and** shown each weight correctly on the scales.

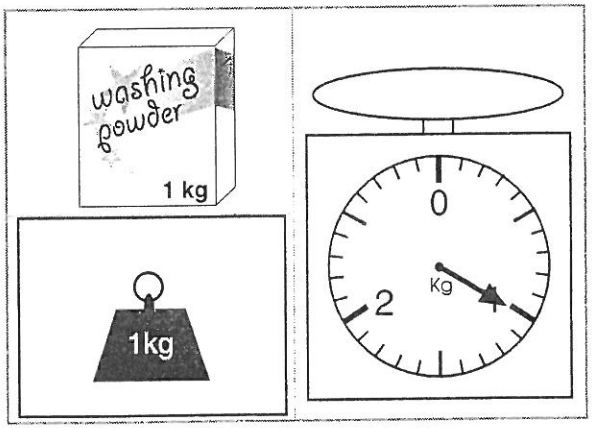












2392 Sensible Answers

1. 169 divided by 50 is between 3 and 4 . With 3 coaches only 150 people could go.
   So the sensible answer is 4.

2. 49 divided by 11 is between 4 and 5. The football club would need 55 players to field 5 teams.
   So the sensible answer is 4.

3. 116 divided by 25 is between 4 and 5. With 4 tins of paint you could only cover 100 square metres.
   So the sensible answer is 5.

4. 102 divided by 12 is between 8 and 9. To make up 9 crates the wholesaler would need 108 bottles.
   So the sensible answer is 8.

5. 67 divided by 10 is between 6 and 7. If Ms Kershaw ordered 6 packets of books there would only be enough for 60 students.
   So the sensible answer is 7.

6. 1 hour is 60 minutes, so 3 hours is 180 minutes.
   180 divided by 40 is between 4 and 5. To record 5 episodes Jameela would need 200 minutes of tape.
   So the sensible answer is 4.

2393 Equivalent Pairs

You may have played the game against the clock. Well done if you managed to collect all 10 pairs in under 2 minutes.

2394 Make That Number

You may have played the game against the computer. Well done if you managed to beat the computer, especially if you were playing at level 2.

2395 Maximum Remainder

Did you manage to complete the Practice Round successfully?
You may have played the games against the computer. Well done if you managed to beat the computer at both games.

2396 FindTheLine

Well done if you managed to score full marks on all four levels and claim your SMILE FindTheLine Certificate.

2397 Guess Inequality

Well done if you managed to score full marks on all four levels and claim your SMILE Guess Inequality Certificate.

2398 Decimal Places Match

Number on calculator	Number to 1 decimal place	Number to 2 decimal places	Number to 3 decimal places
3.4457982	3.4 to 1 dp	3.45 to 2 dp	3.446 to 3 dp

Number on calculator	Number to 1 decimal place	Number to 2 decimal places	Number to 3 decimal places
3.4561207	3.5 to 1 dp	3.46 to 2 dp	3.456 to 3 dp

Number on calculator	Number to 1 decimal place	Number to 2 decimal places	Number to 3 decimal places
3.4672331	3.5 to 1 dp	3.47 to 2 dp	3.467 to 3 dp

Number on calculator	Number to 1 decimal place	Number to 2 decimal places	Number to 3 decimal places
3.5471035	3.5 to 1 dp	3.55 to 2 dp	3.547 to 3 dp

Number on calculator	Number to 1 decimal place	Number to 2 decimal places	Number to 3 decimal places
3.5568156	3.6 to 1 dp	3.56 to 2 dp	3.557 to 3 dp

2399 Number Stories

1) This is the number story for 8 – 5 + 2.
I had eight stickers. Then I gave five to my friend. Then my sister gave me two.

This is the number story for 6 + 5 – 4.
I had six stickers. My friend gave me five more. Then I gave four to my little brother.

2) This is the number story for 6 x 2 – 5.
I had six pounds saved up. On my birthday my money was doubled. Then I spent five pounds on a CD.

This is the number story for 10 ÷ 2 – 4.
My parents gave me ten pounds. Then I gave my brother half of my money. I spent four pounds at the cinema.

3) Show your number stories for the other two calculations to your teacher.

2400 Circle Cut

The area of each small semicircle is $\frac{\pi r^2}{2}$
The area of the large circle is πR^2
Since R = 2r, the area of the large circle can also be written as $\pi(2r)^2 = 4\pi r^2$
Hence the area of a quarter of the large circle is πr^2

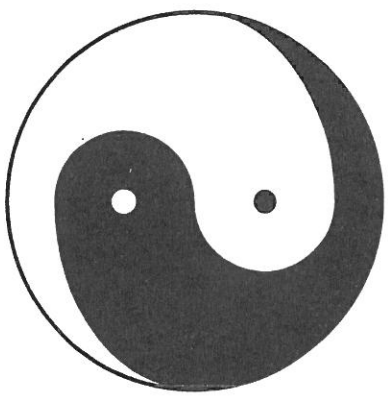
The area of this shape is therefore $\pi r^2 - \frac{\pi r^2}{2} = \frac{\pi r^2}{2}$ which is the same as the area of each small semicircle.

Therefore a straight cut at an angle of 45° to the vertical passing through the centre of the circle will divide each of the two regions exactly in two.

If your solution is different to the one above, ask your teacher to check it.

Note: The diagram on the worksheet is based upon the symbol representing Yin-Yang (shown on the right). Yin-Yang, in Chinese thought, are the two complementary forces that make up all aspects and phenomena of life. Yin is conceived of as earth, female and is present in even numbers, valleys and streams. Yang is conceived of as heavén, male and is present in odd numbers and mountains. When in harmony, the two forces are depicted as the light and dark halves of a circle.

(Source: Encyclopaedia Britannica web site)



2401 Play Your Cards Right

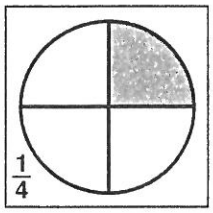
Show your scores to your teacher.

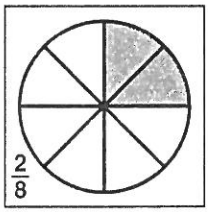
It may be impossible to make an even number or an odd number with your cards. For example, with the cards 2, 4, 8, 6, 2, it is impossible to make an odd number. How likely is this to happen?

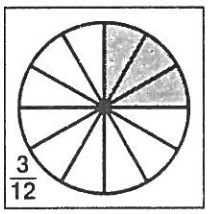
2402 Equivalent Fractions Sort

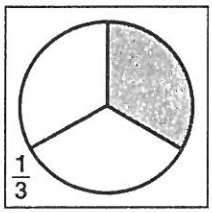
1. For each fraction, check that you have shaded the correct number of sectors by using the diagrams below.

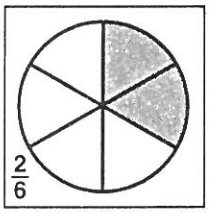
2. The fractions are arranged below in order of size with the smallest at the top and the largest at the bottom.

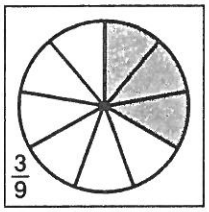


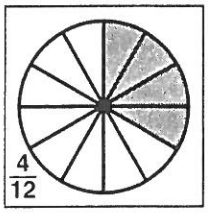


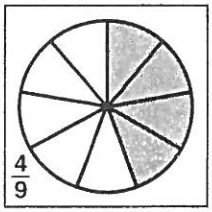


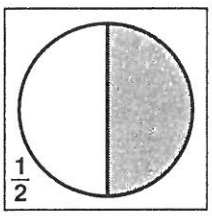


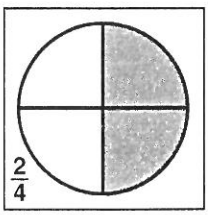


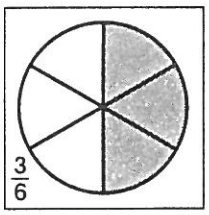


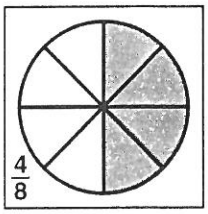


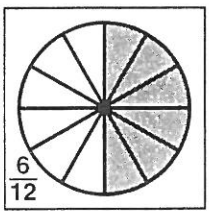


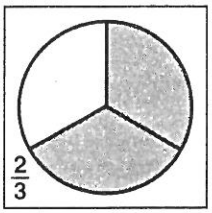


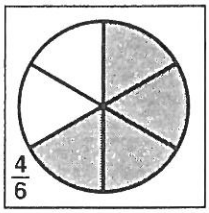


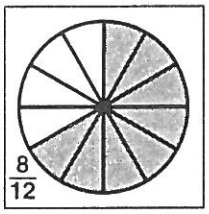












continued /

2402 Equivalent Fractions Sort (cont)

3. The fractions in each row above are equivalent:

$$\frac{1}{4} = \frac{2}{8} = \frac{3}{12}$$

$$\frac{1}{3} = \frac{2}{6} = \frac{3}{9} = \frac{4}{12}$$

$$\frac{1}{2} = \frac{2}{4} = \frac{3}{6} = \frac{4}{8} = \frac{6}{12}$$

$$\frac{2}{3} = \frac{4}{6} = \frac{8}{12}$$

4. You could have chosen any two fractions from this sequence, which are all equivalent to $\frac{3}{4}$

$$\frac{6}{8}\ ,\ \frac{9}{12}\ ,\ \frac{12}{16}\ ,\ \frac{15}{20}\ ,\ \ldots$$

2403 Missing the Point

Check carefully that your decimal points are in the right places. Here are the correct additions and subtractions:

A) 1. $4.05 + 24.05 = 28.1$
2. $5.8 + 7.4 = 13.2$
3. $0.7 + 4 = 4.7$
4. $77.7 + 7.07 = 84.77$
5. $0.45 + 0.55 = 1$
6. $0.3 + 7 = 7.3$

B) 1. $4.5 - 1.95 = 2.55$
2. $60.5 - 3.12 = 57.38$
3. $49 - 4.9 = 44.1$
4. $0.5 - 0.01 = 0.49$
5. $123 - 122.9 = 0.1$
6. $60 - 3.12 = 56.88$

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Answers

2382 to 2403

SMILE MATHEMATICS

2382 Areas of Polygons

1. A) 4cm^2 B) $5\frac{1}{2}\text{cm}^2$ C) $3\frac{1}{2}\text{cm}^2$

   D) $3\frac{1}{2}\text{cm}^2$ E) 7cm^2 F) $2\frac{1}{2}\text{cm}^2$

   G) 5cm^2 H) $3\frac{1}{2}\text{cm}^2$ I) $4\,\text{cm}^2$

2. In order of area (largest first): E, B, G, A and I, C and D and H, F

3. Make sure you recorded your area in cm^2.
   Get somebody else to check your answers.

2383 Solid Expressions

1. a) $\frac{1}{2}hwl$

   b) $hw + hl + wl + l\sqrt{h^2+w^2}$

   c) $3l + 2h + 2w + 2\sqrt{h^2+w^2}$

2. a) The cylinder is made up of two circles and a curved rectangular strip.

   Each circle has area $\pi\left(\frac{d}{2}\right)^2 = \frac{\pi d^2}{4}$

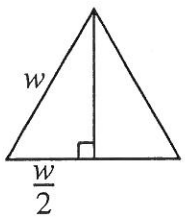
   The curved strip has area $\pi d \times h$

   The total surface area is $2\left(\frac{\pi d^2}{4}\right) + \pi dh = \frac{\pi d^2}{2} + \pi dh$

   b) $\frac{\pi d^2 h}{4}$

   c) $2\pi d$

3. a)



   The height of the equilateral triangle is $\sqrt{w^2-\left(\frac{w}{2}\right)^2} = \frac{\sqrt{3}w}{2}$

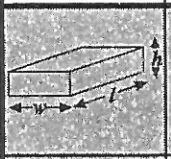
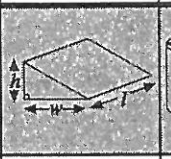
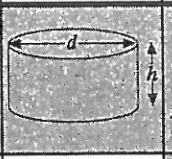
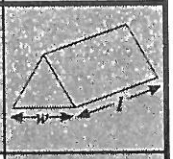
   The volume of the prism is $\frac{1}{2} \times w \times \frac{\sqrt{3}w}{2} \times l = \frac{\sqrt{3}lw^2}{4}$

   b) $\frac{\sqrt{3}w^2}{2} + 3wl$

   c) $3l + 6w$

continued/

4.

	Cuboid	Right-angled triangular prism	Cylinder	Equilateral triangular prism
Diagram				
Volume	hwl	$\frac{1}{2}hwl$	$\frac{\pi d^2 h}{4}$	$\frac{\sqrt{3}lw^2}{4}$
Surface area	$2(hw+hl+wl)$	$hw+hl+wl+l\sqrt{h^2+w^2}$	$\frac{\pi d^2}{2}+\pi dh$	$\frac{\sqrt{3}w^2}{2}+3wl$
Total edge length	$4(h+w+l)$	$3l+2h+2w+2\sqrt{h^2+w^2}$	$2\pi d$	$3l+6w$

5. When you multiply together two lengths, you multiply the values **and the units,**
   e.g. 2cm x 3cm = 6cm^2 (cm x cm gives cm^2)
   When you add together two lengths or multiply by a number, you change the values **but the units stay the same,**
   e.g. 2cm + 3cm = 5cm, 3 x 2cm = 6cm
   Hence:
   a) An expression describing volume (measured in cm^3) would include terms containing three lengths multiplied together.
   b) An expression describing surface area (measured in cm^2) would include terms containing two lengths multiplied together.
   c) An expression describing total edge length (measured in cm) would include terms containing lengths only.

6. a) $\frac{3\sqrt{3}lw^2}{2}$ describes volume.

   b) $6lw + 3\sqrt{3}w^2$ describes surface area.

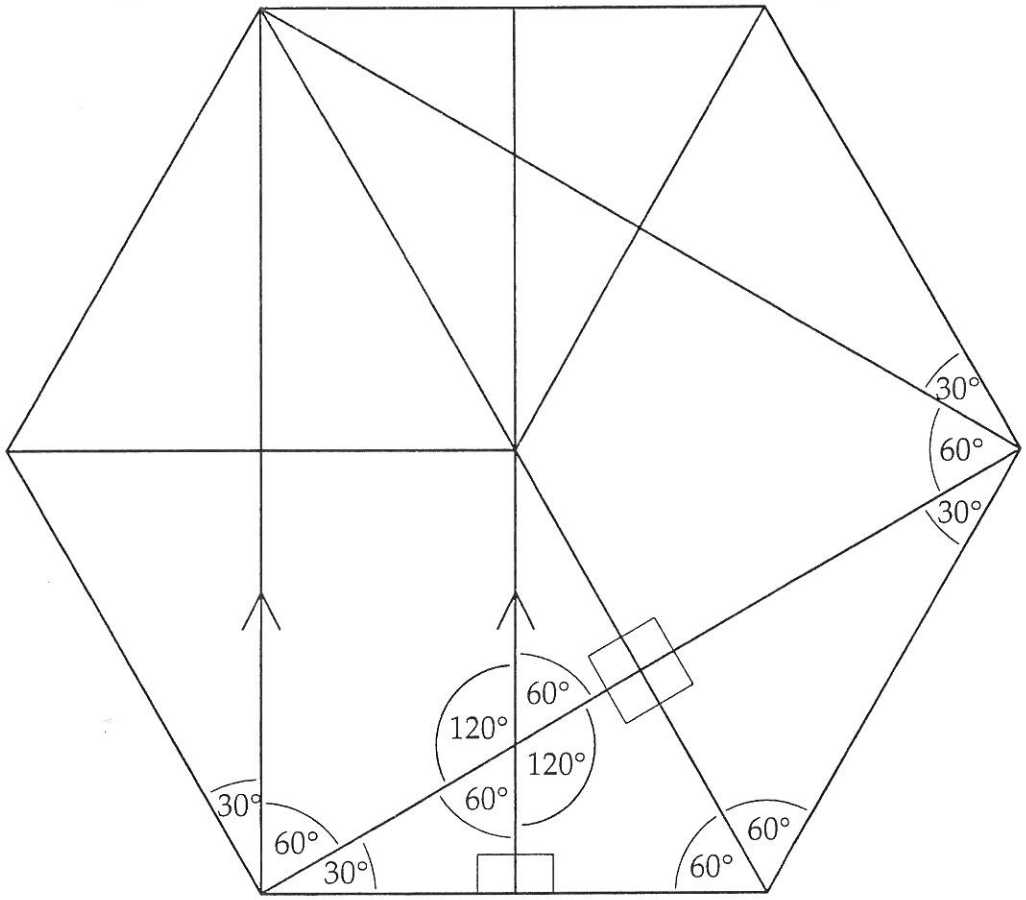
   c) $12w + 6l$ describes total edge length.

2384 Angles in a Regular Hexagon

Here are some of the facts that you need to use to find all the unmarked angles:

- Angles around a point add up to 360°.
- Angles on a straight line add up to 180°.
- The interior angles of a triangle add up to 180°.
- The interior angles of a quadrilateral add up to 360°.
- Vertically opposite angles are equal.

Some of the angles in the worksheet have been marked in the diagram below.



2385 Nine Nine Nine

1.

1 x 9 = 9	1 x 99 = 99	1 x 999 = 999	1 x 9999 = 9999	1 x 99999 = 99999
2 x 9 = 18	2 x 99 = 198	2 x 999 = 1998	2 x 9999 = 19998	2 x 99999 = 199998
3 x 9 = 27	3 x 99 = 297	3 x 999 = 2997	3 x 9999 = 29997	3 x 99999 = 299997
4 x 9 = 36	4 x 99 = 396	4 x 999 = 3996	4 x 9999 = 39996	4 x 99999 = 399996
5 x 9 = 45	5 x 99 = 495	5 x 999 = 4995	5 x 9999 = 49995	5 x 99999 = 499995
6 x 9 = 54	6 x 99 = 594	6 x 999 = 5994	6 x 9999 = 59994	6 x 99999 = 599994
7 x 9 = 63	7 x 99 = 693	7 x 999 = 6993	7 x 9999 = 69993	7 x 99999 = 699993
8 x 9 = 72	8 x 99 = 792	8 x 999 = 7992	8 x 9999 = 79992	8 x 99999 = 799992
9 x 9 = 81	9 x 99 = 891	9 x 999 = 8991	9 x 9999 = 89991	9 x 99999 = 899991

continued/

2385 Nine Nine Nine (cont)

2. Here are some things you may have noticed:
   - The first digit of each number increases by 1.
   - The last digit of each number decreases by 1.
   - The outside digits give the 9 times table.
   - There are 9's in between.

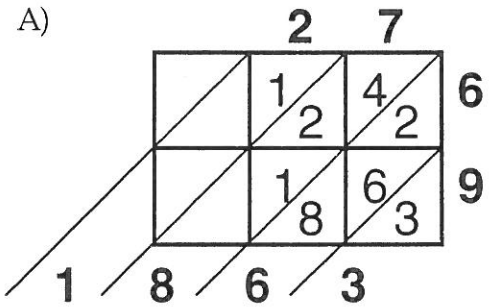
   'Add 9' is the same as 'add 10 and subtract 1'.
   'Add 99' is the same as 'add 100 and subtract 1'.
   Etc.

3. 10 x 9 = 90 10 x 99 = 990 10 x 999 = 9990
   11 x 9 = 99 11 x 99 = 1089 11 x 999 = 10989
   12 x 9 = 108 12 x 99 = 1188 12 x 999 = 11988
   13 x 9 = 117 13 x 99 = 1287 13 x 999 = 12987
   The pattern will break down after the 10th term of each sequence.

2386 Multiplication Review

2. You might like to find out more about some of the methods for multiplication in this activiy:
   Method A is the Chinese or Gelosia method (see Smile 0174).
   Method B is based on the area of rectangles (see Smile 0850).
   Method C is Egyptian multiplication.
   Method D is the Vedic method from India.
   Method E is Russian multiplication (see Smile 2064).

3. A)



B)

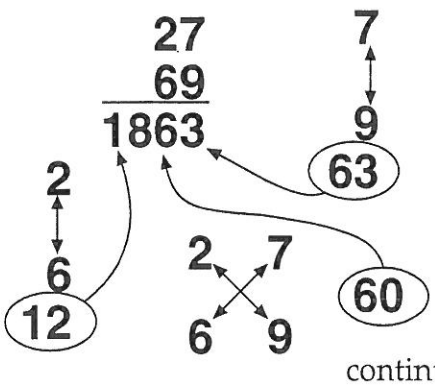
	20	7
60	1200	420
9	180	63

1200 + 420 + 180 + 63 = 1863

C)

27 x 10 = 270
27 x 20 = 540
27 x 40 = 1080 +
27 x 70 = 1890
27 x 1 = 27 −
27 x 69 = 1863

D)



continued/

2386 Multiplication Review (cont)

E)

27	69
13	138
~~6~~	~~276~~
3	552
1	1104
	1863

4. Explain each of the methods to another student or your teacher.

2387 Multiples of Ten

1. These are the five other pairs.

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

2. These are the three groups.

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

3. These are the five groups.

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

4. These are the two groups.

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

continued/

5. These are the four groups.

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

6. These are the four groups.

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

7. There are six groups in this shape.

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

There are six groups in this shape.

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

If you found a group in a different shape, ask your teacher to check your answers.

2388 Six Pyramids

The length and width of the base of each pyramid are both 6cm.
The vertical height is 3cm.
Using Pythagoras' Theorem:

The height of each triangular face is $\sqrt{3^2+3^2} = \sqrt{18} = 4.24$cm.

The length of each sloping edge of the pyramid is $\sqrt{18+3^2} = \sqrt{27} = 5.20$cm.

If you have drawn the nets of your pyramids accurately using ruler and compasses, they will fold back into a cube.

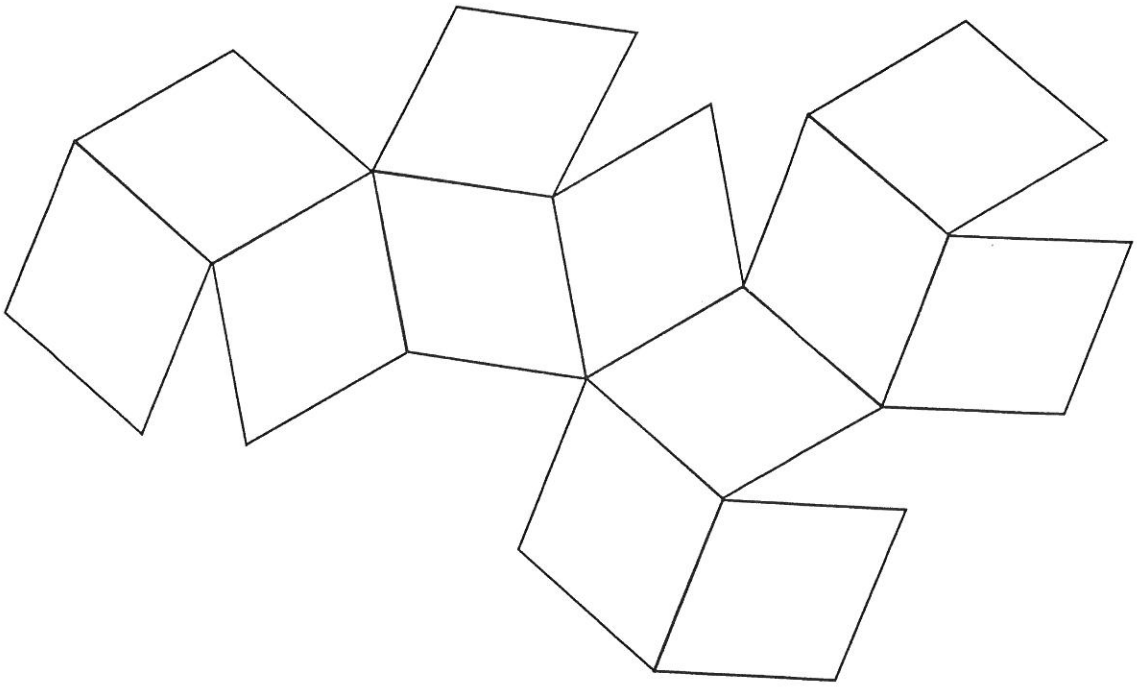
Solutions to the four problems:

The six pyramids make a cube with volume 6 x 6 x 6 = 216cm^3. They surround another cube with volume 216cm^3. The volume of the new solid is therefore 432cm^3.

The area of each triangular face of a pyramid is 6 x 4.24 ÷ 2 = 12.72cm^2.
The surface area of the new solid is therefore 12.72 x 24 = 305.28cm^2.

The new solid will have 12 faces. The angle between the triangular face and the base of each pyramid is 45°. Therefore each face, together with a triangular face from a neighbouring pyramid, will make a rhombus.

Here is one possible net for the new solid. Each rhombus has an edge length of 5.20cm and a short diagonal of 6cm.



2389 Percentage Puzzle

There are two possibilities for each correct calculation.

10%	of	150	=	15	or	150%	of	10	=	15
50%	of	70	=	35	or	70%	of	50	=	35
25%	of	80	=	20	or	80%	of	25	=	20
60%	of	75	=	45	or	75%	of	60	=	45

2390 Consecutive Products

1. a) 12 → 3, 4 b) 72 → 8, 9 c) 90 → 9, 10 d) 56 → 7, 8

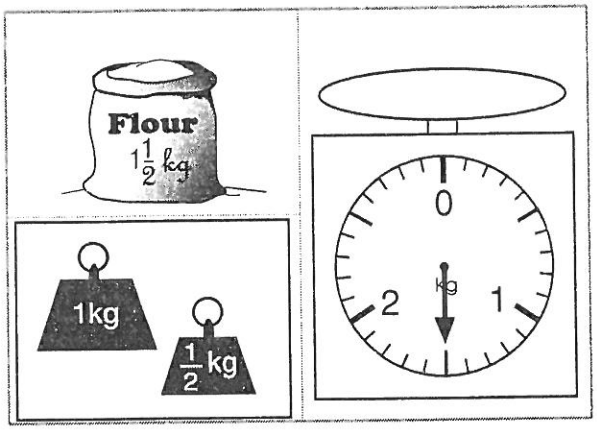
   e) 110 → 10, 11 f) 462 → 21, 22 g) 306 → 17, 18 h) 756 → 27, 28

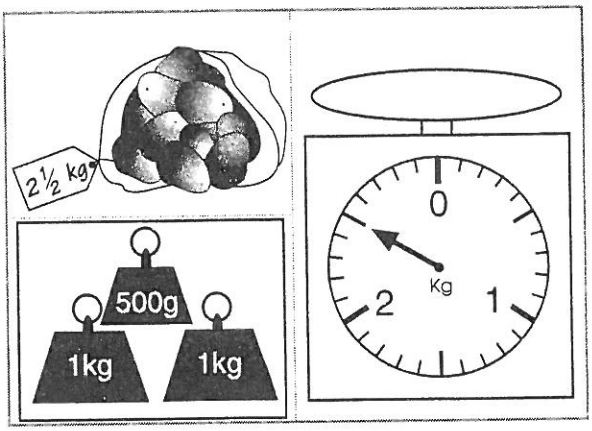
   i) 210 → 14, 15 j) 1806 → 42, 43 k) 3782 → 61, 62 l) 3192 → 56, 57

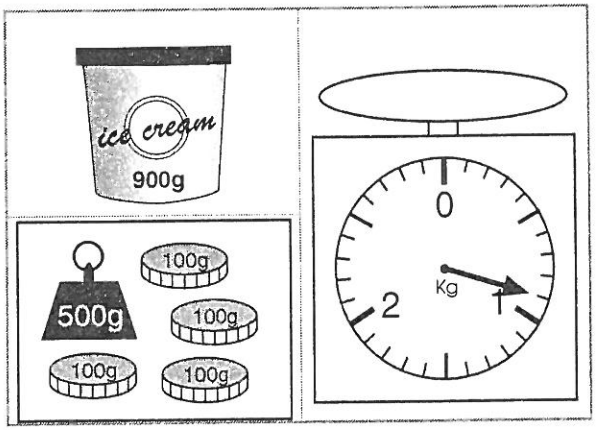
2. a) 336 → 6, 7, 8 b) 990 → 9, 10, 11 c) 21924 → 27, 28, 29

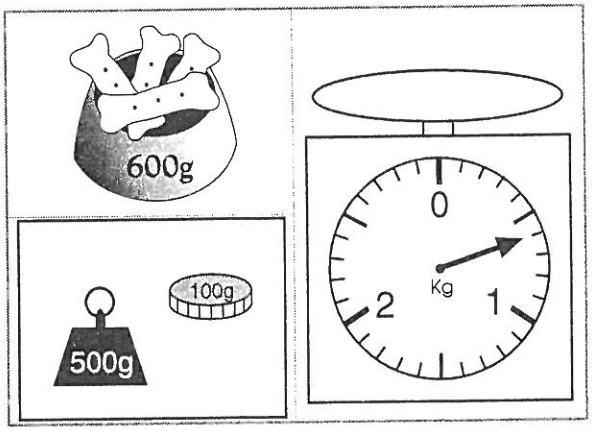
2391 Matching Weights

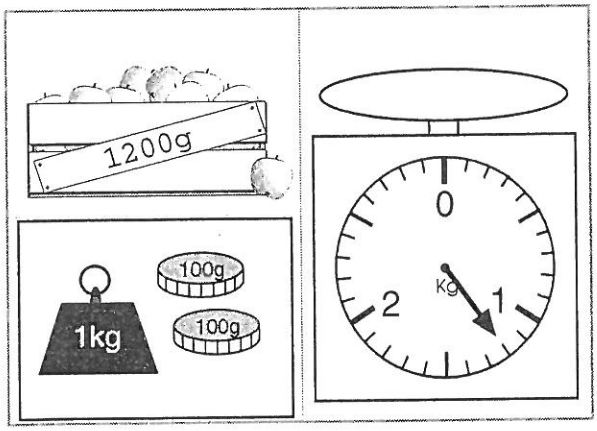
Make sure that you have matched the weights **and** shown each weight correctly on the scales.

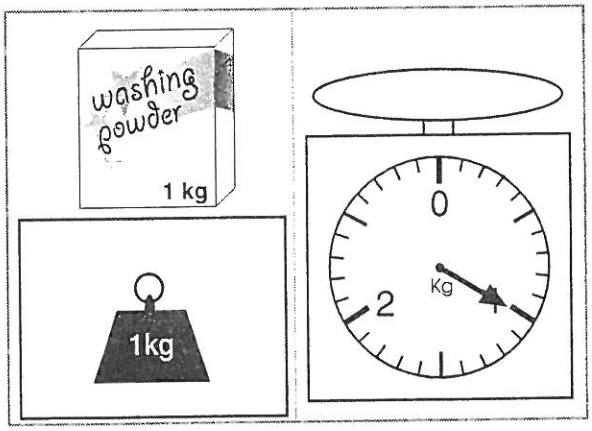












2392 Sensible Answers

1. 169 divided by 50 is between 3 and 4 . With 3 coaches only 150 people could go.
   So the sensible answer is 4.

2. 49 divided by 11 is between 4 and 5. The football club would need 55 players to field 5 teams.
   So the sensible answer is 4.

3. 116 divided by 25 is between 4 and 5. With 4 tins of paint you could only cover 100 square metres.
   So the sensible answer is 5.

4. 102 divided by 12 is between 8 and 9. To make up 9 crates the wholesaler would need 108 bottles.
   So the sensible answer is 8.

5. 67 divided by 10 is between 6 and 7. If Ms Kershaw ordered 6 packets of books there would only be enough for 60 students.
   So the sensible answer is 7.

6. 1 hour is 60 minutes, so 3 hours is 180 minutes.
   180 divided by 40 is between 4 and 5. To record 5 episodes Jameela would need 200 minutes of tape.
   So the sensible answer is 4.

2393 Equivalent Pairs

You may have played the game against the clock. Well done if you managed to collect all 10 pairs in under 2 minutes.

2394 Make That Number

You may have played the game against the computer. Well done if you managed to beat the computer, especially if you were playing at level 2.

2395 Maximum Remainder

Did you manage to complete the Practice Round successfully?
You may have played the games against the computer. Well done if you managed to beat the computer at both games.

2396 FindTheLine

Well done if you managed to score full marks on all four levels and claim your SMILE FindTheLine Certificate.

2397 Guess Inequality

Well done if you managed to score full marks on all four levels and claim your SMILE Guess Inequality Certificate.

2398 Decimal Places Match

Number on calculator	Number to 1 decimal place	Number to 2 decimal places	Number to 3 decimal places
3.4457982	3.4 to 1 dp	3.45 to 2 dp	3.446 to 3 dp

Number on calculator	Number to 1 decimal place	Number to 2 decimal places	Number to 3 decimal places
3.4561207	3.5 to 1 dp	3.46 to 2 dp	3.456 to 3 dp

Number on calculator	Number to 1 decimal place	Number to 2 decimal places	Number to 3 decimal places
3.4672331	3.5 to 1 dp	3.47 to 2 dp	3.467 to 3 dp

Number on calculator	Number to 1 decimal place	Number to 2 decimal places	Number to 3 decimal places
3.5471035	3.5 to 1 dp	3.55 to 2 dp	3.547 to 3 dp

Number on calculator	Number to 1 decimal place	Number to 2 decimal places	Number to 3 decimal places
3.5568156	3.6 to 1 dp	3.56 to 2 dp	3.557 to 3 dp

2399 Number Stories

1) This is the number story for 8 – 5 + 2.
I had eight stickers. Then I gave five to my friend. Then my sister gave me two.

This is the number story for 6 + 5 – 4.
I had six stickers. My friend gave me five more. Then I gave four to my little brother.

2) This is the number story for 6 x 2 – 5.
I had six pounds saved up. On my birthday my money was doubled. Then I spent five pounds on a CD.

This is the number story for 10 ÷ 2 – 4.
My parents gave me ten pounds. Then I gave my brother half of my money. I spent four pounds at the cinema.

3) Show your number stories for the other two calculations to your teacher.

2400 Circle Cut

The area of each small semicircle is $\frac{\pi r^2}{2}$
The area of the large circle is πR^2
Since R = 2r, the area of the large circle can also be written as $\pi(2r)^2 = 4\pi r^2$
Hence the area of a quarter of the large circle is πr^2

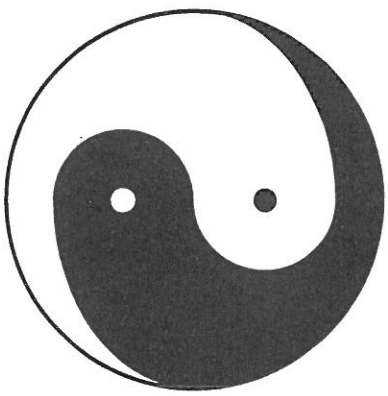
The area of this shape is therefore $\pi r^2 - \frac{\pi r^2}{2} = \frac{\pi r^2}{2}$ which is the same as the area of each small semicircle.

Therefore a straight cut at an angle of 45° to the vertical passing through the centre of the circle will divide each of the two regions exactly in two.

If your solution is different to the one above, ask your teacher to check it.

Note: The diagram on the worksheet is based upon the symbol representing Yin-Yang (shown on the right). Yin-Yang, in Chinese thought, are the two complementary forces that make up all aspects and phenomena of life. Yin is conceived of as earth, female and is present in even numbers, valleys and streams. Yang is conceived of as heavén, male and is present in odd numbers and mountains. When in harmony, the two forces are depicted as the light and dark halves of a circle.

(Source: Encyclopaedia Britannica web site)



2401 Play Your Cards Right

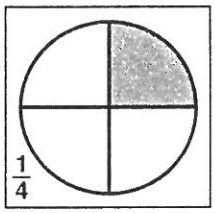
Show your scores to your teacher.

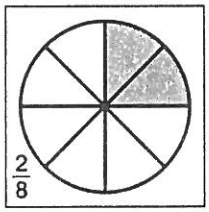
It may be impossible to make an even number or an odd number with your cards. For example, with the cards 2, 4, 8, 6, 2, it is impossible to make an odd number. How likely is this to happen?

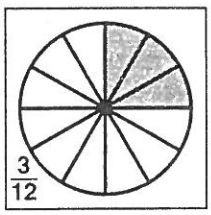
2402 Equivalent Fractions Sort

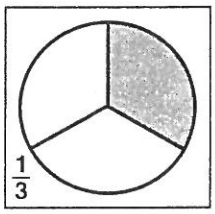
1. For each fraction, check that you have shaded the correct number of sectors by using the diagrams below.

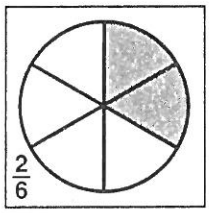
2. The fractions are arranged below in order of size with the smallest at the top and the largest at the bottom.

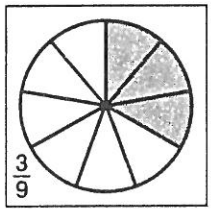


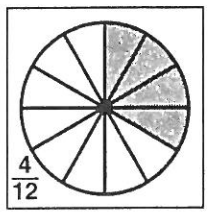


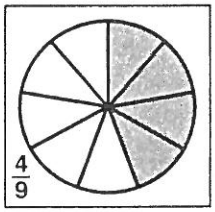


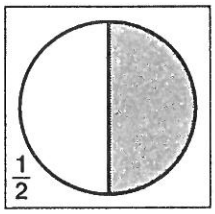


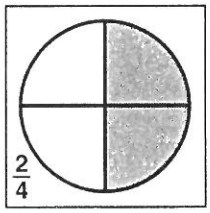


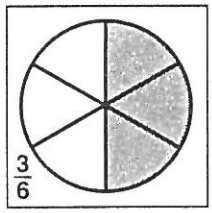


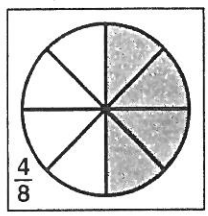


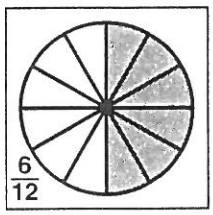


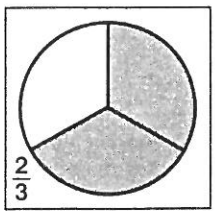


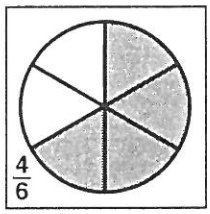


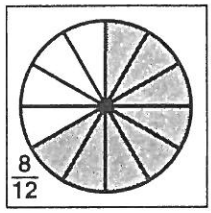












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2402 Equivalent Fractions Sort (cont)

3. The fractions in each row above are equivalent:

$$\frac{1}{4} = \frac{2}{8} = \frac{3}{12}$$

$$\frac{1}{3} = \frac{2}{6} = \frac{3}{9} = \frac{4}{12}$$

$$\frac{1}{2} = \frac{2}{4} = \frac{3}{6} = \frac{4}{8} = \frac{6}{12}$$

$$\frac{2}{3} = \frac{4}{6} = \frac{8}{12}$$

4. You could have chosen any two fractions from this sequence, which are all equivalent to $\frac{3}{4}$

$$\frac{6}{8}\ ,\ \frac{9}{12}\ ,\ \frac{12}{16}\ ,\ \frac{15}{20}\ ,\ \ldots$$

2403 Missing the Point

Check carefully that your decimal points are in the right places. Here are the correct additions and subtractions:

A) 1. $4.05 + 24.05 = 28.1$
2. $5.8 + 7.4 = 13.2$
3. $0.7 + 4 = 4.7$
4. $77.7 + 7.07 = 84.77$
5. $0.45 + 0.55 = 1$
6. $0.3 + 7 = 7.3$

B) 1. $4.5 - 1.95 = 2.55$
2. $60.5 - 3.12 = 57.38$
3. $49 - 4.9 = 44.1$
4. $0.5 - 0.01 = 0.49$
5. $123 - 122.9 = 0.1$
6. $60 - 3.12 = 56.88$

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Answers

2382 to 2403

SMILE MATHEMATICS

2382 Areas of Polygons

1. A) 4cm^2 B) $5\frac{1}{2}\text{cm}^2$ C) $3\frac{1}{2}\text{cm}^2$

   D) $3\frac{1}{2}\text{cm}^2$ E) 7cm^2 F) $2\frac{1}{2}\text{cm}^2$

   G) 5cm^2 H) $3\frac{1}{2}\text{cm}^2$ I) $4\,\text{cm}^2$

2. In order of area (largest first): E, B, G, A and I, C and D and H, F

3. Make sure you recorded your area in cm^2.
   Get somebody else to check your answers.

2383 Solid Expressions

1. a) $\frac{1}{2}hwl$

   b) $hw + hl + wl + l\sqrt{h^2+w^2}$

   c) $3l + 2h + 2w + 2\sqrt{h^2+w^2}$

2. a) The cylinder is made up of two circles and a curved rectangular strip.

   Each circle has area $\pi\left(\frac{d}{2}\right)^2 = \frac{\pi d^2}{4}$

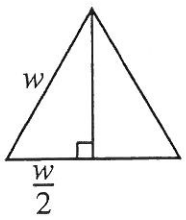
   The curved strip has area $\pi d \times h$

   The total surface area is $2\left(\frac{\pi d^2}{4}\right) + \pi dh = \frac{\pi d^2}{2} + \pi dh$

   b) $\frac{\pi d^2 h}{4}$

   c) $2\pi d$

3. a)



   The height of the equilateral triangle is $\sqrt{w^2-\left(\frac{w}{2}\right)^2} = \frac{\sqrt{3}w}{2}$

   The volume of the prism is $\frac{1}{2} \times w \times \frac{\sqrt{3}w}{2} \times l = \frac{\sqrt{3}lw^2}{4}$

   b) $\frac{\sqrt{3}w^2}{2} + 3wl$

   c) $3l + 6w$

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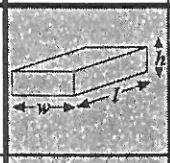
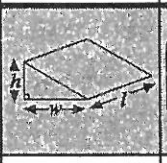
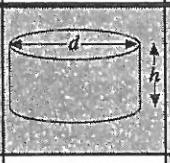
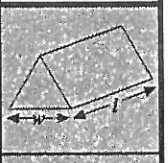
4.

	Cuboid	Right-angled triangular prism	Cylinder	Equilateral triangular prism
Diagram				
Volume	hwl	$\frac{1}{2}hwl$	$\frac{\pi d^2 h}{4}$	$\frac{\sqrt{3}lw^2}{4}$
Surface area	$2(hw+hl+wl)$	$hw+hl+wl$ $+l\sqrt{h^2+w^2}$	$\frac{\pi d^2}{2}+\pi dh$	$\frac{\sqrt{3}w^2}{2}+3wl$
Total edge length	$4(h+w+l)$	$3l+2h+2w$ $+2\sqrt{h^2+w^2}$	$2\pi d$	$3l+6w$

5. When you multiply together two lengths, you multiply the values **and the units,**
   e.g. 2cm x 3cm = 6cm^2 (cm x cm gives cm^2)
   When you add together two lengths or multiply by a number, you change the values **but the units stay the same,**
   e.g. 2cm + 3cm = 5cm, 3 x 2cm = 6cm
   Hence:
   a) An expression describing volume (measured in cm^3) would include terms containing three lengths multiplied together.
   b) An expression describing surface area (measured in cm^2) would include terms containing two lengths multiplied together.
   c) An expression describing total edge length (measured in cm) would include terms containing lengths only.

6. a) $\frac{3\sqrt{3}lw^2}{2}$ describes volume.

   b) $6lw + 3\sqrt{3}w^2$ describes surface area.

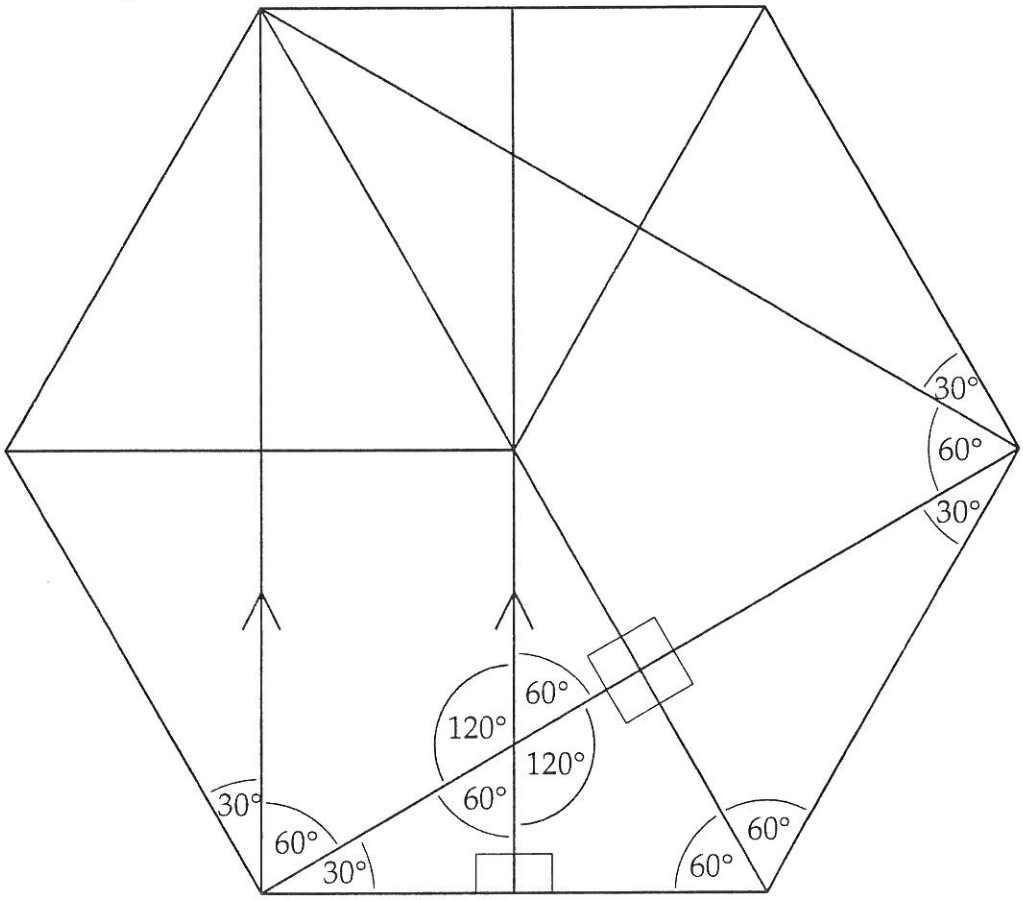
   c) $12w + 6l$ describes total edge length.

2384 Angles in a Regular Hexagon

Here are some of the facts that you need to use to find all the unmarked angles:

- Angles around a point add up to 360°.
- Angles on a straight line add up to 180°.
- The interior angles of a triangle add up to 180°.
- The interior angles of a quadrilateral add up to 360°.
- Vertically opposite angles are equal.

Some of the angles in the worksheet have been marked in the diagram below.



2385 Nine Nine Nine

1.

1 x 9 = 9	1 x 99 = 99	1 x 999 = 999	1 x 9999 = 9999	1 x 99999 = 99999
2 x 9 = 18	2 x 99 = 198	2 x 999 = 1998	2 x 9999 = 19998	2 x 99999 = 199998
3 x 9 = 27	3 x 99 = 297	3 x 999 = 2997	3 x 9999 = 29997	3 x 99999 = 299997
4 x 9 = 36	4 x 99 = 396	4 x 999 = 3996	4 x 9999 = 39996	4 x 99999 = 399996
5 x 9 = 45	5 x 99 = 495	5 x 999 = 4995	5 x 9999 = 49995	5 x 99999 = 499995
6 x 9 = 54	6 x 99 = 594	6 x 999 = 5994	6 x 9999 = 59994	6 x 99999 = 599994
7 x 9 = 63	7 x 99 = 693	7 x 999 = 6993	7 x 9999 = 69993	7 x 99999 = 699993
8 x 9 = 72	8 x 99 = 792	8 x 999 = 7992	8 x 9999 = 79992	8 x 99999 = 799992
9 x 9 = 81	9 x 99 = 891	9 x 999 = 8991	9 x 9999 = 89991	9 x 99999 = 899991

continued/

2385 Nine Nine Nine (cont)

2. Here are some things you may have noticed:
   - The first digit of each number increases by 1.
   - The last digit of each number decreases by 1.
   - The outside digits give the 9 times table.
   - There are 9's in between.

   'Add 9' is the same as 'add 10 and subtract 1'.
   'Add 99' is the same as 'add 100 and subtract 1'.
   Etc.

3.

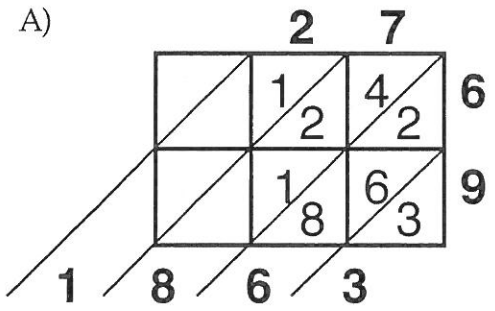
10 x 9 = 90	10 x 99 = 990	10 x 999 = 9990
11 x 9 = 99	11 x 99 = 1089	11 x 999 = 10989
12 x 9 = 108	12 x 99 = 1188	12 x 999 = 11988
13 x 9 = 117	13 x 99 = 1287	13 x 999 = 12987

The pattern will break down after the 10th term of each sequence.

2386 Multiplication Review

2. You might like to find out more about some of the methods for multiplication in this activiy:
   Method A is the Chinese or Gelosia method (see Smile 0174).
   Method B is based on the area of rectangles (see Smile 0850).
   Method C is Egyptian multiplication.
   Method D is the Vedic method from India.
   Method E is Russian multiplication (see Smile 2064).

3. A)



B)

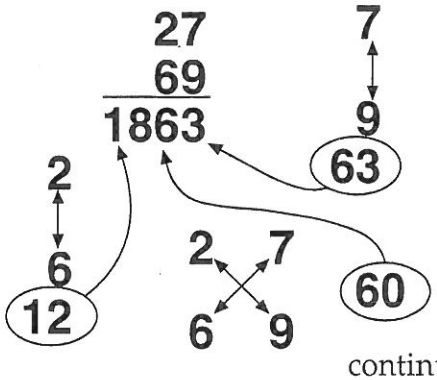
	20	7
60	1200	420
9	180	63

1200 + 420 + 180 + 63 = 1863

C)

27 x 10 = 270
27 x 20 = 540
27 x 40 = 1080 +
27 x 70 = 1890
27 x 1 = 27 −
27 x 69 = 1863

D)



continued /

2386 Multiplication Review (cont)

E)

27	69
13	138
~~6~~	~~276~~
3	552
1	1104
	1863

4. Explain each of the methods to another student or your teacher.

2387 Multiples of Ten

1. These are the five other pairs.

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

2. These are the three groups.

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

3. These are the five groups.

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

4. These are the two groups.

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

continued/

5. These are the four groups.

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

6. These are the four groups.

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

7. There are six groups in this shape.

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

There are six groups in this shape.

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

If you found a group in a different shape, ask your teacher to check your answers.

2388 Six Pyramids

The length and width of the base of each pyramid are both 6cm.
The vertical height is 3cm.
Using Pythagoras' Theorem:

The height of each triangular face is $\sqrt{3^2+3^2} = \sqrt{18} = 4.24$cm.

The length of each sloping edge of the pyramid is $\sqrt{18+3^2} = \sqrt{27} = 5.20$cm.

If you have drawn the nets of your pyramids accurately using ruler and compasses, they will fold back into a cube.

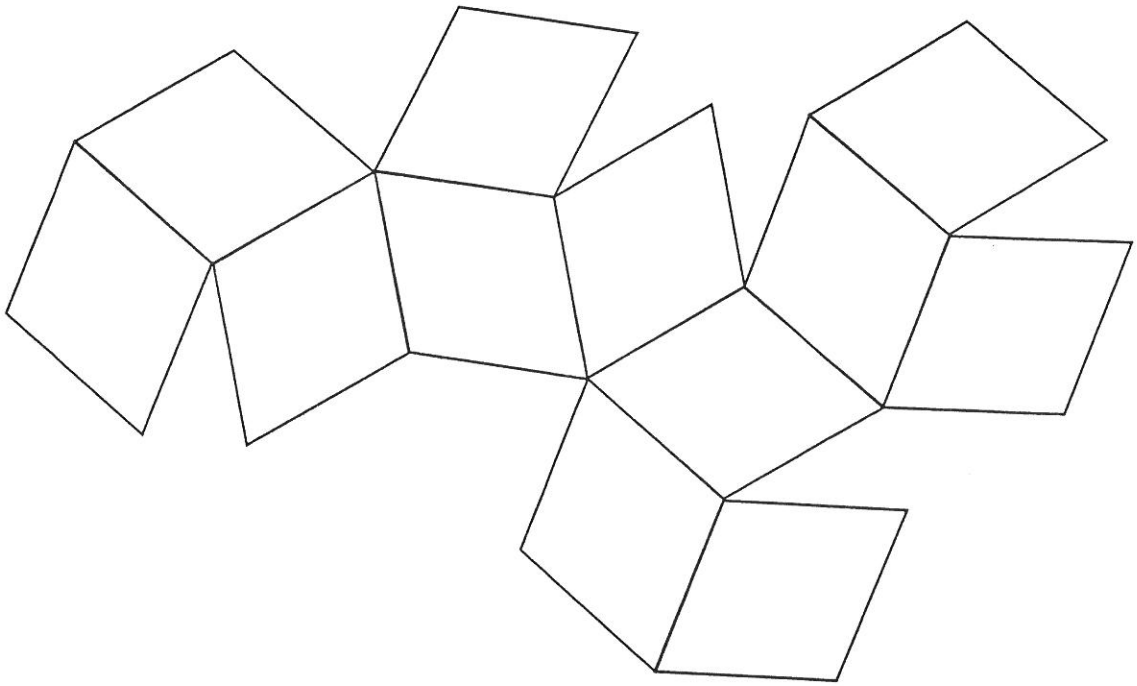
Solutions to the four problems:

The six pyramids make a cube with volume 6 x 6 x 6 = 216cm^3. They surround another cube with volume 216cm^3. The volume of the new solid is therefore 432cm^3.

The area of each triangular face of a pyramid is 6 x 4.24 ÷ 2 = 12.72cm^2.
The surface area of the new solid is therefore 12.72 x 24 = 305.28cm^2.

The new solid will have 12 faces. The angle between the triangular face and the base of each pyramid is 45°. Therefore each face, together with a triangular face from a neighbouring pyramid, will make a rhombus.

Here is one possible net for the new solid. Each rhombus has an edge length of 5.20cm and a short diagonal of 6cm.



2389 Percentage Puzzle

There are two possibilities for each correct calculation.

10%	of	150	=	15	or	150%	of	10	=	15
50%	of	70	=	35	or	70%	of	50	=	35
25%	of	80	=	20	or	80%	of	25	=	20
60%	of	75	=	45	or	75%	of	60	=	45

2390 Consecutive Products

1. a) 12 → 3, 4 b) 72 → 8, 9 c) 90 → 9, 10 d) 56 → 7, 8

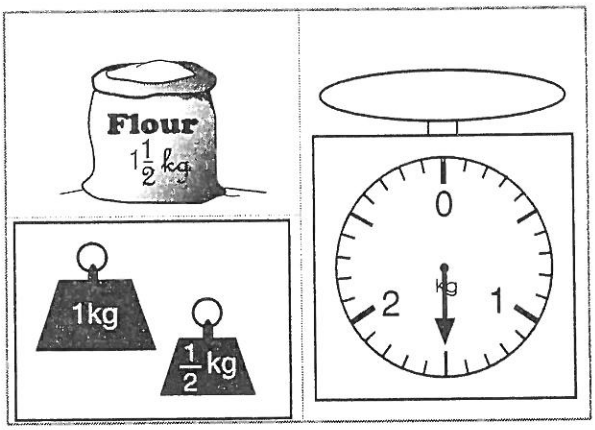
   e) 110 → 10, 11 f) 462 → 21, 22 g) 306 → 17, 18 h) 756 → 27, 28

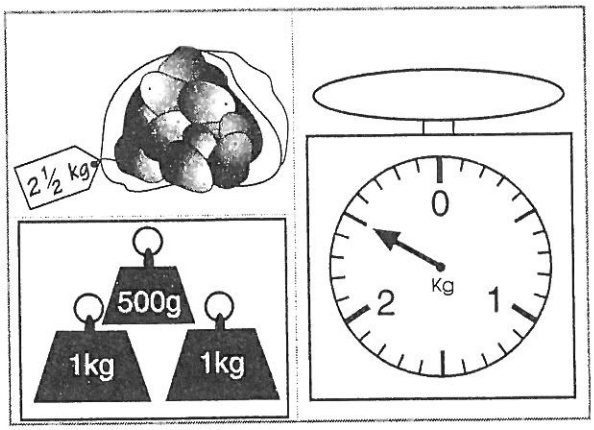
   i) 210 → 14, 15 j) 1806 → 42, 43 k) 3782 → 61, 62 l) 3192 → 56, 57

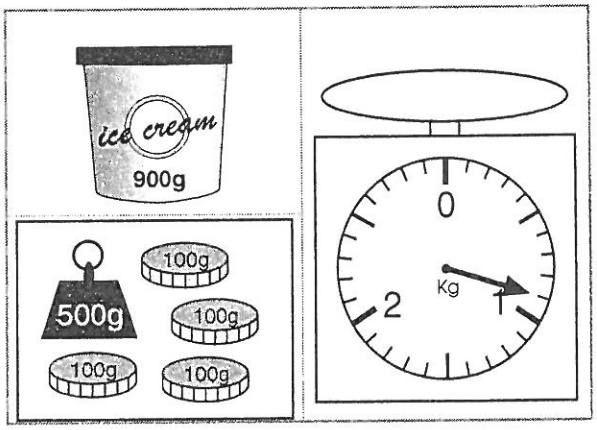
2. a) 336 → 6, 7, 8 b) 990 → 9, 10, 11 c) 21924 → 27, 28, 29

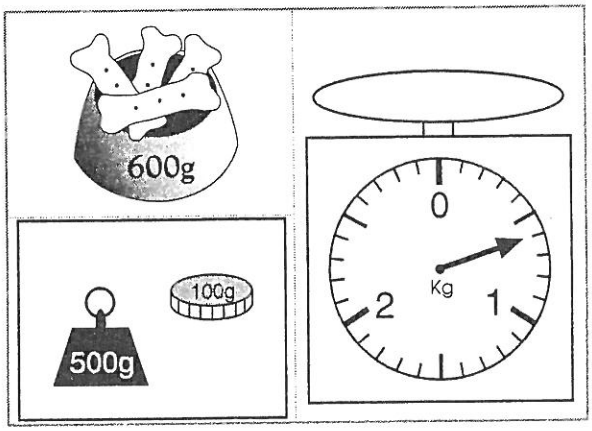
2391 Matching Weights

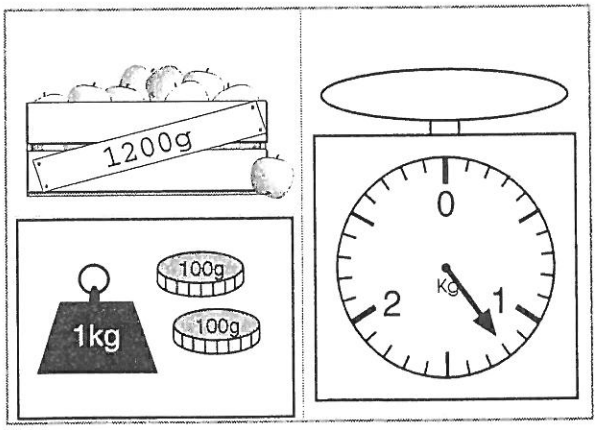
Make sure that you have matched the weights **and** shown each weight correctly on the scales.

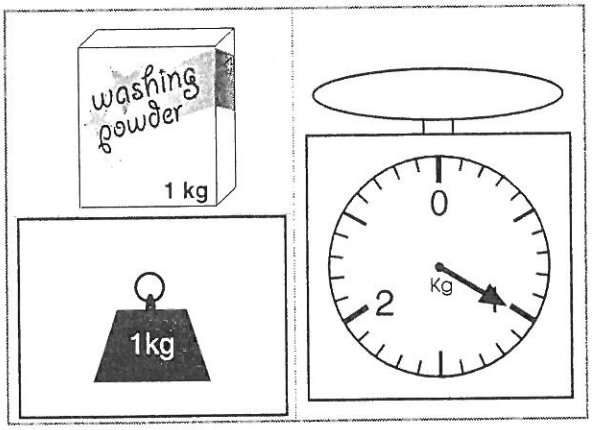












2392 Sensible Answers

1. 169 divided by 50 is between 3 and 4 . With 3 coaches only 150 people could go.
   So the sensible answer is 4.

2. 49 divided by 11 is between 4 and 5. The football club would need 55 players to field 5 teams.
   So the sensible answer is 4.

3. 116 divided by 25 is between 4 and 5. With 4 tins of paint you could only cover 100 square metres.
   So the sensible answer is 5.

4. 102 divided by 12 is between 8 and 9. To make up 9 crates the wholesaler would need 108 bottles.
   So the sensible answer is 8.

5. 67 divided by 10 is between 6 and 7. If Ms Kershaw ordered 6 packets of books there would only be enough for 60 students.
   So the sensible answer is 7.

6. 1 hour is 60 minutes, so 3 hours is 180 minutes.
   180 divided by 40 is between 4 and 5. To record 5 episodes Jameela would need 200 minutes of tape.
   So the sensible answer is 4.

2393 Equivalent Pairs

You may have played the game against the clock. Well done if you managed to collect all 10 pairs in under 2 minutes.

2394 Make That Number

You may have played the game against the computer. Well done if you managed to beat the computer, especially if you were playing at level 2.

2395 Maximum Remainder

Did you manage to complete the Practice Round successfully?
You may have played the games against the computer. Well done if you managed to beat the computer at both games.

2396 FindTheLine

Well done if you managed to score full marks on all four levels and claim your SMILE FindTheLine Certificate.

2397 Guess Inequality

Well done if you managed to score full marks on all four levels and claim your SMILE Guess Inequality Certificate.

2398 Decimal Places Match

Number on calculator	Number to 1 decimal place	Number to 2 decimal places	Number to 3 decimal places
3.4457982	3.4 to 1 dp	3.45 to 2 dp	3.446 to 3 dp

Number on calculator	Number to 1 decimal place	Number to 2 decimal places	Number to 3 decimal places
3.4561207	3.5 to 1 dp	3.46 to 2 dp	3.456 to 3 dp

Number on calculator	Number to 1 decimal place	Number to 2 decimal places	Number to 3 decimal places
3.4672331	3.5 to 1 dp	3.47 to 2 dp	3.467 to 3 dp

Number on calculator	Number to 1 decimal place	Number to 2 decimal places	Number to 3 decimal places
3.5471035	3.5 to 1 dp	3.55 to 2 dp	3.547 to 3 dp

Number on calculator	Number to 1 decimal place	Number to 2 decimal places	Number to 3 decimal places
3.5568156	3.6 to 1 dp	3.56 to 2 dp	3.557 to 3 dp

2399 Number Stories

1) This is the number story for $8 - 5 + 2$.
I had eight stickers. Then I gave five to my friend. Then my sister gave me two.

This is the number story for $6 + 5 - 4$.
I had six stickers. My friend gave me five more. Then I gave four to my little brother.

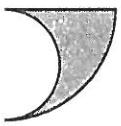
2) This is the number story for $6 \times 2 - 5$.
I had six pounds saved up. On my birthday my money was doubled. Then I spent five pounds on a CD.

This is the number story for $10 \div 2 - 4$.
My parents gave me ten pounds. Then I gave my brother half of my money. I spent four pounds at the cinema.

3) Show your number stories for the other two calculations to your teacher.

2400 Circle Cut

The area of each small semicircle is $\frac{\pi r^2}{2}$
The area of the large circle is πR^2
Since $R = 2r$, the area of the large circle can also be written as $\pi(2r)^2 = 4\pi r^2$
Hence the area of a quarter of the large circle is πr^2

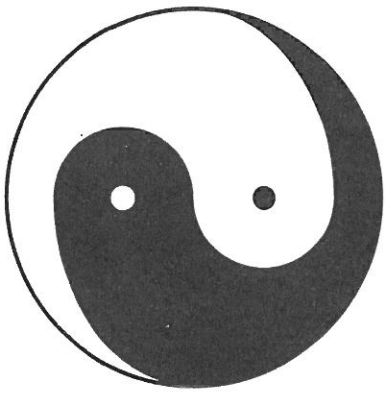
The area of this shape  is therefore $\pi r^2 - \frac{\pi r^2}{2} = \frac{\pi r^2}{2}$ which is the same as the area of each small semicircle.

Therefore a straight cut at an angle of 45° to the vertical passing through the centre of the circle will divide each of the two regions exactly in two.

If your solution is different to the one above, ask your teacher to check it.

Note: The diagram on the worksheet is based upon the symbol representing Yin-Yang (shown on the right). Yin-Yang, in Chinese thought, are the two complementary forces that make up all aspects and phenomena of life. Yin is conceived of as earth, female and is present in even numbers, valleys and streams. Yang is conceived of as heavén, male and is present in odd numbers and mountains. When in harmony, the two forces are depicted as the light and dark halves of a circle.

(Source: Encyclopaedia Britannica web site)



2401 Play Your Cards Right

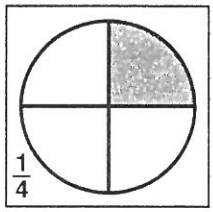
Show your scores to your teacher.

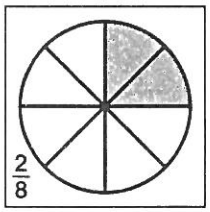
It may be impossible to make an even number or an odd number with your cards. For example, with the cards 2, 4, 8, 6, 2, it is impossible to make an odd number. How likely is this to happen?

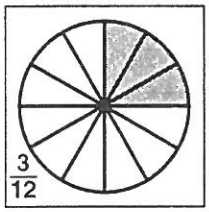
2402 Equivalent Fractions Sort

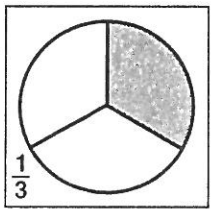
1. For each fraction, check that you have shaded the correct number of sectors by using the diagrams below.

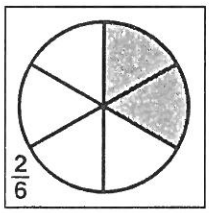
2. The fractions are arranged below in order of size with the smallest at the top and the largest at the bottom.

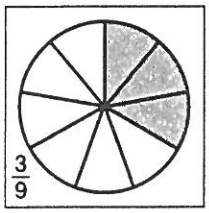


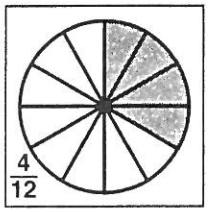


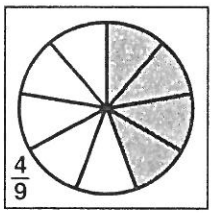


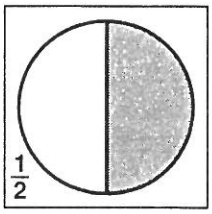


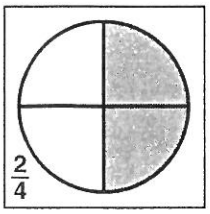


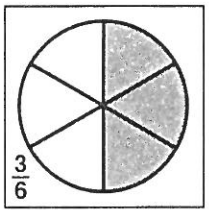


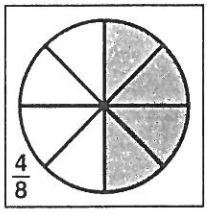


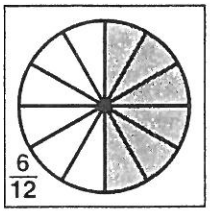


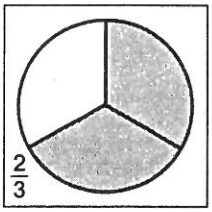


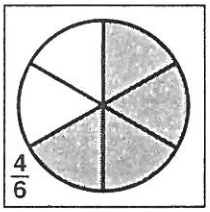


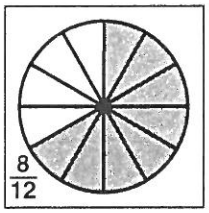












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2402 Equivalent Fractions Sort (cont)

3. The fractions in each row above are equivalent:

$$\frac{1}{4} = \frac{2}{8} = \frac{3}{12}$$

$$\frac{1}{3} = \frac{2}{6} = \frac{3}{9} = \frac{4}{12}$$

$$\frac{1}{2} = \frac{2}{4} = \frac{3}{6} = \frac{4}{8} = \frac{6}{12}$$

$$\frac{2}{3} = \frac{4}{6} = \frac{8}{12}$$

4. You could have chosen any two fractions from this sequence, which are all equivalent to $\frac{3}{4}$

$$\frac{6}{8}\ ,\ \frac{9}{12}\ ,\ \frac{12}{16}\ ,\ \frac{15}{20}\ ,\ \ldots$$

2403 Missing the Point

Check carefully that your decimal points are in the right places. Here are the correct additions and subtractions:

A) 1. $4.05 + 24.05 = 28.1$
2. $5.8 + 7.4 = 13.2$
3. $0.7 + 4 = 4.7$
4. $77.7 + 7.07 = 84.77$
5. $0.45 + 0.55 = 1$
6. $0.3 + 7 = 7.3$

B) 1. $4.5 - 1.95 = 2.55$
2. $60.5 - 3.12 = 57.38$
3. $49 - 4.9 = 44.1$
4. $0.5 - 0.01 = 0.49$
5. $123 - 122.9 = 0.1$
6. $60 - 3.12 = 56.88$

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