

# Answers

## 1A PLACE VALUE

- 1 a 20 b 200 c 2 000 000  
 2 a 34 b 683 c 40 292  
 3 a  $40 + 2$  b  $300 + 10 + 8$  c  $8000 + 200 + 30 + 5$   
 d  $70\,000 + 200 + 60 + 1$   
 4 a two thousand and seventy nine  
 b twelve thousand, eight hundred and ninety eight  
 c two hundred and twenty four thousand, six hundred and eighty  
 5 a 405 b 6719 c 9 450 208  
 6 \$48, eighty four dollars, \$408, four hundred and eighty dollars  
 7 Q1 323 m, Eureka Tower 297 m, Central Park 249 m, Soleil 243 m, Westpac House 132 m  
 8 12 569

## 1B ROUNDING NUMBERS

- 1 a 80 b 120 c 4070 d 14 010 e 300  
 2 a 900 b 4200 c 100 d 1300 e 87 100  
 3 a 1000 b 2000 c 12 000 d 28 000 e 4 225 000  
 4 a 90 b 100 c 5000 d 20 000 e 8 000 000  
 5 a 2900 b 4300 c 870 d 16 000 e 39 000  
 6 a 3420 b 79 200 c 919 000  
 7 a 9800 people b \$32 000 c 16 000 flights

## 1C OPERATIONS

- 1 a 21 b 104 c 20 d 22  
 3 a 33 b 24 c 97 d 4  
 5 a 24 b 48 c 0 d 24 e 80 f 0  
 6 32 cookies  
 7 a 9 b 9 c undefined d 11 e 0 f 24  
 8 9 floors

## 1D INDEX NOTATION

- 1 a D b C c B d E e A  
 2 a  $3^2 \times 5$  b  $2^3 \times 3^2$  c  $2 \times 3 \times 5^3$  d  $7^2 \times 11^2 \times 13$   
 3 a 32 b 12 c 216 d 150  
 4 a 392 b 1764 c 265 837 d 1080 e 72 000  
 f 2 556 125

## REVIEW OF CHAPTER 1

- 1 thirty two thousand, seven hundred and eighty  
 2 600 000 3 764 320  
 4 a 240 b 1600 c 15 000 5 \$33 000  
 6 0 7 a 12 b 8 c 9  
 8 a  $3^2 \times 4^2$  b  $2 \times 7^3 \times 11^2$  9 a 54 b 60

## 2A SQUARE NUMBERS

- 1 a 49 b 144 2 a 256 b 4225  
 3 169, 196, 225 4  $32^2 = 1024$   
 5 a 8 b 20 c 90 d 1000 e 25 f 18  
 6 a  $\sqrt{36} = 6$  b  $\sqrt{225} = 15$   
 $\sqrt{36} \times \sqrt{36} = 36$   $\sqrt{225} \times \sqrt{225} = 225$

## 2B CUBIC NUMBERS

- 1 a 3375 b 13 824 2 125, 216, 343, 512, 729  
 3  $2^3 + 11^3 = 8 + 1331 = 1339$

## 2C DIVISIBILITY

- 1 a divisible b not divisible c divisible d not divisible  
 2 35  
 3 Yes, when any counting number is divided by itself, the result is 1 with no remainder.

## 2D EVEN AND ODD NUMBERS

- 1 a even b odd c even d odd  
 2 a 52, 56, 60, 64, 68 b 51, 53, 55, 57, 59, 61, 65, 67, 69  
 c 64  
 3 a odd b even  
 4 a  $2 = 2 = 1^2 + 1$   
 $2 + 4 = 6 = 2^2 + 2$   
 $2 + 4 + 6 = 12 = 3^2 + 3$   
 $2 + 4 + 6 + 8 = 20 = 4^2 + 4$   
 $2 + 4 + 6 + 8 + 10 = 30 = 5^2 + 5$   
 b  $12^2 + 12 = 144 + 12 = 156$

## 2E DIVISIBILITY TESTS

- 1 a divisible b not divisible c divisible  
 2 a divisible b not divisible  
 3 a true b false c false d true e false  
 4 48 762 is divisible by 2, 3, and 9 but is not divisible by 4 or 5.  
 5 a 0 b 0 or 5 c 0, 4, or 8 d 1, 4, or 7 e 9  
 6 a 264 or 624  
 b  $2 + 4 + 6 = 12$ , which is divisible by 3.  
 Therefore any number containing these digits, regardless of their order, is divisible by 3.  
 c No, for a number to be divisible by 5, the last digit must be 0 or 5, and the only digits available are 2, 4, and 6.

## 2F FACTORS

- 1 a yes b no  
 2  $12 = 1 \times 12$ ,  $12 = 2 \times 6$ ,  $12 = 3 \times 4$   
 $\therefore$  the factors of 12 are 1, 2, 3, 4, 6, and 12.  
 3 a 1, 2, 3, 6 b 1, 3, 5, 9, 15, 45  
 c 1, 2, 5, 7, 10, 14, 35, 70  
 4 a 9 b 16 c 11 d 44  
 5 6

**2G PRIME AND COMPOSITE NUMBERS**

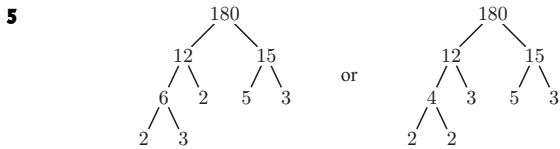
- 1 a 40 (41) 42 (43) 44 45 46 (47) 48 49  
50 51 52 (53) 54 55 56 57 58 (59)  
60 (61) 62 63 64 65 66 (67) 68 69

b 47, 53, 59, 61

2 37, 53, or 73

3 a  $425 = 5 \times 85$  b  $561 = 3 \times 187$

4 a  $44 = 2^2 \times 11$  b  $72 = 2^3 \times 3^2$



6 a  $96 = 2^5 \times 3$  b  $120 = 2^3 \times 3 \times 5$

**2H HIGHEST COMMON FACTOR**

1 a 3 b 12 c 5 2 a 4 b 7

3 a 60 b 15 4 5 cm squares 5 9 packs

**2I MULTIPLES**

1 a 3, 6, 9, 12 b 7, 14, 21, 28 c 12, 24, 36, 48

2 a 88 b 80 3 a 495 b 1507

- 4 a, b 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)

c 14, 28

5 35 6 20 and 40

**2J LOWEST COMMON MULTIPLE**

1 a 99 b 30 c 30 d 42 e 120

2 60 players 3 45 m

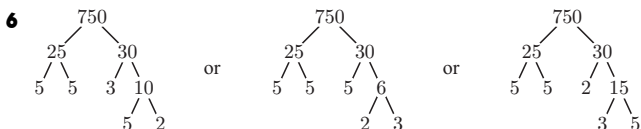
**REVIEW OF CHAPTER 2**

- 1 121  
2 516 is divisible by 2, 3, and 4 but is not divisible by 5 or 9.

3 a 26 b 23 c 108

4 a 1, 2, 3, 6, 7, 14, 21, 42 b 1, 3, 9, 27, 81

5  $26835 = 3 \times 8945$



7  $720 = 2^4 \times 3^2 \times 5$  8 16 9 36, 45, 54 10 88

**3A LINES**

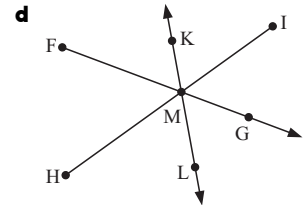
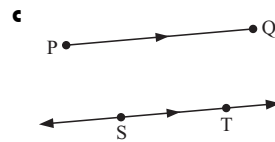
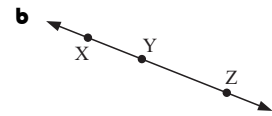
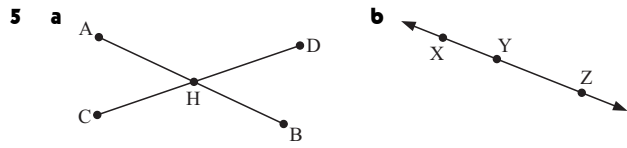
1 (PQ), (QP), (PR), (RP), (QR), or (RQ)

2 a [TU] b [EF] c (BC)

3 a [AB], [BC], [CD], [AD] b [BC] and [CD]

c No, the points do not lie on the same line.

4 a E b A c E d [EF]



6 a intersect at B b parallel c concurrent at D

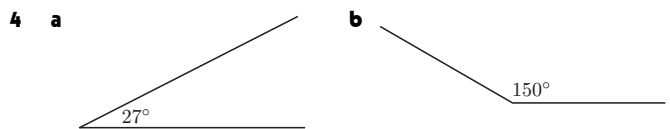
d collinear

**3B ANGLES**

1 a B b C c A

2 a  $\widehat{XYZ}$ , reflex b  $\widehat{ABC}$ , right c  $\widehat{CAD}$ , acute

3 a  $90^\circ$  b  $35^\circ$  c  $100^\circ$  d  $80^\circ$  e  $45^\circ$  f  $105^\circ$



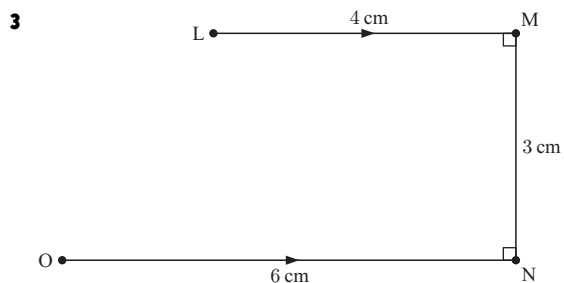
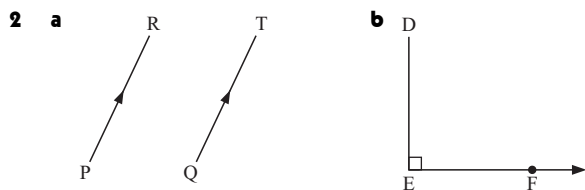
5  $45^\circ$

6 a  $43^\circ$ , acute b  $87^\circ$ , acute c  $113^\circ$ , obtuse

d  $130^\circ$ , obtuse

**3C PARALLEL AND PERPENDICULAR LINES**

1 a  $[PU] \perp [TV]$  b  $[XY] \parallel [WZ]$



**3D ANGLE PROPERTIES**

1 a  $90^\circ$ , complementary b  $190^\circ$ , neither

c  $180^\circ$ , supplementary

2 a  $78^\circ$  b  $60^\circ$

3 a  $a = 58$  b  $b = 50$  c  $c = 18$

4 a  $a = 140$  b  $b = 75$

5 a  $a = 67$     b  $b = 72$

**3E VERTICALLY OPPOSITE ANGLES**

1 a  $P$  and  $R$ ,  $Q$  and  $S$     b  $\widehat{PXS}$  and  $\widehat{QXR}$ ,  $\widehat{PXQ}$  and  $\widehat{SXR}$   
 2 a  $a = 57$     b  $b = 91$     c  $c = 44$

**3F ANGLE PAIRS**

1 a yes    b no    c yes    d no  
 2 a  $Q$     b  $C$     c  $R$   
 3 a  $Y$  and  $Z$     b  $W$  and  $Y$     c  $X$  and  $Z$     d  $X$  and  $Y$   
 4 a alternate    b corresponding    c co-interior  
 d vertically opposite    e corresponding    f co-interior  
 g vertically opposite    h alternate

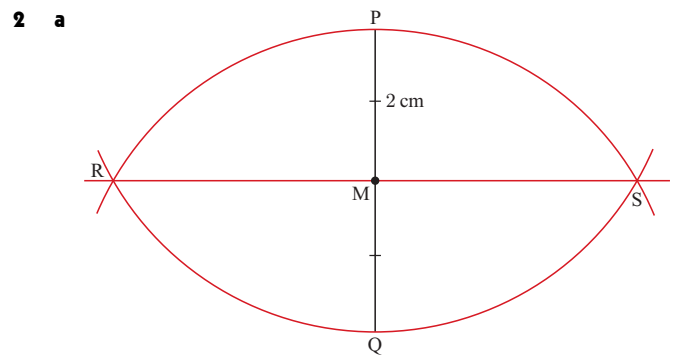
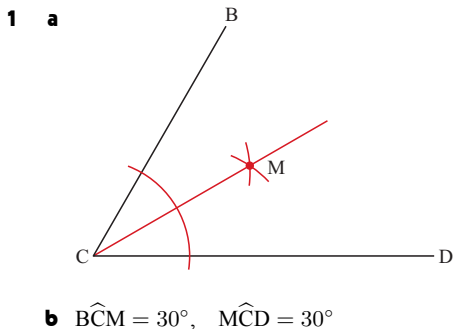
**3G ANGLE PAIRS ON PARALLEL LINES**

1 a  $a = 80$  {equal corresponding angles}  
 b  $b = 73$  {equal alternate angles}  
 c  $c = 118$  {supplementary co-interior angles}  
 d  $d = 70$  {equal corresponding angles}  
 e  $e = 42$  {equal alternate angles}  
 2 a  $f = 110$  {vertically opposite angles}  
      $g = 110$  {equal corresponding angles}  
 b  $h = 97$  {supplementary co-interior angles}  
      $i = 277$  {angles at a point}  
 c  $j = 107$  {equal corresponding angles}  
      $k = 73$  {supplementary co-interior angles}  
 3  $a + b = 180$  {vertically opposite angles,  
 supplementary co-interior angles}

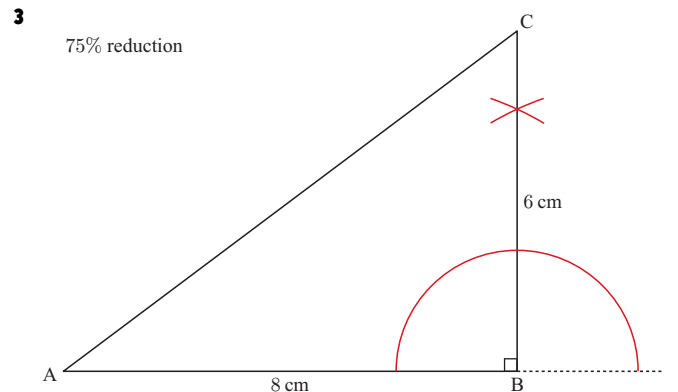
**3H TESTS FOR PARALLELISM**

1 a parallel {equal alternate angles}  
 b not parallel {co-interior angles do not sum to  $180^\circ$ }  
 c parallel {equal corresponding angles}  
 d not parallel {angles on a straight line,  
 co-interior angles do not sum to  $180^\circ$ }  
 2 The figure contains a pair of parallel lines. {equal alternate angles}  
 $\therefore a = 100$  {supplementary co-interior angles}

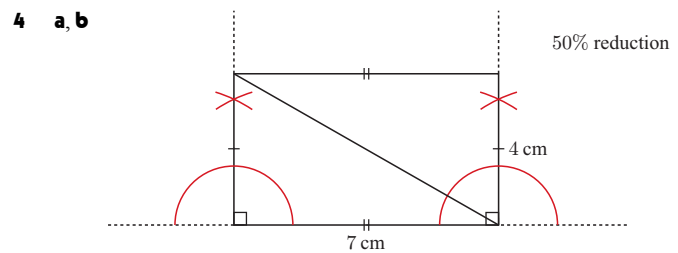
**3I GEOMETRIC CONSTRUCTION**



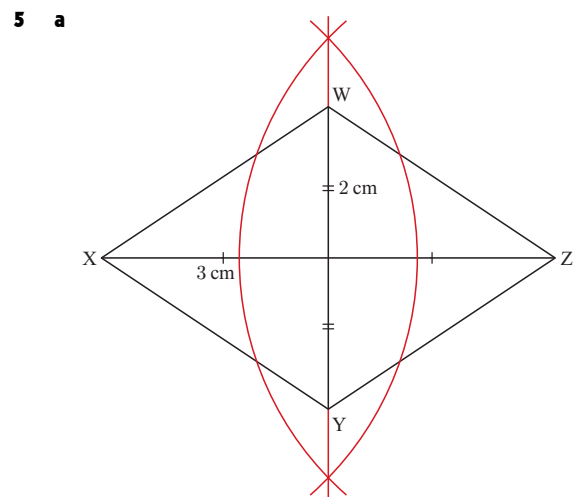
b i  $\widehat{PMR} = 90^\circ$     ii  $PM = 2 \text{ cm}$ ,  $MQ = 2 \text{ cm}$



$AC = 10 \text{ cm}$



b Length of diagonal  $\approx 81 \text{ mm}$

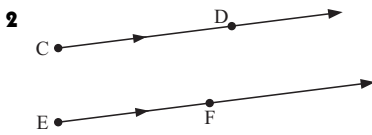


$XW \approx 36 \text{ mm}$ ,  $WZ \approx 36 \text{ mm}$ ,  $ZY \approx 36 \text{ mm}$ ,  
 $YX \approx 36 \text{ mm}$

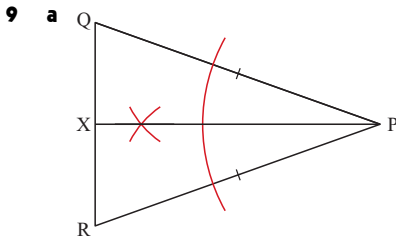
b XYZW is a rhombus.

**REVIEW OF CHAPTER 3**

1 a [OP]    b [IJ]



- 2
- 3 a  $\widehat{ABC}$ , obtuse      b  $\widehat{SRT}$ , straight
- 4  $133^\circ$       5 a  $a = 60$       b  $b = 30$
- 6 a W      b Q      c T
- 7 a  $x = 66$  {equal alternate angles}  
b  $x = 65$  {supplementary co-interior angles}
- 8 Yes,  $[WX] \parallel [YZ]$  {vertically opposite angles, equal corresponding angles}



b  $QX = XR$ , so X is the midpoint of QR.

**4A ADDITION STRATEGIES**

- 1 a 59      b 381      c 2095
- 2 a 83      b 906      c 11 352
- 3 a 63      b 108      c 717
- 4 a 158      b 742      c 150      5 411

**4B SUBTRACTION STRATEGIES**

- 1 a 41      b 67      c 219
- 2 a 35      b 85      c 259
- 3 a 308      b 29
- 4 a 344      b 909      5 19 cm

**4C MULTIPLICATION STRATEGIES**

- 1 a 450      b 3400      c 160 000
- 2 a 6100      b 2600      c 7000
- 3 a 720      b 1512      c 2250
- 4 a 120      b 609      c 4752
- 5 a 42 000      b 30 000      c 2756      d 26 946
- 6 420 flowers

**4D DIVISION STRATEGIES**

- 1 a 4      b 6      c 20
- 2 a 6      b 4      c 30
- 3 a 26      b 38      c 104
- 4 6 bags      5 \$123

**4E ESTIMATION**

- 1 a  $\approx 12\ 000$       b  $\approx 100\ 000$       c  $\approx 20\ 000$
- 2  $\approx 1600$
- 3 a  $\approx 10\ 000$       b  $\approx 600\ 000$       c  $\approx 45\ 000\ 000$

- 4 a  $\approx 6$       b  $\approx 70$       c  $\approx 300$
- 5  $\approx 5\ 400\ 000$  people      6  $\approx 200$  stars      7  $\approx 7700$  km
- 8 a  $\approx 1\ 200\ 000$   
b No, Mason's answer is about one tenth of the estimated answer in a.

**4F ORDER OF OPERATIONS**

- 1 a 4      b 10      c 4      d 4
- 2 a 0      b 37      c 4
- 3 a 36      b 100      c 6      d 50      e 22      f 25
- 4 a 25      b 50      c 102
- 5 a 135      b 100      c 46 550
- 6 a  $22 - 3 \times 5 = 7$       b  $42 \div 6 - 3 = 4$       c  $2 \times 3 + 5^2 = 31$
- 7 a  $(6 + 8 - 2) \div 2 = 6$       b  $(5 - 3) \times 4 + 11 = 19$   
c  $(13 + 22) \div (11 - 4) = 5$

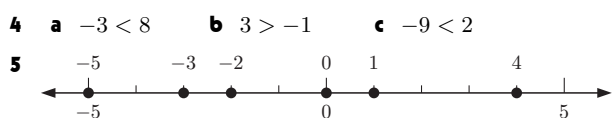
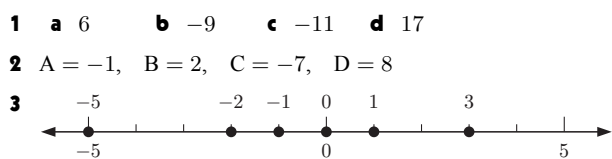
**4G PROBLEM SOLVING**

- 1 a  $50 - 3 \times 15$  dollars      b \$5
- 2 a  $19 + 6 - 4 \times 2$  cupcakes      b 17 cupcakes
- 3 a  $(8 + 3 + 22) \div 3$  mm      b 11 mm
- 4 a  $(16 + 37 \times 2) \div 10$  tables      b 9 tables

**REVIEW OF CHAPTER 4**

- 1 a 283      b 21 679      2 565
- 3 a 21 000      b 13 000      4 156 flowers
- 5 a 15      b 41      6 13 cards
- 7 a  $\approx 63\ 000\ 000$       b  $\approx 200$       8  $\approx 1000$  m
- 9 a 28      b 4      c 100
- 10 a  $8 + 15 \div (3 + 2) = 11$       b  $63 \div (3 + 6 - 2) = 9$
- 11 a  $188 - (24 + 17 + 53)$  parking spaces  
b 94 parking spaces

**5A THE NUMBER LINE**



-5, -3, -2, 0, 1, 4

- 6 Buenos Aires  $18^\circ\text{C}$ , Sydney  $11^\circ\text{C}$ , New York  $-3^\circ\text{C}$ , Stockholm  $-5^\circ\text{C}$

**5B WORDS INDICATING POSITIVE AND NEGATIVE**

- 1 a -3      b +11      c -15
- 2 a -7      b +22      c -650
- 3 a +5      b +20      c -10

- 4 a 3 km to the north      b 16 m below sea level

	Statement	Number	Opposite of statement	Opposite number
a	2 kg overweight	+2	2 kg underweight	-2
b	17 m to the west	-17	17 m to the east	+17
c	30 minutes early	-30	30 minutes late	+30

- 6 a going up 5 floors      b losing 7 kg

	Statement	Operation	Opposite of statement	Opposite operation
a	losing \$20	subtract \$20	gaining \$20	add \$20
b	warming by 3°C	add 3°C	cooling by 3°C	subtract 3°C
c	rising 850 m	add 850 m	falling 850 m	subtract 850 m

### 5C ADDITION AND SUBTRACTION WITH NEGATIVE NUMBERS

- 1 a 4      b -5      2 a -7      b -5  
 3 a -1      b 3  
 4 1 floor below ground level  
 5 2 km north of the lighthouse  
 6 a losing 2 kg      b a fall of 3°C

### 5D ADDING AND SUBTRACTING NEGATIVE NUMBERS

- 1 a 3      b -7      c -10      d 25  
 2 a 1      b 5      c 2  
 3 a 9      b 11      c 9  
 4 a bird: 2, boat: 0, fish: -2, turtle: -7  
 b i 7 m      ii 4 m      iii 9 m      iv 5 m

### 5E MULTIPLYING NEGATIVE NUMBERS

- 1 a -24      b -81      c 15      d -12      e 88  
 f -28      g -120      h -36  
 2 a  $-2 \times 2 = -4$       b  $7 \times -6 = -42$       c  $-12 \times -8 = 96$   
 d  $-15 \times 3 = -45$       e  $8 \times -8 = -64$       f  $-12 \times -4 = 48$   
 3 a -5 points      b -15 points  
 4 a 12      b -80      c -8      d 200      e -63      f 72

### 5F DIVIDING NEGATIVE NUMBERS

- 1 a 3      b -10      c 7      d -10      e -2      f -4  
 g -9      h 11  
 2 a  $10 \div -2 = -5$       b  $-16 \div 4 = -4$       c  $-15 \div -3 = 5$   
 d  $-25 \div -5 = 5$       e  $-40 \div 8 = -5$       f  $-60 \div 10 = -6$   
 g  $-60 \div -12 = 5$       h  $72 \div -6 = -12$       i  $120 \div -4 = -30$   
 3  $-4^\circ\text{C}$  (drops  $4^\circ\text{C}$  per hour)

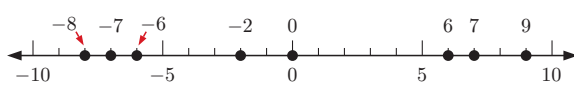
### 5G ORDER OF OPERATIONS

- 1 a -13      b -5      c 10  
 2 a -32      b 5      c -20      d 3      e -14      f -12  
 3  $-7^\circ\text{C}$   
 4 a  $(260 - 760 - 840 + 1370 - 830) \div 5$  dollars  
 b  $-\$160$  (a loss of \$160 per week)


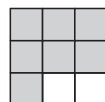
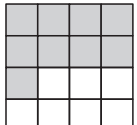
### 5H CALCULATOR USE

- 1 a -100      b -174      c 756      d -61      e -54      f 160  
 2 6 m below his original position

### REVIEW OF CHAPTER 5

- 1 a 4      b -13      c 21  
 2  $A = -3, B = 1, C = 6, D = -5, E = -1$   
 3 a   
 9, 7, 6, 0, -2, -6, -7, -8  
 b 17  
 4 a +14      b -6      5 a -8      b 3  
 6 a -1      b 14      7 a -42      b 8  
 8 a -13      b -12  
 9 a  $-30 \div 2 = -15$       b  $-3 \times -13 = 39$   
 10 a 5      b 1  
 11 6 steps below his original position      12 -783

### 6A FRACTIONS

- 1 a  $\frac{5}{6}$       b  $\frac{3}{10}$       c  $\frac{3}{4}$   
 2 a       b   
 c   
 3 a  $\frac{2}{3}$       b  $\frac{1}{5}$       c  $\frac{7}{8}$   
 4 a  $\frac{7}{16}$       b  $\frac{5}{16}$       c  $\frac{12}{16}$

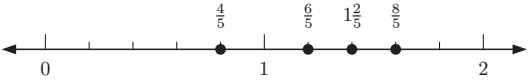
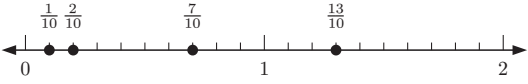
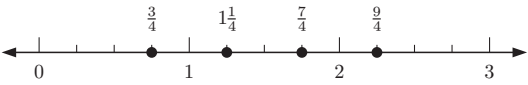
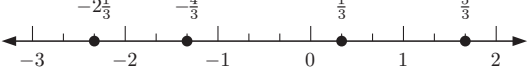


### 6B FRACTIONS AS DIVISION

- 1 a  $\frac{1}{7}$       b  $\frac{4}{9}$       c  $\frac{8}{15}$       d  $\frac{12}{8}$   
 2 a  $2 \div 5$       b  $7 \div 8$       c  $8 \div 14$       d  $17 \div 20$   
 3 a  $\frac{-3}{11}$       b  $\frac{8}{-10}$       c  $\frac{-16}{-12}$       d  $\frac{-26}{13}$   
 4 a  $15 \div -16$       b  $-11 \div -13$       c  $-40 \div 30$       d  $25 \div -35$   
 5 a  $25 \div 5 = 5$       b  $18 \div 9 = 2$       c  $-30 \div 6 = -5$   
 d  $96 \div -8 = -12$   
 6 a 2      b -4      c 9

**6C** **PROPER AND IMPROPER FRACTIONS**

- 1 a  $\frac{7}{2}$     b  $\frac{22}{5}$     c  $\frac{25}{8}$     d  $\frac{53}{9}$   
 2 a  $5\frac{1}{2}$     b  $3\frac{3}{10}$     c  $4\frac{5}{10}$     d  $9\frac{2}{9}$     e  $7\frac{3}{7}$   
 f  $-4\frac{3}{4}$     g  $-5\frac{3}{5}$     h  $-7\frac{1}{6}$   
 3  $2\frac{2}{5}$  m

**6D** **FRACTIONS ON A NUMBER LINE**

- 1 a   
 b   
 2 a A =  $\frac{1}{3}$ , B =  $\frac{7}{3}$  or  $2\frac{1}{3}$ , C =  $\frac{2}{3}$ , D =  $\frac{5}{3}$  or  $1\frac{2}{3}$   
 b A =  $\frac{14}{8}$  or  $1\frac{6}{8}$ , B =  $\frac{22}{8}$  or  $2\frac{6}{8}$ , C =  $\frac{9}{8}$  or  $1\frac{1}{8}$ ,  
 D =  $\frac{19}{8}$  or  $2\frac{3}{8}$   
 3 a   
 b  $\frac{3}{4}$ ,  $1\frac{1}{4}$ ,  $\frac{7}{4}$ ,  $\frac{9}{4}$   
 4 a   
 b   
 5 a   
 b  $1\frac{1}{6}$ ,  $\frac{4}{6}$ ,  $-\frac{1}{6}$ ,  $-\frac{4}{6}$

**6E** **EQUAL FRACTIONS**

- 1 false    2 a  $\frac{4}{10}$     b  $\frac{2}{5}$     c  $\frac{32}{80}$   
 3 a  $\frac{15}{25}$     b  $\frac{30}{25}$     c  $\frac{21}{25}$

**6F** **LOWEST TERMS**

- 1 a  $\frac{3}{4}$     b  $\frac{6}{7}$     c  $\frac{1}{3}$     d  $\frac{1}{2}$   
 2 a  $\frac{9}{4}$     b  $\frac{9}{2}$     c  $\frac{10}{9}$   
 3 a  $-\frac{1}{4}$     b  $\frac{4}{-9}$     c  $-\frac{4}{3}$   
 4 a  $\frac{1}{2}$     b  $\frac{11}{4}$     c  $\frac{8}{3}$

**6G** **CANCELLING COMMON FACTORS**

- 1 a  $\frac{3 \times \cancel{7}}{\cancel{7} \times 7} = \frac{3}{7}$     b  $\frac{\cancel{7} \times 2}{9 \times \cancel{7}} = \frac{2}{9}$     c  $\frac{\cancel{7} \times 4}{\cancel{7} \times 3} = \frac{4}{3}$   
 2 a 12    b -10    c 8  
 3 a  $\frac{2}{5}$     b  $\frac{1}{2}$     c  $\frac{7}{8}$     d  $\frac{3}{5}$     e  $\frac{-7}{10}$     f  $\frac{3}{-8}$

**6H** **ONE QUANTITY AS A FRACTION OF ANOTHER**

- 1 a  $\frac{5}{9}$     b  $\frac{13}{20}$     c  $\frac{1}{8}$     2  $\frac{6}{7}$     3  $\frac{1}{6}$

**6I** **COMPARING FRACTIONS**

- 1 a  $\frac{3}{7} < \frac{5}{7}$     b  $\frac{2}{11} > -\frac{4}{11}$     c  $-\frac{9}{17} > -\frac{12}{17}$   
 2 a  $\frac{2}{7} < \frac{5}{14}$     b  $\frac{13}{15} > \frac{17}{20}$     c  $-\frac{3}{8} > -\frac{5}{11}$   
 3 a  $3\frac{5}{8} < \frac{23}{6}$     b  $\frac{20}{7} > 2\frac{7}{9}$   
 4  $\frac{7}{12} < \frac{5}{8}$  ∴ Don planted the greater fraction of flowers.  
 5 a  $-\frac{4}{3}$ ,  $\frac{1}{3}$ ,  $\frac{5}{6}$ ,  $1\frac{1}{6}$     b  $-\frac{3}{2}$ ,  $-\frac{5}{8}$ ,  $\frac{3}{16}$ ,  $\frac{9}{8}$ ,  $1\frac{1}{4}$

**6J** **ADDING AND SUBTRACTING FRACTIONS**

- 1 a  $\frac{1}{5}$     b 1    c  $\frac{2}{7}$     d  $\frac{10}{9}$     e  $\frac{13}{3}$     f  $\frac{4}{5}$   
 2 a  $\frac{3}{2}$     b  $\frac{11}{20}$     c  $\frac{1}{12}$     d  $\frac{45}{56}$     e  $\frac{17}{24}$     f  $\frac{107}{40}$   
 3 a  $4\frac{1}{4}$     b  $4\frac{31}{36}$     c  $3\frac{29}{70}$   
 4 a  $2\frac{19}{24}$     b  $5\frac{11}{18}$     5  $4\frac{3}{4}$  chickens    6  $\frac{7}{20}$

**6K** **MULTIPLYING A FRACTION BY A WHOLE NUMBER**

- 1 a  $\frac{15}{8}$     b 16    c  $\frac{10}{3}$     d  $\frac{56}{3}$  or  $18\frac{2}{3}$   
 e  $\frac{35}{2}$  or  $17\frac{1}{2}$     f  $\frac{110}{3}$  or  $36\frac{2}{3}$   
 2 a 32 kg    b 36 marks    c \$49  
 3 \$18    4 30 questions

**6L** **MULTIPLYING FRACTIONS**

- 1 a  $\frac{1}{8}$     b  $\frac{3}{20}$     c  $\frac{2}{21}$     d  $\frac{12}{77}$     e  $\frac{8}{63}$     f  $9\frac{1}{6}$   
 2 a  $\frac{4}{3}$     b  $\frac{2}{7}$     c 1    d  $\frac{2}{3}$     e  $\frac{5}{2}$     f  $\frac{15}{16}$   
 3 a  $\frac{2}{15}$     b  $\frac{44}{5}$     4 a  $1\frac{1}{2}$     b  $3\frac{4}{7}$   
 5 a  $\frac{1}{21}$     b  $\frac{3}{10}$     c  $\frac{1}{14}$   
 6 a  $-\frac{3}{14}$     b  $-1\frac{3}{5}$     7  $2\frac{5}{8}$  batches    8  $\frac{5}{14}$

**6M** **RECIPROCAL**

- 1 a  $\frac{7}{3}$     b  $\frac{2}{7}$     c  $\frac{5}{6}$     d  $\frac{20}{11}$   
 2 a  $\frac{3}{10}$     b  $\frac{9}{19}$     c  $\frac{2}{21}$     d  $\frac{7}{19}$   
 3 a  $-\frac{9}{5}$     b  $-\frac{7}{10}$     c  $-\frac{23}{6}$     d  $-\frac{7}{12}$

**6N** **DIVIDING FRACTIONS**

- 1 a 5    b  $\frac{5}{8}$     c  $\frac{1}{11}$     d  $\frac{16}{35}$     e  $\frac{64}{45}$     f  $\frac{15}{13}$   
 2 a  $\frac{3}{20}$     b  $4\frac{2}{3}$     c  $\frac{1}{4}$     d  $4\frac{4}{5}$     e  $1\frac{3}{11}$     f  $1\frac{5}{5}$   
 3 a  $2\frac{5}{12}$     b  $\frac{9}{7}$   
 4 a  $-\frac{3}{2}$     b  $-\frac{6}{5}$     5 20 bottles    6 \$400 000

**REVIEW OF CHAPTER 6**

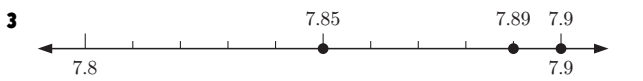
- 1 a  $\frac{7}{10}$     b  $\frac{7}{16}$   
 2 a  $-64 \div -8 = 8$     b  $-108 \div 9 = -12$   
 3 a 3    b -4    4 a  $\frac{47}{8}$     b  $\frac{65}{9}$   
 5 A =  $\frac{10}{7}$  or  $1\frac{3}{7}$ , B =  $\frac{1}{7}$ , C =  $\frac{15}{7}$  or  $2\frac{1}{7}$   
 6 a  $\frac{1}{6}$     b  $\frac{10}{32}$     7 a  $\frac{6}{7}$     b  $\frac{7}{3}$   
 8 a  $\frac{9}{7} < \frac{19}{14}$     b  $\frac{11}{12} > \frac{13}{16}$   
 9 a  $\frac{3}{4}$     b  $\frac{17}{20}$   
 10 a  $\frac{5}{3}$     b  $3\frac{7}{10}$     c  $\frac{50}{9}$     d  $\frac{2}{3}$   
 11 a \$45    b 480 kg    12 42 kg    13  $\frac{13}{15}$

**7A DECIMAL NUMBERS**

- 1 a  $\frac{2}{100}$     b  $\frac{9}{1000}$     c 60    d  $\frac{1}{10\,000}$   
 2 a  $1 + \frac{9}{10}$     b  $2 + \frac{6}{10} + \frac{1}{100}$     c  $8 + \frac{8}{100} + \frac{3}{1000}$   
 d  $\frac{6}{10\,000} + \frac{2}{100\,000}$     e  $10 + 3 + \frac{7}{10} + \frac{6}{100} + \frac{1}{1000}$   
 3 a 0.8    b 0.21    c 0.066    d 0.304    e 0.5982  
 4 a 0.63    b 0.215    c 1.79    d 9.05    e 7.284  
 f 8.099  
 5 a  $\frac{7}{100}$     b  $\frac{49}{100}$     c  $\frac{81}{100}$

**7B DECIMAL NUMBERS ON A NUMBER LINE**

- 1 a 16.4 cm    b 3.23 kg  
 2 a A: 8.1, B: 8.7    b A: 3.24, B: 3.28  
 c A: 1.072, B: 1.077    d A: -0.06, B: 0.04



- b -2.1, -1.5, -0.7, 0.6, 1.3

**7C ORDERING DECIMAL NUMBERS**

- 1 a  $0.226 < 0.262$     b  $8.08 > 0.88$   
 c  $0.50 = \frac{50}{100}$     d  $18.181 > 18.18$   
 e  $\frac{89}{100} = 0.89$     f  $0.00178 < 0.0178$   
 2 a 4.48, 4.84, 4.88, 8.48    b 0.0678, 0.0876, 0.687, 0.876  
 3 a 1.71, 1.7, 1.17    b 2.552, 2.502, 2.255, 2.055  
 4 3.87 g, 3.78 g, 3.76 g, 3.7 g, 3.62 g

**7D ROUNDING DECIMAL NUMBERS**

- 1 a 5.09    b 13.15    c 0.01    d 84.10  
 2 a 16.5    b 7.95    c 80.8    d 0.0911  
 3 a 8    b 7.6    c 7.638  
 4 a 36.0    b 35.98    c 36  
 5 0.5674 British pounds    6 1.60 cm  
 7 a 0.345    b 7.29    c 1.41    d 10.7

**7E CONVERTING DECIMALS TO FRACTIONS**

- 1 a  $\frac{1}{5}$     b  $\frac{37}{100}$     c  $\frac{17}{20}$     d  $6\frac{7}{20}$   
 2 a  $\frac{59}{1000}$     b  $\frac{121}{500}$     c  $1\frac{1}{200}$     d  $2\frac{3}{40}$   
 3 a  $-\frac{2}{5}$     b  $-\frac{1}{4}$     c  $-4\frac{4}{25}$     d  $-5\frac{1}{8}$

**7F CONVERTING FRACTIONS TO DECIMALS**

- 1 a 0.43    b 0.601    c 4.034  
 2 a 0.4    b 0.52    c 2.15    d 0.095    e 0.044  
 f 7.056    g -0.25    h -1.18  
 3 a  $\frac{7}{50} = 0.14$ ,  $\frac{36}{250} = 0.144$ ,  $\frac{1}{8} = 0.125$   
 b  $\frac{1}{8}$ , 0.13,  $\frac{7}{50}$ ,  $\frac{36}{250}$ , 0.15

**7G ADDING AND SUBTRACTING DECIMAL NUMBERS**

- 1 a 0.65    b 0.7831    c 11.978  
 2 a 2.11    b 4.85    c 3.6112  
 3 a 28.287    b 29.5961  
 4 a 9.63    b 1.002  
 5 1.169 kg    6 a 2.13 km    b 0.37 km

**7H MULTIPLYING BY POWERS OF 10**

- 1 a 2.515    b 25.15    c 251.5    d 2515  
 2 a 21    b 348    c 1090    d 1.77    e 21 200    f 0.11  
 3 a -6.3    b -4073.2

**7I DIVIDING BY POWERS OF 10**

- 1 a 0.624    b 0.006 24    c 0.000 062 4    d 0.000 000 624  
 2 a 0.7    b 8.4    c 0.056    d 0.0955  
 e 23.464    f 0.002 735  
 3 a -4.32    b -0.000 061 5

**7J MULTIPLYING DECIMAL NUMBERS**

- 1 a 1.5    b 0.14    c 1.2    d 28  
 2 a 0.15    b 0.018    c 0.001    d 0.104    e 0.0252  
 3 a 0.056    b 0.000 07  
 4 a 4048.8    b 40.488    c 4.0488  
 5 a 16.56 (18)    b 130.68 (120)  
 6 a -0.18    b 0.0156    7 \$7.70    8 \$108.49

**7K DIVIDING DECIMAL NUMBERS**

- 1 a 0.441    b 2.375    c 41.1  
 2 a 8    b 60    c 8  
 3 a 0.7    b 0.23    c 0.01825  
 4 a -0.13    b 23    5 50 bottles    6 0.2675 kg

**REVIEW OF CHAPTER 7**

- 1  $\frac{3}{100}$     2 a  $8\frac{13}{20}$     b  $3 + \frac{6}{100} + \frac{1}{10\,000}$   
 3 2.707    4 a 7.83    b 41.9  
 5 3.42, 3.402, 3.24, 3.042  
 6 a 0.95    b -0.072  
 7 a 19.291    b 5.7885  
 8 a 42.3    b 0.619    c 0.000 713  
 9 a 0.21    b -0.132    c -2.37    d 1.1  
 10 0.375 kg    11 \$3.20

**8A BUILDING EXPRESSIONS**

- 1 a  $(2 \times 7 + 3)$  strawberries    b  $(2 \times 10 + 3)$  strawberries  
 c  $(2 \times p + 3)$  strawberries

**8B PRODUCT NOTATION**

- 1 a  $p + 4$       b  $3p + 1$   
 2 a  $4b$       b  $2e + 4f$       c  $3 + 2c + d$   
 3 a  $3a$       b  $3a$       c  $4x$       d  $6q$   
 4 a  $b + 3$       b  $b + p$       c  $2b + 4p + 7$   
 5 a  $a + 2b$       b  $2m + n + 7$       c  $2p + 2q + 6$   
 6 a  $3p - q$       b  $4y - 5$   
 7 a  $4 - 3s$       b  $3a - 2b$       c  $2m - 2n$   
 8 a  $2c + 4d$       b  $a - 6b$       c  $5x - 2y$   
 9 a  $ab$       b  $6cd$       c  $7ef$       d  $wyz$   
 10 a  $3p - qr$       b  $7 + 3ij$

**8C INDEX NOTATION**

- 1 a  $7x^3$       b  $5v^3w^2$       c  $f^3g$       d  $a + b^2$   
 e  $z^2 - z$       f  $b^2 - 3b^3$       g  $9d^4 + d^2$       h  $y^3 - 3$   
 i  $5ab - a^2 + b$   
 2 a  $c \times c$       b  $4 \times t \times t \times t$       c  $4 \times g \times h \times h$   
 d  $a \times a + 7 \times b \times b$   
 e  $3 \times x \times x - 2 \times x \times y \times y \times y$   
 f  $5 \times p \times p \times q - p \times q \times q \times q \times q$   
 3 a  $3a^2$       b  $35q^2$       c  $72y^3$       d  $20x^2y$


**8D READING EXPRESSIONS**

- 1 a  $y$  minus 7      b the sum of 3 times  $a$  and  $b$   
 c  $a$  divided by the sum of  $b$  and  $c$   
 2 a  $5d$       b  $\frac{7}{3+x}$       c  $3x + 2y$   
 3 a 3 times  $x$  squared      b  $x$  squared divided by  $y$  squared  
 4 a  $a - b^2$       b  $c^2d$

**8E TERMS AND COEFFICIENTS**

- 1 a  $-4x, -14$       b  $6x, 6, -8y$   
 2 a 11      b  $-14$   
 3 a 3      b 13      c  $-1$       d 4  
 4 a 4 terms      b  $-7$       c 1      d  $y$  and  $-3y$   
 5 a  $-3$  and  $-2, -3p$  and  $-5p$       b  $5z^2$  and  $-z^2$   
 c  $3b$  and  $-5b, -c$  and  $7c$

**8F EQUAL EXPRESSIONS**

- 1 a i 3r raspberries      ii  $r$  raspberries      iii  $4r$  raspberries  
 b  $3r + r = 4r$   
 2 a  $p + 4 + p + 4 = 2p + 8$       b  $2b + 3 + 3b = 5b + 3$   
 c  $b + 2p + 2b + p + 2 = 3b + 3p + 2$   
 3  $p + 1 + 2p + 3$  is:       $4p + 4$  is:  
  
 The expressions are not equal.  
 4 a  $3p$       b  $3p + 4$       c  $2p$       d  $p + 2$

**8G COLLECTING LIKE TERMS**

- 1 a  $3a + 2$       b  $4p$       c  $7a$       d  $12w$   
 e cannot be simplified      f  $2c + 10$   
 2 a  $-4b$       b  $-3a$       c cannot be simplified  
 d  $-t - 8$       e cannot be simplified      f  $-3g$   
 3 a  $8x + 3y$       b  $8p + t + 5$       c  $5x + 2y - 4z$

**8H ALGEBRAIC SUBSTITUTION**

- 1 a 27      b 19      c 1      d 15      e 5      f  $-4$   
 2 a  $(2a + 7)$  apples      b i 19 apples      ii 29 apples  
 3 a 16      b 32      c 22  
 4 a 5      b 1      c  $-21$       d 10      e  $-9$       f 15  
 g 11      h  $-65$   
 5 a 4      b 18      c 18      d 3      e  $-15$       f  $-14$   
 g 0      h 64

**8I FORMULAE**

1 a

$x$	$-1$	$1$	$3$	$5$	$7$
$C$	$-9$	$-1$	$7$	$15$	$23$

b

$t$	$0$	$1$	$4$	$6$	$10$
$L$	$-2$	$0$	$30$	$70$	$198$

- 2 a  $y = 8$       b  $y = -10$   
 3 a  $T = 90$       b  $T = -484$   
 4 a \$165      b \$285  
 5 a 70 km/h      b 86 km/h  
 6 a \$40p      b  $C = 40p + 200$   
 c i \$400      ii \$680      iii \$300  
 7 a 15 bread rolls      b  $B = 15t + 10$   
 c i 130 bread rolls      ii 310 bread rolls

**REVIEW OF CHAPTER 8**

- 1 a 26 bottles      b  $(6b + 2)$  bottles      c  $(6b + j)$  bottles  
 2 a  $3p$       b  $6qr$       3 a  $2s + s^2$       b  $28t^2$   
 4 a  $x$  minus 2 times  $y$       b  $u$  squared divided by  $v$   
 5 a 4 terms      b  $-3$       c  $-1$   
 6 a  $6a - 5b + 3$       b cannot be simplified      c  $a^2 + 12a + 35$   
 7 a 7      b  $-15$       8 a  $-7$       b  $-7$   
 9
- |     |      |      |      |     |      |
|-----|------|------|------|-----|------|
| $t$ | $-2$ | $0$  | $2$  | $4$ | $8$  |
| $K$ | $26$ | $20$ | $14$ | $8$ | $-4$ |
- 10 a \$15t      b  $Q = 15t + 120$       c \$1320

**9A PERCENTAGE**

- 1 a 30%      b 44%  
 2 a  $\frac{17}{100}$       b  $\frac{3}{100}$       c  $\frac{82}{100}$   
 3 a 27%      b 98%      c 225%  
 4 a Beth's      b Caitlin's      c Annie's  
 5 a  $\approx 30\%$       b  $\approx 85\%$



**9B CONVERTING PERCENTAGES INTO DECIMALS AND FRACTIONS**

- 1 a 0.59    b 5    c 0.837    d 0.0209  
 2 a  $\frac{1}{2}$     b  $\frac{4}{5}$     c  $\frac{7}{20}$     d  $\frac{17}{10}$

**9C CONVERTING DECIMALS AND FRACTIONS INTO PERCENTAGES**

- 1 a 82%    b 52.6%    c 105%    d 70%  
 e 2.1%    f 21.07%    g 350%    h 0.32%  
 2 a 60%    b 44%    c 72%    d 64.3%  
 3 a 32.5%    b 79.5%    c  $\approx 66.667\%$     d  $\approx 21.739\%$   
 4 a  $\frac{17}{20}$     b 85%    c 15%

**9D EXPRESSING ONE QUANTITY AS A PERCENTAGE OF ANOTHER**

- 1 a 50%    b 60%    c 75%    d 37.5%  
 2 a 40%    b 62.5%    c 55%    d 70%  
 3 a 80%    b 2%    c 17.5%    d 12.5%  
 4 35%    5 Yes, it contains only 1.25% fat.

**9E FINDING A PERCENTAGE OF A QUANTITY**

- 1 a 12 marks    b 29 people    c \$42    d 3.92 tonnes  
 2 15 cm    3 \$72    4 24 mL  
 5 a 33 students    b 9 students    c 36 students    d 27 students

**9F PERCENTAGE INCREASE OR DECREASE**

- 1 a \$150    b \$5150    2 a 7 cm    b 147 cm  
 3 a 4.2 kg    b 275 mL    4 a \$8    b \$32  
 5 a 54°C    b 126°C    6 a 225 cm    b \$97.50

**REVIEW OF CHAPTER 9**

- 1 17%    2 a 0.54    b 0.836  
 3 a  $\frac{17}{100}$     b  $\frac{21}{50}$   
 4 a 76%    b 12.5%    c 0.18%    d 400%  
 5 a 9%    b 25%    6 59%    7 374 tonnes  
 8 a 104 cars    b 24 utes  
 9 a 3000 people    b 18 000 people  
 10 a 5.5 km    b \$382.50

**10A EQUATIONS**

- 1 a true    b false  
 2 a  $x = 6$     b  $x = 4$

**10B SOLVING BY INSPECTION**

- 1 a  $x = 4$     b  $x = 3$     c  $x = 3$     d  $x = 3$   
 2 a  $x = -4$     b  $x = -12$     c  $x = -2$     d  $x = -5$

**10C MAINTAINING BALANCE**

- 1 a  $3x + 8 = 4$     b  $13x = 10$   
 2 a  $7x - 4 = 1$     b  $x = -11$   
 3 a  $x = 27$     b  $x - 2 = -15$   
 4 a  $x = 3$     b  $x - 7 = 2$

**10D INVERSE OPERATIONS**

- 1 a  $\div 6$     b  $+ 7$     c  $\times 2$     d  $\div \frac{1}{4}$   
 2 a  $x = 2$     b  $x = 4$     c  $x = 0.3$     d  $x = 6$   
 e  $x = -1$     f  $x = 8\frac{1}{2}$   
 3 a  $x = 3$     b  $x = -8$     c  $x = 0$     d  $x = 40$   
 e  $x = -35$     f  $x = -8$   
 4 a  $x = -5$     b  $x = 16$     c  $x = -6$     d  $x = -60$   
 e  $x = 8$     f  $x = -\frac{4}{13}$

**10E ALGEBRAIC FLOWCHARTS**

- 1 a  $x \xrightarrow{-2} x-2 \xrightarrow{\times 3} 3(x-2)$   
 b  $x \xrightarrow{+5} x+5 \xrightarrow{\div 2} \frac{x+5}{2}$   
 c  $x \xrightarrow{\times 3} 3x \xrightarrow{-7} 3x-7$   
 d  $x \xrightarrow{\div 2} \frac{x}{2} \xrightarrow{+5} \frac{x}{2}+5$   
 2 a  $x \xrightarrow{\div 4} \frac{x}{4} \xrightarrow{-3} \frac{x}{4}-3$   
 b  $x \xrightarrow{+5} x+5 \xrightarrow{\times 3} 3(x+5)$   
 c  $x \xrightarrow{\times 9} 9x \xrightarrow{+1} 9x+1$   
 d  $x \xrightarrow{-6} x-6 \xrightarrow{\div 8} \frac{x-6}{8}$   
 3 a Build up:  $x \xrightarrow{\times 3} 3x \xrightarrow{-11} 3x-11$   
 Undo:  $3x-11 \xrightarrow{+11} 3x \xrightarrow{\div 3} x$   
 b Build up:  $x \xrightarrow{\times -8} -8x \xrightarrow{+9} -8x+9$   
 Undo:  $-8x+9 \xrightarrow{-9} -8x \xrightarrow{\div -8} x$   
 4 a Build up:  $x \xrightarrow{+1} x+1 \xrightarrow{\times 5} 5(x+1)$   
 Undo:  $5(x+1) \xrightarrow{\div 5} x+1 \xrightarrow{-1} x$   
 b Build up:  $x \xrightarrow{-5} x-5 \xrightarrow{\div 3} \frac{x-5}{3}$   
 Undo:  $\frac{x-5}{3} \xrightarrow{\times 3} x-5 \xrightarrow{+5} x$

**10F SOLVING EQUATIONS**

- 1 a  $x = 3$     b  $x = -3$     c  $x = 2$     d  $x = \frac{5}{2}$   
 2 a  $x = 9$     b  $x = -\frac{29}{3}$   
 3 a  $x = 24$     b  $x = -8$     c  $x = -6$     d  $x = 1$   
 4 a  $x = 7$     b  $x = -6$     c  $x = -7$     d  $x = -9$   
 5 a  $x = -5$     b  $x = 2\frac{3}{5}$   
 6 a  $x = 33$     b  $x = -9$     c  $x = 70$     d  $x = 3$

**10G EQUATIONS WITH A REPEATED VARIABLE**

- 1 a  $x = -3$     b  $x = 2$     c  $x = 1$     d  $x = 2$   
 e  $x = -10$     f  $x = \frac{1}{2}$

**10H GEOMETRY PROBLEMS**

- 1 a  $a = 33$     b  $b = 115$     c  $c = 95$     d  $d = 48$

**10I WRITING EQUATIONS**

- 1 a  $11 - x = 5$     b  $\frac{x}{3} + 10 = 13$     c  $4(x + 8) = 12$   
 2 a  $x - 4 = 3$     b  $2(x + 5) = 18$     c  $\frac{x}{2} - 5 = 9$

**10J WORD PROBLEMS**

- 1 The number is 9.    2 8 km    3 30 biscuits  
 4 The book costs \$13 and the magazine costs \$6.    5 5 bags

**REVIEW OF CHAPTER 10**

- 1  $x = -7$     2 a  $x = 8$     b  $x = 4$     3  $\frac{x}{6} = 7$

- 4 a  $\times 4$     b  $-8$     c  $+\frac{1}{2}$     d  $\div 10$

- 5 a  $x = -10$     b  $x = -8$     c  $x = \frac{6}{7}$

6 a  $x \xrightarrow{\times 8} 8x \xrightarrow{-6} 8x - 6$

b  $x \xrightarrow{+1} x + 1 \xrightarrow{\div 7} \frac{x + 1}{7}$

7 Build up:  $x \xrightarrow{\div 3} \frac{x}{3} \xrightarrow{-9} \frac{x}{3} - 9$

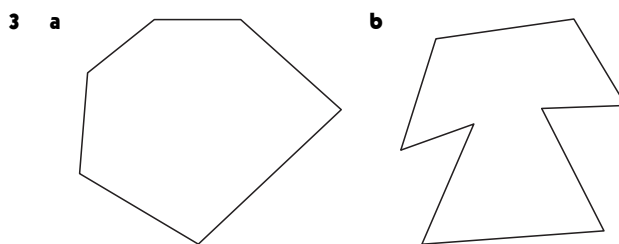
Undo:  $\frac{x}{3} - 9 \xrightarrow{+9} \frac{x}{3} \xrightarrow{\times 3} x$

- 8 a  $x = -2$     b  $x = -3$     c  $x = 2$

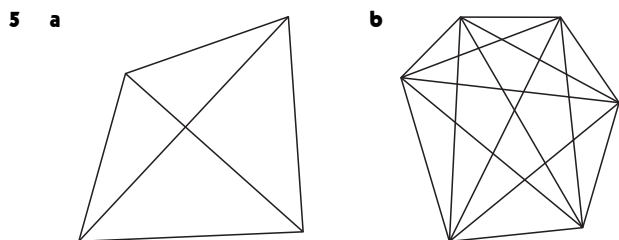
- 9 a  $a = 27$     b  $b = 60$     10 \$55

**11A POLYGONS**

- 1 a polygon  
 b not a polygon as sides cross over  
 c not a polygon as not all sides are straight  
 d not a polygon as figure is not closed  
 2 a convex pentagon    b non-convex hexagon  
 c convex quadrilateral    d non-convex octagon



- 4 a all sides not equal in length    b all angles not equal



- 6 a false    b true    c false

**11B TRIANGLES**

- 1 a scalene    b equilateral    c isosceles  
 2 a right angled    b acute    c obtuse

**11C ANGLE SUM OF A TRIANGLE**

- 1 a  $x = 80$     b  $x = 28$     2 a  $a = 55$     b  $b = 30$   
 3 a  $x = 56$     b  $x = 35$

**11D EXTERIOR ANGLES OF A TRIANGLE**

- 1 a  $x = 160$     b  $x = 74$     c  $x = 68$

**11E ISOSCELES TRIANGLES**

- 1 a  $x = 67$     b  $x = 4$     c  $x = 150$     d  $x = 67$   
 2 a  $x = 38$ ,  $\triangle ABC$  is isosceles with  $AB = BC$ .  
 b  $x = 18$ ,  $\triangle PQR$  is isosceles with  $PR = QR$ .

**11F QUADRILATERALS**

- 1 a A trapezium has one pair of opposite sides which are parallel.  
 b A rhombus has all four sides equal in length.  
 c A kite has two pairs of adjacent sides which are equal in length.  
 d A parallelogram has both pairs of opposite sides parallel.  
 e A square has right angled corners *and* all sides equal in length.  
 f A rectangle has right angled corners.  
 2 a rhombus    b kite  
 3 a true    b false  
 4  $[AB] \parallel [DC]$ ,  $[AB] \perp [AD]$ ,  $[AD] \perp [DC]$   
 5 a  $x = 12$  {diagonals of a rectangle are equal in length}  
 $y = 5$  {opposite sides of a rectangle}  
 b  $x = 45$  {diagonals of a square bisect the angles at each vertex}  
 c  $y = 90$  {diagonals of a square bisect each other at right angles}

**11G ANGLE SUM OF A QUADRILATERAL**

- 1 a  $x = 71$     b  $b = 85$     c  $c = 53$   
 d  $a = 98, b = 65, c = 151$

**REVIEW OF CHAPTER 11**

- 1 a not a polygon    b not a polygon    c polygon  
 2 non-convex pentagon    3 obtuse, isosceles  
 4 a  $x = 66$     b  $x = 17$     c  $x = 46$   
 5 true    6 a rectangle    b  $a = 20, b = 20$   
 7 a  $x = 74$     b  $x = 90, y = 40$     c  $a = 94, b = 96$

**12A LENGTH**

- 1 a mm    b km    c cm    2 C  
 3 a 3.8 cm    b 6.3 cm  
 4 a 25 m    b 860 cm    c 6 mm    d 3670 mm  
 e 3.4 m    f 1.9 cm    g 4.95 km    h 22.5 km  
 i 2.67 m  
 5 a 7.575 m    b 28 048 m  
 6 a 3.443 km    b 1.577 km farther    7 1.084 km

**12B PERIMETER**

- 1 a 39 m    b 22.5 cm    c 82 mm  
 2 a 100 mm    b 78 cm    c 48 m  
 3 a 21 cm    b 24.8 km    4 14.9 cm    5 27 m

**12C AREA**

- 1 a  $m^2$     b  $cm^2$     c  $km^2$     d  $mm^2$   
 2 C    3 a  $18 cm^2$     b  $20 cm^2$

**12D THE AREA OF A RECTANGLE**

- 1 a  $15 m^2$     b  $6.25 km^2$     c  $0.748 km^2$     d  $1.98 cm^2$   
 2 a length = 2.8 m, width = 2.3 m    b  $6.44 m^2$     c \$64.40  
 3 a  $44 m^2$     b  $0.16 m^2$     c 275 pavers    4 5 m

**12E THE AREA OF A TRIANGLE**

- 1 a  $15 cm^2$     b  $9 m^2$     c  $1.8 m^2$   
 2  $64 cm^2$     3 16 cm

**12F THE AREA OF A PARALLELOGRAM**

- 1 a  $32 cm^2$     b  $320 m^2$     c  $63 cm^2$     2  $1200 cm^2$

**12G THE AREA OF A TRAPEZIUM**

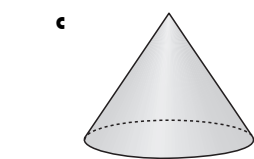
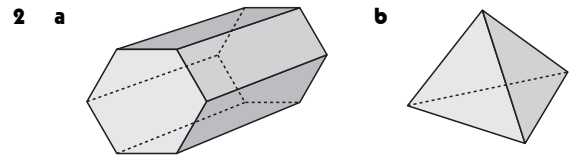
- 1 a  $21 cm^2$     b  $112 m^2$     c  $130.5 m^2$   
 2 a  $13.05 m^2$     b \$182.70

**REVIEW OF CHAPTER 12**

- 1 a 380 cm    b 2.295 km    c 630 mm  
 2 27.55 m    3 a 34 m    b 74 cm  
 4 a  $64 cm^2$     b  $98.4 m^2$     c  $780 mm^2$     d  $43.4 km^2$   
 5 12 m    6  $m^2$   
 7 a  $0.0625 m^2$     b  $14 m^2$     c 224 tiles

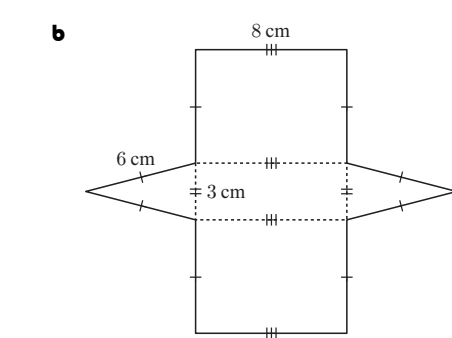
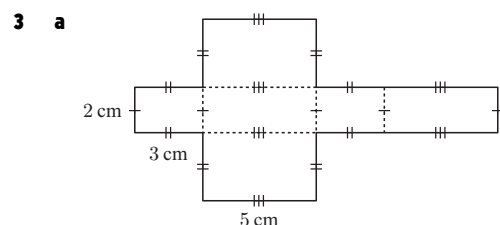
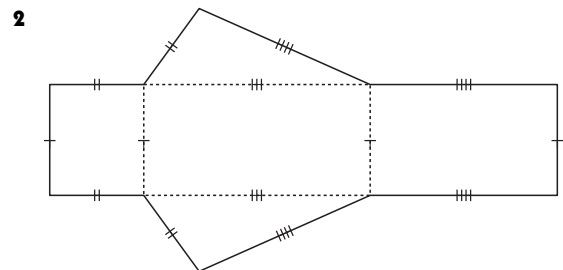
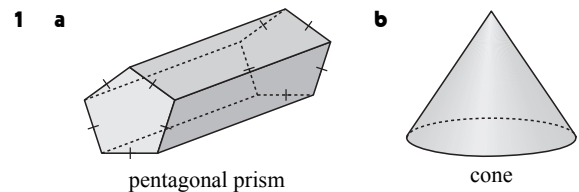
**13A SOLIDS**

- 1 a cube    b triangular prism    c cylinder

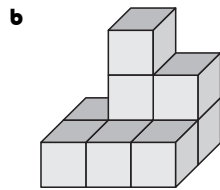
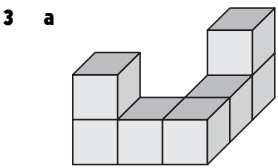
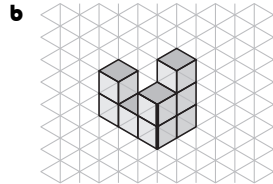
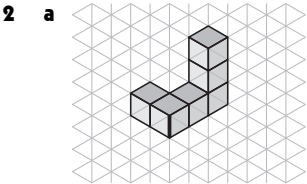
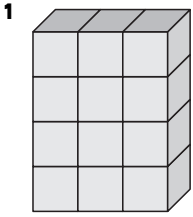


- 3 a cylinder    b rectangular prism    c cone

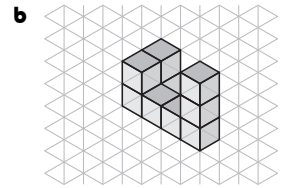
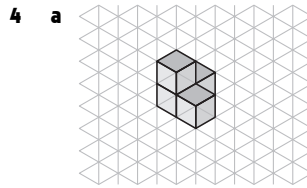
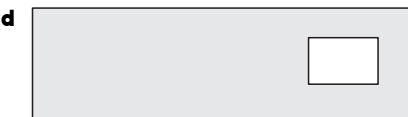
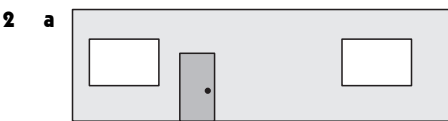
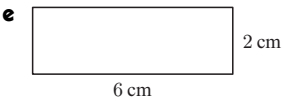
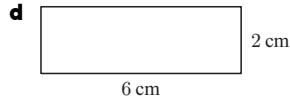
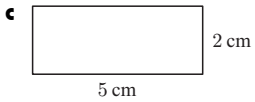
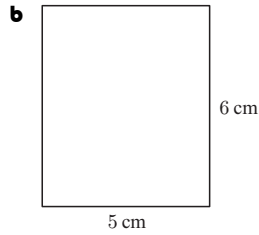
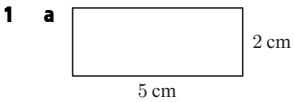
**13B NETS OF SOLIDS**



**13C OBLIQUE AND ISOMETRIC PROJECTIONS**



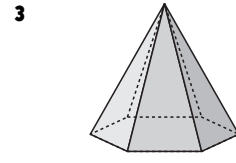
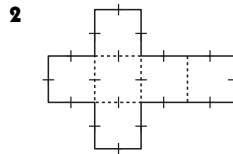
**13D VIEWS OF SOLIDS**



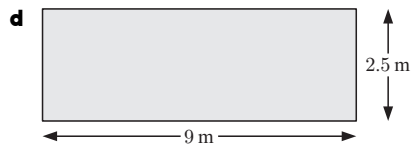
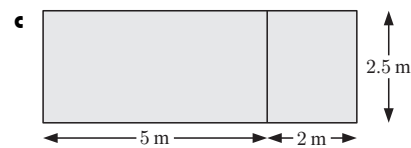
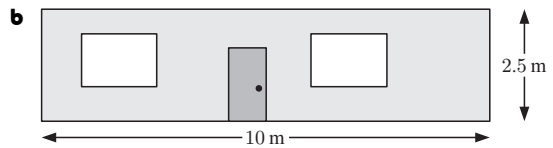
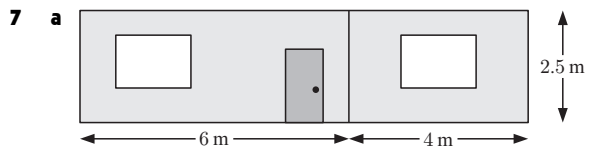
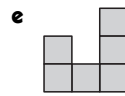
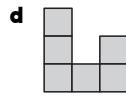
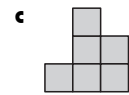
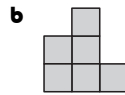
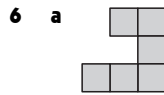
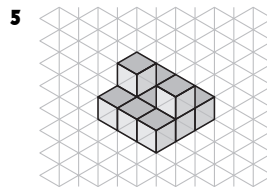
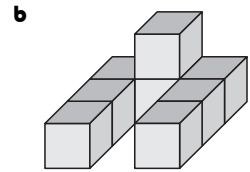
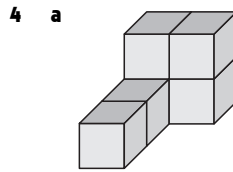
**REVIEW OF CHAPTER 13**

1 a sphere

b rectangular-based pyramid



hexagonal-based pyramid



**14A VOLUME**

- 1 a  $15 \text{ cm}^3$     b  $72 \text{ cm}^3$   
 2 a  $\text{m}^3$     b  $\text{mm}^3$     c  $\text{cm}^3$     3 c

**14B THE VOLUME OF A PRISM**

- 1 a  $36 \text{ m}^3$     b  $1920 \text{ cm}^3$   
 2 a  $32 \text{ mm}^3$     b  $1600 \text{ cm}^3$     c  $144 \text{ m}^3$   
 3  $7200 \text{ cm}^3$   
 4 a  $12 \text{ cm}^3$     b  $385 \text{ m}^3$     c  $510 \text{ m}^3$   
 5  $1296 \text{ cm}^3$     6  $14.52 \text{ cm}^3$     7  $572.4 \text{ cm}^3$

**14C CAPACITY**

- 1 a mL    b L    c ML  
 2 a 3 L    b 1300 kL    c 29 L  
 3 80 cups of tea    4 30 L each week

**14D CONNECTING VOLUME AND CAPACITY**

- 1 a 1.5 L    b 1.728 ML  
 2 a  $37.5 \text{ m}^2$     b  $562.5 \text{ m}^3$   
 c i 562.5 kL    ii 562 500 L  
 3 Cherie needs  $7.2 \times 1.5$  L bottles.  
 $\therefore$  8 whole bottles are needed.

**14E MASS**

- 1 a milligrams    b tonnes    c kilograms  
 2 a 2350 mg    b 600 g    c 0.348 t  
 3 60 kg    4 12.67 kg    5 6.8 kg

**14F THE RELATIONSHIP BETWEEN UNITS**

- 1 200 g    2 611.3 g    3 a 448 L    b 446.4 kg

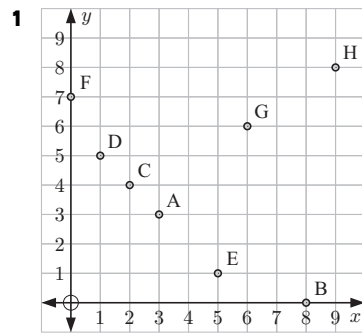
**REVIEW OF CHAPTER 14**

- 1  $\text{cm}^3$     2 a  $64 \text{ m}^3$     b  $54 \text{ mm}^3$   
 3 a  $2112 \text{ cm}^3$     b 300 bricks  
 4 a 3.875 L    b 2 000 000 mL  
 5 a  $5200 \text{ cm}^2$     b i 520 000 mL    ii 520 L  
 6 a 4260 mg    b 0.21 t    7 125 t    8 900 mL

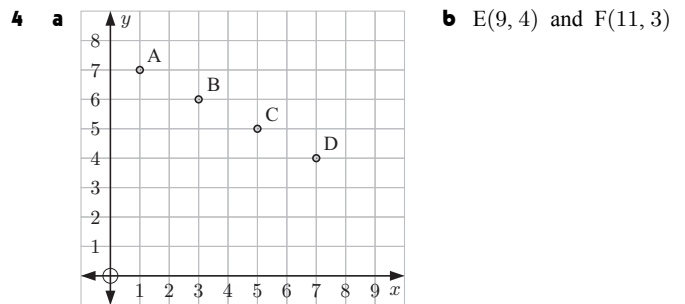
**15A GRID REFERENCES**

- 1 a i Skydive Townsville  
 ii Newmarket Hotel & Steakhouse    iii Rhino Bar  
 iv Shamrock Hotel  
 b i A5    ii C4    iii C2    iv B3  
 c D1, E1, E2, F1

**15B COORDINATES**

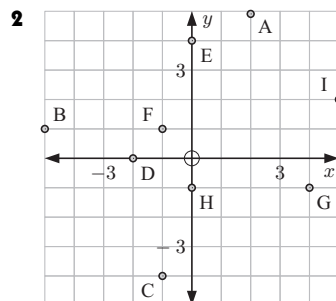


- 1 a i 7    ii 9    b i 2    ii 4  
 c A(5, 2), B(6, 6), C(8, 1), D(0, 4), E(5, 9), F(7, 5), G(4, 0), H(2, 4), I(9, 3), J(1, 8)  
 d A and E. They lie on the same vertical line.  
 e D and H. They lie on the same horizontal line.  
 f B(6, 6)  
 3 a i (6, 5)    ii (8, 7)    iii (9, 3)  
 b i Carmen    ii Elliot    iii Alice

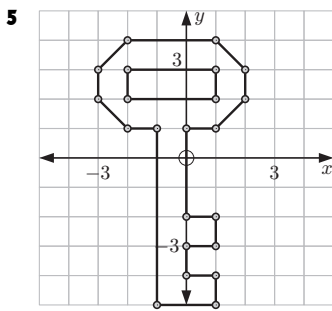


**15C POSITIVE AND NEGATIVE COORDINATES**

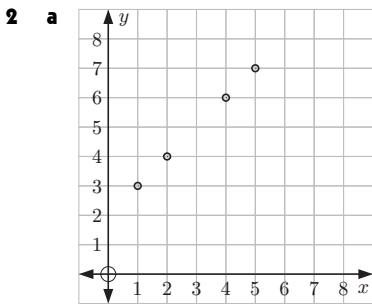
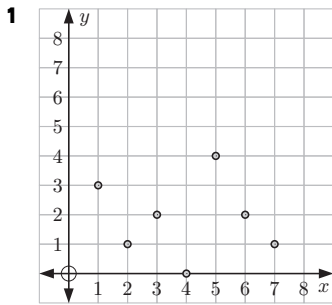
- 1 a i 4    ii -1    iii 0  
 b i 1    ii 0    iii -3  
 c A(-3, 1), B(3, -1), C(4, 2), D(-3, -2), E(2, -3), F(-1, 4), G(1, 0), H(0, -3), I(2, 4), J(-4, 0), K(0, 2)  
 d i D    ii C and I    e H and K



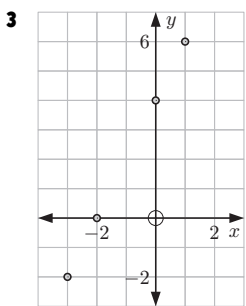
- 3 a fourth    b third    c first    d second  
 4 first and third quadrants



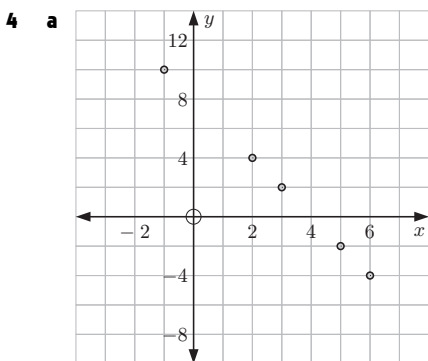
**15D** **PLOTTING POINTS FROM A TABLE OF VALUES**



b Yes, the points lie in a straight line.      c 2 L



x	-3	-2	0	1
y	-2	0	4	6



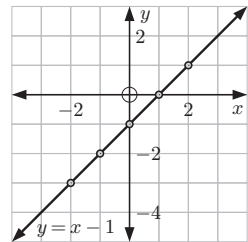
b i (4, 0)      ii (1, 6)

**15E** **THE EQUATION OF A LINE**

1 a  $y = x + 3$       b  $y = \frac{x}{4}$

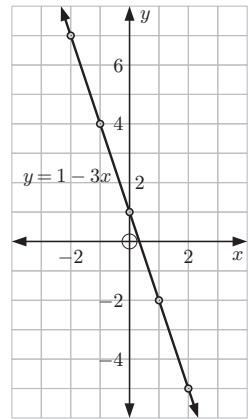
2 a

x	-2	-1	0	1	2
y	-3	-2	-1	0	1



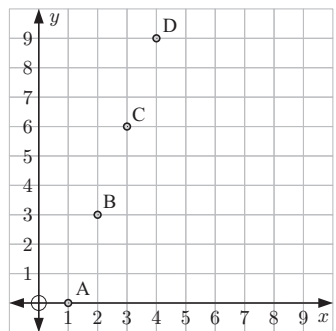
b

x	-2	-1	0	1	2
y	7	4	1	-2	-5

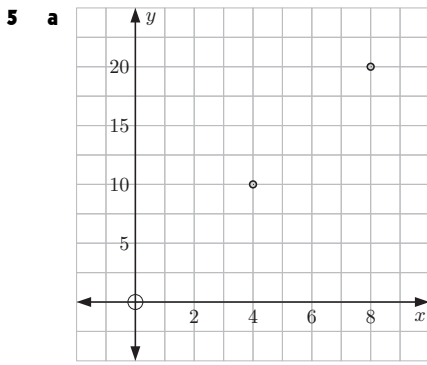


**REVIEW OF CHAPTER 15**

1 a i B4      ii E4  
 b i Sydney Opera House      ii Chinese Garden of Friendship  
 2 a i (-3, -2)      ii (4, -4)      iii (2, 1)  
 b F and J      c D(2, -2)  
 3 a      b E(5, 12)



4 a first      b second      c fourth      d third

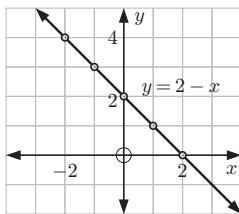


- b i \$5      ii \$15

6  $y = \frac{x}{2} + 3$

7

$x$	-2	-1	0	1	2
$y$	4	3	2	1	0



**16A RATIO**

- 1 a 4 : 9      b 8 : 11      c 13 : 7  
 2 a 9 : 11      b 9 : 10  
 3 a 8 : 12      b 19 : 500      c 29 : 2000      d 35 : 180  
 4 a 12 : 10      b 20 : 4      c 150 : 10 000

**16B RATIO AND FRACTIONS**

- 1 a  $\frac{9}{11}$       b  $\frac{2}{11}$   
 2 a i 1 : 3      ii  $\frac{1}{4}$       iii 25%  
 b i 7 : 11      ii  $\frac{7}{18}$       iii  $\approx 38.9\%$   
 3 a 5 : 1      b  $\frac{5}{6}$       4 2 : 3

**16C EQUAL RATIOS**

- 1 a 4 : 6      b 48 : 72  
 2 a equal      b equal      c not equal      d not equal

**16D LOWEST TERMS**

- 1 a 1 : 2      b 2 : 7      c 3 : 4      d 9 : 10  
 2 a 2 : 3      b 3 : 2      3 a 1 : 1      b 5 : 3  
 4 a 1 : 10      b 3 : 5      c 1 : 5      d 1 : 20  
 e 2 : 5      f 2 : 9  
 5 a not equal      b equal      c not equal      d equal

**16E PROPORTIONS**

- 1 a 48 : 8 = 6 : 1      b 9 : 10 = 45 : 50      c 11 : 8 = 88 : 64  
 d 18 : 14 = 9 : 7      e 8 : 5 = 32 : 20      f 3 : 8 = 24 : 64  
 2 a 36°      b 40°      3 6 supervisors      4 55 km/h

**16F USING RATIOS TO DIVIDE QUANTITIES**

- 1 a i  $\frac{3}{8}$       ii  $\frac{5}{8}$   
 b i 12 lemons      ii 20 lemons  
 2 a 520 g mince, 80 g breadcrumbs  
 b 2.6 kg mince, 400 g breadcrumbs  
 3 a \$30, \$40      b \$35, \$60      4 \$700

**16G RATES**

- 1 a 50 litres in 1 minute      b 7 kg in 1 month  
 c 25 metres in 1 second      d 29 dollars in 1 hour  
 2 a 15 litres per minute      b 1.5 kg per square metre  
 c 90 cents per apple  
 3 a Marissa: \$18 per hour, Daphne: \$17 per hour  
 b Marissa

**16H UNIT COST**

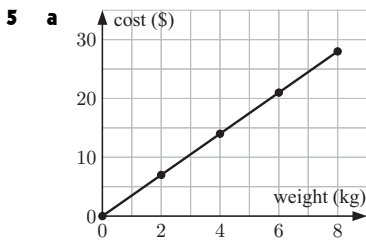
- 1 a \$0.90 per soap      b \$2.44 per L      c \$6.80 per L  
 d 30 cents per 10 g  
 2 a 700 g at \$0.65 per 100 g  
 b 12 doughnuts at  $\approx$  \$0.483 per doughnut  
 c 10 m at \$7.50 per 5 m  
 3 a 300 g tub: \$0.92 per 100 g, 500 g tub: \$0.62 per 100 g  
 b 500 g tub      c Yes, the rate is  $\approx$  \$0.613 per 100 g.

**REVIEW OF CHAPTER 16**

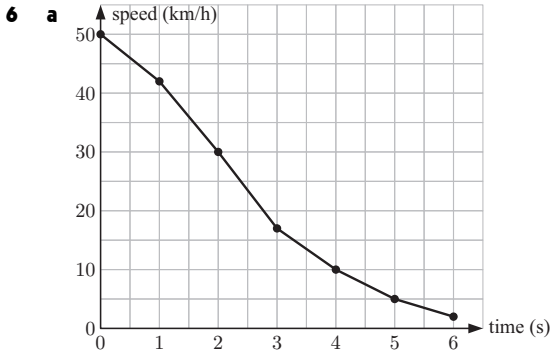
- 1 a 19 : 7      b 47 : 120  
 2 a  $\frac{6}{17}$       b  $\frac{11}{17}$       3 7 : 5  
 4 a 2 : 5      b 4 : 3      c 17 : 4  
 5 a not equal      b equal  
 6 a 2 : 7 = 8 : 28      b 24 : 18 = 4 : 3  
 7 a 35 questions      b 77 questions  
 8 Diana receives \$80, Zinzi receives \$220  
 9 20 mL per second      10 Carrie  
 11 a 10 kg bag at \$1.90 per kg      b 1.5 kg bag at  $\approx$  \$1.67 per kg

**17A LINE GRAPHS**

- 1 a A      b B      c C  
 2 a 25°C      b 5 min      c 3 min  
 d 10 minutes after it was put on the stove.  
 e i from 0 min to 5 min      ii from 8 min to 15 min  
 3 a 25 tables from 8 pm until 9 pm      b 7 tables at 6 pm  
 c From 7 pm until 8 pm, the number of tables occupied increased from 10 tables to 25 tables. The number of tables occupied remained constant until 9 pm. From 9 pm until 10 pm, the number of tables occupied decreased from 25 tables to 20 tables.  
 d  $\approx$  14 tables  
 4 a 2°C      b 30 min  
 c 50 minutes after putting them in the freezer. The temperature of the chicken pieces starts to increase after 50 minutes.  
 d 50 min



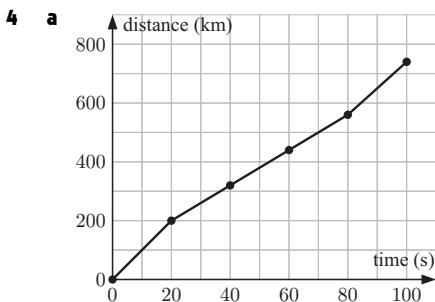
b \$3.50 per kg



b decreasing

**17B TRAVEL GRAPHS**

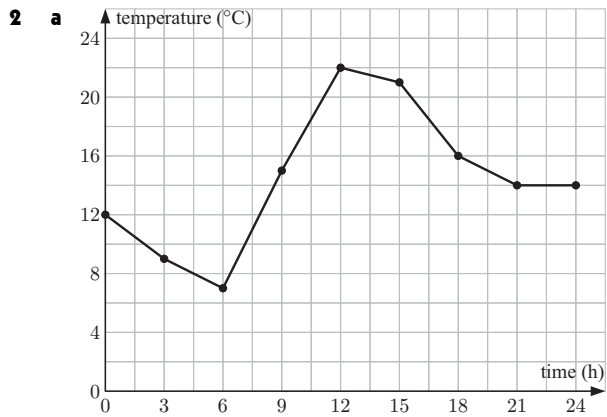
- 1 a 7 hours    b 75 km    c 20 km    d 2 hours  
 e after  $4\frac{1}{2}$  hours
- 2 a 6:30 pm    b  $2\frac{1}{2}$  hours  
 c i 2.5 km    ii 4.5 km  
 d 1.5 km  
 e i 4.5 km    ii 40 min
- 3 a Bus B    b Bus A: 2 km, Bus B: 6 km  
 c after 7 minutes    d Bus A: 5 km, Bus B: 6 km



b i  $\approx 500$  m    ii  $\approx 38$  s

**REVIEW OF CHAPTER 17**

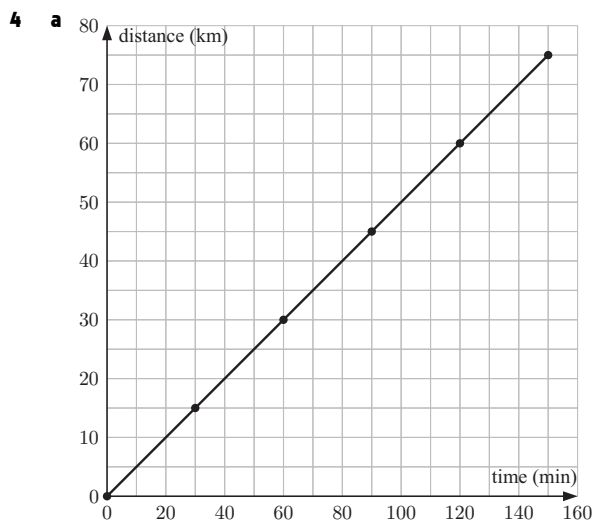
- 1 a 180 min  
 b i after 75 minutes    ii 15 minutes    iii 720 m  
 c after 15 min and after  $\approx 160$  min    d  $\approx 360$  m



b after 9 hours and  $\approx 19\frac{1}{2}$  hours

c increasing in some sections and decreasing in others

- 3 a 8.5 km    b  $\approx 8$  min    c after 25 minutes    d 45 min



b 20 km    c 30 km per h

**18A DESCRIBING PROBABILITY**

- 1 a certain    b unlikely    c impossible
- 2 a possible    b certain    c possible    d impossible
- 3 a no    b almost impossible
- 4 a It is more likely that the marshmallow is white, as there are more white marshmallows than pink marshmallows.  
 b i unlikely    ii likely

**18B USING NUMBERS TO DESCRIBE PROBABILITIES**

- 1 a unlikely    b slightly more than 50-50 chance  
 c highly unlikely
- 2 a i unlikely    ii likely    b Sunday
- 3 a  $L'$  = Lucinda will not remember to pack lunch today  
 b  $P(L') = 0.21$     c unlikely
- 4 a  $\frac{1}{4} = 0.25$ ,  $\frac{1}{5} = 0.2$ ,  $\frac{11}{20} = 0.55$   
 b The sum of the probabilities is 1. It is certain that the lolly will be red, blue, or green.  
 c green    d 0.45
- 5 a slightly more than 50-50 chance    b Clark  
 c i  $C'$  = Clark will not win his next match



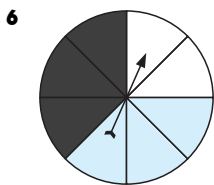
- ii  $P(C') = 0.22$
- d i  $P(B) + P(C) = 0.38 + 0.78 = 1.16$  which is  $> 1$   
 $\therefore$  no, it is not possible that Britta and Clark are playing against each other.
- ii  $P(A) + P(B) = 0.62 + 0.38 = 1$   
 $\therefore$  yes, it is possible that Andrew and Britta are playing against each other.

**18C SAMPLE SPACE**

- 1 a  $\{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$ , 10 outcomes
- b  $\{\text{Adelaide, Brisbane, Canberra, Darwin, Hobart, Melbourne, Perth, Sydney}\}$ , 8 outcomes
- c  $\{\text{blue, red}\}$ , 2 outcomes
- 2 a  $\{a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z\}$
- b 26 outcomes c 5 outcomes
- 3 a  $\{\text{HHHH, HHHT, HHTH, HTHH, THHH, HHTT, HTHT, HTTH, THTT, THTH, TTHH, HTTT, THTT, TTHT, TTTH, TTTT}\}$ , 16 outcomes
- b  $\{(1, 1), (1, 2), (1, 3), (1, 4), (1, 5), (2, 1), (2, 2), (2, 3), (2, 4), (2, 5), (3, 1), (3, 2), (3, 3), (3, 4), (3, 5), (4, 1), (4, 2), (4, 3), (4, 4), (4, 5), (5, 1), (5, 2), (5, 3), (5, 4), (5, 5)\}$ , 25 outcomes
- 4 a  $\{\text{RB, BR, RG, GR, BG, GB}\}$  b 6 outcomes c 4 outcomes

**18D THEORETICAL PROBABILITY**

- 1 a  $\{\text{January, February, March, April, May, June, July, August, September, October, November, December}\}$ , 12 outcomes
- b i  $\frac{1}{12}$  ii  $\frac{3}{12} = \frac{1}{4}$  iii  $\frac{4}{12} = \frac{1}{3}$
- 2 a  $\frac{2}{6} = \frac{1}{3}$  b  $\frac{3}{8}$
- 3 a  $\frac{1}{6}$  b  $\frac{3}{6} = \frac{1}{2}$  c  $\frac{5}{6}$
- 4 a  $\frac{8}{16} = \frac{1}{2}$  b  $\frac{6}{16} = \frac{3}{8}$  c  $\frac{14}{16} = \frac{7}{8}$  d 0
- e  $\frac{8}{16} = \frac{1}{2}$  f 1
- 5 a i  $\frac{3}{9} = \frac{1}{3}$  ii  $\frac{4}{9}$  iii  $\frac{3}{9} = \frac{1}{3}$
- b i  $P(E) = \frac{4}{9}$
- ii  $E'$  = selected shape is not horizontally nor vertically adjacent to exactly one triangle
- iii  $P(E') = \frac{5}{9}$



- 6
- 7 a 16 possible outcomes
- b i  $\frac{1}{16}$  ii  $\frac{9}{16}$  iii  $\frac{7}{16}$
- 8 a  $\frac{2}{20} = \frac{1}{10}$  b  $\frac{6}{20} = \frac{3}{10}$  c  $\frac{4}{20} = \frac{1}{5}$

**18E EXPERIMENTAL PROBABILITY**

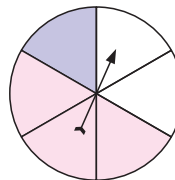
- 1  $\approx 0.774$  2 a  $\approx 0.781$  b  $\approx 0.219$
- 3 a  $\approx 0.471$  b  $\approx 0.129$

**18F THE ACCURACY OF EXPERIMENTAL PROBABILITIES**

- 1 a i  $\approx 0.644$  ii  $\approx 0.708$
- b Douglas' probability is likely to be more accurate as Douglas drew more cards overall than Diane.
- 2 a  $\approx 0.725$  b  $\approx 0.907$
- c The estimate in a is likely to be more accurate as Mark made more attempts in the first half of the season.
- d  $\approx 0.799$

**REVIEW OF CHAPTER 18**

- 1 highly unlikely
- 2 a  $P(B') = 0.59$
- b i slightly less than 50-50 chance
- ii slightly more than 50-50 chance
- 3  $\{P, R, O, B, A, I, L, T, Y\}$ , 9 outcomes
- 4 a  $\frac{6}{20} = \frac{3}{10}$  b  $\frac{12}{20} = \frac{3}{5}$  c  $\frac{6}{20} = \frac{3}{10}$  d 0
- 5
- 6 a  $\frac{4}{21}$  b  $\frac{13}{21}$
- 7 a  $\{H1, H2, H3, H4, H5, T1, T2, T3, T4, T5\}$ , 10 outcomes
- b i  $\frac{1}{10}$  ii  $\frac{2}{10} = \frac{1}{5}$  iii  $\frac{3}{10}$
- 8 a i  $\approx 0.894$  ii  $\approx 0.904$
- b Today's estimate is likely to be more accurate as more shots were made.



**19A DATA COLLECTION**

- 1 a sample b census c census d sample
- 2 sample

**19B CATEGORICAL DATA**

1 a

Favourite teacher	Tally	Frequency
Mr Smith		7
Mr White		9
Mrs Brown		4
Miss Doyle		5
Total		25

- b  $\frac{1}{5}$
- c Mr White; more students chose Mr White as their favourite teacher than any other teacher.

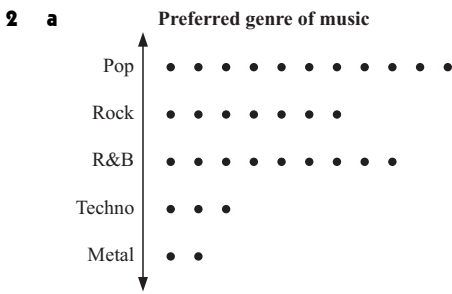
2 a

Preferred sport	Tally	Frequency
Badminton		9
Squash		7
Tennis		12
Total		28

- c 25%
- b tennis

**19C** **DISPLAYING CATEGORICAL DATA**

1 a 13 students b 50 food items c 18% d sandwiches

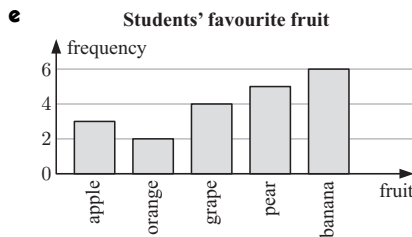


b 32 people c pop d i  $\approx 34.4\%$  ii 50%

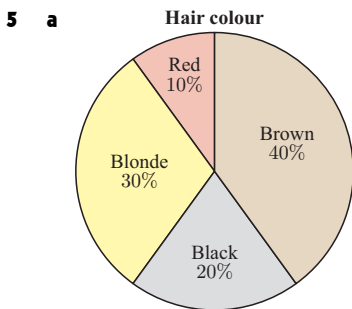
3 a

Favourite fruit	Tally	Frequency
Apple		3
Orange		2
Grape		4
Pear		5
Banana		6
Total		20

b 4 students c 15% d banana



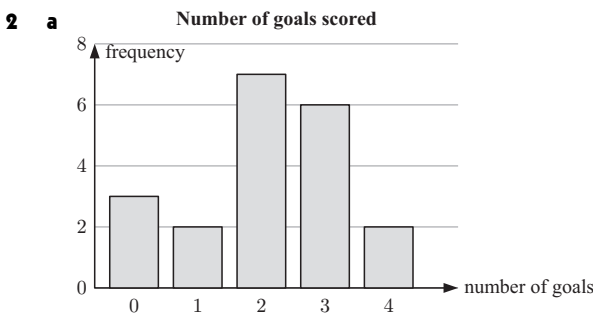
4 a full licence b i 111 students ii 12 students c  $54^\circ$



b i 10% ii 70% c  $\frac{1}{5}$

**19D** **NUMERICAL DATA**

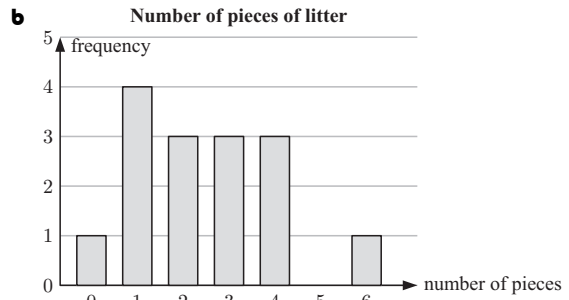
1 a 6 families b 21 families c 3 children d yes, 7 children



b 2 goals c 20 matches d  $\frac{2}{5}$

3 a

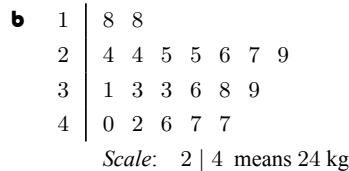
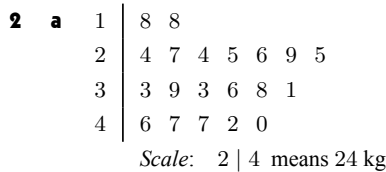
Number of pieces of litter	Tally	Frequency
0		1
1		4
2		3
3		3
4		3
5		0
6		1
Total		15



c 6 pieces d 1 piece e  $\approx 66.7\%$  f yes, 6 pieces

**19E** **STEM-AND-LEAF PLOTS**

1 a 17 fishers b 2 fishers c 4 fish d 52 fish



c 4 piglets d i 47 kg ii 18 kg

**19F** **MEASURING THE CENTRE**

1 a 5.625 b 3.38 2 a 9 b 4.5

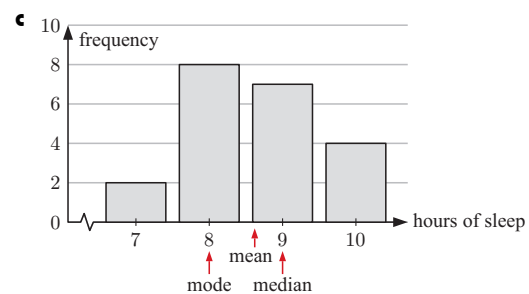
3 a i  $\approx 2.86$  abalone ii 3 abalone iii 5 abalone

b No, as the mode is 5 abalone, which is the maximum value in the data set, it does not give an accurate measure of the "centre" of the data set.

4 a 4.3 b 4.8 c 4.8

5 a 19 students

b i 8 hours ii 9 hours iii  $\approx 8.62$  hours



6 a Chris: mean  $\approx 130$  km/h, median = 127 km/h  
Hamed: mean = 129 km/h, median = 126 km/h

- b Chris, as his mean and median values are higher than Hamed's.
- c i mean  $\approx$  132 km/h, median = 129 km/h
- ii Hamed's new mean and median values are now higher than Chris', so Hamed now has a faster bowling speed overall.

**19G MEASURING THE SPREAD**

- 1 a 13    b 8.3    2 a 36    b 4
- 3 a
- |         | Mon | Tue | Wed | Thu | Fri | Range |
|---------|-----|-----|-----|-----|-----|-------|
| Laura   | 21  | 19  | 17  | 22  | 20  | 5     |
| Matthew | 8   | 9   | 5   | 12  | 10  | 7     |
| Nick    | 14  | 13  | 14  | 16  | 15  | 3     |
| Olivia  | 2   | 3   | 2   | 3   | 4   | 2     |
| Pedro   | 35  | 34  | 36  | 38  | 40  | 6     |
- b i Matthew's    ii Olivia's

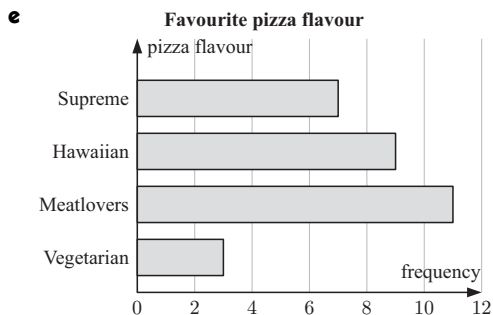
**REVIEW OF CHAPTER 19**

- 1 a census    b sample
- 2 a 21 students
- b
- Number of showbags bought
- 
- c 3 showbags    d  $\frac{10}{21}$     e 7 showbags
- 3 a False, as the total angle for both the emu and echidna sectors is less than  $\frac{1}{2}$  of  $360^\circ = 180^\circ$ .
- b True, as the angle for the platypus sector is more than  $\frac{1}{4}$  of  $360^\circ = 90^\circ$ .

4 a

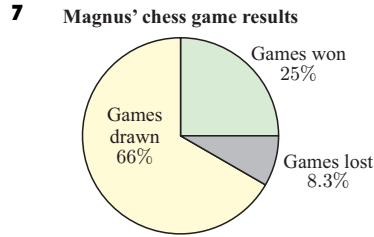
Favourite pizza flavour	Tally	Frequency
Supreme		7
Hawaiian		9
Meatlovers		11
Vegetarian		3
<b>Total</b>		<b>30</b>

- b 9 students    c meatlovers    d 10%



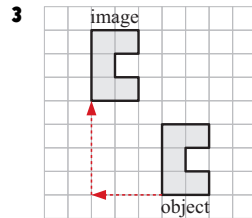
- 5 a 6.2, 7.3, 7.5, 7.9, 8.1, 8.2, 8.2, 8.5, 9.0, 9.7
- b i 8.2    ii 8.06    iii 8.15    iv 3.5
- 6 a 53 sit-ups
- b i mean = 46.3 sit-ups, median = 45.5 sit-ups
- ii mean = 50.2 sit-ups, median = 49 sit-ups

- c Michelle, as her mean and median values are higher than Shannon's.

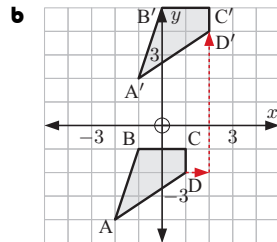


**20A TRANSLATIONS**

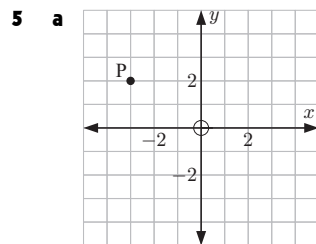
- 1 a 3 units right, 2 units down    b 3 units left, 5 units down
- c 5 units right, 1 unit up
- 2 a 4 units right, 3 units down    b 8 units right, 2 units up
- c 5 units left    d 3 units up
- e 8 units left, 5 units down    f 8 units right, 5 units up



- 4 a A(-2, -4), B(-1, -1), C(1, -1), D(1, -2)

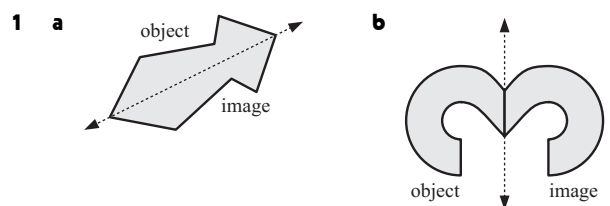


- c A'(-1, 2), B'(0, 5), C'(2, 5), D'(2, 4)

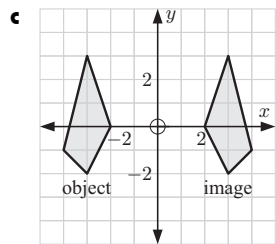
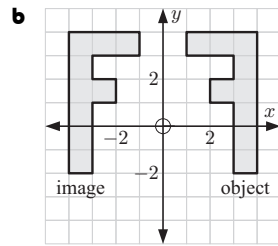
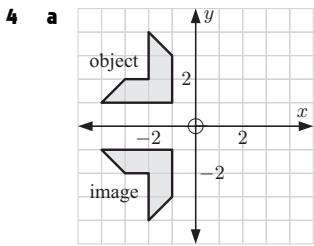
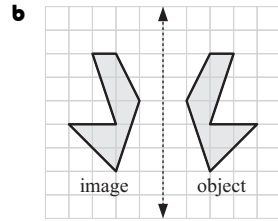
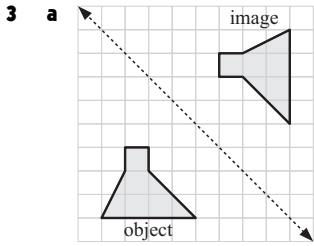
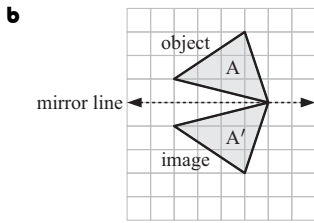


- b i (4, 4)    ii (-1, 1)    iii (2, -4)

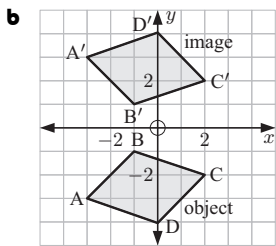
**20B REFLECTIONS**



- 2 a A is not the same distance from the mirror line as B.

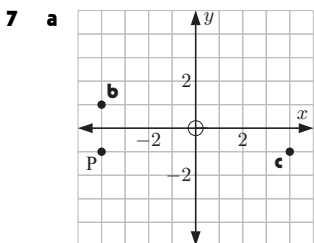


**5 a**  $A(-3, -3)$ ,  $B(-1, -1)$ ,  $C(2, -2)$ ,  $D(0, -4)$



**c**  $A'(-3, 3)$ ,  $B'(-1, 1)$ ,  $C'(2, 2)$ ,  $D'(0, 4)$

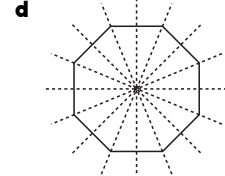
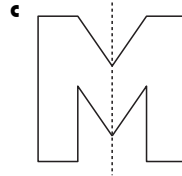
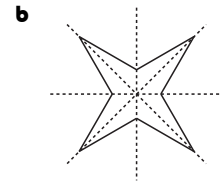
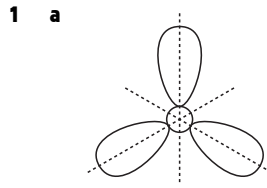
**6** 3rd quadrant



**b**  $(-4, 1)$       **c**  $(4, -1)$

**20C**

**LINE SYMMETRY**

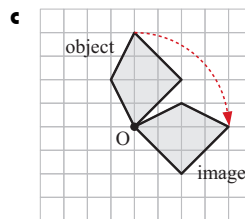
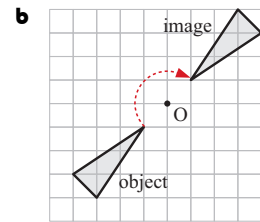
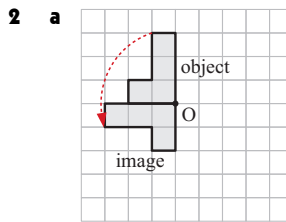
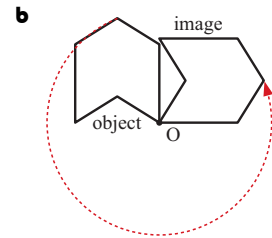
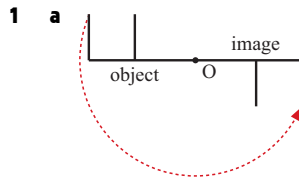


**2 a** two lines of symmetry

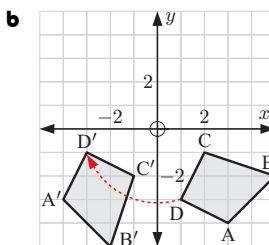
**b** no lines of symmetry

**20D**

**ROTATIONS**

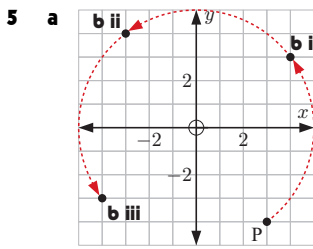


**3 a**  $A(3, -4)$ ,  $B(5, -2)$ ,  $C(2, -1)$ ,  $D(1, -3)$



**c**  $A'(-4, -3)$ ,  $B'(-2, -5)$ ,  $C'(-1, -2)$ ,  $D'(-3, -1)$

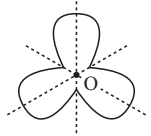
**4** 1st quadrant



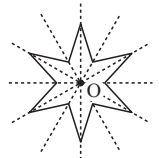
- b** i (4, 3)    ii (-3, 4)    iii (-4, -3)

**20E**    **ROTATIONAL SYMMETRY**

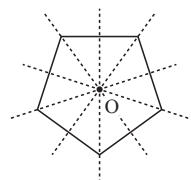
- 1** a yes    b no    c yes    d yes  
**2** a i    ii 3



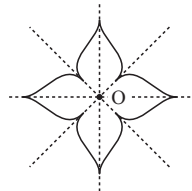
- b** i    ii 6



- c** i    ii 5

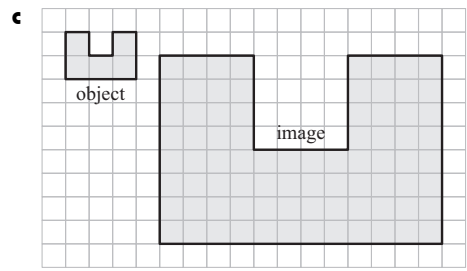
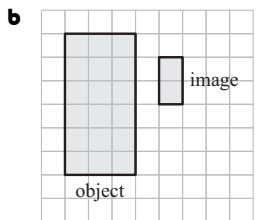
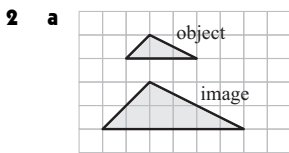


**3** Note: There may be other answers.



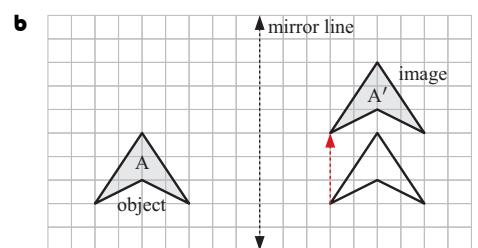
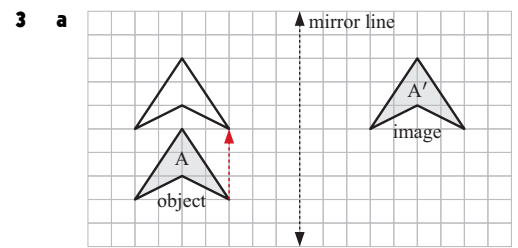
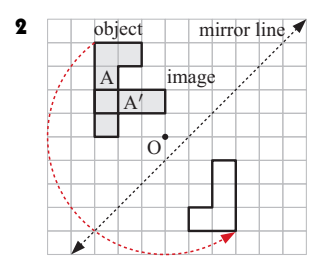
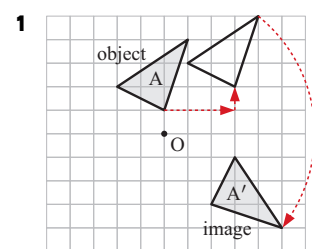
**20F**    **ENLARGEMENTS AND REDUCTIONS**

- 1** a 3    b  $\frac{1}{2}$     c 2    d  $\frac{1}{3}$

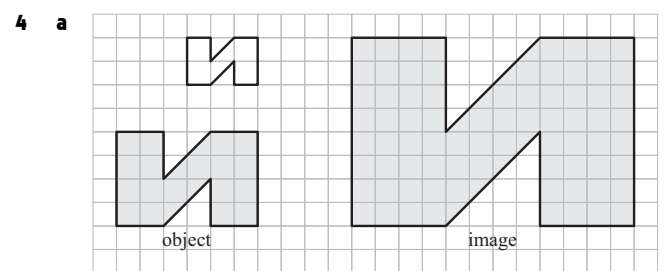


- 3** a  $\frac{1}{2}$     b 2

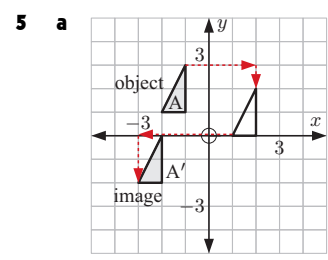
**20G**    **COMBINATIONS OF TRANSFORMATIONS**



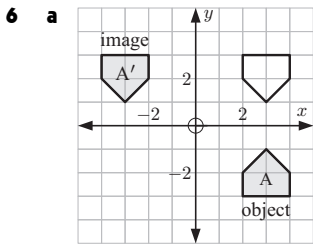
**c** Yes, the result is the same.



**b** Enlarge the original figure with scale factor 2.



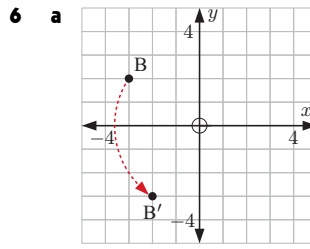
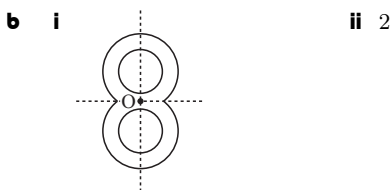
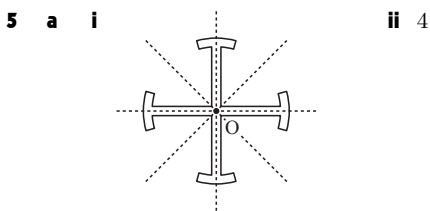
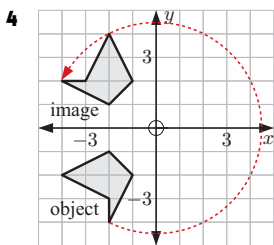
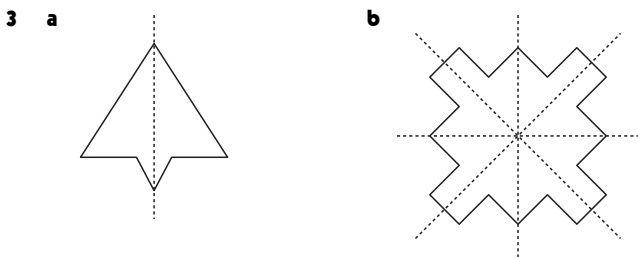
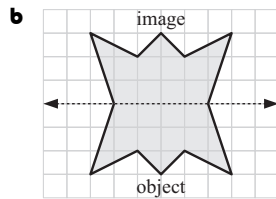
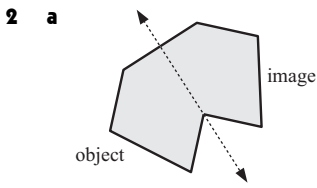
**b** Translate A 1 unit left and 3 units down.



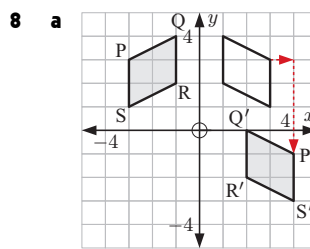
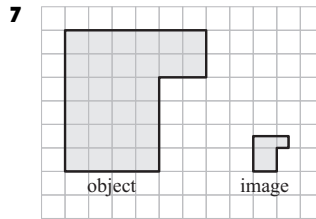
**b** A rotation of  $180^\circ$  about O.

**REVIEW OF CHAPTER 20**

- 1 a** 5 units right, 4 units down  
**b** 6 units left, 1 unit up  
**c** 4 units right, 2 units up  
**d** 3 units left, 1 unit up



- b**  $B'(-2, -3)$       **c** 1 unit right, 5 units down



- b**  $P'(4, -1)$ ,  $Q'(2, 0)$ ,  $R'(2, -2)$ ,  $S'(4, -3)$   
**c** Reflect  $P'Q'R'S'$  in the  $y$ -axis, then translate the result 1 unit right and 4 units up.