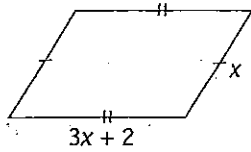


# Basic algebra

## Problem solving and algebra

Find the perimeter of each of the following shapes:

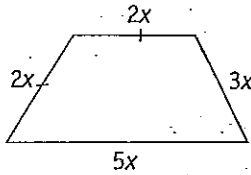
1



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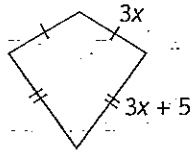
2



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3

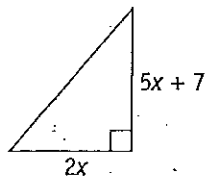


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Find the area of each of the following shapes.

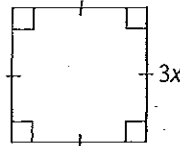
4



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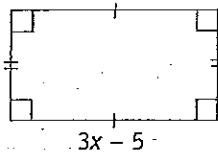
5



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6



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7 Find the sum of  $3x$  and  $5y$ .

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8 What is the product of  $8m$  and  $5n$ ?

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9 Find the average of  $6x$ ,  $2x$  and  $7x$ .

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10 Find an expression for 5 more than the sum of 3 and  $2x$ .

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11 Find the area of a square with side length  $y$  metres.

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12 If the first number is  $4x$ , write the next consecutive integer.

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13 Increase  $9x$  by 10 and then decrease this result by  $2x$ .

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14 Find the volume of a cube with side length  $2x$  cm.

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15 Find the number  $(x - 2)$  less than  $4x + 5y$ .

---

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# Basic algebra

## TOPIC TEST

## PART A

- Instructions**
- This part consists of 15 multiple choice questions
  - Fill in only ONE CIRCLE for each question.
  - Each question is worth 1 mark
  - Calculators may be used

**Time allowed: 15 minutes**

**Total marks = 15**

				Marks		
<b>1</b>	If $a = -4$ and $b = 3$ the value of $a^2b$ is	(A) 48	(B) 144	(C) -24	(D) -48	1
<b>2</b>	$a^3 + a^3 =$	(A) $a^6$	(B) $a^3$	(C) $2a^6$	(D) $2a^3$	1
<b>3</b>	$15x^8 \div 5x^4 =$	(A) $3x^4$	(B) $3x^2$	(C) $10x^4$	(D) $10x^2$	1
<b>4</b>	$2a \times 3a \times 4a =$	(A) $9a$	(B) $9a^3$	(C) $24a$	(D) $24a^3$	1
<b>5</b>	$\frac{1}{x} \div \frac{1}{y} =$	(A) $\frac{1}{xy}$	(B) $\frac{y}{x}$	(C) $\frac{x}{y}$	(D) $xy$	1
<b>6</b>	$3x - (-x) =$	(A) 3	(B) $3x$	(C) $3x^2$	(D) $-4x$	1
<b>7</b>	$3y^2 - 2y + 5y + 4y^2 =$	(A) $7y^2 + 3y$	(B) $7y^2 - 7y$	(C) $7y^3 + 3y$	(D) $7y^4 - 7y$	1
<b>8</b>	$7t^3 \times (-4t^2) =$	(A) $3t^5$	(B) $3t^6$	(C) $-28t^5$	(D) $-28t^6$	1
<b>9</b>	$3(x + 4) - x =$	(A) 12	(B) 15	(C) $2x + 4$	(D) $2x + 12$	1
<b>10</b>	$(4x^3)^2 =$	(A) $4x^6$	(B) $4x^9$	(C) $16x^6$	(D) $16x^9$	1

11  $\frac{6a^2}{2ab} =$

(A)  $3ab$

(B)  $\frac{3a}{b}$

(C)  $6b$

(D)  $\frac{6}{b}$

12  $3ab - b + ab - 2b =$

(A)  $2ab - b$

(B)  $2ab - 3b$

(C)  $4ab - b$

(D)  $4ab - 3b$

13  $\frac{x^4 \times x^6}{x^2} =$

(A)  $x^5$

(B)  $x^8$

(C)  $x^{12}$

(D)  $x^{22}$

14  $(y^6 \div y^2)^2 =$

(A)  $y^5$

(B)  $y^6$

(C)  $y^8$

(D)  $y^9$

15 The correct factorisation of  $2ab - a$  is

(A)  $2a(b - 1)$

(B)  $2a(b - a)$

(C)  $a(2b - 1)$

(D)  $a(2b - a)$

---

**Total marks achieved for PART**

---

# Basic algebra

## TOPIC TEST

1

- Instructions**
- This part consists of 15 questions
  - Each question is worth 1 mark
  - Write answers in the 'Answers only' column

1

**Time allowed: 15 minutes**

**Total marks = 15**

1

1

1

15

**Questions**

**Answers only**

**1** Simplify  $3y - 4y - y$

**2** Simplify  $6a^2 \times a$

**3** Factorise  $7x + 14y$

**4** If  $\frac{x}{4} = 11$  find  $x$

**5** Expand  $3x(2x - 5y)$

**6** If  $a = 3$ ,  $b = -2$  and  $c = 0$ , find the value of  $3a + 2b - c$

Simplify the following.

**7**  $\frac{6x^3}{x^2}$

**8**  $(3a^2b)^2$

**9**  $\sqrt{49x^2}$

**10**  $36m^3 - 12m^3$

**11**  $\frac{8a}{9} - \frac{3a}{9}$

**12**  $\frac{3x+5}{4} + \frac{x}{4}$

**13**  $\frac{xy}{3} \times \frac{9}{xy}$

**14**  $\frac{4a}{5} \div \frac{a}{10}$

**15**  $3(a - 4) + 4(a + 2b)$

**Total marks achieved for PART B**

# Basic algebra

## TOPIC TEST

P

- Instructions**
- This part consists of 4 questions
  - Each question is worth 5 marks
  - Show all necessary working

**Time allowed: 20 minutes**

**Total marks = 20**

**1** If  $a = 2$ ,  $b = -4$  and  $c = -6$ , find the value of each expression.

a  $abc$  \_\_\_\_\_

b  $5(a + b + c)$  \_\_\_\_\_

c  $5ab^2$  \_\_\_\_\_

d  $3ab + 2c$  \_\_\_\_\_

e  $a^2 + b^2 - c^2$  \_\_\_\_\_

**2** Simplify.

a  $-7a + 6a + 4a$  \_\_\_\_\_

b  $6a + 5(3 - a)$  \_\_\_\_\_

c  $-8(2a + 3b) + a$  \_\_\_\_\_

d  $\frac{9}{a} - \frac{5}{a}$  \_\_\_\_\_

e  $\frac{3x}{5} + \frac{2x}{17}$  \_\_\_\_\_

**3** Expand and simplify.

a  $9x - 3(x + 5)$  \_\_\_\_\_

b  $x(3x - 2) - 3(x^2 - x)$  \_\_\_\_\_

c  $25 - (x + 17)$  \_\_\_\_\_

d  $-9(x - y) + 3(2x - y)$  \_\_\_\_\_

e  $-6(a + 2b) - 2(b - a)$  \_\_\_\_\_

**4** Factorise.

a  $3x - x^2$  \_\_\_\_\_

b  $3p^2q + 12pq^2$  \_\_\_\_\_

c Solve  $3(x - 1) = 6$  \_\_\_\_\_

Simplify the following.

d  $5p^2 \times q^5 \times pq$  \_\_\_\_\_

e  $\frac{15a^3b^2}{8ac^2} \div \frac{25ab}{(2c)^2}$  \_\_\_\_\_

**Total marks achieved for PART C**

# Answers

12 \$23 072 13 \$426.67 14 300 15 \$375

**PAGES 32 & 33** 1 D 2 C 3 B 4 B 5 D 6 C 7 D 8 C 9 D 10 A 11 C 12 D 13 C 14 B 15 C

**PAGE 34** 1 9 2  $16\frac{2}{3}$  3 750 4 93 5 198 kg 6 817 7 60% 8 74% 9 375 10 99.36 11 12 12  $\frac{22}{25}$  13 90

14  $\frac{33}{50}$  15 900

**PAGE 35** 1 a 90 b 6 c 52 d 340 e 165 2 a 140 cm b \$221 c 4.505 L d 2.94 h e 105 3 a  $\frac{11}{20}$ , 0.55

b  $\frac{17}{20}$ , 85% c 1250%, 12.5 d  $\frac{1}{16}$ , 0.0625 e 60%, 0.6 4 a 48% b 25% c 124% d \$312 e \$64

**PAGE 36** 1 a 11x b 16x c 16x d 27x e 41x f 45x g 14xy h 20mn i 38a j 18x k  $42a^2$  l 19p 2 a 4a b 8a c 5a d 15x e 7m f 4y g 6x h 2xy i  $22x^2$  j 8y k 5x l 11p 3 a 12a b 8x c 14a d 14a e 20xy f 8mn g  $9x^2$  h  $13a^2$  i 5x j 16t k 10m l 12a 4 a  $3x+5y$  b  $9a+11b$  c  $5m+2n$  d  $4x^2$  e  $2a+5b$  f  $14a-6b$  g  $15y-7x$  h 6xy 5 a  $22-10x$  b  $3m+3n$  c  $19x-2y$  d  $11x^2-7y^2$  e  $8m+2n$  f  $6xy+6yz$  g  $9a+6b$  h  $3a+6b$  i  $6t+3$  j 18ab

**PAGE 37** 1 a 10a b 18b c 72y d 21y e -6ab f 6a g -3ab h 6ab i 18x j  $-45a^2b$  k  $16a^2$  l  $12x^2$  2 a 18ab b  $6x^2$  c 40xy d  $24y^2$  e 27ab f  $-30a^2$  g  $48y^2$  h  $6t^2$  i  $54x^2y$  j  $-30a^2b$  3 a  $2a^2b$  b 90a c  $30a^2bc$  d  $a^2b^2c^2$  e  $-54ab^2c$  f  $42a^2p$  g -40x h  $6xy^2$  4 a 40ab b  $14k^2$  c  $-72x^2y^2$  d  $8a^3x^2$  e  $36m^2$  f  $24m^2t$  g  $3y^3$  h  $-30x^2$  5 a  $-8a^2b^2$  b  $-84a^2$  c  $-18x^2y$  d 30abc e  $-4a^2b$  f  $-x^2y$  g  $25p^2$  h  $-36a^2$

**PAGE 38** 1 a 3a b 3pq c  $\frac{4}{5m}$  d 3x e 3y f 6a g 2a h 9x i  $\frac{3}{y}$  2 a 3 b 4y c 3n d 8m e -x f 8b g 4 h 8a i 4y j -3b k 3b l 4x 3 a -3x b -2b c 2y d 3x e 3y f 4 g  $4x^2$  h 12y i -5q j 10n 4 a -4 b 17 c -8x d -2 e 2x f 6m g 5y h 8b 5 a -4b b 4x c -1 d 9y e 1 f  $\frac{ab}{c}$  g  $\frac{3}{b}$  h 2x

**PAGE 39** 1 a  $16a^2$  b  $60a^2c$  c  $15a^2$  d  $288a^4$  e  $-27x^2$  f  $-36a^3$  g  $45x^3y$  h  $15y^3$  i  $96a^2b$  j  $72a^3$  k  $3a^4b$  l  $9a^3b^3$  2 a 5 b 9 c 6 d 25 e -2q f -7x g -4b h -4a i 4p j 4yz k 5 l -9n 3 a -9 b  $-\frac{5b}{a}$  c -1 d 7abc e 3 f 7t g 4y h -5b i  $\frac{5}{2}$  j -5a 4 a  $-15a^2$  b 40abc c  $-56x^2$  d  $48a^3$  e  $-30a^2b$  f  $-40x^2y$  g  $36a^3b^2$  h  $-a^4b^4$  i  $8xy^3$  j  $-15x^2y$  5 a 6 b 12 c  $\frac{10}{3}$  d  $4b^2$  e 6ab f -x

**PAGE 40** 1 a  $a^5$  b  $6p^5$  c  $y^{11}$  d  $m^7$  e  $32a^8$  f  $x^{15}$  g  $x^{12}$  h  $72a^9$  i  $80p^{11}$  j  $x^{20}$  k  $a^7b^7$  l  $36x^4y^5$  2 a  $a^4$  b  $4m^2$  c 4ab d  $a^8$  e  $k^3$  f  $2a^2b^5$  g  $a^{12}$  h  $4a^2$  i  $-9x^{10}y$  j  $m^7$  k  $m^2n^2$  l  $8a^2b^2$  3 a  $a^6$  b  $y^{20}$  c  $64x^4y^5$  d  $m^{10}$  e  $x^{21}$  f  $729a^3b^5$  g  $x^{24}$  h  $-64a^5$  i  $125m^{12}$  j  $a^{12}$  k  $81p^4$  l  $1000a^9b^9$  4 a 1 b 1 c 9 d 1 e 1 f 2 g 1 h 1 i 1

5 a  $x^7$  b  $p^4q$  c  $a^{14}$  d  $m^9$  e  $64p^4$  f  $x^6$  g  $30x^5$  h  $9m^9n$  i  $3x^3$  6 a  $12a^{12}$  b  $2ab^4$  c  $a^2$  d 9a e  $\frac{4a^2}{b^2}$  f  $45a^2b^2$  g  $x^3$  h  $a^6b^3$  i 4xy

**PAGE 41** 1 a  $3x+3y$  b  $10a+15b$  c  $8a+12$  d  $48a-42b$  e  $8m+24p$  f  $15a-12m$  g  $5x^2+40x$  h  $7x-35$  i  $9a^2-18ab$  j  $24x-36$  k  $12am+6mn$  l  $45x-105$  2 a  $-3x-6$  b  $-10x^2-5x$  c  $-4x+14$  d  $-16x^2+6xy$  e  $-12x+15$  f  $-xy-y^3$  g  $-64x+72$  h  $-3m^2-8m$  i  $-2x^2-2x$  j  $-16n+10mn$  k  $-6x^2-15x$  l  $-12t^2+18t$  3 a  $10x+35$  b  $21x-77$  c  $-12x+27$  d  $-8x-20$  e  $48y+24$  f  $-15a^2-15a$  g  $-2x^2-7x$  h  $-8m^2+5m$  i  $-6t^2-10t$  j  $16a^2+24ab$  k  $-24x^2+40x$  l  $12p^2-18mp$  4 a  $7x+6$  b  $11y+17$  c  $2xy-35$  d  $p-70$  e  $2y^2+12y$  f  $5x+6$  g  $12p-24$  h  $9m-16$  i  $8m^2+9m$  j  $4x-26$  k  $5t-24$  l  $3x+54$  5 a  $6m+14$  b  $2x+18$  c  $19x+62$  d  $8x+76$  e  $3y+37$  f  $17x+24$  g  $5n-32$  h.  $2x^2-3$

**PAGE 42** 1 a 28 b 336 c  $2\frac{1}{3}$  d 784 e 4032 f 209 g 23 h 37 i -11 j 71 k 1316 l 380 2 a 27 b 1 c 7 d 69 e 96 f 88 g 50 h 64 i 3 j 45 k 48 l -33 3 a 10.7 b 17.1 c 34.2 d 23.13 e 114.49 f 483.84 g 425.088 h 5.0 i 0.2 j 4.1 k 8.8 l 3.9 4 a 138 b 50 c 360 d -18 e 32 f 11 g 212 h -5 i 30

**PAGE 43** 1 a  $7(x+1)$  b  $2(5a-1)$  c  $7(y+2)$  d  $4(2x-1)$  e  $3(a+5)$  f  $4(x-3y)$  g  $3(y+1)$  h  $5(m+6)$  i  $4(8x-7)$  j  $5(a-1)$  k  $2(3a-b)$  l  $5(a+7)$  2 a  $y(y+3)$  b  $3y^2(2y-1)$  c  $3x^2(2x-1)$  d  $2m(m+3)$  e  $4a(2a-1)$  f  $m(m-9)$  g  $8a(a+3)$  h  $3y(5y-2)$  i  $8a(2a-1)$  j  $x(x+9)$  k  $3a^2(3a-2)$  l  $7x(4x-1)$  3 a  $-3(x+1)$  b  $-4(y^2-4)$  c  $-3(2n+1)$  d  $-5(x+8)$  e  $-3(x-9)$  f  $-7(t+2)$  g  $-2(m^2+2)$  h  $-5(m^2-7)$  i  $-11(x^2+2)$  j  $-6(a^2-2)$  k  $-8(a^2+4)$  l  $-13(y-3)$  4 a  $-6x(x+2)$  b  $-4x(4x+1)$  c  $-3(2x+3)$  d  $-4y(2x+1)$  e  $-9x^2(x-3)$  f  $-5x(3x+y)$  g  $-3(2mn+1)$  h  $-5xy(xy-5)$  i  $-3m(2n-5m)$  j  $-4xy(2z-1)$  k  $-3x(3x+5)$  l  $-x(1+3y)$  5 a  $8(a+2b)$  b  $5(a-5)$  c  $4(2x-y)$  d  $9(a-b)$  e  $8(1-t)$

# Answers

f  $m^2(m-4)$  g  $a(16b-a)$  h  $7(2m-1)$  i  $8ab(2-a)$  j  $5xy(3xy-1)$  k  $-6(m+6)$  l  $-4(m+3n)$  6 a  $3(a+b+c)$   
 b  $p(16q-7)$  c  $-x(x+7)$  d  $8(x+y-2z)$  e  $x(t-1)$  f  $5(3a+b-2c)$  g  $4(x-2y)$  h  $y^2(y-1)$  i  $3(6x-3y+2)$  j  $16(x-2y)$   
 k  $3n(5m-1)$  l  $3(2a^2+a+3)$  m  $m(m-2n)$  n  $q(8p-q)$  o  $-6(x+xy+2)$

**PAGE 44** 1 a  $\frac{x}{4}$  b  $x$  c  $\frac{17x}{15}$  d  $\frac{2a}{9}$  e  $\frac{2x}{7}$  f  $\frac{y}{3}$  g  $\frac{7x}{12}$  h  $\frac{25a}{63}$  i  $\frac{13a}{14}$  j  $\frac{46x}{35}$  k  $\frac{11m}{9}$  l  $\frac{29a}{35}$  2 a  $\frac{a}{3}$   
 b  $\frac{2x}{7}$  c  $\frac{10y}{11}$  d  $\frac{4m}{13}$  e  $\frac{p}{12}$  f  $\frac{x}{3}$  g  $\frac{4x}{21}$  h  $\frac{x}{24}$  i  $\frac{y}{36}$  j  $\frac{x}{20}$  k  $\frac{3a+2}{14}$  l  $\frac{14x+3}{12}$  3 a  $\frac{19x}{6}$  b  $\frac{x}{20}$  c  $\frac{3x}{4}$   
 d  $\frac{-x}{8}$  e  $\frac{4x}{3}$  f  $\frac{2x}{3}$  g  $\frac{5x}{9}$  h  $\frac{95m}{16}$  i  $\frac{37x}{50}$  j  $\frac{13x}{72}$  k  $\frac{7x}{16}$  l  $\frac{71m}{50}$  4 a  $\frac{5p}{9}$  b  $\frac{45y}{8}$  c  $\frac{17a}{30}$  d  $\frac{19x}{30}$  e  $\frac{19a}{14}$   
 f  $\frac{5m}{6}$  g  $\frac{31x}{45}$  h  $\frac{95m}{16}$

**PAGE 45** 1 a  $\frac{a^2}{12}$  b  $\frac{xy}{30}$  c  $\frac{m^2}{6}$  d  $\frac{p^2}{32}$  e  $\frac{a}{2x}$  f  $\frac{3n}{m}$  g  $12\frac{1}{2}$  h  $\frac{5}{x}$  i  $\frac{1}{2x}$  j  $\frac{2y}{3}$  k  $\frac{4}{a}$  l  $\frac{1}{5x}$  2 a  $\frac{5}{2}$  b  $\frac{2}{3}$   
 c  $\frac{15}{64}$  d  $\frac{5}{6}$  e  $\frac{5}{16}$  f  $\frac{a^2}{10}$  g  $\frac{2b}{a}$  h  $3xy$  i 2 j  $\frac{5}{14}$  k  $\frac{18}{55}$  l  $\frac{3b}{c}$  3 a  $\frac{7x^2}{20}$  b 1 c  $\frac{a^2}{b^2}$  d  $\frac{27}{20}$  e  $\frac{2}{3}$  f  $\frac{l}{n}$  g  $\frac{15}{8}$   
 h  $\frac{25}{24a}$  i 1 j  $\frac{3y}{4}$  k 2a l  $\frac{x}{y}$  4 a  $\frac{8n}{m}$  b  $\frac{4}{m^2}$  c  $\frac{c}{2}$  d  $\frac{4}{9}$  e  $\frac{2}{mp}$  f  $\frac{3y}{4}$  g  $\frac{b}{a}$  h  $\frac{c}{a^2b}$  i  $\frac{12}{xy}$

**PAGE 46** 1  $8x+4$  2  $12x$  3  $12x+10$  4  $5x^2+7x$  5  $9x^2$  6  $6x^2-10x$  7  $3x+5y$  8  $40mn$  9  $5x$  10  $2x+8$  11  $y^2 m^2$   
 12  $4x+1$  13  $7x+10$  14  $8x^3 \text{ cm}^3$  15  $3x+5y+2$

**PAGES 47 & 48** 1 A 2 D 3 A 4 D 5 B 6 D 7 A 8 C 9 D 10 D 11 B 12 D 13 B 14 C 15 C

**PAGE 49** 1  $-2y$  2  $6a^3$  3  $7(x+2y)$  4  $x=44$  5  $6x^2-15xy$  6 5 7  $6x$  8  $9a^4b^2$  9  $7x$  10  $24m^3$  11  $\frac{5a}{9}$  12  $\frac{4x+5}{4}$   
 13 3 14 8 15  $7a+8b-12$

**PAGE 50** 1 a 48 b -40 c 160 d -36 e -16 2 a  $3a$  b  $a+15$  c  $-15a-24b$  d  $\frac{4}{a}$  e  $\frac{61x}{85}$  3 a  $6x-15$  b  $x$   
 c  $8-x$  d  $-3x+6y$  e  $-4a-14b$  4 a  $x(3-x)$  b  $3pq(p+4q)$  c  $x=3$  d  $5p^3q^6$  e  $\frac{3ab}{10}$

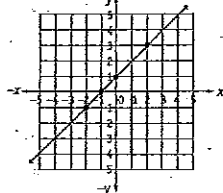
**PAGE 51** 1 a 1:2 b 1:3 c 1:3 d 1:6 e 1:7 f 1:12 g 1:9 h 1:8 i 1:9 j 1:4 k 1:5 l 1:9 2 a 5:13 b 1:3  
 c 1:3 d 2:19 e 1:13 f 2:21 g 2:9 h 1:13 i 3:14 j 2:11 k 2:15 l 4:9 3 a 1:3:5 b 3:1 c 9:16 d 3:4 e 1:5  
 f 5:1 g 1:3 h 5:7 i 6:13 j 5:6 k 12:1 l 1:5 4 a 4:21 b 4:15 c 1:6 d 2:5 e 3:4 f 1:7 g 8:25 h 2:3 i 5:2  
 j 4:5 k 10:1 l 5:4 5 a 6:25 b 1:15 c 5:18 d 3:1 e 7:18 f 8:1 g 5:7 h 7:8

**PAGE 52** 1 a 20 kg, 160 kg b \$10, \$35 c \$168, \$672 d \$300 e \$800 2 a 25 cm b 15 c  $40^\circ, 60^\circ, 80^\circ$  d 16:25  
 e 9 3 a 28 m b \$36, \$60 c 3:10 d \$1200, \$1600, \$2000

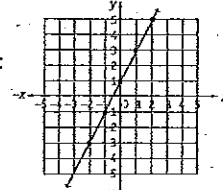
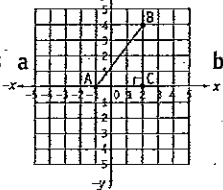
**PAGE 53** 1 a 80 km/h b \$20 c  $5\frac{1}{3}$  L/min d \$7.95 2 a 1 b 960 c 3600 d \$300 e 1800 f  $0.6^\circ$

3 a 80 km/h b 108 km c 48.6 L 4 a 2.5 km/min b 0.027 km/s c 136 5 a 168.75 km/h b 2.58 m/y c 37

**PAGE 54** 1 a 1:1500 b 1:200 c 1:30 000 d 1:5000 e 3:500 f 1:40 g 1:30 000 h 3:10 i 1:8000 2 a 1 m  
 b 4 m c 6 m d 50 cm e 70 cm f 2 km g 60 cm h 80 cm i 1.5 km 3 a 4 m b 100 m c 8 km d 75 m e 9.3 km  
 f 23.45 km g 9 m h 15.2 km i 48.25 km 4 a 6 cm b 7 cm c 13.8 cm d 0.5 cm e 50 cm f 39.65 cm  
 5 a  $4.8 \text{ m} \times 5.6 \text{ m}$  b 0.58 m

**PAGE 55** 1 a  b yes c see diagram d  $y=x+1$  2 a  $y=2x+1$  b  $(-1, -1)$

x	-1	0	1	2
y	-1	1	3	5

$(0, 1), (1, 3), (2, 5)$  c  d yes 3 a  b right-angled triangle c 3 units d 4 units

