CHAPTER 5
Ratio, rates and the number plane

EXCEL YEAR 8 MATHEMATICS
Ch. 9.1.1, p. 144

Equivalent ratios

QUESTION 1 Express the following ratios in simplest form.

a 4 : 8 = _____ **b** 5 : 15 = _____ **c** 8 : 24 = _____

d 6 : 36 = _____ **e** 5 : 35 = _____ **f** 4 : 48 = _____

g 2 : 18 = _____ **h** 3 : 24 = _____ **i** 8 : 72 = _____

j 9 : 36 = _____ **k** 12 : 60 = _____ **l** 11 : 99 = _____

QUESTION 2 Simplify the following ratios.

a 25 : 65 = _____ **b** 24 : 72 = _____ **c** 18 : 54 = _____

d 10 : 95 = _____ **e** 5 : 65 = _____ **f** 8 : 84 = _____

g 14 : 63 = _____ **h** 7 : 91 = _____ **i** 6 : 28 = _____

j 4 : 22 = _____ **k** 8 : 60 = _____ **l** 16 : 36 = _____

QUESTION 3 Express as a ratio in its simplest form.

a 5 : 15 : 25 = _____ **b** $\frac{1}{3} : \frac{1}{9}$ = _____ **c** $2\frac{1}{4} : 4$ = _____

d $1\frac{1}{2} : 2$ = _____ **e** $\frac{1}{4} : \frac{5}{4}$ = _____ **f** $3 : \frac{3}{5}$ = _____

g $\frac{1}{7} : \frac{3}{7}$ = _____ **h** 0.5 : 0.7 = _____ **i** 1.2 : 2.6 = _____

j 2.5 : 3 = _____ **k** $2 : \frac{1}{6}$ = _____ **l** 1.2 : 6 = _____

QUESTION 4 Express the following ratios in simplest form.

a \$8 : \$42 = _____ **b** 80c : \$3 = _____

c 12 h : 3 days = _____ **d** 800 g : 2 kg = _____

e 60c : 80c = _____ **f** 5 days : 5 weeks = _____

g 80 cm : 2.5 m = _____ **h** 40 sec : 1 min = _____

i 4 kg : 1600 g = _____ **j** 800 mL : 1 L = _____

k 5 km : 500 m = _____ **l** 10 cm : 80 mm = _____

QUESTION 5 Simplify the following ratios.

a 60 cm : $2\frac{1}{2}$ m = _____ **b** 600 g : 9 kg = _____

c 50 min : 3 h = _____ **d** 2 h : 40 min = _____

e $3\frac{1}{2} : 9$ = _____ **f** $1 : \frac{1}{8}$ = _____

g 2.5 : 3.5 = _____ **h** 3.5 : 4 = _____

Ratio, rates and the number plane

Using ratios

QUESTION 1

a Divide 180 kg in the ratio 1 : 8

b Divide $45 in the ratio 2 : 7

c Divide $840 in the ratio 1 : 4

d $500 is divided in the ratio 3 : 2. Find the larger part.

e $2800 is divided in the ratio 2 : 5. Find the smaller part.

QUESTION 2

a Two sides of a rectangle are in the ratio 2 : 5. If the shorter side is 10 cm, what is the length of the rectangle?

b The ratio of girls to boys is 4 : 5. If there are 12 girls, how many boys are there?

c The three angles of a triangle are in the ratio 2 : 3 : 4. Find the size of each angle.

d Find the ratio of the areas of two squares whose sides are 4 cm and 5 cm respectively.

e The ratio of children to adults is 8 : 3. If there are 24 children, how many adults are there?

QUESTION 3

a A piece of rope is cut into two lengths in the ratio 2 : 5. If the shorter length is 8 m, find the length of the original rope.

b Divide $96 between two girls in the ratio of their ages, 6 years and 10 years.

c The dimensions of a rectangle are 8 cm and 12 cm. What is the ratio of its length to its perimeter?

d Divide $4800 in the ratio 3 : 4 : 5

Ratio, rates and the number plane

Rates

QUESTION **1** Complete the following sentences.

a 480 km in 6 hours is a rate of _____ per hour.

b 64 books bought for $1280 is at a rate of _____ per book.

c If 1600 litres of water flows through a tap in 5 hours, it flows at a rate of _____ per minute.

d 5 kg of meat cost $39.75 which equals _____ per kg.

QUESTION **2** Complete the equivalent rates.

a 60 km/h = _____ km/min **b** 40 L/h = _____ L/day **c** 60 m/min = _____ m/h

d $5/min = _____ $/h **e** 30 mL/min = _____ mL/h **f** 36°/min = _____ °/sec

QUESTION **3**

a Michelle drives 240 km in 3 hours. Find her average speed.

_____

b A car travels at the speed of 30 m/s. How many kilometres does it travel in 1 hour?

_____

c A car uses petrol at a rate of 10.8 L/100 km. How many litres would be used to travel 450 km?

_____

QUESTION **4**

a Change 150 km/h to km/min

_____

b Change 100 km/h to km/s

_____

c Andrew delivered 680 bottles of milk every evening between 4 p.m. and 9 p.m. Find his hourly rate of delivery.

_____

QUESTION **5**

a A car travels 900 km and covers this distance in 5 hours 20 minutes. Calculate the average speed per hour.

_____

b A tree grows to height of 16.8 metres over a period of $6\frac{1}{2}$ years. What is the average annual growth rate in metres per year?

_____

c In a cricket match runs were scored at a rate of 4 runs per over. How many overs did it take to score 148 runs?

_____

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Scale drawing

QUESTION **1** Write each of the following scales in ratio form.

a 2 mm to 3 m _____

b 1 cm to 2 m _____

c 1 cm to 300 m _____

d 20 cm to 1 km _____

e 6 mm to 1 m _____

f 5 cm to 2 m _____

g 1 mm to 30 m _____

h 30 cm to 1 m _____

i 1 mm to 8 m _____

QUESTION **2** Using a scale of 1 : 100, what length is represented by each of the following?

a 1 cm _____

b 4 cm _____

c 6 cm _____

d 5 mm _____

e 7 mm _____

f 20 m _____

g 6 mm _____

h 8 mm _____

i 15 m _____

QUESTION **3** Using a scale of 1 : 1000, what real length is represented by each of the following?

a 4 mm _____

b 10 cm _____

c 8 m _____

d 7.5 cm _____

e 9.3 m _____

f 23.45 m _____

g 9 mm _____

h 15.2 m _____

i 48.25 m _____

QUESTION **4** The real distance between two points is given. Find the following distances between the two points in a scale drawing of scale 1 cm to 100 m?

a 600 m _____

b 700 m _____

c 1380 m _____

d 50 m _____

e 5000 m _____

f 3965 m _____

QUESTION **5**

a The plan of a house is drawn to a scale of 1 : 100. If a room measures 48 mm by 56 mm on the plan, how big is the room in real life?

_____

b A drawing has a scale of 1 : 100. convert the real distance of 58 m to a scaled distance.

_____

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** $8x^3$ 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** $7a+8b-12$

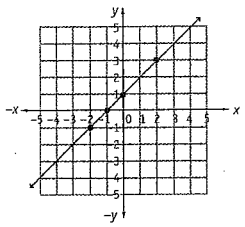
PAGE 50 **1 a** 48 **b** -40 **c** 160 **d** -36 **e** -16 **2 a** $3a$ **b** $a+15$ **c** $-15a-24b$ **d** $\frac{4}{a}$ **e** $\frac{61x}{85}$ **3 a** $6x-15$ **b** x **c** $8-x$ **d** $-3x+6y$ **e** $-4a-14b$ **4 a** $x(3-x)$ **b** $3pq(p+4q)$ **c** $x=3$ **d** $5p^3q^6$ **e** $\frac{3ab}{10}$

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

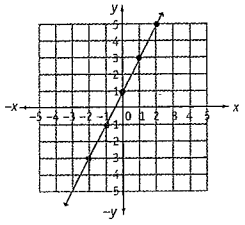
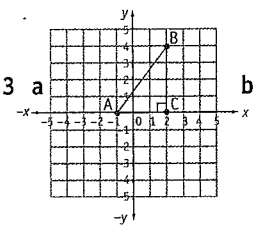
PAGE 52 **1 a** 20 kg, 160 kg **b** \$10, \$35 **c** \$168, \$672 **d** \$300 **e** \$800 **2 a** 25 cm **b** 15 **c** 40°, 60°, 80° **d** 16:25 **e** 9 **3 a** 28 m **b** \$36, \$60 **c** 3:10 **d** \$1200, \$1600, \$2000

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° **3 a** 80 km/h **b** 108 km **c** 48.6 L **4 a** 2.5 km/min **b** 0.027̇ 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 m × 5.6 m **b** 0.58 m

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

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

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

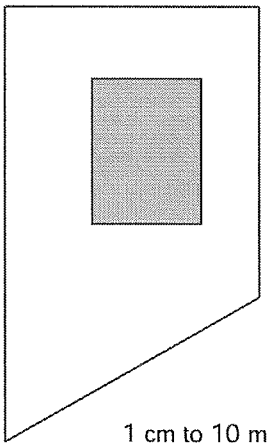
Worksheet 10-04 Scale drawings

1 This is a plan of a block of land. The shaded rectangle indicates the position of the house. Using the given scale, find:

a the perimeter of the land

b the area of the land

c the area taken up by the house



1 cm to 10 m

2 You are to draw a scale drawing of a courtroom. It is 12 m square. The bench, 3 m × 0.25 m, is centred on one wall and is 0.75 m from the wall. The bar table, 4 m × 0.5 m, is 4 m from the bench and directly in front of it. The public gallery is 2 m behind the bar table and has a rail right across the room dividing it from the court. The dock, 2 m × 0.5 m, is attached to the wall on the judge's left, 4 m from the gallery rail. The witness box, 1.25 m × 1.25 m, is attached to the end of the bench on the judge's right. Label each part of your drawing.

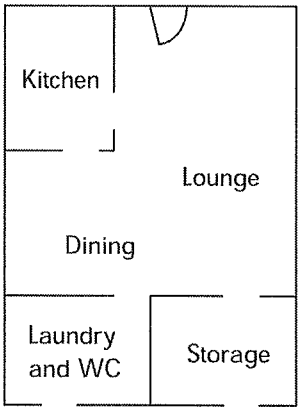
3 This is a plan for the ground floor of a townhouse. Using the given scale, find:

a the dimensions of the kitchen

b the area of the storage room

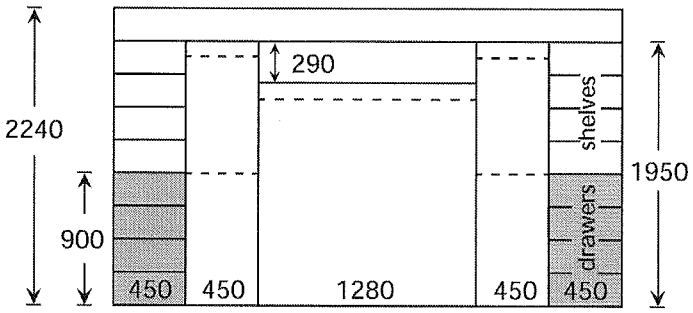
c the length of the lounge

d the lounge/dining area is to be carpeted. How many square metres would be needed?



1 : 200

4 This is a design for a built-in wardrobe. Draw an exact scale drawing of this design using a scale of 1 : 20. All measurements are in millimetres.

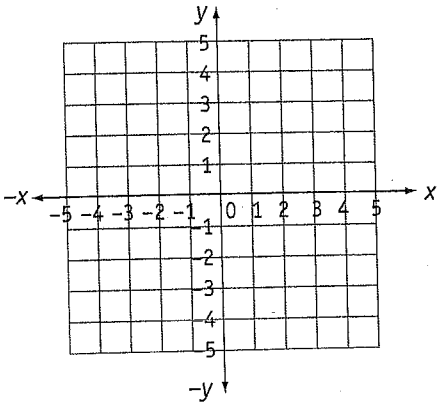


Rails for hanging clothes (- - - -). Top rails are 150 mm below the shelves above. Design is symmetrical.

Ratio, rates and the number plane

Graphing ordered pairs and number patterns

QUESTION 1



a Draw the following ordered pairs on the number plane:
A(−2, −1) B(−1, 0) C(0, 1) D(2, 3) E(3, 4)

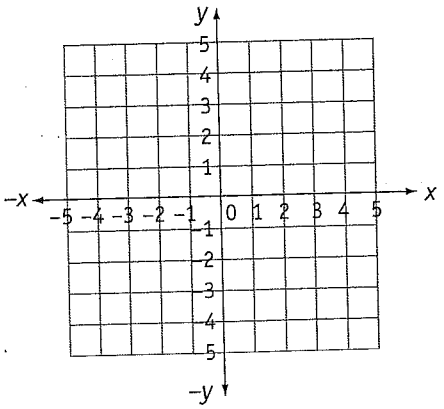
b Are the points are collinear?

_____

c Join the collinear points on the number plane.

d What is the rule? _____

QUESTION 2



a Complete the table for the rule $y = 2x + 1$

x	y
−1	
0	
1	
2	

b Write the set of ordered pairs formed.

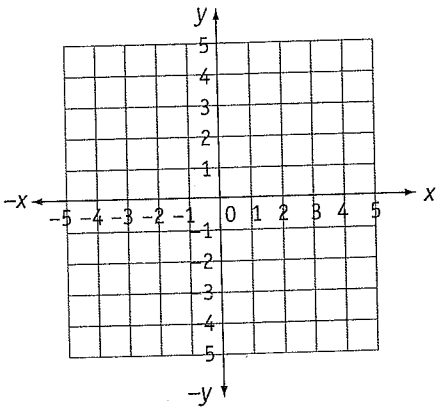
_____

c Plot the set of ordered pairs on the number plane.

d Are the points collinear?

_____

QUESTION 3



a Plot the set of ordered pairs:
A(−1, 0) B(2, 4) C(2, 0)

b What type of triangle is ΔABC? _____

c What is the length of side AC? _____

d What is the length of side BC? _____

e Use Pythagors' theorem to calculate the length of side AB.

_____

f What is the perimeter of ΔABC? _____

g What is the area of ΔABC? _____

QUESTION 4 Complete each table and write the set of ordered pairs formed alongside.

a $y = x + 5$

x	y	(x, y)
0		
1		
2		
3		

b $y = 2x + 3$

x	y	(x, y)
−1		
0		
1		
2		

c $y = 3x - 2$

x	y	(x, y)
−1		
0		
1		
2		

Ratio, rates and the number plane

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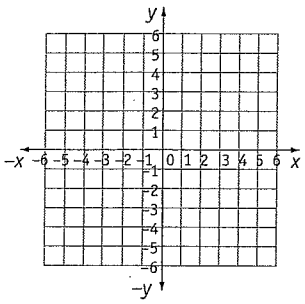
Ch. 4.3, 4.5, p. 51, 54

Graphing lines on the number plane

QUESTION 1 Complete the tables of values and then graph the equation on the number plane.

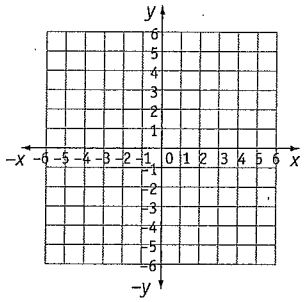
a $y = x + 2$

x	-1	0	1	2
y				



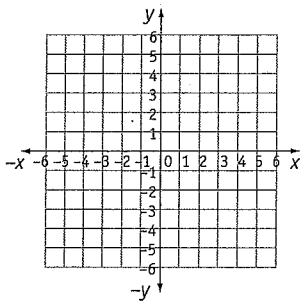
b $y = 2x - 1$

x	-1	0	1	2
y				



c $y = -2x + 1$

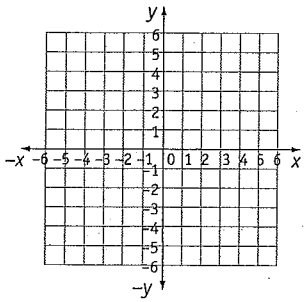
x	-1	0	1	2
y				



QUESTION 2 Complete the tables of values and then graph the equation on the number plane.

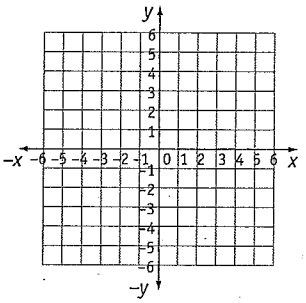
a $x = -1$

x				
y	-1	0	1	2



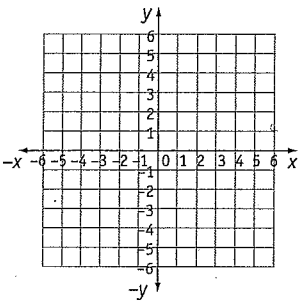
b $y = 2$

x	-1	0	1	2
y				



c $x = -4$

x				
y	-1	0	1	2



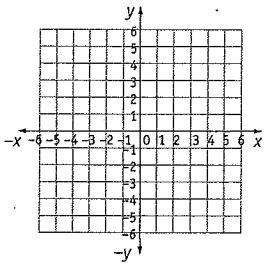
QUESTION 3 On the same number plane, graph the following equations by first completing the tables of values. Find their point of intersection.

a $y = 2x$

x	-1	0	1	2
y				

$y = -2x$

x	-1	0	1	2
y				

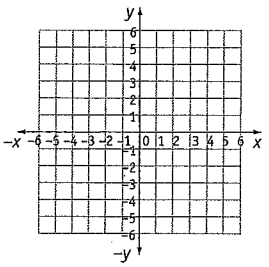


b $y = 2x + 2$

x	-1	0	1	2
y				

$y = x + 2$

x	-1	0	1	2
y				



Ratio, rates and the number plane

Graphing points of intersection

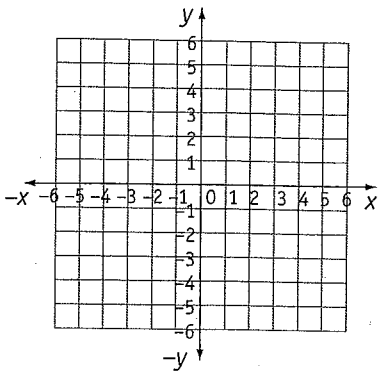
QUESTION **1** Graph each pair of lines on the same number plane and find their point of intersection.

a $x = 3$

x				
y				

$y = 1$

x				
y				

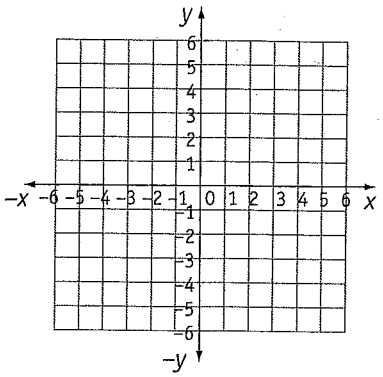


b $x = 2$

x				
y				

$y = -1$

x				
y				



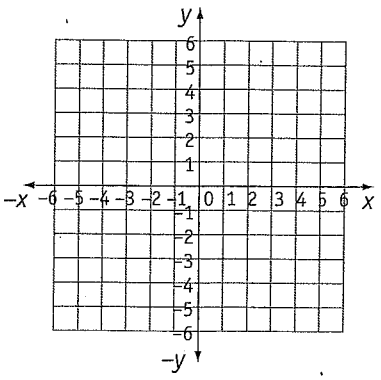
QUESTION **2** Graph each pair of lines on the same number plane and find their point of intersection.

a $y = 3x + 1$

x	−2	−1	0	1
y				

$y = 2x - 1$

x	−2	−1	0	1
y				

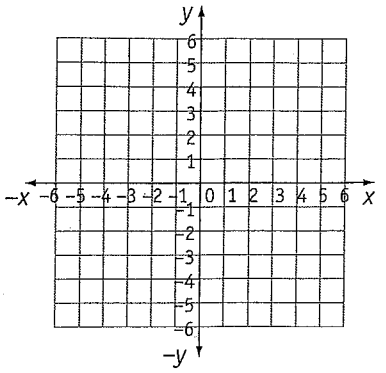


b $y = 2x + 1$

x	−1	0	1	2
y				

$y = -x - 2$

x	−1	0	1	2
y				



Ratio, rates and the number plane

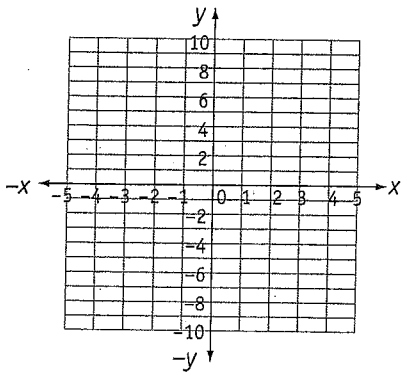
EXCEL YEAR 8 MATHEMATICS
Ch. 4.7, p. 57

Graphing curves

QUESTION **1** Complete the following table of values and then graph the equation on the number plane.

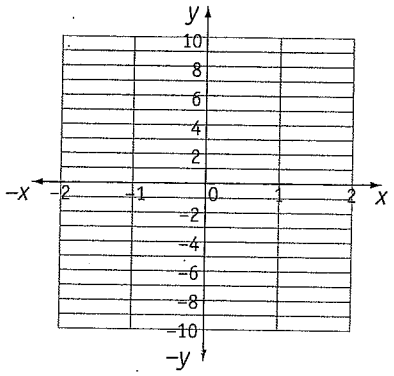
a $y = x^2 + 1$

x	−3	−2	−1	0	1	2	3
y							



b $y = x^3$

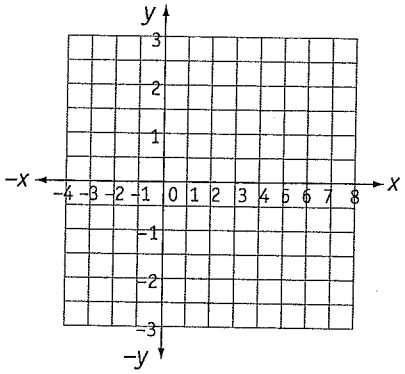
x	−2	−1.5	−1	−0.5	0	0.5	1	1.5	2
y									



QUESTION **2** Complete the following table of values and then graph the equation on the number plane.

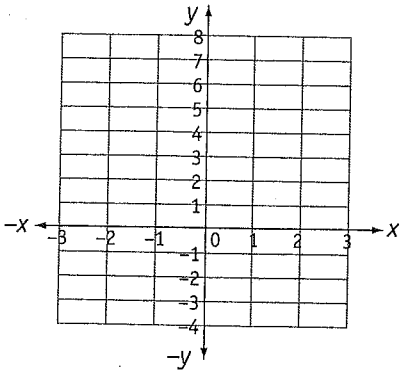
a $x = y^2 - 1$

x							
y	−3	−2	−1	0	1	2	3



b $y = x^2 - 1$

x	−3	−2	−1	0	1	2	3
y							



Ratio, rates and the number plane

EXCEL YEAR 8 MATHEMATICS
Ch. 9.1.3, 9.2,
p. 149, 153

Problem solving

1 In a class of 35 students there are 15 boys. What is the ratio of:

a boys to girls?

b girls to the total number of students?

2 Tom buys a camera for $80 and sells it for $100. What is the ratio of:

a cost price to selling price?

b selling price to cost price?

3 John drives 560 km in 7 hours. Find his average speed.

4 Divide $560 in the ratio 3 : 4

5 Two angles of a triangle are 30° and 70°. What is the ratio of:

a the third angle to the sum of the angles of the triangle?

b the smallest angle to the largest angle?

6 A car travels 840 km in 7 hours. What is the speed of the car per hour?

7 If a 40 kg bag of potatoes costs $12 calculate the price of 1 kg of potatoes.

8 The areas of two squares are 9 m^2 and 16 m^2. What is the ratio of the smaller side to the larger side?

9 The ratio of tax to income is 1 : 8. If tax is $500, what is the income?

10 The complementary angles x and y are in the ratio 1 : 2. What is the size of each angle?

11 A silo is being filled with wheat at the rate of 1.5 t/min. Express this rate in kg/s.

Ratio, rates and the number plane

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

1 When a tank is $\frac{2}{5}$ full there is 12 000 L in it. The total capacity of the tank is

Ⓐ 4800 L Ⓑ 6800 L Ⓒ 18 000 L Ⓓ 30 000 L [1]

2 If \$30 is divided in the ratio 3 : 2, the smaller amount is

Ⓐ \$10 Ⓑ \$12 Ⓒ \$18 Ⓓ \$20 [1]

3 The ratio of 9 grams to 4 kilograms is

Ⓐ 9 : 4 Ⓑ 3 : 2 Ⓒ 9 : 400 Ⓓ 9 : 4000 [1]

4 A car travels 24 km between 9:30 a.m. and 10:15 a.m. What is its average speed in km/h?

Ⓐ 18 km/h Ⓑ 30 km/h Ⓒ 32 km/h Ⓓ 36 km/h [1]

5 Ore is removed from a mine at the rate of 270 tonnes per hour. Express this in kg/s.

Ⓐ 7.5 kg/s Ⓑ 75 kg/s Ⓒ 450 kg/s Ⓓ 4500 kg/s [1]

6 If $5 : 3 = x : 1$ then x equals

Ⓐ $\frac{3}{5}$ Ⓑ $\frac{5}{3}$ Ⓒ 2 Ⓓ 3 [1]

7 An amount is divided in the ratio 2 : 3. If the smaller part is \$30, the original amount was

Ⓐ \$45 Ⓑ \$50 Ⓒ \$75 Ⓓ \$78 [1]

8 If you divide \$65 in the ratio 6 : 7, what is the smaller part?

Ⓐ \$13 Ⓑ \$26 Ⓒ \$30 Ⓓ \$35 [1]

9 In travelling 100 km a car uses 20 L of petrol. At this rate, how many litres of petrol are needed to travel 1 km?

Ⓐ 0.02 L Ⓑ 0.2 L Ⓒ 0.5 L Ⓓ 5 L [1]

10 Given that $5 : 4 = m : 1$ then m equals

Ⓐ $\frac{4}{5}$ Ⓑ $\frac{5}{4}$ Ⓒ $1\frac{1}{5}$ Ⓓ none of these [1]

Marks

11 A recipe requires m grams of flour for n people. How many grams are needed for one person?

Ⓐ $m - n$ Ⓑ $n - m$ Ⓒ $\frac{n}{m}$ Ⓓ $\frac{m}{n}$ [1]

12 \$12 000 is divided in the ratio 2 : 3. The larger amount is

Ⓐ \$8400 Ⓑ \$7000 Ⓒ \$7200 Ⓓ \$4800 [1]

13 When \$220 is divided in the ratio 5 : 6, the smaller amount is

Ⓐ \$140 Ⓑ \$120 Ⓒ \$90 Ⓓ \$100 [1]

14 The ratio of 3.5 kg to 56 kg is

Ⓐ 8 : 1 Ⓑ 1 : 16 Ⓒ 16 : 1 Ⓓ 28 : 3 [1]

15 $y = 3x + 2$; find y when $x = 4$

Ⓐ 12 Ⓑ 14 Ⓒ 10 Ⓓ 20 [1]

Total marks achieved for PART A [/15]

Ratio, rates and the number plane

TOPIC TEST — PART B

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

Time allowed: 15 minutes — **Total marks = 15**

Questions	Answers only	Marks
Express the following as ratios in simplest form.		
1 \$12 : \$15	_____	1
2 20 minutes : 2 hours	_____	1
3 100 kg : 350 kg	_____	1
4 \$125 is divided in the ratio 12 : 13. What is the larger part?	_____	1
5 A car is travelling at 45 km/h. How many metres does it travel in 4 seconds?	_____	1
6 Express 0.08 : 0.32 in its simplest form.	_____	1
7 Write $3\frac{3}{5} : 2\frac{1}{10}$ in its simplest form.	_____	1
8 Change 120 km/h to m/s	_____	1
9 How much time will it take to travel 1200 km at 90 km/h?	_____	1
10 Divide 640 m in the ratio 2 : 3	_____	1
11 3 books are bought for \$23.40. How much would 7 books cost?	_____	1
12 Express $3p^2 : 6pq$ in its simplest form.	_____	1
13 If $x : 3 = 8 : 5$, what does x equal?	_____	1
14 A 30 litre container full of water is leaking at a rate of 100 mL per hour. How much will be left in the container after 3 days?	_____	1
15 The three angles of a triangle are in the ratio 2 : 3 : 4. Find the size of the smallest angle.	_____	1

Total marks achieved for PART B ____/15

Ratio, rates and the number plane

TOPIC TEST

PART C

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

Time allowed: 20 minutes **Total marks = 20**

Marks

1 **a** Simplify the ratio 80 g : 2 kg _____

b There are 70 girls at a party. If the ratio of boys to girls is 7 : 5, how many boys are at the party? _____

c $75 is divided in the ratio 3 : 2. Find the smaller part. _____

d A car travels at an average speed of 75 km/h, how long will it take to cover 350 km?

_____

e If John earns $86.50 for 25 hours, how much will he earn for 40 hours?

_____

5

2 **a** If $\frac{2}{5} = \frac{x}{25}$ find x _____

b Simplify the ratio 12 : 156 _____

c Two lengths of timber are in the ratio 4 : 7. If the longer length is 154 cm, find the shorter length. _____

d If a car travels 60 km in 3 hours, find the average speed. _____

e Change 10 m/s into km/min _____

5

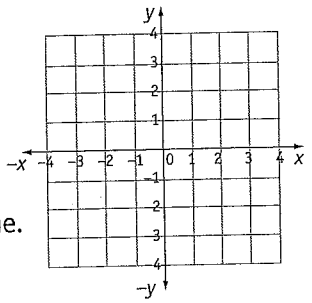
3 Complete the tables below.

a $x + y = 2$

x	−1	0	1	2
y				

b $2x - y = 1$

x	−1	0	1	2
y				



c Draw the graph of each line from parts **a** and **b** on the number plane.

d Find the point of intersection. _____

5

4 Plot and label the following coordinates on the number plane.

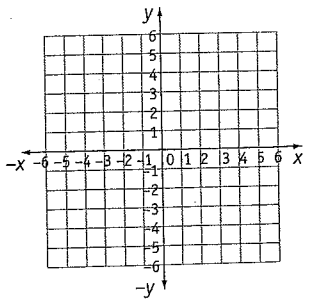
a A(−1, 2) B(2, 2) C(5, −3) D(−3, −3)

b Join the points together A → B → C → D → A

c Name the shape. _____

d What is the ratio of the lengths of the parallel sides?

_____



5

Total marks achieved for PART C ____/20

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** $\frac{19x}{24}$ **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 m² **12** $4x+1$ **13** $7x+10$ **14** $8x^3$ cm³ **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** $\frac{31x}{35}$ **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** $\frac{3ab}{10}$

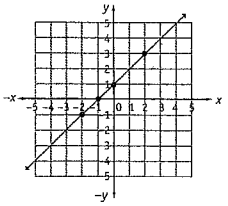
PAGE 51 **1 a** 1:2 **b** 1:3 **c** 1:3 **d** 1:6 **e** 1:7 **f** 1:12 **g** 1:9 **h** 1:8 **i** 1:9 **j** 1:4 **k** 1:5 **l** 1:9 **2 a** 5:13 **b** 1:3 **c** 1:3 **d** 2:19 **e** 1:13 **f** 2:21 **g** 2:9 **h** 1:13 **i** 3:14 **j** 2:11 **k** 2:15 **l** 4:9 **3 a** 1:3:5 **b** 3:1 **c** 9:16 **d** 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°, 60°, 80° **d** 16:25 **e** 9 **3 a** 28 m **b** \$36, \$60 **c** 3:10 **d** \$1200, \$1600, \$2000

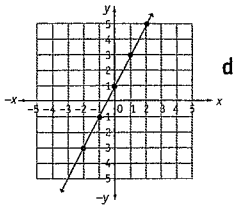
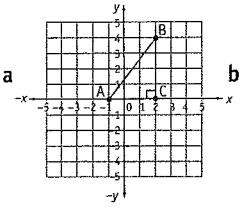
PAGE 53 **1 a** 80 km/h **b** \$20 **c** $5\frac{1}{3}$ L / min **d** \$7.95 **2 a** 1 **b** 960 **c** 3600 **d** \$300 **e** 1800 **f** 0.6°

3 a 80 km/h **b** 108 km **c** 48.6 L **4 a** 2.5 km/min **b** $0.02\dot{7}$ 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 m × 5.6 m **b** 0.58 m

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

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

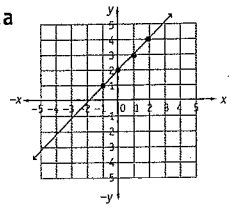
b $(-1, -1)$, $(0, 1)$, $(1, 3)$, $(2, 5)$ **c**  **d** yes **3 a**  **b** right-angled triangle **c** 3 units **d** 4 units

Answers

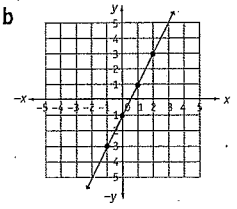
e 5 units **f** 12 units **g** 6 units^2 **4 a** (0, 5), (1, 6), (2, 7), (3, 8) **b** (−1, 1), (0, 3), (1, 5), (2, 7) **c** (−1, −5), (0, −2), (1, 1), (2, 4)

PAGE 56 **1 a** (−1, 1), (0, 2), (1, 3), (2, 4) **b** (−1, −3), (0, −1), (1, 1), (2, 3) **c** (−1, 3), (0, 1), (1, −1), (2, −3) **2 a** (−1, −1), (−1, 0), (−1, 1), (−1, 2) **b** (−1, 2), (0, 2), (1, 2), (2, 2) **c** (−4, −1), (−4, 0), (−4, 1), (−4, 2) **3 a** (−1, −2), (0, 0), (1, 2), (2, 4); (−1, 2), (0, 0), (1, −2), (2, −4); the point of intersection is (0, 0) **b** (−1, 0), (0, 2), (1, 4), (2, 6); (−1, 1), (0, 2), (1, 3), (2, 4); the point of intersection is (0, 2)

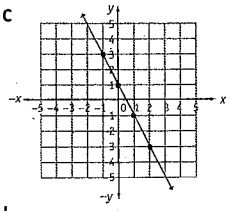
1a



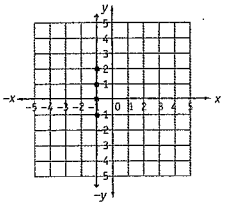
1b



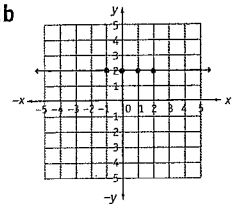
1c



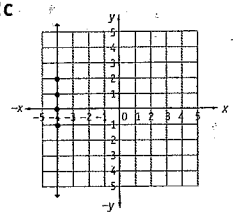
2a



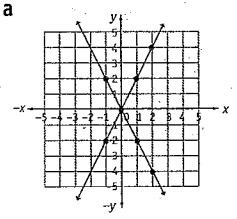
2b



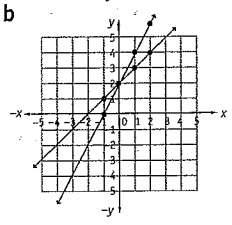
2c



3a

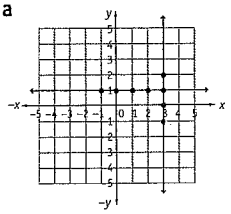


3b

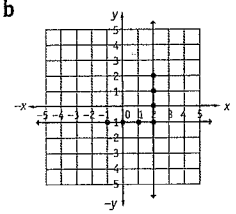


PAGE 57 **1 a** (3, −1), (3, 0), (3, 1), (3, 2); (−1, 1), (0, 1), (2, 1), (3, 1); the point of intersection is (3, 1) **b** (2, −1), (2, 0), (2, 1), (2, 2); (−1, −1), (0, −1), (1, −1), (2, −1); the point of intersection is (2, −1) **2 a** (−2, −5), (−1, −2), (0, 1), (1, 4); (−2, −5), (−1, −3), (0, −1), (1, 1); the point of intersection is (−2, −5) **b** (−1, −1), (0, 1), (1, 3), (2, 5); (−1, −1), (0, −2), (1, −3), (2, −4); the point of intersection is (−1, −1)

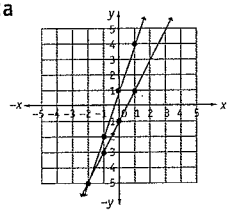
1a



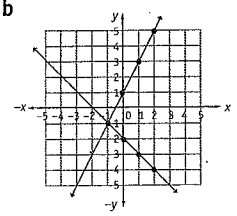
1b



2a

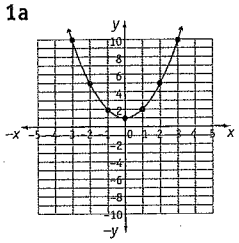


2b

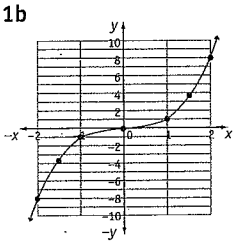


PAGE 58 **1 a** (−3, 10), (−2, 5), (−1, 2), (0, 1), (1, 2), (2, 5), (3, 10) **b** (−2, −8), (−1.5, −3.375), (−1, −1), (−0.5, −0.125), (0, 0), (0.5, 0.125), (1, 1), (1.5, 3.375), (2, 8) **2 a** (8, −3), (3, −2), (0, −1), (−1, 0), (0, 1), (3, 2), (8, 3) **b** (−3, 8), (−2, 3), (−1, 0), (0, −1), (1, 0), (2, 3), (3, 8)

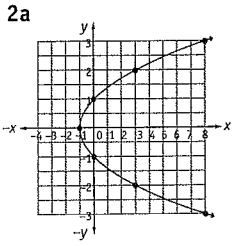
1a



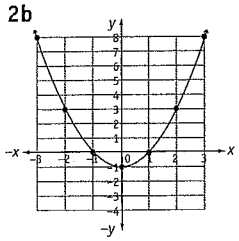
1b



2a



2b



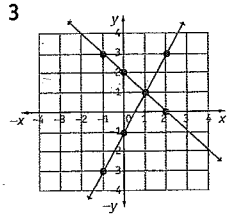
PAGE 59 **1 a** 3: 4 **b** 4:7 **2 a** 4:5 **b** 5:4 **3** 80 km/h **4** $240, $320 **5 a** 4:9 **b** 3:8 **6** 120 km/h **7** 30 cents **8** 3:4 **9** $4000 **10** 30°, 60° **11** 25 kg/s

PAGES 60 & 61 **1** D **2** B **3** D **4** C **5** B **6** B **7** C **8** C **9** B **10** B **11** D **12** C **13** D **14** B **15** B

PAGE 62 **1** 4:5 **2** 1:6 **3** 2:7 **4** $65 **5** 50 m **6** 1:4 **7** 12:7 **8** $33\frac{1}{3}$ m/s **9** 13 h 20 min **10** 256 m, 384 m **11** $54.60 **12** p:$2q$ **13** 4.8 **14** 22.8 L **15** 40°

PAGE 63 **1 a** 1:25 **b** 98 **c** $30 **d** 4 h 40 min **e** $138.40 **2 a** 10 **b** 1:13 **c** 88 cm **d** 20 km/h **e** 0.6 km/min **3 a** (−1, 3), (0, 2), (1, 1), (2, 0) **b** (−1, −3), (0, −1), (1, 1), (2, 3) **c** see diagram **d** point of intersection is (1, 1) **4 a** see diagram **b** see diagram **c** trapezium **d** 3:8

3



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