Name: File

Teacher: _____

SYDNEY TECHNICAL HIGH SCHOOL

MATHEMATICS

YEAR 8 YEARLY EXAM

2011

Time Allowed: 70 minutes

Instructions:

- Calculators may be used
- Show **all** working and answers in spaces provided

Question		Marks
1	Revision and Number Plane	/15
2	Area and Volume	/15
3	Equations and Inequalities	/15
4	Rates and Ratio	/15
5	Statistics and Graphs	/15
	TOTAL	/75

Question 1 Revision and Number Plane /15

a) Simplify $\frac{4a^2}{8}$

1

b) A traveller changing money receives 80 cents American for each $1 Australian. How many Australian dollars must be changed to receive $1000 American?

1

c) Five less than the square of x is

A. $(x - 5)^2$ B. $(5 - x)^2$ C. $x^2 - 5$ D. $5 - x^2$

1

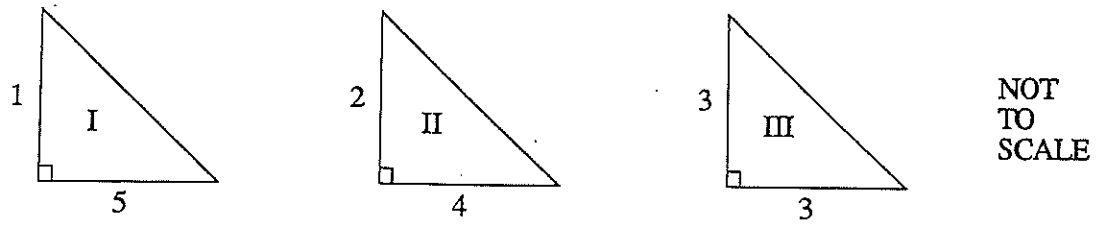
d) A recipe for lemonade requires $2\frac{1}{2}$ cups of sweetened water for the juice of one lemon.

One lemon gives about a $\frac{1}{4}$ of a cup of juice.

What is the greatest number of cups of lemonade that can be made using this recipe and 12 lemons ?

1

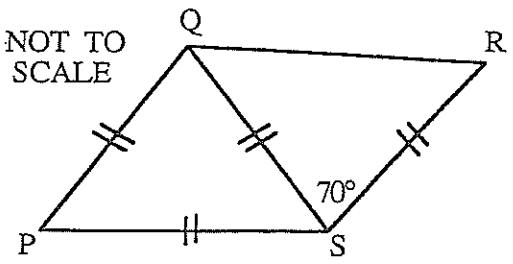
e)



Which figure has the largest *perimeter*?

1

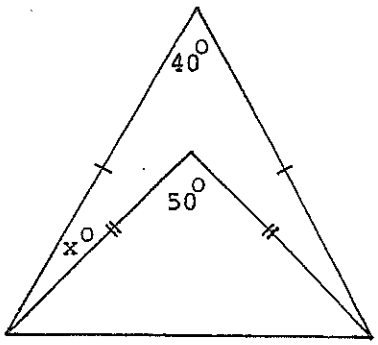
f)



∴ Angle PQR = _____

1

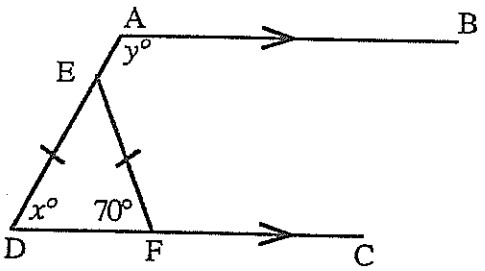
g)



$\therefore$ x = _____

1

h)



AB || DC

DE = FE

angle DFE = 70°

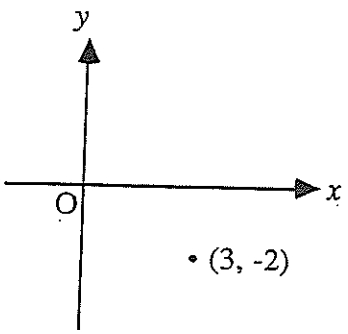
Kim was asked to find y, giving reasons. Here is Kim's answer, without the reasons.

Fill in the missing reasons.

i) $x = 70$ (.....)

ii) Therefore $y = 110$ (.....) 2mks

i)



The equation of the line through $(3, -2)$ parallel to the x axis is _____

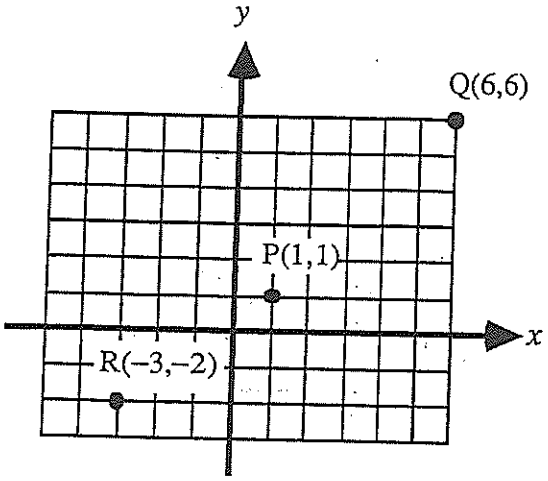
1

j)

If $(2, k)$ lies on the line $x + 2y = 8$, then the value of k is _____

1

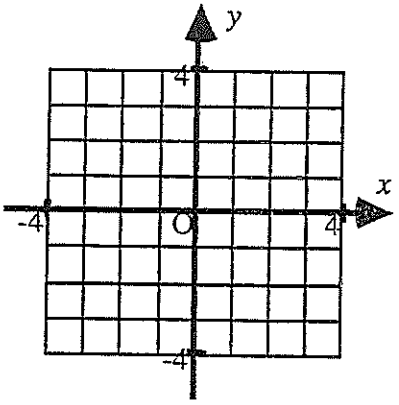
k)



Which point is 5 units from the point P (1, 1)?

l)

Draw the graph of $y = 2x - 2$ on the number plane provided.



m)

If x and y are both negative, which of these expressions is <u>always</u> negative?

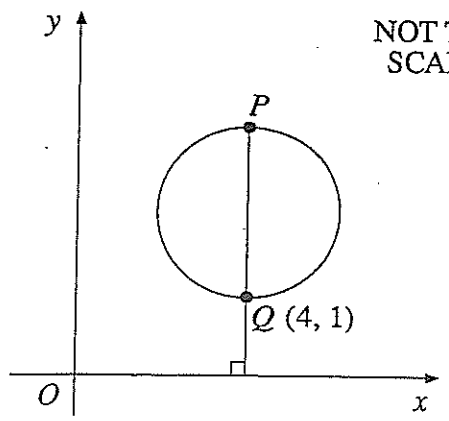
A. $x + y$

B. $x - y$

C. xy

D. $\frac{x}{y}$

n)



NOT TO SCALE

This circle has radius 2 units. PQ passes through the centre of the circle and is perpendicular to the x axis.

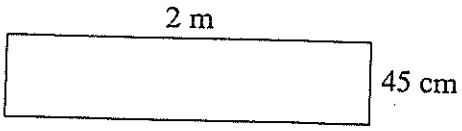
Q is the point (4, 1).

Find the co-ordinates of P

_____

Question 2 Area and Volume /15

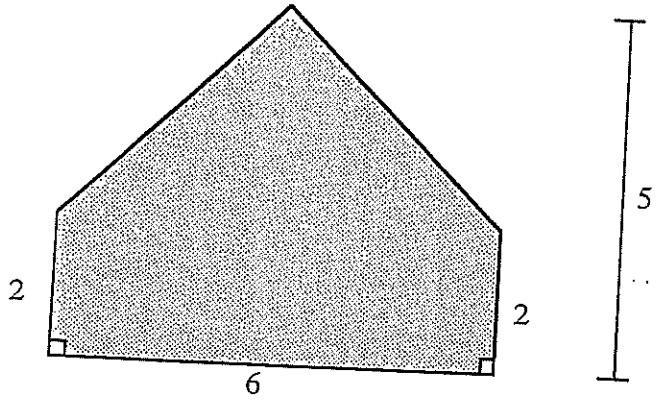
a)



The area of this rectangle is

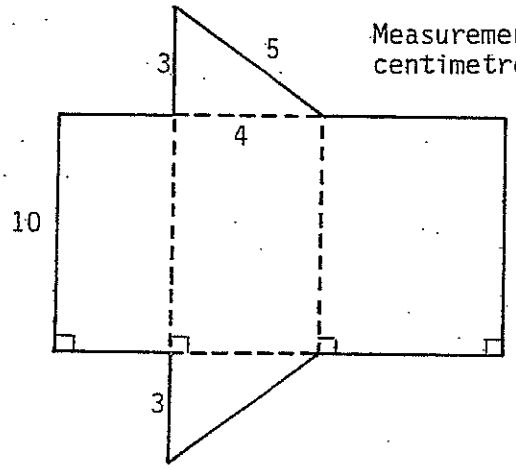
(A) 0·9 cm^2 (B) 0·9 m^2 (C) 90 cm^2 (D) 90 m^2

b)



The dimensions of this figure are in metres. What is its area?

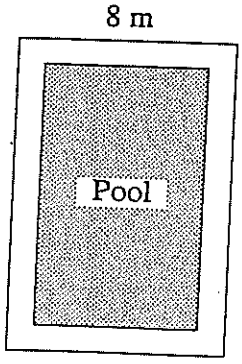
c)



Measurements are in centimetres.

A carton is made from this net.
What will be the volume of the carton ?

d)



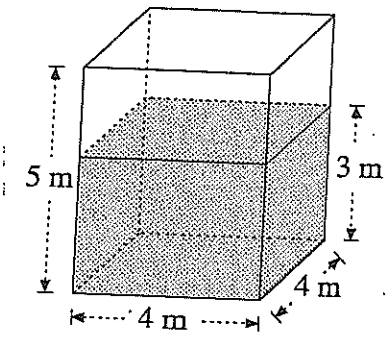
NOT TO SCALE

A rectangular swimming-pool has a tiled path around it.

The path is 1 m wide.

The perimeter of the pool in metres is _____ .

e)



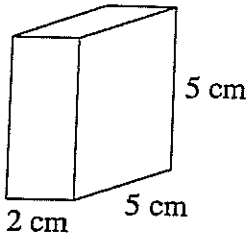
This large tank contains oil.

How much *more* oil is needed to fill the tank?

(answer in m^3)

2mks

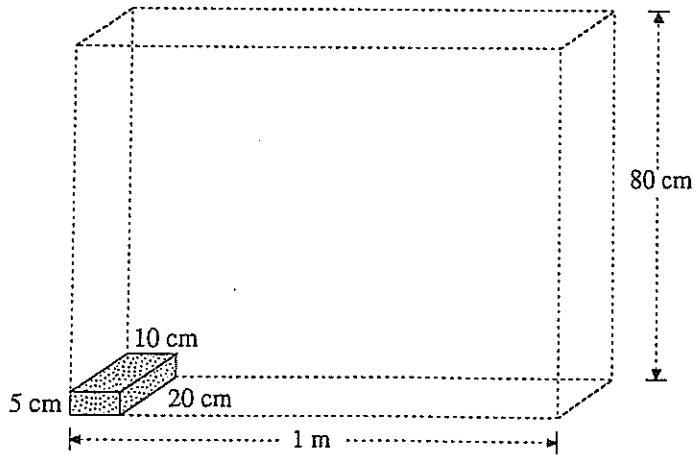
f)



What is the total surface area of this rectangular prism?

2mks

g)

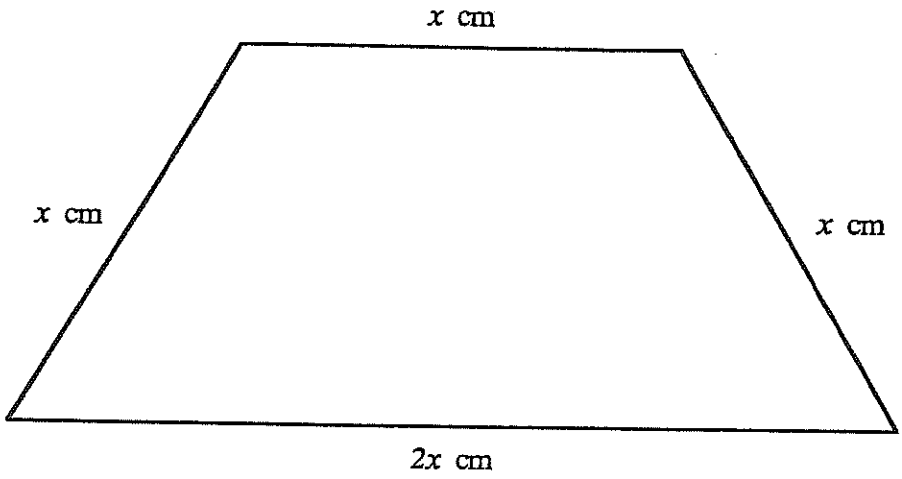


Marco is making a stack of bricks 1 m long and 80 cm high, as shown.

How many bricks will be in the stack?

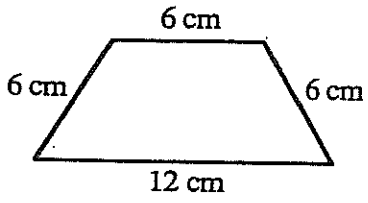
1

h)



The area of this trapezium is given by the formula $A = 1{\cdot}3x^2$.
Use this formula in (a) and (b) below.

i)



Find, in square centimetres, the area of this trapezium.

.....

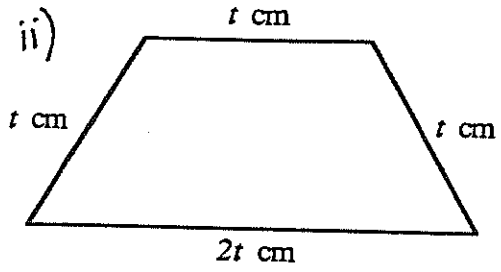
.....

.....

.....

.....

ii)



The area of this trapezium is 213 cm^2.

Find the value of t, correct to one decimal place.

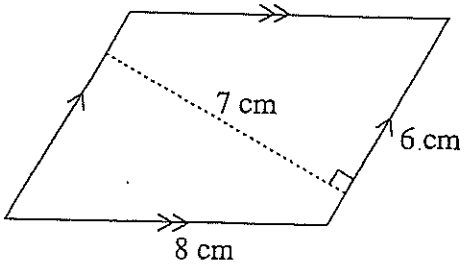
.....

.....

.....

(2mks)

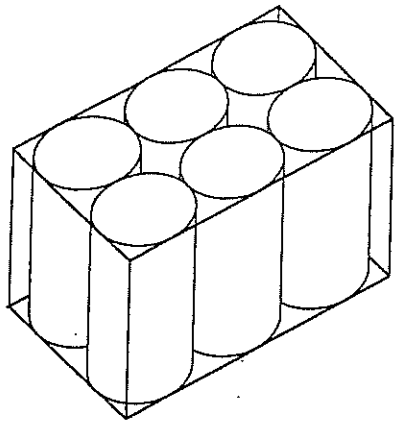
i)



The area of the parallelogram is _____

1

j)



This box just holds six cans. Each can is 15 cm high and has a radius of 5 cm. What are the dimensions of the box?

(A) 15 cm × 15 cm × 10 cm

(B) 15 cm × 15 cm × 20 cm

(C) 15 cm × 30 cm × 10 cm

(D) 15 cm × 30 cm × 20 cm

1

k)

How many litres of water fell on one hectare of land during a rainfall of 5 millimetres?

(Remember $1cm^3 = 1$ mL)

2mks

Question 3 Equations and Inequalities /15

a) If $2x + 6 = 14$, what is the value of $6x + 2$?

b) The statement *"3 less than 5 times a number n is the same as 2 more than the number n"* may be represented by

A. $5n - 3 = 2n$
B. $3 - 5n = 2n$
C. $5n - 3 = n + 2$
D. $3 - 5n = n + 2$

c) To solve the equation $3(x - 1) = 15$, Joe wrote the following:

$$\begin{aligned} 3(x-1) &= 15 \quad (1) \\ x-1 &= 5 \quad (2) \\ x &= 4 \quad (3) \end{aligned}$$

Which of the following statements is true?

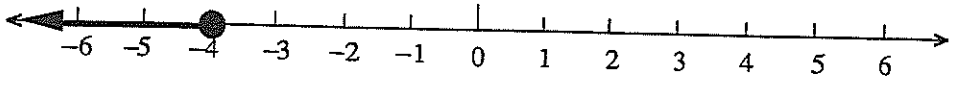
(A) There are no mistakes in the solution.

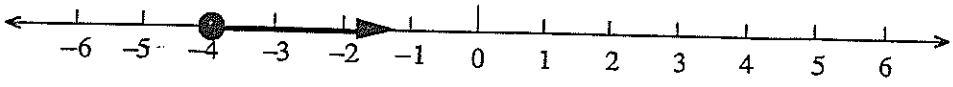
(B) There is a mistake in line (2) only.

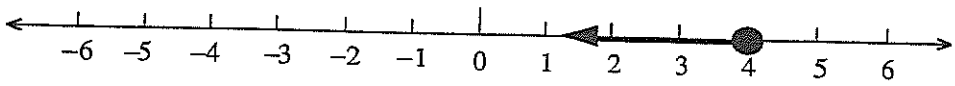
(C) There is a mistake in line (3) only.

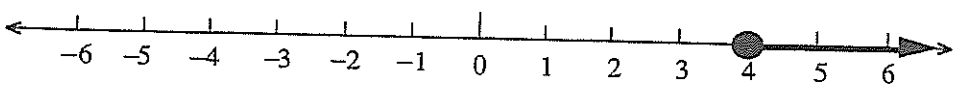
(D) There are two mistakes in the solution.

d) The solution to $5 - x \leq 9$ is represented on the number line as:

(A)


(B)


(C)


(D)


e)

When both sides of the inequality

$$-2x - 4 < \frac{1}{2}$$

are multiplied by -2, the result is

(A) $4x - 8 < -1$

(B) $4x + 8 < -1$

(C) $4x - 8 > -1$

(D) $4x + 8 > -1$

1

f)

A salesman in a bicycle shop is paid $200 per week plus $10 for each bicycle he sells.

i) How much is the salesman paid for a week in which he sells 12 bicycles ?

ii) His boss calculates his weekly wage ($w) using the formula

$$w = 200 + 10n$$

Explain what n stands for.

iii) Last week the salesman's wage was $450. How many bicycles did he sell ?

iv) The boss agrees to increase the salesman's pay to $220 per week plus $15 for each bicycle he sells. Write a formula for his new weekly wage ($W).

4mks

g) Solve $3(x+1)-2(1-3x)=4$

2mks

h) Solve and sketch the solution on a number line

$3x+5<5x-2$

2mks

i) Bob tries to guess the number of beans in a bottle but guesses 75 too many. Susan guesses 63 too few. The average of their guesses is 350. Let the number of beans in the bottle be x, write an equation to show this information and solve it to find the number of beans in the bottle.

2mks

Question 4 Rates and Ratio /15

(i) Express in the simplest form the ratio of

(a) \$12 to \$15

(b) 20 minutes to 2 hours.

(2mks)

(ii) A child grows 20 cm in 4 years.
Find the child's average growth rate in centimetres per year.

1

(iii) Robin can lay 80 bricks an hour.

(a) How many bricks can Robin lay in 4 hours ?

(b) How many hours will it take Robin to build a wall containing 4000 bricks ?

(3mks)

(c) Kim can lay bricks at a rate of 90 bricks per hour. In 4 hours, how many more bricks can Kim lay than Robin ?

(iv) Pink marshmallows and white marshmallows are put into packets in the ratio 3:5.

(a) A packet contains 40 marshmallows.
How many pink marshmallows are there in the packet ?

(b) A smaller packet contains 9 pink marshmallows.
How many white ones are there in this packet ?

(2 mks)

(v) The annual birthrate in a country is 25 per 1000 head of population.
Use this rate to answer the following:

(a) Calculate the number of births in a year for a city with a population of 200 000.

(b) A town has 100 births in a year.
Calculate its population at the start of that year. (2mks)

vi) To make film developing solution, Katie mixes chemicals and water together in the ratio 1 : 9. Katie wants 1.2 litres of developing solution.

How much water will she need?

(2mks)

vii) Express 50 km/h as a speed in m/s.

1

viii) A hotel charges $1 a day more for weekends than for week days. If a man stayed from Wednesday to the following Sunday inclusive and the bill was $82, what is the average daily rate per person on weekdays?

(2mks)

Question 5 Statistics and Graphs /15

a)

The table shows the distance a car travels before stopping, after the brakes are applied.

Speed (km/h)	40	50	60	70	80	90	100	110
Stopping Distance (m)	20·6	29·6	38·1	48·5	60·2	73·1	87·2	102·4

Jess is driving her car at a speed of 50 km/h. Ben is driving his car twice as fast.

Jess and Ben apply their brakes at the same time. How much further than Jess will Ben travel before his car stops?

1

b)

Score	*Frequency*
5	3
6	1
7	2
8	7

For this set of scores, which of the following statements is correct?

(A) There are 4 scores and their mean is 6·5.

(B) There are 4 scores and their mean is 7.

(C) There are 13 scores and their mean is 6·5.

(D) There are 13 scores and their mean is 7.

1

c)

Year 3 and Year 4 students were tested on their knowledge of multiplication tables. The results are shown in this back-to-back stem-and-leaf display.

Test Scores
(5/1 represents 51)

Year 3 Results: *Leaf*	*Stem*	Year 4 Results: *Leaf*
9 8 3 0	3	5
8 8 7 4 2 2 2	4	
8 7 7 4 0	5	1 4 6 6 9
7 6 3	6	0 2 2 5 8
1	7	3 6 8 8 9 9 9
	8	0 0

i) Find the MODE (Year 3) _____

MEDIAN (Year 3) _____

RANGE (Year 3) _____

ii) The score of 35 lies well below the other scores for Year 4. What is the name given to this score ? _____

(4mks)

d)

Score	*Frequency*
11	2
12	4
13	6
14	1
15	1

A score of 15 is added to this sample.

Which of these measures will change?

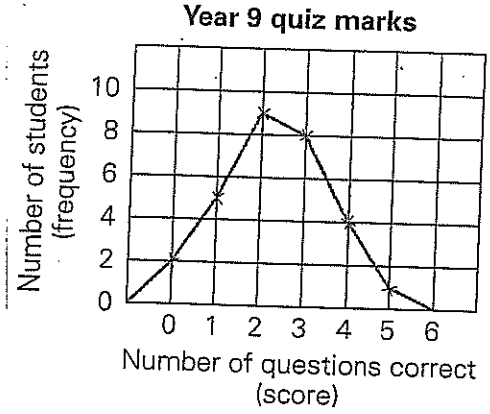
(A) Mean (B) Median

(C) Mode (D) Range

1

e)

This frequency polygon shows the marks achieved by Year 9 students in a quiz with six questions:



i) How many students got more than half of the questions correct?

_____

ii) How many students did the quiz?

_____

iii) How many students got no questions correct?

_____

3

f)

A lifesaver records the number of rescues in one week. The following results were obtained :

7, 9, 9, 10, 13, 14, 15

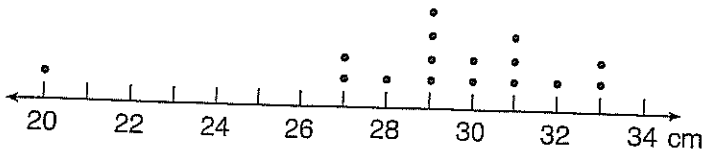
Which of the following measures is biggest?

(A) mean (B) median (C) mode (D) range

1

9)

The lengths of 16 fish caught were measured. The results are shown on this dot plot.



What is the:

i) median? ii) range?

Median = _____

Range = _____

2

h)

A shop assistant in a book store wrote down the number of books bought by each of the people entering the shop during one hour. The results are shown below.

NUMBER OF BOOKS BOUGHT	NUMBER OF PEOPLE
0	10
1	11
2	6
3	1
4	1
5	1

i) How many books were bought during this hour? _____

ii) What fraction of the people entering the shop bought more than 2 books? _____ (2mks)

Name: Solutions.

Teacher: _____

SYDNEY TECHNICAL HIGH SCHOOL

MATHEMATICS

YEAR 8 YEARLY EXAM

2011

Time Allowed: 70 minutes

Instructions:

- Calculators may be used
- Show **all** working and answers in spaces provided

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2	Area and Volume	/15
3	Equations and Inequalities	/15
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5	Statistics and Graphs	/15
	TOTAL	/75

Question 1 Revision and Number Plane /15.

a) Simplify $\frac{4a^2}{8}$ $\frac{a^2}{2}$ 1

b) A traveller changing money receives 80 cents American for each $1 Australian. How many Australian dollars must be changed to receive $1000 American?

$1250 Aust 1

c) Five less than the square of x is

A. $(x - 5)^2$ B. $(5 - x)^2$ C. $x^2 - 5$ D. $5 - x^2$

C 1

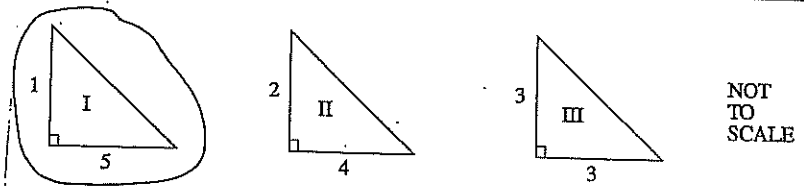
d) A recipe for lemonade requires $2\frac{1}{2}$ cups of sweetened water for the juice of one lemon.

One lemon gives about a $\frac{1}{4}$ of a cup of juice.

What is the greatest number of cups of lemonade that can be made using this recipe and 12 lemons ?

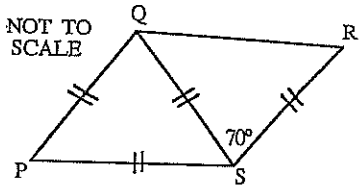
33 cups 1

e)



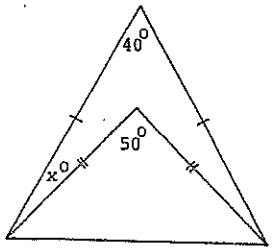
Which figure has the largest *perimeter*? I 1

f)



∴ Angle PQR = 115° 1

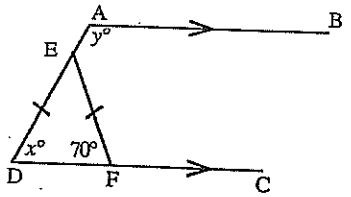
g)



$\therefore x =$ 5°

1

h)



AB || DC

DE = FE

angle DFE = 70°

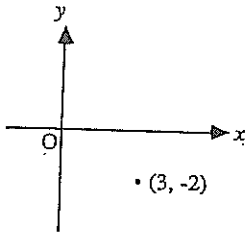
Kim was asked to find y, giving reasons. Here is Kim's answer, without the reasons.

Fill in the missing reasons.

i) x = 70 (angles opposite equal sides in isosceles triangle)

ii) Therefore y = 110 (co-interior angles AB||DC) 2mks

i)



The equation of the line through $(3, -2)$ parallel to the x axis is $y = -2$

(not just -2)

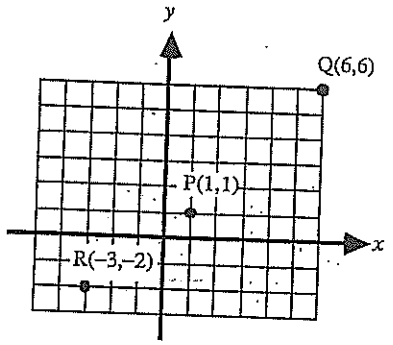
1

j)

If $(2, k)$ lies on the line $x + 2y = 8$, then the value of k is $k = 3$

1

k)



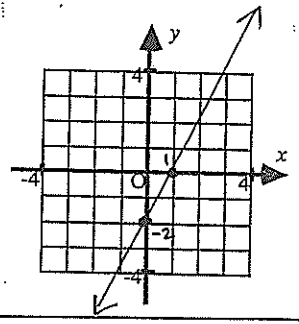
Which point is 5 units from the point P (1, 1)?

R

1

l)

Draw the graph of $y = 2x - 2$ on the number plane provided.



1

m)

If x and y are both negative, which of these expressions is always negative?

A. $x + y$

B. $x - y$

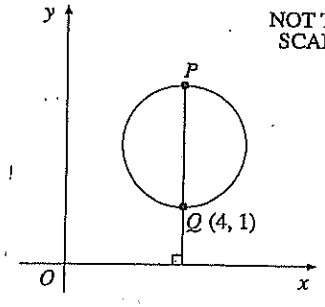
C. xy

D. $\frac{x}{y}$

A

1

n)



NOT TO SCALE

This circle has radius 2 units. PQ passes through the centre of the circle and is perpendicular to the x axis.

Q is the point (4, 1).

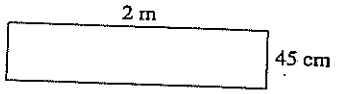
Find the co-ordinates of P

P(4, 5)

1

Question 2 Area and Volume /15

a)



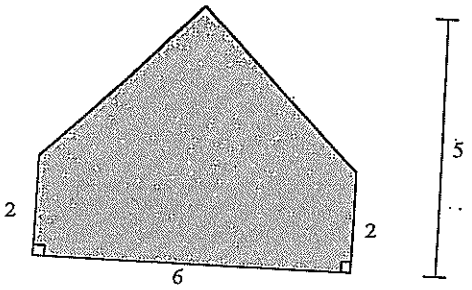
The area of this rectangle is

(A) 0·9 cm^2 (B) 0·9 m^2 (C) 90 cm^2 (D) 90 m^2

B

1

b)

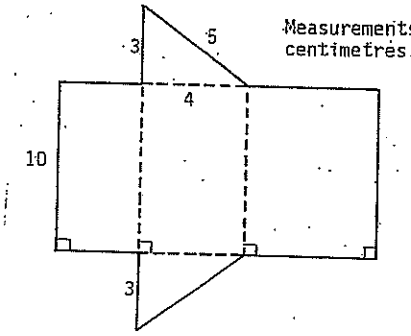


The dimensions of this figure are in metres. What is its area?

$A = 21 m^2$

1

c)



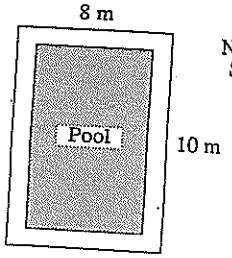
Measurements are in centimetres.

$V = 60 cm^3$

A carton is made from this net.
What will be the volume of the carton ?

1

d)



NOT TO SCALE

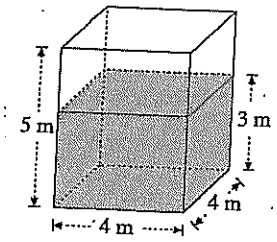
A rectangular swimming-pool has a tiled path around it.

The path is 1 m wide.

The perimeter of the pool in metres is 28m

1

e)



This large tank contains oil.

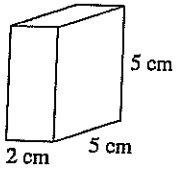
How much *more* oil is needed to fill the tank?
(answer in m^3)

$V = (4 \times 4 \times 5) - (4 \times 4 \times 3)$

$= 32 m^3$

2mks

f)



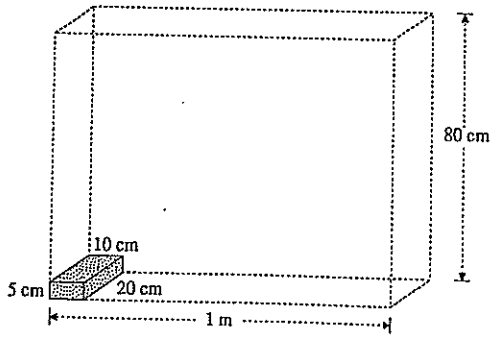
What is the total surface area of this rectangular prism?

$SA = 2(10 + 25 + 10)$

$= 90 cm^2$

2mks

g)

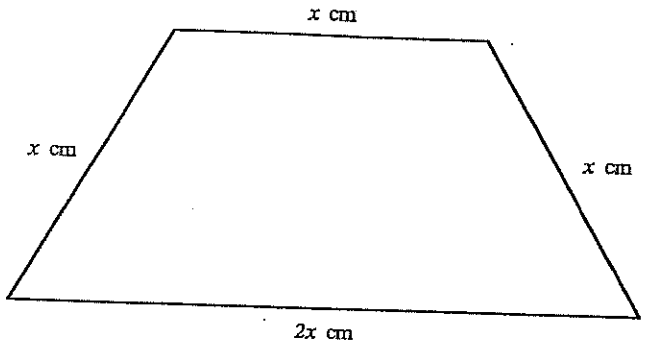


Marco is making a stack of bricks 1 m long and 80 cm high, as shown.

How many bricks will be in the stack? $10 \times 16 = 160$

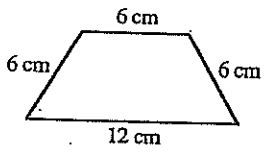
1

h)



The area of this trapezium is given by the formula $A = 1{\cdot}3x^2$.
Use this formula in (a) and (b) below.

i)

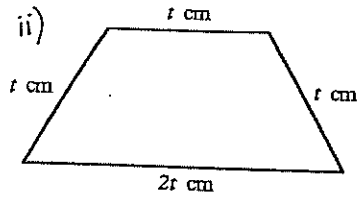


Find, in square centimetres, the area of this trapezium.

$A = 1{\cdot}3 \times 6^2$

$= 46{\cdot}8\ cm^2$

ii)



The area of this trapezium is 213 cm^2.

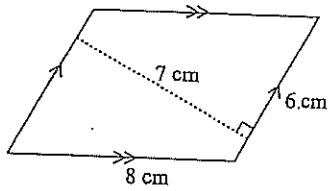
Find the value of t, correct to one decimal place.

$213 = 1{\cdot}3\,t^2$

$t = 12{\cdot}8$ cm

(2mks)

i)

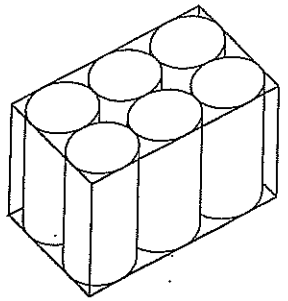


The area of the parallelogram is _____

$42\ cm^2$

1

j)



This box just holds six cans. Each can is 15 cm high and has a radius of 5 cm. What are the dimensions of the box?

(A) 15 cm × 15 cm × 10 cm

(B) 15 cm × 15 cm × 20 cm

(C) 15 cm × 30 cm × 10 cm

(D) 15 cm × 30 cm × 20 cm

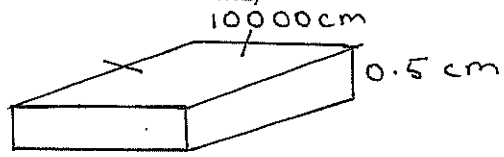
D

1

k)

How many litres of water fell on one hectare of land during a rainfall of 5 millimetres?

(Remember $1cm^3 = 1$ mL)



$V = (10{,}000)^2 \times 0{\cdot}5$

$V = 50{,}000{,}000\ cm^3$

$= 50{,}000$ L

2mks

a) If $2x + 6 = 14$, what is the value of $6x + 2$?

26 1

b) The statement *"3 less than 5 times a number n is the same as 2 more than the number n"* may be represented by

A. $5n - 3 = 2n$
B. $3 - 5n = 2n$
C. $5n - 3 = n + 2$
D. $3 - 5n = n + 2$

C 1

c) To solve the equation $3(x - 1) = 15$, Joe wrote the following:

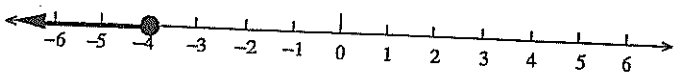
$3(x-1) = 15$ ①
$x - 1 = 5$ ②
$x = 4$ ③

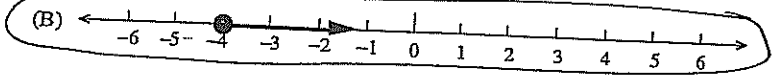
Which of the following statements is true?

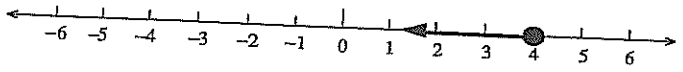
(A) There are no mistakes in the solution.
(B) There is a mistake in line ② only.
(C) There is a mistake in line ③ only.
(D) There are two mistakes in the solution.

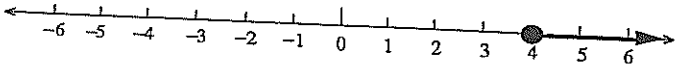
C 1

d) The solution to $5 - x \leq 9$ is represented on the number line as:

(A)


(B)


(C)


(D)


B 1

e) When both sides of the inequality

$$-2x - 4 < \tfrac{1}{2}$$

are multiplied by -2, the result is

(A) $4x - 8 < -1$
(B) $4x + 8 < -1$
(C) $4x - 8 > -1$
(D) $4x + 8 > -1$

D 1

f) A salesman in a bicycle shop is paid $200 per week plus $10 for each bicycle he sells.

i) How much is the salesman paid for a week in which he sells 12 bicycles ?

$ 320

ii) His boss calculates his weekly wage ($w) using the formula

$$w = 200 + 10n$$

Explain what n stands for.

n is number of bicycles

iii) Last week the salesman's wage was $450. How many bicycles did he sell ?

n = 25

iv) The boss agrees to increase the salesman's pay to $220 per week plus $15 for each bicycle he sells. Write a formula for his new weekly wage ($W).

W = 220 + 15n

4mks

g) Solve $3(x+1)-2(1-3x)=4$

$3x+3-2+6x=4$

$9x+1=4$

$9x=3$

$x=\frac{1}{3}$

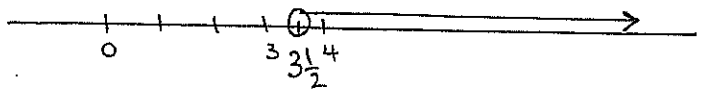
2mks

h) Solve and sketch the solution on a number line

$3x+5<5x-2$

$-2x<-7$

$x>\frac{7}{2}$



2mks

i) Bob tries to guess the number of beans in a bottle but guesses 75 too many. Susan guesses 63 too few. The average of their guesses is 350. Let the number of beans in the bottle be x, write an equation to show this information and solve it to find the number of beans in the bottle.

Bob $(x+75)$

Susan $(x-63)$

$\frac{(x+75)+(x-63)}{2}=350$

$2x+12=700$

$2x=688$

$x=344$ beans in bottle

2mks

Question 4 Rates and Ratio /15

(i) Express in the simplest form the ratio of

(a) \$12 to \$15 — 4:5

(b) 20 minutes to 2 hours. — 1:6

(2mks)

(ii) A child grows 20 cm in 4 years.
Find the child's average growth rate in centimetres per year.

5cm/yr 1

(iii) Robin can lay 80 bricks an hour.

(a) How many bricks can Robin lay in 4 hours ?

320

(b) How many hours will it take Robin to build a wall containing 4000 bricks ?

50hours (3mks)

(c) Kim can lay bricks at a rate of 90 bricks per hour. In 4 hours, how many more bricks can Kim lay than Robin ?

Kim 360

Rob 320 ∴ 40 bricks more

(iv) Pink marshmallows and white marshmallows are put into packets in the ratio 3:5.

P W

(a) A packet contains 40 marshmallows.
How many pink marshmallows are there in the packet ?

$\frac{3}{8}\times 40 = 15$ pink

(b) A smaller packet contains 9 pink marshmallows.
How many white ones are there in this packet ?

P W

3 : 5 = 9 : W

$\frac{3}{5}=\frac{9}{W}$ $3W=45$

$W=15$

(2 mks

(v) The annual birthrate in a country is 25 per 1000 head of population.
Use this rate to answer the following:

(a) Calculate the number of births in a year for a city with a population of 200 000.

5,000 births

(b) A town has 100 births in a year.
Calculate its population at the start of that year.

25 births ⇒ 1000 head pop.

∴ 100 births ⇒ 4000 head pop.

(2mks)

vi) To make film developing solution, Katie mixes chemicals and water together in the ratio 1 : 9. Katie wants 1.2 litres of developing solution.
C W
How much water will she need?

$\frac{9}{10} \times 1.2\,L = 1.08\,L$

(2mks)

vii) Express 50 km/h as a speed in m/s.

$13.\dot{8}$ m/s

1

viii) A hotel charges $1 a day more for weekends than for week days. If a man stayed from Wednesday to the following Sunday inclusive and the bill was $82, what is the average daily rate per person on weekdays?

W T F S S

$3x + 2(x+1) = 82$

$5x + 2 = 82$

$5x = 80$

$x = \$16$

(2mks)

Question 5 Statistics and Graphs /15

a) The table shows the distance a car travels before stopping, after the brakes are applied.

Speed (km/h)	40	50	60	70	80	90	100	110
Stopping Distance (m)	20·6	29·6	38·1	48·5	60·2	73·1	87·2	102·4

Jess is driving her car at a speed of 50 km/h. Ben is driving his car twice as fast.

Jess and Ben apply their brakes at the same time. How much further than Jess will Ben travel before his car stops? 57.6 m

1

b)

Score	*Frequency*
5	3
6	1
7	2
8	7

For this set of scores, which of the following statements is correct?

(A) There are 4 scores and their mean is 6·5.

(B) There are 4 scores and their mean is 7.

(C) There are 13 scores and their mean is 6·5.

(D) There are 13 scores and their mean is 7.

D

1

c) Year 3 and Year 4 students were tested on their knowledge of multiplication tables. The results are shown in this back-to-back stem-and-leaf display.

Test Scores
(5/1 represents 51)

Year 3 Results		Year 4 Results
9 8 3 0	3	
8 8 7 4 2 2 2	4	
8 7 7 4 0	5	1 4 6 6 9
7 6 3	6	0 2 2 5 8
1	7	3 6 8 8 9 9 9
	8	0 0

i) Find the MODE (Year 3) 42

MEDIAN (Year 3) 48

RANGE (Year 3) 41

ii) The score of 35 lies well below the other scores for Year 4. What is the name given to this score ? outlier

(4mks)

d)

Score	*Frequency*
11	2
12	4
13	6
14	1
15	1

A score of 15 is added to this sample.

Which of these measures will change?

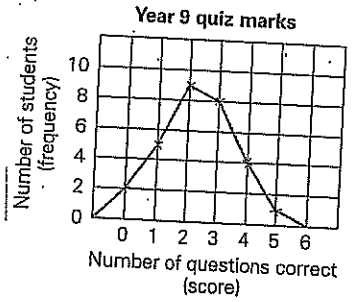
(A) Mean (B) Median A

(C) Mode (D) Range

1

e)

This frequency polygon shows the marks achieved by Year 9 students in a quiz with six questions:



i) How many students got more than half of the questions correct?

5

ii) How many students did the quiz?

29

iii) How many students got no questions correct?

2

3

f)

A lifesaver records the number of rescues in one week. The following results were obtained :

7, 9, 9, 10, 13, 14, 15

Which of the following measures is biggest?

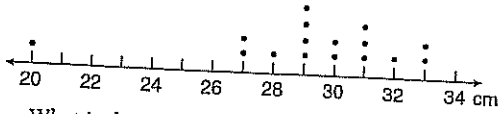
A

(A) mean (B) median (C) mode (D) range

1

g)

The lengths of 16 fish caught were measured. The results are shown on this dot plot.



What is the:

i) median? ii) range?

Median = $\frac{29+30}{2}$

= 29.5

Range = 14

2

h)

A shop assistant in a book store wrote down the number of books bought by each of the people entering the shop during one hour. The results are shown below.

NUMBER OF BOOKS BOUGHT x	NUMBER OF PEOPLE f	fx
0	10	0
1	11	11
2	6	12
3	1 ✓	3
4	1 ✓	4
5	1 ✓	5
	Σ30	

i) How many books were bought during this hour? 35

ii) What fraction of the people entering the shop bought more than 2 books? $\frac{3}{10} = \frac{1}{10}$ (2mks)