NAME MASTER

SYDNEY GRAMMAR SCHOOL

2017 Annual Examination

FORM III

MATHEMATICS

Thursday 2nd November 2017

General Instructions

- Writing time — 2 hours
- Write using black pen.
- Board-approved calculators and templates may be used.

Total — 104 Marks

- All questions may be attempted.
- All necessary working should be shown.
- Start each question on a new page.

Collection

- Write your name, class and Master on each page of your answers.
- Staple your answers in a single bundle.
- Write your name, class and Master on this question paper and hand it in with your answers.

3A: RPL	3B: SDP	3C: FMW	3D: RR
3E: REJ	3F: LYL	3G: WJM	3H: CMDB
3I: NJL	3J: BDD		

Checklist

- Writing paper required.
- Candidature — 188 boys

Examiner

CMDB

QUESTION ONE (13 marks) Start a new page.

(a) Simplify $2x + 5x$.

(b) Simplify $\sqrt{45}$.

(c) Solve $2a + 3 = 11$.

(d) Express p^{-4} with a positive index.

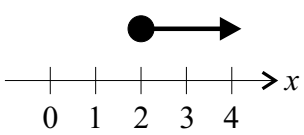
(e) Write $4{\cdot}07 \times 10^3$ as a basic numeral.

(f) State the gradient of the line $y = 3x + 2$.

(g) Factorise fully $15xy - 10x$.

(h) Evaluate $\cos 47°$, correct to three decimal places.

(i)



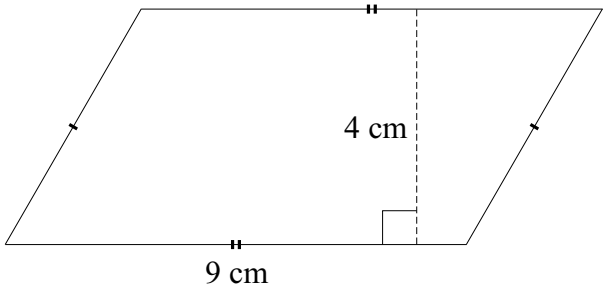
What inequality is represented by the number line shown above?

(j) Expand and simplify:

(i) $(x + 3)(x - 3)$

(ii) $(x - 5)(x + 2)$

(k)



Find the area of the parallelogram shown above.

(l) Solve $(x - 4)(x + 3) = 0$.

Examination continues next page ...

QUESTION TWO (13 marks) Start a new page.

(a) Find the simple interest earned on an investment of \$2400 at 6% p.a. over 3 years.

(b) The frequency table below shows the number of televisions per household for a group of people.

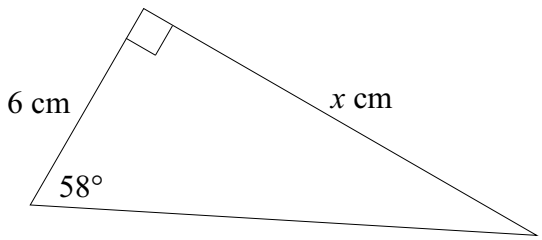
Televisions	frequency
0	2
1	7
2	14
3	11
4 +	6

(i) How many people were surveyed?

(ii) What is the mode?

(c) Make p the subject of $m = \dfrac{p-n}{q}$.

(d)



Find the value of x in the above diagram, correct to one decimal place.

(e)

stem	leaf
6	1 4 5
7	0 2 2 6 8
8	5 7
9	3

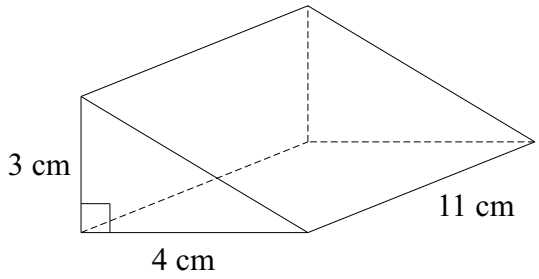
6 | 1 represents 61.

Find the median of the data in the stem-and-leaf plot shown above.

(f) Express $\dfrac{4}{\sqrt{7}}$ with a rational denominator.

Examination continues overleaf ...

(g)



Find the volume of the triangular prism shown above.

(h) Expand and simplify $\left(2\sqrt{3}-5\right)^2$.

(i) Write the equation of the horizontal line that passes through $(5, 6)$.

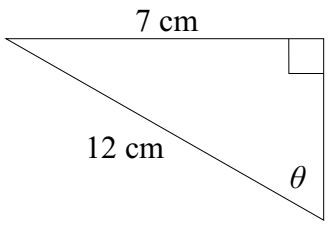
(j) Convert 3600 square centimetres to square metres.

Examination continues next page ...

QUESTION THREE (13 marks) Start a new page.

(a) Simplify $\left(2p^5\right)^4 \times 4p^7$.

(b)



Find the value of θ, correct to the nearest degree.

(c) Simplify $\dfrac{4x+2}{2}$.

(d) Given the line $y = 3x - 4$:

(i) Find the x- and y-intercepts.

(ii) Hence, or otherwise, sketch the graph of the line, clearly labelling the x- and y-intercepts.

(e) Solve the following equations simultaneously:

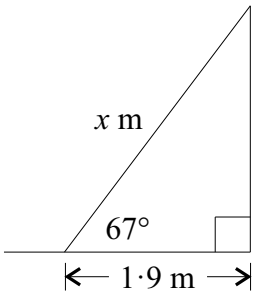
$$y = 20 - x$$
$$y = 2x - 1$$

(f) A parallelogram is a quadrilateral with both pairs of opposite sides parallel. Write down three more properties of this shape.

Examination continues overleaf ...

QUESTION FOUR (13 marks) Start a new page.

(a)



A ladder is leaning against a wall. The ladder makes an angle of 67° with the ground, and the foot of the ladder is 1·9 m away from the wall. Find the length of the ladder, giving your answer correct to one decimal place.

(b) In Krakozhia, GST is charged at 12·5%. A television costs \$1260 including GST. How much did the television cost before GST was added?

(c) Solve the following:

(i) $x^2 - 3x - 28 = 0$

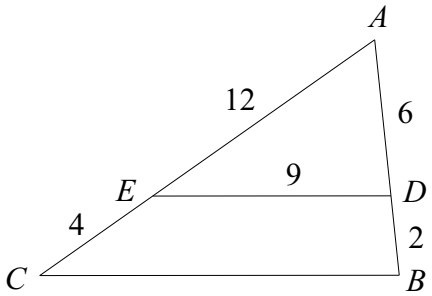
(ii) $2x^2 - x - 15 = 0$

(d) The endpoints of an interval are $A(-2, 3)$ and $B(8, -1)$. Find:

(i) the exact length of interval AB.

(ii) the midpoint of AB.

(e)



In the diagram shown above, $AE = 12$, $EC = 4$, $AD = 6$, $DB = 2$ and $ED = 9$. All measurements are in centimetres.

(i) Prove that $\triangle ABC$ and $\triangle ADE$ are similar.

(ii) Hence, find CB, giving a geometric reason.

(f) Given the lines $y = mx + 4$ and $2y - 3x + 10 = 0$ are parallel, find the value of m.

Examination continues next page ...

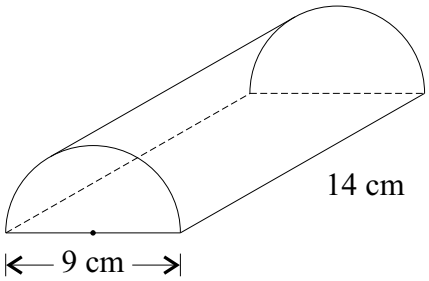
QUESTION FIVE (13 marks) Start a new page.

(a) Solve $x^2 + 8x + 1 = 0$ by completing the square, giving your answer:

(i) in exact form.

(ii) to two decimal places.

(b)



Find the surface area of the solid half cylinder shown above. Give your answer correct to one decimal place.

(c) A straight line passes through $(1, 3)$ and $(4, 15)$.

(i) Find the gradient of the line.

(ii) Find the equation of the line.

(d) Daisy leaves home and travels 10 km on a bearing of 065°T. She then goes directly south until she is due east of her starting position.

(i) Draw a diagram to represent the information given above.

(ii) How far does Daisy need to go to return home? Give your answer correct to one decimal place.

(e) Simplify $3y \div 6y^{-1}$.

(f) Solve the following equations simultaneously:

$$2x + 3y = 4$$
$$x - 4y = 13$$

Examination continues overleaf ...

QUESTION SIX (13 marks) Start a new page.

(a) Simplify the following:

(i) $\dfrac{x^2+6x+5}{4} \times \dfrac{10}{x^2+5x}$

(ii) $\dfrac{12}{x^2+6x+8} - \dfrac{3}{x+2}$

(b) Mimi buys two notebooks and three pens for \$16, while Joey buys three notebooks and one pen for \$17.
Let x dollars be the cost of a notebook and let y dollars be the cost of a pen.

(i) Write two equations to represent this information.

(ii) Solve your equations to determine the cost of each item.

(c) During a three year period, the price of movie tickets went up by 5% in the first year, then rose by 10% in the second and finally went down by 5% in the third. What single percentage increase would result in the same final price for the three year period? Give your answer correct to one decimal place.

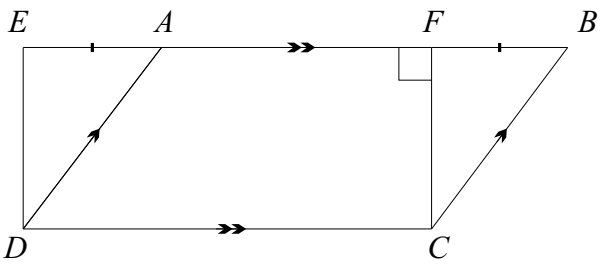
(d) A cylinder has a height equal to its diameter. If the volume is $432\pi\,\text{cm}^3$ then find the height of the cylinder.

Examination continues next page ...

QUESTION SEVEN (13 marks) Start a new page.

(a) Solve $x^2 - 7x + 3 = 0$ by completing the square.

(b)



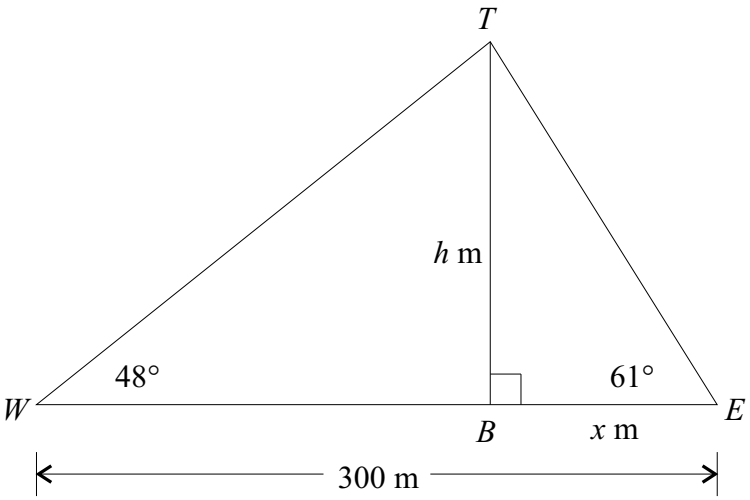
In the diagram shown above, $ABCD$ is a parallelogram.

(i) Prove that $\triangle EAD \equiv \triangle FBC$.

(ii) Hence, prove that $EFCD$ is a rectangle.

(c) Find the equation of the perpendicular bisector of the interval AB, where A is the point $(-2, 5)$ and B is the point $(3, 1)$.

(d)



The angle of elevation to the top of a tree T from point W, directly west of the tree, is 48°. The angle of elevation from point E, directly east of the tree, is 61°. The two points are 300 metres apart. Let the height of the tree be h metres and let the distance from the base of the tree B to point E be x metres. This information is shown in the diagram above.

(i) Using $\triangle ETB$, find an expression for $\tan 61°$.

(ii) Using $\triangle TWB$, find an expression for $\tan 48°$.

(iii) Hence, show that $h = \dfrac{300 \tan 48° \tan 61°}{\tan 48° + \tan 61°}$.

Examination continues overleaf ...

QUESTION EIGHT (13 marks) Start a new page.

(a) Factorise $x^2(x-y)+y^2(y-x)$.

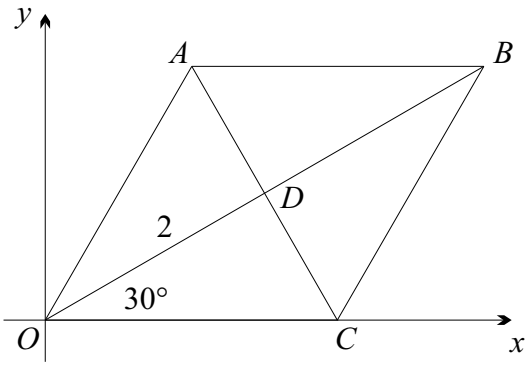
(b) Given that $\left(\sqrt{x}+\sqrt{y}\right)^2 = x+y+2\sqrt{xy}$, find a and b such that

$$\sqrt{a}+\sqrt{b} = \sqrt{10+2\sqrt{21}}$$

where a and b are positive integers.

(c) A square backyard of side length x metres is to be landscaped. A flower bed of width 4 metres is to be dug around 3 sides of the yard. The remaining yard is to be covered in grass. If $\frac{5}{8}$ of the yard is taken up by the flower bed then what is the area of the grass?

(d)



The diagram above shows the rhombus $OABC$. The diagonals OB and AC intersect at the point D. The diagonal OB makes an angle of 30° with the positive x-axis. The length of OD is 2 units. Find the coordinates of A, in exact form.

(e) A school gets a big donation and adds ten rooms. This reduces the average number of pupils per room by ten. After two months, a storm badly damages five rooms, forcing the school to close them. This causes the average number of pupils per room to increase by four. The number of pupils at the school remains constant throughout this time. How many pupils are at the school? Justify your answer with working.

END OF EXAMINATION

Form III Annual 2017 Solutions

Question One

a). $7x$ ✓

b). $3\sqrt{5}$ ✓

c). $2a + 3 = 11$

$2a = 8$

$a = 4$ ✓

d). $p^{-4} = \frac{1}{p^4}$ ✓

e). 4 070 ✓

f). 3 ✓

g). $5x(3y - 2)$ ✓

h). $\cos 47^\circ \doteq 0.682$ ✓

i). $x \geq 2$ ✓

j). (i). $(x+3)(x-3) = x^2 - 9$ ✓

(ii). $(x-5)(x+2) = x^2 - 3x - 10$ ✓

k). $A = 9 \times 4$

$= 36\ cm^2$ ✓

l). $x - 4 = 0$ or $x + 3 = 0$

$x = 4$ or $x = -3$ ✓

Question Two

a) $I = 2\,400 \times 0.06 \times 3$
$= \$432$ ✓

b) (i). $2+7+14+11+6 = 40$ people ✓
(ii). mode = 2 televisions ✓

c). $mq = p - n$
$p = mq + n$ ✓

d). $\tan 58° = \frac{x}{6}$ ✓
$x = 6 \tan 58°$ ✓
$\doteq 9.6$ cm

e). median = 72 ✓

f). $\frac{4}{\sqrt{7}} \times \frac{\sqrt{7}}{\sqrt{7}} = \frac{4\sqrt{7}}{7}$ ✓

g). $V = \frac{1}{2} \times 4 \times 3 \times 11$ ✓
$= 66\ cm^3$

h). $(2\sqrt{3} - 5)^2 = 4 \times 3 - 20\sqrt{3} + 25$ ✓
$= 12 - 20\sqrt{3} + 25$
$= 37 - 20\sqrt{3}$ ✓

i). $y = 6$ ✓

j). $3600 \div 100^2 = 0.36\ m^2$ ✓

Question Three

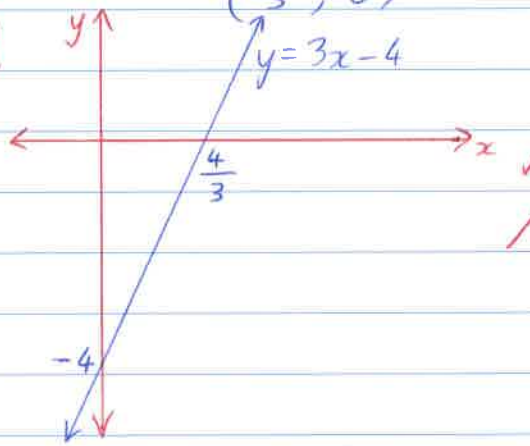
a). $(2p^5)^4 \times 4p^7 = 16p^{20} \times 4p^7$ ✓
$= 64p^{27}$ ✓

b). $\sin\theta = \frac{7}{12}$ ✓
$\theta = \sin^{-1}\left(\frac{7}{12}\right)$ ✓
$\doteq 36°$

c). $\frac{4x+2}{2} = \frac{2(2x+1)}{2}$ ✓
$= 2x+1$ ✓

d). (i). y-int: $(0, -4)$ ✓
x-int: sub in $y=0$
$0 = 3x - 4$
$4 = 3x$
$x = \frac{4}{3}$
$(\frac{4}{3}, 0)$ ✓

(ii).



✓ ✓

deduct one mark for:
intercepts wrong way round
poor drawing
missing values

e). $y = 20 - x$ ①
$y = 2x - 1$ ②
Sub ② into ①: $2x - 1 = 20 - x$
$3x = 21$ ✓
$x = 7$ ✓
Sub $x = 7$ into ①: $y = 20 - 7$ ✓
$= 13$

$\therefore x = 7, y = 13$

f). Opposite sides are equal.
Opposite angles are equal.
Diagonals bisect each other.
One pair of sides are equal and parallel.
Adjacent angles are supplementary.

1 for one property.
2 for three properties.
Don't accept angle sum of 360°.

Question Four

a) $\cos 67° = \frac{1.9}{x}$ ✓

$x = \frac{1.9}{\cos 67°}$

$\div 4.9$ ✓

∴ The ladder is 4.9 m long.

b) Let x be the cost before GST was added.

$1.125x = 1260$

$x = 1260 \div 1.125$ ✓

$= \$1120$

c) (i) $x^2 - 3x - 28 = 0$

$(x-7)(x+4) = 0$

$x - 7 = 0$ or $x + 4 = 0$

$x = 7$ or $x = -4$ ✓

(ii) $2x^2 - x - 15 = 0$

$2x^2 - 6x + 5x - 15 = 0$

$2x(x-3) + 5(x-3) = 0$ ✓

$(x-3)(2x+5) = 0$

$x - 3 = 0$ or $2x + 5 = 0$

$x = 3$ $\quad 2x = -5$

$x = 3$ or $x = -\frac{5}{2}$ ✓

d) (i) $d = \sqrt{(-2-8)^2 + (3--1)^2}$

$= \sqrt{(-10)^2 + (4)^2}$

$= \sqrt{100 + 16}$

$= \sqrt{116}$ ✓ not required to simplify

$= 2\sqrt{29}$ units

(ii) $M = \left(\frac{-2+8}{2}, \frac{3+-1}{2}\right)$

$= \left(\frac{6}{2}, \frac{2}{2}\right)$

$= (3, 1)$ ✓

Question Four (cont.)

e). (i). In $\triangle ABC$ and $\triangle ADE$:

$\angle A$ is common.

$\frac{AE}{AC} = \frac{12}{16}$

$= \frac{3}{4}$

$\frac{AD}{AB} = \frac{6}{8}$

$= \frac{3}{4}$

$\frac{AE}{AC} = \frac{AD}{AB}$ ✓

$\therefore \triangle ABC \,|||\, \triangle ADE$ (SAS) ✓

(ii). $\frac{CB}{ED} = \frac{AB}{AD}$ (matching sides of similar $\triangle$'s) ✓ reason

$\frac{CB}{9} = \frac{8}{6}$

$CB = \frac{8}{6} \times 9$ ✓

$= 12$ cm

f). $2y - 3x + 10 = 0$

$2y = 3x - 10$

$y = \frac{3}{2}x - 5$

Parallel lines have the same gradient.

$\therefore m = \frac{3}{2}$ ✓

Question Five

a). (i). $x^2+8x+1=0$

$x^2+8x=-1$

$(x+4)^2=-1+4^2$ ✓

$(x+4)^2=-1+16$

$(x+4)^2=15$

$x+4=\pm\sqrt{15}$

$x=-4\pm\sqrt{15}$ ✓

(ii). $x\doteq -0.13$ or -7.87 ✓

b). $S.A.=\frac{1}{2}(2\times\pi\times4.5^2+2\times\pi\times4.5\times14)+(9\times14)$ ✓

$\doteq 261.5+126$ ✓ 1 for flat base, 1 for half cylinder

$\doteq 387.5\ cm^2$ ✓

c). (i). $m=\frac{15-3}{4-1}$

$=\frac{12}{3}$ ✓

$=4$

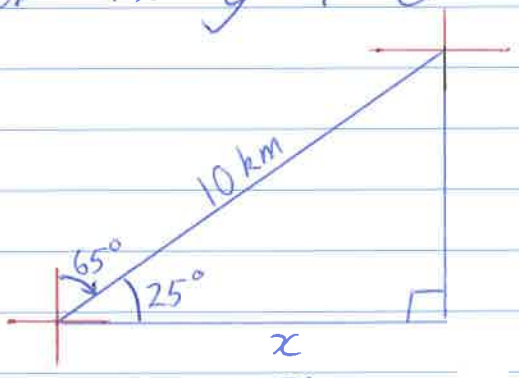
(ii). $y-3=4(x-1)$ ✓

$y-3=4x-4$ ✓

$y=4x-1$ either form okay.

or $4x-y-1=0$

d). (i).



✓

(ii). $\cos 25^\circ=\frac{x}{10}$

$x=10\cos 25^\circ$ ✓

$\doteq 9.1\ km$

Question Five (cont.)

e) $3y \div 6y^{-1} = 3y \div \frac{6}{y}$

$= \frac{3y}{1} \times \frac{y}{6_2}$

$= \frac{y^2}{2}$ ✓

f) $2x + 3y = 4$ ①

$x - 4y = 13$ ②

② × 2: $2x - 8y = 26$ ③

① − ③: $11y = -22$

$y = -2$ ✓

Sub $y = -2$ into ①:

$x - 4x - 2 = 13$

$x + 8 = 13$

$x = 5$ ✓

$\therefore x = 5, \ y = -2$

Question Six

a). (i). $\frac{x^2+6x+5}{4} \times \frac{10}{x^2+5x} = \frac{(x+1)(x+5)}{4_2} \times \frac{10^5}{x(x+5)}$ ✓

$= \frac{5(x+1)}{2x}$ ✓

(ii). $\frac{12}{x^2+6x+8} - \frac{3}{x+2} = \frac{12}{(x+2)(x+4)}$ ✓ $- \frac{3}{x+2}$

$= \frac{12-3(x+4)}{(x+2)(x+4)}$ ✓ common denominator

$= \frac{12-3x-12}{(x+2)(x+4)}$

$= \frac{-3x}{(x+2)(x+4)}$ ✓

b). (i). $2x+3y=16$ ① ✓

$3x+y=17$ ②

(ii). ②×3: $9x+3y=51$ ③

③−①: $7x=35$

$x=5$ ✓

Sub $x=5$ into ②:

$3\times5+y=17$

$15+y=17$ ✓

$y=2$

$\therefore x=5, y=2$ i.e. Notebooks cost \$5, pens cost \$2.

c). Let x be the original price.

New price $= x \times 1.05 \times 1.1 \times 0.95$ ✓

$= 1.09725x$ ✓ don't penalise if 9.725%

$\therefore$ 9.7% increase.

d). Let r be the radius. The height is $2r$.

$\pi \times r^2 \times 2r = 432\pi$ ✓

$2r^3 = 432$

$r^3 = 216$

$r = \sqrt[3]{216}$ ✓

$= 6$

$\therefore$ The height is 12 cm. ✓

OR

Let h be the height. The radius is $\frac{h}{2}$.

$\pi \times (\frac{h}{2})^2 \times h = 432\pi$ ✓

$\frac{h^3}{4} = 432$ ✓

$h^3 = 1728$

$h = \sqrt[3]{1728}$ ✓

$= 12$

Question Seven

a) $x^2 - 7x + 3 = 0$

$x^2 - 7x = -3$

$(x - \frac{7}{2})^2 = -3 + (\frac{7}{2})^2$ ✓

$(x - \frac{7}{2})^2 = -3 + \frac{49}{4}$

$= \frac{37}{4}$

$x - \frac{7}{2} = \pm\sqrt{\frac{37}{4}}$

$= \pm\frac{\sqrt{37}}{2}$

$x = \frac{7 \pm \sqrt{37}}{2}$ ✓

b) (i) In $\triangle EAD$ and $\triangle FBC$:

$EA = FB$ (given)

$AD = BC$ (opposite sides of a parallelogram are equal) } ✓

$\angle EAD = \angle FBC$ (corresponding $\angle$'s, $AD \parallel BC$) ✓

$\therefore \triangle EAD \equiv \triangle FBC$ (SAS)

(ii) $\angle AED = \angle BFC = 90°$ (matching $\angle$'s of congruent $\triangle$'s) ✓

$\angle AED + \angle BFC = 180°$

co-interior $\angle$'s are supplementary

$\therefore ED \parallel FC$ ✓

Opposite sides are parallel and one angle is a right angle.

$\therefore EFCD$ is a rectangle.

other methods okay:
- opposite sides equal and a right angle.
- one pair of sides equal and parallel with a right angle.

c) $M = \left(\frac{-2+3}{2}, \frac{5+1}{2}\right)$

$= (\frac{1}{2}, 3)$ ✓

$m_{AB} = \frac{5-1}{-2-3}$

$= -\frac{4}{5}$

$m_\perp = \frac{5}{4}$ ✓

$y - 3 = \frac{5}{4}(x - \frac{1}{2})$

$= \frac{5}{4}x - \frac{5}{8}$

$y = \frac{5}{4}x + \frac{19}{8}$ ✓ either form okay

or $8y = 10x + 19$

$10x - 8y + 19 = 0$

Question Seven (cont.)

d) (i) $\tan 61^\circ = \frac{h}{x}$ ✓

(ii) $\tan 48^\circ = \frac{h}{300-x}$ ✓

(iii) $\tan 61^\circ = \frac{h}{x}$

$$x = \frac{h}{\tan 61^\circ} \quad (1)$$

$$\tan 48^\circ = \frac{h}{300-x}$$

$$300 - x = \frac{h}{\tan 48^\circ}$$

$$-x = \frac{h}{\tan 48^\circ} - 300$$

$$x = 300 - \frac{h}{\tan 48^\circ} \quad (2)$$

Sub (1) into (2):

$$\frac{h}{\tan 61^\circ} = 300 - \frac{h}{\tan 48^\circ}$$ ✓

$$h \tan 48^\circ = 300 \tan 48^\circ \tan 61^\circ - h \tan 61^\circ$$

$$h \tan 48^\circ + h \tan 61^\circ = 300 \tan 48^\circ \tan 61^\circ$$

$$h(\tan 48^\circ + \tan 61^\circ) = 300 \tan 48^\circ \tan 61^\circ$$ ✓

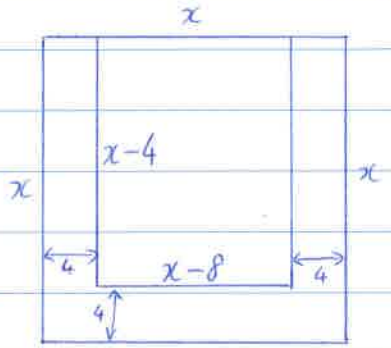
$$h = \frac{300 \tan 48^\circ \tan 61^\circ}{\tan 48^\circ + \tan 61^\circ}$$

Question Eight

a) $x^2(x-y)+y^2(y-x) = x^2(x-y)-y^2(x-y)$
$= (x-y)(x^2-y^2)$
$= (x-y)(x-y)(x+y)$
$= (x-y)^2(x+y)$

b) $\sqrt{a}+\sqrt{b} = \sqrt{10+2\sqrt{21}}$
$(\sqrt{a}+\sqrt{b})^2 = 10+2\sqrt{21}$
$a+b+2\sqrt{ab} = 10+2\sqrt{21}$
$a+b=10$ $\quad ab=21$ ②
$a=10-b$ ①
Sub ① into ②: $(10-b)b=21$
$10b-b^2=21$
$b^2-10b+21=0$
$(b-3)(b-7)=0$
$b-3=0$ or $b-7=0$
$b=3$ or $b=7$
Sub into ①: $a=7$ or $a=3$
$\therefore a=7, b=3$ or $a=3, b=7$

c)



$\frac{x^2-(x-4)(x-8)}{x^2} = \frac{5}{8}$
$\frac{x^2-(x^2-12x+32)}{x^2} = \frac{5}{8}$
$\frac{x^2-x^2+12x-32}{x^2} = \frac{5}{8}$
$\frac{12x-32}{x^2} = \frac{5}{8}$
$8(12x-32) = 5x^2$
$96x-256 = 5x^2$
$5x^2-96x+256=0$
$5x^2-80x-16x+256=0$
$5x(x-16)-16(x-16)=0$
$(x-16)(5x-16)=0$

Question Eight (cont.)

$x - 16 = 0$ or $5x - 16 = 0$

$x = 16$ or $5x = 16$

$x = \frac{16}{5}$ ✓

But $x \geq 8$

$\therefore x = 16$

Area of grass $= (16-4)(16-8)$

$= 12 \times 8$

$= 96 m^2$ ✓

d). $\angle ODC = 90°$ (diagonals of rhombus are perpendicular)

In $\triangle ODC$: $\cos 30° = \frac{2}{OC}$

$OC = \frac{2}{\cos 30°}$

$= \frac{2}{\frac{\sqrt{3}}{2}}$

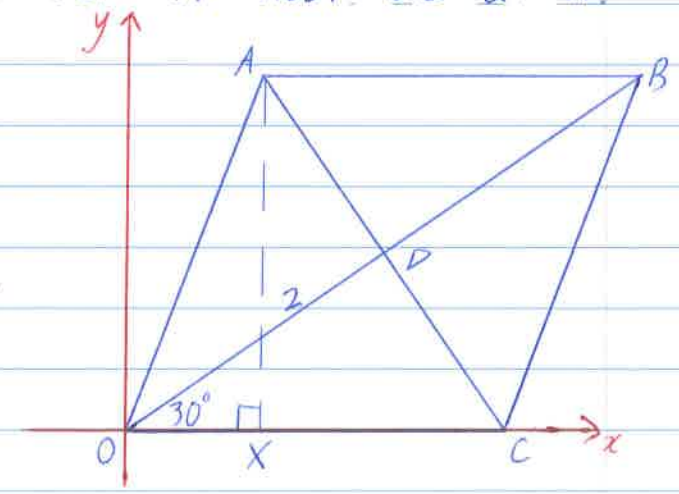
$= \frac{4}{\sqrt{3}}$ ✓

$OA = OC = \frac{4}{\sqrt{3}}$ (all sides of rhombus are equal)

$\angle AOD = \angle COD$ (diagonals of rhombus bisect vertex angles)

$\therefore \angle AOC = 60°$

Let the perpendicular line from A meet OC at X.



$\cos 60° = \frac{OX}{OC}$

$= \frac{OX}{\frac{4}{\sqrt{3}}}$

$OX = \frac{4}{\sqrt{3}} \cos 60°$

$= \frac{4}{\sqrt{3}} \times \frac{1}{2}$

$= \frac{2}{\sqrt{3}}$

$= \frac{2\sqrt{3}}{3}$ ✓

$\sin 60° = \frac{AX}{OC}$

$= \frac{AX}{\frac{4}{\sqrt{3}}}$

$AX = \frac{4}{\sqrt{3}} \sin 60°$

$= \frac{4}{\sqrt{3}} \times \frac{\sqrt{3}}{2}$

$= 2$ ✓

$\therefore A = \left(\frac{2}{\sqrt{3}}, 2\right)$ or $\left(\frac{2\sqrt{3}}{3}, 2\right)$

Question Eight (cont.)

e) Let x be the number of pupils in the school.
Let r be the original number of rooms.

Before donation: mean $= \frac{x}{r}$

After donation: mean $= \frac{x}{r+10}$

$$\frac{x}{r+10} = \frac{x}{r} - 10$$

$$xr = x(r+10) - 10r(r+10)$$

$$xr = xr + 10x - 10r^2 - 100r$$

$$10r^2 + 100r = 10x$$

$$x = r^2 + 10r \quad (1)$$ ✓

After storm: mean $= \frac{x}{r+5}$

$$\frac{x}{r+5} = \frac{x}{r} - 6$$

$$xr = x(r+5) - 6r(r+5)$$

$$xr = xr + 5x - 6r^2 - 30r$$

$$6r^2 + 30r = 5x \quad (2)$$

Sub (1) into (2):

$$6r^2 + 30r = 5(r^2 + 10r)$$

$$6r^2 + 30r = 5r^2 + 50r$$

$$r^2 - 20r = 0$$

$$r(r-20) = 0$$

$r = 0$ or $r - 20 = 0$

$r = 20$ ✓

Since $r > 0$, $r = 20$.

Sub $r = 20$ into (1):

$$x = 20^2 + 10 \times 20$$

$$= 400 + 200$$

$$= 600$$

∴ The school has 600 pupils. ✓

Must show working, no guess and check.