NORTH VISTA SECONDARY SCHOOL

END-OF-YEAR EXAMINATION 2018

40

NAME: _____( ) **CLASS:** _____

SUBJECT: MATHEMATICS (PAPER 1) **DATE: 4 OCTOBER 2018**

LEVEL/STREAM: SECONDARY 2 NORMAL ACADEMIC **TIME: 1 HOUR**

READ THESE INSTRUCTIONS FIRST

Write your register number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** questions.
The number of marks is given in brackets [ ] at the end of each question or part question.

If working is needed for any question, it must be shown with the answer.
Omission of essential working will result in loss of marks.
The total of the marks for this paper is **40**.

The use of an approved scientific calculator is expected, where appropriate.
If the degree of accuracy is not specified in the question and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

For Examiner's Use	
Category	**Question No.**
Accuracy	
Brackets	
Fractions	
Units	
Others	
Marks Deducted	

Answer **all** the questions.

1 **(a)** Express 48 as the product of its prime factors.

Answer ..... [1]

(b) Given that $144 = 2^4 \times 3^2$, find the HCF of 48 and 144.

Answer .....[1]

2 **(a)** Solve $10x > 4x - 36$.

Answer ..... [1]

(b) Hence, represent the solution on a number line.

Answer [1]

3 Factorise

(a) $3a(b-2c)+5(b-2c)$,

Answer ..... [2]

(b) $2p(1-4q)-(4q-1)$.

Answer ..... [2]

---

4 **(a)** Factorise $4x^2+8x+3$.

Answer ..... [2]

(b) Hence, find the other two factors of 483 other than 1 and 483.

Answer ..... [2]

---

5 y is inversely proportional to $(x+5)$ and $y=\frac{1}{3}$ when $x=1$.

Find

(a) an equation connecting x and y,

Answer ..... [2]

(b) the value of y when $x=5$.

Answer ..... [2]

6 The school pays \$2000 as a subsidy of the admission ticket for the students and teachers visiting the Science Centre. The price of one student ticket and adult ticket is \$11.50 and \$20 respectively. A total of 4 teachers will be following the students.

(a) Given that x represents the number of students, write an algebraic expression for the total cost of x students.

Answer \$ ..... [1]

(b) Form an inequality in terms of x.

Answer ..... [1]

(c) Solve the inequality and find the maximum number of students who can enjoy the subsidy.

Answer ..... students [2]

7 Expand

(a) $-5x(x+2)$,

Answer ..... [1]

(b) $(a-3)(a+4)$,

Answer ..... [2]

(c) $(2x+3)^2$.

Answer ..... [2]

8 Express each of the following as a single fraction

(a) $\frac{4ab^2}{c} \times \frac{ac}{16}$,

Answer ..... [1]

(b) $\frac{p}{2} + \frac{5p}{6}$,

Answer ..... [2]

(c) $\frac{5(x+2)}{3} - 2x$.

Answer ..... [2]

9 The following table shows the distribution of the number of storeys in a matured HDB estate.

0	4	5	7	9	
1	0	2	4	4	4
2	3	5	5	8	
3	2				

Key: 0|4 means 4 storeys

(a) Find the percentage of HDB blocks that has at least 10 storeys.

Answer .....% [1]

(b) Find the mode.

Answer ..... storeys[1]

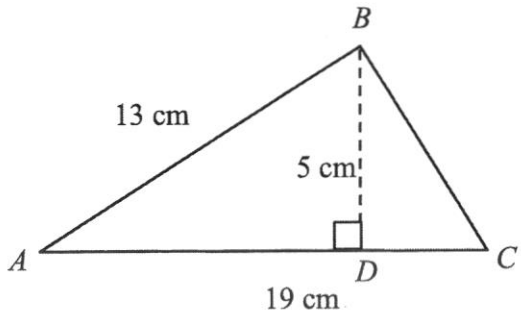
(c) Find the median.

Answer .....storeys [1]

(d) Find the mean.

Answer ..... storeys [2]

10 The diagram shows a triangle ABC with sides $AB = 13$ cm, $AC = 19$ cm, $BD = 5$ cm and angle $ADB = 90°$.



(a) Find the length of AD.

Answer ..... cm [2]

(b) Hence or otherwise, find the length of CD.

Answer ..... cm [1]

(c) Is angle $ABC = 90°$? Show your reason clearly.

Answer (c) .....

.....

.....

.....

.....

.....[2]

End of Paper

NORTH VISTA SECONDARY SCHOOL

END-OF-YEAR EXAMINATION 2018

45

NAME: _____( ) **CLASS:** _____

SUBJECT: MATHEMATICS (PAPER 2) **DATE: 8 OCTOBER 2018**

LEVEL/STREAM: SECONDARY 2 NORMAL (ACADEMIC) **TIME: 1 HOUR 30 MINUTES**

READ THESE INSTRUCTIONS FIRST

Write your register number and name on all the work you hand in.
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Answer **all** questions.
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For Examiner's Use	
Category	**Question No.**
Accuracy	
Brackets	
Fractions	
Units	
Others	
Marks Deducted	

This paper consists of **10** printed pages.

Answer **all** the questions.

1 **(a)** Factorise $x^2 - y^2$. [1]

(b) Given that $x^2 - y^2 = 12$ and $x + y = 5$, find the value of $x - y$. [2]

---

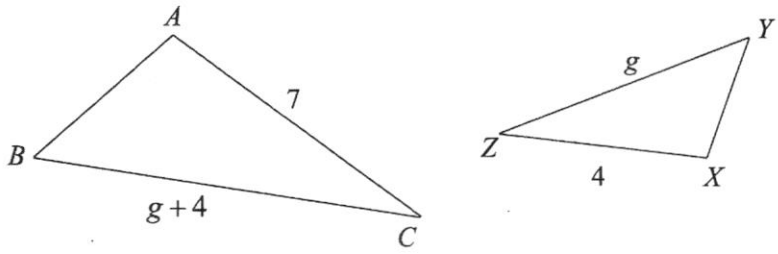
2 The floor plan of a house is drawn to a scale of 1:40.

(a) The length of the house on the plan is 22 cm. Find the actual length, in metres, of the house. [1]

(b) The area of the balcony is 3.7 m^2.
Find the area, in cm^2, of the balcony on the plan. [2]

---

3 Triangle ABC is similar to triangle XYZ.
It is given that $AC = 7$ cm, $BC = (g+4)$ cm, $YZ = g$ cm and $XZ = 4$ cm.
Calculate the value of g. [3]



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4 In a class of 40 students, 20 students joined Uniformed Groups, $\frac{1}{5}$ joined Clubs/Societies and the remaining students joined Performing Arts. One student is selected at random.

(a) Find the probability that the student selected is from Performing Arts. [2]

(b) A few new students joined the class and they chose Uniformed Groups as their CCA. The probability of students in Uniformed Groups from the class is now $\frac{6}{11}$.
Find the number of new students who joined the class. [3]

---

5 Simplify

(a) $\dfrac{2f^2}{3g^3} \div \dfrac{4f^2}{g^4}$, [2]

(b) $\dfrac{1}{3x-12} \times \dfrac{x^2-16}{(x+4)^2}$. [3]

6 **(a)** Factorise $3x-2+10y-15xy$. [2]

(b) Given the formula $S=\frac{n(a+b)}{2}$, find

(i) value of S when $a=1,\ b=-2$ and $n=12$, [2]

(ii) value of n when $a=-2,\ b=10$ and $S=200$. [2]

7 The diagram shows the graph of the straight line $y - x = -4$.

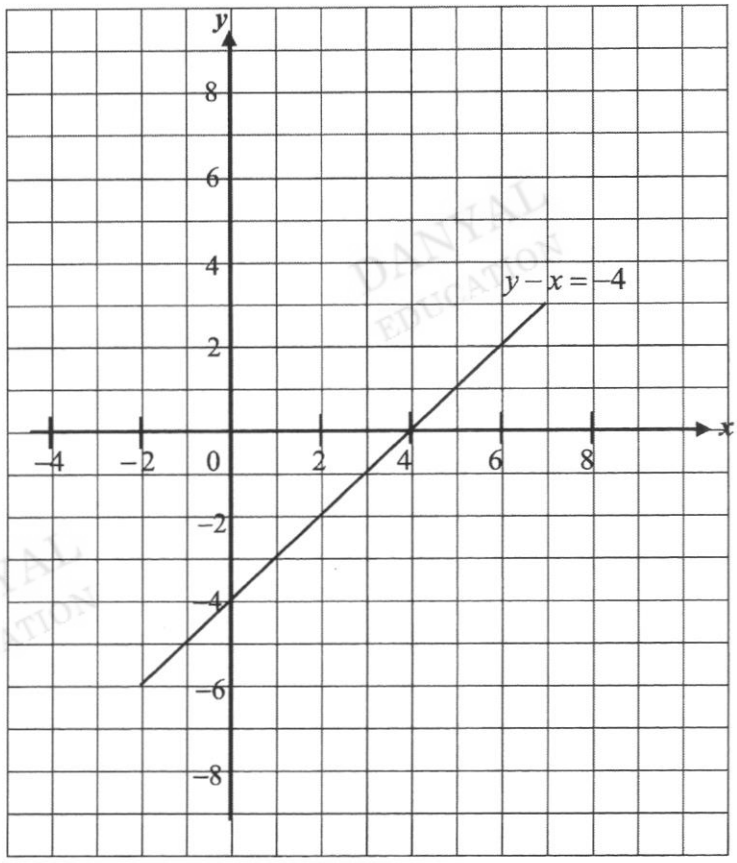
(a) Find the gradient of the line $y - x = -4$. [1]

(b) The table of values below is for $2x + y = 2$.

x	–2	0	5
y	6	2	a

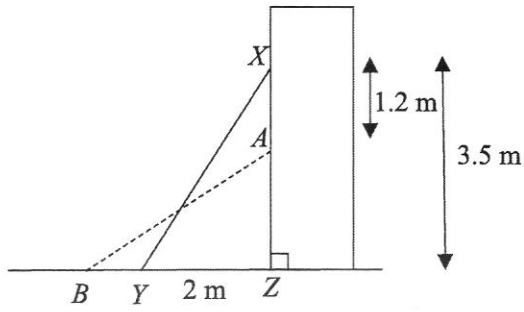
(i) Calculate the value of a. [1]

(ii) On the same diagram, use the values in the table above to draw the line $2x + y = 2$. [1]



(c) Use your graph to solve the simultaneous equations $y - x = -4$ and $2x + y = 2$. [1]

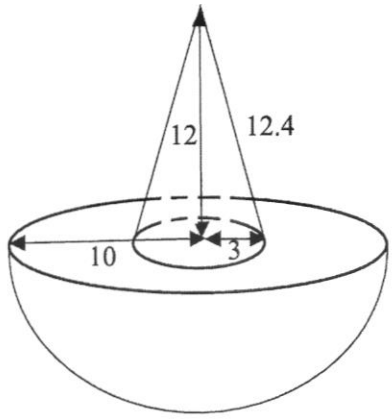
8 The diagram shows a ladder, XY, that leans against a vertical wall where $XZ = 3.5$ m and $YZ = 2$ m.



(a) Find the length of the ladder. [2]

(b) The upper end X slides down 1.2 m to a point A. Calculate the distance the lower end Y has slid away from its original position to a point B. [3]

9 The solid wooden ornament below is made up of a cone and a hemisphere. The radius of the cone and the sphere are 3 cm and 10 cm respectively. The height of the cone is 12 cm and the slant height is 12.4 cm.



(a) Find the volume of the solid wood ornament. [3]

(b) The wood must not have a mass of greater than 1000 g.
Four types of wood are available.
The table shows these wood and their densities.

Wood	Douglas Fir	Red Cedar	Maple
Density (g/cm^3)	0.53	0.38	0.70

Which of these types of wood could be used to make the solid wooden ornament?
Justify your decision and show your calculations clearly. [2]

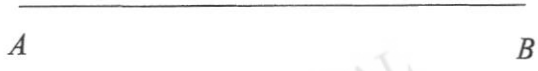
[Volume of cone $= \frac{1}{3}\pi r^2 h$]

[Surface area of sphere $= 4\pi r^2$, Volume of sphere $= \frac{4}{3}\pi r^3$]

[Mass (g) = Density × Volume]

9 *For working*

10 **(a)** Construct a triangle ABC where $AB = 7$ cm, $BC = 6$ cm and angle $ABC = 50°$. [2]
AB is drawn below. Complete the triangle.



(b) Construct the

(i) perpendicular bisector of AB, [1]

(ii) angle bisector of $\angle ABC$. [1]

(c) The two bisectors meet at point M. Complete the statements below.

The point M is equidistant from the lines _____ and _____.

The point M is equidistant from the points _____ and _____ . [2]

END OF PAPER

NORTH VISTA SECONDARY SCHOOL

END-OF-YEAR EXAMINATION 2018

Marking Scheme

40

NAME: _____( ) **CLASS:** _____

SUBJECT: MATHEMATICS (PAPER 1) **DATE: 4 OCTOBER 2018**

LEVEL/STREAM: SECONDARY 2 NORMAL ACADEMIC **TIME: 1 HOUR**

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Answer **all** the questions.

1 **(a)** Express 48 as the product of its prime factors.

$48 = 2^4 \times 3$ ------B1

Answer ..... [1]

(b) Given that $144 = 2^4 \times 3^2$, find the HCF of 48 and 144.

$48 = 2^4 \times 3$

$144 = 2^4 \times 3^2$

$HCF = 48 - - - - - B1$

Answer .....[1]

2 **(a)** Solve $10x > 4x - 36$.

$10x > 4x - 36$

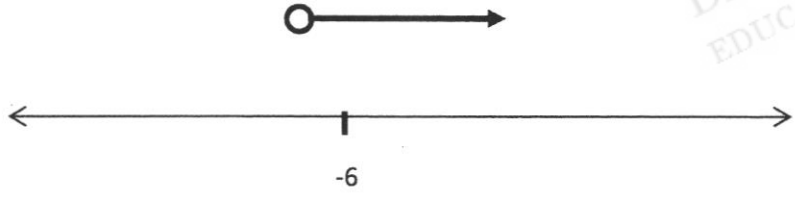
$6x > -36$

$x > -6 - - - - - B1$

Answer ..... [1]

(b) Hence, represent the solution on a number line.

Answer [1]



3 Factorise

(a) $3a(b-2c)+5(b-2c)$,

$3a(b-2c)+5(b-2c)=(3a+5)(b-2c)---B2$

Answer ..... [2]

(b) $2p(1-4q)-(4q-1)$.

$2p(1-4q)-(4q-1)=(2p+1)(1-4q)----B2$

Answer ..... [2]

---

4 **(a)** Factorise $4x^2+8x+3$.

$4x^2+8x+3=(2x+1)(2x+3)$

$M1$(Cross Method)

A1

Answer (a) ..... [2]

(b) Hence, find the other two factors of 483 other than 1 and 483.

When $x=10$

The other two factors are 21 and 23. B2

Answer (b) ..... [2]

---

5 y is inversely proportional to $(x+5)$ and $y=\frac{1}{3}$ when $x=1$.

Find

(a) an equation connecting x and y,

$y(x+5)=k$

$\frac{1}{3}(6)=k$

$k=2$ -----$M1$

$\therefore y(x+5)=2$ *or* $y=\frac{2}{x+5}$ ----$A1$

Answer ..... [2]

(b) the value of y when $x=5$. [2]

When $x=5$

$y(5+5)=2$ ----$M1(Sub)$

$y=\frac{1}{5}$ ----$A1$

Answer ..... [2]

6 The school pays \$2000 as a subsidy of the admission ticket for the students and teachers visiting the Science Centre. The price of one student ticket and adult ticket is \$11.50 and \$20. A total of 4 teachers will be following the students.

(a) Given that x represents the number of students, write an algebraic expression for the total cost of x students.

$11.5x$ -----B1

Answer \$ ..... [1]

(b) Form an inequality in terms of x.

$11.5x+80\leq 2000$ ---$B1$

Answer ..... [1]

(c) Solve the inequality and find the maximum number of students who can enjoy the subsidy.

$11.5x+80\leq 2000$

$11.5x\leq 1920$

$x\leq 166\frac{22}{23}$ ---$M1$

166 students will benefit from the subsidy. ----A1

Answer ..... students [2]

7 Expand

(a) $-5x(x+2)$,

$-5x(x+2) = -5x^2 - 10x$ ---B1

Answer ..... [1]

(b) $(a-3)(a+4)$,

$(a-3)(a+4) = a^2 - 3a + 4a - 12$ ---M1

$= a^2 + a - 12$ ----A1

Answer ..... [2]

(c) $(2x+3)^2$.

$(2x+3)^2 = (2x+3)(2x+3)$ ---M1

$= 4x^2 + 6x + 6x + 9$

$= 4x^2 + 12x + 9$ ----A1

Answer ..... [2]

8 Express each of the following as a single fraction

(a) $\frac{4ab^2}{c} \times \frac{ac}{16}$,

$$\frac{4ab^2}{c} \times \frac{ac}{16} = \frac{a^2b^2}{4} \text{ ---} B1$$

Answer ..... [1]

(b) $\frac{p}{2} + \frac{5p}{6}$,

$$\frac{p}{2} + \frac{5p}{6} = \frac{3p+5p}{6} \text{ ---} M1$$
$$= \frac{8p}{6}$$
$$= \frac{4p}{3} \text{ ----} A1$$

Answer ..... [2]

(c) $\frac{5(x+2)}{3} - 2x$

$$\frac{5(x+2)}{3} - 2x$$
$$= \frac{5x+10-6x}{3} \text{ ----} M1$$
$$= \frac{-x+10}{3} \text{ ----} A1$$

Answer ..... [2]

9 Write as a single fraction in its simplest form The following table show the distribution of the number of storeys in a matured HDB estate.

0	4	5	7	9	
1	0	2	4	4	4
2	3	5	5	8	
3	2				

Key: 0|4 means 4 storeys

(a) Find the percentage of HDB blocks that has at least 10 storeys.

(a) Percentage

$$= \frac{10}{14} \times 100\%$$

$$= 71\frac{3}{7}\% \text{ or } 71.4\% --- B1$$

Answer .....% [1]

(b) Find the mode.

(b) Mode =14 levels---B1

Answer ..... storeys[1]

(c) Find the median.

(c) Median = 14 storeys---B1

Answer (c) .....storeys [1]

(d) Find the mean.

(d) Mean

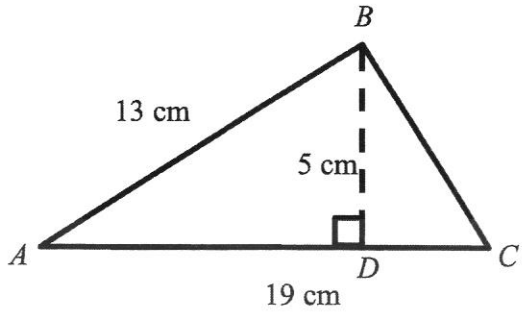
$$= \frac{4+5+7+9+10+12+14+14+14+23+25+25+28+32}{14} --- M1$$

$$= \frac{222}{14}$$

$$= 15\frac{6}{7} \text{ storeys} --- A1$$

Answer (d) ..... storeys [2]

10 The diagram shows a triangle ABC with sides $AB = 13$ cm, $AC = 19$ cm, $BD = 5$ cm and angle $ADB = 90°$.



(a) Find the length of AD.

By Pythagoras Theorem,

$AD = \sqrt{13^2 - 5^2}$ ----M1

$= 12$ cm ----A1

Answer ..... cm [2]

(b) Hence or otherwise, find the length of CD.

CD= 19 -12 = 7cm---B1

Answer ..... cm [1]

(c) Is angle $ABC = 90°$? Show your reason clearly.

$BC = \sqrt{7^2 + 5^2}$

$= \sqrt{74}cm$ ---M1

$AB^2 + BC^2 = 13^2 + \left(\sqrt{74}\right)^2$

$= 243$

$AC^2 = 19^2$

$= 361$

A1

[2]

Since $AB^2 + BC^2 \neq AC^2$, by the converse of Pythagoras' Theorem, $\measuredangle ABC$ is not $90°$.

NORTH VISTA SECONDARY SCHOOL

END-OF-YEAR EXAMINATION 2018

45

NAME: SOLUTIONS ( ) **CLASS:** _____

SUBJECT: MATHEMATICS (PAPER 2) **DATE: 8 OCTOBER 2018**

LEVEL/STREAM: SECONDARY 2 NORMAL (ACADEMIC) **TIME: 1 HOUR 30 MINUTES**

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Answer **all** the questions.

1 **(a)** Factorise $x^2 - y^2$. [1]

(b) Given that $x^2 - y^2 = 12$ and $x + y = 5$, find the value of $x - y$. [2]

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

$= (x - y)(x + y)$ B1

(b)

$(x + y)(x - y) = 12$

$5(x - y) = 12$ } M1 either or

$(x - y) = \frac{12}{5}$

$(x - y) = 2.4$ A1

---

2 The floor plan of a house is drawn to a scale of 1:40.

(a) The length of the house on the plan is 22 cm. Find the actual length, in metres, of the house. [1]

(b) The area of the balcony is 3.7 m^2.
Find the area, in cm^2, of the balcony on the plan. [2]

(a) Actual length

$= 22 \times 40$

$= 880cm$ B1

$= 8.8m$

(b)

$1 : 0.4$

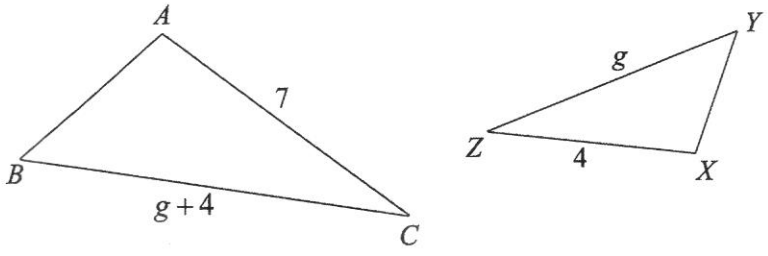
$1cm^2 : 0.16m^2$ M1

$Area = 3.7 \div 0.16$

$= 23\frac{1}{8}cm^2$ A1

---

3 ΔABC is similar to ΔXYZ.
It is given that $AC = 7$ cm, $BC = (g+4)$ cm, $YZ = g$ cm and $XZ = 4$ cm.
Calculate the value of g. [3]



$$\frac{BC}{YZ} = \frac{AC}{XZ}$$

$$\frac{g+4}{g} = \frac{7}{4} \quad \text{M1}$$

$$4g + 16 = 7g \quad \text{M1}$$

$$3g = 16$$

$$g = 5\frac{1}{3} \quad \text{A1}$$

---

4 In a class of 40 students, 20 students joined Uniformed group, $\frac{1}{5}$ joined clubs/societies and the remaining students joined Performing Arts. One student is selected at random.

(a) Find the probability that the student is from Performing Arts. [2]

(b) A few new students joined the class and they chose Uniformed Group as their CCA. The probability of students in Uniform Group from the class is now $\frac{6}{11}$. How many students joined the class? [3]

a)

No. of students from club

$$= \frac{1}{5} \times 40$$

$$= 8 \quad \text{M1}$$

$$\text{P(P.A)} = \frac{12}{40} = \frac{3}{10} \quad \text{A1}$$

b) Let no. of students who joined be x.

$$\frac{20+x}{40+x} = \frac{6}{11} \quad \text{M1}$$

$$220 + 11x = 240 + 6x \quad \text{M1}$$

$$11x - 6x = 240 - 220$$

$$5x = 20$$

$$x = 4 \quad \text{A1}$$

---

5 Simplify

(a) $\dfrac{2f^2}{3g^3} \div \dfrac{4f^2}{g^4}$, [2]

(b) $\dfrac{1}{3x-12} \times \dfrac{x^2-16}{(x+4)^2}$. [3]

a)

$$\frac{2f^2}{3g^3} \div \frac{4f^2}{g^4}$$

$$= \frac{2f^2}{3g^3} \times \frac{g^4}{4f^2} \quad \text{M1}$$

$$= \frac{2f^2g^4}{12f^2g^3}$$

$$= \frac{g}{6} \quad \text{A1}$$

b)

$$\frac{1}{3x-12} \times \frac{x^2-16}{(x+4)^2}$$

$$= \frac{1}{3(x-4)} \times \frac{(x-4)(x+4)}{(x+4)(x+4)} \quad \text{M2}$$

$$= \frac{1}{3(x+4)} \quad \text{A1}$$

6 **(a)** Factorise $3x-2+10y-15xy$. [2]

(b) Given the formula $S=\frac{n(a+b)}{2}$, find

(i) value of S when $a=1,\ b=-2$ and $n=12$. [2]

(ii) value of n when $a=-2,\ b=10$ and $S=200$. [2]

a)

$3x-2+10y-15xy$

$=1(3x-2)-5y(-2+3x)$ M1

$=(1-5y)(3x-2)$ A1

bi)

$S=\frac{n(a+b)}{2}$

$S=\frac{12(1-2)}{2}$ M1

$S=-6$ A1

bii)

$S=\frac{n(a+b)}{2}$

$200=\frac{n(-2+10)}{2}$ M1

$200=\frac{8n}{2}$

$4n=200$

$n=50$ A1

7 The diagram shows the graph of the straight line $y - x = -4$.

(a) Find the gradient of the line $y - x = -4$. [1]

$y = x - 4$
gradient $= 1$ B1

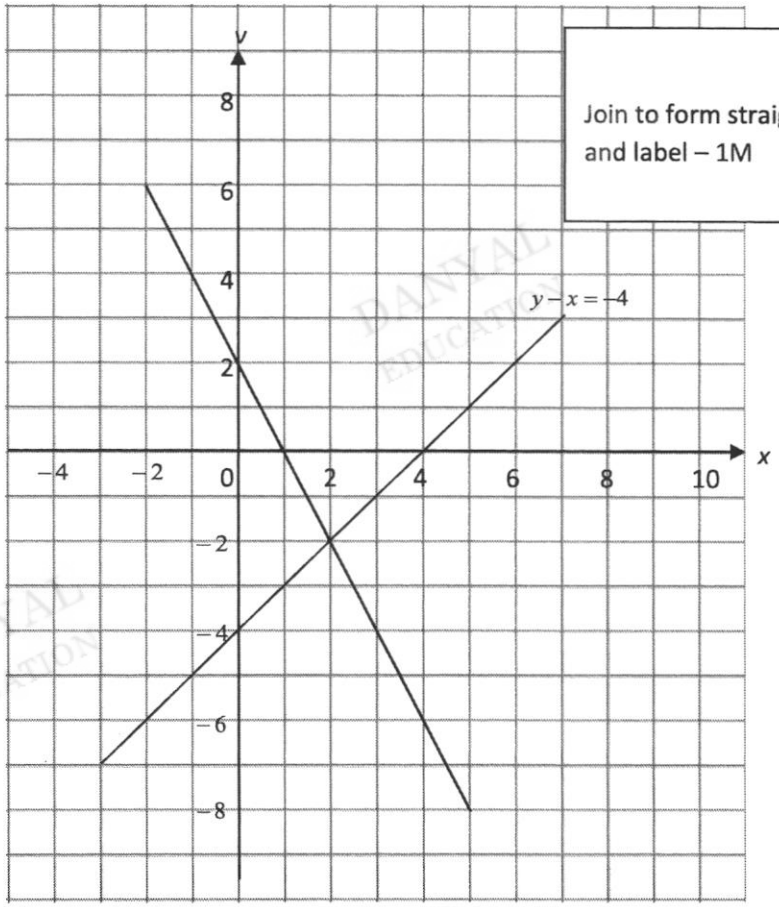
(b) The table of values below is for $2x + y = 2$.

x	-2	0	5
y	6	2	a

(i) Calculate the value of a. [1]

$a = -8$ B1

(ii) Use the values on the above table to draw the line $2x + y = 2$. [1]

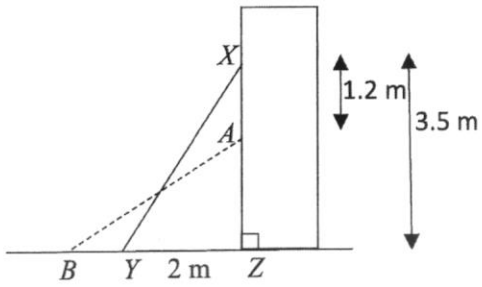


Join to form straight line and label – 1M

(c) Use your graph to solve the simultaneous equations $y - x = -4$ and $2x + y = 2$. [1]

$x = 2, y = -2$ B1

8 The diagram shows a ladder, XY, that leans against a vertical wall where $XZ = 3.5$ m and $YZ = 2$ m.



(a) Find the length of the ladder. [2]

(b) The upper end X slides down 1.2 m to a point A. How far has the lower end Y slid away from its original position? [3]

a)

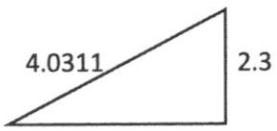
Using Pythagoras' Theorem,

$XY = \sqrt{3.5^2 + 2^2}$ M1

$= 4.0311288$

$= 4.03m$ A1

b)



Using Pythagoras' Theroem,

$BZ^2 = 4.0311^2 - 2.3^2$ M1

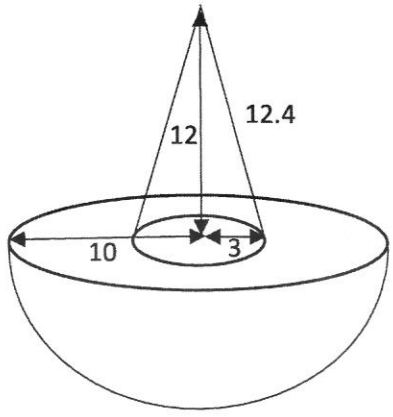
$BZ = \sqrt{10.95976}$

$BZ = 3.31055$

$BZ = 3.31m$ M1

$3.31 - 2 = 1.31m$ A1

9 The solid wooden ornament below is made up of a cone and a hemisphere. The radius of the cone and the sphere are 3 cm and 10 cm respectively. The height of the cone is 12 cm and the slant height is 12.4 cm.



(a) Find the volume of the solid wood ornament. [3]

(b) The wood must not have a mass of greater than 1000 g.
Four types of wood are available.
The table shows these wood and their densities.

Wood	Douglas Fir	Red Cedar	Maple
Density (g/cm^3)	0.53	0.38	0.70

Which of these wood could be used to make the solid wooden ornament?
Show your working. [2]

[Volume of cone $= \frac{1}{3}\pi r^2 h$]

[Surface area of sphere $= 4\pi r^2$, Volume of sphere $= \frac{4}{3}\pi r^3$]

[Mass (g) = Density × Volume]

a) Volume

$= \frac{1}{3}\pi(3)^2(12) + \frac{2}{3}\pi(10)^3$ M2

$= 2207.4924$

$= 2210 cm^3$ (3sf) A1

9 *For working*

$Mass = density \times volume$
$2207d \leq 1000$
$d \leq 0.453$ M1
Therefore, Red Cedar. A1

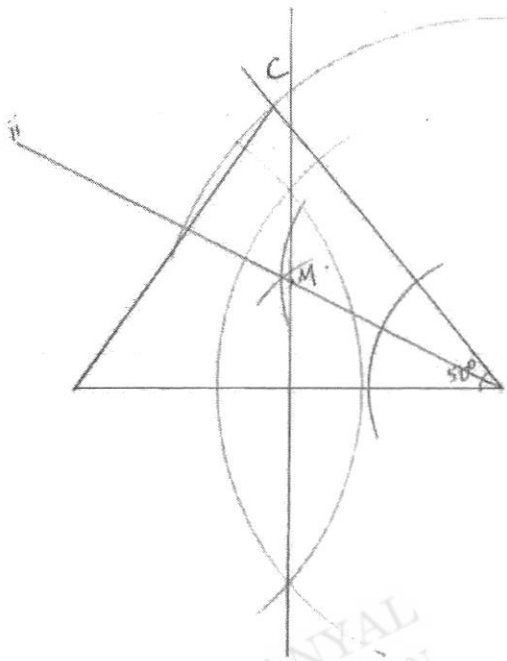
OR

Wood	Douglas Fir	Red Cedar	Maple
Mass (g)	1171.3g	839.8g	1547g
OR	1169.97	838.84	1545.24

M1

Therefore, Red Cedar. A1

10 **(a)** Construct a triangle ABC where $AB = 7$ cm, $BC = 6$ cm and $\angle ABC = 50°$.
AB is drawn below. Complete the triangle.



(b) Construct the

(i) perpendicular bisector of AB, [1]

(ii) angle bisector of $\angle ABC$. [1]

(c) The two bisectors meet at point M. Complete the statements below.

The point M is equidistant from the lines ___***AB***___ and ___***BC***___.

The point M is equidistant from the points ___***A***___ and ___**B**___. [2]

END OF PAPER