



Student's Name: .....

Teacher's Initials: .....

### PART A: COMMON SECTION [49 marks]

Marks

1. Simplify  
(a)  $4ab - 3ba + 2ab$

1

- (b)  $c^8 \div c^3$

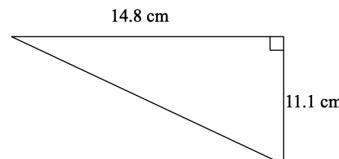
1

2. Calculate the simple interest earned on \$540 in 8 years if the interest rate is 2% p.a.

1

3. Calculate the length of the hypotenuse of this triangle.

2



TOTALS

<b>PART A: Common</b>			<b>49</b>
<b>PART B: 5.3 only</b>	Your marks	Totals	
Q21 Geometry		<b>7</b>	
Q22 Quadratics and Surds		<b>11</b>	
Q23 Statistics		<b>8</b>	
Q24 Coordinate Geometry		<b>8</b>	
Q25 Interest, Depreciation and Measurement		<b>10</b>	
Q26 Probability		<b>9</b>	
Q27 Trigonometry		<b>8</b>	
Q28 Logarithms and Indices		<b>10</b>	
Q29 Curve Sketching		<b>13</b>	
Q30 Mixed Questions		<b>8</b>	
<b>TOTAL PART B</b>			<b>92</b>
<b>TOTAL OF PARTS A and B</b>			<b>141</b>

**YEAR 10**

### 5.3 MATHEMATICS

#### Semester 2 Examination

VAB\* RAS

AYG DXC

PDJ JZT

WMD JWH

ARP BHC

1:20 PM FRIDAY 8<sup>th</sup> NOVEMBER

TERM 4, 2019

TOTAL TIME: 2 HOURS

240 COPIES

INSTRUCTIONS TO STUDENTS: Calculators may be used.

Write your name in the spaces provided.

Attempt ALL questions, writing answers in the spaces provided.

Show ALL necessary working.

Marks may not be awarded for careless or badly arranged work.

Diagrams are NOT necessarily drawn to scale.

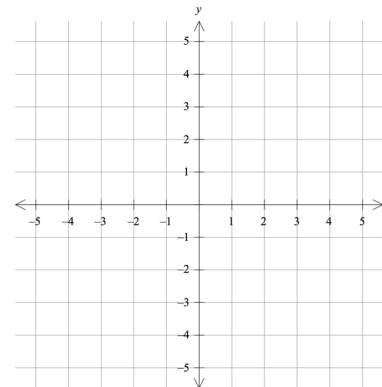
A formula sheet is provided with this paper. Please detach this sheet.

Name .....

Teacher's initials .....

8. On the number plane below, using a pencil and ruler, graph the line  $y = 3x - 2$

2



4. If  $d = 4$  and  $e = -3$ , find the value of

(i)  $3d - 5e$

2

(ii)  $2d^3e^2$

2

5. A normal 6-sided die is rolled. Calculate the probability of rolling a:

(i) 3

1

(ii) number which is more than 4

1

9. Solve  $x - 4 = 28$

1

10. Solve  $\frac{3x}{2} = 18$

2

6. Expand  $3x(2x - 4y)$

2

11. Solve  $3(a - 4) = 5a + 3$

3

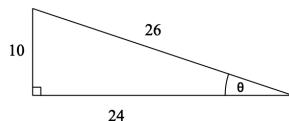
7. Expand and simplify  $(x - 2)(x + 3)$

2

Name .....

Teacher's initials .....

12. For the triangle below, write the ratio for  $\cos\theta$ .

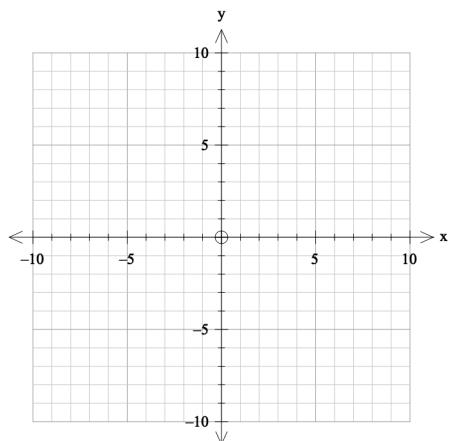


1

13. Point A has the coordinates  $(-2, 5)$  and Point B has the coordinates  $(3, -7)$

- (i) Plot these points on the number plane below.

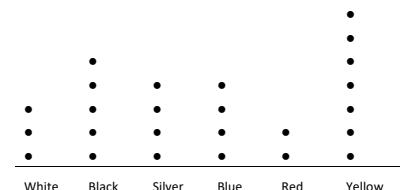
2



- (ii) Evaluate the coordinates of the mid-point of these points.

2

14. Athena is trying to find out which is the most popular colour of car. She counts each car as it drives up College Cres between 7:45 and 8:00am one Sunday morning and places the data in a dot plot.



- (i) Circle the type of data is Athena collecting

1

(A) Categorical  
Nominal

(B) Categorical  
Ordinal

(C) Quantitative  
Discrete

(D) Quantitative  
Continuous

- (ii) Write one conclusion about the popular colour of cars that Athena could draw from her data?

1

- (iii) Write one way that Athena could improve her collection of data.

1

15. Bob deposits \$14 000 in a bank account for 6 years.

- (i) Calculate the amount he has in total at the end of this investment if the interest is

3.5% p.a. compounded annually (to the nearest cent)

2

- (ii) Calculate the amount of interest he receives at the end of the 6 years.

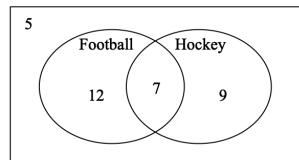
1

Name .....

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18. The graph below shows the curve  $y = x^2$ . On the same axes draw a sketch of  $y = 2x^2$ . **1**

16. Consider the Venn diagram below showing the results of a survey asking students if they played Football or Hockey.



- (i) How many people have been surveyed? **1**

If one student is selected at random from the group:

- (ii) What is the probability that the student played Hockey but not Football? **1**

- (iii) What is the probability that the student played Football? **1**

- (iv) What is the probability that the student played neither Football nor Hockey? **1**

17. For this data set 19, 23, 25, 18, 20, 22, 17, 19, 22, determine the following:

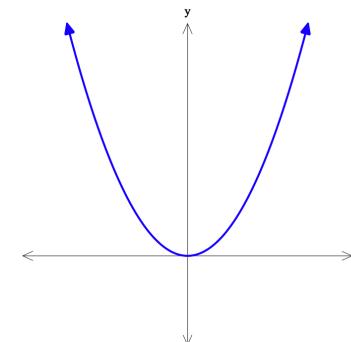
- (i) The mean **1**

- (ii) The median **1**

- (iii) The mode(s) **1**

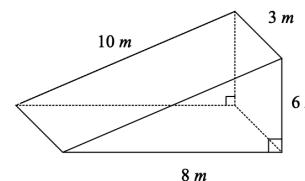
- (iv) The range **1**

- (v) If each score in the dataset is decreased by 2, which of the measures (mean, median, mode or range) will **not** change? **1**



19. If  $y = 3x - 5$ , find the value of  $x$  if  $y = 4$ . **2**

20. Find the surface area of the triangular prism below: **3**



Name .....

**PART B Question 22 Quadratics and Surds (11 marks)**

Marks

Teacher's initials .....

- (a) Factorise
- $4x^2 - 4x - 15$

2

**PART B 5.3****Question 21 Geometry (7 marks)**

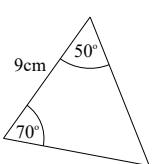
Marks

- (a) (i) Which two of the four triangles below are congruent to each other? .....

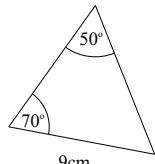
1

- (ii) Write the 3-letter congruence proof which applies to the pair. ....

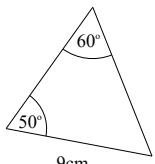
1



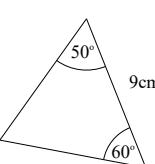
A



B



C



NOT TO SCALE

- (b) Solve
- $x^2 - 11x - 26 = 0$

2

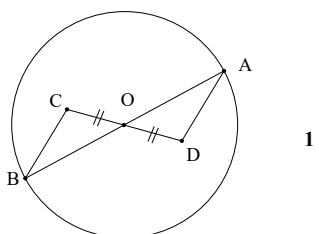
- (c) Solve
- $(3^x)^2 - 8(3^x) - 9 = 0$
- using the substitution
- $y = 3^x$
- or otherwise.

3

- (b) AB is a diameter of the circle shown and O is its centre.

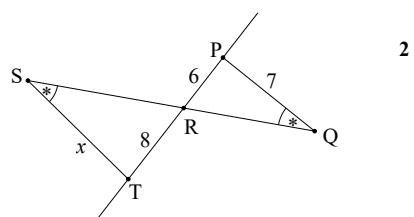
State the 3-letter congruence proof which proves  
that  $\triangle ABCO$  is congruent to  $\triangle ADO$ .

.....



1

- (c) (i) Find the length of side ST in this diagram
- 
- given that the two triangles are similar.



2

- (d) Solve
- $\sqrt{3}x = \sqrt{6} + 3$
- answering in simplest form without a denominator.

2

- (ii) Given the area of
- $\triangle RPQ$
- is
- $18\text{cm}^2$
- find the area of
- $\triangle RTS$
- .

2

- (e) Expand and simplify
- $\left(\frac{5-3\sqrt{7}}{\sqrt{3}}\right)^2$

2

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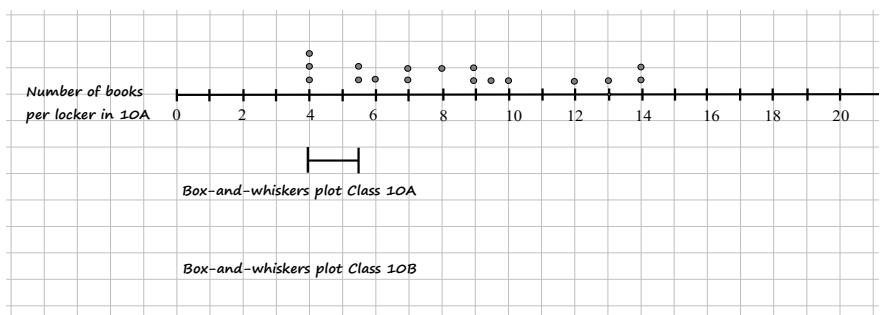
**PART B Question 23 Statistics (8 marks)**

Marks

(a) The dot plot below shows the number of books in each of the 17 students' lockers in Class 10A.

A partly completed box-and-whisker plot is also included.

- (i) Find the median number of books. .... 1
- (ii) Find the upper quartile ( $Q_3$ ). .... 1
- (iii) Find the interquartile range (IQR). .... 1
- (iv) Complete the box-and-whisker plot to represent the data. .... 1
- (v) Class 10B has a higher median, a smaller range and twice as many students as 10A.  
Rule in a possible box-and-whisker plot for Class 10B underneath 10A's plot. .... 1



(b) The table shows ages of children at a playgroup one week.

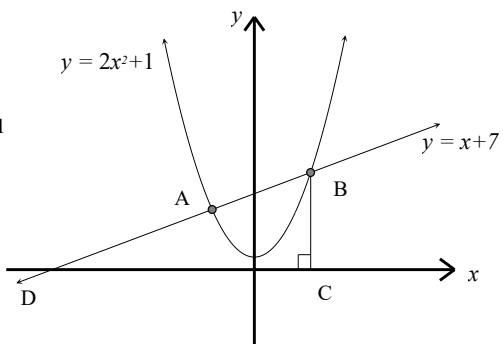
Age (years)	Number of children
2	5
3	11
4	6
5	1

- (i) Using your calculator, find the mean age (1 decimal place). .... 1
- (ii) Find the standard deviation (1 decimal place). .... 1
- (iii) The following week several extra 5 year-olds joined the existing group.  
Would this cause the standard deviation to change, and if so, in what way? .... 1

**PART B Question 24 Coordinate Geometry (8 marks)**

Marks

The graphs of  $y = 2x^2 + 1$  and  $y = x + 7$   
intersect at A  $(-1\frac{1}{2}, 5\frac{1}{2})$  and B  $(2, 9)$  as shown.



- (i) Find the midpoint M of the interval AB. .... 1

- (ii) Find the equation of the line through M perpendicular to AB, in general form. .... 3

- (iii) Find the area of triangle CBD shown above, given CB is perpendicular to CD. .... 2

- (iv) Solve the equations of the two curves above simultaneously to confirm that the points of intersection do indeed have the  $x$  values stated above. .... 2

Name .....

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**PART B Question 25 Interest, Depreciation and Measurement (10 marks) Marks**

- (a) Charlotte invested \$1800 for 3 years at 6% interest compounded quarterly.

Find the final value of her investment.

2

- (b) Olivia bought a new car and after 4 years it had depreciated to only half its original value.

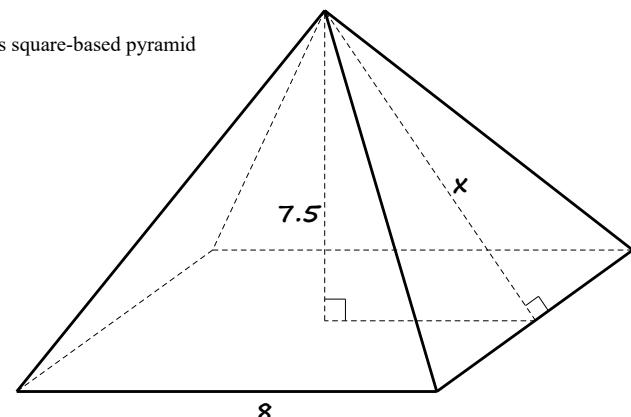
Find the annual rate of depreciation, as a percentage, to the nearest percent.

3

**PART B Question 25 (continued) Interest, Depreciation and Measurement**

Marks

- (c) The measurements for this square-based pyramid are given in centimetres.



- (i) Calculate the volume of the pyramid.

2

- (ii) Calculate the slant height x.

1

- (iii) Find the surface area of the closed pyramid.

2

QUESTION 25 continues on the next page

**END OF QUESTION 25**

Name .....  
 Teacher's initials .....

**PART B Question 26 Probability (9 marks)**

(a) Samantha throws 2 dice. Find the probability for each of the following outcomes:

(i) The sum of the numbers rolled is 10 or more. 2

(ii) At least one of the numbers rolled is 5. 1

(b) From a group of 9 students made up of 5 boys and 4 girls, how many ways are there to choose one captain and one vice-captain? 1

**PART B Question 26 Probability (continued)**

Marks

(c) David has a bowl of 5 mandarins and 4 apples on the table.

As he does his homework he takes one piece of fruit after another at random and eats it.

If he chooses 3 pieces of fruit altogether, what is the chance that he selects 3 apples? 2

(d) Evan has a string of 5 Christmas lights that change colour independently of each other, each light showing red, green or white.

(i) How many different combinations of R, G and W are there for the 5 lights? 1

(ii) What is the probability that at a particular time there is no red light? 1

(iii) What is the probability that there is at least one red light? 1

Name .....  
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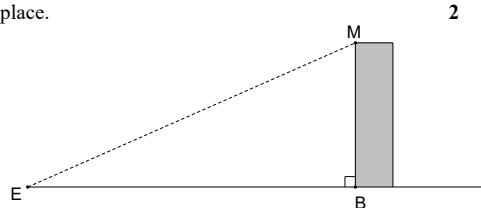
**PART B Question 27 Trigonometry (8 marks)**

(a) Given  $\sin \theta = 0.64$ , find two possible values of  $\theta$  to the nearest degree.

2

(b) Edward (E) on the ground observes Mark (M) on the roof of a building at an angle of elevation  $25^{\circ}12'$ . The distance of E from B at the base of the building is 28.2 metres.

Find the height of the building to 1 decimal place.



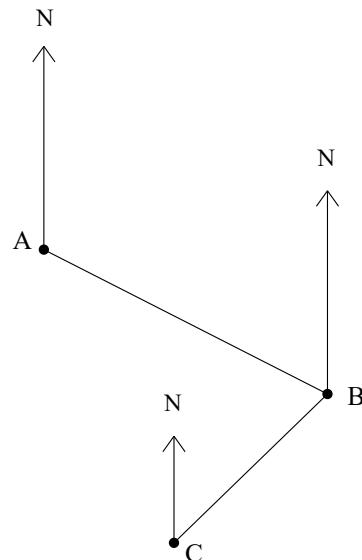
(c) (i) B is on a bearing of  $110^{\circ}$  from A.

4

C is on a bearing of  $230^{\circ}$  from B.

**Mark this information on the diagram provided.**

(ii) Given  $AC = 12\text{km}$  and  $BC = 8\text{km}$ , use the sine rule to find the bearing of C from A (nearest degree).



**PART B Question 28 Logarithms and Indices (10 marks)**

Marks

(a) Evaluate  $\log_2 32$

1

(b) Rewrite the equation  $\log_x 12 = 2$ , using indices rather than logarithms.

1

(c) Given  $\log_x 3 = 0.416$  and  $\log_x 5 = 0.61$  evaluate

(i)  $\log_x \frac{5}{3}$

1

(ii)  $\log_x(9x)$

2

(d) Solve (i)  $3^x = \frac{1}{9}$

2

(ii)  $4^{x+1} = 8^{3x+1}$

3

Name .....

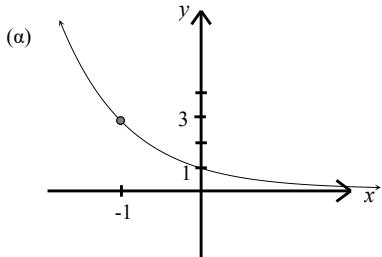
Teacher's initials .....

**PART B Question 29 (continued) Curve Sketching**

Marks

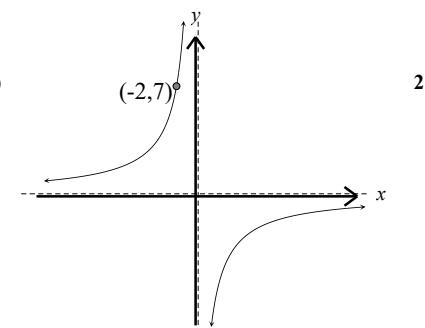
**PART B Question 29 Curve Sketching (13 marks)**

- (a) Write possible equations for each curve.



Marks

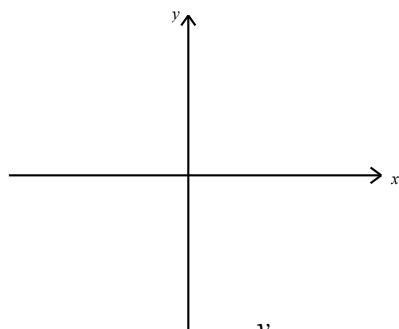
(b)



2

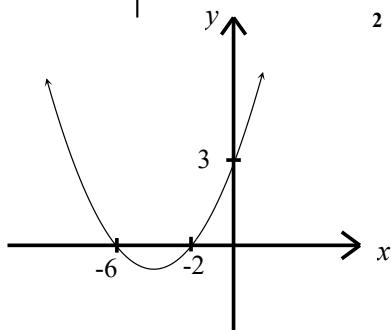
- (b) Sketch
- $y = (x - 4)^2 + 2$
- , labelling the vertex and any intercepts.

2



- (c) Find the equation of the parabola shown at right.

2



- (ii) Find the coordinates of the vertex.

1

- (iii) If the curve is reflected across the x-axis write its new equation.

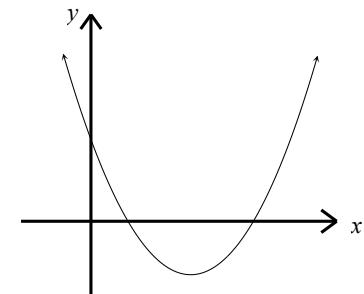
1

- (iv) (a) If this new curve is subsequently reflected across the y-axis, find its new equation.

1

- (b) If this new curve is subsequently reflected across the y-axis, find its new equation.

1



- (d)
- $y = x^2 - 8x + 6$
- is sketched here.

- (i) Show that the x-intercepts are
- $x = 4 \pm \sqrt{10}$

2

Name .....

Teacher's initials .....

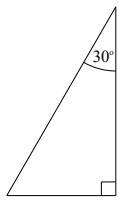
**PART B Question 30 Mixed Questions (8 marks)**

Marks

(a)

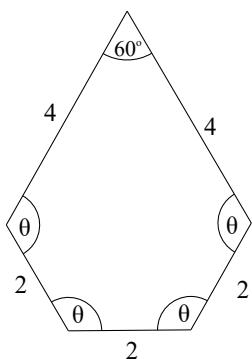
- (i) Given  $\sin 30^\circ = \frac{1}{2}$ , find  $\sin 60^\circ$  answering in exact surd form.

1



- (ii) (a) The pentagon shown has an angle of  $60^\circ$  and the other angles are each of size  $\theta$ . Calculate  $\theta$ .

2



- (β) Hence find the exact area of the pentagon.

2

**PART B Question 30 Mixed Questions (continued)**

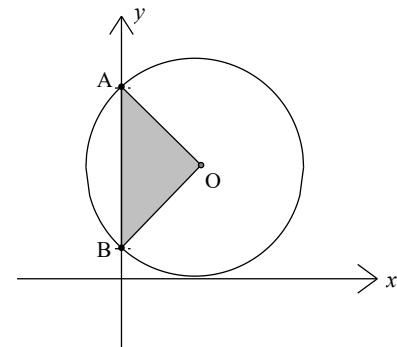
Marks

- (b) The circle shown has centre O (2, 3) and radius 3 units.

3

A and B represent the y-intercepts of the circle.

Find the area of triangle ABO answering in exact surd form.



## YEAR 10 - FORMULA SHEET

### Simple Interest

$$I = Prn$$

$P$  is initial amount  
 $r$  is interest rate per period, expressed as a decimal  
 $n$  is number of periods

### Compound Interest

$$A = P(1 + r)^n$$

$A$  is final amount  
 $P$  is initial amount  
 $r$  is interest rate per period, expressed as a decimal  
 $n$  is number of compounding periods

### Depreciation

$$A = P(1 - r)^n$$

$A$  is final value of asset after  $n$  periods  
 $P$  is initial value of asset  
 $r$  is depreciation rate per period,

### Gradient-intercept form of a line

$$y = mx + b$$

$m$  is gradient  
 $b$  is  $y$ -intercept

### Slope (gradient) of a line

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

### Distance between two points

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

### Midpoint between two points

$$M = \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

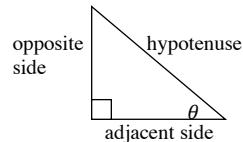
### Point-gradient of the equation of a line

$$y - y_1 = m(x - x_1)$$

### Solution of a quadratic equation

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

### Trigonometric Ratios



$$\sin \theta = \frac{\text{opposite side}}{\text{hypotenuse}}$$

$$\cos \theta = \frac{\text{adjacent side}}{\text{hypotenuse}}$$

$$\tan \theta = \frac{\text{opposite side}}{\text{adjacent side}}$$

### Sine rule

In  $\Delta ABC$

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

### Cosine Rule

In  $\Delta ABC$

$$c^2 = a^2 + b^2 - 2ab \cos C$$

or

$$\cos C = \frac{a^2 + b^2 - c^2}{2ab}$$

### Area of a triangle

In  $\Delta ABC$

$$A = \frac{1}{2} ab \sin C$$

### Circumference of a circle

$$C = 2\pi r \text{ or } C = \pi D$$

$r$  is radius

$D$  is diameter

### Area

#### Circle

$$A = \pi r^2$$

$r$  is radius

#### Sector

$$A = \frac{\theta}{360} \pi r^2$$

$r$  is radius

$\theta$  is number of degrees in central angle

#### Annulus

$$A = \pi(R^2 - r^2)$$

$R$  is radius of outer circle

$r$  is radius of inner circle

#### Trapezium

$$A = \frac{h}{2}(a + b)$$

$h$  is perpendicular height

$a$  and  $b$  are the lengths of the parallel sides

### Surface Area

#### Sphere

$$A = 4\pi r^2$$

$r$  is radius

#### Closed cylinder

$$A = 2\pi r^2 + 2\pi rh$$

$r$  is radius

$h$  is perpendicular height

### Volume

#### Prism or cylinder

$$V = Ah$$

$A$  is area of base

$h$  is perpendicular height

#### Pyramid or cone

$$V = \frac{1}{3} Ah$$

$A$  is area of base

$h$  is perpendicular height

#### Volume and capacity

Unit conversion:  $1 \text{ m}^3 = 1000 \text{ L}$

YEAR 10

SEMESTER 2 EXAM

PART A: COMMON SECTION

(1) (a)  $3ab$

(b)  $C^{8-3} = \underline{C^5}$

(2)  $I = \$540 \times 2\% \times 8$

$I = \$86.40$

(3)  $(\text{hypotenuse})^2 = 14.8^2 + 11.1^2$

$(\text{hypotenuse})^2 = 342.25$

hypotenuse =  $\sqrt{342.25}$

hypotenuse = 18.5 cm

(4) (i)  $3(4) - 5(-3) = 27$

(ii)  $2(4^3) - (-3)^2 = 1152$

(5) (i)  $\frac{1}{6}$

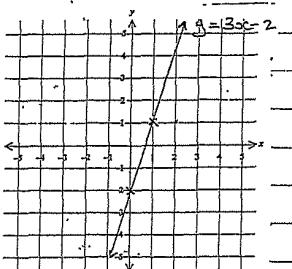
(ii)  $\frac{2}{6} = \frac{1}{3}$

(6)  $6x^2 - 12xy$

(7)  $x^2 + 3x - 2x - 6 =$

$x^2 + 1x - 6$

(8)



(9)  $x = 28 + 4$   
 $x = 32$

(10)  $3x = 36$

$x = \frac{36}{3}$

$x = 12$

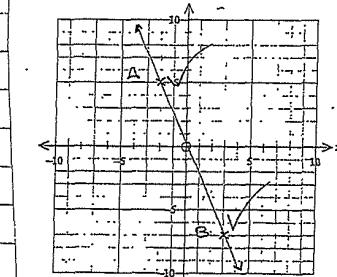
(11)  $3a - 12 = 5a + 3$

$-2a = 15$

$a = -\frac{15}{2}$

(12)  $\cos \theta = \frac{24}{26}$

$= \frac{12}{13}$



(13)

(1)

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

$M = \left( \frac{1}{2}, -1 \right)$

(14) (i) Categorical Nominal

(ii) Yellow is the more popular colour  
or Red is the least popular colour.  
(iii) survey on numerous days

(15) (i)  $A = \frac{1}{2} 14000 (1 + 3.5\%)^6$

$A = \$17209.57$

(ii) Interest =  $\$17209.57 - \$14000$   
 $= \$3209.57$

(16) (i)  $5+12+7+9 = 33 \text{ people}$

(ii)  $\frac{9}{33}$

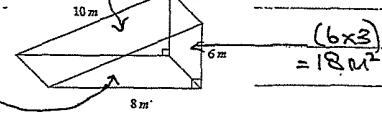
(iii)  $\frac{19}{33}$

(iv)  $\frac{5}{33}$

(20)  $A = (10 \times 3)$   
 $= 30 \text{ m}^2$

$A = \frac{1}{2}(8)(6)$

$= 24 \text{ m}^2$



$(6 \times 3)$   
 $= 18 \text{ m}^2$

Area of floor =  $8 \times 3 = 24 \text{ m}^2$

Area of right hand face =  $18 \text{ m}^2$

Area of front face =  $24 \text{ m}^2$

Area of rear face =  $24 \text{ m}^2$

Area of top face =  $30 \text{ m}^2$

Total surface area =  $120 \text{ m}^2$

END OF COMMON SECTION

Note

$y = 2x^2$  is narrower

arms are steeper

than  $y = x^2$

(19)  $4 = 3x - s$

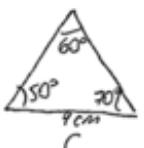
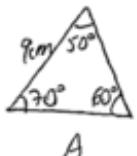
$9 = 3x$

$\frac{9}{3} = x$

$3 = x$

Question 21

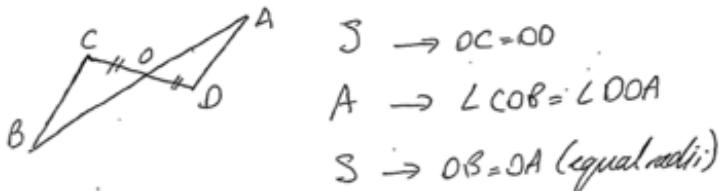
a) i)



Notice the 9cm side is opposite the 60° angle in both triangles.

ii) AAS, since the triangles have 2 common angles, and a common side length.

b.)



$\therefore$  SAS is the proof to use.

(i) Since triangles are similar, corresponding sides are in the same ratio:

$$\frac{ST}{PQ} = \frac{TR}{PR}$$

$$\frac{x}{7} = \frac{8}{6}$$

$$x = \frac{56}{6}$$

$$= \underline{\underline{28}}$$

$$21(c) \text{ ii) length ratio/enlargement factor} = \frac{8}{6} = \frac{4}{3}$$

$$\therefore \text{enlargement factor for area} = \left(\frac{4}{3}\right)^2 = \frac{16}{9}$$

$$\therefore \text{area } \triangle RTS = \frac{16}{9} \times 18$$

$$= 32 \text{ cm}^2$$

$$22(a) \quad 4x^2 - 4x - 15$$

P	(-6)
S	(-4)

$$= 4x^2 - 10x + 6x - 15$$

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

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

$$b.) \quad x^2 - 11x - 26 = 0$$

$$(x-13)(x+2) = 0$$

$$x = 13, -2$$

$$c.) \quad \text{let } y = 3^x$$

$$y^2 - 8y - 9 = 0$$

$$(y-9)(y+1) = 0$$

$$y = 9 \quad y = -1$$

$$3^x = 9 \quad 3^x = -1$$

↑ not possible, rejected

$$\therefore x = 2$$

$$22 \text{ d.) } \sqrt{3}x = \sqrt{6} + 3$$

$$\begin{aligned} x &= \frac{\sqrt{6} + 3}{\sqrt{3}} \\ &= \frac{\sqrt{6}}{\sqrt{3}} + \frac{3}{\sqrt{3}} \\ &= \sqrt{2} + \frac{3\sqrt{3}}{3} \\ &= \sqrt{2} + \sqrt{3} \end{aligned}$$

$$\begin{aligned} \text{e.) } \left( \frac{5-3\sqrt{7}}{\sqrt{3}} \right)^2 &= \frac{25 - 30\sqrt{7} + 9 \cdot 7}{3} \\ &= \frac{25 - 30\sqrt{7} + 63}{3} \\ &= \frac{88 - 30\sqrt{7}}{3} \end{aligned}$$

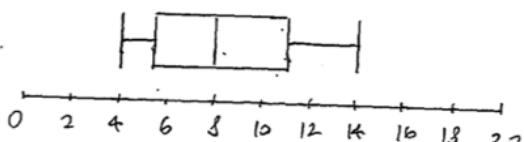
$$23 \text{ a.) i) median} = 8$$

$$\text{ii) } UQ = 11$$

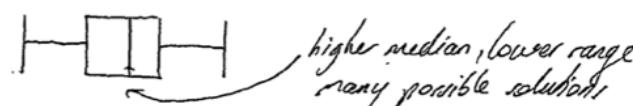
$$\text{iii) } LQ = 5.5$$

$$\begin{aligned} \therefore IQR &= 11 - 5.5 \\ &= 5.5 \end{aligned}$$

iv.)



v.)



23 b.) i) Using calculator:

$$\text{mean} = 3.1 \text{ (1.d.p.)}$$

p2

ii) standard deviation = 0.8 (1.d.p.)

iii) Yes, as the standard deviation would increase as we are adding scores that are more than the current standard deviation away from the current mean. i.e. We're adding high scores that increase the spread.

$$24.) \text{ i) } x_M = -\frac{3}{2} + 2 = \frac{1}{4}$$

$$y_M = \frac{\frac{11}{2} + 9}{2} = \frac{29}{4} \quad M\left(\frac{1}{4}, \frac{29}{4}\right)$$

$$\text{ii) gradient of } AB = \frac{9 - \frac{11}{2}}{2 - (-\frac{3}{2})}$$

$$= 1$$

∴ gradient of perpendicular = -1

$$m = -1 \text{ point } \left(\frac{1}{4}, \frac{29}{4}\right)$$

$$y - \frac{29}{4} = -1\left(x - \frac{1}{4}\right)$$

$$y - \frac{29}{4} = -x + \frac{1}{4}$$

$$x + y - \frac{30}{4} = 0 \longrightarrow$$

$$\text{Correct general form: } x + y - \frac{15}{2} = 0 \longrightarrow 2x + 2y - 15 = 0$$

24.) iii)



For D:  
need x-int  
 $y = x + 7$   
when  $y = 0$   
 $x = -7$

$$\therefore CD = 7 + 2 \\ = 9 \text{ units}$$

$$BC = 9 \text{ units}$$

$$\therefore \text{area} = \frac{1}{2} \times 9 \times 9 \\ = 40.5 \text{ u}^2$$

iv.)  $y = 2x^2 + 1$ ,  $y = x + 7$

$$2x^2 + 1 = x + 7$$

$$2x^2 - x - 6 = 0$$

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

$$x = -\frac{3}{2}, x = 2$$

when  $x = -\frac{3}{2}$

$$y = -\frac{3}{2} + 7 \\ = \frac{11}{2}$$

$$\therefore A\left(-\frac{3}{2}, \frac{11}{2}\right)$$

when  $x = 2$

$$y = 2 + 7 \\ = 9$$

$$B(2, 9)$$

25.) a.) accepted quarterly rate of  $\frac{6\%}{4} = 1.5\%$  per quarter p3

$$A = P(1+r)^n \quad r = 1.5\% \text{ per quarter} \\ n = 3 \times 4 \\ = 1800 \left(1 + \frac{6\%}{4}\right)^{3 \times 4} \\ = 1800(1.015)^{12} \\ = \$2152.11 \text{ (nearest cent)}$$

Also accepted quarterly rate of 6% p.q.

$$A = 1800(1 + 6\%)^{3 \times 4} \\ = \$3621.95$$

b.)  $A = P(1-r)^n$  want to find  $r$  when  $n=4$   
 $A = \frac{P}{2}$

$$\frac{P}{2} = P(1-r)^4$$

divide both sides by  $P$

$$\frac{1}{2} = (1-r)^4$$

$$\left(\frac{1}{2}\right)^{\frac{1}{4}} = 1-r$$

$$\left(\frac{1}{2}\right)^{\frac{1}{4}} - 1 = -r$$

$$r = 1 - \left(\frac{1}{2}\right)^{\frac{1}{4}} = 0.16 \\ = 16\% \text{ (nearest percentage)}$$

$$25 \text{ c.) i) } V = \frac{1}{3}Ah \quad A = 8 \times 8 \\ = 64 \\ h = 7.5 \\ \therefore V = \frac{1}{3} \times 64 \times 7.5 \\ = 160 \text{ cm}^3$$

$$\text{ii) } \begin{array}{l} \text{Diagram of a triangular prism with base 8 cm, height 7.5 cm, and depth 4 cm.} \\ x^2 = 7.5^2 + 4^2 \\ x = \sqrt{7.5^2 + 4^2} \\ = \sqrt{72.25} \\ = 8.5 \text{ cm} \end{array}$$

$$\text{iii) Area of base} = 8 \times 8 \\ = 64 \text{ cm}^2 \\ \text{Area of each triangular face} = \frac{1}{2} \times 8 \times 8.5 \quad (\text{start height is } 8.5 \text{ cm}) \\ = 34$$

$$\therefore \text{SA.} = 64 + 4 \times 34 \\ = 200 \text{ cm}^2$$

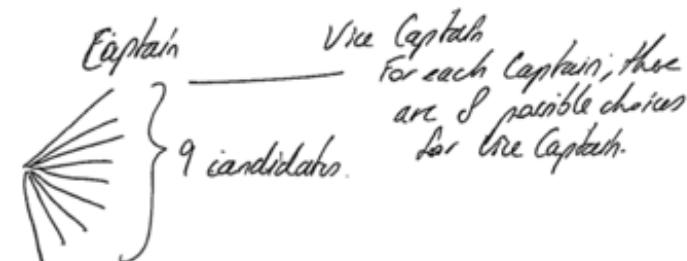
26.) a.) i) Possible outcomes:  $(4, 6), (6, 4), (5, 5), (5, 6)$   
 $(6, 5), (6, 6)$

Each has a probability of  $\frac{1}{6} \times \frac{1}{6} = \frac{1}{36}$

$$\therefore P(10 \text{ or more}) = 6 \times \frac{1}{36} \\ = \frac{1}{6}$$

$$26 \text{ a.) ii) } P(\text{at least one 5}) = 1 - P(\text{neither is 5}) \quad P^4 \\ = 1 - \left(\frac{5}{6} \times \frac{5}{6}\right) \\ = 1 - \frac{25}{36} \\ = \frac{11}{36}$$

26 b.) Consider tree diagram:



$$\therefore 9 \times 8 = 72$$

$$26 \text{ c.) } P(AAA) = \frac{4}{9} \times \frac{3}{8} \times \frac{2}{7} \\ = \frac{1}{21}$$

d.) i) 3 different possible outcomes for each light:

$$\underline{3} \times \underline{3} \times \underline{3} \times \underline{3} \times \underline{3} = 3^5 = 243$$

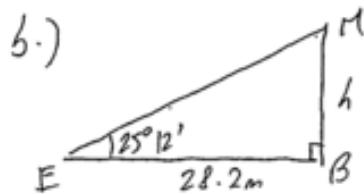
$$\text{ii) } P(\text{no red}) = \left(\frac{2}{3}\right)^5 \\ = \frac{32}{243}$$

$$26 \text{ d.) iii)} P(\text{at least 1 red}) = 1 - P(0 \text{ red}) \\ = 1 - \frac{32}{243} \\ = \frac{211}{243}$$

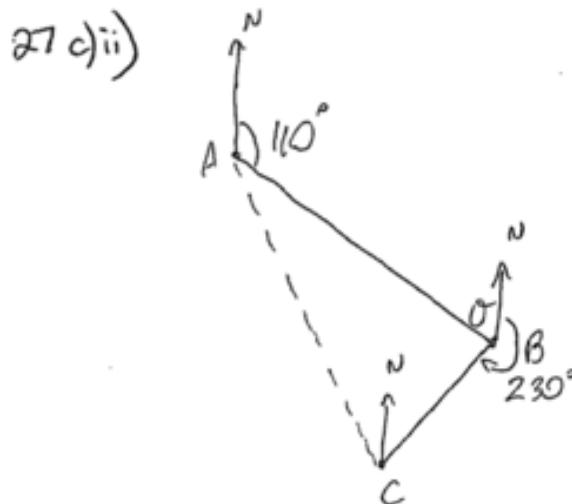
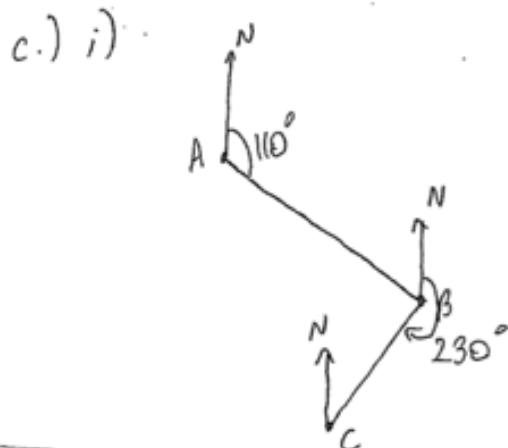
$$27 \text{ a.) } \sin \theta = 0.64$$

$$\text{acute angle} = 40^\circ$$

$$\begin{aligned}\text{obtuse angle} &= 180^\circ - 40^\circ \\ &= 140^\circ\end{aligned}\quad \theta = 40^\circ, 140^\circ$$



$$\begin{aligned}\tan 25^\circ 12' &= \frac{h}{28.2} \\ h &= 28.2 \tan 25^\circ 12' \\ &= 13.3 \text{ m (1.d.p.)}\end{aligned}$$



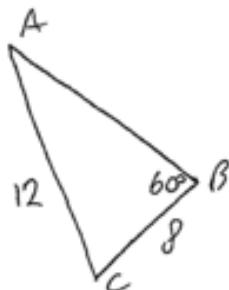
$\theta = 70^\circ$  (alternate angles of parallel NS lines)

$$\therefore \angle ABC = 360^\circ - 230^\circ - 70^\circ \\ = 60^\circ$$

we need angle BAC

$$\frac{\sin 60^\circ}{12} = \frac{\sin (\beta AC)}{8}$$

$$\sin (\beta AC) = \frac{\sin 60^\circ}{12}$$



$\therefore \angle BAC = 35^\circ$  (nearest degree)

$$\therefore \text{bearing} = 110^\circ + 35^\circ \\ = 145^\circ$$

$$28.) \text{ a.) } \log_2 32 \Rightarrow 2^? = 32 \\ ? = 5.$$

$$\text{b.) } \log_x 12 = 2 \\ x^2 = 12$$

$$\text{c.) i) } \log_x \left(\frac{5}{3}\right) = \log_x 5 - \log_x 3 \\ = 0.61 - 0.416 \\ = 0.194$$

$$\text{ii) } \log_x (9x) = \log_x 9 + \log_x x \\ = \log_x 3^2 + 1 \\ = 2\log_x 3 + 1 \\ = 2 \times 0.416 + 1 \\ = 1.832$$

$$\text{d.) i) } 3^x = \frac{1}{9} \\ 3^x = \frac{1}{3^2} \\ 3^x = 3^{-2} \\ \therefore x = -2$$

$$\text{ii) } 4^{x+1} = 8^{3x+1} \\ (2^2)^{x+1} = (2^3)^{3x+1} \\ 2^{2x+2} = 2^{9x+3} \\ 2x+2 = 9x+3 \\ 7x = -1 \\ x = -\frac{1}{7}$$

29.) a.)

$$\alpha.) \quad y = a^{-x} \\ \text{when } x = -1 \text{ or } y = 3 \\ 3 = a^1 \\ a = 3 \\ \therefore y = 3^{-x}$$

$$\text{b.) } y = (x-4)^2 + 2$$

vertex (4, 2)

concave up

no x-intercepts

$$\text{when } x = 0 \quad y = (0-4)^2 + 2 \\ = 18$$

$$\therefore y - \text{int} = 18$$

$$\text{c.) } y = a(x+6)(x+2)$$

$$\text{when } x = 0 \quad y = 3$$

$$3 = a(6)(2)$$

$$3 = 12a$$

$$\therefore a = \frac{1}{4}$$

$$y = \frac{1}{4}(x+6)(x+2)$$

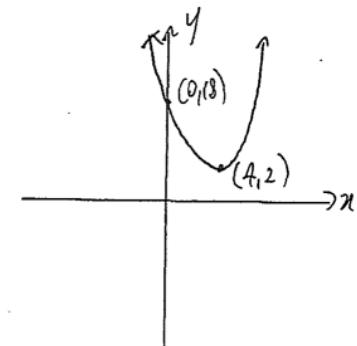
pb

$$\beta.) \quad xy = k$$

$$\text{when } x = -2 \quad y = 7$$

$$\therefore k = -14$$

$$xy = -14 \text{ or } y = \frac{-14}{x}$$



29.) d)  $y = x^2 - 8x + 6$

i)  $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$   
 $= \frac{-(-8) \pm \sqrt{(-8)^2 - 4(1)(6)}}{2(1)}$   
 $= \frac{8 \pm \sqrt{64 - 24}}{2}$   
 $= \frac{8 \pm \sqrt{40}}{2}$   
 $= \frac{8 \pm 2\sqrt{10}}{2}$   
 $= 4 \pm \sqrt{10}$

ii)  $x = -\frac{b}{2a}$  (axis of symmetry)

$$= \frac{-(-8)}{2}$$

$$= 4$$

when  $x = 4$

$$y = 4^2 - 8(4) + 6$$

$$= 16 - 32 + 6$$

vertex  $(4, -10)$

iii)  $y$  intercept is  $(0, 6)$

iv) a) to reflect across  $x$ -axis, multiply  $y$  values by  $-1$

$$y = -(x^2 - 8x + 6)$$

$$= -x^2 + 8x - 6$$

b.) to reflect across  $y$ -axis, multiply  $x$ -values by  $-1$

$$y = -x^2 + 8x - 6 \text{ is the original equation}$$

$$y = -(-x)^2 + 8(-x) - 6$$

$$= -x^2 - 8x - 6$$

30a.) i)



$$\sin 60^\circ = \frac{\sqrt{3}}{2}$$

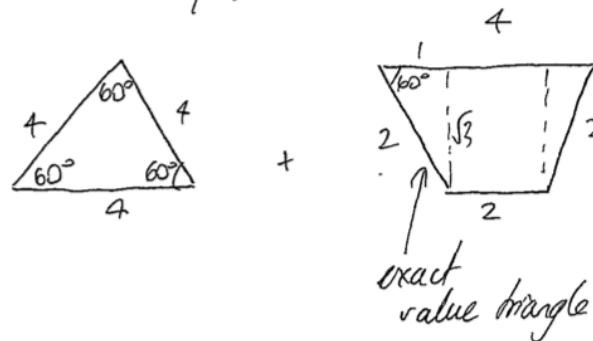
ii) a.) Interior angle sum =  $(n-2) \times 180$   
 $= (5-2) \times 180$   
 $= 540^\circ$

$$4\theta + 60 = 540$$

$$4\theta = 480$$

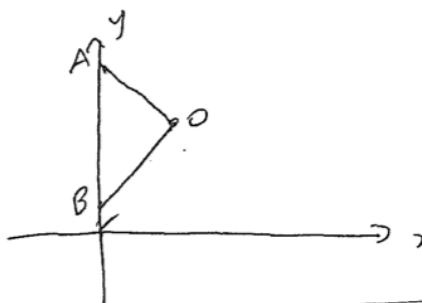
$$\theta = 60^\circ$$

30.) a.) ii) β.)



$$\begin{aligned} \text{Area} &= \frac{1}{2} ab \sin C + \text{area of trapezium} \\ &= \frac{1}{2} \times 4 \times 4 \times \sin 60^\circ + \frac{(2+4) \times \sqrt{3}}{2} \\ &= \frac{8\sqrt{3}}{2} + \frac{6\sqrt{3}}{2} \\ &= 4\sqrt{3} + 3\sqrt{3} \\ &= 7\sqrt{3} \end{aligned}$$

305.)



30b) cont

Need A and B.

$$\text{Equation of circle: } (x-2)^2 + (y-3)^2 = 3^2$$

y-intercept: when  $x=0$ 

$$(0-2)^2 + (y-3)^2 = 9$$

$$4 + (y-3)^2 = 9$$

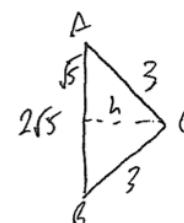
$$(y-3)^2 = 5$$

$$y-3 = \pm \sqrt{5}$$

$$y = \sqrt{5} + 3 \quad y = -\sqrt{5} + 3$$

$$\therefore A(0, \sqrt{5} + 3) \quad B(-\sqrt{5} + 3)$$

$$\begin{aligned} \therefore AB &= (\sqrt{5} + 3) - (-\sqrt{5} + 3) \\ &= 2\sqrt{5} \end{aligned}$$



$$\begin{aligned} h &= \sqrt{3^2 - 2\sqrt{5}^2} \\ &= \sqrt{9-20} \\ &= \sqrt{-11} = 2 \end{aligned}$$

$$\begin{aligned} \therefore A &= \frac{1}{2} \times 2\sqrt{5} \times 2 \\ &= 2\sqrt{5} u^2 \end{aligned}$$