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| High School | |
| Half Yearly  Examination | |
| 2015  Year 10  Advanced  Mathematics Course | |
| **General Instructions**   * Reading time: 5 minutes * Working time: 2 hours * There will be a short break between Section 1 and Section 2 * Write using black or blue pen * You may use a pencil to draw or complete diagrams * Attempt ALL questions * Approved calculators may be used in Section 2. * Write your Name and Teacher’s Name in the spaces provided. * A formula Sheet is on the reverse of this page and can be detached and used in all sections of the test. | **Total Marks – 100**  **Section 1**  Non Calculator Section.  **25 marks**  Time allowed for this section is 30 minutes.  Write all answers in the spaces provided.  **Section 2**  Time allowed for this section is 1 hour and 30 minutes.  **Part A**  Multiple Choice Section.  Mark your answers on the separate answer sheet at the end of the examination.  **50 marks**  **Part B**  Longer Answer Section.  Write all answers in the spaces provided.  **25 marks** |

Formula Sheet

**Pythagoras’ Theorem**



*c* = hypotenuse

*a* and *b* are the shorter sides

**Circumference of a circle**



*d* = diameter

**Area of a circle**



*r* = radius

**Area of a parallelogram**



*b* = base

*h* = perpendicular height

**Area of a rhombus or kite**



*x* and *y* are the diagonals

**Area of a trapezium**



*h* = perpendicular height

*a* and *b* are the parallel sides

**Volume of a prism**



*A* = area of base

*h* = perpendicular height

**Volume of a pyramid**



*A* = area of base

*h* = perpendicular height

**Volume of a cylinder**



*r* = radius

*h* = perpendicular height

**Volume of a cone**



**Volume of a sphere**



**Surface Area of a Cylinder**



**Surface Area of Cone**



*r* = radius

*l* = slant height

**Surface Area of a sphere**



**Trigonometric formulae for a triangle ABC.**

**Sine Rule**



**Cosine Rule**



or



**Area of a triangle**



**Simple interest**



*P* = Principal

*R* = interest rate per time period as a decimal

*T* = number of time periods

**Compound Interest**



*A =* Final amount to which the investment grows

*P* = Principal

*r* = interest rate per compounding period as a decimal

*n* = number of compounding periods

**Depreciation**



*SV =* Salvage Value to which the initial value falls

*IV* = Initial Value

*r* = depreciation rate per compounding period as a decimal

*n* = number of compounding periods

**Gradient of a line**



 and  are points on the line

*m* = gradient

**Midpoint of a line segment**



**Length of a line segment**



**Equation of a line**



or



*b* = *y* intercept

Half Yearly Examination

**Advanced Mathematics**

Class/Teacher \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Section 1**

**25 marks**

Time allowed for this section is 30 minutes

Answer Questions 1–25 in the spaces provided.

Calculators are **NOT** to be used in this section.

There will be a short break between Section 1 and Section 2.

|  |  |
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| **Section 1** Non Calculator Section | |
|  | Write all working and answers in the spaces provided on this test paper.  Diagrams are not to scale, unless otherwise stated. |
| 1. | Find the value of  …………………………………………………………………………………………………  ………………………………………………………………………………………………… |
| 2. | …………………………………………………………………………………………………  ………………………………………………………………………………………………… |
| 3. | In a bulk store, cereal costs $3.85 per kilogram.  Adrian buys 0.8 kg of this cereal.  What does it cost, to the nearest 5 cents?  …………………………………………………………………………………………………  ………………………………………………………………………………………………… |
| 4. | Zena works delivering catalogues.  On one weekend she earned $192.00 for delivering 800 catalogues.  How much was she paid for each catalogue that she delivered?  …………………………………………………………………………………………………  ………………………………………………………………………………………………… |
| 5. | Nathan buys a games console which is normally priced at $280, and is given a 30% discount.  How much does he pay for the console?  …………………………………………………………………………………………………  ………………………………………………………………………………………………… |
| 6. | Beau pays a photographer to take some portraits of his family.  The photographer charges $80 per hour plus 10% GST.  The photographer works for 2.5 hours to take the portraits.  What will Beau have to pay the photographer?  …………………………………………………………………………………………………  ………………………………………………………………………………………………… |
| 7. | In a gathering of company employees there are 6 accountants, 12 clerical assistants and 2 designers.  What is the ratio of clerical assistants to other employees? (Answer in simplest form.)  …………………………………………………………………………………………………  ………………………………………………………………………………………………… |
| 8. | What is the value of *x* in the diagram?  ……………………………………………  ……………………………………………………  …………………………………………………  ……………………………………………… |
| 9. | Which two words from those in the box could be used to describe  Acute Obtuse Right  Equilateral Isosceles Scalene  ………………………………………………  ……………………………..……………….. |
| 10. | The quadrilateral EFGH is a kite.  What is the size of  ………………………………………………  ………………………………………………  ………………………………………………  ……………………………………………… |
| 11. | A Cougar sedan is 3.2 metres in length.  A Cougar coupe is 40 cm shorter than the sedan.  How long is the coupe? (Answer to the nearest 10th of a metre)  …………………………………………………………………………………………………  ………………………………………………………………………………………………… |
| 12. | What is the perimeter of the polygon shown?  ………………………………………………  ………………………………………………  ………………………………………………  ……………………………………………… |
| 13. | A flag is in the shape of a triangle as shown.  What area of fabric is needed for the flag?  ………………………………………………  ………………………………………………  ………………………………………………  ……………………………………………… |
| 14. | A concrete tile is in the shape of a rectangular prism with the dimensions shown.  How many cubic metres of concrete is needed to make 500 of these tiles?  (1 cubic metre = 1 000 000 cm3)    ………………………………………………  ………………………………………………  ………………………………………………  ……………………………………………… |
| 15. | Yvonne takes a shortcut along the path through the centre of the park from V to X.  How many metres does she save, compared to walking around the outside through W?  ………………………………………………  ………………………………………………  ………………………………………………  ……………………………………………… |
| 16. | Simplify  …………………………………………………………………………………………………  ………………………………………………………………………………………………… |
| 17. | Simplify  …………………………………………………………………………………………………  ………………………………………………………………………………………………… |
| 18. | Expand and simplify  …………………………………………………………………………………………………  ………………………………………………………………………………………………… |
| 19. | What is the midpoint of the interval joining the points *A*( , 4) and *B*( , ) on the number plane?  ………………………………………………  ………………………………………………  ………………………………………………  ……………………………………………… |
| 20. | …………………………………………………………………………………………………  ………………………………………………………………………………………………… |
| 21. | Find the value of *m* if  …………………………………………………………………………………………………  ………………………………………………………………………………………………… |
| 22. | In Jacks bag of marbles, there are 19 catseyes, 16 aggies and 5 glassies.  If Jack chooses one marble at random from his bag, what is the probability that it is an aggie?  …………………………………………………………………………………………………  ………………………………………………………………………………………………… |
| 23. | The heights (in metres) of a group of family members is listed below.  1.65, 0.95, 1.84, 1.32, 1.45, 0.87, 1.88, 1.24, 1.35, 1.75.  What is the median height of the group?  …………………………………………………………………………………………………  ………………………………………………………………………………………………… |
|  | **Questions 24 and 25 refer to the graph below.**    The Harriers Club holds a fete every two years. The graph shows the profit from the fete over a number of years. |
| 24. | Between which two years was the biggest increase in profit from one fete to the next?  …………………………………………………………………………………………………  ………………………………………………………………………………………………… |
| 25. | Mark will be in charge of the 2017 fete and he sets a goal of beating the current record profit by 10%.  To meet Marks Goal, how much more does the fete need to make in 2017, than it did in 2015?  …………………………………………………………………………………………………  ………………………………………………………………………………………………… |
|  | **End of Section 1** |

Half Yearly Examination

**Advanced Mathematics**

**Section 2**

**75 marks**

Time allowed for this section is

1 hour and 30 minutes

This section has TWO parts

Part A – Fifty multiple-choice questions worth 1 mark each.

Mark your answers on the separate answer sheet provided at the end of the examination.

Part B – Longer answer questions worth a total of 25 marks.

Write all answers and working in the spaces provided on this examination paper.

Calculators may be used in this section.

Do not commence Section 2 until you are instructed to do so.

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|  | **Section 2**  **Part A**  Multiple Choice Section |
|  | Use the multiple choice answer sheet at the end of the paper to record your answers.  Completely shade the bubble corresponding to the correct answer for each question. |
|  | Which of the following is the prime factorisation of 540?  A.  B.  C.  D. |
|  | Xanthe is a salesperson who is paid a retainer of $700 per week plus 5% of her sales up to and including $4 000 and 2% of her sales over $4 000.  What would she earn in a week where her sales totalled $6 500?  A. $750 B. $850 C. $950 D. $1 050 |
|  | Liam buys a motorbike by paying a $750 deposit and making monthly payments of $281.25 for 4 years.  The cash price for the bike was $12 000.  How much interest did he pay in buying the bike this way?  A. $1 500 B. $1 750 C. $2 000 D. $2 250 |
|  | Dion borrows $3 250 from his parents and three years later he pays them back $3 835, which is the money he borrowed plus interest.  What annual rate of simple interest did he pay?  A. 5.5% B. 6.0% C. 6.5% D. 7.5% |
|  | Will has 63 pieces of clothing that he wants to donate to charity.  He gives them to Anglicare and Vinnies in the ratio 4 : 3.  How many pieces does Anglicare receive?  A. 9 pieces B. 18 pieces C. 27 pieces D. 36 pieces |
|  | Find the value of *q*.  NOT  TO  SCALE  A. *q* = 13 B. *q* = 48  C. *q* = 77 D. *q* = 103 |
|  | In the diagram which pair of triangles are **not** congruent?  A.  B.  C.  D. |
|  | In the diagram  A proof that *x* = 65 has been completed with no reasons provided.  Which of these reasons is not used in this proof?  A. Angle sum of a triangle.  B. Angle sum of a quadrilateral.  C. Base angles of isosceles triangle are equal.  D. Sum of adjacent angles. |
|  | What is the sum of the interior angles of a heptagon (seven sided polygon)?    A. 540o B. 720o  C. 900o D. 1 080o |
|  | There is 11 300 cm3 of liquid in this cylindrical tank.  What is the depth of the liquid?  A. 4 cm  B. 12 cm  C. 16 cm  D. 25 cm |
|  | What is the surface area of the solid shown?  A. 580 cm2  B. 860 cm2  C. 880 cm2  D. 920 cm2 |
|  | What is the volume of the solid shown?  A. 7.2 m3  B. 12.0 m3  C. 14.4 m3  D. 16.8 m3 |
|  | What is the size of angle *B*, to the nearest degree?    A. 37o  B. 40o  C. 50o  D. 53o |
|  | What is the value of *g*, correct to 1 decimal place?    A. 8.4 m  B. 9.3 m  C. 10.3 m  D. 11.3 m |
|  | What is the bearing of *P* from *Q* in the diagram?  A. 133o  B. 137o  C. 227o  D. 313o |
|  | Fully factorise  A.  B.  C.  D. |
|  | What is the equation of the line shown?  A.  B.  C.  D. |
|  | Which point does not lie on the line  ?  A. (-2, 0) B. (1, 2) C. (2, 3) D. (4, 4) |
|  | A.  B.  C.  D. |
|  | A.  B.  C.  D. |
|  | Questions 71 – 73 refer to the stem and leaf plot below.   |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  | 1 | 1 | 4 | 6 |  |  |  |  | |  |  |  |  |  | 2 | 2 | 5 | 6 | 7 | 8 |  |  | |  |  |  |  |  | 3 | 0 | 2 | 3 | 5 | 6 | 6 | 9 | |  |  |  |  |  | 4 | 2 | 4 | 7 | 9 |  |  |  | |  |  |  |  |  | 5 | 3 | 5 |  |  |  |  |  |   The sum of all the scores in the plot is 700. |
|  | What is the mean of the scores?  A. 32½ B. 33⅓ C. 36 D. 140 |
|  | What is the median of the scores in the plot?  A. 33 B. 35 C. 36 D. 44 |
|  | What is the interquartile range of the scores?  A. 17.5 B. 25.5 C. 43 D. 44 |
|  | Questions 74 and 75 refer to the frequency histogram below. |
|  | Which term could be used to describe the shape of the distribution?  A. Bimodal B. Negatively skewed  C. Positively Skewed D. Unimodal |
|  | Which measures would be equal?  A. The mean and the mode.  B. The mean and the range.  C. The mode and the median.  D. The median and the mean. |
|  | Eddie invests $2 500 for five years in an account paying 6.4% pa interest, compounding annually.  How much interest will he earn in that time?  A. $800.00 B. $909.17 C. $934.11 D. $939.89 |
|  | A new car, once purchased, loses value at 12% p.a.  Oliver buys a new car for $24 000.  What will be its value in three years’ time? (Answer to the nearest dollar)  A. $14 393 B. $15 360 C. $16 355 D. $23 959 |
|  | A.  B.  C.  D. |
|  | A.  B.  C.  D. |
|  | Simplify  A.  B.  C.  D. |
|  | What is the value of *x*?  A. *x* = 10 B. *x* = 20 C. *x* = 40 D. *x* = 50 |
|  | *PR* is a diameter of the circle, centre *O*.  Q is a point on the circumference such that  Find the value of *x*.  A. *x* = 21  B. *x* = 24  C. *x* = 42  D. *x* = 48 |
|  | *ABCD* is a trapezium and    Find the area of the trapezium *ABCD*.  A. 306 cm2 B. 382.5 cm2 C. 612 cm2 D. 765 cm2 |
|  | A mountain rises 800 m above a horizontal plain.  The mountain has a cross section which is an isosceles triangle with a base which is 1.2 km across.  An observer at *A,* on the plain, views the top of the mountain at an angle of elevation of 34o.  How far is the observer from the base of the mountain, *B*?  A. 540 m  B. 586 m  C. 660 m  D. 1186 m |
|  | A domed roof on a building is in the shape of a hemisphere with a diameter of 20 metres.  What is the surface area of the dome?  A. 212 m2  B. 424 m2  C. 628 m2  D. 1 256 m2 |
|  | A regular octahedron is formed by joining two square pyramids base to base.  The pyramids have base edges of 6 cm and a perpendicular height of  What is the volume of the octahedron?  A.  B.  C.  D. |
|  | A.  B.  C.  D. |
|  | Completely factorise  A.  B.  C.  D. |
|  | A.  B.  C.  D. |
|  | The line is shown on the number plane.  What is the simultaneous solution of and  A. (0, 4) B. (3, 6) C. (4½, 7) D. (12, 12) |
|  | Solve the equation  A.  B.  C.  D. |
|  | Find the exact solutions to the equation  A.  B.  C.  D. |
|  | **Questions 68 and 69 refer to the following graph.**  The graph below shows the air pressure outside an aircraft as it completes a journey.  Air pressure is lower at higher altitudes.  The start and end of the aircraft’s journey are both close to sea level. |
|  | If the aircraft departed at 10:50 am, at what times did the outside air pressure reach 40 kPa?  A. 11:05 am and 12:15 pm  B. 11:05 am and 12:25 pm  C. 11:10 am and 12:15 pm  D. 11:10 am and 12:25 pm |
|  | Which best explains the change in air pressure during the journey?  A. The aircraft climbs at a slow rate from sea level to an altitude where the air pressure is much lower, remains around this altitude for a few minutes only and then descends at a similar slow rate till it is again close to sea level.  B. The aircraft climbs at a gradual rate from sea level to an altitude where the air pressure is much lower, remains around this altitude for just over an hour and then returns at the same gradual rate till it is again close to sea level.  C. The aircraft climbs at a gradual rate from sea level to an altitude where the air pressure is much lower, remains around this altitude for just over an hour and then descends quickly till it is again close to sea level.  D. The aircraft climbs quickly from sea level to an altitude where the air pressure is much lower, remains around this altitude for just over an hour and then descends at a more gradual rate till it is again close to sea level. |
|  | Which graph could represent the equation    A. B.  C. D. |
|  | **Questions 71 and 72 refer to the Venn diagram below.**  The Venn diagram shows three aspects of students in year 10.    One student is chosen at random from the students in year 10. |
|  | What is the probability that the person plays sport and music, but does not have a job?  A.  B.  C.  D. |
|  | What is the probability that the person does not play music?  A.  B.  C.  D. |
|  | A results of a survey of the heights of 200 people are summarised in the box plot below.  How many people were between 1.5 m and 1.95 m in height?  A. 25 B. 50 C. 75 D. 150 |
|  | What is the standard deviation of the scores shown on the dot plot below (correct to 3 significant figures)?   |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  |  |  |  |  |  | ● |  |  |  |  |  |  | |  |  |  |  |  | ● | ● | ● |  |  |  |  |  | |  |  |  |  | ● | ● | ● | ● | ● |  |  |  |  | |  |  |  | ● | ● | ● | ● | ● | ● | ● |  |  |  | |  |  | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |  | |  |  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |   A. 2.05 B. 2.18 C. 3.00 D. 14.2 |
|  | The Berries and the Bears have played the same number of games in an Australian football competition.  The mean and standard deviation of the points scored in each game by both teams so far in the competition are shown below.   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | |  | Team | | Mean | | Standard Deviation | |  | Berries | 65.9 | | 28.5 | | |  | Bears | 66.1 | | 16.2 | |   Which is **not true** based on the analysis above?  A. Both teams score around the same average number of points in each game.  B. The Berries are likely to have more scores higher than 90 than the Bears.  C. The Bears are likely to have more scores between 50 and 85 than the Berries.  D. The Bears are likely to have more scores lower than 38 than the Berries. |
|  | **End of Section 2**  **Part A** |

|  |  |  |
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| **Section 2**  **Part B**  Longer Answer Section | | Name : \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Class/Teacher\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
|  | Write all working and answers in the spaces provided on this examination paper.  Calculators are allowed for this section. | |

|  | | **Marks** |
| --- | --- | --- |
| 76. | Express  as a single fraction with a rational denominator  .…………………………………………………………………….…………………….  ……………………………………………………………………………..……………  …………………………………………………………………….……………………  …….…………………………………………………………………..………………..  …………………………………………………………………….………………… | **3** |
| 77. | A right cone has the dimensions shown. |  |
|  | 1. Show that   ……………………………………………………………………………..……………  …………………………………………………………………….……………………  …….…………………………………………………………………..……………….. | **1** |
|  | (b) Calculate the volume of the cone, correct to 3 significant figures.  ……………………………………………………………………………..……………  …………………………………………………………………….……………………  …….…………………………………………………………………..……………….. | **1** |
|  | (c) Find the exact surface area of the cone.  ……………………………………………………………………………..……………  …………………………………………………………………….……………………  …….…………………………………………………………………..……………….. | **1** |
| 78. | Two aircraft leave airport A. Aircraft B flies on a bearing of 120o for a distance of 2 500 km and aircraft C flies on a bearing of 155o for a distance of 1 380 km.  At this time, B is due east of C. |  |
|  | (a) Given that D is a point due south of A and due west of both B and C, find the distance DC (to the nearest km).  ……………………………………………………………………………..……………  …………………………………………………………………….……………………  …….…………………………………………………………………..……………….. | **1** |
|  | (c) Calculate the distance between the aircraft B and C (to the nearest km).  ……………………………………………………………………………..……………  …………………………………………………………………….……………………  …….…………………………………………………………………..……………….. | **2** |
| 79. | Michael invests $8 600 that he got from selling his car into an account that pays 7.2% pa interest compounding monthly.  How much interest will he have earned after 2½ years?  ……………………………………………………………………………..……………  …………………………………………………………………….……………………  …….…………………………………………………………………..……………….. | **2** |
| 80. | (a) Expand .  …………………………………………………………………….……………………  …….…………………………………………………………………..……………….. | **1** |
|  | (b) Factorise .  ……………………………………………………………………………..……………  …………………………………………………………………….…………………… | **1** |
|  | (c) Simplify completely:  .  ……………………………………………………………………………..……………  …………………………………………………………………….……………………  …….…………………………………………………………………..………………..  …….…………………………………………………………………..………………..  …….…………………………………………………………………..……………….. | **2** |
| 81. | (a) Given that twice the square of a number is five more than nine times the number, what possible values can the number take?  ……………………………………………………………………………..……………  ……………………………………………………………………………..……………  …………………………………………………………………….……………………  …….…………………………………………………………………..……………….. | **2** |
|  | (b) Solve  , correct to two decimal places.  ……………………………………………………………………………..……………  ……………………………………………………………………………..……………  …………………………………………………………………….……………………  …….…………………………………………………………………..……………….. | **2** |
| 82. | Draw a neat sketch of  , showing all *x* and *y* intercepts and the position of the vertex.  ……………………………………………………………………………..……………  …………………………………………………………………….…………………… | **3** |
| 83. | (a) The grouped frequency table below gives the results of the year 10 students at Mystic High School on a test out of a possible 30 marks.  Complete the class centres in the table.   |  |  |  |  | | --- | --- | --- | --- | |  | Group | Class Centre | Frequency | |  | 1 – 6 |  | 7 | |  | 7 – 12 |  | 12 | |  | 13 – 18 |  | 17 | |  | 19 – 24 |  | 15 | |  | 25 – 30 |  | 9 | |  |  |  | 60 | | **1** |
|  | (b) Use the class centres and frequencies to estimate the mean and standard deviation (correct to 2 decimal places) for the set of data.  ……………………………………………………………………………..……………  …………………………………………………………………….……………………  …….…………………………………………………………………..……………….. | **1** |
|  | (c) St Brigitte’s College, also with 60 year 10 students, had a mean of 16.2 and a standard deviation of 3.45 on the same test.  Compare the results of the two schools.  ……………………………………………………………………………..……………  …………………………………………………………………….……………………  …….…………………………………………………………………..……………….. | **1** |
|  | **End of Examination** |  |

High School

Half Yearly Exam

Advanced Mathematics Course

Multiple Choice Section Answer Sheet

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Teacher \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Completely fill the response oval representing the most correct answer.

26. A B C D

27. A B C D

28. A B C D

29. A B C D

30. A B C D

31. A B C D

32. A B C D

33. A B C D

34. A B C D

35. A B C D

36. A B C D

37. A B C D

38. A B C D

39. A B C D

40. A B C D

41. A B C D

42. A B C D

43. A B C D

44. A B C D

45. A B C D

46. A B C D

47. A B C D

48. A B C D

49. A B C D

50. A B C D

51. A B C D

52. A B C D

53. A B C D

54. A B C D

55. A B C D

56. A B C D

57. A B C D

58. A B C D

59. A B C D

60. A B C D

61. A B C D

62. A B C D

63. A B C D

64. A B C D

65. A B C D

66. A B C D

67. A B C D

68. A B C D

69. A B C D

70. A B C D

71. A B C D

72. A B C D

73. A B C D

74. A B C D

75. A B C D