

# Mathematics Standard 2

## HSC Marking Feedback 2019

### Question 16

**Students should:**

- identify the correct values to substitute into the appropriate volume of a sphere formula selected from the Reference Sheet
- clearly show every step of the process in calculating the volume of the hemisphere.

**In better responses, students were able to:**

- use the value of the radius rather than the diameter
- half the calculated volume of the sphere to find the volume of the hemisphere
- persevere in their calculation and not stop in the middle of the process.

**Areas for students to improve include:**

- identifying the correct formula from the reference sheet
- showing all correct substitutions
- understanding the term 'hemisphere'.

### Question 17

**Students should:**

- understand the difference between significant figures and decimal places when rounding numbers
- use the correct trigonometric formula appropriate to non-right angled triangles
- show all relevant working.

**In better responses, students were able to:**

- apply the cosine rule showing detailed processes to find the length of the side  $x$
- interpret the reasonableness of their solution to then find the square root
- round their answer correctly to 2 significant figures.

**Areas for students to improve include:**

- rounding values to correct significant figures
- substitute correctly into the correct formula
- checking for reasonableness of their solution from the given diagram.

## Question 18

**In better responses, students were able to:**

- write the ratio using correct notation and original values, in correct order
- simplify the ratio fully
- use the ratio to find the total runs scored by the team (b).

**Areas for students to improve include:**

- writing ratios in the correct order
- understanding that simplified ratios do not involve decimal or fractional values
- differentiating between dividing a quantity in a given ratio to using a ratio for a calculation.

## Question 19

**Students should:**

- address the key words 'justify your answer with calculations'
- know to apply the mathematical concept of an outlier to determine whether the shortest member was an outlier.

**In better responses, students were able to:**

- correctly find the upper and lower quartiles and calculated the interquartile range
- apply the formula to determine the boundary for an outlier
- draw an accurate conclusion from their calculation.

**Areas for students to improve include:**

- understanding the difference between range and interquartile range
- acknowledging the outlier condition (from Reference Sheet) and how to apply it
- remembering to draw a conclusion.

## Question 20

**In better responses, students were able to:**

- calculate the correct probability
- multiply a probability by 18 500 to find the expected frequency.

**Areas for students to improve include:**

- reading the question carefully to understand there are 37 outcomes
- understanding that the number 8 was an outcome and not part of the probability result.

## Question 21

**In better responses, students were able to:**

- understand the terms 'dividend' and 'percentage dividend yield'.

**Areas for students to improve include:**

- remembering the dividend yield formula  $\frac{\text{dividend}}{\text{value of shares}}$
- calculating the dividend as a percentage.

## Question 22

**In better responses, students were able to:**

- find  $AC$  by using either Pythagoras theorem or the cosine rule
- use right-angled trigonometry ( $\cos \theta = \frac{A}{H}$ ) to find  $\theta$ .

**Areas for students to improve include:**

- remembering to square root their answer when using Pythagoras' theorem or the cosine rule
- practising with two triangles of different orientations and identifying the correct trig ratio
- avoiding rounding too soon when solving problems with several steps
- understanding that if angles are alternate then the appropriate parallel lines would have been marked on the diagram.

## Question 23

**Students should:**

- practice calculating Pearson's correlation coefficient
- understand the difference between skewness and correlation.

**In better responses, students were able to:**

- calculate the correct coefficient
- use terminology involving both strength and direction.

**Areas for students to improve include:**

- accurately substituting the data presented in the graph into their calculator
- only rounding answers that need to be rounded (c).

## Question 24

**In better responses, students were able to:**

- make one of the conversions, such as kilojoules to kilocalories or kilocalories/km to kilojoules/km.

**Areas for students to improve include:**

- solving using actual conversions rather than using guess and check as it is not reliable enough
- identifying the difference between kilojoules and kilocalories.

## Question 25

**In better responses, students were able to:**

- determine the probabilities of drawing one and then a second apple in a non-replacement scenario
- draw a useful probability tree and use it to answer the question
- understand the concept of two-stage probability involving non-replacement.

**Areas for students to improve include:**

- understanding when to add and when to multiply in probability
- practising labelling tree diagrams with consistency
- showing working as a bald answer here was awarded only one mark since this was one of the initial probabilities.

## Question 26

**Students should:**

- understand the difference between the minimum time and the duration of the activities in the non-critical path of a network diagram
- clearly label the activities with the correct EST, EFT and/or duration
- be consistent in labelling their network diagram, either the activities are in the nodes or on the edges
- understand how the float time for an activity is calculated (b).

**In better responses, students were able to:**

- draw a network diagram connecting the appropriate activities and their corresponding weight from their predecessors
- show by calculation that the float time is the difference between LST and EFT (b).

**Areas for students to improve include:**

- being consistent in the positioning of their weights and activities in their diagrams either as part of the node or on the edge
- checking they include all activities and their weights in their response
- knowing that the minimum time is the time required to complete all activities not the lowest time on their path.

## Question 27

**Students should:**

- read the question carefully as to whether simple or compound interest is required
- be able to recognise when their answer makes sense in relation to the question.

**In better responses, students were able to:**

- convert yearly rates to daily rates

- calculate a correct compound interest rate for the time period.

**Areas for students to improve include understanding:**

- that the number of days for credit card interest being inclusive of the end days (this was stated in the question)
- the term 'minimum payment', then continuing to perform further operations on their answer.

## Question 28

**Students should:**

- practise conversions of time from a decimal to hours and minutes
- be familiar with Year 11 content to understand the use of a variety of formulae and variables (such as in the given BAC formula) .

**In better responses, students were able to:**

- calculate the number of standard drinks
- divide by 0.015 and convert this result to hours and minutes as required.

**Areas for students to improve include:**

- avoiding rounding too early and giving answers that are truncated
- showing all working steps clearly, so an earlier error can be tracked
- making sure they finish the question by calculating the time asked for in the question.

## Question 29

**In better responses, students were able to:**

- calculate GST
- calculate the value of  $A + B = \$16.70$  or calculate  $B$  from an incorrect  $A$ .

**Areas for students to improve include:**

- using the GST given in a question to calculate the cost of the chocolates
- knowing whether the value of  $A$  should include the cost of the GST in the receipt.

## Question 30

**In better responses, students were able to:**

- show the minimum spanning tree
- interpret the closed section of the network and give a clear guideline of where they were going
- highlight the minimum spanning tree on the question which was helpful for them to successfully transfer this to the answer box
- use the diagram to cross out path  $CH$  to obtain a visual understanding of what was being asked (b).

**Areas for students to improve include:**

- applying Prim's algorithm correctly to find the minimum spanning tree
- being able to supply some form of spanning tree which is a minimum.

**Question 31****Students should:**

- understand the difference between  $18 \text{ cm}^2$  and  $18^2$
- review how the model being considered relates to the graph given.

**In better responses, students were able to:**

- successfully explain that the values below the  $x$ -axis and to the left of the  $y$ -axis related to a negative width or area, which was not possible
- relate the model to the graph of a parabola
- use guess and check (into  $18 = 2w^2 + 5w$ ) to find the width
- identify  $(2, 18)$  on the parabola and established the link between the graph and the model.

**Areas for students to improve include:**

- using correct mathematical terminology or notation
- writing brief explanations
- identifying what the variables refer to (in this case width and area of a rectangle).

**Question 32****In better responses, students were able to:**

- find the taxable income by acknowledging that given 2% they needed to find 100% by either dividing the Medicare Levy by 0.02 or using the unitary method
- identify the correct line in the tax table and find the tax payable.

**Areas for students to improve include:**

- reviewing the terms Medicare Levy and taxable income
- given a percentage of the total amount, being able to find the total amount
- understanding how to use the tax table and when to add and when to multiply.

**Question 33****Students should:**

- show their working (a) and clearly indicate coordinates on the grid (b)
- read the question to identify what is to be included for their answer
- use a ruler only to complete a line and not for drawing a parabola.

**In better responses, students were able to:**

- identify they needed to use  $\text{Speed} = \frac{\text{Distance}}{\text{Time}}$  to solve the question
- plot four points and sketch the correct curve smoothly.

**Areas for students to improve include:**

- looking for the easiest method to solve the problem
- plotting the minimum number of points required
- understanding that more than one point is needed to sketch a curve.

### Question 34

**In better responses, students were able to:**

- use rise/run correctly to find  $\frac{4}{7}$  (a)
- with a non-attempt or incorrect answer for (a), complete the two-step conversion required in (b).

**Areas for students to improve include:**

- writing a direct variation equation with/without the template provided
- ensuring they read the question to understand that a 'fraction' was required rather than a decimal approximation.

### Question 35

**Students should:**

- be able to identify the correct formula from the reference sheet for an area
- understand a compass radial survey has its directions given as bearings
- use all the information given in the question.

**In better responses, students were able to:**

- find the angle by rearranging the area of a triangle formula and add to 1250
- round the angle correct to the nearest degree.

**Areas for students to improve include:**

- understanding that 'Not to Scale' means the angles are not exact in the diagram
- solving the area of a non-right angle triangle to find an unknown value
- interpreting the diagram to find a bearing from calculated values.

### Question 36

**Students should know how to:**

- interpret a graph to find a point of intersection, the gradient and y-intercept and how to calculate the relevant equations from this information
- solve linear equations that involve brackets.

**In better responses, students were able to:**

- correctly find the point of intersection from a graph (a)
- show their method to find gradients from the graph
- clearly identify that  $\text{Profit} = \text{Revenue} - \text{Cost}$ .

**Areas for students to improve include:**

- understanding how to find profit from cost and revenue
- reading and using the correct scale from the given graph
- showing their method of finding gradients from graphical methods.

### Question 37

**In better responses, students were able to:**

- determine the depreciation rate using either the declining-balance formula or by first calculating the depreciation between consecutive years
- use a formula rather than the longer year by year depreciation per annum to avoid stopping too soon, at 9 years, or continue past to 11 years.

**Areas for students to improve include:**

- solving the equation to find the rate after substitution
- calculating the rate using values from a table
- understanding the difference between the  $V_0$  and  $S$  values.

### Question 38

**Students should:**

- appreciate that  $z$ -score questions usually involve either a formula or a diagram, both of which are given on the Reference Sheet.

**In better responses, students were able to:**

- present a normal curve or  $z$ -score number line and realise that 95% meant 2 standard deviations from the mean
- successfully determine the  $z$ -score once they got the standard deviation as 700.

**Areas for students to improve include:**

- substituting the correct values into a formula including the denominator
- understanding that 95% is not the standard deviation
- interpreting whether a question requires a  $z$ -score or a standard deviation.

### Question 39

**Students should:**

- know how to draw an accurate box-plot
- realise that a comparison involves explanations supported by relevant calculations.



**In better responses, students were able to:**

- calculate a correct comparison of range and/or *IQR*
- draw a box-plot with correct values for  $Q_1$ ,  $Q_2$  and  $Q_3$ .

**Areas for students to improve include:**

- understanding that the median is the only measure of central tendency given in a box-plot not the mean
- making comparisons of central tendency, spread and skewness and doing calculations are required, not just stating values with no explanation.

## Question 40

**Students should:**

- practise applications of minimum cuts in a range of applications.

**In better responses, students were able to:**

- realise that the direction of the flow determined if it was included in capacity cuts
- write a realistic recommendation.

**Areas for students to improve include:**

- drawing the minimum cut (b)
- interpreting the impact of a cut
- understanding the terms 'minimum cut' and 'maximum outflow'.

## Question 41

**Students should:**

- understand what is required in a 'show' question.

**In better responses, students were able to convert the:**

- speed into metres/60 minutes and did a  $s = \frac{d}{t}$  calculation, then linked the distance to 5 cm on the diagram
- diagram lengths to actual lengths before attempting to find the area.

**Areas for students to improve include:**

- using speed to calculate distance travelled in 10 minutes and relating this back to the diagram given
- using units such as 1 cm = 2 min rather than the distance ie 5 squares so 500 m
- converting 20 mm to 0.02 m for volume calculations or cm to m<sup>3</sup> (b)
- using the formula that was asked for in the question.

## Question 42

**In better responses, students were able to:**

- interpret and identify the correct value from the table for 6 years.

**Areas for students to improve include:**

- understanding the nature of annuities
- realising that the value of the 7<sup>th</sup> year is based on the value after 6 years not \$2000
- understanding that the wording 'after the contribution' means the last \$2000 is added to get the final amount.