**IB MATH STUDIES EXAM REVIEW: Topic 1 Markscheme**

**Rounding, Scientific Notation, Percent Error, Currency Conversion, Compound Interest, Arithmetic and Geometric Sequences and Series, Solving Systems of Linear Equations, Solving Quadratic Equations**

**1.** (a) *p* = 1.775 –  (M1)

**Note:** Award (M1)for correctly substituted equation for p.

 = 1.75  (A1) (C2)

(b) (i) *x* = 2, *y* = 1, *z* = 50 (A1)

(ii) *p* = 1.98  (A1)(ft) (C2)

**Note:** Follow through from part (b)(i), irrespective of whether working is shown.If 2 s.f. used throughout part (b)(i) award (A1)(ft)for 1.78 or 1.8.

(c)  × 100 (M1)

**Note:** Award (M1)for correctly substituted % error formula.

Follow through from parts (a) and (b).

 = 13.1% (A1)(ft) (C2)

**Notes:** % sign not required. Do not accept **–**13.1%. If 100 missing and incorrect answer, award (M0)(A0).
If 100 missing and answer incorrectly rounded, award (M1)(A1)(AP).

[6]

**2.** ***Unit penalty applies in part (a)***

**UP** (a) 6900 km (A1) (C1)

(b) 2π(6900) (M1)(A1)(ft)

**Notes:** Award (M1)for substitution into circumference formula, (A1)(ft)for correct substitution. Follow through from part (a).

 = 43354 (A1)(ft) (C3)

**Notes:** Follow through from part (a). The final (A1)is awarded for rounding their answer correct to the nearest km.
Award (A2)for 43400 shown with no working.

(c) 4.3354 × 104 (A1)(ft)(A1)(ft) (C2)

**Notes:** Award (A1)(ft)for 4.3354, (A1)(ft)for × 104.
Follow through from part (b). Accept 4.34×104

[6]

**3.** ***Financial penalty applies in parts (b) and (c).***

 (a) 0.88×16000 **OR** 0.12×16000 **OR** 1920 (M1)
14080 (A1) (C2)

(b) 1.6407×5.25×14080 (M1)

**FP** 121280.54 USD (A1)(ft) (C2)

**Note:** Follow through from their answer to part (a).

(c) 12 ×  (M1)

**FP** 13.73 AUD (A1) (C2)

**Note:** If division used in part (b) and multiplication used in part (c), award (M0)(A0)for part (b) and (M1)(A1)(ft)for part (c).

[6]

**4.** (a) 45000 + (5 – 1)1750 (M1)(A1)

**Note:** Award (M1)for substituted AP formula, (A1)for correct substitutions.

 = 52000 USD (A1) (C3)

**Notes:** If a list is used, award (M1)for recognizing AP, award (A1)for seeing 52000 in their list, (A1)for final answer.

(b) (2(45000) + (10 – 1)(1750)) (M1)(A1)

**Notes:** Award (M1) for substituted AP formula, (A1)(ft) for correct substitutions. Follow through from their common difference used in part (a).

 = 528750 USD (A1)(ft) (C3)

**Notes:** Accept 529000.
If a list is used, award (M1)for recognizing sum of AP, (A1)for seeing 60750 included in the sum or 528750 in a cumulative list.

[6]

**5.** (a) (i)  (M1)
=  (A1) (C2)

(ii) *y* = *x* + 2 (A1)(ft) (C1)

**Notes:** Follow through from their gradient in part (a)(i).
Accept equivalent forms for the equation of a line.

(b) area =  (A1)(M1)

**Note:** Award (A1)for 1.5 seen, (M1)for use of triangle formula with 6 seen.

 = 4.5 (A1) (C3)

[6]

**6.** (a) *r* =  (A1) (C1)

**Note:** Accept 0.333.

(b) *u*1 = 36 (M1)

**Note:** Award (M1)for correct substitution in formula for nth term of a GP. Accept equivalent forms.

 *u*1 = 78732 (A1)(ft) (C2)

**Notes:** Accept 78700. Follow through from their common ratio found in part (a). If 0.333 used from part (a) award (M1)(A1)(ft)for an answer of 79285 or 79300 irrespective of whether working is shown.

(c) 118096 =  (M1)(M1)

**Notes:** Award (M1)for correct substitution in the sum of a GP formula, (M1)for equating their sum to 118096. Follow through from parts (a) and (b).

 **OR**

 Sketch of the function *y* = 78732 (M1)
Indication of point where *y* = 118 096 (M1)

 **OR**

 78 732 + 26 244 + 8748 + 2916 + 972 + 324 + 108 + 36 + 12 + 4
= 118 096 (M1)(M1)

**Note:** Award (M1)for a list of at least 8 correct terms, (M1)for the sum of the terms equated to 118096.

 *k* = 10 (A1)(ft) (C3)

**Notes:** Follow through from parts (a) and (b). If k is not an integer, do not award final (A1). Accept alternative methods.
If 0.333 and 79285 used award (M1)(M1)(A1)(ft)for k = 5.
If 0.333 and 79300 used award (M1)(M1)(A0).

[6]

**7.** (a) *y* = –2*x* + 8 (M1)

**Note:** Award (M1)for rearrangement of equation or for –2 seen.

 *m*(perp) =  (A1) (C2)

(b) (i) 2(4) + *k* – 8 = 0 (M1)

**Note:** Award (M1)for evidence of substituting x = 4 into R1.

 *k* = 0 (A1) (C2)

(ii) *y* = *x* + *c* (*can be implied*) (M1)

**Note:** Award (M1)for substitution of  into equation of the line.

 0 = (4) + *c
y* = *x* – 2 (A1)(ft) (C2)

**Notes:** Follow through from parts (a) and (b)(i). Accept equivalent forms for the equation of a line.

 **OR**

 *y* – *y*1 = (*x* – *x*1) (M1)

**Note:** Award (M1)for substitution of  into equation of the line.

 *y* = (*x* – 4) (A1)(ft) (C2)

**Notes:** Follow through from parts (a) and (b)(i). Accept equivalent forms for the equation of a line.

[6]

**8.** (a) *x + y* = 10000 (A1) (C1)

(b) 2 × 12 + 3 × 5 (M1)

 39 (39.0, 39.00) (AUD) (A1) (C2)

(c) 12*x* + 5*y* = 108800 (A1) (C1)

(d) *x* = 8400, *y* = 1600 (A1)(ft)(A1)(ft) (C2)

**Notes:** Follow through from their equations.
If x and y are both incorrect then award (M1)for attempting to solve simultaneous equations.

[6]

**9.** (a) (*x* + 8)2 = (*x* + 7)2 + *x*2 (A1)

**Note:** Award (A1)for a correct equation.

 *x*2 + 16*x* + 64 = *x*2 + 14*x* + 49 + *x*2 (A1)

**Note:** Award (A1)for correctly removed parentheses.

 *x*2 – 2*x* –15 = 0 (A1) (C3)

**Note:** Accept any equivalent form.

(b) *x* = 5, *x* = –3 (A1)(ft)(A1)(ft) (C2)

**Notes:** Accept (A1)(ft)only from candidate’s **quadratic** equation.

(c) 30 cm (A1)(ft) (C1)

**Note:** Follow through from a positive answer found in part (b).

[6]

**10.** (a) common difference = 3 (may be implied) (A1)
*u*11 = 31 (A1)(G2)

(b) (i) (3 × 100 – 1) **OR ** (M1)14950 (A1)(G2)

(ii) (a) (3*n* – 1) = 477 **OR **(2 + 3(*n* – 1)) = 477 (M1)
3*n*2 *– n* = 954 (M1)
3*n*2 *– n* *–* 954 = 0 (AG)

**Notes:** Award second (M1)for correct removal of denominator **or** brackets and no further incorrect working seen.
Award at most (M1)(M0)if last line not seen.

(b) 18 (G2)

**Note:** If both solutions to quadratic equation are seen and correct value is not identified as required answer, award (G1)(G0).

[8]

**11.** ***Financial penalty (FP) applies in parts (b) and (d).
Accuracy*** ***penalty*** ***applies*** ***in*** ***part*** ***(e)*** ***if*** ***answer*** ***not*** ***given*** ***correct*** ***to******2*** ***decimal*** ***places***

(a) 4000 × 0.97 **=** 3880.00 (3880) (M1)(A1)(G2)

**Note:** Award (M1) for multiplication of correct numbers.

 **OR**

 3% of 4000 **=** 120 (A1)
4000–120 **=** 3880.00 (3880) (A1)(G2)

**FP** (b) 3880 × 0.3071 **=** 1191.55 (M1)(A1)(ft)(G2)

**Note:** Award (M1) for multiplication of correct numbers. Follow through from their answer to part (a).

(c) **=** 1280.00 (1280) (M1)(A1)(G2)

**Note:** Award (M1) for division of correct numbers.

**FP** (d) 63.20 (A1)(ft)

**Note:** Follow through (their (c) –1216.80).

(e) *t* = **=** 4.94 (M1)(A1)(ft)(G2)

**Note:** Follow through from their answers to parts (c) and (d).

[9]

**12.** (a) 1024*r*3 = 128 (M1)

 *r*3 =  **or** *r* =  (M1)

 *r* =  (0.5) (AG)

**Notes:** Award at most (M1)(M0)if last line not seen.
Award (M1)(M0)if 128 is found by repeated multiplication (division) of 1024 by 0.5 (2).

(b) 1024 × 0.510 (M1)

**Notes:** Award (M1)for correct substitution into correct formula.
Accept an equivalent method.

 1 (A1)(G2)

(c) *S*8 =  (M1)(A1)

**Note:** Award (M1)for substitution into the correct formula, (A1)for correct substitution.

 **OR**

 (A1)for complete and correct list of eight terms (A1)
(M1)for their eight terms added (M1)

 *S*8 = 2040 (A1)(G2)

(d)  *>* 2047.968 (M1)(M1)(ft)

**Notes:** Award (M1)for correct substitution into the correct formula for the sum, (M1)for comparing to 2047.968.
Accept equation. Follow through from their expression for the sum used in part (c).

 **OR**

 If a list is used: *S*15 = 2047.9375 (M1)
 *S*16 = 2047.96875 (M1)

 *n* = 16 (A1)(ft)(G2)

**Note:** Follow through from their expression for the sum used in part (c).

[10]

**13.** ***Unit Penalty applies in parts (a) and (d) and Financial Penalty applies in parts (b) and (e).***

(a) BD2 = 1902 + 1202 –2(190)(120)cos75° (M1)(A1)

**Note:** Award (M1)for substituted cosine formula, (A1)for correct substitution.

**UP** = 197 m (A1)(G2)

**Note:** If radians are used award a maximum of (M1)(A1)(A0).

(b) cost = 196.717... × 17 (M1)

**FP** = 3344 USD (A1)(ft)(G2)

**Note:** Accept 3349 from 197.

(c)  (M1)(A1)

**Note:** Award (M1)for substituted sine formula, (A1)for correct substitution.

 = 18.81°... (A1)(ft)
= 18.8° (AG)

**Notes:** Both the unrounded and rounded answers must be seen for the final (A1)to be awarded. Follow through from their (a). If 197 is used the unrounded answer is 18.78°…

(d) angle BDA = 46.2° (A1)
Area =  (M1)(A1)

**Note:** Award (M1)for substituted area formula, (A1)for correct substitution.

**UP** Area of ABD = 4970 m2 (A1)(ft)(G2)

**Notes:** If 197 used answer is 4980.

**Notes:** Follow through from (a) only. Award (G2)if there is no working shown and 46.2° not seen. If 46.2° seen without subsequent working, award (A1)(G2).

(e) 4969.38... × 120 (M1)

**FP** = 596 327 USD (A1)(ft)(G2)

**Notes:** Follow through from their (d).

(f) 300 000 = 600 000 or equivalent (A1)(M1)(A1)

**Notes:** Award (A1)for 600 000 seen or implied by alternative formula, (M1)for substituted CI formula, (A1)for correct substitutions.

 *r* = 4.73 (A1)(ft)(G3)

**Notes:** Award G3 for 4.73 with no working.
Award G2 for 4.7 with no working.

[18]