

Western Mathematics Exams

School Name

Yearly Examination

2016

Year 10

Advanced Mathematics Course

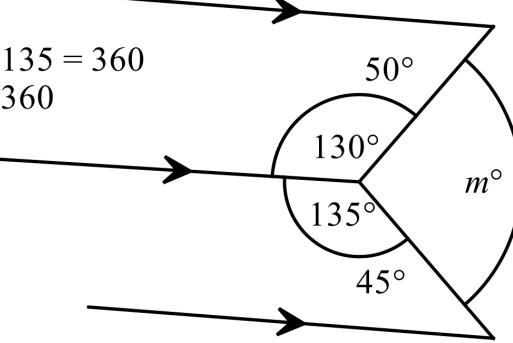
Solutions

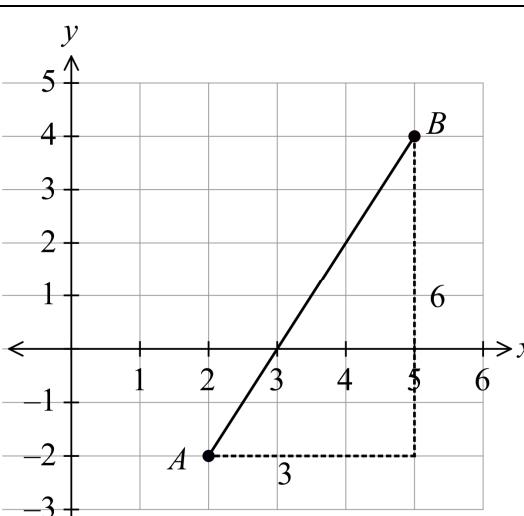
WME Solutions
 Year 10 *Advanced Mathematics*
Yearly 2016

Non Calculator

Section 1 Short Answer Section

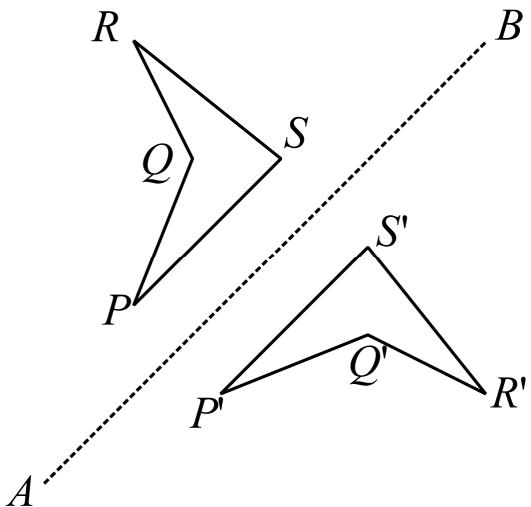
ANSWERS

No.	WORKING	ANSWER
1.	$\begin{aligned} \text{Percentage children} &= \frac{28}{35} \times 100\% \\ &= \frac{4}{5} \times 100\% \\ &= 80\% \end{aligned}$	80%
2.	$\begin{aligned} \frac{7}{8} \text{ of } 72 &= \frac{7}{8} \times 72 \\ &= 63 \end{aligned}$	63
3.	$\begin{aligned} \frac{-42 + 18}{-3} &= \frac{-24}{-3} \\ &= 8 \end{aligned}$	8
4.	$\begin{aligned} m + 130 + 135 &= 360 \\ m + 265 &= 360 \\ m &= 95 \end{aligned}$ 	$m = 95$
5.	$\begin{aligned} x + 2x + 3x + 4x &= 360^\circ \text{ (angle sum quadrilateral)} \\ 10x &= 360 \\ x &= 36 \end{aligned}$	$x = 36$
6.	Glasgow is 9 hours behind, so Sydney is 9 hours ahead of 1:45 pm, which is 10:45 pm on Saturday 12 th November.	10:45 pm on Saturday 12 th Nov

7.	$\text{Area} = \frac{h}{2}(a + b)$ $540 = \frac{h}{2}(24 + 36)$ $540 = \frac{h}{2}(60)$ $30h = 540$ $h = \frac{540}{30} = 18 \text{ cm}$	18 cm
8.	$\text{Area of top of slab} = 5 \text{ squares each } 3 \text{ m} \times 3 \text{ m}$ $= 5 \times 9$ $= 45 \text{ m}^2$ $\text{Volume of Slab} = 45 \times 0.2$ $= 9.0 \text{ m}^3$	9 m^2
9.	$T = \frac{mv^2}{L}$ $= \frac{100 \times 3^2}{6}$ $= \frac{100 \times 9}{6} \quad OR = \frac{900}{6}$ $= 150$	150
10.	$4ab - 3a(2a - 4b) = 4ab - 3a(2a - 4b)$ $= 4ab - 6a^2 + 12ab$ $= 16ab - 6a^2$	$16ab - 6a^2$
11.	$\text{Gradient} = \frac{\text{rise}}{\text{run}}$ $= \frac{6}{3}$ $= 2$ 	2
12.	$27^{-\frac{1}{3}} = \frac{1}{\sqrt[3]{27}} = \frac{1}{3}$	$\frac{1}{3}$

13.	$3d - 12 = 18 - 2d$ $5d - 12 = 18$ $5d = 30$ $d = \frac{30}{5} = 6$	$d = 6$
14.	Total number of Photos = $12 + 18 + 15 + 16 + 9 + 10 = 80$ Percentage from Bea = $\frac{16}{80} \times \frac{100}{4} = 4 \times 5 = 20\%$	20%
15.	Mean = $\frac{80}{6} = 13\frac{2}{6} = 13\frac{1}{3}$	$13\frac{1}{3}$
16.	$2 \text{ hours and } 20 \text{ min} : 1 \text{ hour and } 45 \text{ min} = 140 \text{ min} : 105 \text{ min}$ $= \frac{140}{5} : \frac{105}{5}$ $= 28 : 21$ $= 4 : 3$	4 : 3
17.	Midpoint of interval joining $P(-6, 10)$ and $Q(4, 5)$ $MP = \left(\frac{-6+4}{2}, \frac{10+5}{2} \right)$ $= \left(\frac{-2}{2}, \frac{15}{2} \right)$ $= \left(-1, 7\frac{1}{2} \right)$	$\left(-1, 7\frac{1}{2} \right)$
18.	$\cos A = \frac{A}{H} = \frac{15}{17}$	$\frac{15}{17}$
19.	Surface Area = $22 \times 10 \times 2 + 22 \times 20 \times 2 + 10 \times 20$ = $440 + 880 + 200$ = 1520 cm^2	1520 cm^2
20.	Volume = $\frac{1}{3} \times A \times h$ = $\frac{1}{3} \times 3 \times 3 \times 1.2$ = 3.6 m^3	3.6 m^3

21.



The image $P'Q'R'S'$ is drawn accurately.

22.

$$P(\text{divisible by } 3) = \frac{3}{10}$$

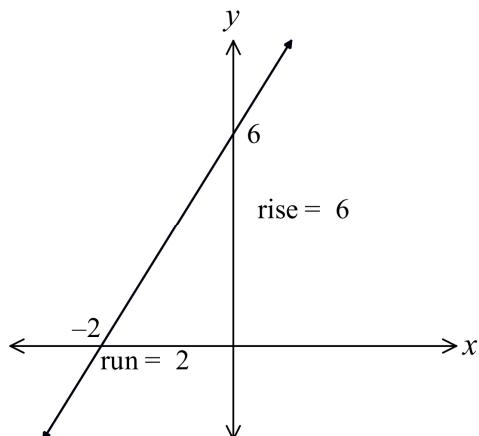
$$\frac{3}{10}$$

23.

$$\begin{aligned} \text{Gradient } m &= \frac{\text{rise}}{\text{run}} \\ &= \frac{6}{2} = 3 \end{aligned}$$

$$y \text{ intercept} = 6$$

$$\begin{aligned} \text{Equation } y &= mx + b \\ y &= 3x + 6 \end{aligned}$$



$$y = 3x + 6$$

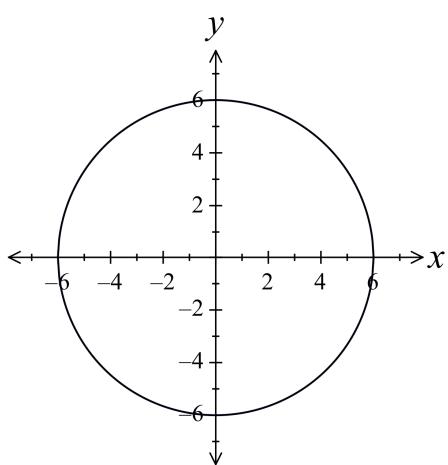
24.

$$x^2 + y^2 = r^2$$

$$x^2 + y^2 = 6^2$$

$$r = 6$$

Centre is the origin.



See the graph.

25.

$$\begin{aligned}\frac{BX}{DX} &= \frac{AX}{CX} \\ \frac{8+12}{12} &= \frac{x+18}{18} \\ \frac{20}{12} &= \frac{x+18}{18} \\ x+18 &= 18 \times \frac{20}{12} \\ x+18 &= 3(18) \times \frac{10(20)}{12} \\ x+18 &= 30 \\ x &= 30 - 18 = 12\end{aligned}$$

$$x = 12$$

WME Solutions
**Year 10 Advanced Mathematics
Yearly**

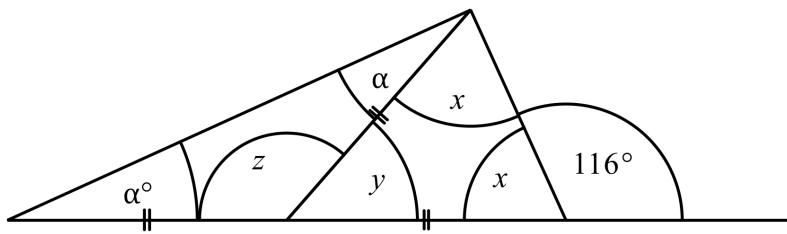
Calculator Allowed

Section 2 Part A Multiple Choice Section

ANSWERS

No.	WORKING	ANSWER
26.	 $\frac{1}{2} = \frac{4}{8} \quad \frac{5}{8} \quad \frac{3}{4} = \frac{6}{8} \quad \frac{7}{8}$	B
27.	$I = PRN$ $672 = 6400 \times 0.06 \times N$ $672 = 384 \times N$ $N = \frac{672}{384}$ $= 1.75 \text{ years}$ $= 1 \text{ year and } 9 \text{ months}$	B
28.	$\angle COD = 90 - 58 = 32^\circ \text{ (adjacent angles in right } \angle \text{le)}$ $\angle COE = 32 + 45 = 77^\circ \text{ (adjacent } \angle \text{l}\emptyset)$ $\angle GOF = \angle COE = 77^\circ \text{ (vert opp } \angle)$ $\angle EOF = 180 - 77 = 103^\circ \text{ (angles on straight line)}$ <p>OTHER POSSIBLE REASONING</p>	A

29.



$$x = 180 - 116 = 64^\circ \text{ (angles on st line)}$$

$$2x + y = 180^\circ \text{ (angles in isosceles } \Delta)$$

$$128 + y = 180$$

$$y = 180 - 128 = 52$$

$$2\alpha = 52 \text{ (exterior angle isos } \Delta)$$

$$\alpha = 26^\circ$$

$$\text{(or find } z \text{ first } z = 180 - 52 = 128)$$

$$\text{(or } z = 2x = 2 \times 64 = 128)$$

$$2\alpha + 128 = 180$$

$$2\alpha = 52$$

$$\alpha = 26$$

B

30.

$$\begin{aligned} SV &= IV (1 - r)^n \\ SV &= 36000 (1 - 0.12)^4 \\ &= 36000 (0.88)^4 \\ &= \$21\,589.03 \end{aligned}$$

B

31.

$$\begin{aligned} 3x - 5x^2 + 2x(3 - 4x) &= 3x - 5x^2 + 6x - 8x^2 \\ &= 9x - 13x^2 \end{aligned}$$

D

32.

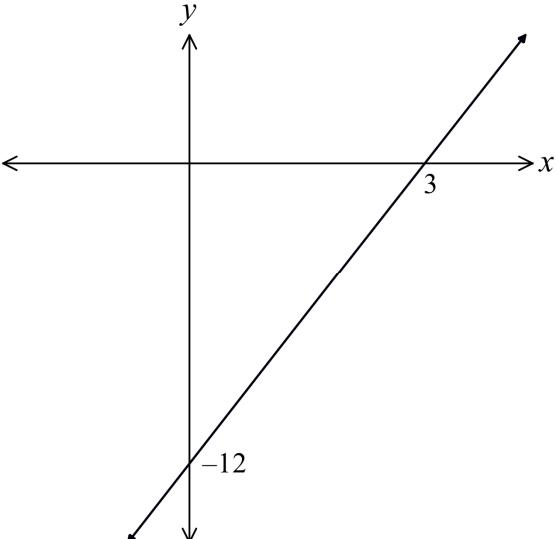
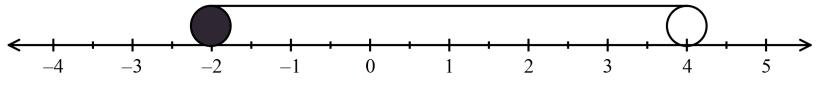
$$\begin{aligned} 8ax^3 - 12ax^2 &= 4ax^2(2x - 3) \\ &= 2ax \times 2x(2x - 3) \\ \text{So } 2ax, 4ax^2, \text{ and } (2x - 3) &\text{ are factors and } 8x \text{ is not.} \end{aligned}$$

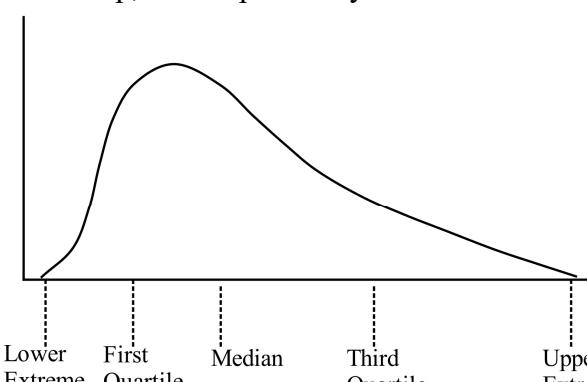
A

33.

$$\begin{aligned} \frac{3x}{4} \div \frac{6x}{5} &= \frac{3x}{4} \times \frac{5}{6x} \\ &= \frac{15x}{24x} \\ &= \frac{5}{8} \end{aligned}$$

A

34.	<p>Gradient $m = \frac{12}{3}$ $m = 4$</p> <p>y intercept $b = -12$</p> <p>Equation $y = 4x - 12$</p> 	D
35.	$\text{Percentage} = \frac{6.42 \times 10^{23}}{5.97 \times 10^{24}} \times 100$ $= 10.753768844221105527638190954774$ $= 10.8\% \text{ (correct to 3 sig fig)}$	A
36.	$-2 \leq x < 4$ <p>-2 is included, so is shaded and 4 is not so is not shaded, and x lies between these two, so the line joins -2 and 4.</p> 	B

37.	<p>As the lower quartile, lower extreme and median are more closely groups than the upper quartile and upper extreme, the scores are more bunched toward the lower values, so the tail is toward the top, so it is positively skewed.</p> 	C
38.	<p>67 is the first quartile, so three-quarters of the scores will be equal or higher.</p> $\frac{3}{4} \times 48 = 36$	D
39.	<p>Probability from Birch Downs = $\frac{65}{250} = 0.26$ Probability not from Birch Downs = $1 - 0.26 = 0.74$</p>	C
40.	<p>Bearing of Daedalus = $270^\circ - 34^\circ = 236^\circ$</p>	D
41.	$\cos 25^\circ = \frac{140}{KL}$ $KL \times \cos 25^\circ = 140$ $KL = \frac{140}{\cos 25^\circ}$ $= 154.47291$ $= 154 \text{ m (nearest m)}$	A
42.	$\angle STW = 180 - (24 + 107) = 180 - 131 = 49^\circ$ $\angle STU = 180 - (24 + 49) = 180 - 73 = 107^\circ$ $\therefore \text{The angles in } \triangle STU \text{ are } 24^\circ, 49^\circ \text{ and } 107^\circ$ $\text{and The angles in } \triangle STW \text{ are } 24^\circ, 49^\circ \text{ and } 107^\circ$ $\therefore \triangle STW \parallel \triangle STU$	A

43.	$\begin{aligned} \text{Speed} &= \frac{750}{3} \text{ m/min} \\ &= 250 \text{ m/min} \\ &= 15000 \text{ m/h} \\ &= 15 \text{ km/h} \end{aligned}$	D
44.	<p>Interest rate = 7.2% pa = 0.6% per month</p> <p>Period = 4 years = 48 months</p> $\begin{aligned} A &= P(1 + r)^n \\ &= 30000(1.0006)^{48} \\ &= \$39978.30061 \\ &= \$39\,978.30 \end{aligned}$	C
45.	<p>$y = 2x + 4$ has a gradient $m = 2$ the parallel line will have the same gradient It will be of the form $y = 2x + b$ And since passes through (2, -6)</p> $\begin{aligned} -6 &= 2(2) + b \\ -6 &= 4 + b \\ b &= -10 \end{aligned}$ <p>Equation $y = 2x - 10$</p>	C
46.	$\begin{aligned} \frac{3^{-5} \times 9}{\sqrt{3} \div 27} &= \frac{3^{-5} \times 3^2}{3^{\frac{1}{2}} \div 3^3} \\ &= \frac{3^{-5+2}}{3^{\frac{1}{2}-3}} \\ &= \frac{3^{-3}}{3^{-\frac{5}{2}}} \\ &= 3^{-3 - (-2\frac{1}{2})} \\ &= 3^{-\frac{1}{2}} \\ &= \frac{1}{\sqrt{3}} \end{aligned}$	B

47.	<p>Number of mistakes for those 16 and under – 17, 18, 18, 14, 17, 15, 15, 11 Mean = $\frac{17 + 18 + 18 + 14 + 17 + 15 + 15 + 11}{8}$ $= \frac{125}{8}$ $= 15.625$</p>	D
48.	<p>The dots on the graph quite clearly follow a linear shape (straight line) so it is a strong relationship, and the number of mistakes decreases as the age increases so the relationship is negative.</p> <p>So there is a strong negative relationship between age and number mistakes.</p>	A
49.	<p>The graph has a y intercept of about 11, so only B and D have this.</p> <p>The graph is exponential so equation is B $y = 2^x + 10$</p> <p>Or by testing a second point</p> <p>e.g. when $x = 6$</p> <p>B. $y = 2^6 + 10 = 64 + 10 = 74$</p> <p>D. $y = 6^2 + 11 = 36 + 11 = 47$</p> <p>On Graph, when $x = 6, y = 74$ so correct graph is B.</p>	B
50.	<p>A parabola has a term in x^2 (or y^2) only, so correct equation is $y = x^2 + 10$</p>	C
51.	$y = 3x - 4$ gradient = 3 since parallel $y = 3x - 5$ $3x - y - 5 = 0$	C
52.	$\text{Volume} = \frac{1}{3} \pi r^2 h$ $= \frac{1}{3} \times \pi \times 7.5^2 \times 16$ $= 300 \pi \text{ cm}^3$	A

53.	$\frac{2w - 5}{3} = \frac{w}{4} + 3$ $\cancel{4} \times \frac{2w - 5}{\cancel{3}} = 3 \cancel{4} \times \frac{w}{\cancel{4}} + 12 \times 3$ $8w - 20 = 3w + 36$ $5w - 20 = 36$ $5w = 56$ $w = \frac{56}{5} = 11\frac{1}{5}$	D
54.	$\sigma_n = 0.068$ from calculator	A
55.	$\frac{3x - 2}{6} + \frac{x - 5}{2} = \frac{3x - 2}{6} + \frac{3(x - 5)}{3 \times 2}$ $= \frac{3x - 2 + 3x - 15}{6}$ $= \frac{6x - 17}{6}$	C
56.	<p>The curve is a hyperbola with asymptote at $x = 4$</p> <p>So equation is of the form $y = \frac{a}{x - b}$ where b is the x value of the asymptote.</p> <p>So possible equation is $y = \frac{1}{x - 4}$</p>	C
57.	$x^2 - 10x + 9 = 0$ $(x - 9)(x - 1) = 0$ $\therefore x = 1 \text{ or } x = 9$	D
58.	<p>To make y the subject of equation (2) would be a step in using the substitution method, but it gives a rather complicated equation $y = \frac{2x - 15}{3}$ to substitute into equation (1).</p>	B
59.	<p>Starts from a stationary position, so the graph needs to start at zero, and since the acceleration changes, it needs to be a curved line. The acceleration increases to begin with, so the curve gets steeper, then decreases back to zero, so the slope decreases till it is horizontal. This describes graph A.</p>	A

60.	$\begin{aligned}\frac{6\sqrt{5}}{2\sqrt{6}} &= \frac{6\sqrt{5}}{2\sqrt{6}} \times \frac{\sqrt{6}}{\sqrt{6}} \\ &= \frac{6\sqrt{30}}{2 \times 6} \\ &= \frac{6\sqrt{30}}{12} \\ &= \frac{\sqrt{30}}{2}\end{aligned}$	C
61.	<p>Circumference = 70 cm = πd</p> $d = \frac{70}{\pi} = 22.3 \text{ cm}$ $r = 11.1 \text{ cm}$ $\begin{aligned}SA &= 4\pi r^2 \\ &= 4 \times \pi \times 11.1^2 \\ &= 1559.72 \\ &\approx 1560 \text{ cm}^2\end{aligned}$	A
62.	$\begin{aligned}e &= \frac{\sqrt{a^2 - b^2}}{a} \\ a e &= \sqrt{a^2 - b^2} \\ a^2 e^2 &= a^2 - b^2 \\ a^2 e^2 - a^2 &= -b^2 \\ b^2 &= a^2 - a^2 e^2 \\ b &= \pm\sqrt{a^2 - a^2 e^2}\end{aligned}$	B
63.	$\begin{aligned}(2m - 3)(3m + 5) &= 6m^2 + 10m - 9m - 15 \\ &= 6m^2 + m - 15\end{aligned}$	D
64.	<p>Let slant height be l cm</p> $\begin{aligned}l^2 &= 6^2 + 8^2 \\ &= 100 \\ l &= \sqrt{100} = 10\end{aligned}$ $\begin{aligned}SA &= 12^2 + 4 \times \frac{1}{2} \times 12 \times 10 \\ &= 144 + 240 \\ &= 384 \text{ cm}^2\end{aligned}$	D

65.	<p>Morning flights have the greater mean, so if they are longer on average, so A and C are incorrect.</p> <p>Afternoon flights have the greater standard deviation, so they have more variation, so B is incorrect and D is correct..</p>	D																														
66.	$\begin{aligned} AB^2 &= 25^2 + 19^2 - 2 \times 25 \times 19 \times \cos 65^\circ \\ &= 584.51 \\ AB &= \sqrt{584.51} \\ &= 24.17669 \\ &= 24.2 \text{ cm (1 d.p.)} \end{aligned}$	B																														
67.	<p>If $BD \parallel AC$ then $\angle ACB = \angle EBD$ (alt ang on \parallel lines)</p> <p>then $\angle BAC = \angle B\Delta$ (angle sum Δ)</p> <p>$\therefore \Delta ABC \sim \Delta DEB$ (corresponding angles equal)</p>	D																														
68.	<table border="1"> <thead> <tr> <th>Colour</th> <th>Style</th> <th>Sedan</th> <th>Hatch</th> <th>Ute</th> <th>Coupe</th> </tr> </thead> <tbody> <tr> <td>Red</td> <td></td> <td>RS</td> <td>RH</td> <td>RU</td> <td>RC</td> </tr> <tr> <td>Blue</td> <td></td> <td>BS</td> <td>BH</td> <td>BU</td> <td>BC</td> </tr> <tr> <td>White</td> <td></td> <td>WS</td> <td>WH</td> <td>WU</td> <td>WC</td> </tr> <tr> <td>Green</td> <td></td> <td>GS</td> <td>GH</td> <td>GU</td> <td>GC</td> </tr> </tbody> </table> $P(R \text{ or } C) = \frac{6}{16} = \frac{3}{8} = 0.375$	Colour	Style	Sedan	Hatch	Ute	Coupe	Red		RS	RH	RU	RC	Blue		BS	BH	BU	BC	White		WS	WH	WU	WC	Green		GS	GH	GU	GC	C
Colour	Style	Sedan	Hatch	Ute	Coupe																											
Red		RS	RH	RU	RC																											
Blue		BS	BH	BU	BC																											
White		WS	WH	WU	WC																											
Green		GS	GH	GU	GC																											
69.	<p>Find the gradient of line through $(2, -1)$ and $(-2, 7)$</p> $\begin{aligned} m &= \frac{7 - -1}{-2 - 2} \\ &= \frac{8}{-4} \\ &= -2 \end{aligned}$ <p>Find equation</p> $\begin{aligned} y - y_1 &= m(x - x_1) \\ y - -1 &= -2(x - 2) \\ y + 1 &= -2x + 4 \\ y &= -2x + 3 \\ 2x + y - 3 &= 0 \end{aligned}$	C																														

<p>70.</p> <p>$\angle FEG = \angle FHG = 40^\circ$ (angles on same arc are equal) $\angle EGH = \angle EFG = 58^\circ$ (angles on same arc are equal) $\angle GHE = 90^\circ$ (angle in semicircle = 90°) $\angle GEH = 180^\circ - 90^\circ - 58^\circ = 32^\circ$ (angle sum Δ) $\angle FEH = 40^\circ + 32^\circ = 72^\circ$ (adjacent angles)</p>	<p>B</p>
<p>71.</p> $\frac{\sin \theta}{80} = \frac{\sin 40^\circ}{64}$ $(\sin \theta) = \frac{80 \times \sin 40^\circ}{64}$ $= 0.803484$ $\theta = \sin^{-1}(0.803484)$ $= 53.46414$ $= 53^\circ \text{ (nearest degree)}$	<p>D</p>
<p>72.</p> $3x - 2y + 8 = 0$ $2y = 3x + 8$ $y = \frac{3}{2}x + 4$ $\text{Gradient} = \frac{3}{2}$ <p>Perpendicular line has a gradient of $-\frac{2}{3}$ through $(4, 5)$</p> $y - 5 = -\frac{2}{3}(x - 4)$ $3y - 15 = -2x + 8$ $2x + 3y - 23 = 0$	<p>B</p>
<p>73.</p> <p>There are 26 who listed Sport. Of those 4 chose both Music and Reading $P(\text{Music and Reading given Sport}) = \frac{4}{26} = \frac{2}{13}$</p>	<p>A</p>

74. $\begin{aligned}x &= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \\&= \frac{3 \pm \sqrt{(-3)^2 - 4 \times 1 \times (-2)}}{2 \times 1} \\&= \frac{3 \pm \sqrt{9 + 8}}{2} \\&= \frac{3 \pm \sqrt{17}}{2}\end{aligned}$	D
75. $\begin{aligned}y &= x^2 - 3x - 4. \\&= (x + 1)(x - 4) \\x \text{ intercepts where } y &= 0 \\(x + 1)(x - 4) &= 0 \\x &= -1, \text{ and } x = 4 \\s &= -1, \text{ and } t = 4 \\y \text{ intercepts where } x &= 0 \\y &= (0 + 1)(0 - 4) = -4 \\ \text{so } v &= -4 \\s &= -1, t = 4 \text{ and } v = -4\end{aligned}$	B

School Name
Year 10 Advanced Mathematics Examination
Solutions 2016
Multiple Choice Section Answer Sheet

Name Marking Sheet Teacher _____

Completely fill the response oval representing the most correct answer.

Use a black or blue pen or 2B pencil.

- | | |
|--|--|
| 26. A <input type="radio"/> B <input checked="" type="radio"/> C <input type="radio"/> D <input type="radio"/> | 51. A <input type="radio"/> B <input type="radio"/> C <input checked="" type="radio"/> D <input type="radio"/> |
| 27. A <input type="radio"/> B <input checked="" type="radio"/> C <input type="radio"/> D <input type="radio"/> | 52. A <input checked="" type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> |
| 28. A <input checked="" type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> | 53. A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input checked="" type="radio"/> |
| 29. A <input type="radio"/> B <input checked="" type="radio"/> C <input type="radio"/> D <input type="radio"/> | 54. A <input checked="" type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> |
| 30. A <input type="radio"/> B <input checked="" type="radio"/> C <input type="radio"/> D <input type="radio"/> | 55. A <input type="radio"/> B <input type="radio"/> C <input checked="" type="radio"/> D <input type="radio"/> |
| 31. A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input checked="" type="radio"/> | 56. A <input type="radio"/> B <input type="radio"/> C <input checked="" type="radio"/> D <input type="radio"/> |
| 32. A <input checked="" type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> | 57. A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input checked="" type="radio"/> |
| 33. A <input checked="" type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> | 58. A <input type="radio"/> B <input checked="" type="radio"/> C <input type="radio"/> D <input type="radio"/> |
| 34. A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input checked="" type="radio"/> | 59. A <input checked="" type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> |
| 35. A <input checked="" type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> | 60. A <input type="radio"/> B <input type="radio"/> C <input checked="" type="radio"/> D <input type="radio"/> |
| 36. A <input type="radio"/> B <input checked="" type="radio"/> C <input type="radio"/> D <input type="radio"/> | 61. A <input checked="" type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> |
| 37. A <input type="radio"/> B <input type="radio"/> C <input checked="" type="radio"/> D <input type="radio"/> | 62. A <input type="radio"/> B <input checked="" type="radio"/> C <input type="radio"/> D <input type="radio"/> |
| 38. A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input checked="" type="radio"/> | 63. A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input checked="" type="radio"/> |
| 39. A <input type="radio"/> B <input type="radio"/> C <input checked="" type="radio"/> D <input type="radio"/> | 64. A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input checked="" type="radio"/> |
| 40. A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input checked="" type="radio"/> | 65. A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input checked="" type="radio"/> |
| 41. A <input checked="" type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> | 66. A <input type="radio"/> B <input checked="" type="radio"/> C <input type="radio"/> D <input type="radio"/> |
| 42. A <input checked="" type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> | 67. A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input checked="" type="radio"/> |
| 43. A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input checked="" type="radio"/> | 68. A <input type="radio"/> B <input type="radio"/> C <input checked="" type="radio"/> D <input type="radio"/> |
| 44. A <input type="radio"/> B <input type="radio"/> C <input checked="" type="radio"/> D <input type="radio"/> | 69. A <input type="radio"/> B <input type="radio"/> C <input checked="" type="radio"/> D <input type="radio"/> |
| 45. A <input type="radio"/> B <input type="radio"/> C <input checked="" type="radio"/> D <input type="radio"/> | 70. A <input type="radio"/> B <input checked="" type="radio"/> C <input type="radio"/> D <input type="radio"/> |
| 46. A <input type="radio"/> B <input checked="" type="radio"/> C <input type="radio"/> D <input type="radio"/> | 71. A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input checked="" type="radio"/> |
| 47. A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input checked="" type="radio"/> | 72. A <input type="radio"/> B <input checked="" type="radio"/> C <input type="radio"/> D <input type="radio"/> |
| 48. A <input checked="" type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> | 73. A <input checked="" type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> |
| 49. A <input type="radio"/> B <input checked="" type="radio"/> C <input type="radio"/> D <input type="radio"/> | 74. A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input checked="" type="radio"/> |
| 50. A <input type="radio"/> B <input type="radio"/> C <input checked="" type="radio"/> D <input type="radio"/> | 75. A <input type="radio"/> B <input checked="" type="radio"/> C <input type="radio"/> D <input type="radio"/> |

Year 10	<i>WME Solutions</i> <i>Advanced</i> <i>Mathematics</i> <i>Yearly 2016</i>	Calculator Allowed
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Section 2 Part B Longer Answer Section

ANSWERS

		Marks												
76. (a)	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%; padding: 5px;">Number (n) =</td><td style="width: 15%; padding: 5px;">26</td> <td style="width: 10%;"></td> </tr> <tr> <td>Mean (\bar{x}) =</td><td>5.04</td><td></td> </tr> <tr> <td>Median =</td><td>5</td><td></td> </tr> <tr> <td>Standard deviation (σ_n) =</td><td>1.43</td><td></td> </tr> </table>	Number (n) =	26		Mean (\bar{x}) =	5.04		Median =	5		Standard deviation (σ_n) =	1.43		2 marks for all correct measures. 1 mark for answer which has at least two correct measures
Number (n) =	26													
Mean (\bar{x}) =	5.04													
Median =	5													
Standard deviation (σ_n) =	1.43													
(b)	Both Groups had around the same mean and median so the centre of the data was similar, but group B was considerably more spread from the centre.	1 mark for any reasonable answer which includes mention of difference in the spread.												
77. (a)	$ \begin{aligned} 9x^2 - 9x - 10 &= 9x^2 + 6x - 15x - 10 \\ &= 3x(3x + 2) - 5(3x + 2) \\ &= (3x + 2)(3x - 5) \end{aligned} $	1 mark for correct answer												

<p>(b)</p>	<p>By elimination</p> $\begin{cases} 3a + 4b = 0 & (1) \\ a - 2b + 5 = 0 & (2) \\ 2a - 4b + 10 = 0 & (3) \end{cases}$ $\begin{array}{l} \textcircled{2} \times 2 \\ \textcircled{1} + (3) \end{array}$ $\begin{aligned} 5a + 10 &= 10 \\ 5a &= -10 \\ a &= -2 \end{aligned}$ $\begin{aligned} 3(-2) + 4b &= 0 && \text{Sub } \textcircled{5} \text{ in } \textcircled{1} \\ -6 + 4b &= 0 \\ 4b &= 6 \\ b &= \frac{6}{4} = 1.5 \\ a &= -2 \text{ and } b = 1.5 \end{aligned}$ <p>By substitution</p> $\begin{cases} 3a + 4b = 0 & (1) \\ a - 2b + 5 = 0 & (2) \\ a = 2b - 5 & (3) \end{cases}$ $\begin{array}{l} \text{Change subject of } \textcircled{2} \\ \text{Sub } \textcircled{3} \text{ in } \textcircled{1} \end{array}$ $\begin{aligned} 3(2b - 5) + 4b &= 0 \\ 6b - 15 + 4b &= 0 \\ 10b &= 15 \\ b &= \frac{15}{10} = 1.5 \end{aligned}$ $\begin{aligned} a &= 2(1.5) - 5 && \text{Sub } \textcircled{4} \text{ in } \textcircled{3} \\ a &= 3 - 5 = -2 \\ a &= -2 \text{ and } b = 1.5 \end{aligned}$	<p>2 marks for correct values of a and b by either method.</p> <p>Other possible working including guess, check and refine can give the result.</p> <p>1 mark for worked answer with minor error(s)</p>
<p>78. (a)</p>	$P = \frac{\sqrt{1-2k}}{m}$ $Pm = \sqrt{1-2k}$ $P^2 m^2 = 1-2k$ $P^2 m^2 + 2k = 1$ $2k = 1 - P^2 m^2$ $k = \frac{1 - P^2 m^2}{2}$	<p>1 mark for correct answer</p>
<p>(b)</p>	$\begin{aligned} \frac{4a+3}{3} + \frac{4-3a}{2} &= \frac{2(4a+3)}{6} + \frac{3(4-3a)}{6} \\ &= \frac{8a+6}{6} + \frac{12-9a}{6} \\ &= \frac{18-a}{6} \end{aligned}$	<p>2 marks for correct expression.</p> <p>1 mark for mainly correct worked solution with 1 or 2 minor error(s) in algebra.</p>

79.	<p> $\angle ACO = 90 - w$ ($\angle ACD + \angle ACO = 90^\circ$) $\angle AOB = 180 - 2w$ (angle at centre is twice that at circum) $OA = OB$ (equal radii) $\angle OAB = \angle OBA$ (base angle of isosceles Δ) $2 \times \angle OAB + 180 - 2w = 180$ (angle sum Δ) $2 \times \angle OAB = 2w$ $\angle OAB = w$ </p>	<p>3 marks for any correct proof, if angle at centre property is not known it can still be done using isosceles triangles.</p> <p>2 mark for basically correct proof with minor error in logic or which uses wrong reasons or is missing some reasons.</p> <p>1 mark for attempt at the proof that includes at least two correct and relevant statements with reasons.</p>
80. (a)	<p> $\angle ABS = 180 - 68 = 112^\circ$ $\angle ASB = 180 - (112 + 38)$ $= 180 - 150$ $= 30$ </p>	1 mark for correct answer
(b)	$\frac{BS}{\sin 112^\circ} = \frac{16.5}{\sin 30^\circ}$ $BS = \frac{\sin 112^\circ \times 16.5}{\sin 30^\circ}$ $= 30.6 \text{ km}$	1 mark for correct answer

(c)	$\begin{aligned}\text{Area } \Delta ABS &= \frac{1}{2} ab \sin C \\ &= \frac{1}{2} \times 16.5 \times 30.6 \times \sin 38^\circ \\ &= 155.408843 \\ &= 155 \text{ km}^2 \text{ (3 s f)}\end{aligned}$	1 mark for correct answer
81. (a)	<p>$A(-2, 6)$, $B(6, 2)$ and $C(-1, -2)$</p> $\begin{aligned}AC &= \sqrt{(-2 - -1)^2 + (6 - -2)^2} & BC &= \sqrt{(6 - -1)^2 + (2 - -2)^2} \\ &= \sqrt{(-1)^2 + (8)^2} & &= \sqrt{(7)^2 + (4)^2} \\ &= \sqrt{1 + 64} & &= \sqrt{49 + 16} \\ AC &= \sqrt{65} & BC &= \sqrt{65} \\ \therefore AC &= BC\end{aligned}$	<p>2 marks for correctly showing the distances are equal, using the formula or Pythagoras Theorem</p> <p>1 mark for a worked solution with a minor error or which shows some progress toward correct solution.</p>
(b)	<p>Gradient of $y = 2x + 6$ is $m_1 = 2$</p> $\begin{aligned}\text{Gradient of } AB & m_2 = \frac{2 - 6}{6 - -2} \\ &= \frac{-4}{8} \\ &= -\frac{1}{2} \\ m_1 \cdot m_2 &= -2 \times -\frac{1}{2} = -1 \\ \therefore AB &\text{ is perpendicular to } y = 2x + 6\end{aligned}$	<p>2 marks for correctly finding the gradients and showing their product is -1</p> <p>1 mark for a worked solution with a minor error or which shows some progress toward correct solution.</p>

82. (a)	$6x^2 - 7x - 5 = 0$ $6x^2 + 3x - 10x - 5 = 0$ $3x(2x + 1) - 5(2x + 1) = 0$ $(3x - 5)(2x + 1) = 0$ $3x = 5 \text{ or } 2x = -1$ $x = \frac{5}{3} = 1\frac{2}{3} \text{ or } x = -\frac{1}{2}$	1 mark for both correct answers.
(b)	$3a^2 - 2a - 4 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $a = \frac{2 \pm \sqrt{4 + 48}}{4}$ $= \frac{2 \pm \sqrt{52}}{4}$ $= \frac{2 \pm 2\sqrt{13}}{4}$ $a = \frac{1 \pm \sqrt{13}}{2}$	2 marks for correct answer in simplified form 1 mark for answer found using Quadratic Formula or completing the square which has a minor error or is not simplified correctly

83. (a)	$y = x^2 + x - 2$ $= (x + 2)(x - 1)$ <p>x intercepts $x = -2$ and $x = 1$.</p> <p>y intercept $y = -2$</p> <p>Turning point where $x = \frac{-2+1}{2} = -\frac{1}{2}$</p> $y = \left(-\frac{1}{2} + 2\right)\left(-\frac{1}{2} - 1\right)$ $= \frac{3}{2} \times -\frac{3}{2} = -\frac{9}{4}$ <p>Vertex $\left(-\frac{1}{2}, -2\frac{1}{4}\right)$</p> <p>Graph</p>	<p>2 marks for correct graph including the correct intercepts, and vertex in correct x position, (exact y value not needed)</p> <p>1 mark for a graph which is inaccurately drawn, has a minor error in intercepts or which is incomplete.</p>
(b)	<p>The points of intersection have x values which correspond to the solution of the equation $x^2 + x - 2 = 2^x$.</p> <p>These values are approximately $x = -2.2$ and $x = 2$.</p>	<p>1 mark if both answers given.</p>