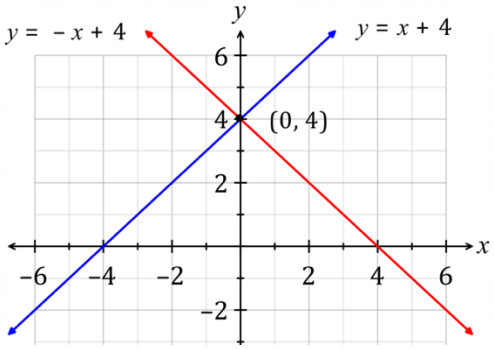
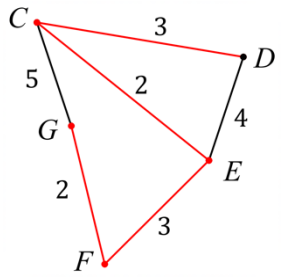
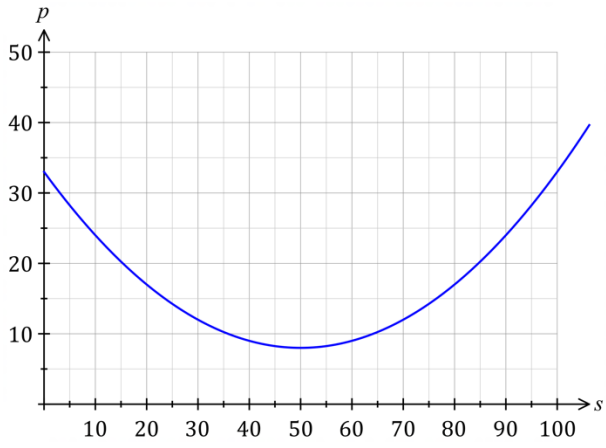
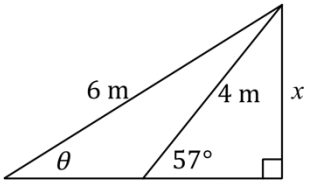
ACE Examination Paper 1
Year 12 Mathematics Standard 1 Yearly Examination
Worked solutions and marking guidelines

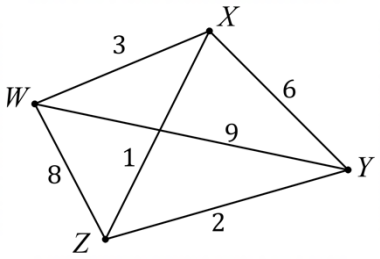
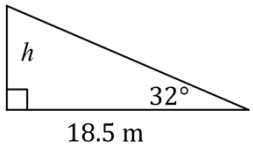
Section I		
	Solution	**Criteria**
1.	$\tan 40° = \frac{h}{50}$ $h = 50 \times \tan 40°$	1 Mark: A
2.	A path is a walk with no repeated vertices. $\therefore$ S–T–U–V	1 Mark: B
3.	Distance travelled $D = S \times T = 100 \times 4 = 400$ km Time taken $T = \frac{D}{S} = \frac{400}{80} = 5$ h	1 Mark: D
4.	180 m = 1 mm 30 m $= \frac{1}{6}$ mm 240 m $= \frac{8}{6}$ mm ≈ 1.33 mm	1 Mark: A
5.	$FV = PV(1+r)^n$ $= 3125 \times \left(1 + \frac{0.06}{4}\right)^{4\times4}$ $= 3965.5798\ldots \approx \$3966$	1 Mark: C
6.	 $\therefore$ Point of intersection is (0, 4)	1 Mark: B
7.	$d = \frac{5vt}{18} + \frac{v^2}{170}$ $= \frac{5 \times 70 \times 0.50}{18} + \frac{70^2}{170} = 38.5457\ldots \approx 39$ m	1 Mark: C
8.	Age increases and foot length increases. Positive association.	1 Mark: A
9.	Total paid $= 2200 + 820 \times 12 \times 4$ $= \$41\,560$	1 Mark: D
10.	$N = 1000(2.5^t)$ $= 1000 \times 2.5^2 = 6250$	1 Mark: D

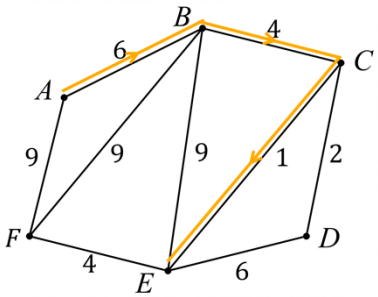
Section II

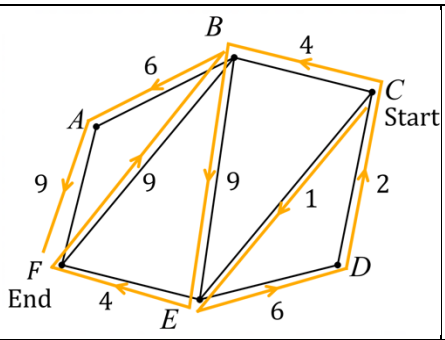
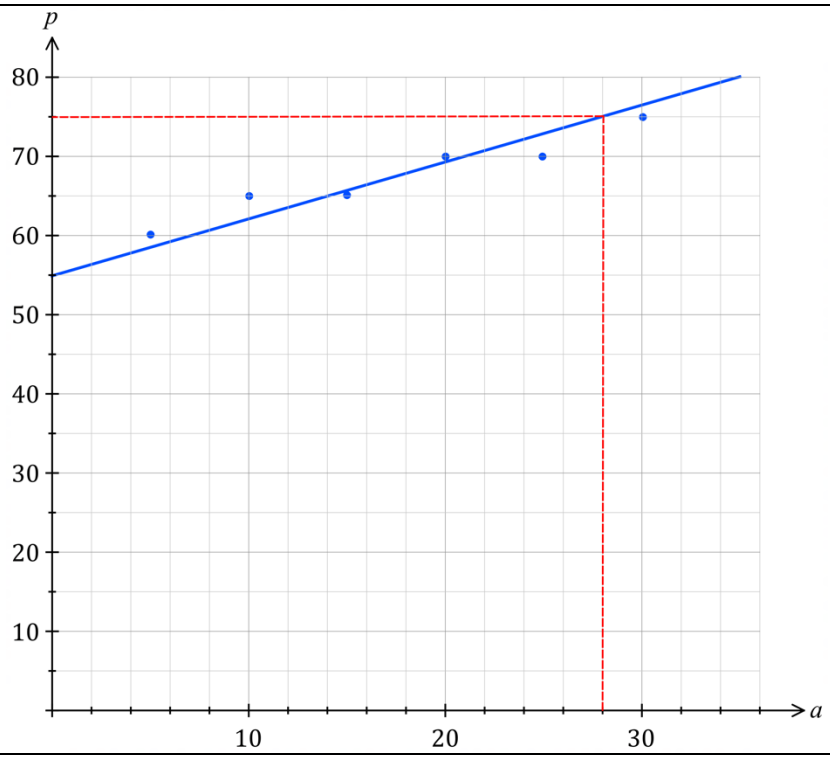
	Solution	Criteria
11	Alice : Layla = 5 : 4 Total parts $= 5 + 4 = 9$ 9 parts $= 72$ text messages 1 part $= 8$ text messages 4 parts $= 32$ text messages $\therefore$ Layla receives 32 text messages.	2 Marks: Correct answer. 1 Mark: Finds the total number of parts.
12	Find the minimum spanning tree.  Length $= 2 + 3 + 2 + 3$ $= 10$ km $\therefore$ Minimum length of pipes is 10 km.	2 Marks: Correct answer. 1 Mark: Shows some understanding.
13(a)	<table><tr><td>s</td><td>0</td><td>20</td><td>40</td><td>50</td><td>60</td><td>80</td><td>100</td></tr><tr><td>p</td><td>33</td><td>17</td><td>9</td><td>8</td><td>9</td><td>17</td><td>33</td></tr></table>	1 mark: Correct answer.
13(b)	 	1 mark: Correct answer.
13(c)	When $s = 30$ $p = 0.01s^2 - s + 33$ $= 0.01 \times 30^2 - 30 + 33$ $= 12$ litres per 100 km Litres of petrol $= 12$L for 100 km $= 1.2$L for 10 km $= 4.8$L for 40 km $\therefore$ The car used 4.8 L of petrol.	1 mark: Correct answer.
13(d)	When $s = 0$ $p = 0.01s^2 - s + 33$ $= 0.01 \times 0^2 - 0 + 33$ $= 33$ litres per 100 km However the car is not moving so no petrol is being used.	1 mark: Correct answer.

14(a)	<table><tr><td>Vertex</td><td>A</td><td>B</td><td>C</td><td>D</td><td>E</td><td>F</td></tr><tr><td>Degree</td><td>1</td><td>4</td><td>1</td><td>1</td><td>3</td><td>2</td></tr></table>	1 mark: Correct answer.
14(b)	No. Path (Eulerian trail) only exists if the graph has exactly two vertices with an odd degree. There are 4 vertices with odd degree.	1 mark: Correct answer.
15(a)	$S = V_0(1-r)^n$ $= 16000 \times (1-0.20)^2$ $= \$10\ 240$ $\therefore$ Salvage value of the car is \$10 240	1 mark: Correct answer.
15(b)	Answer are obtained by trial and error. $n = 6$ $S = V_0(1-r)^n$ $= 16000 \times (1-0.20)^6 = \$4194$ $n = 7$ $S = V_0(1-r)^n$ $= 16000 \times (1-0.20)^7 = \$3355$ $\therefore$ Number of years is 7 to be less than \$4 000.	2 marks: Correct answer. 1 mark: Substitutes at least two correct values into depreciation formula.
16	$V = 28 - (2 \times 3)$ $= 22$ L $\therefore$ Volume of petrol in the tank after 3 seconds is 22 L.	1 mark: Correct answer.
17(a)	$\sin 57° = \frac{x}{4}$ $x = 4 \times \sin 57°$ $= 3.3545\ldots$ ≈ 3.35 m  $\therefore$ Distance up the wall is 3.35 m	2 marks: Correct answer. 1 mark: Uses trig ratio with one correct value.
17(b)	$\sin\theta = \frac{x}{6}$ $\theta = \sin^{-1}\left(\frac{3.3546\ldots}{6}\right)$ $= 33.9945\ldots \approx 34°$ $\therefore$ The longer ladder makes angle of 34°.	2 marks: Correct answer. 1 mark: Uses trig ratio with one correct value.
18(a)	Total paid $= 1910 \times 26 \times 7$ $= \$347\ 620$ $\therefore$ Total paid is \$347 620	1 mark: Correct answer.
18(b)	Interest $= 347\ 620 - 220\ 000$ $= \$127\ 620$ $\therefore$ Interest on the loan is \$127 620	1 mark: Correct answer.
18(c)	$I = Prn$ $127\ 620 = 220\ 00 \times r \times 7$ $r = \frac{127\ 620}{220\ 000 \times 7}$ $= 0.08287\ldots \approx 8.3\%$ $\therefore$ Equivalent flat interest rate is 8.3%	2 marks: Correct answer. 1 mark: Substitutes one correct value in the formula.

19(a)		1 mark: Correct answer.
19(b)	Length $\approx 3.1 \times 100$ ≈ 310 cm ≈ 3.1 m Breadth $\approx 1.5 \times 100$ ≈ 150 cm ≈ 1.5 m 	1 mark: Correct answer.
19(c)	Length $\approx 5.4 \times 100$ ≈ 540 cm ≈ 5.4 m Breadth $\approx 4.6 \times 100$ ≈ 460 cm ≈ 4.6 m $A = lb$ $= 5.4 \times 4.6$ $= 24.84 \approx 25$ m^2 $\therefore$ Area of the extension is 25 m^2	1 mark: Correct answer.
20(a)	Daily interest rate $= \frac{16.3\%}{365}$ $= 0.044657\ldots$ $\approx 0.04466\%$	1 mark: Correct answer.
20(b)	12 days (27,28,29,30,31,1,2,3,4,5,6,7) Interest $= 1029 \times 0.04466\% \times 12$ $= 5.5146\ldots$ $\approx \$5.51$ Total paid $= 1029 + 5.51$ $= \$1034.51$ $\therefore$ Total amount paid for the TV is \$1034.51	2 marks: Correct answer. 1 mark: Finds the interest or shows some understanding.
21(a)	$m = \frac{\text{Rise}}{\text{Run}}$ $= -\frac{70}{100}$ $= -0.7$ $\therefore$ Gradient is –0.7 	1 mark: Correct answer.
21(b)	y-intercept is 100 $y = mx + c$ $h = -0.7 + 100$	1 mark: Correct answer.
22	Time taken is 2 h 15 min or 2.25 h $S = \frac{D}{T}$ $900 = \frac{D}{2.25}$ $D = 2025$ km $\therefore$ Distance travelled is 2025 km.	2 marks: Correct answer. 1 mark: Finds the time taken.

23(a)	When $t = 0$ then $N = 15$ $\therefore$ Initial number of bacteria is 15 000	1 mark: Correct answer.
23(b)	Using the graph when $N = 45$ then $t \approx 4.9$ (Acceptable range 4.8 to 5.0)	1 mark: Correct answer.
23(c)	Using the graph when $N = 30$ then $t \approx 3.1$ (Acceptable range 3.0 to 3.2)	1 mark: Correct answer.
24	End of 2017 $S = V_0(1-r)^n$ $= 30\,000 \times (1-0.30)^1$ $= \$21\,000$ End of 2018 $S = V_0(1-r)^n$ $= 21\,000 \times (1-0.25)^1$ $= \$15\,750$ $\therefore$ Value of the car is \$15 750	2 marks: Correct answer. 1 mark: Finds the value of the car at the end of 2017 or shows some understanding.
25(a)	To find the value of k substitute a value from the table. $L = km + 32$ $41.2 = 2k + 32$ $2k = 9.2$ $k = 4.6$	1 mark: Correct answer.
25(b)	When no item is attached then $m = 0$ $L = 4.6m + 32$ $= 4.6 \times 0 + 32$ $= 32$ $\therefore$ The length of the spring is 32 cm.	1 mark: Correct answer.
25(c)	To find m when $L = 78$ $L = 4.6m + 32$ $78 = 4.6m + 32$ $4.6m = 46$ $m = 10$ kg $\therefore$ Mass of 10 kg makes the spring 78 cm long.	1 mark: Correct answer.
26	Weighted edge: $WX = 3$, $WY = 9$, $WZ = 8$, $XY = 6$, $XZ = 1$, $YZ = 2$ 	2 marks: Correct answer. 1 mark: Draws the vertices with at least one correct edge.
27	$\tan 32° = \frac{h}{18.5}$ $h = 18.5 \times \tan 32°$ $= 11.5600\ldots$ ≈ 11.6 m $\therefore$ Difference in height is 11.6 m 	2 marks: Correct answer. 1 mark: Shows some understanding.

28(a)	$I = Prn$ $= 12\,590 \times 0.18 \times 2$ $= \$4532.40$ $\therefore$ Interest to be paid is \$4532.40.	2 marks: Correct answer. 1 mark: Substitutes one correct value in the formula.
28(b)	$I = Prn$ $= 12\,590 \times 0.21 \times 1.5$ $= \$3965.85$ Saving $= 4532.40 - 3965.85$ $= \$566.55$ $\therefore$ Mia saved \$566.55	2 marks: Correct answer. 1 mark: Calculates the interest on the new card.
29(a)	Intersection of the two linear graphs (15, 400) $\therefore$ Businesses charge the same amount for 15 people.	1 mark: Correct answer.
29(b)	Business A: when $n = 10$ then $c \approx 300$ Business B: when $n = 10$ then $c \approx 340$ $\therefore$ Recommend business A as it is \$40 cheaper.	1 mark: Correct answer.
29(c)	Business A: when $n = 25$ then $c \approx 600$ Cost per person $= 600 \div 25 = \$24.00$ Business B: when $n = 25$ then $c \approx 520$ Cost per person $= 520 \div 25 = \$20.80$ Difference $= 24 - 20.8$ $= \$3.20$ $\therefore$ There is a difference of \$3.20 per person.	2 Marks: Correct answer. 1 Mark: Finds the cost per person for one of the businesses.
30	$P = 0.5n + 4.5$ $= 0.5 \times 100\,000\,000 + 4.5$ $= \$50\,000\,004.5$ This is not an accurate prediction. It is extremely unlikely that a worker can produce 100 million units to make a profit of \$50 000 004.5	2 Marks: Correct answer. 1 Mark: Finds the profit.
31	Total parts $= 7 + 6 + 12 = 25$ 25 parts $= 100$ 1 part $= 4$ 7 parts $= 28$ g/m^2 6 parts $= 24$ g/m^2 12 parts $= 48$ g/m^2 $\therefore$ Nitrogen is 28 g, phosphorus is 24 g and potassium is 48 g	2 Marks: Correct answer. 1 Mark: Makes some progress.
32(a)	Identifying the alternative routes from A to E. Shortest path is A–B–C–E Length $= 6 + 4 + 1$ $= 11$  	2 Marks: Correct answer. 1 Mark: Finds the shortest path or shows some understanding.

32(b)	There are two vertices with an odd degree. deg(C) = 3 and deg(F) = 3. Walk C–E–D–C–B–E–F–B–A–F Note: other answers are possible. 	2 Marks: Correct answer. 1 Mark: Shows some understanding.
33(a)		2 Marks: Correct answer. 1 Mark: Finds an appropriate scale for the axes or plots some correct points.
33(b)	See line draw on the scatterplot	1 mark: Correct answer.
33(c)	Pulse rate is approximately 75 beats per minute for when a person's age is 28 years.	1 mark: Correct answer.
34(a)	'DW' stands for dishwasher.	1 mark: Correct answer.
34(b)	Dimensions of the kitchen are 3150 mm by 2700 mm	1 mark: Correct answer.
35	$FV = PV(1+r)^n$ $= \$940\,000 \times (1+0.06)^5$ $= \$1\,257\,932.043$ $\approx \$1\,257\,932$ ∴ The value of the house after of 5 years is \$1 257 932	2 Marks: Correct answer. 1 Mark: Substitutes one correct value into the formula.
36	Total parts $= 2 + 3 + 4$ $= 9$ 4 parts = \$6480 1 part = \$1620 3 parts = \$4860 ∴ Bella's share is \$4860.	2 Marks: Correct answer. 1 Mark: Shows some understanding.