CHIJ St Joseph's Convent
Solutions for 4 EXP Elementary Math Preliminary Exam Paper 1 2021

Qn	Marking Point
1	-6
2	$x < 3x - 4 \le 12$ $-2x < -4$ $x > 2$ *and* $3x \le 16$ $x \le 5\frac{1}{3}$ $2 < x \le 5\frac{1}{3}$ 3, 4, 5
3(i)	$(2x+5)(x-2)$
3(ii)	$[2(2y-3)+5][(2y-3)-2]$ $=(4y-1)(2y-5)$
4(a)	$2^3 \times 3^3 \times 5$
4(b)	$a = 2$ $b = 3$ $c = 2$
4(c)	36
5(i)	$(2a + 2b)^2 = [2(a + b)]^2$ $= 4(a + b)^2$ $= 4(a^2 + b^2 + 2ab)$ $= 4[(a - b)^2 + 2ab + 2ab]$ $= 4[(a - b)^2 + 4ab]$ $= 4(196)$ $= 784$
5(ii)	$(2a)^2 - (2b)^2 = 4a^2 - 4b^2$ $= 4(a^2 - b^2)$ $= 4(a + b)(a - b)$ Since $a > 0$ and $b > 0$, $a + b > 0$. From **(i)**, $(a + b)^2 = 196$ $\therefore a + b = \sqrt{196}$ $= 14$ $\therefore (2a)^2 - (2b)^2 = 4(a + b)(a - b)$ $= 4(14)(-6)$ $= -336$

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6	Original area of triangle = $\frac{1}{2}(AB)(AC)$ New area of triangle = $\frac{1}{2}(0.9AB)(1+\frac{x}{100})AC$ $\therefore \frac{\frac{1}{2}(0.9)(1+\frac{x}{100})(AB)(AC) - \frac{1}{2}(AB)(AC)}{\frac{1}{2}(AB)(AC)} = \frac{125}{100}$ $\frac{\frac{1}{2}(AB)(AC)[0.9(1+\frac{x}{100}) - 1]}{\frac{1}{2}(AB)(AC)} = \frac{5}{4}$ $0.9 + \frac{9x}{1000} - 1 = \frac{5}{4}$ $\frac{9x}{1000} = \frac{5}{4} + 0.1$ $\frac{9x}{1000} = \frac{27}{20}$ $\therefore x = \frac{27}{20} \times \frac{1000}{9}$ $= 150$
7(i)	14
7(ii)	$35 = 7\sqrt{t-12}$ $25 = t - 12$ $t = 37$
8(a)(i)	$1426 \div 115 \times 15$ \$186
8(a)(ii)	$\frac{1426}{115} \times 100$ or $\frac{186}{15} \times 100$ \$1240
8(b)	$\frac{1240 - 1007.50}{1240} \times 100\%$ $= 18.75\%$
9(a)(i)	1
9(a)(ii)	2

Qn	Marking Point
9(b)	$54 = \frac{k}{r^2}$ $F = \frac{k}{9r^2}$ $F = \frac{1}{9}(\frac{k}{r^2})$ $F = \frac{1}{9}(54)$ $F = 6$
10(a)	$A \cap B'$
10(b)	(i) $\subset$ (ii) $\not\subset$ (iii) $\in$
11(a)	168.3 cm
11(b)	The key here is that the response should refer to the "change" of the gradient of the graph for female. This can be done explicitly or implicitly. Explicitly mentioning about the steepness of the curve of the graph: • It does no longer go straight up, it straightens out. • The curve levels off. • It is more flat after 12. • The line of the girls starts to even out and the boys line just gets bigger. • It straightens out and the boys graph keeps rising. • You can see the **gradient** is less. • The **rate of change** of the graph decreases from 12 years on. • [The student computed the angles of the curve with respect to the x-axis before and after 12 years.] Implicit comparison using the actual amount of growth before 12 years and after 12 years of age: • From 10 to 12 the growth is about 15 cm, but from 12 to 20 the growth is only about 17 cm. • The average growth rate from 10 to 12 is about 7.5 cm per year, but about 2 cm per year from 12 to 20 years.
12(a)	$\frac{1}{2}(4)^2(2\times 0.125)$ = 2cm^2
12(b)	$\tan 0.25 = \frac{CT}{4}$ $CT \approx 1.0213$ Area of triangle $OCT = \frac{1}{2}\times 1.0213\times 4$ Area of region BCT = 0.0426 cm^2

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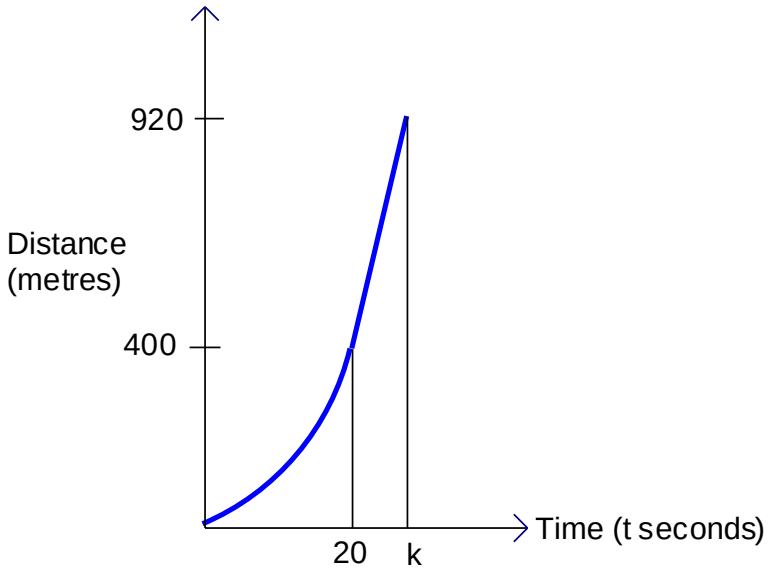
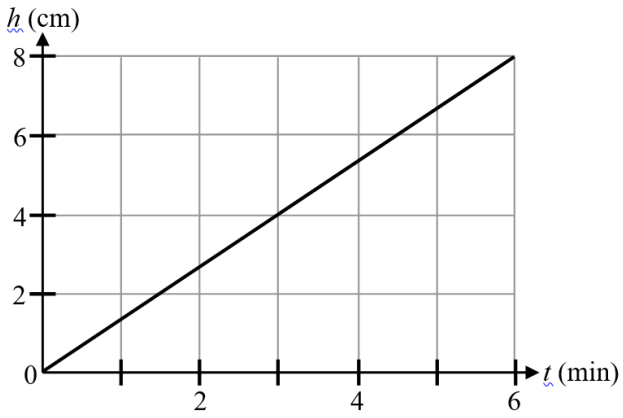
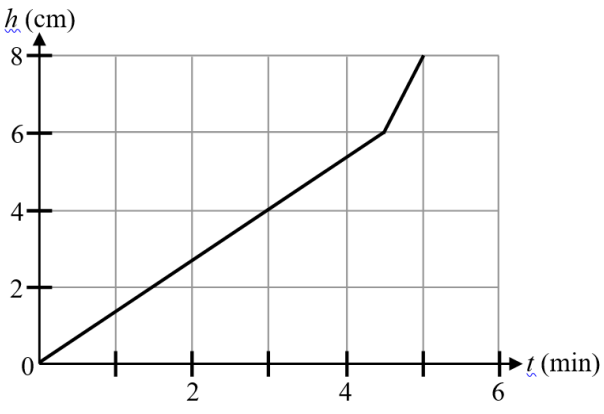
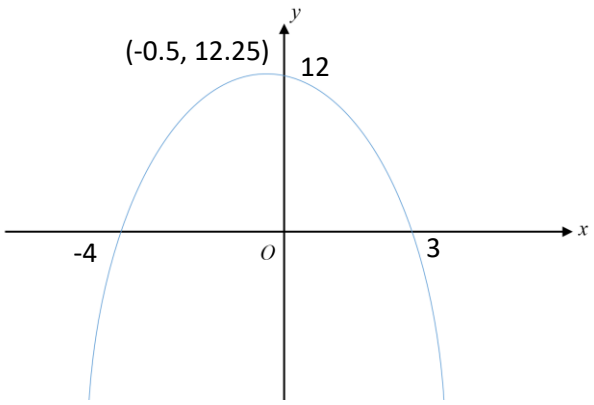
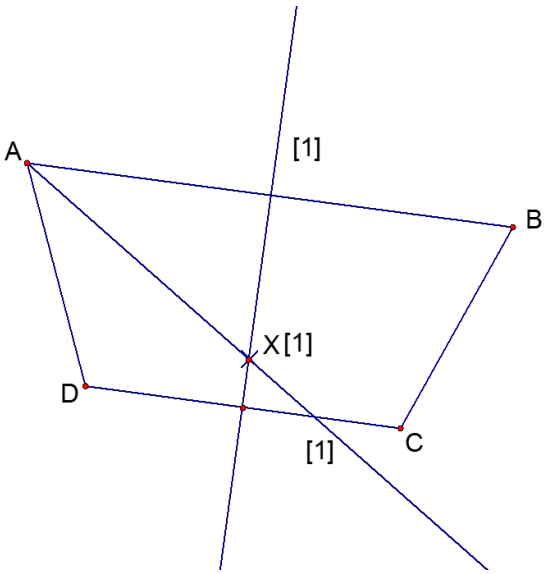
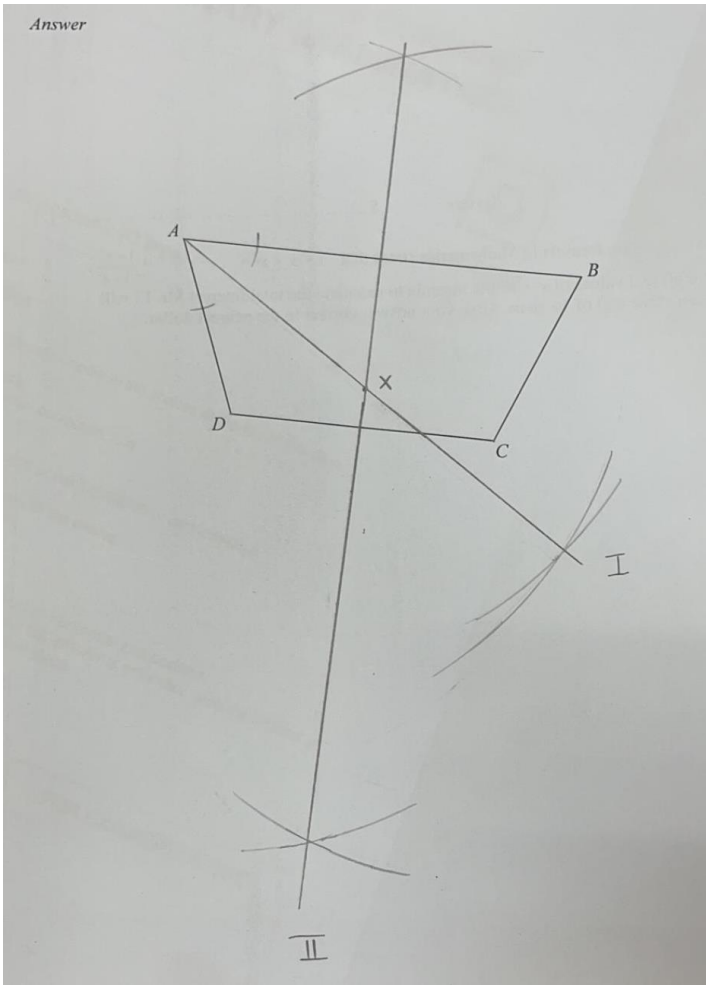
13(a)	Acceleration when t = 6 s = $\frac{40}{20}$ = 2 ms^{-2}
13(b)	$\frac{1}{2}(40)(20)+40(k-20)=920$ k-20 = 13 k = 33
13(c)	
14(a)	(a) 
14(b)	(b) 

Qn	Marking Point
15(a)(i)	
15(a)(ii)	$x = -0.5$
15(b)	
16	 [3]

Qn	Marking Point
	
17(a)	Amount accumulated at the end of 2 years $= 5000\left(1+\frac{4}{100}\right)^2 + 5000\left(1+\frac{4}{100}\right)$ = \$10 608 Interest earned at the end of 2 years = \$(10 608 – 10 000) = \$608
17(b)	Amount accumulated at the end of 10 years $= 5000\left(1+\frac{4}{100}\right)^{10} + 5000\left(1+\frac{4}{100}\right)^{9} + ... + 5000\left(1+\frac{4}{100}\right)$ $= 5000(1.04 + 1.04^2 + \ldots + 1.04^{10})$ $= 5000(1.04)(1 + 1.04 + \ldots + 1.04^{9})$ $= 5200\left(\frac{1-1.04^{10}}{1-1.04}\right)$ = \$62 431.76 (correct to 2 d.p)

Qn	Marking Point
	Total interest = \$62 431.76 – 10(\$5000) = \$12 431.76 = \$12 432 (correct to the nearest dollar)
18(a)	$\angle BCD = 120°$ (Angles in opposite segments)
18(b)	$\angle CDB = 30°$ (base angle of isosceles triangle) $\angle EDB = 74°$ (angle sum of triangle) $\angle CDE = 104°$
18(c)	$\angle ADC = 90°$ (right angle in semicircle) $\angle ADE = 14°$
19(a)	Gradient of $BC = \frac{5-3}{6-2}$ $= \frac{1}{2}$
19(b)(i)	Form a rectangle $ADBECF$ Area of ΔABC = Area of $ADBECF$ – Area of ΔADB – Area of ΔBEC – Area of ΔAFC $10 = (8-2)(5-k) - \frac{1}{2}(8-2)(3-k) - \frac{1}{2}(6-2)(5-3) - \frac{1}{2}(8-6)(5-k)$ or $10 = 6(5-k) - 3(3-k) - 4 - (5-k)$
19(b)(ii)	$6(5-k) - 3(3-k) - 4 - (5-k) = 10$ $30 - 6k - 9 + 3k - 4 - 5 + k = 10$ $12 - 2k = 10$ $2k = 2$ $k = 1$
20(a)(i)	27
20(a)(ii)	11.1
20(b)	**Class Integrity** performed better as its **mean mark is higher** than that of class Respect. There is a **narrower spread** in the marks **in Class Integrity** as its **standard deviation is lower** than that of Class Respect. (or **The marks in Class Integrity are more consistent** as the **standard deviation** of the marks in Class Integrity is **smaller** than that of Class Respect.)

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