PERTH MODERN SCHOOL
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Independent Public School

Course   Methods

Year 11

Student name: _____*Solutions*_____

Teacher name: _____

Date: 27/07/20

Task type: Response

Time allowed for this task: 30 mins

Number of questions: 5

Materials required: NO CALCULATORS ALLOWED
ONE A4 PAGE BOTH SIDES OF NOTES ALLOWED
FORMULA SHEET PROVIDED

Standard items: Pens (blue/black preferred), pencils (including coloured), sharpener,
correction fluid/tape, eraser, ruler, highlighters

Special items: Drawing instruments, templates and formula sheet

Marks available: 30 marks

Task weighting: 10 %

Formula sheet provided: Yes

Note: All part questions worth more than 2 marks require working to obtain full marks.

Question 1   (1.3.2)   **(2, 2 = 4 marks)**

Evaluate and express your answer in whole numbers.

i) $6! = 6 \times 5 \times 4 \times 3 \times 2 \times 1$ ✓

$$= 720 ✓$$

$$\begin{array}{r} 36 \\ \times\ 20 \\ \hline \end{array}$$

ii) $\binom{10}{6} = \dfrac{10!}{(10-6)!\ 6!}$

$$\approx \dfrac{10!}{4!\ 6!} ✓$$

$$\approx \dfrac{10 \times 9^3 \times 8 \times 7}{4 \times 3 \times 2}$$

$$= 210. ✓$$

Question 2   **(1.3.1)**   **(2, 3 = 5 marks)**

a) Expand $(1-x)^4$ in ascending powers of x. Express your answer as whole numbers. ✓

$$= x^4 - 4x^3 + 6x^2 - 4x + 1 \quad ✓$$

b) Show how you would use your answer in (a) to calculate the value of 0.99^4. State this value correct to 4 decimal places. ✓

$$(1-0.01)^4 = \cancel{((0.01)^4} - 4(0.01)^3 + 6(0.01)^2 - 4(0.01) + 1$$

$$= 0.9606 \quad ✓$$

$$
\begin{array}{r}
1.\overset{0}{\cancel{0}}\overset{9}{\cancel{0}}06 \\[-2pt]
-\ 0.0400 \\ \hline
0.9606
\end{array}
$$
✓

$$
\begin{array}{r}
1.000 \\
+\ 0.00000001 \\
+\ 0.0006 \\ \hline
1.\overset{0}{\cancel{0}}\overset{9}{\cancel{0}}06|0001 \\
-\ 0.0400|0400 \\ \hline
0.9606|
\end{array}
$$

Question 3   (1.3.2)   **(1, 1, 1, 2, 2 = 7 marks)**

The Australian Chess team of 9 people is to be selected from 10 from West Australia, 8 from NSW and 5 from Victoria. Write mathematical expressions for the number of different ways the team can be selected if:

a) There are no restrictions

$$\binom{23}{9} \quad \checkmark$$

b) All three states are equally represented.

$$\binom{10}{3}\binom{8}{3}\binom{5}{3} \quad \checkmark$$

c) There are no Victorians

$$\binom{18}{9} \quad \checkmark$$

d) The NSW representatives are in the majority

$$\binom{8}{5}\binom{15}{4} + \binom{8}{6}\binom{15}{3} + \binom{8}{7}\binom{15}{2} + \binom{8}{8}\binom{15}{1} \quad \checkmark$$

e) The WA husband and wife pair Elise and Nathan can only afford to have one of them in the team.

$$\binom{23}{9} - \binom{2}{2}\binom{21}{7} \quad \checkmark\checkmark$$

$$\text{or}$$

$$\binom{2}{1}\binom{21}{8} + \binom{21}{9}$$

Question 4   **(1.2.7)**   **(1, 1, 1, 1, 2, 2 = 8 marks)**

The diagram shows a unit circle with centre O. A is a point on the unit circle with co-ordinates (p, q). The ray OA is inclined at an angle of $25°$ to the positive x-axis as shown.
Use the unit circle to find in terms of p and/or q:

a) $\cos -25° = p$ ✓

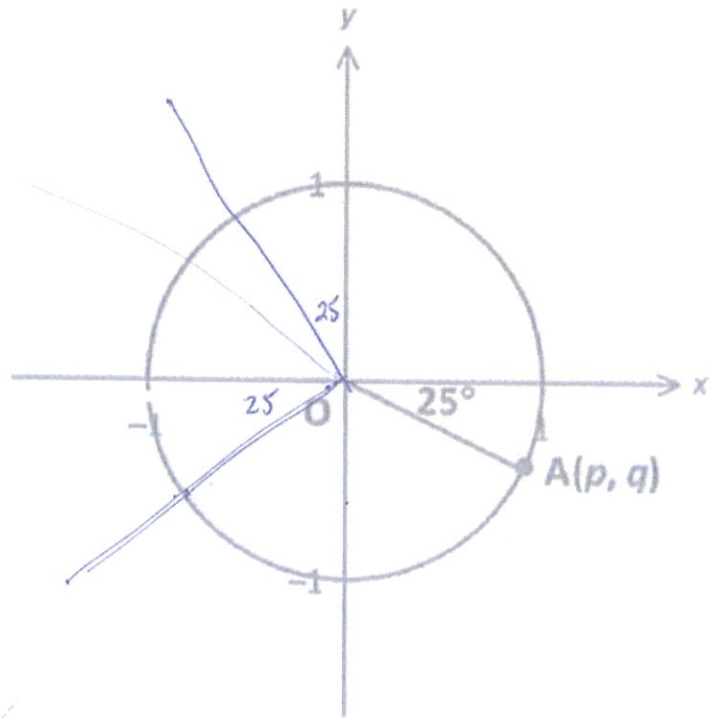b) $\sin (25°)$ $-q$ ✓

c) $\cos (155°)$ $-p$ ✓

d) $\sin (205°)$ q ✓

e) $\tan (115°)$ $\dfrac{p}{-q}$ ✓✓

f) $\tan (-155°)$ $\dfrac{q}{-p}$ ✓✓

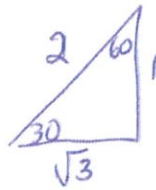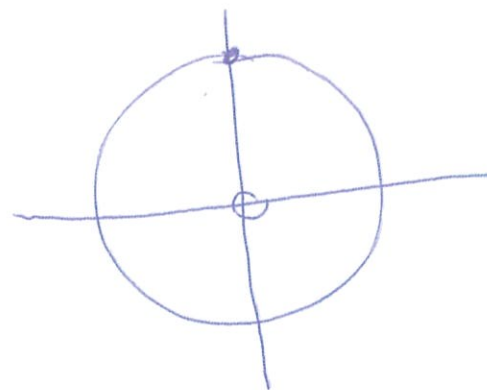**Question 5**   (1.2.8)   (2, 2, 2 = 6 marks)

What are the exact values of
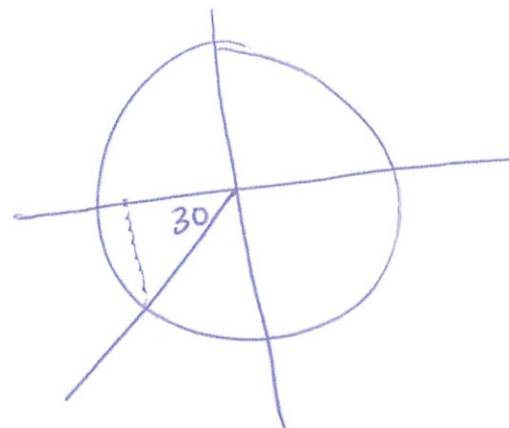
a) $\sin\left(-\frac{2\pi}{3}\right) = -\sin 60$ ✓

$= -\frac{\sqrt{3}}{2}$ ✓
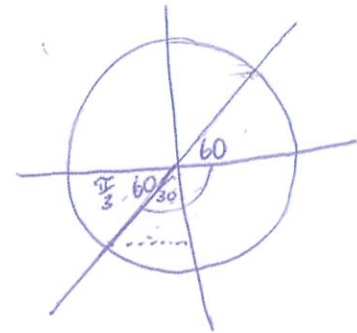
b) $\tan\left(\frac{15\pi}{6}\right) = \tan\left(\frac{12\pi}{6} + \frac{3\pi}{6}\right)$

$\left(2\pi + \frac{\pi}{2}\right)$ ✓

$= \tan 90°$

$= $ undefined ✓

c) $\cos 210° = -\cos 30$ ✓

$= -\frac{\sqrt{3}}{2}$ ✓

END OF TEST