*numbers are out of order

3/4/19

Take Home Test

Mandi Andersen

$b = 0\ 2;0,0\ 60 - 20,30;30.16 = 40\ 39\ 44$

7. approximate $\sqrt{5}$

$a=2$

$5-(2)^2=b$

$5-4=1=b$

$c=\frac{1}{2}(1)(\frac{1}{2})$

$c=\frac{1}{4}$

$\sqrt{5}=2+\frac{1}{4}=2\frac{1}{4}$

$=2+\frac{1}{2}(1)(\frac{1}{2})$

$=2\frac{1}{4}$

$a=34;56$

$2-(34;56)^2=2-20,20;20,16$

$b=40;39,44$

$c=\frac{1}{2}b\frac{1}{a}=\frac{1}{2}$?

our $\sqrt{5}=2.24$

theirs was $2\frac{1}{4}$ or 2.25

They were one hundreath off in their approximation.

$(34;56)^2=$

34;56
34,56

1904 3136
1156 1904 0

1156 3808 3136

~~1156 3860 16~~

1220 20 16

20, 20; 20, 16

8. $\sqrt{683,929}$

① $N \geq (800)^2$

② $N-800^2=43929 \geq 2(800)(b\cdot10)+(b+10)^2$

③ $11529 \geq 2(820)(b\cdot1)+(b\cdot1)^2$

$2(820)(7\cdot1)+(7\cdot1)^2$

11529 11529

$\boxed{=827}$

$(800)^2=640,000$

$(900)^2=810,000$

b=3

b=6

b=8 =13184

b=7 =11529

b=6

$2(800)(6\cdot10)+(6\cdot10)^2$

99600

b=2

* $2(800)(2\cdot10)+(2\cdot10)^2$

32400

b=3

$2(800)(3\cdot10)+(3\cdot10)^2$

48900

9.

a. $crd(80°)=$

$crd(180-100)$

$=\sqrt{14400-(crd\,100)^2}$

$=\sqrt{14400-(92)^2}$

$=\sqrt{14400-8464}$

$\boxed{=\sqrt{5936}}$

b. $crd(20°)=$

$120\,crd(\alpha-\beta)=crd\,\alpha\ crd(180-\beta)-crd\,\beta\cdot crd(180-\alpha)$

$120\,crd(120-100)=crd\,120\cdot crd\,80-crd\,100\cdot crd\,60$

$120\,crd(20)=60\sqrt{3}\cdot\sqrt{5936}-92\cdot60$

$\frac{120\,crd(20)}{120}=\frac{60\sqrt{17808}-5520}{120}$

$crd(20)=\boxed{\frac{\sqrt{17808}}{2}-46}$

Page 2

$2\sqrt{3}$ $\sqrt{12}$ $\sqrt{4}\cdot\sqrt{3}$

$(30\sqrt{6}-30\sqrt{2})(30\sqrt{6}-30\sqrt{2})$

$900\cdot 6-900\sqrt{12}-900\sqrt{12}+900\cdot 2$

$5400-900\sqrt{12}-900\sqrt{12}+1800$

$\cancel{7200-1800\sqrt{12}}$

$=7200-1800\cdot 4\sqrt{3}$

$=7200-7200\sqrt{3}$

?

c. $\text{Crd}(50^\circ)=$

$120\,\text{crd}(\alpha-\beta)=\text{crd}\,\alpha\,\text{crd}(180-\beta)-\text{crd}\,\beta\,\text{crd}(180-\alpha)$

$120\,\text{crd}(150-100)=\text{crd}\,150\,\text{crd}(80)-\text{crd}\,100\,\text{crd}(30)$

*continued on next page

d. $\text{Crd}(150^\circ)=$

$\text{Crd}(180-30)$

$=\sqrt{14400-(\text{crd}\,30)^2}$

$=\boxed{\sqrt{14400-(30\sqrt{6}-30\sqrt{2})^2}}$

$\boxed{11}$

a. $\sin 13^\circ=\sin(11\tfrac{1}{4}+1\tfrac{3}{4})$

$=\sin(11\tfrac{1}{4})+\dfrac{1\tfrac{3}{4}}{2(3\tfrac{3}{4})}(\Delta_i+\Delta_{i+1})-\dfrac{(1\tfrac{3}{4})^2}{2(3\tfrac{3}{4})^2}(\Delta_i-\Delta_{i+1})$

$=671+\dfrac{1\tfrac{3}{4}}{7\tfrac{1}{2}}(222+219)-\dfrac{\tfrac{49}{16}}{2(\tfrac{225}{16})}(222-219)$

$=671+\dfrac{7}{30}(441)-\dfrac{23}{225}(3)$

$=671+\dfrac{168}{5}-\dfrac{23}{75}$

$\boxed{=704}$

$\sin 13 \approx \dfrac{704}{3438}=0.205 \leftarrow$ his

$0.225 \leftarrow$ ours

b. $\sin 13^\circ=\dfrac{4\cdot 3438\cdot 13(180-13)}{40500-13(180-13)}$

$\boxed{=779}$

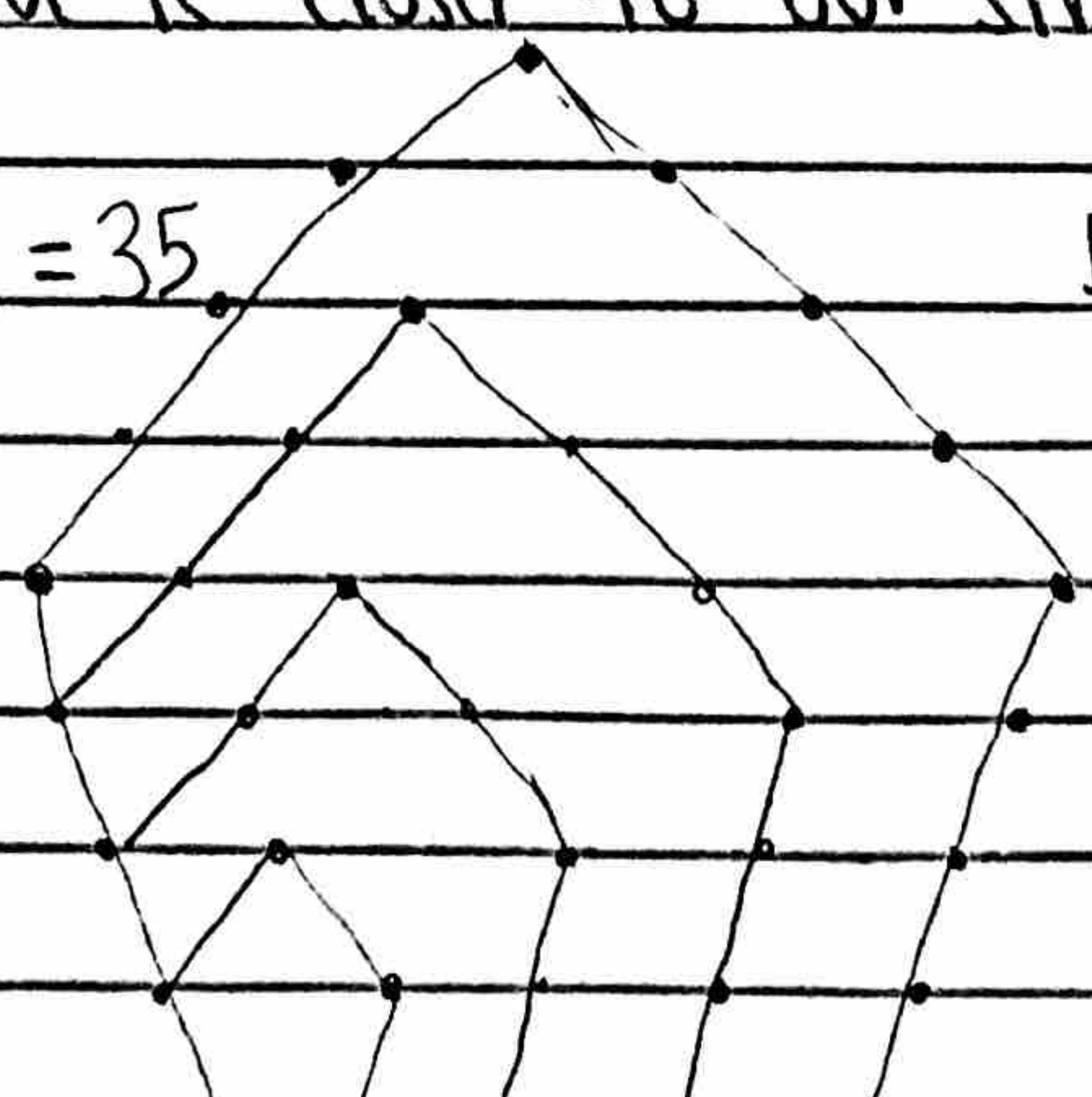
$\sin 13 \approx \dfrac{779}{3438}=0.227 \leftarrow$ his

$0.225 \leftarrow$ ours

c. Bhāskara's calculation was more precise because his sin value is closer to our sin value than Brahmagupta's.

$\boxed{12.}$

a. $P_5=35$



b. $n=1$ $P_1-T_1=1-1=0$

$n=2$ $P_2-T_2=5-3=2$

$n=3$ $P_3-T_3=12-6=6$

$n=4$ $P_4-T_4=22-10=12$

c. $P_n-T_n=O_{n-1}$

Mandi Andersen

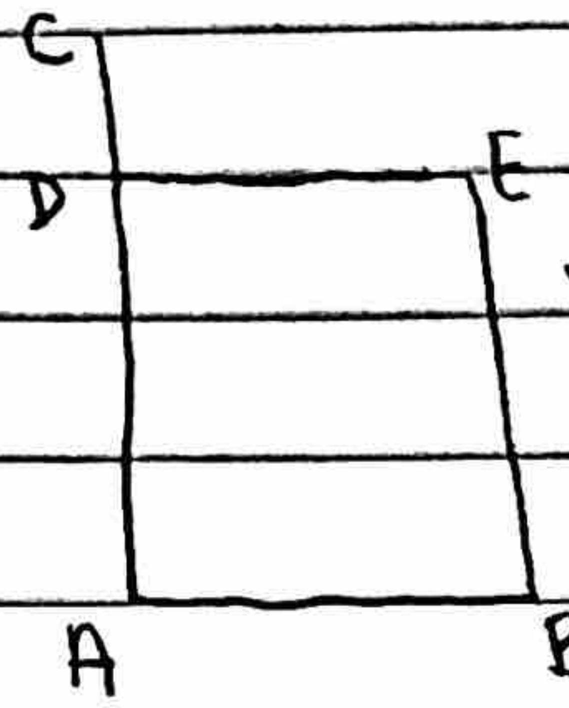
9 Continued...

c $$\frac{120\,\text{crd}(50)}{120} = \frac{\sqrt{14400-(30\sqrt{6}-30\sqrt{2})^2} \;\; \text{crd}\,80 - 92 \cdot 30\sqrt{6} - 30\sqrt{2}}{120}$$

$$\text{crd}(50) = \boxed{\frac{\sqrt{14400(30\sqrt{6}-30\sqrt{2})^2} \;\; \text{crd}\,80 - 92 \cdot 30\sqrt{6} - 30\sqrt{2}}{120}}$$

14 Proposition 1-46

- AC is perpendicular to AB.
- Make a point D so that AD=AB and they meet at point E.



- Quadrilateral ADEB is a square.
- ADEB is a parallelogram because it has two pairs of parallel sides (proven in 1-11 and 1-13).

- By 1-34, opposite sides are equal, therefore all four sides are equal.
- ADEB is a square, so all angles are right angles.
- AD crosses AB and DE, so the interior angles ∠BAD and ∠ADE are two right angles by proposition 1-29.
- Both ∠BAD and ∠ADE are right angles
- By 1-34, opposite angles are equal, so ∠DEB and ∠EBA are also right angles, and the four right angles make ADEB a square.

13 Jyesthadeva is saying that by using the diameter of a circle, you can find the length of a side of the square. This length is approximately the same area of the circle. For example, dividing the diameter into 15 parts and then reducing it by 2 gives you 13/15. The side of the square is 13/15 of the diameter. 13/15 is also the area of the circle. You can use this to approximate π by squaring it and multiplying it by 4. Ex: $4\left(\frac{13}{15}\right)^2 = 3.00444444$.

$a_4 = \sqrt{r^2 - \left(\frac{c_n}{2}\right)^2}$

$a_4 = \sqrt{10^2 - \left(\frac{\sqrt{200}}{2}\right)^2}$

$a_4 = 7.07$

$\boxed{10.}$

a. S_{16}

$n=8$

$S_{16} = \frac{1}{2}(8) r C_8$

$S_{16} = \frac{1}{2}(8)(10) C_8$

$S_{16} = \frac{1}{2}(8)(10)(7.65)$

$S_{16} = 306$

$C_8 = \sqrt{\left(\frac{C_4}{2}\right)^2 + (r - a_4)^2}$

$C_8 = \sqrt{\left(\frac{\sqrt{200}}{2}\right)^2 + (10 - a_4)^2}$

$C_8 = \sqrt{\left(\frac{\sqrt{200}}{2}\right)^2 + (10 - 7.07)^2}$

$C_8 = 7.65$

b. S_{2n} for $n=96$ and $r=10$

$= 314\frac{64}{625} = \pi = 3.141024 \approx 3.14$

$\pi \approx 3.14$