

आर्यभटीय गणितपाद १०

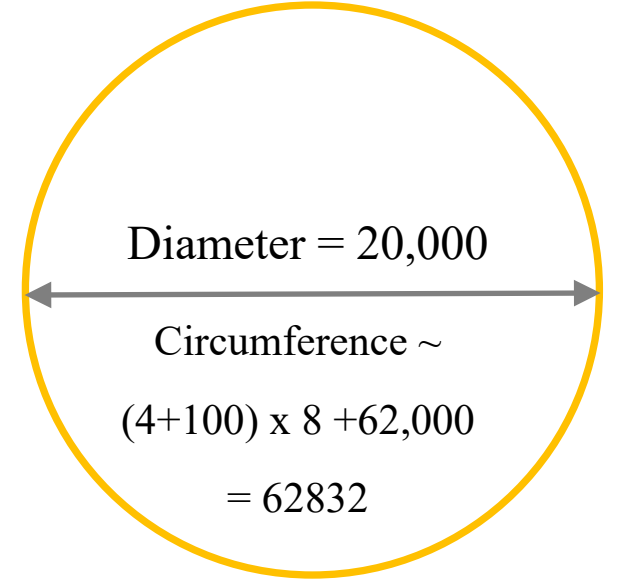
āryabhaṭīya gaṇitapāda 10

~ 500 AD

चतुर्-अधिकम् शतम् अष्ट-गुणम् द्वा-षष्टिः तथा सहस्राणाम्

अयुत-द्वय-विष्कम्भस्य आसन्नः वृत्त-परिणाहः ।

Four added to hundred, multiplied by eight, sixty-two also of thousands, is the approximate produced circumference of a circle of diameter of double ten-thousand.



$$\pi \stackrel{\text{def}}{=} \frac{\text{Circumference}}{\text{Diameter}} \cong \frac{(4 + 100) \times 8 + 62,1000}{20,000} = 3.1416 \quad \text{Aryabhata Estimate}$$

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catur-adhikam śatam aṣṭa-guṇam dvā-ṣaṣṭiḥ tathā sahasrāṇām
ayuta-dvaya-viṣkambhasya āsannaḥ vṛtta-pariṇāhaḥ |

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Adverb	n Acc Sg	n Nom Sg	f Nom Sg	Adverb	n Gen Pl
catur-	śatam	aṣṭa-	guṇam	dvā-	śaṣṭiḥ
-m ś- = -ṃ ś-		-m d- = -ṃ d-		-ḥ t- = -s t-	
	m Gen Sg	m Nom Sg	m Nom Sg		
ayuta-	dvaya-	viṣkambhasya	āsannaḥ	vṛtta-	pariṇāhaḥ
				-ḥ v- = -o v-	

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Element	Type	Meaning	Formation
catur-	चतुर्-	Noun	four
adhika-	अधिक-	Adverb	plus, added
śata-	शत-	Noun	hundred
aṣṭan-	अष्टन्-	Noun	eight; (aṣṭa- in compound)
guṇa-	गुण-	Noun	multiplier
dvi-	द्वि-	Noun	two; (dvā- or dvi- in compound)
śaṣṭi-	षष्टि-	Noun	sixty
tathā	तथा	Adverb	thus, in this way, also, likewise
sahasra-	सहस्र-	Noun	thousand
ayuta-	अयुत-	Noun	ten-thousand
dvaya-	द्वय-	Noun	double, pair
viṣkambha-	विष्कम्भ-	Noun	diameter
āsanna-	आसन्न-	Adjective	approximate, near
vṛtta-	वृत्त-	Adjective	accomplished, produced, arrived
pariṇāha-	परिणाह-	Noun	circumference of circle

śata-n	Singular	Dual	Plural	sahasra-n	Singular	Dual	Plural	pariṇāha-m	Singular	Dual	Plural
Nominative	śatam	śate	śatāni	Nominative	sahasram	sahasre	sahasrāṇi	Nominative	pariṇāhaḥ	pariṇāhau	pariṇāhāḥ
Vocative	śata	śate	śatāni	Vocative	sahasra	sahasre	sahasrāṇi	Vocative	pariṇāha	pariṇāhau	pariṇāhāḥ
Accusative	śatam	śate	śatāni	Accusative	sahasram	sahasre	sahasrāṇi	Accusative	pariṇāham	pariṇāhau	pariṇāhān
Instrumental	śatena	śatābhyām	śataiḥ	Instrumental	sahasreṇa	sahasrābhyām	sahasraiḥ	Instrumental	pariṇāhena	pariṇāhābhyām	pariṇāhaiḥ
Dative	śatāya	śatābhyām	śatebhyaḥ	Dative	sahasrāya	sahasrābhyām	sahasrebhyaḥ	Dative	pariṇāhāya	pariṇāhābhyām	pariṇāhebhyaḥ
Ablative	śatāt	śatābhyām	śatebhyaḥ	Ablative	sahasrāt	sahasrābhyām	sahasrebhyaḥ	Ablative	pariṇāhāt	pariṇāhābhyām	pariṇāhebhyaḥ
Genitive	śatasya	śatayoḥ	śatānām	Genitive	sahasrasya	sahasrayoḥ	sahasrāṇām	Genitive	pariṇāhasya	pariṇāhayoḥ	pariṇāhānām
Locative	śate	śatayoḥ	śateṣu	Locative	sahasre	sahasrayoḥ	sahasreṣu	Locative	pariṇāhe	pariṇāhayoḥ	pariṇāheṣu
guṇa-n	Singular	Dual	Plural	viṣkambha-m	Singular	Dual	Plural				
Nominative	guṇam	guṇe	guṇāni	Nominative	viṣkambhaḥ	viṣkambhau	viṣkambhāḥ				
Vocative	guṇa	guṇe	guṇāni	Vocative	viṣkambha	viṣkambhau	viṣkambhāḥ				
Accusative	guṇam	guṇe	guṇāni	Accusative	viṣkambham	viṣkambhau	viṣkambhān				
Instrumental	guṇena	guṇābhyām	guṇaiḥ	Instrumental	viṣkambheṇa	viṣkambhābhyām	viṣkambhaiḥ				
Dative	guṇāya	guṇābhyām	guṇebhyaḥ	Dative	viṣkambhāya	viṣkambhābhyām	viṣkambhebhyaḥ				
Ablative	guṇāt	guṇābhyām	guṇebhyaḥ	Ablative	viṣkambhāt	viṣkambhābhyām	viṣkambhebhyaḥ				
Genitive	guṇasya	guṇayoḥ	guṇānām	Genitive	viṣkambhasya	viṣkambhayoḥ	viṣkambhāṇām				
Locative	guṇe	guṇayoḥ	guṇeṣu	Locative	viṣkambhe	viṣkambhayoḥ	viṣkambheṣu				
śaṣṭi-f	Singular	Dual	Plural	āsanna-m	Singular	Dual	Plural				
Nominative	śaṣṭiḥ	śaṣṭī	śaṣṭayaḥ	Nominative	āsannaḥ	āsannau	āsannāḥ				
Vocative	śaṣṭe	śaṣṭī	śaṣṭayaḥ	Vocative	āsanna	āsannau	āsannāḥ				
Accusative	śaṣṭim	śaṣṭī	śaṣṭiḥ	Accusative	āsannam	āsannau	āsannān				
Instrumental	śaṣṭyā	śaṣṭibhyām	śaṣṭibhiḥ	Instrumental	āsannena	āsannābhyām	āsannaiḥ				
Dative	śaṣṭyai	śaṣṭibhyām	śaṣṭibhyaḥ	Dative	āsannāya	āsannābhyām	āsannebhyaḥ				
Ablative	śaṣṭyāḥ	śaṣṭibhyām	śaṣṭibhyaḥ	Ablative	āsannāt	āsannābhyām	āsannebhyaḥ				
Genitive	śaṣṭyāḥ	śaṣṭyoḥ	śaṣṭinām	Genitive	āsannasya	āsannayoḥ	āsannānām				
Locative	śaṣṭyām	śaṣṭyoḥ	śaṣṭiṣu	Locative	āsanne	āsannayoḥ	āsanneṣu				

चतुरधिकं शतमष्टगुणं द्वाषष्टिस्तथा सहस्राणाम्
अयुतद्वयविष्कम्भस्यासन्नो वृत्तपरिणाहः ।

caturadhikaṃ śatamaṣṭaguṇaṃ dvāṣaṣṭistathā sahasrāṇām
ayutadvayaviṣkambhasyāsanno vṛttapariṇāhaḥ ।

āryabhaṭṭīya gaṇitapāda 10 [500 AD]