The LADIES *Diary:*

OR, THE

Woman's ALMANACK,

For the YEAR of our LORD, 1747.

Being the *Third* after *Biſſextile*, or LEAP-YEAR.

Containing many Delightful and Entertaining PARTICULARS
Peculiarly adapted for the *Uſe* and *Diverſion* of the

FAIR-SEX.

Being the *Forty Fourth* ALMANACK publiſh'd of this Kind.

YE *Britiſh* FAIR, with ev'ry Grace refin'd,
Born to delight, and to ſubdue Mankind!



2. Vouchſafe in *Arts*, your ſprightlier Parts to lend,
And Wit and Senſe their Empire ſhall extend:

3. The World PEN more than the *Needle* prize,
One pleaſes *Hearts!* the Other pleaſes *Eyes!*

4. Thus o'er the World, LADIES, aſſert your Sway,
Beauty commands, and *Science* leads the Way:
Proceed and conquer by your matchleſs Charms,
And lead Whole *Nations* captive to your *Arms!*

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PREFACE.

MATHEMATICAL PROBLEMS are but another Kind of *Ænigma*'s to Thoſe which are uſually ſo call'd: The One *Species* being Propoſitions intricately involv'd, concerning the Properties of *Lines*, *Number*, &c. in Geometry; Affections of Quantity, or *Modes Intellectual*: And the other being Propoſitions intricately involved, concerning the Properties of Action, or of Things in Nature; Affections of Quality, or *Modes Natural*.

THE Evolution of ſuch Propoſitions in finding out all the intermediate *Ideas*, by which the Chain of Connection is link'd together, ſo as to diſcover the Agreement of Truth at laſt, is the Solution of the *Problem*, or *Ænigma* propoſed: And this is an Exerciſe of the Invention and Judgment, the greateſt the *Mind* is capable of.

AND however trifling and uſeleſs, ſuch *Ænigmas* may appear to ſome, yet, by ſuch an Exerciſe of *Invention* and *Judgment*, frequently repeated, the Mind acquires a Habit of reaſoning diſtinctly and cloſely, and the *Intellectual Faculties* are extended to their utmoſt Limits of Improvement.

IF in the following *Sheets*, the Fancies and Judgment of the LADIES of *Great-Britain* are puzzled, and pleaſed, I hope they will concur in Conjunction, by promoting the ſame mutual and deſireable End.

HURLOTHUNDRO.

ECLIPSES.

The ECLIPSES, *Calculated for* 1747, *ſhewing in what Parts of the* World *they will be* Viſible. *By Mr.* Ralph Hulſe.

1. ON *January* 29th, at 3 h. in the *Afternoon*, the *Sun* will be Eclipſed in ♒, 21 Deg. vertical to *Brazil*, *Lat.* 14 Deg. South. *Long.* 50 Degrees, W. This *Eclipſe* will be very ſmall, and *Viſible* near the *Antartic Circle*.

2. *Feb.* 14th, at 5 h. 2[1] in the *Morning*, the *Moon* will be *Eclipſed Viſible* and *Total*, at *London*: Beginning 3 h. 15'. Middle 5 h. End 6 h. 45'. Total Duration 3 h. 30'. *Digits* eclips'd 20 1 quarter.

3. *Feb.* 28th, at 5 in the *Morning*, the *Sun* will be Eclipſed 1 *Digit* in ♓ 20 *Deg.* He is then *Vertical* to the *Indian Sea*, between *Bornio* and *Java*: *Lat.* 4 Deg. So. *Long.* 110 *Deg.* and will be ſeen in *Greenland*, and the Places adjacent.

4. *July* 26th, at 8 in the *Forenoon*, the *Sun* will be 1 *Digit* Eclips'd in ♌, 13 *Deg.* *Vertical* to *Arabia Fælix*: *Lat.* 17 *Deg.* *Long.* 41 *Deg.* E. *Viſible* in the North *Frozen* Sea, *Lat.* 80 *Degrees*.

5. On *Auguſt* 9th, at 10 in the *Forenoon*, the *Moon* will be *Totally Eclips'd*, viz. 27 *Deg.* in ♒. She is then *Vertical* to *Mardelzur*, *Lat.* 12 *Deg.* South. *Long.* 146 *Deg.* W. *Viſible* to the *Japan*, and *Philippine Iſlands*, to all the *Weſt* Ocean, between *Aſia* and *America*, from S. to N. including *Jamaica*, *Cuba*, *Carolina*, and *Virginia*. — And the Horizon of the *Viſible Disk*, paſſes through *Penſilvania*.

The 6th, and Laſt, is *Aug.* 24th, at 9 at *Night*, when the *Sun* will be Eclips'd in ♍, 12 *Deg.* This will be a very *ſmall Eclipſe*, and *Viſible* only in the *Unknown* Southern Parts of the World.

For

MOON Eclips'd.

For a Larger Account *of the* MOON's Eclipse *in* February, *and for more Variety, the* following TABLE *is inserted.*

MOON Eclips'd, *Feb.* 14th, *Morning.*		Begin.	Mid.	End.	Dur.	Dig.
		h. ' ''	h. ' ''	h. ' ''	h. ' ''	h. ' ''
Mr. *Cuth. Cockson* by *Leadbetter's* Tables.	*London*	3 13 20	5 1 30	5 50 29	3 36 9	19 43
	Durham	3 8 18	4 56 28	5 45 27	† End	of
	Lambton	3 8 10	4 56 20	5 45 19	Total	Darkness.
	Cornwen	2 56 9	4 44 17	5 33 16		
By *New* Tables from Sir *Isaac Newton's* Theory	*Durham*	3 2 10	4 44 9	5 40 8		
	Lambton	3 2 2	4 44 1	5 40 0	3 40 18	19 54
	Cornwen	2 50 1	4 32 0	5 27 59		
By Mr. *Bulman*	*London*	3 2 0	5 5	7 5 *	* End	of the
	Edinburgh	2 50	4 53	6 53	Eclipse.	
	Dublin	2 34	4 37	6 37	4 3	19 58
	Carlisle	2 51	4 54	6 54		
	Rochester	3 3	5 6	7 6		
Mr. *Cowper*	*London*	3 24 34	5 13 19	7 2 4	3 37 30	19 43
Mr. *Farrer*	*Sunderland*	2 41	4 30	6 19	3 38	20 12

All Persons who are pleased to be CONTRIBUTORS, by answering the ÆNIGMAS, QUESTIONS, &c. in this DIARY; or by sending New Ænigmas, Questions, Paradoxes, or other Subjects fitting for this WORK, are desired to send their Solutions with them, before the End of *April*, 1747. directed for the Author, at Mr. Simpson's, at Stationers-Hall, LONDON.

[Post Paid.]

1747 January hath xxxi Days.

First Quarter, the 7th day, at 10 in the Morning.
Full Moon, the 14th day, at 8 in the Evening.
Last Quarter, the 22d day, at 4 in the Morning
New Moon, the 29th day, at 3 in the Afternoon.

1	T	**Circumcision. NEW-YEAR's-DAY.**	5 A	51
2	F	Day increased, and Night shortned 30 min.	7	14
3	S	*Sun* rises 3 min after 8, sets 57 min. after 3	8	32
4	D	2 **Sunday after Christmas**	9	46
5	M	*Good Pendulums should be 10 min. faster than Sun*	10	59
6	T	**Epiphany. CHRIST's Appearance to the Gentiles**	Morn.	
7	W	*Sun* rises at 8, sets at 4.	0	12
8	T	*By Equation of Natural Days, Watches too fast 11m*	1	25
9	F	Day breaks 46 min. after 5. *Plan. hour 41 min.*	2	33
10	S	*Sun* rises 53 min. after 7, sets 8 min. after 4	3	41
11	D	1 **Sunday after Epiphany**	4	50
12	M	Day 8 ho. 16 min. Night 15. ho. 44 min.	6	1
13	T	*Hilary* **Marriage comes in**	6	51
14	W	**Oxford** Hilary, and **Cambridge** Lent Term beg.	7	30
15	T	*Sun* rises 3 quar. after 7, sets 1 quar. after 4.	☾	rises
16	F	*Sun* due *East*, at 5 in the morning	5 A	31
17	S	*Watches 13 min and half too fast*	6	52
18	D	2 **Sunday after Epiphany.** Day incr. 1 h. 20 min	8	14
19	M	Day breaks 34 min. after 5	9	37
20	T	**Prince of *WALES* Born.** Octab. Hil. 1 Return	11	1
21	W	*Watch 14 m. too fast. Planetary hour 44 mi.*	Morn	
22	T	*Sun* rises 34 min. after 7, sets 26 min. after 4.	0	27
23	F	**Hilary Term Begins**	1	54
24	S	*Sun* rises 30 min. after 7, sets 30 min. after 4	3	21
25	D	**Conversion of St. PAUL. 3 Sund. after Epiph.**	4	40
26	M	Day break 23 min. after 5	5	43
27	T	Quind. Hil. 2 Ret. *Watches 14 min. 3 qu. too fast*	6	30
28	W	Day lengthen'd 1 ho. 50 m. Day br. 20 m. after 5	7	2
29	T	*Sun Ecl. Invis.* *Sun* rises 21 m. aft. 7, sets 39 m. 4	☽	sets
30	F	**K. CHARLES I. Martyr'd at *Whitehall*,**	6 A	5
31	S	[at 12 minutes past One, 1648	7	28

LADIES, I'm come again, Yourselves prepare
To taste the prom'sing *Blessings* of the YEAR:
REBELLION's Head is in your *Conqueror*'s Hand,
Whose *God-like* Fame rejoices all the Land.

1747 February hath xxviii Days.

First Quarter, the 6th day at Noon
Full Moon, the 13th day, at 9 Morning
Last Quarter, the 20th day, at 6 Afternoon
New Moon, the 28th day, at 5 Morning

M. D's.	W. D's.	Sundays, Holy-days, Remarkable Days, Eclipses, Sun-rising, Sun-setting, Length of Days and Nights, Regulation of Clocks, Terms, Returns, Day-break, Twilight, Planetary Hours, &c.	Moon's Rising from the Full to the Change, and Setting from the New to the Full
1	D	4 Sun. aft. Epiph. *Sun* rises 19 aft. 7, sets 39 af. 4.	8 A 40
2	M	Purification, or, Candlemas-Day	9 51
3	T	Craft. Purif. 3 Ret. *Wa.* 14 *m.* 45 *sec. too fast*	11 3
4	W	Day 9 hours 42 m. Night 14 ho. 18 min. long.	Morn.
5	T	Day break 6 m. after 5. Incr. 2 ho. 24 min.	0 15
6	F	*Sun* rises 5 min aft. 7, sets at 55 aft. 4	1 39
7	S	Day 10 hours long. Night 14 hours long	2 43
8	D	5 Sund. after Epiph. *Watches* 14 *min. too fast.*	3 47
9	M	Octab. Purif. 4 Returns	4 43
10	T	*Sun* rises 57 m. aft. 6, sets 3 aft. 5	5 28
11	W	*Planetary hour by day* 50 *m.* Day br. at 4 ho. 56m.	5 55
12	T	Hilary Term Ends	6 16
13	F	Day increas'd 3 hours	6 32
14	S	*Valentine.* Moon Eclips'd Visible and Total	☾ es
15	D	Septuagesima. Marriage goes out	7 17
16	M	*Sun* rises 45 min. after 6, sets 15 min. after 5	8 42
17	T	Day 10 ho. half long. Night 13 ho. half	10 11
18	W	*Watches too fast* 13 *min.* *Sun* due *East*, 5 h. 55	11 40
19	T	Day break 40 min. after 4	Morn.
20	F	*Planetary ho. by Day* 53 *min. by Night* 67	1 9
21	S	Day increas'd 3 hours and an half	2 32
22	D	Sexagesima. Princess of HESSE Born	3 42
23	M	*Sun* rises half h. after 6, sets half h. after 5	4 30
24	T	St. MATTHIAS. Day br. 26 m. after 4	5 7
25	W	*Watches* 11 *min too fast*	5 30
26	T	*Planetary hour by Day* 55 *min.*	5 46
27	F	*Sun* rises 23 min. after 6, sets 37 min. after 5	6 ☌
28	S	Sun Eclips'd Invisible. *Sun* due *East*, 5 h. 48 m.	☽ sets

SOL's tim'rous Rays, now, like the anxious FAIR,
Sometimes are vapour'd, then again are clear:
As He thro' Fogs resistless breaks the Day,
So restless LADIES chase their Gloom away.

1747 March hath xxxi Days.

First Quarter, the 7th day, at 2 in the Afternoon
Full Moon, the 14th day, at 11 in the Morning
Last Quarter, the 22d day, at 8 in the Morning
New Moon. the 29th day, at 9 in the Afternoon

1	D	**Shrove-Sunday. Quinquagesima.** St. DAVID	7	A	36
2	M	*Chad. Sun* rises 15 m. after 6, sets 45 after 5	8		49
3	T	**Shrove-Tuesday.** Day 11 ho. and half long	10		6
4	W	**Ash-Wednesday. First Day of *Lent***	11		1
5	T	**Cambridge** Com. for Batch. of Arts *Watches too*	Morn		
6	F	*Sun* due *East* 57 min after 5 [*fast* 9 *min*	0		30
7	S	Day Increas'd 4 ho. 28 m.	1		41
8	D	**Quadragesima. 1 S. in Lent. Invocavit.** *Cyprian*	2		40
9	M	***Sun* in *Aries.*** *Sun* rises and sets at 6 *Equal Day*	3		20
10	T	[*and Night in all the Habitable World.*	4		0
11	W	**Ember-Week.** *Sun* rises 4 m before 6, sets 4 af. 6	4		2
12	T	Day inc. 4 ho. 3 qu. Day breaks 52 m. after 3.	4		40
13	F	*Watches 6 min. and half too fast*	4		50
14	S	**Prince EDWARD Born**	5		10
15	D	**2 Sun. in Lent. Reminiscere.** *Plan. ho. by d. 62 m.*	☾	rises	
16	M	*Sun* rises 45 min after 5, sets 15 min. after 6	7	A	57
17	T	St. *Patrick.* Day 12 ho 32 min. long	9		28
18	W	Day breaks 35 m. after 3.	11		0
19	T	*Watch 4 min 3 qu. too fast*	Morn		
20	F	*Cuthbert. Planetary hour by day 1 h 4 m.*	0		30
21	S	Day break 3 h. 37 m. D. 12 h. 50 m. N. 11,10	1		44
22	D	**3 Sunday in Lent. Oculi**	2		30
23	M	*Sun* rises half ho. after 5, sets half ho. after 6	3		17
24	T	Day 13 ho. Night 11 ho. long.	3		42
25	W	**Annunciation of Virgin Mary, or, Lady-Day**	4		0
26	T	*Watches 3 min. too fast*	4		14
27	F	*Twilight* ends 51 min. aft. 8	4		27
28	S	Day inc. 5 h. 36 m.	4		39
29	D	**4 Sunday. Midlent-Sunday. Lætare.**	☽	sets	
30	M	*Sun* rises 15 m aft. 5, sets 45 m. aft. 6.	7	A	58
31	T	*Watch too fast 1 min.*	9		16

Hush, hush, Ye Fair Ones, give me Leave to blow;
That I can bluster, I shall let You know:
For I'll unfold those *Charms* You strive to hide,
Rifle your *Hoop*, and storm your *Locks* beside.

1747 April hath xxx Days.

First Quarter, the 6th day, at 4 in the Morning
Full Moon, the 13th day, at 1 in the Afternoon.
Last Quarter, the 20th day, at 10 in the Morning.
New Moon, the 28th day, at Noon.

1	W	All Fools Day. Day 13 ho. 34 min. long.	10	A 27
2	T	**Camb.** Latter Act. *Sun* rises 11m. aft 5, sets 49 6	11	37
3	F	Day break 50 min. after 3		Morn
4	S	*Good Clocks, Watches, and Sun dials should go together*	0	38
5		**D 5 Sunday in Lent. Judica**	1	30
6	M	Day increas'd 6 ho. and half.	2	7
7	T	*Sun* due *East* 6 ho. 36 min.	2	34
8	W	*Sun* rises at 5, sets at 7.	2	55
9	T	*Watches have lost 1 min of the Sun*	3	11
10	F	**Cambridge** Term Ends. *Planet. ho. by Day 71 m.*	3	31
11	S	**Oxford** Term Ends	3	40
12		**D 6 Sunday in Lent. Palm-Sunday**	3	51
13	M	Day 14 ho. 20 m. long. Night 9 ho. 4 min.	4	6
14	T	*Sun* rises 3 quar. after 4, sets 1 quar. after 7	☾	rises
15	W	**Prince WILLIAM Born**	10	A 11
16	T	Day 14 hours half long, increas'd 7 hours 1 quar.	11	41
17	F	**Good-Friday. Our SAVIOUR's Crucifixion**		Morn
18	S	*Watches 3 min. too slow*	0	44
19		**D Easter-Day. Our SAVIOUR's Resurrection**	1	26
20	M	**Easter-Monday**	1	56
21	T	**Easter-Tuesday**	2	14
22	W	*Sun* due *East* 58 min. after 6. *Plan hour 74 min.*	2	28
23	T	**St. George,** Favourite of *Chance* and *Fortune*	2	40
24	F	*Sun* rises half ho. after 4, sets half ho. after 7	2	50
25	S	**St. *MARK*, Evangelist**	3	2
26		**D 1 Sund. after Easter. Low-Sunday. Quasimodo**	3	12
27	M	**Marriage comes in.**	3	26
28	T	Day break 18 min. after 1, ends at 10, 42 min.	☽	sets
29	W	**Oxford** and **Cambridge** Easter Terms Begin	9	A 30
30	T	*Sun* rises 20 min. after 4, sets 40 min. after 7	10	34

Now, in the Spring, the *Sap* begins to rise,
All-pregnant Nature labours to be wise:
Soft *Phœbe* now, and am'rous *Collin* meet;
And opening *Buds* receive the *radiant* Heat.

1747 May hath xxxi Days.

First Quarter, the 5th day, at 2 in the Afternoon
Full Moon, the 13th day, at 6 in the Morning
Last Quarter, the 20th day, at 3 in the Afternoon
New Moon, the 28th day, at 4 in the Morning

1	F	**St. Philip and Jacob**	11	A28
2	S	Day 15 ho. half long. Ni. 8 ho and half	Morn.	
3		**D 2 Sunday after Easter. Misericordia**	0	10
4	M	Quind Pasch. 1 Return	0	40
5	T	*Watches 4 min. too slow*	1	3
6	W	**East. Term begins.** *Sun* ri. 11m. aft. 4, sets 49 m. 7	1	19
7	T	*Plan ho. by day,* 1 *ho* 18 *m.* Sun *due* East *at* 7, 3	1	32
8	F	Day 15 ho. 44 min long. Night 8 ho. 16 m.	1	43
9	S	*Watches 4 min. too slow*	1	56
10	⊙	**D 3 Sund. aft. East. Jubilate.** *Sun* due *E.* 7 h. 6 m.	2	11
11	M	Tres Paschæ 2 Ret. Day br. 3 min. aft. midnight	2	29
12	T	Day increas'd 8 ho and half	2	53
13	W	*No real Night, but all Twilight 'till 14th of* July	☾	rises
14	T	*Sun* rises at 4, sets at 8.	10	A25
15	F	*Watches 3 min. half too slow*	11	19
16	S	*Sun* rises 3 min. before 4, sets 3 min. after 8	11	58
17		**D 4 Sunday after Easter. Cantate**	Morn	
18	M	Mens. Pasch 3 Ret. **Westminster Election.**	0	20
19	T	*Dunstan.* Day incr. 8 ho. 40 min.	0	35
20	W	*Planetary ho.* 81 *m.* *Sun* due *East* 7. h. 12 m.	0	47
21	T	*Watches 3 min. too slow.*	0	58
22	F	*Sun* rises 51 min. after 3, sets 9 min. after 8	1	10
23	S	**Marriage goes out.** Day incr. 8 ho. 58 min.	1	21
24		**D Rogat. 5 S. aft. East. Jucunditatis, Pr. GEO. Born**	1	33
25	M	Quinq. Pasch. 4 Returns. Rogation Week	1	48
26	T	*Augustine. Watches too slow 2 min. and a quarter*	2	8
27	W	*Sun* rises 47 m. after 3, sets 13 m. after 8	2	35
28	T	**Holy-Thursday. CHRIST's Ascension. Fœlix**	☽	sets
29	F	**King CHARLES II. Restauration**	10	A 7
30	S	**Pr. *Amel.* and *Car* B.** Day 16 h. ha. long, N. 7 half	10	40
31		**D 6 Sunday after Easter. Exaudi.**	11	5

Your Characters, Fair LADIES, I express,
For Youth, for Beauty, Innocence and Dress:
For what, but *Lovely* LADIES, can compare
With *Roses* Sweetness, and the *Lilies* fair?

1747 June hath xxx Days.

First Quarter, the 3d day, at 1 in the Afternoon
Full Moon, the 11th day, at 10 in the Afternoon
Last Quarter, the 19th day, at 7 in the Morning
New Moon, the 26th day, at 6 in the Afternoon

1	M	**Term Ends**	11	A 23
2	T	*Sun* rises 44 m. after 3, sets 16 m. after 8	11	37
3	W	Day 16 hours, 34 min. long Night 7 ho. 26	11	50
4	T	**Oxford and Cambridge** Terms End. *Plan. ho*		Morn
5	F	*Watches and Sun go together* [83 *min. by day*	○	1
6	S	*Sun* rites 42 m. after 3, sets 18 after 8	○	13
7	D	**Whit-Sunday ; or, the Descent of the Holy-Ghost**	○	27
8	M	**Whit-Monday**	○	44
9	T	**Whit-Tuesday-** *Sun* in ♋	1	8
10	W	**Ember-Week.** Longest Day at *Coventry* 16 h 30	1	42
11	T	**K. GEORGE II. Inaug. St. Barnabas**	☾	rises
12	F	The greatest Lengthning of days 9 ho. 16 m.	9	A 44
13	S	Sun due *East* 18 m. aft. 7. *Watch 1 m ha. too fast*	10	14
14	D	**Trinity Sunday. Marriage comes in.**	10	32
15	M	Cras. Tr. 1 Ret. **Trin. Col** Elect. **K. G. II. Pro.**	10	46
16	T	Sun rises 43 m. after 3, sets 17 min. after 8.	11	2
17	W	**Oxford** Term Begins	11	13
18	T	Corpus Christi Day. Day shortned 3 min.	11	24
19	F	**Trinity Term Begins**	11	36
20	S	Day 16 ho. 32 m. long. Night 7 ho. 28 min.	11	49
21	D	**1 Sunday after Trinity.** *Watch too fast* 3 *m.*		Morn
22	M	Octab. Trin. 2 Ret.	○	7
23	T	*Sun* rises 46 min. after 3, sets 14 m. after 8	○	31
24	W	**St. JOHN, Baptist ; or, Midsummer-Day.**	1	4
25	T	**St. John's College Oxon.** Election.	1	49
26	F	*Watches 4 min. too fast*	☽	sets
27	S	Day 16 ho. 20 m. long. Shortned 16 m.	9	A 3
28	D	**2 Sunday after Trinity**	9	23
29	M	**S. PETER, and St. PAUL.** Quind. Trin. 3 Ret.	9	39
30	T	**Exeter College** Election	9	53

Dress'd, like a *Bridegroom*, in all Nature's Pride!
My lovely *May* attends me as a *Bride*:
Who, but the *Happy Pair*, with us can say,
A Couple warm as *June*, and sweet as *May*?

1747 July hath xxxi Days.

First Quarter, the 4th day, at 3 in the Morning
Full Moon, the 11th day, at Noon
Last Quarter, the 18th day, at 9 in the Morning
New Moon, the 26th day, at 8 in the Morning

1	W	*Sun* rises 7 min. before 4, sets 7 min. after 8	10	A	4
2	T	Visit. *Mary* Day 16 h. 12 m. long. N. 7h. 48m.	10		16
3	F	*Watch too fast 5 min. Plan. hour by day, 81 m.*	10		29
4	S	Oxford Act, seven Days before Term Ends	10		43
5	D	3 **Sunday after Trinity**	11		4
6	M	Tres Trin. 4 Ret *Sun* due *East* 8 m. aft. 7 morn.	11		33
7	T	*Thomas à Becket.* Cambridge Commencement	Morn		
8	W	**Trinity Term Ends.**	0		16
9	T	*Sun* rises at 4, sets at 8	1		14
10	F	Day 15 hours, 54 min long. Night 8 ho. 6 m	6		rises
11	S	*Watches 5 min. and half too fast Plan. hour 79 m.*	8	A	34
12	D	4 **Sunday after Trinity**	8		50
13	M	*Now some Night again, Sun at Midnight being*	9		5
14	T	[*above 18 Deg. below the Horizon.*	9		17
15	W	*Swithin*, Bishop of *Winchester.*	9		28
16	T	Day breaks 27 min. aft. midnight.	9		37
17	F	Day decreas'd 1 h. *Watches* 5 m. 3 q. too fast	9		52
18	S	*Sun* rises 1 q. after 4, sets 3 q after 7	10		9
19	D	5 **S. aft. Trin. Dog-Days beg.** *Sirius* rises with *Sun*	10		38
20	M	Day break at 1 a-clock, Day-Light ends at 11	11		12
21	T	*Planet. hour by day, 1 ho. 16 m*	11		49
22	W	*Magdalen.*	Morn		
23	T	*Watches too fast 6 m half*	0		37
24	F	Magdalen College Election.	1		41
25	S	St. JAMES, the Apostle	2		53
26	D	6 **Sunday after Trinity. Sun Eclips'd Invisible**	☽ sets		
27	M	*Sun* rises 30 m. after 4, sets 30 min. after 7	8	A	0
28	T	Day 15 ho. Night 9 ho long	8		13
29	W	Day shortned and Night lengthen'd 1 ho. 45 m.	8		25
30	T	*Watches 5 min. too fast Plan. ho. by day 1 h 19 q.*	8		37
31	F	**Prin. AUGUSTA Born** Day br. 45 m. aft. 1	8		52

Who can endure the sultry *Dog-Star*'s Rage?
To Shades, Ye *Nymphs*; or, in soft Streams engage;
Some *gentle Youth* will wait upon your Call
To *Ranelaigh*'s sweet Spot, or dear *Vaux-Hall.*

1747 August hath xxxi Days.

First Quarter, the 2d day, at 5 in the Morning
Full Moon, the 10th day, at 2 in the Morning
Last Quarter, the 17th day, at 11 in the Morning
New Moon, the 24th day, at 9 in the Afternoon

1	S	**Lammas-Day.** Day break at 2. Day shortned 2 h.	9	A 9
2	D	7 Sunday after Trinity	9	35
3	M	Day 14 ho. half long Night 9 ho. and half.	10	12
4	T	*Sun* rises 3 quar. after 4, sets 1 quar. after 7	11	5
5	W	Day-break 15 mi. after 2. *Twil.* end 9 ho. 45 m		Morn.
6	T	*Watches 13 min and half too fast*	0	17
7	F	*Sun* rises 49 m after 4. sets 11 m after 7.	1	41
8	S	*Planetary hour by day 1 ho. 11 min. Night 49 m.*	3	11
9	D	8 Sunday after Trinity. Moon Eclips'd Invisible	(	rises
10	M	*Lawrence. Sun* due *East* 38 min after 6	7	A 26
11	T	Day breaks half an hour after 2	7	37
12	W	*Sun* rises at 5, sets at 7. Day 14 ho. Night 10 h	7	49
13	T	*Watches 2 min too fast*	8	2
14	F	Day decreas'd 2 ho 3 quar.	8	19
15	S	*Sun* rises 5 m. aft. 5, sets 5 min. before 7	8	40
16	D	9 Sunday after Trinity	9	5
17	M	Day break 52 m. aft. 2. *Planet. ho. 69 min.*	9	40
18	T	*Now by Eq. of Time, good Pend. should keep Time*	10	30
19	W	*exactly with the Sun, his Motion being swifter*	11	30
20	T	*Sun* rises 1 qu. after 5, sets 3 qu. after 6		Morn
21	F	Day 13 ho half long. Night 10 ho. and half	0	36
22	S	*Watches have lost 1 m. of the Sun*	1	56
23	D	10 Sunday after Trinity.	3	24
24	M	St. BARTHOLOMEW, the Apostle.	)	sets
25	T	Day breaks 13 m after 3. *Planet. ho. 66 m.*	6	A 40
26	W	*Sun* due *East* at 6 ho 21 min.	6	51
27	T	Dog-Days End. *Syrius* rises at 3 in the morn.	7	3
28	F	*Sun* rises half ho. after 5, sets half ho aft. 6	7	23
29	S	*The Twilight ending, is, when the Sun is 18 Deg*	8	50
30	D	11 Sund after Trinity *below our Horizon.*	8	20
31	M	*Watch 3 m. half too slow*	9	7

Loaden with *Fruit*, the Branches gently bend
To You, Ye FAIR, and seem to recommend;
Fraught with rich Juice, It courts your lovely Hand
To pluck and taste, or press, as You command.

1747 September hath xxx Days.

First Quarter, the 3d day, at 6 in the Morning
Full Moon. the 10th day, at 3 in the Afternoon
Last Quarter, the 18th day, at Noon
New Moon, the 23d day, at 8 in the Morning

1	T	Sun riſes 38 min. after 5, ſets 22 min. after 6	10	A
2	W	**LONDON Burnt, in the Year 1666**	11	33
3	T	Day 12 ho. and half Night 11 ho. and half long	Morn.	
4	F	Day breaks 3 qu. after 5. *Twil.* ends 15 m. aft. 8	1	
5	S	*Watches 5 min. and half too ſlow*	2	2
6	D	**12 Sunday after Trinity**	3	5
7	M	Day ſhortned 4 ho. and a quarter	(	riſes
8	T	*Sun* riſes 55 min. after 5, ſets 5 min. after 6	6	A 5
9	W	*Planetary and Common Hour equal*	6	1
10	T	*Watches 7 min. too ſlow.*	6	33
11	F	*Sun* in ♎ *Sun* riſes and ſets at 6. *Equal Day and*	6	53
12	S	Day break at 4 [*Ni. in all the Habitable World*	7	15
13	D	**13 Sunday after Trinity**	7	40
14	M	*Watches 8 min. too ſlow*	8	29
15	T	*Planetary hour by day, 58 m.*	9	26
16	W	**Ember Week.** Day ſhortned 5 hours	10	31
17	T	Day 11 ho. 30 m long. Night 12 ho. 30 m. long	11	45
18	F	Sun riſes 1 qu. after 6, ſets 1 q. before 6	Morn	
19	S	*Watches 10 min. too ſlow*	1	4
20	D	**14 Sunday after Trinity**	2	23
21	M	**St. MATTHEW, the Evangeliſt**	3	40
22	T	*Plan. ho. by day 56 min. Sun* Eaſt 5 h. 48 m.	4	56
23	W	Day break 25 min after 4	)	ſets.
24	T	*Watches 11 min. 1 qu. too ſlow*	5	A 43
25	F	Day 11 hours. Night 13 ho. long	6	0
26	S	*Sun* riſes 30 m. aft. 6, ſets 30 min. after 5	6	31
27	D	**15 Sunday after Trinity**	7	17
28	M	Day br. 34 m. after 4	8	16
29	T	**St. MICHAEL, the Arch-Angel**	9	45
30	W	*Sun* riſes 37 min. after 6, ſets 23 min. after 5	10	57

Autumnal Blaſts now bluſter in the Sky,
And SOL retiring ſhews the *Winter* nigh.
The ſilken LADIES now begin to ſcreen,
And for a *Fire*, exchange their *Capuchin*.

1747 October hath xxxi Days.

First Quarter, the 1st day, at 5 in the Afternoon
Full Moon, the 8th day, at 2 in the Morning
Last Quarter, the 15th day, at 11 in the Morning
New Moon, the 22d day, at 7 in the Morning
First Quarter, the 30th day, at 4 in the Morning

			Morn	
1	T	*Watch* 13 *min.* 1 *q. too slow*		
2	F	Day break 42 min. after 4 Twil. ends 7. 18.	0	20
3	S	*Sun* rises 3 q. aft. 6. sets 1 q. after 5	1	44
4	D	**16 Sunday after Trinity**	3	2
5	M	*Good Pendulums will be* 14 *min. too slow*	4	20
6	T	Day decreas'd 6 hours 20 min.	5	38
7	W	*Sun* due *East*, 30 min. after 5. *Plan. ho* 51 *m.*	☾	rises
8	T	*Sun* rises 6 min. before 7, sets 6 after 5.	5	A 4
9	F	*Dennis.* Day breaks at 5 in the morning	5	24
10	S	**Oxford** and **Cambridge** Terms Begin.	5	52
11	D	**17 Sund. aft. Trin. K. GEORGE II. Crown'd**	6	35
12	M	*Sun* rises at 7, sets at 5.	7	27
13	T	*Planetary hour* 49 *m.*	8	25
14	W	*According to Equation of Natural Days, good*	9	34
15	T	*Pend. Clocks & Watch* 15 *m. after the Sun*	10	50
16	F	Day break 9 m. after 5. Ends 51 m. aft. 6	Morn	
17	S	*Sun* due *East* 19 min. after 5 in the morning.	0	5
18	D	**18 Sund. after Trin. St. LUKE, the Evangelist.**	1	22
19	M	*Sun* rises 1 q. after 7, sets 3 q after 4	2	40
20	T	Tres. Mich 1 Return.	3	59
21	W	Day br. 15 m. aft. 5, Shortned 7 ho. 1 quar.	5	20
22	T	**Princess of ORANGE Born.**	☽	sets
23	F	**Michaelmas Term Begins**	4	A 31
24	S	The old unequal *Jewish*, or *Plan.* hour, 45 m. lo.	5	9
25	D	**19 Sunday after Trinity.**	6	2
26	M	*Sun* rises 30 m. after 7, sets 30 after 4	7	18
27	T	Mens. Mich. 2 Ret. Day 9 hq. long	8	44
28	W	**St. SIMON, and St. JUDE, Apostles**	10	10
29	T	*Watch* 15 *m.* 3 *q. too slow*	11	34
30	F	**K. GEORGE II. Born, 1683**	Morn	
31	S	*Sun* rises 37 m. after 7, sets 23 m. after 4.	0	57

Now pass the tedious melancholy Hours,
Nature looks sad, even so the Case is *ours*.
LADIES, attend the Play-House with the *'Squire*;
And make his *Courage* rise a little higher.

1747 November hath xxx Days.

Full Moon, the 6th day, at 1 in the After oon
Laſt Quarter, the 13th day, at 10 in the Afternoon
New Moon, the 21ſt day, at 5 in the Morning
Firſt Quarter, the 28th day, at 2 in the Afternoon

1	D	**20 Sunday after Trinity. All Saints**	♃ M	1
2	M	All Souls. Day 8 hours 42 minutes long.	3	2
3	T	Craft. Anim. 3 Ret. **All-Souls Coll.** Election	4	4
4	W	Sun riſes 45 min. after 7, ſets 15 min. after 4	5	5
5	T	**Gun-Powder Treaſon, 1605.**	7	1
6	F	Day 8 ho. 26 m. long. Night 15 ho. 34 m.	☾	riſes
7	S	Day break 42 min. after 5, ends 18 aft. 6.	4 A	28
8	D	**21 Sunday after Trinity** *Watch 14 m. too ſlow*	5	14
9	M	*Sun* riſes 52 min. after 7, ſets 8 mi. aft. 4	6	13
10	T	Day 8 h. 12 m long.	7	2
11	W	*Martin,* Biſhop of *Tours*	8	3
12	T	Craft. Mart. 4 Returns.	9	4
13	F	Day decreaſed 8 ho. 32 min.	☾	
14	S	**Prince WILLIAM-HENRY Born.**		Morn
15	D	**22 Sunday after Trinity**	0	14
16	M	*Plan. to.* 40 *m.* Sun *Eaſt* 4 ho. 51 m.	1	3
17	T	*Watches too ſlow* 11 *min. and half*	2	5
18	W	Octab. Mart. 5 Returns.	4	1
19	T	**Princeſs of WALES Born**	5	43
20	F	Sun riſes 6 m. after 8, ſets 54 after 3	7	14
21	S	Day breaks 55 m. after 5. 7 ho. 48 mi. long	☽	ſets
22	D	**23 Sunday after Trinity:** *Cecilia,* Virg. and Mar.	4 A	48
23	M	*Clement.* Day-light begins and ends at 6	6	11
24	T	Day ſhortened 9 hours	7	38
25	W	St. *Catherine.* Quind. Mart. 6 Returns.	9	10
26	T	**Ballol College** Election	☾	34
27	F	Sun riſes 13 m. after 8, ſets 47 after 3	1	56
28	S	**Michaelmas Term Ends**		Morn
29	D	**Advent Sunday.** **Marriage goes out.**	1	15
30	M	**St. ANDREW, the Apoſtle.** *Watches ſlow* 6 *m*	2	29

Cold froſty *Days*, and *Evenings* intervene,
And both to pinch us *moſt* do now begin.
The LADIES now for *Plays*, or *Opera* call,
Cards, *Oratorio*, *Maſquerades*, or *Ball.*

1747 December hath xxxi Days.

Full Moon, the 5th day, at 11 in the Afternoon
Laſt Quarter, the 13th day, at 8 in the Morning
New Moon, the 20th day, at 4 in the Afternoon
Firſt Quarter, the 28th day, at 1 in the Morning *R. Hulſe.*

1	T	*Sun* riſes 16 min. after 8, ſets 16 m. before 4	3 M. 42
2	W	Day 7 ho. 28 min. long. Night 16 ho. 32 min.	4 50
3	T	Day breaks 2 min. after 6. Shortned 9 ho. 12 m.	6 2
4	F	*Watches 4 min. and half too ſlow*	7 25
5	S	*Sun* due *Eaſt* 4. 43 *m. Planetary hour* 37 *min.*	☾ riſes
☾	D	2 Sunday in Advent	3 A 55
7	M	Princeſs of DENMARK Born	4 57
8	T	The greateſt ſhortning of Days, is 9 ho. 12 min.	6 8
9	W	Day 7 ho. 24 min. long	7 23
10	T	*Sun* riſes at *Coventry* 18 m. after 8, ſets 42 aft. 3	8 34
11	F	Day breaks 3 min. after 6. Sun in ♑	9 41
12	S	*New good Clocks, Watches, and Sun go together*	11 ☾
13	D	3 Sunday in Advent	Morn.
14	M	Day increas'd 1 minute	0 15
15	T	*Sun* riſes 17 min. after 8, ſets 17 min. before 4	1 35
16	W	Ember Week. *O Sapientia.*	3 ☾
17	T	Oxford and Cambridge Term: End	4 30
18	F	*Good Pendulums gain 2 m. 1 h. of Sun in 6 days*	6 0
19	S	Day 7 hours and half long	7 24
20	D	4 Sunday in Advent.	☽ ſets
21	M	St. THOMAS, the Apoſtle — *Sun* riſes 1 qu aft 8, ſets 45. after 3.	1 A 5
22	T	Day increas'd 8 min. Day-break at 6.	6 24
23	W	*Watches 5 min. half too faſt.*	7 57
24	T	*Sun* riſes 12 min. after 8, ſets 47 min. after 3	9 20
25	F	CHRIST-MAS-DAY	0 40
26	S	St. STEPHEN, Proto-Martyr	11 56
27	D	1 Sunday after Chriſtmas St. JOHN, Evangeliſt	Morn
28	M	INNOCENTS; or, *Herod's* Murthering the Infants	1 10
29	T	*Planetary Hour by Day, 38 min.*	2 22
☾	W	Prin. ELIZABETH Born *Watch too faſt 8 min*	3 39
31	T	*Sun* riſes 6 min after 8, ſets 54 m after 3.	4 50

Now in full Pow'r, old rigid *Winter* reigns,
Earth, Springs and Floods, faſt fett'ring in his Chains;
While fleeting *Scators* skim his Ice by Turns,
And on the Bank ſome *Amaryllis* burns.

Upnor-enſis.

ANSWERS to the ÆNIGMAS in the last Year's *Diary*.

276. CHEARFULNESS. 277. PLEIADES.
278. HUNGER. 279. A MOLE.
280. A CANDLE. 281. THE ALPHABET.
282. A COCK. 283. FROST.
Prize A GOOSE.

All the ÆNIGMAS answered in the *following Lines* by *Mall. Ormiſhaw.*

——*Quantos humana negotia motus*
Alternaſque vices miſcent! Quo turbine fertur
Vita hominum!

Does he then yield to unrelenting Fate?
Cou'd not his great Deſerts prolong his Date?
Ah no! the few remaining Sands were run
Like dying CANDLES, or the ſetting Sun. 5.
Blind, as a MOLE, to all Futurity, 4.
Man gropes and wanders in Uncertainty.
Life, like a Weather-COCK with ev'ry Breath, 7.
Still veers and changes threat'ning *him* with *Death*.
Pale FAMINE, Sickneſs, Plagues, on him attend 3.
Conſpiring all to bring him to his End.
Num'rous as STARS in FROST we may perceive 2, 8.
Are the *high Roads* that lead him to the *Grave*.
No longer ſhall his *QUILL inſtruct the *Fair*, *Prize*.
Whom to delight was his peculiar *Care*;
No longer captivate th' attentive YOUTH 1.
With Love of LETTERS, and unerring *Truth*: 6.
Since cruel Death has ſnatcht him from our Sight,
And clos'd his Eyes in everlaſting Night.

* *Alluding to the* Gooſe.

The Courage of *Col. Dagger's* Nephew, when about to engage with one of a *ſuperior Claſs*, exemplified in the following *Solution*.

Tho' Cold as ICE, whilſt INNOCENCE adorns my Active Life, 8. 1.
Still free from LUST, that Slave to Senſe, I fear no Hurt from Strife: 3.
The MOLE ſo plac'd good Luck portends, my STARS propitious prove; 4. 2.
And EVERY LETTER, from my Friends, proclaims how much they love. 6.
" Begin then bold Antagoniſt, of Triumph Emulous;
" Tho' CANDLE mine compar'd to thine, is like a COCK t'a GOOSE. 5. 7. Pr.

Anſwer'd by Mr. *Ralph Hulſe*, in the following Deſcription of the *Lapland Lover*.

——*Exitus acta probat.*

ASK me no more my Truth to prove,
What I wou'd ſuffer for my Love:

Tho' STARV'D, in Exile surely go 3.
To Regions of Eternal Snow.
O'er Floods by solid ICE confin'd, 8.
Thro' Forests bare with Northern Wind;
Whilst all around my Eyes I cast,
Where LEARNING's lost and all lies waste, 6.
Shou'd the Low Sun withdraw his LIGHT, 5.
And CHEARFUL Day exchange for Night, 1.
Lucina, and the PLEIADES fair, 2.
Shall safe conduct me to my *Dear*.
The softest Mos shall deck her Bed
Since *Down* of GEESE cannot be had! *Pr.*
The watchful COCK shall Centry keep, 7.
No grov'ling MOLE molest her Sleep. 4.

All the *Ænigmas* answered for 1746, by *Miranda*, in Advice to *Chloe* being slighted by her Lover.

DEAR *Chloe*, I earnestly beg you'll attend
And deign to accept the Advice of a Friend.
Be CHEARFUL and Gay — ne'er mind the False Swain, 1.
Who boasts of his Conquest, and laughs at your Pain.
Tho' in LETTERS conceited, yet all must agree 6.
A GOOSE knows as much of *Learning* as *He*. *Pr.*
You are blind, like the MOLE, to his Failings I know, 4.
And doat on this Fool, because *He's* a Beau:
With his Hat, COCK and pinch, and his Coat dawb'd with Lace, 7.
He looks like a Footman to wait on his *Grace*.
But this vain EMPTY MAN (I plainly aver) 3.
Is not worth your Regard, tho' he weareth a STAR; 2.
It's observ'd that his Love has such various Turns,
He's to Day cold as ICE — To Morrow he burns. 8.
But make LIGHT of his Passion, and never discover, 5.
That you feel any Pain for so worthless a Lover.

Answered by Mr. *Wm. Dyke*, in *Damon's* Complaint of *Phillis'* Inconstancy.

Phillis, thy Vows no more are true, I find thy VIRTUE's flown, 1
I'll hear no more, false Maid, adieu, thou'rt quite inconstant grown.
Like Weather-COCK thy Fancy turns with every Blast of Wind; 7.
In vain thy *Damon* throbs and mourns, thou never wilt be kind.
Long may I thy false Charms adore, yet no Respect thou'lt have,
Thro' HUNGER, FROST I'll pass no more, nor WANT thy Pow'r to save. 3. 8. 4.
But go, false Maid, go, go thy Way; another's in mine Sight,
Fixt as the STARS, she cannot stray — she's as a CANDLE bright, 2. 5.
By far more learn'd, more wise than thou, with Constancy beset;
Tho' GOOSE-*Quill* signs her real Vow, she's true as ALPHABET. *Pr.* 6.

All the *Ænigmas* answered in *Fickle's* Return to *Lucy*.

Ante leves ergo pascentur in Æthere Cervi,
Et freta destituent nudos in littore pisces ——
Quam nostro Illius labatur Pectore vultus. Virg.

The

The ſetting STARS began to fade away, 2.
And the ſhrill COCK proclaim th' Approach of Day, 7.
When reſtleſs *Fickle* rack'd with anxious Care,
And driv'n by *Lucy's* Coldneſs to Deſpair,
Starts up at Length in Haſte, his CANDLE lights, 5.
And thus a LETTER to the *Fair* indites: 6.
" Why deareſt *Lucy*, cauſe of all my Pain,
" Do You thus treat me with your cool Diſdain?
" Since 'twas alone your *Conſtancy* to prove,
" That I ſo long deferr'd the *Sweets of Love*;
" But by that beauteous MOLE *again* I ſwear, 4.
" That *you* alone are ſtill my *only* Care;
" With *you* ſevereſt Fate CONTENTedly I'd ſhare. 1.
" *Sooner* the HUNGRY *Wolf* ſhall ſpare his Prey, 3.
" And with the GOOSE the *Fox* ſhall harmleſs play; *Pr.*
" *Sooner* harmonious Order ſhall be loſt,
" And Spring lie bound in *everlaſting* FROST; 8.
" *Sooner* ſhall Youth once paſt it's Bloom renew,
" *Than* I prove ever to my *Love* untrue. *Ralph Rattle.*

Anſwered by *Hendrick Hopeall* to *Kitty Sly.*

Would'ſt thou, *Dear Maid*, convey one lovely Smile,
FROST it wou'd *warm*, and meagre WANT beguile: 8. 4.
Nor more my *Pen* ſhould mournful LETTERS write, 6.
Nor Noontide Hours be turn'd to CANDLE Light. 5.
CHEAR'D by thy Love, and with *Religion* bleſt, 1.
No anxious Thoughts ſhould load my heavy Breaſt;
Fierce HUNGER too (if by it e'er o'ertaken) 3.
Should ſoon ſubmit to GOOSE, or COCK and Bacon. *Prize* 7.
Propitious thus my STARS! what would I more 2.
But bleſs my *Maker*, and kind *Heav'n* adore.

Anſwered by Mr. *John Stewart.*

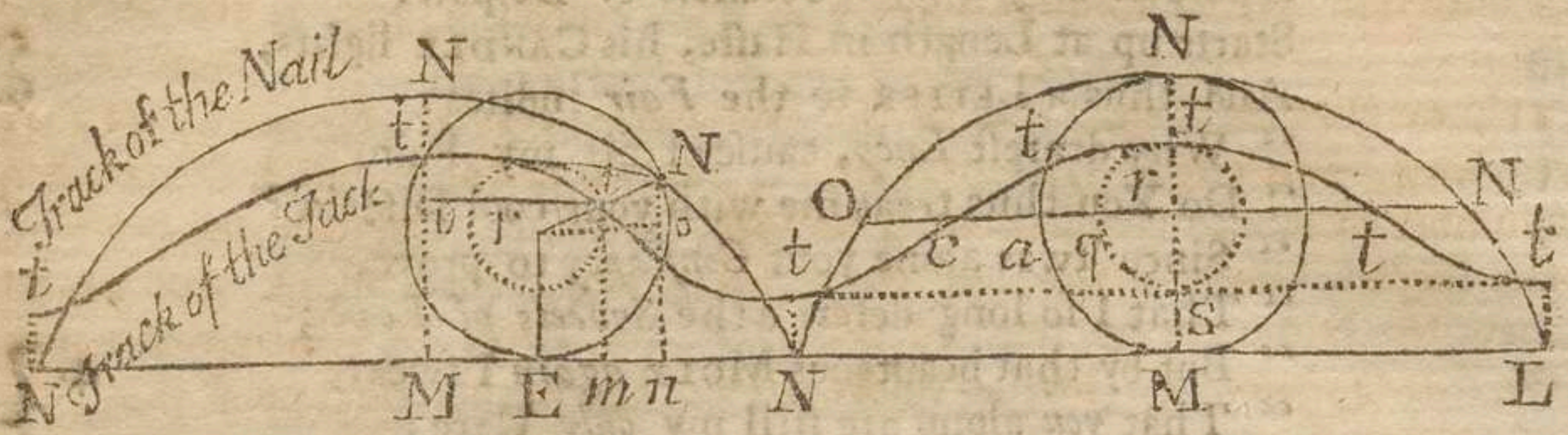
Ye witty bright Laſſes, who fain wou'd conceal,
What your Verſes themſelves too plainly reveal:
Accept of my Anſwers, tho' ruſtickly ſent,
For *Hulſe* ſure was pleas'd when he wrote on CONTENT: 1.
As *Chapple* on STARS: his Lines ſeem to ſhew it; 2.
Tho' *Stew—t* has wrote like a HUNGER-ſtruck *Poet.* 3.
The MOLE, we are certain, the Earth oft divides: 4.
Anonymus plainly the CANDLE deſcribes: 5.
Ralph Ridler by ALPHABET ſeemingly pleaſes; 6.
Reſtacius hath choſe a † COLD THEME for the *Ladies.* [† *Froſt*, 8.] 8.
The COCK and the GOOSE, deny it who can, *Sirs*, 7. *Prize.*
Compleat and exactly finiſh the Anſwers.

Find Fault with me *Fair Ones*; and this your Reward is,
If I ſhou'd gain the Prize it is at your Service.

They were anſwered in like Manner by Mr. *I. Landen*, *Fabius*, Mrs. *Mary Shipman*, Mr. *Tho. Hayward*, Mr. *Jas. Hall*, *Ceſtrienſis Saughall*, Mr. *Rob. Twigger*, *Amiens*, *Philander*, Mr. *William Chaple*, Mr. *Ch. Maſon*, Mr. *Jepſon*, *Philanthropos*, Mr. *Sam. Manfield*, Mrs. *Iſabell Knabbs*, and ſeveral others whoſe Names are inſerted in the Catalogue, at the End.

ANSWERS to the *Queſtions* in the laſt Year's DIARY.

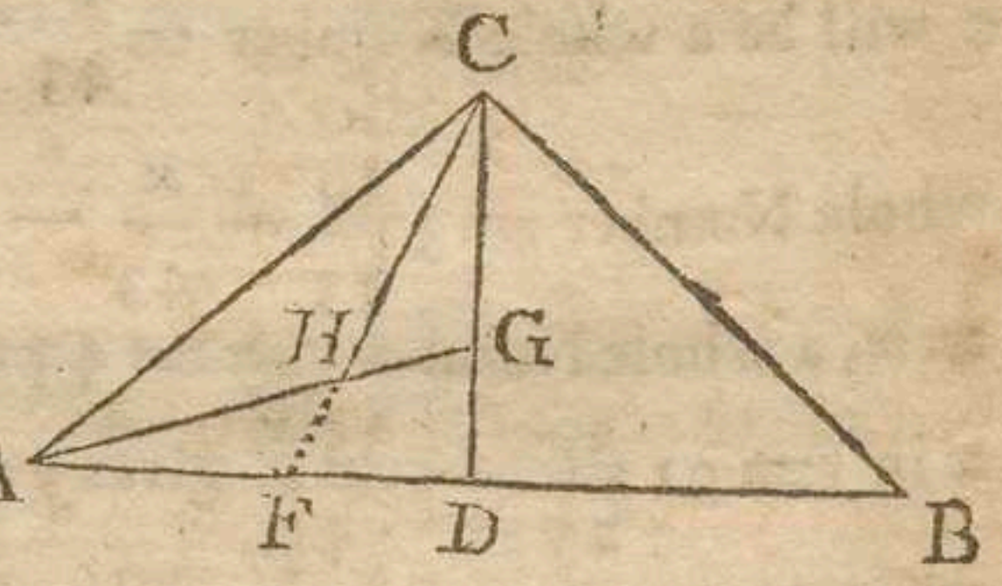
The 265 Queſtion anſwered by the Propoſer Mr. *Heath.*



The Track of the *Nail* will be the Curve LNNONN &c. which is a *Cycloid*, and *that* of the Tack the *Curve* tttt *&c.* both which Curves are thus rectified. Put $a = NM = 7$, $x = Nr$, $y = Or$, $v = ar = \sqrt{ax - xx}$, $z =$ circular Arch $Na = Oa$ (per Nature Curve) $\therefore z + v = y$, $v^2 = ax - xx$, $\dot{v} = \frac{a - 2x}{2v} x\dot{x}$, $\dot{z} = \frac{a\dot{x}}{2v}$, alſo $\dot{y} = \dot{z} + \dot{v} = \frac{a - x}{v}\dot{x} = \frac{a - x}{\sqrt{a - x \times x}}\dot{x}$; hence $\sqrt{\dot{x}\dot{x} + \dot{y}\dot{y}} = \dot{x}\sqrt{\frac{a}{x}}$, whoſe Fluent is $2\sqrt{ax} =$ Arch NO; therefore when $x = a$, Arch N O N $= 2a$, conſequently N O N N t L $= 4a = 28$ Feet, the Nail deſcribes in one Revolution of the Wheel. The Nature of the Curve deſcribed by the Tack is expreſſed by $cq = 2$ Arch qt, which referred to the foregoing Symbols will be $y = 2z + v$ parts of the leſſer Circle. Conſequently by Subſtitution in this Caſe, the Fluxion of the inner *Curve ctt* will be $\dot{x}\sqrt{\frac{9aa - 8ax}{4x \times a - x}}$ whoſe Fluent by *Series* is $3a^{\frac{1}{2}}x^{\frac{1}{2}} + \frac{x^{\frac{3}{2}}}{18a^{\frac{1}{2}}} + \frac{7x^{\frac{5}{2}}}{216a^{\frac{3}{2}}} + \frac{613x^{\frac{7}{2}}}{3 * 7 * 6\lfloor a^{\frac{5}{2}}}$ &c. which when $x = ts = 3.5 = a$, is 11. 696 *fere* (but this Fluent may be otherwiſe found) hence the Tack deſcribes 23. 392 Feet in one Revolution, whilſt the Nail deſcribes 28, and the *Axis* 21. 9911485 *&c.* $=$ 7 $*$ 3, 141592653 the Wheel's Circumference; by which the Wheel will revolve 48019, 31995 Times in travelling 200 Miles — But 21. Feet 9911485 *&c.* : 28 :: 200 : 254, 648 Miles, Feet Miles travelled by the Nail. And 21. 9911485 *&c.* : 23. 392 :: 200 : 212, 74 Miles travelled by the Tack

Tack pretty nearly: the ſmall Difference being only what ĒN (,31995 part of a Revolution) differs in Proportion with N, N, and *t*, *t*, part of Curves deſcribed by *Nail* and *Tack* at the End of the Journey, in the Poſition of N, *t*, *r*, making an ∠ N *r* E =, 31995 × 360 = 115°. Feet 11′, or N *ro* = 25°. 11′ with the Horizon. Whence N*n* = 4, 988 and tm = 4, 244 the Height of *Nail* and *Tack* from the Ground. *N. B.* The Number of whole Revolutions ×'d into the whole Curves aforeſaid, and the Rectifications of the laſt Parts being *reſpectively* added, will exactly ſhew the Diſtances deſcribed by the *Nail* and *Tack*, very nearly as before. Or this Queſtion might be reſolv'd by a Curve deſcrib'd upon the Curve of a great Circle of the Earth, which Solution would come out not much different. Mr. *Bamfield* has curiouſly deſcribed theſe Curves, and given an exact Solution of their Lengths, and ſo has Mr. *I. Waine*, which are the only true Anſwers. Mr. *Bamfield* has found a Point of *Inflection* and *Retrogreſſion* to be in the *inner Curve*, when the Spoke and Tack are horizontal.

The 266 Queſtion anſwered by Mr. *I. Waine*.



Put *x* = Sine, and *y* = Cof. < CAD = < CBD, and *s* and *c* for thoſe of the given < FCB. Then by Elements of Trigonometry $sx - cy$ = Sine, and $sy + cx$ = Cof. < FCD. But < ACD — FCD = < ACF whoſe Tangent is $\frac{sy^2 - sx^2 + 2cxy}{cx^2 - cy^2 + 2sxy}$ which *per* Queſt. = Tangent < CAG. But AD : GD :: Radius : Tangent of the Angle GAD = $\frac{x}{3y}$; whence $\frac{2xy}{3y^2 + x^2}$ = Tang. < CAD — < GAD = $\frac{sy^2 - sx^2 + 2cxy}{cx^2 - cy^2 + 2sxy}$. reduc'd $\frac{x4}{y4} + \frac{6x^2}{yy} - \frac{8cx}{sy} = 3$. ſolved $\frac{x}{y} =$ .80907. Tangent 38°. 58′. 30″; whence AD = 37. 0796, and conſequently the Area 111. 239 Acres. Q. E. F.

Mr. *Kingſton's* Anſwer is the ſame.

Mr. *Aſh* anſwers this Queſtion thus.

Call the Tangent of the given Angle *m*; CD, *a*; and GD, *c*; alſo put *x* for Tangent < ACD. Then Tangent < ACB will be $\frac{2x}{1 - x^2}$, and that of < ACH (when < ACB is obtuſe) $\frac{2x + m - mx^2}{2mx + x_2 - 1}$. But (by Trigonom.) $\frac{c}{ax}$ = Tangent < DAG ∴ $\frac{ax - cx}{ax^2 - c}$ = Tangent < HAC = < ACH. conſeq. $\frac{ax - cx}{ax^2 - c} = \frac{2x + m - mx_2}{2mx + x^2 - 1}$, ſolv'd *x* = 1. 2359 = Tangent 51°. 1′ *fere*. Whence the Area of the Field = 111. 23 Acres.

Mr. *John Turner* has elegantly ſolved this Queſtion; ſo has Mr. *Anth. Baker*, and ſome others.

Mr. *Cuth. Cockſon* informs us that this Queſtion is taken from *Ronayne's* Algebra p. 373, being Caſe 1. of Prob. 12, we would do the Propoſer all the Honour due to ſo diſtinguiſhed a *Genius*, but yet we deſire to have ſent what is *new*, as well as *curious*: Being rather deſirous that the *Ladies Diary* ſhould be a Pattern for, than an Imitation of others. And here we muſt remind the ſeveral ingenious Contributors, at the ſame Time we acknowledge our Thanks for their Favours, that they draw their mathematical Schemes correct, and of a Size fit for the Diary; which they ſtill continue to neglect. And the *Ænigmatiſts* ſhould obſerve to ſend their Compoſitions on new Subjects.

The 267 Queſtion anſwered by Mr. *J. Waine.*

For z in the given Equation $(35x + 43y + 55z)$ ſubſtitute its leaſt Value *viz.* 1, and we have $y = 91\frac{32}{43} - \frac{35}{43}x \therefore \frac{32 - 35x}{43}$ muſt be ſome whole Number, $\times d$ by 2 and divided is $1\frac{21}{43} - \frac{27x}{43} - x \therefore \frac{21 - 27x}{43} \times$ 2 will be a whole Number $= \frac{42}{43} - \frac{11x}{43} - x \therefore \frac{42 - 11x}{43} \times 4$ is alſo ſome whole Number $= 3\frac{39}{43} - \frac{x}{43} - x$, whence $\frac{39 - x}{43}$, or rather $\frac{x - 39}{43} = m$, a whole Number $\therefore x = 43m + 39$, which Value of x ſubſtituted for x in $y = 91\frac{32}{43} - \frac{35x}{43}$ gives $y = 60 - 35m$; whence $x = 43m + 39 = 82$ or 39, $y = 60 - 35m = 60$ or 35, $z = 1$. And thus by aſſuming $z = 1, 2, 3, 4, \&c.$ we obtain all the poſſible Values of x, y, and z: viz. z admitting of 65 different Values, and x and y of 89. Mr. *John Turner* confirms the ſame by working out all the Numbers. Mr. *Farrer* has exhibited a conciſe Method for finding thoſe Numbers; and Mr. *Landen* is very explicite in finding the ſame: Mr. *Cuth. Cockſon*, Mr. *Flitcon*, and Mr. *John Williams* likewiſe anſwered this Queſtion.

The following Table is a Compendium of Mr. *Turner's* deduced from $x = \frac{4000 - 43y - 55z}{35}$ and alſo $= \frac{20z + 8y - 10}{35}$, by finding a Submultiple of 35.

z	y.	x	z	y.	x	z	y	x
1	25. 60. —	82. 39. —	4	—. 35. 70.	—. 65. 22.	7	10. 45. 80.	91. 48. 5.
2	5. 40. 75.	105. 62. 19.	5	15. 50. 85.	88. 45. 2.	8	25. 60. —	71. 28. —
3	20. 55. —	85. 42. —	6	30. 65. —	68. 25. —	9	5. 40. 75.	94. 51. 8.
And ſo on to $z = 65$								

The 268 Queſtion anſwered by Mr. *Heath.*

No Solution has appeared in any Author to Queſtions of this Nature, which will admit of ſeveral *Varieties* ſtill to be propoſed. Mr. *Kay's* Queſtion was the firſt propoſed, in a particular Caſe, and the general Method of Solution is exhibited in the following Examples, not hit upon before, that I have ſeen, by any.

Sorts

Sorts of Faces.	N° of *Chances.*	*Combinations.*	*Permutations of each Comb.*
a^2	6	Sides revolve	
ab	30	$=\frac{6.5}{1.2}$ Prog. ×	2.1 dec. Dice
$\overline{6}\|^2$ all Ch.	=36	of equal	1.1 decreaſe of
2 Dice	6	Indices.	higheſt Indices of Faces.
$a3$	90	$=6.5$ ×	3.2.1
a^2b	120	$=\frac{6.5.4}{1.2.3}$ Prog. ×	2.1.1
abc		eq. Ind.	3.2.1
$\overline{6}\|^3$ all Ch. on 3 Dice	=216		1 1 1
$a4$	6		
$a3b$	120	$=6.5$ ×	4.3.2.1
a^2b^2	90	$=\frac{6.5}{1.2}$ ×	3.2.1.1
a^2bc	720	$=\frac{6.5.4}{1.2}$ ×	4.3.2.1
$abcd$	360	$=\frac{6.5.4.3}{1.2.3.4}$ ×	2.1.2.1
$\overline{6}\|^4$ all on 4 Dice.	=1296		4.3.2.1
$a5$	6		1.1.1.1
$a4b$	150	$=6.5$ ×	5.4.3.2.1
$a3b^2$	300	$=6.5$ ×	4.3.2.1.1
$a3bc$	1200	$=\frac{6.5.4}{1.2}$ ×	5.4.3.2.1
a^2b^2c	1800	$=\frac{6.5.4}{1.2}$ ×	3.2.1.1.1
a^2bcd	3600	$=\frac{6.5.4.3}{1.2.3}$ ×	5.4.3.2.1
$abcde$	720	$=\frac{6.5.4.3.2}{1.2.3.4.5}$ ×	2.1.2.1.1
$\overline{6}\|^5$ all Ch. on 5 Dice	=7776		5.4.3.2.1
a^6	6		2.1.1.1.1
$a5b$	180	$=6.5$ ×	6.5.4.3.2.1
$a4b^2$	450	$=6.5.4$ ×	5.4.3.2.1.1
$a4bc$	1800	$=\frac{6.5.4}{1.2}$ ×	6.5.4.3.2.1
$a3b3$	300	$=\frac{6.5}{1.2}$ ×	4.3.2.1.2.1
$a3b^2c$	7200	$=6.5.4$ ×	6.5.4.3.2.1
$a3bcd$	7200	$=\frac{6.5.4.3}{1.2.3}$ ×	3.2.1.2.1.1
$a^2b^2c^2$	1800	$=\frac{6.5.4}{1.2.3}$ ×	6.5.4.3.2.1
a^2b^2cd	16200	$=\frac{6.5.4.3}{1.2.1.2}$ ×	3.2.1.2.1.1
a^2bcde	10800	$=\frac{6.5.4.3.2}{1.2.3.4}$ ×	6.5.4.3.2.1
$abcdef$	720	$=\frac{6.5.4.3.2.1}{1.2.3.4.5.6}$ ×	2.1.1.1.1.1
$\overline{6}\|^6$ all Ch. on 6 Dice	46656		6.5.4.3.2.1

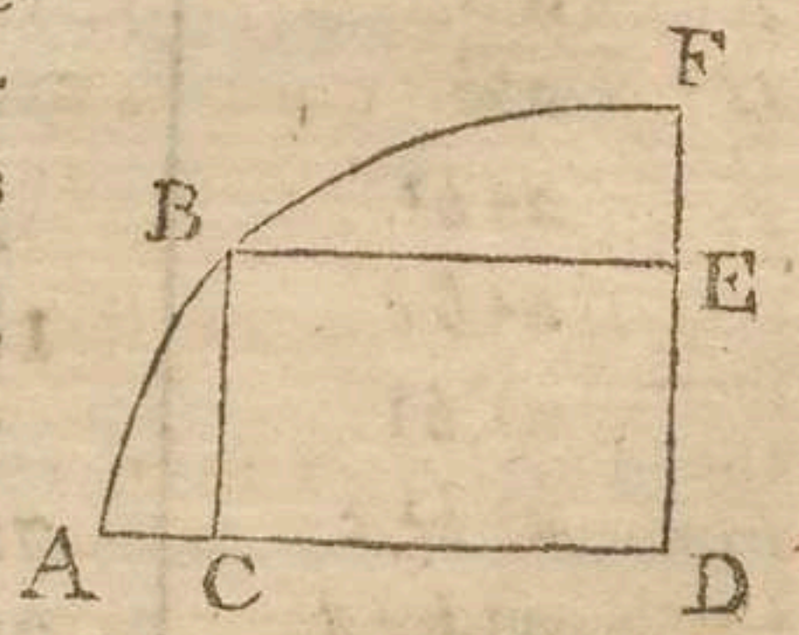
Faces.	*Chances.*	*Combinations.*	*Permutations of each Comb.*
	6		
a^7	210	$= 6.5$ ×	$\frac{7.6.5.4.3.2.1}{6.5.4.3.2.1.1}$
$a^6 b$	630	$= 6.5$ ×	$\frac{7.6.5.4.3.2.1}{5.4.3.2.1.2.1}$
$a^5 b^2$	2520	$= \frac{6.5.4}{1.2}$ ×	$\frac{7.6.5.4.3.2.1}{5.4.3.2.1.1.1}$
$a^5 b c$	1050	$= 6.5$ ×	$\frac{7.6.5.4.3.2.1}{4.3.2.1.3.2.1}$
$a^4 b^3$	12600	$= 6.5.4$ ×	$\frac{7.6.5.4.3.2.1}{4.3.2.1.2.1.1}$
$a^4 b^2 c$	12600	$= \frac{6.5.4.3}{1.2.3}$ ×	$\frac{7.6.5.4.3.2.1}{4.3.2.1.1.1.1}$
$a^4 b c d$	8400	$= \frac{6.5.4}{1.2}$ ×	$\frac{7.6.5.4.3.2.1}{3.2.1.3.2.1.1}$
$a^3 b^3 c$	12600	$= \frac{6.5.4}{1.2}$ ×	$\frac{7.6.5.4.3.2.1}{3.2.1.2.1.2.1}$
$a^3 b^2 c^2$	75600	$= \frac{6.5.4.3}{1.2}$ ×	$\frac{7.6.5.4.3.2.1}{3.2.1.2.1.1.1}$
$a^3 b^2 c d$	25200	$= \frac{6.5.4.3.2}{1.2.3.4}$ ×	$\frac{7.6.5.4.3.2.1}{3.2.1.1.1.1.1}$
$a^3 b c d e$	37800	$= \frac{6.5.4.3}{1.2.3}$ ×	$\frac{7.6.5.4.3.2.1}{2.1.2.1.2.1.1}$
$a^2 b^2 c^2 d$	75600	$= \frac{6.5.4.3.2}{1.2.1.2.3}$ ×	$\frac{7.6.5.4.3.2.1}{2.1.2.1.1.1.1}$
$a^2 b^2 c d e$	75600	$= \frac{6.5.4.3.2.1}{1.2.3.4.5}$ ×	$\frac{7.6.5.4.3.2.1}{2.1.1.1.1.1.1}$
$a^2 b c d e f$	15120		
6 | 7 all the Chances on 7 Dice	279936		

Sum, &c. *ad infinitum.*

Hence the reſpective Chances of A, B, C & D winning are obvious, as 12600, 15120, 37800, and 75600 the ſame as 1; 1, 2; 3; and 6 exactly. And $a^3 b^2 c d$ and $a^2 b^2 c d e$ have equal, and the greateſt Number of Chances for coming up *viz.* 75600. Hence alſo is inferred that the beſt Throw for winning will be when the Sorts are within a Place or two of being all different. Q. E. F.

The 269 Queſtion anſwered by Mr. *John Turner.*

Put $x =$ AC, $y =$ BC, $b =$ AD, $b - x = $ CD, $a =$ Parameter, the Equation of the Curve being $ax = y^3 \therefore y = \overline{ax}|^{\frac{1}{3}}$, and $b - x \times \overline{ax}|^{\frac{1}{3}}$ is to be a *maximum*, which in Fluxions is $- \dot{x} \times^{d} \overline{ax}|^{\frac{1}{3}} \frac{a\dot{x} \times \overline{b - x}}{3\overline{a^2 x^2}|^{\frac{1}{3}}} = 0$; hence $3x = b - x$, and $x = \frac{1}{4} b$ exactly. To proceed, put $z =$ AD, $\frac{z}{4} =$ AC, $z - 5 =$ DF, $\frac{3z}{4} =$ CD, $m = 141.84243$; then BC $= \overline{\frac{az}{4}}|^{\frac{1}{3}}$; DF $= \overline{az}|^{\frac{1}{3}} = z - 5$, $d = 41\frac{1}{3} = 1.5874$, and *per* Queſt. $\overline{\frac{az}{4}}|^{\frac{1}{3}} \times \frac{3z}{4} = m$. Hence $\overline{az}|^{\frac{1}{3}} = \frac{4dm}{3z} = z - 5$; $3z^2 - 15z = 4dm$, here $z = 20$ exactly. And $q = 168.75$, alſo the Length of the Curve ABF $= 27.014$. So that the

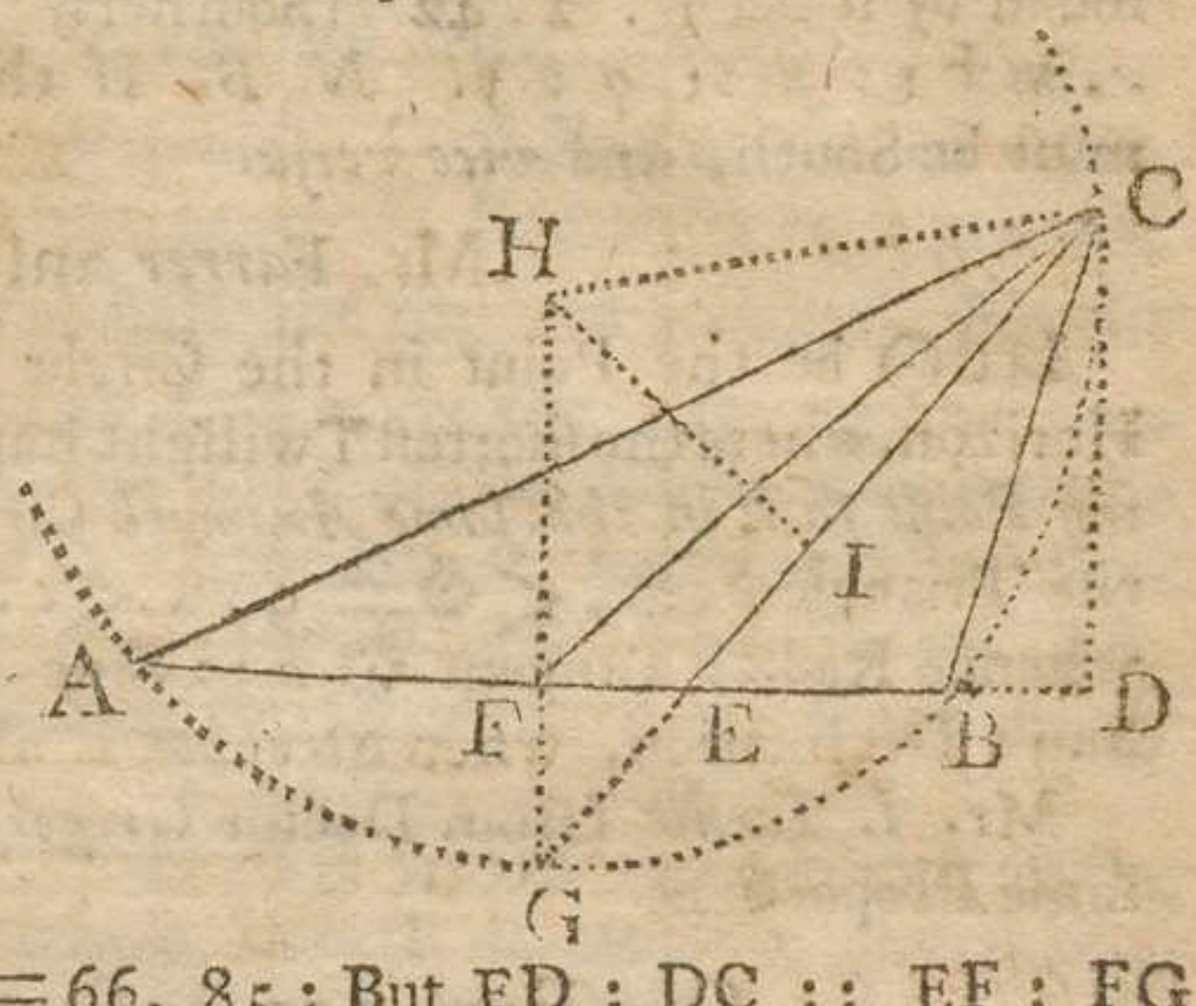


the Fences of the Garden are B C = 9. 4494, and C D = 15; Moreover A D = 20, D F = 15. And the Area A B F D A = $\frac{3}{4}$ A D × D F = 225 *ſq.* Poles, or 1 Acre, 1 Rood, 25 Perches.

This Queſtion was conciſely ſolved by Mr. *Farrer*. And alſo ſolved by Mr. *J. Waine*, and by Mr. *Kingſton* the ſame; the Rev. Mr. *Baker*, the Propoſer, Mr. *Aſh*, and others.

Queſtion the 270 anſwered by Mr. *Farrer*.

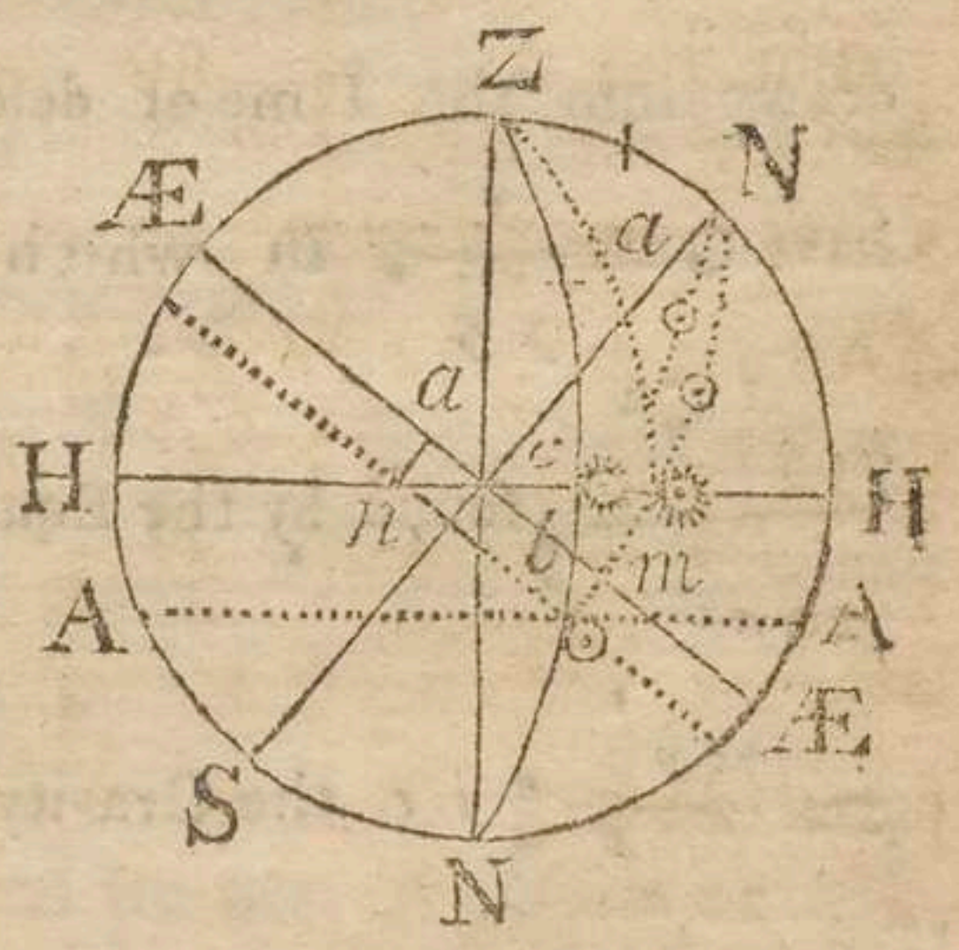
At the Point D, on the Line A D raiſe the Perp. C D = 200 Poles; make C E = 250, and C F = 295; produce C E to cut the Perp. F G in G, draw C H, making the ∠ G C H = ∠ C G H; then upon H, as a Center, with the Rad. H G deſcribe the Arch C B G A. Join C B and C A, and the Triangle A B C is that required. *Calculation.* Having C D, C E and C F given, find E D = 150, F D = 216, 85 and E F = 66, 85: But E D : D C :: E F : F G = 89, 14 ∴ G E = 111, 42 and G F : G E :: G I : G H = 225, 89, hence A B = 359, 58 B C = 203, 41 and A C = 441, 21. The Area 35958 *ſq.* Poles or 224 A. 2 R. 38 Perches.



Mr. *Aſh* has elegantly conſtructed, and ſolved this Queſtion, and ſo has Mr. *John Turner*, Mr. *Joſeph Orchard*, Mr. *John Hunter* (and Mr. *James Terey* who objects to the Solution of 260 Queſt. by Mr. *Heath*, as ſuppoſing him not to know that three Perpendiculars let fall from the ∠s of a △ would interſect, in one Point, within or without the △; his Expreſſion of *Data* not inferring ſuch Thing) It is alſo analytically ſolved by Mr *Richard Gibbons*, Mr. *Baker*, Mr. *I. Waine*, Mr. *Kingſton* and others.

Queſtion 271 ſolved by Mr. *J. Aſh*.

If N repreſent the North Pole, Z the Zenith, H ☼ an Arch of the Horizon, A ⊙ A a Parallel of the Sun's Depreſſion 18° below it; and ☼ ⊙ a Parallel of Declination deſcended; then the ∠ ⊙ N ☼ will be the *Minimum*: but 'tis alſo evident that when the *Crepuſculum* is the ſhorteſt, the Diſtance ☼ ⊙ deſcended in the Parallel of Declination will be a *Minimum*: being the Arch of a leſſer Circle cutting the ſame Azimuth in the Points of ſetting and end of Twilight. And this will be when the Motion of the Sun is moſt Perpendicular, and therefore deſcends the faſteſt to 18°, or the Parallel of A ⊙ A; which he does by touching at the Points ☼ and ⊙ in the ſame Azimuth Z ☼ ⊙ with his ſetting, inſtead of making an oblique ∠ with the ſetting Azimuth, as in the Poſition of ☼ *m* ⊙ with Z *a* ☼. This being admitted, put *y* = Coſ. N ⊙ = N ☼; *m* and *n* Sine and Coſ. Z ⊙ = 108°, or Sines of 72° and 18° *p* and *q* Sine and Coſ. N Z = Comp. Lat. and Rad. Unity



Unity = Z ☼, Then *per* Spherics $\frac{y}{p}$ = Cof. NZ ☼, and alſo $\frac{nq-y}{mp}$ = Cof. NZ ⊙, which (for the above Reaſons) are = to each other, *i. e.* $\frac{y}{p} = \frac{nq-y}{mp}$ ∴ $y = \frac{nq}{m+1}$ which is a *General Theorem* for all Queſtions of this Nature. And the Sun's Declination in the preſent Caſe is found by it = 7°. 2′. 42″ (Southerly) anſwering to *Feb.* 19, or *Sept.* 30. ∴ $m+1 : n :: q : y$. *N. B.* If the Lat. is North, the Declination muſt be South, and *vice verſa.*

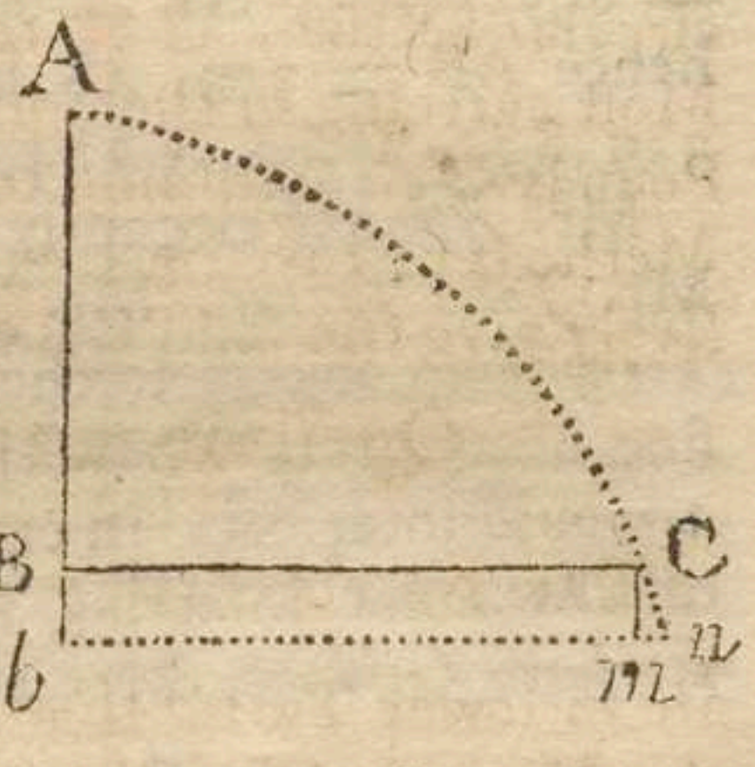
Mr. *Farrer* anſwers thus.

Let ⊙ be the Point in the Circle bounding Twilight 18° below the Horizon, where the ſhorteſt Twilight happens (*without ſaying why the bounding Point falls in the ſame Azimuth Circle with the Sun's ſetting*) Then in the Triangle *b c* ☼, < ☼ = 90°, < *c* = Co Lat. ☼ *b* = 9°. *c* ☼ = *c n*, whence Rad. : Tangent ☼ *b* :: Sine Lat : Sine Arc = 7°. 3′ *fere*, the Sun's Declination, when *Strephon* is allowed to wed his *Cloe.*

Mr. *I. Turner* (from Doctor *Gregory's* Elem. of Aſtron.) confirms the ſame Proportions.

Queſtion 272 anſwered by Mr. *Landen.*

Let *ACn* repreſent the Curve; AB the *Axis* thereof; BC, and *bn* Ordinates indefinitely near each other. Call AB, *x*; BC, *y*; and the Gravity G. Then ſince the Velocity in the Direction BC is always the ſame, that in the Direction *Cm* will be $\frac{\dot{x}}{y}$, whoſe Fluxion $\frac{\ddot{x}}{\dot{y}}$ ($\dot{y}$ being conſtant) will be as $G \times \dot{y}$, that is, as the Force by which the Body is accelerated at C drawn into the Time of deſcribing *Cn*. Hence putting $G \times \dot{y} = \frac{\ddot{x}}{\dot{y}}$ we have $G = \frac{\ddot{x}}{\dot{y}\,\dot{y}}$. In which Expreſſion if for $\ddot{x}$ we put its Value $\frac{7.5\, y^{\frac{1}{2}}\, \dot{y}^2}{20\, a^{\frac{1}{2}}}$, found by the Equation of the Curve ($ax^2 = y^5$) we get G = $\frac{7.5\, y^{\frac{1}{2}}}{20\, a^{\frac{1}{2}}}$. *i. e.* the Gravity, in this Caſe muſt be in a ſubduplicate *Ratio* of the Ordinates, or in a ſubquintuplicate *Ratio* of *x*, the Diſtance of the Ordinate from the Vertex.



Mr. *Farrer* attempted this Solution by another Method, as alſo did Mr. *Aſh.*

Queſtion 273 anſwered by Mr. *I. Aſh.*

Let y = $x\,x$ then (*per* 47. e. 1. and *per* Qu.) $y^2 + y^4 = y6$, $y^2 =$

$\frac{5^{\frac{1}{2}}}{2} + \frac{1}{2} =$ 1. 618034 $y =$ 1. 272019 and the Area required $=$ 1. 02908.

Mr. *Richard Gibbons* ſolved this Queſtion in the ſame elegant Manner. The Rev. Mr. *Baker* likewiſe gave a curious Solution, and ſo did Mr. *Farrer* the Propoſer, and others.

The 274 Queſtion ſolved by Mr. *Landen*.

Put $d =$ diff. of the given Circumferences. $r =$ Rad of the leſſer Circum. and $x =$ any Abſciſſa of the Circle whoſe Radius is r. Then $d \times 2\sqrt{2ax - xx} \times x$ is the Fluxion of half the required Solidity. But the Fluent of $2\sqrt{2ax - xx} \times x$, when $x = r$, is the Area of the ſemi Circle, whoſe Rad is r. therefore, the Area of the Circle ſhewing the Thickneſs of the Ring, multiplied by d, the diff. of the given Circumferences will give the ſolid Content of the Ring $=$ 264 Inches *fere*. Whence the Weight thereof, according to Dr. *Wiberd*, is nearly $=$ 77 Pounds Averdupois.

Mr. *John Turner*, and ſeveral others have proved the Solidity of the Ring, to be equal to a Cylinder whoſe Length is equal to the middle Circumference, and the *Area* at the Baſe, equal to the Area of its circular Section, or of the Circle whoſe Diam. expreſſes the Thickneſs. Moſt agreeing in the Solidity to be $=$ 264, *&c.* Inches and the Weight 73 Pounds *&c.* according to *Ward's* Proportions. *N. B.* There are ſeveral Methods of inveſtigating the Fluxion of this Ring, whoſe Fluents reſpectively give the ſolid Content as above.

Queſtion 275 anſwered by Mr. *John Hampſon*.

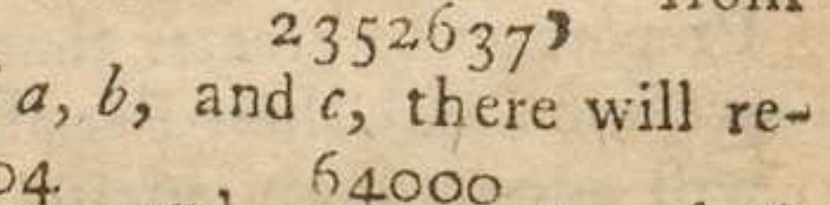
The Numbers are $\frac{13851}{85184}$, $\frac{19467}{85184}$ and $\frac{18954}{85184}$. Theſe Fractions are in lower Terms than thoſe given by Dr. *Wallis* from Dr. *Pell*, where the Method of Solution may be ſeen.

Mr. *Turner* gives this Anſwer from Dr. *Wallis's* Algebra.

1ſt. $a = \frac{494424}{2352637}$, 2d. $b = \frac{472696}{2352637}$, 3d. $c = \frac{448000}{2352637}$ whoſe Sum $= \frac{1415120}{2352637} = \frac{80}{133}$. The Cube of their Sum $= \frac{512000}{2352637}$, from which Numbers taking ſeverally the Values of a, b, and c, there will remain theſe three Cubes *viz.* $\frac{17576}{2352637}$, $\frac{39304}{2352637}$ and $\frac{64000}{2352637}$; whoſe Roots are $\frac{26}{133}$, $\frac{34}{133}$ and $\frac{40}{133}$. Q. E. F.

The 276 Queſtion anſwered by Mr. *I. Aſh*.

Suppoſe Sine $\angle DEA =$, 0507, Then by Trigon. AE is found $=$ 3944, 77 Inches or 328. 73 Feet $=$ Length of the *Pendulum's* String. Hence (per *Keil's* Introd. Theor. 11. p. 302) the Time of one Revolution is equal to the Time of the Perpend. Fall of a heavy Body from a Height equal to the *Pendulum's* Length ∴ 16 $\frac{1}{12}$: 1″ :: 328, 73 : 20″, 439442



the

the Sq. Time, whose Root = 4, 521 Seconds required. This Question was elegantly solved by Mr. *Farrer*, Mr. *Turner*. Rev. Mr. *Baker*, and others, which agree with the Proposer's Solution.

Question 277 answered by Mr. *Heath*.

Square is printed instead of *Square Root* in this Question; correcting which, and putting a = the Pounds of an Annuity, r = 1. 05 the Amount of a Pound, and its Interest for one Year, at 5 *per Cent*; t = the Year's Continuance; then $\frac{a}{r-1}$ *min* $\frac{a}{r^t \times r-1} = x$, the present Worth. And if the Conditions of the Question be substituted therein, the Equation becomes $\frac{a}{r-1}$ *minus* $\frac{a}{r^a \times r-1} = a^{\frac{1}{2}}$. Whence $\overline{1.05}|^a = \frac{a^{\frac{1}{2}}}{a^{\frac{1}{2}}-,05}$; here a = 1.034 *fere* = 1 *l.* 0 *s.* 7 *d.* the *Annuity* required. *N. B.* As the Question was printed, the final Equation is $\overline{1.05}|^a = \frac{1}{1-,05a}$, where a is evidently = 0, or the least Money possible.

Observation on the 278 Question, by the *Editor*.

This Question was proposed with an Intent to *improve Gunnery*, of which there are several Things wanting. In particular, a Treatise on the Subject by an *experienced* Hand: For to be treated on by any other Person, will only be compiling of Matters already known. And in order for this Improvement, and the Solution of this Question, Experiments should be made in a general Way, which we have not yet received.

SOLUTION to the PRIZE QUESTION for 1746.

The biggest two Circles, within one another, admitting of an *infinite* Number of Triangles to be drawn with their Angles and Sides *terminating* in their outer, and *touching* their inner *Peripheries*, are those which are *concentric*, and their Diameters exactly as 2 to 1; in which Case the Δs will be all equal and equilateral. This is so evident, as to appear upon the slightest Examination. And if the Diameters be in Proportion less than 2 to 1, then no Δ whatsoever, can be drawn as aforesaid. But if the Proportion be greater than 2 to 1 (as 310 to 100, or 3, 1 to 1 as in the present Case) their Peripheries being *eccentric* and at a proper Distance, will admit of an *infinite* Variety of Δs to be drawn in and about them, from the Isosceles Δ ACC to that of BDD, which are the *greatest* and *least* Δs: *Because the* Area *of every* Δ *so drawn*, being *equal to the Sum of all the Sides into half the given* Radius *of the inscribed Circle, the more the Sides of any Triangle are situated about the Centre, or Diameter, or the farther removed from them, the greater or less will the Periphery, and consequently Area, of that* Δ *be: The Sides of the* Δs *ACC and BDD being the most near and remote to such a Situation.*

For the Property of drawing Δs as aforesaid, in and about *eccentric* Circles, there is this *Demonstration*.

First

First to inſcribe the *Iſoceles*, or one Δ, ACC in the greater Circle, which at the ſame Time, ſhall circumſcribe the leſſer Circle. Put m = rad. greater Circle = A a, n = rad. leſſer = o v and x = A o, then $\sqrt{x\,x - n\,n}$ = Av; per ſim. Δs Av : Ao :: At : AC = $\frac{x + n \times x}{\sqrt{xx - nn}}$; again A$o$: Av :: AB : AC. = $2m \frac{\sqrt{x^2 - n^2}}{x}$;

hence $\frac{x + n \times x}{\sqrt{xx - nn}} = \frac{2\,m\,\sqrt{x^2 - n^2}}{x}$

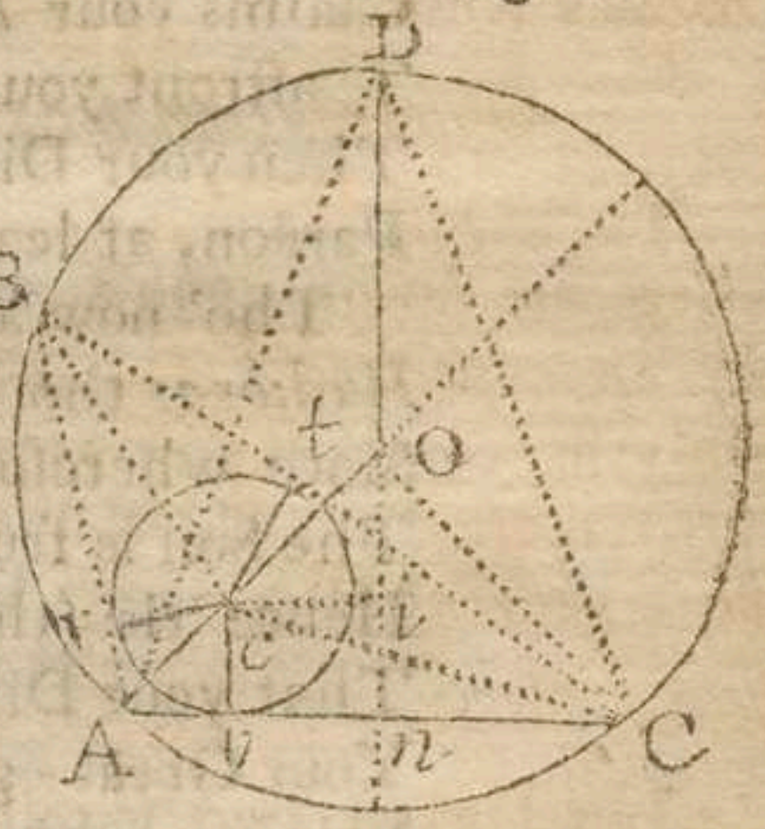
and $x = m\sqrt{m^2 - 2\,m\,n} = a\,o$, the Diſtance of the Centers = 92. 330926, *&c.* whence 12. 669074 = Bt the *neareſt Diſtance* of the Peripheries. And Area Δ ACC = 18242. 89 Yards, the *Greateſt*; and that of Δ BDD = 16799, 82 *&c* the *Leaſt*.

Fig. 1.



The Diſtance of theſe *Centers* of Circles being known, as $d = cO$ (Fig. 2.) capable of having one Δ drawn, as aforeſaid: Suppoſe any Chord AC = x touch the inner Circle at v, then it is plain another Chord, can touch it ſomewhere at t, and *if another can touch it* at r, the Property is proved. But, in general, the < ABC = < ADC = < n OC = $\frac{x}{2\,m}$ and < r Ec = < cB t = < n DC (per 33. and 20. *e.* 3.) = $\frac{x}{2\sqrt{m + 1 \times m,} + m\sqrt{4\,m - x^2}}$; the Coſ.

Fig. 2.



or < rcB = < tcB = < n CD = $\frac{m + \sqrt{m - \frac{1}{4}\,x\,x}}{\sqrt{m + 1 \times m,} + m\sqrt{4\,m - x\,x}}$;

whence, by Trigon. r B = B t = $\frac{2\,n\,m, + 2\,n\sqrt{m - \frac{1}{4}\,x\,x}}{x}$. Again $i\,o = m - n, + \sqrt{m - \frac{1}{4}\,x\,x}\;x$, and (*per* 47. *e.* 1.) ci = vn = $\sqrt{d^2\,min\,m - n, + \sqrt{m - \frac{1}{4}\,x\,x}^2}$ hence v C = $v\,n + \frac{1}{2}\,x$, Av = Ar = $\frac{x}{2} - v\,n$, and AB and BC, alſo < v C c = < c C t and < v C t are expreſſed. Say $\frac{x}{2\,m}$ (< ABC) : x (AC) or 1 : $2m$ :: < v Ct : AB

which gives an Equation ſhewing the general Value of x, whilſt two other Chords are Tangents likewiſe; and Δs *ilk*, *gef*, will revolve as in the 1ſt. Fig. Hence, if any Chord or Side of a Δ is given, the other follow by *Trigonometry*; having firſt found the Diſtance of the Centers aforeſaid. This Property of drawing Δs about Circles I diſcovered ſome Years ago, as may be ſeen in the monthly *Oracle*; tho' the Propoſer has *greatly deſerved* in a long Account of it from *Scilly*, printed in a Book called the Quarterly

o Ænigmas *to be answered in the next* Diary.

Mr. *Landen* puts $b =$ rad. leſſer Circle, $a =$ Diam. greater, and $x =$ Altitude Iſoſceles Δ, and gets $x = \frac{a+2b}{2} \pm \sqrt{\frac{aa-4ab}{4}} = 297$, 33 or 112. 67 *&c.* Whence he infers this Conſtruction. *See Fig.* 1. From the Center of the Garden, along the Diam. ſet off the Diam. of the Pond, find a Center (at *n*) betwixt that *Point* and the other End, deſcribing a Circle A *p q* ϰ, draw *p m* parallel, and *mo* Perp. to AB, and the Point *o* will be the *Center* of the Pond.

Mr. *Aſh* finds the Diſtance of the *Centers* by a *Theorem* like the former; and ſo does Mr. *Bamfield*; who has given a conciſe and *elegant* Solution.

New Ænigmas, to be anſwered in the next *Diary*.

1. *Ænigma* 284, By Mr. W. Chapple.

A *Rev'rend* Elder, once in great Eſteem
(However ſtrange to you my Phiz may ſeem)
Claims your Attention, Ladies, neither is it,
T' affront you that I now make you this Viſit;
Then your Diſtaſte at me, a while remove,
Pardon, at leaſt, what you may diſapprove.
Tho' now among your Sex I'm not reſpected,
Hudibras thought I ſhould not be neglected;
Since whereſoe'er I thrive, it muſt be granted,
The Soil is fruitful, and the Ground well planted:
Hence 'tis (tho' my Salutes but awkward prove)
That your Diſlike is ſometimes mixt with Love.
Your Great-great Grandames never did me fear;
I then was always nurs'd with tender Care,
In various Forms as then the Mode requir'd,
And Belles of Taſte my grateful Dreſs admir'd.
Tho' venerably grave (as has been ſhewn)
I was obſerv'd to dance at every Tune;
And when the Prieſt harang'd againſt a Crime,
I ready ſtood, and to his Words kept Time.
At *Chriſtmas* Feaſts, where all good Cheer was found,
And the full Bumpers merrily went round,
I ſometimes ſipt the Liquor in the Quart,
And at the Table always play'd my Part;
For which a common Proverb I became,
Tho' now I ſeldom there a Place can claim:
For now, alas! (ſo little I'm admir'd)
A Crew of Cut-throats on th' Occaſion hir'd
Uſe their Endeavours to cut off my Race,
And all my ſpreading Iſſue to efface:
But tho' relentleſs at the Root they ſtrike,
I thereby am increas'd, and, *Hydra* like,
For one Head thus lopt off in Time gain Ten,
And, with augmented Vigor, thrive again.

Take

Take one Hint more, and you'll my Name diſcover,
Celinda often finds me with her Lover.

II *Ænigma*, by Mr. *J. Stewart.*

——— *Non eadem miramur.*

Of all *Ænigmas* that have been, of all that yet were wrote,
Ladies, on me I have not ſeen, you've dropt a ſingle Thought.
My Species, much like that of Man, my Nurture much the ſame,
I ſtrive to ruin all I can; hence get a ſhameful Name:
I drink ſtrong Liquors to exceſs, reverſe to Phyſic Rules:
My Need thereby I ſoon redreſs, and quaff the Laws of Schools.
Betray my Friends for ſake of Pelf, and that's my chiefeſt View in,
Seeming you'd think, to drink his Health, I meditate his Ruin
Thus Hypocrites do ſpeak moſt fair, tho' from the Truth remote
Expreſs for you the greateſt Care, and yet wou'd cut your Throat.
Take one Hint more, e're I'm defin'd, a Slave to ſilly Pelf;
Once known, deſpis'd by all Mankind, and, dying hate myſelf.
Fair Ladies, you it now betides, let it be your Decree,
To you and all the World beſides, that I a Stranger be.

III *Ænigma*, 216, By Mr. *W. Bamfield.*

Since I have ne'er adorn'd *Diarian* Page,
I now advance the *Ænigmatic* Stage;
And being of inviting beauteous Hue
Ye lovely FAIR — this Preſent make to you:
So now will here expand my airy *Wing*,
And its chief Properties attempt to ſing.
In various ſplendid Colours I'm array'd,
And *Gold* and *Silver* oft by me 're diſplay'd.
Sometimes like ſpotleſs Innocence appear,
At other Times the deepeſt Mourning wear.
A thouſand *Curioſities* can ſhew,
And all, illuſtrious *Ladies* --- all for you.
Sometimes the ſporting Fiſhes I ſuſtain,
And bluſhing Roſes deck my brittle Plain;
Where *Protean* Clouds are ſeen in azure Sky,
And ſtately Ships are gently wafted by.
Of Limbs preciſely ſimilar I'm made,
And equidiſtant to each other laid.
Of wide Extent my utmoſt Limit's ſeen,
Tho' to a Point I terminate within.
Yet you with Eaſe the Bound'ry may contract,
And ſimilar Parts then cloſing are compact.
My Motion's like a *Pendulum*, to and fro,
Tho' not by pow'rful Weight compell'd to go:
Far eaſier mine --- no dented Pinions need ---
A Child may put in Motion or impede.
Yet am ſo highly priz'd, that I've command
To kiſs the ſweeteſt Lips and niceſt Hand.

Can

Can brave the sultry Heat, or piercing Cold,
And give Refreshment both to Young and Old.
But neither Flesh nor Blood do me compose,
Tho' their adherent Neighbours I disclose.
Perhaps one half of each is neat array'd,
The other half quite *naked* and display'd.
Ladies, Compassion take, and warm that Part
For me to guide the Wishes of your Heart
To him you'd fain possess --- And may your **Love**
Meet just Return --- be blest as that above.

IV. *Ænigma* 287. By *Octavia.*

WHEN *Cloe* comes I meet the Fair,
But when she goes I shun her;
If she smiles, I smile again,
If frowns, I frown upon her;
But tho' I thus affect to seem
Indifferent about her,
Such is my Fate, spite of my Airs,
I cannct live without her.

V. *Ænigma* 288. By Mr. *J. Landen.*

YE *Fair* Ones, your Attention give,
And mark what Kind of Life I live.
When *Cæsar*'s natal Day commands,
Or glorious Feats of martial Bands,
That Loyals Hearts their Gladness shew,
I then appear in publick View;
In Vesture of so bright a red,
That all around my Lustre's spread.
Vast Crowds await, with eager Eyes,
To see me into Being rise,
At Sight of whom, in sportful Mirth,
Their loud *Huzza's* proclaim my Birth;
And from that Moment, till I die,
They fill the Air with Shouts of Joy:
But these Rejoicings soon are done,
Soon, alas! my Glass is run.
I seldom to exist am known,
Before the radiant *Sun* goes down,
And old *sable*-visag'd Night
With her Curtain veils the Light;
Yet before the shining Morn
Does the Eastern Hills adorn,
My Parts disperse, I quite decay,
And all my Splendor fades away.
Enough is said, I'll tell no more;
Ye *Artists*, now my Name explore.

VI. ÆNIGMA 289. *By* Celeſtina.

SOmething, but what I am, I ſcarcely know,
Whom all have *felt*, but no one ever ſaw:
A Sound I'm not; nor Shape, nor Colour wear,
Altho' perceiv'd by Touch, by Eye and Ear.
I'm ſweetly born upon the loveliest Bed,
By ſome brisk Swain prepar'd, and gentle Maid.
Sweet is my Birth, alas! how ſhort my Stay!
I hardly live, but vaniſh quite away:
Like Life, each momentary Pleaſure flies,
Lives but by Birth, and in Creating dies:
Yet ever bleſs'd by the creating Pow'r,
We die, we live, ten Thouſand in an Hour.
Some ſay they *hate me*, but they know they lie;
All know they love me, but they know not why.
By all I'm ſought, thro' *England*, *France*, and *Spain*,
The *Mad*, the *Wiſe*, the *Modeſt*, and the *Vain*:
With *Porters*, *Swains*, with *Kings* and *Monks* I dwell,
And pleaſe the Town, the Cottage, and the Cell.

VII. ÆNIGMA 290. *By Mr.* W. Jepſon.

LADIES, in Holy Writ we're told,
That our Forefathers us'd of Old
To worſhip molten Idol-Gods,
Of Gold and Silver —— earthly Clods!
But Gods themſelves, (who can be free)
Paid Adoration unto me!
To worſhip at my Shrine, great *Jove*
Deſcended from his Throne above,
In borrow'd Forms of *Bull*, and *Swan*,
A *Golden Show'r!* —— a mortal Man.
In this our Age, the Men of Faſhion,
Of ev'ry Sect, in ev'ry Nation,
Ne'er ſay their Pray'rs, or bow the Knee,
To any other God but me.
And tho' the Papal Pow'r's rejected
By all true *Britons*, well affected,
You'd think Idolatry protected:
Altho' the Superſtition vile
Of *Rome* is baniſh'd from our *Iſle*,
In ſacred Churches ſee me ſtand,
With humble Suppliants at Command,
All mortifi'd with Flames and Darts,
Off'ring up Hecatombs of Hearts.
Like the great God of Gods, I can
(The Poets ſay) give Life to Man;
His Soul afflict with Grief and Pain;
Reſtore him Joy and Eaſe again:

The Life I gave annihilate;—
Expiring Souls re-animate!
LADIES, a partial Friend to You
I am; you'll ever find me true,
While Virtue holds the Guiding-Clew:
But if your Steps to Folly bend,
(Tho' you may think me ſtill your Friend)
I *brand* your Character and Name
With laſting Infamy and Shame.

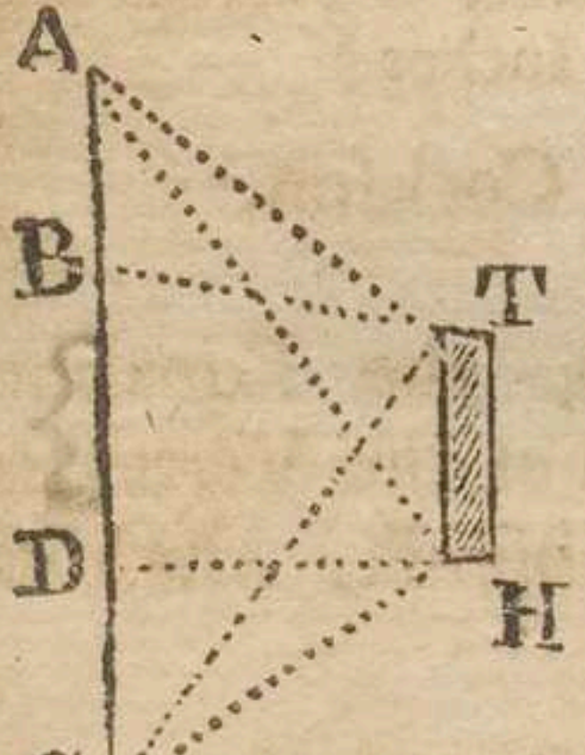
New MATHEMATICAL QUESTIONS, *To be answer'd in the next Year's* DIARY.

I. QUESTION 279. *By Mr.* Landen.

A Charming brisk Maid has aſſur'd me, and ſaid,
Since I'm ſuch a fine Mathematician,
(Laying puzzling aſide, for the Joys of a Bride)
She will wed me——but on this Condition:
That I firſt ſhall unfold what * *Pieces* of Gold
Her Father has for her in Store:
And theſe I muſt find from the *Data* ſubjoin'd,
And then I'm to puzzle no more.

* The Pieces are *Half-Guineas*, *Guineas*, *Moidores*, and *Three Pound Twelves*. The whole Number of them is 4000. And if v, x, y, and z, be put for the Number of each Sort reſpectively, $v^4\ x^3\ y^2\ z$ is a *Maximum*. *Quere* what is the *Lady*'s Fortune?

II. QUESTION 280. *By Mr.* John Williams.



GOing along a *River*'s Side, on an even and direct Road ABC, I obſerved a *Tower* on the River's other Side, whoſe Angle of Altitude at A was 5° 24′; going farther on to B, 100 Yards, the Angle of Altitude was 6° 27′ ½; and intending, again, to take an Obſervation when directly oppoſite to the Tower, but was prevented by an Iſland in the River (over-grown with Furs) I then came to C, 400 Yards from B, where I found the Angle of Altitude was 8° 36′. *Qu.* the Tower's Height?

III. QUESTION 281. *By Mr.* J. May, *jun. of* Amſterdam.

IT is required to find (by a general Theorem) the Number of *Fractions* of different Values, each leſs than Unity, ſo that the greateſt Denominator be leſs than 100?

IV. Question 282. *By the Rev. Mr.* Anthony Baker.

A Gentleman would have a Silver *Punch-Bowl* made in the Form of a Parabolic *Conoid*, containing exactly two Gallons, but being frugally inclined, desires first to know what ought to be its inside Dimensions so that, *cæteris paribus*, it may require the *least* Quantity of Silver possible ?

V. Question 283. *By Mr.* N. Farrer.

Quere the *Axis* and Parameter of a *Parabola* and Semi *Ellipsis*, when the latter is circumscribed by the former, whose Ordinate is equal to the Conjugate Axis, and Abscissa equal to the Semi Transverse : Both Curves having the same *Focus*, the Difference of their Parameters 2, and the Length of the parabolic Curve being 28, 68 ?

VI. Question 284. *By Mr.* Cuth. Cockson.

Quere with what Part of a Cylindrical Stick should a Person strike, to give the greatest Blow ; the Length of the Arm being 20 Inches, and that of the Stick 50 ?

VII. Question 285. *By Mr.* Landen.

I Am about building a House, the Breadth whereof I design shall be 24 Feet, and the perp. Height from the Ground to the Ridge 42 Feet. The Ends, which are to point directly *East* and *West*, will be shelter'd by neighbouring Tenements : But the Sides will be exposed to the Fury of the North and South Winds. I therefore would be satisfied what the Angle of the Ridge must be, and how high the Side Walls, that the Wind blowing from either of those Quarters shall have the least Effect on the Building ?

VIII. Question 286. *By Mr.* J. Ash.

IF a parabolic *Conoid*, whose Altitude is 9, and Base 6 Inches, be cut by a right Line at some Distance from, but parallel to its *Axis*, what is the *Solidity* and *Convex* Surface of that Segment, or Part cut off, when the Height of the Plane of that Section is 5 Inches ?

IX. Question 287. *By Mr.* Cuth. Cockson.

GIVEN $a^3 y + y y x^2 - a a y y = o$, the Equation of a Curve, whose Radius of Evolution at the Vertex is $140 = a$; to find the Value of y, the Abscissa, when its correspondent Semi Ordinate $x = 50$?

X. Question 288. *By Mr.* John Hampson.

REquired to find three Numbers, that when each is severally added to the Cube of their Sum, their respective Sums shall be a cube Number ?

XI. Question 289. *By Mr.* Heath.

ON what *Days* of the Year do our Shadows move slowest and fastest in *London* ? And at what *Times* do they move slowest and fastest on any Day ?

XII. Question 290. *By Mr.* Bulman.

BEING at a *Town* in *Kent*, I obſerved three Objects on the other Side of the River *Mid-way*, (a Caſtle, Windmill, and Spire) whoſe Diſtance from one another are known: From the *Caſtle* (the neareſt Object ſeen) to the *Spire*, is 10 Furlongs; from the *Caſtle* to the *Windmill* 23 Furlongs; and from the *Windmill* to the *Spire* is 25 Furlongs. I alſo obſerved the *Town*-Angle between the *Caſtle* and *Spire* = 28° 34′, and the Town-Angle between the *Caſtle* and *Windmill* = 57° 45′. What Diſtance did I ſtand from each of thoſe Objects? And give a geometrical Conſtruction of the ſame.

XIII. Question 291. *By Mr.* J. Aſh.

A *Lady* of important Speculation
Would gladly know her Age from this * Equation.

$$\frac{*A}{1,05} = \frac{A^{\frac{1}{2}}}{1-,05A^{\frac{1}{2}}}$$

XIV. Question 292. *By Mr.* Heath.

THE *Pounds Power* of their *Nepair*'s Logarithm be
Equal that *Logarithm Power* of Shillings left to me.
From myſtic Words, Artiſts, the Truth extract,
And tell what is the Legacy exact?

XV. Question 293. *By Mr.* Bulman.

A Spheroidal *Ullage* lies upon the Ground with the *Bung* uppermoſt, from whence to the Surface of Liquor (which is exactly the Height of the upper Ends of the Cask) is 9 Inches, and its *Diagonal* either Way from the Bung to the lower Ends = 55 Inches, its Ullage is a *Maximum*; *Quere* the Content of the Cask and Ullage, Brother Gaugers?

XVI. Question 294. *By Mr.* Chr. Maſon.

IN an Evening lately, hearing the Noiſe of *Guns* at a ſmall Diſtance off at Sea, I ſtrait repair'd to the *Strand*, where I loom'd a Man of War's *Tender* giving Chace to a *French* Privateer; I perceived a *Flaſh* of a Gun from the Tender S. W. by S. at 33 half Seconds of Time heard the *Report*: Eight *Min.* after I obſerved another Flaſh at S. S. W. from the ſame, and at 25 half Seconds heard the Report. The Chaſe kept her *Courſe*, making equal Way; in 35 Minutes more was drove on Shore, being but two Minutes of Time a-head of the Tender. What was the *Bearing* and *Diſtance* between my *Station*, the Tender, and pilf'ring Poltroon when *ſtranded*?

PARADOXES

PARADOXES *answer'd.*

PARADOX I. *answer'd by* Jack Tar.

BOTH Sheets *aft*, the Wind at North, in the Gulf of *Florida*, we
Sail a-ſtern by the Current, as ſure as can be.

PARADOX II. *answer'd by Miſs* Arabella Fickle.

ONE End of the Spoke did the Axis attend,
Which an *Axis* deſcrib'd, and a *Curve* t'other End.

PARADOX III. *answer'd by* Ens Generatus.

THE variable Sides of a ▭ proceeding by and with each other's *inſtant* Motion (or Degree of inſtant Increaſe) in the Generation and Production of *Particulars*, ſolve this fluxionary Paradox. So likewiſe will other mutual and reciprocal Motions in the Production of any Thing.

N. B. The Word *born*, in a Place or two, was put inſtead of *begot* (which ſhould go before it) in the laſt Year's Account of Fluxions: The refined Senſe of *begetting* or *generating* being more applicable to a *Fluxion*, than that of being *born*; which is more properly applicable to an Increment, a farther *Increaſe* or Production.

The PRIZE ÆNIGMA, *and* PRIZE QUESTION.

Whoever ſends Anſwers to them before Candlemas *next, has a Chance by Lots to win* 12, 8, *and* 10 Diaries.

PRIZE ÆNIGMA.

I Am (Thanks for the Rhyme, good Madam)
Almoſt, not quite as old as *Adam*;
And among Mortals ſhall be found,
Long as the merry World goes round;
But Heav'n to me will be deny'd,
Tho' Virtue were herſelf my Guide.
To full Maturity I grew,
But Infancy I never knew.
Tho' my own Maſter, yet I have
Full oft' the Doom to be a Slave;
Nor Honours do my ſelf receive,
Altho' all Honours I can give.
Ladies good Names I from 'em ſteal,
And ſo, belike, in Scandal deal;
Yet am no Friend to ſpiteful Railing,
Hiding many a Sinner's Failing.
I thrive when well my Branches ſpread,
But ſicken if I ſhoot at Head.
Whene'er I marry 'tis for Life;
I never yet ſurviv'd my Wife:
Tho', in my Time, been doom'd to wait on
The *Conſtancy* of Mrs. *B——n*.

Prize Queſtion. *By Mr.* Bamfield.

IF the Diameter of *Syſiphus*'s cylindrical Stone be two Feet, which he continually rowls upon the Surface of a *ſemi-globular* Mountain, half a Mile high; *Quere* what Space will a *Spot* on the Convex Surface of that Stone travel thro' in rowling directly up and down the ſaid Mountain? And what will be the Time of its Deſcent from the Top, by the Force of Gravity?

I. Paradox. *By Mr.* J. Hammond.

A Gentleman's *Gard'ner* begs the learned *Ladies* Aſſiſtance,
How to plant four Trees, each two at an equal Diſtance?

II. Paradox. *By Mr.* Orthrodox.

I Am for ever, and yet was never.

III. Paradox. *By* Jaſper Fox.

IN *England*, or *Scotland*, I'm not to be found,
Yet to each of thoſe Places am conſtantly bound.

IV. Paradox. *By* Topas Habbernab.

TWO Men and one Woman went to Bed,
Yet all three were lawfully wed.

We acknowledge the Favours of Mr. J. May *of* Amſterdam, *tho' we are deprived of great Part of his valuable Productions by lurking Privateers, who have intercepted Things coming to our Hands. We likewiſe acknowledge the Favours done us by Mr.* Emerſon, *Mr.* Landen, *Mr.* Turner, *Mr.* Farrer, *Mr.* J. Aſh, *Mr.* Waine, *Mr.* Maſon, *Mr.* Powle, *Mr.* Bamfield, *and ſeveral other of our valuable and conſtant Contributors, whom we hope will continue to ſend us their choice Productions. And that every Mathematical* Genius *may have a larger Field to diſplay their Talents in, we do invite all our ingenious Correſpondents to ſend us a Stock of* ſelect Queſtions *and* Anſwers, *in all Branches of that Science (directed for the* Author *of the* Ladies Diary, *at Mr.* Simpſon's, *Stationers Hall, Poſt paid) over and above* thoſe deſign'd *for the* Ladies Diary. *Theſe we intend to publiſh, with the reſpective Names of the Authors, in proper Claſſes, in ſuch a Manner, that each Perſon ſhall be diſtinguiſhed by the Merit of his Performance, in a Volume, entitled the* Problemist, *or* General Mathematician; *to be printed as ſoon as ſufficient Matter can be collected, and deſign'd as an Introduction to the* Ladies Diary, *as well as for general Uſe and Improvement.*

NOTATION.

NOTATION. The following is for the better underſtanding of our *General Mathematician*, as well as of this *Diary*.

The Product of the Powers of the ſame Root being the Addition of their Indices, $x \times x^2 = x^{1+2} = x^3$; $x^2 \times x^3 = x^{2+3} = x^5$. And the Quotient of Powers of the ſame Root being but a Deduction of the Index of the Denominator from the Index of the Numerator $\frac{x^2}{x} = x^{2-1} = x$; $\frac{x}{x} = x^{1-1} = x^0 = 1$ (Hence any Root raiſed to the Power $0 = 1$)

$\frac{x^{\frac{1}{2}}}{x^{\frac{1}{3}}} = x^{\frac{1}{2}-\frac{1}{3}} = x^{\frac{1}{6}}$. Therefore changing the Sign of the Index tranſpoſes the Denominator into the Numerator, and, *vice verſa*, the Numerator into the Denominator. For

$\frac{x^2}{x^3} = \frac{x^2 \times x^{-3}}{1} = x^{-1} = \frac{x^{-1}}{1} = \frac{1}{x}$; or $\frac{x^2}{x^3} = \frac{1}{x^{3-2}} = \frac{1}{x}$, &c.

PROP. *Two Negative Quantities being multiplied together produce an Affirmative*; becauſe Multiplication being as ſo many Additions, *Minus* ſo many *Minuſſes* will be *plus* their Sum. As not, not 5, or Minus, -5, will be 5 (-5 being 5 times -1) And $-$ being a Sign how much a Perſon is indebted to another, if that Debt is ſubtracted or taken away, it is adding ſo much to the former Perſon's Worth. *Alſo* $+ \times -$, *and* $- \times +$, *produce the ſame, or* $-$; as they but affirm ſo many like Debts, and deny the Worth of the Perſon indebted ſo many Times repeated. For a times $-x$ Debt $= -ax$ Debt; and $-$, x Worth, a times taken, $= -ax$ Loſs of Worth: Which leaves him the ſame in Debt as before. And $a^{(5)}$ by $x^{(4)} = x^{(4)}$ by $a^{(5)}$, or $a^{(5)}$ times $x^{(4)} = x^{(4)}$ times $a^{(5)}$, proved by taking it backward or forward, in the Squares drawn in a $\square$. And it alſo reads backward the ſame as forward; ſo conſequently $ax = xa$, or $a \times -x = -x \times a = -ax = -xa$. Theſe evident Propoſitions ſome Authors have labour'd to prove. Hence

Hence $-x \times -x = +x^{1+1} = x^2$. And $-x \times +x = -x^{1+1} = -x^{1+2}$. And $y^2 \times -y^3 = -y^{2+3} = -y^5$. Alſo, ſince $x^0 = 1$, there will be a Power $x^m = 1$ (*m* being infinitely great) for $\frac{1}{m} = o$ very near. And every Quantity is *infinitely great* in reſpect of its *extreme Limit*, which is ſometimes the Proportion of its continual Increaſe, or Fluxion. *The* EDITOR

FLUXIONS, ſo differently explained and imperfectly comprehended, are thus farther illuſtrated (*vide the Account in the laſt Year's Diary.*) Every Magnitude, whether Line, Surface, or Solid, comprehends between its bounding and oppoſite Extremes all poſſible leſſer Magnitudes, varying by ſome general Proportion; in which Comprehenſion every leaſt Difference poſſible, in the perpetual Succeſſion, from either Extreme to the other, will be a proportional *Extreme of Increaſe* reſpective of its *Magnitude*. And by this *extreme Increaſe* (or leaſt and laſt general Difference) its reſpective Magnitude will be known, and by the Magnitude its extreme Increaſe. For tho' extreme Increaſes, which are ſometimes extreme Limits, have no Value in Reſpect of the Quantities which they are the extreme Increaſes, or extreme Limits of, yet they are reſpectively proportional with one another, and conſequently with the Quantities they are the Affections of. This Proportion of extreme Increaſe reſpecting its Magnitude, and by which one Magnitude continually differs from its immediate Next (which when ſo near may be taken for the ſame) being reduced to its particular State of Proportion, is ſtrictly the Proportion of the Fluxion of that Magnitude. This Fluxion is ſo denominated from its general and particular State of Motion, inſtant Increaſe, or Flowing: So that the Doctrine of Fluxions might explicitly be called the Doctrine of Extreme (or inſtant) Increaſe of variable Quantities.

Hence it is evident, that a Line, generally expreſs'd, will be the Proportion of extreme Increaſe or Fluxion of its reſpective Surface, increaſing by that given Law of Difference, when referr'd to Unity, the ſtandard Dimenſion of all Quantity.

And a Plane, generally expreſſed, will be the Proportion of extreme Increaſe or Fluxion of its reſpective Solid, increaſing by that given Law of Difference, when referr'd to Unity. This being ſometimes the extreme Increaſe of an extreme Increaſe, expreſſed by ſome Power, depending on, or conſtituted of different extreme Increaſes of Lines, the Nature of ſuch Proportions, or Fluxions of Fluxions, are ſhewn farther on. *N.B.* From the Miſtake of calling this Variation of extreme Increaſe of Lines (expreſſed by Powers) mathematical Points, as in the Formation of a Curve Line, came the Miſtake in the *Philoſophical Tranſactions*, of making a Difference in mathematical Points, whereas, in reality, the Difference lies only in the Nature of Extremities of Lines, which Lines are generated by a certain Proportion of inſtant or extreme Increaſe. Mag-

Magnitudes being repreſented by Symbols x, x^2, x^3, and x^a, their *extreme Increaſes*, or reſpective Fluxions, will be in Proportion as their leaſt inſtant Increaſes, diſcoverable by the next Increaſes to the *laſt*, and may be taken for the ſame.

Let $\dot{x}$ repreſent the leaſt Quantity poſſible, or the leaſt Increaſe of x Length, which now ſuppoſe is become $x + \dot{x}$, then x^2 Surface will be augmented in the ſame Time to $\overline{x + \dot{x}}^2 = xx + 2x\dot{x} + \ddot{x}\dot{x}$; and x^3 Solidity to $\overline{x + \dot{x}}^3 = x^3 + 3x^2\dot{x} + 3x\ddot{x}\dot{x} + \dddot{x}\ddot{x}\dot{x}$; alſo x^a Power to $\overline{x + \dot{x}}^a = x^a + ax^{a-1}\dot{x} + a \times \frac{a-1}{2} x^{a-2}\ddot{x}\dot{x}$, &c. at the ſame Rate of Increaſe. Here the leaſt Increaſes poſſible of x, xx, xxx, and x^a are ſeen to be as $\dot{x}$; $2x\dot{x} + \ddot{x}\dot{x}$; $3x^2\dot{x} + 3x\ddot{x}\dot{x} + \dddot{x}\ddot{x}\dot{x}$ and $ax^{a-1}\dot{x} + a \times \frac{a-1}{2} x^{a-2}\ddot{x}\dot{x}$, &c. Theſe divided by $\dot{x}$ leaves the Proportion of *leaſt* Increaſe of thoſe Quantities, as 1; $2x + \dot{x}$; $3x^2 + 3x\dot{x} + \ddot{x}\dot{x}$ and $ax^{a-1} + a \times \frac{a-1}{2} x^{a-2}\dot{x} + \frac{a-1}{2} \times \frac{a-2}{3} x^{a-3}\ddot{x}\dot{x}$, &c. and ſeeing that $\dot{x}$; $3x\dot{x} + \ddot{x}\dot{x}$, and $a \times \frac{a-1}{2} x^{a-2}\dot{x} + \frac{a-1}{2} \times \frac{a-2}{3} x^{a-3}\ddot{x}\dot{x}$, &c. have no Value in reſpect of the Quantities pre-fixed $2x$, $3x^2$, and ax^{a-1}, the Proportion of leaſt general Increaſe, now taken for the extreme Increaſe, or Fluxion of

x, x^2, x^3 and x^a will be as

1, $2x$, $3x^2$ and ax^{a-1} or as

$\dot{x}$, $2x\dot{x}$, $3x^2\dot{x}$ and $ax^{a-1}\dot{x}$ by equal Multiplication

tion by $\dot{x}$, ſignifying any Value; *but more properly Unity.*

This $\dot{x}$ is chiefly of Uſe to diſtinguiſh a fluxional Quantity from its Fluent, or flowing Quantity ſo call'd, by being multiplied into the fluxional Quantity. If it is objected that theſe

are extreme Increaſes of $x + \dot{x}$, $x + \dot{x}^2$, $x + \dot{x}^3$, and $x + \dot{x}^a$, inſtead of x, x^2, x^3, and x^a, for which laſt they are found, it is anſwered that the Difference of thoſe Quantities being unaſſignable, the Proportion of their Fluxions aſſigned will be alike; ſince no Quantity can be aſſigned but what will differ from it by the leaſt Quantity poſſible ($\dot{x}$) more or leſs, except in the Mind.

The Proportions of theſe extreme Increaſes, or Fluxions varying with the variable Magnitude, have a Law or Proportion by which they continually differ or increaſe in their Proportions, as the firſt Magnitudes differ'd in their Increaſe, which theſe are the extreme Increaſes, or Fluxions of.

Theſe are *extreme Increaſes* of extreme Increaſes (if ſuch a Proportion can be conceived) otherwiſe call'd *Fluxions* of Fluxions, illuſtrated thus.

In a Circle whoſe Diameter is repreſented by d, and verſed Sine by x, any Chord, which is the extreme Increaſe of its reſpective Segment, will be repreſented by $2\sqrt{dx - xx}$: this is the Proportion of Fluxion of that Segment to Unity, the Rate of Increaſe of the verſed Sine. But as x varies, it is evident that this Proportion of Increaſe of Segment varies alſo, which Proportion of Variation of the Chord, at every next Increaſe, is determinable by the Rules for finding the Fluxions of firſt Magnitudes. Theſe are found (as may be obſerved by x, x^2, x^3, and x^a, and Fluxions as 1, $2x$, $3x^2$, ax^{a-1}) *by multiplying the Index of the variable Root into its reſpective Power leſſen'd by Unity, and* (if the variable Root is compounded of original Roots x, y, z, v, &c. as $xx^{\frac{1}{2}}$, $yyy^{\frac{1}{3}}$, $zzzz^{\frac{1}{4}}$, $vv^{\frac{1}{4}}$, &c. Powers of Powers) *multiplying that Product into the Fluxion of the Root; the Reſult into* $\dot{x}$, $\dot{y}$, $\dot{z}$, $\dot{v}$, &c. *to diſtinguiſh the fluxional Quantities.*

Thus,

Thus, $2 \times xx \times 2\dot{x}x = 4x^3\dot{x}$ is the Fluxion of $\overline{xx}^2 = x^4$; $3 \times \overline{yyy}^2 \times 3y^2\dot{y} = 9y^8\dot{y}$ the Fluxion of $\overline{yyy}^3 = y^9$; $2 \times zzzz \times 4z^3\dot{z} = 8z^7\dot{z}$ the Fluxion of $\overline{zzzz}^2 = z^8$; and $4 \times \overline{vv}^3 \times 2v\dot{v} = 8v^7\dot{v}$ the Fluxion of $\overline{vv}^4 = v^8$; which is the *general Rule* for finding the Fluxions of all Quantities. This Rule is proved true by finding the Fluxions of Quantities rectangle-wise *viz.* $y\dot{x} + x\dot{y}$ for the Fluxion of xy, or *multiplying the Fluxion of each variable Side into the other Side for the Fluxion of the Rectangle (vid. Lad. Diary 1746.)*

And, if $\frac{x}{y} = v$, then $x = yv$, which put into Fluxions is $\dot{x} = y\dot{v} + v\dot{y}$, and reduced $\dot{v} = \frac{\dot{x} - v\dot{y}}{y} = \frac{x\dot{y} - xy}{yy}$ (by Substitution of $\frac{x}{y}$ for v) the Fluxion of $\frac{x}{y} = xy^{-1}$, whose Fluxion (by the Rules given) $= \dot{x}y^{-1} - y^{-2}\dot{y}x = \frac{\dot{x}}{y} - \frac{y\dot{x}}{yy} = \frac{y\dot{x} - x\dot{y}}{yy}$ as before. Hence, the *Fluxion of a variable Fraction* will be the Fluxion of its Numerator multiplied into the Denominator, *minus* the Fluxion of the Denominator multiplied into the Numerator, divided by the Square of the Denominator. This Rule deduced from the former, also proves the *General Rule* aforesaid. And these *three Rules* are all which are required for finding the Fluxions of all Sorts of Expressions whatsoever.

Hence the Fluxion or extreme Increase of a Chord $2 \times \overline{dx - xx}^{\frac{1}{2}}$, (which is the Fluxion or instant Rate of Increase of the Segment) will be $2 \times \frac{1}{2} \times \overline{dx - xx}^{-\frac{1}{2}} \times \overline{d - 2x} \times \dot{x} = \frac{d - 2x}{\overline{dx - xx}^{\frac{1}{2}}}$ by the *General Rule*. This extreme Increase being double, or an Increase of the Chord at both Ends, increasing

creaſing alike, the half of it $\frac{d-2x \times \dot{x}}{2 \times dx - xx)^{\frac{1}{2}}}$, which is the Fluxion of the *Sine of half the Arc*, is the Increaſe at either End, proportional to $\dot{x}$ the Rate of Increaſe of the *verſed Sine* from the Vertex: being as the Diſtance betwixt any two next Chords.

And (ſuppoſing $\dot{x} = 1$) the hypothenuſal or curvilineal Increaſe between the Extremes of Increaſe of two next Chords bounding the curve Line will be $\dot{x}\sqrt{1 + \frac{d-2x)^2}{4 \times dx - xx}} = \frac{d\dot{x}}{2\sqrt{dx - xx}}$ the Fluxion of the ſaid Curve. And, if inſtead of making it the verſed Sine, x increaſes or flows from the Diameter towards the Vertex of the Circle, then $\sqrt{d^2 - 4x^2}$ will expreſs the Chord, or extreme Increaſe of Space that Way generated: which ſhews that a *Decrement* is but a contrary *Increment*. The Increment increaſing in one Direction, and decreaſing in the contrary; and the Proportion of this Decreaſe of Increaſe of the Chord aforeſaid, will be $\frac{1}{2} \times \overline{d^2 - 4x^2}^{-\frac{1}{2}} \times -8x\dot{x} = \frac{-4x\dot{x}}{d^2 - 4x^2)^{\frac{1}{2}}}$, which being the Increaſe at both Ends, the half $\frac{-2x\dot{x}}{d^2 - 4x^2)^{\frac{1}{2}}}$ *(the Fluxion of the Sine of half the Arc)* is the Increaſe at one End, proportional to $\dot{x}$, the Rate of Increaſe of x, being as the Diſtance between two next Chords. And (ſuppoſing $\dot{x} = 1$) the hypothenuſal or curvilinear Increaſe between the Extremes of Increaſe of two next Chords, bounding the Curve Line, will be $\dot{x}\sqrt{1 + \frac{4x^2}{d^2 - 4xx}} = \frac{d\dot{x}}{\sqrt{d^2 - 4xx}}$, the Fluxion of the ſaid *Curve*, this Way increaſing. The ſame is to be obſerved of a *Plane* generating a Sphere by a parallel Increaſe or Motion from the Surface towards the *Centre*, or from the Centre towards the Surface. For, let $x =$ Diſtance from the Surface, and $d =$ Diam. of that Sphere, then the Diameter of any circular Plane will be $2\sqrt{dx - x^2}$, and Area $(3.1416 = b) = b \times dx - xx$, increaſing towards the Centre,

which

which is the Fluxion of its reſpective Segment. This having its *Fluent* found by the Reverſe of the former General Rule, (viz. *by increaſing the Power of each variable Quantity by Unity, and dividing the Product into which it is multiplied by the Index ſo increaſed. And in complex Expreſſions firſt reduceing them to ſimple Terms by Series, taking the Fluent of each as before, and multiplying the fluxional Roots* x, y, z, *&c. for Diſtinction*) The Segment's Solidity will be $b \times \frac{dx^2}{2} - \frac{x^3}{3}$ in general. Conſequently when $x = \frac{1}{2}d$, the Solidity of half the Sphere will be $= \frac{bd^3}{12}$, and whole Sphere $\frac{bd^3}{6}$. But if the Motion of the Plane be towards the Surface from the *Centre*, and x be the Diſtance from the Centre, the *Diam.* of any circular Plane will be $\sqrt{d^2 - 4x^2}$ and Area $= (f = ,7854)$ $f \times \overline{d^2 - 4x^2}$, which is the Fluxion of the contrary Segment, whoſe Fluent will be found (by the Inverſe Rule) $= f \times d^2x - \frac{4x^3}{3}$ the Solidity, in general, of that Segment, this Way increaſing. Conſequently when $x = \frac{1}{2}d$, the Solidity of the half Sphere will be $\frac{d^3}{3} \times f = \frac{bd^3}{12}$ as before, becauſe $4f = b$, or $f = \frac{b}{4}$. The Fluxion or extreme Increaſe of the aforeſaid Planes $b \times \overline{dx - xx}$, and $f \times \overline{d^2 - 4x^2}$ are found directly $= b \times 1 \times \overline{dx - xx}^{\circ} \times \overline{d - 2x} \times \dot{x} = \overline{d - 2x} \times b\dot{x}$; and $f \times 1 \times \overline{d^2 - 4xx}^{\circ} \times -4x\dot{x} = -4x\dot{x}$. But theſe Fluxions, or extreme Increaſes of circular Planes (the extreme Increaſes of the Segments of Spheres) are not in Proportion as their reſpective extreme Limits of Circles $2b\sqrt{dx - xx}$ and $b\sqrt{d^2 - 4xx}$, becauſe the Areas of thoſe Circular Planes increaſe not as their Peripheries. This proves that extreme *Limits*, or Boundaries of Magnitudes, are not always the Fluxions of thoſe Magnitudes, as ſome have advanced they are. For they are ſo but in particular Caſes where the Root of thoſe Quantities increaſe equally. The *Limits* are not the Fluxions in the Peripheries of Concentric Circles augmenting by *Radii* (or Roots) expreſſed

preſſed by any Power of a ſingle or compound variable Quantity; nor yet in the Surfaces of concentric Spheres augmenting by *Radii* as aforeſaid. Hence an *extreme Increaſe* of a Magnitude is diſtinguiſhed from an extreme Limit, which never are the ſame in *Fluxions* of *Fluxions*, or in extreme Limits of Extremes: and are only ſo in firſt Fluxions, when the Magnitudes increaſe by the Proportion of their extreme Limits.

When the *Radii* or Roots of concentric Circles and Spheres are expreſſed by the ſingle Quantity x, their Fluxions then being as their Peripheries and Surfaces by which they are continually augmented, if x^3 repreſent any *Radius* of a Concentric Circle, the Periphery will be $2bx^3$, and the Area bx^6, whoſe Fluxion will be $6bx^5$, which is not then as the Periphery. But the Periphery moving by the Increaſe of the *Radius*, $3x^2$, if it is multiplied into that Rate of going forward, it will produce the Rate of Increaſe of the Circle, *viz.* $6bx^5$, the Fluxion of its Area bx^6, as before. This accounts for the General Name of Fluxion given by Sir *Iſaac Newton*, called *Velocities* of Quantities, which are their perpetutal Increaſes moving by other Increaſes; making their Sum Total a *Rectangle of Motion*; which is their true and general *Idea*.

Hence every *Line* and Plane, by which Surfaces and Solids continually vary, muſt be multiplied reſpectively into the Rate of Increaſe or Fluxion of the Diſtances gone over, which will give the general Rate of Increaſe in the Product. And here is proved that all Fluxions are the *extreme Limits* of Quantities multiplied into the Degree of Fluxion or Motion in paſſing forward. Now $2b\sqrt{ax-xx}$ Periphery aforeſaid moving by the Degree of Increaſe $\frac{d-2x\times\dot{x}}{2\sqrt{ax-xx}}$ of the Radius $\sqrt{dx-xx}$, produces $d-2x\times b\dot{x}$ the Fluxion of the circular Plane as before.

The Convex Surface of the Sphere augmenting by concentric Circles, which accelerate according to the Acceleration of the Curve over which they paſs at right Angles, the Peripheries being $2b\sqrt{dx-xx}$, and $b\sqrt{d^2-4x..}$, theſe multiplied into the reſpective Fluxions of the Curve $\frac{d\dot{x}}{2\sqrt{dx-xx}}$ & $\frac{d\dot{x}}{\sqrt{a^2-4xx}}$ produce

produce bdx and bdx refpectively, for the Fluxions of the *Convex-Surfaces* of Segments generated as defcribed, whofe Fluents, or convex Areas (by the Rules deliver'd) are each bdx; and when $x = \frac{d}{2}$, then the Semi-Convexity of the Sphere will be $\frac{bd^2}{2}$, and the whole Sphere bd^2; being four Times the Area of the greateft Circle. But variable Quantities join'd to different conftant Quantities will have the fame Fluxion, which is eafily found in all Cafes; but from fome Fluxions it will be difficult to determine the true *Fluent*, which muft be had from the Nature of the Queftion befides the common Methods.

In finding the Convexity of the Globe, from the greateft Circle's Boundary towards the leaft, it is evident that bdx is not the true *Fluent*, but $bdx - b\sqrt{dd - 4xx}$ corrected; becaufe the Convexity was $b\sqrt{dd - 4xx}$, the Circumference of the greateft Circle, when the Increafe of Surface begun.

And fo in other Cafes, the Value of the *Fluent* muft be enquired at the Beginning of Increafe of the Magnitude, which (if any) muft either be fubducted from or added to the *Fluent* found by the Operation, according to the Nature of the *Problem*; and this laft will be the correct *Fluent*.

If any Ordinate of a Curve be always as the Cube of its *Abfciffa* x, then x^3 will be the Proportion of Fluxion of the Curve Surface generated thereby, to Unity; the proportional Fluxion of which Fluxion will be as $3x^2$, whofe Fluxion will be as $6x$, whofe Fluxion will be as 6, where the Variation ftops.

EXAMPLES.

	x,	x^2,	x^3,	x^4,	x^5, &c. *Magnitudes.*
	1,	$2x$,	$3x^2$,	$4x^3$,	$5x^4$, &c. *firft Fluxions.*
2d Fluxions	2,	$6x$,	$12x^2$,	$20x^3$,	&c. *Fluxions of thofe Fluxions.*
3d Fluxions	6,	$24x$,	$60x^2$,		&c. *Fluxions of thofe Fluxions.*
4th Fluxions	24,		$120x$,		&c. *Fluxions of thofe Fluxions.*
5th Fluxions			120,		&c. *Fluxions of thofe Fluxions.*

Or, x^a, *Magnitude*, or *Power*.

ax^{a-1} firſt *Fluxion*.

$\overline{a-1} \times ax^{a-2}$ 2d *Fluxion*.

$\overline{a-2} \times \overline{a-1} \times ax^{a-3}$ 3d *Fluxion*.

$\overline{a-3} \times \overline{a-2} \times \overline{a-1} \times ax^{a-4}$ 4th *Fluxion*, &c. *ad infinitum*.

Where it is *obvious*, that whilſt x is variable in any of the Proportions, that they will be more or leſs continually; and ſo vary by another Proportion, which Proportion will alſo vary, till the Variation ſtops, which will be only when the Index a of the variable Quantity be a whole Number, and the Order or Height of Fluxions be alſo equal to that Number.

Upnor Caſtle, near *Rocheſter*, in *Kent*, *May* 24, 1746.

ROBt. HEATH.

P. S. The above completes the Account of Fluxions in the *Diary*, intended as a full Anſwer to ſeveral Queſtions which have been of late ſolicited concerning their Nature. For their Uſe and Operations in general I cannot recommend a better Treatiſe than Mr. *Emerſon*'s on the Subject, which likewiſe ſhews the true and elegant Method of finding all thoſe *Fluents* which have been deſired of the *Editor* of the Diary by Mr. *Baker*. And this may ſerve to excite an Emulation, among abler Perſons, of better improving this *Ladies* Book of Sciences.

The Liſt of Contributors, for want of Room, we are obliged to defer till our next.

The firſt Prize of 12 *Diaries was won by* Mall Ormiſhaw, *the ſecond by Mr.* Richard Gibbons, *and the third by Mr.* James Hall.

F I N I S.