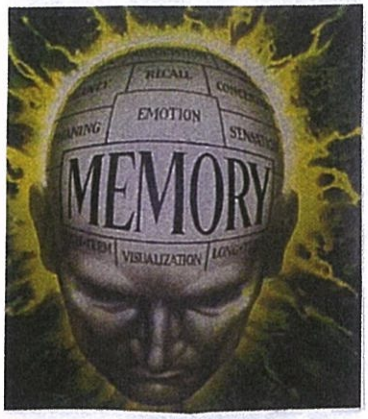
MATH & MEMORY



BARK'S DISCOVERY METHOD

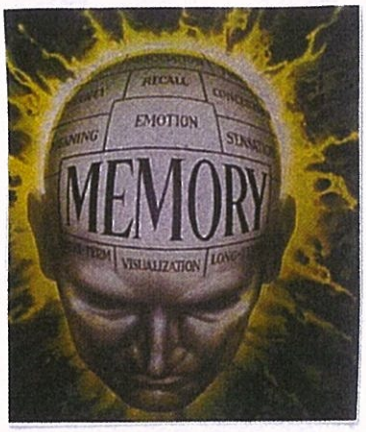
BOOK 3

FOR SECONDARY SCHOOLS

FREE RANGE LEARNING

THE 3RS THE PROFESSIONAL WAY

MATH & MEMORY



BARK'S DISCOVERY METHOD

BOOK 3

ISBN 0 949384 21 6

FREE RANGE LEARNING

THE 3RS THE PROFESSIONAL WAY

INDEX BOOK 3

CALCULATOR

FROM LATIN
CALCULI. PEBBLES. CHALK

97.

NOTE: DIFFERENT BRANDS, DIFFERENT BUTTONS. I'VE USED A 1970 CASIO; STILL THE BEST.

COMPARING INCOME

CONVERT TO YEARLY

5 FINGERS 2 HANDS

PER WEEK	$384	x52	$19 968
PER FORTNIGHT	768	x26	19 968
PER MONTH	1685	x12	19 968
PER ANNUM	20150	–	20150

LOAN $8123 (PRINCIPAL)

@ 14 % P.A. 6 YEARS

INSTALMENTS P.M.

PRINCIPAL + INTEREST (TOTAL) = 184 % = 1.84

8123 × 1.84 ÷ 72 = $207.61

RE-PAYMENTS P.W.

8123 × 1.84 ÷ 312 = $ 47.91

COMPARING PRICES

MONEY ÷ QUANTITY = MONEY

IGNORE DECIMAL POINT

1 kg	$ 4.71	471 ÷ 1000 = .47 MENTALLY OF COURSE
300 g	$ 1.38	138 ÷ 300 = .46
750 g	$ 3.60	36 ÷ 75 = .48 EFFICIENCY!
2 1/2 kg	$ 12.25	1225 ÷ 2500 = .49

PRACTICAL ROUNDING OFF

HOW MANY $2.69 BOOKS FOR $5.00

$500 \div 2.69 = 185.8\ldots$

185

HOW MANY ZIPPERS TO SEW IN @ 90 CENTS EACH TO EARN $250.

$250 \div .9 = 277.8\ldots$

278

CALCULATING GRISS PAY

100.

$10 PER HOUR

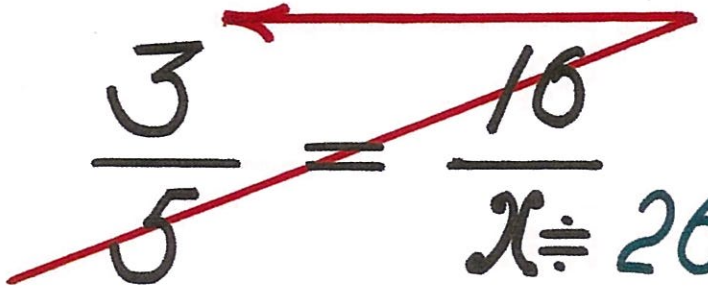
	HOURS
38 HOURS NORMAL	38
4 HOURS DOUBLE TIME (2X)	8
3 HOURS TIME-AND-A-HALF (WHICH IS 1½ X)	4.5
+	50.5

$505

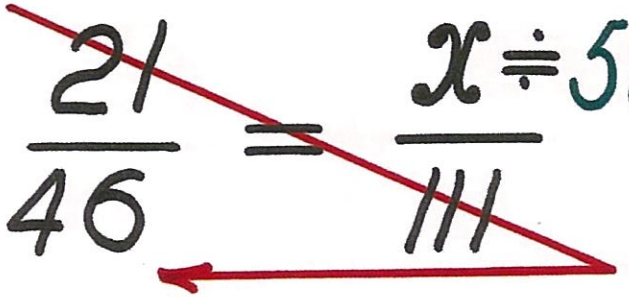
TIMES – DIVIDE

A CROSS-MULTIPLY SHORTCUT

A VISUAL



A VISUAL



VISUAL MATHS: THE **BRAIN** ACTS UPON WHAT THE **EYES** HAVE **SEEN**.
THE STUDENT'S **MOTIVATION** TO **LEARNING** NOW ONLY DEPENDS ON **REMEMBER** **WHAT TO DO**!

CALCULATOR: TASK

1

INCOME: CONVERT TO YEARLY

$374 PER WEEK	$768 PER FORTNIGHT	$1675 PER MONTH	20160 PER ANNUM

2

LOAN: $8000 @ 18% PER YEAR P.A PER ANNUM at 5 YEARS

CALCULATE: INSTALMENTS PER WEEK & PER MONTH

3

WHICH ONE IS THE LOWEST?

1Kg $4.55	250 g $1.18	700 g $3.20	3½ Kg $15

4

HOW MANY $3.79 Books FOR $600

4

HOW MANY ZIPPERS TO SEW IN @ $1.05 EACH TO EARN $300

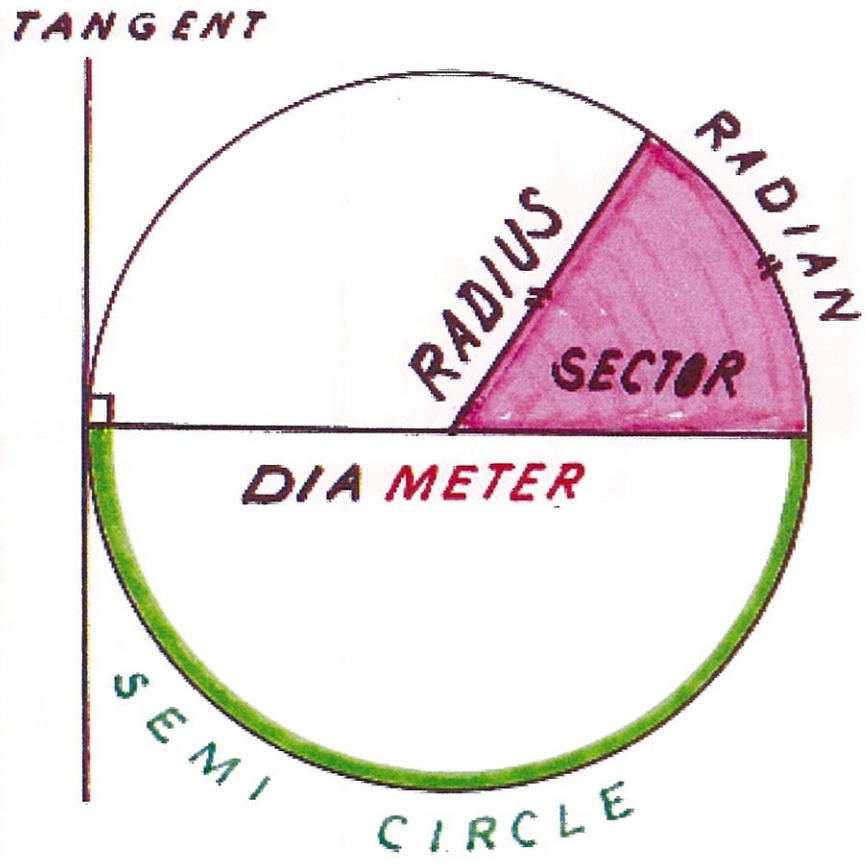
6

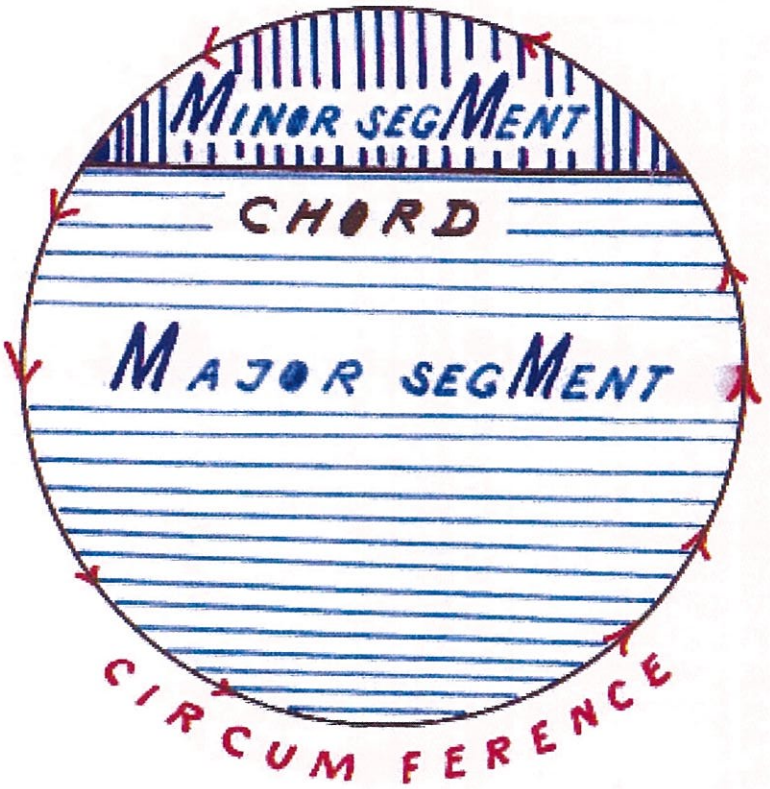
$\frac{4}{7} = \frac{18}{x}$ 2 DECIMAL PLACES

$\frac{23}{42} = \frac{x}{99}$ 3 DECIMAL PLACES

CIRCLES

SEE ALSO ANGLES. AREA. TRIGONOM.





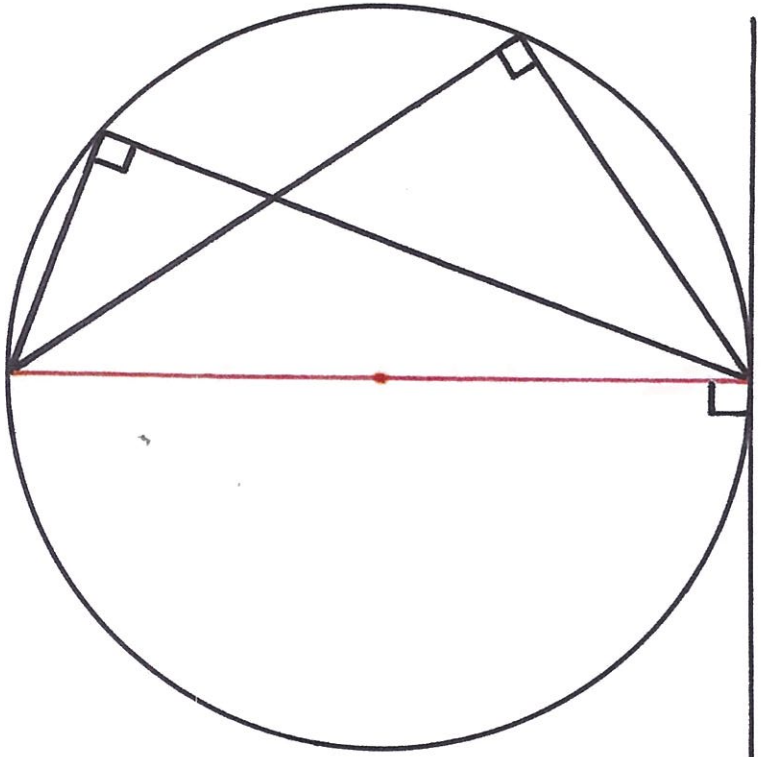
$\pi \doteqdot 3.14$

THE CIRCUMFERENCE IS A BIT MORE THAN 3 TIMES THE DIAMETER $= \pi D$ OR $2R\pi$.

THE AREA $= R^2\pi$

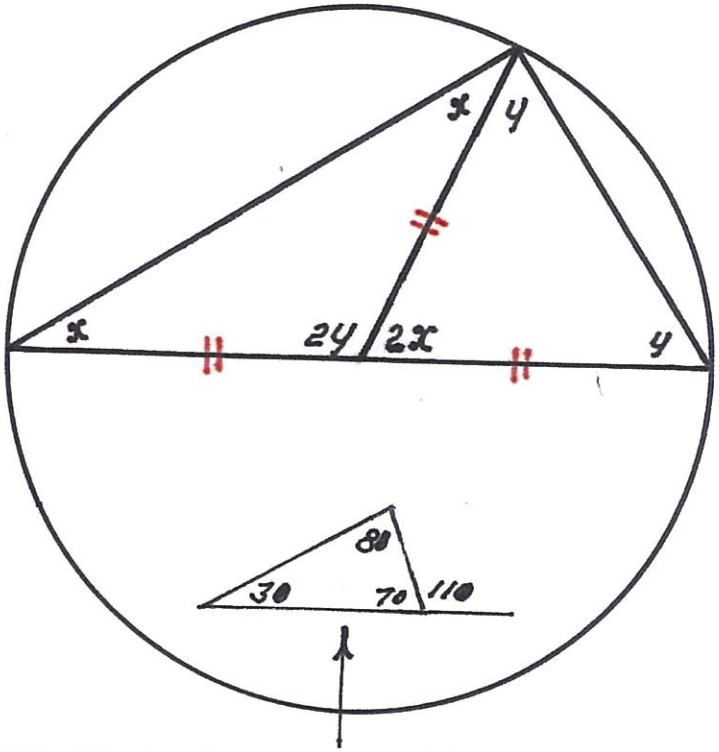
CIRCUMFERENCE ANGLES ARE HALF CENTRE ANGLES STANDING ON THE SAME ARC (AN ARC SUBTENDS AN ANGLE)

180.



TANGENT ⊥ RADIUS

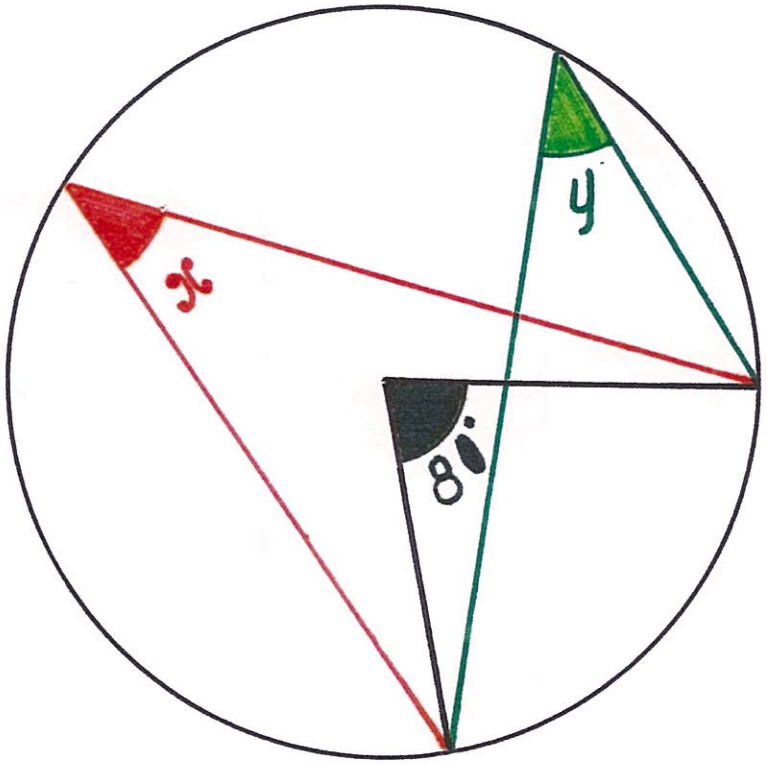
PERPENDICULAR TO



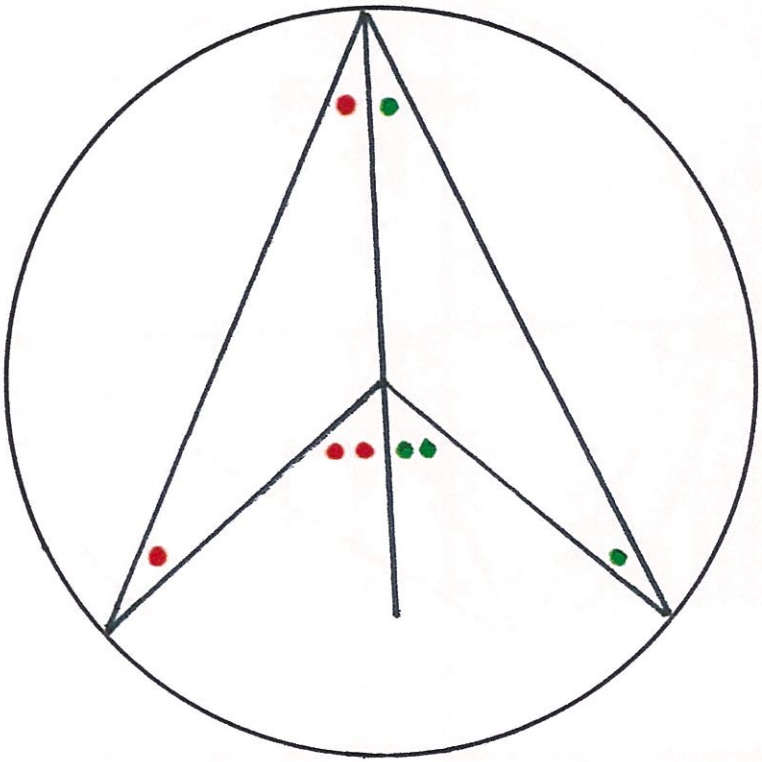
EXTERIOR ANGLE = SUM REMOTE ANGLES

$2x+2y=180^\circ \therefore x+y=90^\circ$

181.

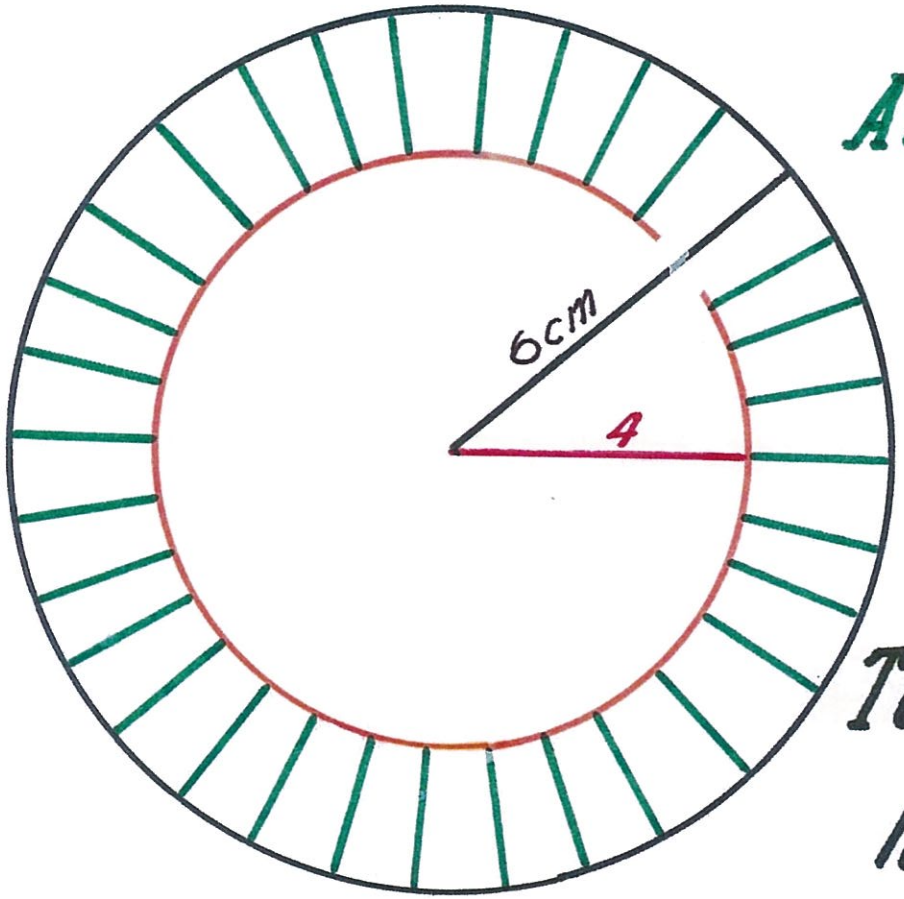


$x = y = 41^\circ$



01

2 CONCENTRIC CIRCLES



AREA ANNULUS

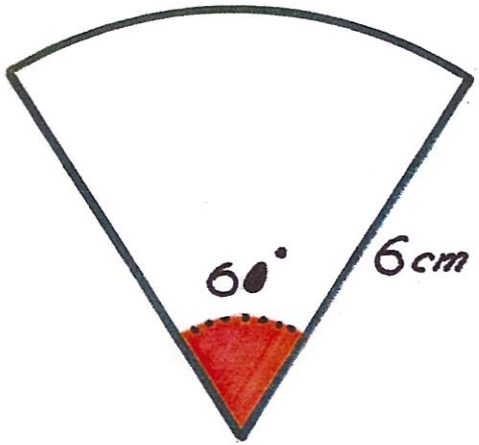
$36\pi - 16\pi = 20\pi \text{ cm}^2$

TOTAL CIRCUMFERENCE

$12\pi + 8\pi = 20\pi \text{ cm}$

AREA SECTOR

632.



$\frac{1}{6} \times 36\pi = 6\pi \div 18.8\ cm^2$

SCALE 1:2

$\div 288°$

THE CIRCUMFERENCE $= 8\pi$ IF 25 cm $= 360°$

THEN 20 $x \div 288°$

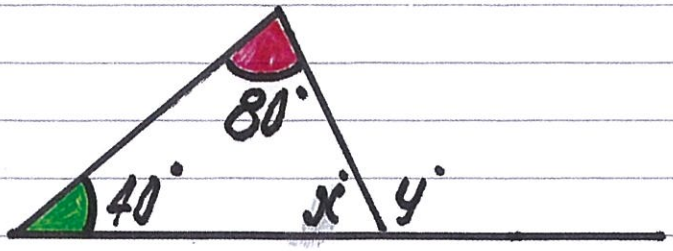
TO CALCULATE THE AREA,

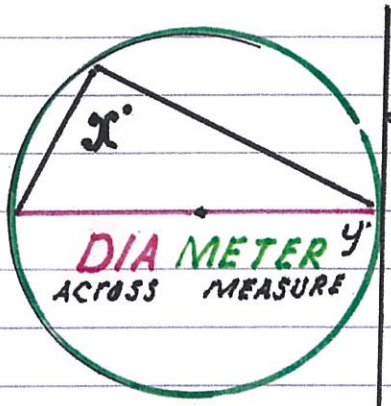
USE $\frac{1}{2}BH$ (TRIANGLE FORMULA!) $\therefore$

AREA $= 40\ cm^2$

CIRCLES: TASK

180 / 9



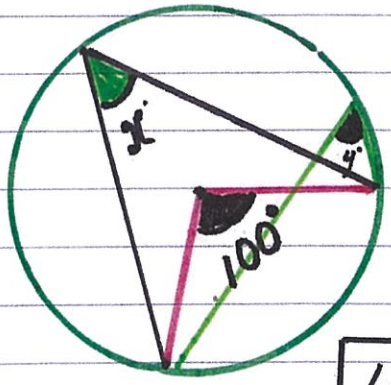


TANGENT - TOUCH LINE

AREA CIRCLE $R^2\pi$ R SQUARE PI

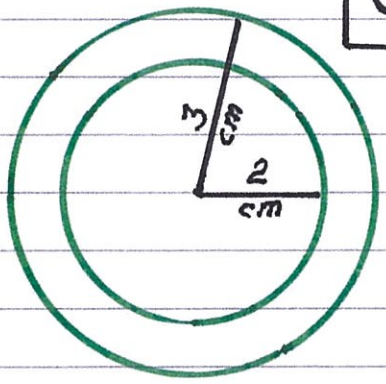
CIRCUMFERENCE $2R\pi$

CALCULATOR EFFICIENCY!



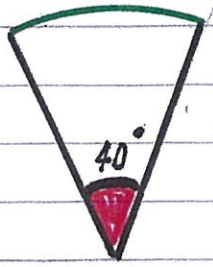
181 / 10

601 / 11



12

AREA SECTOR



RADIUS 3 cm

ARC 15 cm, R 5 cm

CALCULATE SECTOR ANGLE

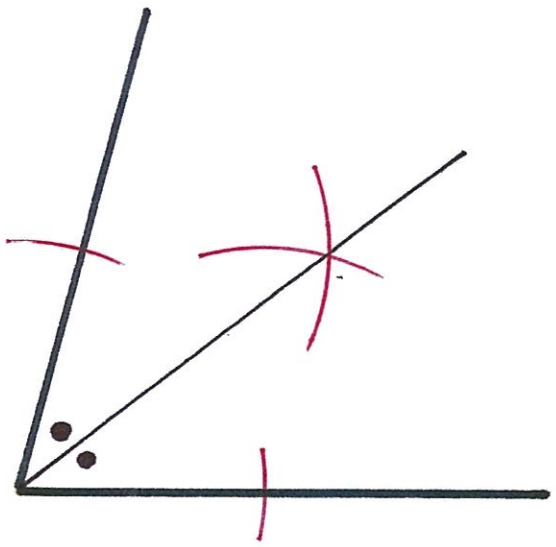
$$\frac{10\pi}{15} = \frac{360}{x}$$

CONSTRUCTIONS

633.

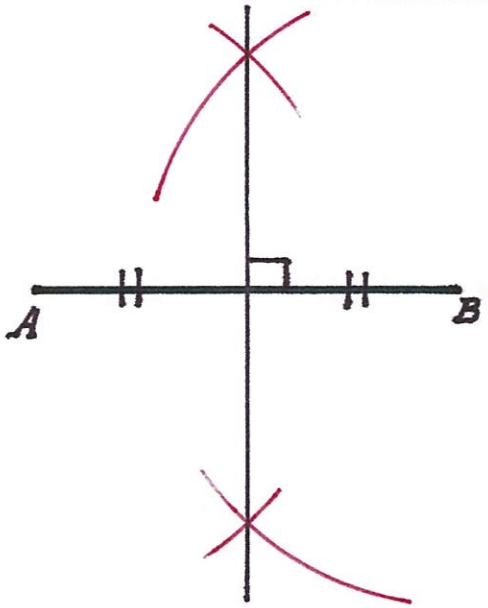
BISECT
INTO 2 CUT

AN ANGLE
NOT AN ANGEL!



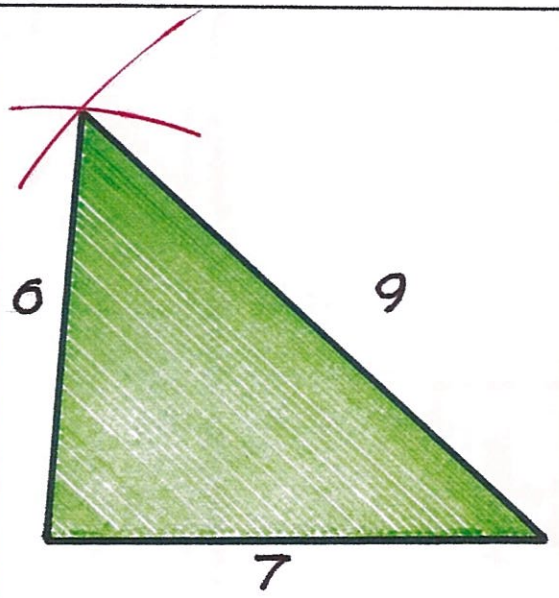
BISECT

AN INTERVAL
LINE SEGMENT



TRIANGLE

SIDES 6, 7, 9 cm



41

$$8(x-4)-2(x+1)=31$$

THINK
$6x=64$

$7(x-2)-3(x+5)=21$

$x=10\frac{2}{3}$

$$24a-3(3a+4)+2=10(4-a)$$

THINK
$25a=50$

$21a-2(5a+4)+1=8(3-a)$

$a=2$

263.

$5x^2 = 180$

$x = \pm 6$

$3x^2 = 75$

$x(x-3) = x^2 + 18$

$x = -6$

$2x(x-5) = 2x^2 + 71$

$\sqrt{5x} = 4$

$\sqrt{3x} = 5$

$x = 3\frac{1}{5}$

$\sqrt{\frac{x}{3}} = 6$

$\sqrt{\frac{x}{3}} = 2$

$x = 108$

$\sqrt[3]{x+6}=3$

$\sqrt[3]{x+2}=5$ $x=21$

$(2x-5)^{\frac{1}{3}}=3$

THINK $\sqrt[3]{2x-5}=3$

$x=16$

$(3x-4)^{1/3}=2$

SEE INDICES

$5^k(5^2)^3=1$

THINK $5^{k+6}=1=5^0$

$K=-6$

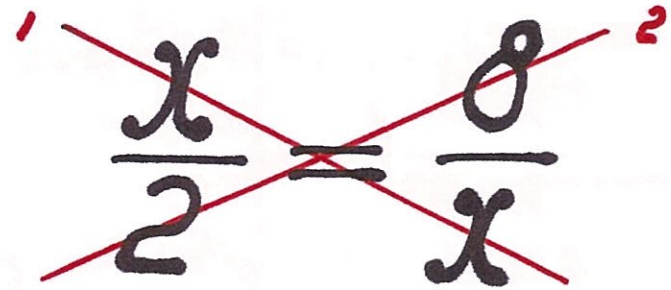
$3^k(3^3)^2=1$

$x^7=78125$

$x^6=65536$

CALCULATOR: $78125\ x^y\ 1a\frac{b}{c}\ 7=5$

EQUATIONS



PROFESSIONAL AND WHY NOT

CROSS

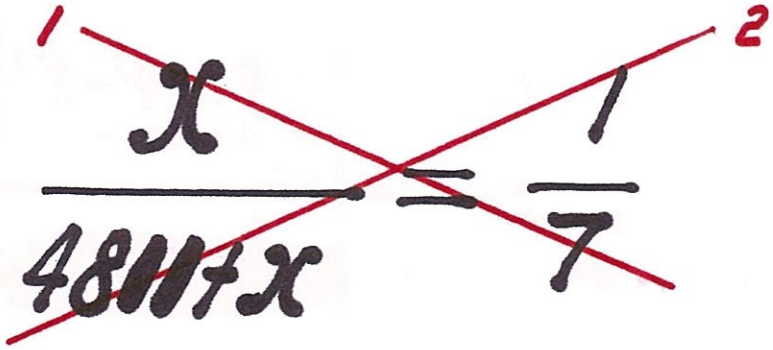
MULTIPLY $x^2 = 16$ $x = \pm 4$

WITH FORESIGHT!
DO NOT USE SCHOLASTIC COMPLEXITIES

265.

$\sqrt{6x-4} = \sqrt{x+16}$

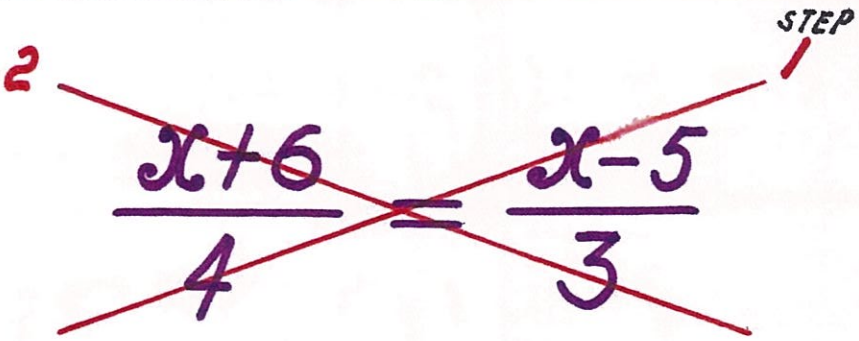
$x = 4$



THINK

$6x = 4800$ $x = 800$

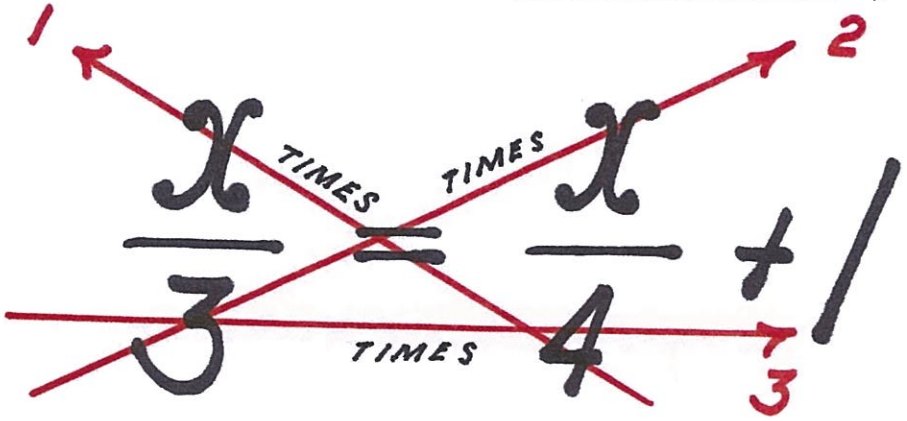
STEP 1



THINK

$4x - 20 = 3x + 18$ $x = 38$

A VISUAL, A NEW PROFESSIONAL ROUTINE



DO NOT USE COMPLICATED SCHOLASTIC TRIVIA; IT WILL ONLY CONFUSE YOU!

$$4x = 3x + 12$$

$$x = 12$$

$$\frac{x+2}{3} = 4 - \frac{x}{2}$$

SEE $2(x+2) = (3 \times 2 \times 4) - 3x$

DO $2x + 4 = 24 - 3x$

$x = 4$

WRITING & SOLVING AN EQUATION

678.

FIRE WOOD: $7 PER BAG PLUS

$9 DELIVERY (1) OR

$8.50 PER BAG INCL. DELIVERY (2)

BREAK-EVEN WHEN $7x+9 = 8.5x$

WHEN $x = 6$

> 6 BAGS, DEAL (1) CHEAPER: $7\times7+9 < 7\times8.5$

$8\times7+9 < 8\times8.5$

683.

12 CM WIRE SHAPED INTO A RECTANGLE AREA 6 CM^2

SCALE 2:1

$6\ cm^2$ $\quad x \doteqdot 1.3\ cm$

$6 - x \doteqdot 4.7\ cm$

$6x - x^2 = 6 \therefore x^2 - 6x + 6 = 1 \therefore \quad x = 3 \pm \sqrt{3}$

EQUATION TASKS

18

$$\frac{x}{2} = \frac{18}{x}$$

$$\sqrt{7x-3} = \sqrt{x+7}$$

$$\frac{x}{1200+x} = \frac{1}{7}$$

$$\frac{x+3}{5} = \frac{x-7}{4}$$

19

$$\frac{x}{5} = \frac{x}{3} + 1$$

20

$$\frac{x+3}{2} = 5 - \frac{x}{3}$$

21

\$11 PER BAG
+ \$10

OR

\$13

22

RECTANGLE
AREA 8 cm²
PERIMETER 16 cm

SOLVE THE QUADRATIC EQUATION WITH THE ALL PURPOSE FORMULA.

LEVEL 1, PAGE 28

307.
BILL IS x YEARS. IN 3 YEARS $(x+3)$ YEARS
3 CONSECUTIVE ODDS: MIDDLE ONE x $(x-2)$ x $(x+2)$
3 CONSECUTIVE EVENS: MIDDLE ONE $2x$ $(2x-2)$ $2x$ $(2x+2)$

RECTANGLE: $P=60m$ $H=x\,m$

$2B+2x=60$ $B=30-x$ $A=x(30-x)$

1 APPLE x CENTS: FOR 24 CENTS, $\frac{24}{x}$

1 APPLE $(x+1)$ CENTS: $\left(\frac{24}{x}-\frac{24}{x+1}\right)$ FEWER APPLES

SUM 2 NUMBERS 25

THEIR PRODUCT $x(25-x)$

10 BALLOONS: SOME 15 CENTS SOME 40 CENTS

SAY x @ 40 CENTS ∴ COST $40x + 15(10-x)$

SUM RECIPROCALS a & b

$$a^{-1} + b^{-1} = \frac{1}{a} + \frac{1}{b} = \frac{b+a}{ab}$$

1. 2. 3.

TIMES. TIMES. TIMES

FACTORISING

$$\frac{5a-b}{2b-10a} = \frac{(5a-b)}{-2(5a-b)} = -\frac{1}{2}$$

(PROVIDED) $5a \neq b$

BECAUSE DIVISION (CANCELLING) BY 0 IS NOT POSSIBLE

$\frac{6}{3} = 2 \therefore 6 = 2 \times 3$ | BUT | $\frac{6}{0} \neq x \because x \times 0 \neq 6$

↑ IS NOT

$$\frac{(6x^2-3x)}{2x-1} = \frac{3x(2x-1)}{(2x-1)} = 3x$$

$x \neq \frac{1}{2}$

EXPANDING = FACTORISING IN REVERSE

(MEANS X

$$3x(2x-1) = 6x^2 - 3x$$

EXPRESSIONS: TASK 1.

24 Bill is $2x$ years In 4 years he will be	
3 CONSECUTIVE ODDS: MIDDLE ONE $2x$	
25 RECTANGLE: $P = 50m$ $H = x\,m$	$B =$ $A =$
1 APPLE x CENTS 1 APPLE $(x+1)$	FOR 30 CENTS HOW MANY LESS?
SUM TWO NUMBERS $= 30$	PRODUCT=
26 10 BALLOONS FOR 20¢ & 35¢	COST
DIFFERENCE OF THE RECIPROCALS	
27 $\dfrac{3a-2b}{-12a+8b}$	FACTORISE
28 $\dfrac{12x^2-4x}{3x-1}$	FACTORISE

312.

$$\frac{3a+6b}{12} = \frac{a+2b}{4}$$

$$\frac{x^2+2x}{(x-2)(x+2)} = \frac{x(x+2)}{(x-2)(x+2)} = \frac{x}{x-2}$$

$x \neq -2$

EXPANDING = MULTIPLICATION

$$-2a^3(b-a^2) = -2a^3b+2a^5$$

SEE BEFOREHAND

$a^3 \times a^2 = a\times a\times a\times a\times a = a^5$

COMBINE MENTALLY

$$4(6-2b) - 5(b-2) = 34 - 13b$$

PERFECT SQUARES

REMEMBER AS A REGULAR PATTERN :. DO NOT EXPAND

SQUARE THE FIRST. DOUBLE THE PRODUCT. SQUARE THE LAST

$$(a+b)^2 = a^2+2ab+b^2$$

$$(a-b)^2 = a^2-2ab+b^2$$

$$(a-5)^2 = a^2-10a+25$$

$$(a+1)^2 = a^2+2a+1$$

COMPLETING THE SQUARE

$$x^2 + 8x + C$$

HALVE & SQUARE TO FIND C

$$x^2 + 8x + 16 = (x+4)^2$$

$$x^2 - Bx + 49 \qquad B > 0$$

SQUARE ROOT & DOUBLE TO FIND B

$$x^2 - 14x + 49 = (x-7)^2$$

THE DIFFERENCE OF 2 SQUARES

316.

$$a^2 - b^2$$

A

How to remember: 1. Cover the 2s and write what you see.

2. Change the sign in the second part

$$(a-b)(a+b)$$

B

LEARN A=B & B=A

EXPRESSIONS

317.

$$x^2 - 9 = (x-3)(x+3)$$

$$4x^2 - 25 = (2x-5)(2x+5)$$

$$3x^2 - 12 = 3(x^2 - 4) = 3(x-2)(x+2)$$

EXPRESSIONS: TASK 2.

30

$$\frac{4a+2b}{12}$$

$$\frac{x^2+5x}{(x+5)(x-5)}$$

31

$-3a^2(b-a^3)$

$7(2-4b)-3(b+3)$

32

$(a-3)^2$

$(a+2)^2$

33

GENERAL FORM:
ax^2+bx+c

x^2+6x+c

$x^2-bx+49$

35

x^2-64

$9x^2-36$

$5x^2-45$

FINANCE

342.

ONE OF THE MOST COMMON QUESTIONS:

WHAT PERCENTAGE IS $\frac{\text{THIS}}{\text{OF THAT}}$

362.88 OF 864

ONLY DO

$362.88 \div 8.64 = 42\%$

THE PROFESSIONAL WAY, AND WHY NOT

NOTE:

ALTHOUGH 36288÷864 WOULD HAVE BEEN SMARTER HERE, THIS ALL PURPOSE RECIPE AVOIDS ×100 IN MOST CASES. WRITING ×100% IS A SCHOLASTIC BLUNDER OF THE FIRST ORDER!

MEANS ×1

37

A PERCENTAGE OF FOR ALERT PEOPLE

343.

TYPE	THE PROFESSIONAL WAY	THINK	SAY
1. MENTALLY	15% OF 300	= 15 X 3	45
TYPE 2. THE SMART WAY	15% OF 260	= 15 X 2.6	
TYPE 3. PROFESSIONALLY	30% OF 260	= 3 X 26	
TYPE 4. ALL PURPOSE ROUTINE	15% OF 365	= .15 X 365	

DO NOT USE SCHOLASTIC TRIVIA!

$233.75 INTEREST IN $6611

IN 5 MONTHS

WHAT PERCENTAGE IS THIS OF THAT

233.75 ÷ 5 X 12 = ... DIVIDE BY 66 = 8.5% P.A.

PER ANNUM (YEAR)

THIS SHOWS CLEARLY THE ADVANTAGE OF THE RECIPE: 6 BUTTONS AVOIDED! X100

ANOTHER BASIC QUESTION

345.

IF 8.5% OF A NUMBER (x) = 382.5,

$x = 382.5 \div .185 = 4500$

CONVERT TO A DECIMAL

A VARIATION

LOAN $x. $2295 SIMPLE INTEREST

OF 8.5% IN 6 YEARS

$x = 2295 \div 6 \div .185 = \$4500$

DISCOUNT 15%. PAY $54.40 WHICH IS 85% OF MARKED PRICE

MARKED PRICE 54.4 ÷ .85 = $64

PRICE, INCLUDING 15% IMPORT DUTY, $322 WHICH IS 115%

COST = 322 ÷ 1.15 = $280

$18000 LOAN @ 9% P.A. 125 DAYS

INTEREST 180 X 9 ÷ 365 X 125 = $554.79

OR 180 X 9 ÷ 365.25 X 125 = $554.41

BORROWED $60000 @ 9.75% P.A. PAID $15750 IN ONE YEAR

100%

STILL OWING 109.75 X 600 − 15750 = $51000

SEE 343 TYPE 1

FINANCE: TASK 1.

USE DECIMALS

5% = .05	15% = .15	25% = .25

37 WHAT % IS 475 OF 1900

38			
23% OF 200	23% OF 280	40% OF 150	18% OF 476

39 $315 INTEREST ON $8800 IN 7 MONTHS
FIND % PA.

40 17% OF X = 764

LOAN: $2462 SIMPLE INTEREST (FLAT RATE) OF 9% IN 5 YEARS

41 DISCOUNT 15%
PAY $72

PRICE INCL 12% DUTY:
$474

42 $15000 @ 8% PA
130 DAYS

$40000 LOAN @ 9% P.A
PAID $14000 IN 1 YEAR

$621 CASH OR 15% DEPOSIT + $26.11 P.M. 2 YEARS

LOAN IS IN 85 X 6.2 (SEE 343 TYPE 2) = $527

PAID 24 X 26.1 = $626.41

INTEREST CHARGED IN 1 YEAR = (626.41 − 527) ÷ 2 = ...

DIVIDE BY 5.27 = 9.43%

BUY $480 SELL $650

PROFIT: 170 ÷ 4.8 = 35.4%

OR SELL FOR

25% DEPOSIT + $22.30 P.M. 2 YEARS

PROFIT: 25X6.5 + 24X22.3 − 480 = ... ÷ 4.8 = 45.4%

DO NOT PRESS UNNECESSARY NOUGHTS

3 DEALERS: EACH ONE MAKES 50% PROFIT

THE LAST ONE GETS $270, COST TO THE FIRST ONE $x

COMPARE COMPOUND INTEREST

$x \times 1.5^3 = 270$

$x = 80$ ∴

THE FIRST DEALER GETS $120,
THE SECOND ONE $180.

COMPOUND INTEREST & DEPRECIATION

351.

WITHOUT FORMULA: IT'S A PATTERN!

$3000 + 8% P.A., 3 YEARS

100%

ACCUMULATED AMOUNT $3000 \times 1.08^{3} = \$3779.14$

AS A DECIMAL

100% — 7%

$23000 CAR. DEPRECIATION 7% P.A.

VALUE AFTER 4 YEARS $23000 \times .93^{4} = \$17205$

FINANCE : TASK 2.

44

$700 CASH OR

18% DEPOSIT + $28 PM, 2 YEARS

43

BUY $500
SELL $680

BUY $500 SELL FOR
15% DEPOSIT + $30 2Y

46

3 DEALERS: 30% PROFIT. LAST ONE $135

COST 1ST ONE IS $X

47

$4000 @ 9% 4 YEARS

PAID IN TOTAL $

47

$36000 CAR

DEPRECIATION 8% VALUE AFTER 4 YEARS

INEQUALITIES

INEQUATIONS

$x < 6$ (LESS)

$x \geq 5$

$2 < 4$ 	BUT	$-2 > -4$ 
$3 < 4$	BUT	$\frac{1}{3} > \frac{1}{4}$
$-2 < 4$	BUT FLIP	$2 > -4$
IF YOU DON'T FLIP, YOU FLOP		CHANGE SIGN, CHANGE SYMBOL

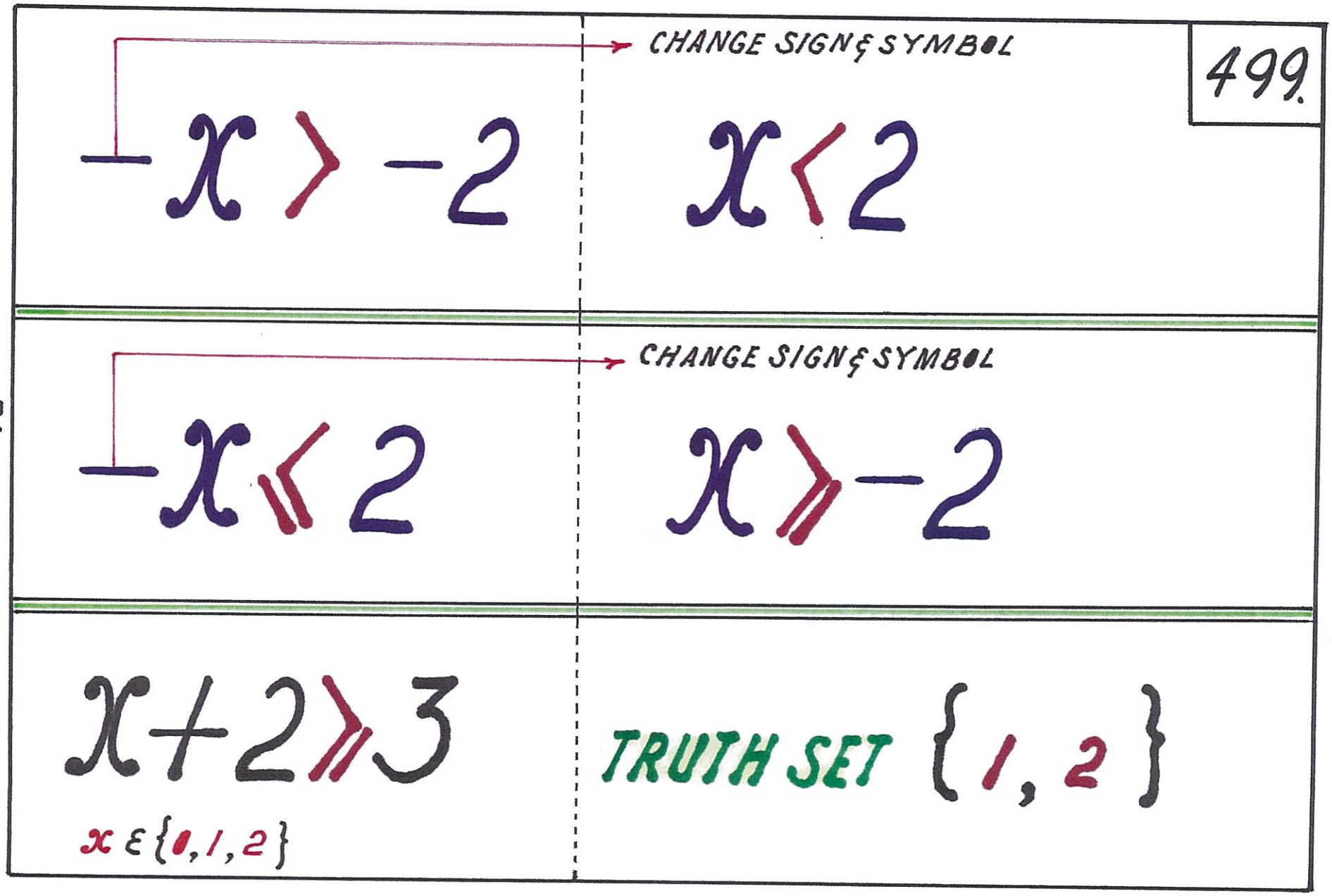
EXERCISE YOUR BRAIN, NOT YOUR PEN!

498.

$3x > 18$	$x > 6$
$4x + 5 \leqslant 13$	$x \leqslant 2$
$4x - 7 > 13$	$x > 5$

50

INEQUALITIES


CHANGE SIGN & SYMBOL
$-x > -2$
$x < 2$
CHANGE SIGN & SYMBOL
$-x \leqslant 2$
$x \geqslant -2$
$x + 2 \geqslant 3$
$x \in \{0, 1, 2\}$
TRUTH SET $\{1, 2\}$

511.

$\{x : -1 \leq x < 3\}$ → SET OF ALL xs

SUCH THAT x IS BETWEEN -1 (INCL.) & 3 (NOT INCL.)

	TRUTH SETS
1. $x \in N$ — x IS AN ELEMENT OF CARDINAL NUMBER	$\{0, 1, 2\}$
2. $x \in J^{-} \equiv -$ — SET OF INTEGERS (WHOLE NUMBERS) NEG. 0. POS — INTEGRITY	$\{-1, 0, 1, 2\}$
3. $x \in Q$ — $\frac{a}{b}$ SET OF RATIONALS (WHOLE NUMBERS $-\frac{7}{1}, \frac{5}{1}-$ & FRACTIONS — Q FOR QUOTIENT	

501.

BEWARE!

$3 - 2x \leqslant 7$ | $x \geqslant -2$

$\frac{3}{4} - x > 15$ | $x < -14\frac{1}{4}$

$-\frac{x}{4} + 2 \leqslant 1$ | $x \geqslant 4$

INTERSECTION (2 OR MORE AT THE SAME TIME) (SIMULTANEOUS EQUATIONS)

2 STRAIGHT LINES TYPE 1.

$$-3x + y = 3 \quad (1.)$$

$$+ \quad 3x - 2y = 8 \quad (2.)$$

$$y = -11$$

ADD TO ELIMINATE x

USE FORESIGHT!

NOT $-y = 11$ AND THEN

PRACTISE EFFICIENCY!

SUBSTITUTE IN (1) TO FIND x

$$x = -4\tfrac{2}{3}$$

INTERSECTION AT $(-4\tfrac{2}{3}, -11)$

2 LINEAR EQUATIONS TYPE 2.

$$7x + 5y = 23 \quad (1.)$$

$$-\quad 2x + 5y = 3 \quad (2.)$$

SUBTRACT TO ELIMINATE y:

$$5x = 20 \therefore x = 4 \text{ SUB (2) } y = -1$$

INTERSECTION AT $(4, -1)$

TYPE 3: ADJUST ONE EQUATION AND ADD

(LESS RISKY)

ADJUST ← CHOOSE OPPOSITES AND ADD

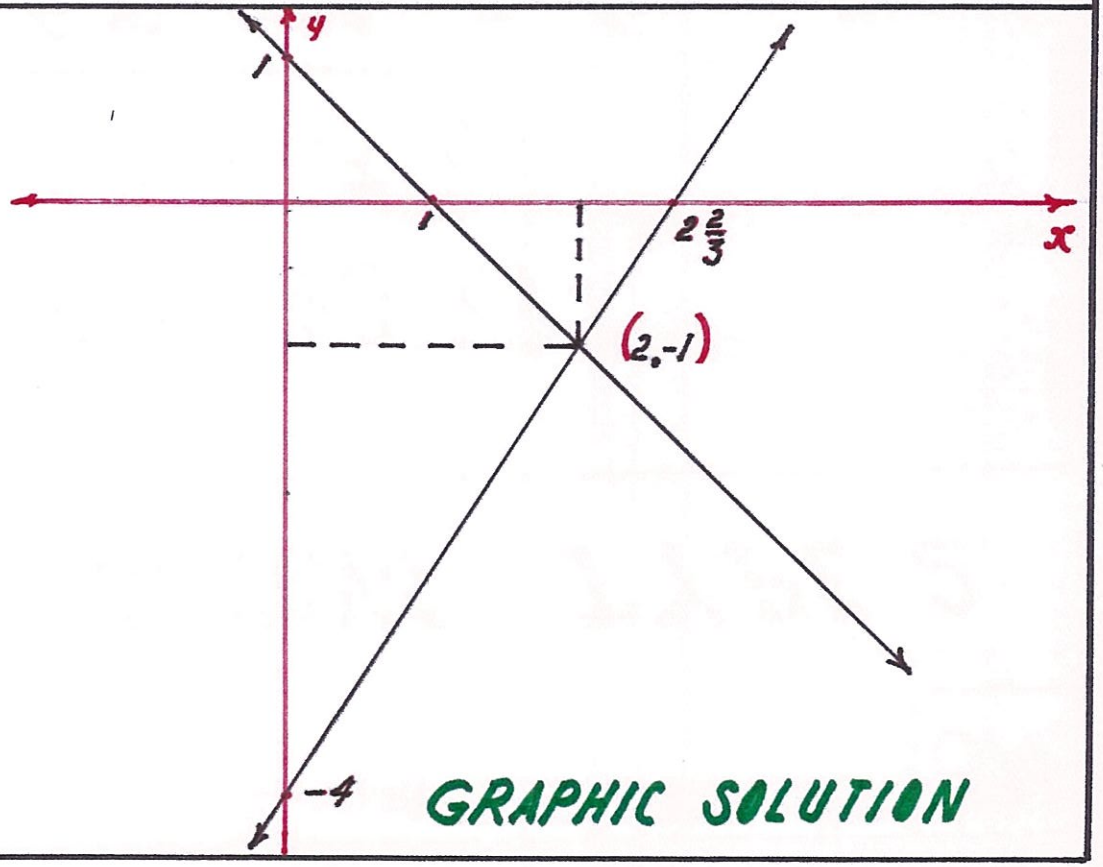
$x+y=1$ (1.)

$3x-2y=8$ (2.)

$2x+2y=2$

$+\ 3x-2y=8$

$x=2$ SUB (1) $y=-1$



GRAPHIC SOLUTION

INTERSECTION

TYPE 4: ADJUST BOTH EQUATIONS

$2x-3y=5$ (1.)

$5x+2y=-16$ (2.)

$4x-6y=10$

$+\ 15x+6y=-48$

$x=-2$ SUB (1) $y=-3$

INTERSECTION AT $(-2,-3)$

INEQUALITIES: TASK

49 $-3 \;?\; -5$	$\frac{1}{4} \;?\; \frac{1}{6}$	$3 \;?\; -5$
50 $4x > 20$	$5x+4 \leq 19$	$6x-9 > 3$
51 $-2x > -6$	$-3x \leq 6$	$x+3 \geq 5$ TRUTH SET: $x \in \{0, 1, 2, 3\}$

52 $\{x : -3 \leq x < 3\}$

$x \in N$	$x \in J$	$x \in Q$
53 $4-3x \leq 10$	$\frac{4}{5} - x > 6$	$\frac{-x}{3} + 2 \leq 3$

INTERSECTION: TASK

54 $-4x+3y=6$ $4x-y=10$	55 $8x+4y=20$ $3x+4y=5$
56 $2x+y=3$ $3x-3y=18$	57 $3x-2y=6$ $4x+3y=8$

LINEAR

STRAIGHT LINES EQUATIONS

1029.

$y = x + 4$ (EQUALS)

AN (x, y) RELATIONSHIP

THE TRADITIONAL-UNNECESSARY-BOX

	A	B	C	D
x	1	-2	FILL IN	
y	FILL IN		6	1

SUBSTITUTE: PRONUMERAL OFF NUMERAL ON

WHEN $x = 1$, $y = 4$ — A(1, 4)

WHEN $x = -2$, $y = 2$ $(-2+4)$: THE POSITIVES 'WIN' BY 2

WHEN $y = 6$, $x = 2$ — C(2, 6)

IN ALPHABETICAL ORDER → x, y

WHEN $y = 1$, $x = -4$ — D(−4, 1)

SHORT HAND

69

FROM LINEAR EQUATION TO LINE

1030.

TO DRAW THE LINE, ONLY 2 POINTS ARE NEEDED.

HOWEVER, A THIRD ONE IS USED TO CHECK

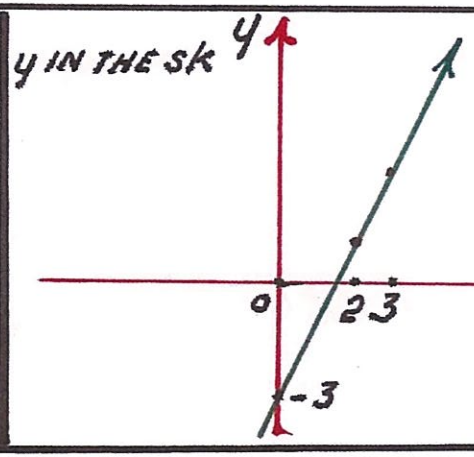
PLOTTING THESE POINTS SHOULD BE A MENTAL & A PHYSICAL EXERCISE
WITHOUT DRAWING SILLY BOXES!

CARTESIAN CO-ORDINATES: (x, y) CHOOSE YOUR OWN, CONVENIENT x OR y
RENÉ DESCARTES ALPHABETICAL ORDER!

ONLY USE, SAY
$(0,-3), (2,1), (3,3)$

$$y = 2x - 3$$

DO NOT WASTE TIME
MARKING AXES!
USE A RULER



$(0,-3)$ PEN ON 0, THEN 3 DOWN

$(2,1)$ PEN ON 2, 1 UP

$(3,3)$ PEN ON 3, 3 UP

DRAW THE LINE

DONE!

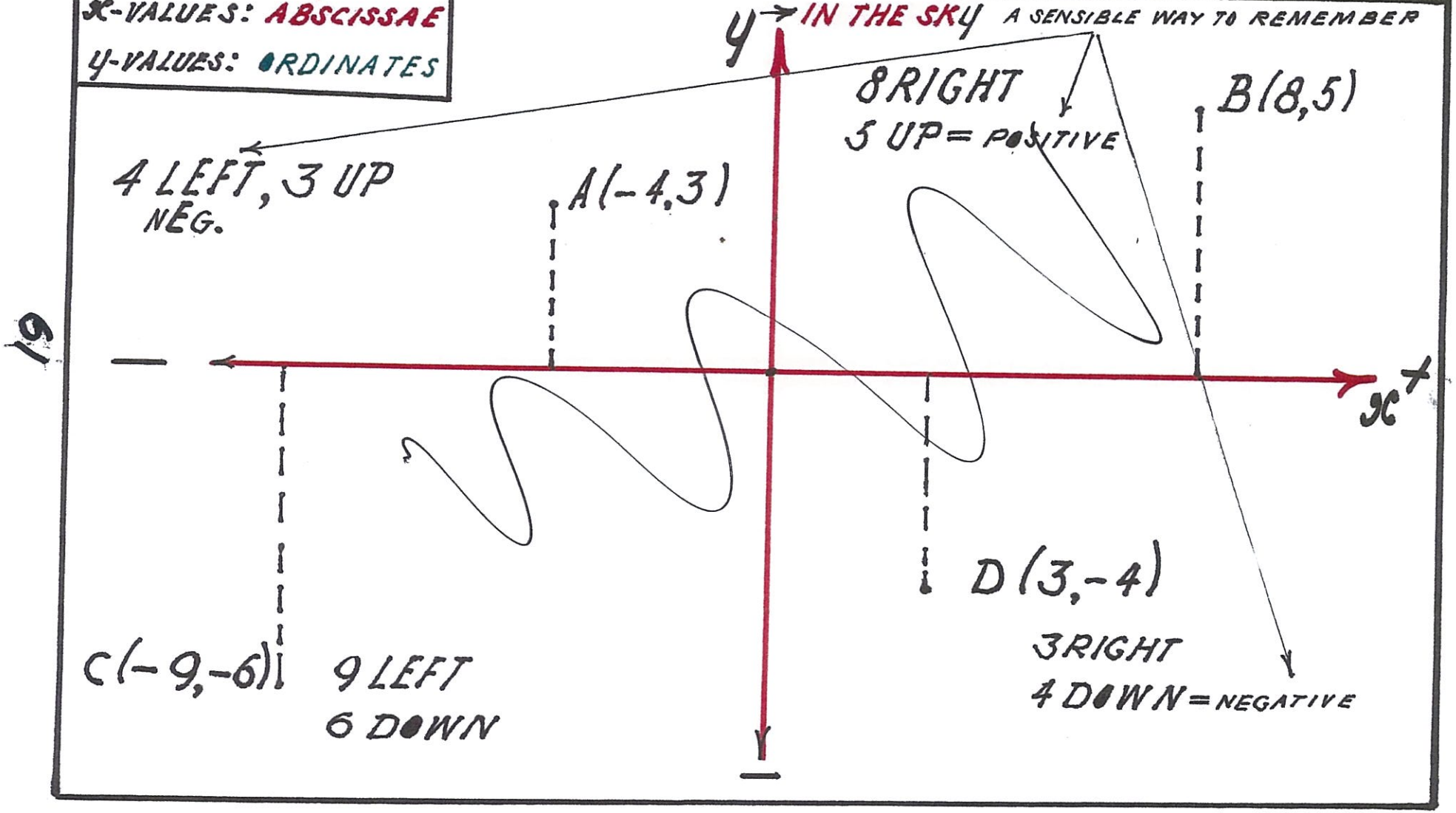
CARTESIAN CO-ORDINATES

PLOTTING POINTS

1131.

x-VALUES: ABSCISSAE

y-VALUES: ORDINATES



DIFFERENT LOOKS, SAME LINE

1032.

29

$2y = 5x - 2$

"NO - NAME"

$y = \frac{5}{2}x - 1$

ONE y

y-INTERCEPT

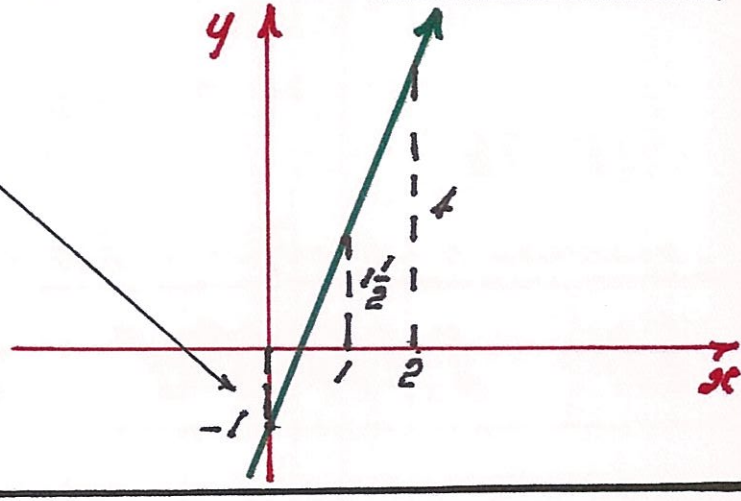
GRADIENT-INTERCEPT FORM

$5x - 2y - 2 = 0$

GENERAL FORM

IN ALPHABETICAL ORDER

GRADIENT m
SLOPE
5÷2=... INV. TAN GIVES ANGLE (68°)



GRADIENT-INTERCEPT FORM

1133.

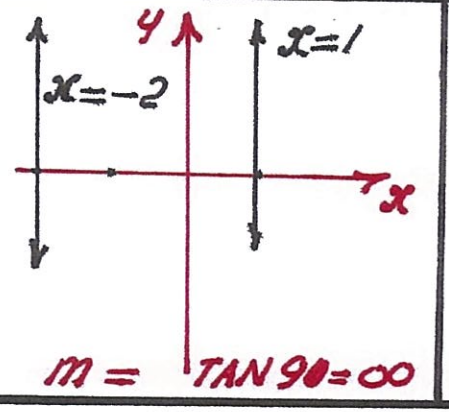
IN THAT ORDER!

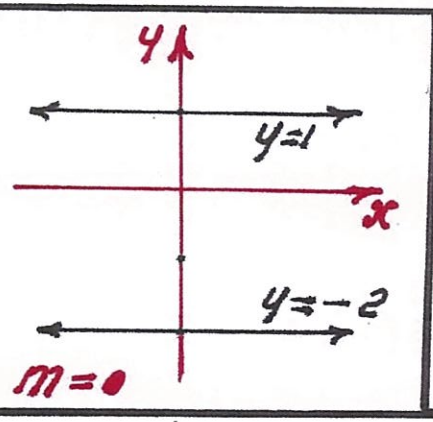
ONE $y = mx + b$

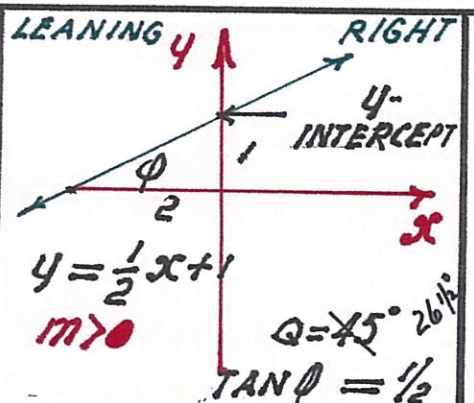
GIVES THE SLOPE (ANGLE) AND THE DIRECTION OF THE LINE

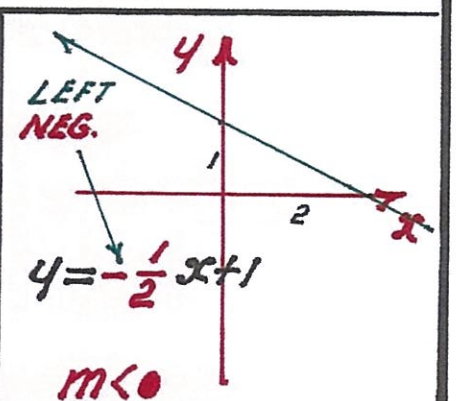
GIVES THE y-INTERCEPT (INTERSECTION LINE & y-AXIS)

FOUR DIFFERENT DIRECTIONS







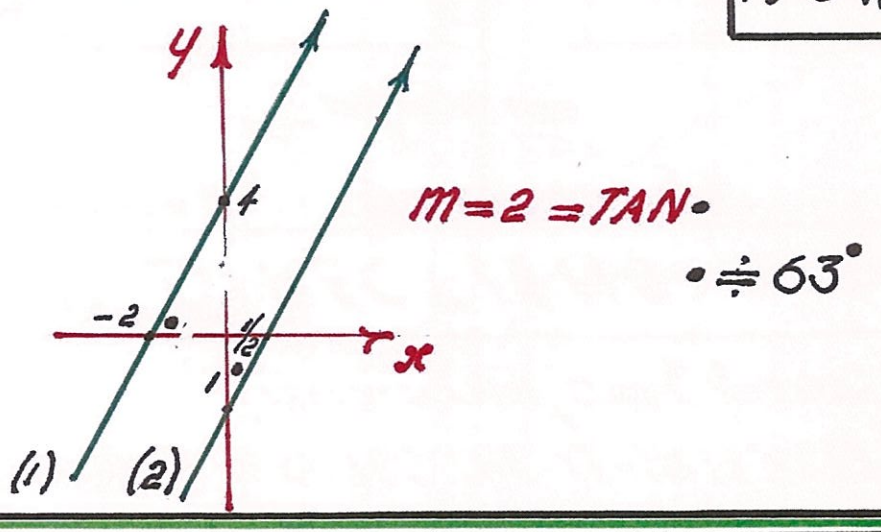


PARALLEL LINES HAVE THE SAME m

1134

$y = 2x + 4$ (1)

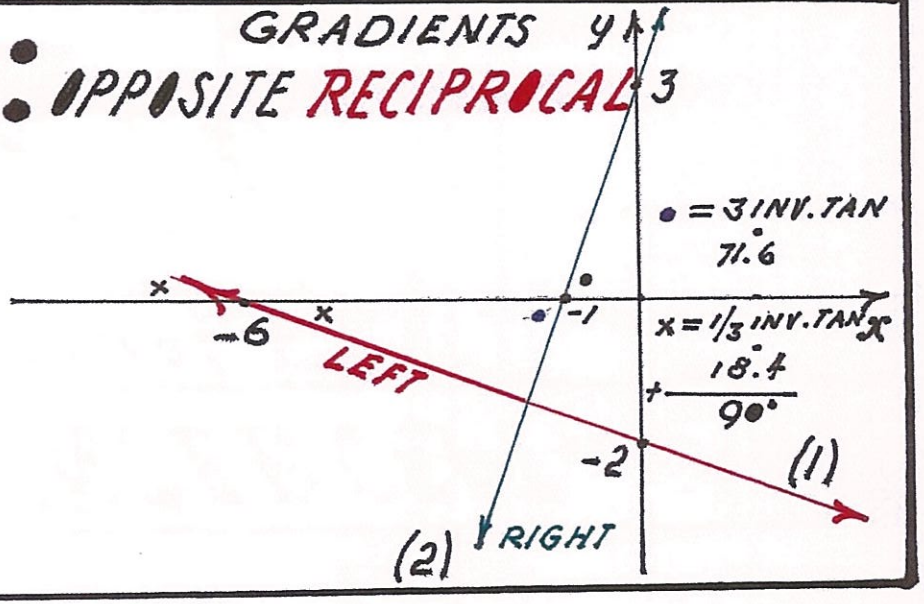
$y = 2x - 1$ (2)



PERPENDICULARS: OPPOSITE RECIPROCAL GRADIENTS

$y = -\frac{1}{3}x - 2$ (1)

$y = 3x + 3$ (2)



FROM GENERAL TO GRADIENT-INTERCEPT

$$-3x+2y-6=0 \rightarrow y=\frac{3}{2}x+3$$

$$\rightarrow \text{ONE } y=mx+b$$

WITHOUT ACTUALLY DRAWING THE LINE, ONLY THE GRADIENT-INTERCEPT FORM ENABLES US TO STATE THAT IT IS LEANING RIGHT BECAUSE $m>0$. THE y-INTERCEPT IS AT $(0,3)$.

$m=\text{TAN}\,\varphi=\frac{3}{2}$ $\therefore$ Q-ANGLE LINE & RIGHT ARM x-AXIS $\doteq 56^\circ$ (INCLINATION)

$\left(\frac{3}{2}\text{ INV. TAN}\right)$

$\therefore$ $3\div 2=\ldots$ INV TAN

CHECK $P(2,1)$ MEANS SUBSTITUTE $x=2$ & $y=1$ | $-6+2-6\neq 0$ $\therefore$ P IS NOT ON LINE.

1036.

FROM GRADIENT-INTERCEPT TO GENERAL

$y = -\frac{5}{6}x - \frac{2}{3} \longrightarrow 5x + 6y + 4 = 0$

ALPHABETICAL ORDER

FROM PAIRS TO EQUATION

WITH SIMULTANEOUS EQUATIONS

	A	B	C	D
x	0	1	2	4
y	-1	1	3	7

SELECT 2 PAIRS

MENTALLY SUBSTITUTE x & y IN $y = mx + b$

1. THE SMART WAY (USING A) $b = -1$ SUB. B

$m - 1 = 1 \therefore m = 2$

(IT'S EASIER TO THINK $mx + b = y$)

2. OTHER WISE (FIRST D, THEN C) A NOT MENTIONED

$4m + b = 7$ (D)

$2m + b = 3$ (C)

BECAUSE ↑

$m = 2$. SUB (D) $b = -1$

$y = 2x - 1$

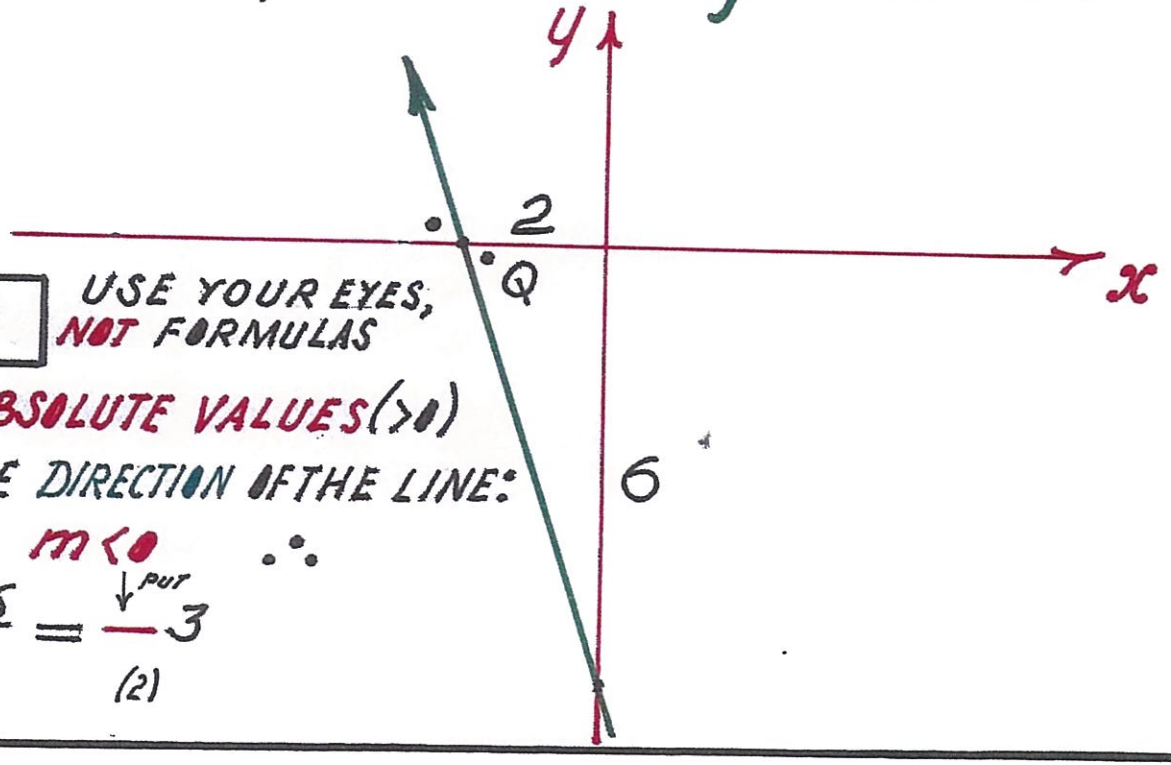
THE INTERCEPTS

1037.

$$y = -3x - 6$$

x-INTERCEPT $(-2, 0)$

y-INTERCEPT $(0, -6)$



TO CALCULATE m USE YOUR EYES, NOT FORMULAS

1. ONLY LOOK AT ABSOLUTE VALUES (>0)
2. THEN LOOK AT THE DIRECTION OF THE LINE:

LEANING LEFT $\therefore m < 0$ $\therefore$

$$m = \tan\varphi = \frac{6}{2} = \frac{\downarrow \text{PUT}}{-3}$$

(1) (2)

19 67

LINEAR EQUATIONS: TASK

62 CONVERT $3y = 7x + 2$ TO GRADIENT-INTERCEPT & GENERAL

63 DRAW $x = -3$ & $x = 2$

DRAW $y = 2$ & $y = -3$

$y = \frac{1}{3}x + 3$

$y = -2x + 2$

64 WRITE 2 EQUATIONS OF PARALLEL LINES

WRITE 2 FOR PERPENDULARS

65 CONVERT $-2x + 3y - 8 = 0$ TO GRADIENT_INTERCEPT

66 CONVERT $y = -\frac{4}{7}x - \frac{3}{5}$ TO GENERAL

66 FROM PAIRS TO EQUATION

$(0, \overset{(1)}{-3})$, $(2, \overset{(2)}{5})$, $(-2, \overset{(3)}{-11})$

67 THE INTERCEPTS FOR $(y = -4x - 3)$

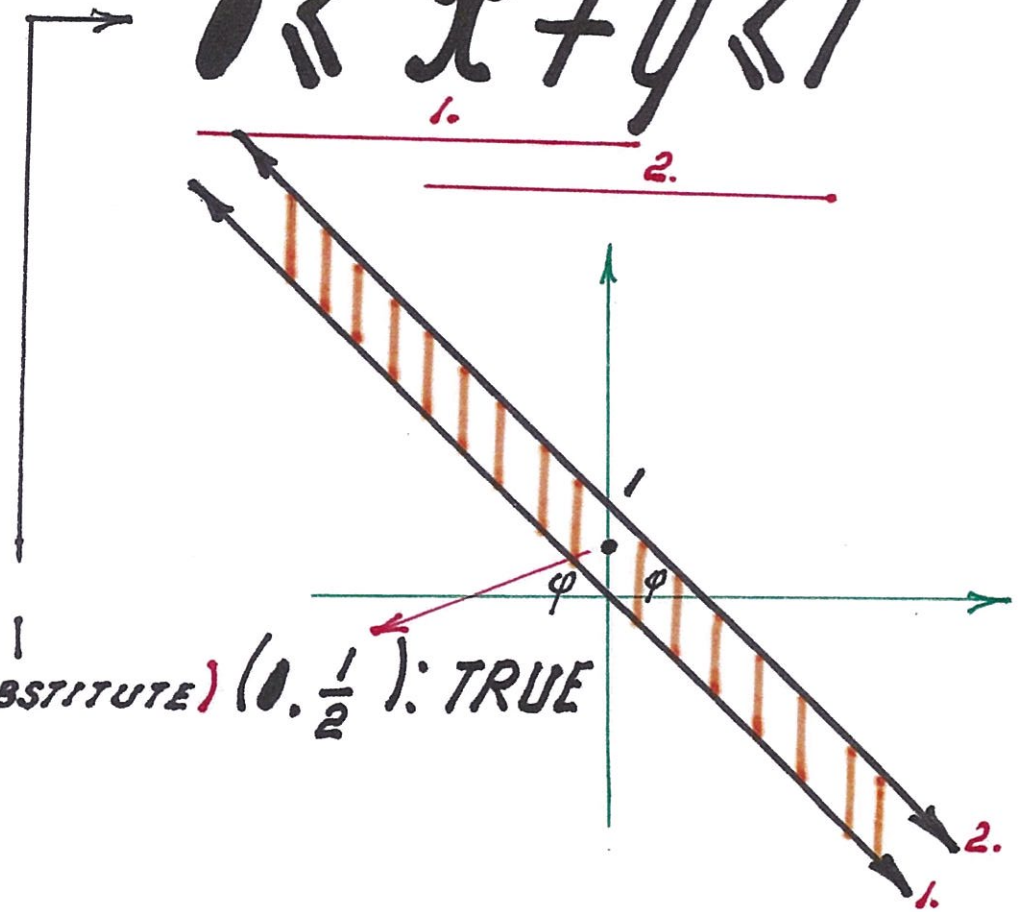
DRAW THE LINE

REGION

927.

BOUNDARIES INCLUDED
FULL LINE

$0 \leq x+y \leq 1$



TEST (SUBSTITUTE) $(0, \frac{1}{2})$: TRUE

LINE LEANING LEFT
GRADIENT $m = \tan\varphi = 1$
$\therefore \varphi = 45°$

DRAW

$y = -x+1$ (2)

SAME m : PARALLEL

$y = -x$ (1)

931.

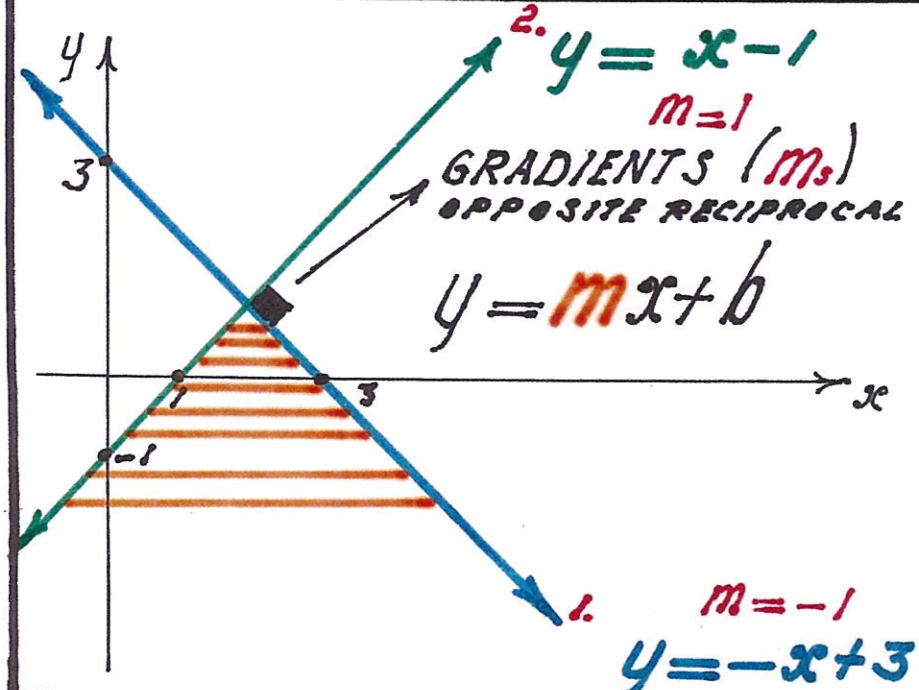
$x + y \leqslant 3$ TEST (0,0) TRUE 1.

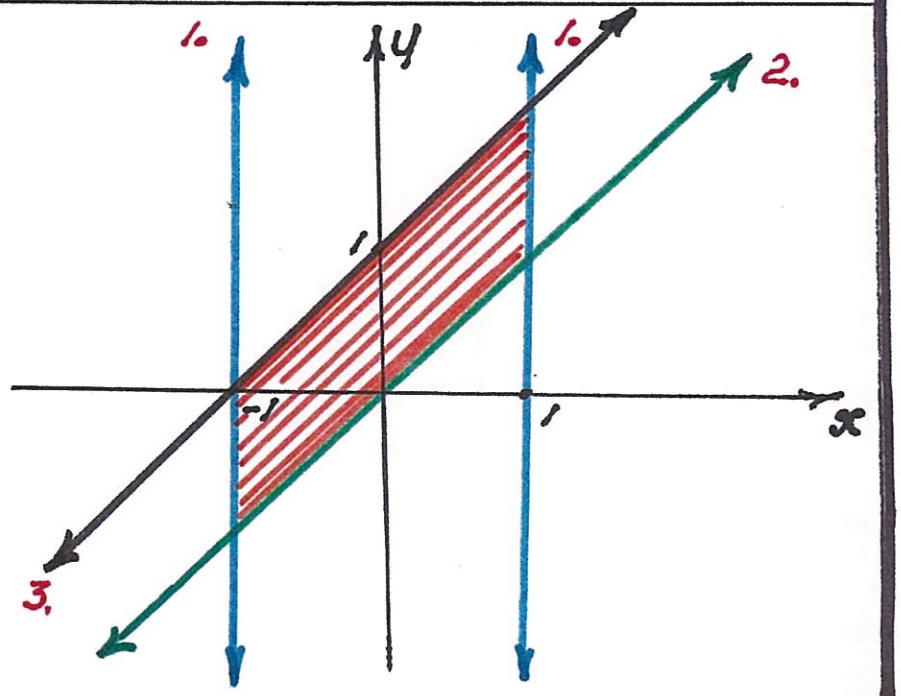
$x - y \geqslant 1$ TEST (0,0) FALSE 2.

ABSOLUTE VALUE: $|x| \leqslant 1$ x IS 1 OR LESS THAN 1 FROM ZERO 1.

TEST $(0, \frac{1}{2})$ TRUE

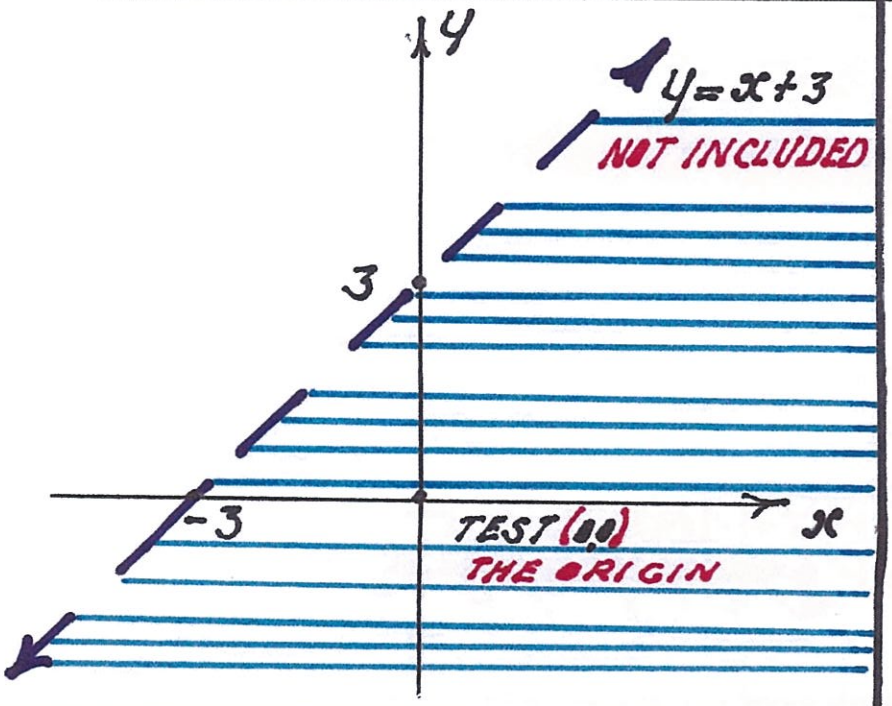
$y \geqslant x$ 2. & $y \leqslant x + 1$ 3.





$y < x + 3$

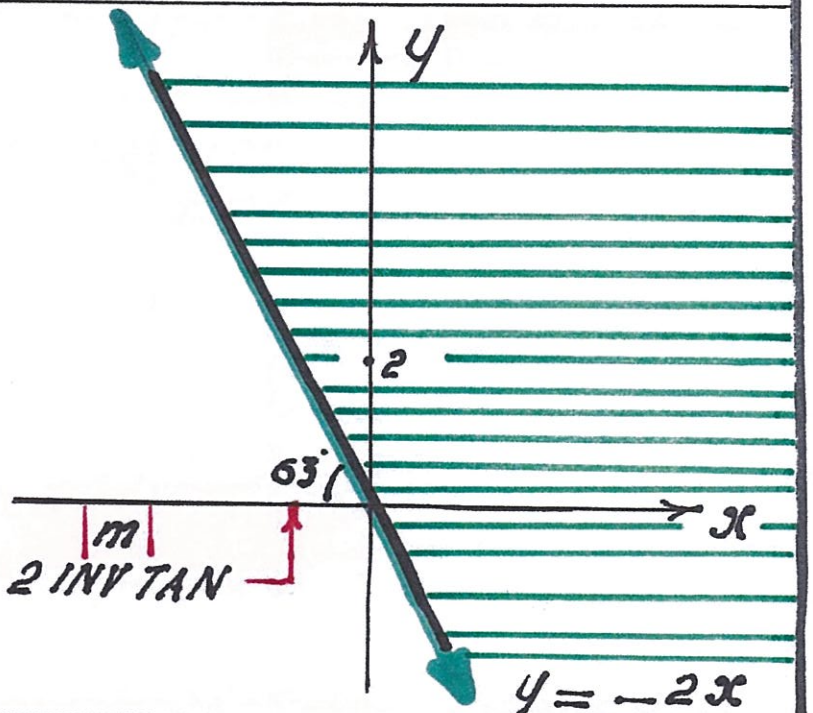
SUBSTITUTE (TEST) (0,0)
TRUE



$y \geq -2x$

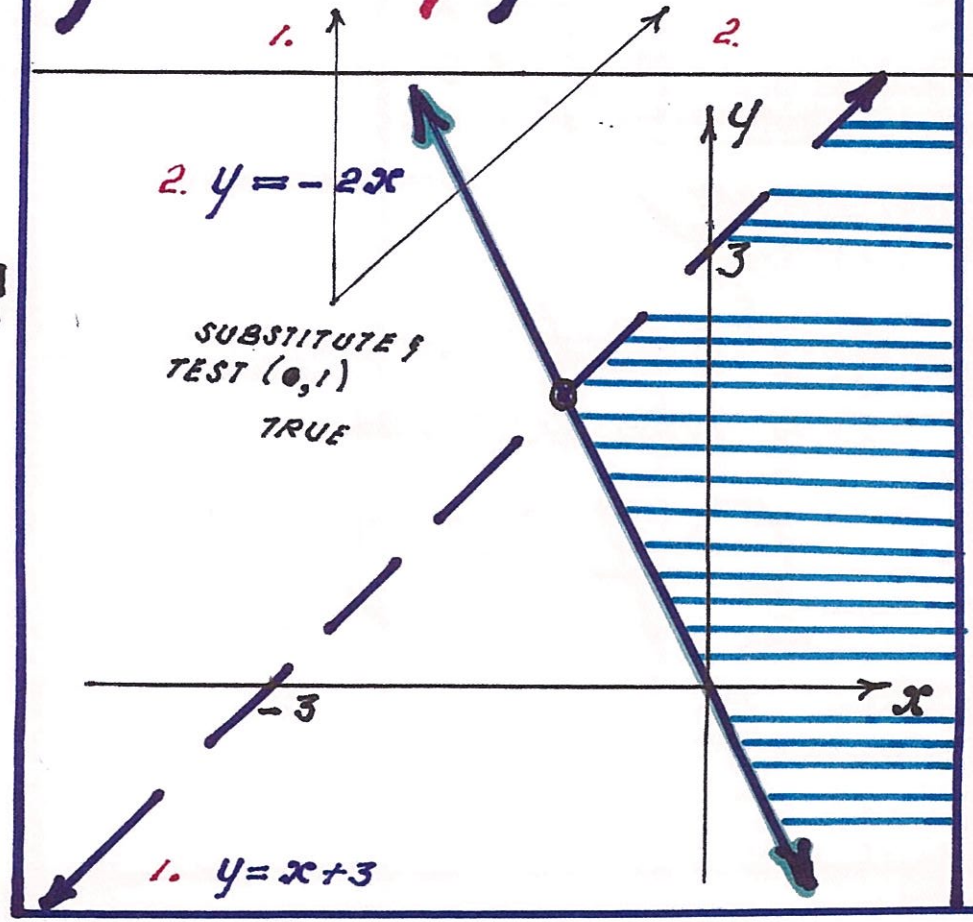
TEST (0,2): TRUE

NEG.
LEANING LEFT



INTERSECTION

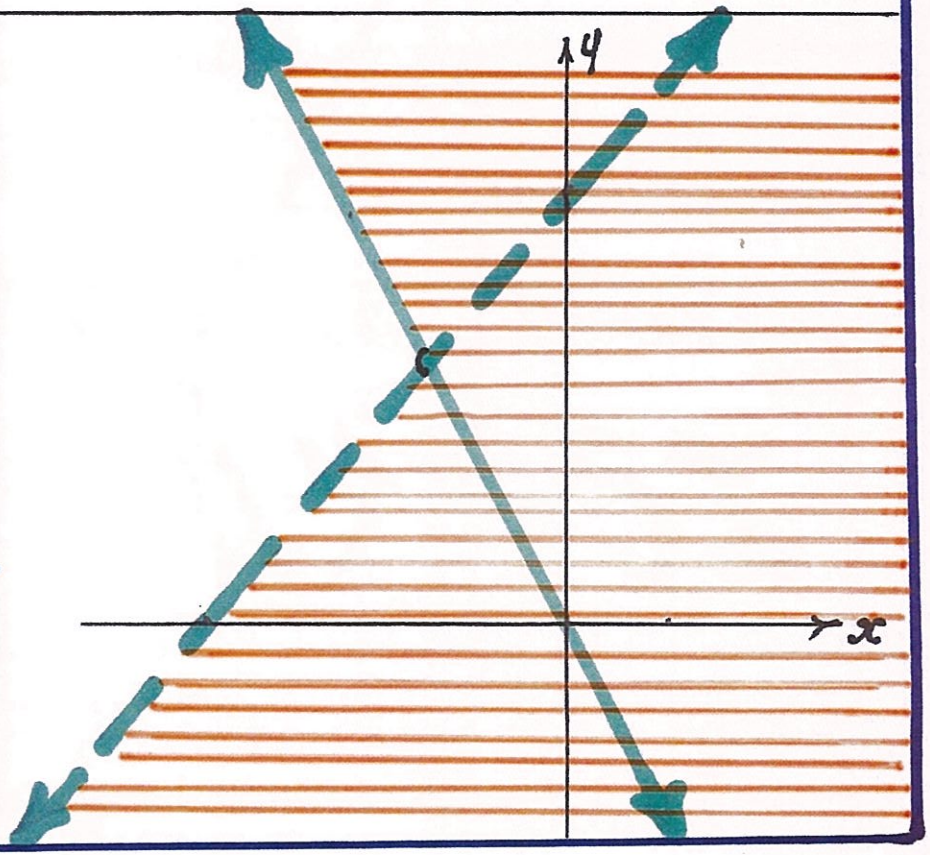
$y < x+3$ & $y \geq -2x$



UNION

932.

$y < x+3$ & $y \geq -2x$



72

69

$$0 \leqslant 2x+y \leqslant 3$$

70

$$x+y \leqslant 2$$
$$2x-y \geqslant 3$$

$$|x| \leqslant 2$$

$$y \geqslant 2x \text{ ; } 2y < x+2$$

71

$$y < 2x+1$$

$$y \geqslant -3x-2$$

72

INTERSECTION

$$y < x+3 \text{ ; } y \geqslant -3x$$
(1) (2)

UNION

$$y < x+1 \text{ ; } y \geqslant -3x$$
(1) (2)

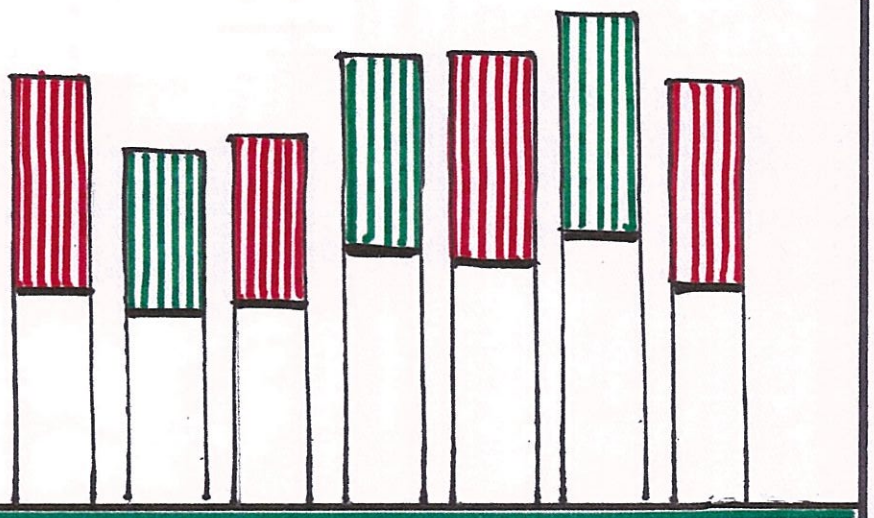
STATISTICS

1118.

TEMPERATURE RANGE

DAY	HIGH	LOW
MONDAY	30	15
TUESDAY	24	13
WEDNESDAY	26	14
THURSDAY	31	18
FRIDAY	32	17
SATURDAY	34	19
SUNDAY	29	15

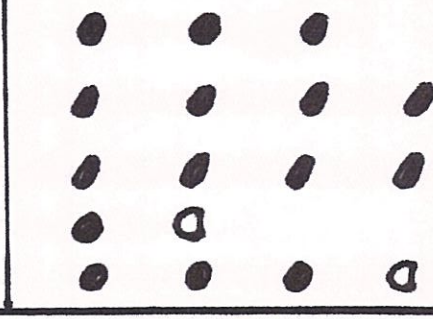
BAR GRAPH



PICTURE GRAPH

SOCCERBALL PRODUCTION

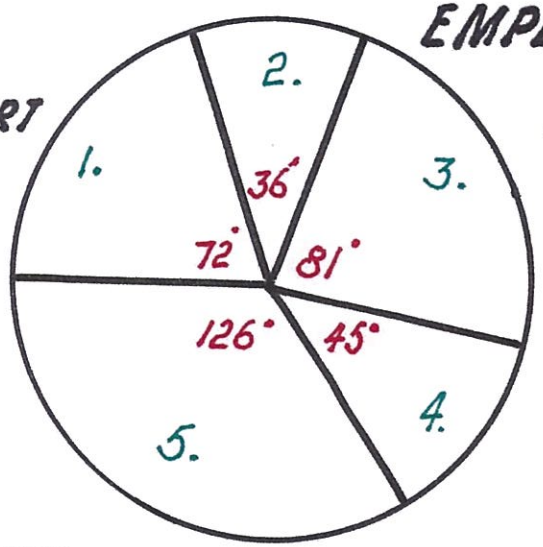
● = 100 ◘ = 50



PIE CHART OR SECTOR GRAPH

200 EMPLOYEES

TRANSPORT CHART



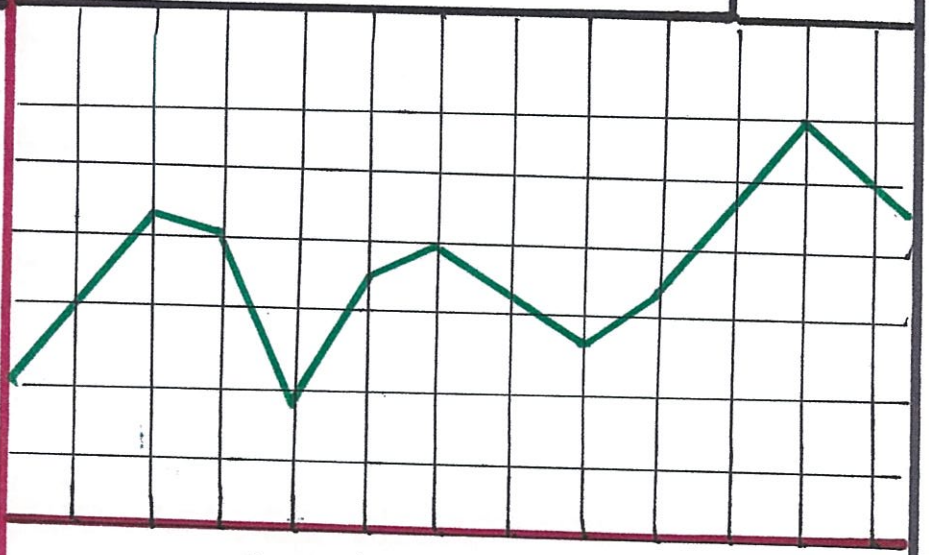
360° FOR 200

9° 5

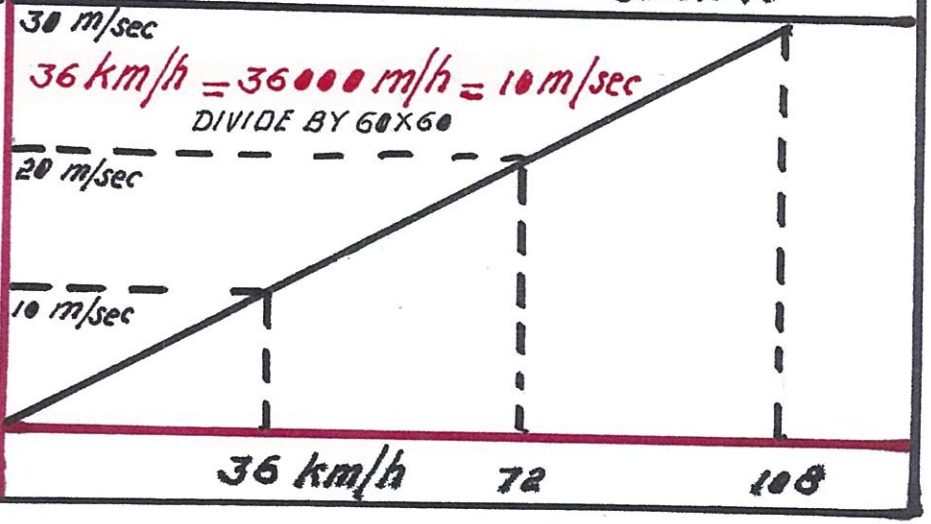
1.	72 ÷ 9X5	= 41	TRAIN
2.	36 ÷ 9X5	= 21	WALK
3.	81 ÷ 9X5	= 45	CAR
4.	45 ÷ 9X5	= 25	PASSENGER
5.	126 ÷ 9X5	= 71	BUS

LINE-SEGMENT GRAPH

1119.



CONVERSION GRAPH



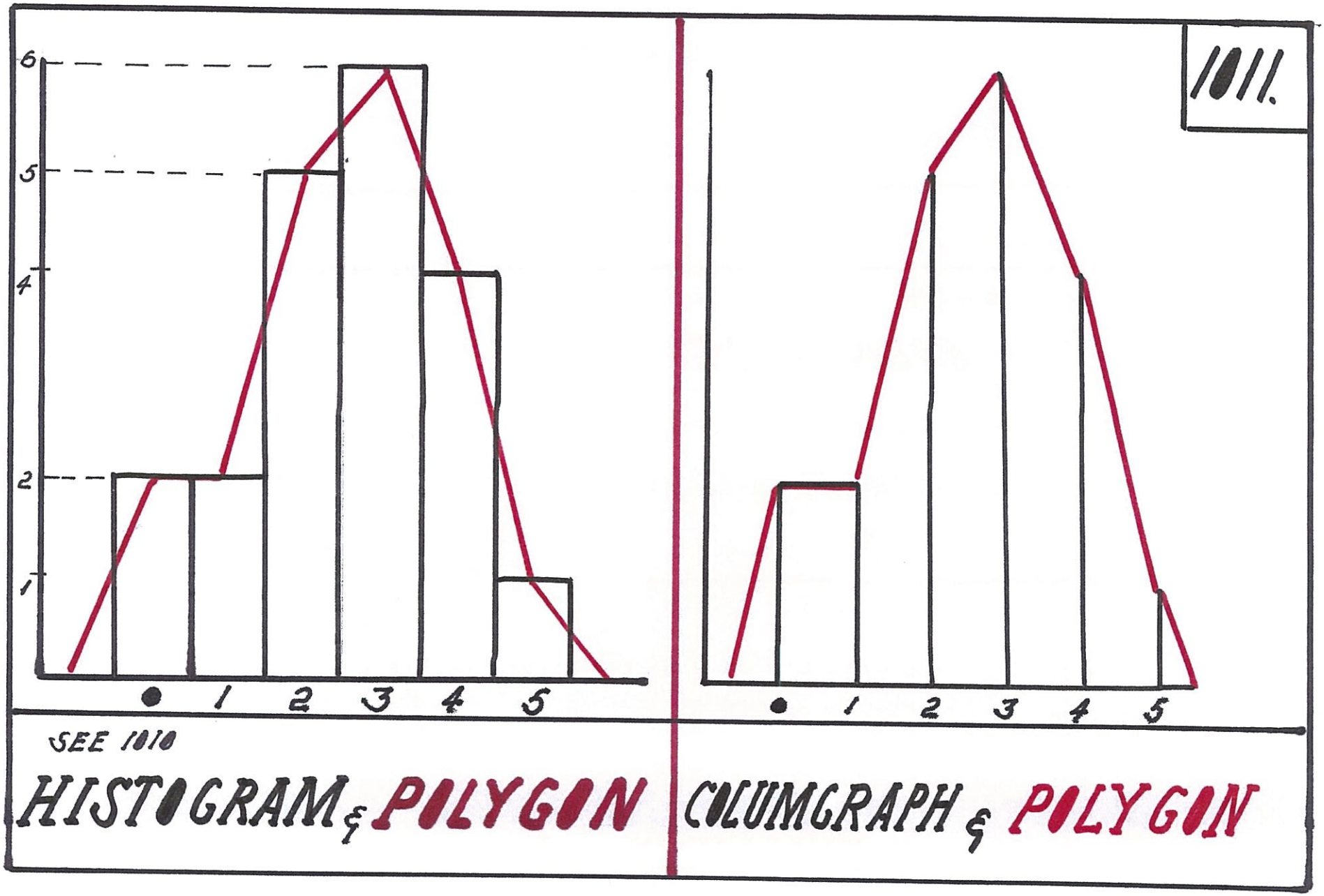
1010.

SCORES: 3. 2. 4. 5. 1. 3. 4. 2. 3. 0.

2. 3. 3. 4. 2. 0. 4. 1. 3. 2. DISTRIBUTION

SCORE	TALLY	FREQUENCY	CUMULATIVE FREQ.	= PROBABILITY RELATIVE FREQ.
0	II	2	2	$\frac{2}{20} = \frac{1}{10}$
1	II	2	= 4	$\frac{2}{20} = \frac{1}{10}$
2	IIII	5	= 9	$\frac{5}{20} = \frac{1}{4}$
3	IIII I	6	15	$\frac{6}{20} = \frac{3}{10}$
4	IIII	4	19	$\frac{4}{20} = \frac{1}{5}$
5	I	1	20	$\frac{1}{20}$

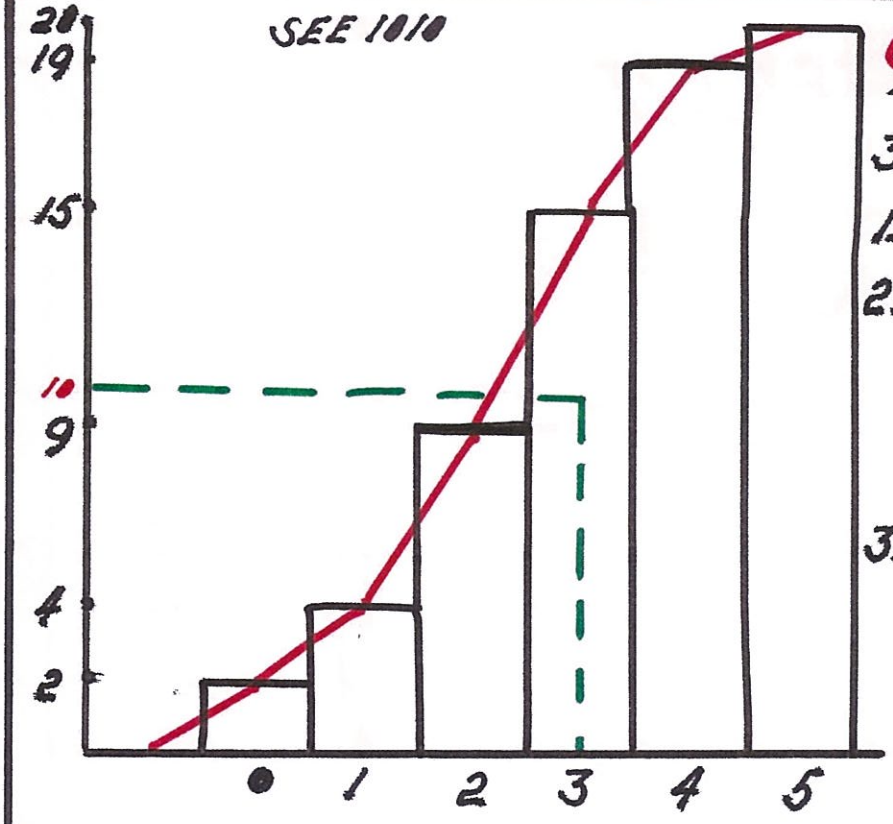
GRAPHS: SEE 1011 & 1012



SEE 1010

HISTOGRAM & POLYGON

COLUMGRAPH & POLYGON



CUMULATIVE FREQUENCY GRAPH

1012.

3 WAYS OF FINDING THE MEDIAN
MIDDLE SCORE

1. GRAPH
2. ORDER THE SCORES (TEDIOUS)

00 11 22222 33 3333 44445
9 2 9
AV. 3

3. USE CUMULATIVE FREQUENCY COLUMN
20 SCORES: MEDIAN = AVERAGE OF 10 & 11
NUMBERS

(ODD NUMBER: 15 SCORES
THINK $7\frac{1}{2}$ UP: THE 8TH IS THE MEDIAN

MEASURES OF CENTRAL TENDENCY: CLUSTER ABOUT A TYPICAL SCORE
OUTRIDERS DIFFER GREATLY

MEAN $\bar{x}$	MODE 3	MEDIAN 3	RANGE 5
AVERAGE	MOST FREQUENT	MIDDLE SCORE	HIGHEST - LOWEST SCORE SCORE
51 ÷ 20 = 2.55			

TRIGONOMETRY

TRI ANGLE MEASURE

1086.

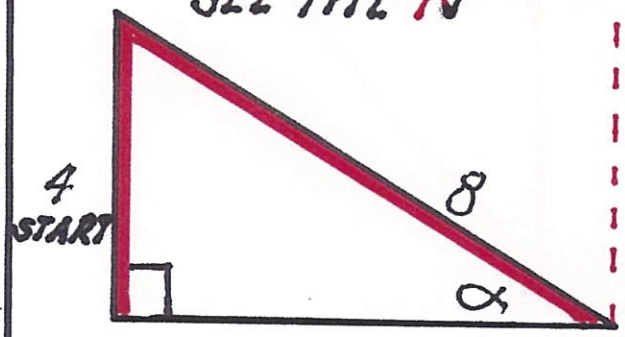
THE 3 MAIN RATIOS IN THE RIGHT TRIANGLE

SINE – COSINE – TANGENT

RELATIONSHIPS BETWEEN ANGLE & 2 SIDES

THEY CAN BE REMEMBERED BY LOOKING! (NO SILLY MNEMONICS)

SEE THE N

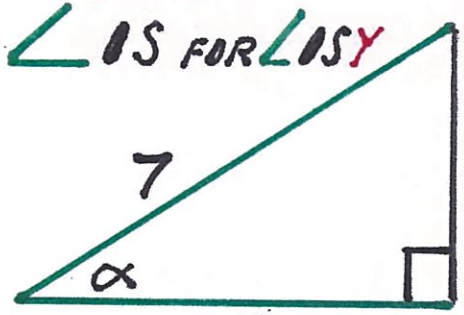


$SIN\alpha = \frac{4}{8}$ ALWAYS ≤ 1

.5 INV. SIN 30°_α

S A S

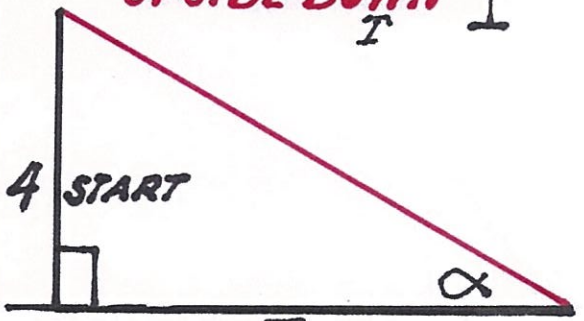
∠ IS FOR LOSY



$COS\alpha = \frac{6}{7}$ ALWAYS ≤ 1

6÷7 = ... INV. COS 31°_α

UPSIDE DOWN I



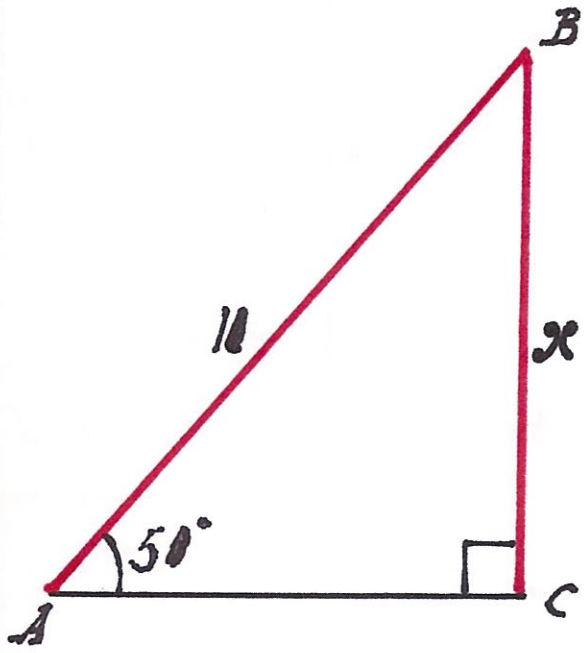
$TAN\alpha = \frac{4}{7}$

4÷7 = ... INV. TAN APPR. 30°_α

62

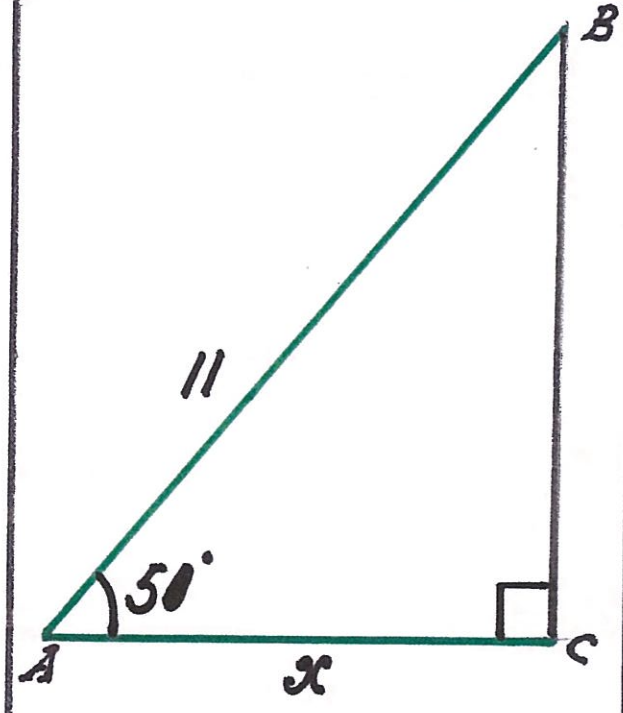
TO CALCULATE A SIDE I

1187.



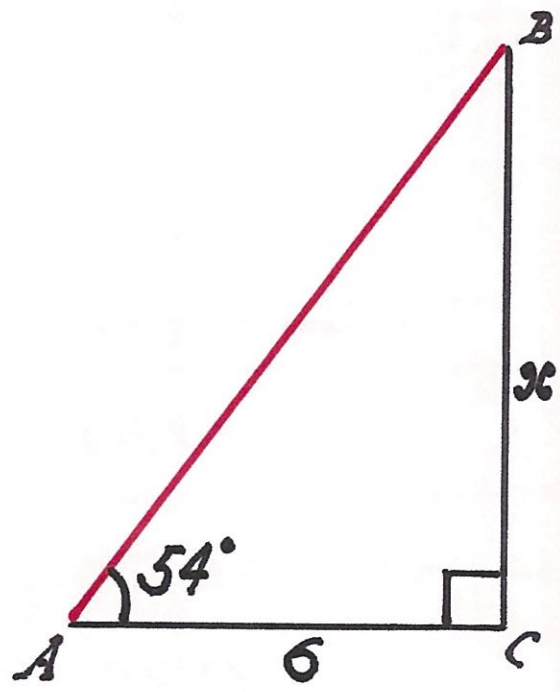
$$\text{SIN}\,51 = \frac{x}{11}$$

$$x = 11\,\text{SIN}\,51 \div 7.7$$



$$\text{CIS}\,51 = \frac{x}{11}$$

$$x = 11\,\text{CIS}\,51 \div 7$$



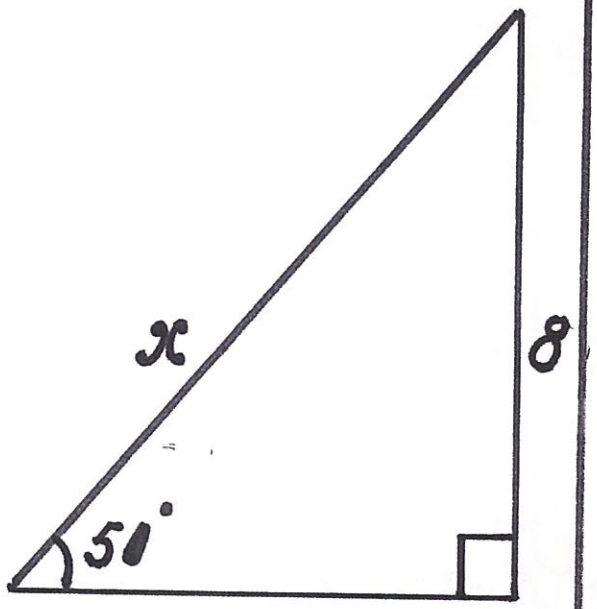
$$\text{TAN}\,54 = \frac{x}{6}$$

$$x = 6\,\text{TAN}\,54 \div 8.3$$

80

TO CALCULATE A SIDE II

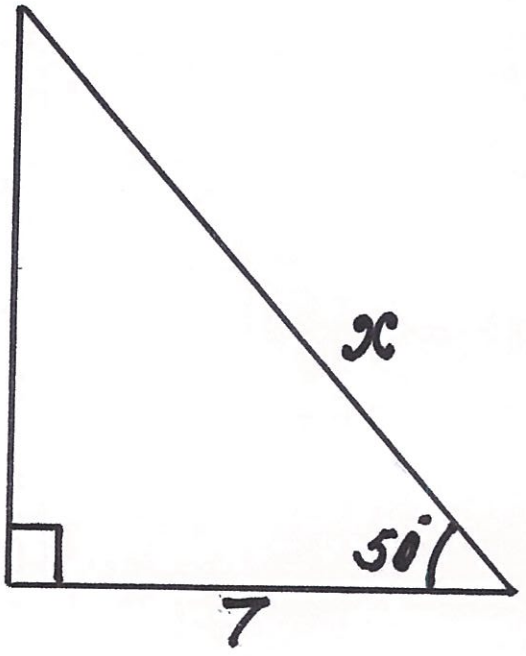
1188.



$$\text{SIN}\,50 = \frac{8}{x}$$

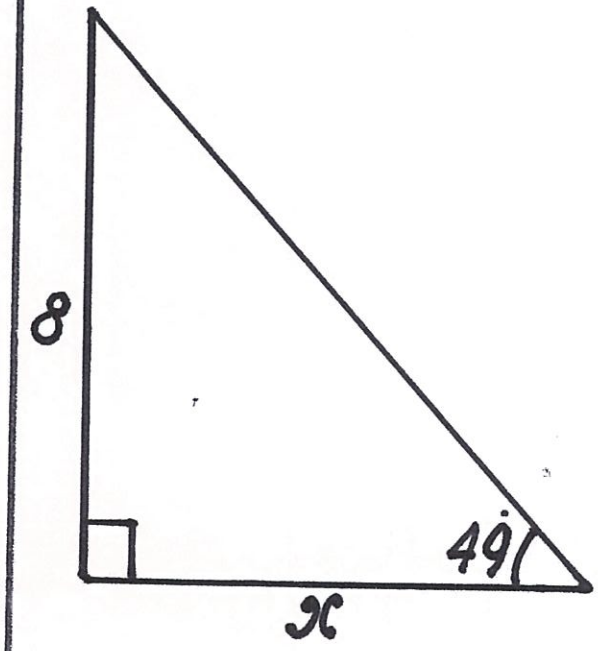
EXCHANGE

$$x = 8 \div \text{SIN}\,50 \fallingdotseq 10.4$$



$$\text{COS}\,50 = \frac{7}{x}$$

$$x = 7 \div \text{COS}\,50 \fallingdotseq 10.9$$

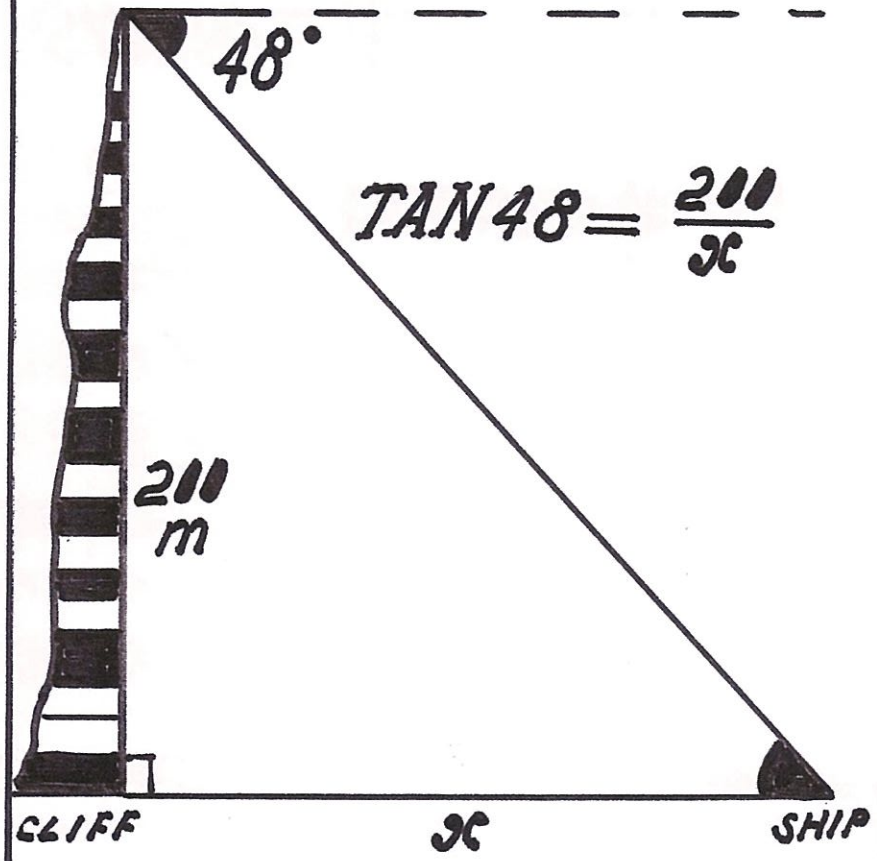


$$\text{TAN}\,49 = \frac{8}{x}$$

$$x = 8 \div \text{TAN}\,49 \fallingdotseq 7$$

DEPRESSION

EYE LEVEL



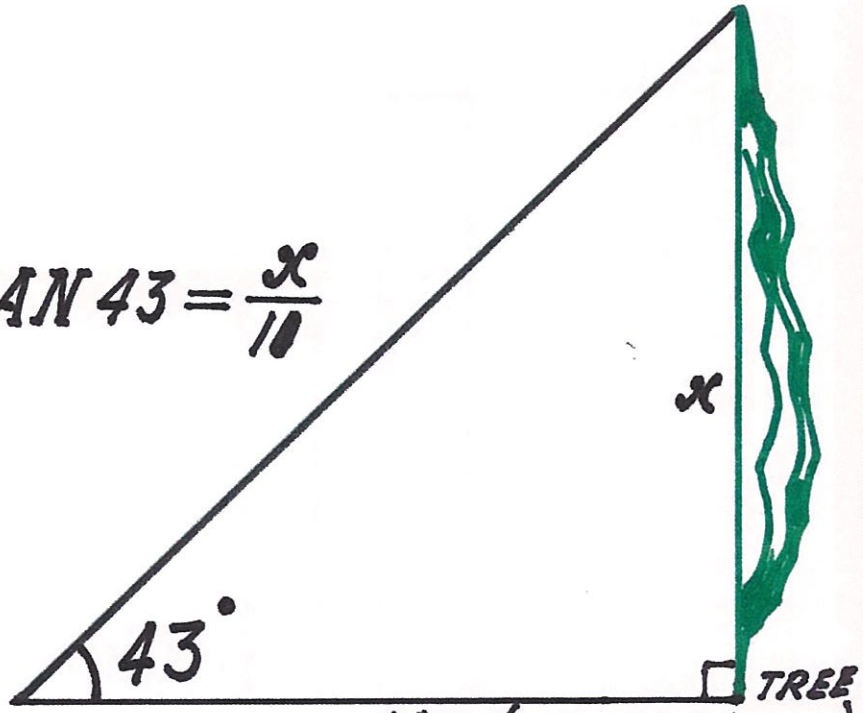
$$TAN48 = \frac{200}{x}$$

$$x = 200 \div TAN48 = 18\ m$$

ELEVATION

1089

ANGLE MEASURED WITH CLINOMETER



$$TAN43 = \frac{x}{10}$$

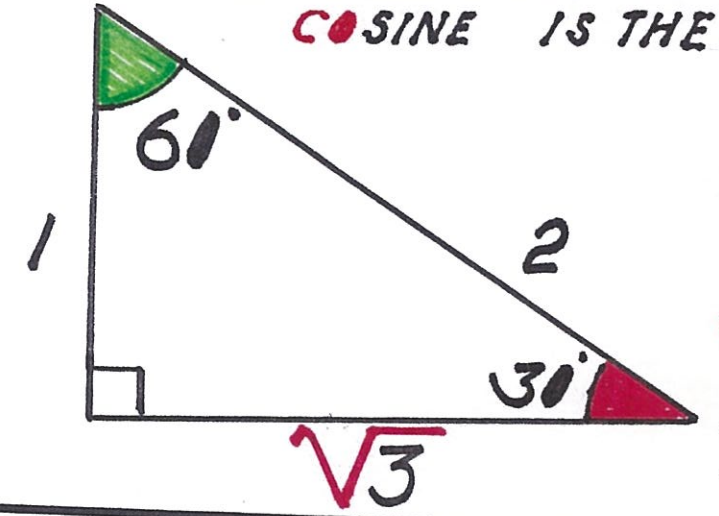
$$x = 10 \times TAN43^{\circ} = 9.3\ m$$

ONLY PRESS 43TAN & MOVE D.P. 1 PLACE →

EXACT RATIOS

1090.

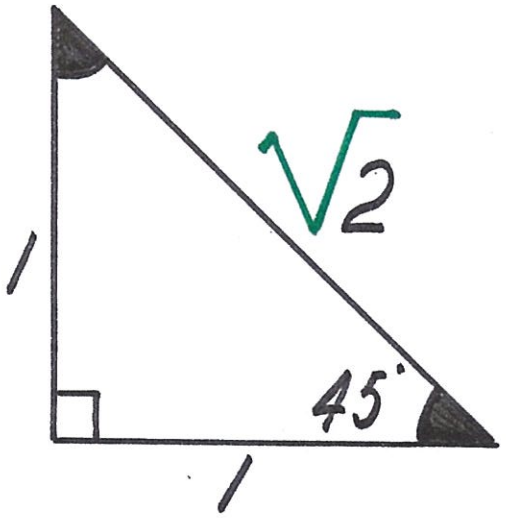
COSINE IS THE COMPLEMENT OF SINE ∴



$\sin 30^\circ = \cos 60^\circ = \frac{1}{2}$

$\sin 60^\circ = \cos 30^\circ = \frac{\sqrt{3}}{2}$

$\tan 60^\circ = \sqrt{3}$ | $\tan 30^\circ = \frac{1}{\sqrt{3}}$



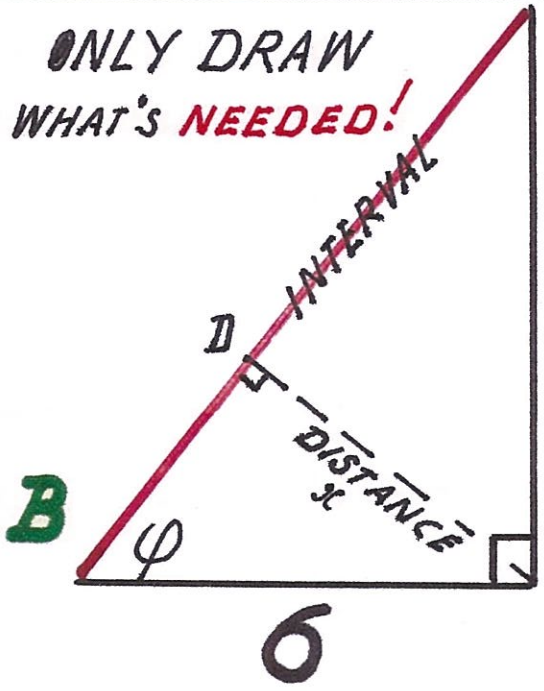
$\sin 45^\circ = \cos 45^\circ = \frac{1}{\sqrt{2}}$

$\tan 45^\circ = 1$

PROTO TYPE

A(4,5) & B(-2,-3)

1139.



THINK: FROM −2 TO 4 = 6
FROM 3 DOWN TO 5 UP = 8

1. $m = \frac{4}{3} = TAN\varphi$ $\quad \varphi \doteq 53°$

ONLY WRITE IT ONCE!

2. (USE A) $\frac{4}{3} \times 4 + b = 5 \therefore$ $y = \frac{4}{3}x - \frac{1}{3}$

EQUATION AB

3. MIDPOINT AB (1,1) NO FORMULA

NOTHING BUT THE AVERAGE OF 4 & -2 AND 5 & -3

INTERVAL $AB = \sqrt{100} = 10$ (PYTHAGORAS TRIAD)

TO AVOID CONFUSION, ONLY USE THE TERM DISTANCE FOR POINT TO LINE e.g. CD

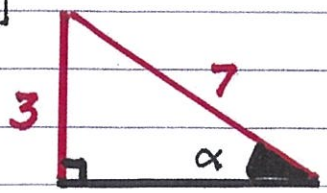
$\sin\varphi = \frac{x}{6}$ $\quad x = 6 \sin 53°$

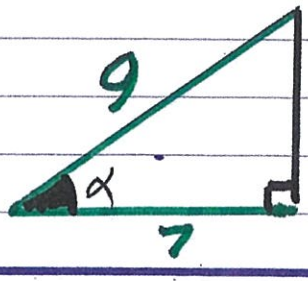
84

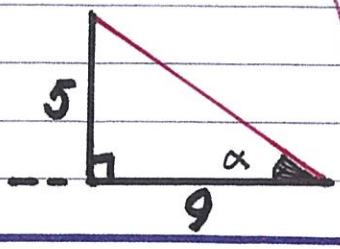
TRI ANGLE MEASURE

TRIGONOMETRY

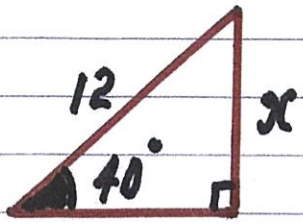
79



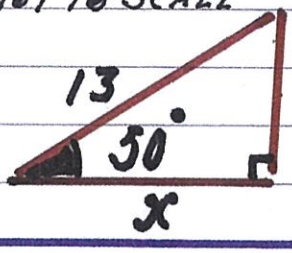


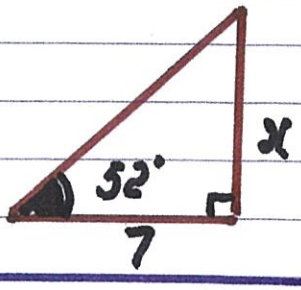


80

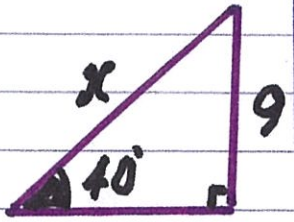


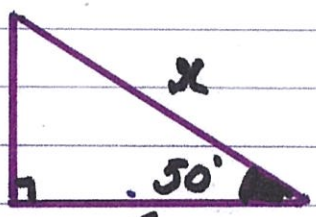
NOT TO SCALE

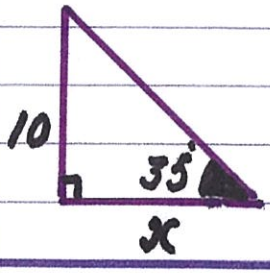




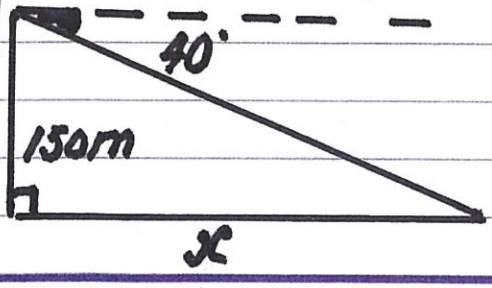
81

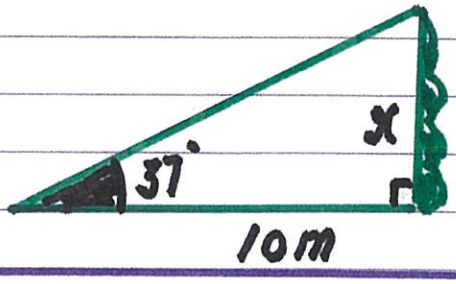




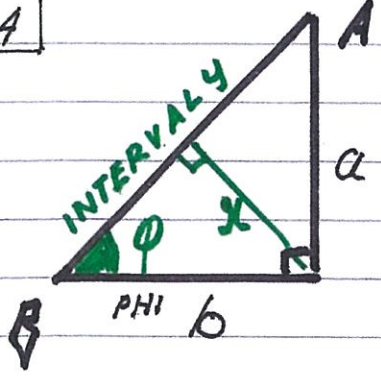


82





84



A(5,7), B(-3,-5)

MIDPOINT (,)

CALCULATE φ, x & y

ANSWERS

1	374×52	768×26	1675×12	20160
2	$8000 \times 1.9 \div 60$ pm	$8000 \times 1.9 \div 260$ pw		
3	$455 \div 1000$	$118 \div 250$	$320 \div 700$	$1500 \div 3500$
4	$60000 \div 379$	158 Books	$30000 \div 105$	286 ZIPPERS
6	$x = 7 \times 18 \div 4$	$x = 23 \times 99 \div 42$		
9	$x = 60^\circ$, $y = 120^\circ$	$x = 90^\circ$. $y = 90$		
10	$x = y = 50^\circ$	11 AREA ANNULUS: $5\pi\ cm^2$ TOTAL $C = 6\pi + 4\pi = 10\pi$ cm		
12	$A = \frac{1}{9} \times 9\pi = \pi\ cm^2$	$C = \frac{1}{9} \times 6\pi$ cm	$x\pi = 15 \times 36 \therefore x = 540 \div \pi = \ldots^\circ$	
15	$7x - 14 - 3x - 15 = 20$, $x = 12\frac{1}{4}$	$21a - 10a - 8 + 1 = 24 - 8a$	$a = 1\frac{12}{19}$	
16	$x = \pm 5$	$2x^2 - \ldots = 2x^2 + 71$ $x = -7\frac{1}{10}$	$3x = 25$ $x = 8\frac{1}{3}$	$x/3 = 4$ $x = 12$
17	$x + 2 = 125$ $x = 123$	$(3x-4)^{1/3} = \sqrt[3]{3x-4}$ $3x - 4 = 8$, $x = 4$	$3^{k+6} = 1 = 3^0$ $K = -6$	$x = 65536\, x^4 / a^{b/c} 6$ =

ANSWERS

18 $x^2 = 36$, $x = \pm 6$ | $7x - 3 = x + 7$, $x = 1\frac{2}{3}$ | $7x = 1200 + x$, $x = 200$ | $4x + 12 = 5x - 35$, $x = 47$

19 $3x = 5x + 15$, $x = -7\frac{1}{2}$

20 $3x + 9 = 30 - 2x$, $x = 4\frac{1}{5}$

21 BREAK EVEN WHEN $11x + 10 = 13x$
WHEN $x = 5$ 6 BAGS \$76 OR \$78

22 SIDES x & $8 - x$ $\therefore x(8-x) = 8 \therefore x^2 - 8x + 8 = 0$ | $x = 4 \pm 2\sqrt{2}$

24 $2x + 4$ | $2x - 2, 2x, 2x + 2$

25 $2B + 2x = 50$ | $B = 25 - x$ | $A = x(25 - x)$

$\frac{30}{x} - \frac{30}{x+1}$ | $x(30 - x)$

26 x FOR 35 $\therefore (10 - x)$ FOR 20
COST $35x + 2(10 - x) = 15x + 200$ ¢

26 $\frac{1}{a} - \frac{1}{b} = \frac{b-a}{ab}$

27 $\frac{(3a - 2b)}{-4(3a - 2b} \neq -\frac{1}{4}$ $2b \neq 3a$

28 $\frac{4x(3x-1)}{3x-1} = 4x$ $x \neq 1/3$

30 $\frac{2a + b}{6}$

$\frac{x(x+5)}{(x+5)(x-5)} = \frac{x}{x-5}$ $x \neq -5$

31 $-3a^2b + 3a^5$

$14 - 28b - 3b - 9 = 5 - 31b$

32 $a^2 - 6a + 9$

$a^2 + 4a + 4$

ANSWERS

33 $x^2+6x+9=(x+3)^2$ | $x^2-14x+49=(x-7)^2$

35 $(x-8)(x+8$ | $9(x^2-4)$ $9(x+2)(x-2)$ | $5(x^2-9)$ $5(x+3)(x-3)$

37 $475 \div 19 = \ldots\ \%$

38 46 | 23×2.8 | 4×150 | $.18 \times 476$

39 $315 \div 7 \times 12 \div 88$

40 $x = 764 \div .17$ | $x = 2462 \div 5 \div .09$

41 $.85x = 72$; $x = 72 \div .85$ | $1.12x = 474$ $\therefore$ $x = 474 \div 1.12$

42 $150 \times 8 \div 365 \times 130$ | $1.09 \times 400 - 14000$

44 LOAN ON $82 \times 7 = \$574$. PAID $24 \times 28 = \$672$
INTEREST IN 1 YEAR $(672-574) \div 2 = \$49$ WHICH IS $49 \div 574 \div 8\%$

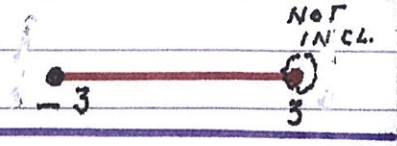
45 PROFIT $180 \div 5 = 36\%$ | PAID $75 + 720 = \$795$
PROFIT $795 - 500 = 295 \div 5 \div 60$

46 $x \times 1.5^3 = 135$
$x = 40$ | 1ST SELLS FOR 60 | 2ND SELLS FOR 90 | 3RD SELLS FOR 135

ANSWERS

47 PAID 4000×1.09^4

48 VALUE $36000 \times .92^4$

49 $-3 > -5$	$\frac{1}{4} > \frac{1}{6}$	$3 > -5$
50 $x > 5$	$x \leqslant 3$	$x > 2$
51 $x < 3$	$x \geqslant -3$	TRUTH SET $\{2, 3\}$
52 $\{0, 1, 2\}$	$\{-2, -1, 0, 1, 2\}$	
53 $x \geqslant 2$	$x < 5\frac{1}{5}$	$x \leqslant -3$

54 $2y = 16$, $y = 8$, $x = 4\frac{1}{2}$

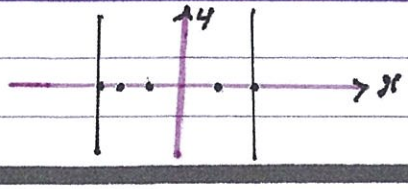
55 $5x = 15$, $x = 3$, $y = -1$

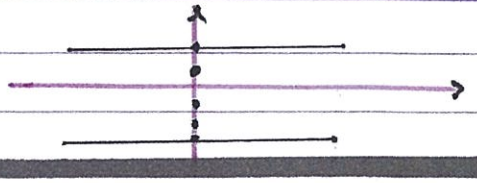
56 $\begin{cases} 6x + 3y = 9 \\ 3x - 3y = 18 \end{cases}$ $\begin{cases} x = 3 \\ y = -3 \end{cases}$

57 $\begin{cases} 9x - 6y = 18 \\ 8x + 6y = 16 \end{cases}$ $\begin{cases} x = 2 \\ y = 0 \end{cases}$

62 m GIVES THE GRADIENT (SLOPE)
$y = \frac{7}{3}x + \frac{2}{3}$; $m > 0$, LEANING RIGHT

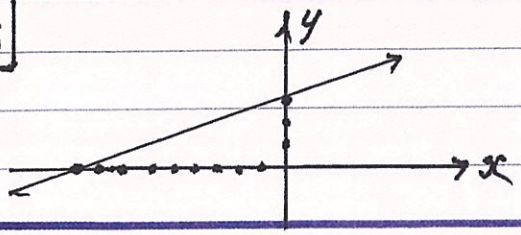
GENERAL FORM
$7x - 3y + 2 = 0$

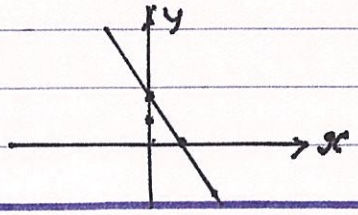
63 



ANSWERS

63





64

$y = 3x$ & $y = 3x + 2$ | $y = -\frac{1}{2}x$ & $y = 2x - 3$

65

$y = \frac{2}{3}x + 2\frac{2}{3}$

66

$4x + 7y + 4\frac{1}{5} = 0$

66

$y = mx + b$ SUB(1) $-3 = b$

$y = mx + b$ SUB(2) & b: $5 = 2m - 3$ $\therefore m = 4$

EQUATION $y = 4x - 3$

67

y INTEREPT $(0, -3)$. x INTERCEPT $(-\frac{3}{4}, 0)$

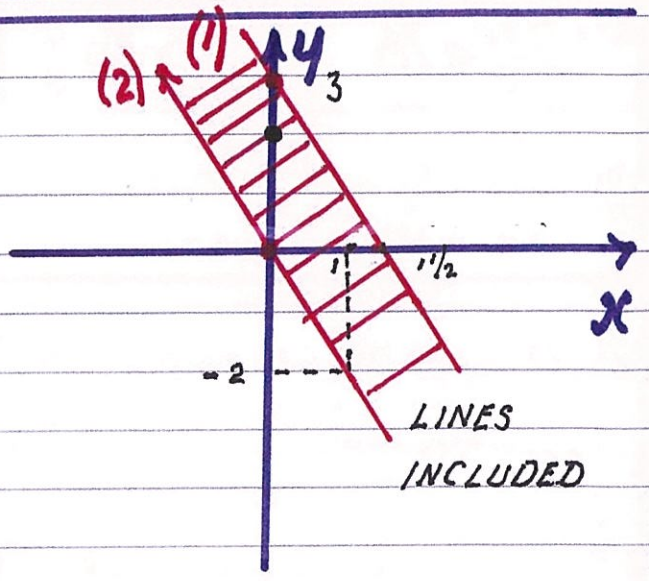
69

(1) $2x + y = 3$

$y = -2x + 3$

(2) $2x + y = 0$

$y = -2x$



TEST $(0, 2)$ ✓

ANSWERS

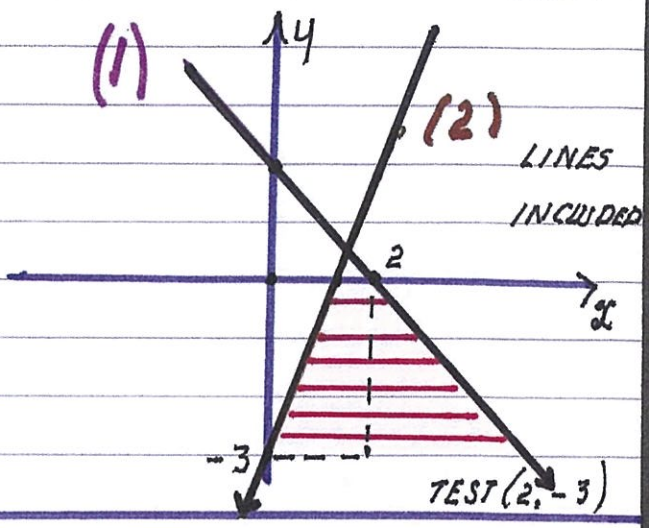
70

(1) $x+y \leq 2$

$y \leq -x+2$

(2) $2x-y \geq 3$

$y \geq 2x-3$

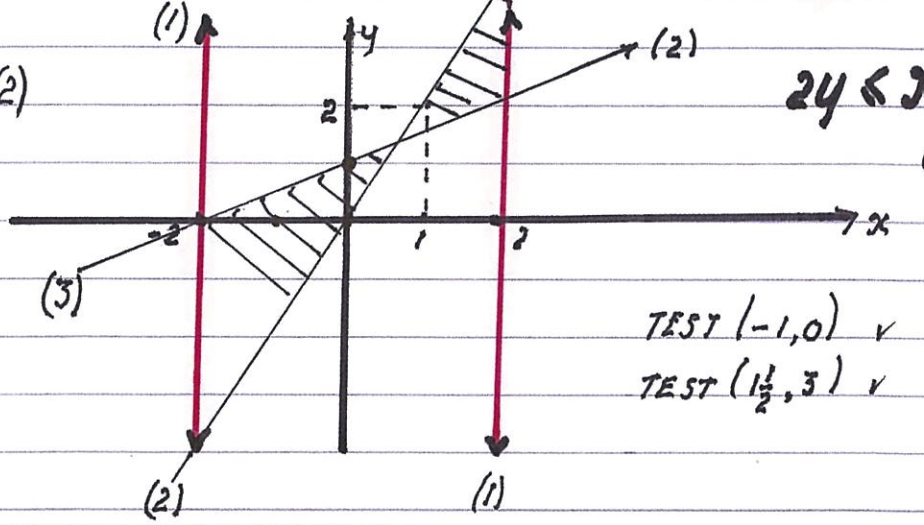


70 ABSOLUTE VALUE SYMBOL → (1) $|x| \leq 2$

x IS 2 OR LESSTHAN 2 FROM ZERO

$y \geq 2x$ (2)

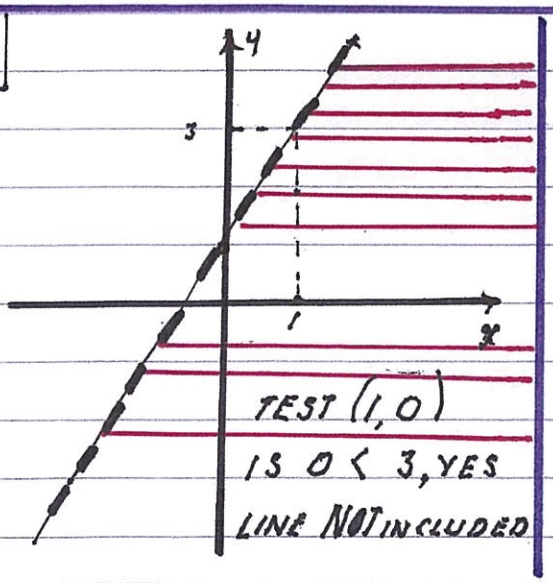
$2y \leq x+2$ (3)



TEST (-1, 0) ✓

TEST $(1\frac{1}{2}, 3)$ ✓

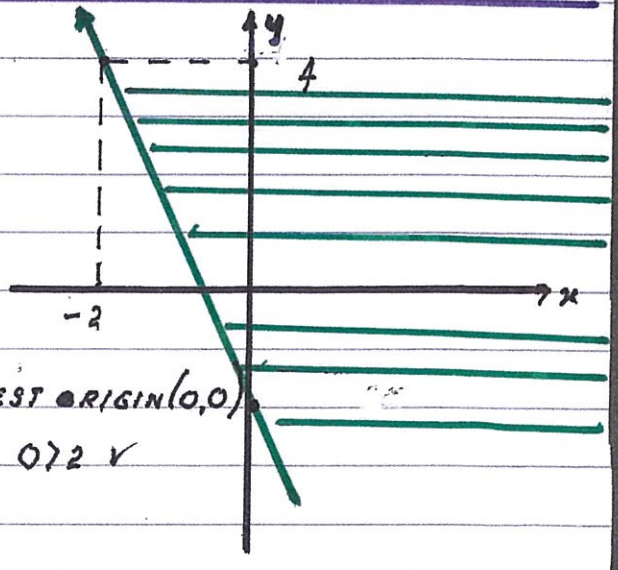
71



TEST (1, 0)

IS 0 < 3, YES

LINE NOT INCLUDED

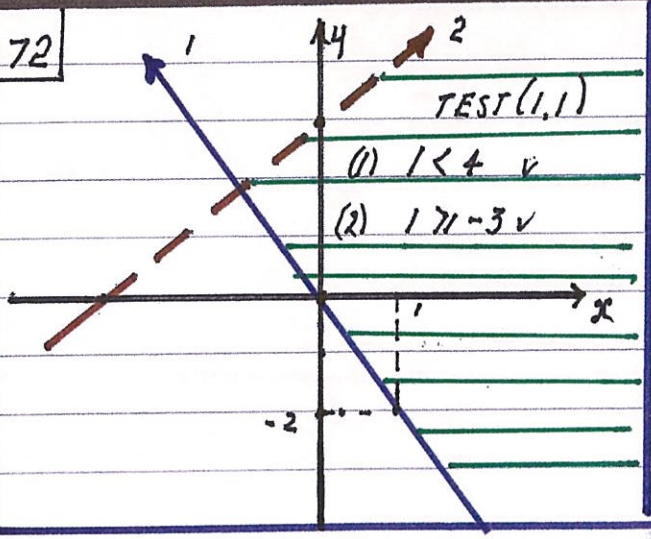


TEST ORIGIN (0, 0)

0 > 2 ✓

ANSWERS

72

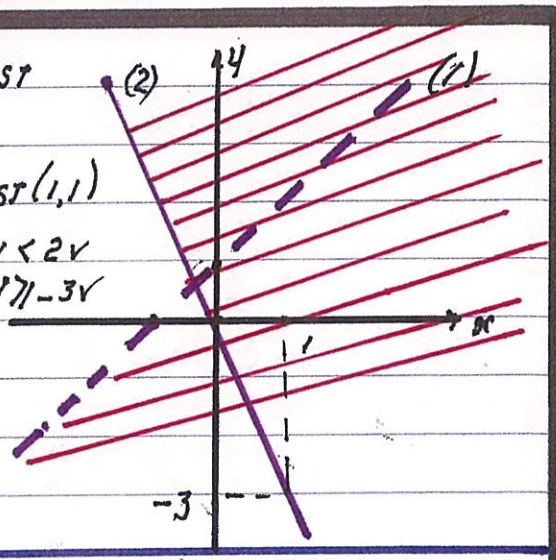


TEST

TEST (1,1)

(1) $1 < 2$ ✓

(2) $1 \geqslant -3$ ✓



79

$\sin\alpha = \frac{3}{7} = \ldots$ INV SIN

$\cos\alpha = \frac{7}{9} = \ldots$ INV COS

$\tan\alpha = \frac{5}{9} = \ldots$ INV TAN

80

$\sin 40^\circ = \frac{x}{12}$ $\quad x = 12 \sin 40^\circ$

$\cos 50^\circ = \frac{x}{13}$ $\quad x = 13 \cos 50^\circ$

$\tan 52^\circ = \frac{x}{7}$ $\quad x = 7 \tan 52$

81

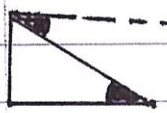
$\sin 40^\circ = \frac{9}{x}$ $\quad x = 9 \div \sin 40^\circ$

$\cos 50^\circ = \frac{6}{x}$ $\quad x = 6 \div \cos 50^\circ$

$\tan 35^\circ = \frac{10}{x}$ $\quad x = 10 \div \tan 35$

82

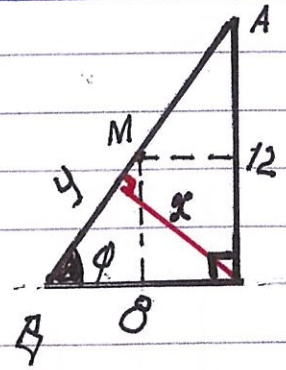
$\tan 40^\circ = \frac{150}{x}$ $\quad x = 150 \div \tan 40$



ALTERNATE

$\tan 37^\circ = \frac{x}{10}$ $\quad x = 10 \tan 37^\circ$

84



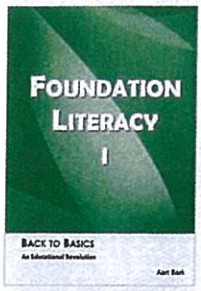
MIDPOINT (1, 1)

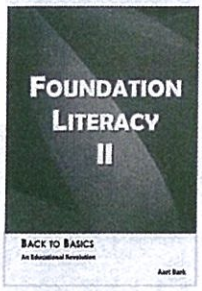
$y = \sqrt{208}$

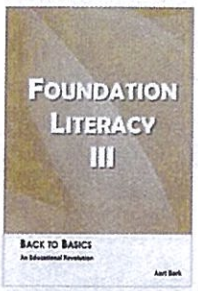
$\tan\varphi = \frac{3}{2} = \ldots$ INV TAN

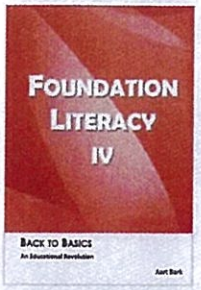
$\varphi =$

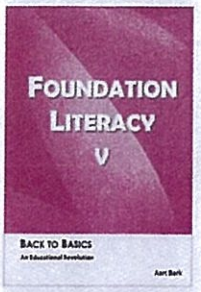
$\sin\varphi = \frac{x}{8} \therefore x = 8 \sin\varphi$

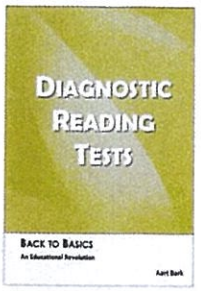


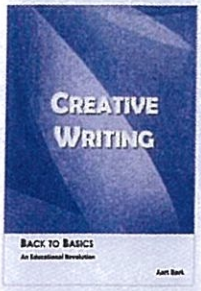


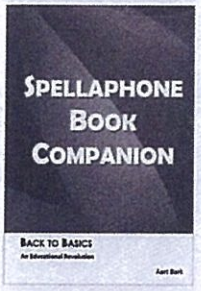


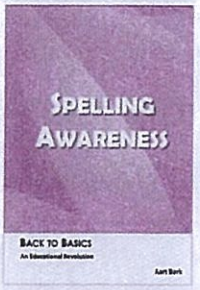


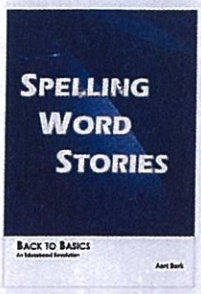


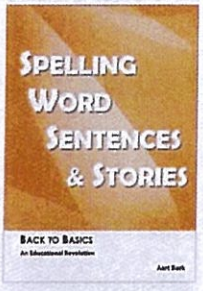


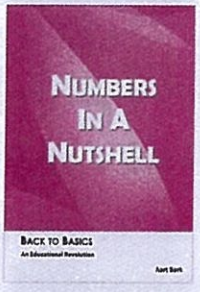










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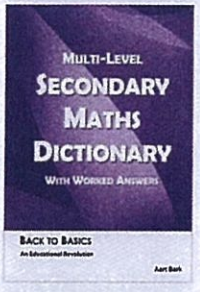

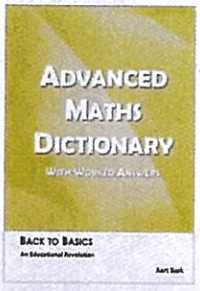

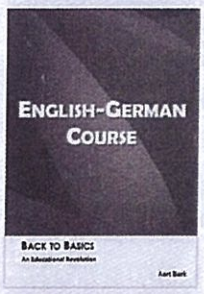

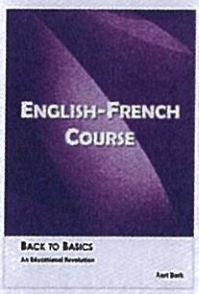

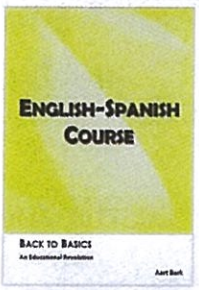

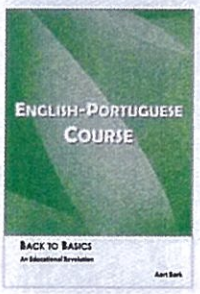

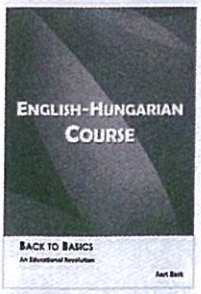

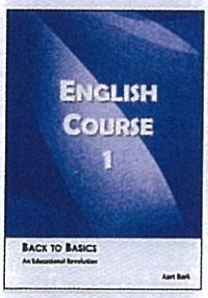

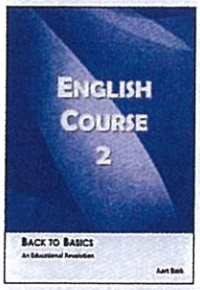

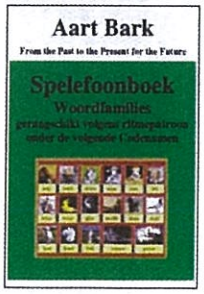

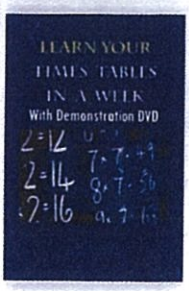

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